Edited by Andreas Schroeter and Annemarie Käsbohrer

German antimicrobial resistance situation in the food chain – DARLink

Salmonella 2000–2008

Authors:
Andreas Schroeter
Bernd-Alois Tenhagen
Kirsten Heckenbach
Beatriz Guerra
Reiner Helmuth
Janine Beutlich
Andreas Hensel
Bernd Appel
Annemarie Käsbohrer

Acknowledgement:
We wish to thank everybody who submitted *Salmonella* isolates, especially the regional laboratories of the federal states. We would also like to thank them for the years of good cooperation. We wish to extend our particular thanks also to the technical staff in the different areas of the BfR. Without their excellent support, this report would not have been possible.

Imprint

BfR Wissenschaft

Edited by A. Schroeter, A. Käsbohrer

German antimicrobial resistance situation
in the food chain – DARLink

Federal Institute for Risk Assessment
Division Press, Public Relations, Risk Communication
Thielallee 88–92
14195 Berlin

Berlin 2011 (BfR-Wissenschaft 03/2011)
339 pages, 68 figures, 237 tables
€ 20,-

Cover design: VK & K Werbeagentur GmbH & Co. KG
Print: Bloch & Partner x-media GmbH

ISBN 3-938163-79-8
ISSN 1614-3795 (Print), 1614-3841 (Online)

Contents

Please note, that in all tables decimal points are given by a comma (,) instead of a dot (.)

1 Abstract

The aim of this report is to give an overview on the results of antimicrobial resistance testing with 33,625 *Salmonella enterica subsp. enterica* isolates that have been submitted for diagnostic purposes to the Federal Institute for Health Protection of Consumers and Veterinary Medicine (BgVV) or its successor, the Federal Institute for Risk Assessment (BfR), respectively, between 2000 and 2008. The isolates originated from animals, food and feeding stuffs as well as from the environment and were submitted from all federal states. All isolates were tested for their susceptibility against a defined panel of antimicrobial substances using the broth microdilution method. The determined minimum inhibitory concentrations were evaluated based on epidemiological cut-off values. These values were taken from the Commission Decision 2007/407/EC as well as from publications of the European Committee on Antimicrobial Susceptibility Testing (EUCAST, www.eucast.org). These cut-off values allow to assess whether the isolates differ from wild-type populations of this pathogen regarding their antimicrobial resistance and therefore give early evidence of resistance development.

The major proportion of the isolates originated from animals (17,635; 52.4 %) and from food (10,853; 32.3 %). Additionally, a considerable number of isolates from feeding stuffs (2710; 8.1 %) and environmental specimens (2427; 7.2 %) was available for testing as well.

Altogether, more than 340 different *Salmonella* serovars were identified according to Kauffmann-White-Le Minor, as well as there were isolates for which complete serological typing could not be achieved. The serovars submitted most often were *S*. Typhimurium (35.3 % of all isolates) and *S*. Enteritidis (11.6 % of all isolates). These two serovars are also the most frequently detected serovars in human *Salmonella* infections throughout Germany and Europe. All other serovars or types represented a proportion of 3 % or less of all examined isolates, respectively.

Of the 33,625 isolates, 48.4 % were resistant to at least one and 35.0 % even resistant to more than one class of antimicrobials. Regarding the single antimicrobial resistance situation, the highest resistance rate (40.6 %) was observed with sulfamethoxazole. Almost 30 % (29.8 %) of the isolates were resistant to tetracycline. Resistance to ampicillin was common as well (28.2 %), and as many as 26.4 % of the isolates were resistant to amoxicilin/clavulanic acid. Resistance rates to the aminoglycosides streptomycin and spectinomycin were about 25 % (27.3 % and 23.1 %), whereas resistance rates to the other active substances of this class of antimicrobials were less than 5 %. While the resistance rates to nalidixic acid and ciprofloxacin were 7.2 % and 7.7 %, respectively, to date only a few isolates (0.4 % to 1.1 %) with resistance to one of the tested third generation cephalosporins have been observed.

Between the different origins and serovars, there were significant differences in the resistance to the tested antimicrobial agents. In addition, the different serovars were submitted with varying frequency in the respective categories of origin, therefore these factors influence the level of resistance significantly in the various sources of origin.

In general, isolates from animals and food showed higher resistance rates to most of the antimicrobial substances than those from the environment and feeding stuffs.

The resistance rates of the most common serovars showed great differences. While in *S*. Typhimurium, *S*. Paratyphi B dT+, *S*. Saintpaul and the monophasic serovar *S*. 4,[5],12:i:- resistances to single antimicrobial substances as well as multiple resistances were very common (>50 %), the majority (≥70 %) of isolates of *S*. Agona, *S*. Enteritidis, *S*. Mbandaka, *S*. Tennessee, *S*. Virchow and the subspecies IIIb and IV was susceptible to all tested antimicrobial classes.

More than two thirds of the isolates of the most frequently submitted serovar from animals, food and the environment, *S.* Typhimurium, were resistant to at least one active substance. Most of the isolates were even resistant to more than one class of antimicrobials, with resistances to sulfonamides, tetracyclines, aminoglycosides, phenicols and aminopenicillins being the most frequent ones.

Only a small proportion of isolates of the monophasic variant *S*. 4,[5],12:i:-, which is closely related to *S*. Typhimurium, was susceptible to all tested antimicrobials. More than 80 % of the isolates showed resistance to more than one class of antimicrobials. In serovar *S*. Typhimurium, similar resistance rates were observed. However, *S*. 4,[5],12:i:- showed significantly less frequent resistance to spectinomycin and phenicols.

Regardless of their origin, more than 80 % of the *S*. Enteritidis isolates were susceptible to all tested active substances. In some isolates (ca. 3 %), resistance to more than one class of antimicrobials was observed. Most common was resistance to sulfonamides.

In general, no particular trend could be noticed regarding the resistance situation during the period of investigation, but there were different trends with regard to both the proportion of serovars in the different categories of origin and the resistance development in the various serovars to different antimicrobial classes.

Third and fourth generation fluoroquinolones and cephalosporins are especially important, as they have been classified by the WHO as antimicrobials of particular importance in human medicine.

Resistances to quinolones and fluoroquinolones have been observed with varying incidence in isolates of different origins as well as in the proven serovars. In isolates from feeding stuffs they were less common (1.2 %) than in isolates from the environment (4.8 % resp. 5.1 %), from animals (6.5 % resp. 7.0 %), and especially from food (10.4 % resp. 10.9 %).

In most of the serovars, resistances to quinolones and fluoroquinolones have been observed. Remarkably high resistance rates (60% to 85 %) were present in *S*. Paratyphi B dT+ (chicken/chicken meat), *S*. Saintpaul (turkey/turkey meat) and *S*. Virchow (chicken/chicken meat).

Resistance to third generation cephalosporins was tested with the active substance ceftiofur between 2000 and 2007. On the whole, resistance rates were low compared with other substances (1.1 %), however, in some serovars the rates were significantly above average. Isolates from the environment and from feeding stuffs showed resistance to ceftiofur only in five or six cases, respectively (0.2 % each).

Resistance to ceftiofur was found most often in *S*. Agona from animals (6.9 %), *S*. Paratyphi B dT+ from food (6.2 %), and *S*. Saintpaul from various origins (9.1 %–24.1 %). Re-sistances to cefotaxim and ceftazidim, which have been tested since 2008, occurred especially in *S*. Anatum from animals (3.2 % each) and more often in *S*. Paratyphi B dT+ from animals and from food (13.3 % or 15.4 %, respectively).

Altogether, these investigations gave heterogeneous results regarding the antimicrobial resistance situation in *Salmonella* and revealed significant differences both between different serovars and different origins. Almost 50 % of the *Salmonella* isolates were re-sistant and 35 % even multiresistant. However, of particular concern is the fact that in isolates from livestock and from food higher rates of resistance have been proven. For example, 74 % of all isolates from pigs and 72 % of the isolates from turkey meat were multiresistant. These isolates from the food chain expose consumers to an increased risk.

Even resistance to antimicrobials that have been classified by the WHO as "critically important" could be detected in isolates of different origins and was extremely common in some serovars. These resistant pathogens themselves as well as the transfer of their resistance to other, especially pathogenic microorganisms are a serious problem in consumer health protection. The present results are the basis for assessment of the associated risks. They also show that continuous monitoring as well as comparing the *Salmonella* resistance situation in the food chain between current and future surveys are necessary. Therefore, this report contributes to the realisation of the German Antimicrobial Resistance Strategy (DART), which should be pursued consistently.

2 Introduction

2.1 Objective

This report gives an overview on the results of resistance testing by the National Reference Laboratory for Salmonella (NRL Salm) and the National Reference Laboratory for Antimicrobial Resistance (NRL AR). For the first time, the situation and development of resistance based on diagnostic isolates are presented in such a comprehensive manner.

The use of antimicrobials in veterinary medicine aims at the cure of animals suffering from infectious diseases and/or the prevention of the spread of infections in animals stocks. This application should be based on information about the susceptibility of the causative pathogen to antimicrobial substances. Thus, the susceptibility should be tested prior to application and the success of treatment should be monitored (German Federal Chamber of Veterinarians, 2000). Based on the results of these investigations, the development of resistance in the patient population can be monitored and the therapy may be adjusted as appropriate.

The monitoring of resistance development includes various objectives:

- On the one hand, therapy of animals suffering from diseases with effective drugs should be ensured. Prior to treatment it should therefore be determined, to which active substances the causative agent is susceptible. As it is often not possible to await the laboratory test results, in acute and severe infections treatment is started, before the test result is available. In this case, the test result can be used to support a change of therapy which may be necessary. Furthermore, the test result provides important information about the general situation in the livestock and will support future therapeutic decisions.

- Monitoring of resistance in zoonotic pathogens and commensals serves mainly for protection of consumers against resistant pathogens. In particular, early detection of resistance development trends should be supported and emerging resistances should be detected. This is of special interest, as active substances of the same class or with the same mechanism of action are often used both in human and veterinary medicine. Emergence and spread of resistance to these antimicrobial substances can impair or impede the therapy of human infections. Both zoonotic pathogens, which can cause infections in humans, as well as actually harmless so-called commensal microorganisms can contribute to this spread of resistance. Like zoonotic pathogens, the latter can acquire resistance genes and transfer them to other bacteria that might be dangerous for humans.

For these two different concerns, different assessment criteria are applied as well. For monitoring effective treatment of infectious agents in animals, isolates from clinical settings are investigated with “clinical breakpoints” applied as assessment criteria in order to predict the expected success of treatment. However, to monitor the resistance situation with respect to public health, zoonotic pathogens and commensals are investigated and assessed by an “epidemiological cut-off value”. These cut-off values allow to assess whether the isolates differ from wild-type populations of this pathogen regarding their antimicrobial resistance. The wild-type population is defined as strains with similar susceptibility and no evidence of developing resistance.

The objective of this first overview on nine years of resistance testing at the BfR or BgVV, respectively, is to assess all test results retrospectively by epidemiological cut-off values and to provide this analysis to a wide readership.

Extracts of the findings have been published or reported already in different ways. For this, a clinical breakpoint has been used so far. The aim is therefore to create a reference document that interest groups and the BfR itself can refer to in future reports and analyses.

The present report is initially limited to the findings in the examination of the genus *Salmonella*, which has been the main pathogen causing food-borne zoonotic infections in humans for years. In future reports, results of resistance monitoring of other zoonotic pathogens and commensals will be presented, too, and development trends will be demonstrated.

2.2 Concept of antimicrobial resistance monitoring

Already in 2005, the BfR has created a comprehensive concept for resistance monitoring, which since then is being gradually implemented. In a first step, isolates from three origins will be included in the monitoring:

(1) representative isolates from food-producing animals
(2) representative isolates from food of animal origin
(3) clinical isolates from food-producing animals

These three pillars will be complemented in an expanded analysis by isolates from the environment, from feeding stuffs and from food of plant origin.

Of special importance is the resistance development in zoonotic pathogens in pigs, cattle and poultry. The Directive 2003/99/EC requires to record resistances of zoonotic pathogens in the regarding animal species in different production systems as well as in different poultry species, namely chicken and turkey.

The implementation of the monitoring programme is limited due to limited resources of the parties concerned and the comprehensive requirements regarding sampling and analysis. Therefore, existing structures and results have been used extensively, and the programmes were implemented successively.

- In an initial step, diagnostic submissions from the investigation facilities were analysed. The following has to be considered here:
    - different reasons for investigation,
    - different causes for submitting isolates.

  It is expected that on the one hand especially *S*. Enteritidis und *S*. Typhimurium have been submitted for phage typing, and on the other hand difficult isolates have been sent in for serotyping.

- Gradually, the conduction of representative studies on the incidence of *Salmonella* in Germany has been started. So far, the following studies have been carried out that can be used for resistance monitoring as well:
    - Baseline studies carried out at EU-level
    - *Salmonella* control programmes
    - Zoonosis sampling plan according to the general administrative regulation on zoonoses in the food chain (AVV Zoonosen Lebensmittelkette)

In this initial overarching report, the results of the diagnostic submissions to the NRL Salm are presented. In the next report, these results will be compared with the isolates from the studies.

The present findings of the investigation were gained within official tasks and were funded from BfR resources. The NRL Salm was responsible for confirming the *Salmonella* isolates and for phenotypic characterisation. Resistance testing was performed at the NRL Salm and, after establishing the NRL AR, continued and evaluated in close cooperation with the NRL Salm.

It was possible to establish this extensive strain collection because of the very good cooperation with the investigation facilities of the federal states as well as with universities and private laboratories.

3 Material and methods

3.1 Samples

Out of the diagnostic *Salmonella* submissions to the National Reference Laboratory for analyses and testing for zoonoses (*Salmonella*) between 2000 and 2008 at the BfR (NRL Salm), 33,625 isolates from animals, food, feeding stuffs and from the environment were included in the evaluation. Isolates originated mainly from investigation facilities of the federal states, but also from universities, zoological gardens and private submitters, and were not taken as part of a sampling plan. Serological differentiation of the *Salmonella* isolates was performed according to White/Kauffmann/Le Minor (2007) or earlier versions, respectively.

3.2 Categorisation of the isolates by origin

Together with the isolates forms that included information about the isolate origin were submitted. Isolates from the main categories animals, food, feeding stuffs and environment were included in the analysis for this report.

Chapter 4 contains an overview on the evaluation of all isolates from food, feeding stuffs and the environment together with data from all animal-derived isolates.

However, the specific chapter about isolates from animals (chapter 5) includes a detailed analysis by livestock species, i.e. cattle, pig, chicken and turkey.

Regarding food isolates (chapter 6), isolates from meat (all livestock species) and especially from minced meat as well as pork, chicken meat and turkey meat were evaluated.

3.3 Determination of the minimum inhibitory concentration

The resistance situation is presented for the entire period of nine years (2000–2008), but also separately for each year in order to reveal potential development trends.

The minimum inhibitory concentration (MIC) of 33,625 *Salmonella* isolates was determined by the broth microdilution method (NCCLS 2000/CLSI 2009). For this, ready-to-use microtiter plates (TREK Diagnostics Ltd., UK) were used. From 2000 to 2007, the microtiter plate NLMV1A with 17 antimicrobials was used. Because of coordination at European level, since 2008, the microplate EUMVS with 14 antimicrobials has been used. Thus, data for certain antimicrobials are only available for the period from 2000 to 2007 or for 2008, respectively (table 3.1).

Dispensing, incubation and reading of the microtiter plates as well as compliance with the quality standards was performed according to NCCLS/CLSI guidelines (M07-A5/M07-A8) and information from TREK Diagnostics Ltd, respectively. *Escherichia coli* strains ATCC 25922 and ATCC 35218 were used as reference strains.

3.4 Evaluation of the minimum inhibitory concentration

Evaluation of the results was performed according to the cut-off values set in Decision 2007/407/EC. These cut-off values are mainly based on the cut-off values set by the European Committee of Antimicrobial Susceptibility Testing (EUCAST) and the recommendations of the European Food Safety Authority (EFSA). In case there was no cut-off value set in the

Commission Decision for a tested active substance, the epidemiological cut-off values defined by EUCAST (www.eucast.org) were used. For three of the tested substances (kanamycin, spectinomycin and amoxicillin/clavulanic acid), epidemiological cut-off values regarding *Salmonella* spp. were not available. In these cases, the epidemiological cut-off values for *Escherichia coli* or *Salmonella Enteritidis*, were used.

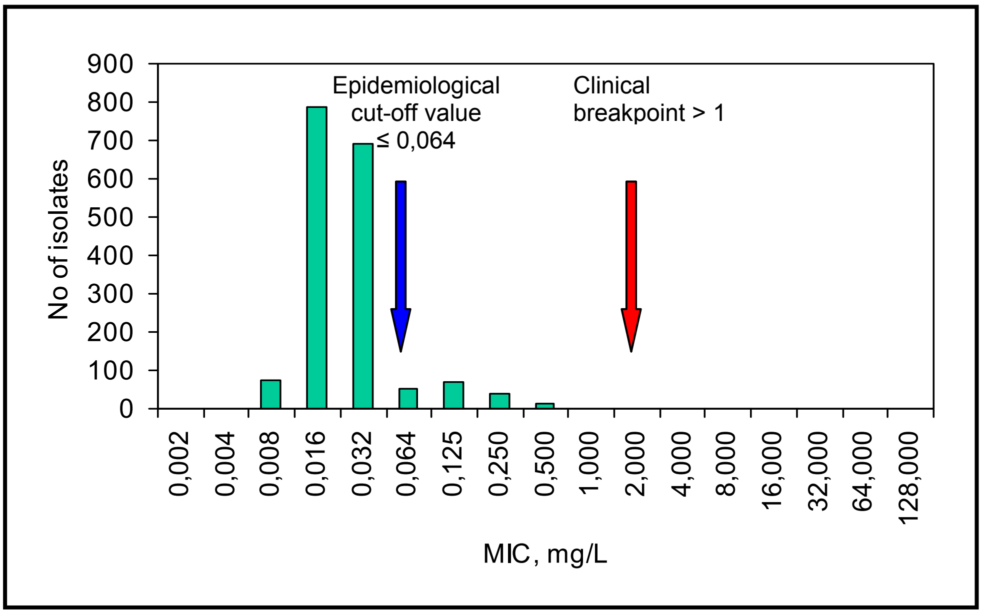
The principle of epidemiologic cut-off values is based on the assumption that in each bacterial species there is a wild-type population without any acquired resistance mechanisms to antimicrobial substances. Therefore, the epidemiological cut-off value is distinguished from the clinical breakpoint, which relates directly to the treatability of the pathogen and therefore takes into account pharmacodynamic and pharmakokinetic aspects as well as specific characteristics of host and target organ.

The advantage of the epidemiological cut-off value is its higher sensitivity towards a possible resistance development. Every MIC value above the cut-off value indicates resistance development, even if this is not necessarily associated yet with direct consequences on the treatability of an infection. In contrast, the clinical breakpoint only classifies a pathogen as resistant, if effective treatment of an infection becomes unlikely due to an elevated MIC value.

Using the example of the fluoroquinolone ciprofloxacin, figure 3.1 shows the difference between the epidemiological cut-off value and the clinical breakpoint. The MIC value distribution often shows two peaks. The left peak represents the pathogen's wild-type population (here: *Salmonella* spp.). At the concentration where it ends (in this case at 0.064), the epidemiologic cut-off value is set. Isolates with MIC values above the epidemiological cut-off value differ from the pathogen's wild-type population and therefore have to be rated as resistant (www.eucast.org).

The clinical breakpoint is set based on complex considerations with a focus on the treatability of infections. The clinical breakpoint is often significantly above the epidemiological cut-off value. Effective treatment of infections caused by pathogens with MIC values above this breakpoint is usually not possible any more with the respective antimicrobial substance.

Fig. 3.1: Epidemological cut-off value and clinical breakpoint for ciprofloxacin in *Salmonella* spp. (www.eucast.org)



Tab. 3.1: Antimicrobial substances used for testing, test ranges and evaluation criteria (As of 15.03.2010)

Antimicrobial class	Antimicrobial substance	Epidemiological cut-off value ≤	Test range		Evaluation criterion
			Minimum	Maximum	
		mg/L	mg/L	mg/L	
Aminoglycosides	Gentamicin	2	0,25[2] (1[1])	32	2007/407/EC
	Neomycin[1]	4	2	32	EUCAST
	Kanamycin	8	4	128[2] (64[1])	EUCAST[a]
	Spectinomycin[1]	64	2	128	EUCAST[a]
	Streptomycin	32	2[2] (4[1])	128[2] (64[1])	2007/407/EC
Amphenicoles	Chloramphenicol	16	2	64	2007/407/EC
	Florfenicol	16	2	64	EUCAST
Cephalosporins	Cefotaxime[2]	0,5	0,06	4	2007/407/EC
	Ceftazidime[2]	2	0,25	16	EUCAST
	Ceftiofur[1]	2	0,5	8	EUCAST
(Fluoro-)quinolones	Nalidixic acid	16	4	64[2] (128[1])	2007/407/EC
	Ciprofloxacin	0,06	0,008[2] (0,03[1])	4[1] (8[2])	2007/407/EC
Aminopenicillins	Amoxicillin /Clavulanic acid[1d]	4	2/1	32/16	EUCAST
	Ampicillin	4	0,5[2] (1[1])	32	2007/407/EC
Polymyxins	Colistin[b]	2	4[1] (8[2])	16[2] (64[1])	EUCAST
Folatsyntheses-inhibitors	Sulfamethoxazole	256	8[2] (32[1])	512[1] (1024[2])	2007/407/EC
	Trimethoprim[c]	2	0,5[2] (4[1])	32	2007/407/EC
Tetracyclines	Tetracycline	8	1[2] (2[1])	32[2] (64[1])	2007/407/EC

[a] EUCAST did not provide an epidemiological cut-off value for *Salmonella* spp. (05.07.2010). Therefore the epidemiological cut-off value for *E. coli* was applied.

[b] The current epidemiological cut-off value is outside the test range (NLMV1A, EUMVS), therefore no evaluation was carried out.

[c] The cut-off value defined by Commission Decision 2007/407/EC is outside the test range applied from 2000 to 2007 (NLMV1A). Therefore only MIC from 2007 and 2008 were evaluated.

[d] The epidemiological cut-off value for *Salmonella* Enteritidis was applied as currently there is no established cut-off value for *Salmonella* spp. (05.07.2010).

[1] Tested from 2000 to 2007

[2] Only tested in 2008

3.5 Definitions

An isolate was characterised as susceptible if its minimum inhibitory concentration (MIC) was less than or equal to the applied epidemiological cut-off value.

An isolate was characterised as resistant if its minimum inhibitory concentration (MIC) was greater than the applied epidemiological cut-off value.

An isolate was characterised as multiresistant if it was resistant to more than one class of antimicrobials.

4 On the antimicrobial resistance situation of *Salmonella* isolates

4.1 Overview on the investigated isolates

4.1.1 Serovars in total

At first, a general overview on the available isolates is presented. A total of 33,625 *Salmonella* isolates was tested for resistance to antimicrobials in the period between 2000 and 2008 and considered in this report. For further analysis, the isolates were classified into the categories environment, feeding stuffs, animals and food according to information given by the submitters.

The main proportion of the isolates originated from animals (17,635; 52.4 %) and from food (10,853; 32.3 %). Additionally, a considerable number of isolates from feeding stuffs (2710; 8.1 %) and environmental specimens (2427; 7.2 %) was available for testing (table 4.1.). Additional data is listed in the appendix in table 13.1.

More than 340 different serovars were identified as well as some types for which complete typing was not possible. Table 4.1 shows the 20 most common serovars each in the environment, feeding stuffs, animals and food as well as in the total collective.

The serovars tested most often for resistance were *S*. Typhimurium (35.3 % of all isolates) and *S*. Enteritidis (11.6 % of all isolates). These two serovars are also the most frequently detected serovars in human *Salmonella* infections throughout Germany (RKI) and Europe (EFSA-CSR). All other serovars or types represented a proportion of 3 % or less of all examined isolates each, respectively.

The different serovars occurred with varying frequency in animals, food, feeding stuffs and the environment. Figure 4.1 shows the ten most frequent serovars and summarises the percen-tage of the rest of the serovars in the group “other serovars” by group of origin. This group included 30 % of the isolates from animals and food, while it accounted for 40 % of the isolates from the environment and 64 % from feeding stuffs. This emphasises the great diversity of the isolates available from feeding stuffs and the environment.

Figure 4.2 shows the percentage of the ten most common serovars in each year. It is obvious that the distribution of the available serovars differs between the years.

Because the extent of the resistance depends on the serovar and on the origin of the isolate, in the following, the occurence of the most common serovars was analysed separately by origin as well.

A detailed presentation of *Salmonella* MIC values and of the most common serovars and origins is provided in the appendix.

Tab. 4.1: Share of the 20 most frequent serovars in the four major source groups environment, feeding stuffs, animals and food and in the total for each serovar (2000–2008)

	Proportion (%) of all isolates by origin					Number
	Total	Environment	Feeding stuffs	Animals	Food	Total
Number of isolates	**33.625**	**2427**	**2710**	**17.635**	**10.853**	**33.625**
S. Typhimurium	35,3	22,6	5,8	43,7	31,9	11.877
S. Enteritidis	11,6	12,4	0,4	9,4	17,8	3905
S. 4,[5],12:i:-	3,0	2,3	0,6	2,9	3,9	1012
S. Infantis	3,0	5,2	1,3	2,4	3,9	998
S. Derby	2,6	2,1	2,1	1,9	4,0	883
S. Paratyphi B dT+	2,5	2,0	0,2	1,5	4,8	835
S. 4,12:d:-	2,5	3,2	1,4	3,2	1,4	824
S. Anatum	2,3	2,9	9,9	1,7	1,2	764
S. Subspec. I rough	2,1	2,0	0,6	1,9	3,0	714
S. Senftenberg	2,1	5,3	13,7	0,8	0,6	706
S. Livingstone	1,9	8,4	3,4	1,5	0,9	647
S. Subspec. IIIb	1,8	0,2	0,1	3,4	0,1	617
S. Saintpaul	1,8	1,0	0,4	1,9	2,2	607
S. Mbandaka	1,2	2,9	5,1	0,6	0,9	408
S. Virchow	1,1	3,6	0,2	1,1	0,8	377
S. Agona	1,1	1,2	4,4	0,5	1,2	373
S. Indiana	1,1	0,6	0,1	1,0	1,5	364
S. Subspec. IV	1,1	0,0	0,0	2,0	0,0	360
S. London	1,0	1,0	0,3	1,0	1,1	332
S. Tennessee	1,0	1,2	8,5	0,3	0,1	332
S. Heidelberg	0,9	0,2	0,0	1,2	0,9	307
S. Hadar	0,9	0,5	0,0	0,6	1,7	300
S. Ohio	0,8	1,1	4,4	0,3	0,6	266
S. Kottbus	0,7	0,8	0,0	0,9	0,5	243
S. Bovismorbificans	0,7	0,4	0,0	0,4	1,4	227
S. Oranienburg	0,7	0,5	2,5	0,4	0,7	221
S. Subspec. II	0,7	0,2	0,0	1,1	0,2	220
S. Montevideo	0,6	0,9	3,2	0,4	0,2	201
S. Subspec. IIIa	0,5	0,0	0,0	1,0	0,0	181
S. Brandenburg	0,5	0,2	0,1	0,3	1,0	171
S. Cerro	0,5	0,5	3,6	0,1	0,2	161
S. Havana	0,4	0,2	3,8	0,1	0,1	138
S. Falkensee	0,2	0,0	2,5	0,0	0,1	80
S. Lexington	0,2	0,1	1,5	0,1	0,1	73
S. Muenster	0,2	0,1	1,5	0,1	0,1	70
S. Albany	0,2	0,3	1,1	0,1	0,1	68
S. Lille	0,1	0,0	1,5	0,0	0,0	45
Other serovars	11,1	14,0	15,7	10,1	10,8	3718

Yellow background: Top 20 of the respective category

Fig. 4.1: Proportions of the ten most frequent serovars among the isolates from the environment, feeding stuffs, animals, food and all sources (2000–2008)

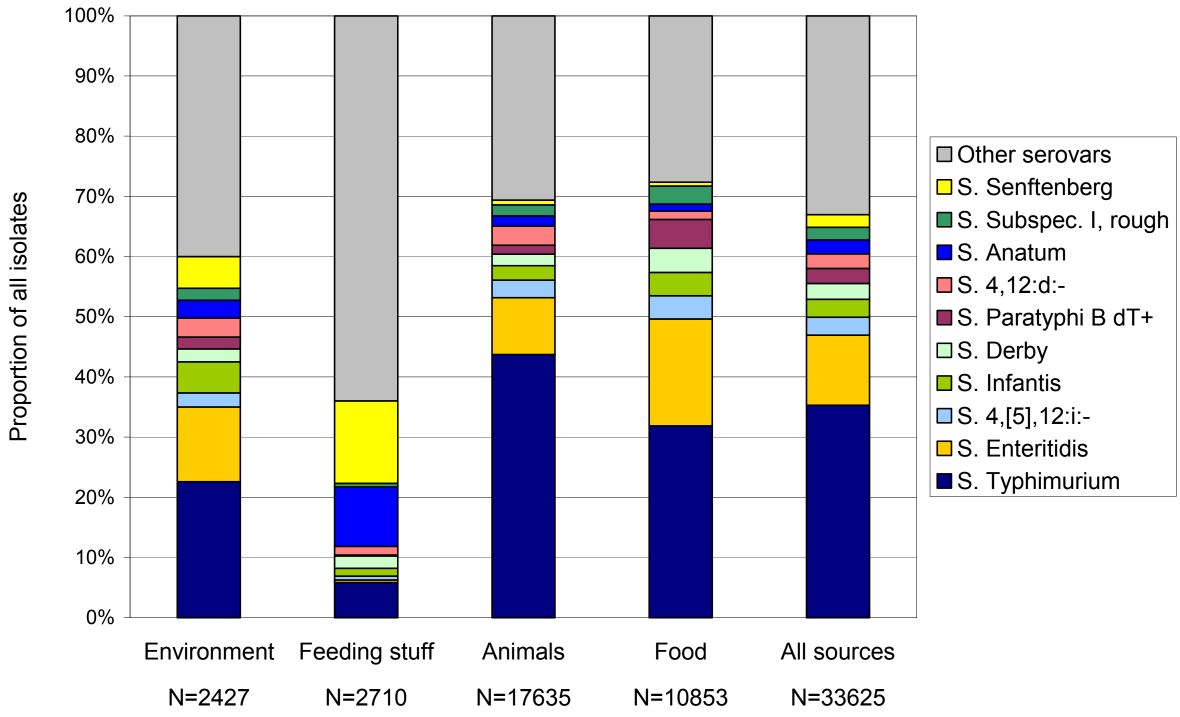
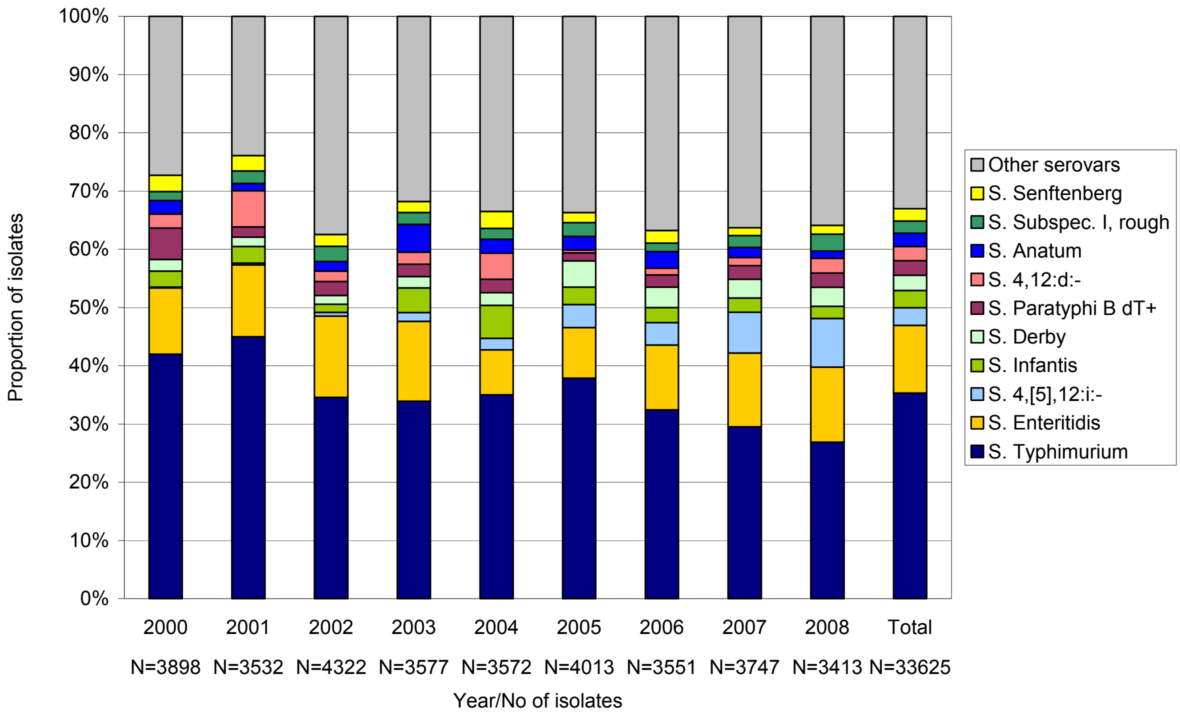


Fig. 4.2: Proportions of the ten most frequent serovars among all isolates from all sources (2000–2008)



4.1.2 Serovars from environmental samples

Typing of 2427 isolates from the environment was performed. The most common serovars were *S.* Typhimurium (22.6 %) and *S.* Enteritidis (12.4 %), followed by *S.* Livingstone (8.4 %), *S.* Senftenberg (5.3 %) and *S.* Infantis (5.2 %) (table 4.1). 17 of the 20 most common serovars in the total collective each accounted for at least 1 % of the isolates from environmental samples. Almost 20 % of the environmental isolates did not belong to any of the most frequent serovars of the total collective.

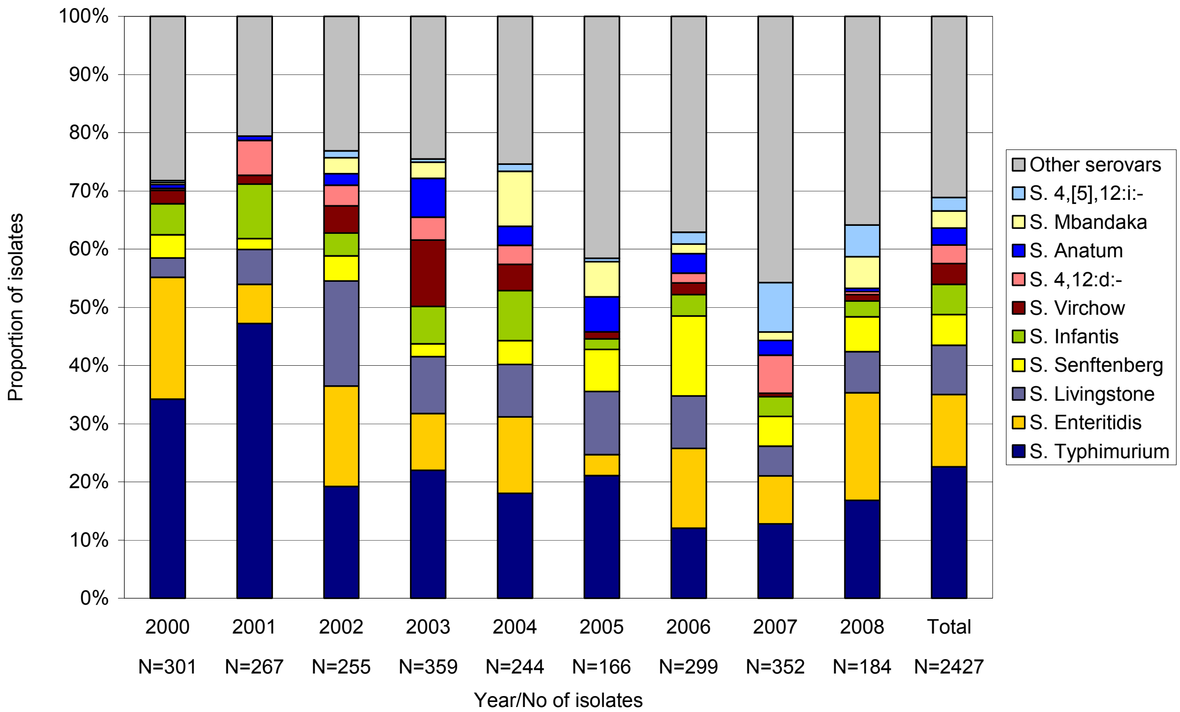
Next to the 20 most common serovars in the total collective, the 20 most common serovars from environmental samples are listed in table 4.1 as well. *S.* Ohio, *S.* Kottbus and *S.* Montevideo were among the 20 most common isolates from environmental samples, with a percentage of 0.8 % to 1.1 % in environmental samples.

The higher proportion of *S.* Livingstone compared with the total collective (8.4 % vs. 1.9 %) is noticeable.

The distribution of the most common serovars from environmental samples between 2000 and 2008 is presented in figure 4.3. Additional detailed data is listed in the appendix in table 13.2.

In 2000 and 2001, a significantly higher proportion of *S.* Typhimurium was investigated than in the following years. In five of the nine years, *S.* Enteritidis accounted for a proportion of more than 10 %. Since 2005, there has been a much higher proportion of other serovars.

Fig. 4.3: Proportions of the ten most frequent serovars among isolates from the environment (2000–2008)



4.1.3 Serovars from feeding stuffs

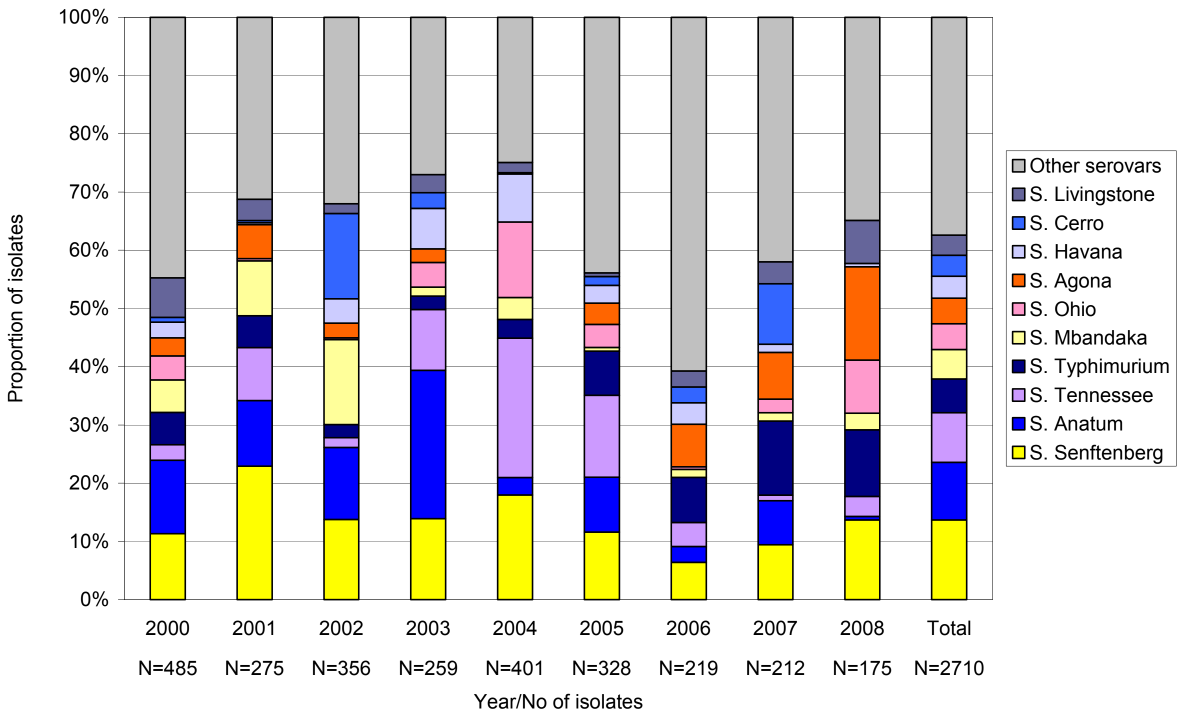
Typing of 2710 isolates from feeding stuffs was performed. Here, the most common serovars were *S.* Senftenberg (13.7 %), *S.* Anatum (9.9 %), *S.* Tennessee (8.5 %), *S.* Typhimurium (5.8 %) and *S.* Mbandaka (5.1 %). *S.* Enteritidis only accounted for 0.4 %. Only ten out of the 20 most common serovars in the total collective each accounted for at least 1 % of the isolates from feeding stuffs. Almost 42 % of the isolates from feeding stuffs did not belong to any of the most frequent serovars of the total collective.

Next to the 20 most common serovars in the total collective, the 20 most common serovars from feeding stuffs are listed in table 4.1 as well. *S.* Ohio, *S.* Havana, *S.* Cerro, *S.* Montevideo, *S.* Falkensee, *S.* Oranienburg, *S.* Lexington, *S.* Muenster, *S.* Lille and *S.* Albany belonged to the 20 most common isolates and reached a percentage of more than 1 % in feeding stuffs.

The distribution of serovars in isolates from feeding stuffs varied considerably between the years of investigation (figure 4.4). For example, S. Senftenberg ranged from 6.4 % to 22.9 %. *S.* Anatum, the most common serovar (25.5 %) in 2003, accounted for only 0.6 % of all isolates from feeding stuffs in 2008. *S.* Agona accounted for 16.0 % in 2008 and ranged from 0 % to 5.8 % between 2000 and 2005.

Detailed data are listed in the appendix in table 13.3.

Fig. 4.4: Proportions of the ten most frequent serovars among isolates from feeding stuffs (2000–2008)



4.1.4 Serovars from animals

Altogether, 17,635 isolates from animals were tested for their resistance characteristics. These isolates included isolates from livestock, domestic animals as well as pets and zoo animals. A detailed review of the serovars from each of the livestock groups can be found in chapter 5.

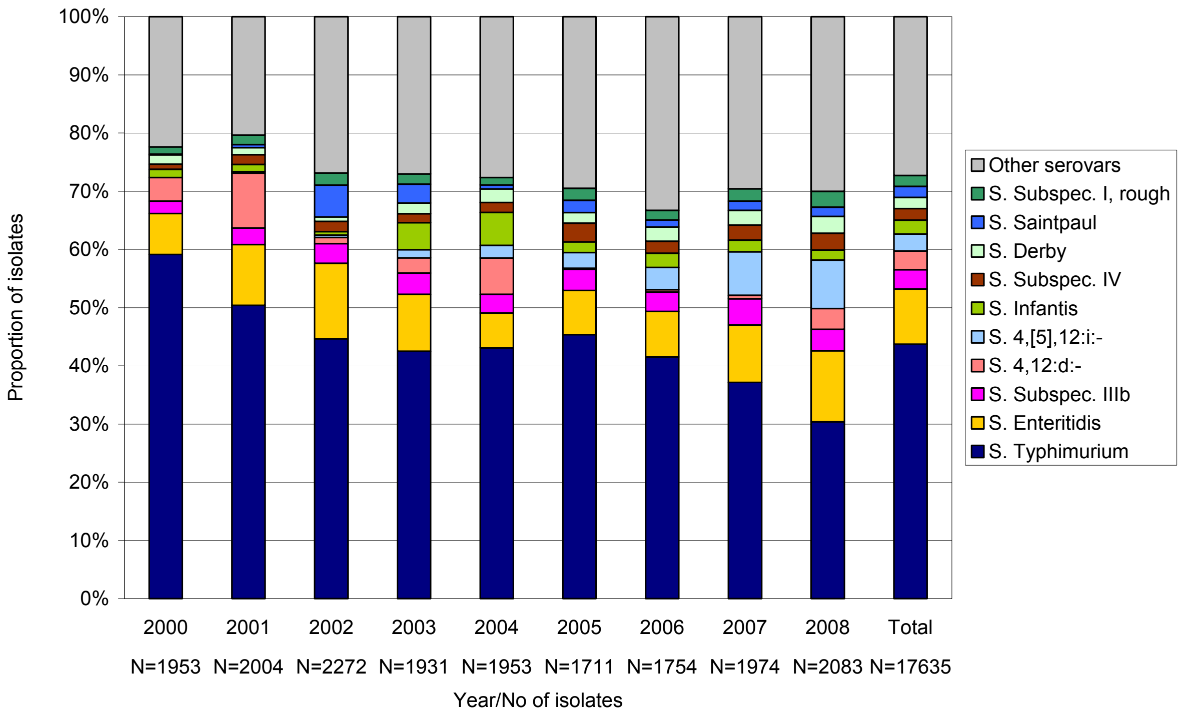
The predominant serovar from animals was *S*. Typhimurium (43.7 %), followed by *S*. Enteritidis with 9.4 % of the isolates (table 4.1). All other serovars accounted for a percentage of less than 5 %. 16 of the 20 most common serovars in the total collective each accounted for at least 1 % of all isolates from animals, 17 % of the isolates from animals did not belong to any of the most frequent serovars of the total collective.

Next to the 20 most common serovars in the total collective, the 20 most common serovars from animals are listed in table 4.1 as well. Compared with the total collective, in this group *S*. Heidelberg, isolates from the subspecies II und IIIa as well as *S*. Kottbus were among the 20 most common serovars from animals and accounted for a proportion of at least 0.9 %.

The proportions of the most common serovars from animals between 2000 and 2008 are presented in figure 4.5. The proportion of *S*. Typhimurium was more than 50 % in 2000 and 2001 and decreased in the following years to a proportion of 30 % in 2008. In comparison, the percentage of the other serovars ranged from 27 % to 33 % between 2002 and 2008. The proportion of *S*. Enteritidis ranged from 6 % to 13 % in this period. While *S*. Saintpaul and *S*. Infantis had proportions of more than 5 % in some years, the monophasic variant S. 4,[5],12:i:- showed a continuous increase. In 2008, this serovar accounted for 8.4 % of all isolates from animals.

Detailed data are listed in the appendix in table 13.4.

Fig. 4.5: Proportions of the ten most frequent serovars among isolates from animals (2000–2008)



4.1.5 Serovars from food

Altogether, 10,853 isolates from food were tested for their resistance characteristics. These isolates originated mainly from food of animal origin. A detailed review of the serovars from selected food groups can be found in chapter 6.

Similar to the situation in animals, the predominant serovar from food was *S*. Typhimurium (31.9 %), followed by *S*. Enteritidis with 17.8 % of the isolates (table 4.1). All other serovars each accounted for a proportion of less than 5 %.

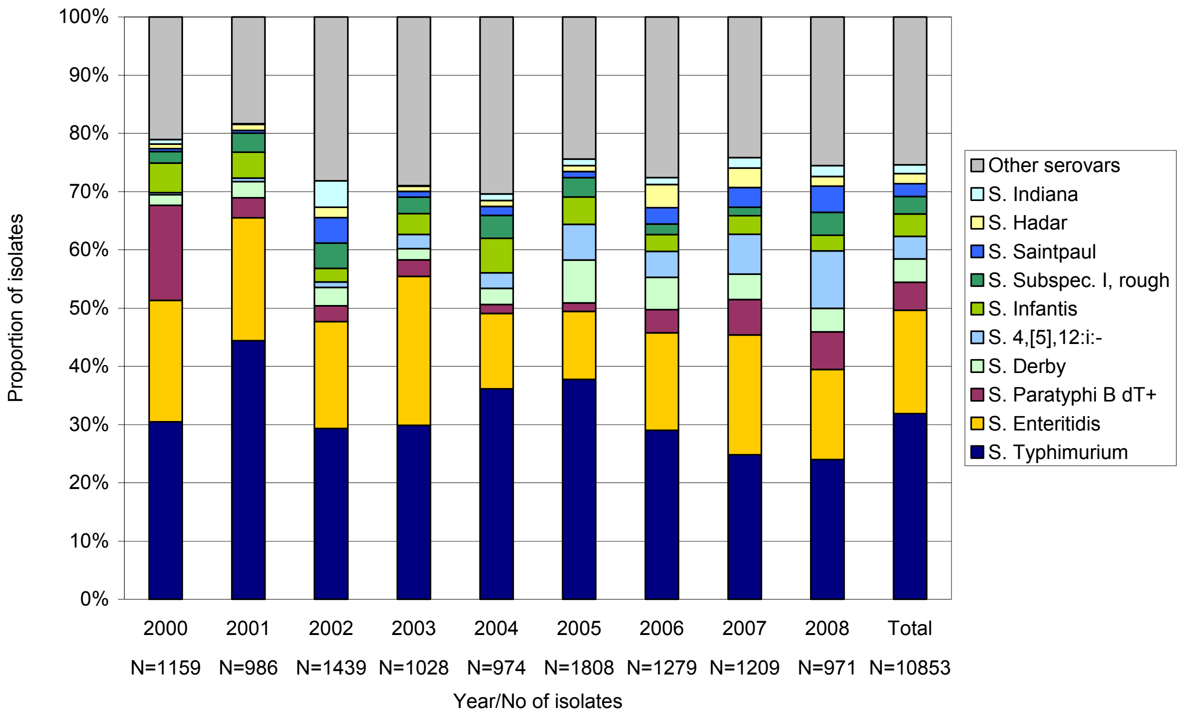
13 of the 20 most common serovars in the total collective each accounted for at least 1 % of all isolates from food; nearly 19 % of the isolates from food did not belong to any of the respective 20 serovars.

Next to the 20 most common serovars in the total collective, the 20 most common serovars from food are listed in table 4.1 as well. Compared with the total collective, in this group *S*. Hadar, *S*. Bovismorbificans as well as *S*. Brandenburg were among the 20 most common serovars from food and accounted for a percentage of at least 1 %.

The distribution of the most common serovars between 2000 and 2008 is presented in figure 4.6. The proportion of *S*. Typhimurium varied without any particular trend between 24.0 % and 44.4 %. The percentage of *S*. Enteritidis ranged from 11.7 % to 25.6 % in this period. The distribution of *S*. Paratyphi B dT+ is noticeable. This serovar accounted for 16.4 % of all isolates from food in 2000. While its proportion fell below 4 % in each of the following years (2001–2006), it increased again to more than 6 % in 2007 and 2008.

Detailed data are listed in the appendix in table 13.5.

Fig. 4.6: Proportions of the ten most frequent serovars among isolates from food (2000–2008)



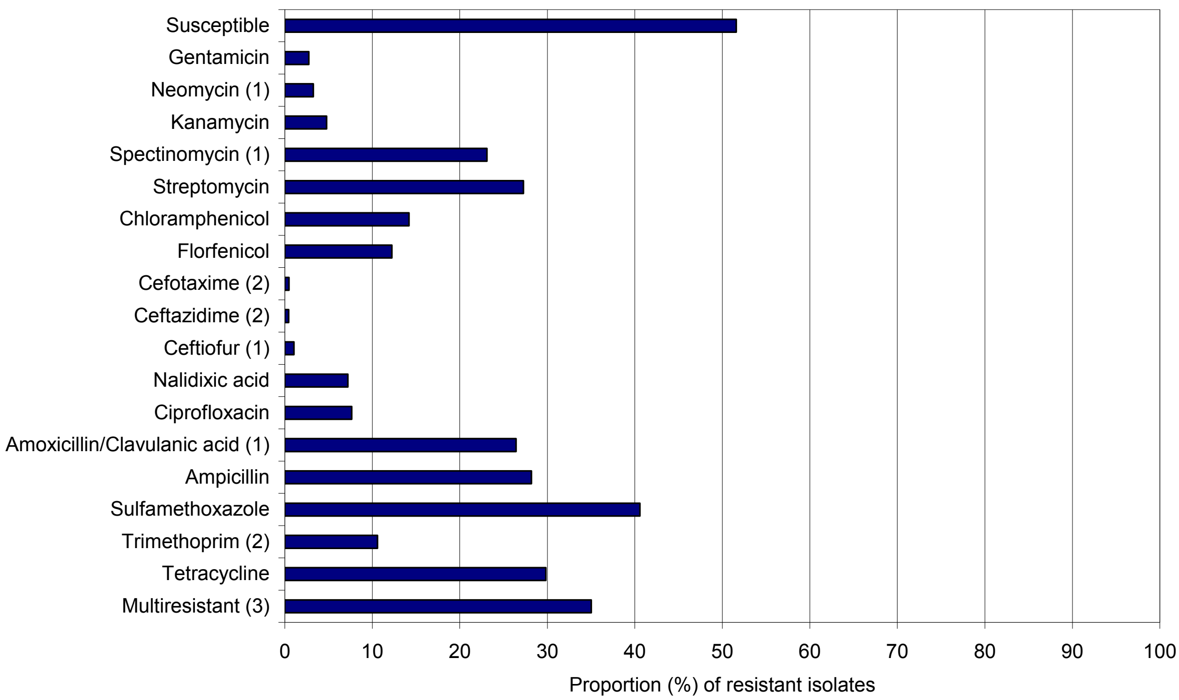
4.2 Antimicrobial resistance situation in *Salmonella* spp.

4.2.1 Overall antimicrobial resistance situation

Looking at the overall resistance situation for *Salmonella* spp. regardless of serovar and isolate origin, the highest resistance rate (40.6 %) was observed with sulfonamides (figure 4.7). Almost 30 % (29.8 %) of the isolates were resistant to tetracycline. Resistance to aminopenicillins was common as well, 28.2 % were resistant to ampicillin, and as many as 26.4 % of the isolates were resistant to amoxicillin/clavulanic acid. Resistance rates to the aminoglycosides streptomycin and spectinomycin were about 25 % (27.3 % and 23.1 %), whereas resistance rates to the other active substances of this class of antimicrobials were less than 5 %. While resistance rates to quinolones were 7.2 % and 7.7 %, to date only a few isolates (0.4 % to 1.1 %) with resistance to cephalosporins have been observed.

Detailed data are listed in the appendix in table 13.6.

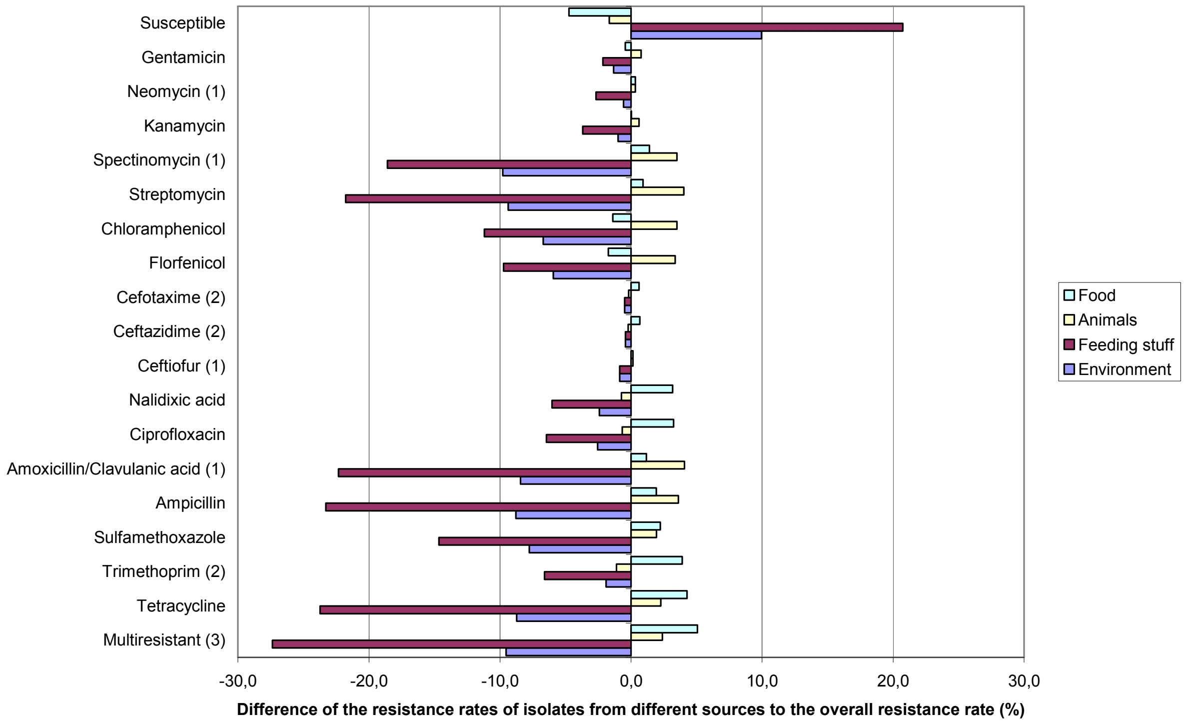
Fig. 4.7: Resistance of *Salmonella* spp. (all sources) to antimicrobial substances (2000–2008)



(1) Antimicrobials were tested from 2000 to 2007
(2) Antimicrobials were tested since 2008
(3) Multiresistant = resistant to more than one class of antimicrobials

There were marked differences between different origins and serovars. Figure 4.8 shows the difference in the resistance rates of the different origins to the resistance rate of all isolates together. For most of the antimicrobial classes, the isolates from the environment and from feeding stuffs showed lower resistance rates compared with the total value.

Fig. 4.8: Difference in the resistance rates of *Salmonella* spp. from different origins to the resistance rates of *Salmonella* spp. from all origins (2000–2008)



(1) Antimicrobials were tested from 2000 to 2007
(2) Antimicrobials were tested since 2008
(3) Multiresistant = resistant to more than one class of antimicrobials

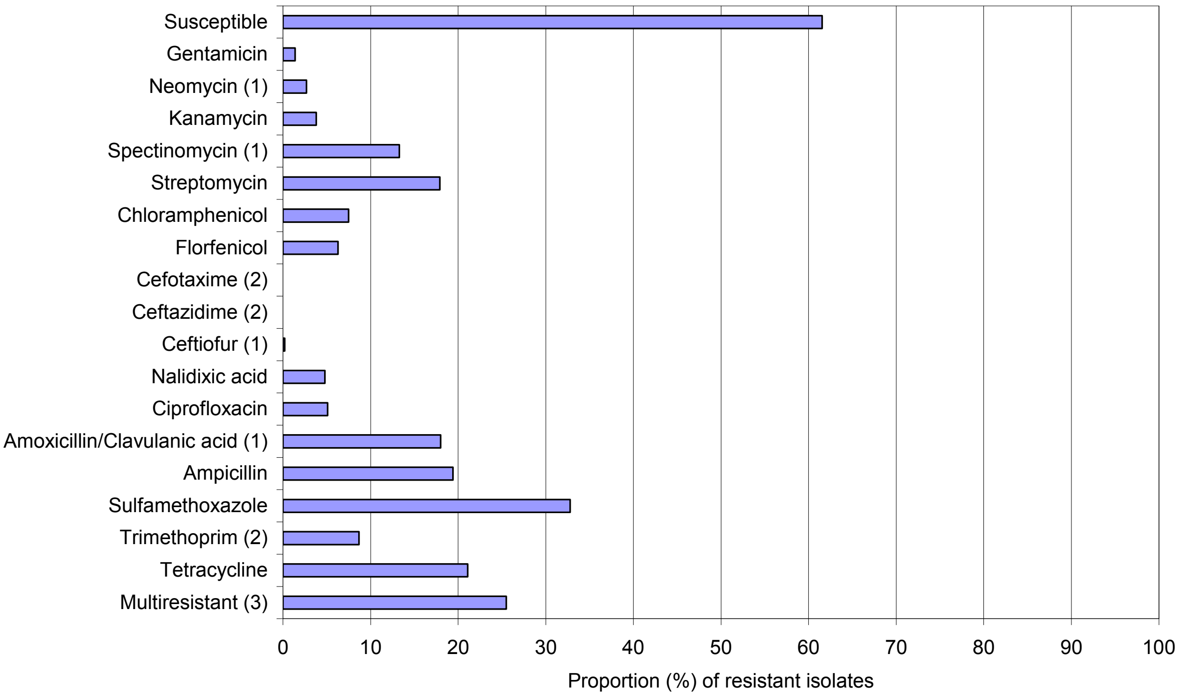
4.2.2 Resistance situation in environmental isolates

In comparison to the situation with *Salmonella* spp. regardless of the isolate origin, the resistance pattern of isolates from the environment was similar to the resistance pattern of the total collective, however, the resistance rates were lower (figure 4.9.). This was especially apparent in active substances for which high resistance rates have been observed, i.e. sulfonamides, tetracyclines, penicillins and the aminoglycosides streptomycin and spectinomycin. For these substances, resistance rates were about 8–10 % lower than in the total average.

Resistances to quinolones were observed rarely in environmental isolates, the rate was about 5 %. In 2008, no resistances to cefotaxim and ceftazidim were observed, but over the whole period, resistance to ceftiofur was detected in five isolates.

Detailed data are listed in the appendix in table 13.6.

Fig. 4.9: Resistance rates in *Salmonella* spp. from the environment (2000–2008)



(1) Antimicrobials were tested from 2000 to 2007
(2) Antimicrobials were tested since 2008
(3) Multiresistant = resistant to more than one class of antimicrobials

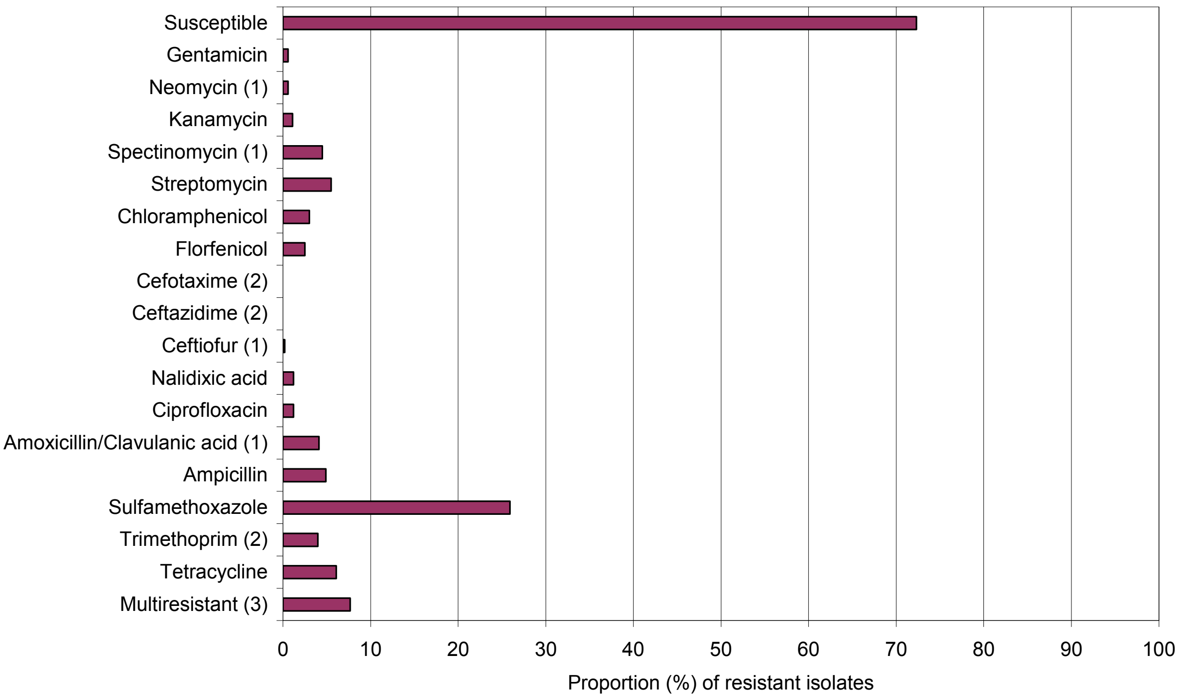
4.2.3 Resistance situation in isolates from feeding stuffs

Similar to *Salmonella* spp. from the environment, compared with the total collective of *Salmonella* isolates, the resistance rates of isolates from feeding stuffs were significantly lower. While a resistance rate of more than 25 % was observed for sulfonamides, the rates for tetracycline and streptomycin were about 5 %. Resistance rates to all other active substances were less than 5 % (figure 4.10).

As with the environmental isolates, in 2008, no resistance to cefotaxim and ceftazidim was observed, but over the whole period, resistance to ceftiofur was detected in six isolates. Resistances to quinolones occurred very rarely (1.2 %) in this group.

Detailed data are listed in the appendix in table 13.6.

Fig. 4.10: Resistance rates in *Salmonella* spp. from feeding stuffs (2000–2008)



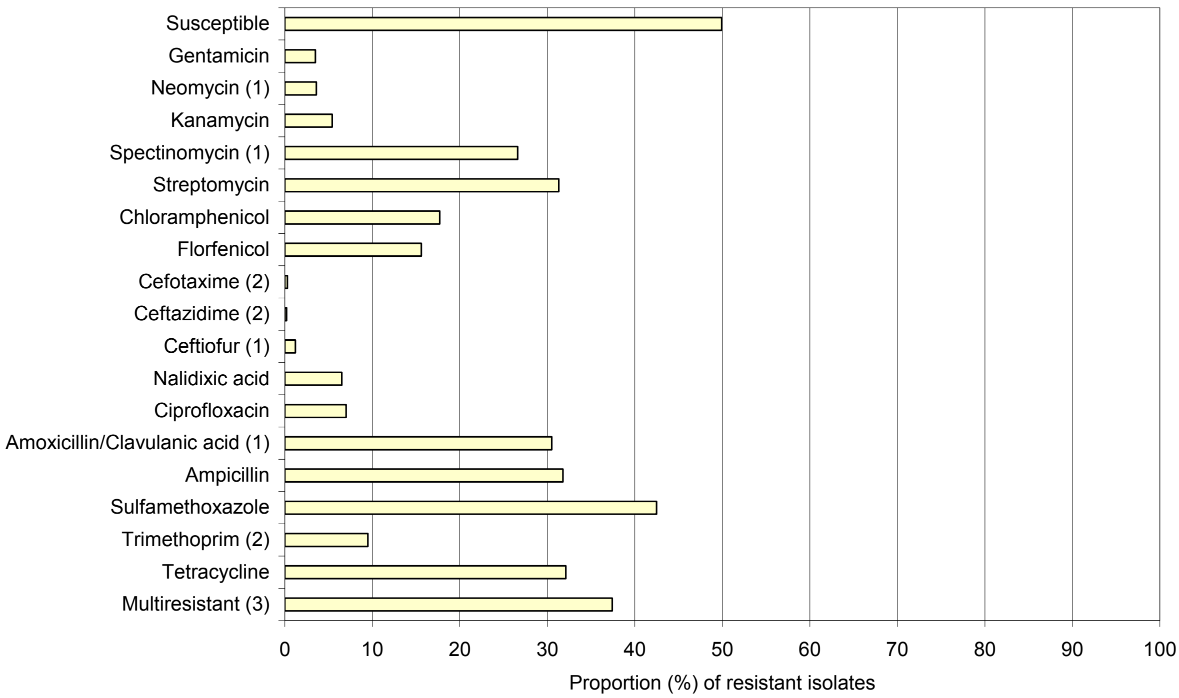
(1) Antimicrobials were tested from 2000 to 2007
(2) Antimicrobials were tested since 2008
(3) Multiresistant = resistant to more than one class of antimicrobials

4.2.4 Resistance situation in isolates from animals

The resistance pattern of *Salmonella* isolates from animals resembled the pattern of the total spectrum. Only for quinolones, a slightly lower rate compared with the total collective was observed. The highest resistance rates to aminoglycosides, phenicols and aminopenicillins, respectively, were seen in isolates from animals. In 1.2 % of the isolates resistance to ceftiofur was detected. Six (0.3 %) and four (0.2 %) isolates were resistant to cefotaxim and ceftazidim, respectively, which have been tested for the first time in 2008 (figure 4.11).

Detailed data are listed in the appendix in table 13.6.

Fig. 4.11: Resistance rates in *Salmonella* spp. from animals (2000–2008)



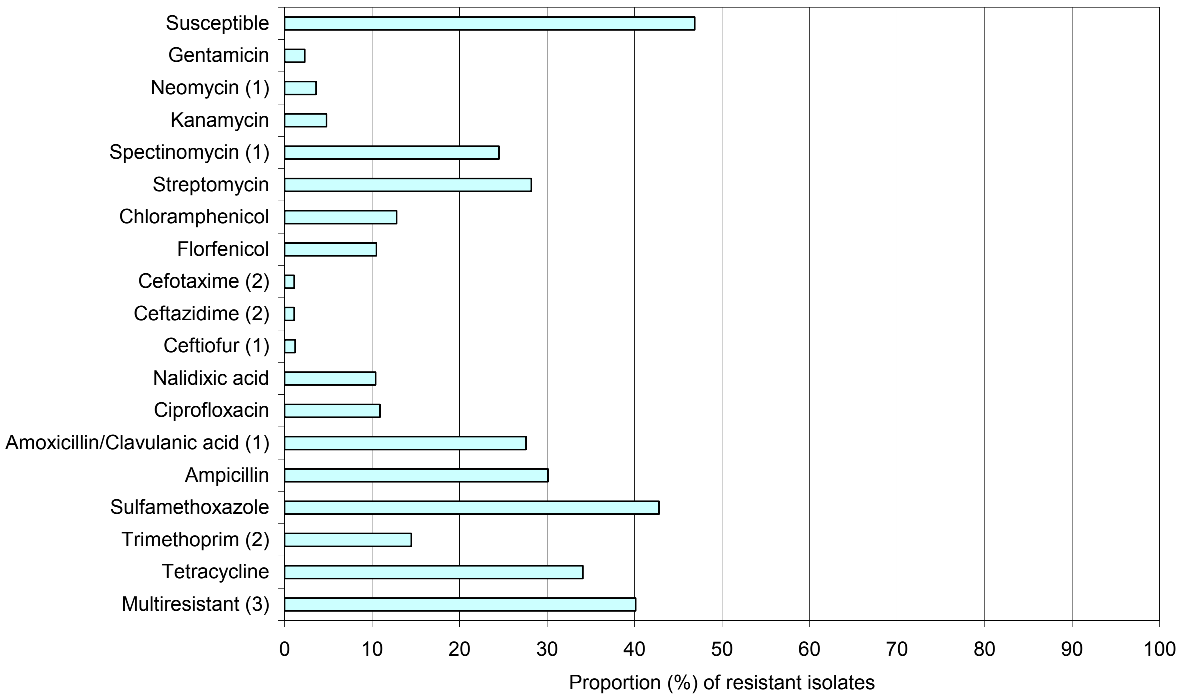
(1) Antimicrobials were tested from 2000 to 2007
(2) Antimicrobials were tested since 2008
(3) Multiresistant = resistant to more than one class of antimicrobials

4.2.5 Resistance situation in isolates from food

The resistance pattern of *Salmonella* isolates from food was similar to the pattern of isolates from animals. In isolates from food, the highest resistance rates to quinolones were determined, with 10.4 % to nalidixic acid and 10.9 % to ciprofloxacin. In cephalosporins as well, partially higher rates compared with isolates from animals were observed. In 1.2 % of the isolates resistance to ceftiofur was proven. Eleven (1.1 %) isolates were resistant to cefotaxim und ceftazidim, respectively, which have been tested for the first time in 2008 (figure 4.12).

Detailed data are listed in the appendix in table 13.6.

Fig. 4.12: Resistance rates in *Salmonella* spp. from food (2000-2008)



(1) Antimicrobials were tested from 2000 to 2007
(2) Antimicrobials were tested since 2008
(3) Multiresistant = resistant to more than one class of antimicrobials

4.3 Resistance situation in the most common serovars of *Salmonella* spp.

Figure 4.13 provides an overview of the resistance rates in the 20 most common serovars in the total collective of isolates. The resistance rates show great differences. While the majority (≥ 70 %) of isolates of *S.* Agona, *S.* Enteritidis, *S.* Mbandaka, *S.* Tennessee, *S.* Virchow and the subspecies IIIb and IV was susceptible to all tested antimicrobial classes, resistances to single antimicrobials and multiresistances were very common (> 50 %) in *S.* Typhimurium, *S.* Paratyphi B dT+, *S.* Saintpaul and the monophasic serovar *S.* 4,[5],12:i:-.

Figure 4.13 also shows the differences in serovar resistance rates depending on the isolate origin. In all of the *S.* Tennessee, subspecies IIIb and subspecies IV isolates from the environment no resistance was found. In all other serovars and origins resistances have been shown. Resistance rates of the 20 most common serovars in the total collective are presented by active substance in figure 4.14.

Depending on origin, 22.2 % to 33.7 % of the *S.* Typhimurium isolates were susceptible to all tested antimicrobial substances. The majority of isolates showed resistance to more than one class of antimicrobials. The highest resistance rates were observed for sulfonamides, tetracyclines, aminoglycosides, phenicols and aminopenicillins.

Independent of their origin, more than 80 % of the *S.* Enteritidis isolates were susceptible to all tested antimicrobial substances. Some isolates (about 3 %) were resistant to more than one class of antimicrobials. Most frequently, resistances to sulfonamides occurred.

Independent of origin, only a small proportion of isolates of the monophasic variant *S.* 4,[5],12:i:- was susceptible to all tested antimicrobials. More than 80 % of the isolates showed resistances to more than one class of antimicrobials. In comparison to the monophasic variant *S.* 4,[5],12:i:-, in *S.* Typhimurium almost as high resistance rates have been observed, but in contrast to *S.* Typhimurium, variant *S*. 4,[5],12:i:- showed significantly less frequently resistances to spectinomycin and phenicols.

At least 60 % of all *S.* Infantis isolates and more than 90 % of the isolates from feeding stuffs were susceptible to all antimicrobial classes. Resistances to multiple antimicrobial classes were proven in more than 20 % of the isolates from food and animals. It is noticeable that in about 17 % of the *S.* Infantis isolates from food and animals resistances to quinolones have been shown.

More than 60 % of *S.* Derby isolates from food and feeding stuffs and 49.1 % of isolates from animals were susceptible to all tested antimicrobial substances. More than 25 % of the isolates from animals showed resistances to more than one class of antimicrobials.

The resistance rates of the most common serovars, considering their origin as well, are listed in the appendix in tables 13.7–13.11.

Fig. 4.13: Resistance in the 20 most frequent *Salmonella*serovars by origin (2000–2008). Proportion of susceptible, resistant and multiresistant isolates – Part 1

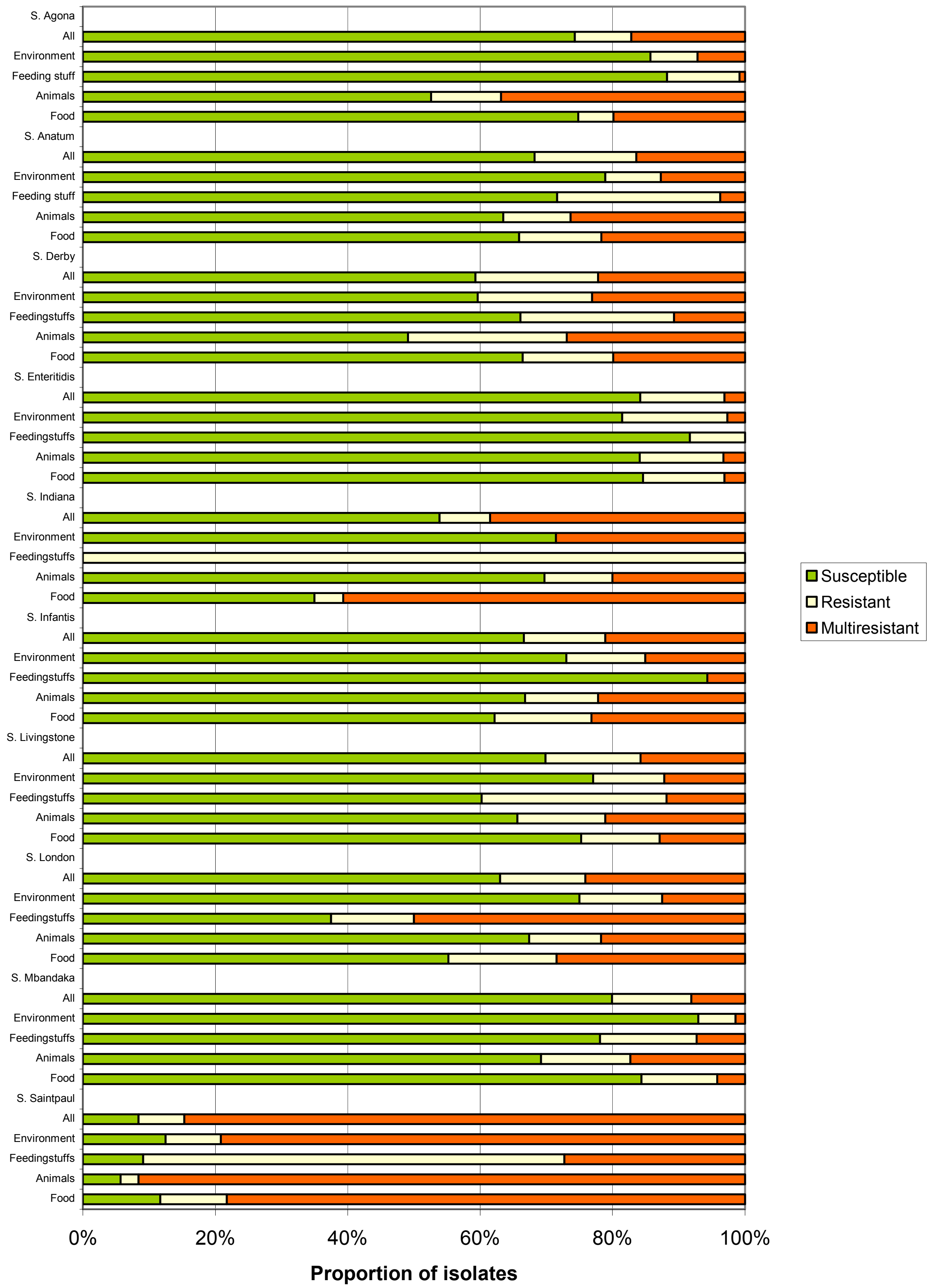


Fig. 4.13: Resistance in the 20 most frequent Salmonella serovars by origin (2000–2008). Proportion of susceptible, resistant and multiresistant isolates – Part 2

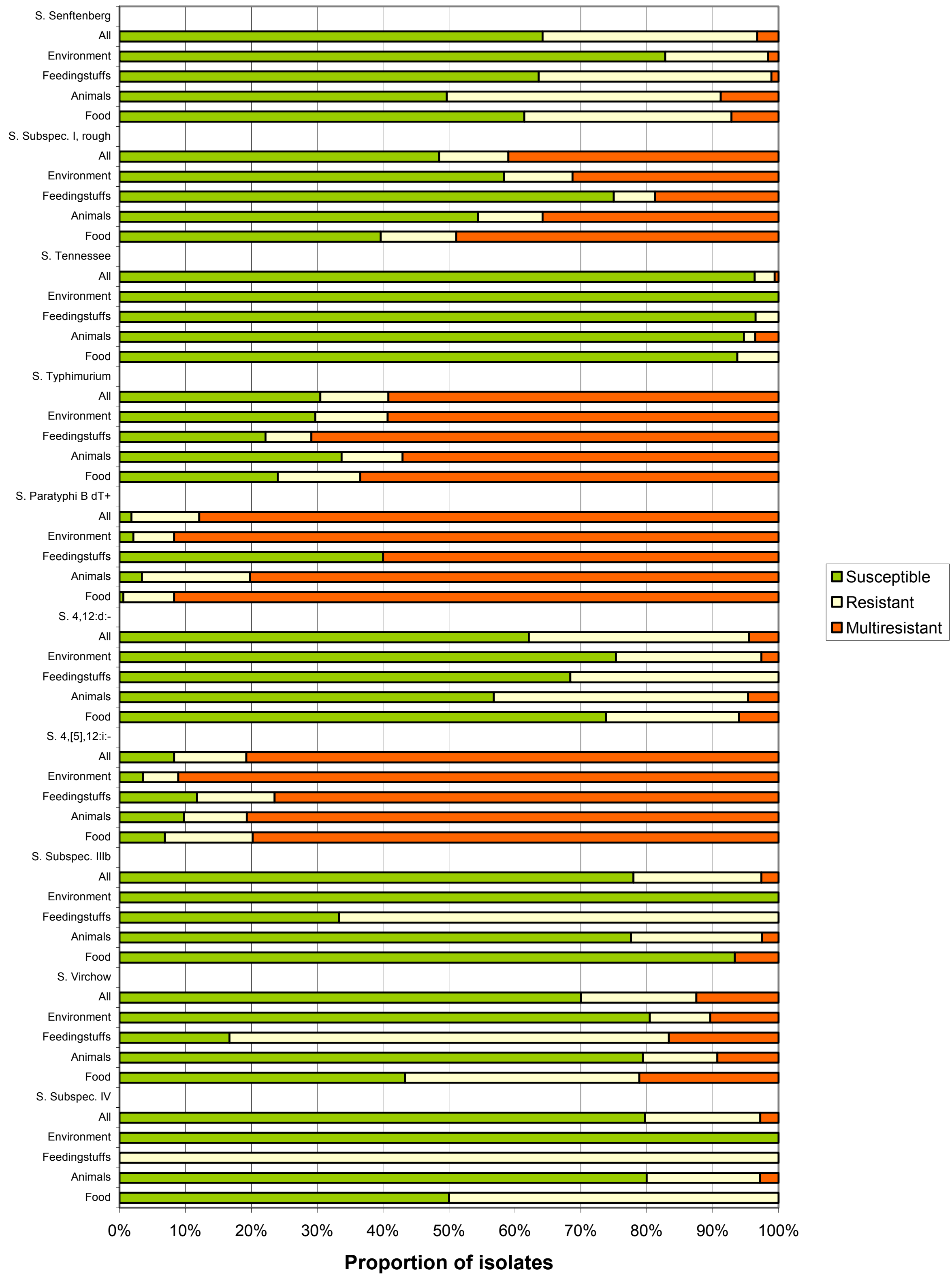
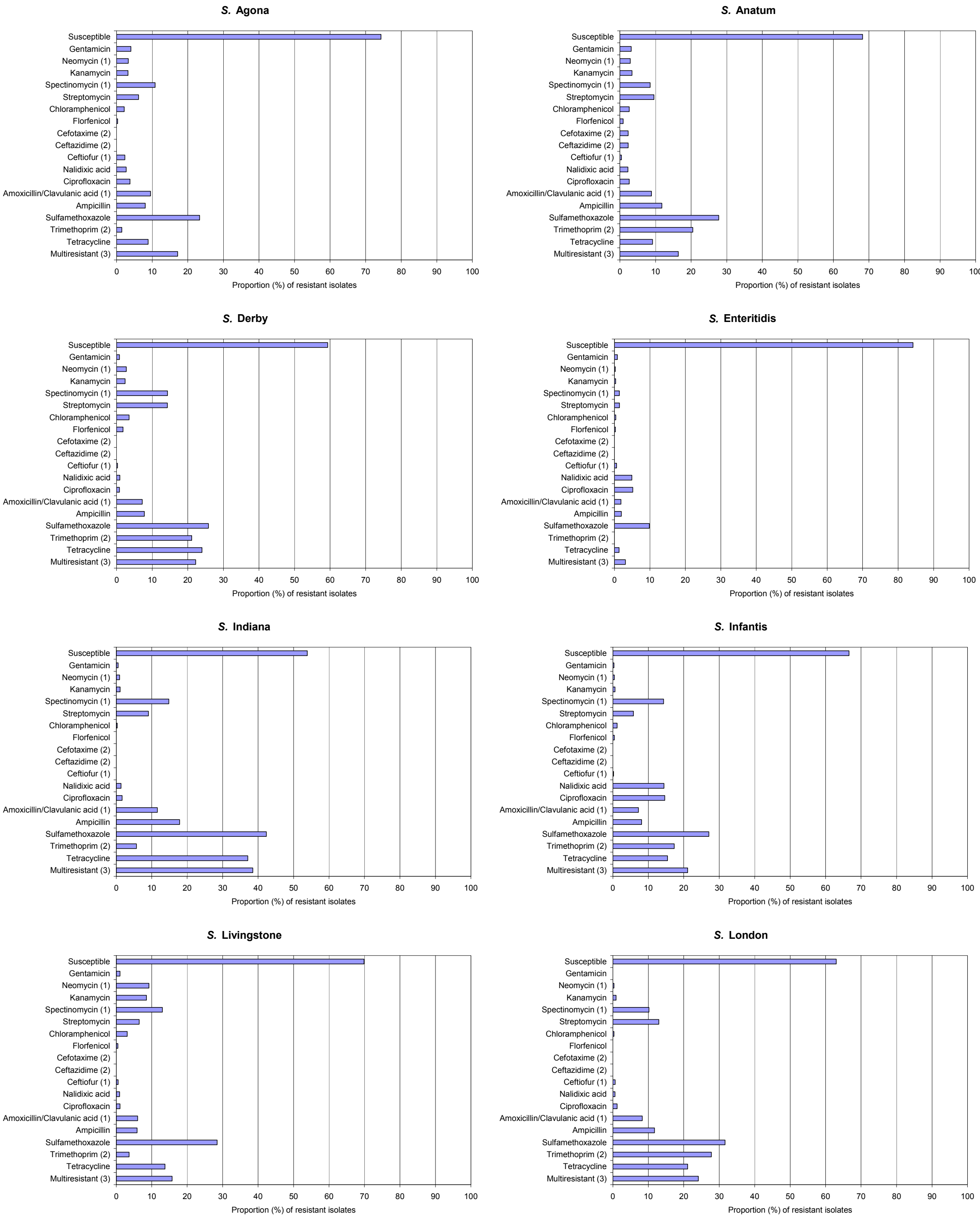
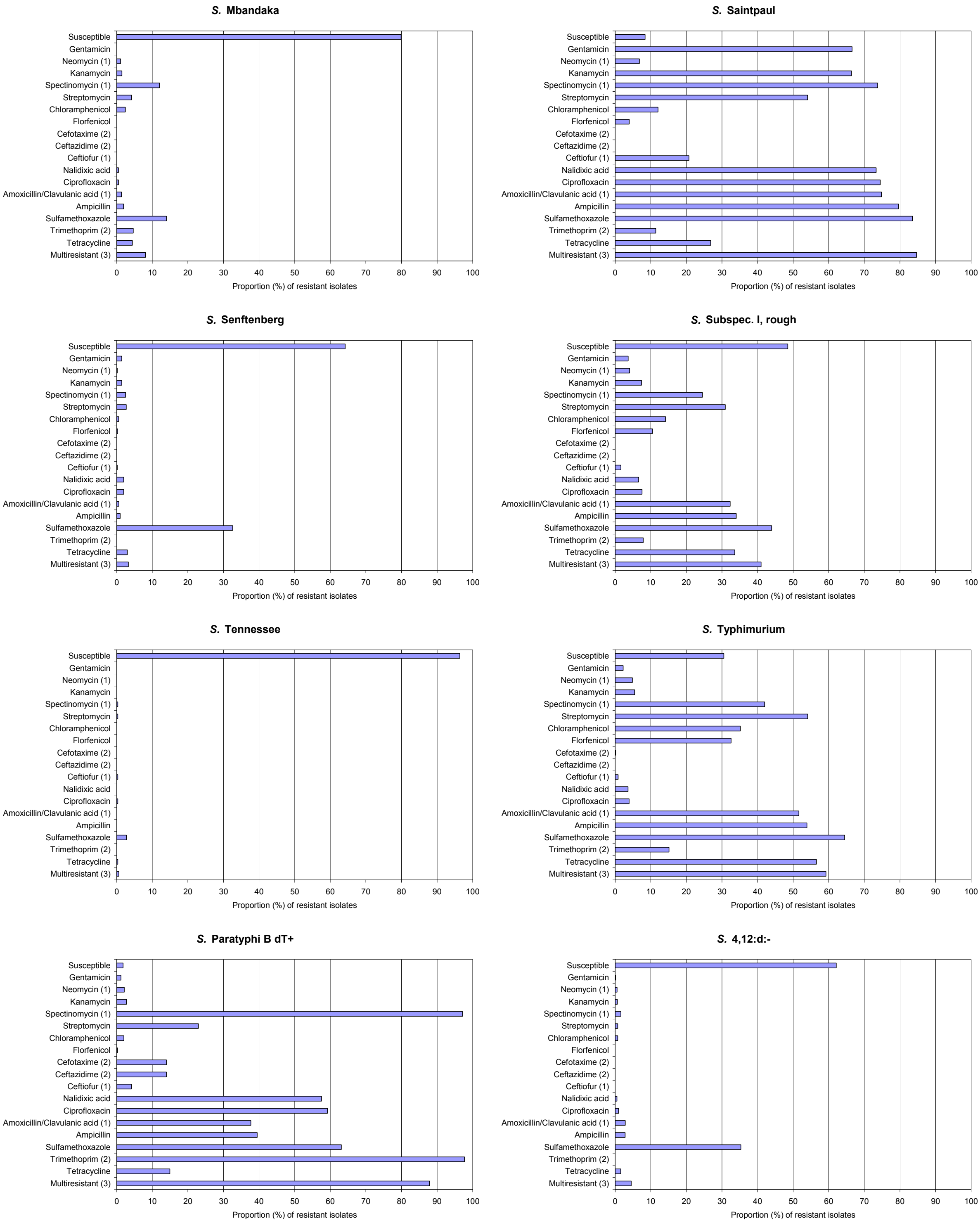


Fig. 4.14: Resistance rates in the 20 most frequent *Salmonella* serovars (2000–2008) – Part 1



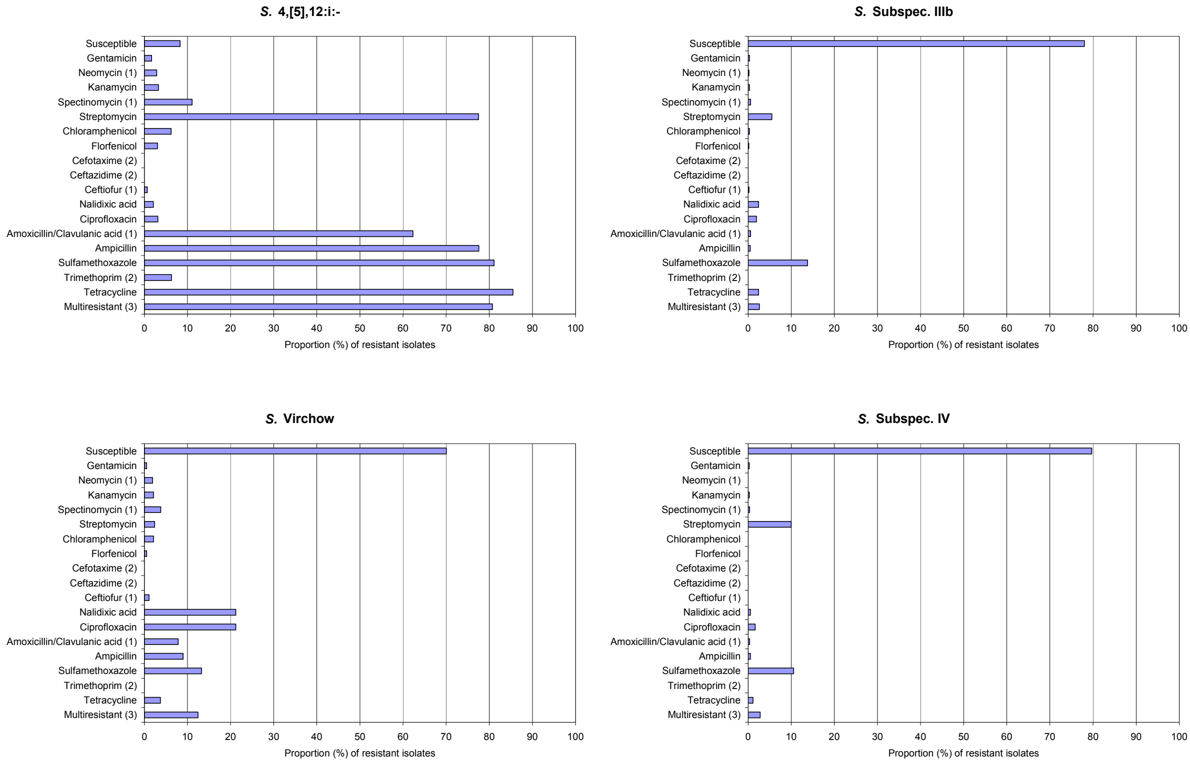
(1) Antimicrobials were tested from 2000 to 2007
(2) Antimicrobials were tested since 2008
(3) Multiresistant = resistant to more than one class of antimicrobials

Fig. 4.14: Resistance rates in the 20 most frequent *Salmonella* serovars (2000–2008) – Part 2



(1) Antimicrobials were tested from 2000 to 2007
(2) Antimicrobials were tested since 2008
(3) Multiresistant = resistant to more than one class of antimicrobials

Fig. 4.14: Resistance rates in the 20 most frequent *Salmonella* serovars (2000–2008) – Part 3



(1) Antimicrobials were tested from 2000 to 2007
(2) Antimicrobials were tested since 2008
(3) Multiresistant = resistant to more than one class of antimicrobials

4.4 Resistance situation for single active substances and classes of antimicrobials

4.4.1 Aminoglycosides

Figures 4.15 to 4.19 illustrate the differences regarding the resistance rates to various aminoglycosides and the 20 most common serovars. Very high resistance rates to gentamicin have been shown for *S.* Saintpaul and to spectinomycin for *S.* Paratyphi B dT+ and *S.* Saintpaul. Very high resistance rates to streptomycin are apparent for *S.* Saintpaul und *S.* Typhimurium. A very high resistance rate to streptomycin, but not to spectinomycin, has been found in the monophasic variant *S.* 4,[5],12:i:-.

Fig. 4.15: Resistance rates to gentamicin in the 20 most frequent *Salmonella* serovars (2000–2008)

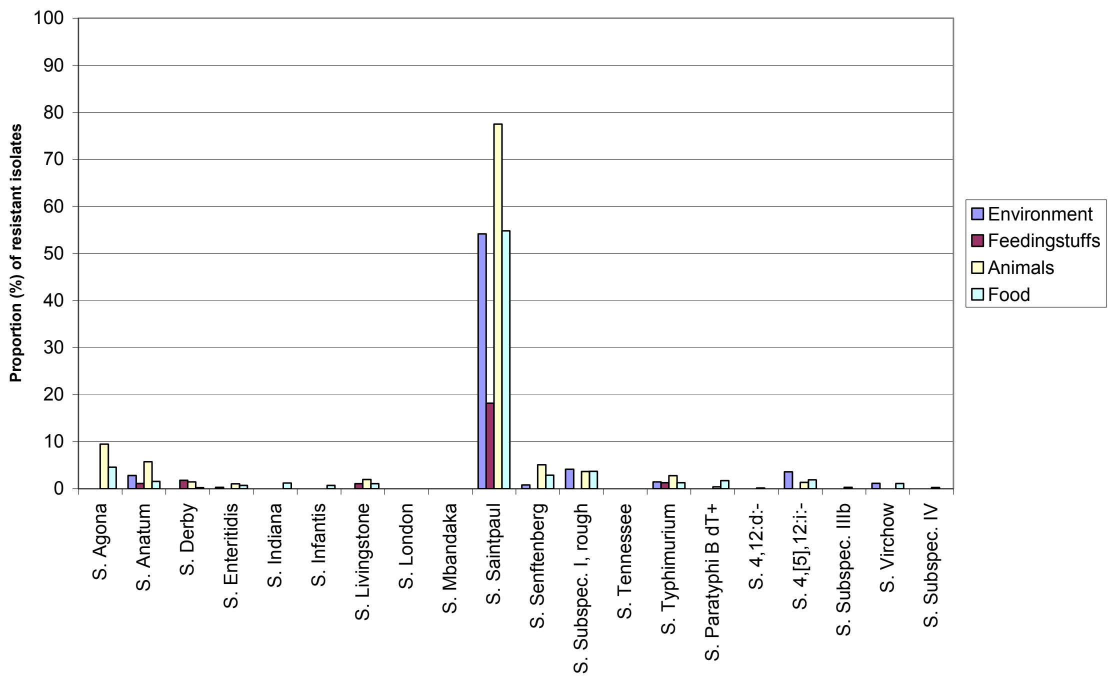


Fig. 4.16: Resistance rates to neomycin in the 20 most frequent *Salmonella* serovars (2000–2007)

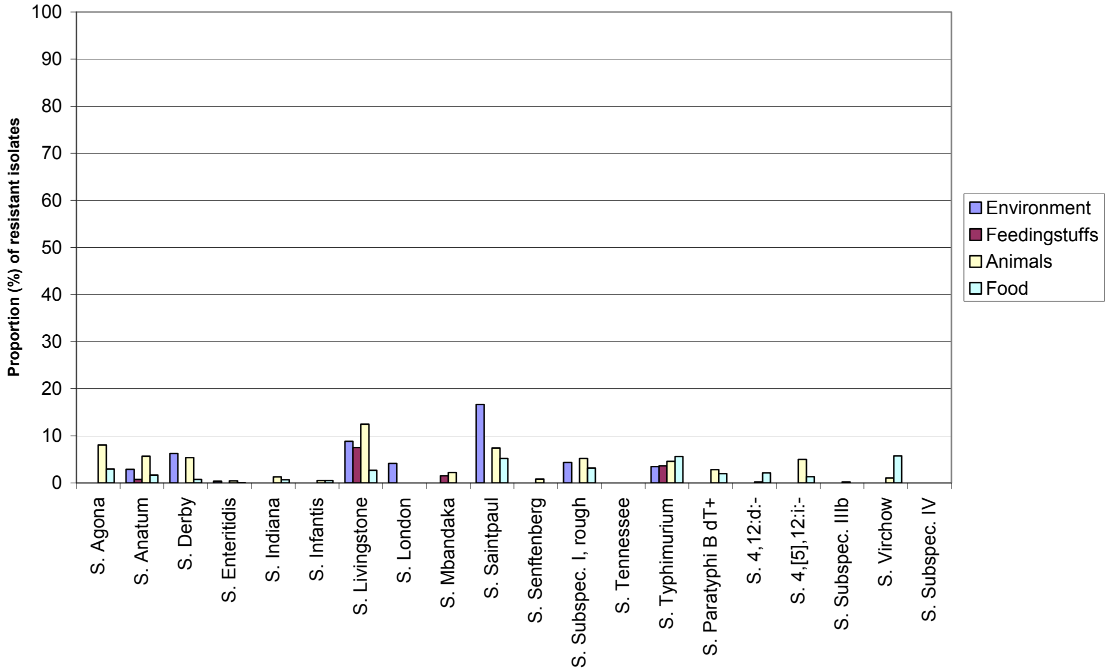


Fig. 4.17: Resistance rates to kanamycin in the 20 most frequent *Salmonella* serovars (2000–2008)

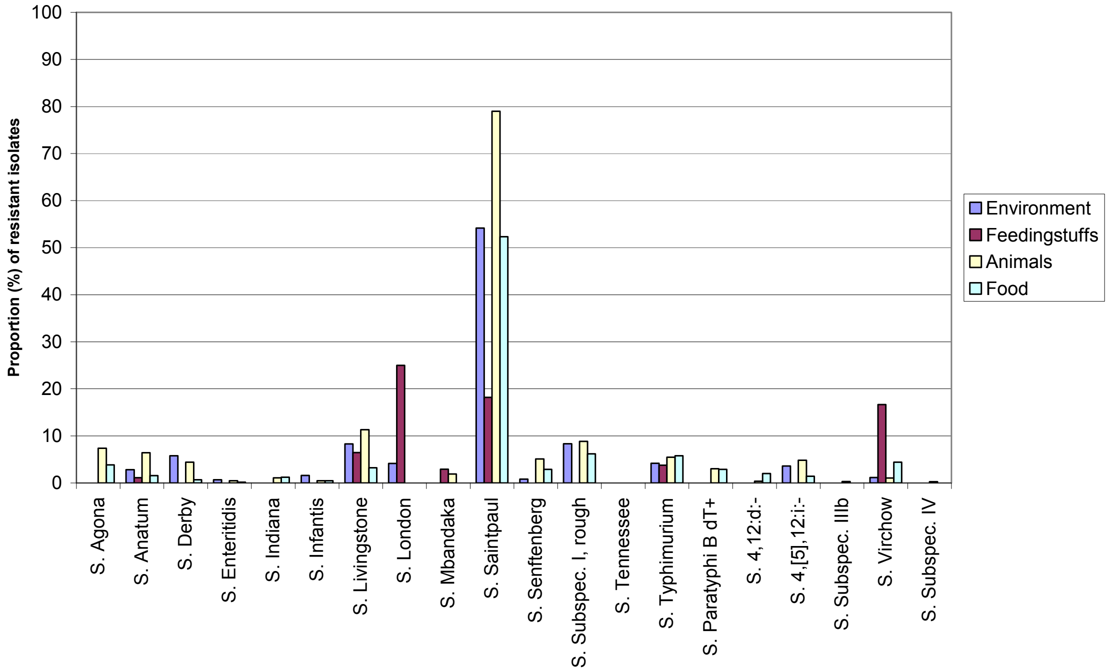


Fig. 4.18: Resistance rates to spectinomycin in the 20 most frequent *Salmonella* serovars (2000–2007)

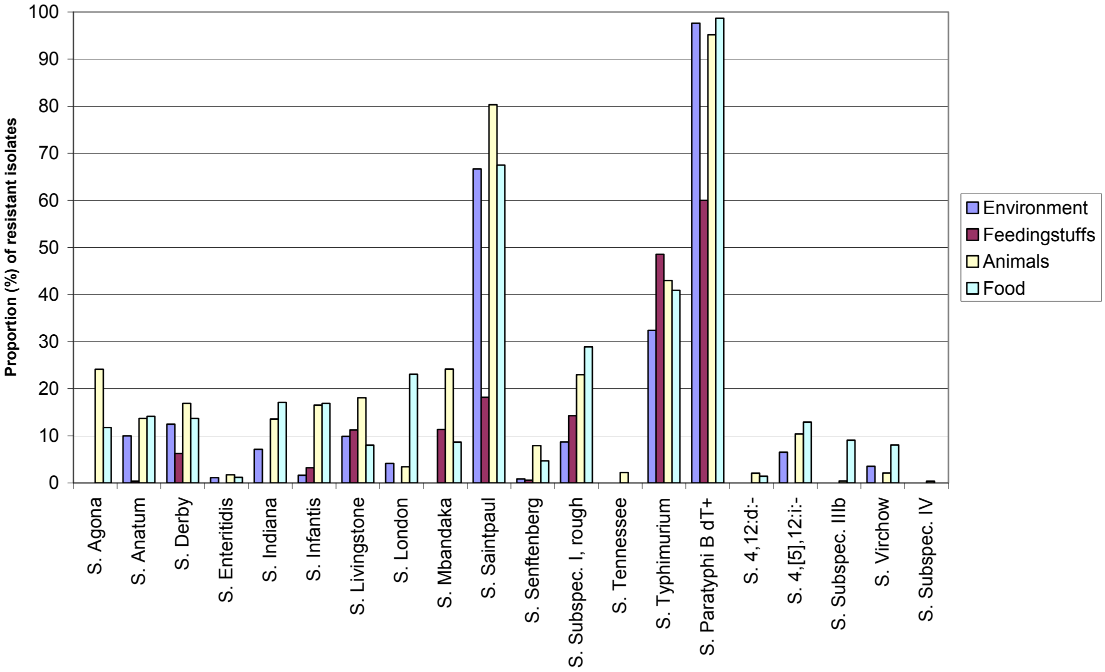
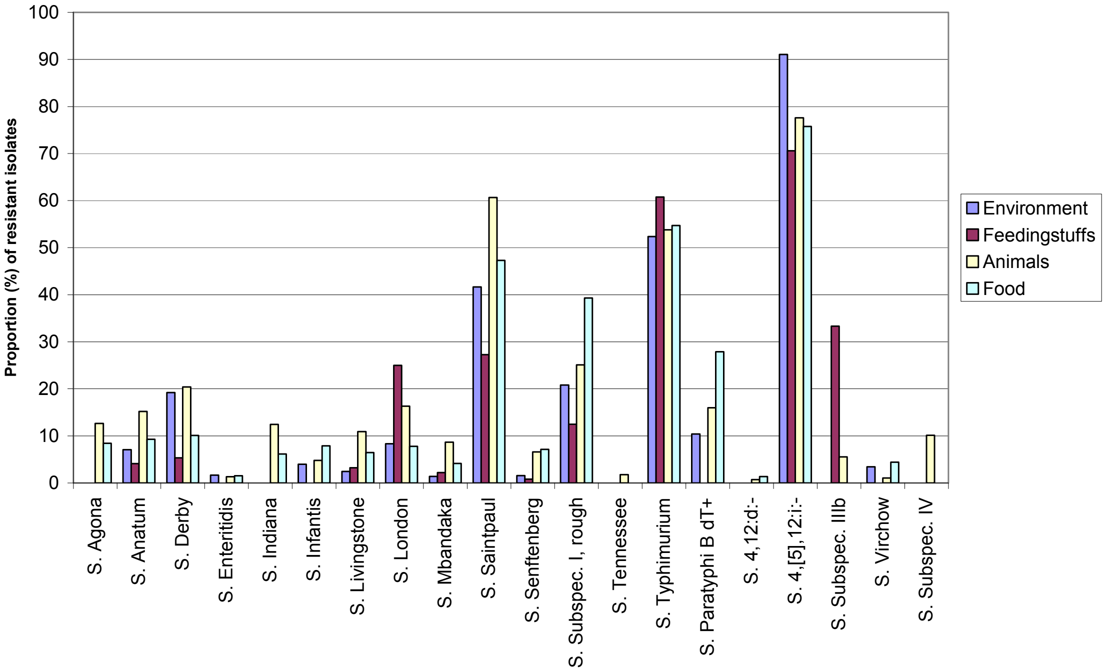


Fig. 4.19: Resistance rates to streptomycin in the 20 most frequent *Salmonella* serovars (2000–2008)



4.4.2 Phenicols

Figures 4.20 and 4.21 illustrate the differences regarding the resistance rates to various tested phenicols and the different serovars. Serovar-specific differences became obvious. Compared with florfenicol, resistance to chloramphenicol was observed more frequently in some serovars.

Fig. 4.20: Resistance rates to Chloramphenicol in the 20 most frequent *Salmonella* serovars (2000–2008)

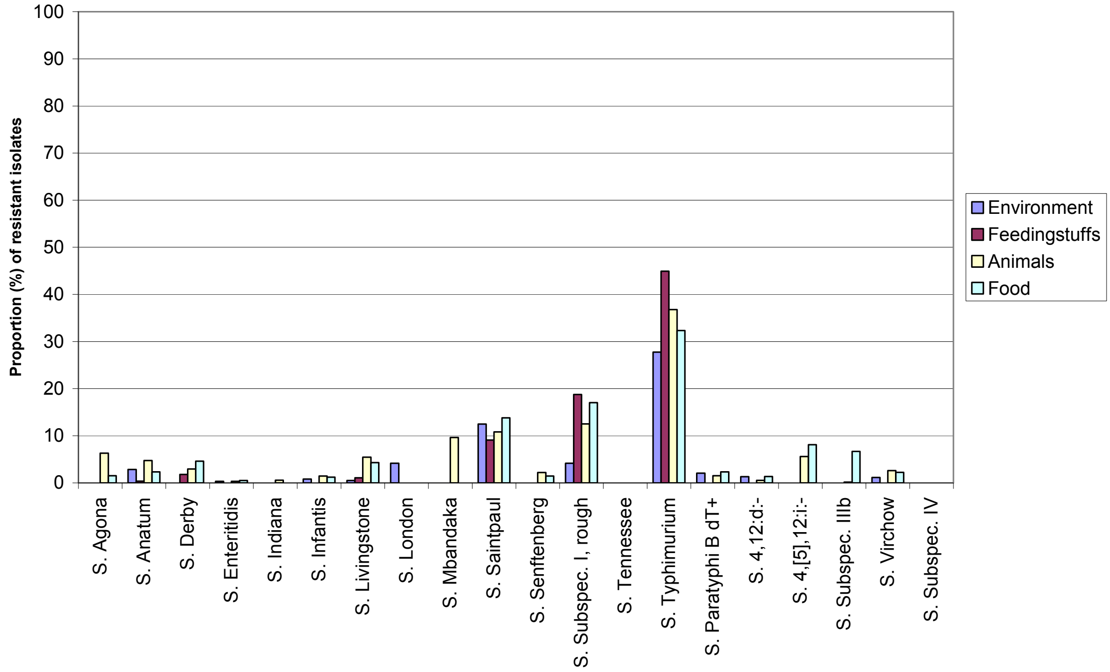
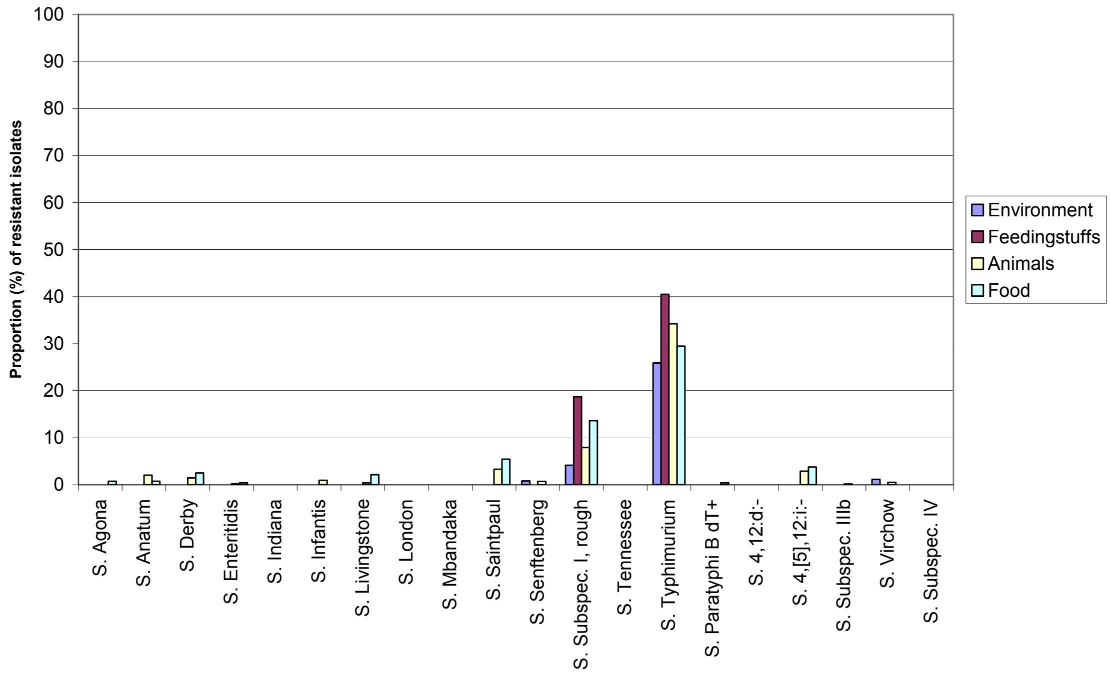


Fig. 4.21: Resistance rates to florfenicol in the 20 most frequent *Salmonella* serovars (2000–2008)



4.4.3 Cephalosporins

Figures 4.22 and 4.23 illustrate the differences regarding the resistance rates to various tested cephalosporins and regarding the different serovars. Most frequently, resistances to ceftiofur were found in *S*. Agona from animals (6.9 %), in *S.* Paratyphi B from food (6.2 %) and in *S.* Saintpaul from various origins (0–24.1 %). Resistances to cefotaxim and ceftazidim (only tested in 2007 and 2008) were observed in *S*. Anatum from animals (3.0 % each) und more often in S. Paratyphi B dT+ from animals and from food (13.3 % and 15.4 %), but not in *S*. Saintpaul.

Fig. 4.22: Resistance rates to ceftiofur in the 20 most frequent *Salmonella* serovars (2000–2007)

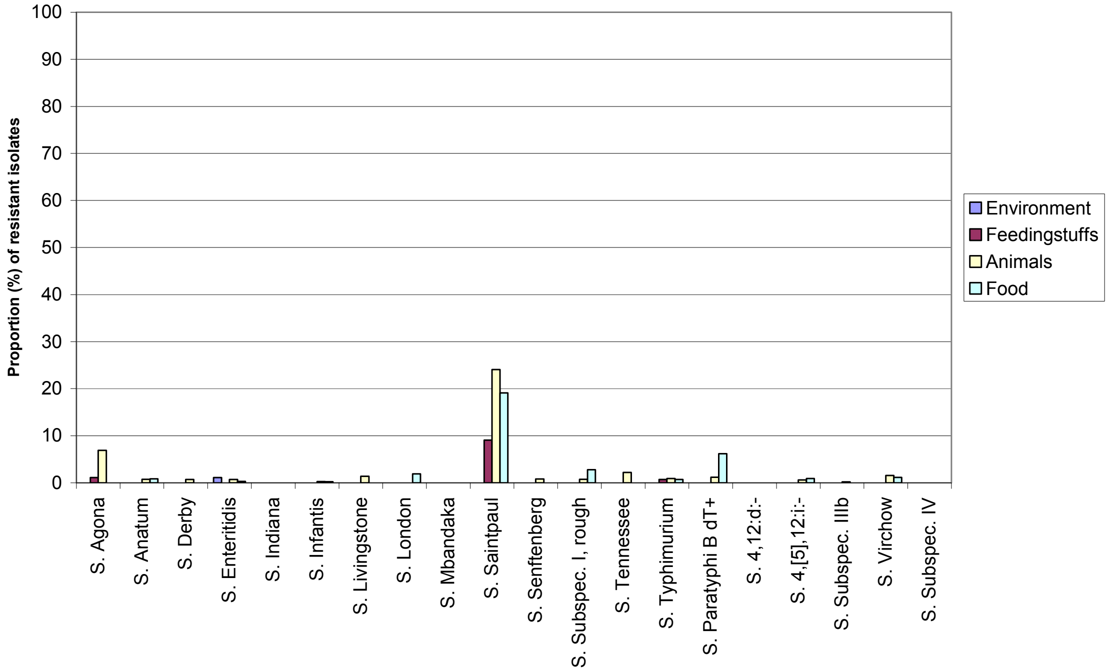
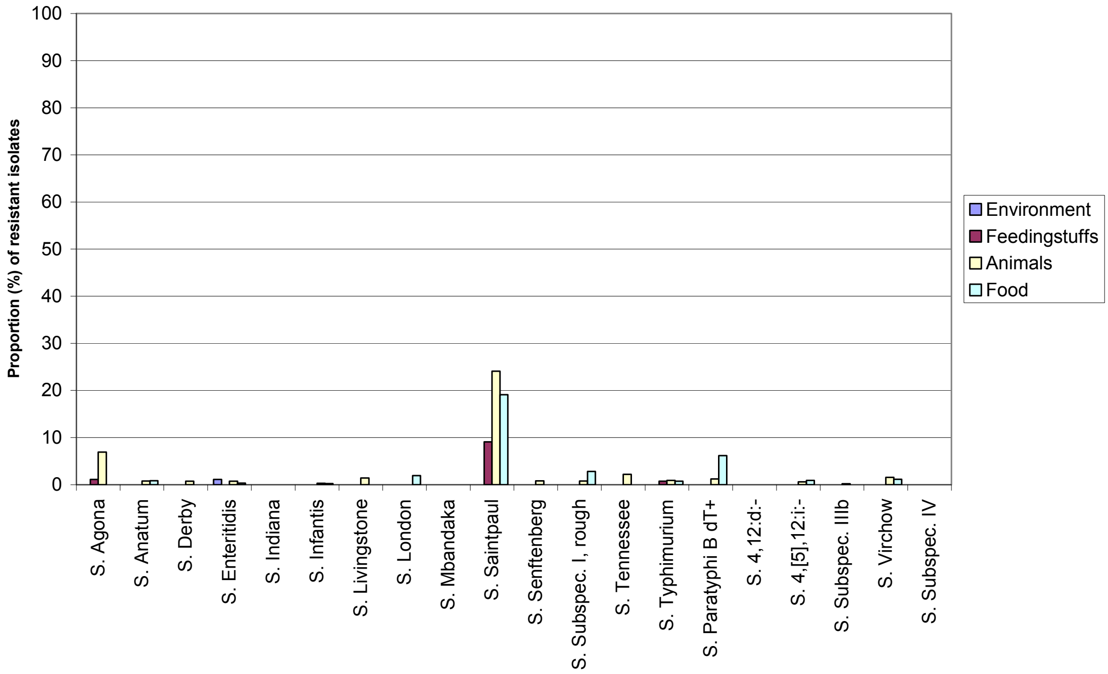


Fig. 4.23: Resistance rates to ceftazidime and cefotaxime in the 20 most frequent *Salmonella* serovars (2007–2008)



4.4.4 Quinolones

Figures 4.24 and 4.25 show the differences regarding the resistance rates to both tested quinolones and the different serovars. For most of the serovars, resistances were observed rarely. Very high resistance rates are especially apparent for *S.* Paratyphi B dT+, *S.* Saintpaul and *S.* Virchow. The noticeable findings in isolates from feeding stuffs, especially in *S.* Indiana, are only represented by two isolates; however, they show that resistances to quinolones are present in this group as well.

