Environmental Contaminants

Refer lecturer for course updated notes.

Students are obliged to follow the courses for evaluation process and presented notes are preliminary drafts for the whole evaluation process.

Definition of Endocrine Disruptor

EFSA and ED EAG	Endocrine Society
An ED is an exogenous substance or mixture that alters function(s) of the endocrine system and consequently causes adverse health effects in an intact organism, or its progeny, or (sub)populations" IPCS/WHO, 2002	*An ED is an exogenous chemical, or mixture of chemicals, that interferes with any aspect of hormone action.* modified EPA definition

"the ability of a chemical to interfere with hormone action is a clear predictor of adverse outcome, much like mutagenicity is a predictor of carcinogenicity"

Course in Identification and assessment of reproductive toxicity and endocrine disruption, IMM Institute of Environmental Medicine, Karolinska Institutet, Stockholm, Sweden, November 25-29, 2013

Definition of ED (endocrine society vs. EPA)

- Using Kavlock (1996) to define an EDC for regulatory purposes is at least **misleading**:

- Kavlock (1996) : “[..] an exogenous agent that interferes with the synthesis, secretion, transport, binding, action, or elimination of natural hormones in the body which are responsible for the maintenance or homeostasis, reproduction, development and or behavior." [no adversity..]

- **But…** consistent with this definition, EPA has stated that it "...does not consider endocrine disruption to be an adverse effect per se, but rather to be a mode or mechanism of action potentially leading to other outcomes, for example carcinogenic, reproductive, or developmental effects, routinely considered in reaching regulatory decisions. Evidence of endocrine disruption alone can [only] influence priority setting for further testing and the assessment of the results of this testing could lead to regulatory action if adverse effect are shown to occur."

Endocrine disruption

- Endocrine disrupters (ED) or endocrine disrupting chemicals (EDC) are exogenous chemical agents that interfere with the pathways of natural hormones (estrogens, androgens):
  - Synthesis
  - Secretion
  - Transport
  - Binding
  - Action
  - Metabolism
  - Elimination

Endocrine Disruptors Sources

Pesticides (herbicides, insecticides, …)

Plasticizers

Natural plant metabolites

Pharmaceuticals (contraceptives, drugs,…)

Detergents

Chemicals from cooking & burning

Antibiotics

Metals

- ☐ Household product ingredient
  Chemicals found in items such as appliances, vehicles, building materials, electronics, crafts, textiles, furniture, and household cleaning products.
- ☐ Personal care product/Cosmetic ingredient
  Chemicals found in products such as cosmetics, shampoos, lotions, soaps, deodorants, fragrances, and shaving products.
- ☐ Food additive
  Antioxidants, dyes, compounds used in food processing and as components in food packaging.
- ☐ Flame retardant
  Chemicals used to prevent fires.
- ☐ Plastic/Rubber
  Components, reactants, or additives used in the manufacturing of rubbers or plastics.
- ☐ Pesticide ingredient
  Insecticides/acaricides (miticides), herbicides, fungicides, rodenticides, and other biocides, including chemicals described as 'inert'.
- ☐ Antimicrobial
  Chemicals that prevent the growth of and/or destroy microorganisms.
- ☐ Biogenic compound
  Naturally occurring or biologically derived chemicals such as phytoestrogens, flavonoids, monophenols, mycochemicals and phenolic acids.
- ☐ Industrial additive
  Chemicals such as preservatives, antioxidants, and surfactants used in such things as glue, plastic, rubber, paint, and wood products.
- ☐ Solvent
  Chemicals used to dissolve other chemicals.
- ☐ Metal/Metallurgy
  Elements or chemicals used in the extraction, processing, or manufacturing of a metal or metal-containing product, including welding.
- ☐ Byproduct/Intermediate/Reactant
  Chemicals used in the synthesis of other compounds and/or unwanted byproducts such as impurities and contaminants, including combustion byproducts.
- ☐ Medical/Veterinary/Research
  Chemicals used in hospitals, medical supplies, and equipment, in laboratories or as reagents, and pharmaceuticals.
- ☐ Metabolite/Degradate
  Breakdown products of other chemicals.

Known Classes of Endocrine Disruptors

Estrogens	**DES, o,p' -DDT, DEHP, bisphenol A**
Anti-estrogens	**hexachloro-4-biphenylol, luteolin**
Anti-androgens	**p,p' -DDE, vinclozolin**
Progestogens	**norethindrone, norgestrel**
Adrenal toxins	**o,p' -DDD, glycyrrhizic acid**
Thyrotoxic agents	**PCBs, goitrin**
Aryl hydrocarbons	**[often anti-estrogens] TCDD, PAH**
Pancreatic toxins	**azoxyglycosides, streptozotocin**
Metals	**cadmium, nickel, aluminum**
Retinoids	**vitamin A analogs**

Xenoestrogens

- Phytoestrogens
  - Lignans
  - Isoflavons
- Synthetic
  - DES (diethylstilbesterol)
  - PCBs
  - Dioxins
  - DDT/DDE
  - Alkylphenols
  - Phthalate esters
  - Bisphenol-A

Some chemical contaminants of concern in products of animal origin

– residues of veterinary medicinal products

– hormone and pesticide residues

– nitrates

– bacterial toxins

– mycotoxins

– phytotoxins

– algal toxins

– marine toxins

– heavy metals

– dioxins and dioxin-like compounds

– disinfectants

– polycyclic aromatic hydrocarbons (PAHs)

– processing contaminants such as acrylamide

– chemicals migrating from packaging materials.

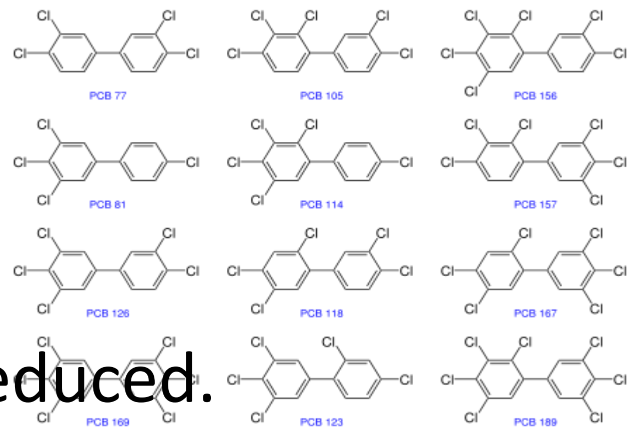
Rev. sci. tech. Off. int. Epiz., 2006, **25** (2), 655-673

On-farm contamination of animals with chemical contaminants

C. Saegerman [1], L. Pussemier [2], A. Huyghebaert [3], M.-L. Scippo [4] & D. Berkvens [5]

Polychlorinated biphenyls (PCBs)

- A polychlorinated biphenyl is an organic chlorine compound with the formula $C_{12}H10{-}_xCl_x$. It is a class of 209 different chemical compounds, called congener, with 1 to 10 chlorine atoms attached to the biphenyl.
- Most PCB variants are colorless, odorless crystals.
- Commercial mixtures are clear viscous liquids (more chlorinated mixtures are more viscous, for example Aroclor 1260 is a "viscous resin").
- Although physical and chemical properties vary widely between classes, PCBs have low water solubility and low vapor pressure.
- They are soluble in most organic solvents, petroleum and oils.



