NUTRITIONAL TOXICOLOGY

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Introduction to Toxicology

**Xenobiotics** - substances - foreign to body (**xenos – forein, bios - life**)

- natural origin
- artificial substanties

**In the body:**
- are not natural, for human body forein
- most of xenobiotics in the body are converted (metabolised)
- effective mechanisms for detoxification and elimination of xenobiotics
- depends on characteristics of substances (lipophilic x hydrophilic)
Toxicology (from the Greek words *toxikos* "poisonous" and *logos*) is a branch of biology, chemistry and medicine or specifically – pharmacology concerned with the study of the adverse effects of chemicals on living organisms.

- Also studies the harmful effects of chemical, biological and physical agents in biological systems that establishes the extent of damage in living organisms.
- Studies the relationship between dose and its effects on the exposed organism.

Factors that influence chemical toxicity: the dosage (acute or chronic); the route of exposure, the species, age, sex and environment.
Toxicology

**History:** Theophrastus Phillipus Auroleus Bombastus von Hohenheim (1493–1541) - known as Paracelsus is also considered "the father" of toxicology

**Definition:**

- **POISON** - toxic chemical substances or mixtures which are able to cause damage of organism and that can be fatal

**Paracelsus:** "All things are poisonous and nothing is without poison; only the dose makes a thing not poisonous."

"The dose makes the poison" or in Latin "Sola dosis facit venenum"
RESOURCES

Recources:

- **environment** – polluted atmosphere, water, soil (traffic, industry, agriculture) and **working environment**
- **food, feed, drinking water, interiors** (flats, offices)
- **agriculture** → Food and Feed
- **industry**

Situation isn’t so horrible - institutions, authorities - issue regulations in the form of legislation limited using of pesticides, and wastewater discharges and **emissions** to atmosphere, other contaminants … ! **Emissions x imissions** ! difference

Discharge of effluents into water, atmosphere, environment - guarding by the **Ministry of Environment**, other authorities as **Central Institute for Supervising and Testing in Agriculture** - authorizes use of pesticides - **subordinate** to Ministry of Agriculture
Entrance paths into the body

**Commonly:**

Main: **by the digestive tract – orally**

- through the skin (dermal input), **respiratory system** (input by inhalation), **injection** - intravenous, intramuscular, subcutaneous
- most of the substances absorbed **in the intestines, stomach**
- they migrate either: the portal vein to the liver and subsequently to the large circulation – [**hydrophilic** = polar xenobiotics]
- via the **lymphatic system** directly to the large circulation – **lipophilic** = non-polar compounds
- partially - absorbed in the mouth (sublingually)

Substances entering **by a different route than through the digestive system** to the liver come later (slowly)
Path xenobiotics in the body

Polar - hydrophilic xenobiotics

- soluble in water environment

- poorly penetrate through the membranes of cells - through a variety of channels, receptors, transporters

- in blood - transported freely (without transport protein)

- rapidly eliminated by the urine
Path xenobiotics in the body

Non-polar – hydrophobic, lipophilic xenobiotics

- water insoluble or poorly soluble
- can diffuse freely through the membrane
- in the blood bounded to the transport proteins - leads to their slow elimination from the organism
- bounded to the protein can´t be secreted into the urine
Biotransformation

Biotransformation of xenobiotics and metabolism

➢ Phase I. = **biotransformation** ⇒ free polar functional groups in the molecule
➢ Phase II. = **conjugation** ⇒ binding with endogenous compounds

**Objective of xenobiotics metabolisation:**

➢ inactivation of xenobiotics and increase the solubility of hydrophobic xenobiotics and removal from the body
Phase I. - biotransformation

**Localization:**

- **in liver** - in the ER membrane, in cytoplasm
- **in many other tissues** - especially at entry, and place of excretion (lung, intestine, skin, kidney)

**Enzymes:**

- hydrolases - esterases, peptidases, etc.
- monooxygenases ((ie. system cytochrome P450)