Fig. 4.24: Resistance rates to nalidixic acid in the 20 most frequent *Salmonella* serovars (2000–2008)

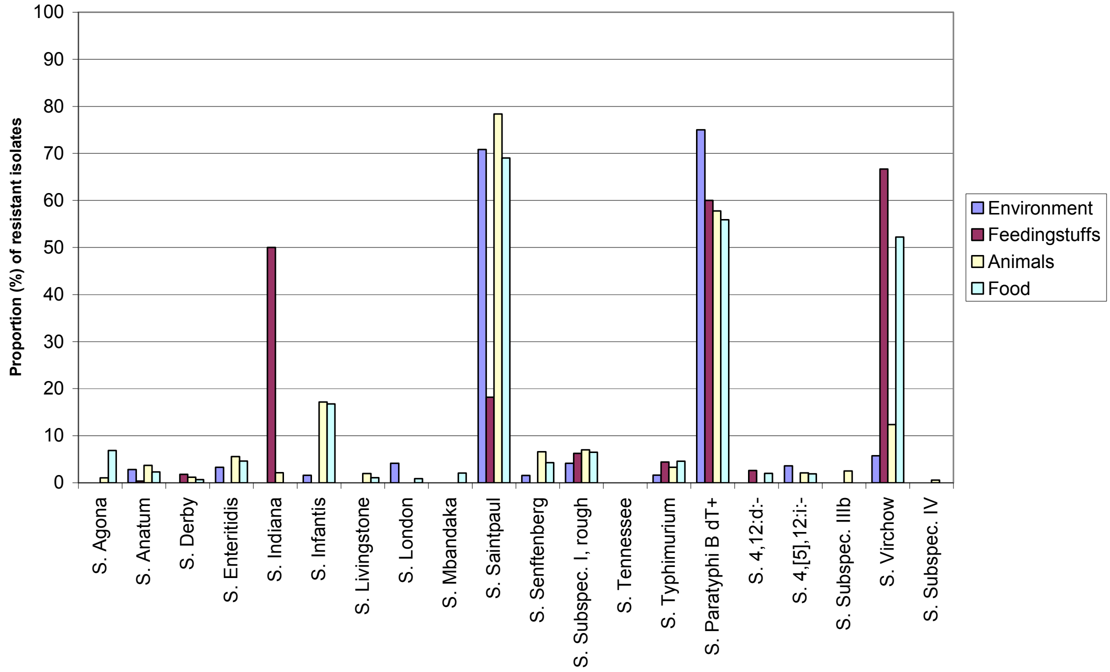
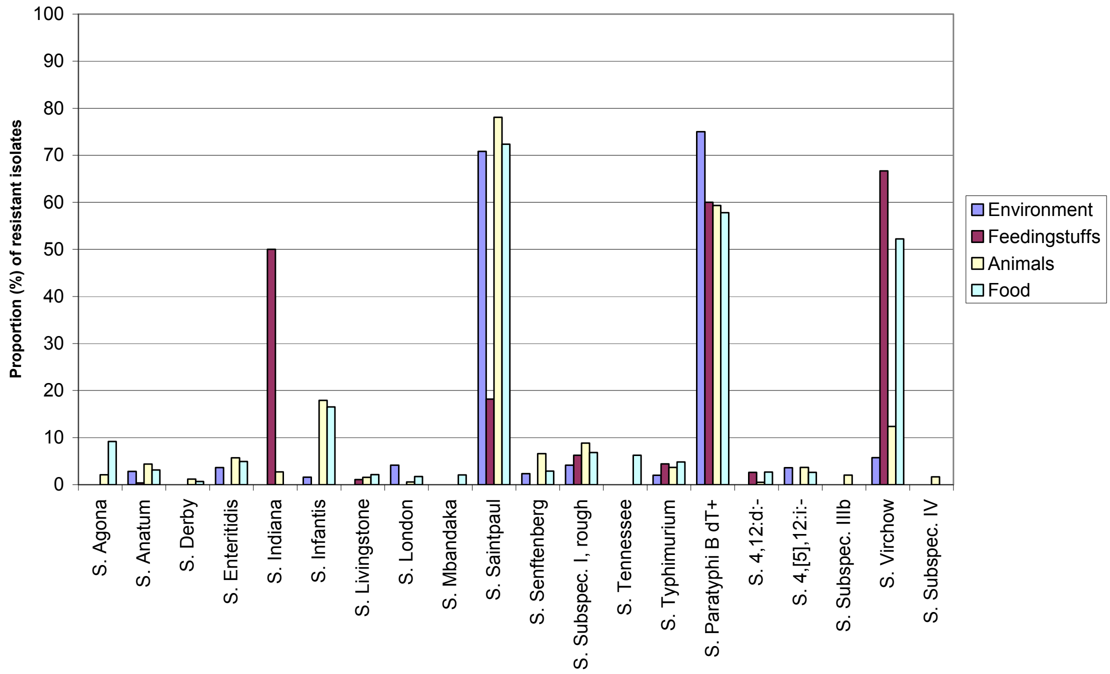


Fig. 4.25: Resistance rates to ciprofloxacin in the 20 most frequent *Salmonella* serovars (2000–2008)



4.4.5 Aminopenicillins

Figures 4.26 and 4.27 show the differences regarding the resistance rates to various tested aminopenicillins and the different serovars. The antimicrobials ampicillin and amoxicillin/clavulanic acid showed very similar resistance patterns. Very high resistance rates (> 50 %) are especially apparent in *S.* Saintpaul, *S.* Typhimurium and *S.* 4,[5],12:i.-. High re-sistance rates to the two aminopenicillins were found in *S.* Paratyphi B dT+ as well as in the rough forms of subspecies I.

Fig. 4.26: Resistance rates to amoxicillin/clavulanic acid in the 20 most frequent *Salmonella* serovars (2000–2007)

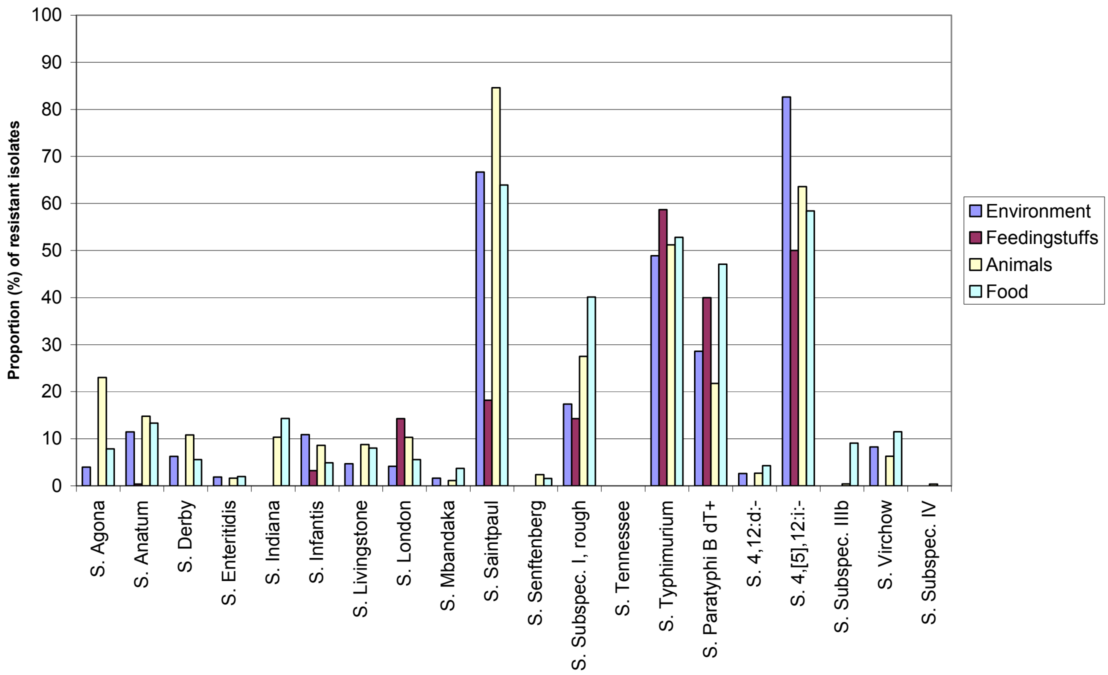
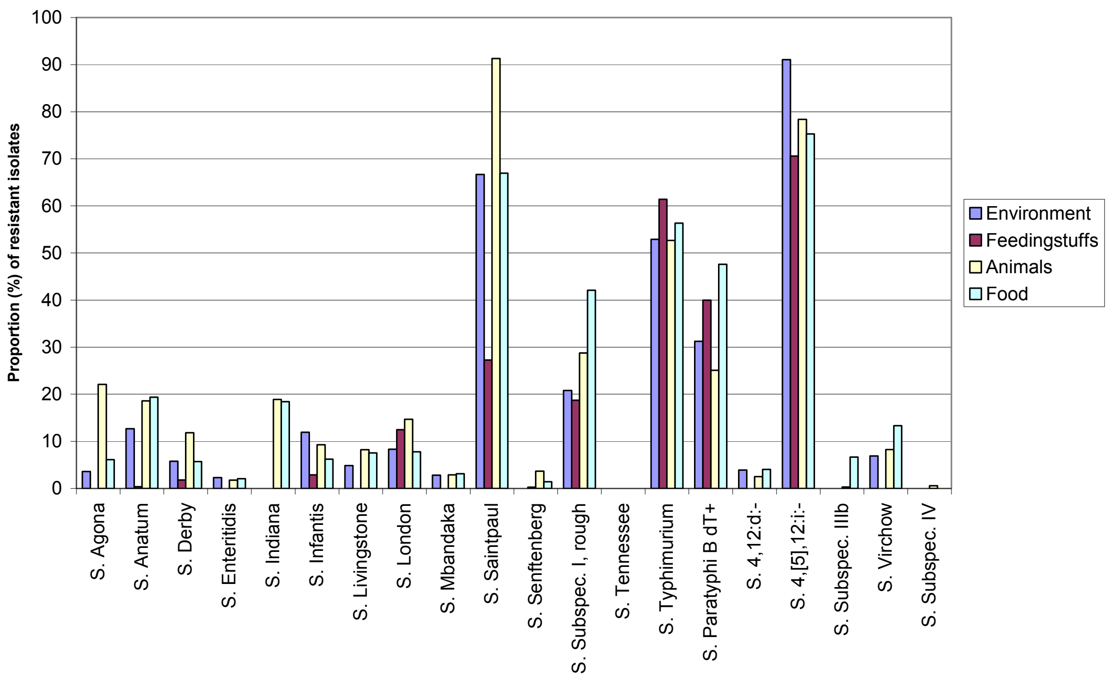


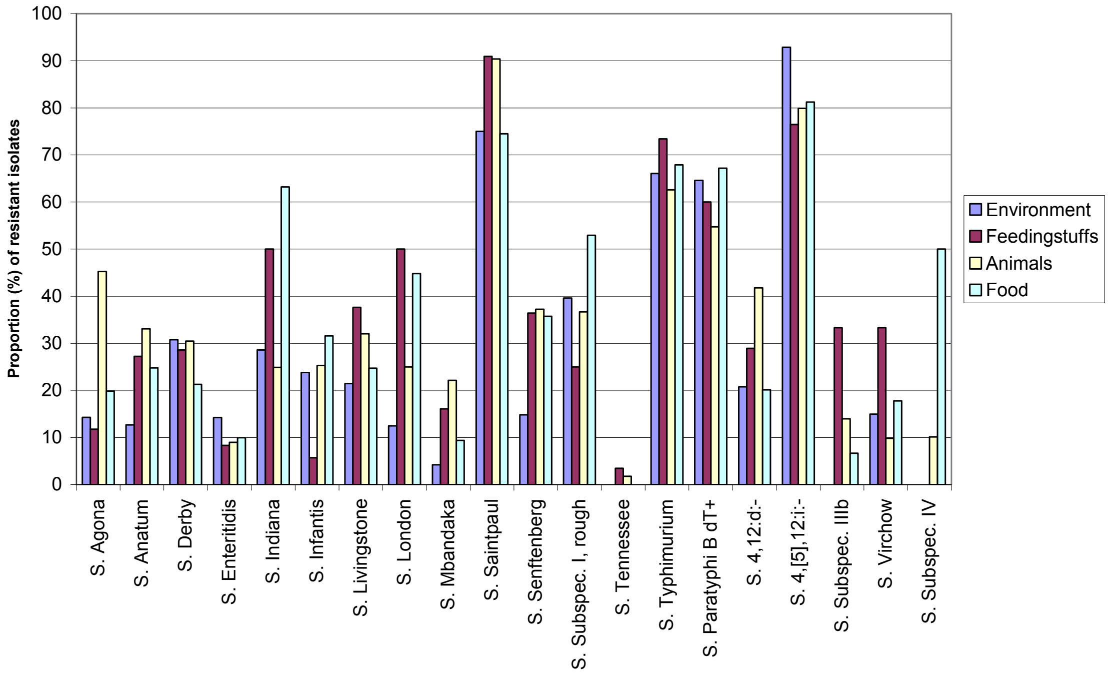
Fig. 4.27: Resistance rates to ampicillin in the 20 most frequent *Salmonella* serovars (2000–2008)



4.4.6 Folic acid synthesis inhibitors

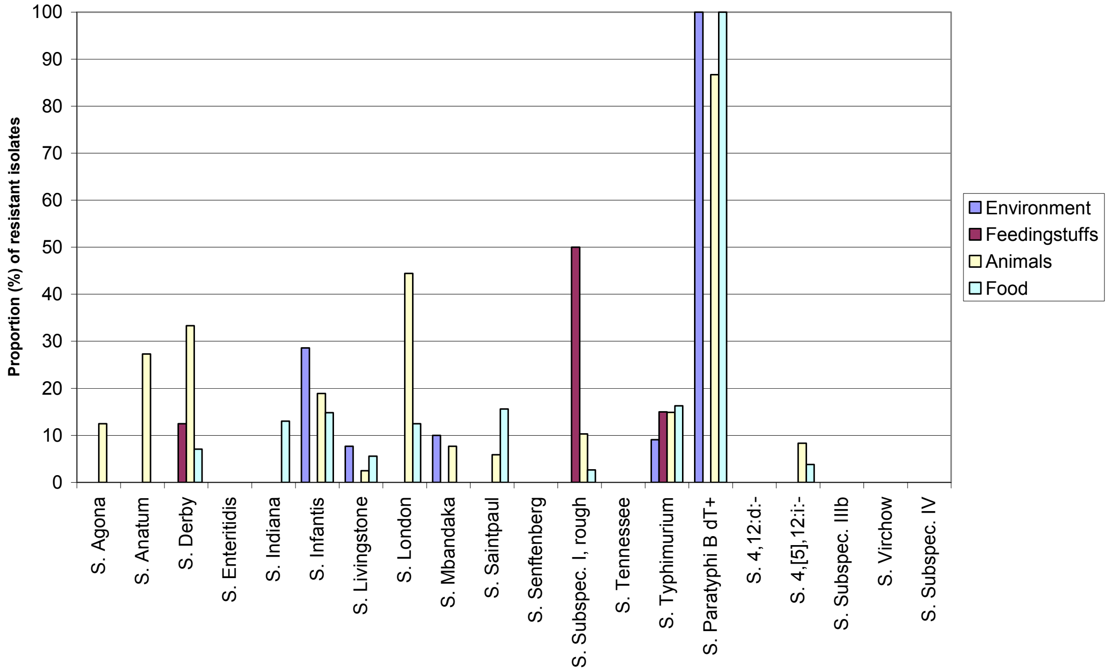
Figures 4.28 and 4.29 show the differences regarding the resistance rates to sulfonamides and trimethoprim (only evaluated in 2008), respectively, in the different serovars. There are considerable differences regarding sulfamethoxazole between the different serovars. Very high resistance rates have been determined for *S*. Saintpaul, *S*. Typhimurium, *S*. Paratyphi B dT+ and *S*. 4,[5],12:i:-. The very high resistance rate (more than 50 %) to sulfamethoxazole in the 163 *S*. Indiana isolates from food is noticeable as well.

Fig. 4.28: Resistance rates to sulfamethoxazole in the 20 most frequent *Salmonella* serovars (2000–2008)



Compared with the situation for sulfamethoxazole, there were significantly lower resistance rates for trimethoprim, which could only be evaluated in 2008. Only in *S*. Paratyphi B dT+ (86 isolates evaluated), extremely high resistance rates were found. Several other serovars showed resistances in some origins, however, the resistance rates are of limited relevance due to the limited number of isolates.

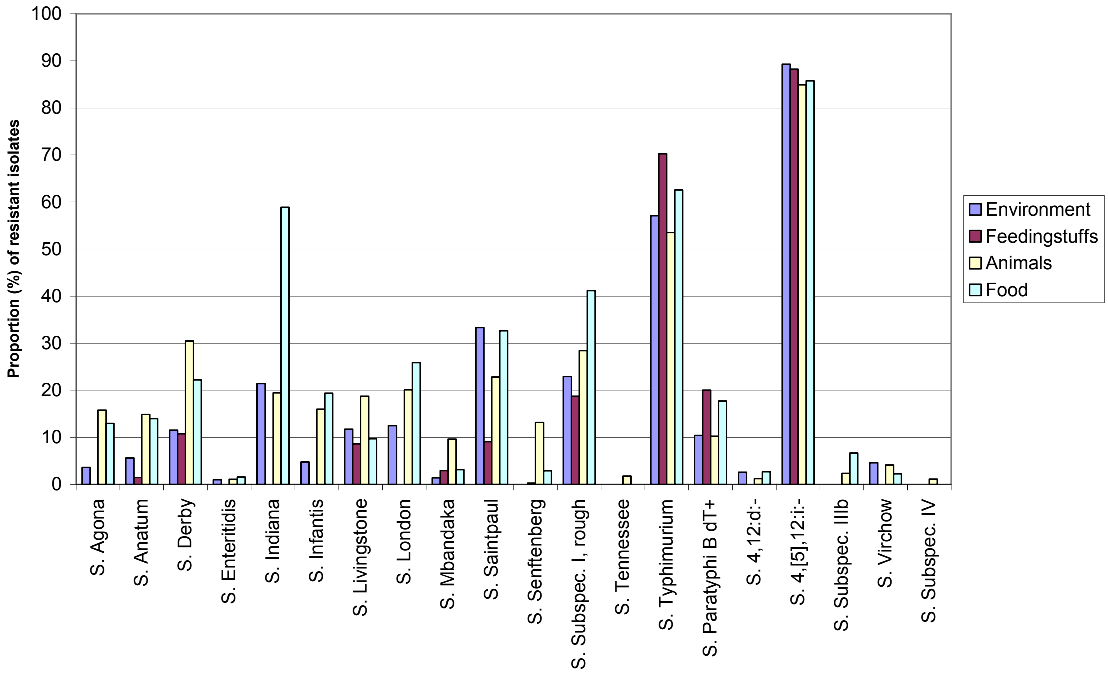
Fig. 4.29: Resistance rates to trimethoprim in the 20 most frequent *Salmonella* serovars (2007–2008)



4.4.7 Tetracyclines

Figure 4.30 shows the differences regarding the resistance rates to tretracyclines in the different serovars. Here as well, partially very high resistance rates in *S.* Typhimurium und *S.* 4,[5],12:i:- were found. Furthermore, the incidence of resistance to tetracyclines in *S.* Indiana isolates (163 isolates) from food is noticeable.

Fig. 4.30: Resistance rates to tetracyclin in the 20 most frequent *Salmonella* serovars (2000–2008)



5 Resistance situation in *Salmonella* isolates from livestock

5.1 Overview on the investigated isolates from animals

5.1.1 Origin of the isolates

From 2000 to 2008, 17,635 *Salmonella* isolates from animal-derived samples have been analysed in the NRL Salmonella. The majority of all submitted and investigated samples originated from animals. 63.5 % of these isolates originated from the four livestock species pigs (n = 3820), cattle (n = 3212), chickens (n = 2927) and turkeys (n = 1235). Because of the outstanding importance of the four mentioned livestock species regarding the potential consumer exposure to *Salmonella*, the resistance rates of these serovars are described in this chapter.

Other common origins were pigeons (n = 1965), reptiles (n = 1882), ducks (n = 465), geese (n = 101), dogs and cats (n = 475) as well as zoo animals (n = 467) and wildlife (n = 163). The resistance situation in *Salmonella* from these origins will be described in subsequent reports. In the appendix, additional tables regarding the described data and MIC values can be found.

5.1.2 Serovars

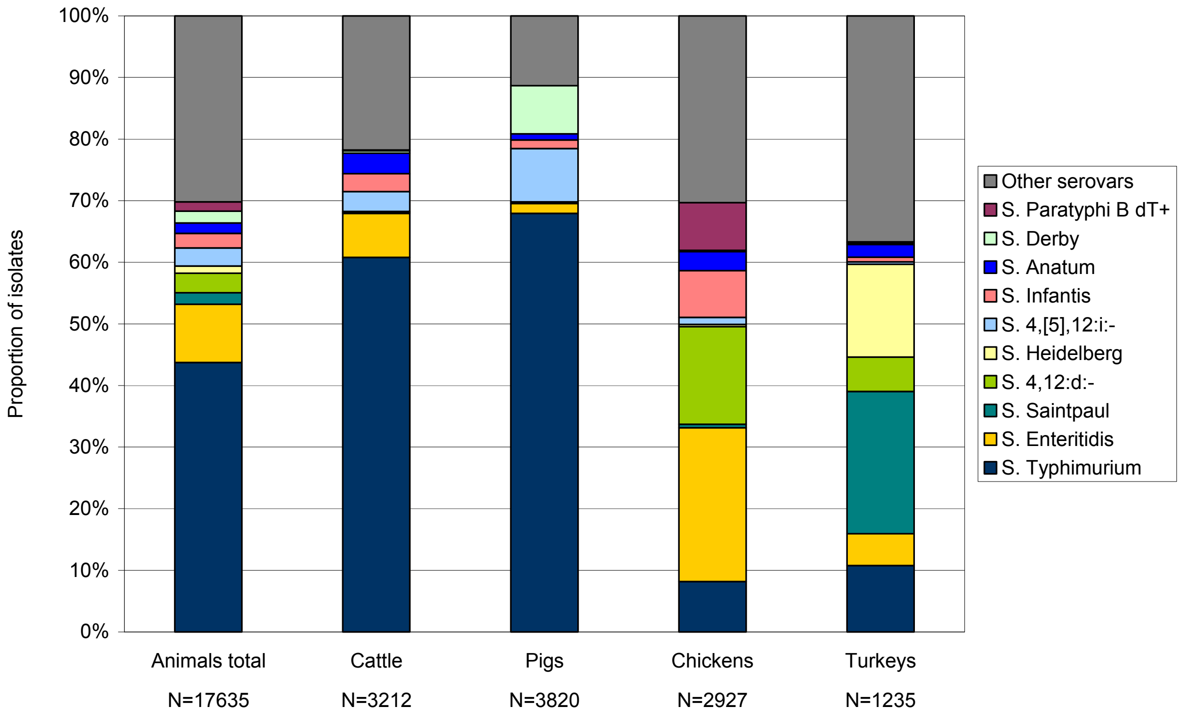
The predominant serovar from animals was *S*. Typhimurium, followed by *S*. Enteritidis (figure 5.1). All other serovars accounted for a proportion of less than 5 % in the total collective (see chapter 4). *S*. Typhimurium was identified in more than 5 % of all isolates from all four animal species. *S.* Enteritidis occurred less frequently in pigs (1.6 %), but in the other three animal species, it was identified in more than 5 % of the isolates.

Cattle and pigs showed a similar serovar distribution. The predominant serovar was *S.* Typhimurium with 61 % and 68 %, respectively. In both animal species, *S.* Enteritidis and *S.* 4,[5],12:i:- were among the most common serovars, too. Serovar *S.* Dublin was specific for cattle, and serovar *S.* Derby was specific for pigs, however, the latter serovar occurred in the other three animal species as well to a lesser extent.

The serovars isolated from chickens and turkeys were more diverse. In chickens, the most common serovar was *S*. Enteritidis (25 %), followed by the monophasic serovar *S.* 4,12:d:- (16 %). Serovar *S.* Paratyphi B dT+ occured almost exclusively in chickens (8 %).

The most common serovars in turkeys were *S.* Saintpaul (23 %) and *S.* Heidelberg (15 %). Both serovars were observed rarely or not at all in the other respective animal species.

Fig. 5.1: Proportions of the ten most frequent serovars among the isolates from animals and the four main livestock species (2000–2008)



5.2 Cattle

5.2.1 Serovars

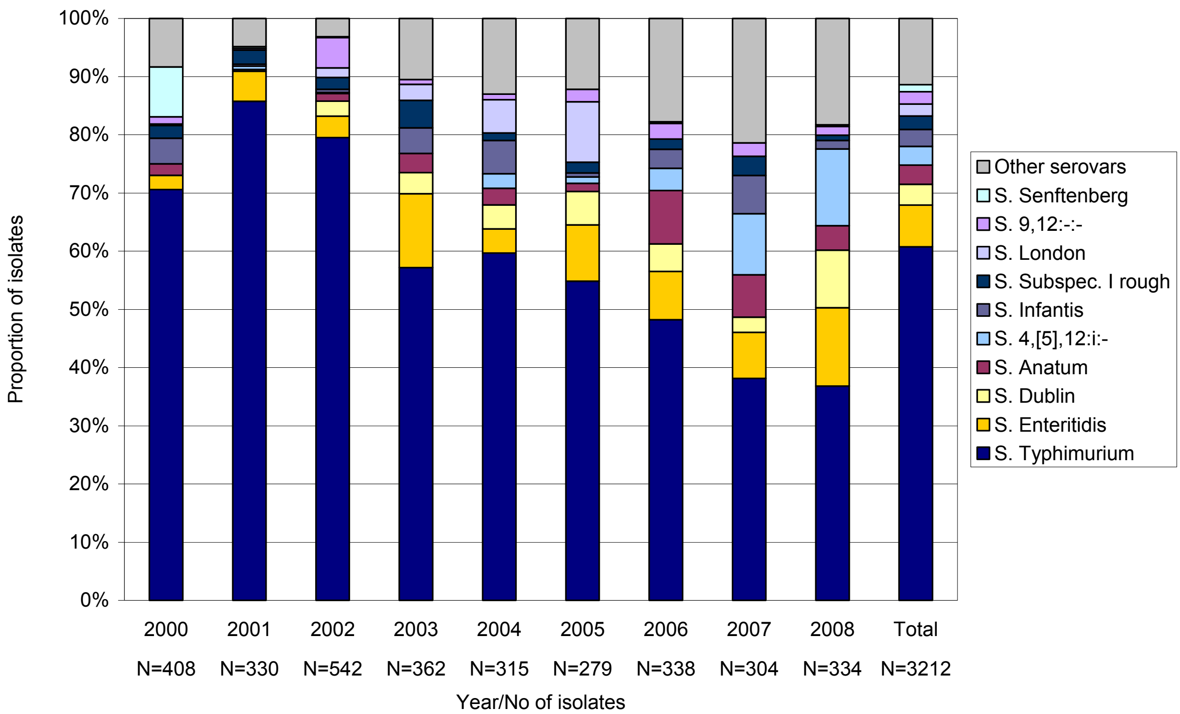
Most of the 3212 submitted *Salmonella* isolates from cattle were identified as *S.* Typhimurium (60.8 %). The second most common serovar was *S*. Enteritidis (7.2 %). The serovars *S.* Dublin, *S.* 4,[5],12:i:- and *S.* Infantis were third, fourth and fifth place (3.5 %, 3.2 % and 2.9 %).

Salmonellosis in cattle is a notifiable animal disease. The Friedrich-Loeffler-Institut (FLI) is the Federal Research Institute for Animal Health and is involved in the control of notifiable animal diseases, as the National Reference Laboratory for Salmonellosis in Cattle is located there. Therefore, part of the *Salmonella* detected in cattle in the federal states is sent to this institute. These isolates have not been taken into account in the present report. The FLI reports about the role of *Salmonella* in outbreaks in the Annual Animal Health Report http://www.fli.bund.de/fileadmin/user_upload/Dokumente/Jahresberichte/TG-JB/FLI_TGJB_2008_web.pdf. In the published FLI data as well, *S.* Typhimurium was the serovar identified most often. However, the proportion of *S.* Typhimurium altogether was lower than in the data presented in this report. On the other hand, the host-adapted serovar *S.* Dublin was identified more often in outbreaks (26.7 % in 2008) as well as the serovar *S.* Abony (11.7 % in 2008). The incidence of *S.* Enteritidis in the data of the FLI (6.6 % in 2008) was comparable to the incidence in the isolates presented here.

5.2.2 Trend of the serovars

The proportion of *S.* Typhimurium decreased from 85.8 % in 2001 to 36.8 % in 2008 (figure 5.2). In contrast, *S.* Enteritidis increased all in all from 3.7 % in 2000/2001 to 10.7 % in 2007/2007, however, with considerable annually variations (12.7 % in 2003 and 4.1 % in 2004). *S.* London increased from 1.7 % in 2002 to 10.4 % in 2005 and has not been detected again since then. *S.* Senftenberg was present in 8.6 % of the submitted isolates in 2000 and has been found only occasionally afterwards (up to 0.3 % of the isolates per year). In the isolates submitted to the FLI, according to the Annual Animal Health Report these serovars were of minor importance as well (< 1 %).

Fig. 5.2: Proportions of the ten most frequent serovars among isolates from cattle (2000–2008)



5.2.3 Serovar resistance

In total, 59.6 % of the *Salmonella* isolates from cattle were resistant, 51.9 % were multiresistant (figure 5.3). Most of the multiresistant isolates were resistant to five classes of antimicrobials. Resistances were found in particular to aminopenicillins, aminoglycosides, amphenicols, sulfamethoxazole, and tetracycline (between 33 % and 57 %, respectively).

82.4 % of the *S.* Typhimurium isolates were resistant, 76.4 % to more than one class of antimicrobials. Here as well, the proportion of isolates with resistances to five classes of antimicrobials was particularly high. The antimicrobial classes concerned were aminopenicillins, aminoglycosides, amphenicols, sulfamethoxazole, and tetracycline. Other resistances were observed relatively rarely (< 10 %). Resistances to third generation cephalosporins were rare (1.2 %, most recently one isolate in 2006). Resistances to nalidixic acid (3.5 %) and ciprofloxacin (4.1 %) occurred only rarely as well.

The 103 isolates of serovar *S.* 4,[5],12:i:- had some resistances (aminopenicillins, aminoglycosides, sulfamethoxazole, and tetracycline) in common with *S.* Typhimurium. The isolates were resistant to these antimicrobials almost without exception. However, most of them were susceptible to spectinomycin and to amphenicols, therefore the major proportion of the multiresistant *S.* 4,[5],12:i:- isolates was resistant to four classes of antimicrobials. This corresponds to the situation in pigs.

Like in the other livestock species, *S.* Enteritidis was resistant much less frequently to antimicrobial substances than *S.* Typhimurium or *S.* 4,[5],12:i:-. Only 6 % of the isolates were resistant, the highest resistance rate was 3.5 % to sulfamethoxazole.

Resistances in *S.* Infantis, *S.* Anatum and *S.* Dublin isolates were uncommon (14.9 %, 9.3 % and 7.0 %), and only a small proportion of isolates was multiresistant (3.2 %, 3.7 % and 3.5 %). Though rarely, in all three serovars resistances to (fluoro-) quinolones occurred.

Fig. 5.3: Resistance of selected *Salmonella* serovars from cattle and pigs (2000–2008); Number of classes of antimicrobials the isolates were resistant to

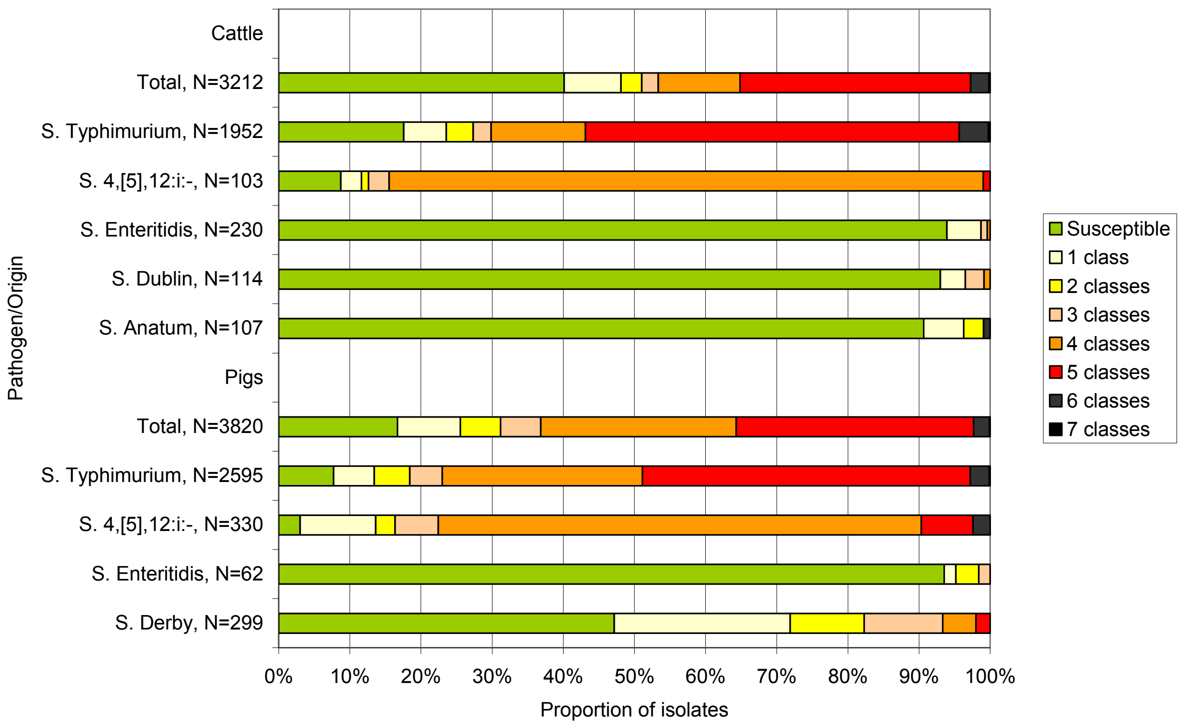
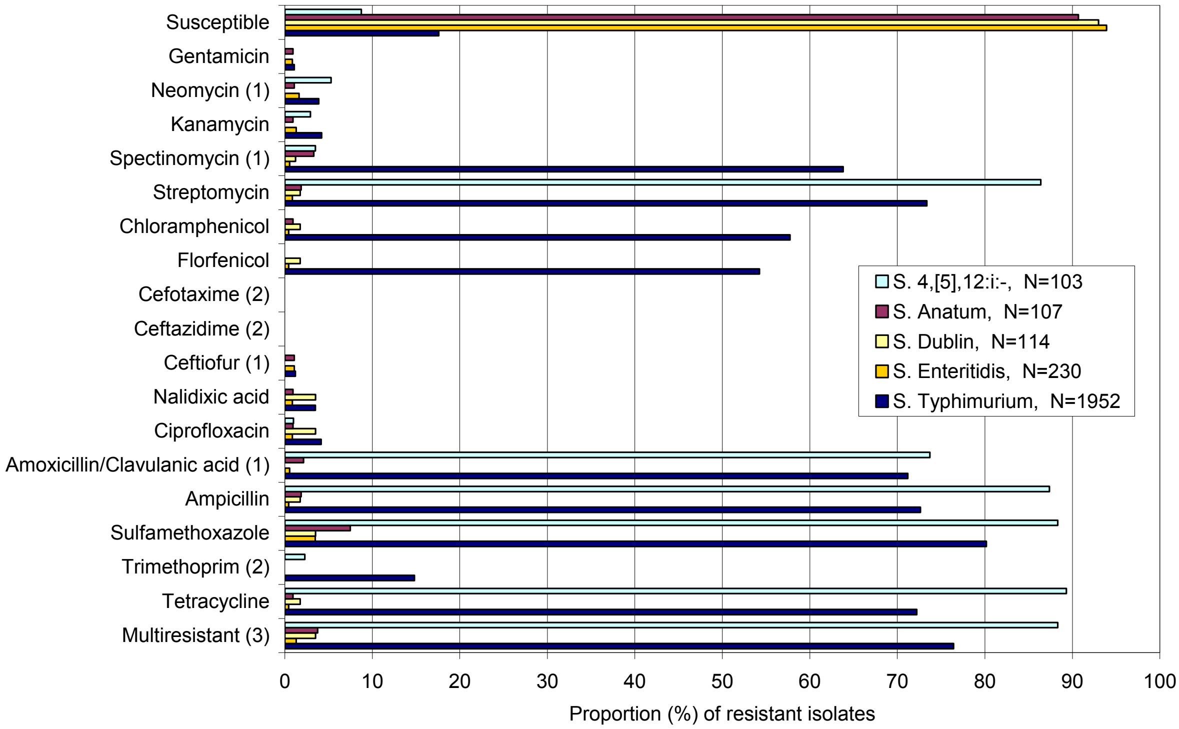


Fig. 5.4: Resistance of selected *Salmonella* serovars from cattle to antimicrobial substances (2000–2008)



5.2.4 Trend of resistance

The percentage of resistant *Salmonella* isolates from cattle decreased over the years from 86.5 % in 2000/2001 to 40.0 % in 2007/2008. This change is partly due to the decrease of the proportion of *S.* Typhimurium. However, changes in the serovar *S.* Typhimurium itself occurred as well: The proportion of resistant isolates fell from 94.6 % in 2000/2001 to 64.4 % in 2007/2008. At the same time, the proportion of multiresistant isolates decreased from 84.4 % to 59.0 %. Resistances to amphenicols and sulfamethoxazole declined.

5.3 Pig

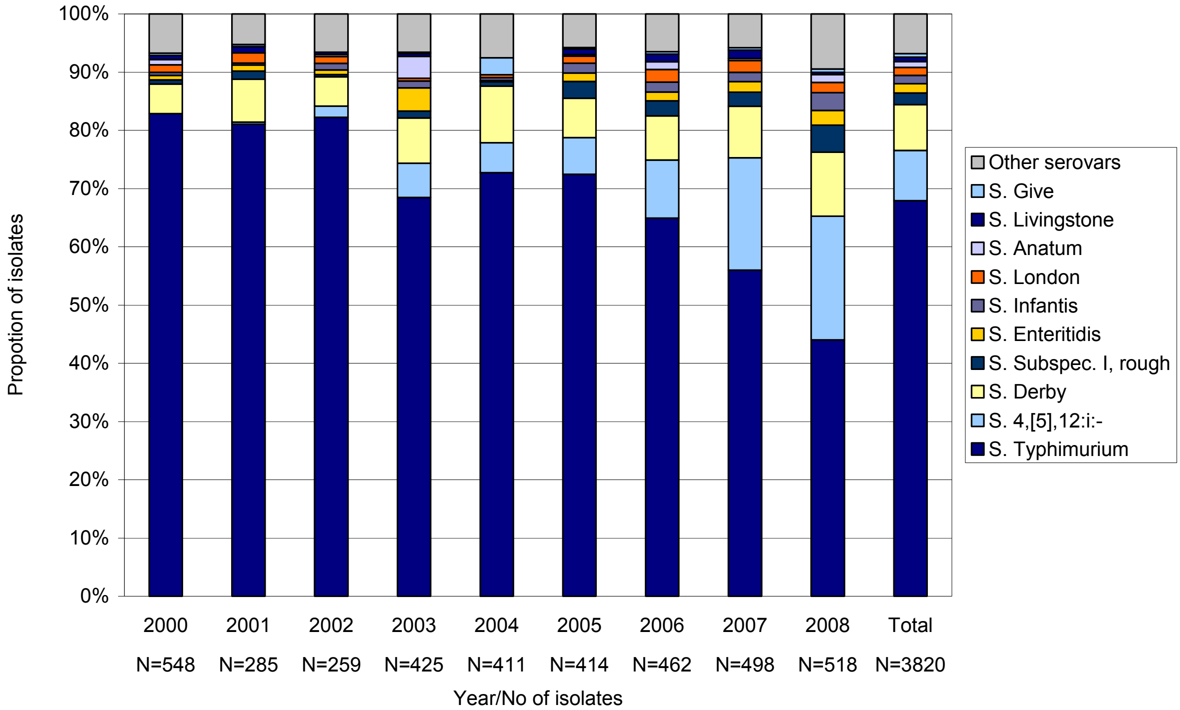
5.3.1 Serovars

Most of the 3820 *Salmonella* isolated from pigs were *S.* Typhimurium (68 % of the isolates, figure 5.5). Other frequently isolated serovars were the monophasic serovar *S.* 4,[5],12:i:- (9 %) and *S.* Derby (8 %). *S.* Enteritidis, the most frequent serovar in humans, was only identified in 1.6 % of the isolates from pigs.

5.3.2 Trend of the serovars

In 2000, *S.* 4,[5],12:i:- had not yet been found, but afterwards has been increasingly isolated and accounted for 21 % of the isolates from pigs in 2008. In the same period, the proportion of *S.* Typhimurium isolates fell from 82.8 % to 44 %. Thereby the proportion of both serovars together decreased over the years (from 82.5 % to 65.3 %). The proportion of the serovars *S.* Derby and *S. enterica* subspecies I rough form increased slightly over the years.

Fig. 5.5: Proportions of the ten most frequent *Salmonella* serovars among isolates from pigs (2000–2008)



5.3.3 Serovar resistance

83 % of *Salmonella* isolates from pigs were resistant to at least one antimicrobial, 74 % showed multiresistance (figure 5.3).

The high proportion of resistant isolates is due to the resistances of *S.* Typhimurium and *S.* 4,[5],12:i:-, which accounted for the largest proportion of isolates. *S.* Typhimurium and *S.* 4,[5],12:i:- had resistance rates of 92.3 % and 97.0 % and a multiresistance rate of 86.6 % and 86.4 %. In contrast, *S.* Derby showed only 52.8 % resistance and 28.1 % multiresistance.

S. Typhimurium was resistant extremely frequently to aminopenicillins, amphenicols, streptomycin, spectinomycin, tetracyclines and sulfamethoxazole (figure 5.6). Little or no resistances have been described for cephalosporins and quinolones.

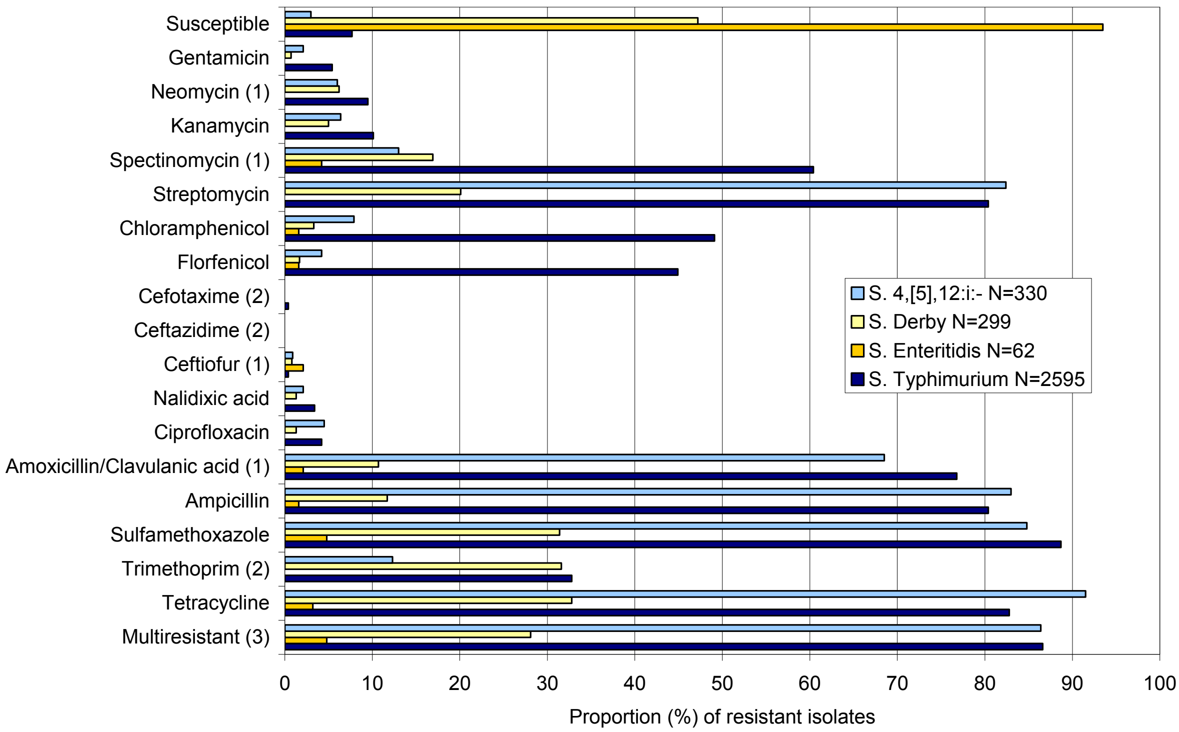
The resistance situation of the monophasic serovar *S.* 4,[5],12:i:- was very similar to that of *S.* Typhimurium. Here as well, only few isolates showed resistance to cephalosporins und quinolones. This serovar showed significantly less resistances to amphenicols, spectinomycin and trimethoprim than *S.* Typhimurium.

S. Derby showed much lower resistance rates than the serovars mentioned above. This was particularly apparent for aminopenicillins, amphenicols, sulfamethoxazole, streptomycin and tetracyclines. *S.* Derby rarely showed resistance to quinolones (1.3 %) or cephalosporins (0.8 %).

The isolates of *S.* Enteritidis from pigs presented only a low resistance rate (6.5 %). Only three of the 62 isolates were multiresistant (4.8 %). The resistances were split up to different antimicrobial substances. The resistance rates to any of the substances did not exceed 5 %.

One isolate was proven to be resistant to ceftiofur (2 %), and there were no resistances to quinolones.

Fig. 5.6: Resistance of selected *Salmonella* serovars from pigs to antimicrobial substances (2000–2008)



(1) Antimicrobials were tested from 2000 to 2007
(2) Antimicrobials were tested/evaluated since 2007
(3) Multiresistant = resistant to more than one class of antimicrobials

5.3.4 Trend of resistance

The percentage of resistant *Salmonella* isolates from pigs decreased over the years from 92.0 % in 2000/2001 to 79.4 % in 2007/2008. The proportion of multiresistant isolates in 2006 to 2008 (68 %–75 %) was below the comparison value of the previous years (73 %–82 %).

The proportion of resistant and multiresistant *S.* Typhimurium isolates varied over the years without any particular trend.

An increase of resistant *S.* Typhimurium isolates was shown for gentamicin, kanamycin and neomycin. Resistances to nalidixic acid and ciprofloxacin were observed in 2008 slightly more often (7 %) than in the previous years (max. 5.7 %). For chloramphenicol, a decrease of resistant isolates was determined (from 55.7 % to 37.3 %).

S. Derby showed an extremly variable proportion of resistant isolates (between 25.7 % and 78.6 %), with the fluctuations being in particular due to the variable resistance to sulfamethoxazole and tetracycline. The percentage of multiresistant isolates varied withouth any particular trend, too, but to a lesser extent (14.3 %–40.9 %).

A conclusion about the trend regarding *S.* 4,[5],12:i:- was not possible, because two thirds of the isolates of this serovar were taken in 2007 and 2008, and there were not enough older isolates available for comparison.

5.4 Chicken

5.4.1 Serovars

The 2927 isolates from chickens were derived from different production branches and originated from breeding flocks, laying hens and broilers.

The spectrum of common serovars was much broader than the one from pigs, with *S.* Enteritidis being the most common serovar (25 %); figure 5.7). Other common isolates were the monophasic serovar *S.* 4,12:d:- (16 %) and the serovars *S.* Typhimurium, *S.* Paratyphi B dT+ and *S.* Infantis (8 % each). *S.* Livingstone and *S.* Virchow were also identified in more than 5 % of the isolates.

5.4.2 Trend of the serovars

The proportion of the individual serovars varied in the period from 2000 to 2008. On the one hand, variation was found in the proportions of *S*. Enteritidis (10 %–47 %) and *S*. 4,12:d:- (0.7 %–34 %), in the proportions of the serovars that were not among the ten most common ones (6 %–30 %), as well as in the proportions of *S.* Typhimurium (4 %–13 %) and of *S.* Paratyphi B dT+ (3 %–17 %). On the other hand, some serovars could not be detected at all in some years, whereas in other years, they accounted for 14 % (*S*. Virchow) and 6 % (*S.* Mbandaka) of all submitted isolates from chickens.

5.4.3 Serovar resistance

Compared with the isolates from the other livestock species, the total of *Salmonella* isolates from chickens was most frequently susceptible to all tested antimicrobial substances (58.2 %) and had the lowest multiresistance rate (12.8 %; figure 5.8). Most of the resistant isolates were only resistant to one or two classes of antimicrobials.

The comparatively low resistance of *Salmonella* is due to the large proportion of *S.* Enteritidis and *S.* 4,12:d:- isolates in the collective. A large percentage (77.7 %) of the *S.* Enteritidis isolates was susceptible to all tested substances. Only to ciprofloxacin and sulfamethoxazole, there were resistances in about 10 % of the *S.* Enteritidis isolates (figure 5.9). Multiresistance was detected in only 4.0 % of the isolates.

The situation in the monophasic serovar *S.* 4,12:d:- was very similar. However, in contrast to *S.* Enteritidis, hardly any resistances to ciprofloxacin were detected.

In contrast to *S.* Enteritidis and *S*. 4,12:d:-, 64.4 % of the *S.* Typhimurium isolates were resistant. 39.7 % of the isolates were multiresistant, and as with cattle and pigs, resistance to five classes of antimicrobials was predominant. The resistance rate to sulfamethoxazole was the highest one, with a value of 62.3 %. Resistance rates between 20 % and 40 % were found for aminopenicillins, amphenicols, and tetracycline as well as for the the aminoglycosides spectinomycin and streptomycin. Similar to *S.* Enteritidis, in *S.* Typhimurium as well resistances to nalidixic acid (9.6 %) and ciprofloxacin (3.3 %) were found.

Serovar *S.* 4,[5],12:i:- from chickens was submitted only rarely. Its resistance pattern was similar to that of *S.* Typhimurium, with the difference that no resistances to amphenicols were detected.

Fig. 5.7: **Proportions of the ten most frequent *Salmonella* serovars among isolates from chickens (2000–2008)**

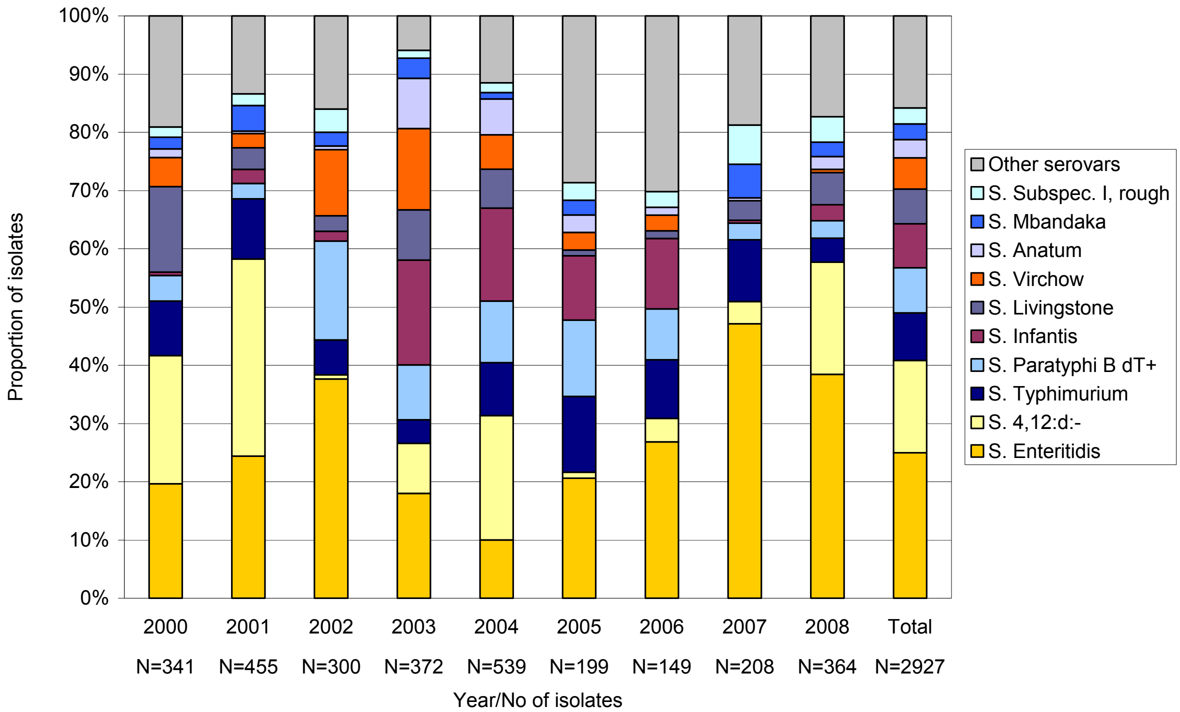
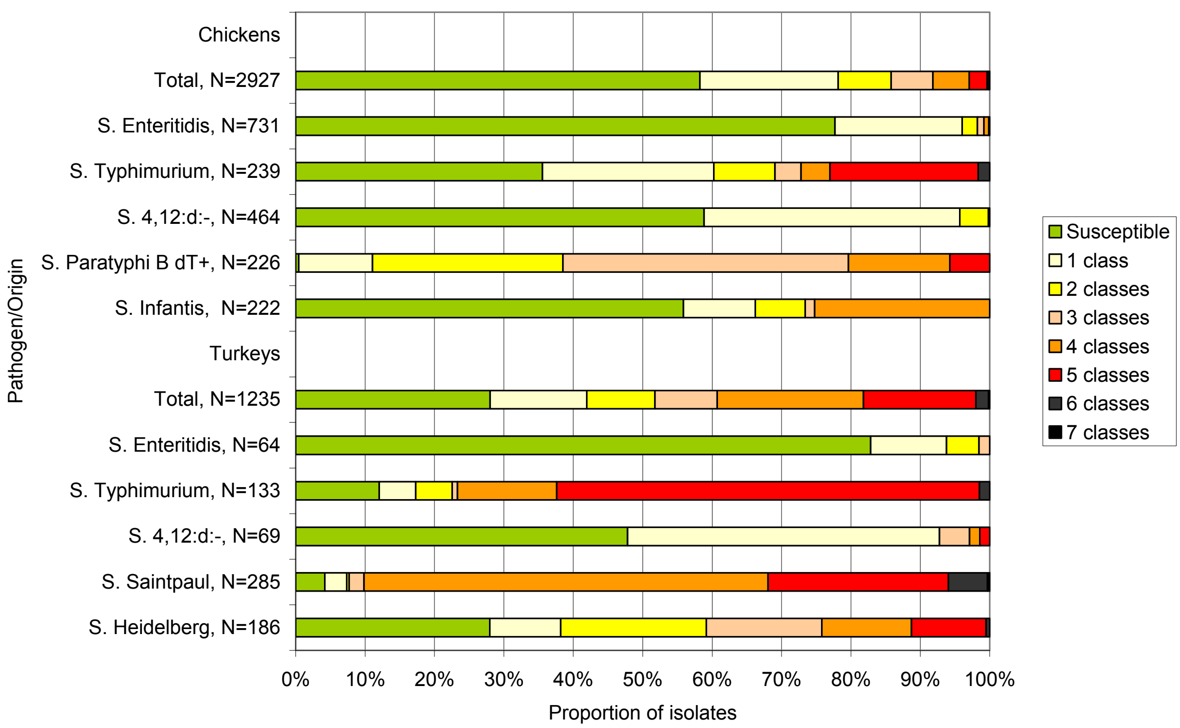


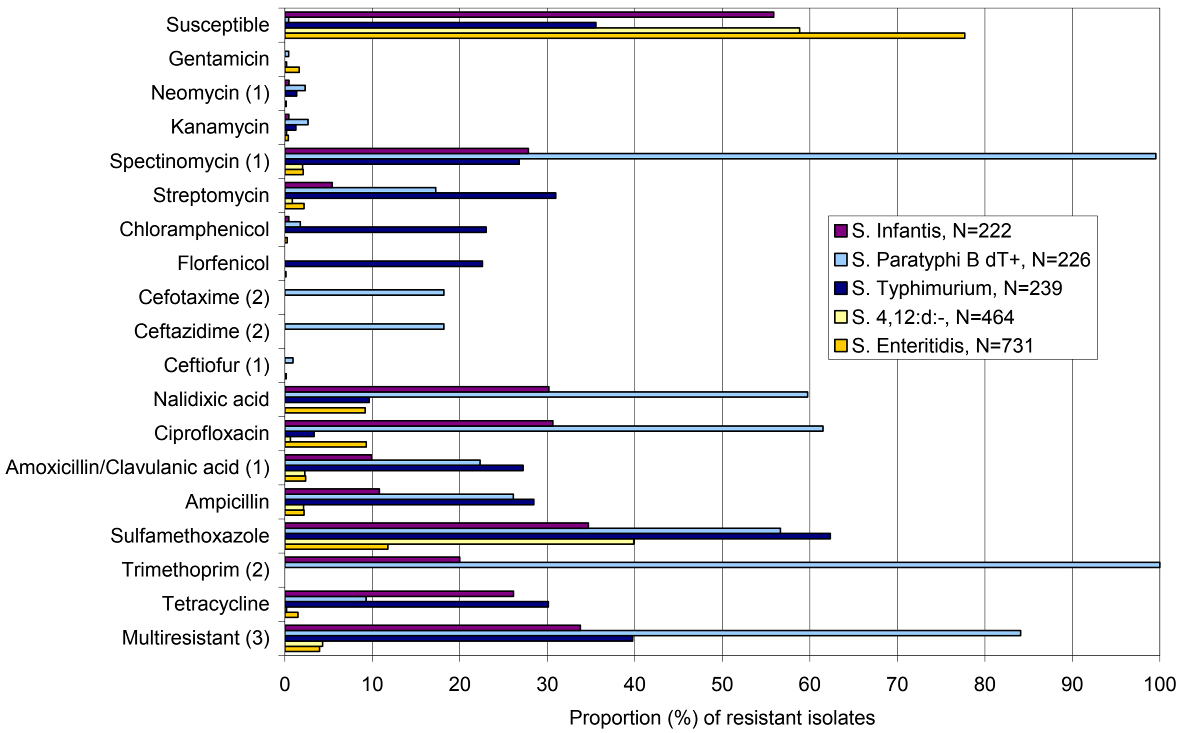
Fig. 5.8: **Resistance of selected *Salmonella* serovars from chickens and turkeys (2000–2008); Number of classes of antimicrobials the isolates were resistant to**



Only very few isolates (0.4 %) of the serovar *S.* Paratyphi B dT+ were susceptible to all tested antimicrobials, 84.1 % were multiresistant, however, in most cases only to two to four classes of antimicrobials. Particularly often, resistance to spectinomycin (99.5 %) and trimethoprim (100 %, evaluated only in 2008) was observed. More than 50 % of the isolates also were resistant to the (fluoro-)quinolones ciprofloxacin (61.5 %) and nalidixic acid (59.7 %), and to sulfamethoxazole (56.6 %).

About half of the *S*. Infantis isolates were shown to be susceptible (55.9 %). The resistant isolates were mostly multiresistant (33.8 % of the isolates), with resistances to spectinomycin, (fluoro-)quinolones, sulfamethoxazole and tetracycline being predominant (about 30 % each). Less frequently, resistances to trimethoprim (20.0 %) and aminopenicillins (about 10 % each) were observed.

Fig. 5.9: Resistance of selected *Salmonella* serovars from chickens to antimicrobial substances (2000–2008)



(1) Antimicrobials were tested from 2000 to 2007
(2) Antimicrobials were tested/evaluated since 2007
(3) Multiresistant = resistant to more than one class of antimicrobials

5.4.4 Trend of resistance

Altogether, the percentage of resistant *Salmonella* isolates from chickens decreased over the years from 73.6 % (2000) to 14.6 % (2008), while the proportion of multiresistant isolates fell from 28.7 % (2000) to 11.3 % (2008).

There was a decline in resistant *S.* Enteritidis serovars as well. The proportion of multiresistant isolates fell from 13.4 % (2000) to 0 % (2008). The peak level of resistance to the quinolones nalidixic acid and ciprofloxacin was reached in the period from 2001 (9.9 %) to 2004 (31.5 %). Before and after, lower resistance rates were determined. Most resistances to sulfamethoxazole were detected in 2000 and 2001, while afterwards only a few resistant isolates were identified.

In serovar S. 4,12:d:- as well, only during the first two years of investigation an increased number of isolates resistant to sulfamethoxazole was identified. Apart from that and very few exceptions, this serovar was susceptible to all tested substances.
The proportion of susceptible *S.* Typhimurium isolates from chickens tended to increase over the years, however, the number of isolates per year was limited, therefore it is questionable whether valid conclusions regarding the trend can be drawn.

In contrast to *S.* Typhimurium and *S.* Enteritidis, *S.* Paratyphi B dT+ did not show any trend with regard to the proportion of resistant and multiresistant isolates. Here as well, the number of isolates per year was limited, so that conclusions regarding the trend are difficult. However, two cephalosporin-resistant isolates (18.2 %) from 2008 were noticeable. Such isolates had been observed only very rarely in the previous years.

Because of the limited number of isolates, it was not possible to evaluate the temporal trend regarding *S.* 4,[5],12:i:-. The majority of available *S.* Infantis isolates was taken in the period from 2003 to 2006, therefore it was not possible to evaluate the temporal trend of the resistance situation, either.

5.5 Turkey

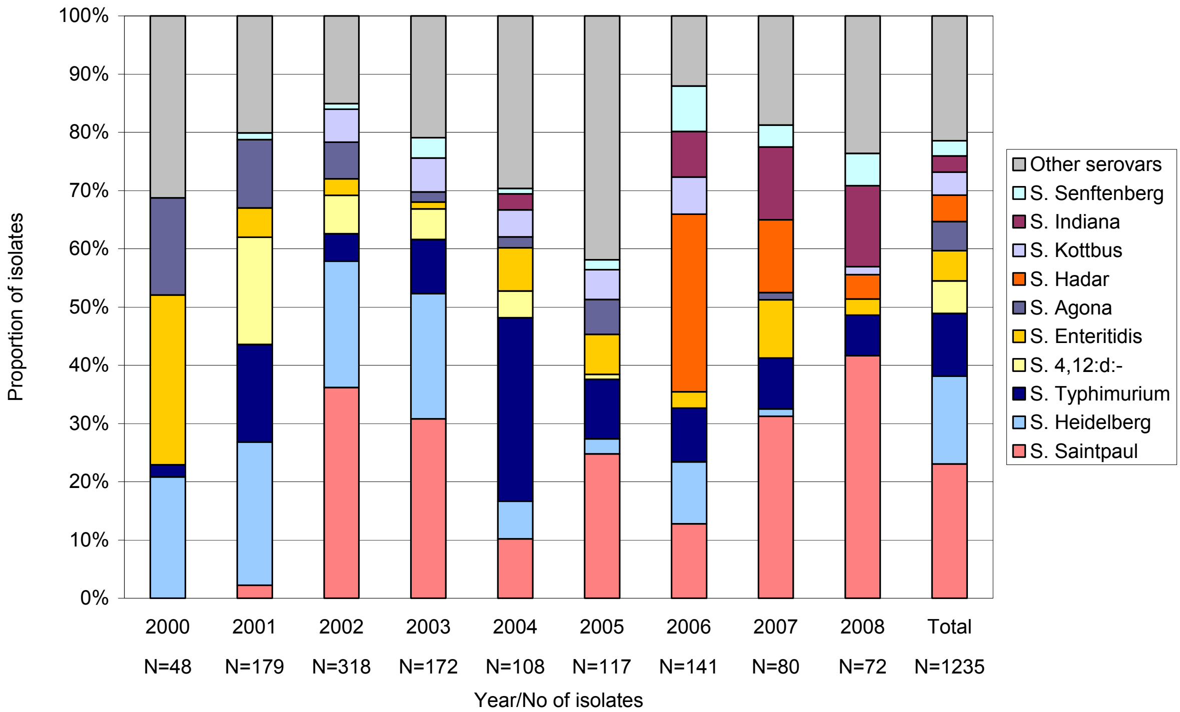
5.5.1 Serovars

The spectrum of the 1235 submitted *Salmonella* serovars from turkeys differed from the spectrum in chickens as well as in cattle and pigs. The most frequently submitted serovar from turkeys was *S.* Saintpaul (23 %; figure 5.10). It was remarkable that most of these isolates were from the year 2002 (115/285). This was due to a research project that was performed in that year. *S.* Heidelberg, the second most common serovar (15 %), was only rarely submitted from other livestock species, too. *S.* Typhimurium (11 %) was in third position, followed by the monophasic serovar *S.* 4,12:d:- (6 %) as well as *S.* Enteritidis and *S.* Agona (5 % each).

5.5.2 Trend of the serovars

There were several trends in the composition of the serovars (figure 5.10). In 2000, *S.* Saintpaul was not submitted, it was submitted in 2001 for the first time and has varied since then between 10 % and 42 %. Conversely, *S.* Heidelberg was one of the predominant serovars in 2000 and was not submitted in 2008. Over five years, from 2001 to 2005, *S.* 4,12:d:- was submitted with decreasing proportions, similar to *S.* Hadar between 2006 and 2008. Only *S.* Typhimurium and *S.* Enteritidis were submitted in every year, even though in variable percentages.

Fig. 5.10: Proportions of the ten most frequent *Salmonella* serovars among isolates from turkeys (2000–2008)



5.5.3 Serovar resistance

In total, 71.2 % of the *Salmonella* isolates from turkeys were resistant, 57.9 % were multiresistant (figure 5.8).

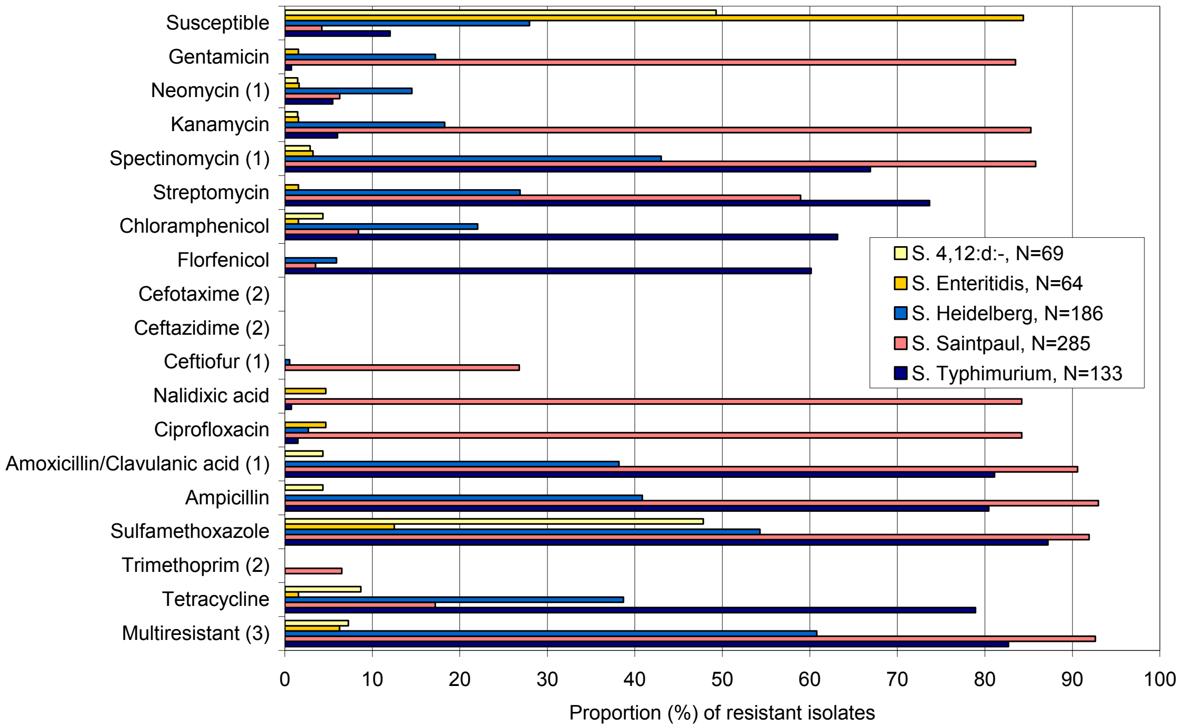
More than 90 % of the *S.* Saintpaul isolates were resistant to aminopenicillins and sulfamethoxazole, respectively (figure 5.11). According to this, the proportion of multiresistant isolates was very high (92.6 %) and the proportion of susceptible isolates very low (4.2 %). Most of the multiresistant isolates were resistant to four or five classes of antimicrobials. *S.* Saintpaul showed the highest resistance rate of all isolates from livestock to third generation cephalosporins (ceftiofur 26.8 %). However, this high proportion was mainly based on the investigations in the year 2002, when 40 % of the *S.* Saintpaul isolates were submitted (see above). In this year, nearly half of the isolates were resistant to ceftiofur (45.2 %). In the total sample collective of the BfR*, S.* Saintpaul showed the most pronounced resistance to antimicrobial agents of all serovars isolated from animals.

72 % of the *S.* Heidelberg isolates were resistant. Most often, resistances to aminopenicillins (ampicillin and amoxicillin/clavulanic acid), spectinomycin, sulfamethoxazole and tetracycline were proven (each between 35 % and 55 %). One quarter of the isolates was resistant to streptomycin and chloramphenicol. Resistances to gentamicin, kanamycin and neomycin were less common (about 15 %). Resistances to cephalosporins and ciprofloxacin did not occur in this serovar, except for one isolate that was resistant to ceftiofur.

In *S*. Typhimurium, 88.0 % of the isolates were resistant. Resistance rates to aminopenicillins, spectinomycin, streptomycin, amphenicols, sulfamethoxazole and tetracycline ranged from 60 % to 90 %.

Serovar *S.* 4,12:d:-, which was common in chickens as well, showed increased resistance rates only to sulfamethoxazole, both in turkeys and in chickens (48 %). For all other antimicrobial substances the isolates‘ resistance rates were less than 10 %.

Fig. 5.11: Resistance of selected *Salmonella* serovars from turkeys to antimicrobial substances (2000–2008)



(1) Antimicrobials were tested from 2000 to 2007
(2) Antimicrobials were tested since 2008
(3) Multiresistant = resistant to more than one class of antimicrobials

5.5.4 Trend of resistance

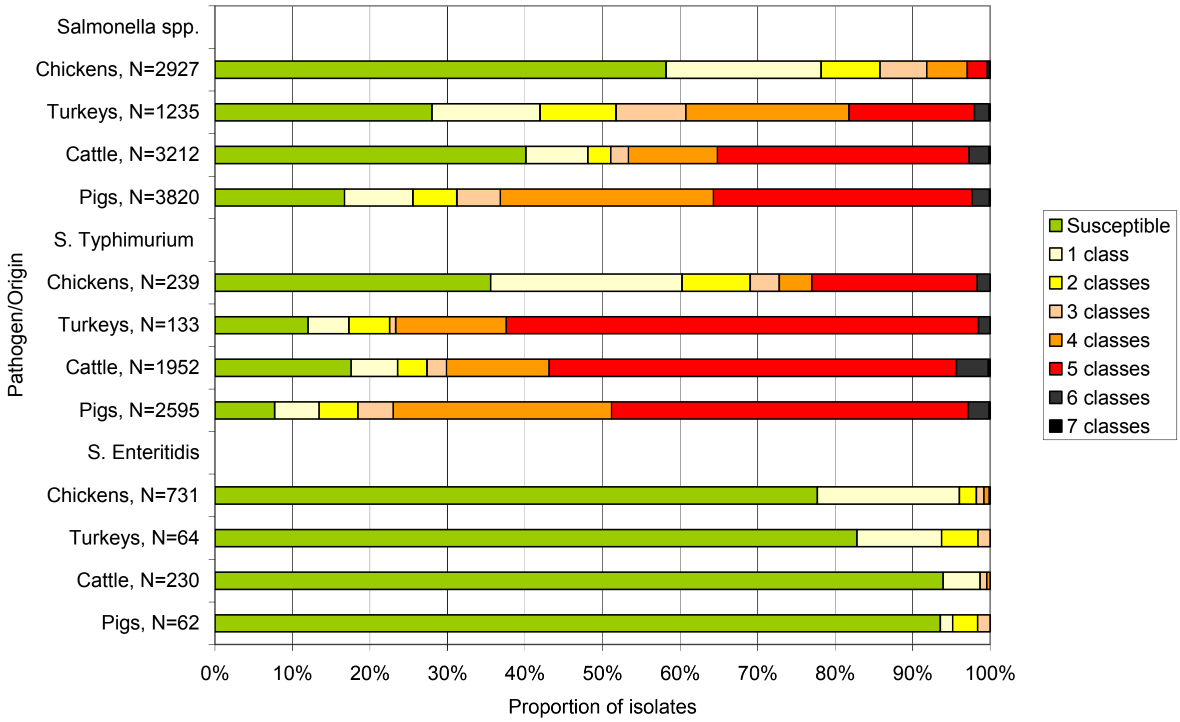
The resistance rates in the individual serovars varied over the years from 2000 to 2008 without any particular trend. Particularly remarkable is the resistance rate of 45 % in *S.* Saintpaul to ceftiofur in 2002 (see above), which had contributed to a great extent to the resistance rate of 27 % for the period from 2000–2008. In two of the years, the proportion of ceftiofur-resistant isolates was 17 % and 19 %, whereas in other years it was 0. In contrast, all other serovars showed maximum resistance rates to ceftiofur of 1 %.

5.6 Comparison of the resistance of serovars from different animal species

5.6.1 *Salmonella* spp.

Overall, *Salmonella* from pigs showed the highest resistance rates (figure 5.12.). Of the 3820 isolates, 83.2 % were resistant to one class of antimicrobials and 74.2 % to more than one class. They were followed by isolates from turkeys (71.2 % and 57.9 %, respectively), from cattle (59.6 % and 51.9 %, respectively), and, with the lowest resistance rate, from chickens (41.8 % and 21.8 %, respectively). Because there were considerable differences both between the proportion of resistant and multiresistant isolates in the serovars as well as in the proportions of the serovars in the different livestock species, a comparison of the resistance rates of specific serovars that occurred in different animal species is presented in the following.

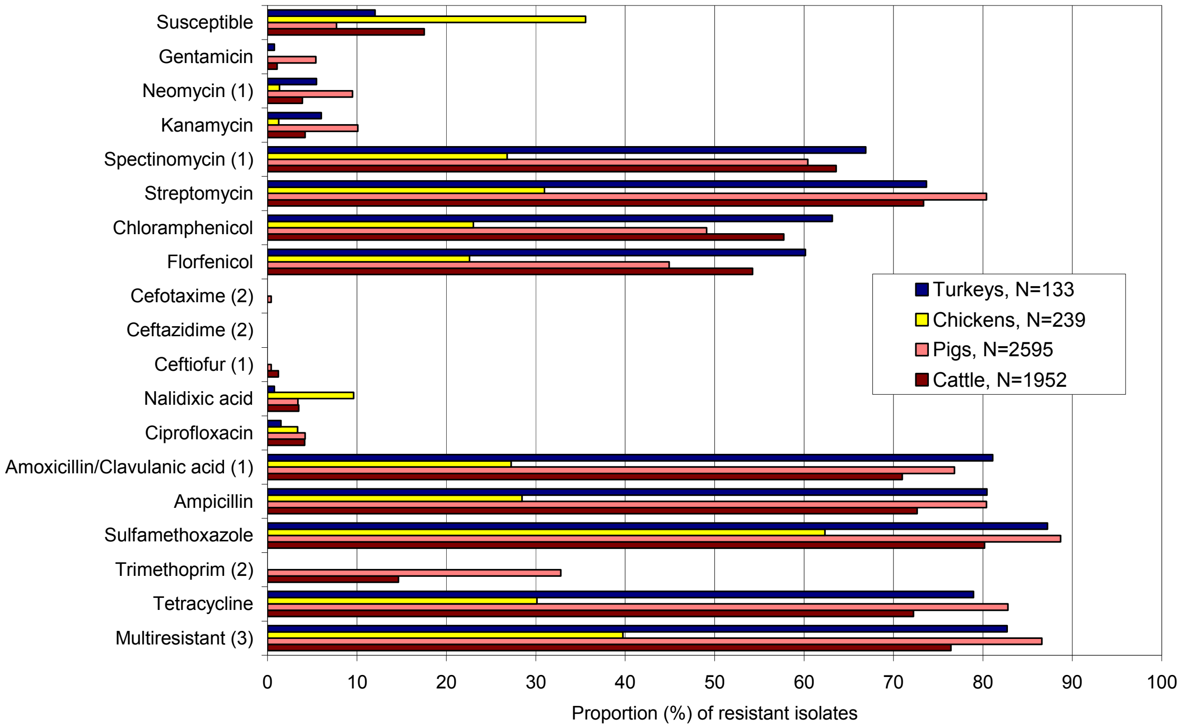
Fig. 5.12: Resistance rates in *Salmonella* spp., *S.* Typhimurium and *S.* Enteritidis from the four livestock species (2000–2008); Number of classes of antimicrobials the isolates were resistant to



5.6.2 *S.* Typhimurium

Except for turkeys, *S*. Typhimurium was the serovar with the most pronounced resistance to antimicrobial agents. The proportion of resistant isolates was highest in pigs (92.3 %), followed by turkeys (88.0 %), cattle (82.4 %) and chickens (64.4 %). Multiresistances were detected in more than 75 % of the isolates from livestock, with isolates from chickens showing a significantly lower multiresistance rate (39.7 %) than the three other livestock species (76.4 %–86.6 %). While more than 70 % of the *S.* Typhimurium isolates from other livestock species were resistant to streptomycin and more than 55 % were resistant to spectinomycin, the resistance rate in chicken isolates was 31.0 % and 26.8 %, respectively (figure 5.13). The situation for phenicols was similar. In this case, the proportion of resistant isolates from chickens was only half as high as the one of isolates from other species (23 % vs. 45–65 %). However, in comparison isolates from chickens were relatively frequently resistant to nalidixic acid (9.6 %) This difference was not observed for ciprofloxacin. *S.* Typhimurium from turkeys and chickens did not show any resistances to third generation cephalosporins during the investigated period. In isolates from cattle and pigs the resistance rate to this class of antimicrobials was 1.2 % and 0.4 %, respectively.

Fig. 5.13: Comparison of resistance in *Salmonella* Typhimurium from cattle, pigs, chickens and turkeys to antimicrobials (2000–2008)

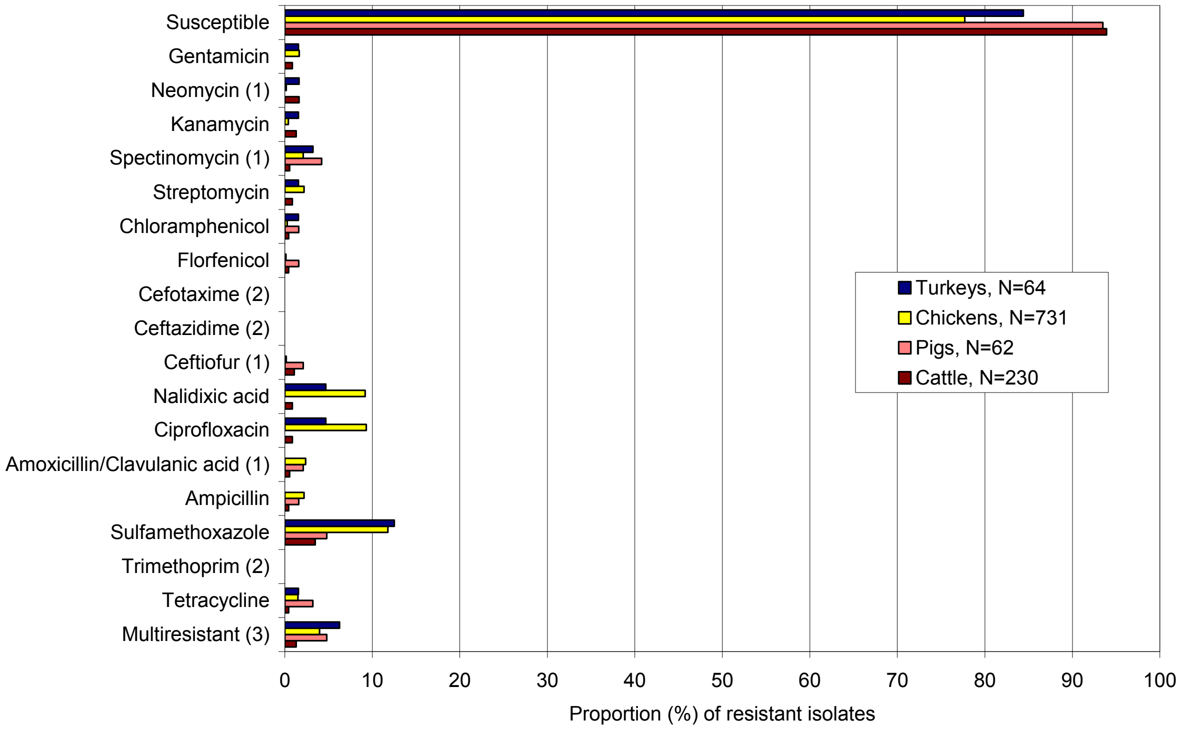


(1) Antimicrobials were tested from 2000 to 2007
(2) Antimicrobials were tested/evaluated since 2007
(3) Multiresistant = resistant to more than one class of antimicrobials

5.6.3 *S.* Enteritidis

S. Enteritidis from chickens showed the highest proportion of resistant isolates (22.3 %), followed by isolates from turkeys (15.6. %), while there was only little difference between isolates from pigs (6.5 %) and from cattle (6.1 %). Multiresistances were observed particularly in turkeys, followed by chickens and pigs. In *S.* Enteritidis from cattle they occurred very rarely (1.3. %). In contrast to isolates from pigs and cattle, 9.3 % of the isolates from chickens showed resistances to ciprofloxacin (figure 5.14). This type of resistance was not detected in isolates from pigs, and in only two isolates from cattle (0.9 %). The second type of resistance, that distinguished isolates from chickens and turkeys from those of the other two animal species, was resistance to sulfamethoxazole (11.8 % and 12.5 % resistant isolates, respectively). However, in chickens as well it was mainly detected in 2000 (58 %) and in 2001 (33 %). Afterwards, the proportion of resistant isolates was between 0 % and 5.1 % per year, too.

Fig. 5.14: Comparison of resistance in *Salmonella* Enteritidis from cattle, pigs, chickens and turkeys to antimicrobials (2000–2008)



(1) Antimicrobials were tested from 2000 to 2007
(2) Antimicrobials were tested since 2008
(3) Multiresistant = resistant to more than one class of antimicrobials

5.6.4 Other serovars

The monophasic serovar *S.* 4,[5],12:i:- occurred mainly in cattle and pigs. Like *S.* Typhimurium, resistance rates were extremely high. In comparison, slightly more isolates from pigs were resistant than those from cattle (97.0 % vs. 91.3 %). The highest resistance rates (82 % to 92 %) were demonstrated in isolates from both animal species to ampicillin, streptomycin, sulfamethoxazole and tetracycline, with only slight differences between both animal species. In contrast to isolates from cattle, isolates from pigs more often showed resistances to amphenicols and ciprofloxacin (4 % to 8 %). These occurred not at all or rarely in cattle isolates (one isolate for ciprofloxacin).

Serovar *S.* 4,12:d:-, which is monophasic, too, only occurred in chickens (464 isolates) and turkeys (69 isolates) frequently enough to allow a comparison of the resistance rates. Both serovars often showed resistance to sulfamethoxazole (chickens 39.9 %, turkeys 47.8 %). In contrast to isolates from chickens, isolates from turkey presented resistances to tetracycline (8.7 %) and chloramphenicol (4.3 %) as well. Only one isolate from chicken was resistant to tetracycline.

6 On the resistance situation of *Salmonella* isolates from food

6.1 Food in total

6.1.1 Serovars

In the period from 2000 to 2008, a total of 10,853 *Salmonella* isolates from food was submitted for further investigation to the NRL Salm. Following *Salmonella* isolates from animals, isolates from food were the second most common ones with a mean proportion of 32 %. Isolates from food accounted for a percentage of 27.3 % (2004) to 45.1 % (2005) of all isolates that were submitted to the NRL Salm.

A total of 179 different serovars including subspecies were identified in isolates from food. The most common serovar was *S.* Typhimurium with 3459 isolates, which accounted for almost one third (31.9 %) of all isolates from food. Listed in order of frequency, other important serovars were *S.* Enteritidis (17.8 %), *S.* Paratyphi B dT+ (4.8 %), *S.* Derby (4.0 %) as well as *S.* 4,[5],12:i:- and *S.* Infantis (3.9 % each; table 13.5).

6.1.2 Trend of the serovars

Between 2000 und 2005, the percentage of the predominant serovar *S*. Typhimurium in food isolates ranged from 29.3 % (2002) to 44.4 % (2001), and then decreased by 2008 to 24.0 % (table 13.5). In contrast, detection of the monophasic serovar *S*. 4,[5],12:i:-, which is genetically related to *S*. Typhimurium, increased from 0.4 % in 2000 to a proportion of 9.9 % in 2008. The percentage of *S*. Paratyphi B dT+ decreased from 16.3 % (2000) to 1.4 % in 2005, and then slightly increased again to 6.5 % in 2008. Among the top 6 of the serovars, the proportions of *S*. Enteritidis, *S*. Derby and *S*. Infantis remained relatively stable.

6.1.3 Serovar resistance

Of the 10,853 isolates, 53.1 % were resistant, with 40.1 % being multiresistant and 13.0 % being resistant to only one of the tested classes of antimicrobials (table 13.6). A high resistance rate occurred to the single substances sulfamethoxazole (42.8 %), tetracycline (34.1 %), ampicillin (30.1 %), streptomycin (28.2 %), amoxicillin/clavulanic acid (27.6 %), and spectinomycin (24.5 %). The isolates showed moderate resistance rates to trimethoprim (14.3 %), chloramphenicol (12.8 %), and florfenicol (10.5 %). A similar level of resistance was proven for ciprofloxacin with 10.9 % and a slightly lower one for the quinolone nalidixic acid with 10.4 %. A low resistance rate was shown for the aminoglycosides kanamycin (4.8 %), neomycin (3.6 %), and gentamicin (2.3 %). The cephalosporin ceftiofur was tested between 2000 and 2007, and 1.2 % of the isolates were resistant. Since the end of 2007, the cephalosporins cefotaxim and ceftazidim have been tested, because since then the European microplate EUMVS has been applied, with 1.1% of the isolates being resistant.

Of the serovar *S.* Typhimurium, which has been detected most often (3459 isolates, 31.9 %), 76.0 % were resistant, with the percentage of the multiresistant isolates (63.5 %) being much higher than the ones with resistance to a single antimicrobial (12.4 %). The following resistance rates to single substances were determined: sulfamethoxazole 67.9 %, tetracycline 62.6 %, ampicillin 56.3 %, streptomycin 54.7 %, spectinomycin 40.9 %, chloramphenicol 32.3 % and florfenicol 29.5 %. The values for the other substances were between 5.8 % for kanamycin and 0.7 % for ceftiofur.

Of the 1927 isolates of *S.* Enteritidis, the second most common serovar (17.8 % of all food isolates) only 15.4 % were resistant, 12.2 % to only one class of antimicrobials and 3.1 % to more than one class. The highest resistance rate determined was to sulfamethoxazole with 10.0 %. For all other substances values ranged between 4.9 % for ciprofloxacin and 0.1 % for neomycin.

Of the 519 *S.* Paratyphi B dT+ isolates (4.8 % of all food isolates), 99.4 % were resistant, 7.7 % to one class of antimicrobials and 91.7 % to two to six classes of antimicrobials. The highest resistance rates were found to spectinomycin (98.7 %) and sulfamethoxazole (67.2 %), followed by the group of (fluoro-)quinolones with 57.8 % for ciprofloxacin and 55.9 % for nalidixic acid. Resistances to third generation cephalosporins were 6.2 % to ceftiofur and 15.4 % for ceftazidim and cefotaxim, respectively.

Serovar *S.* Derby was the fourth most common isolate with 437 isolates (4.0 % of all food isolates), of which 33.6 % were resistant (13.7 % to one class of antimicrobials and 19.9 % to two to five antimicrobials). 22.2 % of the isolates were resistant to tetracycline, 21.3 % to sulfamethoxazole, 13.7 % to spectinomycin and 10.1 % to streptomycin. Some isolates (0.7 %) of *S.* Derby were resistant to quinolones, while all isolates were susceptible to third generation cephalosporins.

The monophasic serovar 4,[5],12:i:-, which is genotypically closely related to *S.* Typhimurium, showed an increasing number of isolates from 2000–2008 and reached a proportion of 3.9 % (421 isolate) in food. Quadruple resistance to tetracycline (85.7 %), sulfamethoxazole (81.2 %), streptomycin (75.8 %) and ampicillin (75.3 %) was clearly predominant. The proportion of resistant isolates to quinolones was lower than in *S.* Typhimurium (ciprofloxacin 2.6 % vs. 4.8 % and nalidixic acid 1.9 % vs. 4.6 %). The isolates showed minor resistance to ceftiofur (0.9 %).

6.1.4 Trend of resistance

The resistance rate of *Salmonella* isolates from food fell from 80.0 % in 2000 to 53.1 % in 2008, with a mean proportion of 48.9 % since 2002. An increase of resistant isolates to tetracycline, ampicillin and the aminoglycosides neomycin and kanamycin was observed from 2000 to 2008, and since 2005 to ciprofloxacin/nalidixic acid, respectively. In contrast, the proportion of resistant isolates in particular to sulfamethoxazole and spectinomycin and to a lower extent to chloramphenicol and florfenicol decreased. However, the proportion of multiresistant isolates remained almost stable, with 45.9 % in 2000 vs. 46.4 % in 2008.

6.2 Meat in total

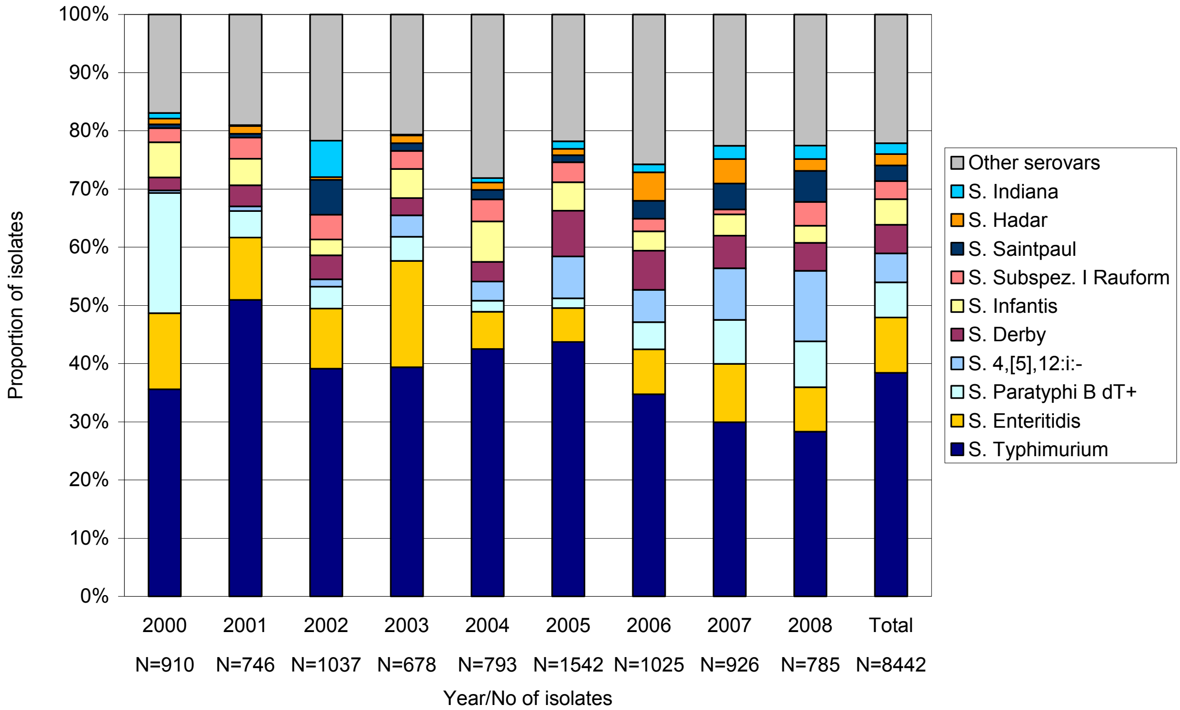
6.2.1 Serovars

Among the isolates from food, the category meat with its 8442 isolates represented the majority of origins (77.8 %). The annual proportion in the investigation period from 2000 to 2008 ranged from 85.3 % to 66.0 %. Here as well, serovar *S.* Typhimurium was predominant with a proportion of 38.4 %, followed by *S.* Enteritidis (9.5 %), *S.* Paratyphi B dT+ (6.0 %), *S.* 4,[5],12:i:- (5.0 %), *S*. Derby (4.9 %) and *S.* Infantis (4.4 %) (figure 6.1 and table 13.155).

6.2.2 Trend of the serovars

In the investigation period, the proportion of the predominant serovar *S.* Typhimurium in meat isolates ranged between 50.9 % in 2001 and 28.3 % in 2008. However, the proportion of *S.* Typhimurium decreased between 2005 and 2008 continuously from 43.7 % to 28.3 %. In contrast, the proportion of the monophasic serovar *S.* 4,[5],12:i:-, which is genetically closely related to *S.* Typhimurium, increased from 0.4 % in 2000 to 12.1 % in 2008. The proportion of *S.* Enteritidis decreased from 2003 on from 18.3 % to 7.6 % in 2008. The proportion of *S.* Paratyphi B dT+ rose again from 2005 on (1.7 %) to 7.9 % in 2008, while the proportion of *S.* Infantis fell from 6.0 % in 2000 to 2.9 % in 2008 (figure 6.1 and table 13.157).

Fig. 6.1: Proportions of the ten most frequent *Salmonella* serovars among isolates from meat (2000–2008)



6.2.3 Serovar resistance

The resistance situation in isolates from meat was mainly determined by serovars *S.* Typhimurium, *S.* Paratyphi B dT+ and *S.* 4,[5],12:i:-. In total, 62.0 % of all isolates from meat were resistant, while the proportion of isolates with multiresistance increased from 8.4 % to 48.5 % (food in total 40.1 %). Comparing the two origins, the resistance rates of isolates were nearly 10 % higher in the origin meat (62 %) than in food in total (53.1 %). Most single substances showed the same trend. The highest resistance rate of the isolates from meat was 49.5 % to sulfamethoxazole, followed by tetracycline (41.3 %), ampicillin (36.6 %), streptomycin (34.1 %), amoxicillin/clavulanic acid (33.5 %) and spectinomycin (29.2 %). Regarding the cephalosporins ceftazidim and cefotaxim, the proportion (1.2 %) was the same as the proportion in food (1.1 % resistant isolates each), which also applied to ceftiofur which has been tested until 2007 (food 1.2 %; meat 1.4 %) (figure 6.2 and table 13.162).

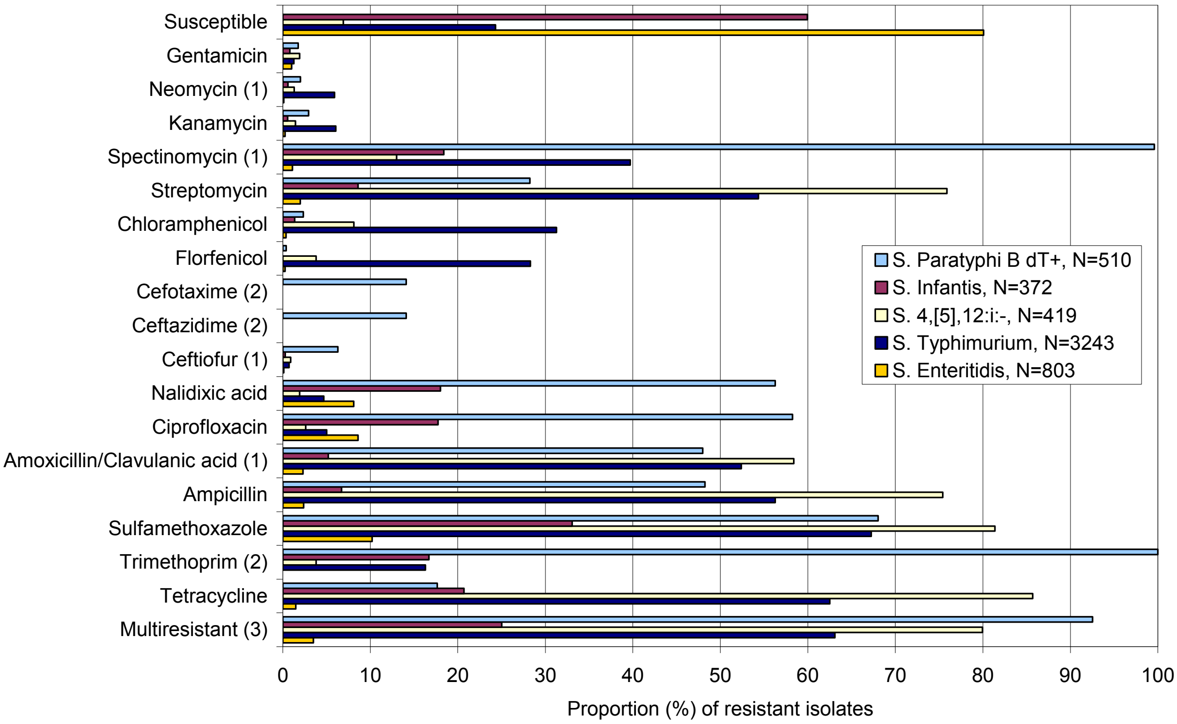
75.7 % (2455) of the isolates of the predominat serovar *S.* Typhimurium in meat (38.4 %, 3243 isolates) were resistant, and 63.1 % (2046 isolates) showed multiple resistances. The proportion of resistant isolates ranged from 85.2 % (2000) to 69.9 % (2006) in the investigation period, however, in most of the years it was between 70 % and 80 %. For more than half of the tested single substances, high resistance rates were found (80.9 % to 25.9 %), so that *S.* Typhimurium isolates had a crucial effect on the resistance situation in meat both because of the number and proportion of resistant isolates, and therefore in food as well. *S.* Typhimurium isolates from meat were very often resistant to sulfamethoxazole (67.3 %), tetracycline (62.5 %), ampicillin (56.3 %), streptomycin (54.4 %) and often resistant to spectinomycin (39.7 %), chloramphenicol (31.3 %) and florfenicol (28.3 %). The rate of resistance was usually slightly lower than for all food isolates. But the proportion of resistant isolates (meat) for the aminoglycosides kanamycin/neomycin was slightly higher (6.0 %/5.9 % vs. 5.8 %/5.6 % in food in total). Resistance rates for quinolones (2000–2007) ranged from 2.5 % to 6.5 %, but rose in 2008 to 9.5 % (ciprofloxacin) and 8.6 % (nalidixic acid). Among the tested cephalosporins, only to ceftiofur (2000–2007) a few resistant *S.* Typhimurium isolates occurred (0.7 %).

S. Enteritidis, the second most common serovar detected in meat (9.5 %, 803 isolates), was mainly susceptible (80.1 %) to all tested classes of substances (table 13.164). Of the 19.9 % resistant isolates, 3.5 % (28 isolates) were multiresistant. Over the investigation period, the proportion of resistant isolates declined steadily, from 52.1 % in 2000 to 6.7 % in 2008. The continuous increase of susceptible isolates applied to all tested antimicrobial substances. The highest resistance rate (10.2 %) determined was the one to sulfamethoxazole. The proportion of resistant isolates to nalidixic acid (8.1 %) and ciprofloxacin (8.6 %) was high compared with *S.* Typhimurium. The resistance rates to all other tested antimicrobial substances was between 0.1 % and 2.4 %, or the isolates were susceptible (cefotaxim and ceftazidim).

S. Paratyphi B dT+ was the third most common serovar in meat (510 isolates, 6.0 %). These isolates were 100 % resistant, and 92.5 % were multiresistant (table 13.167). The highest resistance rate for *S.* Paratyphi B dT+ was determined to spectinomycin (99.6 %), followed by sulfamethoxazole (68.0 %). The isolates were resistant to the quinolones ciprofloxacin with a percentage of 58.2 % and to nalidixic acid with 56.3 % as well as to ampicillin and amoxicillin/clavulanic acid with 48.2 % and 48.0 %, respectively. In comparison to *S.* Typhimurium isolates, the proportion of tetracycline-resistant isolates (17.6 %) was lower by the factor 3.5. While most of the serovars isolated from meat were mainly susceptible to the tested cephalosporins, 6.3 % of the *S.* Paratyphi B dT+ isolates showed resistances to ceftiofur (2000–2007), and 14.1 % to ceftazidim and cefotaxim (2008), respectively. Very low resistance rates were found to amphenicols with a percentage of 2.4 % (chloramphenicol) and 0.4 % (florfenicol) as well as to the tested aminoglycosides kanamycin, neomycin and gentamicin (1.8 %–2.9 %).

Over the investigation period, a constantly increasing number of isolates from meat (419 in total; 5.0 %) was identified as serovar *S.* 4,[5],12:i:- (table 13.166). Like with *S.* Paratyphi B dT+, the proportion of resistant isolates of *S.* 4,[5],12:i:- was very high with a percentage of 93.1 %, as well as the percentage of multiresistant isolates with 80.0 %. So far, this serovar was isolated in particular from pigs and products derived thereof. According to present molecularbiological investigations, it closely resembles *S.*Typhimurium (Hopkins et al. 2010). Compared to *S.* Typhimurium, the resistance rates of *S.* 4,[5],12:i:- isolates to tetracycline (85.7 %), sulfamethoxazole (81.4 %), streptomycin (75.9 %) and ampicillin (75.4 %) was higher by about one quarter. Regarding amoxicillin/clavulanic acid (58,4 %), the resistance rate was almost comparable to *S.* Typhimurium (52.4 %), while it was much lower for amphenicols (chloramphenicol 8.1 %; florfenicol 3.8 %). This was also the case for kanamycin, neomycin, nalidixic acid and ciprofloxacin, while the resistance rate to gentamicin with 1.9 % was slightly higher (1.3 %). Similar to *S.* Typhimurium, the isolates were susceptible to the cephalosporins ceftazidim and cefotaxim. Only in 2002, three isolates in total (0.9 %) were resistant to ceftiofur. Over the investigation period, an increase in resistant *S.* 4,[5],12:i:- isolates was observed, which was mainly due to the increase of resistances to tetracycline, sulfamethoxazole, streptomycin and ampicillin.

Fig. 6.2: Resistance of selected *Salmonella* serovars from meat to antimicrobial substances (2000–2008)



(1) Antimicrobials were tested from 2000 to 2007
(2) Antimicrobials were tested since 2008
(3) Multiresistant = resistant to more than one class of antimicrobials

6.2.4 Trend of resistance

The proportion of resistant isolates fell from 81.0 % in 2000 to 50.9 % in 2003 and then rose again to 63.4 % in 2008. This also applied to multiresistant isolates, their proportion decreased from 54.4 % to 38.8 % (2003) and then increased again to 55.8 %. The percentage of sulfamethoxazole-resistant isolates decreased from 75.1 % (2000) to 48.8 % in 2008 and that of spectinomycin-resistant isolates fell from 37.3 % (2000) to 28.1 % in 2007. In contrast, the proportion of tetracycline-resistant isolates increased from 28.8 % (2000) to 45.9 % in 2008, that of the ciprofloxacin-resistant isolates from 17.1 % (2000) to 19.7 % in 2008, and that of nalidixic acid-resistant isolates from 16.2 % (2000) to 18.5 % in 2008 (table 13.163).

6.3 Chicken meat

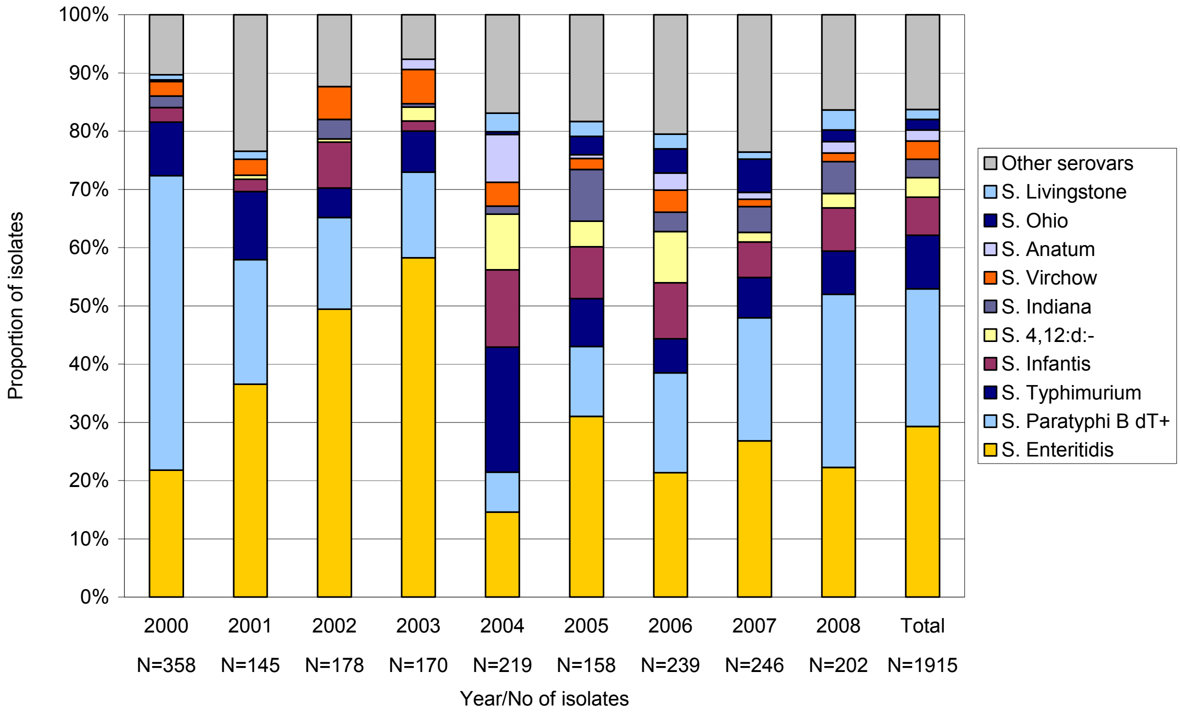
6.3.1 Serovars

1915 (22.7 %) of the 8442 isolates from meat originated from chickens, with the annual proportion ranging from 358 (18.7 %) to 145 (7.6 %) isolates. In total, 46 different serovars were identified. *S.* Enteritidis with 561 isolates and a proportion of 29.3 % of all isolates from this origin was the predominant serovar, followed by *S.* Paratyphi B dT+ with 452 isolates (23.6 %) as well as *S.* Typhimurium with 177 (9.2 %), *S.* Infantis with 125 (6.5 %) and *S.* 4,12:d:- with 64 (3.3 %) isolates (figure 6.3).

6.3.2 Trend of the serovars

The annual proportion of the five most common serovars varied greatly during the investigation period, so that no trend could be derived (figure 6.3).

Fig. 6.3: Proportions of the ten most frequent *Salmonella* serovars among isolates from chicken meat (2000–2008)



6.3.3 Serovar resistance

Among the 1915 isolates from chicken meat, 957 (50.0 %) were resistant and 703 (36.7 %) multiresistant (figure 6.4). All in all, the proportion of resistant isolates decreased from 82.4 % in 2000 to 51.5 % in 2008 (table 13.178).

Isolates from *Salmonella* spp. were frequently resistant to sulfamethoxazole (33.4 %), spectinomycin (31.1 %), ciprofloxacin (25.1 %), nalidixic acid (24.5 %) and ampicillin (20.3 %). The resistance rate for the investigated cephalosporins was 1.9 % (37 ceftiofur resistant isolates) and that of cefotaxim/ceftazidim which has been tested instead in 2008 was 4.3 %.

Serovar *S.* Enteritidis was less frequently resistant in isolates from chicken meat as well (18.5 %), with only 2.5 % being multiresistant (table 13.180). The proportion of resistant isolates decreased over the investigation period from 52.6 % in 2000 to 4.4 % in 2008. The highest resistance rates to single antimicrobials occurred to sulfamethoxazole (9.3 %) and to ciprofloxacin/nalidixic acid (7.7 % and 7.0 %, respectively). The decrease of the percentage of resistant isolates was particularly apparent for sulfamethoxazole, the proportion fell from 48.7 % (2000) to 0 % (2006–2008). All isolates were susceptible to kanamycin, neomycin, chloramphenicol, florfenicol, cefotaxim and ceftazidim. Resistance rates for the other tested antimicrobial substances were between 0.2 % and 2.0 %.

The incidence and resistance of serovar *S.* Paratyphi B dT+ had a crucial impact on the resistance situation in *Salmonella* isolates from chicken meat, because 100 % of the 452 isolates were resistant and 92.5 % multiresistant (table 13.181). Extremely common was resistance to trimethoprim (100 %) and spectinomycin (99.5 %), and a very high resistance rate was determined for sulfamethoxazole (66.8 %), ciprofloxacin (58.8 %) and nalidixic acid (57.5 %). A high resistance rate was shown for ampicillin and amoxicillin/clavulanic acid (48.2 % and 48.5 %, respectively) as well as for streptomycin (28.8 %). In *S.* Paratyphi B dT+, also the majority of resistant isolates occured to the tested cephalosporins ceftiofur (27 of 33 from chicken meat, 6.9 %) and cefotaxim/ceftazidim (each 8 of 9 from chicken meat, 12.9 %).

Among the 177 isolates of serovar *S.* Typhimurium, 36.2 % were resistant and 22.0 % were multiresistant (table 13.179). The proportion of resistant isolates decreased from 63.6 % in 2000 to 20 % in 2008. The highest resistance rates to single antimicrobials occurred to sulfamethoxazole with 33.3 %, ampicillin and tetracycline with 18.6 % each, streptomycin with 17.5 % and amoxicillin/clavulanic acid with 17.4 %. To both ciprofloxacin and nalidixic acid, 17 isolates each (9.6 %) were resistant, and only two isolates (1.2 %) were resistant to ceftiofur.

The fourth most common serovar detected in chicken meat was *S.* Infantis with 125 isolates (table 13.182), of which 68.8 % were resistant and 47.2 % were multiresistant. As the detected number of isolates per year ranged between three and 29, a trend of resistance development could not be derived. The highest proportion of resistant isolates occurred to sulfamethoxazole with 52.8 %, tetracycline with 44.8 %, nalidixic acid with 44.0 %, ciprofloxacin with 43.2 % and spectinomycin with 38.2 %. Only one isolate (0.9 %) was resistant to ceftiofur.

Among the 64 isolates of the monophasic serovar *S.* 4,12:d:-, 9.4 % showed single resistance, namely only to sulfamethoxazole. To all other tested antimicrobial substances the isolates were susceptible (table 13.177).

Fig. 6.4: Resistance of selected *Salmonella* serovars from chicken and turkey meat (2000–2008); Number of classes of antimicrobials the isolates were resistant to

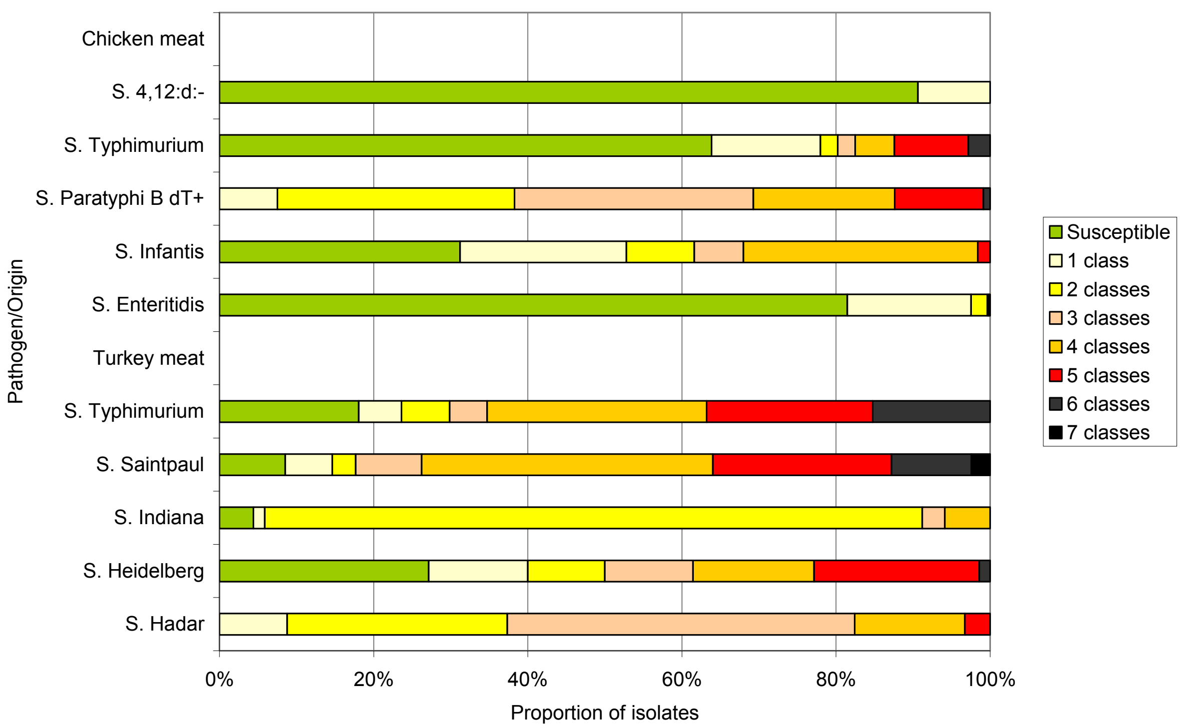
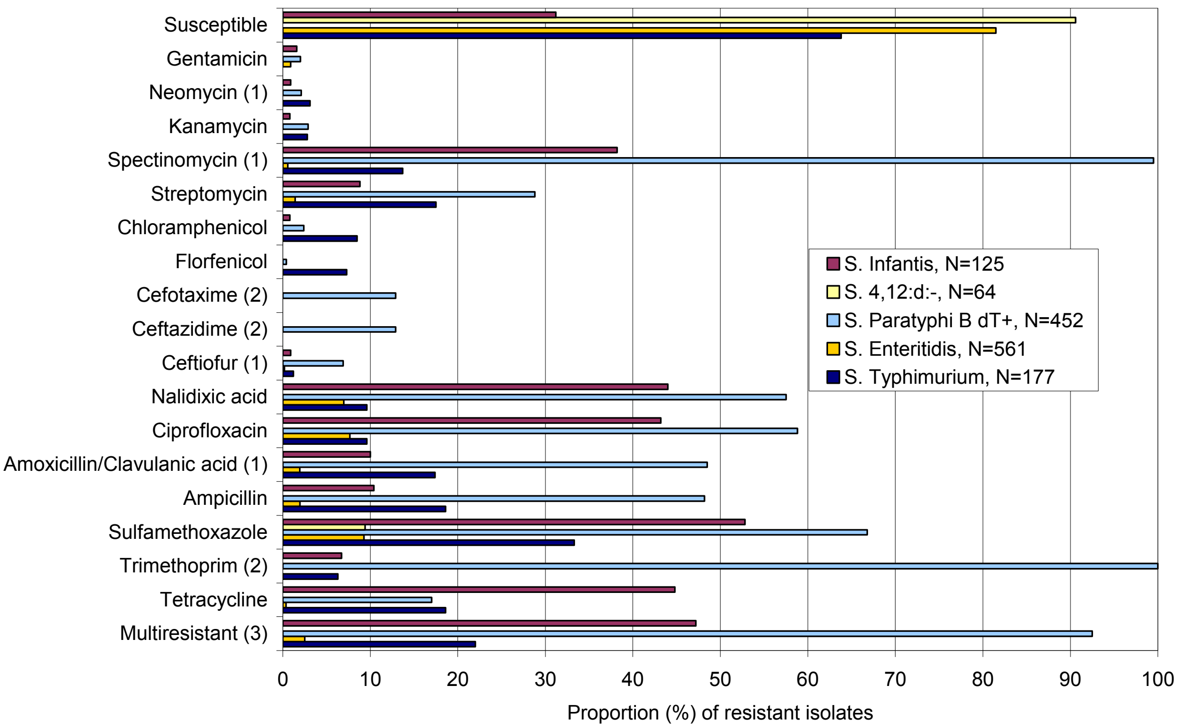


Fig. 6.5: Resistance of selected *Salmonella* serovars from chicken meat to antimicrobial substances (2000–2008)



(1) Antimicrobials were tested from 2000 to 2007
(2) Antimicrobials were tested since 2008
(3) Multiresistant = resistant to more than one class of antimicrobials

6.3.4 Trend of resistance

The resistance situation in chicken meat is influenced by the incidence of certain serovars and their resistance profile. Altogether, the number of resistant isolates decreased from 82.4 % in 2000 to 33.5 % in 2003, and then increased again to 51.5 % in 2008. Regarding tetracycline, an increase of resistant isolates from 7.0 %/5.9 % in 2000/2003 to 23.8 % in 2008 was observed, while for sulfamethoxazole, there was a general decrease from 72.3 % to 26.7 % in 2008. In terms of ciprofloxacin/nalidixic acid, at first there was a decrease from 31.0 %/30.2 % in 2000 to 16.0 % each in 2004, and then an increase to 33.2 %/32.7 % by 2008. A similar situation was seen for spectinomycin, with a decrease of resistant isolates from 53.4 % in 2000 to 13.7 % in 2004, followed by an increase to 32.8 % by 2007.

6.4 Turkey meat

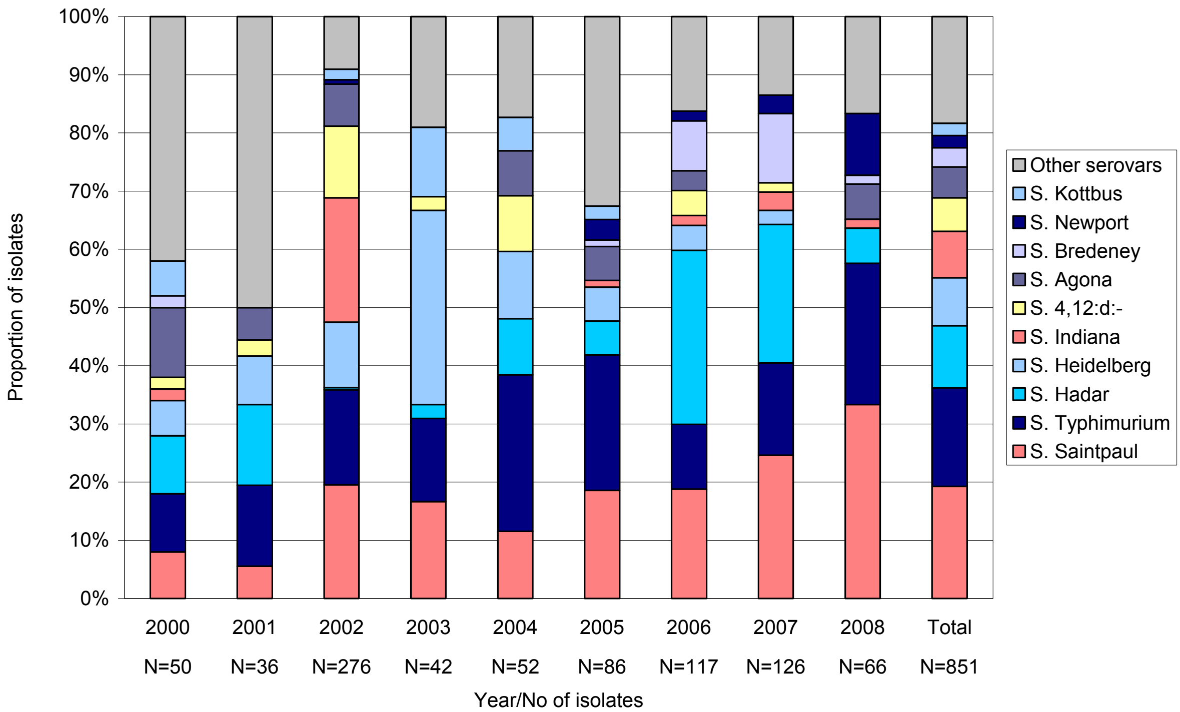
6.4.1 Serovars

In the period from 2000–2008, 851 isolates from turkey meat were investigated, which accounted for 10.1 % of the isolates derived from meat. The annual number of turkey meat isolates fluctuated strongly and was between 36 (4.2 %) and 276 (32.4 %) of all turkey isolates. Altogether, 31 different serovars could be identified (table 13.156). The predominant serovars were *S.* Saintpaul with 164 isolates (19.3 %), followed by *S.* Typhimurium with 144 (16.9 %), *S.* Hadar with 91 (10.7 %), *S.* Heidelberg with 70 (8.2 %) and *S.* Indiana with 68 isolates (8.0 %).

6.4.2 Trend of the serovars

The proportion of *S.* Saintpaul isolates rose from an average of 7 % (2000/2001) to 20 % in 2002 to 2006 and finally to 33 % in 2008, whereas serovar *S.* Typhimurium was detectable relatively constantly in turkey meat isolates (16.9 %). The proportion of the serovars *S.* Hadar, *S.* Heidelberg and *S.* Indiana was subject to strong fluctuation (figure 6.6).

Fig. 6.6: Proportions of the ten most frequent *Salmonella* serovars among isolates from turkey meat (2000–2008)



6.4.3 Serovar resistance

Of the 851 isolates, 81.2 % were resistant and 72.4 % multiresistant (figure 6.4). Altogether, the proportion of resistant isolates ranged between 91.7 % and 70.7 %. The highest percentages of resistant isolates were observed to the antimicrobials sulfamethoxazole (57.9 %), tetracycline (56.9 %), ampicillin (45.1 %) and amoxicillin/clavulanic acid (43.0 %), followed by streptomycin (39.2 %), ciprofloxacin (36.9 %), nalidixic acid (35.5 %) and spectinomycin (31.8 %) (figure 6.7 and table 13.183).

