German Federal Institute for Risk Assessment

FAQ

08 August 2025

Naphthalene regulated in consumer products for health protection

→ Changes compared to the version dated 3 November 2016: fundamental revision of the questions and answers, new references to current study results, update of EU requirements for naphthalene in consumer products, reference to BfR publications on the topic.

Naphthalene belongs to the polycyclic aromatic hydrocarbons, or PAH for short. Naphthalene is obtained primarily through the refinement of aromatic crude oil fractions. – Particularly in the past it has been obtained from coal tar. As a combustion product of organic materials, naphthalene occurs in low concentrations almost everywhere in the environment.

The German Federal Institute for Risk Assessment (BfR) has compiled some questions and answers on naphthalene in consumer products in the following paragraphs.

What is naphthalene?

Naphthalene belongs to the polycyclic aromatic hydrocarbons (PAH), or more precisely: naphthalene is a bicyclic aromatic hydrocarbon (chemical formula $C_{10}H_8$) and therefore the simplest representative of PAHs.

Naphthalene is obtained primarily through the refinement of aromatic crude oil fractions. – Particularly in the past it has been obtained from coal tar. A large proportion of naphthalene is used as a raw material for the production of plastics. As a result, it can potentially occur in a wide range of consumer products. As part of its monitoring programme, the Federal Office of Consumer Protection and Food Safety (BVL) analyzed in 2017 and 2021 the occurrence of PAHs in commodities that come into contact with the human body, such as handles of sports equipment, bicycle helmets or (watch) bracelets, and in toys. In 2017, naphthalene was detected in 14 out of 22 toys (mean value 0.442 mg/kg, maximum 3.7 mg/kg) and in 57 out of 107 commodities (mean value 1.31 mg/kg, maximum 38 mg/kg). In 2021, naphthalene was found in 5 out of 19 toys (mean value 0.196 mg/kg, maximum 1.580 mg/kg) and in 21 out of 107 commodities (mean value 0.186 mg/kg, maximum 5.39 mg/kg) (see below, “More Information on naphthalene in consumer products”: BVL, 2017, 2021). In 2022 and 2023, the Chemical and Veterinary Investigation Office (CVUA) Stuttgart tested 102 toys and other

commodities for PAHs. A small amount of naphthalene was found only in one sample (Halloween mask) (see below, “More Information on naphthalene in consumer products”: CVUA Stuttgart, 2022/23). In 2025, naphthalene was detected in children's raincoats, which were purchased in China or from e-commerce platforms (see below, “More Information on naphthalene in consumer products”: Shi et al., 2025).

In 2024, Stiftung Warentest detected naphthalene in pushchairs, bicycle trailers and massage guns (see below, “More Information on naphthalene in consumer products”: Stiftung Warentest, 2024a; Stiftung Warentest, 2024b; Stiftung Warentest, 2024c).

Naphthalene is also further processed into other compounds, e.g., azo dyes, and it is found in fuels. In a short study recently conducted by a magazine, naphthalene was detected also in children's tattoos in three products (test of a total of 15 brands; see below, “More Information on naphthalene in consumer products”: Mariani and Throl, 2025).

In the past, naphthalene has been used as a moth repellent and insecticide, but has completely been replaced within the EU by other substances in those areas. As a combustion product of organic materials, naphthalene occurs almost ubiquitously in the environment in low concentrations.

Naphthalene can be present as a contaminant in carbon black used for blackening, for example, and in extender oils used as plasticisers.

What health risks are associated with naphthalene?

Naphthalene can be taken up via the oral, inhalation and dermal route. In humans, incidents of poisoning have been described after inhalation, oral or dermal application (e.g., via pharmaceuticals containing naphthalene). Skin reactions after skin contact and haemolytic anaemia after inhalation of naphthalene vapours have been reported. Clouding of the lens, corneal ulcers and cataracts have been described in workers exposed to naphthalene dust or vapour. These observations were made after comparatively high naphthalene exposure.