**Result:**

inactivation of xenobiotic and detoxification of organism

- Danger: increasing the biological activity of xenobiotics
  combination: drugs and xenobiotics → **procarcinogens**!
Phase II. - conjugation

Localization:
➢ liver (intestinal mucosa, skin): ER, cytoplasm

Result:
➢ increasing the polar property (solubility) and a reduction (decreasing) their biological activity

**Requires** - the presence of endogenous conjugating component - **glucuronic acid and glutathione** (synthesized in the liver)

\[ \gamma\text{-glutamylcysteinylglycin} \]
Conjugation of xenobiotics

Endogenous conjugated component

\[ \text{Endogenous conjugated component} \rightarrow \text{activated conjugate component} \]

- Bile
- Urine

Conjugate

Water soluble, inactive, non-toxic

- Převzato z Coolman: Color atlas of biochemistry
Nutritional Toxicology

Toxic compounds in food (feed):

➢ Entry of xenobiotics into the organism by food (toxic potential of food)

➢ Health risk from consumption of food is almost unlimited

➢ Absolute food security – can’t be guaranteed

➢ Toxic substances in foods - are a hazard, risk potential of food (feed)

Risks - can be minimized 😊
Entry into the food chain

Definition:

**Toxic substance in food** - is a harmful chemical that **is not a natural part of the food**. Their presence in food may endanger human health

- **1. Contaminants** - exogenous
  - endogenous
- **2. Residues**
- **3. Additives** - xenobiotics, **are not natural in food** - **non toxic!!** can be added to food products (according legislation)
1. CONTAMINANTS

Characterized briefly

Substances:

- **A. pass into** the food in - advertently during manufacture, farming, planting on field, (plants), storage, transport, processing ... = **exogenous**
  
  **Exogenous** - get into the food from the **external** environment

- **B. are formed** in foods by physical, chemical, biochemical and biological factors or interactions between food ingredients = **endogenous**
  
  **Endogenous** - arise in food **from natural (main) components** as a result of interaction of environmental influence, processing conditions and storage (by heat treatment, the effect of other physical factors, degradation of main components e.g. proteins...)
2. RESIDUAL AS

Residual substances – after application (farming, field production):

- **residues of veterinary drugs** - drugs for treatment of farming animals (residues in muscles, organs, lipids) for human consumption - biologically active agents - antimicrobials, antiparasitics, hormonal agents, morforegulators – prohibited! not allowed, antibiotics (limited use, decreasing) fertilizer ingredients, additives to farm animals feeds …

- **agrochemicals** = substances used to control pests, used to crop treatment (pesticides) and as fertilizers (residues in food – grain, fruits, vegetables, herbs, tea!)
3. ADDITIVES

Characterized briefly“

➢ substances that are added to foods only in strictly necessary quantities in accordance with the principles of good manufacturing practice

➢ Reason:

- technological, sensory, transport, storage and others purposes, but in most of the highest allowable amount (threshold!)

**MRLs** = Maximal Residual Limits in food =

= total content in food in the form for consumer or in the consumer packaging (mg/kg of food)

In the Czech Rep.: **ML** – Maximum allowable amount in food
Limits

➢ **TDI (ADI)** – Tolerably Daily Intake (or Acceptably)
➢ **TWI** – Tolerably Weakly Intake
➢ **PTWI** – provisionally tolerably weekly intake

➢ **Evaluation of Toxicity**
  • **NOAEL** - No observed Adverse Effect Level
  • **SF** (Safety factor /100) → TDI(ADI)
  • **LOAEL** - Lowest Observed Adverse Effect Level

Units: miligrams or micrograms/kg of body weight/day or /week
✓ mg/kg b.w./day
✓ mg/kg b.w./week
Food – cocktail of chemical substances

Fresh foods - contains about **half a million different chemical compounds.**
Much larger amounts of the compounds furthermore arises by enzymatic and non-enzymatic reactions during storage, processing…

