

What's in our food: first results of the BfR MEAL study

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Why do we need Total Diet Studies?

Consumption surveys

- 24h-recall
- Dietary history interview
- Food Frequency Questionnaire
- Dietary record
- Duplicate method



Level of substances

- Food monitoring
- Total Diet Studies
- Data sets, depending on the substance group

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Assessment of dietary exposure

→ Aim of TDS: Representative database for occurrence levels of mostly consumed foods for a population

What are Total Diet Studies?



Criterion 1

- Representative for the (German) population
- Covers 90 % of the German diet
- Includes highly contaminated foods, although they are consumed rarely (< 10 %)



Criterion 2

- Foods are prepared as consumed



Criterion 3

- Similar foods are pooled together to one sample to reduce the number of samples

What is the BfR MEAL Study?

Mahlzeiten für die
Expositionsschätzung und
Analytik von
Lebensmitteln

[Meals for Exposure assessment and
Analysis of foods]

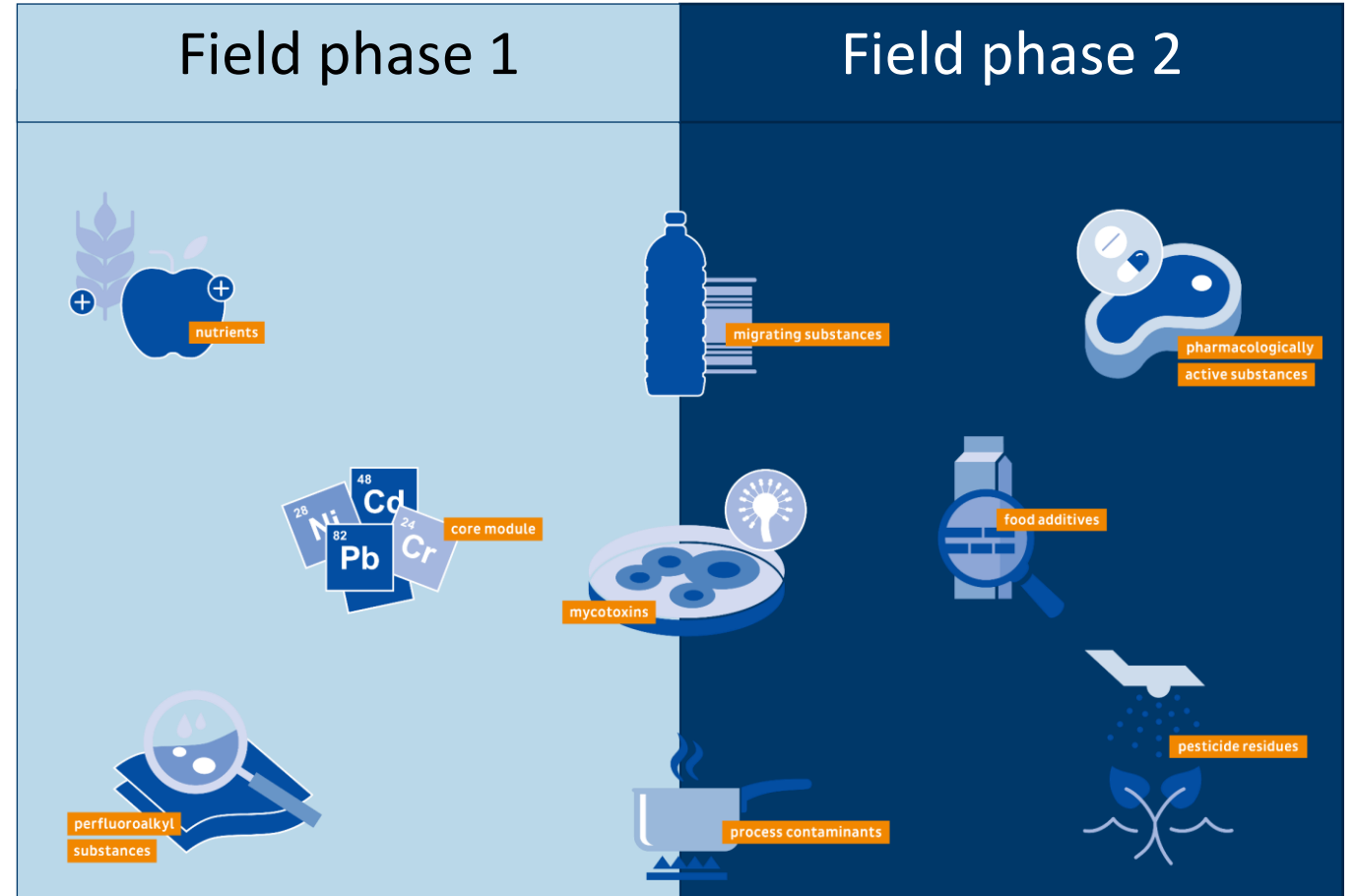
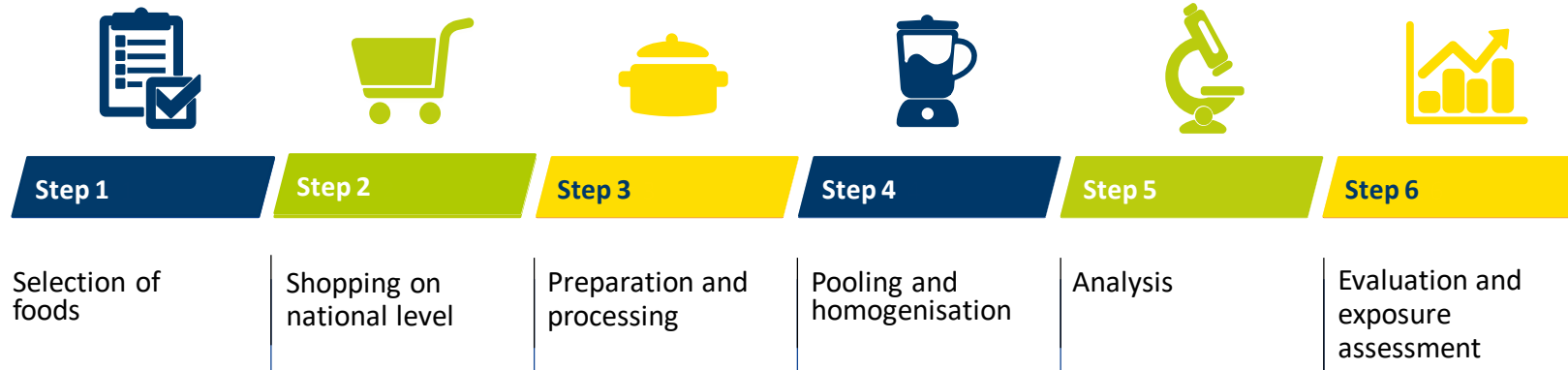