- PCBs are very stable compounds and are not easily reduced.
- However, under certain conditions, they can be destroyed by chemical, thermal and biochemical processes.
- These processes can occur consciously (eg, incineration), unintentionally or metabolically.
- Due to its high thermodynamic stability, all degradation mechanisms are difficult.
- Destruction of unwanted PCBs usually requires high heat or catalysis.
- Environmental and metabolic degradation generally proceeds rather slowly than most other compounds

- Polychlorinated biphenyls were once widely deployed as dielectric and coolant fluids in electrical apparatus, carbonless copy paper and in heat transfer fluids.
- PCBs have been shown to have estrogenic properties, but are weak compared to the natural hormone 17β-estradiol. It is believed that hydroxyl metabolites of PCBs may exhibit estrogenic effects by inhibiting estradiol metabolism, thereby indirectly inducing estrogenic activity by increasing the bioavailability of estradiol in target tissues.

polybrominated diphenyl ethers

- Flame retardants are used in many manufacturing processes, such as the manufacture of plastic products, textiles, construction materials, coatings and electrical appliances to prevent ignition and suppress fires.
- Brominated flame retardants (PBFs), such as polybrominated diphenyl ethers (PBDEs), tetrabromobisphenol-A (TBBPA), hexabromocyclododecane (HBCD), and form. With the rapid increase in the use of BFR, the risk of exposure to humans and the environment is increased. Numerous research reports indicate that high levels of BFR are found not only in water, atmosphere, confined space, soil and sewage, but also in tissue, blood and milk in humans and wild animals.

polybrominated diphenyl ethers

- According to a study describing the relationship between congenital cryptorchidism and exposure to PBDEs in humans, a higher gonadotropin to ensure normal testosterone production by Leydig cells, where the concentrations of PBDE species found in breast milk, such as BDE 47, 100 and 154, are positively correlated with increasing serum LH values. impulse is necessary and therefore a primary testicular dysfunction that is not immediately apparent.

Dioxins

- Dioxins are a group of planar tricyclic chemicals. The term dioxin (s) is generally used to refer to one or more polychlorinated dibenzo-p-dioxins (PCDD) and / or polychlorinated dibenzofurans (PCDF). Both chemical groups contain many homologues that directly affect toxicity, varying in sequence and number of chlorine atoms. There are 75 PCDD species and 135 PCDF species, 7 of which are identified as dioxins and 10 of them are toxic. The data show that chlorine-containing species are most toxic at positions 2, 3, 7 and 8. In particular, brominated and mixed brominated / chlorinated species are also available and may have similar toxicity to chlorinated ones.

- When dioxins enter the animal body, they cause various toxic effects such as exhaustion syndrome, immunosuppression, tumor tendency, stimulation of various drug metabolism enzymes and endocrine disruption. Although many toxic effects of dioxins have been identified, endocrine degradation has a very important effect on reproduction in a wide variety of species, including human; decrease in sperm production, reproductive failure, reproductive disorder and decreased fertility. Such effects on reproduction resulting from contamination of dioxins have been shown to cause a decrease in the populations of cormorants, Phalacrocorax carbo and American mink Mustela vison. Thus, the negative effects of dioxins on reproduction (associated with fitness) may serve as a kind of selection pressure and may even destroy some local populations.

- Dioxins have been shown to be carcinogenic in animals and humans. Excessive risks have been observed in humans for all cancers without specific cancer predominance. In certain populations, excessive risk for reproductive cancers (breast female, endometrium, breast male, testis) has been observed, but in general the model has been found to be inconsistent. In animals, the most sensitive responses to dioxin exposure are endocrine, reproductive and developmental effects. Decrease in sperm count in rats and the formation of endometriosis in Rhesus monkeys occur at a concentration 10 times higher than today's human exposure. In humans, results regarding changes in the concentration of reproductive hormones are inconsistent

Bisphenol A

- BPA ($C_{15}H_{16}O_2$), is one of the most common industrial chemicals produced worldwide. BPA was first introduced in 1891 by the Russian chemist A.P. It was synthesized by Dianin. The compound consists of two adjacent phenol groups and is synthesized by the condensation of acetone (A from here) with phenols. It is primarily used in the production of polycarbonate plastics and epoxy resins, but is also used in flame retardants, carbonless thermal paper and other plastics (eg, polyester resins, polysulfone resins and polyacrylate resins). World production capacity in the 1980s was more than 2.2 million metric tons in 2009 from 1 million metric tons

- Pregnancy 16-18. It was shown that anogenital distance and prostatic size were increased and epididymal weight was decreased in male mice exposed to BPA at 15 weeks of gestation. These changes persisted in adulthood, and there was also an increase in the number of buds in the prostatic glands of male fetuses. In adulthood, these animals have observed decreased sperm production and growth in their prostates. Exposure of fetal prostates to BPA in vitro caused prostate growth mediated by ERs (estrogen receptors) present in the stroma, and this effect was inhibited by antiestrogens. While it was shown that BPA increased expression of the androgen receptor in mice prostate stroma, fetal exposure of mice to BPA caused a change in the differentiation model of peritubular stroma in the same organ. A recent study has shown that the increase in the number and size of the dorsolateral prostate canals and the overall increase in prostate canal volume seen in male mouse fetuses are due to an increase in the proliferation of basal epithelial cells. Malformations in the urethra were also observed and its connection to the bladder was significantly narrowed. Taken together, these results suggest that prenatal BPA exposure causes a permanent change in the control of morphology, histo-architecture and cell proliferation in prostate and other androgen target tissues, making the affected person susceptible to adulthood.

phthalates

- The term phthalates or phthalate esters refers to a large group of compounds that share basic chemical similarities. However, each member of the group has unique physical and chemical properties, and studies to date have shown that they affect biological organisms in different ways. Although some of these toxicity differences between phthalates are well established in experimental animals, current data are not sufficient to allow for the explanation of the range of toxicological differences between phthalates.

- Phthalates have been used as additives in industrial products since the 1930s and are universally recognized as environmental pollutants. The general population is exposed to phthalates with consumer products as well as dietary and medical treatments. Animal studies showing a relationship between some phthalates and testicular toxicity have aroused public and scientific interest in the potential adverse effects of environmental changes on male reproductive health. In particular, prenatal exposure to phthalates has been an important rationale for investigating the side effects of human exposure to the onset of intrauterine life. In developed countries an unprecedented decrease in fertility rates and antenatal origin semen quality has been reported during the last half of the 20th century, and interest in the potential relationship between human and reproductive health, including phthalates, is increasing.

