German Federal Institute for Risk Assessment

FAQ

17 July 2026

Colourful, lightweight, robust – but what about health risks associated with tableware and kitchen utensils made from melamine-formaldehyde resin (MFR)?

→ Changes compared to the version from 25 November 2019: comprehensive revision and updating, as well as the addition of further reading material.

Melamine-formaldehyde resins (MFR) are hard, water- and scratch-resistant plastics made from the basic components melamine and formaldehyde. MFR is shatter-resistant and usually has a smooth surface. Because of these properties, it is also used in the manufacture of tableware and kitchen utensils.

To achieve the desired material properties, a filler is always added to MFR. A few years ago, alternative substances, such as bamboo fibres, were increasingly used for this purpose. Products manufactured in this way were often marketed as 'bamboo ware'. Popular uses included 'coffee to go' cups and children's tableware.

Bamboo and other plant-based materials are not listed in the Commission Regulation (EU) No 10/2011 on plastic food contact materials and are therefore not authorised as fillers in such materials under this European regulation. MFR products containing bamboo or other plant-based additives have now largely disappeared from the market, as they do not comply with the legal requirements and are therefore not marketable.

For both melamine and formaldehyde there are European migration limits, which specify the maximum amounts that may migrate from products such as kitchen utensils into food.

Below, the German Federal Institute for Risk Assessment (BfR) has compiled a list of questions and answers regarding kitchen utensils made from MFR.

What is melamine-formaldehyde resin (MFR)?

Melamine-formaldehyde resins (MFR) are plastics that are very hard, water-resistant and shatter-resistant, and are therefore frequently used in the manufacture of children's and camping products. Kitchenware such as plates, bowls, cups and cutlery can also be made from MFR. The starting materials used in their production are melamine and formaldehyde. To achieve the desired material properties, certain fillers are always added to MFR. A few years ago, alternative substances such as bamboo fibres were increasingly used for this purpose. The finished products were therefore often marketed as 'bamboo ware' (e.g. 'coffee to go' cups). However, these were actually plastic products.

Can melamine and formaldehyde be released from MFR products?

The BfR and the official control laboratories of the German federal states have investigated the amounts of formaldehyde and melamine released during the use of tableware and kitchen utensils made from melamine-formaldehyde resin (MFR). The results show that, when in contact with hot food, in some cases, high amounts of melamine and formaldehyde can be transferred to the food.

At the end of 2019, the German Federal Institute for Risk Assessment (BfR) published an opinion highlighting potential health risks associated with the use of MFR tableware and, in particular, so-called 'bamboo ware'. The findings of investigations carried out by the state authorities and the BfR had shown that plates, cups, bowls and other items made from MFR can, in some cases, release high amounts of melamine and formaldehyde when subjected to intense heat or when very hot food is poured into them. In some cases, the amounts released were significantly above the established limit values and the health-based guidance values derived by the BfR. Exceedances of the limit values were found particularly frequently in so-called 'bamboo ware'. The studies have also shown that products labelled as 'bamboo ware' release, on average, significantly more melamine and formaldehyde than products made from 'conventional' MFR.

Furthermore, long-term tests showed that MFR is not stable when in contact with hot, acidic food. The plastic is attacked and breaks down.

The BfR concluded that tableware made from MFR is not suitable for contact with hot liquid food (e.g. tea, coffee, soup, infant formula) or for use in microwave ovens.

Does MFR break down during use?

Yes, high temperatures and acidic food can lead to the degradation of melamine-formaldehyde resin (MFR) and thus to an increased release of melamine and formaldehyde.

This process can also be recognised by the material losing its shine. Damage to the surface structure accelerates the degradation process. These effects are particularly noticeable when the material comes into contact with hot, acidic foods such as tomato sauce, hot apple sauce or sauerkraut. Even when pouring hot drinks such as coffee or tea, high amounts of melamine and formaldehyde can be released, causing damage to the material (*text in German*).

What is 'bamboo ware'?

