What's in your food – the BfR MEAL Study

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BfR
German Federal Institute for Risk Assessment

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In what quantities do we ingest undesired substances on average with our food? Is food contaminated differently depending on region, season or production method? And what health effects does the preparation method have on the food?

The BfR MEAL Study helps to answer these and other questions. Experts at the German Federal Institute for Risk Assessment (BfR) examine on a large scale which substances in which concentrations are contained in prepared foods. The aim is to identify possible food-related health risks for the population even better.

The BfR MEAL Study is a so-called Total Diet Study. It is a method recommended by the Food and Agriculture Organisation (FAO) of the United Nations and the World Health Organisation (WHO) to estimate mean levels of substances in the average human diet. In combination with information from consumption studies, which determine the average consumption of foods of the population in Germany, the average total intake level of substances via food can be determined reliably and in detail.

Mahlzeiten für die
Expositionsschätzung und
Analytik von
Lebensmitteln

(meals for exposure assessment and analysis of foods)

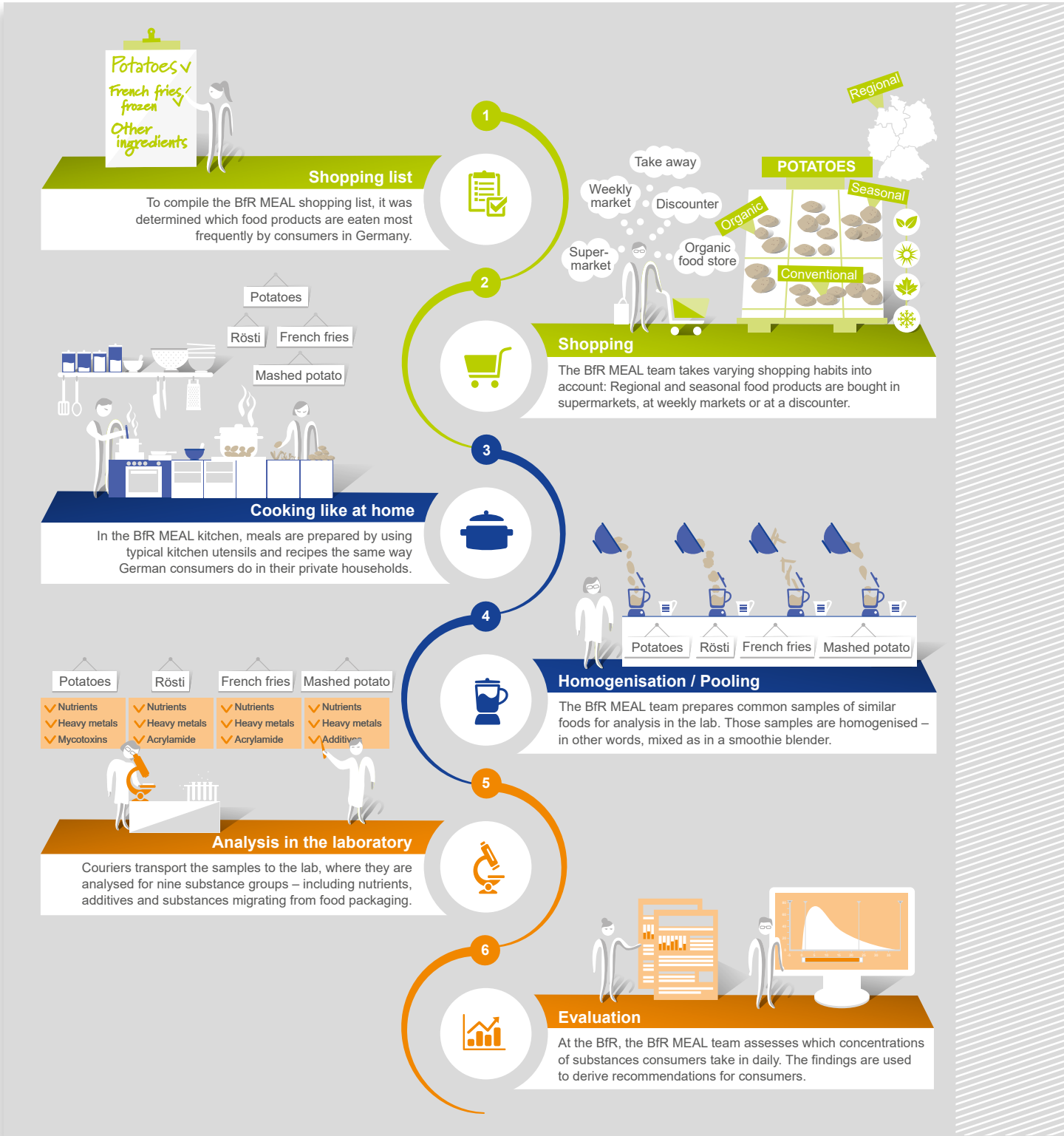
Compared to other Total Diet Studies, the BfR MEAL Study is one of the most comprehensive studies worldwide regarding the number of foods examined connected to the number of substances. In the course of the study, around **60,000 foods** are analysed for almost **300 desired and undesired substances** including heavy metals, mycotoxins, plant protection residues and nutrients. The study represents German eating habits by covering at least 90 percent of the foods consumed in Germany. In addition, rarely eaten foods are included, such as cod liver or boletus mushrooms, which can have particularly high levels of some undesired substances.