- Pesticides
- Fungicides

Example-PAH Smoking process

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doi:10.3168/jds.2010-3647

Contamination of cheese by polycyclic aromatic hydrocarbons in traditional smoking. Influence of the position in the smokehouse on the contamination level of smoked cheese

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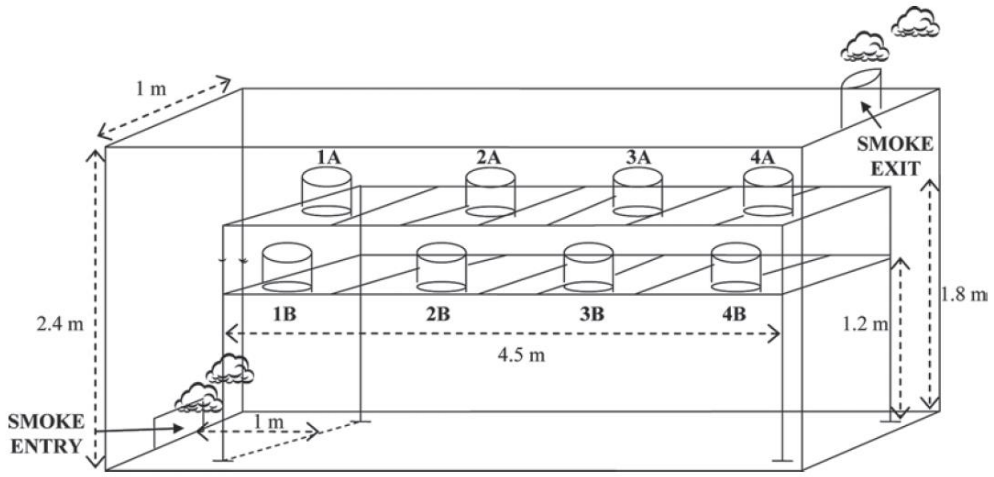

Figure 2. Scheme of the smokehouse for the smoking of the cheeses and position of the cheeses studied. Samples 1A, 2A, 3A, and 4A correspond to the cheeses placed on the upper shelf of the smokehouse and samples 1B, 2B, 3B, and 4B correspond to the cheeses placed on the lower shelf. The numbers refer to the position of the samples: 1: the nearest to the smoke entry; 4: the most distant from the smoke entry; 2 and 3: intermediate positions.

Total PAH concentrations

1B= 1,915.16 µg/kg

4B= 423.39 µg/kg

what is more, it was kept in the smokehouse for almost double the time than cheeses A.

Unsmoked cheese = 33.65 µg/kg.

- High concentrations of light PAH have been found, especially of naphthalene and its alkyl derivatives, whose effect on human health is not yet well established.

Example-PAH Smoking process

- The concentration of B(a)P strongly depends on the time and temperature of processing.
- The optimal temperature is 25°C–30°C.
- Time processing should not exceed 2 h.
- Beech tree is a suitable kind of wood.
- Cheese should be dried before smoking.
- When the light brown colour is appearing, the process should be finished.

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Pol. J. Food Nutr. Sci. 2003, Vol. 12/53, No 4, pp. 33–37

THE CONTENT OF BENZO(A)PYRENE IN SLOVAKIAN SMOKED CHEESE

Rajmund Michalski[1], Robert Germuska[2]

Journal of the Science of Food and Agriculture *J Sci Food Agric* (2008)

sci where science meets business www.soci.org

Polycyclic aromatic hydrocarbons in smoked cheese

Marie Suchanová,[1] Jana Hajšlová,[1]* Monika Tomaniová,[1] Vladimír Kocourek[1] and Luboš Babička[2]

In most cases, the concentrations of B(a)P in smoked cheese obtained from home-made ovens are over acceptable limit.

Significantly higher amounts of PAHs (up to three to six times) were found in surface layers as compared to internal parts of cheese.

Table 2: Maximum levels for benzo[*a*]pyrene and the sum of benzo[*a*]pyrene, benz[*a*]anthracene, benzo[*b*]fluoranthene, and chrysene as laid down in Regulation (EU) No 835/2011

	Foodstuffs	Maximum levels [µg/kg] Benzo[a]pyrene	Sum of benzo[a]pyrene, benz[a]anthracene, benzo[b]fluoranthene and chrysene
6.1.1	Oils and fats (excluding cocoa butter and coconut oil) intended for direct human consumption or use as an ingredient in food	2.0	10.0
6.1.2	Cocoa beans and derived products	5.0 µg/kg fat	35.0 µg/kg fat until 31.3.201530.0 µg/kg fat from 1.4.2015
6.1.3	Coconut oil intended for direct human consumption or use as an ingredient in food	2.0	20.0
5.1.4	Smoked meat and smoked meat products	5.0 until 31.8.20142.0 as from 1.9.2014	30.0 until 31.8.201412.0 as from 1.9.2014
5.1.5	Muscle meat of smoked fish and smoked fishery products, excluding fishery products listed in points 6.1.6 and 6.1.7. The maximum level for smoked crustaceans applies to muscle meat from appendages and abdomen. In case of smoked crabs and crab-like crustaceans it applies to muscle meat from appendages.	5.0 until 31.8.2014 2.0 as from 1.9.2014	30.0 until 31.8.2014 12.0 as from 1.9.2014
5.1.6	Smoked sprats and canned smoked sprats; bivalve molluscs (fresh, chilled or frozen); heat treated meat and heat treated meat products sold to the final consumer	5.0	30.0
5.1.7	Bivalve molluscs (smoked)	6.0	35.0
6.1.8	Processed cereal-based foods and baby foods for infants and young children	1.0	1.0
6.1.9	Infant formulae and follow-on formulae, including infant milk and follow-on milk	1.0	1.0
6.1.10	Dietary foods for special medical purposes intended specifically for infants	1.0	1.0

Table 3: Indicators of maximum levels of benzo[*a*]pyrene in foods regulated in China

Food type/ Name	Maximum levels (µg/kg)
Paddy, wheat	5
Smoked or baked meats	5
Smoked or baked aquatic products	5
Fats and oils, and fat emulsions	10

Example-PAH Smoking process
Salmon

- Salmon smoked by four different industrial cold-smoking processes (smoldering, thermostated plates, friction, and liquid smoke) were investigated for PAH occurrence.

- **Direct exposure** of meat or fish products to smoke results in **higher PAH** contents compared to indirect smoking methods.

- **Hot smoking** resulted in **higher PAH** levels than cold smoking

- Un-smoked salmon is usually of low contamination.

- PAHs of low molecular weight are predominant but in low concentrations (from 0.06 to 0.19 µg/kg).

Example-PAH Smoking process Salmon

- Smoking processes led to higher levels of PAHs of low molecular weight.

- The concentrations of PAH from fluorene to fluoranthene varied between 1 µg/kg and 5 µg/kg.

- **Smoldering gave the highest** and **liquid smoke the lowest levels of low molecular weight PAHs**

three PAHs were detected in a commercial smoked salmon: thalene, phenanthrene, and fluoranthene with concentrations from /kg to 27 µg/kg

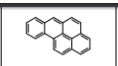
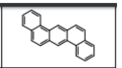
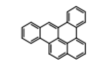
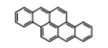
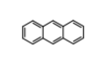
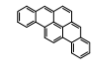
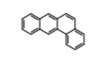
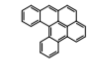
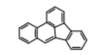
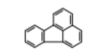
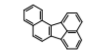
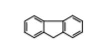
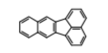
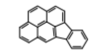
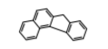
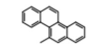
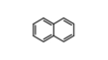
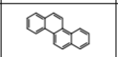
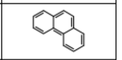
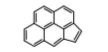
Journal
Polycyclic Aromatic Compounds ›
Volume 35, 2015 - Issue 2-4: Are the 16 EPA PAHs Outdated?

Original Articles

The Occurrence of 16 EPA PAHs in Food – A Review

Zuzana Zelinkova & Thomas Wenzl
Pages 248-284 | Received 02 Jan 2014, Accepted 03 Apr 2014, Published online: 08 Jan 2015
Download citation http://dx.doi.org/10.1080/10406638.2014.918550 Check for updates

- EPA selected 16 PAHs, which are frequently found in environmental monitoring samples, namely
- acenaphthene,
- acenaphthylene,
- anthracene,
- fluoranthene,
- fluorene,
- naphthalene,
- phenanthrene
- pyrene,
- benz[*a*]anthracene,
- benzo[*b*]fluoranthene,
- benzo[*k*]fluoranthene,
- benzo[*ghi*]perylene,
- benzo[*a*]pyrene,
- chrysene,
- dibenz[*a,h*]anthracene, and
- indeno[1,2,3-*cd*]pyrene.

