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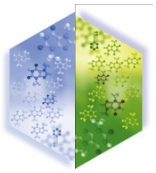

Wie wappnet man sich für die Krise?

15. Juni 2012 ♦ BfR Berlin

Reinhard Matissek
Lebensmittelchemisches Institut des BDSI, Köln

LCI

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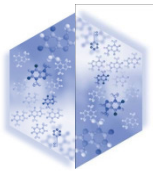

Wie wappnet man sich für die Krise?

dargestellt am Beispiel LCI

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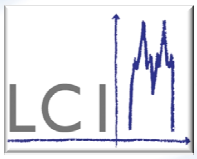
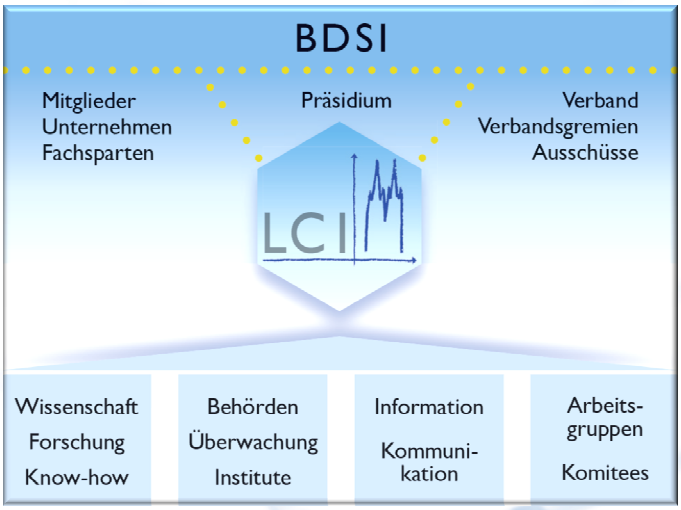
Das LCI.

Lebensmittelchemisches Institut

- Wissenschaftliche Einrichtung der Süßwarenindustrie (BDSI) für Forschungsfragen sowie Lebensmittelsicherheit & Gesundheit
- Gefahrenabwehr
  Krisenmanagement
  Frühwarnsystem
- Gegründet 1950
- Sitz in Köln





Vertretene Lebensmittelkategorien

Kakao & Schokolade | Bonbons & Zuckerwaren | Feine Backwaren | Knabber-artikel | Rohmassen | Markeneis | Kaugummi

BDSI
Bundesverband der Deutschen Süßwarenindustrie e.V.

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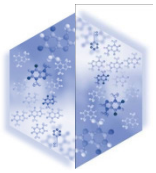

Wie wappnet man sich für die Krise?

- Generelle Aspekte

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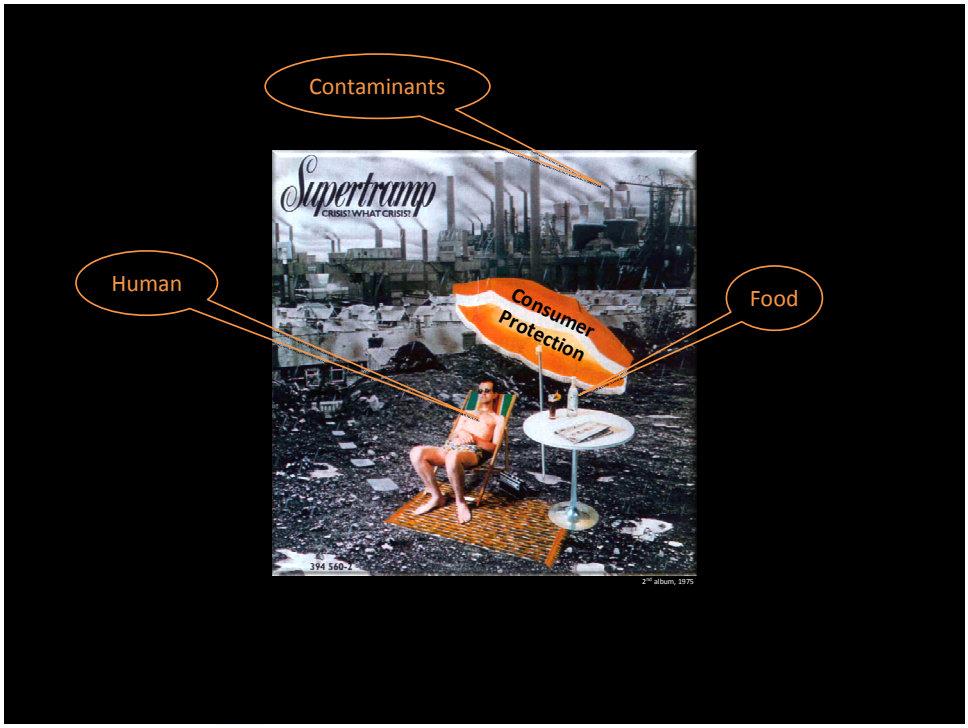