Before being analysed, the foods are prepared as they are usually consumed in German households – potatoes, for example, as mashed potatoes, chips or fried potatoes. The reason: levels of substances can change during preparation. Vitamins can degrade during cooking, while some potentially harming substances such as acrylamide only occur during preparation through intense heating. Additionally, substances can be leaching into the water for example arsenic compounds during washing and cooking of rice.

Similar foods are grouped into pools in order to determine mean levels and to reasonably limit the effort of analysis. During pooling, various product types, types of consumption and cultivation methods for similar foods are considered in accordance with their frequency, such as honey of different trees or flowers or rice from various origins. For a single food, more than one pool sample can also be compiled and investigated. Apples, for example, are analysed in several pools regarding different regions, seasons, methods of farming (conventional/organic) and preparation types (e. g. apple puree).

The BfR MEAL Study is the first German Total Diet Study and very comprehensive by worldwide comparison.

The BfR MEAL Study (meals for exposure assessment and analysis of foods) is the first Total Diet Study for Germany. It determines which substances and what concentration our foods have after processing and preparation.



Nominated Substances for the BfR MEAL Study
(Status: 2023)

Core module (elements and environmental contaminants)	Elements: aluminium, antimony, arsenic, barium, lead, cadmium, cobalt, lithium, methyl mercury, nickel, nitrate, mercury, silver, thallium, vanadium, tin
	Arsenic species: inorganic arsenic, arsenobetaine (AsB), dimethylarsinic acid (DMA), monomethylarsonic acid (MMA)
	Organotin compounds: tetrabutyltin (TeBT), tributyltin (TBT), dibutyltin (DBT), monobutyltin (MBT), triphenyltin (TPT), diphenyltin (DPT), monophenyltin (MPT)
	Dioxins/furans, dioxin-like polychlorinated biphenyls (dl-PCB), non-dioxin-like polychlorinated biphenyls (ndl-PCB)
	Polybrominated diphenyl ethers (PBDE)
Perfluoroalkyl substances (PFAS)	Perfluorooctane sulfonic acid, perfluorooctanoic acid
Mycotoxins	Aflatoxins, alternaria toxins, beauvericin, citrinin, enniatins, ergot alkaloids, fumonisins, ochroatoxin A, patulin, type A trichothecenes, type B trichothecenes, zearalenone
Process contaminants	Acrylamide, glycidol, polycyclic aromatic hydrocarbons (PAH), 2- and 3-MCPD group
Food additives	Benzoates: benzoic acid, calcium benzoate, potassium benzoate, sodium benzoate
	Nitrites: potassium nitrite, sodium nitrite
	Sorbates: potassium sorbate, sorbic acid
	Sulphites: calcium hydrogen sulphite, calcium sulphite, potassium hydrogen sulphite, potassium metabisulphite, sodium hydrogen sulphite, sodium metabisulphite, sodium sulphite, sulphur dioxide
Nutrients	Vitamins: vitamin A (retinol), vitamin E (tocopherols), vitamin K1, vitamin K2, β-carotene, folic acid
	Bulk elements: calcium, chloride, potassium, magnesium, sodium, phosphorus
	Trace elements: chromium, copper, fluoride, iodine, mangan, molybdenum, selenium, zinc
Pesticide residues	Boscalid, captan/tetrahydrophthalimide, chlorate, chlormequat, chlorpyrifos, cyantraniliprole, cypermethrin, cyprodinil, deltamethrin, difenoconazole, dimethoate, ethylenthiourea (ETU), fluopyram, glyphosate/aminomethyl-phosphonic acid (AMPA), hexachlorobenzen, hexythiazox, imazalil, indoxacarb, iprodion, lambda-cyhalothrin, myclobutanyl, omethoat, perchlorate, pirimicarb, pirimicarb-desmethyl, propylenthiourea (PTU), pyraclostrobin, pyrimethanil, spinosad, thiabendazole, thiacloprid, triflumuron, 1,2,4-triazole, triazole acetic acid, triazole alanine, triazole lactic acid
Pharmacologically active substances	Aminoglycosides: dihydrostreptomycin, gentamycin, neomycin, spectinomycin, streptomycin
	Amphenicoles: florfenicol
	Chinolones: ciprofloxacin, danofloxacin, enrofloxacin, marbofloxacin
	Diaminopyrimidine derivates: trimethoprim
	Coccidiostats: dinitrocarbanilides, lasalocid, maduramycin, monensin, narasin
	Macrolides: erythromycin, gamithromycin, tildipirosin, tilmicosin, tulathromycin, tylosin
	Penicillins: amoxicillin, benzylpenicillin
	Sulfonamides: sulfadiazine, sulfadimethoxine, sulfadimidine, sulfadoxine, sulfathiazol
	Tetracyclines: chlortetracycline, doxycycline, epi-chlortetracycline, epi-tetracycline, epi-oxytetracycline, oxytetracycline, tetracycline
Substances migrating from food contact materials	Mineral oil saturated hydrocarbons (MOSH), mineral oil aromatic hydrocarbons (MOAH)
	Plasticisers
	2,4-di-tert-butylphenol

The aim of the BfR MEAL Study is to identify possible food-related health risks for the population in Germany even better.

More information on the BfR MEAL Study at:
www.bfr-meal-studie.de

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