In animal experiments, naphthalene causes inflammations, in particular in the respiratory tract. In animal experiments, even at low concentrations, repeated inhalation exposure to naphthalene results in local inflammation and damage to the upper respiratory tract, especially the nose. Tumours can develop as a result of chronic inflammation, but there is no conclusive evidence of a possible carcinogenic effect in humans from inhalation exposure. Therefore, naphthalene has been classified as a Category 2 carcinogen (“Suspected of causing cancer”) according to the European regulation on the classification, labelling and packaging of substances and mixtures (CLP Regulation (EC) No. 1272/2008). Naphthalene has also been classified as Acute Toxic Category 4 (“Harmful if swallowed”). Acutely toxic substances are classified into four categories, whereby substances with a strong toxic effect are assigned to category 1 and substances with less severe toxic effects assigned to categories 2-4 with 4 being the least severe category.

Is naphthalene carcinogenic?

Although naphthalene has been classified as a Category 2 carcinogen (“Suspected of causing cancer”) under the CLP regulation, its carcinogenic potency is much lower compared to other PAHs. In experiments with rodents, the carcinogenic effect occurred in the respiratory

tract (nasal tissue, lungs) after inhalation. No conclusive epidemiological evidence for a carcinogenic effect from inhalation exposure of humans to naphthalene is available.

Based on a threshold mechanism for the carcinogenic effects in the nasal tissue of rats caused by cytotoxic-inflammatory processes, the Indoor Air Hygiene Commission at the German Federal Environment Agency established guideline values for naphthalene in indoor air in 2013 (see below, "More Information on naphthalene in consumer products": Bundesgesundheitsblatt 2013). A value of 0.01 mg of naphthalene per m^3 of air was established as a precautionary guide value (RW I) and 0.03 mg/m^3 as a hazard guide value (RW II). If RW I is not exceeded, no adverse health effects are to be expected according to the current state of knowledge, even in the case of lifelong exposure of sensitive individuals. Immediate action is required if RW II is reached or exceeded.

How is naphthalene regulated in consumer products?

Although naphthalene is not intentionally added to any consumer product, it can be present as a contaminant. This is due to the use of carbon black as a blackening agent, or extender oils as plasticisers as well as the utilisation of some solvents containing hydrocarbons.

Naphthalene is also listed in Annex II of the European Regulation (EC) No 1223/2009 on cosmetic products and, consequently, must not be used as an ingredient in cosmetics.

The European Directive 2009/48/EC on the safety of toys stipulates in Annex II part III No 3 a generic prohibition for the use of substances that are classified as carcinogenic, mutagenic or toxic for reproduction (CMR); due to its harmonised classification as a Category 2 carcinogen, this applies to naphthalene as well. However, Annex II part III No 4 and 5 allow for derogations from this prohibition; nevertheless, the toy must still comply with the general safety requirement according to Article 10 (2).

According to §30 of the German Food, Consumer Goods and Feed Code (LFGB), the following applies to consumer products: it is prohibited to manufacture or treat consumer products in such a way that when used properly and for their intended or foreseeable purpose, they are capable of being harmful to health through their chemical composition, in particular through toxic substances or contamination. It is also prohibited to market such consumer products.

The maximum values for naphthalene determined for the GS product safety mark (between 1 and 10 mg/kg; see below, "More Information on naphthalene in consumer products": Product Safety Commission (AfPS), as of 10 April 2020) were not derived from a health point of view, rather the values are based on the naphthalene content that is technologically achievable and compliant with current good manufacturing practices; it means that they follow the minimisation principle. Naphthalene levels that clearly exceed the limits specified for the GS mark are an indication that the principles of good manufacturing practice have not been complied with.

In Germany, the monitoring and implementation of existing regulations is in the remit of the enforcement authorities of the federal states ("Laender"). Importers and distributors must ensure product safety. They are obliged to only place products on the market that do not pose a risk to health. They are responsible for their products and must make every effort to ensure that only flawless products are placed on the market.