Before Crisis: Capacity Building

Brain & Money

Brain

Network

Competence

Team

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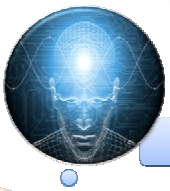
Money



Information

Infrastructure

Equipment

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60 JAHRE LCI in 2010

Sustainable Capacity Building

History of Institute.
Future of Institute.


1950


2010


20XX

Retrospective Sustainability ⧗ Sustainable Development

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During a Crisis: *actio et reactio*

More & More Money & More Human Resources

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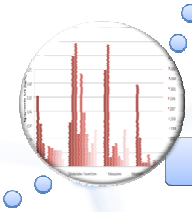
During a Crisis: *actio et reactio*

Accuracy & Communication

Accuracy

Assessment



Statistics

Methodology

Communication

Media

Target Groups

Message – Wording

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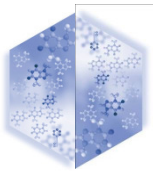

Wie wappnet man sich für die Krise?

Beispiel: Prozesskontaminanten

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Process Contaminants

Substances present in Food as a Result of Food Processing/Preparation that considered to exert Adverse Toxicological Effects in Human.

[LINEBACK D, STADLER R in Process Toxicants, 2009]

- Reaction Products depending on Processes and Conditions such as, Heat Processing, Fermentation, Irradation …
- Reaction Products can have
  - **Beneficial Properties** (Antioxidants, Anticarcinogens, Flavour…) and/or
  - **Toxicological Effects** (Carcinogens, Genotoxicants …)

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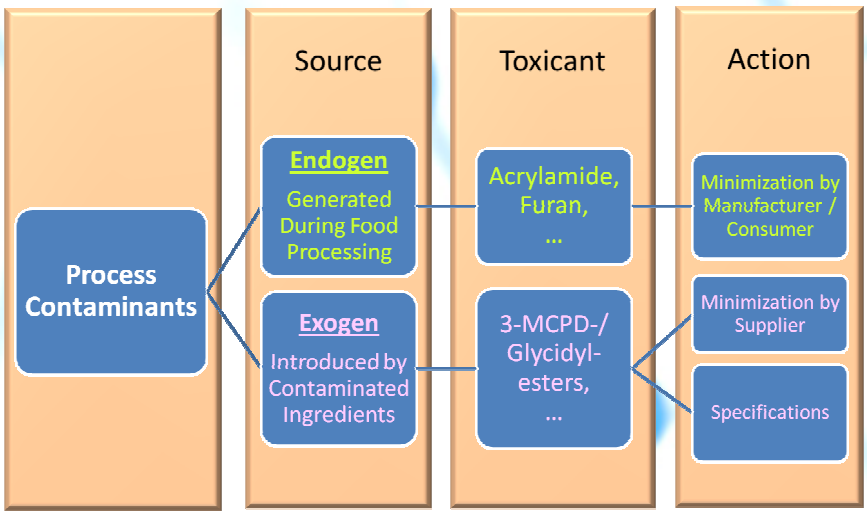
Classification of Process Contaminants



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Heat-induced Substances in Foods

Synonyms

- Heat-generated Reaction Products
- Foodborne Toxicants/Processing Toxicants
- Process Contaminants
- Heat-generated Food Contaminants (HEATOX)