Not all are dangerous! 😊

- **main compounds of food** (proteins, lipids, saccharides, minerals…. ) and others

**EFSA:** All food is made up of chemical substances. Chemicals in food are largely harmless and often desirable – e.g. nutrients such as carbohydrates, protein, fat and fibre are composed of chemical compounds …

**EFSA- European Food Safety Authority,** based 2002 y., European Parliament, from 2005 - Parma, Italy → WHO, FAO, EPA
Food – cocktail of chemicals…

Chemicals can, however, have a variety of toxicological properties, some of which might cause harmful effects in humans, animals

- usually, these are not harmful unless we aren’t exposed to them for a long time at high levels

- protection against harmful effects - establishing safe levels – MRLs (Maximal Residual Limits in food)

- EFSA: „Chemical substances (used in protection of crop) - can play an important role in food production and preservation“
Exogenous contaminants

- **chemical compounds** present at various levels in the environment, e.g. in soil, water and the atmosphere.

- examples include **industrial pollutants** such as dioxins and PCBs, PAH …

- **heavy metals** (Cd, Pb, Hg, As…) can be present naturally in the environment or as a result of human activity.
Exogenous contaminants

Resource: polluted environment
Example: *heavy metals* - Hg, Cd, As, Pb.. fish (!MeHg) - fish, seafood!
PAHs, bisphenol A…

* Brominated flame retardants (BFRs) - reduce flammability of materials
HBCDD – hexabromcyclododecane, TBBPA-tetra brombisfenolA, PBDE - polybrominated difenylethers – lipophilic, persistent….

* contaminants from industry – plastic softeners (plasticisers) - in textiles, components of cars, computers, toys for babies, commonly used objects - contact with food…, some food additives…

Endocrine disruptors
Hormonally active substanties – harmfull for animals (water animals, fish, crayfich and HUMAN reproduction)
BFRs

BFRs are mixtures of man-made chemicals that are added to a wide variety of products to make them less flammable

- commonly used in plastics, textiles and electrical equipment, many are persistent, bioaccumulative, and toxic to humans and the environment

- Between October 2010 and October 2012, EFSA’s Panel on Contaminants in the Food Chain (CONTAM Panel) reported - main groups of BFRs - potential risks to public health from their presence in food! → intensively monitored
BFRs – structure

organobrominated compounds

✓ **HBCDD** – hexabromcyclododecane -
r.2010 Stockholm’s declaration - recommended *a worldwide ban on its use*

➢ **TBBPA-tetra**brombisfenolA - in epoxides, electronics
➢ **PBDE**-polybrominated difenylethers –
➢ 209 congeners - structure similar as **PCB**!
BFRs

↑ temperature, sun lights – released from plastics (interiors of cars, airplanes, electronics, PC monitors, PC components, building, isolation materials, textiles..)

Property:

▪ nonpolar – hydrophobic - not in hydrosphere, not transported by water, but 
  **bioaccumulation!**

▪ lipids, tissue – accumulation, **chronic toxicity**

▪ structurally similar as thyroid **hormones**

▪ binded to transport proteins of blood

▪ mobilised from lipid tissue – released - affinity to CNS, reproduction system
Exogenous contaminants – not only from environment

**Food packaging materials** and containers - **bottles, cups and plates**, used to improve food handling and transport, can contain chemical substances such as **plastic…**

✓ elements **can migrate into food**

Can have **effect as endocrine disruptors - estrogenicity**

E.g. packing, plastic objects, things, PVC, appartement interiors, cosmetics, plastic toys for babies – **phtalic acid esters = phtalates (PAE) – prohibited!** - plastic bottles for babies – dangerous especially for little boys – can cause feminization! prohibited in toys, bottles…

E.g. di-(2-ethylhexyl) phtalate (**DEHP**), di-butyl phtalate (**DBP**), benzylbutyl phtalate (**BBP**) …. **DANGER:** Low acute toxicity, **but – long term exposition of low dose** – proven negative effects: embryotoxicity, teratogenity, spermimototoxicity, hepatotoxicity, nefrotoxicity, carcinogenity, disturb blood coagulability
BPA

