



Bundesamt für  
Verbraucherschutz und  
Lebensmittelsicherheit



# Abstract Report on the National Monitoring 2016

Joint report by the Federal Government and Federal States



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# Abstract Report on the National Monitoring 2016

This Abstract Report presents a short overview about the findings of the analyses of foods, cosmetic products and commodities carried out in 2016. A full version of the Report on the National Monitoring 2016 is available in German from [www.bvl.bund.de/monitoring2016](http://www.bvl.bund.de/monitoring2016). Abstract Reports on the National Monitoring from previous years can be downloaded from [www.bvl.bund.de/monitoring\\_abstracts](http://www.bvl.bund.de/monitoring_abstracts).

## 1 Summary

The Monitoring Scheme is a system of repeated representative measurements and evaluations of levels of substances that are undesirable from a health point of view, such as residues of plant protection products and pesticides, heavy metals, mycotoxins and other contaminants in and on foodstuffs, commodities and cosmetic products. Further details about the monitoring programme are available from [http://www.bvl.bund.de/monitoring\\_EN](http://www.bvl.bund.de/monitoring_EN).

In line with the General Administrative Provision (AVV) for the 2016–2020<sup>1</sup> Monitoring Programme, the following foodstuffs, commodities and cosmetic products from the population's representative market basket were examined in 2016 (market basket monitoring):

### 1.1 Food of Animal Origin

- Hare (meat)
- Calf (liver)
- Milk 3,5 % fat
- Lamb/sheep (liver)
- Venison (meat)
- Pork (fat/leaf fat, meat, liver)

### 1.2 Food of Plant Origin

- Pineapple
- Apple
- Apple juice (clear/cloudy)
- Cereal-based baby food
- Fruit or vegetable based baby food
- Leaf lettuce (various kinds)
- Roll with rye portion
- Strawberries
- Grapefruits
- Raspberries
- Coffee (roasted ground)
- Kiwi fruit
- Kohlrabi
- Nectarine
- Peach
- Plum
- Leek

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<sup>1</sup> "Allgemeine Verwaltungsvorschrift zur Durchführung des Monitorings von Lebensmitteln, kosmetischen Mitteln und Bedarfsgegenständen für die Jahre 2016 bis 2020 (AVV Monitoring 2016-2020)", GMBL 2015, Nr. 68, S. 1341-1346

- Rice (husked and milled)
- Rhubarb
- Bread (rye and rye-wheat-based)
- Rye grains
- Rye flour
- Soy beans
- Soy meal, flakes, grits
- Sunflower oil
- Sunflower oil, cold-pressed
- Asparagus (white/green)
- Tomato
- Wine, white/red
- White cabbage
- Wheat flour
- Wild mushrooms
- Savoy cabbage
- Courgette

### 1.3 Cosmetic Products

- Sunscreen products with high and very high UV protection (sun protection factor 30–50, and factor 50+, respectively)

### 1.4 Commodities

- Packaging material and various items with food contact, made of paper, carton or, cardboard
- Toys and use item with body contact, made of foamed material
- Toys made of hard plastic
- Toys made of paper, carton, or cardboard

Depending on what undesirable substances were expected, the foods were analysed for residues of plant protection products and pesticides as well as for contaminants (for instance, dioxins and polychlorinated biphenyls, per- and polyfluorinated alkyl substances (PFAS), polycyclic aromatic hydrocarbons (PAH), elements, mycotoxins, and nitrate).

In cosmetics, sunscreen products with high and very high UV protection (sun protection factors 30–50 and 50+, respectively) were examined for their content of organic UV filters.

As regards consumer items, packaging materials and products made of paper, carton, or cardboard and intended for food contact, were examined for content in phthalates and other contaminants and for migration of these substances. Furthermore, toys and consumer items of foamed materials and intended for body contact were analysed for volatile organic compounds (VOC). Toys made of paper and cardboard with colour print were analysed for photoinitiators. Baby toys and teething rings of hard plastics were examined for release of elements.

In addition to the market basket monitoring, the following specific subjects were treated in another part of the monitoring programme which is called project monitoring:

- Dioxins and PCB in beef originating from suckler cow husbandry (grazed cows)
- Vitamin A in liver (beef, calf, pork and lamb/sheep)
- Antibiotics in veal
- Ergot alkaloids in milled spelt products
- Tropane alkaloids in infant food

- Residues of plant protection products and selected contaminants in frozen foods of plant origin
- Dioxins and PCB in Baltic herring and eel

As far as comparison with results from earlier monitoring studies was possible, this was considered in the interpretation of findings. Yet, all statements and assessments in this report concerning the presence of substances that are undesirable from a health point of view, solely refer to the products, substances and substance groups considered in 2016. At the same time, it is not possible to estimate the entire exposure to certain substances because only part of the market basket can be examined per year, while the substances considered also occur in other products.