means all the same

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means all the same

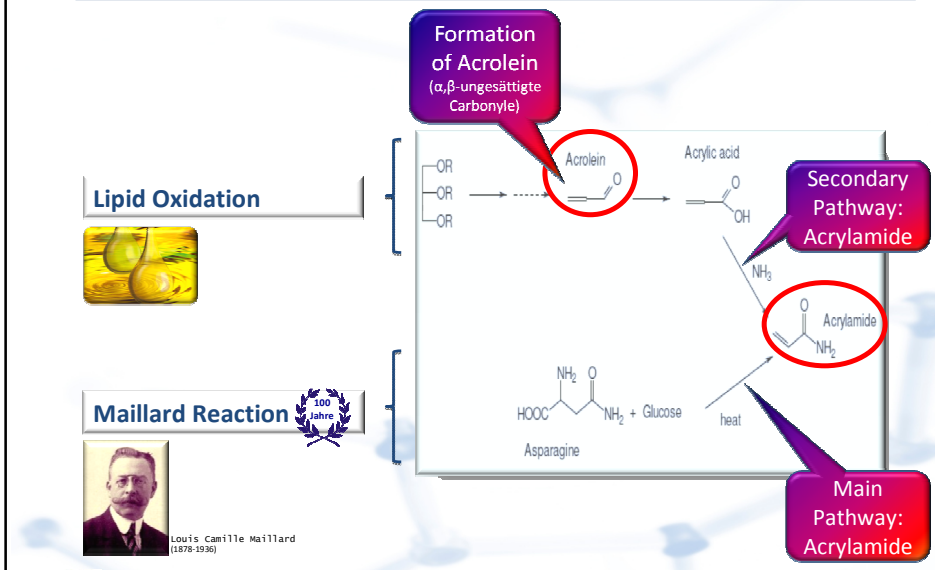
Diversity

- Different Chemical Classes, including Alcohols, Aldehydes, Hydrocarbons, Furans, Ketones, Imidazoles, Pyrazines, Pyridines, Pyrroles, Thiazoles and Thiophenes, as well as a Variety of S-, N- and O-containing Compounds

Two Main Groups

- **Maillard Reaction Products**
- interrelated
- **Lipid Oxidation Products**

e.g. Acrylamide: Routes of Formation



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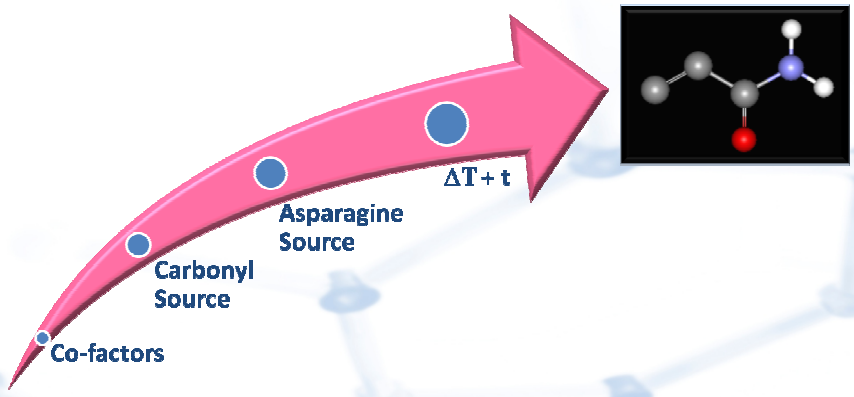
Generation of Acrylamide

Main Pathway



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IARC Classification

International Agency for Research on Cancer Centre International de Recherche sur le Cancer		Examples
Group 1	Carcinogenic to humans	Ethanol, Aflatoxins, Cd, As, Benzene
Group 2A	Probably carcinogenic to humans	Acrylamide Ethyl Carbamate
Group 2B	Possibly carcinogenic to humans	Ochratoxin, Pb, Furan, 4-MEI*
Group 3	Not classifiable	Patulin, Nivalenol
Group 4	Probably not carcinogenic to humans	