Phtalates:
➢ TDI = 0,05 mg/kg, established from NOAEL 5 mg/kg
divided by safety factor (SF) 100 for phtalates (EFSA)

Occurence in food:
✓ small amounth – in spirits and bottled water
✓ in food with fat - can migrate (phtalates are lipophilic) - due to contact with plastic bottle cap (peppers or olives in oil, dressings, peanut butter)

Bisphenol A - BPA – bisfenol-A-diglycidylether
• basic component epoxy –resins, used as inner coating of food cans, water tanks …

Toxicity: carcinogenity is not strictly proved, but from 2006 y.
BPA prohibited!
Endocrine disruptors (ECD)

hormonally active substances

- affect the hormonal system at all levels
- similar structure to hormones
- may occupy receptors
- may modify receptors
- impaired hormonal pathways
- connected with metabolic diseases, DM, impaired reproduction, reduction numbers of sperms
- changed sex of fish, other water organisms (crayfish) – the impossibility of reproduction, growth retardation
The endocrine system keeps our bodies in balance by maintaining homeostasis and guiding proper growth and development.

On the other hand, endocrine disruptors interfere with the endocrine system and cause adverse effects both in human and wildlife.

Fig. 6. Model of endocrine systems that include brain and hypothalamic neuroendocrine system; pituitary; thyroid; cardiovascular system; mammary gland; adipose tissue; pancreas; ovary and uterus in females, and testes and prostate in males physiology (Diamanti-Kandarakis et al., 2009).

ECD

- Pesticides (herbicides, insecticides, rhodenticides..)
- Additives to plastics (softeners)
- BFR = Brominated Flame Retardants
- Pharmaceuticals (drugs, contraceptives …)
- some additives to food

Overview of substances with the estrogenic effects in review:


Endogenous contaminants

Arise in food:

- after **processing conditions** and storages – new substances produced by heat treatment, the effect of other physical factors as -temperature, light, oxygen, etc. from natural ingredients → **processed contaminants**: aromatic nitro compounds, PAHs, products of fat oxidation, products of the Maillard reaction

- after activities of contaminating microflora - **mycotoxins** (aflatoxins), **bacterial toxins** (enterotoxins)

- as the **breakdown products** of metabolism - **biogenic amines**
Mycotoxins

**AFLATOXINS** – toxins - *Aspergillus family* (Aspergillus flavus, A. parasiticus, A. nomius, A. niger) – extremely high toxicity

aflatoxins B1, B2, G1 a G2 (according fluorescence UV-light)

- acute toxicity and carcinogenity
- damage the health of humans and animals
- primarily affecting the liver (hepatotoxicity)
- according classification IARC – **group 1**- direct carc.
- metabolized in the liver to the intermediate epoxide aflatoxins - hepatotoxicity!
- causes **hepatocellular carcinoma**

**MRLs**:  
Aflatoxins … 0,004 mg/kg = only 4 µg/kg!  
Aflatoxin B1: 0,002 mg/kg = only 2 µg/kg - more toxic!
### IARC Classification of Chemical Substances

<table>
<thead>
<tr>
<th>Group</th>
<th>Classification</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group 1</td>
<td>Carcinogenic to humans</td>
<td>119 agents</td>
</tr>
<tr>
<td>Group 2A</td>
<td>Probably carcinogenic to humans</td>
<td>81</td>
</tr>
<tr>
<td>Group 2B</td>
<td>Possibly carcinogenic to humans</td>
<td>292</td>
</tr>
<tr>
<td>Group 3</td>
<td>Not classifiable as to its carcinogenicity to humans</td>
<td>505</td>
</tr>
<tr>
<td>Group 4</td>
<td>Probably not carcinogenic to humans</td>
<td>1</td>
</tr>
</tbody>
</table>