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Process of the BfR MEAL Study



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**BfR
MEAL Studie**
Was im Essen steckt

- ~ **60.000** Food items
- ~ **9.000** Recepties
- 336** Analysed substances
- > **140.000** Results



Step 1



Step 2

Selection of foods

19

- Main Food Groups (FoodEx II-Codes, EFSA)

356

- Food Groups in BfR MEAL **Food List**

869

- Pools, division in:
regionality, seasonality, organic / conventional

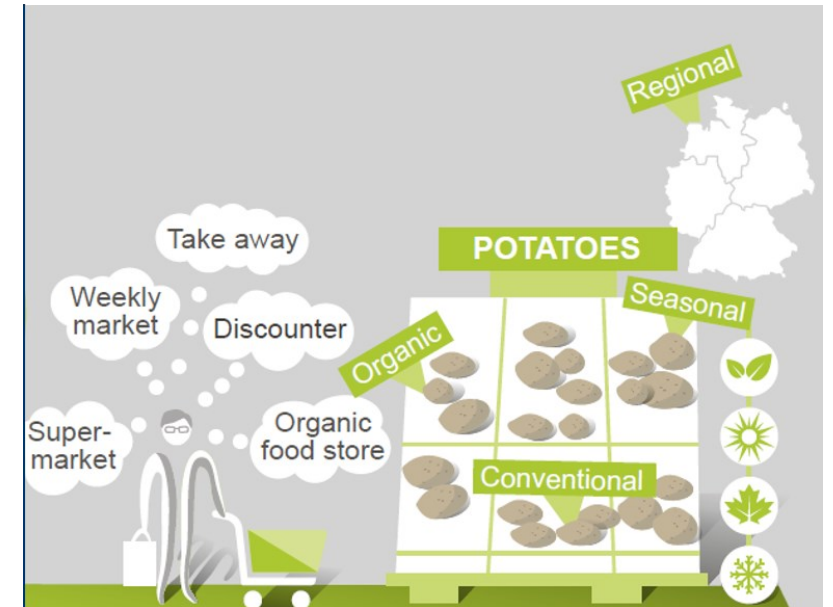


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Representativeness of food preparation

