Netherlands Institute
for Sustainable Packaging

FACT SHEET

Heavy metals
in packaging

PART OF THE DOSSIER ON FOOD SAFETY

MAY 2022

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for Sustainable Packaging

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May 2022

In the Netherlands, there are strict requirements for food products to ensure that the risk of excessive intake of heavy metals through food is very small. But what about packaging materials? Can heavy metals get into the food products from packaging materials? And what are the legal requirements for heavy metals in packaging materials? This fact sheet provides more information and answers these questions.

What are heavy metals?

The definitions used in the literature for the term heavy metals differ. This fact sheet is about heavy metals with a high toxicity, which may be present in packaging materials and where legal limits are set: lead, cadmium, mercury and chromium.

Heavy metals can be released into the environment. For example, through the extraction and storage of metal, paint production and the burning of coal and waste. Heavy metals can also be found in fertilisers. Subsequently, heavy metals attach themselves to clay. Plants take up heavy metals from soil, air and water. Animals take up heavy metals through water and feed. That is why meat and other animal products can also contain heavy metals. Raw materials for packaging materials, whether or not of recycled origin, can also be contaminated with heavy metals, for example through the ink used to print on packaging. They end up in packaging materials as 'non-intentionally added substances' (NIAS).

Applications in packaging and materials

Heavy metals have no specific use in food packaging materials. In fact, in the European Union it is not permitted to sell packaging of which the total concentration of lead, cadmium, mercury and chromium (in that packaging or in a packaging component) exceeds a certain limit (1). This is included in the so-called Essential Requirements of the European Packaging and Packaging Waste Directive and has been laid down in the Dutch Packaging Management Decree in 2014.

In the past, sometimes high levels of heavy metals have been found in packaging materials. Here are a few examples:

Human Environment and Transport Inspectorate

Research in 2012 by the Human Environment and Transport Inspectorate showed that 8% of the packaging examined had exceeded the limits for heavy metals (2). This concerned used dyes (lead) and PVC-type plastics (cadmium). In fifteen cases (42%) of the PVC type screened, an excess level of cadmium was found.

Plastics (plastic bags and clear PVC films)

US research results from 2005, 2006 and 2008 show that transparent PVC films and the ink on plastic bags often contain excessive levels (>100 ppm) of heavy metals (3).

Metal

Heavy metals may be present in the raw material and thus end up in the final packaging material. In the past, there has been a report of chromium from metal lids of glass jars from China (2018.1095) (4).

Paper and cardboard

The inks used on paper and cardboard may contain heavy metals. When paper and cardboard are reused, there is a risk of accumulating the heavy metals from inks that have not been removed. (3).

Inks

Heavy metals (type is unknown) have been reported from dyes and pigment caps of metal containers from Ukraine (2019.3895) (4).

Public Health

Long-term excessive intake of heavy metals may be harmful to human health. How serious this is, depends on the metal in question and the extent to which people have been exposed to it. In general, the presence of heavy metals in the body can lead to damage to organs, the nervous system (5), the immune system and/or the reproductive system (6). Heavy metals can also cause cancer (7) (8) (9).

In the Netherlands, the Food and Consumer Product Safety Authority (NVWA) monitors the safety of food products. This includes monitoring for the presence of heavy metals, to ensure that the risk of excessive intake of heavy metals through food is low. The risks are determined for each type of metal by means of a risk analysis. The following steps are taken:

1. Determining potentially present heavy metals.
2. Hazard identification: conducting an evaluation of the negative health effects caused by a chemical. A possible source for this is studies from the European Food Safety Authority (EFSA) on substances.
3. Hazard characterisation: determining how much of a chemical will lead to a toxic effect.
4. Exposure assessment: determining exposure to a chemical by the consumer, for example through migration from packaging to food.
5. Risk determination: determining the risk based on the above relevant information.