The percentages for the other aminoglycosides were between 21.7 % (kanamycin) and 9.2 % (neomycin). Regarding the tested third generation cephalosporins, only 5.6 % ceftiofur-resistant (2000–2007) isolates were found.

Among the isolates of the predominant serovar *S.* Saintpaul (164 isolates), 91.5 % were resistant, and 85.4 % were multiresistant. The percentage of resistant isolates ranged from 75 % (in 2000, 2005) to 100 % (2002–2004 and 2008), so that it was not possible to derive a trend (table 13.185). High resistance rates were shown to eight antimicrobial substances: sulfamethoxazole (79.3 %), ciprofloxacin (78.7 %), nalidixic acid (75.0 %), ampicillin and spectinomycin (73.8 % each), amoxicillin/clavulanic acid (72.3 %) and streptomycin (48.8 %). The high resistance of the isolates to the aminoglycosides gentamicin (63.4 %) and kanamycin (60.4 %) and to ceftiofur with an average of 25.5 % is noticeable. To cefotaxim and ceftazidim, which have been tested since 2008, no resistant isolates could be detected in turkey meat.

The second most common serovar detected in turkey meat was *S.* Typhimurium (16.9 %). Of the 144 isolates, 81.9 % were resistant and 76.4 % multiresistant. The proportion of resistant isolates ranged between 62.2 % and 100 % (2000–2001, 2003–2006), so here no trend could be derived, either (table 13.186). Particularly frequently, isolates were resistant to sulfamethoxazole and tetracycline (73.6 % each), ampicillin (70.8 %), amoxicillin/clavulanic acid (66.9 %) and streptomycin (60.4 %). In contrast to the *S.* Saintpaul isolates, only 22.9 % of the *S.* Typhimurium isolates carried resistance to nalidixic acid or ciprofloxacin, respectively. Regarding the tested cephalosporins, only in 2002 two ceftiofur-resistant isolates were detected (1.6 %).

S. Hadar was the third most commen serovar in turkey meat (91 isolates, 10.7 %), with the number of isolates per year usually between one and five (table 13.188). Only in 2006 (35 isolates/38.5 %) and 2007 (30 isolates/33.0 %), more isolates were submitted. All isolates (100 %) were resistant, and 91.2 % of these were multiresistant. To single substances, the isolates showed the following resistance rates: tetracycline 97.8 %, streptomycin 72.5 %, ciprofloxacin 60.4 % and nalidixic acid 58.2 %, ampicillin 29.7 % and amoxicillin/clavulanic acid 27.6 %. It is noticeable that only a small number of isolates (11) was resistant to sulfamethoxazole (12.1 %). *S.* Hadar isolates were not resistant to florfenicol, gentamicin, third generation cephalosporins and trimethoprim.

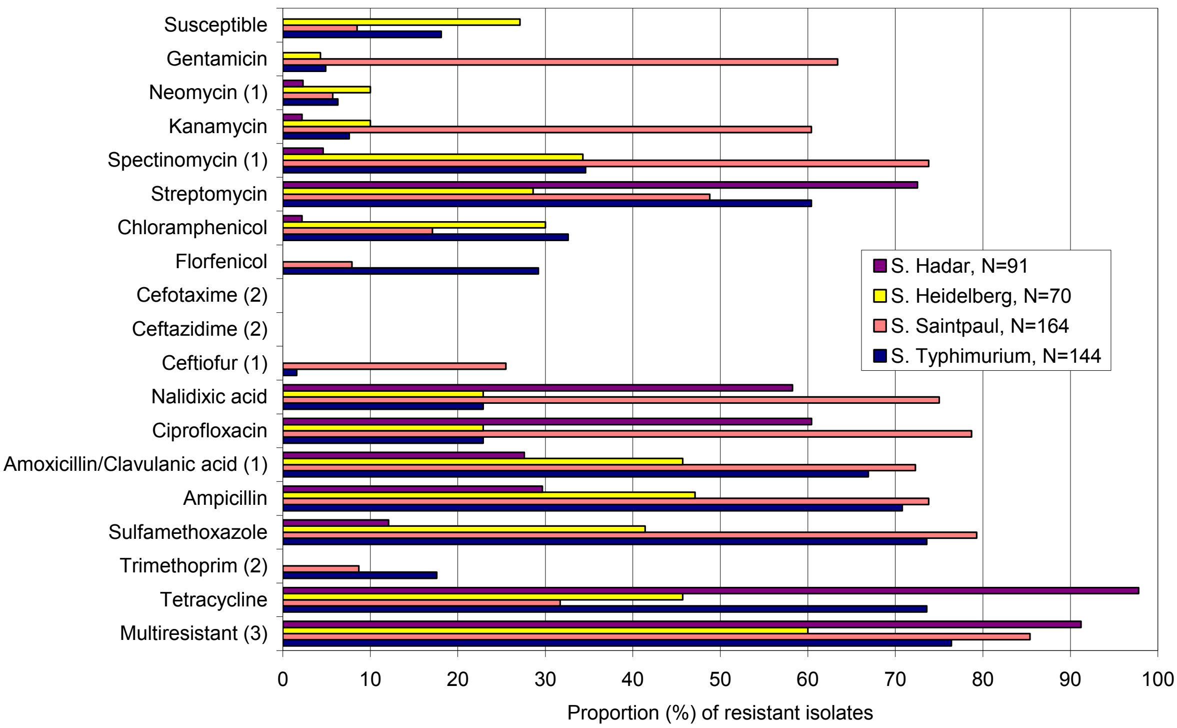
S. Heidelberg accounted for 8.2 % (70 isolates) and was the fourth most common serovar, with 72.9 % of the isolates being resistant and 60.0 % being multiresistant. The number of isolates per year usually was between zero and six, and only in 2002 (31) and 2003 (14) more isolates were submitted (table 13.189). Particularly often, isolates were resistant to ampicillin (47.1 %), tetracycline and amoxicillin/clavulanic acid (45.7 % each), sulfamethoxazole (41.4 %), spectinomycin (34.3 %) and chloramphenicol (30.0 %). 16 isolates each were resistant to ciprofloxacin and nalidixic acid (22.9 %). No resistant isolates to third generation cephalosporins and florfenicol were detectable.

59 of the 68 (86.8 %) *S.* Indiana isolates originated from 2002, therefore trend assessments are not possible. Altogether, 95.6 % of the isolates were resistant and 94.1 % were multiresistant (table 13.187), which is due to resistances to the single substances sulfamethoxazole (95.6 %) and tetracycline (94.1 %). Resistances to ampicillin (7.4 %), spectinomycin and amoxicillin/clavulanic acid (6.0 % each) and streptomycin (1.5 %) were found as well. To all other tested antimicrobial substances the isolates were susceptible.

6.4.4 Trend of resistance

Because of the different number of submitted isolates from turkey meat per year (between 36 in 2001 and 276 in 2002) and the occurring serovars as well as their resistance profile, the percentage of resistant isolates ranged between 70.7 % and 91.7 %. This was also the case for the resistance rates to most of the single substances. For nalidixic acid/ciprofloxacin, from 2006 on an increasing percentage was observed from 23.1 %/24.8 % to 62.1 %/67.7 % in 2008. A similar situation was seen for ampicillin, as in the same period an increase of resistant isolates occurred from 38.5 % to 59.1 %.

Fig. 6.7: Resistance of selected *Salmonella* serovars from turkey meat to antimicrobial substances (2000–2008)



(1) Antimicrobials were tested from 2000 to 2007
(2) Antimicrobials were tested since 2008
(3) Multiresistant = resistant to more than one class of antimicrobials

6.5 Pork

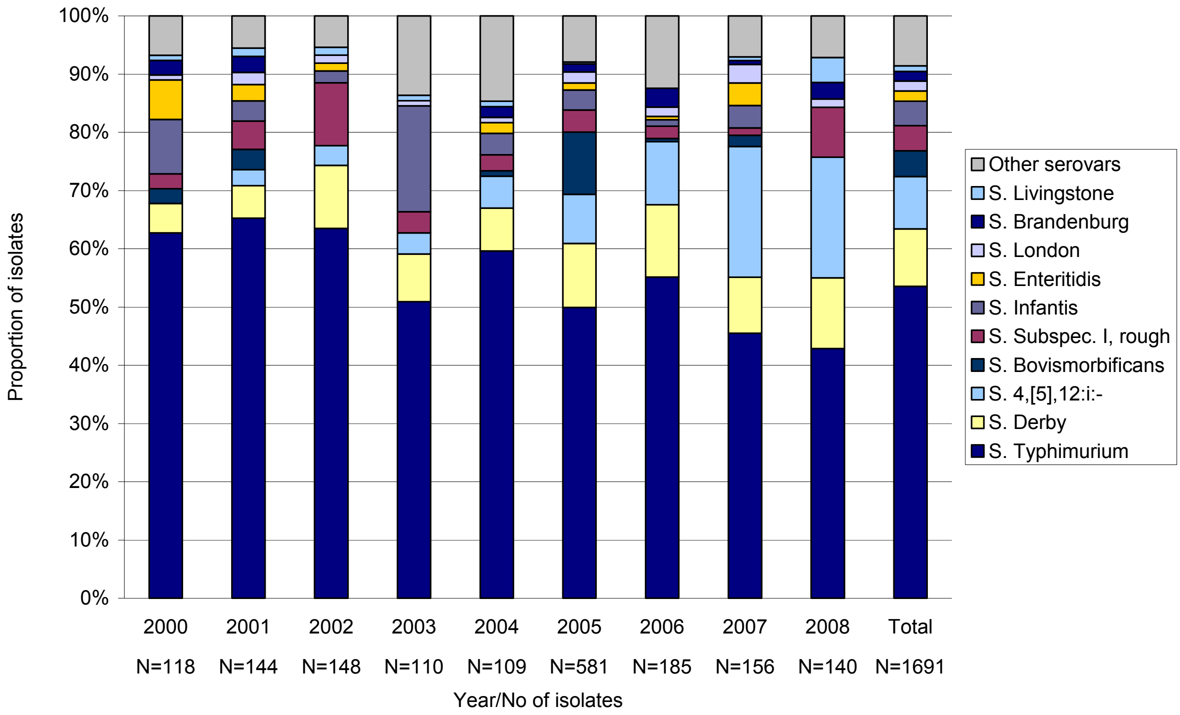
6.5.1 Serovars

The 1691 *Salmonella* isolates investigated in the period from 2000 to 2008 from pork accounted for one fifth (20.0 %) of all isolates from meat. The annual proportion of *Salmonella* isolates from pork ranged from 109 isolates (6.4 %) in 2004 to 581 (34.4 %) in 2005. Altogether, 40 different *Salmonella* serovars could be identified (table 13.156). *S.* Typhimurium was predominant with 906 isolates (53.6 %), followed by *S.* Derby with 166 isolates (9.8 %), *S.* 4,[5],12:i:- with 152 isolates (9.0 %), *S.* Bovismorbificans with 75 isolates (4.4 %) and *S.* Infantis with 71 isolates (4.2 %) (figure 6.8).

6.5.2 Trend of the serovars

The annual proportion of the predominant serovar *S.* Typhimurium (53.6 %) continuously decreased from 62.7 % (2000) and 65.3 % (2001) to 42.9 % in 2008, whereas the proportion of the monophasic serovar *S.* 4,[5],12:i:- increased constantly from zero isolates in 2000 to 22.4 % in 2007 and 20.7 % in 2008. For the other of the five most common serovars *S.* Derby, *S.* Bovismorbificans and *S.* Infantis, a trend could not be derived due to the variation in the annual proportion (0–64 isolates; figure 6.8).

Fig. 6.8: Proportions of the ten most frequent *Salmonella* serovars among isolates from pork (2000–2008)



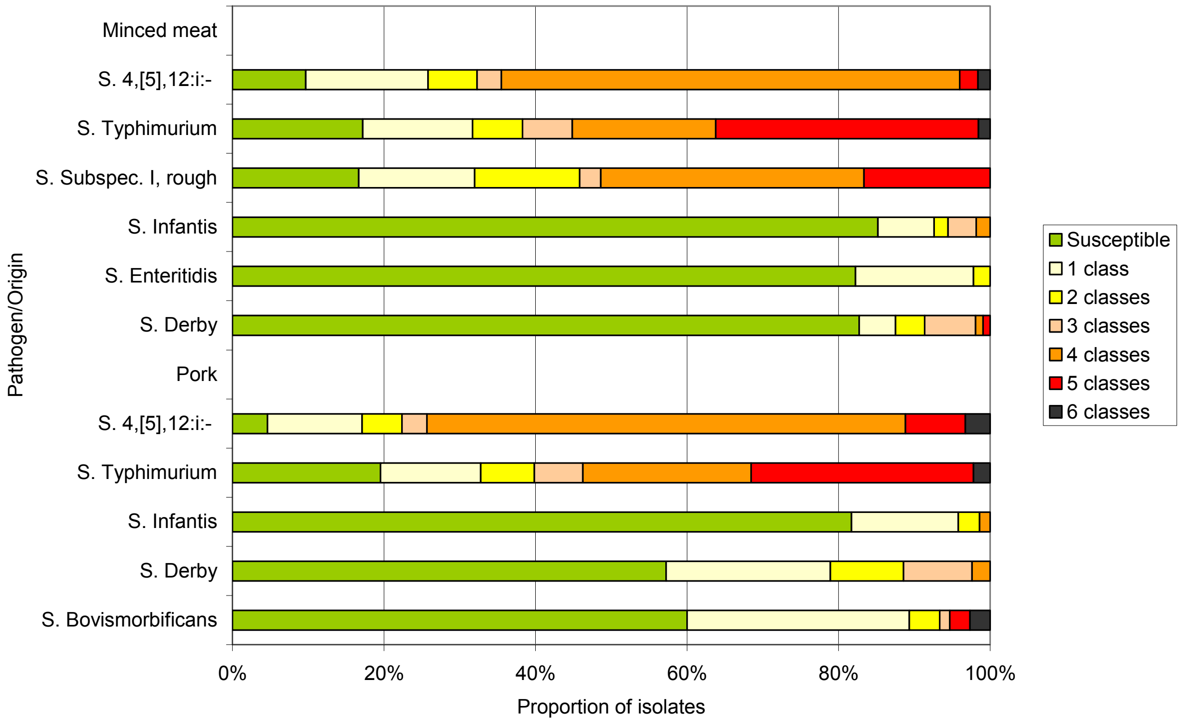
6.5.3 Serovar resistance

Of the 1691 investigated isolates from pork, 1133 (67.0 %) were resistant and 878 (51.9 %) multiresistant (table 13.169). The highest resistance rates were determined to sulfamethoxazole (56.7 %), tetracycline (54.0 %), ampicillin (44.1 %) and streptomycin (43.3 %). Common resistances were found to amoxicillin/clavulanic acid (40.1 %) and spectinomycin (30.3 %), moderate resistance rates were determined to chloramphenicol (20.5 %) and florfenicol (17.0 %). To the aminoglycoside antimicrobials kanamycin (5.0 %), neomycin (4.9 %) and gentamicin (1.1 %) and to the (fluoro-)quinolones ciprofloxacin (3.6 %) and nalidixic acid (3.3 %), a smaller number of isolates was resistant. Only eight isolates (0.5 %) out of 1538 were resistant to ceftiofur (figure 6.10).

Of the 906 *S.* Typhimurium isolates from pork, 80.5 % (729 isolates) were resistant and 67.2 % (609 isolates) were multiresistant. The number of isolates per year varied between 56 and 102, except for 2005 with 290 isolates (table 13.171). Since 2006, the proportion of resistant isolates has increased from 76.5 % to 90.1 % (2007) and 96.7 % (2008). *S.* Typhimurium was the predominant serovar in pork, which was very frequently resistant to sulfamethoxazole (69.1 %), tetracycline (68.9 %), ampicillin (59.4 %), streptomycin (58.1 %) and amoxicillin/clavulanic acid (55.1 %). Lower resistance rates were determined to spectinomycin (44.8 %), chloramphenicol (32.2 %) and florfenicol (28.3 %). Regarding the aminoglycoside antimicrobials, compared with the total of pork isolates, the resistance rate to kanamycin and neomycin (7.9 % each) was higher, while to gentamicin, it was slightly lower (0.8 % vs. 1.1 %). The values for quinolones were comparable with the ones for all pork isolates in total (ciprofloxacin 3.4 %, nalidixic acid 3.1 %). Three out of eight ceftiofur-resistant isolates belonged to *S.* Typhimurium.

Compared with *S.* Typhimurium isolates from pork, the 166 *S.* Derby isolates showed a lower restistance rate (42.8 %), with 21.1 % of these being multiresistant. The annual number of isolates ranged from six (1.0 %) to 23 (13.9 %), except for the 64 isolates (38.6 %) in 2005 (table 13.173). Because of the low number of isolates, a trend assessment regarding the resistance development is not given. The highest resistance rates were determined to tetracycline (33.1 %), sulfamethoxazole (22.9 %) and trimethoprim (16.7 %). The proportion of resistant isolates to the other tested antimicrobial substances ranged from 0 % to cephalosporins to 9.5 % to spectinomycin.

Fig. 6.9: **Resistance of selected *Salmonella* serovars from minced meat and pork (2000–2008); Number of classes of antimicrobials the isolates were resistant to**



The annual number of *S.* 4,[5],12:i:- isolates was relatively low between 2000 and 2004 (zero to six isolates) and then rose to 20 to 49 isolates per year (2005–2008). 95.4 % of the 152 isolates were resistant and 82.9 % multiresistant. Only in 2005 and in 2008, susceptible isolates could be detected (10.2 % and 6.9 %, respectively; table 13.176). Particularly common was resistance to four substances: tetracycline (91.4 %), sulfamethoxazole (80.9 %), streptomycin (77.6 %) and ampicillin (76.3 %). Resistance rates to the other microbial substances ranged from 0.8 % (neomycin) to 17.4 % (spectinomycin). Isolates that were resistant to cefotaxim and ceftazidim were not detected.

62 (82.7 %) of the 75 *S.* Bovismorbificans isolates were isolated in 2005, therefore assessments regarding the resistance situation in this serovar are valid only to a limited extent (table 13.175). Altogether, 40 % of the isolates were resistant and 10.7 % were multiresistant. The largest proportion of resistant isolates (38.7 %) was resistant to sulfamethoxazole. Seven other antimicrobial substances showed a resistance rate between 8.0 % (streptomycin) and 1.3 % (florfenicol), including the fluoroquinolones ciprofloxacin and nalidixic acid with 2.7 % each. No resistant isolates were detected to gentamicin, kanamycin, neomycin, the tested third generation cephalosporins and trimethoprim.

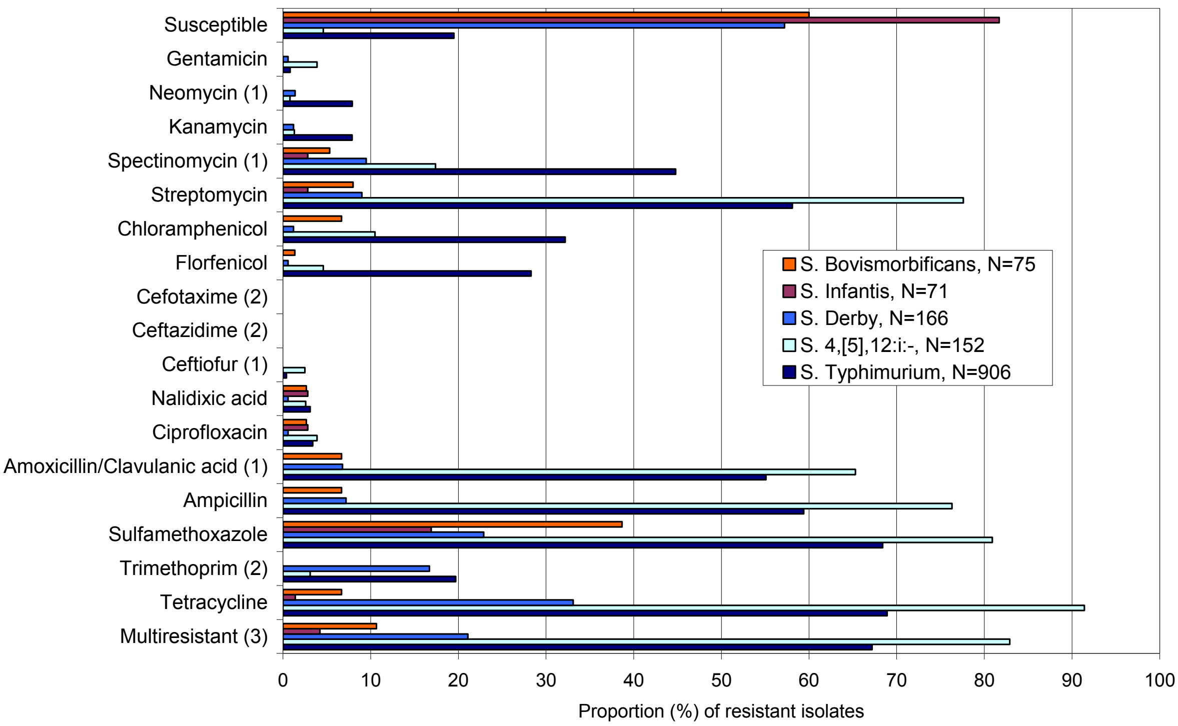
The annual number of the fifth most common serovar *S.* Infantis (71 isolates) ranged between zero and 20, 18.3 % were resistant and 4.2 % were multiresistant. Next to sulfamethoxazole (16.9 %), resistant isolates were only found to spectinomycin, streptomycin, ciprofloxacin, nalidixic acid (2.8 % each) and tetracycline (1.4 %). All 71 isolates were susceptible to the other twelve tested substances.

6.5.4 Trend of resistance

The proportion of resistant *Salmonella* isolates from pork decreased from 80.5 % in 2000 to 60.5 % in 2006, and increased again to 76.4 % in 2008 (table 13.170). The opposite trend of the resistance situation could be observed in some of the single substances. The proportion of resistant isolates to ampicillin, streptomycin and tetracycline increased from 2000 to 2008. At first, the proportion of sulfamethoxazole-resistant isolates decreased from 78.0 % (2000) to 50.9 % (2003), and then increased to 67.1 % in 2008. The findings showed that quadruple resistance was predominant (streptomycin, ampicillin, tetracycline and sulfamethoxazole) in *Salmonella* isolates from pork (43.3 %–56.7 %).

For chloramphenicol and florfenicol, since 2004 a decrease could be observed from 25.7 % and 24.8 % to 13.6 % and 10.7 %, respectively, in 2008.

Fig. 6.10: Resistance of selected *Salmonella* serovars from pork to antimicrobial substances (2000–2008)



(1) Antimicrobials were tested from 2000 to 2007
(2) Antimicrobials were tested since 2008
(3) Multiresistant = resistant to more than one class of antimicrobials

6.6 Minced meat

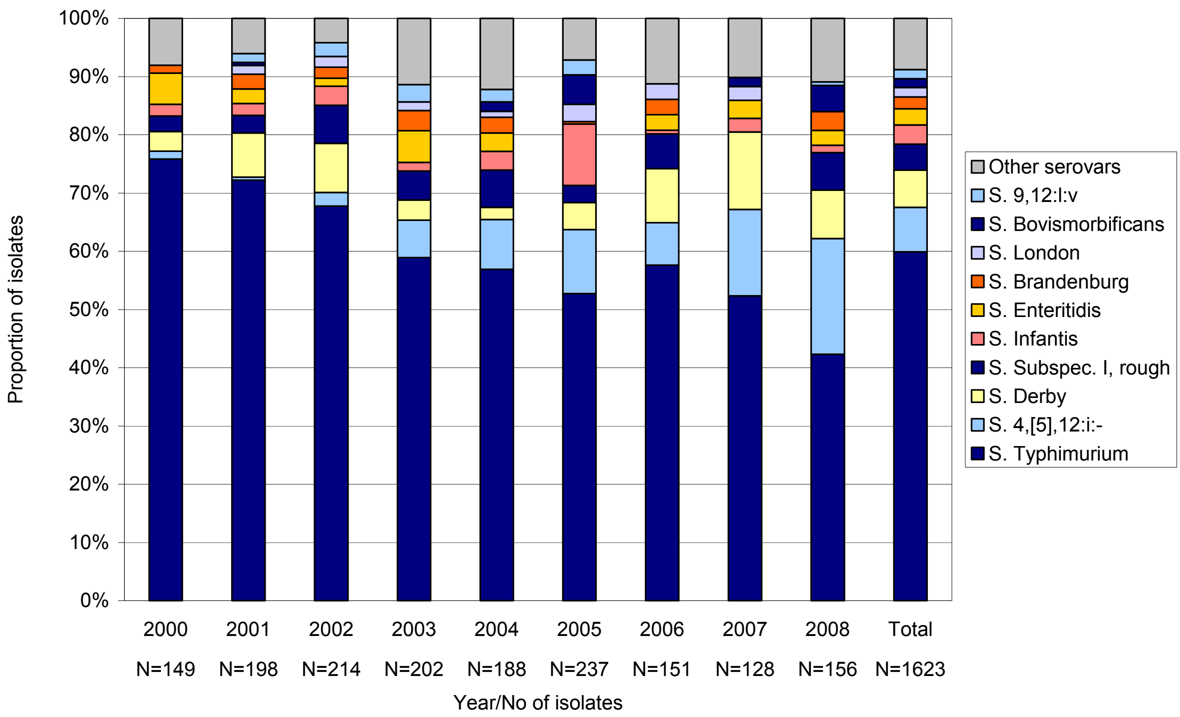
6.6.1 Serovars

The designation of origin „minced meat“ includes *Salmonella* isolates from minced pork and minced beef as well as mixtures thereof. In total, 1623 isolates were investigated, which accounted for 19.2 % of the isolates from meat. The annual number of isolates ranged from 128 (7.9 %) to 237 (14.6 %). 43 different serovars were identified (table 13.156). In this origin, too, serovar *S.* Typhimurium (59.9 %) was predominant, followed by the monophasic serovar *S.* 4,[5],12:i:- with 7.6 % and *S.* Derby (6.4 %), *S.* subspecies I rough (4.4 %), *S.* Infantis (3.3 %) and *S.* Enteritidis (2.8 %; figure 6.11).

6.6.2 Trend of the serovars

The proportion of the predominant serovar *S.* Typhimurium (59.9 %) fell from 75.8 % in 2000 to 42.3 % in 2008. Instead, the number of monophasic *S.* 4,[5],12:i:- isolates increased from 1.3 % in 2000 to 19.9 % in 2008, so that this serovar with an average of 7.6 % was in second place after *S.* Typhimurium. In the serovars following in order of frequency, no trend could be derived from the number of isolates (figure 6.11).

Fig. 6.11: Proportions of the ten most frequent *Salmonella* serovars among isolates from minced meat (2000–2008)



6.6.3 Serovar resistance

Among the 1623 isolates investigated for their resistance, 1116 (68.8 %) were resistant and 881 (54.3 %) multiresistant (figure 6.9.). The highest resistance rates occurred to sulfamethoxazole (60.3 %), tetracycline (53.0 %), ampicillin (47.3 %), streptomycin (46.3 %) and amoxicillin/clavulanic acid (42.2 %) (table 13.191).

S. Typhimurium (972 isolates) was the dominating serovar in minced meat, 82.8 % of the isolates were resistant and 68.3 % multiresistant. The proportion of resistant isolates ranged from 93.8 % (2000) to 73.9 % (2003), however, in most of the years it was between 80 % and 87 %. The highest resistance rates occurred to the single substances sulfamethoxazole (73.6 %), tetracycline (68.6 %), ampicillin (61.5 %) and streptomycin (58.7 %), while there were no resistant isolates to the tested third generation cephalosporins (exception: one ceftiofur-resistant isolate in 2002). The quinolone and fluoroquinolone resistance was between 2 % and 2.5 % and hardly changed at all over the investigation period (table 13.192).

The number of monophasic *S.* 4,[5],12:i:- isolates increased from two in 2000 to 31 in 2008, so that 124 isolates in total were investigated (7.6 % of all isolates from minced meat; table 13.195). Of these, 90.3 % were resistant and 74.2 % were multiresistant. As with the isolates from pork, quadruple resistance to sulfamethoxazole (79.0 %), tetracycline (78.2 %), streptomycin (71.0 %) and ampicillin (68.5 %) was particularly pronounced. The resistance rate to all other tested substances was between 0 % (cephalosporins) and 4.3 % (spectinomycin). In general, the resistance rate to these substances was lower than in *S.* Typhimurium isolates from minced meat.

S. Derby with 104 isolates (6.4 %) was the third most common *Salmonella* serovar detected in minced meat. In contrast to the two serovars mentioned above, the proportion of resistant isolates in this type of origin was only 17.3 %, of which 12.5 % were multiresistant (table 13.194). This is also reflected by the resistance rates to single substances, which showed comparatively lower values as well: 14.4 % to sulfamethoxazole, 11.2 % to spectinomycin as well as 9.6 % each to tetracycline and streptomycin. Only to chloramphenicol/florfenicol (3.8 %/2.9 %) and ampicillin/amoxicillin/clavulanic acid (1.9 %/2.2 %), resistant isolates were found. To all other tested antimicrobial substances (nine) the isolates were susceptible.

Of the 72 isolates (proportion 4.4 %) of *S. s*ubspecies I rough, 83.3 % were resistant and 68.1 % multiresistant, which is comparable to the values of *S.* Typhimurium from minced meat. This also applies to the percentage of resistant isolates to single substances, as the resistance rates to sulfamethoxazole (73.6 %), streptomycin (63.9 %), tetracycline (61.1 %) and ampicillin (56.9 %) were the highest ones. The *S. s*ubspecies I rough isolates were susceptible to the five antimicrobial substances trimethoprim, gentamicin, ceftiofur, ceftazidim and cefotaxim.

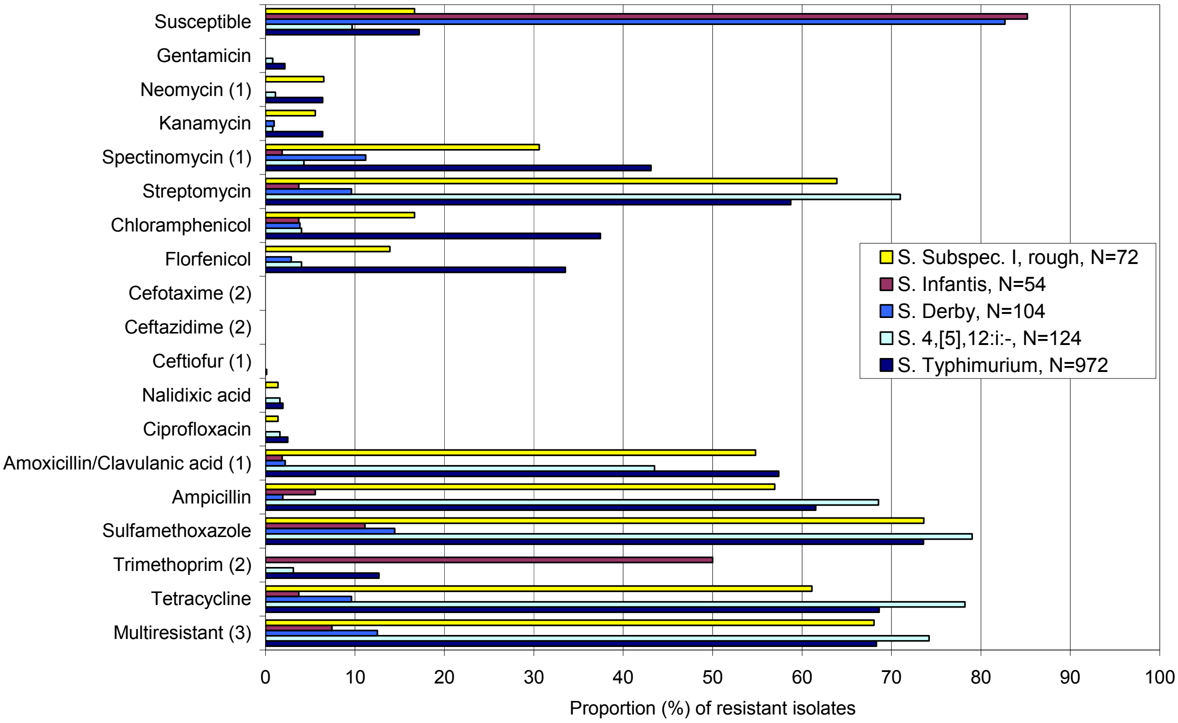
The 54 *S.* Infantis isolates accounted for a proportion of 3.3 % among the 1623 isolates from minced meat. Altogether, 14.8 % were resistant and 7.4 % were multiresistant. The proportion of resistant isolates was 50.0 % to trimethoprim, 11.1 % to sulfamethoxazole, 5.6 % to ampicillin, 3.7 % each to streptomycin, chloramphenicol and tetracycline and 1.9 % each to spectinomycin and amoxicillin/clavulanic acid. To all other antimicrobial substances the isolates were susceptible (table 13.196).

The fifth most common serovar in minced meat was *S.* Enteritidis (45 isolates), 15.6 % of the isolates were resistant and 2.2 % were multiresistant. Except for sulfamethoxazole with 15.6 %, resistant isolates only occurred to gentamicin, nalidixic acid and ciprofloxacin with 2.2 % each. To all other tested antimicrobial substances the isolates were susceptible (table 13.193).

6.6.4 Trend of resistance

The percentage of resistant isolates fell from 87.9 % in 2000 to 57.9 % in 2003 and then rose again to 75 % in 2008 (table 13.191). The percentage of multiresistant isolates decreased from 64.4 % in 2000 to 44.1 % in 2003, and then increased again to 66 % in 2008. Opposite trends were observed for the single substances. Ampicillin resistance of the isolates rose from an average of 45.1 % (2000 – 2006) to 52.3 % (2007) and on to 62.2 % in 2008. Spectinomycin resistance of minced meat isolates initially rose from 34.2 % (2000) to 40.2 % (2002), and then fell until 2007 to 20.3 %. For each of the substances chloramphenicol, florfenicol and sulfamethoxazole, there was a reduction of resistant isolates from 2000 to 2008 from 36.9 % to 20.5 %, 25.5 % to 19.2 % and 81.2 % to 66 %, respectively. At first, a decrease of tetracyline-resistant isolates was observed from 59.1 % (2000) to 47.7 % (2005) and then an increase again to 58.3 % in 2008. In the investigation period, there were no significant trend changes regarding the other substances.

Fig. 6.12: Resistance of selected *Salmonella* serovars from minced meat to antimicrobial substances (2000–2008)



(1) Antimicrobials were tested from 2000 to 2007
(2) Antimicrobials were tested since 2008
(3) Multiresistant = resistant to more than one class of antimicrobials

7 Comparison of resistance rates of important serovars in livestock and food obtained from livestock

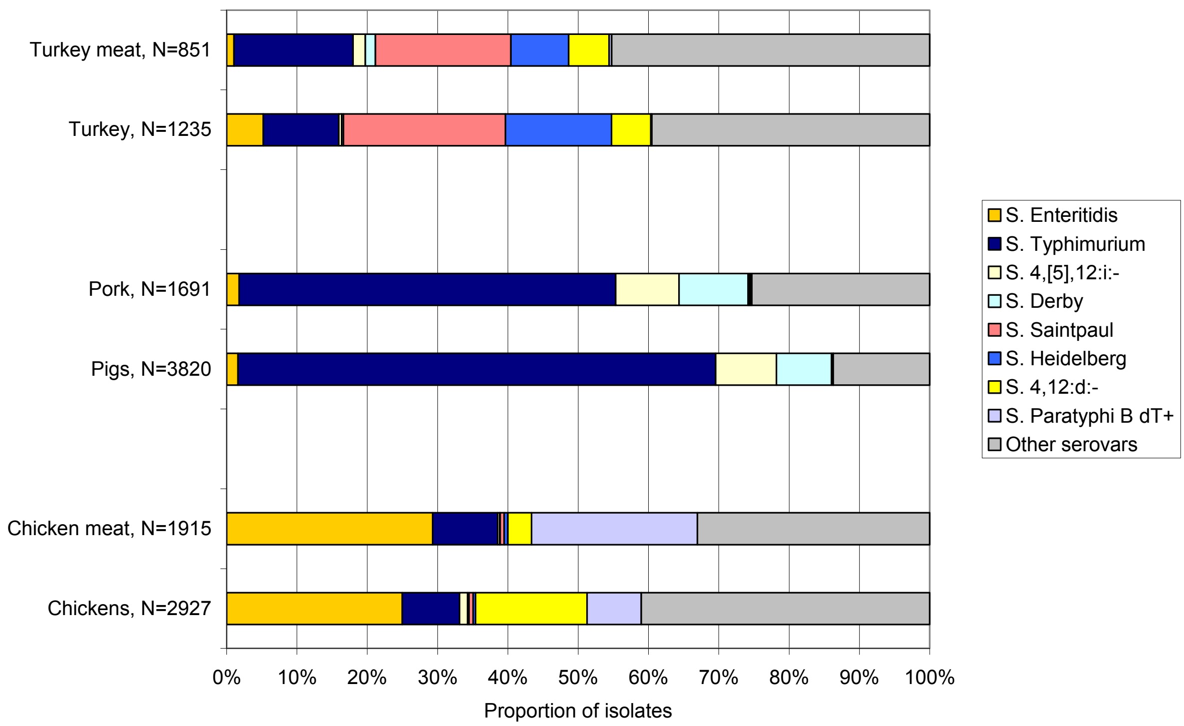
The contamination of food, especially meat, is often caused by cross-contamination from living animals to carcases during slaughter. Because of this it is useful to compare the resistance rates of specific serovars between isolates from animals and isolates from meat from these animals. The results of this comparison are presented in the following. Due to their special importance to human beings, the focus is on isolates of *S.* Enteritidis and *S.* Typhimurium, especially as they could be isolated from all animal species. In three other chapters, serovars that occurred mainly in one animal species are compared with meat from this animal species.

Isolates from cattle and from beef were not compared, as the total number of isolates from beef was low.

7.1 Distribution of serovars

The proportions of the most important serovars in the total of isolates from animals and from meat from these animal species, respectively, were in part (pig, turkey) very similar. The isolates from chicken and from chicken meat showed differences in so far as the monophasic serovar *S.* 4.12:d:- was much less common and serovar *S*. Paratyphi B dT+ was much more common in chicken meat than in chickens. These differences as well as the differences in serovar resistance between chickens and chicken meat discussed in the following chapters is explained in part by the fact that isolates from chickens can originate from all areas of production (breeding, laying hens and broilers), while isolates from chicken meat mainly originate from broilers. Furthermore, meat import from other EU member states and third countries, respectively, may have contributed to the differences in the resistance patterns.

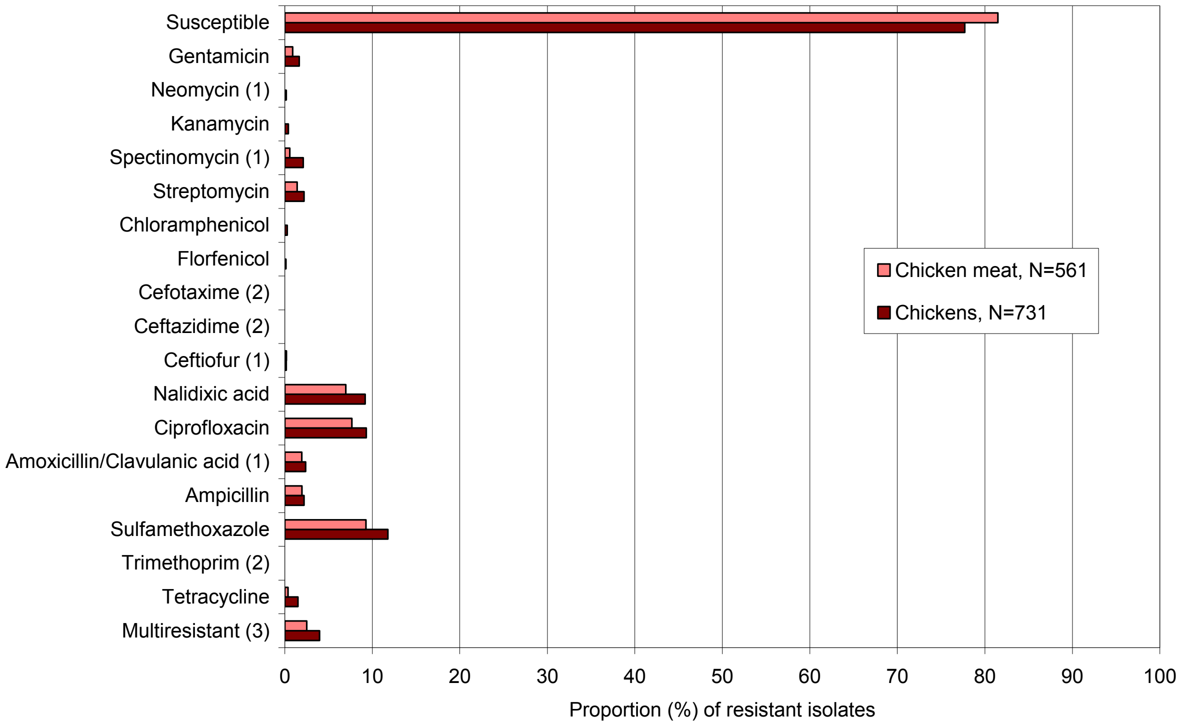
Fig. 7.1: ***Salmonella*** **serovar distributions in livestock species and meat thereof (2000–2008)**



7.2 *S.* Enteritidis from livestock and meat

Altogether, *S.* Enteritidis showed low resistance rates. In isolates from chickens, resistance to nalidixic acid and ciprofloxacin was more common than in isolates from cattle and pigs (see animal chapter). This was also the case in food. *S*. Enteritidis from chicken meat shows higher resistance rates to ciprofloxacin than *S.* Enteritidis from pork (7.7 % vs. 0.0 %). Apart from that, the resistance rates do not differ between isolates from animals and isolates from meat of the respective animals. Figure 7.2 shows the example of the situation in chickens and chicken meat. Due to the relatively small number of *S.* Enteritidis isolates from pork (n = 29) and turkey (n = 9), the comparison is not presented here.

Fig. 7.2: Resistance rates von *S.* Enteritidis from chickens and chicken meat (2000–2008)



(1) Antimicrobials were tested from 2000 to 2007
(2) Antimicrobials were tested since 2008
(3) Multiresistant = resistant to more than one class of antimicrobials

7.3 *S.* Typhimurium from livestock and meat

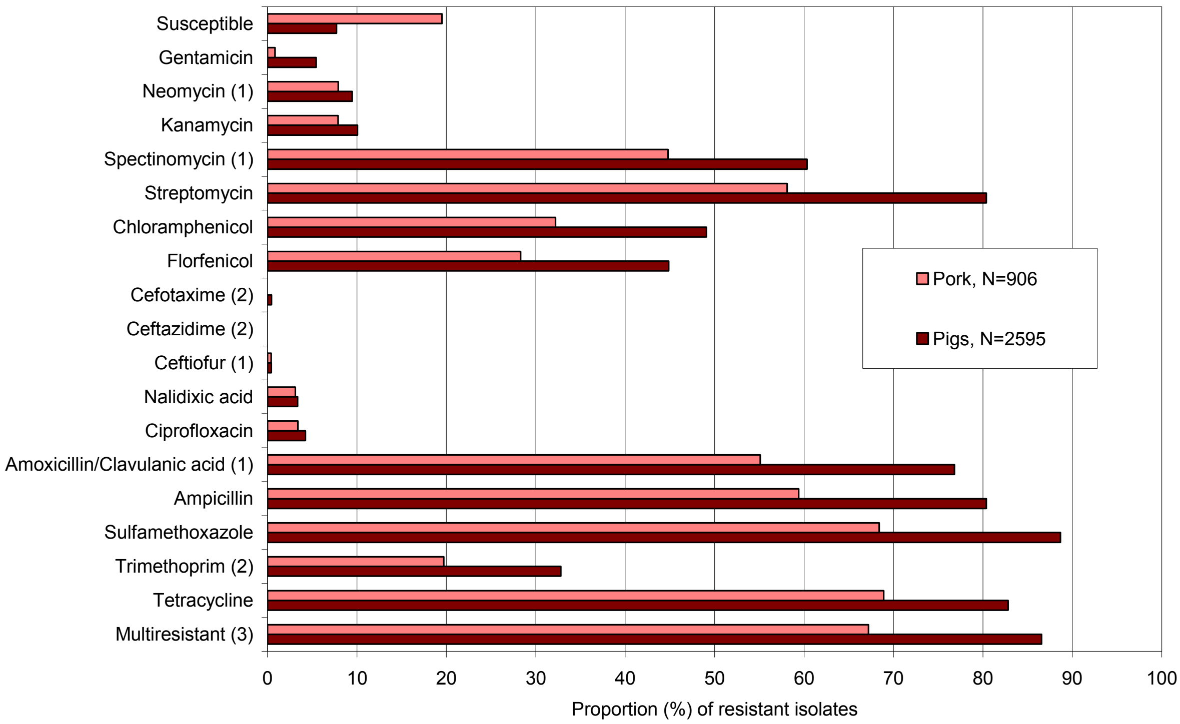
In general, isolates from animals showed higher resistance rates than isolates from meat of this animal species. This was consistently true regarding the comparison of isolates from pig and from pork (figure 7.3). The proportion of resistant isolates from meat was lower (80.5 %) than in isolates from pigs (92.3 %), as well as the proportion of multiresistant isolates with 67.2 % vs. 86.6 %.

The situation in isolates from turkeys and from turkey meat (figure 7.5) was similar (88.0 % vs. 81.9 % resistant, 82.7 % vs. 76.4 % multiresistant). However, nalidixic acid and ciprofloxacin were a remarkable exception. Only one and two, respectively, of the 133 isolates from turkeys were resistant to these antimicrobial substances, while in the isolates from turkey meat, 22.9 % each showed resistances which remained stable over the years.

As with pig and turkey, the proportion of resistant *S.* Typhimurium isolates in total was much lower in chicken meat than in isolates from chickens (36.2 % vs. 64.4 %). This difference was seen in all antimicrobial classes except the (fluoro-)quinolones and trimethoprim, for which higher resistance rates were observed in chicken meat (figure 7.4).

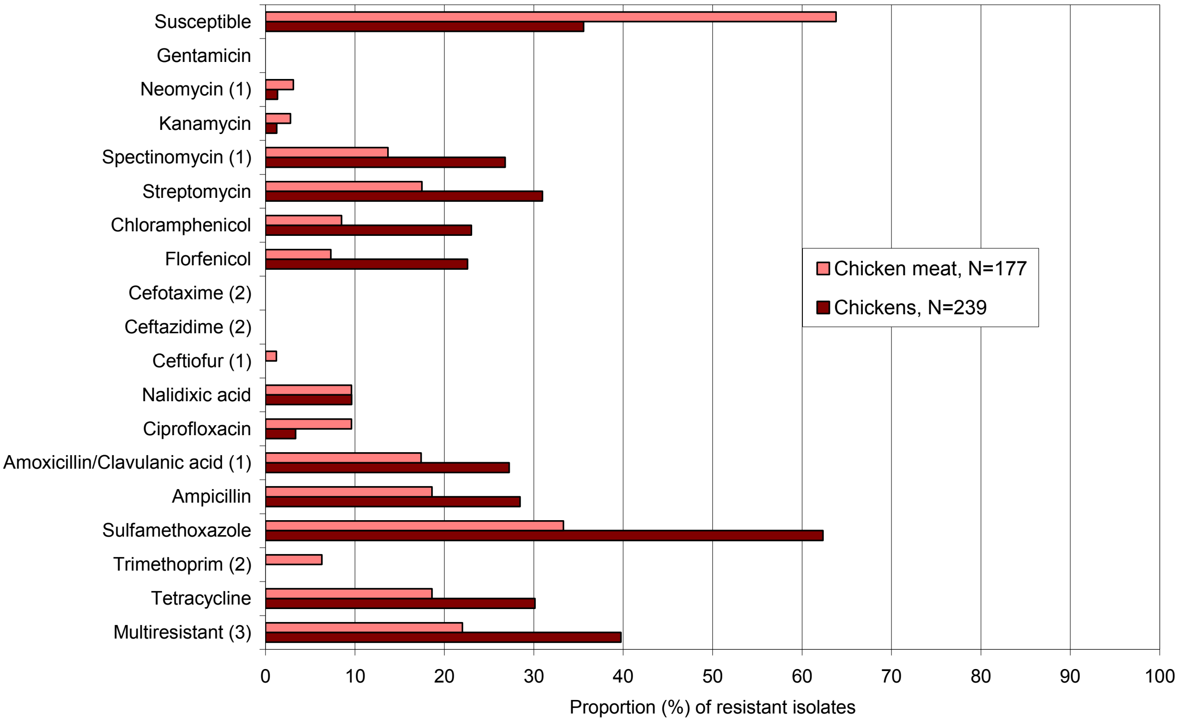
A comparison of isolates from cattle and from beef was not performed due to the low number of isolates from beef.

Fig. 7.3: Resistance rates in *S.* Typhimurium from pigs und pork (2000–2008)



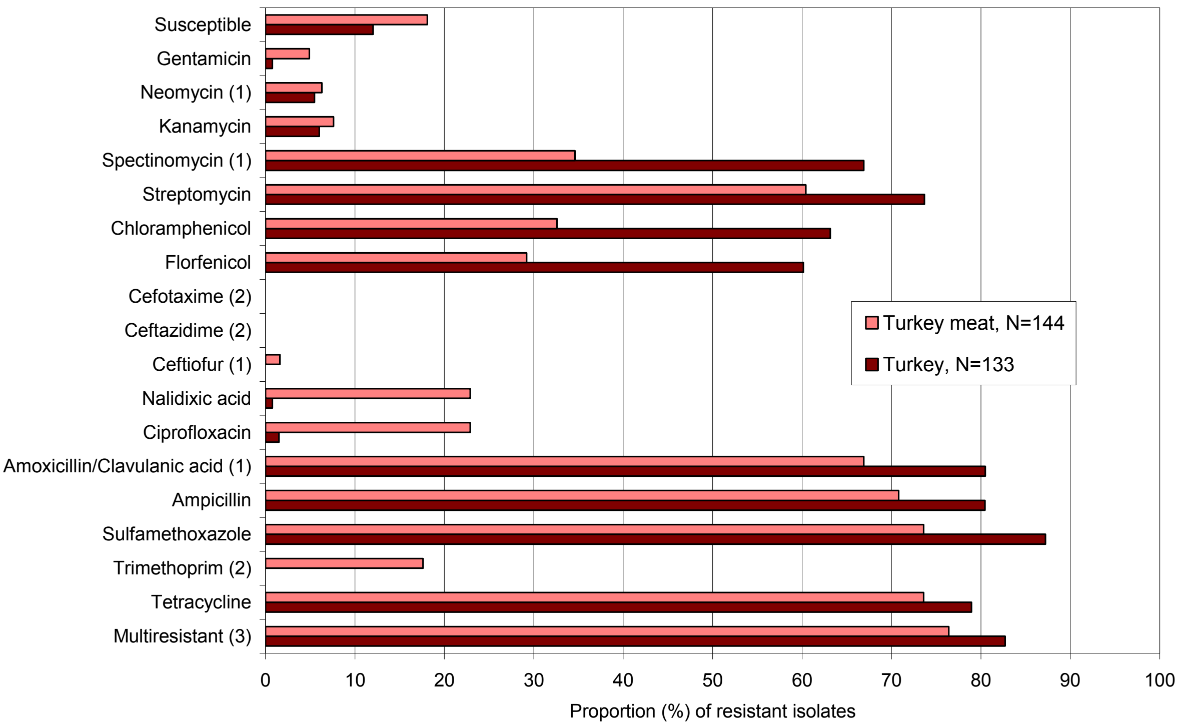
(1) Antimicrobials were tested from 2000 to 2007
(2) Antimicrobials were tested since 2008
(3) Multiresistant = resistant to more than one class of antimicrobials

Fig. 7.4: Resistance rates in *S.* Typhimurium from chickens and chicken meat (2000–2008)



(1) Antimicrobials were tested from 2000 to 2007
(2) Antimicrobials were tested/evaluated since 2008
(3) Multiresistant = resistant to more than one class of antimicrobials

Fig. 7.5: Resistance rates in *S.* Typhimurium from turkeys and turkey meat (2000–2008)



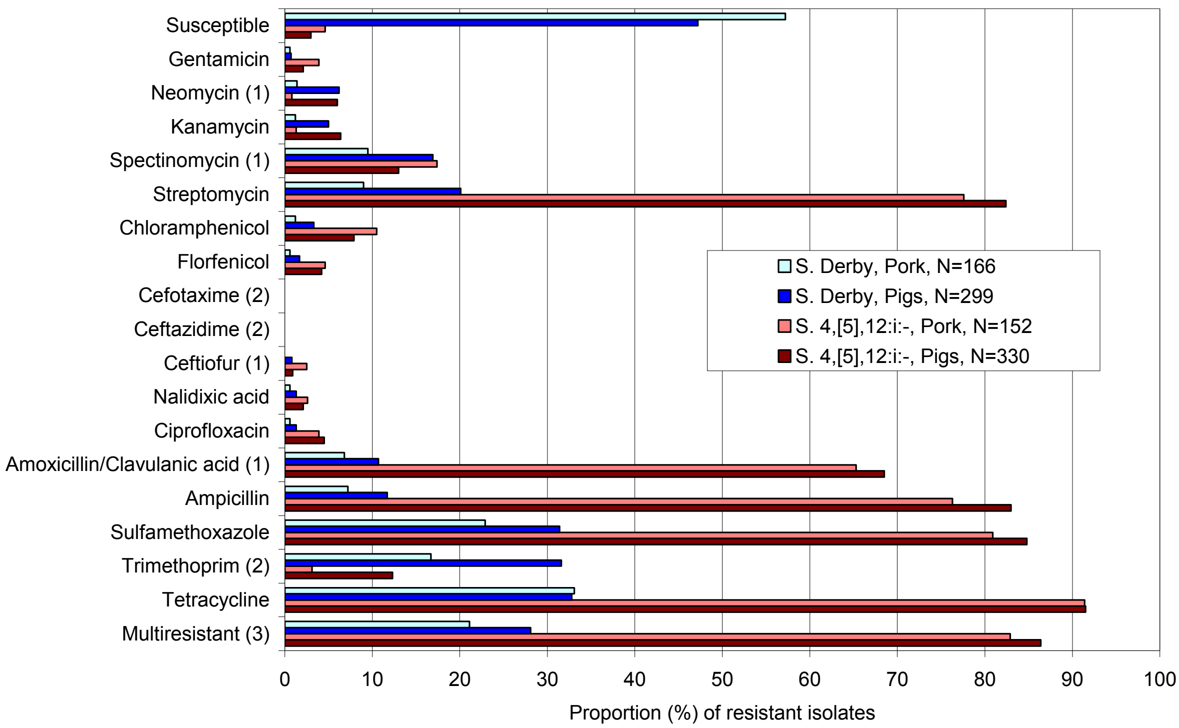
(1) Antimicrobials were tested from 2000 to 2007
(2) Antimicrobials were tested since 2008
(3) Multiresistant = resistant to more than one class of antimicrobials

7.4 *S.* 4,[5],12:i:- and *S.* Derby from pigs and pork

The proportion of resistant *S.* 4,[5],12:i:- isolates from pork (95.4 %) was about the same as the proportion of isolates from pigs (97.0 %; figure 7.6). The proportion of multiresistant isolates was comparable in both origins (82.9 % vs. 86.4 %), too. For single substances as well, the proportions of resistant isolates varied by only a few percentage points.

S. Derby from pigs and pork each were about 50 % resistant. The proportion of re-sistant isolates to single substances from pigs each was slightly higher than from meat.

Fig. 7.6: Resistance rates in *S.* 4,[5],12:i:- and *S.* Derby from pigs and pork (2000–2008)



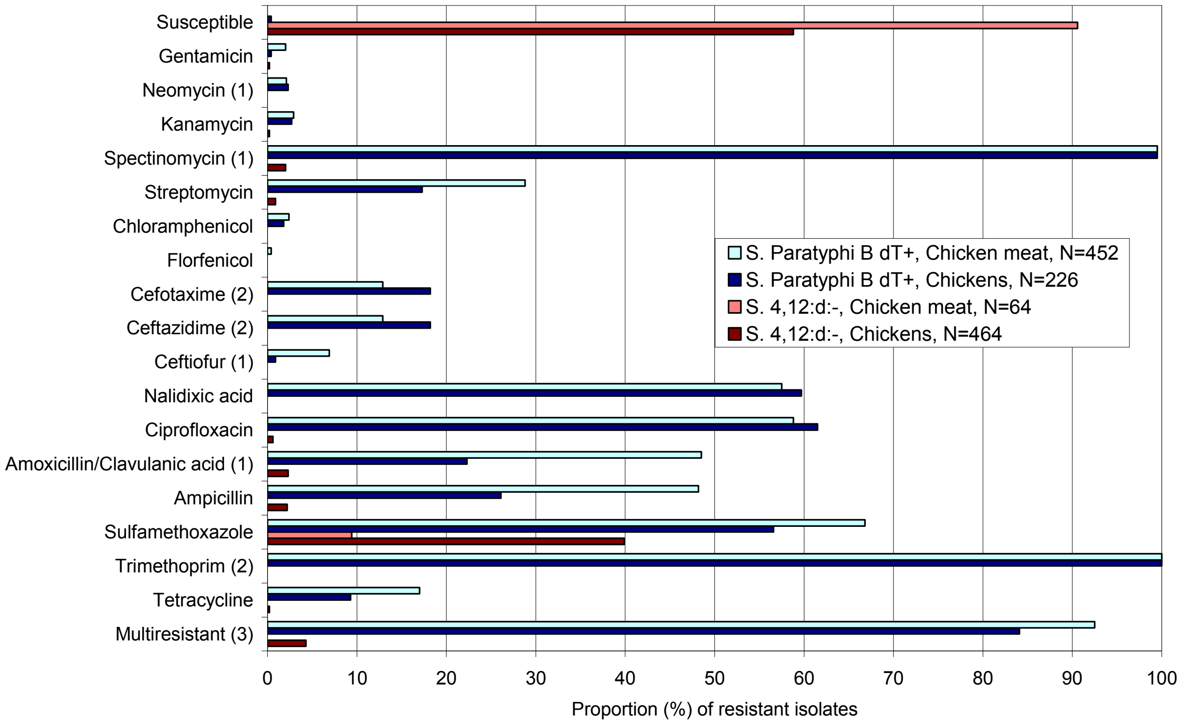
(1) Antimicrobials were tested from 2000 to 2007
(2) Antimicrobials were tested since 2008
(3) Multiresistant = resistant to more than one class of antimicrobials

7.5 *S.* Paratyphi B dT+ and *S.* 4,12:d:- from chickens and chicken meat

S. Paratyphi B dT+ almost exclusively occurred in chickens and chicken meat, however, with substantial resistance rates. Results for isolates from animals and from chicken meat were very similar, with isolates from meat being resistant slightly more often to aminopenicillins, streptomycin, sulfamethoxazole and tetracyclines, but slightly less often to third generation cephalosporins (figure 7.7).

About half of the isolates (58.8 %) of the monophasic serovar *S.* 4,12:d:- from chickens was sensitve, compared with 90 % susceptible isolates from meat. In isolates of both origins, the majority of resistant isolates was resistant to sulfamethoxazole. While in isolates from chickens multiresistances were observed as well (4.3%), this was not the case in isolates from chicken meat.

Fig. 7.7: Resistance rates in *S.* 4,12:d:- and *S.* Paratyphi B dT+ from chickens and chicken meat (2000–2008)



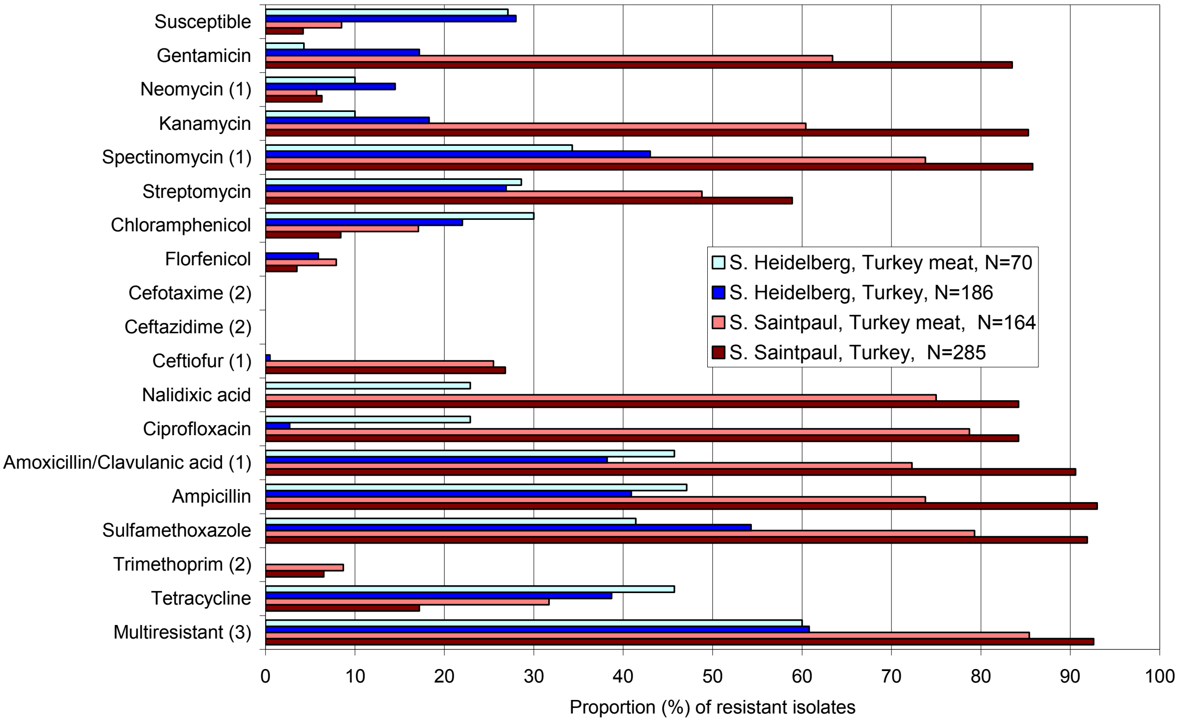
(1) Antimicrobials were tested from 2000 to 2007
(2) Antimicrobials were tested since 2008
(3) Multiresistant = resistant to more than one class of antimicrobials

7.6 *S.* Saintpaul and *S.* Heidelberg from turkeys and turkey meat

All in all, *S.* Saintpaul from turkey meat showed less resistance to antimicrobials than isolates of this serovar from turkeys (figure 7.8). Thus, in turkey meat the proportion of susceptible isolates was higher (8.5 % vs. 4.2 %) and the proportion of multiresistant isolates was lower (85.4 % vs. 92.6 %). Amphenicols and tetracycline were an exception, as *S.* Saintpaul isolates from turkey meat were more often resistant to these substances.

Regarding *S.* Heidelberg, the proportions of resistant isolates from turkey (72.0 %) and from turkey meat (72.9 %) were nearly identical. With regard to multiresistances there was no difference either. Resistance rates to (fluoro-)quinolones were higher in isolates from turkey meat (22.9 % vs. 2.7 %), however, more isolates from turkeys showed resistance to gentamicin (17.2 % vs. 4.3 %).

Fig. 7.8: Resistance rates in *S.* Saintpaul and *S.* Heidelberg from turkeys and turkey meat (2000–2008)



(1) Antimicrobials were tested from 2000 to 2007
(2) Antimicrobials were tested since 2008
(3) Multiresistant = resistant to more than one class of antimicrobials

8 Molecular biological investigation of resistance

8.1 Introduction

Prevalence studies on the occurrance of resistant pathogens and on single resistances to antimicrobial substances provide insight into the incidence as well as the temporal and geographical distribution of the resistance situation in Germany. Together with knowledge on the application of antimicrobials in the respective populations they can help to evaluate the relationship between the quantities used, i.e. the application, of antimicrobials as well as the incidence of resistances and the emergence of new resistances.

However, in order to understand the mechanisms of the spread of individual resistance genes and resistant clones, isolates from the monitoring programmes have to be subjected to detailed molecular biological studies. Today, the identification of resistance mechanisms and their underlying genetic elements via PCR or DNA arrays is international standard. This allows the comprehensive characterisation of resistant pathogens from animal and food production through to the consumer and hence to establish the scientific basis for further risk assessment and management recommendations.

8.2 Molecular principles of antimicrobial effect and resistance

The evaluation of antimicrobial resistances has certain particular features. Not only the mono- and multiresistant bacteria themselves can be transferred, but also individual genetic structures that cause resistance. This takes place both by vertical gene transfer, whereby genetic material is transferred to both daughter cells during cell division, and by horizontal gene transfer. During horizontal gene transfer, genetic material is transferred between individual bacteria of the same or different species by different possible mechanisms. These routes of spread can only be explained and recorded, if the molecular components of resistant pathogens are investigated with molecular biological methods.

The antimicrobial activity of antimicrobials is primarily based on the inhibition of steps in the biosynthesis of important bacterial cell constituents. The main targets are biosynthesis of the cell wall, proteins and nucleic acids as well as other metabolic pathways such as folic acid metabolism. Different classes of antimicrobials affect different targets. Bacteria become resistant, if they can interfere with the mechanism of action of the antimicrobial substances or block their activity.

Some bacterial genera possess structural or functional properties that confer natural tolerance to one or some antimicrobials. In contrast, acquired resistance is caused by one or more changes in the bacterial genome. For example, resistance can be acquired by mutation of genes involved in metabolism or by horizontal transfer of mobile genetic elements that carry resistance genes.

In general, bacterial resistance to antimicrobials can be caused by the following four basic mechanisms:

1. Enzymatic inactivation of the antimicrobial substance
2. Modification or replacement of the bacterial target
3. Reduced uptake of the antimicrobial substance by the bacterial cell
4. Active efflux of the antimicrobial substance by the bacterial cell

Enzymatic inactivation is the main mechanism of resistance to ß-lactam antimicrobials and aminoglycosides. Thereby, the substance is modified. This is performed either by hydrolysis of the antimicrobial’s ß-lactam (ß-lactam ring) by ß-lactamases, hydrolases or esterases, or by adding a chemical moiety by acetyl-, adenyl-, methyl- and phosphortransferases. Because of this, the antimicrobial substance used cannot attack at the bacterial target any more.

Modification or replacement of the bacterial target is a mechanism of acquired resistance to trimethoprim, sulfonamides, quinolones and rifampicin.

Reduced uptake of specific antimicrobial substances, such as quinolones and ß-lactams, is usually caused by changes in the outer membrane of gram-negative bacteria. It is due to the loss or reduced expression of porins, which are the entry route of the antimicrobials. This mechanism usually is not caused by specific resistance genes.

Active efflux is an energy-dependent mechanism to reduce the concentration of a substance in the cytoplasm. The substrate specifitiy of the efflux pumps varies to a great extent. Quinolones, tetracyclines, phenicols, ß-lactams etc. each are usually transported by specific efflux pumps. Different resistance genes that encode for a large number of membrane-associated efflux pumps have already been described in the literature (Nikaido 2005).

In addition to these main mechanisms, protection and overproduction of the targets have also been reported. It is also known that certain resistances can be based on the interaction of several resistance mechanisms (Guardabassi and Courvalin 2006; Nikaido 2005; Schwarz and Chaslus-Dancla 2001; Walsh 2003).

8.3 Routes of spread of resistance mechanisms in the bacterial population

The properties mentioned above can spread in the bacterial population vertically by cell division, that is across several generations of a bacterial clone. Of special importance for the health care system is also the spreading of mobile genetic elements by horizontal gene transfer between different bacteria. The main mechanisms for horizontal transfer of genetic material between bacteria are conjugation, transformation and transduction.

Conjugation is the most common and most efficient mechanism for horizontal gene transfer. Transmissible DNA molecules are transferred from a donor to a recipient cell, after membrane permeability has been caused by so-called sex pili and the fusion of the cell walls of the bacteria concerned. This mechanism serves for the transfer of plasmids, transposons and other mobilisable genetic elements.

Transformation implies uptake and integration of free DNA into competent recipient bacteria. This DNA is available in the environment after bacterial autolysis. Compared with conjugation, transformation is less important for spread of resistance genes under *in vivo* conditions (Davison 1999).

The same applies to **transduction**. During transduction, foreign DNA is transferred to recipient bacteria via bacteriophages. Bacteriophages introduce their DNA into host cells and usually force the cells to produce descendant phages or to introduce the DNA as prophages into the genome of the recipient cells. However, the transfer of resistance genes via bacteriophages seems to be of little importance in nature, for example because there are limitations for the amount of DNA that can be transferred (Davison 1999; Kokjohn 1989).

Bacteria do not only possess very efficient mechanisms for transferring genetic material, they also have genetic properties that allow them to accumulate resistance genes and thus to develop multiresistances. Resistance genes can be exchanged within the bacterium between chromosomal and extrachromosomal DNA elements. The major genetic structures for the transfer of resistance gene between bacteria are mobile genetic elements such as plasmids, transposons, integrons, gene cassettes and so-called genomic islands (Bennett 1995; Schwarz and Chaslus-Dancla 2001).

Plasmids are extrachromosomal, circular DNA molecules that can vary in size from less than two to several 100 kb. They replicate independently of the bacterial chromosome. So far, plasmids have been described in almost all bacterial species. They possess the ability to be transferred by themselves (conjugative plasmids) or together with a self-transmissible plasmid from one bacterium to another. In addition to resistance genes, plasmids often also carry metabolic or virulence characteristics of the pathogens. Resistance plasmids may carry one or more resistance genes, so that resistance to up to ten different antimicrobials can occur and be transferred simultaneously. Plasmids are also responsible for the spread of transposons and integrons/gene cassetts (Carattoli 2003).

Transposons ("jumping genes") are short DNA sequences that can be exchanged between different DNA molecules. They are able to jump back and forth between plasmids and the bacterial genome or between plasmids and bacteriophages. In contrast to plasmids, transposons cannot replicate independently. Stable passing on of transposons to the next generation requires the integration into chromosomal, plasmid or phage DNA. Size and structure of transposons are variable, but all of them carry a transposase gene that encodes their integration and expression. Often, they also include one or more resistance genes. Transposons may be conjugative or non-conjugative. They can move to plasmids and into the DNA of the bacterium very easily. Often, one plasmid carries serveral transposons, which results in transfer of multiple resistances during one conjugation event (Liebert et al. 1999).

Integrons are naturally occurring gene expression elements. Among the five classes of integrons currently known to be associated with resistance, class 1 and class 2 integrons are the ones that are most often detected in nature. They represent intact or defect transposons and are usually characterised by two conserved regions at either side of a variable region. This variable region normally carries the gene cassettes with resistance genes.

Gene cassettes are small elements (<2 kb) consisting of a resistance gene and a recombination sequence. They do not possess replication and transposition systems, but move through recombination and therefore are considered as mobile genetic elements. The 5' conserved integron region contains an integrase gene, which is responsible for the sequence-specific insertion of the cassette into other genetic units. A promotor is included as well, which is responsible for the expression of the genes that are integrated in the cassette. In class 1 integrons, the 3' conserved region carries the gene *qacEΔ1*, which provides resistance to some disinfectants, and gene *sul1*, which causes resistance to sulfonamides. In contrast, class 2 integrons only carry transposition genes. Integrons can either be localised on the bacterial chromosome or mostly on plasmids with a broad host range. Together with the capability for vertical and horizontal gene transfer, these highly specific gene uptake and expression systems are important characteristics of bacteria to resist the effect of antimicrobials (Carattoli 2001; Hall 1997; Mazel 2006).

Since the 1990s, so-called genomic islands have been described. They also harbour bacterial antimicrobial resistance genes. These elements can be integrated sequence-specifically into the bacterial genome. The genomic island 1 (SGI1) is a well-characterised example of a resistance island from *Salmonella* Typhimurium phage type DT104. It carries a multiresistance gene cluster with two class 1 integrons. SGI1 has a size of 43 kb and has been found in the meantime in other *Salmonella* serovars and their various serological variants as well, including *S*. Agona, *S*. Paratyphi B, *S*. Newport, *S*. Albany and *S*. Meleagridis. This widespread distribution suggests the spread of SGI1 by horizontal gene transfer. Usually this multiresistance region encodes resistance to ampicillin ($bla_{\text{PSE-1}}$), chloramphenicol/florfenicol (*floR*), streptomycin/spectinomycin (*aadA2*), tetracycline (*tet*[G]) and sulfonamides (*sul1*).

Other combinations of resistance genes have been described as well (Boyd et al. 2001; Levings et al. 2005).

8.4 Genotypic detection of resistance

According to current knowledge, different resistance determinants can cause the same resistance phenotype (Guerra et al. 2000; Guerra et al. 2003; Guerra et al. 2004; Miko et al. 2002). Because of this, the exact characterisation of a clone's resistance-inducing genetic elements is a first essential step towards the assessment of their epidemiological significance. This includes complete registration of the mobile genetic elements that are responsible for horizontal gene transfer such as integrons, transposons and plasmids. This analysis also allows the identification and characterisation of multiresistance as well as a deeper understanding of the spread and the evaluation of the pathogen. The identification of resistance determinants is also important to give a detailed description of the incidence of resistant bacterial populations in humans and animal pathogens, zoonotic bacteria and bacteria of the normal commensal flora (Gibreel et al. 2004; Guerra et al. 2004; Miko et al. 2005; Soto et al. 2003). Therefore, information about the genetic equipment of a bacterial population or a pathogen is an important prerequisite for risk assessment and control of the spread of specific resistant pathogens (Aarestrup et al. 2008).

In recent years, a number of molecular methods has been developed that allow the detection of resistance genes and mobile resistance elements (Aarts et al. 2001; Aarts et al. 2006; Tenover und Rasheed 2004). Most of these methods are based on the application of DNA probes and polymerase chain reaction (PCR) techniques. Polymerase chain reaction is a method to multiply the genetic material DNA *in vitro*. For this purpose, the enzyme DNA polymerase is used. In this context, the term „chain reaction" describes the fact that the products from previous cycles serve as starting material for the next cycle and therefore allow exponential multiplication. DNA probes are double-stranded DNA molecules with known nucleotide sequence, which are complementary to a specific DNA target segment. A marker is bound to the probes so that binding of the probe to the target DNA can be detected.

Both classical and, more and more frequently, real-time PCR techniques are used. In real-time PCR techniqes, the signals of the DNA-bound probes are detected in *real time*, so that the method allows to estimate the amount of present copies of a gene segment. At the moment, PCR detection of different resistance genes and mobile elements like integrons and transposons is the method of choice.

By hybridisation of PCR products to genomic DNA that has been digested with restriction enzymes and separated by gelelectrophoresis, genetic elements can be localised within the genome of a pathogen. Of particular importance is the question, whether a genetic structure is localised on the bacterial chromosome or on bacterial plasmids that may be transferred horizontally as well. In some cases it is necessary to sequence PCR products to detect point mutations. For example, they are involved in resistances to quinolones, fluorchinolones, erythromycin, ß-lactams and other antimicrobial substances. Usually, PCR methods are fast, uncomplicated, sensitive and specific. By now, there is a large number of published primers that can recognise most of the known resistance genes as well as integron and transposon structures (Guerra et al. 2003; Levesque et al. 1995; Tenover und Rasheed 2004). DNA sequencing is the method of choice for detection of point mutations. In spite of relatively high costs, it is an important technique to detect new and unknown sequences that are responsible for resistances.

8.5 DNA microarrays for molecular characterisation of resistances

By now, microarray technology is a well-established and fully developed technique for the detection of molecular characteristics. It has become more and more important for the characterisation of resistant pathogens, because it allows to address a large number of resistance genes at the same time. The basic principle is to fix a nucleotide sequence (probe) on a solid surface. This probe then can bind complementary DNA of a test organism. This binding is detected by fluorescent reporter molecules included in the test DNA. Often, a multiplex PCR that detects several genes simultaneously is performed first to improve sensitivity or specifity, respectively.

In recent years, a number of DNA microarrays have been reported that are able to detect several different antimicrobial resistance genes at the same time. This allows to avoid the effort that has been involved with the search for resistance genes by different individually specific PCR runs. The first publications with only a few target genes proved the ß-lactamase enzyme family PSE, OXA, FOX, MEN, CMY, TEM, SHV, OXY and AmpC (Lee et al. 2002) and 17 tetracycline resistance genes (Call et al. 2003). Chen et al. developed an array that could identify 23 resistance genes that occur in *E. coli* and *Salmonella* (Chen et al. 2005). The probes used in the three publications mentioned above were PCR products. Afterwards, Van Hoek et al. and Malorny et al. developed oligonucleotide probes to detect different resistance genes in *Salmonella* (Malorny et al. 2007; van Hoek et al. 2005). Frye et al. developed an array for detection of resistance genes in gramnegative and grampositive isolates (Frye et al. 2006). The most comprehensive microarray consists of 223 50- to 60-mer oligonucleotides and covers the antimicrobial classes aminoglycosides, ß-lactams, chloramphenicol, macrolide-lincosamide-streptogramin (MLS), sulfonamides, tetracyclines, trimethoprim and vancomycin (van Hoek und Aarts 2008). An array of 47 clinically relevant resistance genes that cover resistance to aminoglycosides, trimethoprim, sulfonamides, tetracyclines and ß-lactams (including those with an extended spectrum of action) have been established on a convenient array platform (CLONDIAG, Jena, Germany). The resistance test is performed by linear multiplex PCR using 45 biotin-labeled primer pairs.

Shorter oligonucleotide probes are required for the detection of antimicrobial resistance genes that are based on single point mutations. Microarrays regarding some antimicrobial substances have been published, e.g. for quinolone and rifampicin resistance (Yue et al. 2004) or for the single nucleotide polymorphism (SNP) of the ß-lactamase variants (Grimm et al. 2004).

The continuous further development of detection methods contributes significantly to a better understanding of resistance mechanisms, both regarding their mode of action and their trend to spread. This leads to a more reliable interpretation of resistance data and facilitates risk assessment.

9 List of abbreviations

Fig.	Figure
AVV	Allgemeine Verwaltungsvorschrift
BfR	Bundesinstitut für Risikobewertung – Federal Institute for Risk Assessment
BgVV	Bundesinstitut für gesundheitlichen Verbraucherschutz und Veterinärmedizin – Federal Institute for Health Protection for Consumers and Veterinary Medicine
CLSI	Clinical and Laboratory Standards Institute
DNA	Desoxyribonukleinsäure
ECOFF	Epidemiological cut off
EFSA-CSR	European Food Safety Authority – Community Summary Report
EC	European Community
EUCAST	European Committee on Antimicrobial Susceptibility Testing
FLI	Friedrich-Loeffler-Institute – Federal Research Institute for Animal Health
MIC	Minimum Inhibitory Concentration
N	Number of samples
NCCLS	National Committee on Clinical Laboratory Standards
NRL AR	National Reference Laboratory for Antimicrobial Resistance
NRL Salm	National Reference Laboratory for Salmonella
PCR	Polymerase Chain Reaction
RDNC	Non typeable („react but did not conform“)
RKI	Robert Koch-Institute (Federal Institute for Health)
S.	*Salmonella*
spp.	Species
ssp.	Subspecies
Tab.	Table
vs.	versus
WHO	World Health Organization

10 List of figures

11 List of tables

12 References

Aarestrup, F. M., H. C. Wegener, and P. Collignon. 2008. Resistance in bacteria of the food chain: epidemiology and control strategies. Expert Review of Anti-Infective Therapy 6(5):733–750.

Aarts, H. J., K. S. Boumedine, X. Nesme et al. 2001. Molecular tools for the characterisation of antibiotic-resistant bacteria. Vet Res 32(3–4):363–380.

Aarts, H. J., B. Guerra, and B. Malorny. 2006. Molecular methods for detection of antibiotic resistance. In: Antimicrobial resistance in bacteria of animal origin. F. Aarestrup, ed. ASM Press, Washington, D.C.:37–48.

Bennett, P. M. 1995. The spread of drug resistance. In: Population genetics in bacteria. S. Baumberg, J. P. W. Young, E. M. H. Wellington, and J. R. Saunders, eds. Cambridge Univ Press, Cambridge:317–344.

Boyd, D., G. A. Peters, A. Cloeckaert et al. 2001. Complete nucleotide sequence of a 43-kilobase genomic island associated with the multidrug resistance region of *Salmonella enterica* serovar Typhimurium DT104 and its identification in phage type DT120 and serovar Agona. J Bacteriol 183(19):5725–5732.

Call, D. R., M. K. Bakko, M. J. Krug et al. 2003. Identifying antimicrobial resistance genes with DNA microarrays. Antimicrob. Agents Chemother 47(10):3290–3295.

Carattoli, A. 2001. Importance of integrons in the diffusion of resistance. Vet Res 32(3–4):243–259.

Carattoli, A. 2003. Plasmid-mediated antimicrobial resistance in *Salmonella enterica*. Curr Issues Mol Biol 5(4):113–122.

Chen, S., S. Zhao, P. F. McDermott et al. 2005. A DNA microarray for identification of virulence and antimicrobial resistance genes in *Salmonella* serovars and *Escherichia coli*. Mol Cell Probes 19(3):195–201.

Davison, J. 1999. Genetic exchange between bacteria in the environment. Plasmid 42(2):73–91.

Frye, J. G., T. Jesse, F. Long et al. 2006. DNA microarray detection of antimicrobial resistance genes in diverse bacteria. Int J Antimicrob Agents 27(2):138–151.

Gibreel, A., D. M. Tracz, L. Nonaka et al. 2004. Incidence of antibiotic resistance in *Campylobacter jejuni* isolated in Alberta, Canada, from 1999 to 2002, with special reference to tet(O)-mediated tetracycline resistance. Antimicrob Agents Chemother 48(9):3442–3450.

Grimm, V., S. Ezaki, M. Susa et al. 2004. Use of DNA microarrays for rapid genotyping of TEM beta-lactamases that confer resistance. J Clin Microbiol 42(8):3766–3774.

Guardabassi, L., and P. Courvalin. 2006. Modes of antimicrobial action and mechanisms of bacterial resistance. In: Antimicrobial resistance in bacteria of animal origin. F. Aarestrup, ed. ASM Press, Washington, D.C.:1–18.

Guerra, B., E. Junker, A. Miko et al. 2004. Characterization and localization of drug resistance determinants in multidrug-resistant, integron-carrying *Salmonella enterica* serotype Typhimurium strains. Microb Drug Resist 10(2):83–91.

Guerra, B., E. Junker, A. Schroeter et al. 2003. Phenotypic and genotypic characterization of antimicrobial resistance in German *Escherichia coli* isolates from cattle, swine and poultry. J Antimicrob Chemother 52(3):489–492.

Guerra, B., I. Laconcha, S. M. Soto et al. 2000. Molecular characterisation of emergent multiresistant *Salmonella enterica* serotype [4,5,12:i:-] organisms causing human salmonellosis. FEMS Microbiol Lett 190(2):341–347.

Hall, R. M. 1997. Mobile gene cassettes and integrons: moving antibiotic resistance genes in gram-negative bacteria. Ciba Found Symp 207:192–202.

Hopkins, K. L., M. Kirchner, B. Guerra et al. 2010. Multiresistant *Salmonella enterica* serovar 4,[5],12:i:- in Europe: a new pandemic strain? Euro Surveill 15: 19580.

Kokjohn, T. A. 1989. Transduction: mechanism and potential for gene transfer in the environment. In: gene transfer in the environment. S. B. Levy and R. V. Miller, eds. McGraw-Hill Book Co., New York, N.Y.:73–97.

Lee, Y., C. S. Lee, Y. J. Kim et al. 2002. Development of DNA chip for the simultaneous detection of various beta-lactam antibiotic-resistant genes. Mol Cells 14(2):192–197.

Levesque, C., L. Piche, C. Larose et al. 1995. PCR mapping of integrons reveals several novel combinations of resistance genes. Antimicrob Agents Chemother 39(1):185–191.

Levings, R. S., D. Lightfoot, S. R. Partridge et al. 2005. The genomic island SGI1, containing the multiple antibiotic resistance region of *Salmonella enterica* serovar Typhimurium DT104 or variants of it, is widely distributed in other *S. enterica* serovars. J Bacteriol 187(13):4401–4409.

Liebert, C. A., R. M. Hall, und A. O. Summers. 1999. Transposon Tn21, flagship of the floating genome. Microbiol Mol Biol Rev 63(3):507–522.

Malorny, B., C. Bunge, B. Guerra et al. 2007. Molecular characterisation of *Salmonella* strains by an oligonucleotide multiprobe microarray. Mol Cell Probes 21(1):56–65.

Mazel, D. 2006. Integrons: agents of bacterial evolution. Nat Rev Microbiol 4(8):608–620.

Miko, A., B. Guerra, A. Schroeter et al. 2002. Molecular characterization of multiresistant d-tartrate-positive *Salmonella enterica* serovar paratyphi B isolates. J Clin Microbiol 40(9):3184–3191.

Miko, A., K. Pries, A. Schroeter et al. 2005. Molecular mechanisms of resistance in multidrug-resistant serovars of *Salmonella enterica* isolated from foods in Germany. J Antimicrob Chemother 56(6):1025–1033.

Nikaido, H. 2005. Role, structure, and function of multidrug efflux pumps in Gram negative bacteria. In: Frontiers in antimicrobial resistance. A tribute to Stuart B. Levy. G. White, M. N. Aleksun, and P. F. McDermott, eds. ASM Press, Washington, D.C.:261–274.

Schwarz, S., und E. Chaslus-Dancla. 2001. Use of antimicrobials in veterinary medicine and mechanisms of resistance. Vet Res 32(3–4):201–225.

Soto, S. M., M. J. Lobato, and M. C. Mendoza. 2003. Class 1 integron-borne gene cassettes in multidrug-resistant *Yersinia enterocolitica* strains of different phenotypic and genetic types. Antimicrob Agents Chemother 47(1):421–426.

Tenover, F. C., and J. K. Rasheed. 2004. Detection of antimicrobial resistance genes and mutations associated with antimicrobial resistance in microrganisms. In: Molecular microbiology. Diagnostic principles and practice. D. H. Persing, F. C. Tenover, J. Versalovic et al., eds. ASM Press, Washington, D.C.:391–406.

van Hoek, A. H., I. M. Scholtens, A. Cloeckaert et al. 2005. Detection of antibiotic resistance genes in different *Salmonella* serovars by oligonucleotide microarray analysis. J Microbiol Methods 62(1):13–23.

van Hoek, A. H. A. M., and H. J. M. Aarts. 2008. Microarray-based detection of antibiotic resistance genes in *Salmonella*. Food Analytical Methods 1(2):95–108.

Walsh, C. 2003. Antibiotics. Actions, origins, resistance. ASM Press, Washington, D.C.

White/Kaufmann/Le Minor. 2007. Nach Grimont, P. A .D., F.-X. Weill. 2007. Antigenic formulae of the *Salmonella* serovars, 9th edition. WHO Collaborating Centre for Reference and Research on Salmonella, Institut Pasteur, 28 rue du Dr. Roux, 75724 Paris Cedex 15, France.

Yue, J., W. Shi, J. Xie et al. 2004. Detection of rifampin-resistant *Mycobacterium tuberculosis* strains by using a specialised oligonucleotide microarray. Diagn Microbiol Infect Dis 48:47–54.

13 Appendix

13.1 *Salmonella* isolates by category of origin

13.1.1 Distribution of serovars

Tab. 13.1: Number and share of the twenty most frequent serovars according to their origin environment, feeding stuffs, animals and food and in all isolates (2000–2008)

Origin	Total		Environment		Feeding stuffs		Animals		Foodstuffs	
Serovar	N	%	N	%	N	%	N	%	N	%
S. Typhimurium	11877	35,3	548	22,6	158	5,8	7712	43,7	3459	31,9
S. Enteritidis	3905	11,6	302	12,4	12	0,4	1664	9,4	1927	17,8
S. 4,[5],12:i:-	1012	3,0	56	2,3	17	0,6	518	2,9	421	3,9
S. Infantis	998	3,0	126	5,2	35	1,3	419	2,4	418	3,9
S. Derby	883	2,6	52	2,1	56	2,1	338	1,9	437	4,0
S. Paratyphi B dT+	835	2,5	48	2,0	5	0,2	263	1,5	519	4,8
S. 4,12:d:-	824	2,5	77	3,2	38	1,4	560	3,2	149	1,4
S. Anatum	764	2,3	71	2,9	268	9,9	296	1,7	129	1,2
S. Subspec. I, rough	714	2,1	48	2,0	16	0,6	327	1,9	323	3,0
S. Senftenberg	706	2,1	128	5,3	371	13,7	137	0,8	70	0,6
S. Livingstone	647	1,9	205	8,4	93	3,4	256	1,5	93	0,9
S. Subspec. IIIb	617	1,8	5	0,2	3	0,1	594	3,4	15	0,1
S. Saintpaul	607	1,8	24	1,0	11	0,4	333	1,9	239	2,2
S. Mbandaka	408	1,2	71	2,9	137	5,1	104	0,6	96	0,9
S. Virchow	377	1,1	87	3,6	6	0,2	194	1,1	90	0,8
S. Agona	373	1,1	28	1,2	119	4,4	95	0,5	131	1,2
S. Indiana	364	1,1	14	0,6	2	0,1	185	1,0	163	1,5
S. Subspec. IV	360	1,1	1	0,0			355	2,0	4	0,0
S. London	332	1,0	24	1,0	8	0,3	184	1,0	116	1,1
S. Tennessee	332	1,0	29	1,2	230	8,5	57	0,3	16	0,1
S. Heidelberg	307	0,9	4	0,2			204	1,2	99	0,9
S. Hadar	300	0,9	12	0,5			99	0,6	189	1,7
S. Ohio	266	0,8	27	1,1	120	4,4	53	0,3	66	0,6
S. Kottbus	243	0,7	20	0,8	1	0,0	165	0,9	57	0,5
S. Bovismorbificans	227	0,7	9	0,4			63	0,4	155	1,4
S. Oranienburg	221	0,7	12	0,5	67	2,5	70	0,4	72	0,7
S. Subspec. II	220	0,7	4	0,2			189	1,1	27	0,2
S. Montevideo	201	0,6	21	0,9	87	3,2	74	0,4	19	0,2
S. Subspez. IIIa	181	0,5					179	1,0	2	0,0
S. Brandenburg	171	0,5	6	0,2	2	0,1	51	0,3	112	1,0
S. Cerro	161	0,5	13	0,5	98	3,6	25	0,1	25	0,2
S. Havana	138	0,4	5	0,2	102	3,8	23	0,1	8	0,1
S. Falkensee	80	0,2			67	2,5	7	0,0	6	0,1
S. Lexington	73	0,2	2	0,1	42	1,5	22	0,1	7	0,1
S. Muenster	70	0,2	2	0,1	42	1,5	16	0,1	10	0,1
S. Albany	68	0,2	7	0,3	30	1,1	25	0,1	6	0,1
S. Lille	45	0,1			42	1,5			3	0,0
Other serovars (not listed)	3718	11,1	339	14,0	425	15,7	1779	10,1	1175	10,8
Total	33625		2427		2710		17635		10853	

Yellow areas demark the top 20 serovars by category

Tab. 13.2: Development of frequency of the twenty most frequent serovars from the environment (2000–2008)

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	Total
Number of isolates	301	267	255	359	244	166	299	352	184	2427
S. Typhimurium	103	126	49	79	44	35	36	45	31	548
S. Enteritidis	63	18	44	35	32	6	41	29	34	302
S. Livingstone	10	16	46	35	22	18	27	18	13	205
S. Senftenberg	12	5	11	8	10	12	41	18	11	128
S. Infantis	16	25	10	23	21	3	11	12	5	126
S. Virchow	7	4	12	41	11	2	6	2	2	87
S. 4,12:d:-	1	16	9	14	8	0	5	23	1	77
S. Anatum	2	2	5	24	8	10	10	9	1	71
S. Mbandaka	1	0	7	10	23	10	5	5	10	71
S. 4,[5],12:i:-	1	0	3	2	3	1	6	30	10	56
S. Derby	10	1	2	14	3	4	6	8	4	52
S. Paratyphi B dT+	4	5	5	6	7	1	9	5	6	48
S. Subspec. I, rough	12	10	3	9	2	0	0	10	2	48
S. Tennessee	2	0	5	7	3	4	3	4	1	29
S. Agona	3	1	3	5	5	2	2	4	3	28
S. Ohio	0	1	0	2	1	3	1	15	4	27
S. London	0	3	0	1	4	2	3	11	0	24
S. Saintpaul	1	1	5	5	1	0	5	6	0	24
S. Montevideo	1	1	2	2	1	1	2	6	5	21
S. Kottbus	0	0	4	0	1	2	5	5	3	20
Other serovars	52	32	30	37	34	50	75	87	38	435

Tab. 13.3: Development of frequency of the twenty most frequent serovars from feeding stuffs (2000–2008)

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	Total
Number of isolates	485	275	356	259	401	328	219	212	175	2710
S. Senftenberg	55	63	49	36	72	38	14	20	24	371
S. Anatum	61	31	44	66	12	31	6	16	1	268
S. Tennessee	13	25	6	27	96	46	9	2	6	230
S. Typhimurium	27	15	8	6	13	25	17	27	20	158
S. Mbandaka	27	26	52	4	15	2	3	3	5	137
S. Ohio	20	1	1	11	52	13	1	5	16	120
S. Agona	15	16	9	6	0	12	16	17	28	119
S. Havana	13	1	15	18	33	10	8	3	1	102
S. Cerro	4	1	52	7	1	5	6	22	0	98
S. Livingstone	33	10	6	8	7	2	6	8	13	93
S. Montevideo	32	1	5	9	7	16	12	4	1	87
S. Falkensee	23	15	0	1	15	13	0	0	0	67
S. Oranienburg	13	1	13	15	0	22	1	2	0	67
S. Derby	16	4	1	0	1	12	5	9	8	56
S. Lexington	1	3	2	4	0	6	20	4	2	42
S. Lille	4	0	15	1	6	4	11	0	1	42
S. Muenster	0	1	0	0	0	34	7	0	0	42
S. 4,12:d:-	6	9	3	1	2	2	2	10	3	38
S. Infantis	4	7	3	2	12	0	1	2	4	35
S. Albany	25	1	3	1	0	0	0	0	0	30
Other serovars	93	44	69	36	57	35	74	58	42	508

Tab. 13.4: Development of frequency of the twenty most frequent serovars from animals (2000–2008)

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	Total
Number of isolates	1953	2004	2272	1931	1953	1711	1754	1974	2083	17635
S. Typhimurium	1155	1010	1014	821	842	776	728	733	633	7712
S. Enteritidis	137	209	295	189	117	130	138	195	254	1664
S. Subspec. IIIb	42	57	77	70	62	62	58	89	77	594
S. 4,12:d:-	79	189	23	51	122	3	7	12	74	560
S. 4,[5],12:i:-	0	5	10	27	42	46	67	147	174	518
S. Infantis	28	25	14	90	111	32	43	40	36	419
S. Subspez. IV	17	34	40	29	33	55	36	51	60	355
S. Derby	31	24	17	36	46	31	43	50	60	338
S. Saintpaul	3	10	124	62	13	36	21	31	33	333
S. Subspec. I, rough	24	33	48	34	25	35	29	42	57	327
S. Anatum	22	8	17	65	43	13	63	34	31	296
S. Paratyphi B dT+	18	21	59	38	61	29	13	9	15	263
S. Livingstone	55	24	13	40	41	7	10	27	39	256
S. Heidelberg	17	46	71	37	8	3	17	2	3	204
S. Virchow	23	15	49	54	32	6	9	3	3	194
S. Subspec. II	25	17	20	7	25	24	22	24	25	189
S. Indiana	3	10	6	18	18	13	40	47	30	185
S. London	12	7	37	28	35	34	12	10	9	184
S. Subspec. IIIa	12	8	14	14	19	21	24	31	36	179
S. Kottbus	7	4	41	25	16	21	34	8	9	165
Other serovars	243	248	283	196	242	334	340	389	425	2700

Tab. 13.5: Development of frequency of the twenty most frequent serovars from foodstuffs (2000–2008)

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	Total
Number of isolates	1159	986	1439	1028	974	1808	1279	1209	971	10853
S. Typhimurium	353	438	422	307	352	683	371	300	233	3459
S. Enteritidis	242	208	264	263	126	211	214	249	150	1927
S. Paratyphi B dT+	189	34	39	29	15	26	51	73	63	519
S. Derby	21	27	46	20	27	133	71	53	39	437
S. 4,[5],12:i:-	4	6	13	25	26	111	57	83	96	421
S. Infantis	59	44	34	37	58	85	37	38	26	418
S. Subspec. I, rough	23	32	62	29	38	60	23	18	38	323
S. Saintpaul	6	5	63	10	15	19	36	41	44	239
S. Hadar	9	10	26	9	10	18	51	40	16	189
S. Indiana	9	1	65	1	11	21	15	22	18	163
S. Bovismorbificans	5	8	3	4	9	103	2	8	13	155
S. 4,12:d:-	8	6	42	8	28	14	26	8	9	149
S. Agona	12	2	24	37	13	6	6	2	29	131
S. Anatum	4	3	5	16	23	40	23	6	9	129
S. London	7	22	19	8	5	29	10	12	4	116
S. Brandenburg	12	17	15	11	13	18	13	1	12	112
S. Heidelberg	12	5	39	14	7	7	8	7	0	99
S. Mbandaka	11	17	5	18	6	7	5	12	15	96
S. Livingstone	9	9	4	10	13	8	14	8	18	93
S. Virchow	15	7	17	14	12	6	10	6	3	90
Other serovars	149	85	232	158	167	203	236	222	136	1588

13.1.2 Resistance rates in *Salmonella* isolates

Tab. 13.6: Resistance rates in *Salmonella* spp. from all sources and the main categories (2000–2008)

	Environment			Feeding stuffs			Animals			Foodstuffs			Total		
Antimicrobial tested	Tested isolates (Number)	Resistant isolates (Number)	Resistant isolates (in %)	Tested isolates (Number)	Resistant isolates (Number)	Resistant isolates (in %)	Tested isolates (Number)	Resistant isolates (Number)	Resistant isolates (in %)	Tested isolates (Number)	Resistant isolates (Number)	Resistant isolates (in %)	Tested isolates (Number)	Resistant isolates (Number)	Resistant isolates (in %)
Susceptible	2427	1494	61,6	2710	1960	72,3	17635	8807	49,9	10853	5086	46,9	33625	17347	51,6
Resistant	2427	933	38,4	2710	750	27,7	17635	8828	50,1	10853	5767	53,1	33625	16278	48,4
Multiresistant	2427	619	25,5	2710	208	7,7	17635	6601	37,4	10853	4353	40,1	33625	11781	35,0
Gentamicin	2427	35	1,4	2710	15	0,6	17635	614	3,5	10853	255	2,3	33625	919	2,7
Neomycin (1)	2239	60	2,7	2534	16	0,6	15500	558	3,6	9824	349	3,6	30097	983	3,3
Kanamycin	2427	92	3,8	2710	30	1,1	17635	959	5,4	10853	526	4,8	33625	1607	4,8
Spectinomycin (1)	2239	297	13,3	2534	113	4,5	15500	4128	26,6	9824	2411	24,5	30097	6949	23,1
Streptomycin	2427	435	17,9	2710	150	5,5	17635	5524	31,3	10853	3063	28,2	33625	9172	27,3
Chloramphenicol	2427	181	7,5	2710	82	3,0	17635	3124	17,7	10853	1386	12,8	33625	4773	14,2
Florfenicol	2427	154	6,3	2710	69	2,5	17635	2754	15,6	10853	1136	10,5	33625	4113	12,2
Cefotaxime (2)	188	0	0,0	176	0	0,0	2135	6	0,3	1030	11	1,1	3529	17	0,5
Ceftazidime (2)	188	0	0,0	176	0	0,0	2135	4	0,2	1030	11	1,1	3529	15	0,4
Ceftiofur (1)	2239	5	0,2	2534	6	0,2	15500	192	1,2	9824	114	1,2	30097	317	1,1
Nalidixic acid	2427	117	4,8	2710	33	1,2	17635	1151	6,5	10853	1127	10,4	33625	2428	7,2
Ciprofloxacin	2427	124	5,1	2709	33	1,2	17635	1239	7,0	10853	1178	10,9	33624	2574	7,7
Amoxicillin/Clavulanic acid (1)	2239	403	18,0	2534	103	4,1	15500	4735	30,5	9824	2712	27,6	30097	7953	26,4
Ampicillin	2427	472	19,4	2710	132	4,9	17635	5602	31,8	10853	3268	30,1	33625	9474	28,2
Sulfamethoxazole	2427	795	32,8	2710	701	25,9	17635	7502	42,5	10853	4642	42,8	33625	13640	40,6
Trimethoprim (3)	188			176	7	4,0	2135	204	9,6	1030	147	14,3	3529	375	10,6
Tetracycline	2427	513	21,1	2710	165	6,1	15500	5655	32,1	10853	3696	34,1	33625	10029	29,8

(1) Antimicrobials were tested from 2000 to 2007; (2) antimicrobials were tested/evaluated since 2007; (3) resistance to more than one class of antimicrobials.

Tab. 13.7: Resistance rates of the twenty most frequent serovars from all sources (2000–2008)

	S. Agona	S. Anatum	S. Derby	S. Enteritidis	S. Indiana	S. Infantis	S. Livingstone	S. London	S. Mbandaka	S. Saintpaul	S. Senftenberg	S. Subspezc I rough	S. Tennessee	S. Typhimurium	S. Paratyphi B dT+	S. 4,12:d:-	S. 4,[5],12:i:-	S. Subspec. IIIb	S. Virchow	S. Subspec. IV
Susceptible	74,3	68,2	59,3	84,2	53,8	66,6	69,9	63,0	79,9	8,4	64,2	48,5	96,4	30,5	1,8	62,1	8,3	78,0	70,0	79,7
Resistant	25,7	31,8	40,7	15,8	46,2	33,4	30,1	37,0	20,1	91,6	35,8	51,5	3,6	69,5	98,2	37,9	91,7	22,0	30,0	20,3
Multiresistant (3)	17,2	16,4	22,2	3,1	38,5	21,1	15,8	24,1	8,1	84,7	3,3	41,0	0,6	59,2	87,9	4,5	80,8	2,6	12,5	2,8
Gentamicin	4,0	3,1	0,8	0,8	0,5	0,3	1,1	0,0	0,0	66,6	1,4	3,6	0,0	2,3	1,2	0,1	1,7	0,3	0,5	0,3
Neomycin (1)	3,3	2,9	2,7	0,2	1,0	0,4	9,2	0,3	1,1	6,8	0,2	4,1	0,0	4,9	2,1	0,5	2,9	0,2	1,9	0,0
Kanamycin	3,2	3,4	2,4	0,3	1,1	0,6	8,5	0,9	1,5	66,4	1,4	7,4	0,0	5,5	2,8	0,6	3,3	0,3	2,1	0,3
Spectinomycin (1)	10,8	8,5	14,3	1,4	14,8	14,3	13,0	10,2	12,1	73,7	2,5	24,5	0,3	42,0	97,2	1,6	11,1	0,6	3,8	0,3
Streptomycin	6,2	9,6	14,3	1,4	9,1	5,8	6,5	13,0	4,2	54,0	2,7	31,0	0,3	54,1	23,0	0,7	77,5	5,5	2,4	10,0
Chloramphenicol	2,1	2,6	3,5	0,4	0,3	1,2	3,1	0,3	2,5	12,0	0,6	14,1	0,0	35,2	2,0	0,7	6,2	0,3	2,1	0,0
Florfenicol	0,3	0,9	1,8	0,3	0,0	0,4	0,5	0,0	0,0	4,0	0,3	10,5	0,0	32,6	0,2	0,0	3,1	0,2	0,5	0,0
Cefotaxime (2)	0,0	2,3	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,1	14,0	0,0	0,0	0,0	0,0	0,0
Ceftazidime (2)	0,0	2,3	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	14,0	0,0	0,0	0,0	0,0	0,0
Ceftiofur (1)	2,3	0,4	0,3	0,6	0,0	0,2	0,5	0,6	0,0	20,8	0,2	1,6	0,3	0,8	4,1	0,0	0,7	0,2	1,1	0,0
Nalidixic acid	2,7	2,2	0,9	4,9	1,4	14,4	0,9	0,6	0,5	73,3	2,0	6,6	0,0	3,6	57,6	0,5	2,1	2,4	21,2	0,6
Ciprofloxacin	3,8	2,6	0,8	5,1	1,6	14,6	1,1	1,2	0,5	74,5	2,0	7,6	0,3	3,9	59,3	1,0	3,2	1,9	21,2	1,7
Amoxicillin/Clavulanic acid (1)	9,5	8,9	7,2	1,8	11,6	7,2	6,0	8,3	1,4	74,8	0,6	32,2	0,0	51,6	37,7	2,8	62,3	0,6	7,9	0,3
Ampicillin	8,0	11,8	7,8	1,9	17,9	8,1	5,9	11,7	2,0	79,6	1,0	34,0	0,0	53,9	39,5	2,8	77,7	0,5	9,0	0,6
Sulfamethoxazole	23,3	27,7	25,8	9,9	42,3	27,1	28,4	31,6	14,0	83,5	32,6	44,0	2,7	64,4	63,1	35,3	81,1	13,8	13,3	10,6
Trimethoprim	1,5	20,5	21,1	0,0	5,7	17,3	3,6	27,8	4,7	11,4	0,0	7,9	0,0	15,1	97,7	0,0	6,3	0,0	0,0	0,0
Tetracycline	8,8	9,2	24,0	1,3	37,1	15,4	13,8	21,1	4,4	26,9	3,0	33,6	0,3	56,5	15,0	1,6	85,6	2,4	3,7	1,1
Number of isolates	**373**	**764**	**883**	**3905**	**364**	**998**	**647**	**332**	**408**	**607**	**706**	**714**	**332**	**11877**	**835**	**824**	**1012**	**617**	**377**	**360**

(1) Antimicrobials were tested from 2000 to 2007; (2) antimicrobials were tested/evaluated since 2007; (3) resistance to more than one class of antimicrobials.

Tab. 13.8: Resistance rates of the twenty most frequent serovars from the environment (2000–2008)

	S. Agona	S. Anatum	S. Derby	S. Enteritidis	S. Infantis	S. Kottbus	S. Livingstone	S. London	S. Mbandaka	S. Montevideo	S. Ohio	S. Saintpaul	S. Senftenberg	S. Subspec. I, rough	S. Tennessee	S. Typhimurium	S. Paratyphi B dT+	S. 4,12:d:-	S. 4,[5],12:i:-	S. Virchow
Susceptible	85,7	78,9	59,6	81,5	73,0	85,0	77,1	75,0	93,0	66,7	100,0	12,5	82,8	58,3	100,0	29,7	2,1	75,3	3,6	80,5
Resistant	14,3	21,1	40,4	18,5	27,0	15,0	22,9	25,0	7,0	33,3	0,0	87,5	17,2	41,7	0,0	70,3	97,9	24,7	96,4	19,5
Multiresistant (3)	7,1	12,7	23,1	2,6	15,1	10,0	12,2	12,5	1,4	19,0	0,0	79,2	1,6	31,3	0,0	59,3	91,7	2,6	91,1	10,3
Gentamicin	0,0	2,8	0,0	0,3	0,0	0,0	0,0	0,0	0,0	9,5	0,0	54,2	0,8	4,2	0,0	1,5	0,0	0,0	3,6	1,1
Neomycin (1)	0,0	2,9	6,3	0,4	0,0	0,0	8,9	4,2	0,0	0,0	0,0	16,7	0,0	4,3	0,0	3,5	0,0	0,0	0,0	0,0
Kanamycin	0,0	2,8	5,8	0,7	1,6	0,0	8,3	4,2	0,0	19,0	0,0	54,2	0,8	8,3	0,0	4,2	0,0	0,0	3,6	1,1
Spectinomycin (1)	0,0	10,0	12,5	1,1	1,7	0,0	9,9	4,2	0,0	0,0	0,0	66,7	0,9	8,7	0,0	32,4	97,6	0,0	6,5	3,5
Streptomycin	0,0	7,0	19,2	1,7	4,0	0,0	2,4	8,3	1,4	9,5	0,0	41,7	1,6	20,8	0,0	52,4	10,4	0,0	91,1	3,4
Chloramphenicol	0,0	2,8	0,0	0,3	0,8	0,0	0,5	4,2	0,0	0,0	0,0	12,5	0,0	4,2	0,0	27,7	2,1	1,3	0,0	1,1
Florfenicol	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,8	4,2	0,0	25,9	0,0	0,0	0,0	1,1
Cefotaxime (2)	0,0	0,0	0,0	0,0	0,0	0,0	0,0	-	0,0	0,0	0,0	-	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Ceftazidime (2)	0,0	0,0	0,0	0,0	0,0	0,0	0,0	-	0,0	0,0	0,0	-	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Ceftiofur (1)	0,0	0,0	0,0	1,1	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Nalidixic acid	0,0	2,8	0,0	3,3	1,6	10,0	0,0	4,2	0,0	14,3	0,0	70,8	1,6	4,2	0,0	1,6	75,0	0,0	3,6	5,7
Ciprofloxacin	0,0	2,8	0,0	3,6	1,6	5,0	0,0	4,2	0,0	23,8	0,0	70,8	2,3	4,2	0,0	2,0	75,0	0,0	3,6	5,7
Amoxicillin/Clavulanic acid (1)	4,0	11,4	6,3	1,9	10,9	11,8	4,7	4,2	1,6	0,0	0,0	66,7	0,0	17,4	0,0	48,9	28,6	2,6	82,6	8,2
Ampicillin	3,6	12,7	5,8	2,3	11,9	10,0	4,9	8,3	2,8	0,0	0,0	66,7		20,8	0,0	52,9	31,3	3,9	91,1	6,9
Sulfamethoxazole	14,3	12,7	30,8	14,2	23,8	5,0	21,5	12,5	4,2	19,0	0,0	75,0	14,8	39,6	0,0	66,1	64,6	20,8	92,9	14,9
Trimethoprim	0,0	0,0	0,0	0,0	28,6	0,0	7,7	-	10,0	0,0	0,0	-	0,0	0,0	0,0	9,1	100,0	0,0	0,0	0,0
Tetracycline	3,6	5,6	11,5	1,0	4,8	10,0	11,7	12,5	1,4	9,5	0,0	33,3	0,0	22,9	0,0	57,1	10,4	2,6	89,3	4,6
Number of isolates	**28**	**71**	**52**	**302**	**126**	**20**	**205**	**24**	**71**	**21**	**27**	**24**	**128**	**48**	**29**	**548**	**48**	**77**	**56**	**87**

(1) Antimicrobials were tested from 2000 to 2007; (2) antimicrobials were tested/evaluated since 2007; (3) resistance to more than one class of antimicrobials.

Tab. 13.9: Resistance rates of the twenty most frequent serovars from feeding stuffs (2000–2008)

	S. Agona	S. Albany	S. Anatum	S. Cerro	S. Derby	S. Falkensee	S. Havana	S. Infantis	S. Lexington	S. Lille	S. Livingstone	S. Mbandaka	S. Montevideo	S. Muenster	S. Ohio	S. Oranienburg	S. Senftenberg	S. Tennessee	S. Typhimurium	S. 4,12:d:-
Susceptible	88,2	50,0	71,6	96,9	66,1	44,8	89,2	94,3	95,2	90,5	60,2	78,1	72,4	100	82,5	88,1	63,6	96,5	22,2	68,4
Resistant	11,8	50,0	28,4	3,1	33,9	55,2	10,8	5,7	4,8	9,5	39,8	21,9	27,6	0,0	17,5	11,9	36,4	3,5	77,8	31,6
Multiresistant (3)	0,8	0,0	3,7	0,0	10,7	1,5	1,0	5,7	0,0	0,0	11,8	7,3	2,3	0,0	0,0	0,0	1,1	0,0	70,9	0,0
Gentamicin	0,0	0,0	1,1	0,0	1,8	1,5	0,0	0,0	0,0	0,0	1,1	0,0	2,3	0,0	0,0	0,0	0,0	0,0	1,3	0,0
Neomycin (1)	0,0	0,0	0,7	0,0	0,0	0,0	0,0	0,0	0,0	0,0	7,5	1,5	0,0	0,0	0,0	0,0	0,0	0,0	3,6	0,0
Kanamycin	0,0	0,0	1,1	0,0	0,0	0,0	1,0	0,0	0,0	0,0	6,5	2,9	1,1	0,0	0,0	0,0	0,0	0,0	3,8	0,0
Spectinomycin (1)	0,0	0,0	0,4	0,0	6,3	0,0	0,0	3,2	0,0	0,0	11,3	11,4	0,0	0,0	0,0	0,0	0,6	0,0	48,6	0,0
Streptomycin	0,0	0,0	4,1	0,0	5,4	0,0	0,0	0,0	0,0	0,0	3,2	2,2	0,0	0,0	0,0	0,0	0,8	0,0	60,8	0,0
Chloramphenicol	0,0	0,0	0,4	0,0	1,8	0,0	0,0	0,0	0,0	0,0	1,1	0,0	0,0	0,0	0,0	0,0	0,0	0,0	44,9	0,0
Florfenicol	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	40,5	0,0
Cefotaxime (2)	0,0	-	0,0	-	0,0	-	0,0	0,0	0,0	0,0	0,0	0,0	0,0	-	0,0	-	0,0	0,0	0,0	0,0
Ceftazidime (2)	0,0	-	0,0	-	0,0	-	0,0	0,0	0,0	0,0	0,0	0,0	0,0	-	0,0	-	0,0	0,0	0,0	0,0
Ceftiofur (1)	1,1	0,0	0,0	1,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,7	0,0
Nalidixic acid	0,0	10,0	0,4	0,0	1,8	0,0	1,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	4,4	2,6
Ciprofloxacin	0,0	10,0	0,4	0,0	0,0	0,0	1,0	0,0	0,0	0,0	1,1	0,0	0,0	0,0	0,0	0,0	0,0	0,0	4,4	2,6
Amoxicillin/Clavulanic acid (1)	0,0	0,0	0,4	0,0	0,0	0,0	0,0	3,2	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	58,7	0,0
Ampicillin	0,0	0,0	0,4	0,0	1,8	0,0	0,0	2,9	0,0	0,0	0,0	0,0	0,0	0,0	0,8	0,0	0,3	0,0	61,4	0,0
Sulfamethoxazole	11,8	40,0	27,2	2,0	28,6	55,2	9,8	5,7	4,8	9,5	37,6	16,1	26,4	0,0	16,7	11,9	36,4	3,5	73,4	28,9
Trimethoprim	0,0	-	0,0	-	12,5	-	0,0	0,0	0,0	0,0	0,0	0,0	0,0	-	0,0	-	0,0	0,0	15,0	0,0
Tetracycline	0,0	0,0	1,5	0,0	10,7	0,0	0,0	0,0	0,0	0,0	8,6	2,9	0,0	0,0	0,0	0,0	0,3	0,0	70,3	0,0
Number of isolates	**119**	**30**	**268**	**98**	**56**	**67**	**102**	**35**	**42**	**42**	**93**	**137**	**87**	**42**	**120**	**67**	**371**	**230**	**158**	**38**

(1) Antimicrobials were tested from 2000 to 2007; (2) antimicrobials were tested/evaluated since 2007; (3) resistance to more than one class of antimicrobials.

Tab. 13.10: Resistance rates of the twenty most frequent serovars from animals (2000–2008)

	S. Anatum	S. Derby	S. Enteritidis	S. Heidelberg	S. Indiana	S. Infantis	S. Kottbus	S. Livingstone	S. London	S. Saintpaul	S. Subspec. I, rough	S. Subspec. II	S. Subspec. IIIa	S. Subspec. IIIb	S. Subspec. IV	S. Typhimurium	S. Paratyphi B dT+	S. Virchow	S. 4,12:d:-	S. 4,[5],12:i:-
Susceptible	63,5	49,1	84,1	30,4	69,7	66,8	19,4	65,6	67,4	5,7	54,4	80,4	92,7	77,6	80,0	33,7	3,4	79,4	56,8	9,8
Resistant	36,5	50,9	15,9	69,6	30,3	33,2	80,6	34,4	32,6	94,3	45,6	19,6	7,3	22,4	20,0	66,3	96,6	20,6	43,2	90,2
Multiresistant (3)	26,4	26,9	3,2	58,3	20,0	22,2	59,4	21,1	21,7	91,6	35,8	2,1	0,6	2,5	2,8	57,0	80,2	9,3	4,6	80,7
Gentamicin	5,7	1,5	1,0	15,7	0,0	0,0	0,0	2,0	0,0	77,5	3,7	0,0	0,0	0,3	0,3	2,8	0,4	0,0	0,2	1,4
Neomycin (1)	5,7	5,4	0,4	13,4	1,3	0,5	0,0	12,5	0,0	7,4	5,2	0,0	0,0	0,2	0,0	4,6	2,8	1,0	0,2	5,0
Kanamycin	6,4	4,4	0,5	16,7	1,1	0,5	0,0	11,3	0,0	79,0	8,9	0,0	0,0	0,3	0,3	5,5	3,0	1,0	0,4	4,8
Spectinomycin (1)	13,7	16,9	1,7	40,8	13,5	16,5	3,8	18,1	3,4	80,3	23,0	0,0	0,0	0,4	0,3	43,0	95,2	2,1	2,1	10,4
Streptomycin	15,2	20,4	1,3	25,5	12,4	4,8	0,6	10,9	16,3	60,7	25,1	2,1	0,0	5,6	10,1	53,6	16,0	1,0	0,7	77,6
Chloramphenicol	4,7	3,0	0,3	20,6	0,5	1,4	0,0	5,5	0,0	10,8	12,5	0,0	0,0	0,2	0,0	36,8	1,5	2,6	0,5	5,6
Florfenicol	2,0	1,5	0,2	5,9	0,0	1,0	0,0	0,4	0,0	3,3	8,0	0,0	0,0	0,2	0,0	34,3	0,0	0,5	0,0	2,9
Cefotaxime (2)	3,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,2	13,3	0,0	0,0	0,0
Ceftazidime (2)	3,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	13,3	0,0	0,0	0,0
Ceftiofur (1)	0,8	0,7	0,7	0,5	0,0	0,3	3,2	1,4	0,0	24,1	0,7	0,0	0,0	0,2	0,0	0,9	1,2	1,6	0,0	0,6
Nalidixic acid	3,7	1,2	5,6	1,0	2,2	17,2	55,2	2,0	0,0	78,4	7,0	1,6	0,0	2,5	0,6	3,3	57,8	12,4	0,0	2,1
Ciprofloxacin	4,4	1,2	5,7	3,4	2,7	17,9	52,7	1,6	0,5	78,1	8,9	2,1	0,6	2,0	1,7	3,7	59,3	12,4	0,5	3,7
Amoxicillin/Clavulanic acid (1)	14,8	10,8	1,6	37,3	10,3	8,6	56,4	8,8	10,3	84,6	27,5	1,2	0,0	0,4	0,3	51,2	21,8	6,3	2,7	63,6
Ampicillin	18,6	11,8	1,7	39,2	18,9	9,3	58,2	8,2	14,7	91,3	28,7	1,1	0,0	0,3	0,6	52,7	25,1	8,2	2,5	78,4
Sulfamethoxazole	33,1	30,5	9,0	52,5	24,9	25,3	9,1	32,0	25,0	90,4	36,7	16,4	7,3	14,0	10,1	62,6	54,8	9,8	41,8	79,9
Trimethoprim	27,3	33,3	0,0	0,0	0,0	18,9	0,0	2,5	44,4	5,9	10,3	0,0	0,0	0,0	0,0	14,9	86,7	0,0	0,0	8,3
Tetracycline	14,9	30,5	1,1	36,8	19,5	16,0	55,8	18,8	20,1	22,8	28,4	0,0	0,0	2,4	1,1	53,5	10,3	4,1	1,3	84,9
Number of isolates	**296**	**338**	**1664**	**204**	**185**	**419**	**165**	**256**	**184**	**333**	**327**	**189**	**179**	**594**	**355**	**7712**	**263**	**194**	**560**	**518**

(1) Antimicrobials were tested from 2000 to 2007; (2) antimicrobials were tested/evaluated since 2007; (3) resistance to more than one class of antimicrobials.