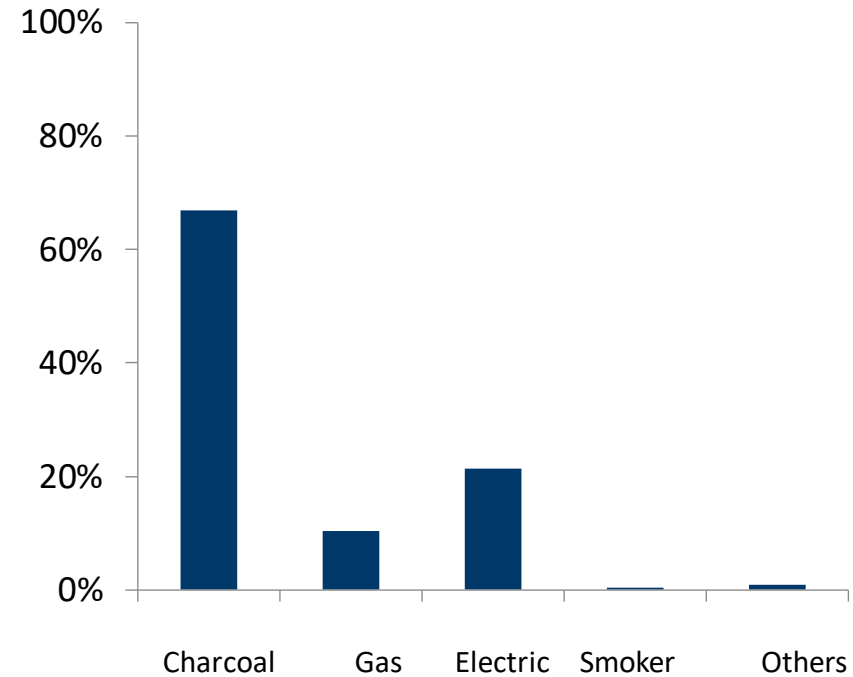
Market data

- Most sold recipe books

Surveys

- Most visited cooking homepages
- Kitchen utensils
(Telephone survey; N= 1.008)
- Preparation of foods
(Telephone survey; N = 1.008)
- Degree of browning
(Online survey, N = 2.003)

Preparation of foods





Pooling and homogenisation



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- 15 – 20 Subsamples are pooled to one sample
- Representative pools for the average consumption in Germany
- No information on variability of substance levels in subsamples

▶ **> 3400 pooled samples**



Dioxins and dioxin-like polychlorinated biphenyls (dl-PCBs)

Formation and characteristics

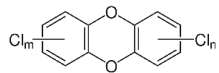
- Byproducts of combustion processes
- Non burning fluids in power transformers
- Persistent
- Lipophilic

Occurrence

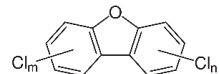
- Soil, sediments
- Accumulation in foods

Impact on health

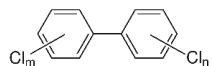
- Reproduction and development
- Immune system
- Liver, thyroid



7 x PCDDs: polychlorinated dibenzo-*p*-dioxins

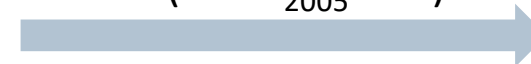


10 x PCDFs: polychlorinated dibenzofurans



12 x DL-PCBs: dioxin-like polychlorinated biphenyls

WHO toxic equivalency factor (WHO₂₀₀₅-TEF)



WHO₂₀₀₅-TEQ/g ww




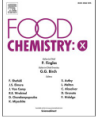
Foods with highest dioxin and dl-PCB levels

No maximum regulatory levels exceeded

Contents lists available at [ScienceDirect](https://www.sciencedirect.com)

Food Chemistry: X

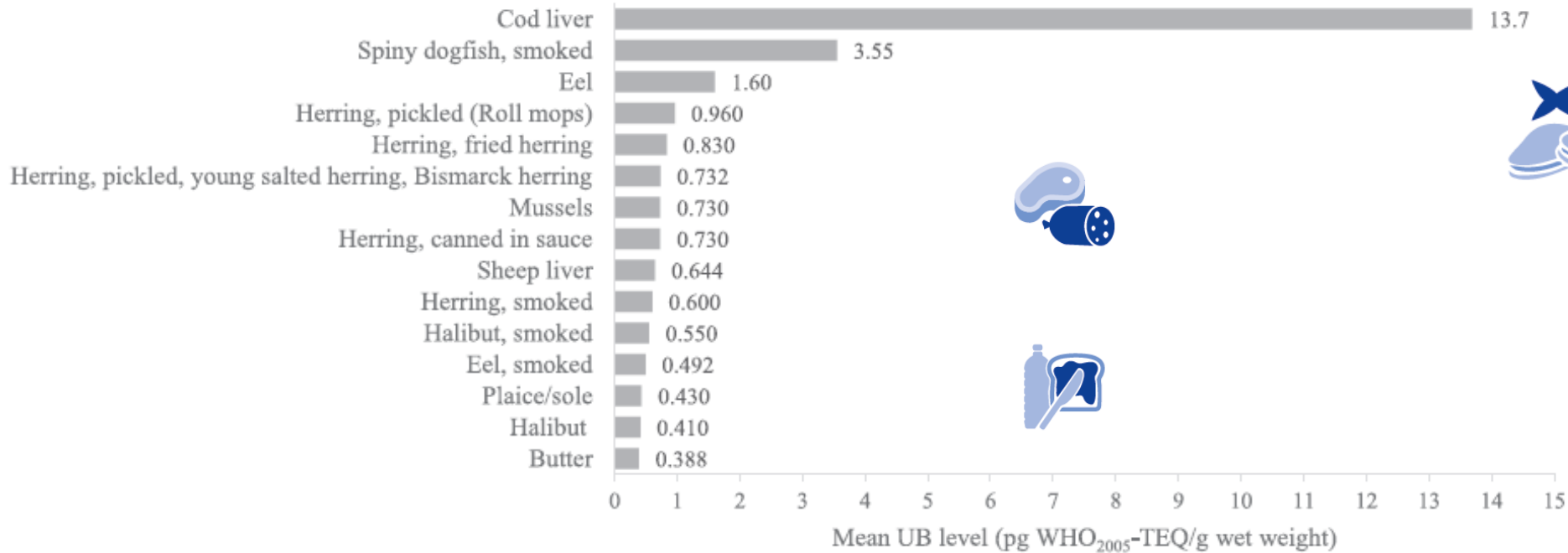
journal homepage: www.sciencedirect.com/journal/food-chemistry-x