*) new in 2010

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Aufstockung der Kapazität

Schnelle, nachhaltige Entscheidungen bereits am 23.5.2002

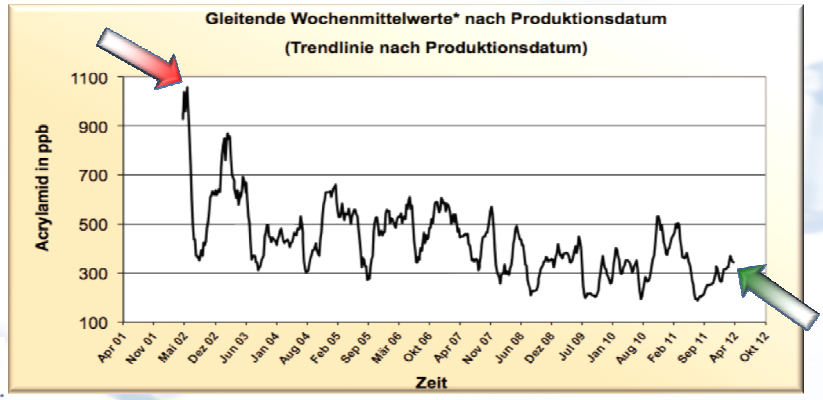
Aufstockung der Kapazität

Schnelle, nachhaltige Entscheidungen bereits am 23.5.2002

Acrylamid

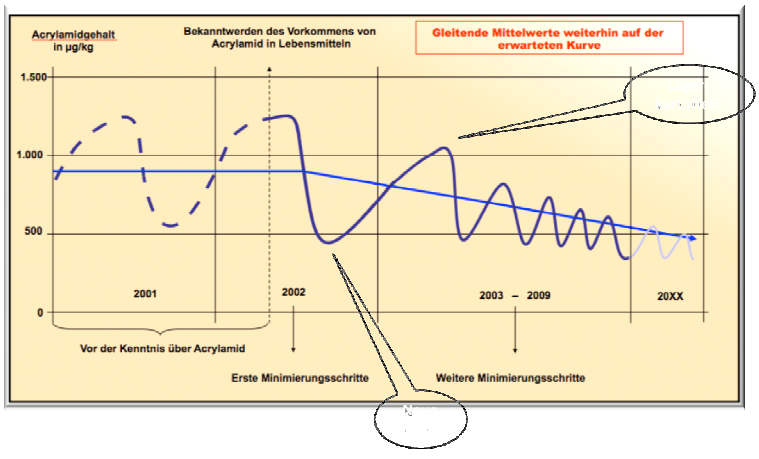
2002–2012

- **Sehr erfolgreiche Minimierung** des Acrylamidgehaltes: Koordinierungskreise aller Produktkategorien im BDSI seit 2002
- Aktueller Stand – Deutsche Kartoffelchipshersteller: www.lci-koeln.de



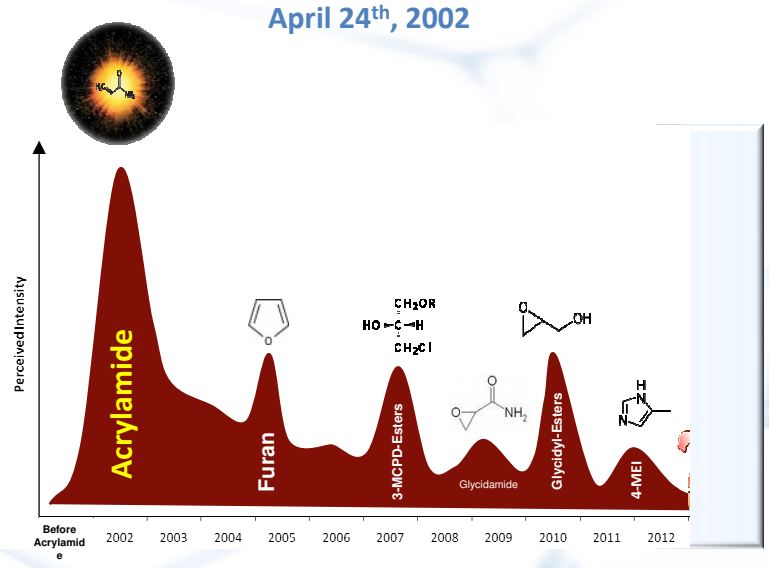
Minimierung von Acrylamid in Kartoffelchips

Hypothetische Trendlinie



„The Big Bang"

April 24th, 2002



theheatoxproject

approx. 800 Compounds
generated by Maillard Reaction resp.
Lipid Oxidation identified

[Cotterill et al., Food and Chemical Toxicology 46 (2008) 1905 -1918]

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« TOP 50 »

Table 4
Predicted toxicities and other available information for compounds predicted to be potentially harmful by both Topkat® and DEREK® (rows in bold indicate also evidence of carcinogenicity or genotoxic effects in the literature)