Tab. 13.11: Resistance rates of the twenty most frequent serovars from foodstuffs (2000–2008)

	S. Agona	S. Anatum	S. Brandenburg	S. Bovismorbificans	S. Derby	S. Enteritidis	S. Hadar	S. Heidelberg	S. Indiana	S. Infantis	S. Livingstone	S. London	S. Mbandaka	S. Saintpaul	S. Subspec. I, rough	S. Typhimurium	S. Paratyphi B dT+	S. Virchow	S. 4,12:d:-	S. 4,[5],12:i:-
Susceptible	74,8	65,9	56,3	54,8	66,4	84,6	12,7	31,3	35,0	62,2	75,3	55,2	84,4	11,7	39,6	24,0	0,6	43,3	73,8	6,9
Resistant	25,2	34,1	43,8	45,2	33,6	15,4	87,3	68,7	65,0	37,8	24,7	44,8	15,6	88,3	60,4	76,0	99,4	56,7	26,2	93,1
Multiresistant (3)	19,8	21,7	14,3	20,0	19,9	3,1	82,5	52,5	60,7	23,2	12,9	28,4	4,2	78,2	48,9	63,5	91,7	21,1	6,0	79,8
Gentamicin	4,6	1,6	0,0	0,0	0,2	0,7	0,5	4,0	1,2	0,7	1,1	0,0	0,0	54,8	3,7	1,3	1,7	1,1	0,0	1,9
Neomycin (1)	2,9	1,7	3,0	2,8	0,8	0,1	1,7	7,1	0,7	0,5	2,7	0,0	0,0	5,2	3,2	5,6	2,0	5,7	2,1	1,3
Kanamycin	3,8	1,6	2,7	2,6	0,7	0,2	2,1	7,1	1,2	0,5	3,2	0,0	0,0	52,3	6,2	5,8	2,9	4,4	2,0	1,4
Spectinomycin (1)	11,8	14,2	8,0	7,0	13,7	1,2	5,2	30,3	17,1	16,9	8,0	23,1	8,6	67,5	28,9	40,9	98,7	8,0	1,4	12,9
Streptomycin	8,4	9,3	10,7	7,1	10,1	1,5	64,6	27,3	6,1	7,9	6,5	7,8	4,2	47,3	39,3	54,7	27,9	4,4	1,3	75,8
Chloramphenicol	1,5	2,3	4,5	3,9	4,6	0,5	1,6	24,2	0,0	1,2	4,3	0,0	0,0	13,8	17,0	32,3	2,3	2,2	1,3	8,1
Florfenicol	0,8	0,8	1,8	0,6	2,5	0,4	0,5	3,0	0,0	0,0	2,2	0,0	0,0	5,4	13,6	29,5	0,4	0,0	0,0	3,8
Cefotaxime (2)	0,0	0,0	0,0	0,0	0,0	0,0	0,0	-	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	15,4	0,0	0,0	0,0
Ceftazidime (2)	0,0	0,0	0,0	0,0	0,0	0,0	0,0	-	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	15,4	0,0	0,0	0,0
Ceftiofur (1)	0,0	0,8	0,0	0,0	0,0	0,3	0,0	0,0	0,0	0,3	0,0	1,9	0,0	19,1	2,8	0,7	6,2	1,1	0,0	0,9
Nalidixic acid	6,9	2,3	0,0	1,9	0,7	4,6	57,1	23,2	0,0	16,7	1,1	0,9	2,1	69,0	6,5	4,6	55,9	52,2	2,0	1,9
Ciprofloxacin	9,2	3,1	0,0	1,9	0,7	4,9	58,7	23,2	0,0	16,5	2,2	1,7	2,1	72,4	6,8	4,8	57,8	52,2	2,7	2,6
Amoxicillin/Clavulanic acid (1)	7,8	13,3	7,0	12,0	5,6	2,0	30,1	39,4	14,3	4,9	8,0	5,6	3,7	63,9	40,1	52,8	47,1	11,5	4,3	58,4
Ampicillin	6,1	19,4	6,3	17,4	5,7	2,1	30,7	41,4	18,4	6,2	7,5	7,8	3,1	66,9	42,1	56,3	47,6	13,3	4,0	75,3
Sulfamethoxazole	19,8	24,8	33,9	44,5	21,3	10,0	12,7	40,4	63,2	31,6	24,7	44,8	9,4	74,5	52,9	67,9	67,2	17,8	20,1	81,2
Trimethoprim	0,0	0,0	8,3	69,2	7,1	0,0	0,0	-	13,0	14,8	5,6	12,5	0,0	15,6	2,6	16,3	100,0	0,0	0,0	3,8
Tetracycline	13,0	14,0	13,4	14,2	22,2	1,6	84,7	39,4	58,9	19,4	9,7	25,9	3,1	32,6	41,2	62,6	17,7	2,2	2,7	85,7
Number of isolates	**131**	**129**	**112**	**155**	**437**	**1927**	**189**	**99**	**163**	**418**	**93**	**116**	**96**	**239**	**323**	**3459**	**519**	**90**	**149**	**421**

(1) Antimicrobials were tested from 2000 to 2007; (2) antimicrobials were tested/evaluated since 2007; (3) resistance to more than one class of antimicrobials.

13.1.3 Distribution of MIC values in *Salmonella* isolates

13.1.3.1 Isolates from all origins

Tab. 13.12: *Salmonella* spp. from all origins (2000–2008)

Antimicrobial tested	Tested isolates (Number)	Microbiologically resistent isolates (Number) (4)	Microbiological resistent isolates (in %) (4)	Distribution (%) of MICs (µg/ml) (5)																
				0,008	0,015	0,03125	0,0625	0,125	0,25	0,5	1	2	4	8	16	32	64	128	256	512
Gentamicin	33625	919	2,7								96,1	1,2	0,2	1,2	0,8	0,3	0,2			
Neomycin (1)	30097	983	3,3									95,6	1,2	0,1	0,2	1,0	1,9			
Kanamycin	33625	1607	4,8										93,2	2,1	0,3	1,1	0,5	3,0		
Spectinomycin (1)	30097	6949	23,1									0,0	0,0	0,3	20,0	49,0	7,6	3,5	19,6	
Streptomycin	33625	9172	27,3										21,8	27,4	15,5	8,0	12,4	15,0		
Chloramphenicol	33625	4773	14,2									5,0	27,8	46,9	6,1	0,3	1,5	12,4		
Florfenicol	33625	4113	12,2									10,1	49,8	24,8	3,1	4,6	6,0	1,6		
Cefotaxime (2)	3529	17	0,5				47,7	43,4	7,7	0,7	0,0	0,0	0,0	0,5						
Ceftazidime (2)	3529	15	0,4						67,6	29,6	2,3	0,1	0,2	0,0	0,1	0,1				
Ceftiofur (1)	30097	317	1,1							56,1	38,3	4,6	0,6	0,2	0,2					
Nalidixic acid	33625	2428	7,2										82,3	9,7	0,8	0,2	0,1	7,0		
Ciprofloxacin	33624	2574	7,7			88,7	3,6	0,9	2,6	2,3	1,5	0,3	0,0	0,0						
Amoxicillin/Clavulanic acid (1)	30097	7953	26,4									71,2	2,4	9,5	14,3	2,5	0,2			
Ampicillin	33625	9474	28,2								55,3	14,7	1,4	0,1	0,0	2,7	25,4			
Colistin (3)	33625													99,4	0,5	0,0				
Sulfamethoxazole	33625	13640	40,6													24,0	25,6	8,7	1,2	3,6
Trimethoprim (3)	33625												89,1	0,9	0,1	0,8	9,1			
Tetracycline	33625	10029	29,8									64,1	5,5	0,7	0,6	8,7	20,5			

(1) Neomycin, spectinomycin, ceftiofur, amoxicillin/clavulanic acid were tested in the years 2000 to 2007 only.

(2) Cefotaxime and ceftazidime were tested in 2008 only.

(3) For colistin and trimethoprim no evaluation was performed as the lowest tested concentration was above the epidemiological cut-off value.

(4) The vertical lines demark the epidemiological cut-off values, which are the basis for the evaluation of microbiological resistance.

(5) The white areas demark the range tested. Isolates resistant to the highest concentration are given in the next concentration level.
Values for the lowest concentration include isolates with MICs below the tested range.

13.1.3.2 Isolates from the environment

Tab. 13.13: *Salmonella* spp. from the environment (2000–2008)

Antimicrobial tested	Tested isolates (Number)	Microbiologically resistent isolates (Number) (4)	Microbiological resistent isolates (in %) (4)	Distribution (%) of MICs (µg/ml) (5) 0,008	0,015	0,03125	0,0625	0,125	0,25	0,5	1	2	4	8	16	32	64	128	256	512	1024
Gentamicin	2427	35	1,4								97,3	1,3	0,1	0,5	0,6	0,2	0,0				
Neomycin (1)	2239	60	2,7									96,0	1,3	0,2	0,5	1,0	1,0				
Kanamycin	2427	92	3,8										94,2	2,0	0,5	0,3	0,5	2,5			
Spectinomycin (1)	2239	297	13,3									0,0	0,0	0,0	19,7	58,1	8,9	1,8	11,4		
Streptomycin	2427	435	17,9										27,3	37,0	14,1	3,7	6,6	11,4			
Chloramphenicol	2427	181	7,5									1,6	23,7	60,1	7,2	0,2	0,7	6,6			
Florfenicol	2427	154	6,3									3,4	56,0	32,1	2,2	2,6	3,1	0,7			
Cefotaxime (2)	188	0	0,0				37,8	55,9	5,3	1,1	0,0	0,0	0,0	0,0							
Ceftazidime (2)	188	0	0,0						60,6	38,8	0,5	0,0	0,0	0,0	0,0	0,0					
Ceftiofur (1)	2239	5	0,2							53,5	42,8	3,5	0,1	0,0	0,1						
Nalidixic acid	2427	117	4,8										85,5	9,0	0,7	0,2	0,0	4,6			
Ciprofloxacin	2427	124	5,1			92,1	2,8	0,5	1,7	1,9	0,7	0,3	0,0	0,0							
Amoxicillin/Clavulanic acid (1)	2239	403	18,0									80,2	1,8	8,4	8,6	0,9	0,1				
Ampicillin	2427	472	19,4								62,8	16,4	1,4	0,0	0,0	1,6	17,8				
Colistin (3)	2427													99,4	0,6	0,0					
Sulfamethoxazole	2427	795	32,8													19,4	35,6	10,6	1,5	2,3	30,4
Trimethoprim (3)	2427												91,5	0,6	0,1	0,7	7,0				
Tetracycline	2427	513	21,1									73,4	5,0	0,5	0,5	6,0	14,7				

(1) Neomycin, spectinomycin, ceftiofur, amoxicillin/clavulanic acid were tested in the years 2000 to 2007 only.

(2) Cefotaxime and ceftazidime were tested in 2008 only.

(3) For colistin and trimethoprim no evaluation was performed as the lowest tested concentration was above the epidemiological cut-off value.

(4) The vertical lines demark the epidemiological cut-off values, which are the basis for the evaluation of microbiological resistance.

(5) The white areas demark the range tested. Isolates resistant to the highest concentration are given in the next concentration level. Values for the lowest concentration include isolates with MICs below the tested range.

Tab. 13.14: *S.* 4,[5],12:i:- from the environment (2000–2008)

Antimicrobial tested	Tested isolates (Number)	Microbiologically resistent isolates (Number) (4)	Microbiological resistent isolates (in %) (4)	Distribution (%) of MICs (µg/ml) (5)																	
				0,008	0,015	0,03125	0,0625	0,125	0,25	0,5	1	2	4	8	16	32	64	128	256	512	1024
Gentamicin	56	2	3,6								96,5	0,0	0,0	0,0	1,8	1,8	0,0				
Neomycin (1)	46	0	0,0									100,0	0,0	0,0	0,0	0,0	0,0				
Kanamycin	56	2	3,6										96,4	0,0	0,0	0,0	1,8	1,8			
Spectinomycin (1)	46	3	6,5									0,0	0,0	0,0	2,2	58,7	32,6	0,0	6,5		
Streptomycin	56	51	91,1										3,6	3,6	1,8	0,0	3,6	87,5			
Chloramphenicol	56	0	0,0									0,0	8,9	91,1	0,0	0,0	0,0	0,0			
Florfenicol	56	0	0,0									3,6	55,4	41,1	0,0	0,0	0,0	0,0			
Cefotaxime (2)	10	0	0,0				70,0	30,0	0,0	0,0	0,0	0,0	0,0	0,0							
Ceftazidime (2)	10	0	0,0						100,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0					
Ceftiofur (1)	46	0	0,0							39,1	56,5	4,3	0,0	0,0	0,0						
Nalidixic acid	56	2	3,6										89,3	7,1	0,0	0,0	0,0	3,6			
Ciprofloxacin	56	2	3,6			94,7	1,8	0,0	3,6	0,0	0,0	0,0	0,0	0,0							
Amoxicillin/Clavulanic acid (1)	46	38	82,6									10,9	6,5	78,3	2,2	2,2	0,0				
Ampicillin	56	51	91,1								5,4	3,6	0,0	0,0	0,0	3,6	87,5				
Colistin (3)	56													100,0	0,0	0,0					
Sulfamethoxazole	56	52	92,9													0,0	7,1	0,0	0,0	3,6	89,3
Trimethoprim (3)	56												94,7	0,0	0,0	0,0	5,4				
Tetracycline	56	50	89,3									8,9	1,8	0,0	0,0	3,6	85,7				

(1) Neomycin, spectinomycin, ceftiofur, amoxicillin/clavulanic acid were tested in the years 2000 to 2007 only.

(2) Cefotaxime and ceftazidime were tested in 2008 only.

(3) For colistin and trimethoprim no evaluation was performed as the lowest tested concentration was above the epidemiological cut-off value.

(4) The vertical lines demark the epidemiological cut-off values, which are the basis for the evaluation of microbiological resistance.

(5) The white areas demark the range tested. Isolates resistant to the highest concentration are given in the next concentration level. Values for the lowest concentration include isolates with MICs below the tested range.

Tab. 13.15: *S.* 4,12:d:- from the environment (2000–2008)

Antimicrobial tested	Tested isolates (Number)	Microbiologically resistent isolates (Number) (4)	Microbiological resistent isolates (in %) (4)	Distribution (%) of MICs (µg/ml) (5)																	
				0,008	0,015	0,03125	0,0625	0,125	0,25	0,5	1	2	4	8	16	32	64	128	256	512	1024
Gentamicin	77	0	0,0								98,7	1,3	0,0	0,0	0,0	0,0	0,0				
Neomycin (1)	76	0	0,0									98,7	1,3	0,0	0,0	0,0	0,0				
Kanamycin	77	0	0,0										98,7	1,3	0,0	0,0	0,0	0,0			
Spectinomycin (1)	76	0	0,0									0,0	0,0	0,0	34,2	63,2	2,6	0,0	0,0		
Streptomycin	77	0	0,0										36,4	51,9	11,7	0,0	0,0	0,0			
Chloramphenicol	77	1	1,3									0,0	18,2	75,3	5,2	0,0	0,0	1,3			
Florfenicol	77	0	0,0									0,0	45,5	53,2	1,3	0,0	0,0	0,0			
Cefotaxime (2)	1	0	0,0				0,0	100,0	0,0	0,0	0,0	0,0	0,0	0,0							
Ceftazidime (2)	1	0	0,0						0,0	100,0	0,0	0,0	0,0	0,0	0,0	0,0					
Ceftiofur (1)	76	0	0,0							56,6	42,1	1,3	0,0	0,0	0,0						
Nalidixic acid	77	0	0,0										93,5	6,5	0,0	0,0	0,0	0,0			
Ciprofloxacin	77	0	0,0			98,7	1,3	0,0	0,0	0,0	0,0	0,0	0,0	0,0							
Amoxicillin/Clavulanic acid (1)	76	2	2,6									96,1	1,3	1,3	1,3	0,0	0,0				
Ampicillin	77	3	3,9								84,4	10,4	1,3	0,0	0,0	0,0	3,9				
Colistin (3)	77													100,0	0,0	0,0					
Sulfamethoxazole	77	16	20,8													32,5	29,9	14,3	2,6	0,0	20,8
Trimethoprim (3)	77												98,7	0,0	0,0	0,0	1,3				
Tetracycline	77	2	2,6									93,5	3,9	0,0	0,0	0,0	2,6				

(1) Neomycin, spectinomycin, ceftiofur, amoxicillin/clavulanic acid were tested in the years 2000 to 2007 only.

(2) Cefotaxime and ceftazidime were tested in 2008 only.

(3) For colistin and trimethoprim no evaluation was performed as the lowest tested concentration was above the epidemiological cut-off value.

(4) The vertical lines demark the epidemiological cut-off values, which are the basis for the evaluation of microbiological resistance.

(5) The white areas demark the range tested. Isolates resistant to the highest concentration are given in the next concentration level. Values for the lowest concentration include isolates with MICs below the tested range.

Tab. 13.16: *S.* Agona from the environment (2000–2008)

Antimicrobial tested	Tested isolates (Number)	Microbiologically resistent isolates (Number) (4)	Microbiological resistent isolates (in %) (4)	Distribution (%) of MICs (µg/ml) (5) 0,008	0,015	0,03125	0,0625	0,125	0,25	0,5	1	2	4	8	16	32	64	128	256	512	1024
Gentamicin	28	0	0,0								96,4	3,6	0,0	0,0	0,0	0,0	0,0				
Neomycin (1)	25	0	0,0									100,0	0,0	0,0	0,0	0,0	0,0				
Kanamycin	28	0	0,0										100,0	0,0	0,0	0,0	0,0	0,0			
Spectinomycin (1)	25	0	0,0									0,0	0,0	0,0	4,0	92,0	4,0	0,0	0,0		
Streptomycin	28	0	0,0										17,9	57,1	21,4	3,6	0,0	0,0			
Chloramphenicol	28	0	0,0									0,0	14,3	78,6	7,1	0,0	0,0	0,0			
Florfenicol	28	0	0,0									0,0	53,6	46,4	0,0	0,0	0,0	0,0			
Cefotaxime (2)	3	0	0,0				0,0	100,0	0,0	0,0	0,0	0,0	0,0	0,0							
Ceftazidime (2)	3	0	0,0						0,0	100,0	0,0	0,0	0,0	0,0	0,0	0,0					
Ceftiofur (1)	25	0	0,0							52,0	48,0	0,0	0,0	0,0	0,0						
Nalidixic acid	28	0	0,0										82,1	17,9	0,0	0,0	0,0	0,0			
Ciprofloxacin	28	0	0,0			100,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0							
Amoxicillin/Clavulanic acid (1)	25	1	4,0									96,0	0,0	4,0	0,0	0,0	0,0				
Ampicillin	28	1	3,6								75,0	14,3	7,1	0,0	0,0	0,0	3,6				
Colistin (3)	28													100,0	0,0	0,0					
Sulfamethoxazole	28	4	14,3													21,4	50,0	10,7	3,6	0,0	14,3
Trimethoprim (3)	28												0,0	0,0	0,0	21,4	78,6				
Tetracycline	28	1	3,6									89,3	7,1	0,0	0,0	0,0	3,6				

(1) Neomycin, spectinomycin, ceftiofur, amoxicillin/clavulanic acid were tested in the years 2000 to 2007 only.

(2) Cefotaxime and ceftazidime were tested in 2008 only.

(3) For colistin and trimethoprim no evaluation was performed as the lowest tested concentration was above the epidemiological cut-off value.

(4) The vertical lines demark the epidemiological cut-off values, which are the basis for the evaluation of microbiological resistance.

(5) The white areas demark the range tested. Isolates resistant to the highest concentration are given in the next concentration level.
Values for the lowest concentration include isolates with MICs below the tested range.

Tab. 13.17: *S.* Anatum from the environment (2000–2008)

Antimicrobial tested	Tested isolates (Number)	Microbiologically resistent isolates (Number) (4)	Microbiological resistent isolates (in %) (4)	Distribution (%) of MICs (µg/ml) (5) 0,008	0,015	0,03125	0,0625	0,125	0,25	0,5	1	2	4	8	16	32	64	128	256	512	1024
Gentamicin	71	2	2,8								97,2	0,0	0,0	0,0	2,8	0,0	0,0				
Neomycin (1)	70	2	2,9									95,7	1,4	0,0	0,0	1,4	1,4				
Kanamycin	71	2	2,8										94,4	2,8	0,0	0,0	1,4	1,4			
Spectinomycin (1)	70	7	10,0									0,0	0,0	0,0	0,0	72,9	17,1	4,3	5,7		
Streptomycin	71	5	7,0										1,4	62,0	26,8	2,8	2,8	4,2			
Chloramphenicol	71	2	2,8									1,4	23,9	67,6	4,2	0,0	1,4	1,4			
Florfenicol	71	0	0,0									2,8	73,2	22,5	1,4	0,0	0,0	0,0			
Cefotaxime (2)	1	0	0,0				0,0	100,0	0,0	0,0	0,0	0,0	0,0	0,0							
Ceftazidime (2)	1	0	0,0						0,0	100,0	0,0	0,0	0,0	0,0	0,0	0,0					
Ceftiofur (1)	70	0	0,0							57,1	42,9	0,0	0,0	0,0	0,0						
Nalidixic acid	71	2	2,8										87,3	8,5	1,4	0,0	0,0	2,8			
Ciprofloxacin	71	2	2,8			94,4	2,8	2,8	0,0	0,0	0,0	0,0	0,0	0,0							
Amoxicillin/Clavulanic acid (1)	70	8	11,4									85,7	2,9	11,4	0,0	0,0	0,0				
Ampicillin	71	9	12,7								74,6	12,7	0,0	0,0	0,0	1,4	11,3				
Colistin (3)	71													98,6	1,4	0,0					
Sulfamethoxazole	71	9	12,7													16,9	45,1	22,5	2,8	2,8	9,9
Trimethoprim (3)	71												0,0	0,0	0,0	16,9	83,1				
Tetracycline	71	4	5,6									91,5	2,8	0,0	0,0	1,4	4,2				

(1) Neomycin, spectinomycin, ceftiofur, amoxicillin/clavulanic acid were tested in the years 2000 to 2007 only.

(2) Cefotaxime and ceftazidime were tested in 2008 only.

(3) For colistin and trimethoprim no evaluation was performed as the lowest tested concentration was above the epidemiological cut-off value.

(4) The vertical lines demark the epidemiological cut-off values, which are the basis for the evaluation of microbiological resistance.

(5) The white areas demark the range tested. Isolates resistant to the highest concentration are given in the next concentration level.
Values for the lowest concentration include isolates with MICs below the tested range.

Tab. 13.18: *S.* Derby from the environment (2000–2008)

Antimicrobial tested	Tested isolates (Number)	Microbiologically resistent isolates (Number) (4)	Microbiological resistent isolates (in %) (4)	Distribution (%) of MICs (µg/ml) (5) 0,008	0,015	0,03125	0,0625	0,125	0,25	0,5	1	2	4	8	16	32	64	128	256	512	1024
Gentamicin	52	0	0,0								96,2	3,8	0,0	0,0	0,0	0,0	0,0				
Neomycin (1)	48	3	6,3									89,6	4,2	0,0	0,0	0,0	6,3				
Kanamycin	52	3	5,8										86,5	7,7	0,0	0,0	0,0	5,8			
Spectinomycin (1)	48	6	12,5									0,0	0,0	0,0	2,1	81,3	4,2	2,1	10,4		
Streptomycin	52	10	19,2										1,9	53,8	23,1	1,9	7,7	11,5			
Chloramphenicol	52	0	0,0									0,0	3,8	71,2	25,0	0,0	0,0	0,0			
Florfenicol	52	0	0,0									0,0	9,6	84,6	5,8	0,0	0,0	0,0			
Cefotaxime (2)	4	0	0,0				25,0	75,0	0,0	0,0	0,0	0,0	0,0	0,0							
Ceftazidime (2)	4	0	0,0						25,0	75,0	0,0	0,0	0,0	0,0	0,0	0,0					
Ceftiofur (1)	48	0	0,0							25,0	72,9	2,1	0,0	0,0	0,0						
Nalidixic acid	52	0	0,0										96,2	1,9	1,9	0,0	0,0	0,0			
Ciprofloxacin	52	0	0,0			92,3	7,7	0,0	0,0	0,0	0,0	0,0	0,0	0,0							
Amoxicillin/Clavulanic acid (1)	48	3	6,3									93,8	0,0	4,2	2,1	0,0	0,0				
Ampicillin	52	3	5,8								69,2	25,0	0,0	0,0	0,0	0,0	5,8				
Colistin (3)	52													100,0	0,0	0,0					
Sulfamethoxazole	52	16	30,8													15,4	50,0	1,9	1,9	0,0	30,8
Trimethoprim (3)	52												0,0	0,0	0,0	15,4	84,6				
Tetracycline	52	6	11,5									78,8	3,8	5,8	0,0	0,0	11,5				

(1) Neomycin, spectinomycin, ceftiofur, amoxicillin/clavulanic acid were tested in the years 2000 to 2007 only.

(2) Cefotaxime and ceftazidime were tested in 2008 only.

(3) For colistin and trimethoprim no evaluation was performed as the lowest tested concentration was above the epidemiological cut-off value.

(4) The vertical lines demark the epidemiological cut-off values, which are the basis for the evaluation of microbiological resistance.

(5) The white areas demark the range tested. Isolates resistant to the highest concentration are given in the next concentration level.
Values for the lowest concentration include isolates with MICs below the tested range.

Tab. 13.19: *S.* Enteritidis from the environment (2000–2008)

Antimicrobial tested	Tested isolates (Number)	Microbiologically resistent isolates (Number) (4)	Microbiological resistent isolates (in %) (4)	Distribution (%) of MICs (µg/ml) (5) 0,008	0,015	0,03125	0,0625	0,125	0,25	0,5	1	2	4	8	16	32	64	128	256	512	1024
Gentamicin	302	1	0,3								99,0	0,7	0,0	0,0	0,0	0,0	0,3				
Neomycin (1)	268	1	0,4									97,8	1,9	0,4	0,0	0,0	0,0				
Kanamycin	302	2	0,7										97,0	2,3	0,3	0,0	0,0	0,3			
Spectinomycin (1)	268	3	1,1									0,0	0,0	0,0	77,6	20,9	0,4	0,7	0,4		
Streptomycin	302	5	1,7										95,4	2,6	0,3	0,0	0,3	1,3			
Chloramphenicol	302	1	0,3									2,6	33,4	60,6	3,0	0,0	0,3	0,0			
Florfenicol	302	0	0,0									4,0	73,2	22,8	0,0	0,0	0,0	0,0			
Cefotaxime (2)	34	0	0,0				41,2	55,9	2,9	0,0	0,0	0,0	0,0	0,0							
Ceftazidime (2)	34	0	0,0						94,1	5,9	0,0	0,0	0,0	0,0	0,0	0,0					
Ceftiofur (1)	268	3	1,1							38,4	57,5	3,0	0,4	0,0	0,7						
Nalidixic acid	302	10	3,3										84,8	11,9	0,0	0,0	0,0	3,3			
Ciprofloxacin	302	11	3,6			93,1	3,3	0,3	1,7	1,3	0,0	0,0	0,0	0,3							
Amoxicillin/Clavulanic acid (1)	268	5	1,9									97,4	0,7	1,1	0,7	0,0	0,0				
Ampicillin	302	7	2,3								66,9	28,8	2,0	0,0	0,0	0,7	1,7				
Colistin (3)	302													99,3	0,3	0,0					
Sulfamethoxazole	302	43	14,2													16,6	54,3	12,9	2,0	0,7	13,6
Trimethoprim (3)	302												0,0	0,0	0,0	16,6	83,5				
Tetracycline	302	3	1,0									92,0	6,6	0,3	0,0	0,7	0,3				

(1) Neomycin, spectinomycin, ceftiofur, amoxicillin/clavulanic acid were tested in the years 2000 to 2007 only.
(2) Cefotaxime and ceftazidime were tested in 2008 only.
(3) For colistin and trimethoprim no evaluation was performed as the lowest tested concentration was above the epidemiological cut-off value.
(4) The vertical lines demark the epidemiological cut-off values, which are the basis for the evaluation of microbiological resistance.
(5) The white areas demark the range tested. Isolates resistant to the highest concentration are given in the next concentration level.
Values for the lowest concentration include isolates with MICs below the tested range.

Tab. 13.20: *S.* Infantis from the environment (2000–2008)

Antimicrobial tested	Tested isolates (Number)	Microbiologically resistent isolates (Number) (4)	Microbiological resistent isolates (in %) (4)	Distribution (%) of MICs (µg/ml) (5)																	
				0,008	0,015	0,03125	0,0625	0,125	0,25	0,5	1	2	4	8	16	32	64	128	256	512	1024
Gentamicin	126	0	0,0								99,3	0,8	0,0	0,0	0,0	0,0	0,0				
Neomycin (1)	119	0	0,0									99,2	0,8	0,0	0,0	0,0	0,0				
Kanamycin	126	2	1,6										97,6	0,8	0,8	0,0	0,0	0,8			
Spectinomycin (1)	119	2	1,7									0,0	0,0	0,0	3,4	86,6	8,4	0,8	0,8		
Streptomycin	126	5	4,0										8,7	58,7	24,6	4,0	2,4	1,6			
Chloramphenicol	126	1	0,8									0,8	23,8	62,7	11,9	0,0	0,0	0,8			
Florfenicol	126	0	0,0									0,8	61,1	37,3	0,8	0,0	0,0	0,0			
Cefotaxime (2)	7	0	0,0				28,6	71,4	0,0	0,0	0,0	0,0	0,0	0,0							
Ceftazidime (2)	7	0	0,0						28,6	71,4	0,0	0,0	0,0	0,0	0,0	0,0					
Ceftiofur (1)	119	0	0,0							52,9	46,2	0,8	0,0	0,0	0,0						
Nalidixic acid	126	2	1,6										94,4	4,0	0,0	0,0	0,0	1,6			
Ciprofloxacin	126	2	1,6			96,8	1,6	0,0	0,8	0,8	0,0	0,0	0,0	0,0							
Amoxicillin/Clavulanic acid (1)	119	13	10,9									86,6	2,5	10,9	0,0	0,0	0,0				
Ampicillin	126	15	11,9								76,2	10,3	1,6	0,0	0,0	0,0	11,9				
Colistin (3)	126													99,2	0,8	0,0					
Sulfamethoxazole	126	30	23,8													19,8	50,0	6,3	0,0	1,6	22,2
Trimethoprim (3)	126												0,0	0,0	0,0	19,8	80,1				
Tetracycline	126	6	4,8									87,3	5,6	2,4	0,0	0,8	4,0				

(1) Neomycin, spectinomycin, ceftiofur, amoxicillin/clavulanic acid were tested in the years 2000 to 2007 only.

(2) Cefotaxime and ceftazidime were tested in 2008 only.

(3) For colistin and trimethoprim no evaluation was performed as the lowest tested concentration was above the epidemiological cut-off value.

(4) The vertical lines demark the epidemiological cut-off values, which are the basis for the evaluation of microbiological resistance.

(5) The white areas demark the range tested. Isolates resistant to the highest concentration are given in the next concentration level. Values for the lowest concentration include isolates with MICs below the tested range.

Tab. 13.21: *S.* Kottbus from the environment (2000–2008)

Antimicrobial tested	Tested isolates (Number)	Microbiologically resistent isolates (Number) (4)	Microbiological resistent isolates (in %) (4)	Distribution (%) of MICs (µg/ml) (5)																	
				0,008	0,015	0,03125	0,0625	0,125	0,25	0,5	1	2	4	8	16	32	64	128	256	512	1024
Gentamicin	20	0	0,0								100,0	0,0	0,0	0,0	0,0	0,0	0,0				
Neomycin (1)	17	0	0,0									100,0	0,0	0,0	0,0	0,0	0,0				
Kanamycin	20	0	0,0										100,0	0,0	0,0	0,0	0,0	0,0			
Spectinomycin (1)	17	0	0,0									0,0	0,0	0,0	11,8	76,5	11,8	0,0	0,0		
Streptomycin	20	0	0,0										30,0	65,0	5,0	0,0	0,0	0,0			
Chloramphenicol	20	0	0,0									0,0	80,0	20,0	0,0	0,0	0,0	0,0			
Florfenicol	20	0	0,0									20,0	80,0	0,0	0,0	0,0	0,0	0,0			
Cefotaxime (2)	3	0	0,0				66,7	33,3	0,0	0,0	0,0	0,0	0,0	0,0							
Ceftazidime (2)	3	0	0,0						100,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0					
Ceftiofur (1)	17	0	0,0							70,6	29,4	0,0	0,0	0,0	0,0						
Nalidixic acid	20	2	10,0										70,0	20,0	0,0	0,0	0,0	10,0			
Ciprofloxacin	20	1	5,0			90,0	5,0	5,0	0,0	0,0	0,0	0,0	0,0	0,0							
Amoxicillin/Clavulanic acid (1)	17	2	11,8									88,2	0,0	5,9	5,9	0,0	0,0				
Ampicillin	20	2	10,0								65,0	25,0	0,0	0,0	0,0	0,0	10,0				
Colistin (3)	20													95,0	5,0	0,0					
Sulfamethoxazole	20	1	5,0													50,0	35,0	10,0	0,0	0,0	5,0
Trimethoprim (3)	20												95,0	0,0	0,0	0,0	5,0				
Tetracycline	20	2	10,0									90,0	0,0	0,0	0,0	0,0	10,0				

(1) Neomycin, spectinomycin, ceftiofur, amoxicillin/clavulanic acid were tested in the years 2000 to 2007 only.
(2) Cefotaxime and ceftazidime were tested in 2008 only.
(3) For colistin and trimethoprim no evaluation was performed as the lowest tested concentration was above the epidemiological cut-off value.
(4) The vertical lines demark the epidemiological cut-off values, which are the basis for the evaluation of microbiological resistance.
(5) The white areas demark the range tested. Isolates resistant to the highest concentration are given in the next concentration level.
Values for the lowest concentration include isolates with MICs below the tested range.

Tab. 13.22: *S.* Livingstone from the environment (2000–2008)

Antimicrobial tested	Tested isolates (Number)	Microbiologically resistent isolates (Number) (4)	Microbiological resistent isolates (in %) (4)	Distribution (%) of MICs (µg/ml) (5)																	
				0,008	0,015	0,03125	0,0625	0,125	0,25	0,5	1	2	4	8	16	32	64	128	256	512	1024
Gentamicin	205	0	0,0								98,5	1,5	0,0	0,0	0,0	0,0	0,0				
Neomycin (1)	192	17	8,9									90,1	1,0	2,1	3,6	2,1	1,0				
Kanamycin	205	17	8,3										90,2	1,5	0,0	0,0	2,9	5,4			
Spectinomycin (1)	192	19	9,9									0,0	0,0	0,0	33,9	51,6	4,7	2,6	7,3		
Streptomycin	205	5	2,4										41,0	41,5	13,2	2,0	2,4	0,0			
Chloramphenicol	205	1	0,5									0,5	32,7	63,4	2,9	0,0	0,0	0,5			
Florfenicol	205	0	0,0									0,0	71,2	26,3	2,4	0,0	0,0	0,0			
Cefotaxime (2)	13	0	0,0				53,8	38,5	7,7	0,0	0,0	0,0	0,0	0,0							
Ceftazidime (2)	13	0	0,0						53,8	38,5	7,7	0,0	0,0	0,0	0,0	0,0					
Ceftiofur (1)	192	0	0,0							83,9	16,1	0,0	0,0	0,0	0,0						
Nalidixic acid	205	0	0,0										92,7	7,3	0,0	0,0	0,0	0,0			
Ciprofloxacin	205	0	0,0			98,1	2,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0							
Amoxicillin/Clavulanic acid (1)	192	9	4,7									94,3	1,0	0,5	2,6	1,6	0,0				
Ampicillin	205	10	4,9								74,1	20,0	1,0	0,0	0,0	3,4	1,5				
Colistin (3)	205													98,5	1,5	0,0					
Sulfamethoxazole	205	44	21,5													30,3	45,4	2,0	1,0	5,4	16,1
Trimethoprim (3)	205												0,0	0,0	0,5	29,8	69,9				
Tetracycline	205	24	11,7									81,5	6,3	0,5	0,0	4,4	7,3				

(1) Neomycin, spectinomycin, ceftiofur, amoxicillin/clavulanic acid were tested in the years 2000 to 2007 only.
(2) Cefotaxime and ceftazidime were tested in 2008 only.
(3) For colistin and trimethoprim no evaluation was performed as the lowest tested concentration was above the epidemiological cut-off value.
(4) The vertical lines demark the epidemiological cut-off values, which are the basis for the evaluation of microbiological resistance.
(5) The white areas demark the range tested. Isolates resistant to the highest concentration are given in the next concentration level.
Values for the lowest concentration include isolates with MICs below the tested range.

Tab. 13.23: *S.* London from the environment (2000–2008)

Antimicrobial tested	Tested isolates (Number)	Microbiologically resistent isolates (Number) (4)	Microbiological resistent isolates (in %) (4)	0,008	0,015	0,03125	0,0625	0,125	0,25	0,5	1	2	4	8	16	32	64	128	256	512	1024
				Distribution (%) of MICs (µg/ml) (5)																	
Gentamicin	24	0	0,0								100,0	0,0	0,0	0,0	0,0	0,0	0,0				
Neomycin (1)	24	1	4,2									95,8	0,0	0,0	0,0	4,2	0,0				
Kanamycin	24	1	4,2										95,8	0,0	0,0	0,0	0,0	4,2			
Spectinomycin (1)	24	1	4,2									0,0	0,0	0,0	20,8	75,0	0,0	0,0	4,2		
Streptomycin	24	2	8,3										29,2	45,8	16,7	0,0	0,0	8,3			
Chloramphenicol	24	1	4,2									12,5	58,3	25,0	0,0	0,0	0,0	4,2			
Florfenicol	24	0	0,0									16,7	75,0	8,3	0,0	0,0	0,0	0,0			
Cefotaxime (2)	0	0	0,0				0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0							
Ceftazidime (2)	0	0	0,0						0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0					
Ceftiofur (1)	24	0	0,0							87,5	12,5	0,0	0,0	0,0	0,0						
Nalidixic acid	24	1	4,2										95,8	0,0	0,0	0,0	0,0	4,2			
Ciprofloxacin	24	1	4,2			91,7	4,2	0,0	0,0	4,2	0,0	0,0	0,0	0,0							
Amoxicillin/Clavulanic acid (1)	24	1	4,2									91,7	4,2	0,0	4,2	0,0	0,0				
Ampicillin	24	2	8,3								75,0	16,7	0,0	0,0	0,0	0,0	8,3				
Colistin (3)	24													100,0	0,0	0,0					
Sulfamethoxazole	24	3	12,5													4,2	41,7	41,7	0,0	0,0	12,5
Trimethoprim (3)	24												95,8	0,0	0,0	0,0	4,2				
Tetracycline	24	3	12,5									83,3	4,2	0,0	0,0	0,0	12,5				

(1) Neomycin, spectinomycin, ceftiofur, amoxicillin/clavulanic acid were tested in the years 2000 to 2007 only.

(2) Cefotaxime and ceftazidime were tested in 2008 only.

(3) For colistin and trimethoprim no evaluation was performed as the lowest tested concentration was above the epidemiological cut-off value.

(4) The vertical lines demark the epidemiological cut-off values, which are the basis for the evaluation of microbiological resistance.

(5) The white areas demark the range tested. Isolates resistant to the highest concentration are given in the next concentration level.
Values for the lowest concentration include isolates with MICs below the tested range.

Tab. 13.24: *S.* Mbandaka from the environment (2000–2008)

Antimicrobial tested	Tested isolates (Number)	Microbiologically resistent isolates (Number) (4)	Microbiological resistent isolates (in %) (4)	Distribution (%) of MICs (µg/ml) (5)																	
				0,008	0,015	0,03125	0,0625	0,125	0,25	0,5	1	2	4	8	16	32	64	128	256	512	1024
Gentamicin	71	0	0,0								100,0	0,0	0,0	0,0	0,0	0,0	0,0				
Neomycin (1)	61	0	0,0									98,4	1,6	0,0	0,0	0,0	0,0				
Kanamycin	71	0	0,0										97,2	2,8	0,0	0,0	0,0	0,0			
Spectinomycin (1)	61	0	0,0									0,0	0,0	0,0	0,0	57,4	42,6	0,0	0,0		
Streptomycin	71	1	1,4										12,7	70,4	15,5	0,0	1,4	0,0			
Chloramphenicol	71	0	0,0									0,0	7,0	90,1	2,8	0,0	0,0	0,0			
Florfenicol	71	0	0,0									0,0	59,2	40,8	0,0	0,0	0,0	0,0			
Cefotaxime (2)	10	0	0,0				10,0	80,0	10,0	0,0	0,0	0,0	0,0	0,0							
Ceftazidime (2)	10	0	0,0						0,0	100,0	0,0	0,0	0,0	0,0	0,0	0,0					
Ceftiofur (1)	61	0	0,0							73,8	26,2	0,0	0,0	0,0	0,0						
Nalidixic acid	71	0	0,0										100,0	0,0	0,0	0,0	0,0	0,0			
Ciprofloxacin	71	0	0,0			100,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0							
Amoxicillin/Clavulanic acid (1)	61	1	1,6									98,4	0,0	1,6	0,0	0,0	0,0				
Ampicillin	71	2	2,8								87,3	9,9	0,0	0,0	0,0	0,0	2,8				
Colistin (3)	71													100,0	0,0	0,0					
Sulfamethoxazole	71	3	4,2													7,0	54,9	33,8	0,0	0,0	4,2
Trimethoprim (3)	71												0,0	0,0	0,0	7,0	92,9				
Tetracycline	71	1	1,4									97,2	1,4	0,0	0,0	0,0	1,4				

(1) Neomycin, spectinomycin, ceftiofur, amoxicillin/clavulanic acid were tested in the years 2000 to 2007 only.
(2) Cefotaxime and ceftazidime were tested in 2008 only.
(3) For colistin and trimethoprim no evaluation was performed as the lowest tested concentration was above the epidemiological cut-off value.
(4) The vertical lines demark the epidemiological cut-off values, which are the basis for the evaluation of microbiological resistance.
(5) The white areas demark the range tested. Isolates resistant to the highest concentration are given in the next concentration level.
Values for the lowest concentration include isolates with MICs below the tested range.

Tab. 13.25: *S.* Montevideo from the environment (2000–2008)

Antimicrobial tested	Tested isolates (Number)	Microbiologically resistent isolates (Number) (4)	Microbiological resistent isolates (in %) (4)	Distribution (%) of MICs (µg/ml) (5)																	
				0,008	0,015	0,03125	0,0625	0,125	0,25	0,5	1	2	4	8	16	32	64	128	256	512	1024
Gentamicin	21	2	9,5								90,5	0,0	0,0	0,0	0,0	9,5	0,0				
Neomycin (1)	16	0	0,0									100,0	0,0	0,0	0,0	0,0	0,0				
Kanamycin	21	4	19,0										81,0	0,0	0,0	0,0	0,0	19,0			
Spectinomycin (1)	16	0	0,0									0,0	0,0	0,0	31,3	62,5	6,3	0,0	0,0		
Streptomycin	21	2	9,5										14,3	76,2	0,0	0,0	0,0	9,5			
Chloramphenicol	21	0	0,0									0,0	23,8	61,9	14,3	0,0	0,0	0,0			
Florfenicol	21	0	0,0									0,0	81,0	9,5	9,5	0,0	0,0	0,0			
Cefotaxime (2)	5	0	0,0				60,0	0,0	20,0	20,0	0,0	0,0	0,0	0,0							
Ceftazidime (2)	5	0	0,0						60,0	40,0	0,0	0,0	0,0	0,0	0,0	0,0					
Ceftiofur (1)	16	0	0,0							87,5	12,5	0,0	0,0	0,0	0,0						
Nalidixic acid	21	3	14,3										76,2	4,8	4,8	14,3	0,0	0,0			
Ciprofloxacin	21	5	23,8			71,4	4,8	4,8	0,0	14,3	4,8	0,0	0,0	0,0							
Amoxicillin/Clavulanic acid (1)	16	0	0,0									93,8	6,3	0,0	0,0	0,0	0,0				
Ampicillin	21	0	0,0								71,4	19,0	9,5	0,0	0,0	0,0	0,0				
Colistin (3)	21													100,0	0,0	0,0					
Sulfamethoxazole	21	4	19,0													23,8	38,1	19,0	0,0	0,0	19,0
Trimethoprim (3)	21												0,0	0,0	0,0	23,8	76,1				
Tetracycline	21	2	9,5									85,7	4,8	0,0	0,0	0,0	9,5				

(1) Neomycin, spectinomycin, ceftiofur, amoxicillin/clavulanic acid were tested in the years 2000 to 2007 only.
(2) Cefotaxime and ceftazidime were tested in 2008 only.
(3) For colistin and trimethoprim no evaluation was performed as the lowest tested concentration was above the epidemiological cut-off value.
(4) The vertical lines demark the epidemiological cut-off values, which are the basis for the evaluation of microbiological resistance.
(5) The white areas demark the range tested. Isolates resistant to the highest concentration are given in the next concentration level.
Values for the lowest concentration include isolates with MICs below the tested range.

Tab. 13.26: *S.* Ohio from the environment (2000–2008)

Antimicrobial tested	Tested isolates (Number)	Microbiologically resistent isolates (Number) (4)	Microbiological resistent isolates (in %) (4)	Distribution (%) of MICs (µg/ml) (5) 0,008	0,015	0,03125	0,0625	0,125	0,25	0,5	1	2	4	8	16	32	64	128	256	512	1024
Gentamicin	27	0	0,0								100,0	0,0	0,0	0,0	0,0	0,0	0,0				
Neomycin (1)	23	0	0,0									100,0	0,0	0,0	0,0	0,0	0,0				
Kanamycin	27	0	0,0										92,6	7,4	0,0	0,0	0,0	0,0			
Spectinomycin (1)	23	0	0,0									0,0	0,0	0,0	4,3	82,6	13,0	0,0	0,0		
Streptomycin	27	0	0,0										44,4	44,4	11,1	0,0	0,0	0,0			
Chloramphenicol	27	0	0,0									0,0	29,6	70,4	0,0	0,0	0,0	0,0			
Florfenicol	27	0	0,0									0,0	55,6	44,4	0,0	0,0	0,0	0,0			
Cefotaxime (2)	4	0	0,0				50,0	50,0	0,0	0,0	0,0	0,0	0,0	0,0							
Ceftazidime (2)	4	0	0,0						0,0	100,0	0,0	0,0	0,0	0,0	0,0	0,0					
Ceftiofur (1)	23	0	0,0							52,2	47,8	0,0	0,0	0,0	0,0						
Nalidixic acid	27	0	0,0										100,0	0,0	0,0	0,0	0,0	0,0			
Ciprofloxacin	27	0	0,0			100,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0							
Amoxicillin/Clavulanic acid (1)	23	0	0,0									100,0	0,0	0,0	0,0	0,0	0,0				
Ampicillin	27	0	0,0								92,6	3,7	0,0	0,0	0,0	0,0	0,0				
Colistin (3)	27													100,0	0,0	0,0					
Sulfamethoxazole	27	0	0,0													11,1	81,5	7,4	0,0	0,0	0,0
Trimethoprim (3)	27												0,0	0,0	0,0	11,1	88,9				
Tetracycline	27	0	0,0									96,3	3,7	0,0	0,0	0,0	0,0				

(1) Neomycin, spectinomycin, ceftiofur, amoxicillin/clavulanic acid were tested in the years 2000 to 2007 only.

(2) Cefotaxime and ceftazidime were tested in 2008 only.

(3) For colistin and trimethoprim no evaluation was performed as the lowest tested concentration was above the epidemiological cut-off value.

(4) The vertical lines demark the epidemiological cut-off values, which are the basis for the evaluation of microbiological resistance.

(5) The white areas demark the range tested. Isolates resistant to the highest concentration are given in the next concentration level. Values for the lowest concentration include isolates with MICs below the tested range.

Tab. 13.27: *S.* Paratyphi B dT+ from the environment (2000–2008)

Antimicrobial tested	Tested isolates (Number)	Microbiologically resistent isolates (Number) (4)	Microbiological resistent isolates (in %) (4)	Distribution (%) of MICs (µg/ml) (5)																	
				0,008	0,015	0,03125	0,0625	0,125	0,25	0,5	1	2	4	8	16	32	64	128	256	512	1024
Gentamicin	48	0	0,0								100,0	0,0	0,0	0,0	0,0	0,0	0,0				
Neomycin (1)	42	0	0,0									100,0	0,0	0,0	0,0	0,0	0,0				
Kanamycin	48	0	0,0										97,9	2,1	0,0	0,0	0,0	0,0			
Spectinomycin (1)	42	41	97,6									0,0	0,0	0,0	2,4	0,0	0,0	7,1	90,5		
Streptomycin	48	5	10,4										2,1	0,0	25,0	62,5	4,2	6,3			
Chloramphenicol	48	1	2,1									14,6	29,2	50,0	4,2	0,0	0,0	2,1			
Florfenicol	48	0	0,0									18,8	52,1	27,1	2,1	0,0	0,0	0,0			
Cefotaxime (2)	6	0	0,0				0,0	16,7	83,3	0,0	0,0	0,0	0,0	0,0							
Ceftazidime (2)	6	0	0,0						0,0	100,0	0,0	0,0	0,0	0,0	0,0	0,0					
Ceftiofur (1)	42	0	0,0							42,9	45,2	11,9	0,0	0,0	0,0						
Nalidixic acid	48	36	75,0										25,0	0,0	0,0	0,0	0,0	75,1			
Ciprofloxacin	48	36	75,0			25,0	0,0	2,1	25,0	37,5	0,0	10,4	0,0	0,0							
Amoxicillin/Clavulanic acid (1)	42	12	28,6									71,4	0,0	14,3	14,3	0,0	0,0				
Ampicillin	48	15	31,3								39,6	29,2	0,0	0,0	0,0	2,1	29,2				
Colistin (3)	48													100,0	0,0	0,0					
Sulfamethoxazole	48	31	64,6													31,3	4,2	0,0	0,0	6,3	58,4
Trimethoprim (3)	48												0,0	0,0	4,2	27,1	68,9				
Tetracycline	48	5	10,4									83,3	6,3	0,0	0,0	0,0	10,4				

(1) Neomycin, spectinomycin, ceftiofur, amoxicillin/clavulanic acid were tested in the years 2000 to 2007 only.
(2) Cefotaxime and ceftazidime were tested in 2008 only.
(3) For colistin and trimethoprim no evaluation was performed as the lowest tested concentration was above the epidemiological cut-off value.
(4) The vertical lines demark the epidemiological cut-off values, which are the basis for the evaluation of microbiological resistance.
(5) The white areas demark the range tested. Isolates resistant to the highest concentration are given in the next concentration level.
Values for the lowest concentration include isolates with MICs below the tested range.

Tab. 13.28: *S.* Saintpaul from the environment (2000–2008)

Antimicrobial tested	Tested isolates (Number)	Microbiologically resistent isolates (Number) (4)	Microbiological resistent isolates (in %) (4)	0,008	0,015	0,03125	0,0625	0,125	0,25	0,5	1	2	4	8	16	32	64	128	256	512	1024
				Distribution (%) of MICs (µg/ml) (5)																	
Gentamicin	24	13	54,2								45,8	0,0	4,2	20,8	29,2	0,0	0,0				
Neomycin (1)	24	4	16,7									83,3	0,0	0,0	0,0	4,2	12,5				
Kanamycin	24	13	54,2										45,8	0,0	4,2	25,0	8,3	16,7			
Spectinomycin (1)	24	16	66,7									0,0	0,0	0,0	0,0	25,0	8,3	0,0	66,7		
Streptomycin	24	10	41,7										8,3	16,7	12,5	20,8	25,0	16,7			
Chloramphenicol	24	3	12,5									0,0	4,2	41,7	41,7	0,0	0,0	12,5			
Florfenicol	24	0	0,0									0,0	16,7	58,3	25,0	0,0	0,0	0,0			
Cefotaxime (2)	0	0	0,0				0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0							
Ceftazidime (2)	0	0	0,0						0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0					
Ceftiofur (1)	24	0	0,0							16,7	25,0	58,3	0,0	0,0	0,0						
Nalidixic acid	24	17	70,8										25,0	4,2	0,0	0,0	0,0	70,8			
Ciprofloxacin	24	17	70,8			29,2	0,0	0,0	4,2	20,8	45,8	0,0	0,0	0,0							
Amoxicillin/Clavulanic acid (1)	24	16	66,7									33,3	0,0	8,3	50,0	8,3	0,0				
Ampicillin	24	16	66,7								16,7	12,5	4,2	0,0	0,0	0,0	66,7				
Colistin (3)	24													100,0	0,0	0,0					
Sulfamethoxazole	24	18	75,0													12,5	4,2	8,3	0,0	4,2	70,8
Trimethoprim (3)	24												0,0	0,0	0,0	12,5	87,5				
Tetracycline	24	8	33,3									41,7	25,0	0,0	0,0	0,0	33,3				

(1) Neomycin, spectinomycin, ceftiofur, amoxicillin/clavulanic acid were tested in the years 2000 to 2007 only.
(2) Cefotaxime and ceftazidime were tested in 2008 only.
(3) For colistin and trimethoprim no evaluation was performed as the lowest tested concentration was above the epidemiological cut-off value.
(4) The vertical lines demark the epidemiological cut-off values, which are the basis for the evaluation of microbiological resistance.
(5) The white areas demark the range tested. Isolates resistant to the highest concentration are given in the next concentration level.
Values for the lowest concentration include isolates with MICs below the tested range.

Tab. 13.29: *S.* Senftenberg from the environment (2000–2008)

Antimicrobial tested	Tested isolates (Number)	Microbiologically resistent isolates (Number) (4)	Microbiological resistent isolates (in %) (4)	Distribution (%) of MICs (µg/ml) (5)																	
				0,008	0,015	0,03125	0,0625	0,125	0,25	0,5	1	2	4	8	16	32	64	128	256	512	1024
Gentamicin	128	1	0,8								98,4	0,8	0,0	0,0	0,0	0,8	0,0				
Neomycin (1)	117	0	0,0									100,0	0,0	0,0	0,0	0,0	0,0				
Kanamycin	128	1	0,8										98,4	0,8	0,0	0,0	0,0	0,8			
Spectinomycin (1)	117	1	0,9									0,0	0,0	0,0	23,1	72,6	3,4	0,0	0,9		
Streptomycin	128	2	1,6										25,8	46,9	24,2	1,6	0,8	0,8			
Chloramphenicol	128	0	0,0									0,0	5,5	79,7	14,8	0,0	0,0	0,0			
Florfenicol	128	1	0,8									0,8	39,1	55,5	3,9	0,8	0,0	0,0			
Cefotaxime (2)	11	0	0,0				9,1	81,8	9,1	0,0	0,0	0,0	0,0	0,0							
Ceftazidime (2)	11	0	0,0						27,3	72,7	0,0	0,0	0,0	0,0	0,0	0,0					
Ceftiofur (1)	117	0	0,0							23,9	68,4	7,7	0,0	0,0	0,0						
Nalidixic acid	128	2	1,6										86,7	9,4	2,3	0,0	0,0	1,6			
Ciprofloxacin	128	3	2,3			93,7	3,9	0,8	0,0	1,6	0,0	0,0	0,0	0,0							
Amoxicillin/Clavulanic acid (1)	117	0	0,0									97,4	2,6	0,0	0,0	0,0	0,0				
Ampicillin	128	0	0,0								69,5	23,4	7,0	0,0	0,0	0,0	0,0				
Colistin (3)	128													99,2	0,8	0,0					
Sulfamethoxazole	128	19	14,8													37,5	32,0	9,4	6,3	0,8	14,1
Trimethoprim (3)	128												0,0	0,0	0,0	37,5	62,6				
Tetracycline	128	0	0,0									89,8	7,8	2,3	0,0	0,0	0,0				

(1) Neomycin, spectinomycin, ceftiofur, amoxicillin/clavulanic acid were tested in the years 2000 to 2007 only.

(2) Cefotaxime and ceftazidime were tested in 2008 only.

(3) For colistin and trimethoprim no evaluation was performed as the lowest tested concentration was above the epidemiological cut-off value.

(4) The vertical lines demark the epidemiological cut-off values, which are the basis for the evaluation of microbiological resistance.

(5) The white areas demark the range tested. Isolates resistant to the highest concentration are given in the next concentration level.
Values for the lowest concentration include isolates with MICs below the tested range.

Tab. 13.30: *S.* Subspec. I rough from the environment (2000–2008)

Antimicrobial tested	Tested isolates (Number)	Microbiologically resistent isolates (Number) (4)	Microbiological resistent isolates (in %) (4)	Distribution (%) of MICs (µg/ml) (5)																	
				0,008	0,015	0,03125	0,0625	0,125	0,25	0,5	1	2	4	8	16	32	64	128	256	512	1024
Gentamicin	48	2	4,2								93,8	2,1	0,0	4,2	0,0	0,0	0,0				
Neomycin (1)	46	2	4,3									95,7	0,0	0,0	0,0	4,3	0,0				
Kanamycin	48	4	8,3										89,6	2,1	4,2	0,0	0,0	4,2			
Spectinomycin (1)	46	4	8,7									0,0	0,0	0,0	56,5	28,3	6,5	2,2	6,5		
Streptomycin	48	10	20,8										56,3	14,6	4,2	4,2	4,2	16,7			
Chloramphenicol	48	2	4,2									2,1	50,0	39,6	4,2	0,0	0,0	4,2			
Florfenicol	48	2	4,2									8,3	64,6	20,8	2,1	2,1	2,1	0,0			
Cefotaxime (2)	2	0	0,0				50,0	50,0	0,0	0,0	0,0	0,0	0,0	0,0							
Ceftazidime (2)	2	0	0,0						0,0	100,0	0,0	0,0	0,0	0,0	0,0	0,0					
Ceftiofur (1)	46	0	0,0							54,3	41,3	4,3	0,0	0,0	0,0						
Nalidixic acid	48	2	4,2										81,3	14,6	0,0	0,0	0,0	4,2			
Ciprofloxacin	48	2	4,2			93,8	2,1	0,0	0,0	0,0	4,2	0,0	0,0	0,0							
Amoxicillin/Clavulanic acid (1)	46	8	17,4									82,6	0,0	13,0	2,2	2,2	0,0				
Ampicillin	48	10	20,8								66,7	12,5	0,0	0,0	0,0	0,0	20,8				
Colistin (3)	48													98,0	2,1	0,0					
Sulfamethoxazole	48	19	39,6													29,2	29,2	2,1	0,0	2,1	37,5
Trimethoprim (3)	48												0,0	0,0	0,0	29,2	70,9				
Tetracycline	48	11	22,9									70,8	6,3	0,0	0,0	4,2	18,8				

(1) Neomycin, spectinomycin, ceftiofur, amoxicillin/clavulanic acid were tested in the years 2000 to 2007 only.
(2) Cefotaxime and ceftazidime were tested in 2008 only.
(3) For colistin and trimethoprim no evaluation was performed as the lowest tested concentration was above the epidemiological cut-off value.
(4) The vertical lines demark the epidemiological cut-off values, which are the basis for the evaluation of microbiological resistance.
(5) The white areas demark the range tested. Isolates resistant to the highest concentration are given in the next concentration level. Values for the lowest concentration include isolates with MICs below the tested range.

Tab. 13.31: *S.* Tennessee from the environment (2000–2008)

Antimicrobial tested	Tested isolates (Number)	Microbiologically resistent isolates (Number) (4)	Microbiological resistent isolates (in %) (4)	Distribution (%) of MICs (µg/ml) (5) 0,008	0,015	0,03125	0,0625	0,125	0,25	0,5	1	2	4	8	16	32	64	128	256	512	1024
Gentamicin	29	0	0,0								100,0	0,0	0,0	0,0	0,0	0,0	0,0				
Neomycin (1)	28	0	0,0									100,0	0,0	0,0	0,0	0,0	0,0				
Kanamycin	29	0	0,0										100,0	0,0	0,0	0,0	0,0	0,0			
Spectinomycin (1)	28	0	0,0									0,0	0,0	0,0	0,0	85,7	14,3	0,0	0,0		
Streptomycin	29	0	0,0										0,0	51,7	41,4	6,9	0,0	0,0			
Chloramphenicol	29	0	0,0									0,0	13,8	82,8	3,4	0,0	0,0	0,0			
Florfenicol	29	0	0,0									3,4	44,8	48,3	3,4	0,0	0,0	0,0			
Cefotaxime (2)	1	0	0,0				0,0	100,0	0,0	0,0	0,0	0,0	0,0	0,0							
Ceftazidime (2)	1	0	0,0						0,0	100,0	0,0	0,0	0,0	0,0	0,0	0,0					
Ceftiofur (1)	28	0	0,0							53,6	42,9	3,6	0,0	0,0	0,0						
Nalidixic acid	29	0	0,0										93,1	6,9	0,0	0,0	0,0	0,0			
Ciprofloxacin	29	0	0,0			96,6	3,4	0,0	0,0	0,0	0,0	0,0	0,0	0,0							
Amoxicillin/Clavulanic acid (1)	28	0	0,0									100,0	0,0	0,0	0,0	0,0	0,0				
Ampicillin	29	0	0,0								86,2	13,8	0,0	0,0	0,0	0,0	0,0				
Colistin (3)	29													100,0	0,0	0,0					
Sulfamethoxazole	29	0	0,0													48,3	44,8	6,9	0,0	0,0	0,0
Trimethoprim (3)	29												0,0	0,0	0,0	48,3	51,7				
Tetracycline	29	0	0,0									96,6	3,4	0,0	0,0	0,0	0,0				

(1) Neomycin, spectinomycin, ceftiofur, amoxicillin/clavulanic acid were tested in the years 2000 to 2007 only.

(2) Cefotaxime and ceftazidime were tested in 2008 only.

(3) For colistin and trimethoprim no evaluation was performed as the lowest tested concentration was above the epidemiological cut-off value.

(4) The vertical lines demark the epidemiological cut-off values, which are the basis for the evaluation of microbiological resistance.

(5) The white areas demark the range tested. Isolates resistant to the highest concentration are given in the next concentration level.
Values for the lowest concentration include isolates with MICs below the tested range.

Tab. 13.32: *S.* Typhimurium from the environment (2000–2008)

Antimicrobial tested	Tested isolates (Number)	Microbiologically resistent isolates (Number) (4)	Microbiological resistent isolates (in %) (4)	Distribution (%) of MICs (µg/ml) (5)																	
				0,008	0,015	0,03125	0,0625	0,125	0,25	0,5	1	2	4	8	16	32	64	128	256	512	1024
Gentamicin	548	8	1,5								96,3	2,2	0,0	0,7	0,7	0,0	0,0				
Neomycin (1)	515	18	3,5									94,8	1,7	0,0	0,2	1,7	1,6				
Kanamycin	548	23	4,2										93,2	2,6	0,5	0,0	0,4	3,3			
Spectinomycin (1)	515	167	32,4									0,0	0,0	0,0	2,1	54,8	10,7	3,5	28,9		
Streptomycin	548	287	52,4										6,2	31,6	8,6	1,3	20,8	31,6			
Chloramphenicol	548	152	27,7									1,3	17,7	44,3	8,9	0,2	2,4	25,2			
Florfenicol	548	142	25,9									2,7	44,9	23,9	2,6	9,9	13,5	2,6			
Cefotaxime (2)	33	0	0,0				45,5	54,5	0,0	0,0	0,0	0,0	0,0	0,0							
Ceftazidime (2)	33	0	0,0						93,9	6,1	0,0	0,0	0,0	0,0	0,0	0,0					
Ceftiofur (1)	515	0	0,0							48,2	47,8	4,1	0,0	0,0	0,0						
Nalidixic acid	548	9	1,6										81,9	15,0	1,5	0,0	0,0	1,6			
Ciprofloxacin	548	11	2,0			94,0	4,0	0,4	1,3	0,4	0,0	0,0	0,0	0,0							
Amoxicillin/Clavulanic acid (1)	515	252	48,9									48,0	3,1	17,9	28,2	2,5	0,4				
Ampicillin	548	290	52,9								36,3	10,4	0,4	0,0	0,0	4,0	48,9				
Colistin (3)	548													99,5	0,5	0,0					
Sulfamethoxazole	548	362	66,1													5,7	19,7	8,2	0,4	4,9	61,1
Trimethoprim (3)	548												0,0	0,2	0,2	5,3	94,3				
Tetracycline	548	313	57,1									39,8	3,1	0,0	1,1	20,3	35,8				

(1) Neomycin, spectinomycin, ceftiofur, amoxicillin/clavulanic acid were tested in the years 2000 to 2007 only.

(2) Cefotaxime and ceftazidime were tested in 2008 only.

(3) For colistin and trimethoprim no evaluation was performed as the lowest tested concentration was above the epidemiological cut-off value.

(4) The vertical lines demark the epidemiological cut-off values, which are the basis for the evaluation of microbiological resistance.

(5) The white areas demark the range tested. Isolates resistant to the highest concentration are given in the next concentration level.
Values for the lowest concentration include isolates with MICs below the tested range.

Tab. 13.33: *S.* Virchow from the environment (2000–2008)

Antimicrobial tested	Tested isolates (Number)	Microbiologically resistent isolates (Number) (4)	Microbiological resistent isolates (in %) (4)	Distribution (%) of MICs (µg/ml) (5) 0,008	0,015	0,03125	0,0625	0,125	0,25	0,5	1	2	4	8	16	32	64	128	256	512	1024
Gentamicin	87	1	1,1								97,7	1,1	0,0	1,1	0,0	0,0	0,0				
Neomycin (1)	85	0	0,0									96,5	3,5	0,0	0,0	0,0	0,0				
Kanamycin	87	1	1,1										94,3	4,6	0,0	1,1	0,0	0,0			
Spectinomycin (1)	85	3	3,5									0,0	0,0	0,0	2,4	87,1	7,1	0,0	3,5		
Streptomycin	87	3	3,4										9,2	54,0	26,4	6,9	2,3	1,1			
Chloramphenicol	87	1	1,1									2,3	21,8	64,4	10,3	0,0	0,0	1,1			
Florfenicol	87	1	1,1									3,4	64,4	27,6	3,4	1,1	0,0	0,0			
Cefotaxime (2)	2	0	0,0				100,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0							
Ceftazidime (2)	2	0	0,0						100,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0					
Ceftiofur (1)	85	0	0,0							80,0	18,8	1,2	0,0	0,0	0,0						
Nalidixic acid	87	5	5,7										86,2	8,0	0,0	0,0	0,0	5,7			
Ciprofloxacin	87	5	5,7			91,9	2,3	1,1	2,3	2,3	0,0	0,0	0,0	0,0							
Amoxicillin/Clavulanic acid (1)	85	7	8,2									90,6	1,2	3,5	4,7	0,0	0,0				
Ampicillin	87	6	6,9								81,6	10,3	1,1	0,0	0,0	1,1	5,7				
Colistin (3)	87													100,0	0,0	0,0					
Sulfamethoxazole	87	13	14,9													27,6	56,3	1,1	0,0	0,0	14,9
Trimethoprim (3)	87												94,3	1,1	0,0	0,0	4,6				
Tetracycline	87	4	4,6									90,8	4,6	0,0	2,3	0,0	2,3				

(1) Neomycin, spectinomycin, ceftiofur, amoxicillin/clavulanic acid were tested in the years 2000 to 2007 only.

(2) Cefotaxime and ceftazidime were tested in 2008 only.

(3) For colistin and trimethoprim no evaluation was performed as the lowest tested concentration was above the epidemiological cut-off value.

(4) The vertical lines demark the epidemiological cut-off values, which are the basis for the evaluation of microbiological resistance.

(5) The white areas demark the range tested. Isolates resistant to the highest concentration are given in the next concentration level. Values for the lowest concentration include isolates with MICs below the tested range.

13.1.3.3 Isolates from feeding stuffs

Tab. 13.34: *Salmonella* spp. from feeding stuffs (2000–2008)

Antimicrobial tested	Tested isolates (Number)	Microbiologically resistent isolates (Number) (4)	Microbiological resistent isolates (in %) (4)	Distribution (%) of MICs (µg/ml) (5) 0,008	0,015	0,03125	0,0625	0,125	0,25	0,5	1	2	4	8	16	32	64	128	256	512	1024
Gentamicin	2710	15	0,6								97,5	1,9	0,4	0,0	0,1	0,0	0,1				
Neomycin (1)	2534	16	0,6									97,5	1,9	0,2	0,0	0,2	0,3				
Kanamycin	2710	30	1,1										95,1	3,8	0,5	0,1	0,0	0,5			
Spectinomycin (1)	2534	113	4,5									0,0	0,0	0,1	12,9	72,5	10,0	0,9	3,5		
Streptomycin	2710	150	5,5										21,1	45,6	24,3	3,5	2,9	2,6			
Chloramphenicol	2710	82	3,0									1,6	19,2	66,9	9,3	0,1	0,1	2,8			
Florfenicol	2710	69	2,5									3,0	53,0	40,2	1,3	0,7	1,5	0,3			
Cefotaxime (2)	176	0	0,0				33,0	61,9	5,1	0,0	0,0	0,0	0,0	0,0							
Ceftazidime (2)	176	0	0,0						45,5	53,4	1,1	0,0	0,0	0,0	0,0	0,0					
Ceftiofur (1)	2534	6	0,2							62,2	35,2	2,4	0,1	0,1	0,0						
Nalidixic acid	2710	33	1,2										90,8	7,7	0,2	0,1	0,1	1,0			
Ciprofloxacin	2709	33	1,2			96,4	2,3	0,1	0,5	0,5	0,1	0,0	0,0	0,0							
Amoxicillin/Clavulanic acid (1)	2534	103	4,1									95,1	0,8	1,2	2,4	0,4	0,0				
Ampicillin	2710	132	4,9								81,6	12,8	0,7	0,0	0,0	0,3	4,6				
Colistin (3)	2710													99,9	0,1	0,0					
Sulfamethoxazole	2710	701	25,9													26,9	34,1	11,9	1,2	1,8	24,1
Trimethoprim (3)	2710												97,4	0,7	0,1	0,3	1,4				
Tetracycline	2710	165	6,1									87,2	6,0	0,7	0,1	1,7	4,3				

(1) Neomycin, spectinomycin, ceftiofur, amoxicillin/clavulanic acid were tested in the years 2000 to 2007 only.
(2) Cefotaxime and ceftazidime were tested in 2008 only.
(3) For colistin and trimethoprim no evaluation was performed as the lowest tested concentration was above the epidemiological cut-off value.
(4) The vertical lines demark the epidemiological cut-off values, which are the basis for the evaluation of microbiological resistance.
(5) The white areas demark the range tested. Isolates resistant to the highest concentration are given in the next concentration level.
Values for the lowest concentration include isolates with MICs below the tested range.

Tab. 13.35: *S.* 4,12:d:- from feeding stuffs (2000–2008)

Antimicrobial tested	Tested isolates (Number)	Microbiologically resistent isolates (Number) (4)	Microbiological resistent isolates (in %) (4)	0,008	0,015	0,03125	0,0625	0,125	0,25	0,5	1	2	4	8	16	32	64	128	256	512	1024
				Distribution (%) of MICs (µg/ml) (5)																	
Gentamicin	38	0	0,0								100,0	0,0	0,0	0,0	0,0	0,0	0,0				
Neomycin (1)	35	0	0,0									100,0	0,0	0,0	0,0	0,0	0,0				
Kanamycin	38	0	0,0										97,4	2,6	0,0	0,0	0,0	0,0			
Spectinomycin (1)	35	0	0,0									0,0	0,0	0,0	25,7	74,3	0,0	0,0	0,0		
Streptomycin	38	0	0,0										18,4	55,3	21,1	5,3	0,0	0,0			
Chloramphenicol	38	0	0,0									5,3	10,5	78,9	5,3	0,0	0,0	0,0			
Florfenicol	38	0	0,0									7,9	39,5	52,6	0,0	0,0	0,0	0,0			
Cefotaxime (2)	3	0	0,0				33,3	66,7	0,0	0,0	0,0	0,0	0,0	0,0							
Ceftazidime (2)	3	0	0,0						0,0	100,0	0,0	0,0	0,0	0,0	0,0	0,0					
Ceftiofur (1)	35	0	0,0							57,1	40,0	2,9	0,0	0,0	0,0						
Nalidixic acid	38	1	2,6										81,6	15,8	0,0	0,0	0,0	2,6			
Ciprofloxacin	38	1	2,6			97,4	0,0	0,0	2,6	0,0	0,0	0,0	0,0	0,0							
Amoxicillin/Clavulanic acid (1)	35	0	0,0									97,1	2,9	0,0	0,0	0,0	0,0				
Ampicillin	38	0	0,0								78,9	21,1	0,0	0,0	0,0	0,0	0,0				
Colistin (3)	38													100,0	0,0	0,0					
Sulfamethoxazole	38	11	28,9													34,2	23,7	7,9	5,3	0,0	28,9
Trimethoprim (3)	38												94,7	2,6	0,0	0,0	2,6				
Tetracycline	38	0	0,0									81,6	18,4	0,0	0,0	0,0	0,0				

(1) Neomycin, spectinomycin, ceftiofur, amoxicillin/clavulanic acid were tested in the years 2000 to 2007 only.
(2) Cefotaxime and ceftazidime were tested in 2008 only.
(3) For colistin and trimethoprim no evaluation was performed as the lowest tested concentration was above the epidemiological cut-off value.
(4) The vertical lines demark the epidemiological cut-off values, which are the basis for the evaluation of microbiological resistance.
(5) The white areas demark the range tested. Isolates resistant to the highest concentration are given in the next concentration level.
Values for the lowest concentration include isolates with MICs below the tested range.

Tab. 13.36: *S.* Agona from feeding stuffs (2000–2008)

Antimicrobial tested	Tested isolates (Number)	Microbiologically resistent isolates (Number) (4)	Microbiological resistent isolates (in %) (4)	Distribution (%) of MICs (µg/ml) (5) 0,008	0,015	0,03125	0,0625	0,125	0,25	0,5	1	2	4	8	16	32	64	128	256	512	1024
Gentamicin	119	0	0,0								97,4	2,5	0,0	0,0	0,0	0,0	0,0				
Neomycin (1)	91	0	0,0									100,0	0,0	0,0	0,0	0,0	0,0				
Kanamycin	119	0	0,0										95,8	4,2	0,0	0,0	0,0	0,0			
Spectinomycin (1)	91	0	0,0									0,0	0,0	0,0	2,2	89,0	8,8	0,0	0,0		
Streptomycin	119	0	0,0										21,8	59,7	15,1	3,4	0,0	0,0			
Chloramphenicol	119	0	0,0									3,4	2,5	88,2	5,9	0,0	0,0	0,0			
Florfenicol	119	0	0,0									3,4	24,4	71,4	0,8	0,0	0,0	0,0			
Cefotaxime (2)	28	0	0,0				17,9	78,6	3,6	0,0	0,0	0,0	0,0	0,0							
Ceftazidime (2)	28	0	0,0						3,6	96,4	0,0	0,0	0,0	0,0	0,0	0,0					
Ceftiofur (1)	91	1	1,1							56,0	42,9	0,0	0,0	1,1	0,0						
Nalidixic acid	119	0	0,0										95,8	4,2	0,0	0,0	0,0	0,0			
Ciprofloxacin	118	0	0,0			99,2	0,8	0,0	0,0	0,0	0,0	0,0	0,0	0,0							
Amoxicillin/Clavulanic acid (1)	91	0	0,0									100,0	0,0	0,0	0,0	0,0	0,0				
Ampicillin	119	0	0,0								78,2	21,0	0,8	0,0	0,0	0,0	0,0				
Colistin (3)	119													100,0	0,0	0,0					
Sulfamethoxazole	119	14	11,8													30,3	50,4	7,6	0,0	0,0	11,8
Trimethoprim (3)	119												0,0	0,0	0,0	30,3	69,8				
Tetracycline	119	0	0,0									89,9	10,1	0,0	0,0	0,0	0,0				

(1) Neomycin, spectinomycin, ceftiofur, amoxicillin/clavulanic acid were tested in the years 2000 to 2007 only.
(2) Cefotaxime and ceftazidime were tested in 2008 only.
(3) For colistin and trimethoprim no evaluation was performed as the lowest tested concentration was above the epidemiological cut-off value.
(4) The vertical lines demark the epidemiological cut-off values, which are the basis for the evaluation of microbiological resistance.
(5) The white areas demark the range tested. Isolates resistant to the highest concentration are given in the next concentration level.
Values for the lowest concentration include isolates with MICs below the tested range.

Tab. 13.37: *S.* Albany from feeding stuffs (2000–2008)

Antimicrobial tested	Tested isolates (Number)	Microbiologically resistent isolates (Number) (4)	Microbiological resistent isolates (in %) (4)	Distribution (%) of MICs (µg/ml) (5)																	
				0,008	0,015	0,03125	0,0625	0,125	0,25	0,5	1	2	4	8	16	32	64	128	256	512	1024
Gentamicin	30	0	0,0								100,0	0,0	0,0	0,0	0,0	0,0	0,0				
Neomycin (1)	30	0	0,0									100,0	0,0	0,0	0,0	0,0	0,0				
Kanamycin	30	0	0,0										100,0	0,0	0,0	0,0	0,0	0,0			
Spectinomycin (1)	30	0	0,0									0,0	0,0	0,0	6,7	46,7	46,7	0,0	0,0		
Streptomycin	30	0	0,0										6,7	43,3	50,0	0,0	0,0	0,0			
Chloramphenicol	30	0	0,0									0,0	53,3	43,3	3,3	0,0	0,0	0,0			
Florfenicol	30	0	0,0									6,7	53,3	40,0	0,0	0,0	0,0	0,0			
Cefotaxime (2)	0	0	0,0				0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0							
Ceftazidime (2)	0	0	0,0						0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0					
Ceftiofur (1)	30	0	0,0							60,0	36,7	3,3	0,0	0,0	0,0						
Nalidixic acid	30	3	10,0										90,0	0,0	0,0	0,0	0,0	10,0			
Ciprofloxacin	30	3	10,0			86,7	3,3	0,0	3,3	6,7	0,0	0,0	0,0	0,0							
Amoxicillin/Clavulanic acid (1)	30	0	0,0									100,0	0,0	0,0	0,0	0,0	0,0				
Ampicillin	30	0	0,0								93,3	6,7	0,0	0,0	0,0	0,0	0,0				
Colistin (3)	30													96,6	3,3	0,0					
Sulfamethoxazole	30	12	40,0													50,0	10,0	0,0	0,0	0,0	40,0
Trimethoprim (3)	30												93,3	3,3	0,0	3,3	0,0				
Tetracycline	30	0	0,0									96,7	3,3	0,0	0,0	0,0	0,0				

(1) Neomycin, spectinomycin, ceftiofur, amoxicillin/clavulanic acid were tested in the years 2000 to 2007 only.
(2) Cefotaxime and ceftazidime were tested in 2008 only.
(3) For colistin and trimethoprim no evaluation was performed as the lowest tested concentration was above the epidemiological cut-off value.
(4) The vertical lines demark the epidemiological cut-off values, which are the basis for the evaluation of microbiological resistance.
(5) The white areas demark the range tested. Isolates resistant to the highest concentration are given in the next concentration level.
Values for the lowest concentration include isolates with MICs below the tested range.

Tab. 13.38: *S.* Anatum from feeding stuffs (2000–2008)

Antimicrobial tested	Tested isolates (Number)	Microbiologically resistent isolates (Number) (4)	Microbiological resistent isolates (in %) (4)	Distribution (%) of MICs (µg/ml) (5)																	
				0,008	0,015	0,03125	0,0625	0,125	0,25	0,5	1	2	4	8	16	32	64	128	256	512	1024
Gentamicin	268	3	1,1								97,0	1,9	1,1	0,0	0,0	0,0	0,0				
Neomycin (1)	267	2	0,7									95,9	3,4	0,4	0,0	0,4	0,0				
Kanamycin	268	3	1,1										93,7	5,2	0,7	0,0	0,0	0,4			
Spectinomycin (1)	267	1	0,4									0,0	0,0	0,0	0,0	80,1	19,5	0,0	0,4		
Streptomycin	268	11	4,1										1,1	49,6	40,3	4,9	2,6	1,5			
Chloramphenicol	268	1	0,4									0,7	20,5	73,9	4,5	0,4	0,0	0,0			
Florfenicol	268	0	0,0									3,0	56,3	40,3	0,4	0,0	0,0	0,0			
Cefotaxime (2)	1	0	0,0				0,0	100,0	0,0	0,0	0,0	0,0	0,0	0,0							
Ceftazidime (2)	1	0	0,0						0,0	100,0	0,0	0,0	0,0	0,0	0,0	0,0					
Ceftiofur (1)	267	0	0,0							47,2	50,9	1,9	0,0	0,0	0,0						
Nalidixic acid	268	1	0,4										87,7	11,6	0,4	0,4	0,0	0,0			
Ciprofloxacin	268	1	0,4			99,3	0,4	0,0	0,0	0,4	0,0	0,0	0,0	0,0							
Amoxicillin/Clavulanic acid (1)	267	1	0,4									99,6	0,0	0,4	0,0	0,0	0,0				
Ampicillin	268	1	0,4								86,2	13,4	0,0	0,0	0,0	0,0	0,4				
Colistin (3)	268													100,0	0,0	0,0					
Sulfamethoxazole	268	73	27,2													24,6	28,0	19,0	1,1	6,3	20,9
Trimethoprim (3)	268												0,0	0,0	0,0	24,6	75,3				
Tetracycline	268	4	1,5									88,1	10,1	0,4	0,4	0,0	1,1				

(1) Neomycin, spectinomycin, ceftiofur, amoxicillin/clavulanic acid were tested in the years 2000 to 2007 only.
(2) Cefotaxime and ceftazidime were tested in 2008 only.
(3) For colistin and trimethoprim no evaluation was performed as the lowest tested concentration was above the epidemiological cut-off value.
(4) The vertical lines demark the epidemiological cut-off values, which are the basis for the evaluation of microbiological resistance.
(5) The white areas demark the range tested. Isolates resistant to the highest concentration are given in the next concentration level.
Values for the lowest concentration include isolates with MICs below the tested range.

Tab. 13.39: *S.* Cerro from feeding stuffs (2000–2008)

Antimicrobial tested	Tested isolates (Number)	Microbiologically resistent isolates (Number) (4)	Microbiological resistent isolates (in %) (4)	Distribution (%) of MICs (µg/ml) (5) 0,008	0,015	0,03125	0,0625	0,125	0,25	0,5	1	2	4	8	16	32	64	128	256	512	1024
Gentamicin	98	0	0,0								100,0	0,0	0,0	0,0	0,0	0,0	0,0				
Neomycin (1)	98	0	0,0									100,0	0,0	0,0	0,0	0,0	0,0				
Kanamycin	98	0	0,0										98,0	2,0	0,0	0,0	0,0	0,0			
Spectinomycin (1)	98	0	0,0									0,0	0,0	0,0	37,8	61,2	1,0	0,0	0,0		
Streptomycin	98	0	0,0										52,0	40,8	7,1	0,0	0,0	0,0			
Chloramphenicol	98	0	0,0									5,1	50,0	43,9	1,0	0,0	0,0	0,0			
Florfenicol	98	0	0,0									5,1	88,8	6,1	0,0	0,0	0,0	0,0			
Cefotaxime (2)	0	0	0,0				0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0							
Ceftazidime (2)	0	0	0,0						0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0					
Ceftiofur (1)	98	1	1,0							75,5	23,5	0,0	0,0	1,0	0,0						
Nalidixic acid	98	0	0,0										90,8	9,2	0,0	0,0	0,0	0,0			
Ciprofloxacin	98	0	0,0			99,0	1,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0							
Amoxicillin/Clavulanic acid (1)	98	0	0,0									100,0	0,0	0,0	0,0	0,0	0,0				
Ampicillin	98	0	0,0								84,7	14,3	1,0	0,0	0,0	0,0	0,0				
Colistin (3)	98													100,0	0,0	0,0					
Sulfamethoxazole	98	2	2,0													80,6	13,3	4,1	0,0	0,0	2,0
Trimethoprim (3)	98												99,0	0,0	0,0	1,0	0,0				
Tetracycline	98	0	0,0									99,0	1,0	0,0	0,0	0,0	0,0				

(1) Neomycin, spectinomycin, ceftiofur, amoxicillin/clavulanic acid were tested in the years 2000 to 2007 only.

(2) Cefotaxime and ceftazidime were tested in 2008 only.

(3) For colistin and trimethoprim no evaluation was performed as the lowest tested concentration was above the epidemiological cut-off value.

(4) The vertical lines demark the epidemiological cut-off values, which are the basis for the evaluation of microbiological resistance.

(5) The white areas demark the range tested. Isolates resistant to the highest concentration are given in the next concentration level. Values for the lowest concentration include isolates with MICs below the tested range.

Tab. 13.40: *S.* Derby from feeding stuffs (2000–2008)

Antimicrobial tested	Tested isolates (Number)	Microbiologically resistent isolates (Number) (4)	Microbiological resistent isolates (in %) (4)	Distribution (%) of MICs (µg/ml) (5) 0,008	0,015	0,03125	0,0625	0,125	0,25	0,5	1	2	4	8	16	32	64	128	256	512	1024
Gentamicin	56	1	1,8								94,7	3,6	1,8	0,0	0,0	0,0	0,0				
Neomycin (1)	48	0	0,0									100,0	0,0	0,0	0,0	0,0	0,0				
Kanamycin	56	0	0,0										94,6	5,4	0,0	0,0	0,0	0,0			
Spectinomycin (1)	48	3	6,3									0,0	0,0	0,0	4,2	81,3	8,3	0,0	6,3		
Streptomycin	56	3	5,4										7,1	41,1	41,1	5,4	1,8	3,6			
Chloramphenicol	56	1	1,8									0,0	3,6	82,1	12,5	1,8	0,0	0,0			
Florfenicol	56	0	0,0									0,0	33,9	64,3	1,8	0,0	0,0	0,0			
Cefotaxime (2)	8	0	0,0				12,5	75,0	12,5	0,0	0,0	0,0	0,0	0,0							
Ceftazidime (2)	8	0	0,0						0,0	100,0	0,0	0,0	0,0	0,0	0,0	0,0					
Ceftiofur (1)	48	0	0,0							50,0	43,8	6,3	0,0	0,0	0,0						
Nalidixic acid	56	1	1,8										87,5	10,7	0,0	1,8	0,0	0,0			
Ciprofloxacin	56	0	0,0			92,9	7,1	0,0	0,0	0,0	0,0	0,0	0,0	0,0							
Amoxicillin/Clavulanic acid (1)	48	0	0,0									95,8	4,2	0,0	0,0	0,0	0,0				
Ampicillin	56	1	1,8								78,6	17,9	1,8	0,0	0,0	0,0	1,8				
Colistin (3)	56													100,0	0,0	0,0					
Sulfamethoxazole	56	16	28,6													26,8	44,6	0,0	0,0	1,8	26,8
Trimethoprim (3)	56												0,0	0,0	0,0	26,8	73,2				
Tetracycline	56	6	10,7									85,7	3,6	0,0	0,0	1,8	8,9				

(1) Neomycin, spectinomycin, ceftiofur, amoxicillin/clavulanic acid were tested in the years 2000 to 2007 only.

(2) Cefotaxime and ceftazidime were tested in 2008 only.

(3) For colistin and trimethoprim no evaluation was performed as the lowest tested concentration was above the epidemiological cut-off value.

(4) The vertical lines demark the epidemiological cut-off values, which are the basis for the evaluation of microbiological resistance.

(5) The white areas demark the range tested. Isolates resistant to the highest concentration are given in the next concentration level. Values for the lowest concentration include isolates with MICs below the tested range.

Tab. 13.41: *S.* Enteritidis from feeding stuffs (2000–2008)

Antimicrobial tested	Tested isolates (Number)	Microbiologically resistent isolates (Number) (4)	Microbiological resistent isolates (in %) (4)	Distribution (%) of MICs (µg/ml) (5) 0,008	0,015	0,03125	0,0625	0,125	0,25	0,5	1	2	4	8	16	32	64	128	256	512	1024
Gentamicin	12	0	0,0								100,0	0,0	0,0	0,0	0,0	0,0	0,0				
Neomycin (1)	10	0	0,0									100,0	0,0	0,0	0,0	0,0	0,0				
Kanamycin	12	0	0,0										100,0	0,0	0,0	0,0	0,0	0,0			
Spectinomycin (1)	10	0	0,0									0,0	0,0	0,0	70,0	30,0	0,0	0,0	0,0		
Streptomycin	12	0	0,0										91,7	8,3	0,0	0,0	0,0	0,0			
Chloramphenicol	12	0	0,0									8,3	41,7	50,0	0,0	0,0	0,0	0,0			
Florfenicol	12	0	0,0									8,3	75,0	16,7	0,0	0,0	0,0	0,0			
Cefotaxime (2)	2	0	0,0				100,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0							
Ceftazidime (2)	2	0	0,0						100,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0					
Ceftiofur (1)	10	0	0,0							50,0	50,0	0,0	0,0	0,0	0,0						
Nalidixic acid	12	0	0,0										83,3	16,7	0,0	0,0	0,0	0,0			
Ciprofloxacin	12	0	0,0			100,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0							
Amoxicillin/Clavulanic acid (1)	10	0	0,0									100,0	0,0	0,0	0,0	0,0	0,0				
Ampicillin	12	0	0,0								58,3	33,3	8,3	0,0	0,0	0,0	0,0				
Colistin (3)	12													100,0	0,0	0,0					
Sulfamethoxazole	12	1	8,3													41,7	50,0	0,0	0,0	0,0	8,3
Trimethoprim (3)	12												0,0	0,0	0,0	41,7	58,3				
Tetracycline	12	0	0,0									91,7	8,3	0,0	0,0	0,0	0,0				

(1) Neomycin, spectinomycin, ceftiofur, amoxicillin/clavulanic acid were tested in the years 2000 to 2007 only.
(2) Cefotaxime and ceftazidime were tested in 2008 only.
(3) For colistin and trimethoprim no evaluation was performed as the lowest tested concentration was above the epidemiological cut-off value.
(4) The vertical lines demark the epidemiological cut-off values, which are the basis for the evaluation of microbiological resistance.
(5) The white areas demark the range tested. Isolates resistant to the highest concentration are given in the next concentration level.
Values for the lowest concentration include isolates with MICs below the tested range.

Tab. 13.42: *S.* Falkensee from feeding stuffs (2000–2008)

Antimicrobial tested	Tested isolates (Number)	Microbiologically resistent isolates (Number) (4)	Microbiological resistent isolates (in %) (4)	Distribution (%) of MICs (µg/ml) (5) 0,008	0,015	0,03125	0,0625	0,125	0,25	0,5	1	2	4	8	16	32	64	128	256	512	1024
Gentamicin	67	1	1,5								91,0	7,5	1,5	0,0	0,0	0,0	0,0				
Neomycin (1)	67	0	0,0									91,0	9,0	0,0	0,0	0,0	0,0				
Kanamycin	67	0	0,0										94,0	6,0	0,0	0,0	0,0	0,0			
Spectinomycin (1)	67	0	0,0									0,0	0,0	0,0	1,5	94,0	4,5	0,0	0,0		
Streptomycin	67	0	0,0										17,9	50,7	28,4	3,0	0,0	0,0			
Chloramphenicol	67	0	0,0									0,0	3,0	76,1	20,9	0,0	0,0	0,0			
Florfenicol	67	0	0,0									0,0	38,8	56,7	4,5	0,0	0,0	0,0			
Cefotaxime (2)	0	0	0,0				0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0							
Ceftazidime (2)	0	0	0,0						0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0					
Ceftiofur (1)	67	0	0,0							52,2	35,8	11,9	0,0	0,0	0,0						
Nalidixic acid	67	0	0,0										89,6	9,0	1,5	0,0	0,0	0,0			
Ciprofloxacin	67	0	0,0			98,5	1,5	0,0	0,0	0,0	0,0	0,0	0,0	0,0							
Amoxicillin/Clavulanic acid (1)	67	0	0,0									98,5	1,5	0,0	0,0	0,0	0,0				
Ampicillin	67	0	0,0								92,5	7,5	0,0	0,0	0,0	0,0	0,0				
Colistin (3)	67													100,0	0,0	0,0					
Sulfamethoxazole	67	37	55,2													6,0	16,4	22,4	0,0	0,0	55,2
Trimethoprim (3)	67												97,0	1,5	1,5	0,0	0,0				
Tetracycline	67	0	0,0									85,1	10,4	4,5	0,0	0,0	0,0				

(1) Neomycin, spectinomycin, ceftiofur, amoxicillin/clavulanic acid were tested in the years 2000 to 2007 only.
(2) Cefotaxime and ceftazidime were tested in 2008 only.
(3) For colistin and trimethoprim no evaluation was performed as the lowest tested concentration was above the epidemiological cut-off value.
(4) The vertical lines demark the epidemiological cut-off values, which are the basis for the evaluation of microbiological resistance.
(5) The white areas demark the range tested. Isolates resistant to the highest concentration are given in the next concentration level.
Values for the lowest concentration include isolates with MICs below the tested range.

Tab. 13.43: *S.* Havana from feeding stuffs (2000–2008)

Antimicrobial tested	Tested isolates (Number)	Microbiologically resistent isolates (Number) (4)	Microbiological resistent isolates (in %) (4)	Distribution (%) of MICs (µg/ml) (5)																	
				0,008	0,015	0,03125	0,0625	0,125	0,25	0,5	1	2	4	8	16	32	64	128	256	512	1024
Gentamicin	102	0	0,0								98,1	2,0	0,0	0,0	0,0	0,0	0,0				
Neomycin (1)	101	0	0,0									97,0	3,0	0,0	0,0	0,0	0,0				
Kanamycin	102	1	1,0										97,1	2,0	1,0	0,0	0,0	0,0			
Spectinomycin (1)	101	0	0,0									0,0	0,0	1,0	82,2	16,8	0,0	0,0	0,0		
Streptomycin	102	0	0,0										87,3	11,8	1,0	0,0	0,0	0,0			
Chloramphenicol	102	0	0,0									0,0	9,8	84,3	5,9	0,0	0,0	0,0			
Florfenicol	102	0	0,0									1,0	50,0	49,0	0,0	0,0	0,0	0,0			
Cefotaxime (2)	1	0	0,0				0,0	100,0	0,0	0,0	0,0	0,0	0,0	0,0							
Ceftazidime (2)	1	0	0,0						0,0	100,0	0,0	0,0	0,0	0,0	0,0	0,0					
Ceftiofur (1)	101	0	0,0							82,2	17,8	0,0	0,0	0,0	0,0						
Nalidixic acid	102	1	1,0										97,1	2,0	0,0	0,0	1,0	0,0			
Ciprofloxacin	102	1	1,0			98,0	1,0	1,0	0,0	0,0	0,0	0,0	0,0	0,0							
Amoxicillin/Clavulanic acid (1)	101	0	0,0									100,0	0,0	0,0	0,0	0,0	0,0				
Ampicillin	102	0	0,0								97,1	2,9	0,0	0,0	0,0	0,0	0,0				
Colistin (3)	102													100,0	0,0	0,0					
Sulfamethoxazole	102	10	9,8													32,4	22,5	33,3	2,0	0,0	9,8
Trimethoprim (3)	102												99,0	0,0	0,0	1,0	0,0				
Tetracycline	102	0	0,0									99,0	1,0	0,0	0,0	0,0	0,0				

(1) Neomycin, spectinomycin, ceftiofur, amoxicillin/clavulanic acid were tested in the years 2000 to 2007 only.

(2) Cefotaxime and ceftazidime were tested in 2008 only.

(3) For colistin and trimethoprim no evaluation was performed as the lowest tested concentration was above the epidemiological cut-off value.

(4) The vertical lines demark the epidemiological cut-off values, which are the basis for the evaluation of microbiological resistance.

(5) The white areas demark the range tested. Isolates resistant to the highest concentration are given in the next concentration level.
Values for the lowest concentration include isolates with MICs below the tested range.

Tab. 13.44: *S.* Infantis from feeding stuffs (2000–2008)

Antimicrobial tested	Tested isolates (Number)	Microbiologically resistent isolates (Number) (4)	Microbiological resistent isolates (in %) (4)	Distribution (%) of MICs (µg/ml) (5)																	
				0,008	0,015	0,03125	0,0625	0,125	0,25	0,5	1	2	4	8	16	32	64	128	256	512	1024
Gentamicin	35	0	0,0								97,1	2,9	0,0	0,0	0,0	0,0	0,0				
Neomycin (1)	31	0	0,0									96,8	3,2	0,0	0,0	0,0	0,0				
Kanamycin	35	0	0,0										94,3	5,7	0,0	0,0	0,0	0,0			
Spectinomycin (1)	31	1	3,2									0,0	0,0	0,0	0,0	96,8	0,0	3,2	0,0		
Streptomycin	35	0	0,0										17,1	62,9	20,0	0,0	0,0	0,0			
Chloramphenicol	35	0	0,0									2,9	11,4	68,6	17,1	0,0	0,0	0,0			
Florfenicol	35	0	0,0									2,9	48,6	40,0	8,6	0,0	0,0	0,0			
Cefotaxime (2)	4	0	0,0				0,0	75,0	25,0	0,0	0,0	0,0	0,0	0,0							
Ceftazidime (2)	4	0	0,0						25,0	75,0	0,0	0,0	0,0	0,0	0,0	0,0					
Ceftiofur (1)	31	0	0,0							38,7	51,6	9,7	0,0	0,0	0,0						
Nalidixic acid	35	0	0,0										82,9	17,1	0,0	0,0	0,0	0,0			
Ciprofloxacin	35	0	0,0			88,6	11,4	0,0	0,0	0,0	0,0	0,0	0,0	0,0							
Amoxicillin/Clavulanic acid (1)	31	1	3,2									96,8	0,0	3,2	0,0	0,0	0,0				
Ampicillin	35	1	2,9								71,4	22,9	2,9	0,0	0,0	0,0	2,9				
Colistin (3)	35													100,0	0,0	0,0					
Sulfamethoxazole	35	2	5,7													28,6	45,7	17,1	2,9	0,0	5,7
Trimethoprim (3)	35												0,0	0,0	0,0	28,6	71,4				
Tetracycline	35	0	0,0									91,5	5,7	2,9	0,0	0,0	0,0				

(1) Neomycin, spectinomycin, ceftiofur, amoxicillin/clavulanic acid were tested in the years 2000 to 2007 only.

(2) Cefotaxime and ceftazidime were tested in 2008 only.

(3) For colistin and trimethoprim no evaluation was performed as the lowest tested concentration was above the epidemiological cut-off value.

(4) The vertical lines demark the epidemiological cut-off values, which are the basis for the evaluation of microbiological resistance.

(5) The white areas demark the range tested. Isolates resistant to the highest concentration are given in the next concentration level.
Values for the lowest concentration include isolates with MICs below the tested range.

Tab. 13.45: *S.* Lexington from feeding stuffs (2000–2008)

Antimicrobial tested	Tested isolates (Number)	Microbiologically resistent isolates (Number) (4)	Microbiological resistent isolates (in %) (4)	Distribution (%) of MICs (µg/ml) (5)																	
				0,008	0,015	0,03125	0,0625	0,125	0,25	0,5	1	2	4	8	16	32	64	128	256	512	1024
Gentamicin	42	0	0,0								100,0	0,0	0,0	0,0	0,0	0,0	0,0				
Neomycin (1)	40	0	0,0									95,0	5,0	0,0	0,0	0,0	0,0				
Kanamycin	42	0	0,0										97,6	2,4	0,0	0,0	0,0	0,0			
Spectinomycin (1)	40	0	0,0									0,0	0,0	0,0	7,5	92,5	0,0	0,0	0,0		
Streptomycin	42	0	0,0										35,7	59,5	4,8	0,0	0,0	0,0			
Chloramphenicol	42	0	0,0									0,0	23,8	73,8	2,4	0,0	0,0	0,0			
Florfenicol	42	0	0,0									2,4	81,0	16,7	0,0	0,0	0,0	0,0			
Cefotaxime (2)	2	0	0,0				0,0	100,0	0,0	0,0	0,0	0,0	0,0	0,0							
Ceftazidime (2)	2	0	0,0						50,0	50,0	0,0	0,0	0,0	0,0	0,0	0,0					
Ceftiofur (1)	40	0	0,0							57,5	40,0	2,5	0,0	0,0	0,0						
Nalidixic acid	42	0	0,0										100,0	0,0	0,0	0,0	0,0	0,0			
Ciprofloxacin	42	0	0,0			100,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0							
Amoxicillin/Clavulanic acid (1)	40	0	0,0									100,0	0,0	0,0	0,0	0,0	0,0				
Ampicillin	42	0	0,0								88,1	11,9	0,0	0,0	0,0	0,0	0,0				
Colistin (3)	42													100,0	0,0	0,0					
Sulfamethoxazole	42	2	4,8													16,7	69,0	9,5	0,0	0,0	4,8
Trimethoprim (3)	42												100,0	0,0	0,0	0,0	0,0				
Tetracycline	42	0	0,0									95,2	4,8	0,0	0,0	0,0	0,0				

(1) Neomycin, spectinomycin, ceftiofur, amoxicillin/clavulanic acid were tested in the years 2000 to 2007 only.

(2) Cefotaxime and ceftazidime were tested in 2008 only.

(3) For colistin and trimethoprim no evaluation was performed as the lowest tested concentration was above the epidemiological cut-off value.

(4) The vertical lines demark the epidemiological cut-off values, which are the basis for the evaluation of microbiological resistance.

(5) The white areas demark the range tested. Isolates resistant to the highest concentration are given in the next concentration level. Values for the lowest concentration include isolates with MICs below the tested range.

Tab. 13.46: *S.* Lille from feeding stuffs (2000–2008)

Antimicrobial tested	Tested isolates (Number)	Microbiologically resistent isolates (Number) (4)	Microbiological resistent isolates (in %) (4)	Distribution (%) of MICs (µg/ml) (5) 0,008	0,015	0,03125	0,0625	0,125	0,25	0,5	1	2	4	8	16	32	64	128	256	512	1024
Gentamicin	42	0	0,0								97,6	2,4	0,0	0,0	0,0	0,0	0,0				
Neomycin (1)	41	0	0,0									97,6	2,4	0,0	0,0	0,0	0,0				
Kanamycin	42	0	0,0										95,2	4,8	0,0	0,0	0,0	0,0			
Spectinomycin (1)	41	0	0,0									0,0	0,0	0,0	9,8	90,2	0,0	0,0	0,0		
Streptomycin	42	0	0,0										45,2	40,5	14,3	0,0	0,0	0,0			
Chloramphenicol	42	0	0,0									0,0	4,8	83,3	11,9	0,0	0,0	0,0			
Florfenicol	42	0	0,0									2,4	21,4	76,2	0,0	0,0	0,0	0,0			
Cefotaxime (2)	1	0	0,0				0,0	100,0	0,0	0,0	0,0	0,0	0,0	0,0							
Ceftazidime (2)	1	0	0,0						0,0	100,0	0,0	0,0	0,0	0,0	0,0	0,0					
Ceftiofur (1)	41	0	0,0							39,0	58,5	2,4	0,0	0,0	0,0						
Nalidixic acid	42	0	0,0										100,0	0,0	0,0	0,0	0,0	0,0			
Ciprofloxacin	42	0	0,0			100,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0							
Amoxicillin/Clavulanic acid (1)	41	0	0,0									100,0	0,0	0,0	0,0	0,0	0,0				
Ampicillin	42	0	0,0								71,4	28,6	0,0	0,0	0,0	0,0	0,0				
Colistin (3)	42													100,0	0,0	0,0					
Sulfamethoxazole	42	4	9,5													35,7	50,0	4,8	0,0	0,0	9,5
Trimethoprim (3)	42												100,0	0,0	0,0	0,0	0,0				
Tetracycline	42	0	0,0									97,6	2,4	0,0	0,0	0,0	0,0				

(1) Neomycin, spectinomycin, ceftiofur, amoxicillin/clavulanic acid were tested in the years 2000 to 2007 only.

(2) Cefotaxime and ceftazidime were tested in 2008 only.

(3) For colistin and trimethoprim no evaluation was performed as the lowest tested concentration was above the epidemiological cut-off value.

(4) The vertical lines demark the epidemiological cut-off values, which are the basis for the evaluation of microbiological resistance.

(5) The white areas demark the range tested. Isolates resistant to the highest concentration are given in the next concentration level.
Values for the lowest concentration include isolates with MICs below the tested range.

Tab. 13.47: *S.* Livingstone from feeding stuffs (2000–2008)

Antimicrobial tested	Tested isolates (Number)	Microbiologically resistent isolates (Number) (4)	Microbiological resistent isolates (in %) (4)	Distribution (%) of MICs (µg/ml) (5)																	
				0,008	0,015	0,03125	0,0625	0,125	0,25	0,5	1	2	4	8	16	32	64	128	256	512	1024
Gentamicin	93	1	1,1								95,7	3,2	1,1	0,0	0,0	0,0	0,0				
Neomycin (1)	80	6	7,5									83,8	8,8	1,3	1,3	2,5	2,5				
Kanamycin	93	6	6,5										87,1	6,5	0,0	0,0	0,0	6,5			
Spectinomycin (1)	80	9	11,3									0,0	0,0	0,0	15,0	63,8	10,0	2,5	8,8		
Streptomycin	93	3	3,2										29,0	35,5	23,7	8,6	3,2	0,0			
Chloramphenicol	93	1	1,1									4,3	17,2	51,6	25,8	0,0	0,0	1,1			
Florfenicol	93	0	0,0									3,2	40,9	48,4	7,5	0,0	0,0	0,0			
Cefotaxime (2)	13	0	0,0				84,6	15,4	0,0	0,0	0,0	0,0	0,0	0,0							
Ceftazidime (2)	13	0	0,0						76,9	23,1	0,0	0,0	0,0	0,0	0,0	0,0					
Ceftiofur (1)	80	0	0,0							48,8	43,8	7,5	0,0	0,0	0,0						
Nalidixic acid	93	0	0,0										80,6	19,4	0,0	0,0	0,0	0,0			
Ciprofloxacin	93	1	1,1			90,3	8,6	0,0	0,0	0,0	1,1	0,0	0,0	0,0							
Amoxicillin/Clavulanic acid (1)	80	0	0,0									93,8	6,3	0,0	0,0	0,0	0,0				
Ampicillin	93	0	0,0								77,4	18,3	4,3	0,0	0,0	0,0	0,0				
Colistin (3)	93													100,0	0,0	0,0					
Sulfamethoxazole	93	35	37,6													21,5	33,3	6,5	1,1	0,0	37,6
Trimethoprim (3)	93												0,0	0,0	0,0	21,5	78,5				
Tetracycline	93	8	8,6									69,9	17,2	4,3	0,0	1,1	7,5				

(1) Neomycin, spectinomycin, ceftiofur, amoxicillin/clavulanic acid were tested in the years 2000 to 2007 only.
(2) Cefotaxime and ceftazidime were tested in 2008 only.
(3) For colistin and trimethoprim no evaluation was performed as the lowest tested concentration was above the epidemiological cut-off value.
(4) The vertical lines demark the epidemiological cut-off values, which are the basis for the evaluation of microbiological resistance.
(5) The white areas demark the range tested. Isolates resistant to the highest concentration are given in the next concentration level.
Values for the lowest concentration include isolates with MICs below the tested range.

Tab. 13.48: *S.* Mbandaka from feeding stuffs (2000–2008)

Antimicrobial tested	Tested isolates (Number)	Microbiologically resistent isolates (Number) (4)	Microbiological resistent isolates (in %) (4)	Distribution (%) of MICs (µg/ml) (5) 0,008	0,015	0,03125	0,0625	0,125	0,25	0,5	1	2	4	8	16	32	64	128	256	512	1024
Gentamicin	137	0	0,0								98,6	1,5	0,0	0,0	0,0	0,0	0,0				
Neomycin (1)	132	2	1,5									97,0	1,5	0,8	0,0	0,0	0,8				
Kanamycin	137	4	2,9										95,6	1,5	2,2	0,0	0,0	0,7			
Spectinomycin (1)	132	15	11,4									0,0	0,0	0,0	1,5	49,2	37,9	8,3	3,0		
Streptomycin	137	3	2,2										4,4	58,4	29,9	5,1	2,2	0,0			
Chloramphenicol	137	0	0,0									2,2	16,8	63,5	17,5	0,0	0,0	0,0			
Florfenicol	137	0	0,0									2,9	68,6	24,8	3,6	0,0	0,0	0,0			
Cefotaxime (2)	5	0	0,0				20,0	60,0	20,0	0,0	0,0	0,0	0,0	0,0							
Ceftazidime (2)	5	0	0,0						0,0	80,0	20,0	0,0	0,0	0,0	0,0	0,0					
Ceftiofur (1)	132	0	0,0							50,0	46,2	3,8	0,0	0,0	0,0						
Nalidixic acid	137	0	0,0										94,2	5,8	0,0	0,0	0,0	0,0			
Ciprofloxacin	137	0	0,0			99,3	0,7	0,0	0,0	0,0	0,0	0,0	0,0	0,0							
Amoxicillin/Clavulanic acid (1)	132	0	0,0									99,2	0,8	0,0	0,0	0,0	0,0				
Ampicillin	137	0	0,0								75,2	23,4	1,5	0,0	0,0	0,0	0,0				
Colistin (3)	137													100,0	0,0	0,0					
Sulfamethoxazole	137	22	16,1													16,8	46,7	17,5	2,9	0,0	16,1
Trimethoprim (3)	137												0,0	0,0	0,0	16,8	83,2				
Tetracycline	137	4	2,9									84,7	11,7	0,7	0,0	0,0	2,9				

(1) Neomycin, spectinomycin, ceftiofur, amoxicillin/clavulanic acid were tested in the years 2000 to 2007 only.
(2) Cefotaxime and ceftazidime were tested in 2008 only.
(3) For colistin and trimethoprim no evaluation was performed as the lowest tested concentration was above the epidemiological cut-off value.
(4) The vertical lines demark the epidemiological cut-off values, which are the basis for the evaluation of microbiological resistance.
(5) The white areas demark the range tested. Isolates resistant to the highest concentration are given in the next concentration level.
Values for the lowest concentration include isolates with MICs below the tested range.

Tab. 13.49: *S.* Montevideo from feeding stuffs (2000–2008)

Antimicrobial tested	Tested isolates (Number)	Microbiologically resistent isolates (Number) (4)	Microbiological resistent isolates (in %) (4)	Distribution (%) of MICs (µg/ml) (5) 0,008	0,015	0,03125	0,0625	0,125	0,25	0,5	1	2	4	8	16	32	64	128	256	512	1024
Gentamicin	87	2	2,3								94,2	3,4	2,3	0,0	0,0	0,0	0,0				
Neomycin (1)	86	0	0,0									98,8	1,2	0,0	0,0	0,0	0,0				
Kanamycin	87	1	1,1										86,2	12,6	1,1	0,0	0,0	0,0			
Spectinomycin (1)	86	0	0,0									0,0	0,0	0,0	7,0	88,4	4,7	0,0	0,0		
Streptomycin	87	0	0,0										9,2	63,2	27,6	0,0	0,0	0,0			
Chloramphenicol	87	0	0,0									2,3	13,8	66,7	17,2	0,0	0,0	0,0			
Florfenicol	87	0	0,0									3,4	54,0	40,2	2,3	0,0	0,0	0,0			
Cefotaxime (2)	1	0	0,0				100,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0							
Ceftazidime (2)	1	0	0,0						100,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0					
Ceftiofur (1)	86	0	0,0							61,6	34,9	3,5	0,0	0,0	0,0						
Nalidixic acid	87	0	0,0										82,8	17,2	0,0	0,0	0,0	0,0			
Ciprofloxacin	87	0	0,0			96,6	3,4	0,0	0,0	0,0	0,0	0,0	0,0	0,0							
Amoxicillin/Clavulanic acid (1)	86	0	0,0									98,8	1,2	0,0	0,0	0,0	0,0				
Ampicillin	87	0	0,0								83,9	16,1	0,0	0,0	0,0	0,0	0,0				
Colistin (3)	87													100,0	0,0	0,0					
Sulfamethoxazole	87	23	26,4													26,4	42,5	3,4	1,1	3,4	23,0
Trimethoprim (3)	87												0,0	0,0	0,0	26,4	73,4				
Tetracycline	87	0	0,0									96,6	3,4	0,0	0,0	0,0	0,0				

(1) Neomycin, spectinomycin, ceftiofur, amoxicillin/clavulanic acid were tested in the years 2000 to 2007 only.
(2) Cefotaxime and ceftazidime were tested in 2008 only.
(3) For colistin and trimethoprim no evaluation was performed as the lowest tested concentration was above the epidemiological cut-off value.
(4) The vertical lines demark the epidemiological cut-off values, which are the basis for the evaluation of microbiological resistance.
(5) The white areas demark the range tested. Isolates resistant to the highest concentration are given in the next concentration level.
Values for the lowest concentration include isolates with MICs below the tested range.

Tab. 13.50: *S.* Muenster from feeding stuffs (2000–2008)

Antimicrobial tested	Tested isolates (Number)	Microbiologically resistent isolates (Number) (4)	Microbiological resistent isolates (in %) (4)	Distribution (%) of MICs (µg/ml) (5)																	
				0,008	0,015	0,03125	0,0625	0,125	0,25	0,5	1	2	4	8	16	32	64	128	256	512	1024
Gentamicin	42	0	0,0								100,0	0,0	0,0	0,0	0,0	0,0	0,0				
Neomycin (1)	42	0	0,0									100,0	0,0	0,0	0,0	0,0	0,0				
Kanamycin	42	0	0,0										100,0	0,0	0,0	0,0	0,0	0,0			
Spectinomycin (1)	42	0	0,0									0,0	0,0	0,0	0,0	100,0	0,0	0,0	0,0		
Streptomycin	42	0	0,0										57,1	35,7	7,1	0,0	0,0	0,0			
Chloramphenicol	42	0	0,0									0,0	2,4	95,2	2,4	0,0	0,0	0,0			
Florfenicol	42	0	0,0									0,0	83,3	16,7	0,0	0,0	0,0	0,0			
Cefotaxime (2)	0	0	0,0				0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0							
Ceftazidime (2)	0	0	0,0						0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0					
Ceftiofur (1)	42	0	0,0							85,7	14,3	0,0	0,0	0,0	0,0						
Nalidixic acid	42	0	0,0										100,0	0,0	0,0	0,0	0,0	0,0			
Ciprofloxacin	42	0	0,0			100,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0							
Amoxicillin/Clavulanic acid (1)	42	0	0,0									100,0	0,0	0,0	0,0	0,0	0,0				
Ampicillin	42	0	0,0								97,6	2,4	0,0	0,0	0,0	0,0	0,0				
Colistin (3)	42													100,0	0,0	0,0					
Sulfamethoxazole	42	0	0,0													83,3	14,3	0,0	2,4	0,0	0,0
Trimethoprim (3)	42												100,0	0,0	0,0	0,0	0,0				
Tetracycline	42	0	0,0									100,0	0,0	0,0	0,0	0,0	0,0				

(1) Neomycin, spectinomycin, ceftiofur, amoxicillin/clavulanic acid were tested in the years 2000 to 2007 only.

(2) Cefotaxime and ceftazidime were tested in 2008 only.

(3) For colistin and trimethoprim no evaluation was performed as the lowest tested concentration was above the epidemiological cut-off value.

(4) The vertical lines demark the epidemiological cut-off values, which are the basis for the evaluation of microbiological resistance.

(5) The white areas demark the range tested. Isolates resistant to the highest concentration are given in the next concentration level. Values for the lowest concentration include isolates with MICs below the tested range.

Tab. 13.51: *S.* Ohio from feeding stuffs (2000–2008)

Antimicrobial tested	Tested isolates (Number)	Microbiologically resistent isolates (Number) (4)	Microbiological resistent isolates (in %) (4)	Distribution (%) of MICs (µg/ml) (5)																	
				0,008	0,015	0,03125	0,0625	0,125	0,25	0,5	1	2	4	8	16	32	64	128	256	512	1024
Gentamicin	120	0	0,0								97,5	2,5	0,0	0,0	0,0	0,0	0,0				
Neomycin (1)	104	0	0,0									98,1	1,9	0,0	0,0	0,0	0,0				
Kanamycin	120	0	0,0										94,2	5,8	0,0	0,0	0,0	0,0			
Spectinomycin (1)	104	0	0,0									0,0	0,0	0,0	0,0	95,2	4,8	0,0	0,0		
Streptomycin	120	0	0,0										63,3	31,7	5,0	0,0	0,0	0,0			
Chloramphenicol	120	0	0,0									0,0	36,7	50,0	13,3	0,0	0,0	0,0			
Florfenicol	120	0	0,0									0,0	52,5	46,7	0,8	0,0	0,0	0,0			
Cefotaxime (2)	16	0	0,0				6,3	87,5	6,3	0,0	0,0	0,0	0,0	0,0							
Ceftazidime (2)	16	0	0,0						18,8	81,3	0,0	0,0	0,0	0,0	0,0	0,0					
Ceftiofur (1)	104	0	0,0							80,8	17,3	1,9	0,0	0,0	0,0						
Nalidixic acid	120	0	0,0										97,5	2,5	0,0	0,0	0,0	0,0			
Ciprofloxacin	120	0	0,0			97,5	2,5	0,0	0,0	0,0	0,0	0,0	0,0	0,0							
Amoxicillin/Clavulanic acid (1)	104	0	0,0									100,0	0,0	0,0	0,0	0,0	0,0				
Ampicillin	120	1	0,8								96,7	2,5	0,0	0,0	0,0	0,0	0,8				
Colistin (3)	120													100,0	0,0	0,0					
Sulfamethoxazole	120	20	16,7													23,3	55,0	5,0	0,0	0,8	15,8
Trimethoprim (3)	120												0,0	0,0	0,0	23,3	76,6				
Tetracycline	120	0	0,0									94,2	4,2	1,7	0,0	0,0	0,0				

(1) Neomycin, spectinomycin, ceftiofur, amoxicillin/clavulanic acid were tested in the years 2000 to 2007 only.
(2) Cefotaxime and ceftazidime were tested in 2008 only.
(3) For colistin and trimethoprim no evaluation was performed as the lowest tested concentration was above the epidemiological cut-off value.
(4) The vertical lines demark the epidemiological cut-off values, which are the basis for the evaluation of microbiological resistance.
(5) The white areas demark the range tested. Isolates resistant to the highest concentration are given in the next concentration level.
Values for the lowest concentration include isolates with MICs below the tested range.