The first German total diet study (BfR MEAL Study) confirms highest levels of dioxins and dioxin-like polychlorinated biphenyls in foods of animal origin

Mandy Stadion*, Christin Hackethal, Katrin Blume, Birgit Wobst, Klaus Abraham, Carolin Fechner, Oliver Lindtner, Irmela Sarvan

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Exposure assessment of methylmercury

Methylmercury (MeHg) is the organic and most toxic form of mercury

- kidney damage
- neurotoxicity
- cardiovascular disorders

➔ MeHg was measured in mushrooms, fish and seafoods



Exposure assessment of methylmercury in samples of the BfR MEAL Study

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^b University of Veterinary Medicine Hannover, Bünteweg 2, 30559, Hannover, Germany



Exposure assessment of methylmercury

- Smoked fish showed higher levels of meHg
- 24% of the population receive meHg by fish and seafood
- Main exposure from pollack, tuna, ocean perch and herring
- Tuna has a higher contribution to total exposure (36%) for 25-34 year old
- Ocean perch and cod have a higher contribution to total exposure (15% and 12%, respectively) for 65-79 year old



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Table 3

Exposure of MeHg in adults (consumers) with upper bound (UB) and lower bound (LB) approach ($\mu\text{g kg}^{-1} \text{bw week}^{-1}$).

		Total	Sex		Age groups						
			Male	Female	14-<18 Years	18-<25 Years	25-<35 Years	35-<45 Years	45-<55 Years	55-<65 Years	65-<80 Years
Exposure (UB)	Valid N	2916	1449	1466	68	184	363	561	527	508	705
	P 50	0.185	0.194	0.177	0.180	0.201	0.154	0.159	0.207	0.186	.187
	Mean	0.339	0.335	0.343	0.473	0.398	0.334	0.308	0.324	0.352	.338
	P 95	1.059	1.027	1.059	2.175	1.530	1.037	0.999	0.944	1.114	1.030
Exposure (LB)	Valid N	2916	1449	1466	68	184	363	561	527	508	705
	P 50	0.184	0.193	0.176	0.180	0.201	0.154	0.159	0.207	0.186	0.187
	Mean	0.335	0.330	0.340	0.461	0.386	0.328	0.303	0.322	0.350	0.336
	P 95	1.059	1.027	1.059	2.175	1.530	1.037	0.999	0.944	1.114	1.030



Visit our kitchen!
<https://www.bfr.bund.de/meal-studie/EN/vr.html>

Visit us at ISES 2024

Wednesday, 20 March 2024 10:00–11:00, P1	Naturally occurring radionuclides in food: participation in Germany's first total diet study (BfR MEAL Study)	Michaela Achatz, BfS
Wednesday, 20 March 2024 10:00–11:00, P1	Results of the first German total diet study – levels of acrylamide in typically consumed foods	Sara Perestrelo, BfR
Wednesday, 20 March 2024 13:30–14:30, P4	Triazole derivative metabolites in the BfR MEAL Study: occurrence in plant-based foods and dietary exposure estimation	Anna Jäger, BfR
Wednesday, 20 March 2024 13:30–14:30, P4	Exposure assessment for dioxin and dioxin-like PCBs in Germany based on the BfR MEAL Study	Katrin Blume, BfR
Wednesday, 20 March 2024 15:00–16:00, P7	Handling of left- and interval-censored arsenic data from BfR MEAL study for dietary exposure assessment	Annett Martin, BfR



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