*Note: The numbers change (re-evaluated)*
Food and protection

**Historically – discovery of aflatoxins:** turkey – farm near the London (around 1960 y.), feed contaminated - by fungi - **massive mortality of turkeys**

- **bad storage, package and transport conditions** (↑humidity, temperature)
- **foods from tropical countries** (transport - long distance, temperature)

**Risky foods** - the highest incidence:
- peanuts, corn, nuts, pistachios, cotton seeds – subtropic…
- Lower: cereals: wheat - flour-bread, rice, almonds, fruit juices, syrups, cheeses, potatoes, oil, coffee, cocoa, chocolate, dried fruit…

**Aflatoxins cannot be decomposed !!**

**Protect food against:** protection crop on the field, against infection by fungi, good storage, sanitation of stocks, transport, ↓ temperature, ↓ humidity,

**PATULIN** – *Aspergillus clavatis* → mycotoxin, on partially rotten fruits not so danger (IARC –group3), can be decomposed by fermentation

**In:** fruit juice (apple), tomato products, sillage-feed for farm animals
Biogenic amines

**Decomposition of organic matter, proteins** - decarboxylation of AA (e.g. Histidine - arises histamine, lysine cadaverine, arginine agmatine, putrescine, tyramine…)

- at higher levels the **biogenic amines present in fermented foods** arise where activity of microorganisms (sauerkraut, aged meats, cheeses, red wine, beer, fermented fruit juices)
- harmfull effect may occur - combining biogenic amines and medication – psychopharmaceutics, in the case of impaired liver function
- high levels of biogenic amines in foods – start processes of food spoilage

**Risky food - occurrence:** caused by contaminating mikroflóra- **mainly in fish** and meat **during storage** (histamine, cadaverine, putrescine, tyramine) and the bad storage of fruits, vegetables and mushrooms (tyramine)

Occurrence of biogenic amines - can be used as an **indicator (marker) of spoilage** (x freshness)

**Health effects:** excessive intake can lead to disorders of the **central nervous system, circulatory disturbances, headaches, heart palpitations, vomiting and diarrhea**
Enterotoxins – alimentary disease

Pathogenic bacteria → toxins: *Campylobacter jejuni, Staphylococcus aureus, Bacillus cereus, Clostridium perfringens, Salmonella typhi, Shigella dysenteriae*...

Botulism - symptoms of poisoning- manifests after 6 to 72 hours after ingestion of food containing the toxin (strong poison) – botulotoxin.

Caused: *Clostridium botulinum* (anaerobic microorg.) – food contaminating pathogen

Effect:
- Consist of headaches, nausea, vomiting, dry mouth, double vision, and ultimately in paralysis of muscles, including the respiratory, which ends at 30 to 65% of deaths
- Botulotoxin - protein, therefore inactivated by elevated temperature (15 to 25 minutes at 100 °C)
- Botulism is rare, bad sterilization of meat (cans - tempr. > 121°C - kills bacteria)

Alimentary infections – due to contaminated food or water, bad sanitation, hygiene
PAHs

Polyaromatic Hydrocarbons

Typical representative: benzo(a)pyrene

Occurrence: in coal tar, exhaust gases (traffic), in smoke - combustion of organic materials, fossil fuels, tabacco smoke!, grilled and smoked food

✓ in atmosphere (imission limit) for benzo[a]pyrene in external air = 1 ng.m⁻³
✓ in heavily smoked and barbecued foods

Benzo(a)pyrene ...