EPA, SCF, EU	Benzo[*a*] pyrene		EPA, SCF, EU	Dibenz[*a,h*] anthracene	
EPA	Acenaphthene		EU+SCF	Dibenzo [*a,e*]pyrene	
EPA	Acenaphthylene		EU+SCF	Dibenzo [*a,h*]pyrene	
EPA	Anthracene		EU+SCF	Dibenzo [*a,i*]pyrene	
EPA, SCF, EU	Benz[*a*] anthracene		EU+SCF	Dibenzo [*a,l*]pyrene	
EPA, SCF, EU	Benzo[*b*] fluoranthene		EPA	Fluoranthene	
SCF, EU	Benzo[*j*] fluoranthene		EPA	Fluorene	
EPA, SCF, EU	Benzo[*k*] fluoranthene		EPA, SCF, EU	Indeno[1,2,3-*cd*]pyrene	
EU	Benzo[c]fluorene		EU+SCF	5-Methyl chrysene	
EPA, SCF, EU	Benzo[*ghi*] perylene		EPA	Naphthalene	
EPA, SCF, EU	Chrysene		EPA	Phenanthrene	
SCF, EU	Cyclopenta [*cd*]pyrene		EPA	Pyrene	

Polycyclic Aromatic Hydrocarbons (PAHs) Factsheet

https://ec.europa.eu/jrc/sites/jrcsh/files/Factsheet%20PAH_0.pdf

Environmental Pollution
Volume 213, June 2016, Pages 809-824

Review

Biological impact of environmental polycyclic aromatic hydrocarbons (ePAHs) as endocrine disruptors ☆

Yanyan Zhang [a], Sijun Dong [b], Hongou Wang [b], Shu Tao [a], Ryoiti Kiyama [c]

⊞ Show more

https://doi.org/10.1016/j.envpol.2016.03.050

Estrogenic PAHs and associated signaling pathways.

Chemical	Signaling pathway
PAH	
Alizarin, 2-hydroxyanthraquinone	ER
Anthraquinone, benz[*a*]acridine, B[*a*]A -7,12-dione, benzanthrone (estrogenic)	ER
B[*a*]A (estrogenic)	AhR/PKCs/ERK/ER
B[*a*]A, B[*a*]P, B[*b*]F, B[*c*]Ph, monohydroxy PAHs (agonistic)	ERα
B[*a*]A, B[*a*]P, Fla (estrogenic); B[*k*]F (anti-estrogenic)	ER
B[*a*]A, B[*a*]P, DMBA, 3-methylcholanthrene (anti-estrogenic)	AhR/ER
B[*a*]A, dibenz[*a,h*]anthracene (estrogenic)	ER
B[*a*]F (estrogenic)	ERα
B[*a*]P, 3-hydroxy-B[*a*]P, 9-hydroxy-B[*a*]P, 9,10-dihydroxy-B[*a*]P (estrogenic)	ERα
B[*a*]P (anti-estrogenic)	AhR/CYP19/ER
B[*a*]P (anti-estrogenic)	ER
B[*a*]P (estrogenic)	ER/MAPK, PI3K/AK
B[*a*]P (anti-estrogenic)	AhR/ER/BRCA1
B[*a*]P, B[*b*]F, B[*k*]F, chrysene, dibenz[*a,h*]anthracene, IND (anti-estrogenic)	ER
B[*a*]P, 2,3-benzofluorene, dibenz[*a,h*]anthracene, 6-hydroxychrysene (anti-estrogenic)	ER
B[*a*]A, B[*a*]P, dibenz[*a,h*]anthracene (antagonistic)	ER
DMBA + E_2 (estrogenic)	AhR/CYP1A1/ER
DMBA + naringenin (anti-estrogenic)	AhR/CYP1B1/ER
7-Hydroxy-B[*a*]P, 1-hydroxypyrene (estrogenic)	ERα
2-Hydroxychrysene, 2-hydroxy-Ph, 1-hydroxypyrene, 1-naphthol, 2-naphthol (estrogenic)	ER
2-Hydroxyfluorene, 2-hydroxy- Ph, 3-hydroxy-Ph, 1-hydroxypyrene (estrogenic)	ER
9-Hydroxy-Ph, 1-hyroxypyrene, 1-naphthol (estrogenic)	ERβ
3-Methylcholanthrene + E_2 (estrogenic)	AhR/CYP1A/ER
3-Methylcholanthrene (estrogenic)	ERα
Naphthalene (anti-estrogenic)	ER
6-Nitrochrysene (anti-estrogenic)	AhR/ERα
2-Nitrofluorene (estrogenic)	ER
ePAH	
Ambient particulate matter (estrogenic)	ER
Bay sediments (estrogenic)	ER
Charcoal flue gas (estrogenic)	ER
Cigarette smoke (estrogenic)	ER
Coastal sediments (estrogenic/anti-estrogenic)	ER
Coastal sediments/water (estrogenic)	ER
Coastal/river sediments (estrogenic)	ER
Contaminated oil (anti-estrogenic)	ER
Dispersed oil (anti-estrogenic)	ER
Lagoon sediments (estrogenic)	ER
Lake sediments (estrogenic)	ER
Lake sediments (estrogenic)	ER
Marine sediments (antagonistic)	ER
Produced water (anti-estrogenic)	ER
River sediments (anti-estrogenic)	ER
River sediments (estrogenic)	ER

Pathway/cascade/function	ePAH/PAH
MAPK signaling	
MAPK/AKT/NO	ePAHs (DEPs)
MAPK/JNK	B[*a*]P
NF-κB/MAPK	ePAHs (DEPs)
ROS/MAPK	B[*a*]A/B[*k*]F/IND
Other signaling (see Table 4 for ER signaling)	
PPARα/PPARβ/δ	B[*a*]A
PPARβ/δ/AhR crosstalk	DMBA
Chromatin/epigenetic regulation	
Chromatin condensation	3-Methylcholanthrene
Chromatin structure	BPDE
DNA methylation	ePAHs (aerosol, air pollutant), Ph
Histone modification	ePAHs (aerosol)
Apoptosis	
FASL-dependent apoptosis	ePAHs (tobacco/DNA adduct)
Infectious response	ePAHs (DEPs)
p53-dependent apoptosis	B[*a*]P/B[*j*]A/B[*l*]A/CPP/DB[*a,l*]P/Fla/1-Nitropyrene
Autophagy	
Starvation stress	Ph
Cellular metabolism	
AMPK signaling	1-Nitropyrene
IGF-1 signaling	ePAHs (electronic waste)
Insulin resistance	ePAHs (air pollutant)
Insulin/AMPK signaling	2-Aminoanthracene
Cell cycle/DNA damage	
G1/S cell cycle regulation	B[*a*]P/BPDE
G2/M DNA damage checkpoint	B[*a*]P/B[*a*]P-7,8-diol/DMBA
DNA damage response	ePAHs (coke/tobacco/urban dust)
Cytoskeletal regulation and adhesion	
Actin function	B[*a*]P/BPDE/BPE, ePAHs (coal tar/DEPs/tobacco)
Cell adhesion	B[*a*]P/Fla/Fluorene/3-Methylcholanthrene/1-Methylpyrene/Perylene/Ph, ePAHs (coke)
Microtubule dynamics	B[*a*]P
Immunology and inflammation	
B-cell development	DMBA
Cytokine response	B[*a*]A/B[*a*]P/DMBA/Fla/3-Nitrobenzanthrone/3-Nitro-Fla/1-Nitropyrene/Ph/Pyrene, ePAHs (DEPs)
Inflammatory response	B[*a*]P/B[*e*]P, ePAHs (asphalt fume/DEPs/wood smoke particles)
Rheumatoid arthritis	3-Methylcholanthrene
T-dependent antibody response	B[*a*]P-7,8-diol/BPDE/DB[*a,l*]P/Dibenzo[*def,p*]chrysene/DMBA/DMBA-3,4-diol
TLRs-induced immune response	B[*a*]P
Neuroscience	
Behavior/brain metabolism	16 PAH mixture
Neurodevelopment	B[*a*]P/Pyrene
Parkinson's disease	B[*a*]P
Development and differentiation	
Atherogenesis	B[*a*]P
B lymphopoiesis	DMBA
Development	B[*a*]P/Fla, ePAHs (coastal sediments)
Differentiation	B[*a*]P/DMBA/DMBA-3,4-diol