Tab. 13.52: *S.* Oranienburg from feeding stuffs (2000–2008)

Antimicrobial tested	Tested isolates (Number)	Microbiologically resistent isolates (Number) (4)	Microbiological resistent isolates (in %) (4)	Distribution (%) of MICs (µg/ml) (5)																	
				0,008	0,015	0,03125	0,0625	0,125	0,25	0,5	1	2	4	8	16	32	64	128	256	512	1024
Gentamicin	67	0	0,0								100,0	0,0	0,0	0,0	0,0	0,0	0,0				
Neomycin (1)	67	0	0,0									98,5	1,5	0,0	0,0	0,0	0,0				
Kanamycin	67	0	0,0										95,5	4,5	0,0	0,0	0,0	0,0			
Spectinomycin (1)	67	0	0,0									0,0	0,0	0,0	13,4	82,1	4,5	0,0	0,0		
Streptomycin	67	0	0,0										22,4	64,2	11,9	1,5	0,0	0,0			
Chloramphenicol	67	0	0,0									0,0	29,9	58,2	11,9	0,0	0,0	0,0			
Florfenicol	67	0	0,0									1,5	76,1	22,4	0,0	0,0	0,0	0,0			
Cefotaxime (2)	0	0	0,0				0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0							
Ceftazidime (2)	0	0	0,0						0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0					
Ceftiofur (1)	67	0	0,0							79,1	17,9	3,0	0,0	0,0	0,0						
Nalidixic acid	67	0	0,0										95,5	4,5	0,0	0,0	0,0	0,0			
Ciprofloxacin	67	0	0,0			94,0	6,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0							
Amoxicillin/Clavulanic acid (1)	67	0	0,0									100,0	0,0	0,0	0,0	0,0	0,0				
Ampicillin	67	0	0,0								98,5	1,5	0,0	0,0	0,0	0,0	0,0				
Colistin (3)	67													100,0	0,0	0,0					
Sulfamethoxazole	67	8	11,9													79,1	7,5	1,5	0,0	0,0	11,9
Trimethoprim (3)	67												100,0	0,0	0,0	0,0	0,0				
Tetracycline	67	0	0,0									91,0	9,0	0,0	0,0	0,0	0,0				

(1) Neomycin, spectinomycin, ceftiofur, amoxicillin/clavulanic acid were tested in the years 2000 to 2007 only.

(2) Cefotaxime and ceftazidime were tested in 2008 only.

(3) For colistin and trimethoprim no evaluation was performed as the lowest tested concentration was above the epidemiological cut-off value.

(4) The vertical lines demark the epidemiological cut-off values, which are the basis for the evaluation of microbiological resistance.

(5) The white areas demark the range tested. Isolates resistant to the highest concentration are given in the next concentration level. Values for the lowest concentration include isolates with MICs below the tested range.

Tab. 13.53: *S.* Senftenberg from feeding stuffs (2000–2008)

Antimicrobial tested	Tested isolates (Number)	Microbiologically resistent isolates (Number) (4)	Microbiological resistent isolates (in %) (4)	Distribution (%) of MICs (µg/ml) (5)																	
				0,008	0,015	0,03125	0,0625	0,125	0,25	0,5	1	2	4	8	16	32	64	128	256	512	1024
Gentamicin	371	0	0,0								98,1	1,9	0,0	0,0	0,0	0,0	0,0				
Neomycin (1)	346	0	0,0									98,3	1,7	0,0	0,0	0,0	0,0				
Kanamycin	371	0	0,0										97,6	2,4	0,0	0,0	0,0	0,0			
Spectinomycin (1)	346	2	0,6									0,0	0,0	0,3	21,7	75,1	2,3	0,3	0,3		
Streptomycin	371	3	0,8										14,6	56,9	25,3	2,4	0,5	0,3			
Chloramphenicol	371	0	0,0									0,3	14,6	76,8	8,4	0,0	0,0	0,0			
Florfenicol	371	0	0,0									1,3	55,8	42,3	0,5	0,0	0,0	0,0			
Cefotaxime (2)	25	0	0,0				12,0	84,0	4,0	0,0	0,0	0,0	0,0	0,0							
Ceftazidime (2)	25	0	0,0						56,0	44,0	0,0	0,0	0,0	0,0	0,0	0,0					
Ceftiofur (1)	346	0	0,0							63,0	34,4	2,6	0,0	0,0	0,0						
Nalidixic acid	371	0	0,0										92,5	7,3	0,3	0,0	0,0	0,0			
Ciprofloxacin	371	0	0,0			98,4	1,6	0,0	0,0	0,0	0,0	0,0	0,0	0,0							
Amoxicillin/Clavulanic acid (1)	346	0	0,0									100,0	0,0	0,0	0,0	0,0	0,0				
Ampicillin	371	1	0,3								87,9	11,6	0,3	0,0	0,0	0,0	0,3				
Colistin (3)	371													100,0	0,0	0,0					
Sulfamethoxazole	371	135	36,4													27,5	23,7	11,1	1,3	3,2	33,2
Trimethoprim (3)	371												0,0	0,0	0,3	27,2	72,5				
Tetracycline	371	1	0,3									94,7	4,3	0,8	0,0	0,0	0,3				

(1) Neomycin, spectinomycin, ceftiofur, amoxicillin/clavulanic acid were tested in the years 2000 to 2007 only.

(2) Cefotaxime and ceftazidime were tested in 2008 only.

(3) For colistin and trimethoprim no evaluation was performed as the lowest tested concentration was above the epidemiological cut-off value.

(4) The vertical lines demark the epidemiological cut-off values, which are the basis for the evaluation of microbiological resistance.

(5) The white areas demark the range tested. Isolates resistant to the highest concentration are given in the next concentration level. Values for the lowest concentration include isolates with MICs below the tested range.

Tab. 13.54: *S.* Tennessee from feeding stuffs (2000–2008)

Antimicrobial tested	Tested isolates (Number)	Microbiologically resistent isolates (Number) (4)	Microbiological resistent isolates (in %) (4)	Distribution (%) of MICs (µg/ml) (5) 0,008	0,015	0,03125	0,0625	0,125	0,25	0,5	1	2	4	8	16	32	64	128	256	512	1024
Gentamicin	230	0	0,0								99,6	0,4	0,0	0,0	0,0	0,0	0,0				
Neomycin (1)	224	0	0,0									100,0	0,0	0,0	0,0	0,0	0,0				
Kanamycin	230	0	0,0										97,4	2,6	0,0	0,0	0,0	0,0			
Spectinomycin (1)	224	0	0,0									0,0	0,0	0,0	1,3	75,4	23,2	0,0	0,0		
Streptomycin	230	0	0,0										1,3	29,6	57,4	11,7	0,0	0,0			
Chloramphenicol	230	0	0,0									0,0	13,9	77,4	8,7	0,0	0,0	0,0			
Florfenicol	230	0	0,0									0,4	42,2	57,4	0,0	0,0	0,0	0,0			
Cefotaxime (2)	6	0	0,0				0,0	100,0	0,0	0,0	0,0	0,0	0,0	0,0							
Ceftazidime (2)	6	0	0,0						16,7	83,3	0,0	0,0	0,0	0,0	0,0	0,0					
Ceftiofur (1)	224	0	0,0							90,6	9,4	0,0	0,0	0,0	0,0						
Nalidixic acid	230	0	0,0										99,1	0,9	0,0	0,0	0,0	0,0			
Ciprofloxacin	230	0	0,0			99,5	0,4	0,0	0,0	0,0	0,0	0,0	0,0	0,0							
Amoxicillin/Clavulanic acid (1)	224	0	0,0									100,0	0,0	0,0	0,0	0,0	0,0				
Ampicillin	230	0	0,0								96,1	3,5	0,4	0,0	0,0	0,0	0,0				
Colistin (3)	230													100,0	0,0	0,0					
Sulfamethoxazole	230	8	3,5													7,4	70,9	18,3	0,0	0,4	3,0
Trimethoprim (3)	230												0,0	0,0	0,0	7,4	92,6				
Tetracycline	230	0	0,0									97,8	2,2	0,0	0,0	0,0	0,0				

(1) Neomycin, spectinomycin, ceftiofur, amoxicillin/clavulanic acid were tested in the years 2000 to 2007 only.
(2) Cefotaxime and ceftazidime were tested in 2008 only.
(3) For colistin and trimethoprim no evaluation was performed as the lowest tested concentration was above the epidemiological cut-off value.
(4) The vertical lines demark the epidemiological cut-off values, which are the basis for the evaluation of microbiological resistance.
(5) The white areas demark the range tested. Isolates resistant to the highest concentration are given in the next concentration level.
Values for the lowest concentration include isolates with MICs below the tested range.

Tab. 13.55: *S.* Typhimurium from feeding stuffs (2000–2008)

Antimicrobial tested	Tested isolates (Number)	Microbiologically resistent isolates (Number) (4)	Microbiological resistent isolates (in %) (4)	Distribution (%) of MICs (µg/ml) (5) 0,008	0,015	0,03125	0,0625	0,125	0,25	0,5	1	2	4	8	16	32	64	128	256	512	1024
Gentamicin	158	2	1,3								96,9	1,9	0,6	0,0	0,6	0,0	0,0				
Neomycin (1)	138	5	3,6									93,5	2,9	0,0	0,0	0,7	2,9				
Kanamycin	158	6	3,8										92,4	3,8	0,0	0,0	0,0	3,8			
Spectinomycin (1)	138	67	48,6									0,0	0,0	0,0	1,4	39,9	10,1	2,9	45,7		
Streptomycin	158	96	60,8										5,1	20,3	10,1	3,8	31,6	29,1			
Chloramphenicol	158	71	44,9									2,5	11,4	34,8	6,3	0,0	1,9	43,0			
Florfenicol	158	64	40,5									3,8	34,2	19,0	2,5	12,0	22,8	5,7			
Cefotaxime (2)	20	0	0,0				50,0	45,0	5,0	0,0	0,0	0,0	0,0	0,0							
Ceftazidime (2)	20	0	0,0						85,0	15,0	0,0	0,0	0,0	0,0	0,0	0,0					
Ceftiofur (1)	138	1	0,7							50,0	46,4	2,9	0,0	0,7	0,0						
Nalidixic acid	158	7	4,4										84,2	10,8	0,6	0,0	1,3	3,2			
Ciprofloxacin	158	7	4,4			91,1	4,4	0,6	1,9	1,9	0,0	0,0	0,0	0,0							
Amoxicillin/Clavulanic acid (1)	138	81	58,7									39,9	1,4	12,3	39,9	5,8	0,7				
Ampicillin	158	97	61,4								25,3	11,4	1,9	0,0	0,0	2,5	58,9				
Colistin (3)	158													100,0	0,0	0,0					
Sulfamethoxazole	158	116	73,4													6,3	12,7	5,1	2,5	3,2	70,3
Trimethoprim (3)	158												0,0	0,0	0,0	6,3	93,8				
Tetracycline	158	111	70,3									25,3	4,4	0,0	0,0	25,3	44,9				

(1) Neomycin, spectinomycin, ceftiofur, amoxicillin/clavulanic acid were tested in the years 2000 to 2007 only.

(2) Cefotaxime and ceftazidime were tested in 2008 only.

(3) For colistin and trimethoprim no evaluation was performed as the lowest tested concentration was above the epidemiological cut-off value.

(4) The vertical lines demark the epidemiological cut-off values, which are the basis for the evaluation of microbiological resistance.

(5) The white areas demark the range tested. Isolates resistant to the highest concentration are given in the next concentration level.
Values for the lowest concentration include isolates with MICs below the tested range.

13.1.3.4 Isolates from animals

Tab. 13.56: *Salmonella* spp. from animals (2000–2008)

Antimicrobial tested	Tested isolates (Number)	Microbiologically resistent isolates (Number) (4)	Microbiological resistent isolates (in %) (4)	Distribution (%) of MICs (µg/ml) (5) 0,008	0,015	0,03125	0,0625	0,125	0,25	0,5	1	2	4	8	16	32	64	128	256	512	1024
Gentamicin	17635	614	3,5								95,4	1,1	0,2	1,6	1,0	0,5	0,2				
Neomycin (1)	15500	558	3,6									95,3	1,1	0,1	0,2	0,8	2,5				
Kanamycin	17635	959	5,4										92,6	2,0	0,2	1,4	0,5	3,3			
Spectinomycin (1)	15500	4128	26,6									0,0	0,0	0,4	21,6	44,5	6,8	3,9	22,8		
Streptomycin	17635	5524	31,3										18,7	23,1	16,8	10,1	14,7	16,6			
Chloramphenicol	17635	3124	17,7									7,6	30,1	39,4	5,2	0,3	1,9	15,6			
Florfenicol	17635	2754	15,6									15,1	45,6	20,5	3,2	5,7	7,6	2,4			
Cefotaxime (2)	2135	6	0,3				49,4	42,7	6,9	0,7	0,0	0,0	0,0	0,2							
Ceftazidime (2)	2135	4	0,2						71,5	25,9	2,4	0,0	0,1	0,0	0,0	0,0					
Ceftiofur (1)	15500	192	1,2							57,9	36,2	4,6	0,7	0,2	0,3						
Nalidixic acid	17635	1151	6,5										83,1	9,4	0,9	0,2	0,1	6,2			
Ciprofloxacin	17635	1239	7,0			89,0	3,9	1,1	2,4	1,7	1,4	0,3	0,0	0,0							
Amoxicillin/Clavulanic acid (1)	15500	4735	30,5									66,9	2,5	9,7	17,6	3,1	0,2				
Ampicillin	17635	5602	31,8								52,7	13,6	1,4	0,1	0,0	3,1	28,6				
Colistin (3)	17635													99,3	0,6	0,0					
Sulfamethoxazole	17635	7502	42,5													28,5	20,7	7,1	1,2	3,7	38,9
Trimethoprim (3)	17635												89,6	0,9	0,2	0,7	8,6				
Tetracycline	17635	5655	32,1									62,0	5,3	0,6	0,6	9,8	21,6				

(1) Neomycin, spectinomycin, ceftiofur, amoxicillin/clavulanic acid were tested in the years 2000 to 2007 only.
(2) Cefotaxime and ceftazidime were tested in 2008 only.
(3) For colistin and trimethoprim no evaluation was performed as the lowest tested concentration was above the epidemiological cut-off value.
(4) The vertical lines demark the epidemiological cut-off values, which are the basis for the evaluation of microbiological resistance.
(5) The white areas demark the range tested. Isolates resistant to the highest concentration are given in the next concentration level.
Values for the lowest concentration include isolates with MICs below the tested range.

Tab. 13.57: *S.* 4,[5],12:i:- from animals (2000–2008)

Antimicrobial tested	Tested isolates (Number)	Microbiologically resistent isolates (Number) (4)	Microbiological resistent isolates (in %) (4)	Distribution (%) of MICs (µg/ml) (5) 0,008	0,015	0,03125	0,0625	0,125	0,25	0,5	1	2	4	8	16	32	64	128	256	512	1024
Gentamicin	518	7	1,4								98,3	0,4	0,0	0,2	0,8	0,2	0,2				
Neomycin (1)	338	17	5,0									94,4	0,6	0,0	0,6	1,2	3,3				
Kanamycin	518	25	4,8										93,2	1,9	0,2	0,0	0,0	4,7			
Spectinomycin (1)	338	35	10,4									0,0	0,0	0,0	3,8	63,9	21,9	2,4	8,0		
Streptomycin	518	402	77,6										3,3	12,4	5,4	1,4	2,5	75,1			
Chloramphenicol	518	29	5,6									1,4	18,0	71,8	3,3	0,8	0,4	4,4			
Florfenicol	518	15	2,9									2,1	53,7	38,0	3,3	1,2	0,2	1,5			
Cefotaxime (2)	180	0	0,0				66,7	28,9	4,4	0,0	0,0	0,0	0,0	0,0							
Ceftazidime (2)	180	0	0,0						88,9	10,6	0,6	0,0	0,0	0,0	0,0	0,0					
Ceftiofur (1)	338	2	0,6							45,0	47,9	6,5	0,0	0,3	0,3						
Nalidixic acid	518	11	2,1										83,8	11,6	2,5	0,2	0,4	1,6			
Ciprofloxacin	518	19	3,7			92,6	3,7	1,7	0,6	1,0	0,2	0,2	0,0	0,0							
Amoxicillin/Clavulanic acid (1)	338	215	63,6									24,0	12,4	55,0	8,3	0,0	0,3				
Ampicillin	518	406	78,4								16,0	5,0	0,4	0,0	0,0	0,8	77,6				
Colistin (3)	518													100,0	0,0	0,0					
Sulfamethoxazole	518	414	79,9													4,9	12,4	2,5	0,4	0,6	79,4
Trimethoprim (3)	518												91,0	0,0	0,0	0,4	8,7				
Tetracycline	518	440	84,9									14,5	0,6	0,0	0,4	0,8	83,7				

(1) Neomycin, spectinomycin, ceftiofur, amoxicillin/clavulanic acid were tested in the years 2000 to 2007 only.
(2) Cefotaxime and ceftazidime were tested in 2008 only.
(3) For colistin and trimethoprim no evaluation was performed as the lowest tested concentration was above the epidemiological cut-off value.
(4) The vertical lines demark the epidemiological cut-off values, which are the basis for the evaluation of microbiological resistance.
(5) The white areas demark the range tested. Isolates resistant to the highest concentration are given in the next concentration level. Values for the lowest concentration include isolates with MICs below the tested range.

Tab. 13.58: *S.* 4,12:d:- from animals (2000–2008)

Antimicrobial tested	Tested isolates (Number)	Microbiologically resistent isolates (Number) (4)	Microbiological resistent isolates (in %) (4)	Distribution (%) of MICs (µg/ml) (5) 0,008	0,015	0,03125	0,0625	0,125	0,25	0,5	1	2	4	8	16	32	64	128	256	512	1024
Gentamicin	560	1	0,2								96,1	3,8	0,2	0,0	0,0	0,0	0,0				
Neomycin (1)	486	1	0,2									97,3	2,5	0,0	0,0	0,0	0,2				
Kanamycin	560	2	0,4										93,4	6,3	0,2	0,0	0,0	0,2			
Spectinomycin (1)	486	10	2,1									0,0	0,0	0,0	20,6	73,7	3,7	0,4	1,6		
Streptomycin	560	4	0,7										14,8	56,3	25,2	3,0	0,7	0,0			
Chloramphenicol	560	3	0,5									0,0	9,5	82,5	7,5	0,0	0,0	0,5			
Florfenicol	560	0	0,0									0,4	51,1	46,1	2,5	0,0	0,0	0,0			
Cefotaxime (2)	74	0	0,0				6,8	91,9	1,4	0,0	0,0	0,0	0,0	0,0							
Ceftazidime (2)	74	0	0,0						2,7	97,3	0,0	0,0	0,0	0,0	0,0	0,0					
Ceftiofur (1)	486	0	0,0							67,3	31,1	1,6	0,0	0,0	0,0						
Nalidixic acid	560	0	0,0										89,5	9,6	0,9	0,0	0,0	0,0			
Ciprofloxacin	560	3	0,5			98,4	1,1	0,0	0,5	0,0	0,0	0,0	0,0	0,0							
Amoxicillin/Clavulanic acid (1)	486	13	2,7									97,1	0,2	2,3	0,0	0,2	0,2				
Ampicillin	560	14	2,5								88,6	8,6	0,4	0,0	0,0	0,5	2,0				
Colistin (3)	560													99,3	0,4	0,2					
Sulfamethoxazole	560	234	41,8													30,0	16,1	8,2	3,9	2,3	39,5
Trimethoprim (3)	560												97,6	0,5	0,0	0,5	1,4				
Tetracycline	560	7	1,3									86,5	10,5	1,8	0,2	0,4	0,7				

(1) Neomycin, spectinomycin, ceftiofur, amoxicillin/clavulanic acid were tested in the years 2000 to 2007 only.
(2) Cefotaxime and ceftazidime were tested in 2008 only.
(3) For colistin and trimethoprim no evaluation was performed as the lowest tested concentration was above the epidemiological cut-off value.
(4) The vertical lines demark the epidemiological cut-off values, which are the basis for the evaluation of microbiological resistance.
(5) The white areas demark the range tested. Isolates resistant to the highest concentration are given in the next concentration level.
Values for the lowest concentration include isolates with MICs below the tested range.

Tab. 13.59: *S.* Anatum from animals (2000–2008)

Antimicrobial tested	Tested isolates (Number)	Microbiologically resistent isolates (Number) (4)	Microbiological resistent isolates (in %) (4)	Distribution (%) of MICs (µg/ml) (5)																	
				0,008	0,015	0,03125	0,0625	0,125	0,25	0,5	1	2	4	8	16	32	64	128	256	512	1024
Gentamicin	296	17	5,7								91,9	2,4	0,0	1,7	1,4	1,7	1,0				
Neomycin (1)	263	15	5,7									92,8	1,5	0,0	0,4	1,9	3,4				
Kanamycin	296	19	6,4										89,9	3,7	0,7	0,3	0,3	5,0			
Spectinomycin (1)	263	36	13,7									0,0	0,0	0,0	0,4	68,1	17,9	3,0	10,6		
Streptomycin	296	45	15,2										2,7	52,0	24,7	5,4	3,4	11,8			
Chloramphenicol	296	14	4,7									0,3	34,1	55,1	5,7	0,0	0,0	4,7			
Florfenicol	296	6	2,0									1,4	75,7	19,9	1,0	0,0	0,3	1,7			
Cefotaxime (2)	33	1	3,0				27,3	57,6	12,1	0,0	0,0	0,0	0,0	3,0							
Ceftazidime (2)	33	1	3,0						45,5	42,4	9,1	0,0	0,0	0,0	0,0	3,0					
Ceftiofur (1)	263	2	0,8							58,9	39,5	0,8	0,0	0,4	0,4						
Nalidixic acid	296	11	3,7										88,5	7,1	0,7	0,0	0,0	3,7			
Ciprofloxacin	296	13	4,4			93,9	1,7	2,4	2,0	0,0	0,0	0,0	0,0	0,0							
Amoxicillin/Clavulanic acid (1)	263	39	14,8									81,7	3,4	10,3	4,6	0,0	0,0				
Ampicillin	296	55	18,6								72,6	6,4	1,4	0,0	0,0	0,7	17,9				
Colistin (3)	296													99,4	0,7	0,0					
Sulfamethoxazole	296	98	33,1													16,9	29,7	16,6	3,7	3,4	29,8
Trimethoprim (3)	296												0,0	0,0	1,4	15,5	83,2				
Tetracycline	296	44	14,9									81,4	3,0	0,7	0,0	0,3	14,6				

(1) Neomycin, spectinomycin, ceftiofur, amoxicillin/clavulanic acid were tested in the years 2000 to 2007 only.
(2) Cefotaxime and ceftazidime were tested in 2008 only.
(3) For colistin and trimethoprim no evaluation was performed as the lowest tested concentration was above the epidemiological cut-off value.
(4) The vertical lines demark the epidemiological cut-off values, which are the basis for the evaluation of microbiological resistance.
(5) The white areas demark the range tested. Isolates resistant to the highest concentration are given in the next concentration level.
Values for the lowest concentration include isolates with MICs below the tested range.

Tab. 13.60: *S.* Derby from animals (2000–2008)

Antimicrobial tested	Tested isolates (Number)	Microbiologically resistent isolates (Number) (4)	Microbiological resistent isolates (in %) (4)	Distribution (%) of MICs (µg/ml) (5) 0,008	0,015	0,03125	0,0625	0,125	0,25	0,5	1	2	4	8	16	32	64	128	256	512	1024
Gentamicin	338	5	1,5								96,4	2,1	0,0	0,3	0,3	0,9	0,0				
Neomycin (1)	278	15	5,4									92,8	1,8	0,0	0,0	0,0	5,4				
Kanamycin	338	15	4,4										91,1	4,4	0,0	0,0	0,0	4,4			
Spectinomycin (1)	278	47	16,9									0,0	0,0	0,0	6,5	70,9	5,8	1,8	15,1		
Streptomycin	338	69	20,4										6,5	44,1	25,1	3,8	4,7	15,7			
Chloramphenicol	338	10	3,0									0,3	7,1	72,5	17,2	0,9	0,0	2,1			
Florfenicol	338	5	1,5									0,3	20,4	72,5	5,3	0,6	0,0	0,9			
Cefotaxime (2)	60	0	0,0				3,3	80,0	16,7	0,0	0,0	0,0	0,0	0,0							
Ceftazidime (2)	60	0	0,0						3,3	91,7	5,0	0,0	0,0	0,0	0,0	0,0					
Ceftiofur (1)	278	2	0,7							46,8	47,5	5,0	0,7	0,0	0,0						
Nalidixic acid	338	4	1,2										91,1	7,4	0,3	0,0	0,0	1,2			
Ciprofloxacin	338	4	1,2			93,2	5,6	0,0	0,3	0,9	0,0	0,0	0,0	0,0							
Amoxicillin/Clavulanic acid (1)	278	30	10,8									87,8	1,4	6,1	4,0	0,7	0,0				
Ampicillin	338	40	11,8								65,4	21,0	1,8	0,3	0,0	0,0	11,5				
Colistin (3)	338													100,0	0,0	0,0					
Sulfamethoxazole	338	103	30,5													28,4	36,1	4,7	0,3	0,9	29,6
Trimethoprim (3)	338												0,0	0,0	0,3	28,1	71,6				
Tetracycline	338	103	30,5									64,2	4,7	0,6	0,3	1,8	28,4				

(1) Neomycin, spectinomycin, ceftiofur, amoxicillin/clavulanic acid were tested in the years 2000 to 2007 only.
(2) Cefotaxime and ceftazidime were tested in 2008 only.
(3) For colistin and trimethoprim no evaluation was performed as the lowest tested concentration was above the epidemiological cut-off value.
(4) The vertical lines demark the epidemiological cut-off values, which are the basis for the evaluation of microbiological resistance.
(5) The white areas demark the range tested. Isolates resistant to the highest concentration are given in the next concentration level.
Values for the lowest concentration include isolates with MICs below the tested range.

Tab. 13.61: *S.* Enteritidis from animals (2000–2008)

Antimicrobial tested	Tested isolates (Number)	Microbiologically resistent isolates (Number) (4)	Microbiological resistent isolates (in %) (4)	Distribution (%) of MICs (µg/ml) (5)																	
				0,008	0,015	0,03125	0,0625	0,125	0,25	0,5	1	2	4	8	16	32	64	128	256	512	1024
Gentamicin	1664	17	1,0								98,7	0,3	0,1	0,2	0,2	0,4	0,1				
Neomycin (1)	1396	6	0,4									99,1	0,5	0,0	0,1	0,2	0,1				
Kanamycin	1664	8	0,5										98,7	0,8	0,0	0,1	0,2	0,2			
Spectinomycin (1)	1396	24	1,7									0,0	0,1	1,2	72,3	20,9	3,7	0,5	1,2		
Streptomycin	1664	22	1,3										89,3	6,1	2,6	0,6	0,6	0,7			
Chloramphenicol	1664	5	0,3									2,9	37,5	57,6	1,7	0,0	0,0	0,3			
Florfenicol	1664	3	0,2									4,4	74,5	20,6	0,4	0,1	0,1	0,0			
Cefotaxime (2)	268	0	0,0				50,4	48,5	1,1	0,0	0,0	0,0	0,0	0,0							
Ceftazidime (2)	268	0	0,0						92,9	6,7	0,4	0,0	0,0	0,0	0,0	0,0					
Ceftiofur (1)	1396	10	0,7							52,0	45,7	1,6	0,4	0,2	0,1						
Nalidixic acid	1664	93	5,6										84,7	9,4	0,3	0,0	0,1	5,5			
Ciprofloxacin	1664	95	5,7			91,6	2,6	0,1	3,7	1,9	0,1	0,0	0,0	0,0							
Amoxicillin/Clavulanic acid (1)	1396	23	1,6									96,3	2,1	0,8	0,7	0,1	0,0				
Ampicillin	1664	29	1,7								64,2	31,2	2,8	0,2	0,0	0,5	1,1				
Colistin (3)	1664													99,2	0,5	0,0					
Sulfamethoxazole	1664	149	9,0													24,4	52,6	13,6	0,5	0,4	8,6
Trimethoprim (3)	1664												0,0	0,1	0,3	24,0	75,7				
Tetracycline	1664	18	1,1									93,5	5,0	0,4	0,1	0,2	0,8				

(1) Neomycin, spectinomycin, ceftiofur, amoxicillin/clavulanic acid were tested in the years 2000 to 2007 only.

(2) Cefotaxime and ceftazidime were tested in 2008 only.

(3) For colistin and trimethoprim no evaluation was performed as the lowest tested concentration was above the epidemiological cut-off value.

(4) The vertical lines demark the epidemiological cut-off values, which are the basis for the evaluation of microbiological resistance.

(5) The white areas demark the range tested. Isolates resistant to the highest concentration are given in the next concentration level.
Values for the lowest concentration include isolates with MICs below the tested range.

Tab. 13.62: *S.* Heidelberg from animals (2000–2008)

Antimicrobial tested	Tested isolates (Number)	Microbiologically resistent isolates (Number) (4)	Microbiological resistent isolates (in %) (4)	Distribution (%) of MICs (µg/ml) (5) 0,008	0,015	0,03125	0,0625	0,125	0,25	0,5	1	2	4	8	16	32	64	128	256	512	1024
Gentamicin	204	32	15,7								83,4	1,0	0,5	0,5	4,4	7,8	2,5				
Neomycin (1)	201	27	13,4									85,6	1,0	0,0	0,5	3,0	10,0				
Kanamycin	204	34	16,7										77,9	5,4	2,9	0,0	2,9	10,8			
Spectinomycin (1)	201	82	40,8									0,0	0,0	0,0	0,5	40,8	17,9	13,4	27,4		
Streptomycin	204	52	25,5										8,3	35,8	17,2	13,2	15,7	9,8			
Chloramphenicol	204	42	20,6									0,5	18,6	53,9	6,4	1,0	8,3	11,3			
Florfenicol	204	12	5,9									2,9	56,9	17,6	16,7	3,9	2,0	0,0			
Cefotaxime (2)	3	0	0,0				66,7	33,3	0,0	0,0	0,0	0,0	0,0	0,0							
Ceftazidime (2)	3	0	0,0						100,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0					
Ceftiofur (1)	201	1	0,5							64,2	32,8	2,5	0,5	0,0	0,0						
Nalidixic acid	204	2	1,0										82,8	13,2	2,9	0,0	0,0	1,0			
Ciprofloxacin	204	7	3,4			91,7	4,9	2,9	0,0	0,0	0,0	0,5	0,0	0,0							
Amoxicillin/Clavulanic acid (1)	201	75	37,3									59,7	3,0	26,4	10,4	0,5	0,0				
Ampicillin	204	80	39,2								40,7	18,1	2,0	0,0	0,0	10,3	28,9				
Colistin (3)	204													98,5	1,5	0,0					
Sulfamethoxazole	204	107	52,5													27,9	16,2	3,4	0,0	14,2	38,2
Trimethoprim (3)	204												0,0	0,0	0,0	27,9	72,0				
Tetracycline	204	75	36,8									55,4	6,9	1,0	0,5	13,2	23,0				

(1) Neomycin, spectinomycin, ceftiofur, amoxicillin/clavulanic acid were tested in the years 2000 to 2007 only.

(2) Cefotaxime and ceftazidime were tested in 2008 only.

(3) For colistin and trimethoprim no evaluation was performed as the lowest tested concentration was above the epidemiological cut-off value.

(4) The vertical lines demark the epidemiological cut-off values, which are the basis for the evaluation of microbiological resistance.

(5) The white areas demark the range tested. Isolates resistant to the highest concentration are given in the next concentration level. Values for the lowest concentration include isolates with MICs below the tested range.

Tab. 13.63: *S.* Indiana from animals (2000–2008)

Antimicrobial tested	Tested isolates (Number)	Microbiologically resistent isolates (Number) (4)	Microbiological resistent isolates (in %) (4)	Distribution (%) of MICs (µg/ml) (5) 0,008	0,015	0,03125	0,0625	0,125	0,25	0,5	1	2	4	8	16	32	64	128	256	512	1024
Gentamicin	185	0	0,0								100,1	0,0	0,0	0,0	0,0	0,0	0,0				
Neomycin (1)	155	2	1,3									98,1	0,6	0,0	1,3	0,0	0,0				
Kanamycin	185	2	1,1										98,9	0,0	0,0	0,0	0,0	1,1			
Spectinomycin (1)	155	21	13,5									0,0	0,0	0,0	1,9	72,9	11,6	8,4	5,2		
Streptomycin	185	23	12,4										9,7	51,4	21,6	4,9	0,5	11,9			
Chloramphenicol	185	1	0,5									2,2	34,6	62,7	0,0	0,0	0,0	0,5			
Florfenicol	185	0	0,0									3,8	79,5	16,2	0,5	0,0	0,0	0,0			
Cefotaxime (2)	30	0	0,0				90,0	3,3	6,7	0,0	0,0	0,0	0,0	0,0							
Ceftazidime (2)	30	0	0,0						96,7	3,3	0,0	0,0	0,0	0,0	0,0	0,0					
Ceftiofur (1)	155	0	0,0							92,9	6,5	0,6	0,0	0,0	0,0						
Nalidixic acid	185	4	2,2										94,6	2,2	1,1	0,5	0,0	1,6			
Ciprofloxacin	185	5	2,7			96,2	0,5	0,0	2,2	0,5	0,0	0,0	0,0	0,0							
Amoxicillin/Clavulanic acid (1)	155	16	10,3									78,1	11,6	8,4	1,9	0,0	0,0				
Ampicillin	185	35	18,9								63,8	8,1	0,0	0,5	0,0	0,0	18,4				
Colistin (3)	185													100,0	0,0	0,0					
Sulfamethoxazole	185	46	24,9													54,1	8,6	10,8	1,6	1,1	23,8
Trimethoprim (3)	185												0,0	10,3	1,6	42,2	45,9				
Tetracycline	185	36	19,5									77,3	3,2	0,0	0,0	1,1	18,4				

(1) Neomycin, spectinomycin, ceftiofur, amoxicillin/clavulanic acid were tested in the years 2000 to 2007 only.
(2) Cefotaxime and ceftazidime were tested in 2008 only.
(3) For colistin and trimethoprim no evaluation was performed as the lowest tested concentration was above the epidemiological cut-off value.
(4) The vertical lines demark the epidemiological cut-off values, which are the basis for the evaluation of microbiological resistance.
(5) The white areas demark the range tested. Isolates resistant to the highest concentration are given in the next concentration level.
Values for the lowest concentration include isolates with MICs below the tested range.

Tab. 13.64: *S.* Infantis from animals (2000–2008)

Antimicrobial tested	Tested isolates (Number)	Microbiologically resistent isolates (Number) (4)	Microbiological resistent isolates (in %) (4)	Distribution (%) of MICs (µg/ml) (5) 0,008	0,015	0,03125	0,0625	0,125	0,25	0,5	1	2	4	8	16	32	64	128	256	512	1024
Gentamicin	419	0	0,0								98,6	1,4	0,0	0,0	0,0	0,0	0,0				
Neomycin (1)	382	2	0,5									98,4	1,0	0,0	0,0	0,3	0,3				
Kanamycin	419	2	0,5										96,9	2,6	0,0	0,0	0,0	0,5			
Spectinomycin (1)	382	63	16,5									0,0	0,0	0,0	6,8	73,3	3,4	0,5	16,0		
Streptomycin	419	20	4,8										12,4	53,5	15,5	13,8	2,6	2,1			
Chloramphenicol	419	6	1,4									3,6	25,3	60,6	9,1	0,5	0,0	1,0			
Florfenicol	419	4	1,0									3,6	50,8	40,1	4,5	0,2	0,2	0,5			
Cefotaxime (2)	37	0	0,0				5,4	81,1	13,5	0,0	0,0	0,0	0,0	0,0							
Ceftazidime (2)	37	0	0,0						10,8	86,5	2,7	0,0	0,0	0,0	0,0	0,0					
Ceftiofur (1)	382	1	0,3							51,3	41,4	7,1	0,0	0,0	0,3						
Nalidixic acid	419	72	17,2										74,9	6,9	1,0	0,0	0,0	17,2			
Ciprofloxacin	419	75	17,9			76,4	5,7	0,5	8,6	8,1	0,7	0,0	0,0	0,0							
Amoxicillin/Clavulanic acid (1)	382	33	8,6									89,0	2,4	7,9	0,8	0,0	0,0				
Ampicillin	419	39	9,3								71,6	15,0	4,1	0,2	0,0	0,2	8,8				
Colistin (3)	419													99,1	1,0	0,0					
Sulfamethoxazole	419	106	25,3													21,0	49,9	3,1	0,7	0,2	25,1
Trimethoprim (3)	419												0,0	0,0	0,2	20,8	79,0				
Tetracycline	419	67	16,0									79,7	4,1	0,2	0,0	0,7	15,3				

(1) Neomycin, spectinomycin, ceftiofur, amoxicillin/clavulanic acid were tested in the years 2000 to 2007 only.
(2) Cefotaxime and ceftazidime were tested in 2008 only.
(3) For colistin and trimethoprim no evaluation was performed as the lowest tested concentration was above the epidemiological cut-off value.
(4) The vertical lines demark the epidemiological cut-off values, which are the basis for the evaluation of microbiological resistance.
(5) The white areas demark the range tested. Isolates resistant to the highest concentration are given in the next concentration level.
Values for the lowest concentration include isolates with MICs below the tested range.

Tab. 13.65: *S.* Kottbus from animals (2000–2008)

Antimicrobial tested	Tested isolates (Number)	Microbiologically resistent isolates (Number) (4)	Microbiological resistent isolates (in %) (4)	Distribution (%) of MICs (µg/ml) (5) 0,008	0,015	0,03125	0,0625	0,125	0,25	0,5	1	2	4	8	16	32	64	128	256	512	1024
Gentamicin	165	0	0,0								98,8	1,2	0,0	0,0	0,0	0,0	0,0				
Neomycin (1)	156	0	0,0									100,0	0,0	0,0	0,0	0,0	0,0				
Kanamycin	165	0	0,0										99,4	0,6	0,0	0,0	0,0	0,0			
Spectinomycin (1)	156	6	3,8									0,0	0,0	0,0	4,5	66,7	25,0	1,9	1,9		
Streptomycin	165	1	0,6										10,3	68,5	17,0	3,6	0,0	0,6			
Chloramphenicol	165	0	0,0									22,4	72,1	4,8	0,6	0,0	0,0	0,0			
Florfenicol	165	0	0,0									43,0	56,4	0,6	0,0	0,0	0,0	0,0			
Cefotaxime (2)	9	0	0,0				88,9	11,1	0,0	0,0	0,0	0,0	0,0	0,0							
Ceftazidime (2)	9	0	0,0						100,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0					
Ceftiofur (1)	156	5	3,2							63,5	31,4	1,9	0,0	3,2	0,0						
Nalidixic acid	165	91	55,2										43,0	1,8	0,0	0,0	0,6	54,6			
Ciprofloxacin	165	87	52,7			44,8	2,4	41,2	8,5	3,0	0,0	0,0	0,0	0,0							
Amoxicillin/Clavulanic acid (1)	156	88	56,4									42,9	0,6	19,2	27,6	9,6	0,0				
Ampicillin	165	96	58,2								32,7	9,1	0,0	0,0	0,0	10,3	47,9				
Colistin (3)	165													100,0	0,0	0,0					
Sulfamethoxazole	165	15	9,1													70,3	17,0	3,0	0,6	2,4	6,7
Trimethoprim (3)	165												91,6	0,0	0,0	4,2	4,2				
Tetracycline	165	92	55,8									43,0	1,2	0,0	0,6	10,3	44,8				

(1) Neomycin, spectinomycin, ceftiofur, amoxicillin/clavulanic acid were tested in the years 2000 to 2007 only.

(2) Cefotaxime and ceftazidime were tested in 2008 only.

(3) For colistin and trimethoprim no evaluation was performed as the lowest tested concentration was above the epidemiological cut-off value.

(4) The vertical lines demark the epidemiological cut-off values, which are the basis for the evaluation of microbiological resistance.

(5) The white areas demark the range tested. Isolates resistant to the highest concentration are given in the next concentration level.
Values for the lowest concentration include isolates with MICs below the tested range.

Tab. 13.66: *S.* Livingstone from animals (2000–2008)

Antimicrobial tested	Tested isolates (Number)	Microbiologically resistent isolates (Number) (4)	Microbiological resistent isolates (in %) (4)	Distribution (%) of MICs (µg/ml) (5) 0,008	0,015	0,03125	0,0625	0,125	0,25	0,5	1	2	4	8	16	32	64	128	256	512	1024
Gentamicin	256	5	2,0								94,1	3,9	0,8	0,0	0,0	0,4	0,8				
Neomycin (1)	216	27	12,5									83,3	4,2	0,5	2,8	5,1	4,2				
Kanamycin	256	29	11,3										83,2	5,5	1,2	0,0	0,0	10,2			
Spectinomycin (1)	216	39	18,1									0,0	0,0	0,0	29,6	48,1	4,2	1,4	16,7		
Streptomycin	256	28	10,9										48,8	21,9	12,9	5,5	4,3	6,6			
Chloramphenicol	256	14	5,5									0,0	17,2	65,2	12,1	0,0	0,4	5,1			
Florfenicol	256	1	0,4									0,0	43,4	51,2	5,1	0,0	0,0	0,4			
Cefotaxime (2)	40	0	0,0				77,5	17,5	5,0	0,0	0,0	0,0	0,0	0,0							
Ceftazidime (2)	40	0	0,0						80,0	20,0	0,0	0,0	0,0	0,0	0,0	0,0					
Ceftiofur (1)	216	3	1,4							62,5	31,5	4,6	0,0	0,0	1,4						
Nalidixic acid	256	5	2,0										84,4	12,9	0,8	0,8	0,0	1,2			
Ciprofloxacin	256	4	1,6			92,2	6,3	0,4	0,4	0,4	0,0	0,4	0,0	0,0							
Amoxicillin/Clavulanic acid (1)	216	19	8,8									90,3	0,9	7,4	1,4	0,0	0,0				
Ampicillin	256	21	8,2								73,0	16,8	1,6	0,0	0,0	1,2	7,0				
Colistin (3)	256													99,2	0,4	0,0					
Sulfamethoxazole	256	82	32,0													18,0	44,5	5,1	0,4	0,8	31,3
Trimethoprim (3)	256												0,0	0,0	0,0	18,0	82,1				
Tetracycline	256	48	18,8									73,9	5,9	1,6	0,0	0,8	18,0				

(1) Neomycin, spectinomycin, ceftiofur, amoxicillin/clavulanic acid were tested in the years 2000 to 2007 only.

(2) Cefotaxime and ceftazidime were tested in 2008 only.

(3) For colistin and trimethoprim no evaluation was performed as the lowest tested concentration was above the epidemiological cut-off value.

(4) The vertical lines demark the epidemiological cut-off values, which are the basis for the evaluation of microbiological resistance.

(5) The white areas demark the range tested. Isolates resistant to the highest concentration are given in the next concentration level. Values for the lowest concentration include isolates with MICs below the tested range.

Tab. 13.67: *S*. London from animals (2000–2008)

Antimicrobial tested	Tested isolates (Number)	Microbiologically resistent isolates (Number) (4)	Microbiological resistent isolates (in %) (4)	Distribution (%) of MICs (µg/ml) (5)																	
				0,008	0,015	0,03125	0,0625	0,125	0,25	0,5	1	2	4	8	16	32	64	128	256	512	1024
Gentamicin	184	0	0,0								99,9	0,0	0,0	0,0	0,0	0,0	0,0				
Neomycin (1)	175	0	0,0									98,9	1,1	0,0	0,0	0,0	0,0				
Kanamycin	184	0	0,0										97,3	2,7	0,0	0,0	0,0	0,0			
Spectinomycin (1)	175	6	3,4									0,0	0,0	0,0	22,9	68,0	5,7	1,1	2,3		
Streptomycin	184	30	16,3										27,2	45,7	9,8	1,1	4,9	11,4			
Chloramphenicol	184	0	0,0									7,6	57,1	34,2	1,1	0,0	0,0	0,0			
Florfenicol	184	0	0,0									32,6	61,4	5,4	0,5	0,0	0,0	0,0			
Cefotaxime (2)	9	0	0,0				100,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0							
Ceftazidime (2)	9	0	0,0						100,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0					
Ceftiofur (1)	175	0	0,0							85,7	13,7	0,6	0,0	0,0	0,0						
Nalidixic acid	184	0	0,0										92,9	7,1	0,0	0,0	0,0	0,0			
Ciprofloxacin	184	1	0,5			97,3	2,2	0,0	0,5	0,0	0,0	0,0	0,0	0,0							
Amoxicillin/Clavulanic acid (1)	175	18	10,3									85,1	4,6	5,7	4,6	0,0	0,0				
Ampicillin	184	27	14,7								72,8	12,5	0,0	0,0	0,0	0,5	14,1				
Colistin (3)	184													99,0	1,1	0,0					
Sulfamethoxazole	184	46	25,0													11,4	35,9	27,7	0,0	1,1	23,9
Trimethoprim (3)	184												0,0	0,0	0,0	11,4	88,6				
Tetracycline	184	37	20,1									78,3	1,6	0,0	0,0	1,1	19,0				

(1) Neomycin, spectinomycin, ceftiofur, amoxicillin/clavulanic acid were tested in the years 2000 to 2007 only.

(2) Cefotaxime and ceftazidime were tested in 2008 only.

(3) For colistin and trimethoprim no evaluation was performed as the lowest tested concentration was above the epidemiological cut-off value.

(4) The vertical lines demark the epidemiological cut-off values, which are the basis for the evaluation of microbiological resistance.

(5) The white areas demark the range tested. Isolates resistant to the highest concentration are given in the next concentration level.
Values for the lowest concentration include isolates with MICs below the tested range.

Tab. 13.68: *S.* Paratyphi B dT+ from animals (2000–2008)

Antimicrobial tested	Tested isolates (Number)	Microbiologically resistent isolates (Number) (4)	Microbiological resistent isolates (in %) (4)	Distribution (%) of MICs (µg/ml) (5) 0,008	0,015	0,03125	0,0625	0,125	0,25	0,5	1	2	4	8	16	32	64	128	256	512	1024
Gentamicin	263	1	0,4								99,6	0,0	0,0	0,0	0,4	0,0	0,0				
Neomycin (1)	248	7	2,8									96,4	0,8	0,0	1,6	0,8	0,4				
Kanamycin	263	8	3,0										96,2	0,8	0,0	0,0	0,4	2,7			
Spectinomycin (1)	248	236	95,2									0,0	0,0	0,0	1,6	3,2	0,0	9,3	85,9		
Streptomycin	263	42	16,0										3,0	1,9	30,4	48,7	11,0	5,0			
Chloramphenicol	263	4	1,5									28,9	36,5	25,5	7,6	0,0	0,4	1,1			
Florfenicol	263	0	0,0									39,9	40,7	15,2	4,2	0,0	0,0	0,0			
Cefotaxime (2)	15	2	13,3				6,7	20,0	60,0	0,0	0,0	0,0	0,0	13,3							
Ceftazidime (2)	15	2	13,3						6,7	73,3	6,7	0,0	13,3	0,0	0,0	0,0					
Ceftiofur (1)	248	3	1,2							66,9	23,8	8,1	1,2	0,0	0,0						
Nalidixic acid	263	152	57,8										35,0	6,5	0,8	0,0	0,0	57,8			
Ciprofloxacin	263	156	59,3			38,0	2,7	1,1	26,6	22,8	5,7	2,7	0,4	0,0							
Amoxicillin/Clavulanic acid (1)	248	54	21,8									72,6	5,6	17,7	4,0	0,0	0,0				
Ampicillin	263	66	25,1								57,0	14,4	3,4	1,1	0,0	1,1	22,8				
Colistin (3)	263													98,1	1,5	0,0					
Sulfamethoxazole	263	144	54,8													38,8	4,9	1,5	0,0	8,7	46,0
Trimethoprim (3)	263												0,0	0,0	0,0	38,8	61,1				
Tetracycline	263	27	10,3									78,3	10,6	0,8	0,0	0,4	9,9				

(1) Neomycin, spectinomycin, ceftiofur, amoxicillin/clavulanic acid were tested in the years 2000 to 2007 only.

(2) Cefotaxime and ceftazidime were tested in 2008 only.

(3) For colistin and trimethoprim no evaluation was performed as the lowest tested concentration was above the epidemiological cut-off value.

(4) The vertical lines demark the epidemiological cut-off values, which are the basis for the evaluation of microbiological resistance.

(5) The white areas demark the range tested. Isolates resistant to the highest concentration are given in the next concentration level.
Values for the lowest concentration include isolates with MICs below the tested range.

Tab. 13.69: *S.* Saintpaul from animals (2000–2008)

Antimicrobial tested	Tested isolates (Number)	Microbiologically resistent isolates (Number) (4)	Microbiological resistent isolates (in %) (4)	0,008	0,015	0,03125	0,0625	0,125	0,25	0,5	1	2	4	8	16	32	64	128	256	512	1024
				Distribution (%) of MICs (µg/ml) (5)																	
Gentamicin	333	258	77,5								22,5	0,0	3,0	49,8	22,5	1,5	0,6				
Neomycin (1)	299	22	7,4									92,0	0,7	0,0	0,0	1,0	6,4				
Kanamycin	333	263	79,0										21,0	0,0	1,5	55,3	15,3	6,9			
Spectinomycin (1)	299	240	80,3									0,0	0,0	0,0	0,0	12,4	7,4	28,4	51,8		
Streptomycin	333	202	60,7										1,8	7,2	3,3	27,0	49,2	11,4			
Chloramphenicol	333	36	10,8									0,0	3,6	24,3	61,3	4,5	0,9	5,4			
Florfenicol	333	11	3,3									1,2	19,2	27,3	48,9	1,8	1,5	0,0			
Cefotaxime (2)	34	0	0,0				5,9	5,9	79,4	8,8	0,0	0,0	0,0	0,0							
Ceftazidime (2)	34	0	0,0						5,9	58,8	35,3	0,0	0,0	0,0	0,0	0,0					
Ceftiofur (1)	299	72	24,1							9,0	16,7	50,2	23,1	1,0	0,0						
Nalidixic acid	333	261	78,4										20,4	1,2	0,0	0,6	0,6	77,1			
Ciprofloxacin	333	260	78,1			21,3	0,6	0,0	0,9	11,1	56,2	9,9	0,0	0,0							
Amoxicillin/Clavulanic acid (1)	299	253	84,6									8,4	7,0	5,4	43,1	36,1	0,0				
Ampicillin	333	304	91,3								6,3	1,8	0,6	0,0	0,0	24,9	66,4				
Colistin (3)	333													99,1	0,6	0,0					
Sulfamethoxazole	333	301	90,4													2,7	2,1	3,3	1,5	24,3	66,1
Trimethoprim (3)	333												0,0	0,0	0,0	2,7	97,3				
Tetracycline	333	76	22,8									36,9	39,6	0,6	0,0	3,0	19,8				

(1) Neomycin, spectinomycin, ceftiofur, amoxicillin/clavulanic acid were tested in the years 2000 to 2007 only.

(2) Cefotaxime and ceftazidime were tested in 2008 only.

(3) For colistin and trimethoprim no evaluation was performed as the lowest tested concentration was above the epidemiological cut-off value.

(4) The vertical lines demark the epidemiological cut-off values, which are the basis for the evaluation of microbiological resistance.

(5) The white areas demark the range tested. Isolates resistant to the highest concentration are given in the next concentration level. Values for the lowest concentration include isolates with MICs below the tested range.

Tab. 13.70: *S.* Subspec. I, rough from animals (2000–2008)

Antimicrobial tested	Tested isolates (Number)	Microbiologically resistent isolates (Number) (4)	Microbiological resistent isolates (in %) (4)	Distribution (%) of MICs (µg/ml) (5)																	
				0,008	0,015	0,03125	0,0625	0,125	0,25	0,5	1	2	4	8	16	32	64	128	256	512	1024
Gentamicin	327	12	3,7								95,7	0,6	0,6	2,1	0,9	0,0	0,0				
Neomycin (1)	269	14	5,2									93,7	1,1	0,0	0,4	3,0	1,9				
Kanamycin	327	29	8,9										90,5	0,6	0,6	1,8	0,3	6,1			
Spectinomycin (1)	269	62	23,0									0,0	0,0	0,0	33,8	36,8	6,3	3,0	20,1		
Streptomycin	327	82	25,1										41,3	20,5	7,0	6,1	10,1	15,0			
Chloramphenicol	327	41	12,5									8,0	32,7	41,0	5,8	1,2	1,5	9,8			
Florfenicol	327	26	8,0									10,1	48,0	28,4	5,5	3,7	3,1	1,2			
Cefotaxime (2)	58	0	0,0				32,8	58,6	8,6	0,0	0,0	0,0	0,0	0,0							
Ceftazidime (2)	58	0	0,0						50,0	44,8	5,2	0,0	0,0	0,0	0,0	0,0					
Ceftiofur (1)	269	2	0,7							54,6	36,8	7,8	0,0	0,4	0,4						
Nalidixic acid	327	23	7,0										83,2	8,9	0,9	0,9	0,0	6,1			
Ciprofloxacin	327	29	8,9			88,4	2,4	0,6	2,8	2,1	3,4	0,0	0,0	0,0							
Amoxicillin/Clavulanic acid (1)	269	74	27,5									70,6	1,9	10,4	13,4	3,7	0,0				
Ampicillin	327	94	28,7								48,6	20,2	2,1	0,0	0,0	1,5	27,2				
Colistin (3)	327													99,7	0,3	0,0					
Sulfamethoxazole	327	120	36,7													41,3	19,0	2,4	0,6	1,8	34,8
Trimethoprim (3)	327												0,0	0,3	1,2	39,8	58,6				
Tetracycline	327	93	28,4									66,7	4,9	0,0	2,1	5,2	21,1				

(1) Neomycin, spectinomycin, ceftiofur, amoxicillin/clavulanic acid were tested in the years 2000 to 2007 only.

(2) Cefotaxime and ceftazidime were tested in 2008 only.

(3) For colistin and trimethoprim no evaluation was performed as the lowest tested concentration was above the epidemiological cut-off value.

(4) The vertical lines demark the epidemiological cut-off values, which are the basis for the evaluation of microbiological resistance.

(5) The white areas demark the range tested. Isolates resistant to the highest concentration are given in the next concentration level.
Values for the lowest concentration include isolates with MICs below the tested range.

Tab. 13.71: *S.* Subspec. II from animals (2000–2008)

Antimicrobial tested	Tested isolates (Number)	Microbiologically resistent isolates (Number) (4)	Microbiological resistent isolates (in %) (4)	Distribution (%) of MICs (µg/ml) (5)																	
				0,008	0,015	0,03125	0,0625	0,125	0,25	0,5	1	2	4	8	16	32	64	128	256	512	1024
Gentamicin	189	0	0,0								99,5	0,5	0,0	0,0	0,0	0,0	0,0				
Neomycin (1)	164	0	0,0									98,8	1,2	0,0	0,0	0,0	0,0				
Kanamycin	189	0	0,0										99,5	0,5	0,0	0,0	0,0	0,0			
Spectinomycin (1)	164	0	0,0									0,0	0,0	3,0	57,9	37,8	1,2	0,0	0,0		
Streptomycin	189	4	2,1										47,6	31,2	14,8	4,2	2,1	0,0			
Chloramphenicol	189	0	0,0									0,5	18,5	73,0	7,9	0,0	0,0	0,0			
Florfenicol	189	0	0,0									2,1	42,9	53,4	1,6	0,0	0,0	0,0			
Cefotaxime (2)	25	0	0,0				20,0	76,0	4,0	0,0	0,0	0,0	0,0	0,0							
Ceftazidime (2)	25	0	0,0						56,0	44,0	0,0	0,0	0,0	0,0	0,0	0,0					
Ceftiofur (1)	164	0	0,0							48,8	49,4	1,8	0,0	0,0	0,0						
Nalidixic acid	189	3	1,6										92,6	5,3	0,5	0,5	0,0	1,1			
Ciprofloxacin	189	4	2,1			95,3	2,6	0,0	0,0	2,1	0,0	0,0	0,0	0,0							
Amoxicillin/Clavulanic acid (1)	164	2	1,2									98,8	0,0	0,6	0,0	0,0	0,6				
Ampicillin	189	2	1,1								57,1	38,6	2,6	0,0	0,5	0,0	0,5				
Colistin (3)	189													99,4	0,5	0,0					
Sulfamethoxazole	189	31	16,4													46,6	22,8	11,1	3,2	0,0	16,4
Trimethoprim (3)	189												100,0	0,0	0,0	0,0	0,0				
Tetracycline	189	0	0,0									93,6	6,3	0,0	0,0	0,0	0,0				

(1) Neomycin, spectinomycin, ceftiofur, amoxicillin/clavulanic acid were tested in the years 2000 to 2007 only.

(2) Cefotaxime and ceftazidime were tested in 2008 only.

(3) For colistin and trimethoprim no evaluation was performed as the lowest tested concentration was above the epidemiological cut-off value.

(4) The vertical lines demark the epidemiological cut-off values, which are the basis for the evaluation of microbiological resistance.

(5) The white areas demark the range tested. Isolates resistant to the highest concentration are given in the next concentration level.
Values for the lowest concentration include isolates with MICs below the tested range.

Tab. 13.72: *S.* Subspec. IIIa from animals (2000–2008)

Antimicrobial tested	Tested isolates (Number)	Microbiologically resistent isolates (Number) (4)	Microbiological resistent isolates (in %) (4)	Distribution (%) of MICs (µg/ml) (5)																	
				0,008	0,015	0,03125	0,0625	0,125	0,25	0,5	1	2	4	8	16	32	64	128	256	512	1024
Gentamicin	179	0	0,0								97,8	2,2	0,0	0,0	0,0	0,0	0,0				
Neomycin (1)	142	0	0,0									99,3	0,7	0,0	0,0	0,0	0,0				
Kanamycin	179	0	0,0										98,3	1,7	0,0	0,0	0,0	0,0			
Spectinomycin (1)	142	0	0,0									0,0	0,0	0,0	87,3	12,7	0,0	0,0	0,0		
Streptomycin	179	0	0,0										89,4	6,1	4,5	0,0	0,0	0,0			
Chloramphenicol	179	0	0,0									4,5	55,3	40,2	0,0	0,0	0,0	0,0			
Florfenicol	179	0	0,0									26,8	70,4	2,8	0,0	0,0	0,0	0,0			
Cefotaxime (2)	37	0	0,0				81,1	16,2	2,7	0,0	0,0	0,0	0,0	0,0							
Ceftazidime (2)	37	0	0,0						97,3	2,7	0,0	0,0	0,0	0,0	0,0	0,0					
Ceftiofur (1)	142	0	0,0							88,7	11,3	0,0	0,0	0,0	0,0						
Nalidixic acid	179	0	0,0										96,6	2,8	0,6	0,0	0,0	0,0			
Ciprofloxacin	179	1	0,6			97,2	1,7	0,0	0,0	0,6	0,0	0,0	0,0	0,0							
Amoxicillin/Clavulanic acid (1)	142	0	0,0									97,9	2,1	0,0	0,0	0,0	0,0				
Ampicillin	179	0	0,0								90,5	7,8	0,6	0,0	0,0	0,0	0,0				
Colistin (3)	179													100,0	0,0	0,0					
Sulfamethoxazole	179	13	7,3													50,9	35,2	6,1	0,6	1,1	6,1
Trimethoprim (3)	179												99,5	0,0	0,6	0,0	0,0				
Tetracycline	179	0	0,0									97,7	2,2	0,0	0,0	0,0	0,0				

(1) Neomycin, spectinomycin, ceftiofur, amoxicillin/clavulanic acid were tested in the years 2000 to 2007 only.

(2) Cefotaxime and ceftazidime were tested in 2008 only.

(3) For colistin and trimethoprim no evaluation was performed as the lowest tested concentration was above the epidemiological cut-off value.

(4) The vertical lines demark the epidemiological cut-off values, which are the basis for the evaluation of microbiological resistance.

(5) The white areas demark the range tested. Isolates resistant to the highest concentration are given in the next concentration level. Values for the lowest concentration include isolates with MICs below the tested range.

Tab. 13.73: *S.* Subspec. IIIb from animals (2000–2008)

Antimicrobial tested	Tested isolates (Number)	Microbiologically resistent isolates (Number) (4)	Microbiological resistent isolates (in %) (4)	0,008	0,015	0,03125	0,0625	0,125	0,25	0,5	1	2	4	8	16	32	64	128	256	512	1024
				Distribution (%) of MICs (µg/ml) (5)																	
Gentamicin	594	2	0,3								99,5	0,2	0,3	0,0	0,0	0,0	0,0				
Neomycin (1)	516	1	0,2									99,8	0,0	0,0	0,0	0,2	0,0				
Kanamycin	594	2	0,3										99,2	0,5	0,2	0,0	0,0	0,2			
Spectinomycin (1)	516	2	0,4									0,0	0,0	0,6	17,1	77,1	4,8	0,2	0,2		
Streptomycin	594	33	5,6										1,9	13,3	55,7	23,6	5,2	0,3			
Chloramphenicol	594	1	0,2									15,2	69,2	15,2	0,3	0,2	0,0	0,0			
Florfenicol	594	1	0,2									41,6	55,6	2,4	0,3	0,2	0,0	0,0			
Cefotaxime (2)	78	0	0,0				96,2	2,6	1,3	0,0	0,0	0,0	0,0	0,0							
Ceftazidime (2)	78	0	0,0						98,7	1,3	0,0	0,0	0,0	0,0	0,0	0,0					
Ceftiofur (1)	516	1	0,2							91,3	7,8	0,8	0,0	0,0	0,2						
Nalidixic acid	594	15	2,5										95,3	2,0	0,2	0,0	0,8	1,7			
Ciprofloxacin	594	12	2,0			95,9	1,2	0,5	1,0	0,3	0,0	0,2	0,0	0,0							
Amoxicillin/Clavulanic acid (1)	516	2	0,4									98,1	1,6	0,2	0,2	0,0	0,0				
Ampicillin	594	2	0,3								86,9	8,8	1,2	0,2	0,0	0,0	0,2				
Colistin (3)	594													98,9	1,0	0,0					
Sulfamethoxazole	594	83	14,0													29,8	29,5	21,7	5,1	0,5	13,5
Trimethoprim (3)	594												96,6	2,4	0,5	0,2	0,3				
Tetracycline	594	14	2,4									95,2	2,2	0,2	0,7	0,5	1,2				

(1) Neomycin, spectinomycin, ceftiofur, amoxicillin/clavulanic acid were tested in the years 2000 to 2007 only.
(2) Cefotaxime and ceftazidime were tested in 2008 only.
(3) For colistin and trimethoprim no evaluation was performed as the lowest tested concentration was above the epidemiological cut-off value.
(4) The vertical lines demark the epidemiological cut-off values, which are the basis for the evaluation of microbiological resistance.
(5) The white areas demark the range tested. Isolates resistant to the highest concentration are given in the next concentration level.
Values for the lowest concentration include isolates with MICs below the tested range.

Tab. 13.74: *S.* Subspec. IV from animals (2000–2008)

Antimicrobial tested	Tested isolates (Number)	Microbiologically resistent isolates (Number) (4)	Microbiological resistent isolates (in %) (4)	Distribution (%) of MICs (µg/ml) (5) 0,008	0,015	0,03125	0,0625	0,125	0,25	0,5	1	2	4	8	16	32	64	128	256	512	1024
Gentamicin	355	1	0,3								99,2	0,6	0,0	0,0	0,3	0,0	0,0				
Neomycin (1)	294	0	0,0									100,0	0,0	0,0	0,0	0,0	0,0				
Kanamycin	355	1	0,3										99,4	0,3	0,0	0,3	0,0	0,0			
Spectinomycin (1)	294	1	0,3									0,0	0,0	0,0	24,1	71,8	3,7	0,0	0,3		
Streptomycin	355	36	10,1										8,2	9,6	38,6	33,5	9,3	0,8			
Chloramphenicol	355	0	0,0									3,9	39,4	52,7	3,9	0,0	0,0	0,0			
Florfenicol	355	0	0,0									13,0	62,0	23,4	1,7	0,0	0,0	0,0			
Cefotaxime (2)	61	0	0,0				50,8	47,5	1,6	0,0	0,0	0,0	0,0	0,0							
Ceftazidime (2)	61	0	0,0						91,8	8,2	0,0	0,0	0,0	0,0	0,0	0,0					
Ceftiofur (1)	294	0	0,0							60,9	37,8	1,4	0,0	0,0	0,0						
Nalidixic acid	355	2	0,6										93,8	5,1	0,6	0,3	0,0	0,3			
Ciprofloxacin	355	6	1,7			95,8	2,5	0,3	0,3	0,8	0,0	0,3	0,0	0,0							
Amoxicillin/Clavulanic acid (1)	294	1	0,3									99,0	0,7	0,3	0,0	0,0	0,0				
Ampicillin	355	2	0,6								77,2	20,8	0,6	0,0	0,0	0,0	0,6				
Colistin (3)	355													99,4	0,6	0,0					
Sulfamethoxazole	355	36	10,1													43,7	30,1	11,0	5,1	3,1	7,0
Trimethoprim (3)	355												99,5	0,3	0,0	0,0	0,3				
Tetracycline	355	4	1,1									95,7	3,1	0,0	0,0	0,0	1,1				

(1) Neomycin, spectinomycin, ceftiofur, amoxicillin/clavulanic acid were tested in the years 2000 to 2007 only.

(2) Cefotaxime and ceftazidime were tested in 2008 only.

(3) For colistin and trimethoprim no evaluation was performed as the lowest tested concentration was above the epidemiological cut-off value.

(4) The vertical lines demark the epidemiological cut-off values, which are the basis for the evaluation of microbiological resistance.

(5) The white areas demark the range tested. Isolates resistant to the highest concentration are given in the next concentration level. Values for the lowest concentration include isolates with MICs below the tested range.

Tab. 13.75: *S.* Typhimurium from animals (2000–2008)

Antimicrobial tested	Tested isolates (Number)	Microbiologically resistent isolates (Number) (4)	Microbiological resistent isolates (in %) (4)	Distribution (%) of MICs (µg/ml) (5) 0,008	0,015	0,03125	0,0625	0,125	0,25	0,5	1	2	4	8	16	32	64	128	256	512	1024
Gentamicin	7712	215	2,8								96,1	1,1	0,1	1,2	0,8	0,5	0,2				
Neomycin (1)	7062	326	4,6									94,1	1,3	0,2	0,1	1,0	3,4				
Kanamycin	7712	421	5,5										92,5	2,1	0,2	0,7	0,2	4,3			
Spectinomycin (1)	7062	3040	43,0									0,0	0,0	0,5	16,3	34,7	5,4	5,1	38,0		
Streptomycin	7712	4150	53,8										3,9	14,9	15,9	11,5	26,5	27,4			
Chloramphenicol	7712	2836	36,8									11,3	24,8	24,3	2,8	0,1	3,7	32,9			
Florfenicol	7712	2642	34,3									21,3	29,9	12,6	2,0	12,3	16,9	5,0			
Cefotaxime (2)	650	1	0,2				51,2	40,3	7,1	1,2	0,2	0,0	0,0	0,0							
Ceftazidime (2)	650	0	0,0						77,4	20,6	2,0	0,0	0,0	0,0	0,0	0,0					
Ceftiofur (1)	7062	66	0,9							54,5	39,8	4,7	0,3	0,2	0,5						
Nalidixic acid	7712	255	3,3										83,8	11,8	1,0	0,3	0,1	2,9			
Ciprofloxacin	7712	282	3,7			90,9	5,4	0,9	1,6	0,8	0,2	0,0	0,0	0,0							
Amoxicillin/Clavulanic acid (1)	7062	3614	51,2									46,5	2,4	13,0	33,3	4,6	0,3				
Ampicillin	7712	4063	52,7								37,4	8,6	1,1	0,0	0,0	5,0	47,7				
Colistin (3)	7712													99,2	0,6	0,0					
Sulfamethoxazole	7712	4827	62,6													27,3	6,5	3,0	0,6	5,4	57,2
Trimethoprim (3)	7712												88,3	0,7	0,1	0,6	10,4				
Tetracycline	7712	4128	53,5									41,3	4,6	0,5	0,9	20,6	31,9				

(1) Neomycin, spectinomycin, ceftiofur, amoxicillin/clavulanic acid were tested in the years 2000 to 2007 only.
(2) Cefotaxime and ceftazidime were tested in 2008 only.
(3) For colistin and trimethoprim no evaluation was performed as the lowest tested concentration was above the epidemiological cut-off value.
(4) The vertical lines demark the epidemiological cut-off values, which are the basis for the evaluation of microbiological resistance.
(5) The white areas demark the range tested. Isolates resistant to the highest concentration are given in the next concentration level.
Values for the lowest concentration include isolates with MICs below the tested range.

Tab. 13.76: *S.* Virchow from animals (2000–2008)

Antimicrobial tested	Tested isolates (Number)	Microbiologically resistent isolates (Number) (4)	Microbiological resistent isolates (in %) (4)	Distribution (%) of MICs (µg/ml) (5) 0,008	0,015	0,03125	0,0625	0,125	0,25	0,5	1	2	4	8	16	32	64	128	256	512	1024
Gentamicin	194	0	0,0								97,4	2,6	0,0	0,0	0,0	0,0	0,0				
Neomycin (1)	191	2	1,0									97,9	1,0	0,0	0,0	0,0	1,0				
Kanamycin	194	2	1,0										97,4	1,5	0,0	0,0	0,0	1,0			
Spectinomycin (1)	191	4	2,1									0,0	0,0	0,0	7,9	83,8	6,3	0,0	2,1		
Streptomycin	194	2	1,0										12,4	62,4	20,1	4,1	1,0	0,0			
Chloramphenicol	194	5	2,6									1,5	34,5	57,7	3,6	0,0	0,0	2,6			
Florfenicol	194	1	0,5									2,1	78,9	17,0	1,5	0,5	0,0	0,0			
Cefotaxime (2)	3	0	0,0				100,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0							
Ceftazidime (2)	3	0	0,0						66,7	33,3	0,0	0,0	0,0	0,0	0,0	0,0					
Ceftiofur (1)	191	3	1,6							74,3	23,6	0,5	0,0	0,0	1,6						
Nalidixic acid	194	24	12,4										78,9	7,7	1,0	0,0	0,0	12,4			
Ciprofloxacin	194	24	12,4			86,1	1,5	2,1	6,7	3,6	0,0	0,0	0,0	0,0							
Amoxicillin/Clavulanic acid (1)	191	12	6,3									91,6	2,1	5,2	1,0	0,0	0,0				
Ampicillin	194	16	8,2								76,8	14,4	0,5	0,0	0,0	0,0	8,2				
Colistin (3)	194													100,0	0,0	0,0					
Sulfamethoxazole	194	19	9,8													11,9	70,6	7,7	0,0	0,0	9,8
Trimethoprim (3)	194												96,3	0,0	0,0	0,0	3,6				
Tetracycline	194	8	4,1									94,3	1,5	0,0	0,0	0,0	4,1				

(1) Neomycin, spectinomycin, ceftiofur, amoxicillin/clavulanic acid were tested in the years 2000 to 2007 only.
(2) Cefotaxime and ceftazidime were tested in 2008 only.
(3) For colistin and trimethoprim no evaluation was performed as the lowest tested concentration was above the epidemiological cut-off value.
(4) The vertical lines demark the epidemiological cut-off values, which are the basis for the evaluation of microbiological resistance.
(5) The white areas demark the range tested. Isolates resistant to the highest concentration are given in the next concentration level.
Values for the lowest concentration include isolates with MICs below the tested range.

13.1.3.5 Isolates from food

Tab. 13.77: *Salmonella* spp. from food (2000–2008)

Antimicrobial tested	Tested isolates (Number)	Microbiologically resistent isolates (Number) (4)	Microbiological resistent isolates (in %) (4)	Distribution (%) of MICs (µg/ml) (5) 0,008	0,015	0,03125	0,0625	0,125	0,25	0,5	1	2	4	8	16	32	64	128	256	512	1024
Gentamicin	10853	255	2,3								96,6	1,1	0,2	1,1	0,7	0,2	0,2				
Neomycin (1)	9824	349	3,6									95,4	1,0	0,1	0,3	1,5	1,7				
Kanamycin	10853	526	4,8										93,4	1,7	0,2	1,0	0,5	3,1			
Spectinomycin (1)	9824	2411	24,5									0,0	0,0	0,1	19,5	47,9	7,9	3,8	20,7		
Streptomycin	10853	3063	28,2										25,9	27,6	11,6	6,7	12,2	16,0			
Chloramphenicol	10853	1386	12,8									2,3	27,1	51,3	6,6	0,3	1,5	10,9			
Florfenicol	10853	1136	10,5									5,2	54,3	26,4	3,7	4,1	5,4	0,9			
Cefotaxime (2)	1030	11	1,1				48,3	39,4	10,2	1,0	0,0	0,0	0,0	1,1							
Ceftazidime (2)	1030	11	1,1						64,7	31,5	2,6	0,2	0,4	0,1	0,4	0,2					
Ceftiofur (1)	9824	114	1,2							52,2	41,2	5,4	0,8	0,2	0,2						
Nalidixic acid	10853	1127	10,4										78,1	10,7	0,8	0,2	0,1	10,1			
Ciprofloxacin	10853	1178	10,9			85,4	3,7	0,9	3,6	3,8	2,0	0,4	0,0	0,0							
Amoxicillin/Clavulanic acid (1)	9824	2712	27,6									69,6	2,8	11,5	13,6	2,4	0,1				
Ampicillin	10853	3268	30,1								51,4	16,7	1,7	0,1	0,0	3,0	27,0				
Colistin (3)	10853													99,4	0,5	0,0					
Sulfamethoxazole	10853	4642	42,8													16,8	29,2	10,0	1,2	4,3	38,5
Trimethoprim (3)	10853												85,5	1,1	0,1	1,1	12,1				
Tetracycline	10853	3696	34,1									59,5	5,7	0,8	0,7	9,3	24,0				

(1) Neomycin, spectinomycin, ceftiofur, amoxicillin/clavulanic acid were tested in the years 2000 to 2007 only.

(2) Cefotaxime and ceftazidime were tested in 2008 only.

(3) For colistin and trimethoprim no evaluation was performed as the lowest tested concentration was above the epidemiological cut-off value.

(4) The vertical lines demark the epidemiological cut-off values, which are the basis for the evaluation of microbiological resistance.

(5) The white areas demark the range tested. Isolates resistant to the highest concentration are given in the next concentration level.
Values for the lowest concentration include isolates with MICs below the tested range.

Tab. 13.78: *S.* 4,[5],12:i:- from food (2000–2008)

Antimicrobial tested	Tested isolates (Number)	Microbiologically resistent isolates (Number) (4)	Microbiological resistent isolates (in %) (4)	Distribution (%) of MICs (µg/ml) (5)																	
				0,008	0,015	0,03125	0,0625	0,125	0,25	0,5	1	2	4	8	16	32	64	128	256	512	1024
Gentamicin	421	8	1,9								97,2	1,0	0,2	0,0	0,5	1,2	0,0				
Neomycin (1)	317	4	1,3									97,2	1,6	0,0	0,3	0,3	0,6				
Kanamycin	421	6	1,4										95,5	3,1	0,5	0,0	0,0	1,0			
Spectinomycin (1)	317	41	12,9									0,0	0,0	0,0	1,9	66,2	18,9	1,6	11,4		
Streptomycin	421	319	75,8										2,9	14,5	5,5	1,4	3,1	72,7			
Chloramphenicol	421	34	8,1									0,2	16,2	71,7	3,8	0,2	1,4	6,4			
Florfenicol	421	16	3,8									0,2	53,7	36,1	6,2	1,7	0,5	1,7			
Cefotaxime (2)	105	0	0,0				62,9	31,4	4,8	1,0	0,0	0,0	0,0	0,0							
Ceftazidime (2)	105	0	0,0						80,0	19,0	1,0	0,0	0,0	0,0	0,0	0,0					
Ceftiofur (1)	317	3	0,9							48,6	47,3	3,2	0,3	0,6	0,0						
Nalidixic acid	421	8	1,9										86,0	11,4	0,7	0,0	0,0	1,9			
Ciprofloxacin	421	11	2,6			92,4	5,0	1,2	0,7	0,0	0,7	0,0	0,0	0,0							
Amoxicillin/Clavulanic acid (1)	317	185	58,4									30,0	11,7	52,1	6,3	0,0	0,0				
Ampicillin	421	317	75,3								18,1	5,9	0,7	0,0	0,0	1,2	74,1				
Colistin (3)	421													100,0	0,0	0,0					
Sulfamethoxazole	421	342	81,2													3,8	10,7	3,8	0,5	1,2	80,0
Trimethoprim (3)	421												89,1	0,0	0,0	1,0	10,0				
Tetracycline	421	361	85,7									13,7	0,5	0,0	0,0	2,6	83,2				

(1) Neomycin, spectinomycin, ceftiofur, amoxicillin/clavulanic acid were tested in the years 2000 to 2007 only.

(2) Cefotaxime and ceftazidime were tested in 2008 only.

(3) For colistin and trimethoprim no evaluation was performed as the lowest tested concentration was above the epidemiological cut-off value.

(4) The vertical lines demark the epidemiological cut-off values, which are the basis for the evaluation of microbiological resistance.

(5) The white areas demark the range tested. Isolates resistant to the highest concentration are given in the next concentration level.
Values for the lowest concentration include isolates with MICs below the tested range.

Tab. 13.79: *S.* 4,12:d:- from food (2000–2008)

Antimicrobial tested	Tested isolates (Number)	Microbiologically resistent isolates (Number) (4)	Microbiological resistent isolates (in %) (4)	Distribution (%) of MICs (µg/ml) (5)																	
				0,008	0,015	0,03125	0,0625	0,125	0,25	0,5	1	2	4	8	16	32	64	128	256	512	1024
Gentamicin	149	0	0,0								100,1	0,0	0,0	0,0	0,0	0,0	0,0				
Neomycin (1)	140	3	2,1									96,4	1,4	0,0	0,0	2,1	0,0				
Kanamycin	149	3	2,0										96,6	1,3	0,0	0,0	2,0	0,0			
Spectinomycin (1)	140	2	1,4									0,0	0,0	0,0	14,3	82,1	2,1	1,4	0,0		
Streptomycin	149	2	1,3										18,1	55,7	24,2	0,7	0,7	0,7			
Chloramphenicol	149	2	1,3									0,0	6,7	85,2	6,7	0,0	0,0	1,3			
Florfenicol	149	0	0,0									2,0	58,4	38,3	1,3	0,0	0,0	0,0			
Cefotaxime (2)	9	0	0,0				22,2	66,7	11,1	0,0	0,0	0,0	0,0	0,0							
Ceftazidime (2)	9	0	0,0						33,3	66,7	0,0	0,0	0,0	0,0	0,0	0,0					
Ceftiofur (1)	140	0	0,0							35,0	62,1	2,9	0,0	0,0	0,0						
Nalidixic acid	149	3	2,0										81,9	15,4	0,7	0,0	0,0	2,0			
Ciprofloxacin	149	4	2,7			96,0	1,3	0,7	2,0	0,0	0,0	0,0	0,0	0,0							
Amoxicillin/Clavulanic acid (1)	140	6	4,3									94,3	1,4	2,9	1,4	0,0	0,0				
Ampicillin	149	6	4,0								67,8	26,8	1,3	0,0	0,0	1,3	2,7				
Colistin (3)	149													99,3	0,7	0,0					
Sulfamethoxazole	149	30	20,1													36,2	22,8	10,7	10,1	3,4	16,8
Trimethoprim (3)	149												97,9	0,7	0,7	0,0	0,7				
Tetracycline	149	4	2,7									87,9	9,4	0,0	0,0	0,0	2,7				

(1) Neomycin, spectinomycin, ceftiofur, amoxicillin/clavulanic acid were tested in the years 2000 to 2007 only.

(2) Cefotaxime and ceftazidime were tested in 2008 only.

(3) For colistin and trimethoprim no evaluation was performed as the lowest tested concentration was above the epidemiological cut-off value.

(4) The vertical lines demark the epidemiological cut-off values, which are the basis for the evaluation of microbiological resistance.

(5) The white areas demark the range tested. Isolates resistant to the highest concentration are given in the next concentration level. Values for the lowest concentration include isolates with MICs below the tested range.

Tab. 13.80: *S.* Agona from food (2000–2008)

Antimicrobial tested	Tested isolates (Number)	Microbiologically resistent isolates (Number) (4)	Microbiological resistent isolates (in %) (4)	Distribution (%) of MICs (µg/ml) (5)																	
				0,008	0,015	0,03125	0,0625	0,125	0,25	0,5	1	2	4	8	16	32	64	128	256	512	1024
Gentamicin	131	6	4,6								94,7	0,8	0,0	0,0	3,8	0,8	0,0				
Neomycin (1)	102	3	2,9									96,1	1,0	0,0	0,0	1,0	2,0				
Kanamycin	131	5	3,8										93,1	3,1	0,0	0,0	0,8	3,0			
Spectinomycin (1)	102	12	11,8									0,0	0,0	0,0	0,0	82,4	5,9	5,9	5,9		
Streptomycin	131	11	8,4										13,7	55,7	19,1	3,1	6,9	1,5			
Chloramphenicol	131	2	1,5									0,8	6,1	86,3	5,3	0,0	0,8	0,8			
Florfenicol	131	1	0,8									1,5	29,0	67,2	1,5	0,8	0,0	0,0			
Cefotaxime (2)	29	0	0,0				10,3	79,3	10,3	0,0	0,0	0,0	0,0	0,0							
Ceftazidime (2)	29	0	0,0						6,9	89,7	3,4	0,0	0,0	0,0	0,0	0,0					
Ceftiofur (1)	102	0	0,0							29,4	69,6	1,0	0,0	0,0	0,0						
Nalidixic acid	131	9	6,9										74,8	16,0	2,3	0,0	0,8	6,1			
Ciprofloxacin	131	12	9,2			90,1	0,8	0,0	3,8	4,6	0,8	0,0	0,0	0,0							
Amoxicillin/Clavulanic acid (1)	102	8	7,8									92,2	0,0	2,9	2,9	2,0	0,0				
Ampicillin	131	8	6,1								61,1	32,1	0,8	0,0	0,0	5,3	0,8				
Colistin (3)	131													100,0	0,0	0,0					
Sulfamethoxazole	131	26	19,8													15,3	52,7	12,2	0,0	6,9	13,0
Trimethoprim (3)	131												0,0	0,0	0,0	15,3	84,8				
Tetracycline	131	17	13,0									74,0	13,0	0,0	0,8	3,8	8,4				

(1) Neomycin, spectinomycin, ceftiofur, amoxicillin/clavulanic acid were tested in the years 2000 to 2007 only.
(2) Cefotaxime and ceftazidime were tested in 2008 only.
(3) For colistin and trimethoprim no evaluation was performed as the lowest tested concentration was above the epidemiological cut-off value.
(4) The vertical lines demark the epidemiological cut-off values, which are the basis for the evaluation of microbiological resistance.
(5) The white areas demark the range tested. Isolates resistant to the highest concentration are given in the next concentration level.
Values for the lowest concentration include isolates with MICs below the tested range.

Tab. 13.81: *S.* Anatum from food (2000–2008)

Antimicrobial tested	Tested isolates (Number)	Microbiologically resistent isolates (Number) (4)	Microbiological resistent isolates (in %) (4)	Distribution (%) of MICs (µg/ml) (5)																	
				0,008	0,015	0,03125	0,0625	0,125	0,25	0,5	1	2	4	8	16	32	64	128	256	512	1024
Gentamicin	129	2	1,6								96,9	1,6	0,0	0,0	0,8	0,0	0,8				
Neomycin (1)	120	2	1,7									97,5	0,8	0,0	0,0	0,8	0,8				
Kanamycin	129	2	1,6										93,8	4,7	0,0	0,0	0,8	0,8			
Spectinomycin (1)	120	17	14,2									0,0	0,0	0,0	0,8	45,8	39,2	8,3	5,8		
Streptomycin	129	12	9,3										1,6	38,0	37,2	14,0	4,7	4,7			
Chloramphenicol	129	3	2,3									0,8	25,6	67,4	3,9	0,0	0,8	1,6			
Florfenicol	129	1	0,8									3,1	62,0	31,8	2,3	0,0	0,0	0,8			
Cefotaxime (2)	9	0	0,0				11,1	88,9	0,0	0,0	0,0	0,0	0,0	0,0							
Ceftazidime (2)	9	0	0,0						0,0	100,0	0,0	0,0	0,0	0,0	0,0	0,0					
Ceftiofur (1)	120	1	0,8							74,2	22,5	2,5	0,0	0,0	0,8						
Nalidixic acid	129	3	2,3										93,0	4,7	0,0	0,0	0,0	2,4			
Ciprofloxacin	129	4	3,1			94,6	2,3	0,8	2,3	0,0	0,0	0,0	0,0	0,0							
Amoxicillin/Clavulanic acid (1)	120	16	13,3									75,8	10,8	11,7	1,7	0,0	0,0				
Ampicillin	129	25	19,4								68,2	9,3	3,1	0,0	0,0	1,6	17,8				
Colistin (3)	129													100,0	0,0	0,0					
Sulfamethoxazole	129	32	24,8													11,6	30,2	25,6	7,8	1,6	23,3
Trimethoprim (3)	129												0,0	0,0	0,0	11,6	88,5				
Tetracycline	129	18	14,0									81,4	4,7	0,0	0,0	2,3	11,7				

(1) Neomycin, spectinomycin, ceftiofur, amoxicillin/clavulanic acid were tested in the years 2000 to 2007 only.
(2) Cefotaxime and ceftazidime were tested in 2008 only.
(3) For colistin and trimethoprim no evaluation was performed as the lowest tested concentration was above the epidemiological cut-off value.
(4) The vertical lines demark the epidemiological cut-off values, which are the basis for the evaluation of microbiological resistance.
(5) The white areas demark the range tested. Isolates resistant to the highest concentration are given in the next concentration level.
Values for the lowest concentration include isolates with MICs below the tested range.

Tab. 13.82: *S.* Bovismorbificans from food (2000–2008)

Antimicrobial tested	Tested isolates (Number)	Microbiologically resistent isolates (Number) (4)	Microbiological resistent isolates (in %) (4)	Distribution (%) of MICs (µg/ml) (5)																	
				0,008	0,015	0,03125	0,0625	0,125	0,25	0,5	1	2	4	8	16	32	64	128	256	512	1024
Gentamicin	155	0	0,0								99,4	0,6	0,0	0,0	0,0	0,0	0,0				
Neomycin (1)	142	4	2,8									95,8	1,4	0,0	0,0	0,0	2,8				
Kanamycin	155	4	2,6										96,1	1,3	0,0	0,0	0,0	2,6			
Spectinomycin (1)	142	10	7,0									0,0	0,0	0,0	2,8	88,7	1,4	2,1	4,9		
Streptomycin	155	11	7,1										0,0	75,5	14,2	3,2	2,6	4,5			
Chloramphenicol	155	6	3,9									0,6	85,2	10,3	0,0	0,0	0,0	3,9			
Florfenicol	155	1	0,6									21,9	71,6	5,2	0,6	0,0	0,0	0,6			
Cefotaxime (2)	13	0	0,0				76,9	15,4	7,7	0,0	0,0	0,0	0,0	0,0							
Ceftazidime (2)	13	0	0,0						84,6	15,4	0,0	0,0	0,0	0,0	0,0	0,0					
Ceftiofur (1)	142	0	0,0							87,3	12,7	0,0	0,0	0,0	0,0						
Nalidixic acid	155	3	1,9										96,1	1,9	0,0	0,0	0,0	1,9			
Ciprofloxacin	155	3	1,9			95,4	2,6	0,0	0,6	1,3	0,0	0,0	0,0	0,0							
Amoxicillin/Clavulanic acid (1)	142	17	12,0									86,6	1,4	7,7	4,2	0,0	0,0				
Ampicillin	155	27	17,4								79,4	3,2	0,0	0,0	0,6	0,0	16,8				
Colistin (3)	155													100,0	0,0	0,0					
Sulfamethoxazole	155	69	44,5													1,3	9,7	29,0	15,5	1,9	42,6
Trimethoprim (3)	155												0,0	0,0	0,0	1,3	98,7				
Tetracycline	155	22	14,2									85,2	0,6	0,0	0,0	1,3	12,9				

(1) Neomycin, spectinomycin, ceftiofur, amoxicillin/clavulanic acid were tested in the years 2000 to 2007 only.
(2) Cefotaxime and ceftazidime were tested in 2008 only.
(3) For colistin and trimethoprim no evaluation was performed as the lowest tested concentration was above the epidemiological cut-off value.
(4) The vertical lines demark the epidemiological cut-off values, which are the basis for the evaluation of microbiological resistance.
(5) The white areas demark the range tested. Isolates resistant to the highest concentration are given in the next concentration level.
Values for the lowest concentration include isolates with MICs below the tested range.

Tab. 13.83: *S.* Brandenburg from food (2000–2008)

Antimicrobial tested	Tested isolates (Number)	Microbiologically resistent isolates (Number) (4)	Microbiological resistent isolates (in %) (4)	0,008	0,015	0,03125	0,0625	0,125	0,25	0,5	1	2	4	8	16	32	64	128	256	512	1024
				Distribution (%) of MICs (µg/ml) (5)																	
Gentamicin	112	0	0,0								99,1	0,9	0,0	0,0	0,0	0,0	0,0				
Neomycin (1)	100	3	3,0									97,0	0,0	0,0	0,0	1,0	2,0				
Kanamycin	112	3	2,7										96,4	0,9	0,0	0,0	0,9	1,8			
Spectinomycin (1)	100	8	8,0									0,0	0,0	0,0	3,0	82,0	7,0	4,0	4,0		
Streptomycin	112	12	10,7										7,2	58,9	17,0	6,3	6,3	4,5			
Chloramphenicol	112	5	4,5									0,0	8,9	82,1	4,5	0,0	1,8	2,7			
Florfenicol	112	2	1,8									0,0	58,0	38,4	1,8	0,9	0,0	0,9			
Cefotaxime (2)	12	0	0,0				41,7	50,0	8,3	0,0	0,0	0,0	0,0	0,0							
Ceftazidime (2)	12	0	0,0						100,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0					
Ceftiofur (1)	100	0	0,0							57,0	40,0	3,0	0,0	0,0	0,0						
Nalidixic acid	112	0	0,0										92,0	8,0	0,0	0,0	0,0	0,0			
Ciprofloxacin	112	0	0,0			100,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0							
Amoxicillin/Clavulanic acid (1)	100	7	7,0									91,0	2,0	2,0	3,0	2,0	0,0				
Ampicillin	112	7	6,3								76,8	15,2	1,8	0,0	0,0	2,7	3,6				
Colistin (3)	112													100,0	0,0	0,0					
Sulfamethoxazole	112	38	33,9													9,8	48,2	7,1	0,9	5,4	28,6
Trimethoprim (3)	112												89,3	0,0	0,0	3,6	7,1				
Tetracycline	112	15	13,4									60,7	1,8	24,1	5,4	3,6	4,5				

(1) Neomycin, spectinomycin, ceftiofur, amoxicillin/clavulanic acid were tested in the years 2000 to 2007 only.
(2) Cefotaxime and ceftazidime were tested in 2008 only.
(3) For colistin and trimethoprim no evaluation was performed as the lowest tested concentration was above the epidemiological cut-off value.
(4) The vertical lines demark the epidemiological cut-off values, which are the basis for the evaluation of microbiological resistance.
(5) The white areas demark the range tested. Isolates resistant to the highest concentration are given in the next concentration level.
Values for the lowest concentration include isolates with MICs below the tested range.

Tab. 13.84: ***S.* Derby from food (2000–2008)**

Antimicrobial tested	Tested isolates (Number)	Microbiologically resistent isolates (Number) (4)	Microbiological resistent isolates (in %) (4)	Distribution (%) of MICs (µg/ml) (5)																	
				0,008	0,015	0,03125	0,0625	0,125	0,25	0,5	1	2	4	8	16	32	64	128	256	512	1024
Gentamicin	437	1	0,2								98,4	1,4	0,0	0,0	0,0	0,0	0,2				
Neomycin (1)	395	3	0,8									98,2	1,0	0,3	0,0	0,5	0,0				
Kanamycin	437	3	0,7										96,8	2,5	0,2	0,0	0,2	0,2			
Spectinomycin (1)	395	54	13,7									0,0	0,0	0,0	6,8	74,2	5,3	2,3	11,4		
Streptomycin	437	44	10,1										5,5	54,7	24,7	5,0	3,4	6,6			
Chloramphenicol	437	20	4,6									0,2	4,1	78,5	12,6	0,5	0,9	3,2			
Florfenicol	437	11	2,5									0,9	25,2	66,4	5,0	2,3	0,2	0,0			
Cefotaxime (2)	42	0	0,0				7,1	76,2	16,7	0,0	0,0	0,0	0,0	0,0							
Ceftazidime (2)	42	0	0,0						4,8	92,9	2,4	0,0	0,0	0,0	0,0	0,0					
Ceftiofur (1)	395	0	0,0							46,8	49,4	3,8	0,0	0,0	0,0						
Nalidixic acid	437	3	0,7										93,8	5,5	0,0	0,0	0,0	0,7			
Ciprofloxacin	437	3	0,7			95,5	3,9	0,0	0,0	0,7	0,0	0,0	0,0	0,0							
Amoxicillin/Clavulanic acid (1)	395	22	5,6									92,9	1,5	3,0	2,3	0,3	0,0				
Ampicillin	437	25	5,7								72,5	19,2	2,5	0,0	0,0	0,5	5,3				
Colistin (3)	437													99,8	0,2	0,0					
Sulfamethoxazole	437	93	21,3													28,8	43,5	6,4	0,0	2,3	19,0
Trimethoprim (3)	437												0,0	0,2	0,0	28,6	71,2				
Tetracycline	437	97	22,2									72,5	5,0	0,2	0,5	5,3	16,5				

(1) Neomycin, spectinomycin, ceftiofur, amoxicillin/clavulanic acid were tested in the years 2000 to 2007 only.

(2) Cefotaxime and ceftazidime were tested in 2008 only.

(3) For colistin and trimethoprim no evaluation was performed as the lowest tested concentration was above the epidemiological cut-off value.

(4) The vertical lines demark the epidemiological cut-off values, which are the basis for the evaluation of microbiological resistance.

(5) The white areas demark the range tested. Isolates resistant to the highest concentration are given in the next concentration level.
Values for the lowest concentration include isolates with MICs below the tested range.

Tab. 13.85: *S.* Enteritidis from food (2000–2008)

Antimicrobial tested	Tested isolates (Number)	Microbiologically resistent isolates (Number) (4)	Microbiological resistent isolates (in %) (4)	Distribution (%) of MICs (µg/ml) (5) 0,008	0,015	0,03125	0,0625	0,125	0,25	0,5	1	2	4	8	16	32	64	128	256	512	1024
Gentamicin	1927	14	0,7								98,2	1,0	0,2	0,2	0,3	0,1	0,0				
Neomycin (1)	1770	1	0,1									99,2	0,8	0,0	0,0	0,0	0,1				
Kanamycin	1927	3	0,2										98,6	1,2	0,1	0,0	0,0	0,1			
Spectinomycin (1)	1770	21	1,2									0,0	0,0	0,3	78,0	20,1	0,4	0,1	1,1		
Streptomycin	1927	29	1,5										93,9	3,7	0,7	0,2	0,8	0,7			
Chloramphenicol	1927	9	0,5									2,3	41,7	53,5	2,1	0,0	0,1	0,4			
Florfenicol	1927	8	0,4									4,0	77,4	17,6	0,6	0,2	0,2	0,1			
Cefotaxime (2)	157	0	0,0				60,5	38,2	1,3	0,0	0,0	0,0	0,0	0,0							
Ceftazidime (2)	157	0	0,0						94,9	5,1	0,0	0,0	0,0	0,0	0,0	0,0					
Ceftiofur (1)	1770	6	0,3							52,8	43,7	3,2	0,1	0,1	0,1						
Nalidixic acid	1927	89	4,6										83,8	11,3	0,4	0,1	0,0	4,5			
Ciprofloxacin	1927	95	4,9			91,7	3,4	0,7	2,6	1,6	0,0	0,0	0,0	0,0							
Amoxicillin/Clavulanic acid (1)	1770	35	2,0									96,4	1,6	0,7	1,2	0,1	0,0				
Ampicillin	1927	40	2,1								67,0	28,7	2,1	0,1	0,0	0,0	2,0				
Colistin (3)	1927													99,1	0,9	0,0					
Sulfamethoxazole	1927	192	10,0													14,9	59,8	14,7	0,7	0,1	9,9
Trimethoprim (3)	1927												0,0	0,1	0,1	14,7	85,2				
Tetracycline	1927	30	1,6									92,0	6,0	0,5	0,3	0,2	1,1				

(1) Neomycin, spectinomycin, ceftiofur, amoxicillin/clavulanic acid were tested in the years 2000 to 2007 only.

(2) Cefotaxime and ceftazidime were tested in 2008 only.

(3) For colistin and trimethoprim no evaluation was performed as the lowest tested concentration was above the epidemiological cut-off value.

(4) The vertical lines demark the epidemiological cut-off values, which are the basis for the evaluation of microbiological resistance.

(5) The white areas demark the range tested. Isolates resistant to the highest concentration are given in the next concentration level.
Values for the lowest concentration include isolates with MICs below the tested range.

Tab. 13.86: *S.* Hadar from food (2000–2008)

Antimicrobial tested	Tested isolates (Number)	Microbiologically resistent isolates (Number) (4)	Microbiological resistent isolates (in %) (4)	Distribution (%) of MICs (µg/ml) (5)																	
				0,008	0,015	0,03125	0,0625	0,125	0,25	0,5	1	2	4	8	16	32	64	128	256	512	1024
Gentamicin	189	1	0,5								95,3	4,2	0,0	0,0	0,0	0,0	0,5				
Neomycin (1)	173	3	1,7									97,1	1,2	0,6	0,0	0,0	1,2				
Kanamycin	189	4	2,1										94,7	3,2	0,5	0,0	0,0	1,6			
Spectinomycin (1)	173	9	5,2									0,0	0,0	0,0	1,2	70,5	23,1	0,0	5,2		
Streptomycin	189	122	64,6										0,5	18,0	5,8	11,1	46,6	18,0			
Chloramphenicol	189	3	1,6									10,6	61,9	16,4	9,5	0,0	0,0	1,6			
Florfenicol	189	1	0,5									27,5	49,2	15,9	6,9	0,5	0,0	0,0			
Cefotaxime (2)	16	0	0,0				50,0	25,0	18,8	6,3	0,0	0,0	0,0	0,0							
Ceftazidime (2)	16	0	0,0						62,5	31,3	6,3	0,0	0,0	0,0	0,0	0,0					
Ceftiofur (1)	173	0	0,0							43,9	38,2	17,9	0,0	0,0	0,0						
Nalidixic acid	189	108	57,1										38,1	2,6	2,1	2,6	0,0	54,5			
Ciprofloxacin	189	111	58,7			38,1	3,2	3,2	22,2	23,3	10,1	0,0	0,0	0,0							
Amoxicillin/Clavulanic acid (1)	173	52	30,1									67,1	2,9	5,8	22,5	1,2	0,6				
Ampicillin	189	58	30,7								48,7	12,7	7,9	0,5	0,0	0,0	30,2				
Colistin (3)	189													99,5	0,5	0,0					
Sulfamethoxazole	189	24	12,7													48,1	36,5	2,1	0,5	0,0	12,7
Trimethoprim (3)	189												0,0	0,0	0,5	47,6	51,8				
Tetracycline	189	160	84,7									13,8	1,6	0,0	0,0	13,2	71,5				

(1) Neomycin, spectinomycin, ceftiofur, amoxicillin/clavulanic acid were tested in the years 2000 to 2007 only.

(2) Cefotaxime and ceftazidime were tested in 2008 only.

(3) For colistin and trimethoprim no evaluation was performed as the lowest tested concentration was above the epidemiological cut-off value.

(4) The vertical lines demark the epidemiological cut-off values, which are the basis for the evaluation of microbiological resistance.

(5) The white areas demark the range tested. Isolates resistant to the highest concentration are given in the next concentration level.
Values for the lowest concentration include isolates with MICs below the tested range.

Tab. 13.87: *S.* Heidelberg from food (2000–2008)

Antimicrobial tested	Tested isolates (Number)	Microbiologically resistent isolates (Number) (4)	Microbiological resistent isolates (in %) (4)	Distribution (%) of MICs (µg/ml) (5)																	
				0,008	0,015	0,03125	0,0625	0,125	0,25	0,5	1	2	4	8	16	32	64	128	256	512	1024
Gentamicin	99	4	4,0								94,9	1,0	0,0	0,0	0,0	2,0	2,0				
Neomycin (1)	99	7	7,1									92,9	0,0	0,0	0,0	5,1	2,0				
Kanamycin	99	7	7,1										89,9	3,0	0,0	0,0	5,1	2,0			
Spectinomycin (1)	99	30	30,3									0,0	0,0	0,0	10,1	33,3	26,3	8,1	22,2		
Streptomycin	99	27	27,3										11,1	22,2	27,3	12,1	7,1	20,2			
Chloramphenicol	99	24	24,2									5,1	15,2	38,4	17,2	0,0	5,1	19,2			
Florfenicol	99	3	3,0									12,1	36,4	21,2	27,3	2,0	1,0	0,0			
Cefotaxime (2)	0	0	0,0				0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0							
Ceftazidime (2)	0	0	0,0						0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0					
Ceftiofur (1)	99	0	0,0							52,5	37,4	10,1	0,0	0,0	0,0						
Nalidixic acid	99	23	23,2										60,6	15,2	1,0	1,0	0,0	22,2			
Ciprofloxacin	99	23	23,2			75,8	1,0	3,0	2,0	18,2	0,0	0,0	0,0	0,0							
Amoxicillin/Clavulanic acid (1)	99	39	39,4									56,6	4,0	25,3	14,1	0,0	0,0				
Ampicillin	99	41	41,4								33,3	23,2	2,0	0,0	0,0	7,1	34,3				
Colistin (3)	99													99,0	1,0	0,0					
Sulfamethoxazole	99	40	40,4													37,4	18,2	1,0	3,0	6,1	34,3
Trimethoprim (3)	99												0,0	0,0	0,0	37,4	62,6				
Tetracycline	99	39	39,4									51,5	7,1	2,0	0,0	10,1	29,3				

(1) Neomycin, spectinomycin, ceftiofur, amoxicillin/clavulanic acid were tested in the years 2000 to 2007 only.

(2) Cefotaxime and ceftazidime were tested in 2008 only.

(3) For colistin and trimethoprim no evaluation was performed as the lowest tested concentration was above the epidemiological cut-off value.

(4) The vertical lines demark the epidemiological cut-off values, which are the basis for the evaluation of microbiological resistance.

(5) The white areas demark the range tested. Isolates resistant to the highest concentration are given in the next concentration level.
Values for the lowest concentration include isolates with MICs below the tested range.

Tab. 13.88: *S.* Indiana from food (2000–2008)

Antimicrobial tested	Tested isolates (Number)	Microbiologically resistent isolates (Number) (4)	Microbiological resistent isolates (in %) (4)	Distribution (%) of MICs (µg/ml) (5)																	
				0,008	0,015	0,03125	0,0625	0,125	0,25	0,5	1	2	4	8	16	32	64	128	256	512	1024
Gentamicin	163	2	1,2								98,8	0,0	0,0	1,2	0,0	0,0	0,0				
Neomycin (1)	140	1	0,7									99,3	0,0	0,0	0,0	0,0	0,7				
Kanamycin	163	2	1,2										98,8	0,0	0,6	0,0	0,0	0,6			
Spectinomycin (1)	140	24	17,1									0,0	0,0	0,0	0,7	58,6	23,6	2,9	14,3		
Streptomycin	163	10	6,1										3,1	32,5	44,2	14,1	2,5	3,7			
Chloramphenicol	163	0	0,0									1,2	39,9	58,9	0,0	0,0	0,0	0,0			
Florfenicol	163	0	0,0									2,5	93,3	4,3	0,0	0,0	0,0	0,0			
Cefotaxime (2)	23	0	0,0				73,9	17,4	8,7	0,0	0,0	0,0	0,0	0,0							
Ceftazidime (2)	23	0	0,0						87,0	13,0	0,0	0,0	0,0	0,0	0,0	0,0					
Ceftiofur (1)	140	0	0,0							52,1	47,1	0,7	0,0	0,0	0,0						
Nalidixic acid	163	0	0,0										71,2	28,8	0,0	0,0	0,0	0,0			
Ciprofloxacin	163	0	0,0			98,8	1,2	0,0	0,0	0,0	0,0	0,0	0,0	0,0							
Amoxicillin/Clavulanic acid (1)	140	20	14,3									81,4	4,3	11,4	2,1	0,7	0,0				
Ampicillin	163	30	18,4								39,9	37,4	2,5	0,0	0,0	1,2	17,2				
Colistin (3)	163													100,0	0,0	0,0					
Sulfamethoxazole	163	103	63,2													11,0	14,1	10,4	1,2	38,7	24,5
Trimethoprim (3)	163												0,0	0,0	0,0	11,0	88,9				
Tetracycline	163	96	58,9									39,3	1,8	0,0	0,0	37,4	21,4				

(1) Neomycin, spectinomycin, ceftiofur, amoxicillin/clavulanic acid were tested in the years 2000 to 2007 only.
(2) Cefotaxime and ceftazidime were tested in 2008 only.
(3) For colistin and trimethoprim no evaluation was performed as the lowest tested concentration was above the epidemiological cut-off value.
(4) The vertical lines demark the epidemiological cut-off values, which are the basis for the evaluation of microbiological resistance.
(5) The white areas demark the range tested. Isolates resistant to the highest concentration are given in the next concentration level.
Values for the lowest concentration include isolates with MICs below the tested range.

Tab. 13.89: *S.* Infantis from food (2000–2008)

Antimicrobial tested	Tested isolates (Number)	Microbiologically resistent isolates (Number) (4)	Microbiological resistent isolates (in %) (4)	Distribution (%) of MICs (µg/ml) (5) 0,008	0,015	0,03125	0,0625	0,125	0,25	0,5	1	2	4	8	16	32	64	128	256	512	1024
Gentamicin	418	3	0,7								98,1	1,2	0,2	0,0	0,5	0,0	0,0				
Neomycin (1)	391	2	0,5									98,5	1,0	0,0	0,3	0,3	0,0				
Kanamycin	418	2	0,5										98,3	1,2	0,0	0,0	0,0	0,5			
Spectinomycin (1)	391	66	16,9									0,0	0,0	0,0	5,1	72,4	5,6	3,6	13,3		
Streptomycin	418	33	7,9										10,0	52,6	18,2	11,2	5,0	2,8			
Chloramphenicol	418	5	1,2									0,5	28,0	55,5	14,8	0,5	0,0	0,7			
Florfenicol	418	0	0,0									0,7	58,9	35,2	5,3	0,0	0,0	0,0			
Cefotaxime (2)	27	0	0,0				3,7	59,3	37,0	0,0	0,0	0,0	0,0	0,0							
Ceftazidime (2)	27	0	0,0						18,5	74,1	7,4	0,0	0,0	0,0	0,0	0,0					
Ceftiofur (1)	391	1	0,3							51,2	39,6	9,0	0,0	0,0	0,3						
Nalidixic acid	418	70	16,7										73,2	10,0	0,0	0,0	0,0	16,8			
Ciprofloxacin	418	69	16,5			79,2	4,3	0,5	4,3	8,9	2,9	0,0	0,0	0,0							
Amoxicillin/Clavulanic acid (1)	391	19	4,9									91,3	3,8	4,3	0,5	0,0	0,0				
Ampicillin	418	26	6,2								75,4	14,6	3,8	0,0	0,2	0,7	5,3				
Colistin (3)	418													99,0	1,0	0,0					
Sulfamethoxazole	418	132	31,6													24,9	38,5	4,8	0,2	1,9	29,7
Trimethoprim (3)	418												0,0	0,0	0,0	24,9	75,1				
Tetracycline	418	81	19,4									73,2	6,5	1,0	0,0	1,4	17,9				

(1) Neomycin, spectinomycin, ceftiofur, amoxicillin/clavulanic acid were tested in the years 2000 to 2007 only.
(2) Cefotaxime and ceftazidime were tested in 2008 only.
(3) For colistin and trimethoprim no evaluation was performed as the lowest tested concentration was above the epidemiological cut-off value.
(4) The vertical lines demark the epidemiological cut-off values, which are the basis for the evaluation of microbiological resistance.
(5) The white areas demark the range tested. Isolates resistant to the highest concentration are given in the next concentration level.
Values for the lowest concentration include isolates with MICs below the tested range.

Tab. 13.90: *S.* Livingstone from food (2000–2008)

Antimicrobial tested	Tested isolates (Number)	Microbiologically resistent isolates (Number) (4)	Microbiological resistent isolates (in %) (4)	Distribution (%) of MICs (µg/ml) (5) 0,008	0,015	0,03125	0,0625	0,125	0,25	0,5	1	2	4	8	16	32	64	128	256	512	1024
Gentamicin	93	1	1,1								96,8	2,2	0,0	0,0	0,0	1,1	0,0				
Neomycin (1)	75	2	2,7									96,0	1,3	0,0	0,0	1,3	1,3				
Kanamycin	93	3	3,2										94,6	2,2	0,0	0,0	0,0	3,3			
Spectinomycin (1)	75	6	8,0									0,0	0,0	0,0	29,3	56,0	6,7	1,3	6,7		
Streptomycin	93	6	6,5										35,5	37,6	17,2	3,2	0,0	6,5			
Chloramphenicol	93	4	4,3									1,1	21,5	62,4	10,8	0,0	0,0	4,3			
Florfenicol	93	2	2,2									1,1	40,9	51,6	4,3	1,1	0,0	1,1			
Cefotaxime (2)	18	0	0,0				55,6	44,4	0,0	0,0	0,0	0,0	0,0	0,0							
Ceftazidime (2)	18	0	0,0						55,6	44,4	0,0	0,0	0,0	0,0	0,0	0,0					
Ceftiofur (1)	75	0	0,0							73,3	24,0	2,7	0,0	0,0	0,0						
Nalidixic acid	93	1	1,1										89,2	9,7	0,0	0,0	0,0	1,1			
Ciprofloxacin	93	2	2,2			92,4	5,4	1,1	0,0	1,1	0,0	0,0	0,0	0,0							
Amoxicillin/Clavulanic acid (1)	75	6	8,0									92,0	0,0	8,0	0,0	0,0	0,0				
Ampicillin	93	7	7,5								75,3	16,1	0,0	0,0	0,0	0,0	7,5				
Colistin (3)	93													99,0	1,1	0,0					
Sulfamethoxazole	93	23	24,7													22,6	47,3	5,4	0,0	0,0	24,8
Trimethoprim (3)	93												0,0	0,0	0,0	22,6	77,5				
Tetracycline	93	9	9,7									79,6	10,8	0,0	1,1	1,1	7,6				

(1) Neomycin, spectinomycin, ceftiofur, amoxicillin/clavulanic acid were tested in the years 2000 to 2007 only.

(2) Cefotaxime and ceftazidime were tested in 2008 only.

(3) For colistin and trimethoprim no evaluation was performed as the lowest tested concentration was above the epidemiological cut-off value.

(4) The vertical lines demark the epidemiological cut-off values, which are the basis for the evaluation of microbiological resistance.

(5) The white areas demark the range tested. Isolates resistant to the highest concentration are given in the next concentration level.
Values for the lowest concentration include isolates with MICs below the tested range.

Tab. 13.91: *S.* London from food (2000–2008)

Antimicrobial tested	Tested isolates (Number)	Microbiologically resistent isolates (Number) (4)	Microbiological resistent isolates (in %) (4)	Distribution (%) of MICs (µg/ml) (5)																	
				0,008	0,015	0,03125	0,0625	0,125	0,25	0,5	1	2	4	8	16	32	64	128	256	512	1024
Gentamicin	116	0	0,0								97,4	2,6	0,0	0,0	0,0	0,0	0,0				
Neomycin (1)	108	0	0,0									100,0	0,0	0,0	0,0	0,0	0,0				
Kanamycin	116	0	0,0										99,1	0,9	0,0	0,0	0,0	0,0			
Spectinomycin (1)	108	25	23,1									0,0	0,0	0,0	32,4	42,6	1,9	1,9	21,3		
Streptomycin	116	9	7,8										28,4	34,5	17,2	12,1	4,3	3,4			
Chloramphenicol	116	0	0,0									14,7	61,2	20,7	3,4	0,0	0,0	0,0			
Florfenicol	116	0	0,0									42,2	52,6	5,2	0,0	0,0	0,0	0,0			
Cefotaxime (2)	8	0	0,0				87,5	12,5	0,0	0,0	0,0	0,0	0,0	0,0							
Ceftazidime (2)	8	0	0,0						100,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0					
Ceftiofur (1)	108	2	1,9							65,7	26,9	5,6	0,0	0,0	1,9						
Nalidixic acid	116	1	0,9										87,9	10,3	0,9	0,9	0,0	0,0			
Ciprofloxacin	116	2	1,7			97,4	0,9	0,0	0,9	0,9	0,0	0,0	0,0	0,0							
Amoxicillin/Clavulanic acid (1)	108	6	5,6									90,7	3,7	2,8	2,8	0,0	0,0				
Ampicillin	116	9	7,8								71,6	17,2	3,4	0,0	0,0	3,4	4,3				
Colistin (3)	116													98,3	0,9	0,0					
Sulfamethoxazole	116	52	44,8													11,2	30,2	13,8	0,0	12,1	32,8
Trimethoprim (3)	116												0,0	0,0	0,0	11,2	88,9				
Tetracycline	116	30	25,9									71,5	2,6	0,0	0,0	3,4	22,4				

(1) Neomycin, spectinomycin, ceftiofur, amoxicillin/clavulanic acid were tested in the years 2000 to 2007 only.
(2) Cefotaxime and ceftazidime were tested in 2008 only.
(3) For colistin and trimethoprim no evaluation was performed as the lowest tested concentration was above the epidemiological cut-off value.
(4) The vertical lines demark the epidemiological cut-off values, which are the basis for the evaluation of microbiological resistance.
(5) The white areas demark the range tested. Isolates resistant to the highest concentration are given in the next concentration level. Values for the lowest concentration include isolates with MICs below the tested range.

Tab. 13.92: *S.* Mbandaka from food (2000–2008)

Antimicrobial tested	Tested isolates (Number)	Microbiologically resistent isolates (Number) (4)	Microbiological resistent isolates (in %) (4)	Distribution (%) of MICs (µg/ml) (5) 0,008	0,015	0,03125	0,0625	0,125	0,25	0,5	1	2	4	8	16	32	64	128	256	512	1024
Gentamicin	96	0	0,0								94,8	5,2	0,0	0,0	0,0	0,0	0,0				
Neomycin (1)	81	0	0,0									96,3	3,7	0,0	0,0	0,0	0,0				
Kanamycin	96	0	0,0										96,9	3,1	0,0	0,0	0,0	0,0			
Spectinomycin (1)	81	7	8,6									0,0	0,0	0,0	0,0	40,7	50,6	6,2	2,5		
Streptomycin	96	4	4,2										7,3	55,2	30,2	3,1	1,0	3,1			
Chloramphenicol	96	0	0,0									0,0	12,5	72,9	14,6	0,0	0,0	0,0			
Florfenicol	96	0	0,0									0,0	49,0	50,0	1,0	0,0	0,0	0,0			
Cefotaxime (2)	15	0	0,0				46,7	53,3	0,0	0,0	0,0	0,0	0,0	0,0							
Ceftazidime (2)	15	0	0,0						33,3	66,7	0,0	0,0	0,0	0,0	0,0	0,0					
Ceftiofur (1)	81	0	0,0							42,0	49,4	8,6	0,0	0,0	0,0						
Nalidixic acid	96	2	2,1										95,8	2,1	0,0	0,0	0,0	2,1			
Ciprofloxacin	96	2	2,1			96,9	1,0	0,0	0,0	2,1	0,0	0,0	0,0	0,0							
Amoxicillin/Clavulanic acid (1)	81	3	3,7									93,8	2,5	0,0	3,7	0,0	0,0				
Ampicillin	96	3	3,1								84,4	11,5	1,0	0,0	0,0	0,0	3,1				
Colistin (3)	96													100,1	0,0	0,0					
Sulfamethoxazole	96	9	9,4													8,3	50,0	30,2	2,1	0,0	9,4
Trimethoprim (3)	96												0,0	0,0	0,0	8,3	91,7				
Tetracycline	96	3	3,1									89,6	4,2	3,1	0,0	0,0	3,1				

(1) Neomycin, spectinomycin, ceftiofur, amoxicillin/clavulanic acid were tested in the years 2000 to 2007 only.

(2) Cefotaxime and ceftazidime were tested in 2008 only.

(3) For colistin and trimethoprim no evaluation was performed as the lowest tested concentration was above the epidemiological cut-off value.

(4) The vertical lines demark the epidemiological cut-off values, which are the basis for the evaluation of microbiological resistance.

(5) The white areas demark the range tested. Isolates resistant to the highest concentration are given in the next concentration level. Values for the lowest concentration include isolates with MICs below the tested range.

Tab. 13.93: *S.* Paratyphi B dT+ from food (2000–2008)

Antimicrobial tested	Tested isolates (Number)	Microbiologically resistent isolates (Number) (4)	Microbiological resistent isolates (in %) (4)	Distribution (%) of MICs (µg/ml) (5) 0,008	0,015	0,03125	0,0625	0,125	0,25	0,5	1	2	4	8	16	32	64	128	256	512	1024
Gentamicin	519	9	1,7								97,8	0,4	0,0	0,4	1,3	0,0	0,0				
Neomycin (1)	454	9	2,0									98,0	0,0	0,0	0,9	1,1	0,0				
Kanamycin	519	15	2,9										96,7	0,4	0,0	0,0	0,0	2,9			
Spectinomycin (1)	454	448	98,7									0,0	0,0	0,0	0,0	1,1	0,2	5,3	93,4		
Streptomycin	519	145	27,9										0,0	1,3	17,5	53,2	15,0	12,9			
Chloramphenicol	519	12	2,3									9,2	25,6	50,7	12,1	0,6	0,6	1,2			
Florfenicol	519	2	0,4									13,9	42,8	35,5	7,5	0,0	0,4	0,0			
Cefotaxime (2)	65	10	15,4				4,6	32,3	46,2	1,5	0,0	0,0	0,0	15,4							
Ceftazidime (2)	65	10	15,4						4,6	70,8	9,2	0,0	6,2	0,0	6,2	3,1					
Ceftiofur (1)	454	28	6,2							26,7	53,1	14,1	5,3	0,0	0,9						
Nalidixic acid	519	290	55,9										35,8	6,9	1,3	0,2	0,6	55,1			
Ciprofloxacin	519	300	57,8			35,6	6,6	2,1	16,0	24,1	9,2	5,8	0,6	0,0							
Amoxicillin/Clavulanic acid (1)	454	214	47,1									50,7	2,2	27,1	19,2	0,7	0,2				
Ampicillin	519	247	47,6								34,1	16,4	1,9	0,4	0,0	2,7	44,5				
Colistin (3)	519													99,8	0,2	0,0					
Sulfamethoxazole	519	349	67,2													21,2	7,7	2,5	1,3	4,0	63,2
Trimethoprim (3)	519												1,3	0,0	0,0	4,4	94,2				
Tetracycline	519	92	17,7									59,1	19,7	3,5	0,0	0,8	17,0				

(1) Neomycin, spectinomycin, ceftiofur, amoxicillin/clavulanic acid were tested in the years 2000 to 2007 only.

(2) Cefotaxime and ceftazidime were tested in 2008 only.

(3) For colistin and trimethoprim no evaluation was performed as the lowest tested concentration was above the epidemiological cut-off value.

(4) The vertical lines demark the epidemiological cut-off values, which are the basis for the evaluation of microbiological resistance.

(5) The white areas demark the range tested. Isolates resistant to the highest concentration are given in the next concentration level.
Values for the lowest concentration include isolates with MICs below the tested range.

