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# The inorganic substances and Food and Feed Safety

Food and Feed contamination with emphasis on heavy metals

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14 April 2005



## 2 Belgian competent authorities

**Federal Public Service Health, Food Chain Safety and Environment:**

**legislation on authorised uses, maximum levels etc**

**Whole food chain from pesticides to food supplements**

**Agency for the Safety of the Food Chain**

**Control of compliance with the legislation in the whole food chain**

**Specific control legislation (e.g. sampling method, frequency of control, autocontrol, ...)**



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## Safety issues

**Dangers can be**

- **Acute effects (e.g. vomiting)**
- **Chronic effects: more important for humans than for animals (e.g. cancer)**



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## Feed contamination

**Feed contaminations can be**

- 1. Dangers for public health via food of animal origin**
- 2. Dangers for animal health**
- 3. Dangers for animal production**

**Food contaminant issues are always linked to public health issues**



## Understanding food contaminants

**Some food contaminants are of environmental origin, others are processing contaminants or originate from mould or from packaging or from plant culture**

**Environmental: dioxins/PCBs, heavy metals**

**Processing contaminants: 3-MCPD, PAH, acrylamide**

**Mycotoxins: AF, OTA, DON, ...**

**Packaging migration: tin**

**Plant culture: nitrate**



## 6 Link food contaminants - feed

**Some food contaminants are linked to feed contamination, others are not**

**Yes in most cases: dioxins and dioxin-like PCBs**

**Sometimes yes, often not: heavy metals**

**No (with a few exceptions): mycotoxins, PAH, 3-MCPD, nitrate, tin**



## Cadmium

- Enters the food chain via feed, but also directly in food from plant origin
- Is taken up from soil to plant, to different extent for different plants (more in leafy vegetables than in cabbage ..., high levels in sunflowerseeds)
- Cadmium is present within the plant (whereas lead is more present on the surface of plants)
- Cadmium concentrates in kidney and liver in animals
- Can be present as an impurity in chemicals



## Cadmium: dangers

**Cadmium accumulates during life, especially in kidney**

**For humans:**

**nephrotoxic (kidney dysfunction), skeletal changes and reproductive deficiencies**

**Human carcinogen**

**For animals: similar, but concern lies with public health rather**



## 9 Cadmium: exposure

### Level of exposure

Up to about 40% of tolerable intake for the mean consumer, 65% for children 4-6 years old.

A part of the population exceeds the tolerable intake.

Part of the population shows effects on health from cadmium exposure (contaminated areas)

### Most important contributors to human exposure:

potatoes, vegetables, cereals

Frequent consumption of kidney/liver from older cattle, horses or from wildlife can contribute significantly to human exposure.



## Lead in food

**Exposure of consumer not only from food, but also dust etc**

**Vulnerable groups: children: foetal neurodevelopmental effects,  
reduced learning capacity**

**Cardiovascular effects**

**Mean intake in EU is 14% of tolerable intake, children 35% on  
average, intake can exceed the tolerable intake**

**Beverages, fruit and vegetables: important intake sources.**

**Foods with sometimes high levels: wine, game, fish, meat**

**Difficult discussion on MLs for lead in fish continues**



# Lead in feed

**Contaminated soil, local pollution**

**Lead in feed: public health issue via foods of animal origin**

**Lead accumulates in liver, kidney, bones**

**Animal health issue: sensitive species cattle and sheep  
neurotoxicity**



## 12 Mercury

### **Methylmercury of concern**

**Only fish very important for human exposure of methylmercury  
Uptake by plants from soil is low**

**Unborn child, small children: alterations in the normal development of the brain; Neurological effect in adults**

**Advice on consumption of certain fish for pregnant women and small children**

**Animal health issue**



# Arsenic

## Cancerogenic

**Difficulties on speciation and analyses. Organic and inorganic forms. Organic forms less or not toxic. Different inorganic forms with different toxicity.**

**Not in 466/2001 (EU food contaminants regulation) for the moment.**

**Maximum levels for total arsenic in some purity criteria of food additives and in the feed legislation undesirable substances.**



## Arsenic (2)

**Concern for human health is in the first place for seafood/fish  
(and purity of food supplements)**

**Hijiki seaweed warning against consumption because the  
arsenic present is in a dangerous inorganic form**

**Transfer feed-food not so important**

**Not enough information and technical possibilities for good risk  
management.**



# Fluoride

**TOO much is not good for teeth and bones, but at the same time it is needed for health in appropriate levels**

**Maximum levels in water**

**In Belgium in the past allowed to add as a nutrient to food, but not any more taking into account exposure levels**

**Exceptionally contaminated feed can give fluorosis in animals. Maximum levels help to prevent this.**



# Purity criteria food additives: heavy metals

**Identity and purity described additive by additive**

**Harmonised in EU in directives from the Commission**

**Little discussion**

**Example**

**E170 calciumcarbonate max 3 mg/kg arsenic, 10 mg/kg lead, 1 mg/kg cadmium, fluoride 50 mg/kg**

**E530 magnesiumoxide max 3 mg/kg arsenic, 10 mg/kg lead**



## Dioxins and dioxin-like PCBs

**Strong link feed → food contamination → human exposure**

**After assuring feed safety, difficult issues in food contamination with dioxins and dioxin-like PCBs remain**

**-Fish**

**-Free circulation: e.g. eggs are contaminated when chicken have access to outdoor soil**

**-Milk at few hot spots**



## Dioxins and dioxin-like PCBs

**Toxicologically similar**

**Part of the populations exceeds tolerable intake**

**Different sources**

**Much more experience on dioxins than on dioxin-like PCBs  
(data, analytical possibilities, source measures)**

**Exposure of the consumer nowadays more from dioxin-like PCBs  
than from dioxins**

**Maximum levels for dioxins + dioxin-like PCBs for the near  
future as well for food as for feed (similar approach)**

**Minerals for feed included**



## 19 Measures to reduce

**Codex Alimentarius protects the health of consumers and ensures fair trade practices through the elaboration of codes of practice for the prevention and reduction of contaminants combined with the establishment of maximum levels providing a strong incentive for the application of the codes of practice**