Legislation

The release of components of the packaging material into food products is called migration. The amount that may migrate from the material to the food is set in migration limits. These are included in European and national legislation. The migration limits in Europe are based on risk assessments issued by EFSA.

European legislation

The European Directive (94/62/EC) on Packaging and Packaging Waste has established in the Essential Requirements an upper limit for the quantity of heavy metals in packaging. This concerns the packaging material including printing. A packaging may not contain more than 100 ppm (100 milligrams per kilogram) of heavy metals or their compounds (the total of lead, cadmium, mercury and chromium or their compounds).

There are exceptions for plastic crates and pallets (Directive 2009/292/EC), packaging made of crystal glass (Directive 69/493/EEC) and glass packaging (Directive 2001/171/EC), provided that they comply with the regulations.

In addition, there are laws regarding the following materials:

- Ceramic articles: Directive 84/500/EEC on the approximation of the laws of the Member States relating to ceramic articles intended to come into contact with foodstuff.

- Plastics: Commission Regulation (EU) No. 10/2011 on plastic materials and articles intended to come into contact with food.

Dutch national legislation

The Dutch Packaging Management Decree 2014 (article 2) lays down, as does European legislation, that the total concentration of lead, cadmium, mercury and (hexavalent) chromium, or compounds thereof, in a packaging or in a packaging component may not exceed 100 ppm by weight (10).

In addition, the following laws are relevant; these include requirements for substances, migration limits and specific migration requirements:

- The Packaging and Materials Commodities Act Decree.
- The Packaging and Materials Commodities Act.

The Belgian Royal Decree of 11 May 1992 on materials and articles intended to come into contact with food products sets specific migration limits for the application of lead and cadmium to glass articles (11).

Control measures

Obligations for the producer of packaging materials

The producer of packaging materials must carry out a risk analysis for each raw material. If this shows that heavy metals can be contained in the packaging, a migration test must be carried out. This can then demonstrate that the heavy metals do not migrate from the packaging into the food products in an amount which constitutes a hazard to the consumer, or that they are outside legal migration limits. The results of these migration tests must be included in the so-called Declaration of Compliance (DoC).

The producers of packaging materials are responsible for keeping the concentrations of heavy metals and their compounds in packaging materials as low as possible. This can be achieved by (3):

- use of substitute additives in packaging materials;
- use of alternative raw materials for the production of packaging materials;
- other packaging designs;
- other/improved production processes.

Obligations for the buyer/ user of packaging materials

The buyer/ user of packaging materials must check the declaration of compliance and ensure that the conditions of use and the food products to be packaged correspond to the intended use of the packaging material. As both producer and user are responsible for controlling food safety hazards, it is recommended that packaging be regularly analysed for heavy metals.

Finally

The KIDV has drawn up this fact sheet in collaboration with Riskplaza. Riskplaza is a database with information on the food safety of ingredients, as well as measures to control food safety hazards.

The greatest possible care has been taken in compiling the text; see also the appendix for the sources consulted. No rights can be derived from the texts.

If you still have questions after reading the fact sheet, please ask them in the questionnaire on the KIDV website.

Interesting links

- Information sheet 'Heavy Metals' (DUTCH ONLY) | Rijksinstituut voor Volksgezondheid en Milieu (RIVM)
- Metals as contaminants in food | European Food Safety Authority (EFSA)
- Packaging Waste Directive - Heavy Metals Concentration Level | European Chemicals Agency
- BfR recommends lower release of lead and cadmium | The German Federal Institute for Risk Assessment (BfR)

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NOTE: Always consult consolidated legislation at https://eur-lex.europa.eu/.

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KIDV fact sheets Food Safety

This fact sheet is part of a series of KIDV fact sheets on food safety. There are fact sheets on the following subjects:

- Mineral oils in packaging materials
- Bisphenol A in packaging materials
- Microplastics in packaging materials
- Heavy metals in packaging materials
- NIAS – Not-intentionally added substances
- Legislation on food contact materials

See also our dossier page on Food Safety on the KIDV website.