Tab. 13.94: *S.* Saintpaul from food (2000–2008)

Antimicrobial tested	Tested isolates (Number)	Microbiologically resistent isolates (Number) (4)	Microbiological resistent isolates (in %) (4)	Distribution (%) of MICs (µg/ml) (5)																	
				0,008	0,015	0,03125	0,0625	0,125	0,25	0,5	1	2	4	8	16	32	64	128	256	512	1024
Gentamicin	239	131	54,8								44,8	0,4	1,7	37,7	13,4	1,3	0,8				
Neomycin (1)	194	10	5,2									94,3	0,5	0,0	0,0	3,6	1,5				
Kanamycin	239	125	52,3										46,9	0,8	1,3	40,2	8,4	2,6			
Spectinomycin (1)	194	131	67,5									0,0	0,0	0,0	2,1	26,8	3,6	28,9	38,7		
Streptomycin	239	113	47,3										7,9	13,4	8,4	23,0	33,9	13,4			
Chloramphenicol	239	33	13,8									0,0	5,9	42,7	37,7	6,7	1,7	5,4			
Florfenicol	239	13	5,4									0,8	23,8	31,8	38,1	3,8	0,4	1,3			
Cefotaxime (2)	45	0	0,0				24,4	20,0	44,4	11,1	0,0	0,0	0,0	0,0							
Ceftazidime (2)	45	0	0,0						37,8	31,1	26,7	4,4	0,0	0,0	0,0	0,0					
Ceftiofur (1)	194	37	19,1							17,0	28,4	35,6	17,5	1,5	0,0						
Nalidixic acid	239	165	69,0										25,5	2,9	2,5	0,4	0,0	68,6			
Ciprofloxacin	239	173	72,4			25,5	2,1	1,3	4,2	18,8	45,2	2,9	0,0	0,0							
Amoxicillin/Clavulanic acid (1)	194	124	63,9									34,5	1,5	5,2	30,9	27,3	0,5				
Ampicillin	239	160	66,9								20,9	9,2	2,9	0,0	0,0	23,0	43,9				
Colistin (3)	239													100,0	0,0	0,0					
Sulfamethoxazole	239	178	74,5													9,6	8,4	5,0	2,5	23,8	50,7
Trimethoprim (3)	239												0,0	0,0	0,0	9,6	90,4				
Tetracycline	239	78	32,6									32,6	33,9	0,8	0,0	5,0	27,6				

(1) Neomycin, spectinomycin, ceftiofur, amoxicillin/clavulanic acid were tested in the years 2000 to 2007 only.
(2) Cefotaxime and ceftazidime were tested in 2008 only.
(3) For colistin and trimethoprim no evaluation was performed as the lowest tested concentration was above the epidemiological cut-off value.
(4) The vertical lines demark the epidemiological cut-off values, which are the basis for the evaluation of microbiological resistance.
(5) The white areas demark the range tested. Isolates resistant to the highest concentration are given in the next concentration level.
Values for the lowest concentration include isolates with MICs below the tested range.

Tab. 13.95: *S.* Subspec. I, rough from food (2000–2008)

Antimicrobial tested	Tested isolates (Number)	Microbiologically resistent isolates (Number) (4)	Microbiological resistent isolates (in %) (4)	Distribution (%) of MICs (µg/ml) (5): 0,008	0,015	0,03125	0,0625	0,125	0,25	0,5	1	2	4	8	16	32	64	128	256	512	1024
Gentamicin	323	12	3,7								95,6	0,6	0,0	3,1	0,6	0,0	0,0				
Neomycin (1)	284	9	3,2									96,1	0,7	0,0	0,0	1,8	1,4				
Kanamycin	323	20	6,2										93,2	0,6	0,0	3,1	0,3	2,8			
Spectinomycin (1)	284	82	28,9									0,0	0,0	0,0	23,2	41,2	6,7	9,2	19,7		
Streptomycin	323	127	39,3										31,0	18,9	6,2	4,6	15,5	23,9			
Chloramphenicol	323	55	17,0									5,0	31,6	35,3	11,1	1,2	1,9	13,9			
Florfenicol	323	44	13,6									6,5	40,9	30,7	8,4	3,7	7,7	2,2			
Cefotaxime (2)	39	0	0,0				33,3	61,5	5,1	0,0	0,0	0,0	0,0	0,0							
Ceftazidime (2)	39	0	0,0						66,7	28,2	5,1	0,0	0,0	0,0	0,0	0,0					
Ceftiofur (1)	284	8	2,8							43,7	44,7	8,8	1,8	1,1	0,0						
Nalidixic acid	323	21	6,5										82,4	10,8	0,3	0,0	0,3	6,2			
Ciprofloxacin	323	22	6,8			87,9	5,3	0,6	1,5	0,6	3,7	0,3	0,0	0,0							
Amoxicillin/Clavulanic acid (1)	284	114	40,1									58,8	1,1	20,1	11,3	8,1	0,7				
Ampicillin	323	136	42,1								38,1	16,7	3,1	0,0	0,0	5,6	36,5				
Colistin (3)	323													99,3	0,6	0,0					
Sulfamethoxazole	323	171	52,9													23,8	14,6	7,1	1,5	7,7	45,2
Trimethoprim (3)	323												0,0	0,0	0,0	23,8	76,1				
Tetracycline	323	133	41,2									53,9	4,3	0,6	3,1	7,1	30,9				

(1) Neomycin, spectinomycin, ceftiofur, amoxicillin/clavulanic acid were tested in the years 2000 to 2007 only.
(2) Cefotaxime and ceftazidime were tested in 2008 only.
(3) For colistin and trimethoprim no evaluation was performed as the lowest tested concentration was above the epidemiological cut-off value.
(4) The vertical lines demark the epidemiological cut-off values, which are the basis for the evaluation of microbiological resistance.
(5) The white areas demark the range tested. Isolates resistant to the highest concentration are given in the next concentration level.
Values for the lowest concentration include isolates with MICs below the tested range.

Tab. 13.96: *S.* Typhimurium from food (2000–2008)

Antimicrobial tested	Tested isolates (Number)	Microbiologically resistent isolates (Number) (4)	Microbiological resistent isolates (in %) (4)	0,008	0,015	0,03125	0,0625	0,125	0,25	0,5	1	2	4	8	16	32	64	128	256	512	1024
				Distribution (%) of MICs (µg/ml) (5)																	
Gentamicin	3459	44	1,3								97,8	1,0	0,2	0,4	0,2	0,2	0,2				
Neomycin (1)	3207	181	5,6									93,2	1,2	0,1	0,2	2,2	3,1				
Kanamycin	3459	200	5,8										92,4	1,9	0,2	0,1	0,6	4,9			
Spectinomycin (1)	3207	1312	40,9									0,0	0,0	0,1	1,9	47,7	9,4	4,9	36,0		
Streptomycin	3459	1892	54,7										7,9	26,2	8,1	3,1	24,5	30,2			
Chloramphenicol	3459	1118	32,3									1,2	19,0	43,3	4,1	0,1	3,4	28,7			
Florfenicol	3459	1019	29,5									3,1	45,5	19,6	2,4	11,4	15,8	2,3			
Cefotaxime (2)	252	0	0,0				60,7	32,9	5,6	0,8	0,0	0,0	0,0	0,0							
Ceftazidime (2)	252	0	0,0						77,8	22,2	0,0	0,0	0,0	0,0	0,0	0,0					
Ceftiofur (1)	3207	23	0,7							54,4	40,8	4,1	0,3	0,2	0,2						
Nalidixic acid	3459	158	4,6										80,7	13,5	1,2	0,1	0,1	4,3			
Ciprofloxacin	3459	167	4,8			90,6	4,5	0,5	2,5	1,5	0,2	0,1	0,1	0,1							
Amoxicillin/Clavulanic acid (1)	3207	1694	52,8									44,3	2,9	17,8	30,7	4,1	0,2				
Ampicillin	3459	1949	56,3								34,1	8,9	0,6	0,1	0,0	5,4	50,8				
Colistin (3)	3459													99,5	0,4	0,0					
Sulfamethoxazole	3459	2349	67,9													9,0	15,1	7,6	0,5	6,0	61,9
Trimethoprim (3)	3459												0,0	0,1	0,1	8,8	91,1				
Tetracycline	3459	2164	62,6									34,1	3,2	0,2	1,4	22,2	38,9				

(1) Neomycin, spectinomycin, ceftiofur, amoxicillin/clavulanic acid were tested in the years 2000 to 2007 only.

(2) Cefotaxime and ceftazidime were tested in 2008 only.

(3) For colistin and trimethoprim no evaluation was performed as the lowest tested concentration was above the epidemiological cut-off value.

(4) The vertical lines demark the epidemiological cut-off values, which are the basis for the evaluation of microbiological resistance.

(5) The white areas demark the range tested. Isolates resistant to the highest concentration are given in the next concentration level.
Values for the lowest concentration include isolates with MICs below the tested range.

Tab. 13.97: *S.* Virchow from food (2000–2008)

Antimicrobial tested	Tested isolates (Number)	Microbiologically resistent isolates (Number) (4)	Microbiological resistent isolates (in %) (4)	Distribution (%) of MICs (µg/ml) (5) 0,008	0,015	0,03125	0,0625	0,125	0,25	0,5	1	2	4	8	16	32	64	128	256	512	1024
Gentamicin	90	1	1,1								97,7	1,1	1,1	0,0	0,0	0,0	0,0				
Neomycin (1)	87	5	5,7									94,3	0,0	1,1	0,0	0,0	4,6				
Kanamycin	90	4	4,4										91,1	4,4	0,0	0,0	0,0	4,4			
Spectinomycin (1)	87	7	8,0									0,0	0,0	0,0	3,4	79,3	9,2	1,1	6,9		
Streptomycin	90	4	4,4										8,9	54,4	25,6	6,7	1,1	3,3			
Chloramphenicol	90	2	2,2									1,1	42,2	46,7	7,8	0,0	1,1	1,1			
Florfenicol	90	0	0,0									4,4	67,8	24,4	3,3	0,0	0,0	0,0			
Cefotaxime (2)	3	0	0,0				100,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0							
Ceftazidime (2)	3	0	0,0						100,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0					
Ceftiofur (1)	87	1	1,1							67,8	29,9	1,1	0,0	0,0	1,1						
Nalidixic acid	90	47	52,2										44,4	3,3	0,0	0,0	0,0	52,2			
Ciprofloxacin	90	47	52,2			47,8	0,0	6,7	34,4	10,0	1,1	0,0	0,0	0,0							
Amoxicillin/Clavulanic acid (1)	87	10	11,5									86,2	2,3	6,9	4,6	0,0	0,0				
Ampicillin	90	12	13,3								67,8	18,9	0,0	0,0	0,0	1,1	12,2				
Colistin (3)	90													100,0	0,0	0,0					
Sulfamethoxazole	90	16	17,8													21,1	57,8	3,3	0,0	2,2	15,6
Trimethoprim (3)	90												92,2	0,0	0,0	1,1	6,7				
Tetracycline	90	2	2,2									88,9	8,9	0,0	0,0	1,1	1,1				

(1) Neomycin, spectinomycin, ceftiofur, amoxicillin/clavulanic acid were tested in the years 2000 to 2007 only.
(2) Cefotaxime and ceftazidime were tested in 2008 only.
(3) For colistin and trimethoprim no evaluation was performed as the lowest tested concentration was above the epidemiological cut-off value.
(4) The vertical lines demark the epidemiological cut-off values, which are the basis for the evaluation of microbiological resistance.
(5) The white areas demark the range tested. Isolates resistant to the highest concentration are given in the next concentration level. Values for the lowest concentration include isolates with MICs below the tested range.

13.2 *Salmonella* isolates from animals

13.2.1 Distribution of the serovars in animals

Tab. 13.98: The 20 most frequent serovars in animals and the four main livestock species (2000–2008)

	Animal total		Cattle		Pig		Chicken		Turkey		Other animals
Serovar	N	%	N	%	N	%	N	%	N	%	N
Number of isolates	**17635**		**3212**		**3820**		**2927**		**1235**		**6441**
S. Typhimurium	7712	43,7	1952	60,8	2595	67,9	239	8,2	133	10,8	2793
S. Enteritidis	1664	9,4	230	7,2	62	1,6	731	25,0	64	5,2	577
S. Subspec. IIIb	594	3,4	7	0,2	4	0,1	1	0,0	0	0,0	582
S. 4,12:d:-	560	3,2	4	0,1	9	0,2	464	15,9	69	5,6	14
S. 4,[5],12:i:-	518	2,9	103	3,2	330	8,6	33	1,1	5	0,4	47
S. Infantis	419	2,4	94	2,9	53	1,4	222	7,6	9	0,7	41
S. Subspec. IV	355	2,0	1	0,0	3	0,1	1	0,0	0	0,0	350
S. Derby	338	1,9	13	0,4	299	7,8	6	0,2	3	0,2	17
S. Saintpaul	333	1,9	6	0,2	0	0,0	17	0,6	285	23,1	25
S. Subspec. I, rough	327	1,9	73	2,3	77	2,0	81	2,8	32	2,6	64
S. Anatum	296	1,7	107	3,3	38	1,0	91	3,1	26	2,1	34
S. Paratyphi B dT+	263	1,5	4	0,1	1	0,0	226	7,7	2	0,2	30
S. Livingstone	256	1,5	13	0,4	29	0,8	174	5,9	3	0,2	37
S. Heidelberg	204	1,2	0	0,0	1	0,0	10	0,3	186	15,1	7
S. Virchow	194	1,1	0	0,0	2	0,1	158	5,4	1	0,1	33
S. Subspec. II	189	1,1	0	0,0	1	0,0	3	0,1	0	0,0	185
S. Indiana	185	1,0	3	0,1	0	0,0	31	1,1	34	2,8	117
S. London	184	1,0	67	2,1	53	1,4	6	0,2	10	0,8	48
S. Subspec. IIIa	179	1,0	0	0,0	1	0,0	2	0,1	0	0,0	176
S. Kottbus	165	0,9	13	0,4	2	0,1	26	0,9	49	4,0	75
S. Senftenberg	137	0,8	39	1,2	4	0,1	29	1,0	32	2,6	33
S. Dublin	123	0,7	114	3,5	4	0,1	1	0,0	0	0,0	4
S. Mbandaka	104	0,6	8	0,2	9	0,2	79	2,7	1	0,1	7
S. Hadar	99	0,6	3	0,1	3	0,1	18	0,6	56	4,5	19
S. 4,[5],12:-:1,2	99	0,6	23	0,7	9	0,2	6	0,2	1	0,1	60
S. Agona	95	0,5	4	0,1	7	0,2	9	0,3	62	5,0	13
S. 9,12:-:-f	87	0,5	67	2,1	3	0,1	6	0,2	0	0,0	11
S. group B	85	0,5	4	0,1	24	0,6	10	0,3	6	0,5	41
S. group E1	80	0,5	7	0,2	1	0,0	9	0,3	7	0,6	56
S. Montevideo	74	0,4	17	0,5	2	0,1	13	0,4	26	2,1	16
S. Newport	68	0,4	19	0,6	1	0,0	3	0,1	5	0,4	40
S. Give	64	0,4	27	0,8	24	0,6	2	0,1	0	0,0	11
S. Bovismorbificans	63	0,4	13	0,4	10	0,3	1	0,0	29	2,3	10
S. Ohio	53	0,3	25	0,8	13	0,3	10	0,3	0	0,0	5
S. 6,7:-:1	52	0,3	1	0,0	17	0,4	0	0,0	0	0,0	34
S. Brandenburg	51	0,3	19	0,6	17	0,4	1	0,0	13	1,1	1
S. Goldcoast	34	0,2	17	0,5	14	0,4	0	0,0	0	0,0	3
S. Manhattan	33	0,2	2	0,1	2	0,1	2	0,1	27	2,2	0
S. Gallinarum	32	0,2	0	0,0	0	0,0	31	1,1	0	0,0	1
S. Thompson	32	0,2	20	0,6	0	0,0	4	0,1	0	0,0	8
S. group C2	27	0,2	0	0,0	0	0,0	0	0,0	13	1,1	14
S. Cerro	25	0,1	6	0,2	1	0,0	14	0,5	0	0,0	4
S. Panama	23	0,1	2	0,1	14	0,4	0	0,0	0	0,0	7
S. Lexington	22	0,1	17	0,5	3	0,1	0	0,0	0	0,0	2
S. Rissen	18	0,1	1	0,0	10	0,3	5	0,2	2	0,2	0
S. Kimuenza	11	0,1	0	0,0	0	0,0	11	0,4	0	0,0	0
S. Kedougou	11	0,1	0	0,0	11	0,3	0	0,0	0	0,0	0
Other serovars	1098	6,2	67	2,1	57	1,5	141	4,8	44	3,6	789

Yellow areas demark the top 20 serovars by category

Tab. 13.99: Development of proportions of the ten most frequent serovars from cattle (2000–2008)

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	Total
Number of isolates	408	330	542	362	315	279	338	304	334	3212
S. Typhimurium	70,6	85,8	79,5	57,2	59,7	54,8	48,2	38,2	36,8	60,8
S. Enteritidis	2,5	5,2	3,7	12,7	4,1	9,7	8,3	7,9	13,5	7,2
S. Dublin	0,0	0,3	2,6	3,6	4,1	5,7	4,7	2,6	9,9	3,5
S. Anatum	2,0	0,0	1,3	3,3	2,9	1,4	9,2	7,2	4,2	3,3
S. 4,[5],12:i:-	0,0	0,6	0,2	0,0	2,5	1,1	3,8	10,5	13,2	3,2
S. Infantis	4,4	0,3	0,6	4,4	5,7	0,7	3,3	6,6	1,5	2,9
S. Subspec. I, rough	2,2	2,4	2,0	4,7	1,3	1,8	1,8	3,3	0,9	2,3
S. London	0,2	0,0	1,7	2,8	5,7	10,4	0,0	0,0	0,0	2,1
S. 9,12:-:-	1,2	0,3	5,2	0,8	1,0	2,2	2,7	2,3	1,5	2,1
S. Senftenberg	8,6	0,3	0,2	0,0	0,0	0,0	0,3	0,0	0,3	1,2
Other serovars	8,3	4,8	3,1	10,5	13,0	12,2	17,8	21,4	18,3	11,4

Tab. 13.100: Development of proportions of the ten most frequent serovars from pig (2000–2008)

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	Total
Number of isolates	548	285	259	425	411	414	462	498	518	3820
S. Typhimurium	82,8	81,1	82,2	68,5	72,7	72,5	64,9	56,0	44,0	67,9
S. 4,[5],12:i:-	0,0	0,4	1,9	5,9	5,1	6,3	10,0	19,3	21,2	8,6
S. Derby	5,1	7,4	5,0	7,8	9,7	6,8	7,6	8,8	11,0	7,8
S. Subspec. I, rough	0,7	1,4	0,4	1,2	0,7	2,9	2,6	2,4	4,6	2,0
S. Enteritidis	0,7	1,1	0,8	4,0	0,2	1,4	1,5	1,8	2,5	1,6
S. Infantis	0,5	0,4	1,2	1,2	0,5	1,7	1,7	1,6	3,1	1,4
S. London	1,3	1,8	1,2	0,5	0,5	1,2	2,2	2,0	1,7	1,4
S. Anatum	0,9	0,0	0,4	3,8	0,0	0,2	1,3	0,4	1,4	1,0
S. Livingstone	0,7	1,1	0,4	0,5	0,0	1,0	1,3	1,4	0,4	0,8
S. Give	0,4	0,4	0,0	0,2	2,9	0,2	0,4	0,4	0,6	0,6
Other serovars	6,8	5,3	6,6	6,6	7,5	5,8	6,5	5,8	9,5	6,8

Tab. 13.101: Development of proportions of the ten most frequent serovars from chicken (2000–2008)

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	Total
Number of isolates	341	455	300	372	539	199	149	208	364	2927
S. Enteritidis	19,6	24,4	37,7	18,0	10,0	20,6	26,8	47,1	38,5	25,0
S. 4,12:d:-	22,0	33,8	0,7	8,6	21,3	1,0	4,0	3,8	19,2	15,9
S. Typhimurium	9,4	10,3	6,0	4,0	9,1	13,1	10,1	10,6	4,1	8,2
S. Paratyphi B	4,4	2,6	17,0	9,4	10,6	13,1	8,7	2,9	3,0	7,7
S. Infantis	0,6	2,4	1,7	18,0	16,0	11,1	12,1	0,5	2,7	7,6
S. Livingstone	14,7	3,7	2,7	8,6	6,7	1,0	1,3	3,4	5,5	5,9
S. Virchow	5,0	2,4	11,3	14,0	5,9	3,0	2,7	0,0	0,5	5,4
S. Anatum	1,5	0,4	0,7	8,6	6,1	3,0	1,3	0,5	2,2	3,1
S. Mbandaka	1,8	2,0	4,0	1,3	1,7	3,0	2,7	6,7	4,4	2,8
S. Subspec. I, rough	2,1	4,4	2,3	3,5	1,1	2,5	0,0	5,8	2,5	2,7
Other serovars	19,1	13,4	16,0	5,9	11,5	28,6	30,2	18,8	17,3	15,8

Tab. 13.102: Development of proportions of the ten most frequent serovars from turkey (2000–2008)

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	Total
Number of isolates	48	179	318	172	108	117	141	80	72	1235
S. Saintpaul	0,0	2,2	36,2	30,8	10,2	24,8	12,8	31,3	41,7	23,1
S. Heidelberg	20,8	24,6	21,7	21,5	6,5	2,6	10,6	1,3	0,0	15,1
S. Typhimurium	2,1	16,8	4,7	9,3	31,5	10,3	9,2	8,8	6,9	10,8
S. 4,12:d:-	0,0	18,4	6,6	5,2	4,6	0,9	0,0	0,0	0,0	5,6
S. Enteritidis	29,2	5,0	2,8	1,2	7,4	6,8	2,8	10,0	2,8	5,2
S. Agona	16,7	11,7	6,3	1,7	1,9	6,0	0,0	1,3	0,0	5,0
S. Hadar	0,0	0,0	0,0	0,0	0,0	0,0	30,5	12,5	4,2	4,5
S. Kottbus	0,0	0,0	5,7	5,8	4,6	5,1	6,4	0,0	1,4	4,0
S. Indiana	0,0	0,0	0,0	0,0	2,8	0,0	7,8	12,5	13,9	2,8
S. Senftenberg	0,0	1,1	0,9	3,5	0,9	1,7	7,8	3,8	5,6	2,6
Other serovars	31,3	20,1	15,1	20,9	29,6	41,9	12,1	18,8	23,6	21,5

13.2.2 Development of resistance rates in *Salmonella* isolates from animals

13.2.2.1 Isolates from pigs

Tab. 13.103: Resistance rates in *Salmonella* isolates from pigs (2000–2008)

	Salmonella spp.	*S.* Typhimurium	*S.* Enteritidis	*S.* 4,[5],12:i:-	*S.* Derby
Tested isolates	3820	2595	62	330	299
Susceptible	16,8	7,7	93,5	3,0	47,2
Resistant	83,2	92,3	6,5	97,0	52,8
Multiresistant (3)	74,2	86,6	4,8	86,4	28,1
Gentamicin	4,5	5,4	0,0	2,1	0,7
Neomycin (1)	8,9	9,5	0,0	6,0	6,2
Kanamycin	9,1	10,1	0,0	6,4	5,0
Spectinomycin (1)	47,9	60,4	4,2	13,0	16,9
Streptomycin	67,7	80,4	0,0	82,4	20,1
Chloramphenicol	36,0	49,1	1,6	7,9	3,3
Florfenicol	31,8	44,9	1,6	4,2	1,7
Cefotaxime (2)	0,8	0,4	0,0	0,0	0,0
Ceftazidime (2)	0,4	0,0	0,0	0,0	0,0
Ceftiofur (1)	0,5	0,4	2,1	0,9	0,8
Nalidixic acid	3,0	3,4	0,0	2,1	1,3
Ciprofloxacin	4,0	4,2	0,0	4,5	1,3
Amoxicillin/Clavulanic acid (1)	63,6	76,8	2,1	68,5	10,7
Ampicillin	66,7	80,4	1,6	83,0	11,7
Sulfamethoxazole	76,6	88,7	4,8	84,8	31,4
Trimethoprim (2)	25,4	32,8	0,0	12,3	31,6
Tetracycline	72,0	82,8	3,2	91,5	32,8

(1) Antimicrobials were tested from 2000 to 2007; (2) antimicrobials were tested/evaluated since 2007;
(3) resistance to more than one class of antimicrobials.

Tab. 13.104: Development of resistance rates in *Salmonella* isolates from pigs (2000–2008)

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008
Tested isolates	548	285	259	425	411	414	462	498	518
Susceptible	6,9	10,2	17,8	17,2	16,3	17,4	24,2	18,5	22,0
Resistant	93,1	89,8	82,2	82,8	83,7	82,6	75,8	81,5	78,0
Multiresistant (3)	81,6	74	76,1	74,8	73,2	75,1	70,3	74,9	68,1
Gentamicin	3,5	2,8	5	3,5	6,8	5,8	4,5	3,2	5,2
Neomycin (1)	4,2	5,3	5,8	9,6	10,9	12,3	12,3	9,5	-
Kanamycin	4,2	6,7	5,8	10,8	11,2	12,8	12,1	10	7,9
Spectinomycin (1)	50,9	56,8	57,5	41,6	47,9	51,2	45	39,5	-
Streptomycin	73,7	68,4	71,4	69,2	67,9	70,5	65,6	66,1	59,1
Chloramphenicol	47,6	47,7	49,8	34,4	35,8	40,6	30,7	29,1	19,5
Florfenicol	39,8	44,6	45,6	31,1	33,1	35,3	27,3	24,7	17,2
Cefotaxime (2)	-	-	-	-	-	-	-	0,0	0,8
Ceftazidime (2)	-	-	-	-	-	-	-	0,0	0,4
Ceftiofur (1)	0,4	0	3,5	0,2	0,5	0	0	0,2	-
Nalidixic acid	3,1	2,5	3,9	1,6	1,2	2,7	4,3	2,2	5
Ciprofloxacin	4,9	3,2	3,5	1,9	1,7	3,9	5,4	4,8	5
Amoxicillin/Clavulanic acid (1)	71	56,8	64,9	63,1	58,2	60,9	62,3	67,4	-
Ampicillin	72,1	57,9	67,2	69,4	63,5	67,9	66,5	70,1	61,8
Sulfamethoxazole	90,5	83,5	75,3	76,9	79,8	74,6	69,3	74,3	66,6
Trimethoprim (2)	-	-	-	-	-	-	-	42,9	24,9
Tetracycline	78,8	71,2	74,9	72,2	66,4	74,9	66,9	72,7	69,5

(1) Antimicrobials were tested from 2000 to 2007; (2) antimicrobials were tested/evaluated since 2007;
(3) resistance to more than one class of antimicrobials.

Tab. 13.105: Development of resistance rates in *S.* Typhimurium from pigs (2000–2008)

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008
Tested isolates	454	231	213	291	299	300	300	279	228
Susceptible	3,3	5,6	12,2	5,5	7,4	7,3	12,7	7,2	11,8
Resistant	96,7	94,4	87,8	94,5	92,6	92,7	87,3	92,8	88,2
Multiresistant (3)	89,9	82,7	84,0	91,4	85,6	86,3	84,0	87,5	83,8
Gentamicin	3,5	3	6,1	4,1	8,4	6,3	6	3,6	9,2
Neomycin (1)	4	3	6,6	8,9	14	14	15	10,9	-
Kanamycin	3,7	4,8	6,6	10	14,4	14,3	14,7	11,1	12,7
Spectinomycin (1)	57,5	67,1	64,8	55,3	59,5	63,7	60,3	59,3	-
Streptomycin	83,3	78,4	79,3	85,9	81,6	81,3	79	78,9	71,5
Chloramphenicol	55,7	57,6	58,7	47,8	46,2	51,7	42,3	42,7	37,3
Florfenicol	47,4	54,1	54	44	44,1	48,3	38,3	40,1	33,8
Cefotaxime (2)	-	-	-	-	-	-	-	0	0,4
Ceftazidime (2)	-	-	-	-	-	-	-	0	0
Ceftiofur (1)	0,4	0	3,3	0,3	0	0	0	0	-
Nalidixic acid	3,5	2,6	3,8	1,4	1,7	3,7	4	3,2	7
Ciprofloxacin	5,1	3,5	3,3	1,7	2	4,7	5	5,7	7
Amoxicillin/Clavulanic acid (1)	82,6	68,8	75,6	78	72,2	73,3	76	83,3	-
Ampicillin	83,9	70,1	77,9	85,9	78,6	78,3	80,7	84,6	78,5
Sulfamethoxazole	95,2	91,8	84	92,4	90	86,3	83,3	87,5	82
Trimethoprim (2)	-	-	-	-	-	-	-	0	33,3
Tetracycline	86,8	77,5	82,2	89	77,9	85	77,7	84,2	81,6

(1) Antimicrobials were tested from 2000 to 2007; (2) antimicrobials were tested/evaluated since 2007;
(3) resistance to more than one class of antimicrobials.

Tab. 13.106: Development of resistance rates in *S.* Derby from pigs (2000–2008)

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008
Tested isolates	28	21	13	33	40	28	35	44	57
Susceptible	21,4	33,3	46,2	42,4	60	71,4	74,3	52,3	26,3
Resistant	78,6	66,7	53,8	57,6	40	28,6	25,7	47,7	73,7
Multiresistant (3)	35,7	19	23,1	15,2	32,5	14,3	20	40,9	35,1
Gentamicin	0	4,8	0	0	0	0	0	2,3	0
Neomycin (1)	0	4,8	0	36,4	0	0	2,9	2,3	-
Kanamycin	0	4,8	0	36,4	0	0	2,9	2,3	0
Spectinomycin (1)	25	19	15,4	12,1	22,5	10,7	11,4	18,2	-
Streptomycin	28,6	33,3	30,8	6,1	20	10,7	11,4	25	22,8
Chloramphenicol	0	0	0	0	2,5	3,6	2,9	11,4	3,5
Florfenicol	0	0	0	0	0	0	0	6,8	3,5
Cefotaxime (2)	-	-	-	-	-	-	-	-	0
Ceftazidime (2)	-	-	-	-	-	-	-	-	0
Ceftiofur (1)	0	0	0	0	5	0	0	0	-
Nalidixic acid	0	4,8	0	0	0	0	8,6	0	0
Ciprofloxacin	0	4,8	0	0	0	0	8,6	0	0
Amoxicillin/Clavulanic acid (1)	0	4,8	0	15,2	2,5	7,1	14,3	27,3	-
Ampicillin	0	4,8	0	15,2	5	7,1	14,3	29,5	12,3
Sulfamethoxazole	71,4	23,8	23,1	21,2	22,5	14,3	14,3	38,6	42,1
Trimethoprim (2)	-	-	-	-	-	-	-	-	31,6
Tetracycline	35,7	38,1	38,5	12,1	35	17,9	11,4	31,8	59,6

(1) Antimicrobials were tested from 2000 to 2007; (2) antimicrobials were tested/evaluated since 2007;
(3) resistance to more than one class of antimicrobials.

Tab. 13.107: Development of resistance rates in *S*. Enteritidis from pigs (2000–2008)

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008
Tested isolates	4	3	2	17	1	6	7	9	13
Susceptible	75	100	50	94,1	100	83,3	100	88,9	100
Resistant	25	0	50	5,9	0	16,7	0	11,1	0
Multiresistant (3)	0	0	50	0	0	16,7	0	11,1	0
Gentamicin	0	0	0	0	0	0	0	0	0
Neomycin (1)	0	0	0	0	0	0	0	0	-
Kanamycin	0	0	0	0	0	0	0	0	0
Spectinomycin (1)	0	0	50	0	0	0	0	12,5	-
Streptomycin	0	0	0	0	0	0	0	0	0
Chloramphenicol	0	0	0	0	0	0	0	11,1	0
Florfenicol	0	0	0	0	0	0	0	11,1	0
Cefotaxime (2)	-	-	-	-	-	-	-	-	0
Ceftazidime (2)	-	-	-	-	-	-	-	-	0
Ceftiofur (1)	0	0	50	0	0	0	0	0	-
Nalidixic acid	0	0	0	0	0	0	0	0	0
Ciprofloxacin	0	0	0	0	0	0	0	0	0
Amoxicillin/Clavulanic acid (1)	0	0	0	0	0	0	0	12,5	-
Ampicillin	0	0	0	0	0	0	0	11,1	0
Sulfamethoxazole	25	0	0	0	0	16,7	0	11,1	0
Trimethoprim (2)	-	-	-	-	-	-	-	-	0
Tetracycline	0	0	0	0	0	16,7	0	11,1	0

(1) Antimicrobials were tested from 2000 to 2007; (2) antimicrobials were tested/evaluated since 2007;
(3) resistance to more than one class of antimicrobials.

Tab. 13.108: Development of resistance rates in *S*. 4,[5],12:i:- from pigs (2000–2008)

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008
Tested isolates	0	1	5	25	21	26	46	96	110
Susceptible	-	0	0	0	4,8	3,8	2,2	2,1	4,5
Resistant		100	100	100	95,2	96,2	97,8	97,9	95,5
Multiresistant (3)	-	100	100	96	81	80,8	80,4	86,5	88,2
Gentamicin	-	0	0	0	0	0	0	3,1	3,6
Neomycin (1)	-	0	20	4	0	3,8	2,2	9,8	-
Kanamycin	-	0	20	8	0	3,8	2,2	9,4	6,4
Spectinomycin (1)	-	100	40	20	9,5	11,5	15,2	8,7	-
Streptomycin	-	100	80	84	71,4	76,9	80,4	83,3	85,5
Chloramphenicol	-	100	0	12	9,5	7,7	10,9	11,5	1,8
Florfenicol	-	100	0	4	4,8	0	10,9	5,2	0,9
Cefotaxime (2)	-	-	-	-	-	-	-	0	0
Ceftazidime (2)	-	-	-	-	-	-	-	0	0
Ceftiofur (1)	-	0	20	0	0	0	0	1,1	-
Nalidixic acid	-	0	0	0	0	0	8,7	1	1,8
Ciprofloxacin	-	0	0	0	4,8	0	10,9	7,3	1,8
Amoxicillin/Clavulanic acid (1)	-	100	60	68	57,1	50	71,7	75,0	-
Ampicillin	-	100	80	84	66,7	76,9	78,3	84,4	88,2
Sulfamethoxazole	-	100	80	84	90,5	80,8	80,4	85,4	86,4
Trimethoprim (2)	-	-	-	-	-	-	-	75,0	10
Tetracycline	-	100	100	96	76,2	92,3	95,7	90,6	91,8

(1) Antimicrobials were tested from 2000 to 2007; (2) antimicrobials were tested/evaluated since 2007;
(3) resistance to more than one class of antimicrobials.

13.2.2.2 Isolates from cattle

Tab. 13.109: Resistence rates in *Salmonella* isolates from cattle (2000–2008)

	Salmonella spp.	*S.* Typhimurium	*S.* Enteritidis	*S.* Dublin	*S.* Anatum	*S.* 4,[5],12:i:-
Tested isolates	3212	1952	230	114	107	103
Susceptible	40,4	17,6	93,9	93,0	90,7	8,7
Resistant	59,6	82,4	6,1	7,0	9,3	91,3
Multiresistant (3)	51,9	76,4	1,3	3,5	3,7	88,3
Gentamicin	0,8	1,1	0,9	0,0	0,9	0,0
Neomycin (1)	3,1	3,9	1,6	0,0	1,1	5,3
Kanamycin	3,2	4,2	1,3	0,0	0,9	2,9
Spectinomycin (1)	42,2	63,8	0,5	1,2	3,3	3,5
Streptomycin	49,1	73,4	0,9	1,8	1,9	86,4
Chloramphenicol	35,8	57,7	0,4	1,8	0,9	0,0
Florfenicol	33,5	54,3	0,4	1,8	0,0	0,0
Cefotaxime (2)	0,0	0,0	0,0	0,0	0,0	0,0
Ceftazidime (2)	0,0	0,0	0,0	0,0	0,0	0,0
Ceftiofur (1)	1,2	1,2	1,1	0,0	1,1	0,0
Nalidixic acid	3,0	3,5	0,9	3,5	0,9	0,0
Ciprofloxacin	3,6	4,1	0,9	3,5	0,9	1,0
Amoxicillin/Clavulanic acid (1)	48,4	71,2	0,5	0,0	2,2	73,7
Ampicillin	48,8	72,6	0,4	1,8	1,9	87,4
Sulfamethoxazole	56,6	80,2	3,5	3,5	7,5	88,3
Trimethoprim (2)	7,0	14,8	0,0	0,0	0,0	2,2
Tetracycline	48,5	72,2	0,4	1,8	0,9	89,3

(1) Antimicrobials were tested from 2000 to 2007; (2) antimicrobials were tested/evaluated since 2007;
(3) resistance to more than one class of antimicrobials.

Tab. 13.110: Development of resistance rates in *Salmonella* isolates from cattle (2000–2008)

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008
Tested isolates	408	330	542	362	315	279	338	304	334
Susceptible	16,9	9,4	39,3	45,6	32,1	48,4	59,2	61,8	58,4
Resistant	83,1	90,6	60,7	54,4	67,9	51,6	40,8	38,2	41,6
Multiresistant (3)	54,9	82,7	56,6	51,9	59,0	47,3	38,5	32,2	38,3
Gentamicin	1,5	0,6	1,3	0,3	1,0	1,1	0,3	0,7	0,6
Neomycin (1)	7,4	1,2	0,9	1,1	7,0	0,4	2,1	5,1	-
Kanamycin	6,6	1,8	1,1	1,7	7,9	1,4	2,1	5,3	1,5
Spectinomycin (1)	44,9	73,9	40,6	37,3	53,3	42,7	25,4	18,6	-
Streptomycin	52,5	75,5	54,8	50,6	57,5	43,0	36,4	30,9	35,0
Chloramphenicol	43,1	70,9	40,0	31,5	43,8	40,9	21,6	12,5	13,5
Florfenicol	34,8	65,8	38,9	30,1	43,5	40,1	20,4	11,5	13,2
Cefotaxime (2)	-	-	-	-	-	-	-	0,0	0,0
Ceftazidime (2)	-	-	-	-	-	-	-	0,0	0,0
Ceftiofur (1)	2,2	0,3	3,7	0,3	0,0	0,4	0,3	0,0	-
Nalidixic acid	1,5	1,2	7,7	3,3	1,9	2,9	0,3	2,6	2,4
Ciprofloxacin	3,7	1,5	7,7	3,6	2,2	2,9	0,9	4,9	2,7
Amoxicillin/Clavulanic acid (1)	49,8	72,7	52,6	44,2	56,8	44,8	32,5	29,2	-
Ampicillin	52,2	74,2	55,5	45,3	57,8	46,6	33,1	31,3	37,4
Sulfamethoxazole	80,9	89,1	57,2	51,4	66,0	47,0	39,1	32,6	38,0
Trimethoprim (2)	-	-	-	-	-	-	-	11,1	6,9
Tetracycline	52,2	70,9	53,5	45,9	58,4	45,9	36,7	30,3	38,0

(1) Antimicrobials were tested from 2000 to 2007; (2) antimicrobials were tested/evaluated since 2007;
(3) resistance to more than one class of antimicrobials.

Tab. 13.111: Development of resistance rates in *S.* Typhimurium isolates from cattle (2000–2008)

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008
Tested isolates	288	283	431	207	188	153	163	116	123
Susceptible	10,1	0,7	27,4	19,3	3,7	15	24,5	43,1	28,5
Resistant	89,9	99,3	72,6	80,7	96,3	85	75,5	56,9	71,5
Multiresistant (3)	75	94	68,4	79,2	89,9	80,4	71,8	51,7	65,9
Gentamicin	1,7	0,7	0,9	0	1,6	2	0,6	1,7	0,8
Neomycin (1)	10,1	0,7	0,7	1	11,2	0	3,1	8,1	-
Kanamycin	9	1,4	0,7	1,4	12,8	2	3,1	8,6	3,3
Spectinomycin (1)	60,8	84,8	49,2	60,4	88,3	74,5	50,9	43,2	-
Streptomycin	73,3	86,2	67,7	78,3	89,9	74,5	68,1	47,4	60,2
Chloramphenicol	59,7	82	49,7	52,7	72,9	73,2	42,9	32,8	35
Florfenicol	49	76	48,3	51,2	72,3	71,9	40,5	30,2	34,1
Cefotaxime (2)	-	-	-	-	-	-	-	0,0	0
Ceftazidime (2)	-	-	-	-	-	-	-	0,0	0
Ceftiofur (1)	2,1	0	3,5	0	0	0	0,6	0	-
Nalidixic acid	1	1,1	8,8	3,9	0,5	3,3	0,6	6	1,6
Ciprofloxacin	3,5	1,4	8,8	4,3	1,1	3,3	1,8	6,9	1,6
Amoxicillin/Clavulanic acid (1)	69,4	83,7	65	70	87,8	77,8	61,3	46,8	-
Ampicillin	72,6	84,8	68,2	71	88,3	80,4	62	49,1	65,9
Sulfamethoxazole	88,9	98,6	69,4	79,7	96,3	80,4	73	53,4	65,9
Trimethoprim (2)	-	-	-	-	-	-	-	20,0	14,6
Tetracycline	72,6	80,6	66,1	73,4	88,8	79,1	68,7	45,7	67,5

(1) Antimicrobials were tested from 2000 to 2007; (2) antimicrobials were tested/evaluated since 2007;
(3) resistance to more than one class of antimicrobials.

Tab. 13.112: Development of resistance rates in *S.* 4,[5],12:i:- isolates from cattle (2000–2008)

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008
Tested isolates	0	2	1	0	8	3	13	32	44
Susceptible	-	0	0	-	0	33,3	23,1	3,1	9,1
Resistant		100	100		100	66,7	76,9	96,9	90,9
Multiresistant (3)	-	50	100	-	100	66,7	69,2	93,8	90,9
Gentamicin	-	0	0	-	0	0	0	0	0
Neomycin (1)	-	0	0	-	0	0	15,4	3,3	-
Kanamycin	-	0	0	-	0	0	15,4	3,1	0
Spectinomycin (1)	-	0	0	-	0	0	15,4	0	-
Streptomycin	-	50	100	-	100	66,7	61,5	90,6	90,9
Chloramphenicol	-	0	0	-	0	0	0	0	0
Florfenicol	-	0	0	-	0	0	0	0	0
Cefotaxime (2)	-	-	-	-	-	-	-	0	0
Ceftazidime (2)	-	-	-	-	-	-	-	0	0
Ceftiofur (1)	-	0	0	-	0	0	0	0	-
Nalidixic acid	-	0	0	-	0	0	0	0	0
Ciprofloxacin	-	0	0	-	0	0	0	0	2,3
Amoxicillin/Clavulanic acid (1)	-	0	0	-	75	33,3	61,5	90,0	-
Ampicillin	-	50	100	-	100	66,7	69,2	93,8	88,6
Sulfamethoxazole	-	100	100	-	100	66,7	61,5	93,8	90,9
Trimethoprim (2)	-	-	-	-	-	-	-	0	2,3
Tetracycline	-	50	100	-	100	33,3	76,9	96,9	90,9

(1) Antimicrobials were tested from 2000 to 2007; (2) antimicrobials were tested/evaluated since 2007;
(3) resistance to more than one class of antimicrobials.

Tab. 13.113: Development of resistance rates in *S*. Enteritidis isolates from cattle (2000–2008)

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008
Tested isolates	10	17	20	46	13	27	28	24	45
Susceptible	40	88,2	90	95,7	100	100	96,4	95,8	100
Resistant	60	11,8	10	4,3	0	0	3,6	4,2	0
Multiresistant (3)	10	0	0	2,2	0	0	3,6	0	0
Tested isolates	0	0	10	0	0	0	0	0	0
Neomycin (1)	0	0	10	2,2	0	0	0	0	-
Kanamycin	0	0	10	2,2	0	0	0	0	0
Spectinomycin (1)	10	0	0	0	0	0	0	0	-
Streptomycin	0	0	0	0	0	0	3,6	4,2	0
Chloramphenicol	0	0	0	2,2	0	0	0	0	0
Florfenicol	0	0	0	2,2	0	0	0	0	0
Cefotaxime (2)	-	-	-	-	-	-	-	-	0
Ceftazidime (2)	-	-	-	-	-	-	-	-	0
Ceftiofur (1)	10	5,9	0	0	0	0	0	0	-
Nalidixic acid	10	0	0	2,2	0	0	0	0	0
Ciprofloxacin	10	0	0	2,2	0	0	0	0	0
Amoxicillin/Clavulanic acid (1)	0	0	0	0	0	0	3,6	0	-
Ampicillin	0	0	0	0	0	0	3,6	0	0
Sulfamethoxazole	50	5,9	0	2,2	0	0	3,6	0	0
Trimethoprim (2)	-	-	-	-	-	-	-	-	0
Tetracycline	0	0	0	0	0	0	3,6	0	0

(1) Antimicrobials were tested from 2000 to 2007; (2) antimicrobials were tested/evaluated since 2007;
(3) resistance to more than one class of antimicrobials.

Tab. 13.114: Development of resistance rates in *S*. Dublin isolates from cattle (2000–2008)

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008
Tested isolates	0	1	14	13	13	16	16	8	33
Susceptible	-	100,0	100,0	92,3	100,0	93,8	87,5	75,0	93,9
Resistant	-	0,0	0,0	7,7	0,0	6,3	12,5	25,0	6,1
Multiresistant (3)	-	0,0	0,0	7,7	0,0	0,0	12,5	12,5	0,0
Gentamicin	-	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Neomycin (1)	-	0,0	0,0	0,0	0,0	0,0	0,0	0,0	-
Kanamycin	-	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Spectinomycin (1)	-	0,0	0,0	7,7	0,0	0,0	0,0	0,0	-
Streptomycin	-	0,0	0,0	0,0	0,0	0,0	12,5	0,0	0,0
Chloramphenicol	-	0,0	0,0	0,0	0,0	0,0	12,5	0,0	0,0
Florfenicol	-	0,0	0,0	0,0	0,0	0,0	12,5	0,0	0,0
Cefotaxime (2)	-	-	-	-	-	-	-	-	0,0
Ceftazidime (2)	-	-	-	-	-	-	-	-	0,0
Ceftiofur (1)	-	0,0	0,0	0,0	0,0	0,0	0,0	0,0	-
Nalidixic acid	-	0,0	0,0	0,0	0,0	6,3	0,0	12,5	6,1
Ciprofloxacin	-	0,0	0,0	0,0	0,0	6,3	0,0	12,5	6,1
Amoxicillin/Clavulanic acid (1)	-	0,0	0,0	0,0	0,0	0,0	0,0	0,0	-
Ampicillin	-	0,0	0,0	7,7	0,0	0,0	0,0	12,5	0,0
Sulfamethoxazole	-	0,0	0,0	7,7	0,0	0,0	12,5	12,5	0,0
Trimethoprim (2)	-	-	-	-	-	-	-	-	0,0
Tetracycline	-	0,0	0,0	7,7	0,0	0,0	0,0	12,5	0,0

(1) Antimicrobials were tested from 2000 to 2007; (2) antimicrobials were tested/evaluated since 2007;
(3) resistance to more than one class of antimicrobials.

Tab. 13.115: Development of resistance rates in *S.* Anatum isolates from cattle (2000–2008)

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008
Tested isolates	8	0	7	12	9	4	31	22	14
Susceptible	50,0	-	85,7	100,0	88,9	50,0	96,8	95,5	100,0
Resistant	50,0	-	14,3	0,0	11,1	50,0	3,2	4,5	0,0
Multiresistant (3)	12,5	-	14,3	0,0	0,0	50,0	0,0	0,0	0,0
Gentamicin	12,5	-	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Neomycin (1)	12,5	-	0,0	0,0	0,0	0,0	0,0	0,0	-
Kanamycin	12,5	-	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Spectinomycin (1)	12,5	-	14,3	0,0	0,0	25,0	0,0	0,0	-
Streptomycin	12,5	-	0,0	0,0	0,0	0,0	0,0	4,5	0,0
Chloramphenicol	12,5	-	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Florfenicol	0,0	-	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Cefotaxime (2)	-	-	-	-	-	-	-	0,0	0,0
Ceftazidime (2)	-	-	-	-	-	-	-	0,0	0,0
Ceftiofur (1)	0,0	-	0,0	0,0	0,0	25,0	0,0	0,0	-
Nalidixic acid	12,5	-	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Ciprofloxacin	12,5	-	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Amoxicillin/Clavulanic acid (1)	12,5	-	0,0	0,0	0,0	25,0	0,0	0,0	-
Ampicillin	12,5	-	0,0	0,0	0,0	25,0	0,0	0,0	0,0
Sulfamethoxazole	50,0	-	14,3	0,0	11,1	25,0	3,2	0,0	0,0
Trimethoprim (2)	-	-	-	-	-	-	-	-	0,0
Tetracycline	12,5	-	0,0	0,0	0,0	0,0	0,0	0,0	0,0

(1) Antimicrobials were tested from 2000 to 2007; (2) antimicrobials were tested/evaluated since 2007;
(3) resistance to more than one class of antimicrobials.

13.2.2.3 Isolates from chickens

Tab. 13.116: Resistence rates in *Salmonella* isolates from chickens (2000–2008)

	Salmonella spp.	*S.* Enteritidis	*S.* 4,12:d:-	*S.* Typhimurium	*S.* Paratyphi B dT+	*S.* Infantis
Tested isolates	2927	731	464	239	226	222
Susceptible	58,2	77,7	58,8	35,6	0,4	55,9
Resistant	41,8	22,3	41,2	64,4	99,6	44,1
Multiresistant (3)	21,8	4,0	4,3	39,7	84,1	33,8
Gentamicin	1,1	1,6	0,2	0	0,4	0
Neomycin (1)	2,4	0,2	0	1,3	2,3	0,5
Kanamycin	2,6	0,4	0,2	1,3	2,7	0,5
Spectinomycin (1)	18,3	2,1	2,0	26,8	99,5	27,8
Streptomycin	8,5	2,2	0,9	31,0	17,3	5,4
Chloramphenicol	3,3	0,3	0	23,0	1,8	0,5
Florfenicol	2,0	0,1	0	22,6	0	0
Cefotaxime (2)	0,5	0	0	0	18,2	0
Ceftazidime (2)	0,5	0	0	0	18,2	0
Ceftiofur (1)	0,4	0,2	0	0	0,9	0
Nalidixic acid	13,1	9,2	0	9,6	59,7	30,2
Ciprofloxacin	12,7	9,3	0,6	3,3	61,5	30,6
Amoxicillin/Clavulanic acid (1)	9,6	2,4	2,3	27,2	22,3	9,9
Ampicillin	10,5	2,2	2,2	28,5	26,1	10,8
Sulfamethoxazole	30,6	11,8	39,9	62,3	56,6	34,7
Trimethoprim (2)	7,4	0	0	0	100,0	20,0
Tetracycline	11,3	1,5	0,2	30,1	9,3	26,1

(1) Antimicrobials were tested from 2000 to 2007; (2) antimicrobials were tested/evaluated since 2007;
(3) resistance to more than one class of antimicrobials.

Tab. 13.117: Development of resistance rates in *Salmonella* isolates from chickens (2000–2008)

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008
Tested isolates	341	455	300	372	539	199	149	208	364
Susceptible	26,4	37,1	65,0	63,7	60,3	57,8	59,7	83,2	85,4
Resistant	73,6	62,9	35,0	36,3	39,7	42,2	40,3	16,8	14,6
Multiresistant (3)	28,7	19,6	25,3	24,7	21,7	32,7	26,8	10,1	11,3
Gentamicin	2,1	0,4	0,7	1,9	0,4	0	2,0	3,4	0,5
Neomycin (1)	8,2	3,3	0,7	0,8	0,7	3,0	0,7	0,5	-
Kanamycin	9,4	3,3	1,0	1,1	0,9	3,0	2,7	1,4	1,1
Spectinomycin (1)	21,7	8,8	20,0	26,3	20,2	21,1	19,5	7,7	-
Streptomycin	10,6	5,7	8,0	11,3	10,8	10,6	11,4	2,9	4,7
Chloramphenicol	4,7	2,6	1,3	2,4	5,8	5,0	4,0	0,5	1,9
Florfenicol	1,2	0,7	0,7	2,2	4,8	3,0	1,3	0,5	1,6
Cefotaxime (2)	-	-	-	-	-	-	-	0	0,5
Ceftazidime (2)	-	-	-	-	-	-	-	0	0,5
Ceftiofur (1)	0,9	0	1,0	0,3	0,2	0	2,0	0	-
Nalidixic acid	3,2	10,1	24,3	23,9	9,6	22,6	21,5	9,1	4,4
Ciprofloxacin	3,2	7,0	24,0	23,9	10,0	24,6	20,8	9,1	4,4
Amoxicillin/Clavulanic acid (1)	6,2	7,0	8,3	7,3	15,6	13,6	12,1	5,1	-
Ampicillin	6,7	7,7	11,7	7,8	17,1	14,1	12,1	5,3	9,6
Sulfamethoxazole	70,7	56,5	16,7	24,7	26,7	17,6	21,5	6,3	9,1
Trimethoprim (2)	-	-	-	-	-	-	-	0	7,7
Tetracycline	17,6	6,8	5,3	17,2	12,6	11,6	27,5	7,2	3,6

(1) Antimicrobials were tested from 2000 to 2007; (2) antimicrobials were tested/evaluated since 2007;
(3) resistance to more than one class of antimicrobials.

Tab. 13.118: Development of resistance rates in *S.* Enteritidis isolates from chickens (2000–2008)

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008
Tested isolates	67	111	113	67	54	41	40	98	140
Susceptible	38,8	59,5	77,0	79,1	66,7	92,7	100,0	85,7	98,6
Resistant	61,2	40,5	23,0	20,9	33,3	7,3	0	14,3	1,4
Multiresistant (3)	13,4	5,4	4,4	4,5	1,9	0	0	5,1	0
Gentamicin	6,0	0,9	1,8	1,5	0	0	0	4,1	0
Neomycin (1)	0	0	0,9	0	0	0	0	0	-
Kanamycin	0	0	1,8	1,5	0	0	0	0	0
Spectinomycin (1)	6,0	0	2,7	1,5	0	0	0	4,7	-
Streptomycin	7,5	0	5,3	3,0	1,9	0	0	1,0	0,7
Chloramphenicol	1,5	0,9	0	0	0	0	0	0	0
Florfenicol	0	0	0,9	0	0	0	0	0	0
Cefotaxime (2)	-	-	-	-	-	-	-	0	0
Ceftazidime (2)	-	-	-	-	-	-	-	0	0
Ceftiofur (1)	0	0	0,9	0	0	0	0	0	-
Nalidixic acid	1,5	9,9	14,2	16,4	31,5	4,9	0	9,2	0
Ciprofloxacin	1,5	9,9	14,2	16,4	31,5	7,3	0	9,2	0
Amoxicillin/Clavulanic acid (1)	6,0	0,9	4,4	4,5	1,9	0	0	0	-
Ampicillin	4,5	0,9	5,3	4,5	1,9	0	0	1,0	0,7
Sulfamethoxazole	58,2	33,3	3,5	1,5	0	0	0	5,1	0
Trimethoprim (2)	-	-	-	-	-	-	-	0	0
Tetracycline	4,5	0,9	1,8	1,5	0	0	0	4,1	0

(1) Antimicrobials were tested from 2000 to 2007; (2) antimicrobials were tested/evaluated since 2007;
(3) resistance to more than one class of antimicrobials.

Tab. 13.119: Development of resistance rates in *S.* Typhimurium isolates from chickens (2000–2008)

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008
Tested isolates	32	47	18	15	49	26	15	22	15
Susceptible	6,3	8,5	72,2	26,7	16,3	65,4	53,3	86,4	66,7
Resistant	93,7	91,5	27,8	73,3	83,7	34,6	46,7	13,6	33,3
Multiresistant (3)	15,6	53,2	27,8	66,7	63,3	34,6	20,0	9,1	33,3
Gentamicin	0	0	0	0	0	0	0	0	0
Neomycin (1)	0	4,3	0	0	0	3,8	0	0	-
Kanamycin	0	4,3	0	0	0	3,8	0	0	0
Spectinomycin (1)	15,6	10,6	5,6	60,0	55,1	30,8	20,0	9,1	-
Streptomycin	12,5	19,1	27,8	60,0	59,2	34,6	20,0	4,5	33,3
Chloramphenicol	12,5	4,3	5,6	53,3	53,1	23,1	13,3	4,5	33,3
Florfenicol	12,5	2,1	5,6	53,3	53,1	23,1	13,3	4,5	33,3
Cefotaxime (2)	-	-	-	-	-	-	-	-	0
Ceftazidime (2)	-	-	-	-	-	-	-	-	0
Ceftiofur (1)	0	0	0	0	0	0	0	0	-
Nalidixic acid	6,3	34,0	5,6	0	2,0	3,8	13,3	0	0
Ciprofloxacin	6,3	2,1	5,6	0	2,0	3,8	13,3	0	0
Amoxicillin/Clavulanic acid (1)	12,5	8,5	22,2	53,3	61,2	26,9	13,3	9,1	-
Ampicillin	12,5	8,5	22,2	60,0	63,3	26,9	13,3	9,1	33,3
Sulfamethoxazole	87,5	89,4	27,8	73,3	81,6	34,6	40,0	13,6	33,3
Trimethoprim (2)	-	-	-	-	-	-	-	-	0
Tetracycline	12,5	19,1	22,2	60,0	59,2	30,8	13,3	9,1	33,3

(1) Antimicrobials were tested from 2000 to 2007; (2) antimicrobials were tested/evaluated since 2007;
(3) resistance to more than one class of antimicrobials.

Tab. 13.120: Development of resistance rates in *S.* Paratyphi B dT+ isolates from chickens (2000–2008)

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008
Tested isolates	15	12	51	35	57	26	13	6	11
Susceptible	0,0	0,0	0,0	2,9	0,0	0,0	0,0	0,0	0,0
Resistant	100,0	100,0	100,0	97,1	100,0	100,0	100,0	100,0	100,0
Multiresistant (3)	93,3	66,7	100,0	80,0	66,7	80,8	100,0	100,0	100,0
Gentamicin	0,0	8,3	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Neomycin (1)	0,0	0,0	0,0	5,7	3,5	0,0	7,7	0,0	-
Kanamycin	0,0	0,0	0,0	5,7	3,5	0,0	7,7	0,0	9,1
Spectinomycin (1)	100,0	100,0	100,0	97,1	100,0	100,0	100,0	100,0	-
Streptomycin	20,0	16,7	5,9	37,1	19,3	3,8	23,1	0,0	27,3
Chloramphenicol	6,7	0,0	0,0	0,0	3,5	0,0	7,7	0,0	0,0
Florfenicol	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Cefotaxime (2)	-	-	-	-	-	-	-	-	18,2
Ceftazidime (2)	-	-	-	-	-	-	-	-	18,2
Ceftiofur (1)	0,0	0,0	2,0	2,9	0,0	0,0	0,0	0,0	-
Nalidixic acid	0,0	58,3	100,0	68,6	15,8	76,9	69,2	100,0	81,8
Ciprofloxacin	0,0	58,3	100,0	71,4	19,3	80,8	69,2	100,0	81,8
Amoxicillin/Clavulanic acid (1)	20,0	16,7	9,8	22,9	31,6	11,5	69,2	0,0	-
Ampicillin	20,0	16,7	21,6	25,7	33,3	11,5	69,2	0,0	27,3
Sulfamethoxazole	80,0	58,3	54,9	71,4	59,6	30,8	84,6	0,0	27,3
Trimethoprim (2)	-	-	-	-	-	-	-	-	100,0
Tetracycline	6,7	0,0	0,0	28,6	10,5	0,0	23,1	16,7	0,0

(1) Antimicrobials were tested from 2000 to 2007; (2) antimicrobials were tested/evaluated since 2007;
(3) resistance to more than one class of antimicrobials.

Tab. 13.121: Development of resistance rates in *S.* 4,12:d:- isolates from chickens (2000–2008)

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008
Tested isolates	75	154	2	32	115	2	6	8	70
Susceptible	30,7	25,3	100	100	81,7	50	83,3	87,5	100
Resistant	69,3	74,7	0	0	18,3	50	16,7	12,5	0
Multiresistant (3)	13,3	6,5	0	0	0	0	0	0	0
Gentamicin	1,3	0	0	0	0	0	0	0	0
Neomycin (1)	0	0	0	0	0	0	0	0	-
Kanamycin	1,3	0	0	0	0	0	0	0	0
Spectinomycin (1)	9,3	0,6	0	0	0	0	0	0	-
Streptomycin	0	2,6	0	0	0	0	0	0	0
Chloramphenicol	0	0	0	0	0	0	0	0	0
Florfenicol	0	0	0	0	0	0	0	0	0
Cefotaxime (2)	-	-	-	-	-	-	-	-	0
Ceftazidime (2)	-	-	-	-	-	-	-	-	0
Ceftiofur (1)	0	0	0	0	0	0	0	0	-
Nalidixic acid	0	0	0	0	0	0	0	0	0
Ciprofloxacin	1,3	0,6	0	0	0	50	0	0	0
Amoxicillin/Clavulanic acid (1)	1,3	3,2	0	0	1,7	0	0	12,5	-
Ampicillin	1,3	3,9	0	0	1,7	0	0	12,5	0
Sulfamethoxazole	68	74	0	0	16,5	0	16,7	0	0
Trimethoprim (2)	-	-	-	-	-	-	-	-	0
Tetracycline	1,3	0	0	0	0	0	0	0	0

(1) Antimicrobials were tested from 2000 to 2007; (2) antimicrobials were tested/evaluated since 2007;
(3) resistance to more than one class of antimicrobials.

Tab. 13.122: Development of resistance rates in *S.* Infantis isolates from chickens (2000–2008)

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008
Tested isolates	2	11	5	67	86	22	18	1	10
Susceptible	50,0	18,2	100,0	20,9	74,4	86,4	55,6	100,0	80,0
Resistant	50,0	81,8	0	79,1	25,6	13,6	44,4	0	20,0
Multiresistant (3)	0	81,8	0	61,2	16,3	9,1	44,4	0	10,0
Gentamicin	0	0	0	0	0	0	0	0	0
Neomycin (1)	0	0	0	0	0	4,5	0	0	-
Kanamycin	0	0	0	0	0	4,5	0	0	0
Spectinomycin (1)	0	0	0	59,7	12,8	4,5	38,9	0	-
Streptomycin	0	0	0	13,4	3,5	0	0	0	0
Chloramphenicol	0	0	0	0	0	4,5	0	0	0
Florfenicol	0	0	0	0	0	0	0	0	0
Cefotaxime (2)	-	-	-	-	-	-	-	-	0
Ceftazidime (2)	-	-	-	-	-	-	-	-	0
Ceftiofur (1)	0	0	0	0	0	0	0	0	-
Nalidixic acid	0	0	0	74,6	11,6	0	38,9	0	0
Ciprofloxacin	0	0	0	74,6	11,6	4,5	38,9	0	0
Amoxicillin/Clavulanic acid (1)	0	81,8	0	3,0	9,3	4,5	5,6	0	-
Ampicillin	0	81,8	0	3,0	11,6	4,5	5,6	0	10,0
Sulfamethoxazole	50	81,8	0	59,7	17,4	9,1	44,4	0	20,0
Trimethoprim (2)	-	-	-	-	-	-	-	-	20,0
Tetracycline	0	0	0	61,2	11,6	0	38,9	0	0

(1) Antimicrobials were tested from 2000 to 2007; (2) antimicrobials were tested/evaluated since 2007;
(3) resistance to more than one class of antimicrobials.

Tab. 13.123: Development of resistance rates in *S.* 4,[5],12:i:- isolates from chickens (2000–2008)

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008
Tested isolates	0	1	2	1	6	12	2	4	5
Susceptible	-	0	50	100	0	58,3	0	75	40
Resistant		100	50	0	100	41,7	100	25	60
Multiresistant (3)	-	100	50	0	83,3	33,3	50	25	40
Gentamicin	-	0	0	0	0	0	0	0	0
Neomycin (1)	-	100	0	0	0	0	0	0	-
Kanamycin	-	100	0	0	0	0	0	0	0
Spectinomycin (1)	-	100	0	0	0	0	50	0	-
Streptomycin	-	100	50	0	83,3	25	50	25	40
Chloramphenicol	-	0	0	0	0	0	0	0	0
Florfenicol	-	0	0	0	0	0	0	0	0
Cefotaxime (2)	-	-	-	-	-	-	-	-	0
Ceftazidime (2)	-	-	-	-	-	-	-	-	0
Ceftiofur (1)	-	0	0	0	0	0	0	0	-
Nalidixic acid	-	0	0	0	16,7	0	50	0	20
Ciprofloxacin	-	0	0	0	16,7	0	0	0	20
Amoxicillin/Clavulanic acid (1)	-	0	50	0	66,7	25	50	25	-
Ampicillin	-	100	50	0	83,3	33,3	50	25	40
Sulfamethoxazole	-	100	50	0	83,3	33,3	50	25	40
Trimethoprim (2)	-	-	-	-	-	-	-	-	0
Tetracycline	-	100	50	0	83,3	33,3	50	25	40

(1) Antimicrobials were tested from 2000 to 2007; (2) antimicrobials were tested/evaluated since 2007;
(3) resistance to more than one class of antimicrobials.

13.2.2.4 Isolates from turkeys

Tab. 13.124: Development of resistance rates in *Salmonella* isolates from turkeys (2000–2008)

	Salmonella spp.	*S.* Typhimurium	*S.* Saintpaul	*S.* Heidelberg	*S.* Enteritidis	*S.* 4,12:d:-
Tested isolates	1235	133	285	186	64	69
Susceptible	28,8	12,0	4,2	28,0	84,4	49,3
Resistant	71,2	88,0	95,8	72,0	15,6	50,7
Multiresistant (3)	57,9	82,7	92,6	60,8	6,3	7,2
Gentamicin	25,3	0,8	83,5	17,2	1,6	0,0
Neomycin (1)	7,4	5,5	6,3	14,5	1,6	1,4
Kanamycin	27,8	6,0	85,3	18,3	1,6	1,4
Spectinomycin (1)	41,0	66,9	85,8	43,0	3,2	2,9
Streptomycin	35,5	73,7	58,9	26,9	1,6	0,0
Chloramphenicol	15,1	63,2	8,4	22,0	1,6	4,3
Florfenicol	9,0	60,2	3,5	5,9	0,0	0,0
Cefotaxime (2)	0,0	0,0	0,0	-	0,0	-
Ceftazidime (2)	0,0	0,0	0,0	-	0,0	-
Ceftiofur (1)	7,1	0,0	26,8	0,5	0,0	0,0
Nalidixic acid	26,1	0,8	84,2	0,0	4,7	0,0
Ciprofloxacin	27,9	1,5	84,2	2,7	4,7	0,0
Amoxicillin/Clavulanic acid (1)	45,5	81,1	90,6	38,2	0,0	4,3
Ampicillin	48,1	80,5	93,0	40,9	0,0	4,3
Sulfamethoxazole	56,0	87,2	91,9	54,3	12,5	47,8
Trimethoprim (2)	12,2	0,0	6,5	-	0,0	-
Tetracycline	32,6	78,9	17,2	38,7	1,6	8,7

(1) Antimicrobials were tested from 2000 to 2007; (2) antimicrobials were tested/evaluated since 2007;
(3) resistance to more than one class of antimicrobials.

Tab. 13.125: Development of resistance rates in *Salmonella* isolates from turkeys (2000–2008)

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008
Tested isolates	48	179	318	172	108	117	141	80	72
Susceptible	27,1	21,2	33,6	27,9	24,1	31,6	27,7	35,0	27,8
Resistant	72,9	78,8	66,4	72,1	75,9	68,4	72,3	65,0	72,2
Multiresistant (3)	31,3	53,1	59,7	65,1	58,3	49,6	63,1	53,8	69,4
Gentamicin	8,3	7,3	41,5	40,1	11,1	8,5	11,3	30,0	44,4
Neomycin (1)	10,4	13,4	4,4	9,3	3,7	12,0	3,5	5,1	-
Kanamycin	12,5	14,0	39,3	41,9	13,9	20,5	12,8	32,5	44,4
Spectinomycin (1)	16,7	38,5	52,5	51,7	47,2	27,4	22,0	37,2	-
Streptomycin	16,7	27,4	38,7	45,9	46,3	26,5	41,1	33,8	18,1
Chloramphenicol	12,5	27,9	12,6	11,6	35,2	13,7	5,0	6,3	5,6
Florfenicol	2,1	19,0	4,7	4,7	29,6	9,4	1,4	6,3	4,2
Cefotaxime (2)	-	-	-	-	-	-	-	0,0	0,0
Ceftazidime (2)	-	-	-	-	-	-	-	0,0	0,0
Ceftiofur (1)	2,1	0,6	18,6	6,4	0,0	5,1	2,1	2,6	-
Nalidixic acid	12,5	2,8	42,5	37,2	15,7	17,1	12,1	33,8	43,1
Ciprofloxacin	12,5	5,0	43,1	40,1	16,7	24,8	12,8	33,8	43,1
Amoxicillin/Clavulanic acid (1)	16,7	33,5	51,9	54,7	50,9	43,6	42,6	44,9	-
Ampicillin	16,7	35,2	52,8	56,4	57,4	45,3	44,0	45,0	62,5
Sulfamethoxazole	70,8	74,9	55,3	61,0	63,0	45,3	29,8	42,5	62,5
Trimethoprim (2)	-	-	-	-	-	-	-	0,0	12,5
Tetracycline	16,7	34,1	19,2	28,5	48,1	29,9	64,5	30,0	30,6

(1) Antimicrobials were tested from 2000 to 2007; (2) antimicrobials were tested/evaluated since 2007;
(3) resistance to more than one class of antimicrobials.

Tab. 13.126: Development of resistance rates in *S.* Enteritidis isolates from turkeys (2000–2008)

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008
Tested isolates	14	9	9	2	8	8	4	8	2
Susceptible	42,9	88,9	88,9	100	87,5	100	100	100	100
Resistant	57,1	11,1	11,1	0	12,5	0	0	0	0
Multiresistant (3)	28,6	0	0	0	0	0	0	0	0
Gentamicin	7,1	0	0	0	0	0	0	0	0
Neomycin (1)	7,1	0	0	0	0	0	0	0	-
Kanamycin	7,1	0	0	0	0	0	0	0	0
Spectinomycin (1)	14,3	0	0	0	0	0	0	0	-
Streptomycin	7,1	0	0	0	0	0	0	0	0
Chloramphenicol	7,1	0	0	0	0	0	0	0	0
Florfenicol	0	0	0	0	0	0	0	0	0
Cefotaxime (2)	-	-	-	-	-	-	-	-	0
Ceftazidime (2)	-	-	-	-	-	-	-	-	0
Ceftiofur (1)	0	0	0	0	0	0	0	0	-
Nalidixic acid	14,3	11,1	0	0	0	0	0	0	0
Ciprofloxacin	14,3	11,1	0	0	0	0	0	0	0
Amoxicillin/Clavulanic acid (1)	0	0	0	0	0	0	0	0	-
Ampicillin	0	0	0	0	0	0	0	0	0
Sulfamethoxazole	57,1	0	0	0	0	0	0	0	0
Trimethoprim (2)	-	-	-	-	-	-	-	-	0
Tetracycline	0	0	0	0	12,5	0	0	0	0

(1) Antimicrobials were tested from 2000 to 2007; (2) antimicrobials were tested/evaluated since 2007;
(3) resistance to more than one class of antimicrobials.

Tab. 13.127: Development of resistance rates in *S.* Saintpaul isolates from turkeys (2000–2008)

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008
Tested isolates	0	4	115	53	11	29	18	25	30
Susceptible	-	25	0	0	0	34,5	0	0	3,3
Resistant	-	75	100	100	100	65,5	100	100	96,7
Multiresistant (3)	-	75	99,1	100	90,9	48,3	100	96	93,3
Gentamicin	-	0	93,9	96,2	72,7	24,1	72,2	92	93,3
Neomycin (1)	-	0	3,5	7,5	9,1	13,8	5,6	8,3	-
Kanamycin	-	0	93,9	96,2	81,8	37,9	72,2	92	93,3
Spectinomycin (1)	-	25	98,3	96,2	81,8	27,6	77,8	91,7	-
Streptomycin	-	75	71,3	81,1	81,8	24,1	55,6	36	16,7
Chloramphenicol	-	0	9,6	13,2	18,2	0	11,1	4	3,3
Florfenicol	-	0	3,5	9,4	0	0	0	4	0
Cefotaxime (2)	-	-	-	-	-	-	-	0	0
Ceftazidime (2)	-	-	-	-	-	-	-	0	0
Ceftiofur (1)	-	0	45,2	18,9	0	3,4	16,7	8,3	-
Nalidixic acid	-	0	97,4	96,2	81,8	24,1	72,2	84	90
Ciprofloxacin	-	0	97,4	96,2	81,8	24,1	72,2	84	90
Amoxicillin/Clavulanic acid (1)	-	0	98,3	96,2	81,8	51,7	100	100	-
Ampicillin	-	75	98,3	100	90,9	51,7	100	100	93,3
Sulfamethoxazole	-	75	96,5	100	90,9	51,7	100	96	93,3
Trimethoprim (2)	-	-	-	-	-	-	-	0	6,7
Tetracycline	-	75	7,8	17	45,5	34,5	44,4	12	6,7

(1) Antimicrobials were tested from 2000 to 2007; (2) antimicrobials were tested/evaluated since 2007;
(3) resistance to more than one class of antimicrobials.

Tab. 13.128: Development of resistance rates in *S.* Heidelberg isolates from turkeys (2000–2008)

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008
Tested isolates	10	44	69	37	7	3	15	1	0
Susceptible	30,0	18,2	33,3	27,0	42,9	0,0	26,7	100,0	-
Resistant	70,0	81,8	66,7	73,0	57,1	100,0	73,3	0,0	-
Multiresistant (3)	40,0	65,9	55,1	67,6	57,1	66,7	73,3	0,0	-
Gentamicin	10,0	13,6	20,3	29,7	0,0	0,0	0,0	0,0	-
Neomycin (1)	0,0	27,3	7,2	21,6	14,3	33,3	0,0	0,0	-
Kanamycin	10,0	27,3	11,6	29,7	14,3	33,3	0,0	0,0	-
Spectinomycin (1)	10,0	56,8	42,0	59,5	14,3	66,7	0,0	0,0	-
Streptomycin	30,0	29,6	26,1	40,5	14,3	0,0	0,0	0,0	-
Chloramphenicol	0,0	36,4	23,2	16,2	14,3	66,7	0,0	0,0	-
Florfenicol	0,0	18,2	2,9	2,7	0,0	0,0	0,0	0,0	-
Cefotaxime (2)	-	-	-	-	-	-	-	-	-
Ceftazidime (2)	-	-	-	-	-	-	-	-	-
Ceftiofur (1)	0,0	0,0	1,4	0,0	0,0	0,0	0,0	0,0	-
Nalidixic acid	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	-
Ciprofloxacin	0,0	4,5	2,9	2,7	0,0	0,0	0,0	0,0	-
Amoxicillin/Clavulanic acid (1)	30,0	40,9	30,4	37,8	57,1	66,7	60,0	0,0	-
Ampicillin	30,0	40,9	33,3	37,8	57,1	100,0	73,3	0,0	-
Sulfamethoxazole	70,0	75,0	46,4	62,2	57,1	66,7	0,0	0,0	-
Trimethoprim (2)	-	-	-	-	-	-	-	-	-
Tetracycline	30,0	25,0	42,0	35,1	42,9	66,7	73,3	0,0	-

(1) Antimicrobials were tested from 2000 to 2007; (2) antimicrobials were tested/evaluated since 2007;
(3) resistance to more than one class of antimicrobials.

Tab. 13.129: Development of resistance rates in *S.* Typhimurium isolates from turkeys (2000–2008)

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008
Tested isolates	1	30	15	16	34	12	13	7	5
Susceptible	0,0	0,0	13,3	0,0	0,0	8,3	76,9	42,9	0,0
Resistant	100	100	86,7	100	100	91,7	23,1	57,1	100,0
Multiresistant (3)	0,0	93,3	80	100	94,1	91,7	23,1	57,1	80,0
Gentamicin	0,0	3,3	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Neomycin (1)	0,0	0,0	0,0	18,8	0,0	16,7	7,7	16,7	-
Kanamycin	0,0	0,0	0,0	18,8	0,0	25,0	7,7	14,3	0,0
Spectinomycin (1)	0,0	76,7	60	31,3	91,2	91,7	15,4	66,7	-
Streptomycin	0,0	83,3	66,7	68,8	91,2	91,7	23,1	57,1	60,0
Chloramphenicol	0,0	73,3	53,3	31,3	91,2	83,3	15,4	57,1	40,0
Florfenicol	0,0	73,3	53,3	12,5	88,2	83,3	15,4	57,1	40,0
Cefotaxime (2)	-	-	-	-	-	-	-	0,0	0,0
Ceftazidime (2)	-	-	-	-	-	-	-	0,0	0,0
Ceftiofur (1)	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	-
Nalidixic acid	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	20,0
Ciprofloxacin	0,0	0,0	0,0	0,0	0,0	8,3	0,0	0,0	20,0
Amoxicillin/Clavulanic acid (1)	0,0	86,7	73,3	100,0	94,1	91,7	23,1	66,7	-
Ampicillin	0,0	86,7	73,3	100,0	94,1	91,7	23,1	57,1	80,0
Sulfamethoxazole	100,0	100,0	80,0	100,0	100,0	91,7	23,1	57,1	100,0
Trimethoprim (2)	-	-	-	-	-	-	-	0,0	0,0
Tetracycline	0,0	90	66,7	87,5	94,1	91,7	23,1	57,1	80,0

(1) Antimicrobials were tested from 2000 to 2007; (2) antimicrobials were tested/evaluated since 2007;
(3) resistance to more than one class of antimicrobials.

Tab. 13.130: Development of resistance rates in *S.* 4,12:d:- isolates from turkeys (2000–2008)

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008
Tested isolates	0	33	21	9	5	1	0	0	0
Susceptible	-	9,1	85,7	77,8	100	100	-	-	-
Resistant	-	90,9	14,3	22,2	0	0	-	-	-
Multiresistant (3)	-	12,1	4,8	0	0	0	-	-	-
Gentamicin	-	0	0	0	0	0	-	-	-
Neomycin (1)	-	3	0	0	0	0	-	-	-
Kanamycin	-	3	0	0	0	0	-	-	-
Spectinomycin (1)	-	3	4,8	0	0	0	-	-	-
Streptomycin	-	0	0	0	0	0	-	-	-
Chloramphenicol	-	9,1	0	0	0	0	-	-	-
Florfenicol	-	0	0	0	0	0	-	-	-
Cefotaxime (2)	-	-	-	-	-	-	-	-	-
Ceftazidime (2)	-	-	-	-	-	-	-	-	-
Ceftiofur (1)	-	0	0	0	0	0	-	-	-
Nalidixic acid	-	0	0	0	0	0	-	-	-
Ciprofloxacin	-	0	0	0	0	0	-	-	-
Amoxicillin/Clavulanic acid (1)	-	3	9,5	0	0	0	-	-	-
Ampicillin	-	3	9,5	0	0	0	-	-	-
Sulfamethoxazole	-	90,9	4,8	22,2	0	0	-	-	-
Trimethoprim (2)	-	-	-	-	-	-	-	-	-
Tetracycline	-	12,1	9,5	0	0	0	-	-	-

(1) Antimicrobials were tested from 2000 to 2007; (2) antimicrobials were tested/evaluated since 2007;
(3) resistance to more than one class of antimicrobials.

Tab. 13.131: Development of resistance rates in *S.* Indiana isolates from turkeys (2000–2008)

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008
Tested isolates	0	0	0	0	3	0	11	10	10
Susceptible	-	-	-	-	66,7	-	90,9	60	100
Resistant	-	-	-	-	33,3	-	9,1	40	0
Multiresistant (3)	-	-	-	-	0	-	9,1	20	0
Gentamicin	-	-	-	-	0	-	0	0	0
Neomycin (1)	-	-	-	-	0	-	0	0	-
Kanamycin	-	-	-	-	0	-	0	0	0
Spectinomycin (1)	-	-	-	-	0	-	0	20	-
Streptomycin	-	-	-	-	0	-	0	20	0
Chloramphenicol	-	-	-	-	0	-	0	0	0
Florfenicol	-	-	-	-	0	-	0	0	0
Cefotaxime (2)	-	-	-	-	-	-	-	-	0
Ceftazidime (2)	-	-	-	-	-	-	-	-	0
Ceftiofur (1)	-	-	-	-	0	-	0	0	-
Nalidixic acid	-	-	-	-	0	-	0	20	0
Ciprofloxacin	-	-	-	-	0	-	0	20	0
Amoxicillin/Clavulanic acid (1)	-	-	-	-	0	-	9,1	20	-
Ampicillin	-	-	-	-	0	-	9,1	20	0
Sulfamethoxazole	-	-	-	-	33,3	-	0	20	0
Trimethoprim (2)	-	-	-	-	-	-	-	-	0
Tetracycline	-	-	-	-	0	-	9,1	20	0

(1) Antimicrobials were tested from 2000 to 2007; (2) antimicrobials were tested/evaluated since 2007;
(3) resistance to more than one class of antimicrobials.

13.2.3 Distribution of MIC values in *Salmonella* isolates from animals

13.2.3.1 Isolates from pigs

Tab. 13.132: *Salmonella* spp. from pigs (2000–2008)

Antimicrobial tested	Tested isolates (Number)	Microbiologically resistent isolates (Number) (4)	Microbiological resistent isolates (in %) (4)	Distribution (%) of MICs (µg/ml) (5) 0,008	0,015	0,03125	0,0625	0,125	0,25	0,5	1	2	4	8	16	32	64	128	256	512	1024
Gentamicin	3820	171	4,5								93,9	1,5	0,2	1,4	1,6	0,9	0,4				
Neomycin (1)	3288	293	8,9									89,2	1,9	0,3	0,2	1,9	6,5				
Kanamycin	3820	349	9,1										87,9	3,0	0,3	0,3	0,2	8,4			
Spectinomycin (1)	3288	1575	47,9									0,0	0,0	0,0	3,9	38,6	9,5	4,7	43,2		
Streptomycin	3820	2587	67,7										6,1	16,3	6,9	3,0	22,4	45,3			
Chloramphenicol	3820	1375	36,0									1,1	14,3	42,3	6,4	0,4	2,4	33,2			
Florfenicol	3820	1215	31,8									2,3	33,5	29,0	3,4	10,6	16,7	4,5			
Cefotaxime (2)	532	4	0,8				45,3	44,0	9,0	0,9	0,2	0,0	0,0	0,6							
Ceftazidime (2)	532	2	0,4						61,7	33,8	3,9	0,2	0,0	0,0	0,2	0,2					
Ceftiofur (1)	3288	15	0,5							44,3	47,9	7,4	0,2	0,2	0,1						
Nalidixic acid	3820	114	3,0										82,7	12,7	1,6	0,2	0,1	2,8			
Ciprofloxacin	3820	151	4,0			88,1	8,0	1,0	1,2	1,2	0,4	0,1	0,0	0,0							
Amoxicillin/Clavulanic acid (1)	3288	2092	63,6									32,2	4,1	24,4	34,5	4,3	0,5				
Ampicillin	3820	2547	66,7								24,5	7,8	0,9	0,1	0,0	3,2	63,5				
Colistin (3)	3820													99,3	0,3	0,3					
Sulfamethoxazole	3820	2928	76,6													7,4	11,9	3,7	0,4	3,6	73,1
Trimethoprim (3)	3820												80,5	0,4	0,1	0,7	18,3				
Tetracycline	3820	2750	72,0									25,6	2,0	0,4	1,0	17,5	53,5				

(1) Neomycin, spectinomycin, ceftiofur, amoxicillin/clavulanic acid were tested in the years 2000 to 2007 only.

(2) Cefotaxime and ceftazidime were tested in 2008 only.

(3) For colistin and trimethoprim no evaluation was performed as the lowest tested concentration was above the epidemiological cut-off value.

(4) The vertical lines demark the epidemiological cut-off values, which are the basis for the evaluation of microbiological resistance.

(5) The white areas demark the range tested. Isolates resistant to the highest concentration are given in the next concentration level. Values for the lowest concentration include isolates with MICs below the tested range.

Tab. 13.133: *S.* Derby from pigs (2000–2008)

Antimicrobial tested	Tested isolates (Number)	Microbiologically resistent isolates (Number) (4)	Microbiological resistent isolates (in %) (4)	0,008	0,015	0,03125	0,0625	0,125	0,25	0,5	1	2	4	8	16	32	64	128	256	512	1024
				Distribution (%) of MICs (µg/ml) (5)																	
Gentamicin	299	2	0,7								97,3	2,0	0,0	0,3	0,3	0,0	0,0				
Neomycin (1)	242	15	6,2									93,0	0,8	0,0	0,0	0,0	6,2				
Kanamycin	299	15	5,0										91,3	3,7	0,0	0,0	0,0	5,0			
Spectinomycin (1)	242	41	16,9									0,0	0,0	0,0	5,0	71,9	6,2	1,7	15,3		
Streptomycin	299	60	20,1										4,7	44,8	26,1	4,3	4,3	15,7			
Chloramphenicol	299	10	3,3									0,3	7,0	71,2	18,1	1,0	0,0	2,3			
Florfenicol	299	5	1,7									0,3	18,7	73,6	5,7	0,7	0,0	1,0			
Cefotaxime (2)	57	0	0,0				3,5	78,9	17,5	0,0	0,0	0,0	0,0	0,0							
Ceftazidime (2)	57	0	0,0						3,5	91,2	5,3	0,0	0,0	0,0	0,0	0,0					
Ceftiofur (1)	242	2	0,8							43,8	49,6	5,8	0,8	0,0	0,0						
Nalidixic acid	299	4	1,3										91,0	7,4	0,3	0,0	0,0	1,3			
Ciprofloxacin	299	4	1,3			92,3	6,4	0,0	0,3	1,0	0,0	0,0	0,0	0,0							
Amoxicillin/Clavulanic acid (1)	242	26	10,7									87,6	1,7	6,6	3,3	0,8	0,0				
Ampicillin	299	35	11,7								65,6	20,7	2,0	0,3	0,0	0,0	11,4				
Colistin (3)	299													100,0	0,0	0,0					
Sulfamethoxazole	299	94	31,4													26,7	36,8	5,0	0,0	1,0	30,4
Trimethoprim (3)	299												82,9	0,0	0,3	0,3	16,4				
Tetracycline	299	98	32,8									61,2	5,4	0,7	0,3	1,7	30,7				

(1) Neomycin, spectinomycin, ceftiofur, amoxicillin/clavulanic acid were tested in the years 2000 to 2007 only.
(2) Cefotaxime and ceftazidime were tested in 2008 only.
(3) For colistin and trimethoprim no evaluation was performed as the lowest tested concentration was above the epidemiological cut-off value.
(4) The vertical lines demark the epidemiological cut-off values, which are the basis for the evaluation of microbiological resistance.
(5) The white areas demark the range tested. Isolates resistant to the highest concentration are given in the next concentration level.
Values for the lowest concentration include isolates with MICs below the tested range.

Tab. 13.134: *S.* Enteritidis from pigs (2000–2008)

Antimicrobial tested	Tested isolates (Number)	Microbiologically resistent isolates (Number) (4)	Microbiological resistent isolates (in %) (4)	Distribution (%) of MICs (µg/ml) (5) 0,008	0,015	0,03125	0,0625	0,125	0,25	0,5	1	2	4	8	16	32	64	128	256	512	1024
Gentamicin	62	0	0,0								100,0	0,0	0,0	0,0	0,0	0,0	0,0				
Neomycin (1)	48	0	0,0									100,0	0,0	0,0	0,0	0,0	0,0				
Kanamycin	62	0	0,0										100,0	0,0	0,0	0,0	0,0	0,0			
Spectinomycin (1)	48	2	4,2									0,0	0,0	0,0	64,6	29,2	2,1	2,1	2,1		
Streptomycin	62	0	0,0										88,8	6,5	3,2	1,6	0,0	0,0			
Chloramphenicol	62	1	1,6									3,2	35,5	58,1	1,6	0,0	0,0	1,6			
Florfenicol	62	1	1,6									3,2	74,2	21,0	0,0	1,6	0,0	0,0			
Cefotaxime (2)	14	0	0,0				42,9	57,1	0,0	0,0	0,0	0,0	0,0	0,0							
Ceftazidime (2)	14	0	0,0						92,9	7,1	0,0	0,0	0,0	0,0	0,0	0,0					
Ceftiofur (1)	48	1	2,1							56,3	41,7	0,0	0,0	2,1	0,0						
Nalidixic acid	62	0	0,0										88,7	11,3	0,0	0,0	0,0	0,0			
Ciprofloxacin	62	0	0,0			96,7	3,2	0,0	0,0	0,0	0,0	0,0	0,0	0,0							
Amoxicillin/Clavulanic acid (1)	48	1	2,1									93,8	4,2	0,0	2,1	0,0	0,0				
Ampicillin	62	1	1,6								66,1	29,0	3,2	0,0	0,0	0,0	1,6				
Colistin (3)	62													98,4	1,6	0,0					
Sulfamethoxazole	62	3	4,8													9,6	66,1	16,1	3,2	0,0	4,8
Trimethoprim (3)	62												96,8	1,6	0,0	0,0	1,6				
Tetracycline	62	2	3,2									93,5	3,2	0,0	0,0	1,6	1,6				

(1) Neomycin, spectinomycin, ceftiofur, amoxicillin/clavulanic acid were tested in the years 2000 to 2007 only.

(2) Cefotaxime and ceftazidime were tested in 2008 only.

(3) For colistin and trimethoprim no evaluation was performed as the lowest tested concentration was above the epidemiological cut-off value.

(4) The vertical lines demark the epidemiological cut-off values, which are the basis for the evaluation of microbiological resistance.

(5) The white areas demark the range tested. Isolates resistant to the highest concentration are given in the next concentration level.
Values for the lowest concentration include isolates with MICs below the tested range.

Tab. 13.135: *S.* Typhimurium from pigs (2000–2008)

Antimicrobial tested	Tested isolates (Number)	Microbiologically resistent isolates (Number) (4)	Microbiological resistent isolates (in %) (4)	Distribution (%) of MICs (µg/ml) (5) 0,008	0,015	0,03125	0,0625	0,125	0,25	0,5	1	2	4	8	16	32	64	128	256	512	1024
Gentamicin	2595	141	5,4								93,0	1,6	0,2	1,8	2,0	1,1	0,3				
Neomycin (1)	2363	224	9,5									88,3	2,2	0,4	0,1	2,0	7,0				
Kanamycin	2595	261	10,1										86,9	3,1	0,3	0,4	0,3	9,1			
Spectinomycin (1)	2363	1428	60,4									0,0	0,0	0,0	1,1	30,3	8,2	5,4	55,1		
Streptomycin	2595	2086	80,4										3,4	9,9	3,8	2,5	30,9	49,5			
Chloramphenicol	2595	1274	49,1									0,9	11,3	33,5	5,2	0,3	3,2	45,6			
Florfenicol	2595	1164	44,9									1,9	28,4	22,1	2,8	14,9	24,2	5,8			
Cefotaxime (2)	232	1	0,4				54,7	33,2	9,5	2,2	0,4	0,0	0,0	0,0							
Ceftazidime (2)	232	0	0,0						70,3	26,7	3,0	0,0	0,0	0,0	0,0	0,0					
Ceftiofur (1)	2363	10	0,4							42,5	49,0	8,1	0,2	0,2	0,0						
Nalidixic acid	2595	87	3,4										80,3	14,6	1,7	0,2	0,1	3,0			
Ciprofloxacin	2595	110	4,2			86,4	9,4	1,0	1,4	1,2	0,5	0,1	0,0	0,0							
Amoxicillin/Clavulanic acid (1)	2363	1815	76,8									19,3	3,9	25,3	45,3	5,6	0,6				
Ampicillin	2595	2086	80,4								14,1	4,9	0,6	0,0	0,0	4,4	75,9				
Colistin (3)	2595													99,3	0,4	0,0					
Sulfamethoxazole	2595	2301	88,7													3,6	5,5	2,0	0,3	4,8	83,9
Trimethoprim (3)	2595												78,6	0,5	0,0	0,8	20,0				
Tetracycline	2595	2149	82,8									15,6	1,5	0,1	1,1	24,7	56,9				

(1) Neomycin, spectinomycin, ceftiofur, amoxicillin/clavulanic acid were tested in the years 2000 to 2007 only.

(2) Cefotaxime and ceftazidime were tested in 2008 only.

(3) For colistin and trimethoprim no evaluation was performed as the lowest tested concentration was above the epidemiological cut-off value.

(4) The vertical lines demark the epidemiological cut-off values, which are the basis for the evaluation of microbiological resistance.

(5) The white areas demark the range tested. Isolates resistant to the highest concentration are given in the next concentration level.
Values for the lowest concentration include isolates with MICs below the tested range.

Tab. 13.136: *S.* 4,[5],12:i:- from pigs (2000–2008)

Antimicrobial tested	Tested isolates (Number)	Microbiologically resistent isolates (Number) (4)	Microbiological resistent isolates (in %) (4)	Distribution (%) of MICs (µg/ml) (5) 0,008	0,015	0,03125	0,0625	0,125	0,25	0,5	1	2	4	8	16	32	64	128	256	512	1024
Gentamicin	330	7	2,1								97,2	0,6	0,0	0,3	1,2	0,3	0,3				
Neomycin (1)	216	13	6,0									93,1	0,9	0,0	0,9	1,4	3,7				
Kanamycin	330	21	6,4										91,5	2,1	0,3	0,0	0,0	6,0			
Spectinomycin (1)	216	28	13,0									0,0	0,0	0,0	3,2	59,3	24,5	3,7	9,3		
Streptomycin	330	272	82,4										2,7	10,9	3,3	0,6	2,7	79,7			
Chloramphenicol	330	26	7,9									0,3	17,6	69,1	5,2	0,9	0,6	6,4			
Florfenicol	330	14	4,2									0,6	54,8	35,5	4,8	1,8	0,3	2,1			
Cefotaxime (2)	114	0	0,0				64,0	29,8	6,1	0,0	0,0	0,0	0,0	0,0							
Ceftazidime (2)	114	0	0,0						86,0	13,2	0,9	0,0	0,0	0,0	0,0	0,0					
Ceftiofur (1)	216	2	0,9							42,6	46,8	9,7	0,0	0,5	0,5						
Nalidixic acid	330	7	2,1										83,9	10,9	3,0	0,0	0,3	1,8			
Ciprofloxacin	330	15	4,5			90,9	4,5	2,4	0,0	1,5	0,3	0,3	0,0	0,0							
Amoxicillin/Clavulanic acid (1)	216	148	68,5									18,5	13,0	58,8	9,7	0,0	0,0				
Ampicillin	330	274	83,0								13,6	3,0	0,3	0,0	0,0	0,6	82,4				
Colistin (3)	330													100,0	0,0	0,0					
Sulfamethoxazole	330	280	84,8													2,4	10,3	2,4	0,0	0,3	84,5
Trimethoprim (3)	330												88,5	0,0	0,0	0,6	10,9				
Tetracycline	330	302	91,5									8,5	0,0	0,0	0,6	0,6	90,3				

(1) Neomycin, spectinomycin, ceftiofur, amoxicillin/clavulanic acid were tested in the years 2000 to 2007 only.

(2) Cefotaxime and ceftazidime were tested in 2008 only.

(3) For colistin and trimethoprim no evaluation was performed as the lowest tested concentration was above the epidemiological cut-off value.

(4) The vertical lines demark the epidemiological cut-off values, which are the basis for the evaluation of microbiological resistance.

(5) The white areas demark the range tested. Isolates resistant to the highest concentration are given in the next concentration level.
Values for the lowest concentration include isolates with MICs below the tested range.

13.2.3.2 Isolates from cattle

Tab. 13.137: *Salmonella* spp. from cattle (2000–2008)

Antimicrobial tested	Tested isolates (Number)	Microbiologically resistent isolates (Number) (4)	Microbiological resistent isolates (in %) (4)	Distribution (%) of MICs (µg/ml) (5)																	
				0,008	0,015	0,03125	0,0625	0,125	0,25	0,5	1	2	4	8	16	32	64	128	256	512	1024
Gentamicin	3212	27	0,8								97,8	1,3	0,1	0,3	0,1	0,2	0,2				
Neomycin (1)	2869	88	3,1									95,5	1,4	0,2	0,1	0,7	2,0				
Kanamycin	3212	102	3,2										94,6	2,3	0,2	0,2	0,2	2,5			
Spectinomycin (1)	2869	1210	42,2									0,1	0,0	0,1	9,7	41,4	6,5	7,1	35,1		
Streptomycin	3212	1578	49,1										16,7	23,2	8,6	2,4	27,6	21,4			
Chloramphenicol	3212	1149	35,8									2,6	23,0	34,6	4,1	0,2	5,8	29,9			
Florfenicol	3212	1076	33,5									4,9	41,3	17,4	3,0	13,5	14,4	5,5			
Cefotaxime (2)	343	0	0,0				60,1	35,0	4,1	0,9	0,0	0,0	0,0	0,0							
Ceftazidime (2)	343	0	0,0						80,8	18,1	1,2	0,0	0,0	0,0	0,0	0,0					
Ceftiofur (1)	2869	33	1,2							50,5	43,1	5,3	0,6	0,4	0,2						
Nalidixic acid	3212	95	3,0										84,0	12,4	0,7	0,0	0,0	3,0			
Ciprofloxacin	3212	117	3,6			92,5	3,8	1,5	1,5	0,4	0,2	0,0	0,0	0,0							
Amoxicillin/Clavulanic acid (1)	2869	1388	48,4									49,1	2,5	9,7	32,7	5,8	0,3				
Ampicillin	3212	1567	48,8								38,7	10,1	2,4	0,0	0,0	7,5	41,2				
Colistin (3)	3212													99,1	0,7	0,1					
Sulfamethoxazole	3212	1817	56,6													17,3	18,4	6,8	1,0	7,9	48,6
Trimethoprim (3)	3212												92,2	0,9	0,2	0,6	6,1				
Tetracycline	3212	1558	48,5									48,3	3,0	0,3	1,2	22,1	25,1				

(1) Neomycin, spectinomycin, ceftiofur, amoxicillin/clavulanic acid were tested in the years 2000 to 2007 only.
(2) Cefotaxime and ceftazidime were tested in 2008 only.
(3) For colistin and trimethoprim no evaluation was performed as the lowest tested concentration was above the epidemiological cut-off value.
(4) The vertical lines demark the epidemiological cut-off values, which are the basis for the evaluation of microbiological resistance.
(5) The white areas demark the range tested. Isolates resistant to the highest concentration are given in the next concentration level.
Values for the lowest concentration include isolates with MICs below the tested range.

Tab. 13.138: *S.* Anatum from cattle (2000–2008)

Antimicrobial tested	Tested isolates (Number)	Microbiologically resistent isolates (Number) (4)	Microbiological resistent isolates (in %) (4)	0,008	0,015	0,03125	0,0625	0,125	0,25	0,5	1	2	4	8	16	32	64	128	256	512	1024
				Distribution (%) of MICs (µg/ml) (5)																	
Gentamicin	107	1	0,9								96,2	2,8	0,0	0,0	0,0	0,0	0,9				
Neomycin (1)	91	1	1,1									97,8	1,1	0,0	0,0	0,0	1,1				
Kanamycin	107	1	0,9										96,3	2,8	0,0	0,0	0,0	0,9			
Spectinomycin (1)	91	3	3,3									0,0	0,0	0,0	0,0	83,5	13,2	1,1	2,2		
Streptomycin	107	2	1,9										6,5	59,8	28,0	3,7	0,9	0,9			
Chloramphenicol	107	1	0,9									0,0	50,5	45,8	2,8	0,0	0,0	0,9			
Florfenicol	107	0	0,0									1,9	86,9	11,2	0,0	0,0	0,0	0,0			
Cefotaxime (2)	16	0	0,0				56,3	37,5	6,3	0,0	0,0	0,0	0,0	0,0							
Ceftazidime (2)	16	0	0,0						81,3	18,8	0,0	0,0	0,0	0,0	0,0	0,0					
Ceftiofur (1)	91	1	1,1							67,0	31,9	0,0	0,0	0,0	1,1						
Nalidixic acid	107	1	0,9										90,7	8,4	0,0	0,0	0,0	0,9			
Ciprofloxacin	107	1	0,9			97,2	1,9	0,0	0,9	0,0	0,0	0,0	0,0	0,0							
Amoxicillin/Clavulanic acid (1)	91	2	2,2									95,6	2,2	1,1	1,1	0,0	0,0				
Ampicillin	107	2	1,9								91,6	6,5	0,0	0,0	0,0	0,0	1,9				
Colistin (3)	107													98,2	1,9	0,0					
Sulfamethoxazole	107	8	7,5													31,8	30,8	28,0	1,9	0,9	6,5
Trimethoprim (3)	107												96,3	1,9	0,0	0,0	1,9				
Tetracycline	107	1	0,9									95,3	3,7	0,0	0,0	0,0	0,9				

(1) Neomycin, spectinomycin, ceftiofur, amoxicillin/clavulanic acid were tested in the years 2000 to 2007 only.

(2) Cefotaxime and ceftazidime were tested in 2008 only.

(3) For colistin and trimethoprim no evaluation was performed as the lowest tested concentration was above the epidemiological cut-off value.

(4) The vertical lines demark the epidemiological cut-off values, which are the basis for the evaluation of microbiological resistance.

(5) The white areas demark the range tested. Isolates resistant to the highest concentration are given in the next concentration level.
Values for the lowest concentration include isolates with MICs below the tested range.

Tab. 13.139: *S.* Dublin from cattle (2000–2008)

Antimicrobial tested	Tested isolates (Number)	Microbiologically resistent isolates (Number) (4)	Microbiological resistent isolates (in %) (4)	Distribution (%) of MICs (µg/ml) (5)																	
				0,008	0,015	0,03125	0,0625	0,125	0,25	0,5	1	2	4	8	16	32	64	128	256	512	1024
Gentamicin	114	0	0,0								100,0	0,0	0,0	0,0	0,0	0,0	0,0				
Neomycin (1)	81	0	0,0									100,0	0,0	0,0	0,0	0,0	0,0				
Kanamycin	114	0	0,0										100,0	0,0	0,0	0,0	0,0	0,0			
Spectinomycin (1)	81	1	1,2									0,0	0,0	0,0	7,4	81,5	9,9	0,0	1,2		
Streptomycin	114	2	1,8										27,2	64,9	6,1	0,0	0,0	1,8			
Chloramphenicol	114	2	1,8									22,8	67,5	7,9	0,0	0,0	0,0	1,8			
Florfenicol	114	2	1,8									29,8	64,9	3,5	0,0	0,0	0,0	1,8			
Cefotaxime (2)	33	0	0,0				100,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0							
Ceftazidime (2)	33	0	0,0						100,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0					
Ceftiofur (1)	81	0	0,0							97,5	2,5	0,0	0,0	0,0	0,0						
Nalidixic acid	114	4	3,5										93,9	1,8	0,9	0,0	0,0	3,6			
Ciprofloxacin	114	4	3,5			95,7	0,9	1,8	1,8	0,0	0,0	0,0	0,0	0,0							
Amoxicillin/Clavulanic acid (1)	81	0	0,0									96,3	3,7	0,0	0,0	0,0	0,0				
Ampicillin	114	2	1,8								95,6	2,6	0,0	0,0	0,0	0,0	1,8				
Colistin (3)	114													99,1	0,9	0,0					
Sulfamethoxazole	114	4	3,5													57,0	35,1	4,4	0,0	0,0	3,5
Trimethoprim (3)	114												97,3	0,9	0,0	0,0	1,8				
Tetracycline	114	2	1,8									95,6	2,6	0,0	0,0	0,0	1,8				

(1) Neomycin, spectinomycin, ceftiofur, amoxicillin/clavulanic acid were tested in the years 2000 to 2007 only.

(2) Cefotaxime and ceftazidime were tested in 2008 only.

(3) For colistin and trimethoprim no evaluation was performed as the lowest tested concentration was above the epidemiological cut-off value.

(4) The vertical lines demark the epidemiological cut-off values, which are the basis for the evaluation of microbiological resistance.

(5) The white areas demark the range tested. Isolates resistant to the highest concentration are given in the next concentration level.
Values for the lowest concentration include isolates with MICs below the tested range.

Tab. 13.140: *S.* Enteritidis from cattle (2000–2008)

Antimicrobial tested	Tested isolates (Number)	Microbiologically resistent isolates (Number) (4)	Microbiological resistent isolates (in %) (4)	Distribution (%) of MICs (µg/ml) (5)																	
				0,008	0,015	0,03125	0,0625	0,125	0,25	0,5	1	2	4	8	16	32	64	128	256	512	1024
Gentamicin	230	2	0,9								99,2	0,0	0,0	0,0	0,0	0,9	0,0				
Neomycin (1)	185	3	1,6									98,4	0,0	0,0	0,5	1,1	0,0				
Kanamycin	230	3	1,3										97,8	0,9	0,0	0,0	1,3	0,0			
Spectinomycin (1)	185	1	0,5									0,0	0,0	0,5	75,1	20,5	3,2	0,5	0,0		
Streptomycin	230	2	0,9										88,3	6,5	3,9	0,4	0,4	0,4			
Chloramphenicol	230	1	0,4									1,7	37,0	60,4	0,4	0,0	0,0	0,4			
Florfenicol	230	1	0,4									2,2	70,4	26,5	0,4	0,0	0,4	0,0			
Cefotaxime (2)	45	0	0,0				57,8	42,2	0,0	0,0	0,0	0,0	0,0	0,0							
Ceftazidime (2)	45	0	0,0						91,1	6,7	2,2	0,0	0,0	0,0	0,0	0,0					
Ceftiofur (1)	185	2	1,1							56,2	41,6	1,1	0,5	0,5	0,0						
Nalidixic acid	230	2	0,9										93,5	5,2	0,4	0,0	0,0	0,9			
Ciprofloxacin	230	2	0,9			96,5	2,6	0,0	0,4	0,4	0,0	0,0	0,0	0,0							
Amoxicillin/Clavulanic acid (1)	185	1	0,5									98,4	1,1	0,5	0,0	0,0	0,0				
Ampicillin	230	1	0,4								66,1	31,3	2,2	0,0	0,0	0,0	0,4				
Colistin (3)	230													99,6	0,0	0,4					
Sulfamethoxazole	230	8	3,5													30,0	54,8	11,3	0,4	0,0	3,5
Trimethoprim (3)	230												98,7	0,4	0,4	0,0	0,4				
Tetracycline	230	1	0,4									95,7	3,5	0,4	0,0	0,0	0,4				

(1) Neomycin, spectinomycin, ceftiofur, amoxicillin/clavulanic acid were tested in the years 2000 to 2007 only.

(2) Cefotaxime and ceftazidime were tested in 2008 only.

(3) For colistin and trimethoprim no evaluation was performed as the lowest tested concentration was above the epidemiological cut-off value.

(4) The vertical lines demark the epidemiological cut-off values, which are the basis for the evaluation of microbiological resistance.

(5) The white areas demark the range tested. Isolates resistant to the highest concentration are given in the next concentration level. Values for the lowest concentration include isolates with MICs below the tested range.

Tab. 13.141: *S.* Typhimurium from cattle (2000–2008)

Antimicrobial tested	Tested isolates (Number)	Microbiologically resistent isolates (Number) (4)	Microbiological resistent isolates (in %) (4)	Distribution (%) of MICs (µg/ml) (5)																	
				0,008	0,015	0,03125	0,0625	0,125	0,25	0,5	1	2	4	8	16	32	64	128	256	512	1024
Gentamicin	1952	21	1,1								97,4	1,5	0,1	0,4	0,2	0,2	0,3				
Neomycin (1)	1824	71	3,9									94,6	1,5	0,3	0,1	0,7	2,8				
Kanamycin	1952	82	4,2										93,3	2,5	0,3	0,3	0,2	3,4			
Spectinomycin (1)	1824	1163	63,8									0,1	0,0	0,1	2,3	28,9	4,9	10,3	53,5		
Streptomycin	1952	1432	73,4										6,3	13,6	4,5	2,2	44,0	29,4			
Chloramphenicol	1952	1127	57,7									1,0	14,3	24,3	2,7	0,2	9,3	48,3			
Florfenicol	1952	1059	54,3									2,5	28,8	11,1	3,3	22,0	23,5	8,8			
Cefotaxime (2)	128	0	0,0				53,9	39,1	4,7	2,3	0,0	0,0	0,0	0,0							
Ceftazidime (2)	128	0	0,0						75,8	21,9	2,3	0,0	0,0	0,0	0,0	0,0					
Ceftiofur (1)	1824	22	1,2							44,2	49,1	5,5	0,7	0,4	0,2						
Nalidixic acid	1952	68	3,5										81,5	14,3	0,8	0,1	0,0	3,4			
Ciprofloxacin	1952	81	4,1			91,2	4,6	1,6	1,8	0,5	0,2	0,1	0,1	0,1							
Amoxicillin/Clavulanic acid (1)	1824	1298	71,2									26,3	2,5	12,2	49,7	8,8	0,4				
Ampicillin	1952	1418	72,6								17,7	7,1	2,5	0,0	0,0	12,1	60,5				
Colistin (3)	1952													99,0	0,8	0,1					
Sulfamethoxazole	1952	1565	80,2													9,0	6,7	3,3	0,9	12,6	67,7
Trimethoprim (3)	1952												89,7	0,8	0,2	0,8	8,5				
Tetracycline	1952	1410	72,2									25,2	2,3	0,3	1,7	36,0	34,5				

(1) Neomycin, spectinomycin, ceftiofur, amoxicillin/clavulanic acid were tested in the years 2000 to 2007 only.

(2) Cefotaxime and ceftazidime were tested in 2008 only.

(3) For colistin and trimethoprim no evaluation was performed as the lowest tested concentration was above the epidemiological cut-off value.

(4) The vertical lines demark the epidemiological cut-off values, which are the basis for the evaluation of microbiological resistance.

(5) The white areas demark the range tested. Isolates resistant to the highest concentration are given in the next concentration level.
Values for the lowest concentration include isolates with MICs below the tested range.

Tab. 13.142: *S.* 4,[5],12:i:- from cattle (2000–2008)

Antimicrobial tested	Tested isolates (Number)	Microbiologically resistent isolates (Number) (4)	Microbiological resistent isolates (in %) (4)	Distribution (%) of MICs (µg/ml) (5) 0,008	0,015	0,03125	0,0625	0,125	0,25	0,5	1	2	4	8	16	32	64	128	256	512	1024
Gentamicin	103	0	0,0								100,0	0,0	0,0	0,0	0,0	0,0	0,0				
Neomycin (1)	57	3	5,3									94,7	0,0	0,0	0,0	1,8	3,5				
Kanamycin	103	3	2,9										94,2	2,9	0,0	0,0	0,0	2,9			
Spectinomycin (1)	57	2	3,5									0,0	0,0	0,0	1,8	73,7	21,1	0,0	3,5		
Streptomycin	103	89	86,4										3,9	7,8	1,0	1,0	1,0	85,5			
Chloramphenicol	103	0	0,0									0,0	13,6	86,4	0,0	0,0	0,0	0,0			
Florfenicol	103	0	0,0									0,0	48,5	51,5	0,0	0,0	0,0	0,0			
Cefotaxime (2)	46	0	0,0				65,2	32,6	2,2	0,0	0,0	0,0	0,0	0,0							
Ceftazidime (2)	46	0	0,0						91,3	8,7	0,0	0,0	0,0	0,0	0,0	0,0					
Ceftiofur (1)	57	0	0,0							47,4	52,6	0,0	0,0	0,0	0,0						
Nalidixic acid	103	0	0,0										89,3	10,7	0,0	0,0	0,0	0,0			
Ciprofloxacin	103	1	1,0			96,1	2,9	0,0	1,0	0,0	0,0	0,0	0,0	0,0							
Amoxicillin/Clavulanic acid (1)	57	42	73,7									14,0	12,3	66,7	5,3	0,0	1,8				
Ampicillin	103	90	87,4								8,7	2,9	1,0	0,0	0,0	0,0	87,4				
Colistin (3)	103													100,0	0,0	0,0					
Sulfamethoxazole	103	91	88,3													3,9	5,8	1,0	1,0	0,0	88,4
Trimethoprim (3)	103												96,1	0,0	0,0	0,0	3,9				
Tetracycline	103	92	89,3									10,7	0,0	0,0	0,0	0,0	89,3				

(1) Neomycin, spectinomycin, ceftiofur, amoxicillin/clavulanic acid were tested in the years 2000 to 2007 only.
(2) Cefotaxime and ceftazidime were tested in 2008 only.
(3) For colistin and trimethoprim no evaluation was performed as the lowest tested concentration was above the epidemiological cut-off value.
(4) The vertical lines demark the epidemiological cut-off values, which are the basis for the evaluation of microbiological resistance.
(5) The white areas demark the range tested. Isolates resistant to the highest concentration are given in the next concentration level.
Values for the lowest concentration include isolates with MICs below the tested range.

13.2.3.3 Isolates from chickens

Tab. 13.143: *Salmonella* spp. from chickens (2000–2008)

Antimicrobial tested	Tested isolates (Number)	Microbiologically resistent isolates (Number) (4)	Microbiological resistent isolates (in %) (4)	Distribution (%) of MICs (µg/ml) (5) 0,008	0,015	0,03125	0,0625	0,125	0,25	0,5	1	2	4	8	16	32	64	128	256	512	1024
Gentamicin	2927	32	1,1								97,2	1,7	0,2	0,3	0,2	0,2	0,2				
Neomycin (1)	2551	60	2,4									96,2	1,5	0,0	0,4	0,7	1,3				
Kanamycin	2927	76	2,6										94,6	2,8	0,2	0,2	0,2	2,0			
Spectinomycin (1)	2551	467	18,3									0,0	0,0	0,2	29,0	47,2	5,3	1,6	16,7		
Streptomycin	2927	247	8,4										36,9	29,3	15,7	9,5	5,0	3,5			
Chloramphenicol	2927	96	3,3									5,6	29,3	56,3	5,5	0,1	0,2	3,0			
Florfenicol	2927	58	2,0									8,2	59,8	27,6	2,4	0,5	1,3	0,2			
Cefotaxime (2)	376	2	0,5				37,0	55,6	6,6	0,3	0,0	0,0	0,0	0,5							
Ceftazidime (2)	376	2	0,5						60,6	37,8	1,1	0,0	0,5	0,0	0,0	0,0					
Ceftiofur (1)	2551	11	0,4							64,4	32,6	2,6	0,2	0,0	0,2						
Nalidixic acid	2927	383	13,1										77,3	8,7	0,9	0,7	0,1	12,3			
Ciprofloxacin	2927	373	12,7			84,8	2,5	0,8	6,2	4,4	0,8	0,4	0,0	0,0							
Amoxicillin/Clavulanic acid (1)	2551	244	9,6									88,6	1,9	6,0	3,1	0,5	0,1				
Ampicillin	2927	306	10,5								71,8	16,0	1,6	0,1	0,0	0,7	9,6				
Colistin (3)	2927													99,4	0,5	0,1					
Sulfamethoxazole	2927	897	30,6													23,3	35,6	8,7	1,7	1,6	29,0
Trimethoprim (3)	2927												87,0	0,5	0,1	1,0	11,5				
Tetracycline	2927	331	11,3									80,8	6,9	1,0	0,2	1,9	9,2				

(1) Neomycin, spectinomycin, ceftiofur, amoxicillin/clavulanic acid were tested in the years 2000 to 2007 only.

(2) Cefotaxime and ceftazidime were tested in 2008 only.

(3) For colistin and trimethoprim no evaluation was performed as the lowest tested concentration was above the epidemiological cut-off value.

(4) The vertical lines demark the epidemiological cut-off values, which are the basis for the evaluation of microbiological resistance.

(5) The white areas demark the range tested. Isolates resistant to the highest concentration are given in the next concentration level. Values for the lowest concentration include isolates with MICs below the tested range.

Tab. 13.144: *S.* Enteritidis from chickens (2000–2008)

Antimicrobial tested	Tested isolates (Number)	Microbiologically resistent isolates (Number) (4)	Microbiological resistent isolates (in %) (4)	Distribution (%) of MICs (µg/ml) (5) 0,008	0,015	0,03125	0,0625	0,125	0,25	0,5	1	2	4	8	16	32	64	128	256	512	1024
Gentamicin	731	12	1,6								98,1	0,3	0,3	0,4	0,4	0,4	0,1				
Neomycin (1)	579	1	0,2									99,3	0,5	0,0	0,0	0,2	0,0				
Kanamycin	731	3	0,4										98,9	0,7	0,0	0,1	0,1	0,1			
Spectinomycin (1)	579	12	2,1									0,0	0,0	0,9	77,7	18,7	0,7	0,5	1,6		
Streptomycin	731	16	2,2										94,1	2,3	0,7	0,7	1,0	1,3			
Chloramphenicol	731	2	0,3									3,6	37,6	56,9	1,6	0,0	0,0	0,3			
Florfenicol	731	1	0,1									5,6	73,6	20,4	0,3	0,0	0,1	0,0			
Cefotaxime (2)	152	0	0,0				49,3	50,0	0,7	0,0	0,0	0,0	0,0	0,0							
Ceftazidime (2)	152	0	0,0						96,7	3,3	0,0	0,0	0,0	0,0	0,0	0,0					
Ceftiofur (1)	579	1	0,2							56,8	41,3	1,7	0,0	0,0	0,2						
Nalidixic acid	731	67	9,2										81,3	9,3	0,3	0,0	0,1	9,0			
Ciprofloxacin	731	68	9,3			89,2	1,5	0,1	5,6	3,4	0,1	0,0	0,0	0,0							
Amoxicillin/Clavulanic acid (1)	579	14	2,4									95,0	2,6	1,0	1,0	0,3	0,0				
Ampicillin	731	16	2,2								66,3	28,5	2,9	0,1	0,0	0,7	1,4				
Colistin (3)	731													99,0	0,8	0,1					
Sulfamethoxazole	731	86	11,8													20,1	55,5	12,0	0,5	0,5	11,2
Trimethoprim (3)	731												97,5	0,8	0,3	0,4	1,0				
Tetracycline	731	11	1,5									93,3	4,9	0,3	0,1	0,3	1,1				

(1) Neomycin, spectinomycin, ceftiofur, amoxicillin/clavulanic acid were tested in the years 2000 to 2007 only.
(2) Cefotaxime and ceftazidime were tested in 2008 only.
(3) For colistin and trimethoprim no evaluation was performed as the lowest tested concentration was above the epidemiological cut-off value.
(4) The vertical lines demark the epidemiological cut-off values, which are the basis for the evaluation of microbiological resistance.
(5) The white areas demark the range tested. Isolates resistant to the highest concentration are given in the next concentration level.
Values for the lowest concentration include isolates with MICs below the tested range.