Food Contact Materials-
Plasticizers

- Compounds used to **improve flexibility, workability, and stretchability of polymeric films** as a **process aid, reducing melt flow**.
- **Limp and tacky quality**; found in “cling” films
- **Reduce shear** during mixing steps in polymer production and improve impact resistance in the final plastic film.
- **Phthalic esters**, such as **di-2-ethylhexyl phthalate (DEHP)** used in **PVC formulations**, comprising about **80% of plasticizer volume** for PVC production.
- Plasticizers for PE include
- **dipentyl phthalate (DPP), di-(2-ethylhexyl) adipate (DEHA), di-octyladipate (DOA), di- ethyl phthalates (DEP), diisobutylphthalate, and di-*n*-butyl ph- thalate (DBP).**

PLASTICS GUIDE

SYMBOL	TYPE OF PLASTIC	ITEMS IT CAN BE MADE INTO	FURTHER INFORMATION
1	**PETE or PET** polyethylene terephthalate	clear plastic bottles for water, juice, soft drinks, mouthwash, salad dressing; clear plastic food containers and trays, lids for take-out drink cups	• contains the chemical antimony, a suspected carcinogen • leaches chemicals having estrogenic activity (EA) • accepted most places for recycling without caps and lids
2	**HDPE** high density polyethylene	opaque plastic bottles for juice, milk, shampoo, conditioner, laundry detergent, bleach; drink bottle caps, plastic bags, buckets	• leaches chemicals having estrogenic activity (EA) • accepted most places for recycling without caps and lids
3	**PVC** polyvinyl chloride	bottles for cooking oil, peanut butter; cling wrap, vinyl shower curtains, toys (including pool toys, rubber duckies), tubing, upholstery, wire insulator	• cancer causing dioxins are released into the atmosphere from PVC production • contains phthalates which cause cancer • leaches chemicals having estrogenic activity (EA) • not accepted for recycling - least recyclable plastic
4	**LDPE** low density polyethylene	bags (for groceries, dry cleaning, newspapers, bread, frozen foods, produce), six-pack rings, caps and lids	• leaches chemicals having estrogenic activity (EA)
5	**PP** polypropylene	containers for yogurt, soup, margarine, syrup; rigid caps and lids, food storage containers, straws, bottles for medicines and supplements	• leaches chemicals having estrogenic activity (EA) • accepted in some places for recycling
6	**PS** polystyrene	styrofoam food trays, disposable cups, plates, bowls, clamshell containers, egg cartons, styrofoam packaging, opaque plastic cutlery, CD and DVD cases, lids for take-out coffee cups	• leaches styrene, a known carcinogen into hot food and drinks. Styrene is toxic to the brain and nervous system • leaches chemicals having estrogenic activity (EA) • not accepted for recycling
7	**OTHER** includes polycarbonate	baby bottles, 5-gallon water dispensers, "sport" water bottles, inner linings of food and drink cans, medical devices, bicycle helmets	• polycarbonate plastic leaches bisphenol A (BPA), an endocrine disruptor into food and drinks • BPA is linked to breast cancer, prostrate cancer, diabetes and obesity • leaches chemicals having estrogenic activity (EA) • not accepted for recycling

www.b-e-a-c-h.org/education_images/plastics_brochure.pdf

Food Contact Materials-

Phthalates

- European countries and China have limited the use of phthalates in food contact materials of plastic origin since 2008–2009.

- **EFSA** has set **tolerable daily intakes (TDIs)** for some important phthalates as

10 µg/kg body weight (bw) for dibutyl phthalate (DBP)

50 µg/kg bw for DEHP

500 µg/kg bw for BBP

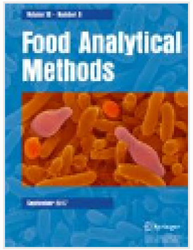
150 µg/kg bw for DIDP and DINP

ECHA
EUROPEAN CHEMICALS AGENCY

- In addition, USEPA specified the reference doses (RfDs) µg/kg bw/day
- 20 µg/kg bw/day DEHP
- 200 µg/kg bw/day BBP
- 100 µg/kg bw/day DBP

Guideline on the interpretation of the concept "which can be placed in the mouth" as laid down in the entry 52 of Annex XVII to REACH Regulation 1907/2006

Phthalates



Food Analytical Methods

September 2017, Volume 10, Issue 9, pp 3052–3062 | Cite as

Determination of Phthalate Residues in Different Types of Yogurt by Gas Chromatography-Mass Spectrometry and Estimation of Yogurt-Related Intake of Phthalates

Authors | Authors and affiliations

Ufuk Tansel Sireli, Ayhan Filazi, Begum Yurdakok-Dikmen, Guzin Iplikcioglu-Cil, Ozgur Kuzukiran, Ceylan Elif Orhan

Analyte
Dimethyl phthalate (DMP)
Diethyl phthalate (DEP)
Internal standard
Dibutyl phthalate (DBP)
Benzyl butyl phthalate (BBP)
Di-ethyl hexyl phthalate (DEHP)
Di-*n*-octylphthalate (DNOP)

- 72 fruit yoghurt (different series/brands): 8 each (pineapple, strawberry, apple, raspberry, apricot, banana, forest fruits, peach, cherry)
- 16 plain yoghurt (8 homogenized, 8 creamed)
- Cream part were tested seperately.
- Overall: 96 samples
- + MIGRATION TESTS (according to 85/572/EEC)

Phthalates

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- Of the samples
- **88.5%** was **contaminated with two or more phthalates**.
- **11%** (2%, pineapple; 1%, apple; 4%, banana; 2%, peach; and 2%, cherry) was contaminated only with a single phthalate compound,
- while **no phthalate** residues were present in **6%** of the samples (1%, raspberry; 2%, apricot; and 3%, banana yogurt).