ADI - 3 μg/kg b.w./day = 0.003 mg/kg/day
✓ carcinogenic (proven) for human! IARC – group 1
PAHs

➢ **Boiled** meat – content benzo[a]pyrene max. **4 ng/g** meat (1) - **gently technology** -

➢ **Fried** chicken - content **5,5 ng/g** meat (2)

➢ **Grilled** - barbeque beef – content **62,6 meat ng/g** (3)

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Processing contaminants

**Heating of lipids** (including effect of oxygen) - oxidation - products of lipid peroxidation, peroxy- acid and hydroxy- fatty acids

✓ irritates the digestive tract, damage of liver functions, retardation of growth, (death)
✓ toxic effect can be decreased - enough of vitamin E (in organisms)
✓ **antioxidants** (added to frying oil) decreases the frying oil oxidation, effectiveness of antioxidant decreases with high frying temperature
✓ refined (fresh) oils – **MCPD – Mono-chlor- propan-diole** - product of high temperature in technology, **ADI** - isn’t given yet, EFSA (panel Contam) for MCPD - studies…

High levels: refined -palmic oil, sunflower, soybean, canola

**The best: olives extra virgine** (best) - technology by pressing (without refining)

**Heating carbohydrates** (saccharides) - higher temperature - **leads to polymeric products** (under the name **caramel** is used as a pigment, for good taste)

The primary products are primarily aldehydes as **furffural**, which have **adverse health effects**
Processing contaminants

Products of the Maillard reaction

➢ produces - typical flavors, fragrances and color on processed food

**Principle:** chemical reaction between amino acids and carbohydrates such as glucose, fructose, lactose

✓ high temperature is necessary for initiation of reactions
✓ **Louis Camille Maillard** (1878-1936), who first described the formation of brown pigments (1912) while heating glucose with glycine
✓ studied for more than 110 years
✓ produce a number of highly reactive new carbonyl compounds
✓ potentially toxic products
✓ reduce the nutritional value of food
Maillard reaction

**Principle:** chemical reaction between amino acids and carbohydrates such as glucose, fructose, lactose

- Maillard reaction - among the **most complex chemical reactions in food**
- formed toxic compounds, most of non-stable intermediates (Amadoriho products)

**Negative health effects:**
- Amadori products or their degradation compounds with free amino groups of proteins **react in organism with long life tissues** - collagen, elastin, myelin – **damage them!**
- AGEs products - Advanced Glycation End products
- processes are irreversible, **permanent damage tissues**
  (in higher concentrations in patients with chronic diseases)
- reducing immunity, cause chronic inflammation, diabetes, disruption of the mechanisms of **DNA repair**
- One of the **most toxic known substance** - **Acrylamide**
  http://www.chempoint.cz/akrylamid-v-potravinach
➤ Akrylamid

➤ Furosin

➤ Carboxymethyllysin

➤ Glycidol (2,3-Epoxy-1-propanol)

➤ Benzo(a)pyren

➤ and more ....

Structure: www.wikipedia
Maillard reaction

Acrylamide – presence in food is undesirable

- known from industrial use in the manufacture of plastics, glues, paper and cosmetics
- professionally exposed employers – neurotoxicity
- has the ability to damage the nerve tissue (high concentration)
- discovered in foods in high concentrations, since 2002 y.
  (Stockholm University reported)

Acrylamide can be formed in food technology after heat treatment:
> t 120 °C = baking, frying, deep frying, roasting, grilling

Risky foods: potato chips, crackers, crisp bread, breakfast cereals (müsli), bread, roasted coffee, dried fruits, baked-grilled vegetables, roasted cernels (almonds, walnuts) …
Acrylamide monitoring

Maillard reaction

Acrylamide:

- IARC group 2A - **Probably carcinogenic to humans**

- U.S.-EPA, WHO, FAO → **dangerous for human health**

- ADI acrylamide has not been established (health effects are studied)

- NOAEL is: **0.5 mg/kg of body weight/day** - **5 µg kg of body weight/day**

- **drinking water**: limit for **acrylamide is: 0.1 µg.l⁻¹**
Decrease levels of Acrylamide in Food

Blocking the reaction during cooking

- ↓ temperature
- ↓ time of processing
- ↓ content of saccharides (potatoes with low content of starch) …
- change of conditions (pH)
- „Acrylamide Toolbox“ – EU authorities

Link:
3. Additives

- Chemical substances - play an important role in **food production and preservation**.