Tab. 13.145: *S.* Infantis from chickens (2000–2008)

Antimicrobial tested	Tested isolates (Number)	Microbiologically resistent isolates (Number) (4)	Microbiological resistent isolates (in %) (4)	Distribution (%) of MICs (µg/ml) (5) 0,008	0,015	0,03125	0,0625	0,125	0,25	0,5	1	2	4	8	16	32	64	128	256	512	1024
Gentamicin	222	0	0,0								99,5	0,5	0,0	0,0	0,0	0,0	0,0				
Neomycin (1)	212	1	0,5									99,1	0,5	0,0	0,0	0,0	0,5				
Kanamycin	222	1	0,5										97,3	2,3	0,0	0,0	0,0	0,5			
Spectinomycin (1)	212	59	27,8									0,0	0,0	0,0	8,0	62,7	1,4	0,5	27,4		
Streptomycin	222	12	5,4										13,1	48,2	12,2	21,2	4,5	0,9			
Chloramphenicol	222	1	0,5									5,9	37,8	55,0	0,9	0,0	0,0	0,5			
Florfenicol	222	0	0,0									5,4	70,3	23,4	0,9	0,0	0,0	0,0			
Cefotaxime (2)	10	0	0,0				0,0	90,0	10,0	0,0	0,0	0,0	0,0	0,0							
Ceftazidime (2)	10	0	0,0						10,0	90,0	0,0	0,0	0,0	0,0	0,0	0,0					
Ceftiofur (1)	212	0	0,0							74,1	25,0	0,9	0,0	0,0	0,0						
Nalidixic acid	222	67	30,2										69,4	0,0	0,5	0,0	0,0	30,2			
Ciprofloxacin	222	68	30,6			68,9	0,5	0,0	14,9	14,4	1,4	0,0	0,0	0,0							
Amoxicillin/Clavulanic acid (1)	212	21	9,9									88,7	1,4	9,4	0,5	0,0	0,0				
Ampicillin	222	24	10,8								84,2	4,1	0,9	0,0	0,0	0,0	10,8				
Colistin (3)	222													99,5	0,5	0,0					
Sulfamethoxazole	222	77	34,7													17,6	46,4	1,4	0,0	0,0	34,7
Trimethoprim (3)	222												95,1	0,9	0,0	0,0	4,1				
Tetracycline	222	58	26,1									73,0	0,9	0,0	0,0	0,9	25,2				

(1) Neomycin, spectinomycin, ceftiofur, amoxicillin/clavulanic acid were tested in the years 2000 to 2007 only.

(2) Cefotaxime and ceftazidime were tested in 2008 only.

(3) For colistin and trimethoprim no evaluation was performed as the lowest tested concentration was above the epidemiological cut-off value.

(4) The vertical lines demark the epidemiological cut-off values, which are the basis for the evaluation of microbiological resistance.

(5) The white areas demark the range tested. Isolates resistant to the highest concentration are given in the next concentration level. Values for the lowest concentration include isolates with MICs below the tested range.

Tab. 13.146: *S.* Paratyphi B dT+ from chickens (2000–2008)

Antimicrobial tested	Tested isolates (Number)	Microbiologically resistent isolates (Number) (4)	Microbiological resistent isolates (in %) (4)	Distribution (%) of MICs (µg/ml) (5) 0,008	0,015	0,03125	0,0625	0,125	0,25	0,5	1	2	4	8	16	32	64	128	256	512	1024
Gentamicin	226	1	0,4								99,6	0,0	0,0	0,0	0,4	0,0	0,0				
Neomycin (1)	215	5	2,3									96,7	0,9	0,0	0,9	0,9	0,5				
Kanamycin	226	6	2,7										96,5	0,9	0,0	0,0	0,4	2,2			
Spectinomycin (1)	215	214	99,5									0,0	0,0	0,0	0,0	0,5	0,0	8,4	91,2		
Streptomycin	226	39	17,3										0,0	0,9	30,5	51,3	11,9	5,3			
Chloramphenicol	226	4	1,8									29,6	36,7	24,3	7,5	0,0	0,4	1,3			
Florfenicol	226	0	0,0									39,8	39,8	15,9	4,4	0,0	0,0	0,0			
Cefotaxime (2)	11	2	18,2				0,0	18,2	63,6	0,0	0,0	0,0	0,0	18,2							
Ceftazidime (2)	11	2	18,2						0,0	72,7	9,1	0,0	18,2	0,0	0,0	0,0					
Ceftiofur (1)	215	2	0,9							65,6	25,1	8,4	0,9	0,0	0,0						
Nalidixic acid	226	135	59,7										33,2	6,2	0,9	0,0	0,0	59,8			
Ciprofloxacin	226	139	61,5			35,8	2,7	0,9	28,3	25,7	4,0	2,2	0,4	0,0							
Amoxicillin/Clavulanic acid (1)	215	48	22,3									72,6	5,1	18,1	4,2	0,0	0,0				
Ampicillin	226	59	26,1								57,5	12,8	3,5	1,3	0,0	1,3	23,5				
Colistin (3)	226													98,7	0,9	0,4					
Sulfamethoxazole	226	128	56,6													39,4	3,1	0,9	0,0	8,0	48,6
Trimethoprim (3)	226												0,4	0,0	0,0	8,0	91,6				
Tetracycline	226	21	9,3									78,3	11,9	0,4	0,0	0,4	8,8				

(1) Neomycin, spectinomycin, ceftiofur, amoxicillin/clavulanic acid were tested in the years 2000 to 2007 only.

(2) Cefotaxime and ceftazidime were tested in 2008 only.

(3) For colistin and trimethoprim no evaluation was performed as the lowest tested concentration was above the epidemiological cut-off value.

(4) The vertical lines demark the epidemiological cut-off values, which are the basis for the evaluation of microbiological resistance.

(5) The white areas demark the range tested. Isolates resistant to the highest concentration are given in the next concentration level.
Values for the lowest concentration include isolates with MICs below the tested range.

Tab. 13.147: *S.* Typhimurium from chickens (2000–2008)

Antimicrobial tested	Tested isolates (Number)	Microbiologically resistent isolates (Number) (4)	Microbiological resistent isolates (in %) (4)	Distribution (%) of MICs (µg/ml) (5) 0,008	0,015	0,03125	0,0625	0,125	0,25	0,5	1	2	4	8	16	32	64	128	256	512	1024
Gentamicin	239	0	0,0								99,2	0,8	0,0	0,0	0,0	0,0	0,0				
Neomycin (1)	224	3	1,3									98,2	0,4	0,0	0,0	0,0	1,3				
Kanamycin	239	3	1,3										97,1	1,7	0,0	0,0	0,0	1,3			
Spectinomycin (1)	224	60	26,8									0,0	0,0	0,0	10,3	55,8	7,1	1,3	25,4		
Streptomycin	239	74	31,0										8,4	31,4	20,5	8,8	19,2	11,7			
Chloramphenicol	239	55	23,0									12,6	25,5	38,1	0,8	0,0	0,4	22,6			
Florfenicol	239	54	22,6									19,2	44,4	13,4	0,4	4,6	15,5	2,5			
Cefotaxime (2)	15	0	0,0				33,3	53,3	13,3	0,0	0,0	0,0	0,0	0,0							
Ceftazidime (2)	15	0	0,0						66,7	26,7	6,7	0,0	0,0	0,0	0,0	0,0					
Ceftiofur (1)	224	0	0,0							62,5	35,7	1,8	0,0	0,0	0,0						
Nalidixic acid	239	23	9,6										76,6	12,6	1,3	5,9	0,4	3,3			
Ciprofloxacin	239	8	3,3			92,4	4,2	0,0	2,1	1,3	0,0	0,0	0,0	0,0							
Amoxicillin/Clavulanic acid (1)	224	61	27,2									71,9	0,9	5,4	20,1	1,3	0,4				
Ampicillin	239	68	28,5								53,1	17,2	0,8	0,0	0,0	0,4	28,0				
Colistin (3)	239													99,5	0,4	0,0					
Sulfamethoxazole	239	149	62,3													18,0	9,2	7,5	2,9	1,3	61,1
Trimethoprim (3)	239												96,3	0,4	0,0	0,0	3,3				
Tetracycline	239	72	30,1									60,2	9,2	0,4	0,0	14,2	15,9				

(1) Neomycin, spectinomycin, ceftiofur, amoxicillin/clavulanic acid were tested in the years 2000 to 2007 only.
(2) Cefotaxime and ceftazidime were tested in 2008 only.
(3) For colistin and trimethoprim no evaluation was performed as the lowest tested concentration was above the epidemiological cut-off value.
(4) The vertical lines demark the epidemiological cut-off values, which are the basis for the evaluation of microbiological resistance.
(5) The white areas demark the range tested. Isolates resistant to the highest concentration are given in the next concentration level.
Values for the lowest concentration include isolates with MICs below the tested range.

Tab. 13.148: *S.* 4,12:d:- from chickens (2000–2008)

				Distribution (%) of MICs (µg/ml) (5)																	
Antimicrobial tested	**Tested isolates (Number)**	**Microbiologically resistent isolates (Number) (4)**	**Microbiological resistent isolates (in %) (4)**	**0,008**	**0,015**	**0,03125**	**0,0625**	**0,125**	**0,25**	**0,5**	**1**	**2**	**4**	**8**	**16**	**32**	**64**	**128**	**256**	**512**	**1024**
Gentamicin	464	1	0,2								95,7	4,1	0,2	0,0	0,0	0,0	0,0				
Neomycin (1)	394	0	0,0									97,0	3,0	0,0	0,0	0,0	0,0				
Kanamycin	464	1	0,2										93,1	6,7	0,2	0,0	0,0	0,0			
Spectinomycin (1)	394	8	2,0									0,0	0,0	0,0	21,1	73,4	3,6	0,3	1,8		
Streptomycin	464	4	0,9										14,0	55,6	26,1	3,4	0,9	0,0			
Chloramphenicol	464	0	0,0									0,0	8,0	83,2	8,8	0,0	0,0	0,0			
Florfenicol	464	0	0,0									0,0	47,0	50,2	2,8	0,0	0,0	0,0			
Cefotaxime (2)	70	0	0,0				7,1	91,4	1,4	0,0	0,0	0,0	0,0	0,0							
Ceftazidime (2)	70	0	0,0						2,9	97,1	0,0	0,0	0,0	0,0	0,0	0,0					
Ceftiofur (1)	394	0	0,0							68,8	29,7	1,5	0,0	0,0	0,0						
Nalidixic acid	464	0	0,0										89,2	9,7	1,1	0,0	0,0	0,0			
Ciprofloxacin	464	3	0,6			98,1	1,3	0,0	0,6	0,0	0,0	0,0	0,0	0,0							
Amoxicillin/Clavulanic acid (1)	394	9	2,3									97,5	0,3	1,8	0,0	0,3	0,3				
Ampicillin	464	10	2,2								91,4	6,3	0,2	0,0	0,0	0,2	1,9				
Colistin (3)	464													99,4	0,2	0,4					
Sulfamethoxazole	464	185	39,9													29,9	16,8	8,6	4,7	1,5	38,4
Trimethoprim (3)	464												97,9	0,2	0,0	0,4	1,5				
Tetracycline	464	1	0,2									85,1	12,5	2,2	0,2	0,0	0,0				

(1) Neomycin, spectinomycin, ceftiofur, amoxicillin/clavulanic acid were tested in the years 2000 to 2007 only.

(2) Cefotaxime and ceftazidime were tested in 2008 only.

(3) For colistin and trimethoprim no evaluation was performed as the lowest tested concentration was above the epidemiological cut-off value.

(4) The vertical lines demark the epidemiological cut-off values, which are the basis for the evaluation of microbiological resistance.

(5) The white areas demark the range tested. Isolates resistant to the highest concentration are given in the next concentration level.
Values for the lowest concentration include isolates with MICs below the tested range.

13.2.3.4 Isolates from turkeys

Tab. 13.149: *Salmonella* spp. from turkeys (2000–2008)

Antimicrobial tested	Tested isolates (Number)	Microbiologically resistent isolates (Number) (4)	Microbiological resistent isolates (in %) (4)	Distribution (%) of MICs (µg/ml) (5) 0,008	0,015	0,03125	0,0625	0,125	0,25	0,5	1	2	4	8	16	32	64	128	256	512	1024
Gentamicin	1235	312	25,3								73,8	1,0	1,0	13,4	7,4	2,5	0,9				
Neomycin (1)	1161	86	7,4									91,8	0,8	0,0	0,2	1,5	5,8				
Kanamycin	1235	343	27,8										70,4	1,9	1,0	14,7	4,9	7,2			
Spectinomycin (1)	1161	476	41,0									0,0	0,0	0,0	8,8	41,8	8,4	11,2	29,8		
Streptomycin	1235	438	35,5										13,0	28,8	10,0	12,7	24,3	11,2			
Chloramphenicol	1235	186	15,1									2,1	24,1	38,8	19,9	1,5	2,7	10,9			
Florfenicol	1235	111	9,0									7,1	46,0	19,8	18,1	4,0	4,8	0,2			
Cefotaxime (2)	74	0	0,0				37,8	14,9	41,9	5,4	0,0	0,0	0,0	0,0							
Ceftazidime (2)	74	0	0,0						43,2	35,1	21,6	0,0	0,0	0,0	0,0	0,0					
Ceftiofur (1)	1161	83	7,1							47,6	30,4	14,8	5,9	0,8	0,4						
Nalidixic acid	1235	322	26,1										64,8	6,9	2,3	0,2	0,2	25,8			
Ciprofloxacin	1235	344	27,9			69,4	2,7	4,0	2,3	4,0	14,9	2,4	0,1	0,0							
Amoxicillin/Clavulanic acid (1)	1161	528	45,5									51,9	2,7	12,1	22,7	10,2	0,4				
Ampicillin	1235	594	48,1								35,7	14,3	1,2	0,1	0,0	10,0	38,1				
Colistin (3)	1235													98,9	1,1	0,0					
Sulfamethoxazole	1235	691	56,0													21,9	14,2	6,6	1,5	11,3	44,7
Trimethoprim (3)	1235												84,9	3,5	0,8	2,5	8,3				
Tetracycline	1235	403	32,6									53,1	13,8	0,4	0,2	8,5	24,0				

(1) Neomycin, spectinomycin, ceftiofur, amoxicillin/clavulanic acid were tested in the years 2000 to 2007 only.

(2) Cefotaxime and ceftazidime were tested in 2008 only.

(3) For colistin and trimethoprim no evaluation was performed as the lowest tested concentration was above the epidemiological cut-off value.

(4) The vertical lines demark the epidemiological cut-off values, which are the basis for the evaluation of microbiological resistance.

(5) The white areas demark the range tested. Isolates resistant to the highest concentration are given in the next concentration level. Values for the lowest concentration include isolates with MICs below the tested range.

Tab. 13.150: *S.* Enteritidis from turkeys (2000–2008)

Antimicrobial tested	Tested isolates (Number)	Microbiologically resistent isolates (Number) (4)	Microbiological resistent isolates (in %) (4)	Distribution (%) of MICs (µg/ml) (5) 0,008	0,015	0,03125	0,0625	0,125	0,25	0,5	1	2	4	8	16	32	64	128	256	512	1024
Gentamicin	64	1	1,6								98,5	0,0	0,0	0,0	0,0	0,0	1,6				
Neomycin (1)	62	1	1,6									96,8	1,6	0,0	0,0	0,0	1,6				
Kanamycin	64	1	1,6										98,4	0,0	0,0	0,0	0,0	1,6			
Spectinomycin (1)	62	2	3,2									0,0	0,0	0,0	72,6	24,2	0,0	0,0	3,2		
Streptomycin	64	1	1,6										96,9	0,0	1,6	0,0	1,6	0,0			
Chloramphenicol	64	1	1,6									1,6	34,4	59,4	3,1	0,0	0,0	1,6			
Florfenicol	64	0	0,0									1,6	84,4	10,9	3,1	0,0	0,0	0,0			
Cefotaxime (2)	2	0	0,0				100,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0							
Ceftazidime (2)	2	0	0,0						100,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0					
Ceftiofur (1)	62	0	0,0							61,3	37,1	1,6	0,0	0,0	0,0						
Nalidixic acid	64	3	4,7										89,1	4,7	1,6	0,0	0,0	4,7			
Ciprofloxacin	64	3	4,7			93,7	1,6	0,0	1,6	3,1	0,0	0,0	0,0	0,0							
Amoxicillin/Clavulanic acid (1)	62	0	0,0									98,4	1,6	0,0	0,0	0,0	0,0				
Ampicillin	64	0	0,0								75,0	25,0	0,0	0,0	0,0	0,0	0,0				
Colistin (3)	64													98,4	1,6	0,0					
Sulfamethoxazole	64	8	12,5													25,0	40,6	20,3	1,6	0,0	12,5
Trimethoprim (3)	64												96,9	3,1	0,0	0,0	0,0				
Tetracycline	64	1	1,6									93,8	3,1	1,6	0,0	0,0	1,6				

(1) Neomycin, spectinomycin, ceftiofur, amoxicillin/clavulanic acid were tested in the years 2000 to 2007 only.

(2) Cefotaxime and ceftazidime were tested in 2008 only.

(3) For colistin and trimethoprim no evaluation was performed as the lowest tested concentration was above the epidemiological cut-off value.

(4) The vertical lines demark the epidemiological cut-off values, which are the basis for the evaluation of microbiological resistance.

(5) The white areas demark the range tested. Isolates resistant to the highest concentration are given in the next concentration level.
Values for the lowest concentration include isolates with MICs below the tested range.

Tab. 13.151: *S.* Heidelberg from turkeys (2000–2008)

Antimicrobial tested	Tested isolates (Number)	Microbiologically resistent isolates (Number) (4)	Microbiological resistent isolates (in %) (4)	Distribution (%) of MICs (µg/ml) (5)																	
				0,008	0,015	0,03125	0,0625	0,125	0,25	0,5	1	2	4	8	16	32	64	128	256	512	1024
Gentamicin	186	32	17,2								81,7	1,1	0,5	0,5	4,8	8,6	2,7				
Neomycin (1)	186	27	14,5									84,4	1,1	0,0	0,5	3,2	10,8				
Kanamycin	186	34	18,3										75,8	5,9	3,2	0,0	3,2	11,8			
Spectinomycin (1)	186	80	43,0									0,0	0,0	0,0	0,5	39,2	17,2	14,0	29,0		
Streptomycin	186	50	26,9										7,5	35,5	16,1	14,0	16,1	10,8			
Chloramphenicol	186	41	22,0									0,5	17,7	52,7	7,0	0,5	9,1	12,4			
Florfenicol	186	11	5,9									3,2	55,9	16,7	18,3	3,8	2,2	0,0			
Cefotaxime (2)	0	0	0,0				0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0							
Ceftazidime (2)	0	0	0,0						0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0					
Ceftiofur (1)	186	1	0,5							65,6	31,2	2,7	0,5	0,0	0,0						
Nalidixic acid	186	0	0,0										84,4	12,4	3,2	0,0	0,0	0,0			
Ciprofloxacin	186	5	2,7			92,5	4,8	2,7	0,0	0,0	0,0	0,0	0,0	0,0							
Amoxicillin/Clavulanic acid (1)	186	71	38,2									58,6	3,2	27,4	10,8	0,0	0,0				
Ampicillin	186	76	40,9								37,6	19,9	1,6	0,0	0,0	10,2	30,6				
Colistin (3)	186													98,4	1,6	0,0					
Sulfamethoxazole	186	101	54,3													26,9	16,1	2,7	0,0	14,5	39,8
Trimethoprim (3)	186												92,5	1,1	0,0	0,5	5,9				
Tetracycline	186	72	38,7									54,8	5,9	0,5	0,5	14,0	24,2				

(1) Neomycin, spectinomycin, ceftiofur, amoxicillin/clavulanic acid were tested in the years 2000 to 2007 only.
(2) Cefotaxime and ceftazidime were tested in 2008 only.
(3) For colistin and trimethoprim no evaluation was performed as the lowest tested concentration was above the epidemiological cut-off value.
(4) The vertical lines demark the epidemiological cut-off values, which are the basis for the evaluation of microbiological resistance.
(5) The white areas demark the range tested. Isolates resistant to the highest concentration are given in the next concentration level.
Values for the lowest concentration include isolates with MICs below the tested range.

Tab. 13.152: *S.* Saintpaul from turkeys (2000–2008)

Antimicrobial tested	Tested isolates (Number)	Microbiologically resistent isolates (Number) (4)	Microbiological resistent isolates (in %) (4)	Distribution (%) of MICs (µg/ml) (5)																	
				0,008	0,015	0,03125	0,0625	0,125	0,25	0,5	1	2	4	8	16	32	64	128	256	512	1024
Gentamicin	285	238	83,5								16,5	0,0	3,2	54,0	24,6	1,8	0,0				
Neomycin (1)	254	16	6,3									92,9	0,8	0,0	0,0	0,8	5,5				
Kanamycin	285	243	85,3										14,7	0,0	1,4	61,1	16,8	6,0			
Spectinomycin (1)	254	218	85,8									0,0	0,0	0,0	0,0	11,0	3,1	31,5	54,3		
Streptomycin	285	168	58,9										1,8	6,3	3,2	29,8	51,6	7,4			
Chloramphenicol	285	24	8,4									0,0	1,8	22,1	67,7	4,9	1,1	2,5			
Florfenicol	285	10	3,5									0,0	15,1	29,1	52,3	2,1	1,4	0,0			
Cefotaxime (2)	31	0	0,0				6,5	6,5	77,4	9,7	0,0	0,0	0,0	0,0							
Ceftazidime (2)	31	0	0,0						6,5	54,8	38,7	0,0	0,0	0,0	0,0	0,0					
Ceftiofur (1)	254	68	26,8							5,5	12,6	55,1	25,6	1,2	0,0						
Nalidixic acid	285	240	84,2										15,4	0,4	0,0	0,0	0,4	83,9			
Ciprofloxacin	285	240	84,2			15,8	0,0	0,0	1,1	11,9	61,4	9,8	0,0	0,0							
Amoxicillin/Clavulanic acid (1)	254	230	90,6									6,7	2,8	4,3	46,1	40,2	0,0				
Ampicillin	285	265	93,0								4,9	1,8	0,4	0,0	0,0	27,7	65,3				
Colistin (3)	285													99,7	0,4	0,0					
Sulfamethoxazole	285	262	91,9													1,1	2,1	3,2	1,8	27,0	64,9
Trimethoprim (3)	285												72,7	9,5	3,2	6,7	8,1				
Tetracycline	285	49	17,2									39,3	42,8	0,7	0,0	2,5	14,7				

(1) Neomycin, spectinomycin, ceftiofur, amoxicillin/clavulanic acid were tested in the years 2000 to 2007 only.
(2) Cefotaxime and ceftazidime were tested in 2008 only.
(3) For colistin and trimethoprim no evaluation was performed as the lowest tested concentration was above the epidemiological cut-off value.
(4) The vertical lines demark the epidemiological cut-off values, which are the basis for the evaluation of microbiological resistance.
(5) The white areas demark the range tested. Isolates resistant to the highest concentration are given in the next concentration level.
Values for the lowest concentration include isolates with MICs below the tested range.

Tab. 13.153: *S.* Typhimurium from turkeys (2000–2008)

Antimicrobial tested	Tested isolates (Number)	Microbiologically resistent isolates (Number) (4)	Microbiological resistent isolates (in %) (4)	Distribution (%) of MICs (µg/ml) (5) 0,008	0,015	0,03125	0,0625	0,125	0,25	0,5	1	2	4	8	16	32	64	128	256	512	1024
Gentamicin	133	1	0,8								97,7	1,5	0,0	0,0	0,0	0,0	0,8				
Neomycin (1)	127	7	5,5									92,9	1,6	0,0	0,0	0,8	4,7				
Kanamycin	133	8	6,0										93,2	0,8	0,0	0,0	0,8	5,3			
Spectinomycin (1)	127	85	66,9									0,0	0,0	0,0	2,4	28,3	2,4	6,3	60,6		
Streptomycin	133	98	73,7										5,3	13,5	6,0	1,5	42,1	31,6			
Chloramphenicol	133	84	63,2									1,5	12,8	18,8	3,8	0,0	5,3	57,9			
Florfenicol	133	80	60,2									3,0	24,1	9,8	3,0	21,8	36,1	2,3			
Cefotaxime (2)	6	0	0,0				33,3	33,3	33,3	0,0	0,0	0,0	0,0	0,0							
Ceftazidime (2)	6	0	0,0						66,7	16,7	16,7	0,0	0,0	0,0	0,0	0,0					
Ceftiofur (1)	127	0	0,0							63,0	33,9	3,1	0,0	0,0	0,0						
Nalidixic acid	133	1	0,8										86,5	9,0	3,8	0,0	0,0	0,8			
Ciprofloxacin	133	2	1,5			94,0	4,5	0,0	0,8	0,8	0,0	0,0	0,0	0,0							
Amoxicillin/Clavulanic acid (1)	127	103	81,1									18,9	0,0	15,0	63,0	3,1	0,0				
Ampicillin	133	107	80,5								14,3	4,5	0,8	0,0	0,0	7,5	72,9				
Colistin (3)	133													98,5	1,5	0,0					
Sulfamethoxazole	133	116	87,2													3,0	3,0	6,8	0,0	8,3	78,9
Trimethoprim (3)	133												87,2	1,5	0,0	1,5	9,8				
Tetracycline	133	105	78,9									21,1	0,0	0,0	0,8	33,1	45,1				

(1) Neomycin, spectinomycin, ceftiofur, amoxicillin/clavulanic acid were tested in the years 2000 to 2007 only.

(2) Cefotaxime and ceftazidime were tested in 2008 only.

(3) For colistin and trimethoprim no evaluation was performed as the lowest tested concentration was above the epidemiological cut-off value.

(4) The vertical lines demark the epidemiological cut-off values, which are the basis for the evaluation of microbiological resistance.

(5) The white areas demark the range tested. Isolates resistant to the highest concentration are given in the next concentration level.
Values for the lowest concentration include isolates with MICs below the tested range.

Tab. 13.154: *S.* 4,[5],12:d:- from turkeys (2000–2008)

Antimicrobial tested	Tested isolates (Number)	Microbiologically resistent isolates (Number) (4)	Microbiological resistent isolates (in %) (4)	Distribution (%) of MICs (µg/ml) (5) 0,008	0,015	0,03125	0,0625	0,125	0,25	0,5	1	2	4	8	16	32	64	128	256	512	1024
Gentamicin	69	0	0,0								98,6	1,4	0,0	0,0	0,0	0,0	0,0				
Neomycin (1)	69	1	1,4									98,6	0,0	0,0	0,0	0,0	1,4				
Kanamycin	69	1	1,4										94,2	4,3	0,0	0,0	0,0	1,4			
Spectinomycin (1)	69	2	2,9									0,0	0,0	0,0	23,2	71,0	2,9	1,4	1,4		
Streptomycin	69	0	0,0										21,7	68,1	8,7	1,4	0,0	0,0			
Chloramphenicol	69	3	4,3									0,0	13,0	81,2	1,4	0,0	0,0	4,3			
Florfenicol	69	0	0,0									2,9	76,8	18,8	1,4	0,0	0,0	0,0			
Cefotaxime (2)	0	0	0,0				0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0							
Ceftazidime (2)	0	0	0,0						0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0					
Ceftiofur (1)	69	0	0,0							62,3	34,8	2,9	0,0	0,0	0,0						
Nalidixic acid	69	0	0,0										92,8	7,2	0,0	0,0	0,0	0,0			
Ciprofloxacin	69	0	0,0			100,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0							
Amoxicillin/Clavulanic acid (1)	69	3	4,3									95,7	0,0	4,3	0,0	0,0	0,0				
Ampicillin	69	3	4,3								72,5	23,2	0,0	0,0	0,0	2,9	1,4				
Colistin (3)	69													100,0	0,0	0,0					
Sulfamethoxazole	69	33	47,8													37,7	10,1	4,3	0,0	5,8	42,0
Trimethoprim (3)	69												97,1	1,4	0,0	1,4	0,0				
Tetracycline	69	6	8,7									91,3	0,0	0,0	0,0	2,9	5,8				

(1) Neomycin, spectinomycin, ceftiofur, amoxicillin/clavulanic acid were tested in the years 2000 to 2007 only.
(2) Cefotaxime and ceftazidime were tested in 2008 only.
(3) For colistin and trimethoprim no evaluation was performed as the lowest tested concentration was above the epidemiological cut-off value.
(4) The vertical lines demark the epidemiological cut-off values, which are the basis for the evaluation of microbiological resistance.
(5) The white areas demark the range tested. Isolates resistant to the highest concentration are given in the next concentration level. Values for the lowest concentration include isolates with MICs below the tested range.

13.3 *Salmonella* isolates from food

13.3.1 Distribution of the serovars in food

Tab. 13.155: Frequency of the 20 most frequent serovars in meat, other foodstuffs and all foodstuffs together (2000–2008)

	Foodstuffs		Meat		Other foodstuffs	
	N	%	N	%	N	%
Number of isolates	10.853		8442		2411	
S. Typhimurium	3459	31,9	3243	38,4	216	9,0
S. Enteritidis	1927	17,8	803	9,5	1124	46,6
S. Paratyphi B dT+	519	4,8	510	6,0	9	0,4
S. Derby	437	4,0	417	4,9	20	0,8
S. 4,[5],12:i:-	421	3,9	419	5,0	2	0,1
S. Infantis	418	3,9	372	4,4	46	1,9
S. Subspec. I, rough	323	3,0	259	3,1	64	2,7
S. Saintpaul	239	2,2	229	2,7	10	0,4
S. Hadar	189	1,7	165	2,0	24	1,0
S. Indiana	163	1,5	155	1,8	8	0,3
S. Bovismorbificans	155	1,4	152	1,8	3	0,1
S. 4,12:d:-	149	1,4	147	1,7	2	0,1
S. Agona	131	1,2	71	0,8	60	2,5
S. Anatum	129	1,2	80	0,9	49	2,0
S. London	116	1,1	111	1,3	5	0,2
S. Brandenburg	112	1,0	110	1,3	2	0,1
S. Heidelberg	99	0,9	93	1,1	6	0,2
S. Mbandaka	96	0,9	49	0,6	47	1,9
S. Livingstone	93	0,9	74	0,9	19	0,8
S. Virchow	90	0,8	82	1,0	8	0,3
S. Senftenberg	70	0,6	30	0,4	40	1,7
S. Thompson	67	0,6	26	0,3	41	1,7
S. Ohio	66	0,6	61	0,7	5	0,2
S. group D1	63	0,6	52	0,6	11	0,5
S. Newport	60	0,6	47	0,6	13	0,5
S. Kottbus	57	0,5	54	0,6	3	0,1
S. Bredeney	50	0,5	47	0,6	3	0,1
S. Give	49	0,5	46	0,5	3	0,1
S. Goldcoast	45	0,4	43	0,5	2	0,1
S. Dublin	44	0,4	28	0,3	16	0,7
S. Braenderup	37	0,3	13	0,2	24	1,0
S. group B	34	0,3	20	0,2	14	0,6
S. Blockley	30	0,3	29	0,3	1	0,0
S. 4,[5],12:-:1,2	30	0,3	24	0,3	6	0,2
S. Kiambu	27	0,2	27	0,3	0	0,0
S. Subspec. II	27	0,2	13		14	0,6
S. Panama	25	0,2	25	0,3	0	0,0
S. Cerro	25	0,2	16	0,2	9	0,4
S. group C2	19	0,2	15	0,2	4	0,2
S. Manhattan	14	0,1	14	0,2	0	0,0
S. Bardo	10	0,1	10	0,1	0	0,0
Other serovars	739	6,8	261	3,1		0,0

Tab. 13.156: The 20 most frequent serovars from the different food categories (2000–2008)

	Pork		Chicken meat		Turkey meat		Minced meat		Other Meat	Meat total
	N	%	N	%	N	%	N	%	N	%
Number of isolates	1691		1915		851		1623		2362	8442
S. Typhimurium	906	53,6	177	9,2	144	16,9	972	59,9	1044	3243
S. Derby	166	9,8	1	0,1	12	1,4	104	6,4	134	417
S. 4,[5],12:i:-	152	9,0	6	0,3	15	1,8	124	7,6	122	419
S. Bovismorbificans	75	4,4	1	0,1	10	1,2	25	1,5	41	152
S. Subspec. I, rough	73	4,3	29	1,5	17	2,0	72	4,4	68	259
S. Infantis	71	4,2	125	6,5	10	1,2	54	3,3	112	372
S. Enteritidis	30	1,8	561	29,3	9	1,1	45	2,8	158	803
S. London	29	1,7	3	0,2	4	0,5	26	1,6	49	111
S. Brandenburg	28	1,7	0	0,0	9	1,1	33	2,0	40	110
S. Livingstone	16	0,9	32	1,7	0	0,0	8	0,5	18	74
S. Anatum	15	0,9	36	1,9	3	0,4	4	0,2	22	80
S. Goldcoast	14	0,8	0	0,0	0	0,0	13	0,8	16	43
S. Give	10	0,6	0	0,0	2	0,2	18	1,1	16	46
S. Kottbus	9	0,5	7	0,4	18	2,1	0	0,0	20	54
S. Ohio	8	0,5	35	1,8	0	0,0	6	0,4	12	61
S. group D1	8	0,5	0	0,0	0	0,0	25	1,5	19	52
S. Panama	8	0,5	1	0,1	1	0,1	6	0,4	9	25
S. group B	7	0,4	2	0,1	0	0,0	5	0,3	6	20
S. 4,[5],12:-:1,2	6	0,4	2	0,1	0	0,0	4	0,2	12	24
S. Hadar	5	0,3	27	1,4	91	10,7	4	0,2	38	165
S. Mbandaka	5	0,3	29	1,5	0	0,0	1	0,1	14	49
S. Paratyphi B dT+	3	0,2	452	23,6	3	0,4	4	0,2	48	510
S. Saintpaul	3	0,2	11	0,6	164	19,3	6	0,4	45	229
S. 4,12:d:-	3	0,2	64	3,3	49	5,8	8	0,5	23	147
S. Senftenberg	3	0,2	7	0,4	8	0,9	0	0,0	12	30
S. Dublin	3		0		0		10		15	28
S. group C2	3	0,2	2	0,1	8	0,9	0	0,0	2	15
S. Indiana	1	0,1	61	3,2	68	8,0	0	0,0	25	155
S. Agona	1	0,1	9	0,5	45	5,3	6	0,4	10	71
S. Newport	1	0,1	6	0,3	18	2,1	0	0,0	22	47
S. Thompson	1	0,1	22	1,1	0	0,0	1	0,1	2	26
S. Braenderup	1	0,1	12	0,6	0	0,0	0	0,0	0	13
S. Heidelberg	0	0,0	10	0,5	70	8,2	2	0,1	11	93
S. Virchow	0	0,0	60	3,1	4	0,5	3	0,2	15	82
S. Bredeney	0	0,0	10	0,5	28	3,3	0	0,0	9	47
S. Blockley	0	0,0	6	0,3	15	1,8	0	0,0	8	29
S. Kiambu	0	0,0	26	1,4	0	0,0	0	0,0	1	27
S. Cerro	0	0,0	10	0,5	1	0,1	0	0,0	5	16
S. Manhattan	0	0,0	5	0,3	8	0,9	1	0,1	0	14
S. Subspec. II	0		0		0		5		8	13
S. Bardo	0	0,0	10	0,5	0	0,0	0	0,0	0	10
Other serovars	27	1,6	58	3,0	17	2,0	28	1,7	131	261

Tab. 13.157: Development of resistance rates of the ten most frequent serovars from meat (2000–2008)

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	Total
Number of isolates	910	746	1037	678	793	1542	1025	926	785	8442
S. Typhimurium	35,6	50,9	39,2	39,4	42,5	43,7	34,7	29,9	28,3	38,4
S. Enteritidis	13,1	10,7	10,3	18,3	6,4	5,8	7,7	10,0	7,6	9,5
S. Paratyphi B dT+	20,7	4,6	3,8	4,1	1,9	1,7	4,7	7,6	7,9	6,0
S. 4,[5],12:i:-	0,4	0,8	1,3	3,7	3,3	7,2	5,6	8,9	12,1	5,0
S. Derby	2,2	3,6	4,1	2,9	3,4	7,8	6,7	5,6	4,8	4,9
S. Infantis	6,0	4,6	2,7	5,0	6,9	4,9	3,3	3,7	2,9	4,4
S. Subspec. I, rough	2,4	3,6	4,2	3,1	3,8	3,4	2,1	0,9	4,1	3,1
S. Saintpaul	0,7	0,7	6,0	1,3	1,6	1,2	3,1	4,4	5,4	2,7
S. Hadar	1,0	1,3	0,5	1,3	1,3	1,1	4,9	4,2	2,0	2,0
S. Indiana	1,0	0,1	6,3	0,1	0,8	1,3	1,4	2,3	2,3	1,8
Other serovars	16,9	19,0	21,7	20,6	28,1	21,8	25,8	22,6	22,5	22,2

Tab. 13.158: Development of resistance rates of the ten most frequent serovars from pork (2000–2008)

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	Total
Number of isolates	118	144	148	110	109	581	185	156	140	1691
S. Typhimurium	62,7	65,3	63,5	50,9	59,6	49,9	55,1	45,5	42,9	53,6
S. Derby	5,1	5,6	10,8	8,2	7,3	11,0	12,4	9,6	12,1	9,8
S. 4,[5],12:i:-	0	2,8	3,4	3,6	5,5	8,4	10,8	22,4	20,7	9,0
S. Bovismorbificans	2,5	3,5	0	0	0,9	10,7	0,5	1,9	0	4,4
S. Subspec. I, rough	2,5	4,9	10,8	3,6	2,8	3,8	2,2	1,3	8,6	4,3
S. Infantis	9,3	3,5	2,0	18,2	3,7	3,4	1,1	3,8	0	4,2
S. Enteritidis	6,8	2,8	1,4	0	1,8	1,2	0,5	3,8	0	1,8
S. London	0,8	2,1	1,4	0,9	0,9	1,9	1,6	3,2	1,4	1,7
S. Brandenburg	2,5	2,8	0	0	1,8	1,4	3,2	0,6	2,9	1,7
S. Livingstone	0,8	1,4	1,4	0,9	0,9	0,3	0	0,6	4,3	0,9
Other serovars	6,8	5,6	5,4	13,6	14,7	7,9	12,4	7,1	7,1	8,6

Tab. 13.159: Development of resistance rates of the ten most frequent serovars from chicken meat (2000–2008)

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	Total
Number of isolates	358	145	178	170	219	158	239	246	202	1915
S. Enteritidis	21,8	36,6	49,4	58,2	14,6	31,0	21,3	26,8	22,3	29,3
S. Paratyphi B dT+	50,6	21,4	15,7	14,7	6,8	12,0	17,2	21,1	29,7	23,6
S. Typhimurium	9,2	11,7	5,1	7,1	21,5	8,2	5,9	6,9	7,4	9,2
S. Infantis	2,5	2,1	7,9	1,8	13,2	8,9	9,6	6,1	7,4	6,5
S. 4,12:d:-	0	0,7	0,6	2,4	9,6	4,4	8,8	1,6	2,5	3,3
S. Indiana	2,0	0	3,4	0,6	1,4	8,9	3,3	4,5	5,4	3,2
S. Virchow	2,5	2,8	5,6	5,9	4,1	1,9	3,8	1,2	1,5	3,1
S. Anatum	0	0	0	1,8	8,2	0,6	2,9	1,2	2,0	1,9
S. Ohio	0,3	0	0	0	0,5	3,2	4,2	5,7	2,0	1,8
S. Livingstone	0,8	1,4	0	0	3,2	2,5	2,5	1,2	3,5	1,7
Other serovars	10,3	23,4	12,4	7,6	16,9	18,4	20,5	23,6	16,3	16,3

Tab. 13.160: Development of resistance rates in the ten most frequent serovars from turkey meat (2000–2008)

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	Total
Number of isolates	50	36	276	42	52	86	117	126	66	851
S. Saintpaul	8,0	5,6	19,6	16,7	11,5	18,6	18,8	24,6	33,3	19,3
S. Typhimurium	10,0	13,9	16,3	14,3	26,9	23,3	11,1	15,9	24,2	16,9
S. Hadar	10,0	13,9	0,4	2,4	9,6	5,8	29,9	23,8	6,1	10,7
S. Heidelberg	6,0	8,3	11,2	33,3	11,5	5,8	4,3	2,4	0	8,2
S. Indiana	2,0	0	21,4	0	0	1,2	1,7	3,2	1,5	8,0
S. 4,12:d:-	2,0	2,8	12,3	2,4	9,6	0	4,3	1,6	0	5,8
S. Agona	12,0	5,6	7,2	0	7,7	5,8	3,4	0	6,1	5,3
S. Bredeney	2,0	0	0	0	0	1,2	8,5	11,9	1,5	3,3
S. Newport	0	0	0,7	0	0	3,5	1,7	3,2	10,6	2,1
S. Kottbus	6,0	0	1,8	11,9	5,8	2,3	0	0	0	2,1
Other serovars	42,0	50,0	9,1	19,0	17,3	32,6	16,2	13,5	16,7	18,3

Tab. 13.161: Development of resistance rates in the ten most frequent serovars from minced meat (2000–2008)

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	Total
Number of isolates	149	198	214	202	188	237	151	128	156	1623
S. Typhimurium	75,8	72,2	67,8	58,9	56,9	52,7	57,6	52,3	42,3	59,9
S. 4,[5],12:i:-	1,3	0,5	2,3	6,4	8,5	11,0	7,3	14,8	19,9	7,6
S. Derby	3,4	7,6	8,4	3,5	2,1	4,6	9,3	13,3	8,3	6,4
S. Subspec. I, rough	2,7	3,0	6,5	5,0	6,4	3,0	6,0	0	6,4	4,4
S. Infantis	2,0	2,0	3,3	1,5	3,2	10,5	0,7	2,3	1,3	3,3
S. Enteritidis	5,4	2,5	1,4	5,4	3,2	0	2,6	3,1	2,6	2,8
S. Brandenburg	1,3	2,5	1,9	3,5	2,7	0,4	2,6	0	3,2	2,0
S. London	0	1,5	1,9	1,5	1,1	3,0	2,6	2,3	0	1,6
S. Bovismorbificans	0	0,5	0	0	1,6	5,1	0	1,6	4,5	1,5
S. 9,12:l:v	0	1,5	2,3	3,0	2,1	2,5	0	0	0,6	1,5
Other serovars	8,1	6,1	4,2	11,4	12,2	7,2	11,3	10,2	10,9	8,8

13.3.2 Development of resistance rates in *Salmonella* isolates from food

13.3.2.1 Isolates from meat

Tab. 13.162: Resistance rate in *Salmonella* isolates from meat (2000–2008)

	Salmonella spp.	*S.* Enteritidis	*S.* Typhimurium	*S.* 4,[5],12:i:-	*S.* Infantis	*S.* Paratyphi B dT+
Tested isolates	8442	803	3243	419	372	510
Susceptible	38,0	80,1	24,3	6,9	59,9	0,0
Resistant	62,0	19,9	75,7	93,1	40,1	100,0
Multiresistant (3)	48,5	3,5	63,1	80,0	25,0	92,5
Gentamicin	2,9	1,0	1,3	1,9	0,8	1,8
Neomycin (1)	4,4	0,1	5,9	1,3	0,6	2,0
Kanamycin	6,0	0,2	6,0	1,4	0,5	2,9
Spectinomycin (1)	29,2	1,1	39,7	13,0	18,4	99,6
Streptomycin	34,1	2,0	54,4	75,9	8,6	28,2
Chloramphenicol	14,7	0,4	31,3	8,1	1,3	2,4
Florfenicol	12,0	0,2	28,3	3,8	0,0	0,4
Cefotaxime (2)	1,2	0,0	0,0	0,0	0,0	14,1
Ceftazidime (2)	1,2	0,0	0,0	0,0	0,0	14,1
Ceftiofur(1)	1,4	0,1	0,7	0,9	0,3	6,3
Nalidixic acid	12,6	8,1	4,7	1,9	18,0	56,3
Ciprofloxacin	13,2	8,6	5,0	2,6	17,7	58,2
Amoxicillin/Clavulanic acid (1)	33,5	2,3	52,4	58,4	5,2	48,0
Ampicillin	36,6	2,4	56,3	75,4	6,7	48,2
Sulfamethoxazole	49,5	10,2	67,3	81,4	33,1	68,0
Trimethoprim (2)	17,2	0,0	16,3	3,8	16,7	100
Tetracycline	41,3	1,5	62,5	85,7	20,7	17,6

(1) Antimicrobials were tested from 2000 to 2007; (2) antimicrobials were tested/evaluated since 2007;
(3) resistance to more than one class of antimicrobials.

Tab. 13.163: Development of resistance rates in *Salmonella* isolates from meat (2000–2008)

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	Total
Tested isolates	910	746	1037	678	793	1542	1025	926	785	8442
Susceptible	19,0	29,8	38,7	49,1	42,1	41,9	45,4	37,8	36,6	38,0
Resistant	81,0	70,2	61,3	50,9	57,9	58,1	54,6	62,2	63,4	62,0
Multiresistant (3)	54,4	48,1	52,7	38,8	43,3	44,0	45,6	54,1	55,8	48,5
Gentamicin	1,8	1,2	9,6	1,5	2,9	1,2	1,4	2,6	3,6	2,9
Neomycin (1)	4,7	2,4	4,0	2,1	3,8	3,9	5,4	8,4	-	4,4
Kanamycin	4,9	2,7	10	3,1	5,0	4,7	5,9	9,8	6,6	6,0
Spectinomycin (1)	37,3	35,0	31,9	26,0	22,8	26,9	26,7	28,1	-	29,2
Streptomycin	30,7	35,7	34,6	30,8	30,8	36,4	34,4	35,6	35,4	34,1
Chloramphenicol	16,0	20,1	18,4	16,5	14,2	14,1	13,1	10,2	11,2	14,7
Florfenicol	10,1	17,6	13,3	14,6	11,5	12,8	10,7	8,2	9,6	12,0
Cefotaxime (2)	-	-	-	-	-	-	-	1,9	1,1	1,2
Ceftazidime (2)	-	-	-	-	-	-	-	1,9	1,1	1,2
Ceftiofur(1)	3,3	0,1	5,3	0,3	0,1	0,3	0,6	0,5	-	1,4
Nalidixic acid	16,2	9,4	13,7	10,6	9,1	8,3	10,8	19,4	18,5	12,6
Ciprofloxacin	17,1	9,7	13,3	10,9	9,6	8,8	11,6	20,1	19,7	13,2
Amoxicillin/Clavulanic acid (1)	29,9	32,2	37,5	31,9	33,8	32,8	30,7	39,2	-	33,5
Ampicillin	30,4	33,6	38,8	33,2	37,5	37,4	32,5	41,7	43,8	36,6
Sulfamethoxazole	75,1	61,8	52,0	38,2	48,0	44,9	38,0	42,2	48,8	49,5
Trimethoprim (2)	-	-	-	-	-	-	-	11,3	17,6	17,2
Tetracycline	28,8	41,2	43,4	34,2	37,2	45,3	44,2	46,1	45,9	41,3

(1) Antimicrobials were tested from 2000 to 2007; (2) antimicrobials were tested/evaluated since 2007;
(3) resistance to more than one class of antimicrobials.

Tab. 13.164: Development of resistance rates in *S.* Enteritidis from meat (2000–2008)

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	Total
Tested isolates	119	80	107	124	51	90	79	93	60	803
Susceptible	47,9	77,5	89,7	81,5	90,2	78,9	88,6	90,3	93,3	80,1
Resistant	52,1	22,5	10,3	18,5	9,8	21,1	11,4	9,7	6,7	19,9
Multiresistant (3)	6,7	2,5	2,8	3,2	5,9	6,7	1,3	1,1	0	3,5
Gentamicin	0,8	0	3,7	0,8	2,0	1,1	0	0	0	1,0
Neomycin (1)	0	0	0	0	2,0	0	0	0	-	0,1
Kanamycin	0	0	0	0	3,9	0	0	0	0	0,2
Spectinomycin (1)	0	1,3	0,9	2,4	3,9	1,1	0	0	-	1,1
Streptomycin	1,7	1,3	5,6	0,8	3,9	3,3	0	1,1	0	2,0
Chloramphenicol	0	0	0,9	0	3,9	0	0	0	0	0,4
Florfenicol	0	0	0,9	0	2,0	0	0	0	0	0,2
Cefotaxime (2)	-	-	-	-	-	-	-	0	0	0,0
Ceftazidime (2)	-	-	-	-	-	-	-	0	0	0,0
Ceftiofur(1)	0	0	0,9	0	0	0	0	0	-	0,1
Nalidixic acid	4,2	5,0	4,7	13,7	5,9	18,9	8,9	4,3	5,0	8,1
Ciprofloxacin	5,0	6,3	4,7	14,5	5,9	18,9	10,1	4,3	5,0	8,6
Amoxicillin/Clavulanic acid (1)	0,8	5,0	0,9	2,4	2,0	1,1	1,3	5,6	-	2,3
Ampicillin	0	6,3	0,9	2,4	2,0	1,1	2,5	5,4	1,7	2,4
Sulfamethoxazole	49,6	12,5	1,9	3,2	5,9	4,4	0	0	0	10,2
Trimethoprim (2)	-	-	-	-	-	-	-	0	0	0,0
Tetracycline	1,7	2,5	0,9	0	2,0	6,7	0	0	0	1,5

(1) Antimicrobials were tested from 2000 to 2007; (2) antimicrobials were tested/evaluated since 2007;
(3) resistance to more than one class of antimicrobials.

Tab. 13.165: Development of resistance rates in *S.* Typhimurium from meat (2000–2008)

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	Total
Tested isolates	324	380	406	267	337	674	356	277	222	3243
Susceptible	14,8	17,9	26,6	29,6	27,9	23,1	30,1	29,2	21,2	24,3
Resistant	85,2	82,1	73,4	70,4	72,1	76,9	69,9	70,8	78,8	75,7
Multiresistant (3)	62,3	63,2	65,5	61,4	61,4	62,8	60,7	63,5	68,5	63,1
Gentamicin	1,9	0,3	2,7	0,4	2,7	1,0	0,8	0,4	0,9	1,3
Neomycin (1)	6,8	2,6	4,4	3,0	5,9	7,3	6,2	11,2	-	5,9
Kanamycin	7,4	2,9	4,7	3,0	6,2	7,7	6,2	10,8	4,1	6,0
Spectinomycin (1)	36,7	44,2	36,9	40,8	32,6	43,8	39,6	38,6	-	39,7
Streptomycin	47,5	53,4	59,9	55,8	52,2	58,5	52,5	52,0	50,9	54,4
Chloramphenicol	37,3	35,3	35,7	35,6	26,1	27,6	30,6	24,5	30,6	31,3
Florfenicol	25,9	33,2	30	34,5	24,9	26,7	29,5	22,7	27,9	28,3
Cefotaxime (2)	-	-	-	-	-	-	-	0	0	0,0
Ceftazidime (2)	-	-	-	-	-	-	-	0	0	0,0
Ceftiofur(1)	1,9	0	2,7	0	0	0	0,3	0,8	-	0,7
Nalidixic acid	4,9	4,5	2,5	3,4	6,5	4,6	4,5	4,3	8,6	4,7
Ciprofloxacin	6,5	4,5	2,5	3,4	6,2	4,9	5,1	4,7	9,5	5,0
Amoxicillin/Clavulanic acid (1)	44,8	48,4	58,4	53,6	53,4	52,1	53,1	56,4	-	52,4
Ampicillin	45,7	50,3	60,1	56,2	58,5	57,3	55,3	59,9	65,8	56,3
Sulfamethoxazole	80,9	76,8	66,3	61,8	67,1	63,1	60,7	61,4	70,3	67,3
Trimethoprim (2)	-	-	-	-	-	-	-	11,1	16,7	16,3
Tetracycline	56,8	57,4	67,5	62,5	54,0	67,5	64,3	64,3	63,1	62,5

(1) Antimicrobials were tested from 2000 to 2007; (2) antimicrobials were tested/evaluated since 2007;
(3) resistance to more than one class of antimicrobials.

Tab. 13.166: Development of resistance rates in *S.* 4,[5],12:i:- from meat (2000–2008)

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	Total
Tested isolates	4	6	13	25	26	111	57	82	95	419
Susceptible	25,0	0	38,5	28,0	7,7	7,2	1,8	1,2	4,2	6,9
Resistant	75,0	100	61,5	72,0	92,3	92,8	98,2	98,8	95,8	93,1
Multiresistant (3)	50	83,3	46,2	24,0	57,7	82,0	84,2	89,0	93,7	80,0
Gentamicin	0	33,3	30,8	0	3,8	0	0	1,2	0	1,9
Neomycin (1)	0	0	0	0	0	0,9	5,3	0	-	1,3
Kanamycin	0	0	0	0	0	0,9	5,3	1,2	1,1	1,4
Spectinomycin (1)	0	33,3	38,5	0	7,7	10,8	21,1	9,8	-	13,0
Streptomycin	0	66,7	38,5	24,0	46,2	78,4	82,5	85,4	91,6	75,9
Chloramphenicol	0	33,3	38,5	8,0	7,7	5,4	12,3	9,8	2,1	8,1
Florfenicol	0	0	7,7	8,0	3,8	2,7	3,5	7,3	1,1	3,8
Cefotaxime (2)	-	-	-	-	-	-	-	0	0	0,0
Ceftazidime (2)	-	-	-	-	-	-	-	0	0	0,0
Ceftiofur(1)	0	0	23,1	0	0	0	0	0	-	0,9
Nalidixic acid	0	0	0	8,0	0	2,7	0	3,7	0	1,9
Ciprofloxacin	0	0	0	8,0	0	2,7	1,8	4,9	1,1	2,6
Amoxicillin/Clavulanic acid (1)	0	66,7	46,2	20	26,9	52,3	75,4	83,8	-	58,4
Ampicillin	0	66,7	46,2	20	50	73,9	82,5	87,8	91,6	75,4
Sulfamethoxazole	50	83,3	46,2	56,0	65,4	80,2	84,2	86,6	93,7	81,4
Trimethoprim (2)	-	-	-	-	-	-	-	0	4,2	3,8
Tetracycline	75,0	100	61,5	40	76,9	85,6	93,0	95,1	90,5	85,7

(1) Antimicrobials were tested from 2000 to 2007; (2) antimicrobials were tested/evaluated since 2007;
(3) resistance to more than one class of antimicrobials.

Tab. 13.167: Development of resistance rates in *S.* Paratyphi B dT+ from meat (2000–2008)

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	Total
Tested isolates	188	34	39	28	15	26	48	70	62	510
Susceptible	0	0	0	0	0	0	0	0	0	0,0
Resistant	100	100	100	100	100	100	100	100	100	100,0
Multiresistant (3)	98,9	94,1	89,7	75,0	86,7	69,2	87,5	94,3	95,2	92,5
Gentamicin	0	8,8	0	3,6	0	3,8	2,1	0	4,8	1,8
Neomycin (1)	0,5	0	5,1	3,6	6,7	0	2,1	4,4	-	2,0
Kanamycin	0,5	0	5,1	3,6	6,7	0	2,1	5,7	8,1	2,9
Spectinomycin (1)	99,5	97,1	100	100	100	100	100	100	-	99,6
Streptomycin	35,1	32,4	15,4	35,7	26,7	11,5	16,7	28,6	25,8	28,2
Chloramphenicol	2,7	0	7,7	0	0	3,8	2,1	0	3,2	2,4
Florfenicol	0,5	0	0	0	0	3,8	0	0	0	0,4
Cefotaxime (2)	-	-	-	-	-	-	-	50,0	12,9	14,1
Ceftazidime (2)	-	-	-	-	-	-	-	50,0	12,9	14,1
Ceftiofur(1)	12,8	2,9	0	0	0	0	4,2	1,5	-	6,3
Nalidixic acid	46,8	64,7	43,6	46,4	53,3	38,5	64,6	74,3	74,2	56,3
Ciprofloxacin	47,9	67,6	43,6	50	53,3	50	68,8	74,3	75,8	58,2
Amoxicillin/Clavulanic acid (1)	53,2	61,8	46,2	46,4	60	53,8	35,4	32,4	-	48,0
Ampicillin	52,7	67,6	46,2	46,4	60	57,7	39,6	34,3	41,9	48,2
Sulfamethoxazole	85,6	88,2	79,5	60,7	73,3	50	41,7	44,3	53,2	68,0
Trimethoprim (2)	-	-	-	-	-	-	-	100	100	100
Tetracycline	3,2	20,6	15,4	17,9	26,7	34,6	35,4	24,3	30,6	17,6

(1) Antimicrobials were tested from 2000 to 2007; (2) antimicrobials were tested/evaluated since 2007;
(3) resistance to more than one class of antimicrobials.

Tab. 13.168: Development of resistance rates in *S.* Infantis from meat (2000–2008)

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	Total
Tested isolates	55	34	28	34	55	75	34	34	23	372
Susceptible	36,4	76,5	50	88,2	58,2	81,3	50	52,9	21,7	59,9
Resistant	63,6	23,5	50	11,8	41,8	18,7	50	47,1	78,3	40,1
Multiresistant (3)	12,7	8,8	46,4	11,8	23,6	16,0	41,2	38,2	60,9	25,0
Gentamicin	0	2,9	0	0	0	0	0	2,9	4,3	0,8
Neomycin (1)	0	0	0	0	0	1,3	2,9	0	-	0,6
Kanamycin	0	0	0	0	0	1,3	2,9	0	0	0,5
Spectinomycin (1)	10,9	11,8	39,3	8,8	14,5	13,3	38,2	27,3	-	18,4
Streptomycin	10,9	11,8	7,1	2,9	3,6	5,3	17,6	11,8	13,0	8,6
Chloramphenicol	0	0	0	5,9	1,8	1,3	0	2,9	0	1,3
Florfenicol	0	0	0	0	0	0	0	0	0	0,0
Cefotaxime (2)	-	-	-	-	-	-	-	0	0	0,0
Ceftazidime (2)	-	-	-	-	-	-	-	0	0	0,0
Ceftiofur(1)	0	0	0	0	0	0	2,9	0	-	0,3
Nalidixic acid	1,8	2,9	42,9	5,9	9,1	10,7	41,2	29,4	60,9	18,0
Ciprofloxacin	1,8	2,9	42,9	5,9	7,3	10,7	41,2	29,4	60,9	17,7
Amoxicillin/Clavulanic acid (1)	0	0	7,1	0	9,1	5,3	8,8	12,1	-	5,2
Ampicillin	0	0	7,1	2,9	9,1	8,0	8,8	17,6	8,7	6,7
Sulfamethoxazole	63,6	14,7	46,4	8,8	25,5	16,0	41,2	38,2	60,9	33,1
Trimethoprim (2)	-	-	-	-	-	-	-	100	13,0	16,7
Tetracycline	7,3	5,9	39,3	5,9	27,3	12,0	35,3	32,4	47,8	20,7

(1) Antimicrobials were tested from 2000 to 2007; (2) antimicrobials were tested/evaluated since 2007;
(3) resistance to more than one class of antimicrobials.

13.3.2.2 Isolates from pork

Tab. 13.169: Resistance rates in *Salmonella* isolates from pork (2000–2008)

	Salmonella spp.	*S.* Enteritidis	*S.* Typhimurium	*S.* 4,[5],12:i:-	*S.* Derby	*S.* Infantis	*S.* Bovismorbificans
Tested isolates	1691	30	906	152	166	71	75
Susceptible	33,0	80,0	19,5	4,6	57,2	81,7	60,0
Resistant	67,0	20,0	80,5	95,4	42,8	18,3	40,0
Multiresistant (3)	51,9	0,0	67,2	82,9	21,1	4,2	10,7
Gentamicin	1,1	0,0	0,8	3,9	0,6	0,0	0,0
Neomycin (1)	4,9	0,0	7,9	0,8	1,4	0,0	0,0
Kanamycin	5,0	0,0	7,9	1,3	1,2	0,0	0,0
Spectinomycin (1)	30,3	0,0	44,8	17,4	9,5	2,8	5,3
Streptomycin	43,3	0,0	58,1	77,6	9,0	2,8	8,0
Chloramphenicol	20,5	0,0	32,2	10,5	1,2	0,0	6,7
Florfenicol	17,0	0,0	28,3	4,6	0,6	0,0	1,3
Cefotaxime (2)	0	-	0,0	0,0	0,0	-	-
Ceftazidime (2)	0	-	0,0	0,0	0,0	-	-
Ceftiofur(1)	0,5	0,0	0,4	2,5	0,0	0,0	0,0
Nalidixic acid	3,3	0,0	3,1	2,6	0,6	2,8	2,7
Ciprofloxacin	3,6	0,0	3,4	3,9	0,6	2,8	2,7
Amoxicillin/Clavulanic acid (1)	40,1	0,0	55,1	65,3	6,8	0,0	6,7
Ampicillin	44,1	0,0	59,4	76,3	7,2	0,0	6,7
Sulfamethoxazole	56,7	20,0	69,1	80,9	22,9	16,9	38,7
Trimethoprim (2)	13,6	-	19,7	3,1	16,7	-	-
Tetracycline	54,0	0,0	68,9	91,4	33,1	1,4	6,7

(1) Antimicrobials were tested from 2000 to 2007; (2) antimicrobials were tested/evaluated since 2007;
(3) resistance to more than one class of antimicrobials.

Tab. 13.170: Development of resistance rates in *Salmonella* isolates from pork (2000–2008)

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	Total
Tested isolates	118	144	148	110	109	581	185	156	140	1691
Susceptible	19,5	24,3	29,7	42,7	33,0	39,1	39,5	25,6	23,6	33,0
Resistant	80,5	75,7	70,3	57,3	67,0	60,9	60,5	74,4	76,4	67,0
Multiresistant (3)	48,3	57,6	62,8	50,9	49,5	41,7	53,0	65,4	65,7	51,9
Gentamicin	1,7	1,4	2,7	0	1,8	0,2	1,6	0,6	2,1	1,1
Neomycin (1)	5,1	1,4	8,8	2,7	3,7	4,3	1,6	13,3	-	4,9
Kanamycin	5,9	1,4	8,8	2,7	3,7	4,3	1,6	12,2	6,4	5,0
Spectinomycin (1)	26,3	41,7	29,7	30	31,2	27,7	28,1	35,7	-	30,3
Streptomycin	38,1	47,2	52,0	40,9	43,1	35,8	44,3	55,1	52,9	43,3
Chloramphenicol	26,3	31,9	31,1	24,5	25,7	15,1	19,5	16,7	13,6	20,5
Florfenicol	13,6	26,4	20,3	23,6	24,8	13,4	18,4	15,4	10,7	17,0
Cefotaxime (2)	-	-	-	-	-	-	-	0	0	0
Ceftazidime (2)	-	-	-	-	-	-	-	0	0	0
Ceftiofur(1)	0,8	0	2,7	0,9	0	0	0,5	0,7	-	0,5
Nalidixic acid	2,5	2,1	1,4	3,6	4,6	4,8	1,6	1,9	3,6	3,3
Ciprofloxacin	3,4	2,1	0	3,6	4,6	5,3	2,7	2,6	3,6	3,6
Amoxicillin/Clavulanic acid (1)	36,4	42,4	51,4	39,1	47,7	30,1	42,2	61,5	-	40,1
Ampicillin	37,3	43,8	53,4	40,9	49,5	33,6	45,4	62,8	60	44,1
Sulfamethoxazole	78,0	71,5	62,8	50,9	56,9	45,1	53,0	62,8	67,1	56,7
Trimethoprim (2)	-	-	-	-	-	-	-	14,3	13,6	13,6
Tetracycline	44,1	52,8	66,2	48,2	54,1	48,7	54,6	66,7	62,1	54,0

(1) Antimicrobials were tested from 2000 to 2007; (2) antimicrobials were tested/evaluated since 2007;
(3) resistance to more than one class of antimicrobials.

Tab. 13.171: Development of resistance rates in *S.* Typhimurium from pork (2000–2008)

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	Total
Tested isolates	74	94	94	56	65	290	102	71	60	906
Susceptible	17,6	21,3	22,3	23,2	21,5	21,7	23,5	9,9	3,3	19,5
Resistant	82,4	78,7	77,7	76,8	78,5	78,3	76,5	90,1	96,7	80,5
Multiresistant (3)	64,9	69,1	74,5	71,4	72,3	56,6	63,7	84,5	83,3	67,2
Gentamicin	1,4	0	0	0	3,1	0,3	2,0	0	1,7	0,8
Neomycin (1)	5,4	2,1	11,7	3,6	6,2	7,9	1,0	29,2	-	7,9
Kanamycin	5,4	2,1	11,7	3,6	6,2	7,9	1,0	26,8	10	7,9
Spectinomycin (1)	37,8	50	34,0	50	47,7	43,8	40,2	64,6	-	44,8
Streptomycin	52,7	58,5	66,0	60,7	63,1	52,1	54,9	70,4	63,3	58,1
Chloramphenicol	37,8	42,6	39,4	42,9	40	24,5	32,4	26,8	23,3	32,2
Florfenicol	20,3	38,3	27,7	41,1	40	23,4	32,4	25,4	18,3	28,3
Cefotaxime (2)	-	-	-	-	-	-	-	0	0	0,0
Ceftazidime (2)	-	-	-	-	-	-	-	0	0	0,0
Ceftiofur(1)	1,4	0	1,1	0	0	0	0	1,5	-	0,4
Nalidixic acid	2,7	3,2	0	5,4	4,6	4,8	1,0	0	3,3	3,1
Ciprofloxacin	4,1	3,2	0	5,4	4,6	5,2	2,0	0	3,3	3,4
Amoxicillin/Clavulanic acid (1)	52,7	53,2	66,0	55,4	69,2	43,8	55,9	80,0	-	55,1
Ampicillin	54,1	55,3	67,0	58,9	70,8	47,6	59,8	83,1	76,7	59,4
Sulfamethoxazole	78,4	75,5	75,5	69,6	75,4	56,6	65,7	80,3	83,3	69,1
Trimethoprim (2)	-	-	-	-	-	-	-	16,7	20	19,7
Tetracycline	59,5	61,7	75,5	69,6	70,8	66,6	68,6	81,7	75,0	68,9

(1) Antimicrobials were tested from 2000 to 2007; (2) antimicrobials were tested/evaluated since 2007;
(3) resistance to more than one class of antimicrobials.

Tab. 13.172: Development of resistance rates in *S.* Enteritidis from pork (2000–2008)

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	Total
Tested isolates	8	4	2	0	2	7	1	6	0	30
Susceptible	25,0	100	100	-	100	100	100	100	-	80,0
Resistant	75,0	0	0	-	0	0	0	0	-	20,0
Multiresistant (3)	0	0	0	-	0	0	0	0	-	0,0
Gentamicin	0	0	0	-	0	0	0	0	-	0,0
Neomycin (1)	0	0	0	-	0	0	0	0	-	0,0
Kanamycin	0	0	0	-	0	0	0	0	-	0,0
Spectinomycin (1)	0	0	0	-	0	0	0	0	-	0,0
Streptomycin	0	0	0	-	0	0	0	0	-	0,0
Chloramphenicol	0	0	0	-	0	0	0	0	-	0,0
Florfenicol	0	0	0	-	0	0	0	0	-	0,0
Cefotaxime (2)	-	-	-	-	-	-	-	-	-	-
Ceftazidime (2)	-	-	-	-	-	-	-	-	-	-
Ceftiofur(1)	0	0	0	-	0	0	0	0	-	0,0
Nalidixic acid	0	0	0	-	0	0	0	0	-	0,0
Ciprofloxacin	0	0	0	-	0	0	0	0	-	0,0
Amoxicillin/Clavulanic acid (1)	0	0	0	-	0	0	0	0	-	0,0
Ampicillin	0	0	0	-	0	0	0	0	-	0,0
Sulfamethoxazole	75,0	0	0	-	0	0	0	0	-	20,0
Trimethoprim (2)	-	-	-	-	-	-	-	-	-	-
Tetracycline	0	0	0	-	0	0	0	0	-	0,0

(1) Antimicrobials were tested from 2000 to 2007; (2) antimicrobials were tested/evaluated since 2007;
(3) resistance to more than one class of antimicrobials.

Tab. 13.173: Development of resistance rates in *S.* Derby from pork (2000–2008)

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	Total
Tested isolates	6	8	16	9	8	64	23	15	17	166
Susceptible	33,3	50	25,0	22,2	62,5	65,6	91,3	46,7	47,1	57,2
Resistant	66,7	50	75,0	77,8	37,5	34,4	8,7	53,3	52,9	42,8
Multiresistant (3)	33,3	12,5	50	55,6	0	14,1	8,7	20	29,4	21,1
Gentamicin	0	0	0	0	0	0	0	6,7	0	0,6
Neomycin (1)	0	0	6,3	11,1	0	0	0	0	-	1,4
Kanamycin	0	0	6,3	11,1	0	0	0	0	0	1,2
Spectinomycin (1)	0	12,5	12,5	11,1	0	10,9	4,3	14,3	-	9,5
Streptomycin	16,7	12,5	18,8	11,1	0	4,7	4,3	13,3	17,6	9,0
Chloramphenicol	0	0	0	11,1	0	0	0	0	5,9	1,2
Florfenicol	0	0	0	11,1	0	0	0	0	0	0,6
Cefotaxime (2)	-	-	-	-	-	-	-	0	0	0,0
Ceftazidime (2)	-	-	-	-	-	-	-	0	0	0,0
Ceftiofur(1)	0	0	0	0	0	0	0	0	-	0,0
Nalidixic acid	0	0	0	0	0	0	0	0	5,9	0,6
Ciprofloxacin	0	0	0	0	0	0	0	0	5,9	0,6
Amoxicillin/Clavulanic acid (1)	0	0	12,5	33,3	0	0	4,3	28,6	-	6,8
Ampicillin	0	0	12,5	33,3	0	0	4,3	26,7	11,8	7,2
Sulfamethoxazole	66,7	37,5	43,8	66,7	0	14,1	8,7	13,3	29,4	22,9
Trimethoprim (2)	-	-	-	-	-	-	-	0	17,6	16,7
Tetracycline	33,3	25,0	68,8	33,3	37,5	34,4	4,3	33,3	35,3	33,1

(1) Antimicrobials were tested from 2000 to 2007; (2) antimicrobials were tested/evaluated since 2007;
(3) resistance to more than one class of antimicrobials.

Tab. 13.174: Development of resistance rates in *S.* Infantis from pork (2000–2008)

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	Total
Tested isolates	11	5	3	20	4	20	2	6	0	71
Susceptible	36,4	40	100	95,0	100	95,0	100	83,3	-	81,7
Resistant	63,6	60	0	5,0	0	5,0	0	16,7	-	18,3
Multiresistant (3)	0	20	0	5,0	0	0	0	16,7	-	4,2
Gentamicin	0	0	0	0	0	0	0	0	-	0,0
Neomycin (1)	0	0	0	0	0	0	0	0	-	0,0
Kanamycin	0	0	0	0	0	0	0	0	-	0,0
Spectinomycin (1)	0	0	0	5,0	0	0	0	16,7	-	2,8
Streptomycin	0	20	0	5,0	0	0	0	0	-	2,8
Chloramphenicol	0	0	0	0	0	0	0	0	-	0,0
Florfenicol	0	0	0	0	0	0	0	0	-	0,0
Cefotaxime (2)	-	-	-	-	-	-	-	-	-	-
Ceftazidime (2)	-	-	-	-	-	-	-	-	-	-
Ceftiofur(1)	0	0	0	0	0	0	0	0	-	0,0
Nalidixic acid	0	0	0	0	0	5,0	0	16,7	-	2,8
Ciprofloxacin	0	0	0	0	0	5,0	0	16,7	-	2,8
Amoxicillin/Clavulanic acid (1)	0	0	0	0	0	0	0	0	-	0,0
Ampicillin	0	0	0	0	0	0	0	0	-	0,0
Sulfamethoxazole	63,6	60	0	5,0	0	0	0	16,7	-	16,9
Trimethoprim (2)	-	-	-	-	-	-	-	-	-	-
Tetracycline	0	0	0	0	0	0	0	16,7	-	1,4

(1) Antimicrobials were tested from 2000 to 2007; (2) antimicrobials were tested/evaluated since 2007;
(3) resistance to more than one class of antimicrobials.

Tab. 13.175: Development of resistance rates in *S.* Bovismorbificans from pork (2000–2008)

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	Total
Tested isolates	3	5	0	0	1	62	1	3	0	75
Susceptible	0	20	-	-	0	66,1	100	66,7	-	60,0
Resistant	100	80	-	-	100	33,9	0	33,3	-	40,0
Multiresistant (3)	33,3	20	-	-	0	8,1	0	33,3	-	10,7
Gentamicin	0	0	-	-	0	0	0	0	-	0,0
Neomycin (1)	0	0	-	-	0	0	0	0	-	0,0
Kanamycin	0	0	-	-	0	0	0	0	-	0,0
Spectinomycin (1)	0	0	-	-	0	6,5	0	0	-	5,3
Streptomycin	0	20	-	-	0	6,5	0	33,3	-	8,0
Chloramphenicol	0	0	-	-	0	6,5	0	33,3	-	6,7
Florfenicol	0	0	-	-	0	0	0	33,3	-	1,3
Cefotaxime (2)	-	-	-	-	-	-	-	-	-	-
Ceftazidime (2)	-	-	-	-	-	-	-	-	-	-
Ceftiofur(1)	0	0	-	-	0	0	0	0	-	0,0
Nalidixic acid	0	0	-	-	0	3,2	0	0	-	2,7
Ciprofloxacin	0	0	-	-	0	3,2	0	0	-	2,7
Amoxicillin/Clavulanic acid (1)	33,3	0	-	-	0	4,8	0	33,3	-	6,7
Ampicillin	33,3	0	-	-	0	4,8	0	33,3	-	6,7
Sulfamethoxazole	100	80	-	-	100	32,3	0	33,3	-	38,7
Trimethoprim (2)	-	-	-	-	-	-	-	-	-	-
Tetracycline	0	0	-	-	0	6,5	0	33,3	-	6,7

(1) Antimicrobials were tested from 2000 to 2007; (2) antimicrobials were tested/evaluated since 2007;
(3) resistance to more than one class of antimicrobials.

Tab. 13.176: Development of resistance rates in *S.* 4,[5],12:i:- from pork (2000–2008)

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	Total
Tested isolates	0	4	5	4	6	49	20	35	29	152
Susceptible	-	0	0	0	0	10,2	0	0	6,9	4,6
Resistant	-	100	100	100	100	89,8	100	100	93,1	95,4
Multiresistant (3)	-	100	100	50	33,3	73,5	95,0	91,4	89,7	82,9
Gentamicin	-	50	80	0	0	0	0	0	0	3,9
Neomycin (1)	-	0	0	0	0	0	5,0	0	-	0,8
Kanamycin	-	0	0	0	0	0	5,0	0	3,4	1,3
Spectinomycin (1)	-	50	100	0	0	14,3	15,0	12,1	-	17,4
Streptomycin	-	100	80	50	16,7	69,4	90	85,7	86,2	77,6
Chloramphenicol	-	50	100	0	0	4,1	5,0	17,1	0	10,5
Florfenicol	-	0	20	0	0	2,0	0	14,3	0	4,6
Cefotaxime (2)	-	-	-	-	-	-	-	0	0	0,0
Ceftazidime (2)	-	-	-	-	-	-	-	0	0	0,0
Ceftiofur(1)	-	0	60	0	0	0	0	0	-	2,5
Nalidixic acid	-	0	0	0	0	4,1	0	5,7	0	2,6
Ciprofloxacin	-	0	0	0	0	4,1	5,0	8,6	0	3,9
Amoxicillin/Clavulanic acid (1)	-	100	100	50	16,7	46,9	80	84,8	-	65,3
Ampicillin	-	100	100	50	16,7	63,3	85,0	88,6	86,2	76,3
Sulfamethoxazole	-	100	100	50	50	69,4	95,0	85,7	89,7	80,9
Trimethoprim (2)	-	-	-	-	-	-	-	0	3,4	3,1
Tetracycline	-	100	100	100	83,3	83,7	100	97,1	89,7	91,4

(1) Antimicrobials were tested from 2000 to 2007; (2) antimicrobials were tested/evaluated since 2007;
(3) resistance to more than one class of antimicrobials.

13.3.2.3 Isolates from chicken meat

Tab. 13.177: Resistance rates in *Salmonella* isolates from chicken meat (2000–2008)

	Salmonella spp.	*S.* Typhi-murium	*S.* Enteriti-dis	*S.* Para-typhi B dT+	*S.* 4,12:d:-	*S.* Infantis
Tested isolates	1915	177	561	452	64	125
Susceptible	50,0	63,8	81,5	0,0	90,6	31,2
Resistant	50,0	36,2	18,5	100,0	9,4	68,8
Multiresistant (3)	36,7	22,0	2,5	92,5	0,0	47,2
Gentamicin	1,2	0,0	0,9	2,0	0,0	1,6
Neomycin (1)	3,0	3,1	0,0	2,1	0,0	0,9
Kanamycin	3,3	2,8	0,0	2,9	0,0	0,8
Spectinomycin (1)	31,1	13,7	0,6	99,5	0,0	38,2
Streptomycin	12,6	17,5	1,4	28,8	0,0	8,8
Chloramphenicol	2,2	8,5	0,0	2,4	0,0	0,8
Florfenicol	0,9	7,3	0,0	0,4	0,0	0,0
Cefotaxime (2)	4,3	0,0	0,0	12,9	0,0	0,0
Ceftazidime (2)	4,3	0,0	0,0	12,9	0,0	0,0
Ceftiofur(1)	1,9	1,2	0,2	6,9	0,0	0,9
Nalidixic acid	24,5	9,6	7,0	57,5	0,0	44,0
Ciprofloxacin	25,1	9,6	7,7	58,8	0,0	43,2
Amoxicillin/Clavulanic acid (1)	18,9	17,4	1,9	48,5	0,0	10,0
Ampicillin	20,3	18,6	2,0	48,2	0,0	10,4
Sulfamethoxazole	33,4	33,3	9,3	66,8	9,4	52,8
Trimethoprim (2)	33,8	6,3	0,0	100	0,0	6,7
Tetracycline	15,8	18,6	0,4	17,0	0,0	44,8

(1) Antimicrobials were tested from 2000 to 2007; (2) antimicrobials were tested/evaluated since 2007;
(3) resistance to more than one class of antimicrobials.

Tab. 13.178: Development of resistance rates in *Salmonella* spp. of from chicken meat (2000–2008)

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	Total
Tested isolates	358	145	178	170	219	158	239	246	202	1915
Susceptible	17,6	49,0	62,4	66,5	56,6	60,8	60,8	55,7	48,5	50,0
Resistant	82,4	51,0	37,6	33,5	43,4	39,2	39,3	44,3	51,5	50,0
Multiresistant (3)	60,3	31,7	29,2	17,1	30,1	27,8	29,3	37,8	43,1	36,7
Gentamicin	0,3	2,1	3,9	1,2	0,5	0,6	0,4	0,8	2,5	1,2
Neomycin (1)	1,1	1,4	1,1	0,6	2,7	1,3	5,0	9,2	-	3,0
Kanamycin	1,1	1,4	1,7	0,6	2,7	1,3	5,0	9,8	4,5	3,3
Spectinomycin (1)	53,4	33,1	27,0	18,8	13,7	25,9	25,9	32,8	-	31,1
Streptomycin	21,8	14,5	8,4	8,2	11,4	9,5	6,7	13,0	12,9	12,6
Chloramphenicol	3,1	3,4	2,2	1,2	1,4	1,9	1,3	3,7	1,5	2,2
Florfenicol	1,1	2,8	0,6	0,6	0	1,9	0	1,2	0,5	0,9
Cefotaxime (2)	-	-	-	-	-	-	-	12,5	4,0	4,3
Ceftazidime (2)	-	-	-	-	-	-	-	12,5	4,0	4,3
Ceftiofur(1)	6,7	0,7	0,6	0	0	1,3	1,3	0,8	-	1,9
Nalidixic acid	30,2	23,4	21,3	20,6	16,0	17,1	21,8	30,5	32,7	24,5
Ciprofloxacin	31,0	24,1	21,3	21,8	16,0	17,1	23,0	30,5	33,2	25,1
Amoxicillin/Clavulanic acid (1)	29,3	20	15,7	8,8	19,6	14,6	10,9	22,7	-	18,9
Ampicillin	29,1	21,4	16,3	9,4	21,9	18,4	13,0	23,2	21,3	20,3
Sulfamethoxazole	72,3	39,3	25,3	12,9	31,5	22,2	18,4	22,4	26,7	33,4
Trimethoprim (2)	-	-	-	-	-	-	-	25,0	34,2	33,8
Tetracycline	7,0	14,5	12,9	5,9	22,8	19,0	19,2	20,3	23,8	15,8

(1) Antimicrobials were tested from 2000 to 2007; (2) antimicrobials were tested/evaluated since 2007;
(3) resistance to more than one class of antimicrobials.

Tab. 13.179: Development of resistance rates in *S.* Typhimurium from chicken meat (2000–2008)

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	Total
Tested isolates	33	17	9	12	47	13	14	17	15	177
Susceptible	36,4	41,2	66,7	83,3	70,2	69,2	85,7	70,6	80	63,8
Resistant	63,6	58,8	33,3	16,7	29,8	30,8	14,3	29,4	20	36,2
Multiresistant (3)	9,1	35,3	33,3	8,3	25,5	30,8	14,3	29,4	20	22,0
Gentamicin	0	0	0	0	0	0	0	0	0	0,0
Neomycin (1)	0	0	11,1	0	4,3	0	7,1	6,3	-	3,1
Kanamycin	0	0	11,1	0	4,3	0	7,1	5,9	0	2,8
Spectinomycin (1)	9,1	41,2	33,3	8,3	2,1	15,4	7,1	25,0	-	13,7
Streptomycin	9,1	29,4	22,2	8,3	23,4	23,1	7,1	17,6	13,3	17,5
Chloramphenicol	6,1	23,5	11,1	8,3	2,1	15,4	0	17,6	6,7	8,5
Florfenicol	3,0	23,5	11,1	8,3	0	15,4	0	17,6	6,7	7,3
Cefotaxime (2)	-	-	-	-	-	-	-	0	0	0,0
Ceftazidime (2)	-	-	-	-	-	-	-	0	0	0,0
Ceftiofur(1)	0	0	0	0	0	0	7,1	6,3	-	1,2
Nalidixic acid	0	5,9	22,2	8,3	17,0	15,4	0	17,6	0	9,6
Ciprofloxacin	0	5,9	22,2	8,3	17,0	15,4	0	17,6	0	9,6
Amoxicillin/Clavulanic acid (1)	6,1	29,4	22,2	8,3	19,1	30,8	14,3	18,8	-	17,4
Ampicillin	6,1	29,4	22,2	8,3	23,4	30,8	14,3	23,5	13,3	18,6
Sulfamethoxazole	60,6	52,9	33,3	8,3	27,7	30,8	14,3	23,5	20	33,3
Trimethoprim (2)	-	-	-	-	-	-	-	0	6,7	6,3
Tetracycline	6,1	23,5	22,2	16,7	25,5	23,1	7,1	29,4	13,3	18,6

(1) Antimicrobials were tested from 2000 to 2007; (2) antimicrobials were tested/evaluated since 2007;
(3) resistance to more than one class of antimicrobials.

Tab. 13.180: Development of resistance rates in *S.* Enteritidis from chicken meat (2000–2008)

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	Total
Tested isolates	78	53	88	99	32	49	51	66	45	561
Susceptible	47,4	77,4	90,9	80,8	90,6	85,7	88,2	90,9	95,6	81,5
Resistant	52,6	22,6	9,1	19,2	9,4	14,3	11,8	9,1	4,4	18,5
Multiresistant (3)	7,7	0	2,3	4,0	3,1	0	2,0	0	0	2,5
Gentamicin	0	0	4,5	1,0	0	0	0	0	0	0,9
Neomycin (1)	0	0	0	0	0	0	0	0	-	0,0
Kanamycin	0	0	0	0	0	0	0	0	0	0,0
Spectinomycin (1)	0	0	0	3,0	0	0	0	0	-	0,6
Streptomycin	2,6	0	5,7	1,0	0	0	0	0	0	1,4
Chloramphenicol	0	0	0	0	0	0	0	0	0	0,0
Florfenicol	0	0	0	0	0	0	0	0	0	0,0
Cefotaxime (2)	-	-	-	-	-	-	-	0	0	0,0
Ceftazidime (2)	-	-	-	-	-	-	-	0	0	0,0
Ceftiofur(1)	0	0	1,1	0	0	0	0	0	-	0,2
Nalidixic acid	5,1	3,8	3,4	13,1	9,4	12,2	9,8	3,0	2,2	7,0
Ciprofloxacin	6,4	5,7	3,4	14,1	9,4	12,2	11,8	3,0	2,2	7,7
Amoxicillin/Clavulanic acid (1)	1,3	3,8	0	3,0	0	0	0	6,3	-	1,9
Ampicillin	0	3,8	0	3,0	0	0	2,0	6,1	2,2	2,0
Sulfamethoxazole	48,7	13,2	1,1	4,0	3,1	2,0	0	0	0	9,3
Trimethoprim (2)	-	-	-	-	-	-	-	0	0	0,0
Tetracycline	2,6	0	0	0	0	0	0	0	0	0,4

(1) Antimicrobials were tested from 2000 to 2007; (2) antimicrobials were tested/evaluated since 2007;
(3) resistance to more than one class of antimicrobials.

Tab. 13.181: Development of resistance rates in *S.* Paratyphi B dT+ from chicken meat (2000–2008)

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	Total
Tested isolates	181	31	28	25	15	19	41	52	60	452
Susceptible	0	0	0	0	0	0	0	0	0	0,0
Resistant	100	100	100	100	100	100	100	100	100,0	100,0
Multiresistant (3)	98,9	93,5	85,7	72,0	86,7	63,2	90,2	94,2	95,0	92,5
Gentamicin	0	9,7	0	4,0	0	5,3	2,4	0	5,0	2,0
Neomycin (1)	0,6	0	3,6	4,0	6,7	0	2,4	6,0	-	2,1
Kanamycin	0,6	0	3,6	4,0	6,7	0	2,4	7,7	6,7	2,9
Spectinomycin (1)	99,4	96,8	100	100	100	100	100	100	-	99,5
Streptomycin	33,7	35,5	14,3	36,0	26,7	5,3	17,1	34,6	25,0	28,8
Chloramphenicol	2,8	0	7,1	0	0	5,3	2,4	0	3,3	2,4
Florfenicol	0,6	0	0	0	0	5,3	0	0	0	0,4
Cefotaxime (2)	-	-	-	-	-	-	-	50,0	11,7	12,9
Ceftazidime (2)	-	-	-	-	-	-	-	50,0	11,7	12,9
Ceftiofur(1)	13,3	3,2	0	0	0	0	2,4	2,0	-	6,9
Nalidixic acid	48,1	71,0	50	44,0	53,3	36,8	68,3	75,0	73,3	57,5
Ciprofloxacin	49,2	71,0	50	48,0	53,3	36,8	73,2	75,0	75,0	58,8
Amoxicillin/Clavulanic acid (1)	53,6	58,1	53,6	40	60	47,4	34,1	34,0	-	48,5
Ampicillin	53,0	64,5	53,6	40	60	52,6	39,0	34,6	40	48,2
Sulfamethoxazole	85,1	90,3	71,4	56,0	73,3	36,8	39,0	40,4	51,7	66,8
Trimethoprim (2)	-	-	-	-	-	-	-	100	100	100
Tetracycline	2,8	22,6	14,3	12,0	26,7	26,3	34,1	30,8	31,7	17,0

(1) Antimicrobials were tested from 2000 to 2007; (2) antimicrobials were tested/evaluated since 2007;
(3) resistance to more than one class of antimicrobials.

Tab. 13.182: Development of resistance rates in *S.* Infantis from chicken meat (2000–2008)

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	Total
Tested isolates	9	3	14	3	29	14	23	15	15	125
Susceptible	11,1	66,7	7,1	66,7	31,0	42,9	39,1	40,0	20,0	31,2
Resistant	88,9	33,3	92,9	33,3	69,0	57,1	60,9	60,0	80,0	68,8
Multiresistant (3)	11,1	33,3	85,7	33,3	37,9	57,1	47,8	40,0	53,3	47,2
Gentamicin	0,0	0,0	0,0	0,0	0,0	0,0	0,0	6,7	6,7	1,6
Neomycin (1)	0,0	0,0	0,0	0,0	0,0	0,0	4,3	0,0	-	0,9
Kanamycin	0,0	0,0	0,0	0,0	0,0	0,0	4,3	0,0	0,0	0,8
Spectinomycin (1)	11,1	33,3	71,4	33,3	20,7	50,0	43,5	40,0	-	38,2
Streptomycin	11,1	33,3	7,1	0,0	6,9	14,3	13,0	6,7	0,0	8,8
Chloramphenicol	0,0	0,0	0,0	33,3	0,0	0,0	0,0	0,0	0,0	0,8
Florfenicol	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Cefotaxime (2)	-	-	-	-	-	-	-	-	0,0	0,0
Ceftazidime (2)	-	-	-	-	-	-	-	-	0,0	0,0
Ceftiofur(1)	0,0	0,0	0,0	0,0	0,0	0,0	4,3	0,0	-	0,9
Nalidixic acid	11,1	33,3	78,6	33,3	17,2	42,9	52,2	53,3	66,7	44,0
Ciprofloxacin	11,1	33,3	78,6	33,3	13,8	42,9	52,2	53,3	66,7	43,2
Amoxicillin/Clavulanic acid (1)	0,0	0,0	14,3	0,0	17,2	7,1	8,7	6,7	-	10,0
Ampicillin	0,0	0,0	14,3	0,0	17,2	14,3	8,7	6,7	6,7	10,4
Sulfamethoxazole	88,9	33,3	85,7	33,3	37,9	57,1	47,8	40,0	53,3	52,8
Trimethoprim (2)	-	-	-	-	-	-	-	-	6,7	6,7
Tetracycline	11,1	33,3	71,4	33,3	51,7	42,9	43,5	40,0	40,0	44,8

(1) Antimicrobials were tested from 2000 to 2007; (2) antimicrobials were tested/evaluated since 2007;
(3) resistance to more than one class of antimicrobials.

13.3.2.4 Isolates from turkey meat

Tab. 13.183: Resistance rates in *Salmonella* isolates from turkey meat (2000–2008)

	Salmonella spp.	*S.* Typhimurium	*S.* Saintpaul	*S.* Heidelberg	*S.* Hadar	*S.* Indiana
Tested isolates	851	144	164	70	91	68
Susceptible	18,8	18,1	8,5	27,1	0,0	4,4
Resistant	81,2	81,9	91,5	72,9	100,0	95,6
Multiresistant (3)	72,4	76,4	85,4	60,0	91,2	94,1
Gentamicin	15,7	4,9	63,4	4,3	0,0	0,0
Neomycin (1)	9,2	6,3	5,7	10,0	2,3	0,0
Kanamycin	21,7	7,6	60,4	10,0	2,2	0,0
Spectinomycin (1)	31,8	34,6	73,8	34,3	4,6	6,0
Streptomycin	39,2	60,4	48,8	28,6	72,5	1,5
Chloramphenicol	14,2	32,6	17,1	30,0	2,2	0,0
Florfenicol	6,9	29,2	7,9	0,0	0,0	0,0
Cefotaxime (2)	0	0,0	0,0	-	0,0	0,0
Ceftazidime (2)	0	0,0	0,0	-	0,0	0,0
Ceftiofur(1)	5,6	1,6	25,5	0,0	0,0	0,0
Nalidixic acid	35,5	22,9	75,0	22,9	58,2	0,0
Ciprofloxacin	36,9	22,9	78,7	22,9	60,4	0,0
Amoxicillin/Clavulanic acid (1)	43,0	66,9	72,3	45,7	27,6	6,0
Ampicillin	45,1	70,8	73,8	47,1	29,7	7,4
Sulfamethoxazole	57,9	73,6	79,3	41,4	12,1	95,6
Trimethoprim (2)	8,7	17,6	8,7	-	0,0	100
Tetracycline	56,9	73,6	31,7	45,7	97,8	94,1

(1) Antimicrobials were tested from 2000 to 2007; (2) antimicrobials were tested/evaluated since 2007; (3) resistance to more than one class of antimicrobials.

Tab. 13.184: Development of resistance rates in *Salmonella* isolates from turkey meat (2000–2008)

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	Total
Tested isolates	50	36	276	42	52	86	117	126	66	851
Susceptible	10	8,3	29,3	11,9	13,5	22,1	18,8	8,7	10,6	18,8
Resistant	90	91,7	70,7	88,1	86,5	77,9	81,2	91,3	89,4	81,2
Multiresistant (3)	68,0	75,0	66,7	76,2	78,8	59,3	76,1	81,7	83,3	72,4
Gentamicin	10	2,8	25,0	16,7	17,3	10,5	6,0	11,1	19,7	15,7
Neomycin (1)	24,0	8,3	5,8	9,5	9,6	4,7	11,1	12,2	-	9,2
Kanamycin	24,0	8,3	26,1	26,2	19,2	15,1	15,4	19,8	31,8	21,7
Spectinomycin (1)	22,0	55,6	31,2	57,1	30,8	30,2	29,1	26,0	-	31,8
Streptomycin	40	38,9	29,7	40,5	32,7	37,2	59,8	46,0	36,4	39,2
Chloramphenicol	22,0	19,4	9,8	26,2	30,8	12,8	13,7	7,9	18,2	14,2
Florfenicol	6,0	11,1	2,5	7,1	9,6	12,8	8,5	4,0	16,7	6,9
Cefotaxime (2)	-	-	-	-	-	-	-	0	0	0
Ceftazidime (2)	-	-	-	-	-	-	-	0	0	0
Ceftiofur(1)	0	0	14,9	2,4	1,9	0	0,9	0	-	5,6
Nalidixic acid	34,0	30,6	27,9	38,1	36,5	40,7	23,1	46,8	62,1	35,5
Ciprofloxacin	36,0	33,3	27,2	38,1	38,5	43,0	24,8	50	66,7	36,9
Amoxicillin/Clavulanic acid (1)	22,0	38,9	39,9	69,0	48,1	54,7	38,5	44,7	-	43,0
Ampicillin	22,0	38,9	40,6	71,4	51,9	54,7	38,5	46,8	59,1	45,1
Sulfamethoxazole	88,0	61,1	62,3	61,9	63,5	53,5	45,3	44,4	62,1	57,9
Trimethoprim (2)	-	-	-	-	-	-	-	0	9,1	8,7
Tetracycline	50	63,9	43,5	47,6	50	48,8	74,4	77,0	66,7	56,9

(1) Antimicrobials were tested from 2000 to 2007; (2) antimicrobials were tested/evaluated since 2007;
(3) resistance to more than one class of antimicrobials.

Tab. 13.185: Development of resistance rates in *S.* Saintpaul from turkey meat (2000–2008)

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	Total
Tested isolates	4	2	54	7	6	16	22	31	22	164
Susceptible	25,0	50	0	0	0	25,0	31,8	3,2	0	8,5
Resistant	75,0	50	100	100	100	75,0	68,2	96,8	100	91,5
Multiresistant (3)	75,0	50	100	100	100	37,5	68,2	90,3	90,9	85,4
Gentamicin	50	0	96,3	100	50	37,5	31,8	45,2	59,1	63,4
Neomycin (1)	50	0	9,3	0	0	0	4,5	0	-	5,7
Kanamycin	50	0	96,3	100	50	37,5	27,3	32,3	59,1	60,4
Spectinomycin (1)	50	50	98,1	100	66,7	37,5	59,1	60,0	-	73,8
Streptomycin	75,0	50	70,4	100	50	6,3	22,7	45,2	36,4	48,8
Chloramphenicol	50	0	20,4	0	100	0	13,6	9,7	13,6	17,1
Florfenicol	0	0	9,3	0	16,7	0	4,5	9,7	13,6	7,9
Cefotaxime (2)	-	-	-	-	-	-	-	0	0	0,0
Ceftazidime (2)	-	-	-	-	-	-	-	0	0	0,0
Ceftiofur(1)	0	0	61,1	14,3	16,7	0	4,5	0	-	25,5
Nalidixic acid	50	50	100	100	100	75,0	27,3	58,1	77,3	75,0
Ciprofloxacin	50	50	100	100	100	75,0	31,8	67,7	86,4	78,7
Amoxicillin/Clavulanic acid (1)	50	50	100	100	66,7	37,5	40,9	63,3	-	72,3
Ampicillin	50	50	100	100	66,7	37,5	40,9	64,5	81,8	73,8
Sulfamethoxazole	75,0	50	100	100	100	37,5	63,6	71,0	77,3	79,3
Trimethoprim (2)	-	-	-	-	-	-	-	0	9,1	8,7
Tetracycline	75,0	50	16,7	0	33,3	0	50	54,8	40,9	31,7

(1) Antimicrobials were tested from 2000 to 2007; (2) antimicrobials were tested/evaluated since 2007;
(3) resistance to more than one class of antimicrobials.

Tab. 13.186: Development of resistance rates in *S.* Typhimurium from turkey meat (2000–2008)

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	Total
Tested isolates	5	5	45	6	14	20	13	20	16	144
Susceptible	0	0	37,8	0	0	0	0	35,0	12,5	18,1
Resistant	100	100	62,2	100	100	100	100	65,0	87,5	81,9
Multiresistant (3)	100	80	62,2	66,7	100	100	92,3	45,0	87,5	76,4
Gentamicin	0	0	2,2	0	28,6	10	0	0	0	4,9
Neomycin (1)	0	0	0	16,7	28,6	10	0	5,3	-	6,3
Kanamycin	0	0	2,2	16,7	28,6	20	0	5,0	0	7,6
Spectinomycin (1)	60	100	15,6	50	21,4	65,0	53,8	15,8	-	34,6
Streptomycin	80	60	55,6	66,7	50	90	76,9	40	50	60,4
Chloramphenicol	60	80	6,7	50	21,4	55,0	69,2	15,0	50	32,6
Florfenicol	20	60	4,4	50	21,4	55,0	69,2	10	50	29,2
Cefotaxime (2)	-	-	-	-	-	-	-	0	0	0,0
Ceftazidime (2)	-	-	-	-	-	-	-	0	0	0,0
Ceftiofur(1)	0	0	4,4	0	0	0	0	0	-	1,6
Nalidixic acid	20	0	2,2	33,3	35,7	30	38,5	25,0	50	22,9
Ciprofloxacin	20	0	2,2	33,3	35,7	30	38,5	25,0	50	22,9
Amoxicillin/Clavulanic acid (1)	80	80	55,6	50	71,4	100	92,3	36,8	-	66,9
Ampicillin	80	80	55,6	66,7	85,7	100	92,3	35,0	87,5	70,8
Sulfamethoxazole	100	80	62,2	66,7	78,6	100	84,6	45,0	87,5	73,6
Trimethoprim (2)	-	-	-	-	-	-	-	0	18,8	17,6
Tetracycline	100	80	53,3	83,3	85,7	90	92,3	60	87,5	73,6

(1) Antimicrobials were tested from 2000 to 2007; (2) antimicrobials were tested/evaluated since 2007;
(3) resistance to more than one class of antimicrobials.

Tab. 13.187: Development of resistance rates in *S.* Indiana from turkey meat (2000–2008)

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	Total
Tested isolates	1	0	59	0	0	1	2	4	1	68
Susceptible	0		0			100	100	0	0	4,4
Resistant	100		0			0	0	0	0	95,6
Multiresistant (3)	0		100			0	0	100	100	94,1
Gentamicin	0		0			0	0	0	0	0,0
Neomycin (1)	0		0			0	0	0	-	0,0
Kanamycin	0		0			0	0	0	0	0,0
Spectinomycin (1)	0		0			0	0	100	-	6,0
Streptomycin	0		1,7			0	0	0	0	1,5
Chloramphenicol	0		0			0	0	0	0	0,0
Florfenicol	0		0			0	0	0	0	0,0
Cefotaxime (2)	-		-			-	-	-	0	0,0
Ceftazidime (2)	-		-			-	-	-	0	0,0
Ceftiofur(1)	0		0			0	0	0	-	0,0
Nalidixic acid	0		0			0	0	0	0	0,0
Ciprofloxacin	0		0			0	0	0	0	0,0
Amoxicillin/Clavulanic acid (1)	0		0			0	0	100	-	6,0
Ampicillin	0		0			0	0	100	100	7,4
Sulfamethoxazole	100		100			0	0	100	100	95,6
Trimethoprim (2)	-		-			-	-	-	100	100
Tetracycline	0		100			0	0	100	100	94,1

(1) Antimicrobials were tested from 2000 to 2007; (2) antimicrobials were tested/evaluated since 2007;
(3) resistance to more than one class of antimicrobials.

Tab. 13.188: Development of resistance rates in *S.* Hadar from turkey meat (2000–2008)

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	Total
Tested isolates	5	5	1	1	5	5	35	30	4	91
Susceptible	0	0	0	0	0	0	0	0	0	0,0
Resistant	100	100	100	100	100	100	100	100	100	100,0
Multiresistant (3)	100	60	100	100	100	100	88,6	93,3	100	91,2
Gentamicin	0	0	0	0	0	0	0	0	0	0,0
Neomycin (1)	20	0	0	0	0	0	2,9	0	-	2,3
Kanamycin	20	0	0	0	0	0	2,9	0	0	2,2
Spectinomycin (1)	0	0	0	0	0	0	8,6	3,3	-	4,6
Streptomycin	100	20	0	0	80	60	85,7	70	50	72,5
Chloramphenicol	0	0	0	0	0	0	5,7	0	0	2,2
Florfenicol	0	0	0	0	0	0	0	0	0	0,0
Cefotaxime (2)	-	-	-	-	-	-	-	-	0	0,0
Ceftazidime (2)	-	-	-	-	-	-	-	-	0	0,0
Ceftiofur(1)	0	0	0	0	0	0	0	0	-	0,0
Nalidixic acid	100	100	100	100	100	100	22,9	66,7	75,0	58,2
Ciprofloxacin	100	100	100	100	100	100	22,9	70	100	60,4
Amoxicillin/Clavulanic acid (1)	0	40	0	0	100	60	20	23,3	-	27,6
Ampicillin	0	40	0	0	100	60	20	26,7	50	29,7
Sulfamethoxazole	100	20	0	0	0	0	11,4	3,3	0	12,1
Trimethoprim (2)	-	-	-	-	-	-	-	-	0	0,0
Tetracycline	100	60	100	100	100	100	100	100	100	97,8

(1) Antimicrobials were tested from 2000 to 2007; (2) antimicrobials were tested/evaluated since 2007;
(3) resistance to more than one class of antimicrobials.

Tab. 13.189: Development of resistance rates in *S.* Heidelberg from turkey meat (2000–2008)

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	Total
Tested isolates	3	3	31	14	6	5	5	3	0	70
Susceptible	0	0	58,1	7,1	0	0	0	0	0	27,1
Resistant	33,3	33,3	9,7	7,1	16,7	20,0	-	33,3	0	72,9
Multiresistant (3)	66,7	66,7	32,3	85,7	83,3	80,0	100	66,7	0	60,0
Gentamicin	0	33,3	6,5	0	0	0	0	0	0	4,3
Neomycin (1)	33,3	33,3	16,1	0	0	0	0	0	0	10,0
Kanamycin	33,3	33,3	16,1	0	0	0	0	0	0	10,0
Spectinomycin (1)	0	66,7	22,6	64,3	83,3	20,0	0	0	0	34,3
Streptomycin	33,3	33,3	16,1	21,4	0	80,0	80,0	66,7	0	28,6
Chloramphenicol	33,3	66,7	16,1	57,1	83,3	0	0	0	0	30,0
Florfenicol	0	0	0	0	0	0	0	0	0	0,0
Cefotaxime (2)	-	-	-	-	-	-	-	-	0	-
Ceftazidime (2)	-	-	-	-	-	-	-	-	0	-
Ceftiofur(1)	0	0	0	0	0	0	0	0	0	0,0
Nalidixic acid	0	33,3	9,7	0	0	100	80,0	100	0	22,9
Ciprofloxacin	0	33,3	9,7	0	0	100	80,8	100	0	22,9
Amoxicillin/Clavulanic acid (1)	33,3	33,3	19,4	92,9	0	80,0	100	66,7	0	45,7
Ampicillin	33,3	33,3	22,6	92,7	0	80,0	100	66,7	0	47,1
Sulfamethoxazole	100	100	19,4	71,4	83,3	20,0	220,0	0	0	41,4
Trimethoprim (2)	-	-	-	-	-	-	-	-	0	-
Tetracycline	33,3	33,3	32,3	57,1	16,7	80,0	100	66,7	0	45,7

(1) Antimicrobials were tested from 2000 to 2007; (2) antimicrobials were tested/evaluated since 2007;
(3) resistance to more than one class of antimicrobials.

13.3.2.5 Isolates from minced meat

Tab. 13.190: Resistance rates in *Salmonella* isolates from minced meat (2000–2008)

	Salmonella spp.	*S.* Typhimurium	*S.* Enteritidis	*S.* 4,[5],12:i:-	*S.* Derby	*S.* Infantis	*S.* Subspec. I, rough
Number of tested isolates	1623	972	45	124	104	54	72
Susceptible	31,2	17,2	82,2	9,7	82,7	85,2	16,7
Resistant	68,8	82,8	15,6	90,3	17,3	14,8	83,3
Multiresistant (3)	54,3	68,3	2,2	74,2	12,5	7,4	68,1
Gentamicin	2,0	2,2	2,2	0,8	0,0	0,0	0,0
Neomycin (1)	4,7	6,4	0,0	1,1	0,0	0,0	6,5
Kanamycin	4,9	6,4	0,0	0,8	1,0	0,0	5,6
Spectinomycin (1)	30,5	43,1	0,0	4,3	11,2	1,9	30,6
Streptomycin	46,3	58,7	0,0	71,0	9,6	3,7	63,9
Chloramphenicol	24,0	37,4	0,0	4,0	3,8	3,7	16,7
Florfenicol	21,2	33,5	0,0	4,0	2,9	0,0	13,9
Cefotaxime (2)	0,6	0,0	0,0	0,0	0,0	0,0	0,0
Ceftazidime (2)	0,6	0,0	0,0	0,0	0,0	0,0	0,0
Ceftiofur (1)	0,3	0,1	0,0	0,0	0,0	0,0	0,0
Nalidixic acid	2,3	2,0	2,2	1,6	0,0	0,0	1,4
Ciprofloxacin	2,8	2,5	2,2	1,6	0,0	0,0	1,4
Amoxicillin/Clavulanic acid (1)	42,2	57,4	0,0	43,5	2,2	1,9	54,8
Ampicillin	47,3	61,5	0,0	68,5	1,9	5,6	56,9
Sulfamethoxazole	60,3	73,6	15,6	79,0	14,4	11,1	73,6
Trimethoprim (2)	12,0	12,7	0,0	3,1	0,0	50,0	0,0
Tetracycline	53,0	68,6	0,0	78,2	9,6	3,7	61,1

(1) Antimicrobials were tested from 2000 to 2007; (2) antimicrobials were tested/evaluated since 2007;
(3) resistance to more than one class of antimicrobials.

Tab. 13.191: Development of resistance rates in *Salmonella* isolates from minced meat (2000–2008)

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	Total
Number of tested isolates	149	198	214	202	188	237	151	128	156	1623
Susceptible	12,1	20,7	35,0	42,1	31,9	40,1	33,1	34,4	25,0	31,2
Resistant	87,9	79,3	65,0	57,9	68,1	59,9	66,9	65,6	75,0	68,8
Multiresistant (3)	64,4	55,1	54,2	44,1	50	49,8	54,3	58,6	66,0	54,3
Gentamicin	4,0	0	5,1	0,5	3,2	0,4	1,3	1,6	1,9	2,0
Neomycin (1)	9,4	3,0	2,8	2,5	5,9	5,1	6,0	4,2	-	4,7
Kanamycin	9,4	4,0	2,8	2,5	6,4	5,1	6,0	4,7	5,1	4,9
Spectinomycin (1)	34,2	38,9	40,2	24,8	26,1	27,4	27,8	20,3	-	30,5
Streptomycin	47,7	45,5	48,1	42,6	43,6	45,6	45,0	50,8	50	46,3
Chloramphenicol	36,9	31,8	34,1	21,8	19,1	16,5	17,9	15,6	20,5	24,0
Florfenicol	25,5	29,8	29,4	20,3	16,5	16,0	17,9	13,3	19,2	21,2
Cefotaxime (2)	-	-	-	-	-	-	-	0	0,6	0,6
Ceftazidime (2)	-	-	-	-	-	-	-	0	0,6	0,6
Ceftiofur (1)	0	0	0,5	0	0	0,8	0,7	0	-	0,3
Nalidixic acid	1,3	3,5	1,9	4,0	1,6	0,4	2,6	0,8	5,1	2,3
Ciprofloxacin	2,7	3,5	1,9	4,0	1,6	0,8	2,6	1,6	7,1	2,8
Amoxicillin/Clavulanic acid (1)	42,3	40,9	44,9	39,1	39,9	40,5	45,7	47,5	-	42,2
Ampicillin	43,6	41,4	46,3	41,1	46,3	49,4	47,0	52,3	62,2	47,3
Sulfamethoxazole	81,2	74,7	55,6	47,0	60,6	53,2	53,0	57,0	66,0	60,3
Trimethoprim (2)	-	-	-	-	-	-	-	0	12,8	12,0
Tetracycline	59,1	51,0	54,7	46,0	47,3	47,7	60,3	60,9	58,3	53,0

(1) Antimicrobials were tested from 2000 to 2007; (2) antimicrobials were tested/evaluated since 2007;
(3) resistance to more than one class of antimicrobials.

Tab. 13.192: Development of resistance rates in *S.* Typhimurium from minced meat (2000–2008)

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	Total
Number of tested isolates	113	143	145	119	107	125	87	67	66	972
Susceptible	6,2	12,6	20,0	26,1	15,0	22,4	18,4	17,9	15,2	17,2
Resistant	93,8	87,4	80,0	73,9	85,0	77,6	81,6	82,1	84,8	82,8
Multiresistant (3)	76,1	67,1	66,9	60,5	68,2	68,0	67,8	73,1	71,2	68,3
Gentamicin	3,5	0,0	6,9	0,8	2,8	0,8	1,1	0,0	1,5	2,2
Neomycin (1)	12,4	3,5	3,4	4,2	6,5	8,8	10,3	3,2	-	6,4
Kanamycin	12,4	4,2	3,4	4,2	6,5	8,8	10,3	3,0	4,5	6,4
Spectinomycin (1)	41,6	46,9	47,6	38,7	38,3	47,2	43,7	33,9	-	43,1
Streptomycin	56,6	56,6	62,1	58,0	57,9	64,0	55,2	59,7	56,1	58,7
Chloramphenicol	46,0	42,0	45,5	34,5	30,8	30,4	31,0	29,9	40,9	37,4
Florfenicol	31,9	40,6	39,3	32,8	28,0	29,6	31,0	25,4	37,9	33,5
Cefotaxime (2)	-	-	-	-	-	-	-	0	0,0	0,0
Ceftazidime (2)	-	-	-	-	-	-	-	0	0,0	0,0
Ceftiofur (1)	0,0	0,0	0,7	0,0	0,0	0,0	0,0	0,0	-	0,1
Nalidixic acid	0,9	4,2	2,8	1,7	1,9	0,0	3,4	0,0	1,5	2,0
Ciprofloxacin	2,7	4,2	2,8	1,7	1,9	0,8	3,4	1,5	3,0	2,5
Amoxicillin/Clavulanic acid (1)	52,2	54,5	60,0	56,3	56,1	63,2	57,5	59,7	-	57,4
Ampicillin	52,2	55,2	62,1	58,8	63,6	69,6	59,8	65,7	74,2	61,5
Sulfamethoxazole	85,8	82,5	68,3	62,2	79,4	68,8	67,8	70,1	75,8	73,6
Trimethoprim (2)	-	-	-	-	-	-	-	0	13,6	12,7
Tetracycline	70,8	62,9	73,1	65,5	60,7	68,0	79,3	77,6	63,6	68,6

(1) Antimicrobials were tested from 2000 to 2007; (2) antimicrobials were tested/evaluated since 2007;
(3) resistance to more than one class of antimicrobials.

Tab. 13.193: Development of resistance rates in *S.* Enteritidis from minced meat (2000–2008)

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	Total
Number of tested isolates	8	5	3	11	6	0	4	4	4	45
Susceptible	25,0	80,0	100,0	100,0	100,0	-	100,0	100,0	75,0	82,2
Resistant	75,0	20,0	0,0	0,0	0,0	-	0,0	0,0	25,0	15,6
Multiresistant (3)	12,5	0,0	0,0	0,0	0,0	-	0,0	0,0	0,0	2,2
Gentamicin	12,5	0,0	0,0	0,0	0,0	-	0,0	0,0	0,0	2,2
Neomycin (1)	0,0	0,0	0,0	0,0	0,0	-	0,0	0,0	-	0,0
Kanamycin	0,0	0,0	0,0	0,0	0,0	-	0,0	0,0	0,0	0,0
Spectinomycin (1)	0,0	0,0	0,0	0,0	0,0	-	0,0	0,0	-	0,0
Streptomycin	0,0	0,0	0,0	0,0	0,0	-	0,0	0,0	0,0	0,0
Chloramphenicol	0,0	0,0	0,0	0,0	0,0	-	0,0	0,0	0,0	0,0
Florfenicol	0,0	0,0	0,0	0,0	0,0	-	0,0	0,0	0,0	0,0
Cefotaxime (2)	-	-	-	-	-	-	-	-	0,0	0,0
Ceftazidime (2)	-	-	-	-	-	-	-	-	0,0	0,0
Ceftiofur (1)	0,0	0,0	0,0	0,0	0,0	-	0,0	0,0	-	0,0
Nalidixic acid	0,0	0,0	0,0	0,0	0,0	-	0,0	0,0	25,0	2,2
Ciprofloxacin	0,0	0,0	0,0	0,0	0,0	-	0,0	0,0	25,0	2,2
Amoxicillin/Clavulanic acid (1)	0,0	0,0	0,0	0,0	0,0	-	0,0	0,0	-	0,0
Ampicillin	0,0	0,0	0,0	0,0	0,0	-	0,0	0,0	0,0	0,0
Sulfamethoxazole	75,0	20,0	0,0	0,0	0,0	-	0,0	0,0	0,0	15,6
Trimethoprim (2)	-	-	-	-	-	-	-	-	0,0	0,0
Tetracycline	0,0	0,0	0,0	0,0	0,0	-	0,0	0,0	0,0	0,0

(1) Antimicrobials were tested from 2000 to 2007; (2) antimicrobials were tested/evaluated since 2007;
(3) resistance to more than one class of antimicrobials.

Tab. 13.194: Development of resistance rates in *S.* Derby from minced meat (2000–2008)

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	Total
Number of tested isolates	5	15	18	7	4	11	14	17	13	104
Susceptible	60,0	66,7	94,4	71,4	100,0	100,0	78,6	88,2	76,9	82,7
Resistant	40,0	33,3	5,6	28,6	0,0	0,0	21,4	11,8	23,1	17,3
Multiresistant (3)	0,0	26,7	5,6	28,6	0,0	0,0	14,3	5,9	23,1	12,5
Gentamicin	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Neomycin (1)	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	-	0,0
Kanamycin	0,0	6,7	0,0	0,0	0,0	0,0	0,0	0,0	0,0	1,0
Spectinomycin (1)	0,0	33,3	5,6	28,6	0,0	0,0	7,1	6,7	-	11,2
Streptomycin	0,0	26,7	5,6	28,6	0,0	0,0	0,0	11,8	7,7	9,6
Chloramphenicol	0,0	6,7	5,6	0,0	0,0	0,0	0,0	0,0	15,4	3,8
Florfenicol	0,0	0,0	5,6	0,0	0,0	0,0	0,0	0,0	15,4	2,9
Cefotaxime (2)	-	-	-	-	-	-	-	0	0,0	0,0
Ceftazidime (2)	-	-	-	-	-	-	-	0	0,0	0,0
Ceftiofur (1)	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	-	0,0
Nalidixic acid	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Ciprofloxacin	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Amoxicillin/Clavulanic acid (1)	0,0	0,0	5,6	0,0	0,0	0,0	0,0	6,7	-	2,2
Ampicillin	0,0	0,0	5,6	0,0	0,0	0,0	0,0	5,9	0,0	1,9
Sulfamethoxazole	40,0	26,7	5,6	28,6	0,0	0,0	14,3	5,9	23,1	14,4
Trimethoprim (2)	-	-	-	-	-	-	-	0	0,0	0,0
Tetracycline	0,0	26,7	5,6	28,6	0,0	0,0	14,3	0,0	7,7	9,6

(1) Antimicrobials were tested from 2000 to 2007; (2) antimicrobials were tested/evaluated since 2007;
(3) resistance to more than one class of antimicrobials.

Tab. 13.195: Development of resistance rates in *S.* 4,[5],12:i:- from minced meat (2000–2008)

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	Total
Number of tested isolates	2	1	5	13	16	26	11	19	31	124
Susceptible	50,0	0,0	80,0	15,4	12,5	3,8	0,0	5,3	3,2	9,7
Resistant	50,0	100,0	20,0	84,6	87,5	96,2	100,0	94,7	96,8	90,3
Multiresistant (3)	0,0	100,0	0,0	23,1	56,3	88,5	81,8	89,5	96,8	74,2
Gentamicin	0,0	0,0	0,0	0,0	0,0	0,0	0,0	5,3	0,0	0,8
Neomycin (1)	0,0	0,0	0,0	0,0	0,0	3,8	0,0	0,0	-	1,1
Kanamycin	0,0	0,0	0,0	0,0	0,0	3,8	0,0	0,0	0,0	0,8
Spectinomycin (1)	0,0	0,0	0,0	0,0	6,3	7,7	0,0	5,6	-	4,3
Streptomycin	0,0	0,0	0,0	23,1	50,0	84,6	81,8	89,5	93,5	71,0
Chloramphenicol	0,0	0,0	0,0	15,4	6,3	3,8	0,0	0,0	3,2	4,0
Florfenicol	0,0	0,0	0,0	15,4	6,3	3,8	0,0	0,0	3,2	4,0
Cefotaxime (2)	-	-	-	-	-	-	-	0	0,0	0,0
Ceftazidime (2)	-	-	-	-	-	-	-	0	0,0	0,0
Ceftiofur (1)	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	-	0,0
Nalidixic acid	0,0	0,0	0,0	15,4	0,0	0,0	0,0	0,0	0,0	1,6
Ciprofloxacin	0,0	0,0	0,0	15,4	0,0	0,0	0,0	0,0	0,0	1,6
Amoxicillin/Clavulanic acid (1)	0,0	0,0	0,0	15,4	25,0	38,5	81,8	83,3	-	43,5
Ampicillin	0,0	0,0	0,0	15,4	50,0	73,1	81,8	89,5	96,8	68,5
Sulfamethoxazole	0,0	100,0	0,0	76,9	62,5	84,6	81,8	89,5	93,5	79,0
Trimethoprim (2)	-	-	-	-	-	-	-	0	3,2	3,1
Tetracycline	50,0	100,0	20,0	30,8	68,8	84,6	90,9	94,7	93,5	78,2

(1) Antimicrobials were tested from 2000 to 2007; (2) antimicrobials were tested/evaluated since 2007;
(3) resistance to more than one class of antimicrobials.

Tab. 13.196: Development of resistance rates in *S.* Infantis from minced meat (2000–2008)

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	Total
Number of tested isolates	3	4	7	3	6	25	1	3	2	54
Susceptible	0,0	100,0	100,0	66,7	83,3	96,0	100,0	66,7	50,0	85,2
Resistant	100,0	0,0	0,0	33,3	16,7	4,0	0,0	33,3	50,0	14,8
Multiresistant (3)	0,0	0,0	0,0	33,3	16,7	0,0	0,0	33,3	50,0	7,4
Gentamicin	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Neomycin (1)	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	-	0,0
Kanamycin	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Spectinomycin (1)	0,0	0,0	0,0	0,0	16,7	0,0	0,0	0,0	-	1,9
Streptomycin	0,0	0,0	0,0	0,0	0,0	0,0	0,0	33,3	50,0	3,7
Chloramphenicol	0,0	0,0	0,0	33,3	16,7	0,0	0,0	0,0	0,0	3,7
Florfenicol	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Cefotaxime (2)	-	-	-	-	-	-	-	-	0,0	0,0
Ceftazidime (2)	-	-	-	-	-	-	-	-	0,0	0,0
Ceftiofur (1)	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	-	0,0
Nalidixic acid	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Ciprofloxacin	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Amoxicillin/Clavulanic acid (1)	0,0	0,0	0,0	0,0	0,0	0,0	0,0	33,3	-	1,9
Ampicillin	0,0	0,0	0,0	33,3	0,0	4,0	0,0	33,3	0,0	5,6
Sulfamethoxazole	100,0	0,0	0,0	0,0	16,7	0,0	0,0	33,3	50,0	11,1
Trimethoprim (2)	-	-	-	-	-	-	-	-	50,0	50,0
Tetracycline	0,0	0,0	0,0	0,0	0,0	0,0	0,0	33,3	50,0	3,7

(1) Antimicrobials were tested from 2000 to 2007; (2) antimicrobials were tested/evaluated since 2007;
(3) resistance to more than one class of antimicrobials.