Phthalates

Yogurt type (n = 8)	DMP (%)	DEP (%)	DBP (%)	BBP (%)	DEHP (%)	DNOP (%)	Total (%)
Pineapple	75	25^{a}	75^{a}	0	62.5^{a}	12.5^{a}	100^{a}
Strawberry	87.5	100^{b}	100^{a}	12.5	100^{a}	0^{a}	100^{a}
Apple	62.5	37.5^{a}	62.5^{a}	0	62.5^{a}	0^{a}	100^{a}
Raspberry	62.5	87.5^{b}	75^{a}	0	37.5^{b}	0^{a}	87.5^{a}
Apricot	62.5	37.5^{a}	62.5^{a}	0	62.5^{a}	0^{a}	75^{b}
Banana	50	0^{a}	12.5^{b}	0	25^{b}	0^{a}	62.5^{b}
Forest fruit	75	25^{a}	62.5^{a}	12.5	100^{a}	0^{a}	100^{a}
Peach	62.5	37.5^{a}	100^{a}	0	25^{b}	0^{a}	100^{a}
Cherry	37.5	12.5^{a}	62.5^{a}	37.5	75^{a}	0^{a}	100^{a}
Plain yogurt	62.5	87.5^{b}	100^{a}	0	87.5^{a}	25^{a}	100^{a}
Plain non-homogenized yogurt	100	100^{b}	100^{a}	12.5	100^{a}	75^{b}	100^{a}
Cream	100	100^{b}	100^{a}	25	100^{a}	100^{b}	100^{a}
P value	0.193	<0.001	<0.001	0.095	<0.001	<0.001	<0.01
Total frequency	70	54	76	8	70	20	94

Table 6 Minimum and maximum migration levels of phthalates in the different brands of yogurt containers

Type of yogurt containers (n = 8)	DMP (μg/L)	DEP (μg/L)	DBP (μg/L)	BBP (μg/L)	DEHP (μg/L)	DNOP (μg/L)
Pineapple	<LOQ	1.1–1.3	<LOQ	<LOQ	22.0–45.5	<LOQ
Strawberry	3.2–13	1–1.2	<LOQ	<LOQ	9.3–19.9	<LOQ
Apple	<LOQ	0.6–0.9	1.7–2.3	<LOQ	15.7–26.9	<LOQ
Raspberry	29–31	2.0–3.0	<LOQ	<LOQ	4.8–7.4	<LOQ
Apricot	<LOQ	0.6–0.9	0.8–2.0	<LOQ	31.9–33.6	<LOQ
Banana	2.0–5.7	0.9–1.1	<LOQ	<LOQ	2.3–4.4	<LOQ
Forest fruit	0.5–10.5	0.9–1.2	0.7–4.2	0.9–8.1	19–29.8	<LOQ
Peach	<LOQ	0.5–4.2	<LOQ	6.7–8.6	1.1–2.0	<LOQ
Cherry	3.3–4.8	0.9–1.1	<LOQ	<LOQ	21.2–29.9	<LOQ
Plain yogurt	7.9–135.6	1.3–10.7	0.8–1.4	<LOQ	7.9–157.8	<LOQ
Non-homogenized yogurt	<LOQ	1.0–1.8	<LOQ	<LOQ	171.7–194.5	<LOQ

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- **Highest concentrations** of phthalates were detected in **non-homogenized yogurts**
- In the non-homogenized yogurts, **cream crust contained a slightly higher frequency** and amount of phthalates than the other parts = lipophilicity of the phthalates/fat content
- **Least contaminated samples were banana and apricot yogurts** ($P < 0.05$), while four of the banana yogurts were contaminated only with a single phthalate.
- The **highest concentrations** of phthalates were found in **cherry yogurt**

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- All yogurt containers tested were **made of polystyrene**.
- In Turkish markets, this container type has been used as the most **common yogurt** container for spoonable yogurt.
- The phthalate contamination in cherry yogurts may derive from the fruit or from the milk itself or from the medium/materials used during production.

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- Namely, **DEP and DEHP were found in almost all of yogurt containers**,

DEP: 0.5 to 10.7 µg/L
DEHP: 1.1 to 194.5 µg/L

- **DEHP values in plain yogurt containers were 7.9–157.8 µg/L**, where the difference between the minimum and maximum values is almost **20-fold**.

This high variety of contamination could be attributed to their wide range of use in various products even initiating from planting shoes to garden irrigation hoses

Meanwhile In Our Lab

Assessment of Yogurt-Related Intake of Phthalates

- Average daily phthalate consumption (μg/kg body weight/ day) = Daily yogurt consumption (kg) × Detected phthalate concentration (μg/kg)/body weight (kg).

- adults (19–64 years old, average weight 74 kg) and
- children (6–8 years old, average weight 24 kg; 9–11 years old, average weight 33.9 kg; 12–14 years old, average weight 47.9 kg; 14–18 years old, average weight 59.9).

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Table 7 The mean estimate exposure to phthalates (μg/kg body weight/day)

Age group	DMP	DEP	DBP	BBP	DEHP	DNOP	Total
6–8 years old	0.035^{a} (0.003–0.343)	0.004^{a} (0.002–0.046)	0.03^{a} (0.002–0.247)	0.007 (0.002–0.012)	0.4^{a} (0.009–3.42)	0.023^{a} (0.006–0.234)	0.49^{a} (0.003–3.73)
9–11 years old	0.0248^{ab} (0.002–0.242)	0.003^{a} (0.002–0.033)	0.02^{ab} (0.002–0.174)	0.005 (0.002–0.009)	0.29^{ab} (0.007–2.42)	0.02^{ab} (0.004–0.165)	0.35^{ab} 0.002–2.64
12–14 years old	0.0175^{b} (0.002–0.171)	0.008^{b} (0.001–0.023)	0.015^{bc} (0.001–0.123)	0.003 (0.001–0.006)	0.2^{bc} 0.005–1.71	0.01^{ab} 0.003–0.117	0.25^{bc} 0.001–1.86
15–18 years old	0.014^{b} (0.001–0.138)	0.005^{b} (0.001–0.019)	0.012^{bc} 0.001–0.099	0.003 (0.001–0.005)	0.16^{bc} (0.004–1.38)	0.01^{b} 0.002–0.094	0.2^{bc} (0.001–1.5)
19–64 years old	0.011^{b} (0.001–0.111)	0.014^{b} 0.001–0.015	0.01^{c} (0.001–0.08)	0.002 (0.001–0.004)	0.13^{c} (0.003–1.11)	0.007^{b} 0.002–0.076	0.16^{c} (0.001–1.21)
P value	<0.001	<0.001	<0.001	0.197	<0.001	0.013	<0.001

Food Contact Materials- Antioxidants

- Added to a variety of polymer resins **to slow the onset of oxidative degradation of plastics from exposure to UV light.**

- **Arylamines** are common antioxidants used in plastic food packaging. **Butylated hydroxytoluene (BHT), 2- and 3-*t*-butyl- 4-hydroxyanisole (BHA), tetrakismethylene-(3,5-di-*t*-butyl-4- hydroxyhydrocinnamate) methane (Irganox 1010),** and bisphenolics such as **Cyanox 2246** and 425, and **bisphenol A** are the most common **phenolics used as antioxidants**

Food Contact Materials-

Heat stabilizers

- Heat stabilizers are added to plastics to prevent thermal degradation of resins from **exposure to elevated temperatures during thermal processing** of foods.

- **PVC, PVDC, vinyl chloride copolymers (for example, vinyl chloride/vinyl acetate), and PVC**

Slip agents

- Reduce friction of the surface of a polymer.

- Provide lubrication to the film surface, slip agents also impart lower surface resistivity (antistatic properties), reduced melt viscosity, better mold release, and antisticking properties

- Common slip compounds are **fatty acid amides (primary erucamide and oleamide), fatty acid esters, metallic stearates (for example, zinc stearate), and waxes.**

Consumer preferences

- Consumers with certain preferences may have an increased intake of dioxins and PCBs.
- Eels from contaminated rivers may contain relatively high levels of dioxins and dioxin-like PCBs
- Frequent consumption-eels-result in elevated exposure.
- Frequent consumption- smoked, barbecued products?