Information on naphthalene and on polycyclic aromatic hydrocarbons (PAH) on the BfR website:

Health assessment of naphthalene
https://www.bfr.bund.de/en/product-safety/gesundheitliche-bewertung-von-pak/health-assessment-of-naphthalene/

Health assessment of polycyclic aromatic hydrocarbons
http://www.bfr.bund.de/en/a-z_index/polycyclic_aromatic_hydrocarbons_pah_-130109.html

More Information on naphthalene in consumer products:

BVL (2017). Berichte zur Lebensmittelsicherheit 2017 – Monitoring, 96-99, https://www.bvl.bund.de/SharedDocs/Downloads/01_Lebensmittel/01_lm_mon_dokumente/01_Monitoring_Berichte/2017_lm_monitoring_bericht.pdf;jsessionid=248E392F50BACCC5373CD895F4071A3C.internet952?__blob=publicationFile&v=9#page=102

BVL (2021). Berichte zur Lebensmittelsicherheit 2021- Monitoring, 116-118, https://www.bvl.bund.de/SharedDocs/Downloads/01_Lebensmittel/01_lm_mon_dokumente/01_Monitoring_Berichte/2021_lm_monitoring_bericht.pdf;jsessionid=248E392F50BACCC5373CD895F4071A3C.internet952?__blob=publicationFile&v=5#page=122

CVUA Stuttgart (2024). https://www.cvuas.de/pub/beitrag.asp?subid=0&Thema_ID=3&ID=3918&Pdf=No&lang=DE

Mariani M. and Throl C. (2025): Test: Kindertattoos - Cool, bunt, ungesund. Öko-Test (2), 83-88

Shi H., Liang S., Wang Z., Lv Q., Zhang Q., and Li M. (2025): Non-targeted analysis of odor components and hazardous volatiles in children's raincoats. Ecotoxicology and Environmental Safety 296, 118220. DOI: 10.1016/j.ecoenv.2025.118220

Stiftung Warentest (2024a): Buggys: Maxi-Cosi mit Maxi-Platz. test (3), 68-73

Stiftung Warentest (2024b): Kinderfahrradanhänger: Totalausfall. test (8), 70-76

Stiftung Warentest (2024c): Massagepistolen: Keine Wunderwaffe. test (7), 74-79

Product Safety Commission (AfPS): GS Specification - Testing and assessment of Polycyclic Aromatic Hydrocarbons (PAHs) in the awarding of GS Marks, date of issue: 10. April 2020; https://www.baua.de/DE/Die-BAuA/Aufgaben/Geschaeftsfuehrung-von-Ausschuessen/AfPS/pdf/AfPS-GS-2019-01-PAK-EN

Bundesgesundheitsblatt 2013, 56:1448–1459: Richtwerte für Naphthalin und Naphthalin-ähnliche Verbindungen in der Innenraumluft; DOI 10.1007/s00103-013-1836-9
https://www.umweltbundesamt.de/sites/default/files/medien/377/dokumente/naphthen_rw_irl-2_2013-10.pdf

About the BfR

The German Federal Institute for Risk Assessment (BfR) is a scientifically independent public health institute within the portfolio of the German Federal Ministry of Agriculture, Food and Regional Identity (BMLEH). It provides advice to the Federal Government as well as the Federal States ('Laender') on questions of food and feed, chemical and product safety. The BfR conducts its own research on topics closely related to its assessment tasks.

This text version is a translation of the original German text which is the only legally binding version.

Legal notice

Publisher:
German Federal Institute for Risk Assessment
Max-Dohrn-Straße 8-10
10589 Berlin, Germany
T +49 30 18412-0
F +49 30 18412-99099
bfr@bfr.bund.de
bfr.bund.de/en

Institution under public law
Represented by the president Professor Dr Dr Dr h. c. Andreas Hensel
Supervisory Authority: Federal Ministry of Agriculture, Food and Regional Identity
VAT ID No. DE 165 893 448
Responsible according to the German Press Law: Dr Suzan Fiack

BfR | Identifying Risks –
Protecting Health