Tab. 13.197: Development of resistance rates in *S*. Subspec. I, rough from minced meat (2000–2008)

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	Total
Number of tested isolates	4	6	14	10	12	7	9	0	10	72
Susceptible	0	16,7	7,1	30,0	16,7	57,1	0		10,0	16,7
Resistant	0	16,7	14,3	10,0	33,3	0	11,1		20,0	83,3
Multiresistant (3)	100	66,7	78,6	60,0	50,0	42,9	88,9		70,0	68,1
Gentamicin	0	0	0	0	0	0	0		0	0,0
Neomycin (1)	0	16,7	0	0	25,0	0	0		-	6,5
Kanamycin	0	16,7	0	0	25,0	0	0		0	5,6
Spectinomycin (1)	50,0	33,3	64,3	0	33,3	14,3	11,1		0	30,6
Streptomycin	100	66,7	64,3	60,0	50,0	42,9	88,9		60,0	63,9
Chloramphenicol	50,0	33,3	35,7	0	8,3	0	0		20,0	16,7
Florfenicol	50,5	16,7	35,7	0	0	0	0		20,0	13,9
Cefotaxime (2)	-	-	-	-	-	-	-		0	0,0
Ceftazidime (2)	-	-	-	-	-	-	-		0	0,0
Ceftiofur (1)	0	0	0	0	0	0	0		-	0,0
Nalidixic acid	0	0	0	0	0	0	0		10,0	1,4
Ciprofloxacin	0	0	0	0	0	0	0		10,0	1,4
Amoxicillin/Clavulanic acid (1)	50,0	50,0	50,0	60,0	50,0	42,9	77,8		0	54,8
Ampicillin	100	50,0	50,0	60,0	50,0	42,8	77,8		50,0	56,9
Sulfamethoxazole	100	83,3	78,6	70,0	66,7	42,9	88,9		70,0	73,6
Trimethoprim (2)	-	-	-	-	-	-	-		0	0,0
Tetracycline	100	50,0	50,0	60,0	58,3	28,6	88,9		70,0	61,1

(1) Antimicrobials were tested from 2000 to 2007; (2) antimicrobials were tested/evaluated since 2007;
(3) resistance to more than one class of antimicrobials.

13.3.3 Distribution of MIC values in *Salmonella* isolates from food

13.3.3.1 Isolates from meat

Tab. 13.198: *Salmonella* spp. from meat (2000–2008)

Antimicrobial tested	Tested isolates (Number)	Microbiologically resistent isolates (Number) (4)	Microbiological resistent isolates (in %) (4)	Distribution (%) of MICs (µg/ml) (5)																	
				0,008	0,015	0,03125	0,0625	0,125	0,25	0,5	1	2	4	8	16	32	64	128	256	512	1024
Gentamicin	8442	243	2,9								96,1	1,1	0,2	1,4	0,8	0,3	0,2				
Neomycin (1)	7605	334	4,4									94,6	1,0	0,1	0,3	1,8	2,1				
Kanamycin	8442	505	6,0										92,3	1,7	0,2	1,3	0,6	3,9			
Spectinomycin (1)	7605	2223	29,2									0,0	0,0	0,1	12,2	50,0	8,5	4,6	24,6		
Streptomycin	8442	2880	34,1										17,2	28,5	12,0	8,0	14,1	20,0			
Chloramphenicol	8442	1245	14,7									2,5	25,1	50,6	7,1	0,4	1,8	12,5			
Florfenicol	8442	1009	12,0									5,3	51,7	26,6	4,5	4,8	6,0	1,1			
Cefotaxime (2)	838	10	1,2				47,3	38,7	11,7	1,2	0,0	0,0	0,0	1,2							
Ceftazidime (2)	838	10	1,2						61,3	34,1	3,1	0,2	0,5	0,1	0,4	0,2					
Ceftiofur (1)	7605	103	1,4							51,3	41,0	6,3	0,9	0,2	0,2						
Nalidixic acid	8442	1067	12,6										75,6	10,9	0,9	0,2	0,1	12,3			
Ciprofloxacin	8442	1111	13,2			82,8	4,0	1,1	4,4	4,5	2,6	0,5	0,0	0,0							
Amoxicillin/Clavulanic acid (1)	7605	2549	33,5									63,3	3,1	14,3	16,1	3,0	0,2				
Ampicillin	8442	3091	36,6								47,5	14,2	1,7	0,1	0,0	3,7	32,7				
Colistin (3)	8442													99,5	0,5	0,0					
Sulfamethoxazole	8442	4180	49,5													15,5	25,0	8,8	1,2	5,3	44,1
Trimethoprim (3)	8442												82,9	1,0	0,1	1,3	14,9				
Tetracycline	8442	3485	41,3									52,3	5,5	0,8	0,8	11,2	29,3				

(1) Neomycin, spectinomycin, ceftiofur, amoxicillin/clavulanic acid were tested in the years 2000 to 2007 only.
(2) Cefotaxime and ceftazidime were tested in 2008 only.
(3) For colistin and trimethoprim no evaluation was performed as the lowest tested concentration was above the epidemiological cut-off value.
(4) The vertical lines demark the epidemiological cut-off values, which are the basis for the evaluation of microbiological resistance.
(5) The white areas demark the range tested. Isolates resistant to the highest concentration are given in the next concentration level.
Values for the lowest concentration include isolates with MICs below the tested range.

Tab. 13.199: *S.* Enteritidis from meat (2000–2008)

Antimicrobial tested	Tested isolates (Number)	Microbiologically resistent isolates (Number) (4)	Microbiological resistent isolates (in %) (4)	Distribution (%) of MICs (µg/ml) (5)																	
				0,008	0,015	0,03125	0,0625	0,125	0,25	0,5	1	2	4	8	16	32	64	128	256	512	1024
Gentamicin	803	8	1,0								98,0	1,0	0,1	0,4	0,5	0,0	0,0				
Neomycin (1)	740	1	0,1									99,1	0,8	0,0	0,0	0,0	0,1				
Kanamycin	803	2	0,2										99,0	0,7	0,0	0,0	0,0	0,2			
Spectinomycin (1)	740	8	1,1									0,0	0,0	0,4	78,4	19,3	0,8	0,1	0,9		
Streptomycin	803	16	2,0										93,3	3,7	0,6	0,4	0,7	1,2			
Chloramphenicol	803	3	0,4									4,1	39,9	52,8	2,9	0,0	0,1	0,2			
Florfenicol	803	2	0,2									5,0	74,2	19,7	0,9	0,1	0,0	0,1			
Cefotaxime (2)	63	0	0,0				65,1	33,3	1,6	0,0	0,0	0,0	0,0	0,0							
Ceftazidime (2)	63	0	0,0						93,7	6,3	0,0	0,0	0,0	0,0	0,0	0,0					
Ceftiofur (1)	740	1	0,1							54,1	40,5	5,3	0,0	0,1	0,0						
Nalidixic acid	803	65	8,1										81,6	9,6	0,7	0,2	0,0	7,8			
Ciprofloxacin	803	69	8,6			88,4	3,0	1,4	5,1	2,1	0,0	0,0	0,0	0,0							
Amoxicillin/Clavulanic acid (1)	740	17	2,3									96,2	1,5	0,7	1,6	0,0	0,0				
Ampicillin	803	19	2,4								70,6	24,7	2,4	0,1	0,0	0,0	2,2				
Colistin (3)	803													99,0	1,0	0,0					
Sulfamethoxazole	803	82	10,2													16,4	57,2	15,3	0,9	0,1	10,1
Trimethoprim (3)	803												98,0	1,0	0,0	0,0	1,0				
Tetracycline	803	12	1,5									92,3	5,7	0,5	0,2	0,2	1,0				

(1) Neomycin, spectinomycin, ceftiofur, amoxicillin/clavulanic acid were tested in the years 2000 to 2007 only.
(2) Cefotaxime and ceftazidime were tested in 2008 only.
(3) For colistin and trimethoprim no evaluation was performed as the lowest tested concentration was above the epidemiological cut-off value.
(4) The vertical lines demark the epidemiological cut-off values, which are the basis for the evaluation of microbiological resistance.
(5) The white areas demark the range tested. Isolates resistant to the highest concentration are given in the next concentration level.
Values for the lowest concentration include isolates with MICs below the tested range.

Tab. 13.200: *S.* Typhimurium from meat (2000–2008)

Antimicrobial tested	Tested isolates (Number)	Microbiologically resistent isolates (Number) (4)	Microbiological resistent isolates (in %) (4)	Distribution (%) of MICs (µg/ml) (5) 0,008	0,015	0,03125	0,0625	0,125	0,25	0,5	1	2	4	8	16	32	64	128	256	512	1024
Gentamicin	3243	41	1,3								97,7	1,0	0,2	0,4	0,2	0,2	0,2				
Neomycin (1)	3003	178	5,9									92,9	1,2	0,1	0,2	2,3	3,3				
Kanamycin	3243	196	6,0										92,2	1,8	0,2	0,1	0,5	5,2			
Spectinomycin (1)	3003	1192	39,7									0,0	0,0	0,1	1,9	48,5	9,9	4,9	34,8		
Streptomycin	3243	1763	54,4										8,1	26,5	8,0	3,1	23,4	31,0			
Chloramphenicol	3243	1014	31,3									1,2	18,7	44,5	4,3	0,2	3,5	27,6			
Florfenicol	3243	918	28,3									3,0	46,3	20,0	2,4	11,1	14,9	2,3			
Cefotaxime (2)	240	0	0,0				60,8	32,9	5,4	0,8	0,0	0,0	0,0	0,0							
Ceftazidime (2)	240	0	0,0						77,9	22,1	0,0	0,0	0,0	0,0	0,0	0,0					
Ceftiofur (1)	3003	20	0,7							54,1	41,0	4,2	0,2	0,2	0,2						
Nalidixic acid	3243	152	4,7										80,3	13,7	1,3	0,1	0,2	4,5			
Ciprofloxacin	3243	163	5,0			90,2	4,7	0,5	2,6	1,6	0,2	0,1	0,0	0,1							
Amoxicillin/Clavulanic acid (1)	3003	1575	52,4									44,5	3,1	18,0	29,9	4,3	0,3				
Ampicillin	3243	1825	56,3								34,4	8,8	0,6	0,1	0,0	5,6	50,6				
Colistin (3)	3243													99,6	0,4	0,0					
Sulfamethoxazole	3243	2181	67,3													9,1	15,6	7,6	0,4	6,2	61,0
Trimethoprim (3)	3243												85,6	0,7	0,0	0,6	13,0				
Tetracycline	3243	2027	62,5									34,1	3,1	0,2	1,5	22,1	38,9				

(1) Neomycin, spectinomycin, ceftiofur, amoxicillin/clavulanic acid were tested in the years 2000 to 2007 only.

(2) Cefotaxime and ceftazidime were tested in 2008 only.

(3) For colistin and trimethoprim no evaluation was performed as the lowest tested concentration was above the epidemiological cut-off value.

(4) The vertical lines demark the epidemiological cut-off values, which are the basis for the evaluation of microbiological resistance.

(5) The white areas demark the range tested. Isolates resistant to the highest concentration are given in the next concentration level.
Values for the lowest concentration include isolates with MICs below the tested range.

Tab. 13.201: *S.* 4,[5],12:i:- from meat (2000–2008)

Antimicrobial tested	Tested isolates (Number)	Microbiologically resistent isolates (Number) (4)	Microbiological resistent isolates (in %) (4)	Distribution (%) of MICs (µg/ml) (5)																	
				0,008	0,015	0,03125	0,0625	0,125	0,25	0,5	1	2	4	8	16	32	64	128	256	512	1024
Gentamicin	419	8	1,9								97,1	1,0	0,2	0,0	0,5	1,2	0,0				
Neomycin (1)	316	4	1,3									97,2	1,6	0,0	0,3	0,3	0,6				
Kanamycin	419	6	1,4										95,7	2,9	0,5	0,0	0,0	1,0			
Spectinomycin (1)	316	41	13,0									0,0	0,0	0,0	1,9	66,5	18,7	1,6	11,4		
Streptomycin	419	318	75,9										2,9	14,3	5,5	1,4	3,1	72,8			
Chloramphenicol	419	34	8,1									0,2	16,2	71,6	3,8	0,2	1,4	6,4			
Florfenicol	419	16	3,8									0,2	53,7	36,0	6,2	1,7	0,5	1,7			
Cefotaxime (2)	104	0	0,0				62,5	31,7	4,8	1,0	0,0	0,0	0,0	0,0							
Ceftazidime (2)	104	0	0,0						79,8	19,2	1,0	0,0	0,0	0,0	0,0	0,0					
Ceftiofur (1)	316	3	0,9							48,7	47,2	3,2	0,3	0,6	0,0						
Nalidixic acid	419	8	1,9										85,9	11,5	0,7	0,0	0,0	1,9			
Ciprofloxacin	419	11	2,6			92,4	5,0	1,2	0,7	0,0	0,7	0,0	0,0	0,0							
Amoxicillin/Clavulanic acid (1)	316	185	58,5									29,7	11,7	52,2	6,3	0,0	0,0				
Ampicillin	419	316	75,4								17,9	6,0	0,7	0,0	0,0	1,2	74,2				
Colistin (3)	419													100,0	0,0	0,0					
Sulfamethoxazole	419	341	81,4													3,8	10,5	3,8	0,5	1,2	80,2
Trimethoprim (3)	419												89,1	0,0	0,0	1,0	10,0				
Tetracycline	419	359	85,7									13,8	0,5	0,0	0,0	2,6	83,0				

(1) Neomycin, spectinomycin, ceftiofur, amoxicillin/clavulanic acid were tested in the years 2000 to 2007 only.
(2) Cefotaxime and ceftazidime were tested in 2008 only.
(3) For colistin and trimethoprim no evaluation was performed as the lowest tested concentration was above the epidemiological cut-off value.
(4) The vertical lines demark the epidemiological cut-off values, which are the basis for the evaluation of microbiological resistance.
(5) The white areas demark the range tested. Isolates resistant to the highest concentration are given in the next concentration level.
Values for the lowest concentration include isolates with MICs below the tested range.

Tab. 13.202: *S.* Infantis from meat (2000–2008)

Antimicrobial tested	Tested isolates (Number)	Microbiologically resistent isolates (Number) (4)	Microbiological resistent isolates (in %) (4)	Distribution (%) of MICs (µg/ml) (5) 0,008	0,015	0,03125	0,0625	0,125	0,25	0,5	1	2	4	8	16	32	64	128	256	512	1024
Gentamicin	372	3	0,8								98,1	1,1	0,3	0,0	0,5	0,0	0,0				
Neomycin (1)	348	2	0,6									98,3	1,1	0,0	0,3	0,3	0,0				
Kanamycin	372	2	0,5										98,1	1,3	0,0	0,0	0,0	0,5			
Spectinomycin (1)	348	64	18,4									0,0	0,0	0,0	5,5	70,4	5,7	3,7	14,7		
Streptomycin	372	32	8,6										9,1	51,9	18,0	12,4	5,6	3,0			
Chloramphenicol	372	5	1,3									0,5	26,3	55,6	16,1	0,5	0,0	0,8			
Florfenicol	372	0	0,0									0,8	58,1	35,2	5,9	0,0	0,0	0,0			
Cefotaxime (2)	24	0	0,0				4,2	58,3	37,5	0,0	0,0	0,0	0,0	0,0							
Ceftazidime (2)	24	0	0,0						16,7	75,0	8,3	0,0	0,0	0,0	0,0	0,0					
Ceftiofur (1)	348	1	0,3							50,9	39,1	9,8	0,0	0,0	0,3						
Nalidixic acid	372	67	18,0										71,0	11,0	0,0	0,0	0,0	18,0			
Ciprofloxacin	372	66	17,7			77,4	4,8	0,5	4,8	9,1	3,2	0,0	0,0	0,0							
Amoxicillin/Clavulanic acid (1)	348	18	5,2									90,8	4,0	4,6	0,6	0,0	0,0				
Ampicillin	372	25	6,7								73,9	15,1	4,3	0,0	0,3	0,8	5,6				
Colistin (3)	372													99,2	0,8	0,0					
Sulfamethoxazole	372	123	33,1													25,0	38,2	3,5	0,3	2,2	30,9
Trimethoprim (3)	372												90,6	3,8	0,0	0,0	5,6				
Tetracycline	372	77	20,7									71,8	6,5	1,1	0,0	1,6	19,1				

(1) Neomycin, spectinomycin, ceftiofur, amoxicillin/clavulanic acid were tested in the years 2000 to 2007 only.

(2) Cefotaxime and ceftazidime were tested in 2008 only.

(3) For colistin and trimethoprim no evaluation was performed as the lowest tested concentration was above the epidemiological cut-off value.

(4) The vertical lines demark the epidemiological cut-off values, which are the basis for the evaluation of microbiological resistance.

(5) The white areas demark the range tested. Isolates resistant to the highest concentration are given in the next concentration level.
Values for the lowest concentration include isolates with MICs below the tested range.

Tab. 13.203: *S.* Paratyphi B dT+ from meat (2000–2008)

Antimicrobial tested	Tested isolates (Number)	Microbiologically resistent isolates (Number) (4)	Microbiological resistent isolates (in %) (4)	Distribution (%) of MICs (µg/ml) (5) 0,008	0,015	0,03125	0,0625	0,125	0,25	0,5	1	2	4	8	16	32	64	128	256	512	1024
Gentamicin	510	9	1,8								97,9	0,4	0,0	0,4	1,4	0,0	0,0				
Neomycin (1)	446	9	2,0									98,0	0,0	0,0	0,9	1,1	0,0				
Kanamycin	510	15	2,9										96,7	0,4	0,0	0,0	0,0	3,0			
Spectinomycin (1)	446	444	99,6									0,0	0,0	0,0	0,0	0,2	0,2	5,4	94,2		
Streptomycin	510	144	28,2										0,0	0,6	17,8	53,3	15,1	13,2			
Chloramphenicol	510	12	2,4									9,2	25,7	50,4	12,4	0,6	0,6	1,2			
Florfenicol	510	2	0,4									14,1	42,2	35,7	7,6	0,0	0,4	0,0			
Cefotaxime (2)	64	9	14,1				4,7	32,8	46,9	1,6	0,0	0,0	0,0	14,1							
Ceftazidime (2)	64	9	14,1						4,7	71,9	9,4	0,0	6,3	0,0	4,7	3,1					
Ceftiofur (1)	446	28	6,3							26,0	53,6	14,1	5,4	0,0	0,9						
Nalidixic acid	510	287	56,3										35,3	7,1	1,4	0,2	0,6	55,5			
Ciprofloxacin	510	297	58,2			35,3	6,5	2,2	16,3	23,9	9,4	5,9	0,6	0,0							
Amoxicillin/Clavulanic acid (1)	446	214	48,0									49,8	2,2	27,6	19,5	0,7	0,2				
Ampicillin	510	246	48,2								33,3	16,5	2,0	0,4	0,0	2,7	45,1				
Colistin (3)	510													99,8	0,2	0,0					
Sulfamethoxazole	510	347	68,0													21,0	7,8	2,2	1,0	4,1	64,0
Trimethoprim (3)	510												0,6	0,0	0,0	4,5	94,9				
Tetracycline	510	90	17,6									58,9	20,0	3,5	0,0	0,8	16,8				

(1) Neomycin, spectinomycin, ceftiofur, amoxicillin/clavulanic acid were tested in the years 2000 to 2007 only.
(2) Cefotaxime and ceftazidime were tested in 2008 only.
(3) For colistin and trimethoprim no evaluation was performed as the lowest tested concentration was above the epidemiological cut-off value.
(4) The vertical lines demark the epidemiological cut-off values, which are the basis for the evaluation of microbiological resistance.
(5) The white areas demark the range tested. Isolates resistant to the highest concentration are given in the next concentration level.
Values for the lowest concentration include isolates with MICs below the tested range.

13.3.3.2 Isolates from pork

Tab. 13.204: *Salmonella* spp. from pork (2000–2008)

Antimicrobial tested	Tested isolates (Number)	Microbiologically resistent isolates (Number) (4)	Microbiological resistent isolates (in %) (4)	Distribution (%) of MICs (µg/ml) (5) 0,008	0,015	0,03125	0,0625	0,125	0,25	0,5	1	2	4	8	16	32	64	128	256	512	1024
Gentamicin	1691	18	1,1								98,1	0,9	0,1	0,4	0,1	0,4	0,2				
Neomycin (1)	1538	75	4,9									94,0	1,2	0,0	0,1	3,1	1,7				
Kanamycin	1691	85	5,0										92,5	2,4	0,1	0,1	0,7	4,1			
Spectinomycin (1)	1538	466	30,3									0,0	0,0	0,1	3,5	56,8	9,3	3,6	26,7		
Streptomycin	1691	732	43,3										9,4	32,9	10,5	3,9	15,1	28,2			
Chloramphenicol	1691	347	20,5									1,1	20,9	52,0	5,6	0,2	2,5	17,9			
Florfenicol	1691	288	17,0									3,1	49,1	27,6	3,1	6,6	8,6	1,9			
Cefotaxime (2)	154	0	0,0				54,5	35,1	9,7	0,6	0,0	0,0	0,0	0,0							
Ceftazidime (2)	154	0	0,0						68,8	29,2	1,9	0,0	0,0	0,0	0,0	0,0					
Ceftiofur (1)	1538	8	0,5							58,6	37,1	3,8	0,1	0,2	0,2						
Nalidixic acid	1691	56	3,3										86,2	10,1	0,5	0,1	0,1	3,1			
Ciprofloxacin	1691	61	3,6			92,9	3,5	0,7	1,4	1,1	0,4	0,0	0,0	0,0							
Amoxicillin/Clavulanic acid (1)	1538	616	40,1									57,2	2,8	19,2	18,9	2,0	0,0				
Ampicillin	1691	746	44,1								45,9	8,7	1,2	0,0	0,0	3,6	40,5				
Colistin (3)	1691													99,7	0,2	0,0					
Sulfamethoxazole	1691	958	56,7													10,8	21,5	9,2	1,9	4,4	52,2
Trimethoprim (3)	1691												84,9	0,5	0,0	1,2	13,4				
Tetracycline	1691	913	54,0									42,5	2,8	0,8	1,0	15,0	38,0				

(1) Neomycin, spectinomycin, ceftiofur, amoxicillin/clavulanic acid were tested in the years 2000 to 2007 only.
(2) Cefotaxime and ceftazidime were tested in 2008 only.
(3) For colistin and trimethoprim no evaluation was performed as the lowest tested concentration was above the epidemiological cut-off value.
(4) The vertical lines demark the epidemiological cut-off values, which are the basis for the evaluation of microbiological resistance.
(5) The white areas demark the range tested. Isolates resistant to the highest concentration are given in the next concentration level.
Values for the lowest concentration include isolates with MICs below the tested range.

Tab. 13.205: *S.* Bovismorbificans from pork (2000–2008)

Antimicrobial tested	Tested isolates (Number)	Microbiologically resistent isolates (Number) (4)	Microbiological resistent isolates (in %) (4)	Distribution (%) of MICs (µg/ml) (5) 0,008	0,015	0,03125	0,0625	0,125	0,25	0,5	1	2	4	8	16	32	64	128	256	512	1024
Gentamicin	75	0	0,0								98,7	1,3	0,0	0,0	0,0	0,0	0,0				
Neomycin (1)	75	0	0,0									98,7	1,3	0,0	0,0	0,0	0,0				
Kanamycin	75	0	0,0										98,7	1,3	0,0	0,0	0,0	0,0			
Spectinomycin (1)	75	4	5,3									0,0	0,0	0,0	2,7	90,7	1,3	1,3	4,0		
Streptomycin	75	6	8,0										0,0	72,0	17,3	2,7	8,0	0,0			
Chloramphenicol	75	5	6,7									1,3	84,0	8,0	0,0	0,0	0,0	6,7			
Florfenicol	75	1	1,3									22,7	68,0	6,7	1,3	0,0	0,0	1,3			
Cefotaxime (2)	0	0	0,0				0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0							
Ceftazidime (2)	0	0	0,0						0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0					
Ceftiofur (1)	75	0	0,0							89,3	10,7	0,0	0,0	0,0	0,0						
Nalidixic acid	75	2	2,7										96,0	1,3	0,0	0,0	2,7	0,0			
Ciprofloxacin	75	2	2,7			93,3	4,0	0,0	1,3	1,3	0,0	0,0	0,0	0,0							
Amoxicillin/Clavulanic acid (1)	75	5	6,7									93,3	0,0	4,0	2,7	0,0	0,0				
Ampicillin	75	5	6,7								92,0	1,3	0,0	0,0	0,0	0,0	6,7				
Colistin (3)	75													100,0	0,0	0,0					
Sulfamethoxazole	75	29	38,7													0,0	4,0	30,7	26,7	38,7	0,0
Trimethoprim (3)	75												94,7	0,0	0,0	0,0	5,3				
Tetracycline	75	5	6,7									92,0	1,3	0,0	0,0	6,7	0,0				

(1) Neomycin, spectinomycin, ceftiofur, amoxicillin/clavulanic acid were tested in the years 2000 to 2007 only.
(2) Cefotaxime and ceftazidime were tested in 2008 only.
(3) For colistin and trimethoprim no evaluation was performed as the lowest tested concentration was above the epidemiological cut-off value.
(4) The vertical lines demark the epidemiological cut-off values, which are the basis for the evaluation of microbiological resistance.
(5) The white areas demark the range tested. Isolates resistant to the highest concentration are given in the next concentration level. Values for the lowest concentration include isolates with MICs below the tested range.

Tab. 13.206: *S.* Derby from pork (2000–2008)

Antimicrobial tested	Tested isolates (Number)	Microbiologically resistent isolates (Number) (4)	Microbiological resistent isolates (in %) (4)	0,008	0,015	0,03125	0,0625	0,125	0,25	0,5	1	2	4	8	16	32	64	128	256	512	1024
				Distribution (%) of MICs (µg/ml) (5)																	
Gentamicin	166	1	0,6								98,8	0,6	0,0	0,0	0,0	0,0	0,6				
Neomycin (1)	148	2	1,4									97,3	1,4	0,0	0,0	1,4	0,0				
Kanamycin	166	2	1,2										97,0	1,8	0,0	0,0	1,2	0,0			
Spectinomycin (1)	148	14	9,5									0,0	0,0	0,0	1,4	85,1	4,1	1,4	8,1		
Streptomycin	166	15	9,0										3,0	56,6	27,1	4,2	9,0	0,0			
Chloramphenicol	166	2	1,2									0,0	6,0	80,7	12,0	0,6	0,0	0,6			
Florfenicol	166	1	0,6									0,0	30,7	63,9	4,8	0,6	0,0	0,0			
Cefotaxime (2)	18	0	0,0				5,6	72,2	22,2	0,0	0,0	0,0	0,0	0,0							
Ceftazidime (2)	18	0	0,0						5,6	88,9	5,6	0,0	0,0	0,0	0,0	0,0					
Ceftiofur (1)	148	0	0,0							48,6	47,3	4,1	0,0	0,0	0,0						
Nalidixic acid	166	1	0,6										94,0	5,4	0,0	0,0	0,6	0,0			
Ciprofloxacin	166	1	0,6			95,8	3,6	0,0	0,0	0,6	0,0	0,0	0,0	0,0							
Amoxicillin/Clavulanic acid (1)	148	10	6,8									92,6	0,7	4,7	2,0	0,0	0,0				
Ampicillin	166	12	7,2								74,1	16,3	2,4	0,0	0,0	0,6	6,6				
Colistin (3)	166													100,0	0,0	0,0					
Sulfamethoxazole	166	38	22,9													24,1	45,8	7,2	0,0	22,9	0,0
Trimethoprim (3)	166												85,5	0,0	0,0	4,8	9,6				
Tetracycline	166	55	33,1									60,2	6,6	0,0	1,2	31,9	0,0				

(1) Neomycin, spectinomycin, ceftiofur, amoxicillin/clavulanic acid were tested in the years 2000 to 2007 only.
(2) Cefotaxime and ceftazidime were tested in 2008 only.
(3) For colistin and trimethoprim no evaluation was performed as the lowest tested concentration was above the epidemiological cut-off value.
(4) The vertical lines demark the epidemiological cut-off values, which are the basis for the evaluation of microbiological resistance.
(5) The white areas demark the range tested. Isolates resistant to the highest concentration are given in the next concentration level.
Values for the lowest concentration include isolates with MICs below the tested range.

Tab. 13.207: *S.* Infantis from pork (2000–2008)

Antimicrobial tested	Tested isolates (Number)	Microbiologically resistent isolates (Number) (4)	Microbiological resistent isolates (in %) (4)	Distribution (%) of MICs (µg/ml) (5) 0,008	0,015	0,03125	0,0625	0,125	0,25	0,5	1	2	4	8	16	32	64	128	256	512	1024
Gentamicin	71	0	0,0								100,0	0,0	0,0	0,0	0,0	0,0	0,0				
Neomycin (1)	71	0	0,0									97,2	2,8	0,0	0,0	0,0	0,0				
Kanamycin	71	0	0,0										98,6	1,4	0,0	0,0	0,0	0,0			
Spectinomycin (1)	71	2	2,8									0,0	0,0	0,0	2,8	91,5	2,8	0,0	2,8		
Streptomycin	71	2	2,8										4,2	70,4	19,7	2,8	2,8	0,0			
Chloramphenicol	71	0	0,0									0,0	26,8	57,7	15,5	0,0	0,0	0,0			
Florfenicol	71	0	0,0									0,0	64,8	35,2	0,0	0,0	0,0	0,0			
Cefotaxime (2)	0	0	0,0				0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0							
Ceftazidime (2)	0	0	0,0						0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0					
Ceftiofur (1)	71	0	0,0							49,3	43,7	7,0	0,0	0,0	0,0						
Nalidixic acid	71	2	2,8										88,7	8,5	0,0	0,0	2,8	0,0			
Ciprofloxacin	71	2	2,8			97,2	0,0	0,0	1,4	1,4	0,0	0,0	0,0	0,0							
Amoxicillin/Clavulanic acid (1)	71	0	0,0									100,0	0,0	0,0	0,0	0,0	0,0				
Ampicillin	71	0	0,0								87,3	12,7	0,0	0,0	0,0	0,0	0,0				
Colistin (3)	71													100,0	0,0	0,0					
Sulfamethoxazole	71	12	16,9													43,7	38,0	1,4	0,0	16,9	0,0
Trimethoprim (3)	71												97,2	1,4	0,0	0,0	1,4				
Tetracycline	71	1	1,4									90,1	7,0	1,4	0,0	1,4	0,0				

(1) Neomycin, spectinomycin, ceftiofur, amoxicillin/clavulanic acid were tested in the years 2000 to 2007 only.

(2) Cefotaxime and ceftazidime were tested in 2008 only.

(3) For colistin and trimethoprim no evaluation was performed as the lowest tested concentration was above the epidemiological cut-off value.

(4) The vertical lines demark the epidemiological cut-off values, which are the basis for the evaluation of microbiological resistance.

(5) The white areas demark the range tested. Isolates resistant to the highest concentration are given in the next concentration level.
Values for the lowest concentration include isolates with MICs below the tested range.

Tab. 13.208: *S.* Typhimurium from pork (2000–2008)

Antimicrobial tested	Tested isolates (Number)	Microbiologically resistent isolates (Number) (4)	Microbiological resistent isolates (in %) (4)	Distribution (%) of MICs (µg/ml) (5) 0,008	0,015	0,03125	0,0625	0,125	0,25	0,5	1	2	4	8	16	32	64	128	256	512	1024
Gentamicin	906	7	0,8								98,7	0,6	0,1	0,3	0,0	0,2	0,1				
Neomycin (1)	840	66	7,9									91,3	0,8	0,0	0,1	4,8	3,0				
Kanamycin	906	72	7,9										89,8	2,2	0,0	0,1	7,8	0,0			
Spectinomycin (1)	840	376	44,8									0,0	0,0	0,1	1,1	43,6	10,5	4,3	40,5		
Streptomycin	906	526	58,1										7,7	24,1	6,6	3,5	58,1	0,0			
Chloramphenicol	906	292	32,2									1,0	15,7	47,4	3,8	0,1	3,6	28,5			
Florfenicol	906	256	28,3									2,1	46,1	21,5	2,0	10,9	14,7	2,6			
Cefotaxime (2)	66	0	0,0				63,6	25,8	10,6	0,0	0,0	0,0	0,0	0,0							
Ceftazidime (2)	66	0	0,0						83,3	16,7	0,0	0,0	0,0	0,0	0,0	0,0					
Ceftiofur (1)	840	3	0,4							58,7	37,4	3,6	0,0	0,1	0,2						
Nalidixic acid	906	28	3,1										84,4	11,8	0,7	0,0	3,1	0,0			
Ciprofloxacin	906	31	3,4			93,0	3,5	0,3	1,3	1,5	0,2	0,0	0,0	0,0							
Amoxicillin/Clavulanic acid (1)	840	463	55,1									42,3	2,6	21,7	30,2	3,2	0,0				
Ampicillin	906	538	59,4								33,7	6,5	0,4	0,0	0,0	5,3	54,1				
Colistin (3)	906													99,8	0,2	0,0					
Sulfamethoxazole	906	626	69,1													6,4	15,6	8,5	0,4	69,1	0,0
Trimethoprim (3)	906												82,2	0,4	0,0	0,6	16,8				
Tetracycline	906	624	68,9									28,6	2,1	0,4	1,2	67,7	0,0				

(1) Neomycin, spectinomycin, ceftiofur, amoxicillin/clavulanic acid were tested in the years 2000 to 2007 only.

(2) Cefotaxime and ceftazidime were tested in 2008 only.

(3) For colistin and trimethoprim no evaluation was performed as the lowest tested concentration was above the epidemiological cut-off value.

(4) The vertical lines demark the epidemiological cut-off values, which are the basis for the evaluation of microbiological resistance.

(5) The white areas demark the range tested. Isolates resistant to the highest concentration are given in the next concentration level.
Values for the lowest concentration include isolates with MICs below the tested range.

Tab. 13.209: *S.* 4,[5],12:i:- from pork (2000–2008)

Antimicrobial tested	Tested isolates (Number)	Microbiologically resistent isolates (Number) (4)	Microbiological resistent isolates (in %) (4)	0,008	0,015	0,03125	0,0625	0,125	0,25	0,5	1	2	4	8	16	32	64	128	256	512	1024
				Distribution (%) of MICs (µg/ml) (5)																	
Gentamicin	152	6	3,9								95,4	0,7	0,0	0,0	1,3	2,6	0,0				
Neomycin (1)	121	1	0,8									97,5	1,7	0,0	0,0	0,0	0,8				
Kanamycin	152	2	1,3										92,1	6,6	0,7	0,0	0,7	0,0			
Spectinomycin (1)	121	21	17,4									0,0	0,0	0,0	1,7	61,2	19,8	4,1	13,2		
Streptomycin	152	118	77,6										2,0	14,5	4,6	1,3	77,6	0,0			
Chloramphenicol	152	16	10,5									0,7	14,5	68,4	5,9	0,0	3,3	7,2			
Florfenicol	152	7	4,6									0,7	52,0	34,2	8,6	1,3	0,7	2,6			
Cefotaxime (2)	32	0	0,0				75,0	25,0	0,0	0,0	0,0	0,0	0,0	0,0							
Ceftazidime (2)	32	0	0,0						90,6	9,4	0,0	0,0	0,0	0,0	0,0	0,0					
Ceftiofur (1)	121	3	2,5							46,3	44,6	6,6	0,8	1,7	0,0						
Nalidixic acid	152	4	2,6										82,9	13,8	0,7	0,0	2,6	0,0			
Ciprofloxacin	152	6	3,9			91,4	4,6	2,0	1,3	0,0	0,7	0,0	0,0	0,0							
Amoxicillin/Clavulanic acid (1)	121	79	65,3									25,6	9,1	57,0	8,3	0,0	0,0				
Ampicillin	152	116	76,3								18,4	3,9	1,3	0,0	0,0	2,6	73,7				
Colistin (3)	152													100,0	0,0	0,0					
Sulfamethoxazole	152	123	80,9													4,6	11,8	2,0	0,7	80,9	0,0
Trimethoprim (3)	152												86,2	0,0	0,0	2,6	11,2				
Tetracycline	152	139	91,4									8,6	0,0	0,0	0,0	91,4	0,0				

(1) Neomycin, spectinomycin, ceftiofur, amoxicillin/clavulanic acid were tested in the years 2000 to 2007 only.

(2) Cefotaxime and ceftazidime were tested in 2008 only.

(3) For colistin and trimethoprim no evaluation was performed as the lowest tested concentration was above the epidemiological cut-off value.

(4) The vertical lines demark the epidemiological cut-off values, which are the basis for the evaluation of microbiological resistance.

(5) The white areas demark the range tested. Isolates resistant to the highest concentration are given in the next concentration level.
Values for the lowest concentration include isolates with MICs below the tested range.

13.3.3.3 Isolates from chicken meat

Tab. 13.210: *Salmonella* spp. from chicken meat (2000–2008)

Antimicrobial tested	Tested isolates (Number)	Microbiologically resistent isolates (Number) (4)	Microbiological resistent isolates (in %) (4)	Distribution (%) of MICs (µg/ml) (5) 0,008	0,015	0,03125	0,0625	0,125	0,25	0,5	1	2	4	8	16	32	64	128	256	512	1024
Gentamicin	1915	23	1,2								97,8	0,9	0,1	0,5	0,7	0,0	0,0				
Neomycin (1)	1705	51	3,0									96,2	0,8	0,1	0,7	1,2	1,0				
Kanamycin	1915	63	3,3										95,5	1,2	0,1	0,1	0,1	3,0			
Spectinomycin (1)	1705	530	31,1									0,0	0,0	0,1	28,7	34,7	5,4	3,3	27,8		
Streptomycin	1915	242	12,6										36,1	22,8	11,7	16,7	6,9	5,7			
Chloramphenicol	1915	43	2,2									3,9	32,6	54,5	6,7	0,2	0,3	1,8			
Florfenicol	1915	17	0,9									6,4	61,8	27,5	3,4	0,4	0,4	0,1			
Cefotaxime (2)	210	9	4,3				36,7	39,5	18,6	1,0	0,0	0,0	0,0	4,3							
Ceftazidime (2)	210	9	4,3						51,9	40,5	3,3	0,0	1,4	0,5	1,4	1,0					
Ceftiofur (1)	1705	33	1,9							47,3	43,9	6,9	1,5	0,1	0,4						
Nalidixic acid	1915	470	24,5										67,2	7,6	0,7	0,1	0,1	24,4			
Ciprofloxacin	1915	480	25,1			71,3	3,6	1,2	9,6	9,3	3,2	1,6	0,2	0,0							
Amoxicillin/Clavulanic acid (1)	1705	323	18,9									78,8	2,3	10,7	7,3	0,9	0,1				
Ampicillin	1915	388	20,3								58,9	18,9	1,9	0,1	0,0	1,2	19,0				
Colistin (3)	1915													99,4	0,6	0,0					
Sulfamethoxazole	1915	640	33,4													18,3	38,0	9,0	1,4	1,9	31,5
Trimethoprim (3)	1915												71,0	0,6	0,0	1,4	27,0				
Tetracycline	1915	303	15,8									73,8	9,1	1,3	0,3	1,7	13,9				

(1) Neomycin, spectinomycin, ceftiofur, amoxicillin/clavulanic acid were tested in the years 2000 to 2007 only.
(2) Cefotaxime and ceftazidime were tested in 2008 only.
(3) For colistin and trimethoprim no evaluation was performed as the lowest tested concentration was above the epidemiological cut-off value.
(4) The vertical lines demark the epidemiological cut-off values, which are the basis for the evaluation of microbiological resistance.
(5) The white areas demark the range tested. Isolates resistant to the highest concentration are given in the next concentration level.
Values for the lowest concentration include isolates with MICs below the tested range.

Tab. 13.211: *S.* Enteritidis from chicken meat (2000–2008)

Antimicrobial tested	Tested isolates (Number)	Microbiologically resistent isolates (Number) (4)	Microbiological resistent isolates (in %) (4)	Distribution (%) of MICs (µg/ml) (5) 0,008	0,015	0,03125	0,0625	0,125	0,25	0,5	1	2	4	8	16	32	64	128	256	512	1024
Gentamicin	561	5	0,9								98,6	0,5	0,0	0,5	0,4	0,0	0,0				
Neomycin (1)	514	0	0,0									99,6	0,4	0,0	0,0	0,0	0,0				
Kanamycin	561	0	0,0										99,1	0,9	0,0	0,0	0,0	0,0			
Spectinomycin (1)	514	3	0,6									0,0	0,0	0,4	80,7	17,7	0,6	0,0	0,6		
Streptomycin	561	8	1,4										95,0	3,0	0,2	0,4	0,7	0,7			
Chloramphenicol	561	0	0,0									3,6	38,5	55,1	2,9	0,0	0,0	0,0			
Florfenicol	561	0	0,0									4,5	75,4	19,4	0,7	0,0	0,0	0,0			
Cefotaxime (2)	47	0	0,0				66,0	31,9	2,1	0,0	0,0	0,0	0,0	0,0							
Ceftazidime (2)	47	0	0,0						93,6	6,4	0,0	0,0	0,0	0,0	0,0	0,0					
Ceftiofur (1)	514	1	0,2							51,6	42,6	5,6	0,0	0,2	0,0						
Nalidixic acid	561	39	7,0										83,6	8,6	0,9	0,0	0,0	7,0			
Ciprofloxacin	561	43	7,7			89,1	3,2	1,1	5,2	1,4	0,0	0,0	0,0	0,0							
Amoxicillin/Clavulanic acid (1)	514	10	1,9									96,9	1,2	0,4	1,6	0,0	0,0				
Ampicillin	561	11	2,0								70,1	25,1	2,9	0,2	0,0	0,0	1,8				
Colistin (3)	561													99,3	0,7	0,0					
Sulfamethoxazole	561	52	9,3													17,8	57,6	14,4	0,9	0,2	9,1
Trimethoprim (3)	561												98,8	0,7	0,0	0,0	0,5				
Tetracycline	561	2	0,4									93,4	5,9	0,4	0,2	0,0	0,2				

(1) Neomycin, spectinomycin, ceftiofur, amoxicillin/clavulanic acid were tested in the years 2000 to 2007 only.
(2) Cefotaxime and ceftazidime were tested in 2008 only.
(3) For colistin and trimethoprim no evaluation was performed as the lowest tested concentration was above the epidemiological cut-off value.
(4) The vertical lines demark the epidemiological cut-off values, which are the basis for the evaluation of microbiological resistance.
(5) The white areas demark the range tested. Isolates resistant to the highest concentration are given in the next concentration level.
Values for the lowest concentration include isolates with MICs below the tested range.

Tab. 13.212: *S.* Infantis from chicken meat (2000–2008)

Antimicrobial tested	Tested isolates (Number)	Microbiologically resistent isolates (Number) (4)	Microbiological resistent isolates (in %) (4)	Distribution (%) of MICs (µg/ml) (5) 0,008	0,015	0,03125	0,0625	0,125	0,25	0,5	1	2	4	8	16	32	64	128	256	512	1024
Gentamicin	125	2	1,6								96,8	1,6	0,0	0,0	1,6	0,0	0,0				
Neomycin (1)	110	1	0,9									98,2	0,9	0,0	0,9	0,0	0,0				
Kanamycin	125	1	0,8										97,6	1,6	0,0	0,0	0,0	0,8			
Spectinomycin (1)	110	42	38,2									0,0	0,0	0,0	3,6	52,7	5,5	5,5	32,7		
Streptomycin	125	11	8,8										16,8	34,4	14,4	25,6	5,6	3,2			
Chloramphenicol	125	1	0,8									1,6	36,0	46,4	15,2	0,8	0,0	0,0			
Florfenicol	125	0	0,0									1,6	54,4	36,0	8,0	0,0	0,0	0,0			
Cefotaxime (2)	15	0	0,0				0,0	66,7	33,3	0,0	0,0	0,0	0,0	0,0							
Ceftazidime (2)	15	0	0,0						13,3	86,7	0,0	0,0	0,0	0,0	0,0	0,0					
Ceftiofur (1)	110	1	0,9							49,1	36,4	13,6	0,0	0,0	0,9						
Nalidixic acid	125	55	44,0										51,2	4,8	0,0	0,0	0,0	44,0			
Ciprofloxacin	125	54	43,2			54,4	2,4	1,6	11,2	22,4	8,0	0,0	0,0	0,0							
Amoxicillin/Clavulanic acid (1)	110	11	10,0									85,5	4,5	8,2	1,8	0,0	0,0				
Ampicillin	125	13	10,4								64,8	20,8	4,0	0,0	0,0	1,6	8,8				
Colistin (3)	125													98,4	1,6	0,0					
Sulfamethoxazole	125	66	52,8													8,8	35,2	2,4	0,8	6,4	46,4
Trimethoprim (3)	125												92,0	2,4	0,0	0,0	5,6				
Tetracycline	125	56	44,8									48,8	5,6	0,8	0,0	4,8	40,0				

(1) Neomycin, spectinomycin, ceftiofur, amoxicillin/clavulanic acid were tested in the years 2000 to 2007 only.
(2) Cefotaxime and ceftazidime were tested in 2008 only.
(3) For colistin and trimethoprim no evaluation was performed as the lowest tested concentration was above the epidemiological cut-off value.
(4) The vertical lines demark the epidemiological cut-off values, which are the basis for the evaluation of microbiological resistance.
(5) The white areas demark the range tested. Isolates resistant to the highest concentration are given in the next concentration level. Values for the lowest concentration include isolates with MICs below the tested range.

Tab. 13.213: *S.* Paratyphi B dT+ from chicken meat (2000–2008)

Antimicrobial tested	Tested isolates (Number)	Microbiologically resistent isolates (Number) (4)	Microbiological resistent isolates (in %) (4)	Distribution (%) of MICs (µg/ml) (5)																	
				0,008	0,015	0,03125	0,0625	0,125	0,25	0,5	1	2	4	8	16	32	64	128	256	512	1024
Gentamicin	452	9	2,0								97,6	0,4	0,0	0,4	1,5	0,0	0,0				
Neomycin (1)	390	8	2,1									97,9	0,0	0,0	0,8	1,3	0,0				
Kanamycin	452	13	2,9										96,7	0,4	0,0	0,0	0,0	2,9			
Spectinomycin (1)	390	388	99,5									0,0	0,0	0,0	0,0	0,3	0,3	5,6	93,8		
Streptomycin	452	130	28,8										0,0	0,7	18,6	52,0	15,5	13,3			
Chloramphenicol	452	11	2,4									9,3	23,0	52,9	12,4	0,7	0,4	1,3			
Florfenicol	452	2	0,4									13,9	40,9	36,5	8,2	0,0	0,4	0,0			
Cefotaxime (2)	62	8	12,9				4,8	33,9	46,8	1,6	0,0	0,0	0,0	12,9							
Ceftazidime (2)	62	8	12,9						4,8	72,6	9,7	0,0	4,8	0,0	4,8	3,2					
Ceftiofur (1)	390	27	6,9							24,9	55,1	13,1	6,2	0,0	0,8						
Nalidixic acid	452	260	57,5										34,7	6,2	1,5	0,2	0,4	56,9			
Ciprofloxacin	452	266	58,8			34,7	6,4	1,5	16,2	24,3	9,5	6,6	0,7	0,0							
Amoxicillin/Clavulanic acid (1)	390	189	48,5									49,5	2,1	27,7	20,0	0,5	0,3				
Ampicillin	452	218	48,2								33,2	16,8	1,8	0,2	0,0	2,7	45,4				
Colistin (3)	452													99,7	0,2	0,0					
Sulfamethoxazole	452	302	66,8													22,4	7,3	2,4	1,1	4,2	62,6
Trimethoprim (3)	452												0,7	0,0	0,0	4,6	94,7				
Tetracycline	452	77	17,0									57,5	21,5	4,0	0,0	0,7	16,4				

(1) Neomycin, spectinomycin, ceftiofur, amoxicillin/clavulanic acid were tested in the years 2000 to 2007 only.
(2) Cefotaxime and ceftazidime were tested in 2008 only.
(3) For colistin and trimethoprim no evaluation was performed as the lowest tested concentration was above the epidemiological cut-off value.
(4) The vertical lines demark the epidemiological cut-off values, which are the basis for the evaluation of microbiological resistance.
(5) The white areas demark the range tested. Isolates resistant to the highest concentration are given in the next concentration level.
Values for the lowest concentration include isolates with MICs below the tested range.

Tab. 13.214: *S.* Typhimurium from chicken meat (2000–2008)

Antimicrobial tested	Tested isolates (Number)	Microbiologically resistent isolates (Number) (4)	Microbiological resistent isolates (in %) (4)	Distribution (%) of MICs (µg/ml) (5)																	
				0,008	0,015	0,03125	0,0625	0,125	0,25	0,5	1	2	4	8	16	32	64	128	256	512	1024
Gentamicin	177	0	0,0								99,5	0,6	0,0	0,0	0,0	0,0	0,0				
Neomycin (1)	161	5	3,1									94,4	2,5	0,0	1,2	0,6	1,2				
Kanamycin	177	5	2,8										96,6	0,6	0,0	0,0	0,6	2,3			
Spectinomycin (1)	161	22	13,7									0,0	0,0	0,0	3,1	67,7	15,5	3,1	10,6		
Streptomycin	177	31	17,5										10,2	56,5	11,9	4,0	7,3	10,2			
Chloramphenicol	177	15	8,5									0,6	36,7	51,4	2,8	0,0	0,6	7,9			
Florfenicol	177	13	7,3									2,8	70,6	18,6	0,6	2,8	3,4	1,1			
Cefotaxime (2)	16	0	0,0				62,5	37,5	0,0	0,0	0,0	0,0	0,0	0,0							
Ceftazidime (2)	16	0	0,0						100,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0					
Ceftiofur (1)	161	2	1,2							59,0	38,5	1,2	0,0	0,0	1,2						
Nalidixic acid	177	17	9,6										76,3	14,1	0,0	0,0	0,0	9,6			
Ciprofloxacin	177	17	9,6			87,0	3,4	0,6	7,3	1,7	0,0	0,0	0,0	0,0							
Amoxicillin/Clavulanic acid (1)	161	28	17,4									81,4	1,2	7,5	8,1	1,9	0,0				
Ampicillin	177	33	18,6								66,1	15,3	0,0	0,0	0,0	1,1	17,5				
Colistin (3)	177													100,0	0,0	0,0					
Sulfamethoxazole	177	59	33,3													17,0	44,1	5,6	0,0	1,7	31,7
Trimethoprim (3)	177												92,7	0,0	0,0	1,1	6,2				
Tetracycline	177	33	18,6									76,8	4,0	0,6	1,1	5,6	11,9				

(1) Neomycin, spectinomycin, ceftiofur, amoxicillin/clavulanic acid were tested in the years 2000 to 2007 only.

(2) Cefotaxime and ceftazidime were tested in 2008 only.

(3) For colistin and trimethoprim no evaluation was performed as the lowest tested concentration was above the epidemiological cut-off value.

(4) The vertical lines demark the epidemiological cut-off values, which are the basis for the evaluation of microbiological resistance.

(5) The white areas demark the range tested. Isolates resistant to the highest concentration are given in the next concentration level.
Values for the lowest concentration include isolates with MICs below the tested range.

Tab. 13.215: *S.* 4,12:d:- from chicken meat (2000–2008)

Antimicrobial tested	Tested isolates (Number)	Microbiologically resistent isolates (Number) (4)	Microbiological resistent isolates (in %) (4)	Distribution (%) of MICs (µg/ml) (5) 0,008	0,015	0,03125	0,0625	0,125	0,25	0,5	1	2	4	8	16	32	64	128	256	512	1024
Gentamicin	64	0	0,0								100,0	0,0	0,0	0,0	0,0	0,0	0,0				
Neomycin (1)	59	0	0,0									100,0	0,0	0,0	0,0	0,0	0,0				
Kanamycin	64	0	0,0										100,0	0,0	0,0	0,0	0,0	0,0			
Spectinomycin (1)	59	0	0,0									0,0	0,0	0,0	13,6	86,4	0,0	0,0	0,0		
Streptomycin	64	0	0,0										14,1	71,9	12,5	1,6	0,0	0,0			
Chloramphenicol	64	0	0,0									0,0	0,0	96,9	3,1	0,0	0,0	0,0			
Florfenicol	64	0	0,0									0,0	50,0	46,9	3,1	0,0	0,0	0,0			
Cefotaxime (2)	5	0	0,0				20,0	60,0	20,0	0,0	0,0	0,0	0,0	0,0							
Ceftazidime (2)	5	0	0,0						20,0	80,0	0,0	0,0	0,0	0,0	0,0	0,0					
Ceftiofur (1)	59	0	0,0							35,6	62,7	1,7	0,0	0,0	0,0						
Nalidixic acid	64	0	0,0										93,8	6,3	0,0	0,0	0,0	0,0			
Ciprofloxacin	64	0	0,0			96,9	3,1	0,0	0,0	0,0	0,0	0,0	0,0	0,0							
Amoxicillin/Clavulanic acid (1)	59	0	0,0									98,3	1,7	0,0	0,0	0,0	0,0				
Ampicillin	64	0	0,0								81,3	18,8	0,0	0,0	0,0	0,0	0,0				
Colistin (3)	64													98,4	1,6	0,0					
Sulfamethoxazole	64	6	9,4													21,9	37,5	14,1	17,2	9,4	0,0
Trimethoprim (3)	64												98,4	1,6	0,0	0,0	0,0				
Tetracycline	64	0	0,0									92,2	7,8	0,0	0,0	0,0	0,0				

(1) Neomycin, spectinomycin, ceftiofur, amoxicillin/clavulanic acid were tested in the years 2000 to 2007 only.

(2) Cefotaxime and ceftazidime were tested in 2008 only.

(3) For colistin and trimethoprim no evaluation was performed as the lowest tested concentration was above the epidemiological cut-off value.

(4) The vertical lines demark the epidemiological cut-off values, which are the basis for the evaluation of microbiological resistance.

(5) The white areas demark the range tested. Isolates resistant to the highest concentration are given in the next concentration level. Values for the lowest concentration include isolates with MICs below the tested range.

13.3.3.4 Isolates from turkey meat

Tab. 13.216: *Salmonella* spp. from turkey meat (2000–2008)

Antimicrobial tested	Tested isolates (Number)	Microbiologically resistent isolates (Number) (4)	Microbiological resistent isolates (in %) (4)	Distribution (%) of MICs (µg/ml) (5) 0,008	0,015	0,03125	0,0625	0,125	0,25	0,5	1	2	4	8	16	32	64	128	256	512	1024
Gentamicin	851	134	15,7								83,0	1,2	0,7	9,0	4,2	1,1	0,7				
Neomycin (1)	782	72	9,2									90,2	0,6	0,3	0,6	4,0	4,3				
Kanamycin	851	185	21,7										76,6	1,6	0,6	10,3	2,9	7,9			
Spectinomycin (1)	782	249	31,8									0,0	0,0	0,0	8,2	45,8	14,2	11,8	20,1		
Streptomycin	851	334	39,2										10,1	20,2	17,4	13,0	24,4	14,8			
Chloramphenicol	851	121	14,2									3,4	21,9	46,4	14,1	2,6	1,9	9,8			
Florfenicol	851	59	6,9									9,0	44,7	24,0	15,4	3,2	2,7	1,1			
Cefotaxime (2)	69	0	0,0				36,2	33,3	24,6	5,8	0,0	0,0	0,0	0,0							
Ceftazidime (2)	69	0	0,0						44,9	37,7	14,5	2,9	0,0	0,0	0,0	0,0					
Ceftiofur (1)	782	44	5,6							33,9	44,0	16,5	4,9	0,8	0,0						
Nalidixic acid	851	302	35,5										48,1	13,2	3,3	0,7	0,2	34,5			
Ciprofloxacin	851	314	36,9			59,4	3,8	2,7	9,0	10,6	13,6	0,9	0,0	0,0							
Amoxicillin/Clavulanic acid (1)	782	336	43,0									54,7	2,3	12,8	20,8	9,0	0,4				
Ampicillin	851	384	45,1								31,7	20,1	3,1	0,1	0,0	12,5	32,5				
Colistin (3)	851													99,3	0,7	0,0					
Sulfamethoxazole	851	493	57,9													21,0	14,7	4,6	1,8	19,9	38,1
Trimethoprim (3)	851												87,2	2,4	0,5	2,7	7,3				
Tetracycline	851	484	56,9									33,5	9,0	0,6	0,6	18,7	37,6				

(1) Neomycin, spectinomycin, ceftiofur, amoxicillin/clavulanic acid were tested in the years 2000 to 2007 only.

(2) Cefotaxime and ceftazidime were tested in 2008 only.

(3) For colistin and trimethoprim no evaluation was performed as the lowest tested concentration was above the epidemiological cut-off value.

(4) The vertical lines demark the epidemiological cut-off values, which are the basis for the evaluation of microbiological resistance.

(5) The white areas demark the range tested. Isolates resistant to the highest concentration are given in the next concentration level.
Values for the lowest concentration include isolates with MICs below the tested range.

Tab. 13.217: *S.* Enteritidis from turkey meat (2000–2008)

Antimicrobial tested	Tested isolates (Number)	Microbiologically resistent isolates (Number) (4)	Microbiological resistent isolates (in %) (4)	Distribution (%) of MICs (µg/ml) (5) 0,008	0,015	0,03125	0,0625	0,125	0,25	0,5	1	2	4	8	16	32	64	128	256	512	1024
Gentamicin	9	1	11,1								88,9	0,0	0,0	0,0	11,1	0,0	0,0				
Neomycin (1)	9	0	0,0									100,0	0,0	0,0	0,0	0,0	0,0				
Kanamycin	9	1	11,1										88,9	0,0	0,0	0,0	0,0	11,1			
Spectinomycin (1)	9	1	11,1									0,0	0,0	0,0	88,9	0,0	0,0	0,0	11,1		
Streptomycin	9	1	11,1										88,9	0,0	0,0	0,0	11,1	0,0			
Chloramphenicol	9	1	11,1									0,0	55,6	22,2	11,1	0,0	11,1	0,0			
Florfenicol	9	0	0,0									0,0	88,9	0,0	11,1	0,0	0,0	0,0			
Cefotaxime (2)	0	0	0,0				0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0							
Ceftazidime (2)	0	0	0,0						0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0					
Ceftiofur (1)	9	0	0,0							77,8	11,1	11,1	0,0	0,0	0,0						
Nalidixic acid	9	2	22,2										66,7	11,1	0,0	0,0	0,0	22,2			
Ciprofloxacin	9	2	22,2			66,7	11,1	0,0	22,2	0,0	0,0	0,0	0,0	0,0							
Amoxicillin/Clavulanic acid (1)	9	0	0,0									100,0	0,0	0,0	0,0	0,0	0,0				
Ampicillin	9	0	0,0								66,7	33,3	0,0	0,0	0,0	0,0	0,0				
Colistin (3)	9													100,0	0,0	0,0					
Sulfamethoxazole	9	1	11,1													11,1	66,7	11,1	0,0	0,0	11,1
Trimethoprim (3)	9												88,9	0,0	0,0	0,0	11,1				
Tetracycline	9	0	0,0									88,9	11,1	0,0	0,0	0,0	0,0				

(1) Neomycin, spectinomycin, ceftiofur, amoxicillin/clavulanic acid were tested in the years 2000 to 2007 only.
(2) Cefotaxime and ceftazidime were tested in 2008 only.
(3) For colistin and trimethoprim no evaluation was performed as the lowest tested concentration was above the epidemiological cut-off value.
(4) The vertical lines demark the epidemiological cut-off values, which are the basis for the evaluation of microbiological resistance.
(5) The white areas demark the range tested. Isolates resistant to the highest concentration are given in the next concentration level.
Values for the lowest concentration include isolates with MICs below the tested range.

Tab. 13.218: *S.* Hadar from turkey meat (2000–2008)

Antimicrobial tested	Tested isolates (Number)	Microbiologically resistent isolates (Number) (4)	Microbiological resistent isolates (in %) (4)	Distribution (%) of MICs (µg/ml) (5)																	
				0,008	0,015	0,03125	0,0625	0,125	0,25	0,5	1	2	4	8	16	32	64	128	256	512	1024
Gentamicin	91	0	0,0								94,5	5,5	0,0	0,0	0,0	0,0	0,0				
Neomycin (1)	87	2	2,3									96,6	1,1	1,1	0,0	0,0	1,1				
Kanamycin	91	2	2,2										93,4	4,4	0,0	0,0	0,0	2,2			
Spectinomycin (1)	87	4	4,6									0,0	0,0	0,0	0,0	66,7	28,7	0,0	4,6		
Streptomycin	91	66	72,5										0,0	12,1	4,4	11,0	51,6	20,9			
Chloramphenicol	91	2	2,2									7,7	52,7	23,1	14,3	0,0	0,0	2,2			
Florfenicol	91	0	0,0									17,6	48,4	22,0	12,1	0,0	0,0	0,0			
Cefotaxime (2)	4	0	0,0				25,0	25,0	50,0	0,0	0,0	0,0	0,0	0,0							
Ceftazidime (2)	4	0	0,0						50,0	25,0	25,0	0,0	0,0	0,0	0,0	0,0					
Ceftiofur (1)	87	0	0,0							29,9	43,7	26,4	0,0	0,0	0,0						
Nalidixic acid	91	53	58,2										36,3	2,2	3,3	5,5	0,0	52,8			
Ciprofloxacin	91	55	60,4			35,2	4,4	1,1	15,4	29,7	14,3	0,0	0,0	0,0							
Amoxicillin/Clavulanic acid (1)	87	24	27,6									66,7	5,7	4,6	23,0	0,0	0,0				
Ampicillin	91	27	29,7								47,3	11,0	12,1	1,1	0,0	0,0	28,6				
Colistin (3)	91													100,0	0,0	0,0					
Sulfamethoxazole	91	11	12,1													36,3	48,4	2,2	1,1	0,0	12,1
Trimethoprim (3)	91												95,6	1,1	0,0	0,0	3,3				
Tetracycline	91	89	97,8									0,0	2,2	0,0	0,0	11,0	86,8				

(1) Neomycin, spectinomycin, ceftiofur, amoxicillin/clavulanic acid were tested in the years 2000 to 2007 only.

(2) Cefotaxime and ceftazidime were tested in 2008 only.

(3) For colistin and trimethoprim no evaluation was performed as the lowest tested concentration was above the epidemiological cut-off value.

(4) The vertical lines demark the epidemiological cut-off values, which are the basis for the evaluation of microbiological resistance.

(5) The white areas demark the range tested. Isolates resistant to the highest concentration are given in the next concentration level. Values for the lowest concentration include isolates with MICs below the tested range.

Tab. 13.219: *S.* Heidelberg from turkey meat (2000–2008)

Antimicrobial tested	Tested isolates (Number)	Microbiologically resistent isolates (Number) (4)	Microbiological resistent isolates (in %) (4)	Distribution (%) of MICs (µg/ml) (5)																	
				0,008	0,015	0,03125	0,0625	0,125	0,25	0,5	1	2	4	8	16	32	64	128	256	512	1024
Gentamicin	70	3	4,3								95,7	0,0	0,0	0,0	0,0	2,9	1,4				
Neomycin (1)	70	7	10,0									90,0	0,0	0,0	0,0	7,1	2,9				
Kanamycin	70	7	10,0										88,6	1,4	0,0	0,0	7,1	2,9			
Spectinomycin (1)	70	24	34,3									0,0	0,0	0,0	14,3	31,4	20,0	11,4	22,9		
Streptomycin	70	20	28,6										15,7	15,7	27,1	12,9	8,6	20,0			
Chloramphenicol	70	21	30,0									7,1	18,6	28,6	15,7	0,0	7,1	22,9			
Florfenicol	70	0	0,0									17,1	32,9	17,1	32,9	0,0	0,0	0,0			
Cefotaxime (2)	0	0	0,0				0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0							
Ceftazidime (2)	0	0	0,0						0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0					
Ceftiofur (1)	70	0	0,0							60,0	28,6	11,4	0,0	0,0	0,0						
Nalidixic acid	70	16	22,9										65,7	11,4	0,0	1,4	0,0	21,4			
Ciprofloxacin	70	16	22,9			77,1	0,0	2,9	2,9	17,1	0,0	0,0	0,0	0,0							
Amoxicillin/Clavulanic acid (1)	70	32	45,7									51,4	2,9	27,1	18,6	0,0	0,0				
Ampicillin	70	33	47,1								34,3	17,1	1,4	0,0	0,0	10,0	37,1				
Colistin (3)	70													98,6	1,4	0,0					
Sulfamethoxazole	70	29	41,4													41,4	11,4	1,4	4,3	8,6	32,9
Trimethoprim (3)	70												92,9	0,0	0,0	1,4	5,7				
Tetracycline	70	32	45,7									50,0	4,3	0,0	0,0	14,3	31,4				

(1) Neomycin, spectinomycin, ceftiofur, amoxicillin/clavulanic acid were tested in the years 2000 to 2007 only.

(2) Cefotaxime and ceftazidime were tested in 2008 only.

(3) For colistin and trimethoprim no evaluation was performed as the lowest tested concentration was above the epidemiological cut-off value.

(4) The vertical lines demark the epidemiological cut-off values, which are the basis for the evaluation of microbiological resistance.

(5) The white areas demark the range tested. Isolates resistant to the highest concentration are given in the next concentration level.
Values for the lowest concentration include isolates with MICs below the tested range.

Tab. 13.220: *S.* Indiana from turkey meat (2000–2008)

Antimicrobial tested	Tested isolates (Number)	Microbiologically resistent isolates (Number) (4)	Microbiological resistent isolates (in %) (4)	Distribution (%) of MICs (µg/ml) (5) 0,008	0,015	0,03125	0,0625	0,125	0,25	0,5	1	2	4	8	16	32	64	128	256	512	1024
Gentamicin	68	0	0,0								100,0	0,0	0,0	0,0	0,0	0,0	0,0				
Neomycin (1)	67	0	0,0									100,0	0,0	0,0	0,0	0,0	0,0				
Kanamycin	68	0	0,0										100,0	0,0	0,0	0,0	0,0	0,0			
Spectinomycin (1)	67	4	6,0									0,0	0,0	0,0	0,0	53,7	40,3	0,0	6,0		
Streptomycin	68	1	1,5										0,0	16,2	72,1	10,3	1,5	0,0			
Chloramphenicol	68	0	0,0									0,0	27,9	72,1	0,0	0,0	0,0	0,0			
Florfenicol	68	0	0,0									1,5	97,1	1,5	0,0	0,0	0,0	0,0			
Cefotaxime (2)	1	0	0,0				100,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0							
Ceftazidime (2)	1	0	0,0						100,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0					
Ceftiofur (1)	67	0	0,0							22,4	77,6	0,0	0,0	0,0	0,0						
Nalidixic acid	68	0	0,0										41,2	58,8	0,0	0,0	0,0	0,0			
Ciprofloxacin	68	0	0,0			100,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0							
Amoxicillin/Clavulanic acid (1)	67	4	6,0									94,0	0,0	4,5	1,5	0,0	0,0				
Ampicillin	68	5	7,4								7,4	79,4	5,9	0,0	0,0	0,0	7,4				
Colistin (3)	68													100,0	0,0	0,0					
Sulfamethoxazole	68	65	95,6													1,5	2,9	0,0	0,0	86,8	8,9
Trimethoprim (3)	68												92,6	0,0	0,0	0,0	7,4				
Tetracycline	68	64	94,1									4,4	1,5	0,0	0,0	86,8	7,4				

(1) Neomycin, spectinomycin, ceftiofur, amoxicillin/clavulanic acid were tested in the years 2000 to 2007 only.

(2) Cefotaxime and ceftazidime were tested in 2008 only.

(3) For colistin and trimethoprim no evaluation was performed as the lowest tested concentration was above the epidemiological cut-off value.

(4) The vertical lines demark the epidemiological cut-off values, which are the basis for the evaluation of microbiological resistance.

(5) The white areas demark the range tested. Isolates resistant to the highest concentration are given in the next concentration level. Values for the lowest concentration include isolates with MICs below the tested range.

Tab. 13.221: *S.* Saintpaul from turkey meat (2000–2008)

Antimicrobial tested	Tested isolates (Number)	Microbiologically resistent isolates (Number) (4)	Microbiological resistent isolates (in %) (4)	Distribution (%) of MICs (µg/ml) (5)																	
				0,008	0,015	0,03125	0,0625	0,125	0,25	0,5	1	2	4	8	16	32	64	128	256	512	1024
Gentamicin	164	104	63,4								36,0	0,6	1,8	42,7	15,9	1,8	1,2				
Neomycin (1)	141	8	5,7									93,6	0,7	0,0	0,0	3,5	2,1				
Kanamycin	164	99	60,4										38,4	1,2	1,8	47,0	8,5	3,0			
Spectinomycin (1)	141	104	73,8									0,0	0,0	0,0	2,1	21,3	2,8	36,9	36,9		
Streptomycin	164	80	48,8										6,1	12,2	7,3	25,6	37,8	11,0			
Chloramphenicol	164	28	17,1									0,0	4,3	40,9	37,8	9,1	2,4	5,5			
Florfenicol	164	13	7,9									0,0	20,1	33,5	38,4	5,5	0,6	1,8			
Cefotaxime (2)	23	0	0,0				17,4	13,0	56,5	13,0	0,0	0,0	0,0	0,0							
Ceftazidime (2)	23	0	0,0						21,7	39,1	30,4	8,7	0,0	0,0	0,0	0,0					
Ceftiofur (1)	141	36	25,5							12,1	28,4	34,0	23,4	2,1	0,0						
Nalidixic acid	164	123	75,0										19,5	3,0	2,4	0,0	0,0	75,0			
Ciprofloxacin	164	129	78,7			19,5	1,8	1,8	3,0	19,5	51,2	3,0	0,0	0,0							
Amoxicillin/Clavulanic acid (1)	141	102	72,3									27,7	0,0	6,4	29,8	35,5	0,7				
Ampicillin	164	121	73,8								17,7	6,1	2,4	0,0	0,0	32,3	41,5				
Colistin (3)	164													100,0	0,0	0,0					
Sulfamethoxazole	164	130	79,3													8,5	5,5	4,9	1,8	33,5	45,8
Trimethoprim (3)	164												78,0	7,3	1,2	7,3	6,1				
Tetracycline	164	52	31,7									31,7	35,4	1,2	0,0	6,1	25,6				

(1) Neomycin, spectinomycin, ceftiofur, amoxicillin/clavulanic acid were tested in the years 2000 to 2007 only.

(2) Cefotaxime and ceftazidime were tested in 2008 only.

(3) For colistin and trimethoprim no evaluation was performed as the lowest tested concentration was above the epidemiological cut-off value.

(4) The vertical lines demark the epidemiological cut-off values, which are the basis for the evaluation of microbiological resistance.

(5) The white areas demark the range tested. Isolates resistant to the highest concentration are given in the next concentration level. Values for the lowest concentration include isolates with MICs below the tested range.

Tab. 13.222: *S.* Typhimurium from turkey meat (2000–2008)

Antimicrobial tested	Tested isolates (Number)	Microbiologically resistent isolates (Number) (4)	Microbiological resistent isolates (in %) (4)	Distribution (%) of MICs (µg/ml) (5) 0,008	0,015	0,03125	0,0625	0,125	0,25	0,5	1	2	4	8	16	32	64	128	256	512	1024
Gentamicin	144	7	4,9								95,1	0,0	2,1	0,0	0,0	1,4	1,4				
Neomycin (1)	127	8	6,3									92,9	0,8	0,0	0,0	0,0	6,3				
Kanamycin	144	11	7,6										92,4	0,0	1,4	0,7	0,0	5,6			
Spectinomycin (1)	127	44	34,6									0,0	0,0	0,0	11,8	36,2	17,3	5,5	29,1		
Streptomycin	144	87	60,4										15,3	14,6	2,8	6,9	35,4	25,0			
Chloramphenicol	144	47	32,6									3,5	13,2	44,4	6,3	0,7	0,7	31,3			
Florfenicol	144	42	29,2									11,8	27,8	26,4	4,9	10,4	15,3	3,5			
Cefotaxime (2)	17	0	0,0				47,1	47,1	0,0	5,9	0,0	0,0	0,0	0,0							
Ceftazidime (2)	17	0	0,0						52,9	47,1	0,0	0,0	0,0	0,0	0,0	0,0					
Ceftiofur (1)	127	2	1,6							41,7	38,6	18,1	0,8	0,8	0,0						
Nalidixic acid	144	33	22,9										53,5	11,8	11,8	0,0	1,4	21,6			
Ciprofloxacin	144	33	22,9			65,3	11,8	0,0	17,4	2,8	2,8	0,0	0,0	0,0							
Amoxicillin/Clavulanic acid (1)	127	85	66,9									29,9	3,1	17,3	45,7	3,1	0,8				
Ampicillin	144	102	70,8								20,1	8,3	0,7	0,0	0,0	16,0	54,9				
Colistin (3)	144													99,4	0,7	0,0					
Sulfamethoxazole	144	106	73,6													12,5	9,0	4,9	0,0	18,1	55,5
Trimethoprim (3)	144												93,7	1,4	0,7	0,0	4,2				
Tetracycline	144	106	73,6									25,0	0,7	0,7	3,5	36,8	33,4				

(1) Neomycin, spectinomycin, ceftiofur, amoxicillin/clavulanic acid were tested in the years 2000 to 2007 only.
(2) Cefotaxime and ceftazidime were tested in 2008 only.
(3) For colistin and trimethoprim no evaluation was performed as the lowest tested concentration was above the epidemiological cut-off value.
(4) The vertical lines demark the epidemiological cut-off values, which are the basis for the evaluation of microbiological resistance.
(5) The white areas demark the range tested. Isolates resistant to the highest concentration are given in the next concentration level.
Values for the lowest concentration include isolates with MICs below the tested range.

Tab. 13.223: *S.* 4,12:d:- from turkey meat (2000–2008)

Antimicrobial tested	Tested isolates (Number)	Microbiologically resistent isolates (Number) (4)	Microbiological resistent isolates (in %) (4)	Distribution (%) of MICs (µg/ml) (5) 0,008	0,015	0,03125	0,0625	0,125	0,25	0,5	1	2	4	8	16	32	64	128	256	512	1024
Gentamicin	49	0	0,0								100,0	0,0	0,0	0,0	0,0	0,0	0,0				
Neomycin (1)	49	3	6,1									91,8	2,0	0,0	0,0	6,1	0,0				
Kanamycin	49	3	6,1										89,8	4,1	0,0	0,0	6,1	0,0			
Spectinomycin (1)	49	1	2,0									0,0	0,0	0,0	14,3	81,6	2,0	2,0	0,0		
Streptomycin	49	0	0,0										20,4	40,8	38,8	0,0	0,0	0,0			
Chloramphenicol	49	2	4,1									0,0	12,2	81,6	2,0	0,0	0,0	4,1			
Florfenicol	49	0	0,0									4,1	81,6	14,3	0,0	0,0	0,0	0,0			
Cefotaxime (2)	0	0	0,0				0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0							
Ceftazidime (2)	0	0	0,0						0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0					
Ceftiofur (1)	49	0	0,0							24,5	71,4	4,1	0,0	0,0	0,0						
Nalidixic acid	49	0	0,0										71,4	28,6	0,0	0,0	0,0	0,0			
Ciprofloxacin	49	1	2,0			98,0	0,0	2,0	0,0	0,0	0,0	0,0	0,0	0,0							
Amoxicillin/Clavulanic acid (1)	49	4	8,2									89,8	2,0	4,1	4,1	0,0	0,0				
Ampicillin	49	4	8,2								42,9	44,9	4,1	0,0	0,0	4,1	4,1				
Colistin (3)	49													100,0	0,0	0,0					
Sulfamethoxazole	49	7	14,3													65,3	10,2	6,1	4,1	6,1	8,2
Trimethoprim (3)	49												98,0	0,0	2,0	0,0	0,0				
Tetracycline	49	3	6,1									89,8	4,1	0,0	0,0	0,0	6,1				

(1) Neomycin, spectinomycin, ceftiofur, amoxicillin/clavulanic acid were tested in the years 2000 to 2007 only.

(2) Cefotaxime and ceftazidime were tested in 2008 only.

(3) For colistin and trimethoprim no evaluation was performed as the lowest tested concentration was above the epidemiological cut-off value.

(4) The vertical lines demark the epidemiological cut-off values, which are the basis for the evaluation of microbiological resistance.

(5) The white areas demark the range tested. Isolates resistant to the highest concentration are given in the next concentration level.
Values for the lowest concentration include isolates with MICs below the tested range.

13.3.3.5 Isolates from minced meat

Tab. 13.224: *Salmonella* spp. from minced meat (2000–2008)

Antimicrobial tested	Tested isolates (Number)	Microbiologically resistent isolates (Number) (4)	Microbiological resistent isolates (in %) (4)	Distribution (%) of MICs (µg/ml) (5)																	
				0,008	0,015	0,03125	0,0625	0,125	0,25	0,5	1	2	4	8	16	32	64	128	256	512	1024
Gentamicin	1623	32	2,0								96,6	1,4	0,3	0,7	0,6	0,2	0,2				
Neomycin (1)	1457	68	4,7									94,2	1,1	0,1	0,1	1,5	2,9				
Kanamycin	1623	80	4,9										93,5	1,6	0,3	0,2	0,4	4,1			
Spectinomycin (1)	1457	444	30,5									0,0	0,0	0,1	6,9	54,1	8,4	4,5	25,9		
Streptomycin	1623	751	46,3										11,4	28,9	10,1	3,4	17,7	28,6			
Chloramphenicol	1623	389	24,0									1,7	21,4	47,1	5,9	0,2	3,1	20,6			
Florfenicol	1623	344	21,2									4,0	45,0	26,7	3,0	8,3	11,8	1,1			
Cefotaxime (2)	166	1	0,6				53,0	38,0	8,4	0,0	0,0	0,0	0,0	0,6							
Ceftazidime (2)	166	1	0,6						63,9	34,9	0,6	0,0	0,6	0,0	0,0	0,0					
Ceftiofur (1)	1457	4	0,3							52,8	42,0	4,9	0,1	0,0	0,2						
Nalidixic acid	1623	38	2,3										84,8	12,3	0,6	0,0	0,1	2,3			
Ciprofloxacin	1623	45	2,8			92,7	4,6	0,4	0,9	1,1	0,2	0,1	0,0	0,1							
Amoxicillin/Clavulanic acid (1)	1457	615	42,2									54,1	3,7	15,2	22,8	4,0	0,3				
Ampicillin	1623	768	47,3								39,9	11,5	1,2	0,1	0,1	4,2	42,9				
Colistin (3)	1623													99,6	0,4	0,0					
Sulfamethoxazole	1623	979	60,3													12,3	18,9	7,8	0,6	5,2	55,1
Trimethoprim (3)	1623												87,1	0,8	0,1	0,7	11,3				
Tetracycline	1623	861	53,0									42,6	3,6	0,8	1,4	15,5	36,2				

(1) Neomycin, spectinomycin, ceftiofur, amoxicillin/clavulanic acid were tested in the years 2000 to 2007 only.

(2) Cefotaxime and ceftazidime were tested in 2008 only.

(3) For colistin and trimethoprim no evaluation was performed as the lowest tested concentration was above the epidemiological cut-off value.

(4) The vertical lines demark the epidemiological cut-off values, which are the basis for the evaluation of microbiological resistance.

(5) The white areas demark the range tested. Isolates resistant to the highest concentration are given in the next concentration level. Values for the lowest concentration include isolates with MICs below the tested range.

Tab. 13.225: *S.* Derby from minced meat (2000–2008)

Antimicrobial tested	Tested isolates (Number)	Microbiologically resistent isolates (Number) (4)	Microbiological resistent isolates (in %) (4)	Distribution (%) of MICs (µg/ml) (5) 0,008	0,015	0,03125	0,0625	0,125	0,25	0,5	1	2	4	8	16	32	64	128	256	512	1024
Gentamicin	104	0	0,0								99,0	1,0	0,0	0,0	0,0	0,0	0,0				
Neomycin (1)	89	0	0,0									100,0	0,0	0,0	0,0	0,0	0,0				
Kanamycin	104	1	1,0										99,0	0,0	1,0	0,0	0,0	0,0			
Spectinomycin (1)	89	10	11,2									0,0	0,0	0,0	15,7	66,3	6,7	2,2	9,0		
Streptomycin	104	10	9,6										4,8	60,6	22,1	2,9	1,9	7,7			
Chloramphenicol	104	4	3,8									0,0	6,7	75,0	14,4	0,0	1,0	2,9			
Florfenicol	104	3	2,9									2,9	20,2	73,1	1,0	1,9	1,0	0,0			
Cefotaxime (2)	15	0	0,0				13,3	73,3	13,3	0,0	0,0	0,0	0,0	0,0							
Ceftazidime (2)	15	0	0,0						6,7	93,3	0,0	0,0	0,0	0,0	0,0	0,0					
Ceftiofur (1)	89	0	0,0							46,1	49,4	4,5	0,0	0,0	0,0						
Nalidixic acid	104	0	0,0										95,2	4,8	0,0	0,0	0,0	0,0			
Ciprofloxacin	104	0	0,0			98,1	1,9	0,0	0,0	0,0	0,0	0,0	0,0	0,0							
Amoxicillin/Clavulanic acid (1)	89	2	2,2									95,5	2,2	1,1	0,0	1,1	0,0				
Ampicillin	104	2	1,9								69,2	25,0	3,8	0,0	0,0	1,0	1,0				
Colistin (3)	104													100,0	0,0	0,0					
Sulfamethoxazole	104	15	14,4													44,3	37,5	3,8	0,0	1,0	13,5
Trimethoprim (3)	104												93,2	1,0	1,0	1,0	3,8				
Tetracycline	104	10	9,6									85,6	4,8	0,0	0,0	1,0	8,7				

(1) Neomycin, spectinomycin, ceftiofur, amoxicillin/clavulanic acid were tested in the years 2000 to 2007 only.
(2) Cefotaxime and ceftazidime were tested in 2008 only.
(3) For colistin and trimethoprim no evaluation was performed as the lowest tested concentration was above the epidemiological cut-off value.
(4) The vertical lines demark the epidemiological cut-off values, which are the basis for the evaluation of microbiological resistance.
(5) The white areas demark the range tested. Isolates resistant to the highest concentration are given in the next concentration level. Values for the lowest concentration include isolates with MICs below the tested range.

Tab. 13.226: *S.* Infantis from minced meat (2000–2008)

Antimicrobial tested	Tested isolates (Number)	Microbiologically resistent isolates (Number) (4)	Microbiological resistent isolates (in %) (4)	Distribution (%) of MICs (µg/ml) (5) 0,008	0,015	0,03125	0,0625	0,125	0,25	0,5	1	2	4	8	16	32	64	128	256	512	1024
Gentamicin	54	0	0,0								98,1	1,9	0,0	0,0	0,0	0,0	0,0				
Neomycin (1)	52	0	0,0									100,0	0,0	0,0	0,0	0,0	0,0				
Kanamycin	54	0	0,0										98,1	1,9	0,0	0,0	0,0	0,0			
Spectinomycin (1)	52	1	1,9									0,0	0,0	0,0	5,8	84,6	7,7	0,0	1,9		
Streptomycin	54	2	3,7										5,6	61,1	27,8	1,9	1,9	1,9			
Chloramphenicol	54	2	3,7									0,0	9,3	79,6	7,4	1,9	0,0	1,9			
Florfenicol	54	0	0,0									1,9	74,1	18,5	5,6	0,0	0,0	0,0			
Cefotaxime (2)	2	0	0,0				0,0	0,0	100,0	0,0	0,0	0,0	0,0	0,0							
Ceftazidime (2)	2	0	0,0						50,0	50,0	0,0	0,0	0,0	0,0	0,0	0,0					
Ceftiofur (1)	52	0	0,0							61,5	30,8	7,7	0,0	0,0	0,0						
Nalidixic acid	54	0	0,0										83,3	16,7	0,0	0,0	0,0	0,0			
Ciprofloxacin	54	0	0,0			96,3	3,7	0,0	0,0	0,0	0,0	0,0	0,0	0,0							
Amoxicillin/Clavulanic acid (1)	52	1	1,9									96,2	1,9	1,9	0,0	0,0	0,0				
Ampicillin	54	3	5,6								77,8	11,1	5,6	0,0	1,9	1,9	1,9				
Colistin (3)	54													100,0	0,0	0,0					
Sulfamethoxazole	54	6	11,1													31,5	53,7	3,7	0,0	0,0	11,2
Trimethoprim (3)	54												90,8	3,7	0,0	0,0	5,6				
Tetracycline	54	2	3,7									92,6	3,7	0,0	0,0	0,0	3,8				

(1) Neomycin, spectinomycin, ceftiofur, amoxicillin/clavulanic acid were tested in the years 2000 to 2007 only.

(2) Cefotaxime and ceftazidime were tested in 2008 only.

(3) For colistin and trimethoprim no evaluation was performed as the lowest tested concentration was above the epidemiological cut-off value.

(4) The vertical lines demark the epidemiological cut-off values, which are the basis for the evaluation of microbiological resistance.

(5) The white areas demark the range tested. Isolates resistant to the highest concentration are given in the next concentration level. Values for the lowest concentration include isolates with MICs below the tested range.

Tab. 13.227: *S.* Subspec. I, rough from minced meat (2000–2008)

Antimicrobial tested	Tested isolates (Number)	Microbiologically resistent isolates (Number) (4)	Microbiological resistent isolates (in %) (4)	Distribution (%) of MICs (µg/ml) (5)																	
				0,008	0,015	0,03125	0,0625	0,125	0,25	0,5	1	2	4	8	16	32	64	128	256	512	1024
Gentamicin	72	0	0,0								100,0	0,0	0,0	0,0	0,0	0,0	0,0				
Neomycin (1)	62	4	6,5									93,5	0,0	0,0	0,0	0,0	6,5				
Kanamycin	72	4	5,6										94,4	0,0	0,0	0,0	0,0	5,6			
Spectinomycin (1)	62	19	30,6									0,0	0,0	0,0	9,7	45,2	14,5	12,9	17,7		
Streptomycin	72	46	63,9										15,3	15,3	4,2	1,4	19,4	44,5			
Chloramphenicol	72	12	16,7									6,9	29,2	37,5	9,7	0,0	4,2	12,5			
Florfenicol	72	10	13,9									6,9	33,3	41,7	4,2	6,9	6,9	0,0			
Cefotaxime (2)	10	0	0,0				40,0	60,0	0,0	0,0	0,0	0,0	0,0	0,0							
Ceftazidime (2)	10	0	0,0						80,0	20,0	0,0	0,0	0,0	0,0	0,0	0,0					
Ceftiofur (1)	62	0	0,0							43,5	45,2	11,3	0,0	0,0	0,0						
Nalidixic acid	72	1	1,4										90,3	8,3	0,0	0,0	0,0	1,4			
Ciprofloxacin	72	1	1,4			94,5	4,2	0,0	1,4	0,0	0,0	0,0	0,0	0,0							
Amoxicillin/Clavulanic acid (1)	62	34	54,8									41,9	3,2	32,3	14,5	8,1	0,0				
Ampicillin	72	41	56,9								25,0	15,3	2,8	0,0	0,0	5,6	51,4				
Colistin (3)	72													100,0	0,0	0,0					
Sulfamethoxazole	72	53	73,6													13,9	5,6	5,6	1,4	13,9	59,7
Trimethoprim (3)	72												86,1	0,0	0,0	0,0	13,9				
Tetracycline	72	44	61,1									37,5	1,4	0,0	4,2	6,9	50,0				

(1) Neomycin, spectinomycin, ceftiofur, amoxicillin/clavulanic acid were tested in the years 2000 to 2007 only.
(2) Cefotaxime and ceftazidime were tested in 2008 only.
(3) For colistin and trimethoprim no evaluation was performed as the lowest tested concentration was above the epidemiological cut-off value.
(4) The vertical lines demark the epidemiological cut-off values, which are the basis for the evaluation of microbiological resistance.
(5) The white areas demark the range tested. Isolates resistant to the highest concentration are given in the next concentration level. Values for the lowest concentration include isolates with MICs below the tested range.

Tab. 13.228: *S.* Typhimurium from minced meat (2000–2008)

Antimicrobial tested	Tested isolates (Number)	Microbiologically resistent isolates (Number) (4)	Microbiological resistent isolates (in %) (4)	Distribution (%) of MICs (µg/ml) (5)																	
				0,008	0,015	0,03125	0,0625	0,125	0,25	0,5	1	2	4	8	16	32	64	128	256	512	1024
Gentamicin	972	21	2,2								96,4	1,4	0,1	0,9	0,7	0,3	0,1				
Neomycin (1)	901	58	6,4									92,3	1,2	0,2	0,2	2,0	4,0				
Kanamycin	972	62	6,4										91,8	1,9	0,3	0,0	0,5	5,5			
Spectinomycin (1)	901	388	43,1									0,0	0,0	0,2	1,3	47,1	8,3	5,9	37,2		
Streptomycin	972	571	58,7										8,3	23,0	7,2	2,7	26,1	32,6			
Chloramphenicol	972	364	37,4									0,6	18,4	38,4	5,1	0,2	4,7	32,5			
Florfenicol	972	326	33,5									1,9	41,8	19,4	3,4	12,9	19,0	1,6			
Cefotaxime (2)	71	0	0,0				59,2	33,8	7,0	0,0	0,0	0,0	0,0	0,0							
Ceftazidime (2)	71	0	0,0						73,2	26,8	0,0	0,0	0,0	0,0	0,0	0,0					
Ceftiofur (1)	901	1	0,1							50,7	44,3	4,9	0,1	0,0	0,0						
Nalidixic acid	972	19	2,0										83,3	14,2	0,5	0,0	0,0	1,9			
Ciprofloxacin	972	24	2,5			92,1	5,5	0,6	0,7	0,8	0,0	0,2	0,0	0,1							
Amoxicillin/Clavulanic acid (1)	901	517	57,4									39,6	3,0	16,5	34,6	5,8	0,4				
Ampicillin	972	598	61,5								28,5	9,2	0,8	0,1	0,0	6,3	55,1				
Colistin (3)	972													99,5	0,5	0,0					
Sulfamethoxazole	972	715	73,6													8,2	11,4	6,2	0,6	6,9	66,7
Trimethoprim (3)	972												85,8	0,7	0,0	0,8	12,7				
Tetracycline	972	667	68,6									28,2	3,1	0,1	1,9	24,6	42,2				

(1) Neomycin, spectinomycin, ceftiofur, amoxicillin/clavulanic acid were tested in the years 2000 to 2007 only.
(2) Cefotaxime and ceftazidime were tested in 2008 only.
(3) For colistin and trimethoprim no evaluation was performed as the lowest tested concentration was above the epidemiological cut-off value.
(4) The vertical lines demark the epidemiological cut-off values, which are the basis for the evaluation of microbiological resistance.
(5) The white areas demark the range tested. Isolates resistant to the highest concentration are given in the next concentration level. Values for the lowest concentration include isolates with MICs below the tested range.

Tab. 13.229: *S.* 4,[5],12:i:- from minced meat (2000–2008)

Antimicrobial tested	Tested isolates (Number)	Microbiologically resistent isolates (Number) (4)	Microbiological resistent isolates (in %) (4)	Distribution (%) of MICs (µg/ml) (5)																	
				0,008	0,015	0,03125	0,0625	0,125	0,25	0,5	1	2	4	8	16	32	64	128	256	512	1024
Gentamicin	124	1	0,8								98,4	0,8	0,8	0,0	0,0	0,0	0,0				
Neomycin (1)	92	1	1,1									97,8	1,1	0,0	0,0	1,1	0,0				
Kanamycin	124	1	0,8										98,4	0,8	0,0	0,0	0,0	0,8			
Spectinomycin (1)	92	4	4,3									0,0	0,0	0,0	2,2	78,3	15,2	0,0	4,3		
Streptomycin	124	88	71,0										5,6	16,9	5,6	0,8	0,8	70,2			
Chloramphenicol	124	5	4,0									0,0	21,8	71,0	3,2	0,0	0,0	4,0			
Florfenicol	124	5	4,0									0,0	54,8	39,5	1,6	2,4	0,0	1,6			
Cefotaxime (2)	32	0	0,0				65,6	28,1	6,3	0,0	0,0	0,0	0,0	0,0							
Ceftazidime (2)	32	0	0,0						65,6	34,4	0,0	0,0	0,0	0,0	0,0	0,0					
Ceftiofur (1)	92	0	0,0							56,5	41,3	2,2	0,0	0,0	0,0						
Nalidixic acid	124	2	1,6										88,7	8,9	0,8	0,0	0,0	1,6			
Ciprofloxacin	124	2	1,6			91,1	7,3	0,0	0,0	0,0	1,6	0,0	0,0	0,0							
Amoxicillin/Clavulanic acid (1)	92	40	43,5									41,3	15,2	40,2	3,3	0,0	0,0				
Ampicillin	124	85	68,5								25,0	6,5	0,0	0,0	0,0	0,0	68,5				
Colistin (3)	124													100,0	0,0	0,0					
Sulfamethoxazole	124	98	79,0													3,2	13,7	4,0	0,0	0,0	79,0
Trimethoprim (3)	124												90,3	0,0	0,0	0,0	9,7				
Tetracycline	124	97	78,2									21,0	0,8	0,0	0,0	2,4	75,8				

(1) Neomycin, spectinomycin, ceftiofur, amoxicillin/clavulanic acid were tested in the years 2000 to 2007 only.

(2) Cefotaxime and ceftazidime were tested in 2008 only.

(3) For colistin and trimethoprim no evaluation was performed as the lowest tested concentration was above the epidemiological cut-off value.

(4) The vertical lines demark the epidemiological cut-off values, which are the basis for the evaluation of microbiological resistance.

(5) The white areas demark the range tested. Isolates resistant to the highest concentration are given in the next concentration level. Values for the lowest concentration include isolates with MICs below the tested range.

13.4 Comparison of *Salmonella* isolates from animals and food

13.4.1 Comparison of the serovars from animals and food

Tab. 13.230: Comparison of the most frequent serovars from animals and meat thereof (2000–2008)

	Chicken	Chicken meat	Pig	Pork	Turkey	Turkey meat
	2927	1915	3820	1691	1235	851
S. Enteritidis	25,0	29,3	1,6	1,8	5,2	1,1
S. Typhimurium	8,2	9,2	67,9	53,6	10,8	16,9
S. 4,[5],12:i:-	1,1	0,3	8,6	9,0	0,4	1,8
S. Derby	0,2	0,1	7,8	9,8	0,2	1,4
S. Saintpaul	0,6	0,6	0,0	0,2	23,1	19,3
S. Heidelberg	0,3	0,5	0,0	0,0	15,1	8,2
S. 4,12:d:-	15,9	3,3	0,2	0,2	5,6	5,8
S. Paratyphi B dT+	7,7	23,6	0,0	0,2	0,2	0,4
Other serovars	41,0	33,1	13,7	25,3	39,5	45,2

13.4.1.1 Comparison of the resistance rates in *Salmonella* isolates from selected animal species and foodstuffs

Tab. 13.231: Comparison of the resistance rates of *S.* Typhimurium from animals and meat thereof (2000–2008)

Origin	Pig	Pork	Chicken	Chicken meat	Turkey	Turkey meat
Number of tested isolates	2595	906	239	177	133	144
Susceptible	7,7	19,5	35,6	63,8	12,0	18,1
Resistant	92,3	80,5	64,4	36,2	88,0	81,9
Multiresistant (3)	86,6	67,2	39,7	22,0	82,7	76,4
Gentamicin	5,4	0,8	0	0,0	0,8	4,9
Neomycin (1)	9,5	7,9	1,3	3,1	5,5	6,3
Kanamycin	10,1	7,9	1,3	2,8	6,0	7,6
Spectinomycin (1)	60,4	44,8	26,8	13,7	66,9	34,6
Streptomycin	80,4	58,1	31,0	17,5	73,7	60,4
Chloramphenicol	49,1	32,2	23,0	8,5	63,2	32,6
Florfenicol	44,9	28,3	22,6	7,3	60,2	29,2
Cefotaxime (2)	0,4	0,0	0	0,0	0,0	0,0
Ceftazidime (2)	0,0	0,0	0	0,0	0,0	0,0
Ceftiofur (1)	0,4	0,4	0	1,2	0,0	1,6
Nalidixic acid	3,4	3,1	9,6	9,6	0,8	22,9
Ciprofloxacin	4,2	3,4	3,3	9,6	1,5	22,9
Amoxicillin/Clavulanic acid (1)	76,8	55,1	27,2	17,4	81,1	66,9
Ampicillin	80,4	59,4	28,5	18,6	80,5	70,8
Sulfamethoxazole	88,7	69,1	62,3	33,3	87,2	73,6
Trimethoprim (2)	32,8	19,7	0	6,3	0,0	17,6
Tetracycline	82,8	68,9	30,1	18,6	78,9	73,6

(1) Antimicrobials were tested from 2000 to 2007; (2) antimicrobials were tested/evaluated since 2007;
(3) resistance to more than one class of antimicrobials.

Tab. 13.232: Comparison of the resistance rates of *S.* Enteritidis from animals and meat thereof (2000–2008)

Origin	Pig	Pork	Chicken	Chicken meat	Turkey	Turkey meat
Number of tested isolates	62	30	731	561	64	9
Susceptible	93,5	80,0	77,7	81,5	84,4	66,7
Resistant	6,5	20,0	22,3	18,5	15,6	33,3
Multiresistant (3)	4,8	0	4,0	2,5	6,3	11,1
Gentamicin	0,0	0	1,6	0,9	1,6	11,1
Neomycin (1)	0,0	0	0,2	0,0	1,6	0,0
Kanamycin	0,0	0	0,4	0,0	1,6	11,1
Spectinomycin (1)	4,2	0	2,1	0,6	3,2	11,1
Streptomycin	0,0	0	2,2	1,4	1,6	11,1
Chloramphenicol	1,6	0	0,3	0,0	1,6	11,1
Florfenicol	1,6	0	0,1	0,0	0,0	0,0
Cefotaxime (2)	0,0	-	0	0,0	0,0	-
Ceftazidime (2)	0,0	-	0	0,0	0,0	-
Ceftiofur (1)	2,1	0	0,2	0,2	0,0	0,0
Nalidixic acid	0,0	0	9,2	7,0	4,7	22,2
Ciprofloxacin	0,0	0	9,3	7,7	4,7	22,2
Amoxicillin/Clavulanic acid (1)	2,1	0	2,4	1,9	0,0	0,0
Ampicillin	1,6	0	2,2	2,0	0,0	0,0
Sulfamethoxazole	4,8	20,0	11,8	9,3	12,5	11,1
Trimethoprim (2)	0,0	-	0	0,0	0,0	-
Tetracycline	3,2	0	1,5	0,4	1,6	0,0

(1) Antimicrobials were tested from 2000 to 2007; (2) antimicrobials were tested/evaluated since 2007;
(3) resistance to more than one class of antimicrobials.

Tab. 13.233: Comparison of the resistance rates of *S.* Derby and *S.* 4,[5],12:i:- from pig and pork (2000–2008)

Serovar	*S.* 4,[5],12:i:-		*S.* Derby	
Origin	Pig	Pork	Pig	Pork
Number of tested isolates	330	152	299	166
Susceptible	3,0	4,6	47,2	57,2
Resistant	97,0	95,4	52,8	42,8
Multiresistant (3)	86,4	82,9	28,1	21,1
Gentamicin	2,1	3,9	0,7	0,6
Neomycin (1)	6,0	0,8	6,2	1,4
Kanamycin	6,4	1,3	5,0	1,2
Spectinomycin (1)	13,0	17,4	16,9	9,5
Streptomycin	82,4	77,6	20,1	9,0
Chloramphenicol	7,9	10,5	3,3	1,2
Florfenicol	4,2	4,6	1,7	0,6
Cefotaxime (2)	0,0	0,0	0,0	0,0
Ceftazidime (2)	0,0	0,0	0,0	0,0
Ceftiofur (1)	0,9	2,5	0,8	0,0
Nalidixic acid	2,1	2,6	1,3	0,6
Ciprofloxacin	4,5	3,9	1,3	0,6
Amoxicillin/Clavulanic acid (1)	68,5	65,3	10,7	6,8
Ampicillin	83,0	76,3	11,7	7,2
Sulfamethoxazole	84,8	80,9	31,4	22,9
Trimethoprim (2)	12,3	3,1	31,6	16,7
Tetracycline	91,5	91,4	32,8	33,1

(1) Antimicrobials were tested from 2000 to 2007; (2) antimicrobials were tested/evaluated since 2007; (3) resistance to more than one class of antimicrobials.

Tab. 13.234: Comparison of the resistance rates of *S*. 4,12:d:- and *S*. Paratyphi B dT+ from chicken and chicken meat (2000–2008)

Serovar	*S*. 4,12:d:-		*S*. Paratyphi B dT+	
Origin	Chicken	Chicken meat	Chicken	Chicken meat
Number of tested isolates	464	64	226	452
Susceptible	58,8	90,6	0,4	0,0
Resistant	41,2	9,4	99,6	100,0
Multiresistant (3)	4,3	0,0	84,1	92,5
Gentamicin	0,2	0,0	0,4	2,0
Neomycin (1)	0	0,0	2,3	2,1
Kanamycin	0,2	0,0	2,7	2,9
Spectinomycin (1)	2,0	0,0	99,5	99,5
Streptomycin	0,9	0,0	17,3	28,8
Chloramphenicol	0	0,0	1,8	2,4
Florfenicol	0	0,0	0	0,4
Cefotaxime (2)	0	0,0	18,2	12,9
Ceftazidime (2)	0	0,0	18,2	12,9
Ceftiofur (1)	0	0,0	0,9	6,9
Nalidixic acid	0	0,0	59,7	57,5
Ciprofloxacin	0,6	0,0	61,5	58,8
Amoxicillin/Clavulanic acid (1)	2,3	0,0	22,3	48,5
Ampicillin	2,2	0,0	26,1	48,2
Sulfamethoxazole	39,9	9,4	56,6	66,8
Trimethoprim (2)	0	0,0	100,0	100
Tetracycline	0,2	0,0	9,3	17,0

(1) Antimicrobials were tested from 2000 to 2007; (2) antimicrobials were tested/evaluated since 2007; (3) resistance to more than one class of antimicrobials.

Tab. 13.235: Comparison of the resistance rates of *S.* Saintpaul and *S.* Heidelberg from turkey and turkey meat (2000–2008)

Serovar	*S*. Saintpaul		*S*. Heidelberg	
Origin	Turkey	Turkey meat	Turkey	Turkey meat
Number of tested isolates	285	164	186	70
Susceptible	4,2	8,5	28,0	27,1
Resistant	95,8	91,5	72,0	72,9
Multiresistant (3)	92,6	85,4	60,8	60,0
Gentamicin	83,5	63,4	17,2	4,3
Neomycin (1)	6,3	5,7	14,5	10,0
Kanamycin	85,3	60,4	18,3	10,0
Spectinomycin (1)	85,8	73,8	43,0	34,3
Streptomycin	58,9	48,8	26,9	28,6
Chloramphenicol	8,4	17,1	22,0	30,0
Florfenicol	3,5	7,9	5,9	0,0
Cefotaxime (2)	0,0	0,0	-	-
Ceftazidime (2)	0,0	0,0	-	-
Ceftiofur (1)	26,8	25,5	0,5	0,0
Nalidixic acid	84,2	75,0	0,0	22,9
Ciprofloxacin	84,2	78,7	2,7	22,9
Amoxicillin/Clavulanic acid (1)	90,6	72,3	38,2	45,7
Ampicillin	93,0	73,8	40,9	47,1
Sulfamethoxazole	91,9	79,3	54,3	41,4
Trimethoprim (2)	6,5	8,7	-	-
Tetracycline	17,2	31,7	38,7	45,7

(1) Antimicrobials were tested from 2000 to 2007; (2) antimicrobials were tested/evaluated since 2007; (3) resistance to more than one class of antimicrobials.

14 Glossary

DNA-Probe — A DNA-Probe is a small synthetic DNA fragment designed to bind to a specific target sequence.

Endemic — Prevalent in a population in a given time period

Epidemiological cut-off (-value) — When testing the minimum inhibitory concentration, the epidemiological cut-off value is an interpretive criterion used for monitoring purposes to classify isolates as wildtype or non-wildtype (see below). In this report, non-wildtype isolates are addressed as resistant.

Gene cassette — Gene cassettes are discrete genetic elements. They may exist as free, circular, non-replicating DNA molecules when moving from one genetic site to another. They are normally found as linear sequences that constitute part of a larger DNA molecule, such as a plasmid or bacterial chromosome. Gene cassettes normally contain only a single gene and an additional short sequence, called a 59 base element that functions as a specific recombination site. Accordingly, the cassettes are small, normally in the order of 500–1000 bp. The genes carried on gene cassettes usually lack promoters and are expressed from a promoter on the integron.

Genomic island — Genomic islands are parts of the genome that used to be mobile and are now fixed. Some genomic islands can excise themselves spontaneously from the chromosome and can be transferred to other suitable recipients. They can encode many functions, for example antibiotic resistance as in *Salmonella* genomic island I.

Integron — An integron is a genetic element that possesses a site, *attI*, at which additional DNA, in the form of gene cassettes, can be integrated by site-specific recombination, and which encodes the enzyme integrase that mediates these site-specific recombination events.

Clinical breakpoint — MIC that will allow for successful treatment considering pharmacokinetics, pharmacodynamics and clinical aspects. Clinical breakpoints need to be defined specifically for the pathogen/tissue/animal species combination. They are defined by international bodies (eg CLSI or EUCAST).

Clone — A cell, group of cells, or organism that is descended from and genetically identical to a single common ancestor, such as a bacterial colony whose members arose from a single original cell.

Commensals — Bacteria colonizing the host without doing harm.

Microarray	Microarrays are molecular biological examination systems that can be used for the simultaneous analysis of several thousand probe sets (genes for example) in a biological sample.
Minimum inhibitory concentration (MIC)	The minimal concentration of a substance that inhibits bacterial growth.
Multiresistant	In this report an isolate was considered multiresistant if it was resistant to more than one antimicrobial class.
Plasmid	Plasmids are extrachromosomal, often circular mobile genetic elements able to replicate independently from the chromosomal DNA. They encode antibiotic resistance and metabolic or virulence characteristics, and are often associated with horizontal gene transfer.
Polymerase chain reaction (PCR)	PCR is a method to amplify a few copies of DNA based on the enzyme DNA-polymerase. The method relies on thermal cycling, consisting of cycles of repeated heating and cooling for DNA melting and enzymatic replication of the DNA, resulting in amplification across several orders of magnitude.
Primers	Primers are short DNA sequences designed to match specific sites used as a starting point in PCR, for example.
Real time PCR, RT-PCR	RT-PCR is a PCR method that allows quantification of the amplified DNA sequence, commonly in real time.
Resistant	An isolate was considered resistant if its MIC was above the epidemiological cut-off value.
Susceptible / Susceptibility	An isolate was considered susceptible if its MIC was equal to or lower than the epidemiological cut-off value. Without reference to a specific substance it refers to isolates that were considered susceptible to all tested substances.
SGI 1	*Salmonella* genomic island is a 43-kb genomic region that contains many drug resistance genes along with two class 1 integrons. SGI1 has been found in *Salmonella enterica* serovars and their serologic variants, such as *S.* Agona, *S.* Paratyphi B, *S.* Newport, *S.* Albany and *S.* Meleagridis, suggesting horizontal gene transfer of this region. Common resistance genes found on SGI1 are *bla*$_{PSE-1}$ for ampicillin, *floR* for chloramphenicol/florfenicol, *aadA2* for streptomycin/spectinomycin, *tet[*G] for tetracycline and *sul1* for resistance to sulfonamides.

Transposon	Transposons are mobile genetic elements able to change their position within the genome of a single cell. The mechanism of transposition can be either "copy and paste" or "cut and paste".
Wild-type population (Definition by EUCAST)	A micro-organism is defined as wild-type (WT) for a bacterial species by the absence of acquired and mutational resistance mechanisms to the drug in question A micro-organism is categorized as wild-type (WT) for a species by applying the appropriate cut-off value in a defined phenotypic test system. This cut-off value will not be altered by changing circumstances Wild-type micro-organisms may or may not respond clinically to antimicrobial treatment
Zoonosis	'Zoonosis' means any disease and/or infection which is naturally transmissible directly or indirectly between animals and humans; (Dir 2003/99/EC).
Zoonotic agents	'Zoonotic agent' means any virus, bacterium, fungus, parasite or other biological entity which is likely to cause a zoonosis; (Dir 2003/99/EC).

Publications that have already appeared in the BfR-Wissenschaft series

01/2004 Edited by L. Ellerbroek, H. Wichmann-Schauer, K. N. Mac
Methoden zur Identifizierung und Isolierung von Enterokokken und deren Resistenzbestimmung
€ 5,-

02/2004 Edited by M. Hartung
Epidemiologische Situation der Zoonosen in Deutschland im Jahr 2002
€ 15,-

03/2004 Edited by A. Domke, R. Großklaus, B. Niemann, H. Przyrembel, K. Richter, E. Schmidt, A. Weißenborn, B. Wörner, R. Ziegenhagen
Verwendung von Vitaminen in Lebensmitteln – Toxikologische und ernährungsphysiologische Aspekte
€ 15,-

04/2004 Edited by A. Domke, R. Großklaus, B. Niemann, H. Przyrembel, K. Richter, E. Schmidt, A. Weißenborn, B. Wörner, R. Ziegenhagen
Verwendung von Mineralstoffen in Lebensmitteln – Toxikologische und ernährungsphysiologische Aspekte
€ 15,-

05/2004 Edited by M. Hartung
Epidemiologische Situation der Zoonosen in Deutschland im Jahr 2003
€ 15,-

01/2005 Edited by A. Weißenborn, M. Burger, G. B. M. Mensink, C. Klemm, W. Sichert-Hellert, M. Kersting und H. Przyrembel
Folsäureversorgung der deutschen Bevölkerung – Abschlussbericht zum Forschungsvorhaben
€ 10,-

02/2005 Edited by R. F. Hertel, G. Henseler
ERiK – Entwicklung eines mehrstufigen Verfahrens der Risikokommunikation
€ 10,-

03/2005 Edited by P. Luber, E. Bartelt
Campylobacteriose durch Hähnchenfleisch
Eine quantitative Risikoabschätzung
€ 5,-

04/2005 Edited by A. Domke, R. Großklaus, B. Niemann. H. Przyrembel, K. Richter, E. Schmidt, A. Weißenborn, B. Wörner, R. Ziegenhagen
Use of Vitamins in Foods
Toxicological and nutritional-physiological aspects
€ 15,-

01/2006 Edited by A. Domke, R. Großklaus, B. Niemann, H. Przyrembel, K. Richter, E. Schmidt, A. Weißenborn, B. Wörner, R. Ziegenhagen
Use of Minerals in Foods
Toxicological and nutritional-physiological aspects
€ 15,-

02/2006 Edited by A. Schulte, U. Bernauer, S. Madle, H. Mielke, U. Herbst, H.-B. Richter-Reichhelm, K.-E. Appel, U. Gundert-Remy
Assessment of the Carcinogenicity of Formaldehyde
€ 10,-

03/2006 Edited by W. Lingk, H. Reifenstein, D. Westphal, E. Plattner
Humanexposition bei Holzschutzmitteln – Abschlussbericht zum Forschungsvorhaben
€ 5,-

04/2006 Edited by M. Hartung
Epidemiologische Situation der Zoonosen in Deutschland im Jahr 2004
€ 15,-

05/2006 Edited by J. Zagon, G. Crnogorac, L. Kroh, M. Lahrssen-Wiederholt, H. Broll
Nachweis von gentechnisch veränderten Futtermitteln – Eine Studie zur Anwendbarkeit von Verfahren aus der Lebensmittelanalytik
€ 10,-

06/2006 Edited by A. Weißenborn, M. Burger, G. B. M. Mensink, C. Klemm, W. Sichert-Hellert, M. Kersting, H. Przyrembel
Folic acid intake of the German population – Final report on the research project
€ 10,-

01/2007 Edited by A. Epp, R. Hertel, G.-F. Böl
Acrylamid in Lebensmitteln – Ändert Risikokommunikation das Verbraucherverhalten?
€ 5,-

02/2007 Edited by B. Niemann, C. Sommerfeld, A. Hembeck, C. Bergmann
Lebensmittel mit Pflanzensterinzusatz in der Wahrnehmung der Verbraucher – Projektbericht über ein Gemeinschaftsprojekt der Verbraucherzentralen und des BfR
€ 5,-

03/2007 Edited by M. Hartung
Epidemiologische Situation der Zoonosen in Deutschland im Jahr 2005
€ 15,-

04/2007 Edited by R. F. Hertel, G. Henseler
ERiK – Development of a multi-stage risk communication process
€ 10,-

05/2007 Edited by B. Niemann, C. Sommerfeld, A. Hembeck, C. Bergmann
Plant sterol enriched foods as perceived by consumers
Project report on a joint project of consumer advice centres and BfR
€ 5,-

01/2008 Edited by A. Epp, R. Hertel, G.-F. Böl
Formen und Folgen behördlicher Risikokommunikation
€ 5,-

02/2008 Edited by T. Höfer, U. Gundert-Remy, A. Epp, G.-F. Böl
REACH: Kommunikation zum gesundheitlichen Verbraucherschutz
€ 10,-

03/2008 Edited by R. Zimmer, R. Hertel, G.-F. Böl
BfR-Verbraucherkonferenz Nanotechnologie
Modellprojekt zur Erfassung der Risikowahrnehmung bei Verbrauchern
€ 5,-

04/2008 Edited by M. Hartung
Erreger von Zoonosen in Deutschland im Jahr 2006
Mitteilungen der Länder zu Lebensmitteln, Tieren, Futtermitteln und Umweltproben
€ 15,-

052008 Edited by R. Zimmer, R. Hertel, G.-F. Böl
Wahrnehmung der Nanotechnologie in der Bevölkerung
Repräsentativerhebung und morphologisch-psychologische Grundlagenstudie
€ 10,-

06/2008 Edited by Thomas Höfer, Ursula Gundert-Remy, Astrid Epp, Gaby-Fleur Böl
REACH: Communication on Consumer Health Protection
€ 10;-

07/2008 Edited by René Zimmer, Rolf Hertel, Gaby-Fleur Böl
Risikowahrnehmung beim Thema Nanotechnologie
Analyse der Medienberichterstattung
€ 10,-

08/2008 Edited by H. Mielke, H. Schneider, D. Westphal, S. Uhlig, K. Simon, S. Antoni, E. Plattner
Humanexposition bei Holzschutzmitteln
Neufassung der Gesamtauswertung von Haupt- und Ergänzungsstudie in deutscher und englischer Sprache
€ 10,-

01/2009 Edited by R. Zimmer, R. Hertel, G.-F. Böl
Public Perceptions about Nanotechnology
Representative survey and basic morphological-psychological study
€ 10,-

02/2009 Edited by E. Ulbig, R. F. Hertel, G.-F. Böl
Evaluierung der Kommunikation über die Unterschiede zwischen „risk“ und „hazard“ – Abschlussbericht
€ 5;-

03/2009 Edited by René Zimmer, Rolf Hertel, Gaby-Fleur Böl
BfR Consumer Conference Nanotechnology
Pilot project to identify consumer risk perception
€ 5,-

04/2009 Edited by René Zimmer, Rolf Hertel, Gaby-Fleur Böl
BfR-Delphi-Studie zur Nanotechnologie
Expertenbefragung zum Einsatz von Nanotechnologie in Lebensmitteln und Verbraucherprodukten
€ 10,-

05/2009 Edited by M. Hartung
Erreger von Zoonosen in Deutschland im Jahr 2007
Mitteilungen der Länder zu Lebensmitteln, Tieren, Futtermitteln und Umweltproben
€ 15,-

01/2010 Edited by E. Ulbig, R. F. Hertel, G.-F. Böl
Kommunikation von Risiko und Gefährdungspotenzial aus Sicht verschiedener Stakeholder – Abschlussbericht
€ 10,-

02/2010 Edited by E. Ulbig, R. F. Hertel, G.-F. Böl
Evaluation of Communication on the Differences between „Risk" and „Hazard"
Final Report
€ 5,-

03/2010 Edited by A. Epp, R. F. Hertel, G.-F. Böl
Chemie im Alltag
Eine repräsentative Befragung deutscher Verbraucherinnen und Verbraucher
€ 10,-

04/2010 Edited by G.-F. Böl, A. Epp, R. F. Hertel
Wahrnehmung der Nanotechnologie in internetgestützten Diskussionen
Ergebnisse einer Onlinediskursanalyse zu Risiken und Chancen von Nanotechnologie und Nanoprodukten
€ 10,-

05/2010 Edited by A. Epp, S. Kurzenhäuser, R. Hertel, G.-F. Böl
Grenzen und Möglichkeiten der Verbraucherinformation durch Produktkennzeichnung
€ 15,-

06/2010 Edited by M. Hartung
Erreger von Zoonosen in Deutschland im Jahr 2008
Mitteilungen der Länder zu Lebensmitteln, Tieren, Futtermitteln und Umweltproben
€ 15,-

07/2010 Edited by A. Epp, B. Michalski, U. Banasiak, G.-F. Böl
Pflanzenschutzmittel-Rückstände in Lebensmitteln
Die Wahrnehmung der deutschen Bevölkerung – Ein Ergebnisbericht
€ 10,-

08/2010 Edited by G.-F. Böl, A. Epp, R. Hertel
Perception of Nanotechnology in Internet-based Discussions
The risks and opportunities of nanotechnology and nanoproducts: results of an online discourse analysis
€ 10,-

09/2010 Edited by R. Zimmer, R. Hertel, G.-F. Böl
BfR Delphi Study on Nanotechnology
Expert Survey of the Use of Nanomaterials in Food and Consumer Products
€ 10,-

10/2010 Edited by R. Zimmer, R. Hertel, G.-F. Böl
Risk Perception of Nanotechnology
Analysis of Media Coverage
€ 10,-

11/2010 Edited by E. Ulbig, R. F. Hertel, G.-F. Böl
Communication of Risk and Hazard from the Angle of Different Stakeholders
Final Report
€ 10,-

12/2010 Edited by A. Schroeter, A. Käsbohrer
Deutsche Antibiotika-Resistenzsituation in der Lebensmittelkette – DARLink
€ 20,-

13/2010 Edited by S. Kurzenhäuser, A. Epp, R. Hertel, G.-F. Böl
Effekte der Risikokommunikation auf Risikowahrnehmung und Risikoverständnis von Zielgruppen
Verständlichkeit, Transparenz und Nutzbarkeit von fachlichen Stellungnahmen des Bundesinstituts für Risikobewertung zur Lebensmittelsicherheit

01/2011 Edited by M. Hartung, A. Käsbohrer
Erreger von Zoonosen in Deutschland im Jahr 2009

The publications in the BfR-Wissenschaft series are available from:

Federal Institute for Risk Assessment
Press Office
Thielallee 88–92
D-14195 Berlin

Fax: +49-(0)30-18412-4970
E-Mail: publikationen@bfr.bund.de