Food Anal. Methods
DOI 10.1007/s12161-015-0367-4

Determination of Selected Polychlorinated Biphenyl Residues in Meat Products by QuEChERS Method Coupled with Gas Chromatography–Mass Spectrometry

Ozgur Kuzukiran[1] · Ayhan Filazi[2]

- The optimized and validated procedure was applied to **75 meat product samples.**
- **PCB28 was the most common PCB**
- Among the samples analyzed, **salami exhibited the highest concentration of total PCBs**.
- European Commission specified a maximum residue limit (MRL) of 40 ng g−1 of fat for indicator PCB residues potentially occurring in meat and meat products.

Table 4 PCB residues in meat products in nanogram/gram of fat

Compound	Frequency of determination (%)	Range of positive samples[a]
PCB28	6.67 (n=5)	0.634–1.376
PCB52	2.67 (n=2)	1.056–1.472
PCB101	1.34 (n=1)	1.757
PCB118	5.34 (n=4)	0.575–1.126
PCB138	1.34 (n=1)	0.906
PCB153	1.34 (n=1)	0.409
PCB180	2.67 (n=2)	0.407–0.763
∑PCBs	14.6 (n=11)	0.407–3.936

[a] Calculated using values ≥LOQ

Table 5 PCB residues (ng/g of fat) in sausage, soudjouk, and salami

Compound	Sausage (n=3)	Soudjouk (n=4)	Salami (n=4)
PCB28	ND	0.656	0.634–1.376
PCB52	ND	1.472–1.056	ND
PCB101	ND	ND	1.757
PCB118	0.575–0.744	0.989	1.126
PCB138	ND	0.906	ND
PCB153	ND	0.409	ND
PCB180	0.407–0.763	ND	ND
∑PCBs	0.407–1.338	0.906–1.881	0.634–3.936

ND not detected

Journal
Journal of Toxicology and Environmental Health, Part A >
Current Issues
Volume 68, 2005 - Issue 4

Original Articles

Effect of Cooking on the Loss of Persistent Organic Pollutants from Salmon

Stéphane Bayen, Philip Barlow, Hian Kee Lee & Jeffrey Philip Obbard

Pages 253-265 | Received 07 May 2004, Accepted 20 Jul 2004, Published online: 24 Feb 2007
Download citation
http://dx.doi.org/10.1080/15287390590895126

- **Higher concentrations at the head end than the tail**, with a **peak in the central section.**
- **After cooking, levels of POPs decreased** in salmon steak with an average **loss of 26 ± 15**% relative to the initial POP load in the raw steak.
- The **removal of the skin from the cooked salmon steak resulted in a further average loss of 9 ± 3%.**
- The loss of POPs did not differ significantly between cooking methods.
- Losses of POPs were significantly and linearly **correlated with the losses of lipid during cooking**, suggesting removal of lipids is the critical factor for POPs reduction in cooked fish.

Journal of Food Composition and Analysis

Volume 5, Issue 3, September 1992, Pages 257-263

Note

Evaluation of the induction of polycyclic aromatic hydrocarbons (PAH) by cooking on two geometrically different types of barbecue

B. Saint-Aubert *, J.F. Cooper †, C. Astre *, J. Spiliotis *, H. Joyeux *

- 6 PAH including benzo[*a*]pyrene
- meat and fish grilled on two geometrically different gas barbecues.

Vertical barbecue

- in which **dripping of fat onto the heat source is prevented,**
- *levels of fluoranthene*, regularly detected, *were lower* or equal to 1 µg/kg.
- Amounts of the *other PAH were very low, under*, or near the detection limit of the analytical method (0.1 µg/kg).

Horizontal lava-rocks barbecue

- *benzo[a]pyrene and other polycyclic aromatic hydrocarbon levels were higher* and varied (1–30 µg/kg) with the kind of food sample and particularly with the cooking time.

Perfume-milk?

Food Safety and Monitoring of Safety Aspects 25

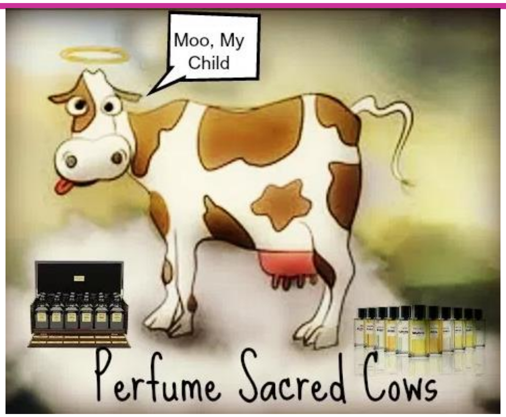
Carry-over of diethylhexylphthalate and aromatic nitro compounds into the milk of lactating cows

Albrecht Blüthgen and Ulrike Ruoff

- Nitro musk compounds are degraded to a significant extent in the rumen can be supported with the only parenteral application of a phenolic nitro fasciolicide to become therapeutically effective.

Conclusions to the carry-over of nitro musk compounds into the milk

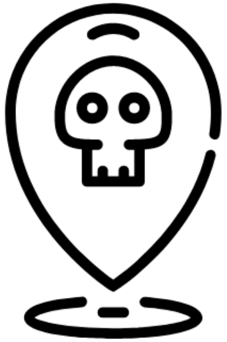
- The carry-over rate is substance-dependent and after low dosage (~ 240 ng/kg b.w.) between 0.008 and 0.04 %
- A provocative dose of 24 µg/kg b.w. is answered with carry-over rates between 2 and 17 %.
- Nitro musk compounds show no persistence in milk fat
- Before main exposition of humans occurs through direct dermal absorption from cosmetics and to a far lesser content from fresh water organisms



Carry-over rates for nitro musk compounds into milk (lactating cows)

	Carry-over rates (%)		
	after 1st dose (150 µg)	for 15 x 150 µg/d	after provocative dose 1 x 15 mg (+ 15x150 µg)
Musk ambrette	<0.01	0.019	3.55
Musk tibetene	0.031	0.008	2.61
Musk xylene	0.018	0.042	17.1
Musk ketone	0.160	0.028	4.04
Musk moskene	0.089	0.033	2.33

Risk of chemical contaminants



- **Risk assessment**

Hazard identification,
Hazard characterisation (dose–response assessment),
Exposure assessment
Risk characterisation.

- Risk associated with **dietary intake**
- Acceptable daily intake (ADI) (e.g. of pesticides, veterinary medicinal drugs),
- Tolerable daily intake (TDI) (e.g. of heavy metals, mycotoxins) and the tolerable weekly (WTI) or monthly (MTI) intake (e.g. of dioxins and dioxin-like compounds).

Risk assessment for EDCs

- First step = compare the detected amounts of **residues** with the **maximum residue level (MRL)** authorised in foodstuffs.