Compound name, CAS number (chemical class)	Route of formation	Predicted Toxicity (TOPKAT)			Toxicity alerts (DEREK)	Other available toxicity information
		Carcinogenicity[a]	Mutagenicity[b]	Rat oral LD_{50} (mg/kg)		
2-Propenal, CAS no. 107-02-8 (Aldehyde)	**Lipid oxidation**		+	50	Mutagenicity, skin sensitisation, irritation (skin, eye and respiratory tract)	Negative for carcinogenicity studies, positive for some AMES mutagenicity studies (CCRIS). Positive mutagenicity study (GENETOX). Possible human carcinogen (HSDB). Rat oral LD_{50} = 26 mg/kg
Acrylamide, CAS no. 79-06-1 (Misc. O-containing)	**Maillard reaction**	–	+	156	Chromosome damage, neurotoxicity, skin sensitisation	Positive for carcinogenicity studies in mice and rats; positive for mouse lymphoma studies but negative for AMES mutagenicity tests (CCRIS). Carcinogenic to animals, probably carcinogenic in humans (HSDB). Positive in one mutagenicity study (GENE-TOX)
[*E*,*E*]-2,4-Hexadienal, CAS no. 142-83-6 (Aldehyde)	**Lipid oxidation**		+	241	Mutagenicity, skin sensitisation, irritation (skin, eye and respiratory tract)	Positive for 1 out of 2 mouse lymphoma and 4 out of 18 AMES mutagenicity studies (CCRIS). Rat oral LD_{50} = 300 mg/kg
2-Amino-6-methylpyridine, CAS no. 1824-81-3 (Pyridine)	Maillard reaction	+		497	Carcinogenicity, skin sensitisation	No information available on carcinogenicity or
1-Penten-3-one, CAS no. 1629-58-9 (Ketone)	**Lipid oxidation**	–				(CCRIS)
2-Amino-3-methylpyridine, CAS no. 1603-40-3 (Pyridine)	Maillard reaction	+	i			
2,3,4,5-Tetramethyl-2-cyclopenten-1-one, CAS no. 54458-61-6 (Ketone)	Maillard reaction	–	+			
1-(5-Methyl-2-furyl)-1-buten-3-one, CAS no. 23120-57-2 (Furan)	Maillard reaction	+	–			
4-(2-Formyl-5-methyl-1-pyrrolyl)butanoic acid, CAS no. 61837-44-3 (Pyrrole)	Maillard reaction	i	+			
(*E* and *Z*)-1-(2-Furyl)-1-buten-3-one, CAS no. 623-15-4 (Furan)	Maillard reaction	+	–			
4H-Pyran-4-one, CAS no. 108-97-4 (Ketone)	Maillard reaction	+	–	1700		

- Extract out of 53 HEATOX Compounds predicted as harmful (carcinogenic / mutagenic)

☛ 2nd Place: ACRYLAMIDE

[Cotterill et al., Food and Chemical Toxicology 46 (2008) 1905 -1918]

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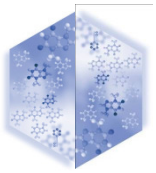
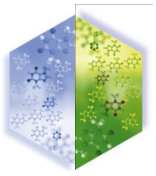


Wie wappnet man sich für die Krise?

Fazit

Forschung...



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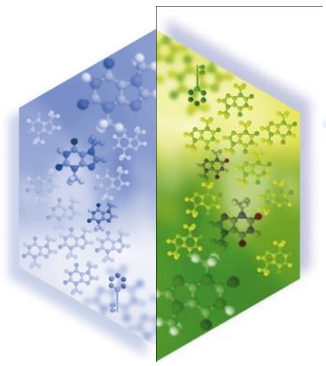
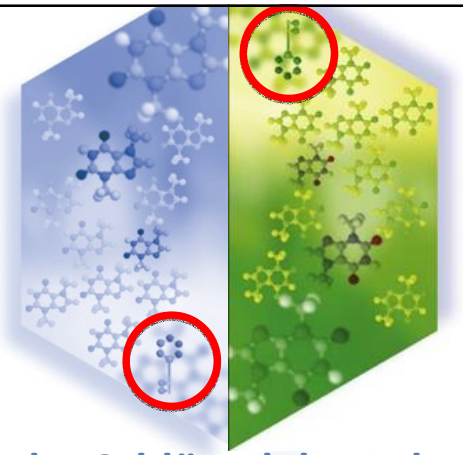
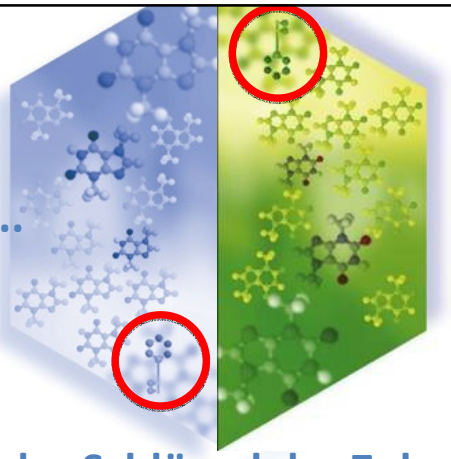


...ist der Schlüssel



...ist der Schlüssel der Zukunft!

Forschung…



…ist der Schlüssel der Zukunft!

…braucht Geld und Nachhaltigkeit!

…erst dann ist man für Krisen gewappnet!

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Forschen nicht nur für die Krise!

Sondern auch…

…und dafür, dass wir genießen können!

60 Jahre

Lebensmittelchemisches Institut

"Weil der Schöpfer dem Menschen die Verpflichtung auferlegte
zu essen, um zu leben,
gab er ihm den Appetit
und belohnte ihn durch den Genuss."

Brillat-Savarin, 18. Jahrhundert