**Additives:**
- prolong the shelf life of foods; others, such as colours, can make food more attractive
- Flavourings are used to make food tastier
- Food supplements are used as sources of nutrition (loss of vitamins in processing – heating, conservation of food in high temperature)

Preservatives, antioxidants, vitamins, stabilizers, emulsifiers, artificial sweeteners, colorants … E110, E 300, E330,…..
ADDITIVES

➢ substances that are added to foods only in strictly necessary quantities in accordance with the principles of good manufacturing practice

➢ Reason:
- technological, sensory, transport, storage and others, but in most of the highest allowable amount (threshold!)

MRLs = Maximal Residual Limits in food =
= total content in food in the form for consumer or in the consumer packaging (mg/kg of food)

➢ Some of them can have effects as ECD
Contaminants

• Additives:
  • https://www.youtube.com/watch?v=3qdnnhgu4FE

• 10 additives to avoid
  • https://www.youtube.com/watch?v=rrAeflOiOts
Monitoring of Contaminants in Europe

- European countries are monitoring the levels of contaminants in food and feed.
- Data are used to evaluate exposure of people and animals.
- Since 2010 data are submitted to EFSA (most of EU countries) = Standard Sample Description – SSD.
- Found contaminants levels are often very low.
EFSA

Second EFSA chemicals in food report underlines “crucial role of data”


Pesticides, veterinary drugs, contaminants

The report focuses on two annual reports – **pesticide residues** and **veterinary drug residues** – and on consumer **exposure to process contaminants** of recent public interest: acrylamide in food, and glycidyl esters and 3-MCPD in vegetable oils and food.
EFSA

- across Europe, EU member states (and stakeholders) collect, monitor and analyze information on levels of chemicals in plants, animals, food and drinks

- it can also help them to understand if new safety assessments or control measures

- the data collected can also be used in risk assessments of individual substances, such as e.g. the process contaminants and s.o.
RASFF

Rapid Alert System for Food and Feed

➢ reported weekly .... dangerous and toxic substances in food and feed in Europe – webside

➢ www.bezpecnostpotravin.cz
RASFF - example

• National consumers website: Czech Republic

• Czech Republic RASFF notifications: 7 results

• 03/01/2017 2017.0005 Italy histamine (< 1252 mg/kg - ppm) in anchovy paste from Italy, with raw material from Morocco No Details

• 22/12/2016 2016.1795 Germany Listeria monocytogenes (2200 CFU/g) in raw milk cheeses from France No Details

• 22/12/2016 2016.1800 Denmark nutrition protein bars from Spain infested with moulds No Details

• 19/12/2016 2016.1765 Czech Republic migration of formaldehyde (35.2; 33.2 mg/kg - ppm) from melamine decorated soup plate from China Yes more info Details

• 19/12/2016 2016.1766 Czech Republic migration of cadmium (bowl: 3.42; 2.84 mg/l and plate: 1.54; 1.12 mg/dm²) from ceramic breakfast set from China, via Spain Yes more info Details

• 16/12/2016 2016.1751 Czech Republic chlorpyrifos (0.084 mg/kg - ppm) in apples from Poland No Details

• 22/11/2016 2016.1601 Austria plastic fragment in fruit roaster from Austria No Details

Select another country Open in RASFF Portal
Authorities in the Czech Republic

Authorities in CR:
➢ **SZPI - Czech Agriculture and Food Inspection Authority**
➢ **SVS - State Veterinary Administration**

WEBSITES: in English, too 😊

➢ [www.bezpecnostpotravin.cz](http://www.bezpecnostpotravin.cz)
➢ [www.agronavigator.cz](http://www.agronavigator.cz)
➢ **RASFF (Rapid Alert System for Food and Feed)**
➢ **EFSA (European Food Safety Authority)**
➢ [www.foodnet.cz](http://www.foodnet.cz)

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Thank you for your attention