- If the residue level in the food exceeds the MRL, the theoretical maximum daily intakes and the **ADI have to be taken into account in order to assess the risk to the consumer**. The exposure is obtained using the basic equation:

$$\text{exposure (mg/kg bw/day)} = \text{consumption (kg/kg bw/day)} \times \text{residue level (mg/kg)}$$

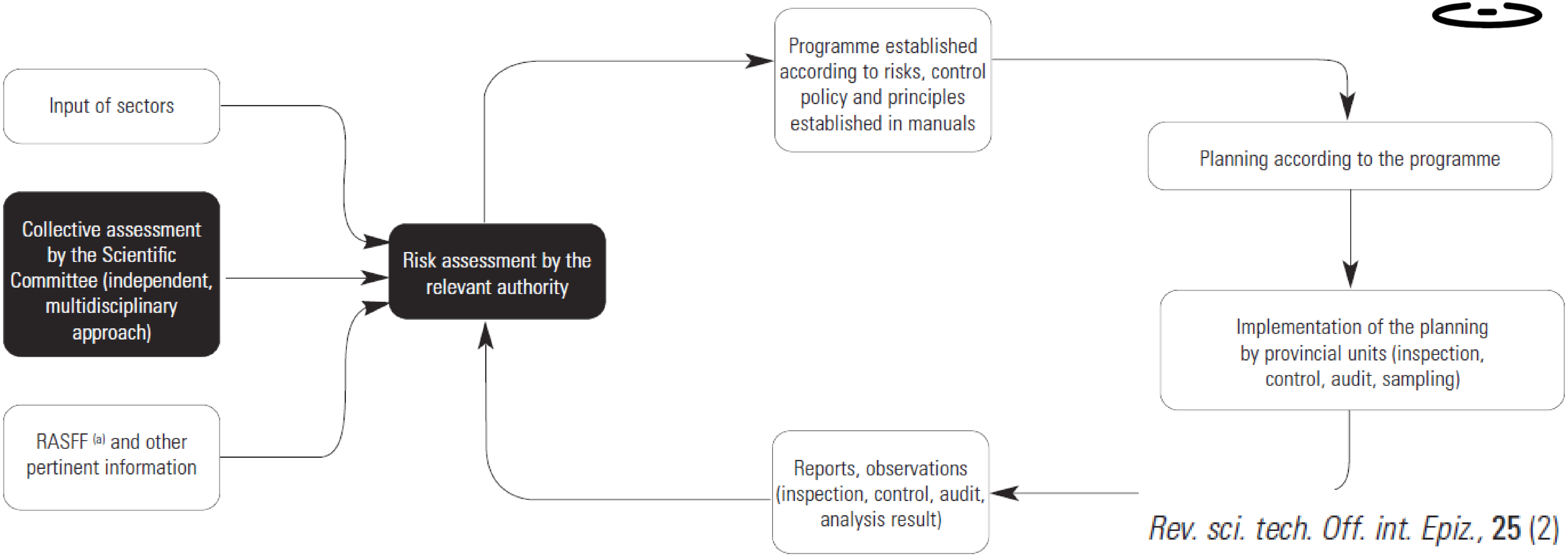
Risk management for EDCs

- Determination of foods/food groups significantly contributing to the exposure
- Occurrence data of the contaminant in the various food/food groups
- Setting a maximum level following the ALARA principle (As Low As Reasonably Achievable - see before prevention versus regulation).
- The degree of severity of the application of this principle depends on the relation exposure - tolerable intake

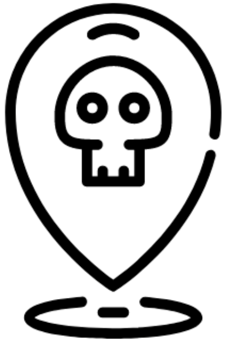
Determine/Apply HACCP for each productio unit…

HACCP principles	
1	Conduct analysis of potential chemical hazards
2	Determine critical control points for the targeted hazard or hazards
3	Establish critical limits
4	Establish routine monitoring procedures to assess these critical limits
5	Establish corrective actions to be implemented if critical limits are exceeded
6	Establish an effective record-keeping system for the programme
7	Establish a system of verification to document that the HACCP programme is being followed

The continued programme of chemical (EDC) control



a) rapid alert system for food and feed



Avoid/prevent

– **identification and registration** of animals, operators and products

– **harmonised systems of traceability** throughout the food chain

– **guidelines** for each sector and procedure for all operators

– **rapid notification of incidents**

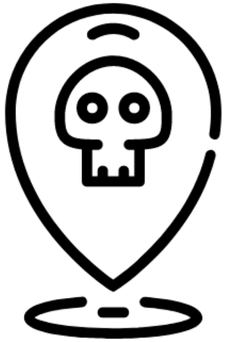
– **scientific advice**

– **risk analysis**

– regular **Exchange of knowledge**

– where necessary, an **adequate use of the precautionary principles** between **regulatory authorities and consumers**

Responsibility



- The **competent authorities** are responsible for translating the results of **scientific risk assessment into enforceable and controllable legislation**, aiming at **optimal consumer protection**.

All EU Member States are required to appoint National Reference Laboratories (NRLs) as a requirement of Regulation EC/882/2004 (EC, 2004). There are NRLs for pesticides and veterinary medicines plus the following five containment areas:

- Mycotoxins
- Heavy metals
- Dioxins (PCDD/Fs) and polychlorinated biphenyls (PCBs)
- Polycyclic aromatic hydrocarbons (PAHs)
- Materials and articles in contact with food.

NRLs work closely with the European Union Reference Laboratories (EU-RLs) appointed by the European Commission and with official national control laboratories (OCLs) within their own country. The role of the NRL includes:

- Providing a channel for communication between the Competent Authority, the EU-RL and national control laboratories
- Advice and representation on contaminants
- Production of standard operating procedures, codes of practice and guidance documents
- Compliance assessment via audit ring trials
- National coordination of EU-RL initiatives.

On the other hand…

Endocrine disruptor standards could damage livestock feed

By Liz Newmark, in Brussels, 20-Jun-2016
Last updated on 20-Jun-2016 at 13:46 GMT

Regulation on endocrine disruptors, chemicals common in pesticides, could indirectly raise meat prices

Job loss fear

EU farm body Copa secretary general Pekka Pesonen said a scientific, risk-based approach was essential. "*While the EU is putting more restrictions on plant protection products (PPPs), many substances already banned in the EU are still used in non-EU countries, putting farmers at a clear competitive disadvantage,*" he said. "*Failure to retain an economically competitive EU agriculture sector puts European jobs at risk while reducing the diversity of high-quality agri-food products available to consumers.*"

The impact assessment with the proposals suggested 13 fungicides, nine herbicides and four insecticides were at risk of being classed as EDCs and so could be removed from the market.

Copa's press officer Amanda Cheesley added that while meat was not directly affected by EDCs, she told *GlobalMeatNews* : "*As the main sector impacted is cereals, the proposal could result in less plant protection products on the market for them.*"

No meat contamination

This could affect meat prices indirectly, however, as the Commission itself admitted crop production would become more expensive and the cost could be passed on to consumers.

The meat industry was reluctant to comment. "*We are not following the issue,*" said the European Livestock and Meat Trades Union's (UECBV's) veterinary adviser Dr Claudia Vinci. The EU liaison centre for the meat processing industry (CLITRAVI) secretary general Dirk Dobbelaere said: "*EDCs are a very complex issue,*" arguing there was no problem with meat contamination from EDCs.

'Too strict'

Meanwhile, environmental organisations are angry at the proposals, saying their scope is too narrow.

And while the Commission wants to implement the new rules quickly, with help from the European Food Safety Authority and European Chemicals Agency, many MEPs at the European Parliament are threatening to veto them. For example, the greens group environment and health spokesperson Bas Eickhout said the Commission's definition was "*very restrictive*".