Products advertised as 'bamboo ware' are generally articles made from melamine-formaldehyde resin (MFR), in the manufacture of which alternative plant-based materials, particularly bamboo fibres, are used as fillers. Despite these plant-based additives, they are plastic products. In contrast, however, there are also products such as cups or plates that are actually made of bamboo, particularly from the stems or dried leaves. These are not what is meant by the term 'bamboo ware', as used here.

'Bamboo ware' has often been advertised as being particularly environmentally friendly. Is that true?

In the past, products denoted as 'bamboo ware' were frequently advertised as 'particularly environmentally friendly', 'biodegradable' or 'made exclusively from renewable raw materials'. Their appearance also often gave the impression that they were natural products. However, the basic structure of such 'bamboo ware' was a plastic (MFR) that is not biodegradable – not even with the addition of plant-based fillers. A few years ago, when 'bamboo ware' was very prevalent on the market, the Stuttgart Chemical and Veterinary Testing Office described many cases in this context as misleading to consumers (*text in German*).

Is 'bamboo ware' suitable as a food contact material?

Conventional so-called melamine tableware is made from melamine-formaldehyde resin (MFR), to which certain fillers, such as cellulose, are added. So-called 'bamboo ware' differs from conventional MFR products in that it uses bamboo fibres or powder as a filler. The bamboo content in MFR is often very high in order to give the article a supposedly 'natural' appearance. As a result, the MFR structure that gives the article its shape loses stability. The article becomes not only more brittle but also chemically less stable. This is particularly relevant when used with hot foods, such as coffee.

Measurements carried out by the German regulatory authorities and the National Reference Laboratory for Materials in Contact with Food showed that, in hot applications, the release of the plastic components melamine and formaldehyde from 'bamboo ware' exceeded the limit values more frequently than the release from conventional MFR products. In general, there were significant differences among the 'bamboo ware' tested. The vast majority of articles complied with the legal requirements (i.e. limit values). However, in around one third of the articles tested, the limit values for the release of melamine and formaldehyde had been exceeded. Excessive release was also measured in around 15 per cent of the conventional MFR articles – though these exceeded the limit values by a maximum of three times; in the case of 'bamboo ware', the highest formaldehyde level was 60 times the permitted limit value.

Bamboo and other plant-based materials are not listed in the Commission Regulation (EU) No 10/2011 on plastic food contact materials and are therefore not authorised under this European regulation as fillers in such materials. MFR products containing bamboo or other plant-based additives have now largely disappeared from the market, as they do not comply with the legal requirements and are therefore not marketable.

Which limit values apply to the migration of melamine and formaldehyde into food?

The EU Regulation on plastics intended to come into contact with food (Commission Regulation (EU) No 10/2011) sets out the maximum amounts of melamine and formaldehyde that may migrate from materials in contact with food into food (i.e. specific migration limit). For melamine, a specific migration limit of 2.5 milligrams per kilogram (mg/kg) of food applies, and for formaldehyde, a specific migration limit of 15 mg/kg of food applies.

As a general rule, these values are calculated on the basis of daily and long-term use of the articles. In most cases, the one-off use of an article from which melamine or formaldehyde is released in quantities exceeding the specific migration limits does not pose a health risk.

Which health risks are associated with an increased intake of melamine and formaldehyde?

With regard to melamine, a long-term animal experiment observed a connection with the formation of bladder stones and an associated increased occurrence of bladder cancer and kidney damage. In 2008, milk powder contaminated with significant amounts of melamine led to severe symptoms, including death from kidney failure, in young children in China. The cause was the formation of melamine crystals which blocked the flow of urine, leading to further secondary damage. However, the intakes of melamine by the children at that time were several orders of magnitude higher than the amounts detected from leaching from kitchen utensils and tableware made of melamine-formaldehyde resin. A corresponding adverse health effect resulting from the use of melamine-formaldehyde resin (MFR) tableware, including so-called ‘bamboo ware’, is highly unlikely.

