German Federal Institute for Risk Assessment

FAQ

28 May 2025

PET bottles: no indication of health risk

→ Changes to the version from 16 July 2020: fully revised; changes include addition of further reading.

PET stands for polyethylene terephthalate, a type of plastic from which products such as bottles and other food packaging are made. Bottles typically bear labels indicating the kind of plastic from which they are made. PET bottles are either labelled with “PET” or with a triangular arrow symbol with the number 1 inside.

Consumers regularly contact the BfR to enquire whether plastic bottles made from PET are hazardous to health. They are particularly concerned that PET bottles might contain hormone-like substances which may be transferred from the plastic to beverages.

In the following, the BfR answers frequently asked questions about PET bottles in order to inform consumers.

Are hormone-like substances transferred from PET bottles to beverages?

One major cause for concern among consumers is whether hormone-like substances from PET bottles can be transferred to beverages. This issue was sparked by studies conducted with snails and cell cultures which were exposed to mineral water from glass and PET bottles. In some cases, there was evidence of oestrogenic activity. However, this was approximately 10,000 times lower than the natural oestrogenic activity of beverages such as milk, beer or red wine. Moreover, the comparison between the water from PET bottles and that from glass bottles showed no difference in the hormonal effects measured in the cell cultures. There is thus no reason to assume that this low level of activity is due to the PET bottles. Furthermore, chemical analyses of mineral water have not detected substances which would cause such oestrogenic activity.

Are oestrogen-effective substances used in the manufacture of PET bottles?

Antimony compounds can be used as catalysts in the manufacture of PET. Antimony is a naturally occurring, rare metalloid with very low oestrogenic activity. In mineral water,

concentrations of up to 2 micrograms (µg) of antimony per litre (L) have been measured. These levels are far below the legal limit value for transfer of antimony from food packaging to food. The migration limit value set by the EU Commission is 40 µg per kilogram (kg) of food.

Are there plasticisers in PET bottles?

The plastic name “polyethylene terephthalate” (PET) is often incorrectly conflated with substances from the orthophthalate group. The latter are used as plasticisers and are a recurring topic of discussion due to their hormone-like effects.

For manufacturing PET bottles, however, orthophthalates and other plasticisers are not used. For this reason, if they were detected in mineral waters at all, it was only in concentrations far too low to explain the measured oestrogenic activities.

Do PET bottles contain Bisphenol A?

Bisphenol A is not used in the manufacturing of PET bottles. Bisphenol A belongs to a group of substances which can have hormone-like (specifically oestrogen-like) effects. Tests found trace amounts of bisphenol A contamination in some PET bottles, particularly those which had been recycled. Small amounts of the substance can be transferred to the mineral water. However, the transferred amounts fall far below the tolerable daily intake for bisphenol A derived by the BfR, meaning that current information provides no indication for potential health impairments.

Mineral water from PET bottles sometimes has a sweet, fruity taste. What does that mean?

Manufacturing and storing PET bottles leads to the formation of a substance called acetaldehyde. If acetaldehyde is transferred from the bottle into the beverage, even very small amounts can be tasted and smelled – at least in mineral water. By contrast, acetaldehyde is not perceptible in drinks with stronger flavours, such as cola or other soft drinks.

Is acetaldehyde in beverages hazardous to health?

According to the relevant EU regulations, no more than 6 milligrams (mg) of acetaldehyde from plastics may be transferred to 1 kilogram (kg) of food. Up to this limit value, there are no indications of adverse health effects. However, humans can clearly smell or taste this substance in an amount even smaller than one hundredth of this limit value. As the measured amounts are well below the legal limit value, no health impairments are to be expected, even if acetaldehyde can be detected by taste or smell.

Do consumers simply have to accept the taste of acetaldehyde when drinking mineral water from PET bottles?

Transfer of tasteable amounts of acetaldehyde from PET is usually a result of technical shortcomings during bottle manufacture. Even if small amounts of acetaldehyde do not pose a health risk for consumers, taste or smell change of the beverage is not desired and not in line with existing regulation. The taste of acetaldehyde is a sensory impairment of the foodstuff, in this case mineral water, and is thus considered a quality defect which consumers do not have to accept. As such, beverages with this defect can be returned. PET manufacturers are responsible for preventing the transfer of acetaldehyde to beverages through appropriate technical measures. These can include using substances which bind the acetaldehyde in the PET and which themselves pose no health risks or sensory impairments. Another option is to provide a glass-like inner coating on the bottles in order to prevent acetaldehyde from being transferred to the beverage.

Further information on the BfR website on PET bottles and related topics

BfR FAQ "**Hygienic handling of mineral, spring and table water as well as drinking water in the household**"
https://www.bfr.bund.de/en/service/frequently-asked-questions/topic/hygienic-handling-of-mineral-spring-and-table-water-as-well-as-drinking-water-in-the-household/

BfR FAQ "**Questions and answers about phthalate plasticisers"**
https://www.bfr.bund.de/cm/349/questions-and-answers-about-phthalate-plasticisers.pdf

BfR FAQ "**Bisphenol A in everyday products"**
https://www.bfr.bund.de/en/service/frequently-asked-questions/topic/bisphenol-a-in-everyday-products-answers-to-frequently-asked-questions/

BfR opinion "**BfR assesses analyses of substances with hormone-like activity in natural mineral waters**"
https://www.bfr.bund.de/en/opinions/bfr-assesses-analyses-of-substances-with-hormone-like-activity-in-natural-mineral-waters/

BfR opinion "**BfR evaluates study results for mineral water samples with hormone-like activity"**
https://www.bfr.bund.de/en/opinions/bfr-evaluates-study-results-for-mineral-water-samples-with-hormone-like-activity/

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 related to food, 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.

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Responsible according to the German Press Law: Dr Suzan Fiack

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