Formaldehyde irritates the skin and mucous membranes and, if taken up over long periods, can have a carcinogenic effect and cause inflammatory changes in the mucous membranes at the site of initial contact (oesophagus, stomach). Intake via the respiratory tract (inhalative) can cause cancer in the nasopharyngeal region. However, the concentrations at which such effects occurred in long-term animal experiments were many times higher than the permitted release levels from food-contact materials; consequently, such effects are not to be expected from the use of MFR tableware, including ‘bamboo ware’, which is in compliance with or only slightly exceeds these release limits. Among the articles assessed in the BfR’s 2019 opinion, however, there was also a group of ‘bamboo ware’ articles that exhibited such a high formaldehyde release that the resulting intakes or concentrations in food were very close to the doses at which harmful effects were observed in animal experiments. In the BfR’s view, these articles should therefore not be used in contact with food (particularly hot liquid foods).

How can tableware and kitchen utensils made from MFR be identified?

Consumers can only tell whether tableware or kitchen utensils are made of melamine-formaldehyde resin (MFR) if manufacturers indicate this on the articles themselves or on the packaging. There is no mandatory labelling requirement. In many cases, however, an indication of this can be found on the articles themselves or on the packaging.

In the case of products labelled as 'bamboo ware' (e.g. 'coffee to go' cups), it can generally be assumed that they are made of MFR. However, the European Commission clarified in 2020 that bamboo and other plant-based materials are not authorised as fillers in MFR. Consequently, such products containing bamboo or other alternative plant-based additives have largely disappeared from the market.

In some cases, manufacturers also point out that the product may only come into contact with food for a certain period of time and only up to a specific temperature limit.

What advice does the BfR give regarding the use of tableware and kitchen utensils made from melamine-formaldehyde resin (MFR)?

In view of the release of melamine and formaldehyde at high temperatures, the BfR recommends that kitchen utensils or tableware made from melamine-formaldehyde resin (MFR) should not be used in contact with hot food. This applies both to cooking and to serving hot food (e.g. cooking spoons, 'coffee to go' cups and bowls for preparing infant formula, amongst others). Articles made from MFR should also not be used to heat food in the microwave.

However, no health effects are expected when using MFR products at low temperatures, for example with cold or lukewarm food.

As the material can be damaged and broken down, particularly at high temperatures, consumers should check the surface of their MFR tableware for visible signs of wear and tear and replace it if it is damaged.

Further information on tableware and kitchen utensils made from melamine-formaldehyde resin (MFR) is available on the BfR website:

BfR FAQ **'Use of customers' own reusable cups for 'coffee to go': pay attention to hygiene standards and materials**"
https://www.bfr.bund.de/en/service/frequently-asked-questions/topic/frequently-asked-questions-about-the-use-of-customers-own-refillable-cups-for-coffee-to-go/

BfR press release: **'Do not use 'bamboo ware' tableware for hot drinks and meals**'
https://www.bfr.bund.de/en/press-release/do-not-use-bamboo-ware-tableware-for-hot-drinks-and-meals/

BfR opinion **'Tableware made from melamine-formaldehyde resin, such as 'Coffee to go' cups from 'Bambusware', can leach substances that are harmful to health into hot food'** (*in German*)

https://www.bfr.bund.de/stellungnahme/gefaesse-aus-melamin-formaldehyd-harz-wie-coffee-to-go-becher-aus-bambusware-koennen-gesundheitlich-bedenkliche-stoffe-in-heisse-lebensmittel-abgeben/

BfR opinion **'Release of melamine and formaldehyde from tableware and kitchen utensils'** (*in German*)
https://www.bfr.bund.de/stellungnahme/freisetzung-von-melamin-und-formaldehyd-aus-geschirr-und-kuechenutensilien/

BfR press release: **'Cooking spoons and crockery made of melamine resin are not suited for microwaves and cooking'**
https://www.bfr.bund.de/press-release/cookware-and-dishes-made-from-melamine-resin-are-not-suited-for-microwaves-or-cooking/

BfR press release: **'Carcinogenic effects of formaldehyde inhalation sufficiently proven**' (*in German*)
https://www.bfr.bund.de/presseinformation/krebserregende-wirkung-von-eingeatmetem-formaldehyd-hinreichend-belegt/

About the BfR

The German Federal Institute for Risk Assessment (BfR) is a scientifically independent institution within the portfolio of the German Federal Ministry of Agriculture, Food and Regional Identity (BMLEH). It protects people's health preventively in the fields of public health and veterinary public health. The BfR 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.

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