Altogether, the findings of the 2016 food monitoring programme again support the recommendation of a varied and balanced diet, in order to minimise the dietary intake of undesirable substances which is, to some degree, unavoidable.

In total, 8,961 samples of products of domestic and foreign origin were analysed in the framework of market basket and project monitoring in 2016, including 8,047 samples of foodstuffs, 366 samples of cosmetic products, and 548 samples of consumer items (here, certain products intended for food contact or body contact). The findings are presented in the following chapters.

## 2 Foodstuffs

### 2.1 Residues of Plant Protection Products and Pesticides

#### 2.1.1 Food of Animal Origin

Residues of plant protection products and pesticides were detected in 32 % of the samples tested in cow milk, 26 % of samples of venison, and 34 % of porcine samples.

As in other foodstuffs of animal origin, quantifiable residues mostly stemmed from ubiquitous, persistent organo-chlorine compounds that used to be applied heavily in the past in products for crop protection and pest control, and still enter the food chain from the environment now.

Compared to findings in the years 2010 and 2013, the portion of milk samples containing residues has declined, in particular with regard to residues of persistent organo-chlorine compounds.

Legal Maximum Residue Levels (MRLs) were not exceeded in any food sample of animal origin, and the residues found did not signal any health risk to consumers.

#### 2.1.2 Food of Plant Origin

Residues of plant protection products were found to different extent in all foodstuffs of vegetal origin tested therefor.

Quantifiable residue findings were least frequent in sunflower oil, rhubarb, and asparagus, while they were most frequent, comparatively, in strawberries, raspberries and peach. These same foodstuffs also had the most frequent findings of multiple residues.

1.2 % of the samples of vegetal foodstuffs of domestic production – mostly of apple and leek – showed residues of active substances which were not authorised for use in the respective crops in Germany in 2016.

Samples carrying residues higher than the legal maximum residue levels occurred most frequently with grapefruit (7.4 % of samples) and savoy cabbage (5.8 %). There were 11 more foodstuffs with non-compliant residue findings, but here the portions of non-compliant samples ranged between 0.4 % and 2.8 %. The remaining nine foodstuffs of vegetal origin examined in this programme had no non-compliant residue findings.

Looking at the trend, there is no recognisable uniform development. While some products show a steady decline in residue loads (e.g., savoy cabbage), other foods show a continuous increase in residues of plant protection products (e.g., grapefruit).

The risk assessment of findings resulted in the opinion that the residues of prochloraz found in one sample of pineapple and residues of methiocarb in one sample of leek had a potential of acute health impairment.

All other residues found, including those exceeding the respective maximum residue levels, did not imply any acute health risks to consumers.

In addition to that, one monitoring project dealt with residues of plant protection products and selected contaminants in frozen food products of vegetal origin. This project demonstrated, by the example of two product groups each from fruits and from vegetables, that frozen products may differ considerably from fresh products as regards residue loads. One reason may be that the high storage and transport stability of frozen food products encourages imports into the EU from a large number of originating countries. Also, production of frozen food products brings about more mixing of product batches. Multiple ways of post-harvest treatment of product intended for freezing may result both in more residues and contaminants (for instance, by cross-contamination or disinfection by-products) or in less residues, for instance as a result of blanching.

The residues found in deep-frozen foodstuffs of vegetal origin did not indicate health risks to consumers. In a risk assessment of dithiocarbamates in frozen Brussels sprouts, the Federal Institute for Risk Assessment (BfR) came to the conclusion that a health risk to children and adults owing to intake of dithiocarbamates through consumption of frozen Brussels sprouts is practically excluded, based on the amounts of residues found.

## 2.2 Chlorate

Leaf lettuces (Romaine, oak leaf lettuce, lollo rosso/bianco), head lettuce, and asparagus had large portions of samples with quantifiable residues of chlorate. In order to strengthen the data basis needed for a solid risk assessment providing the basis for establishing specific maximum levels, the monitoring programmes of 2017 and the following years will continue to analyse chlorate in a large variety of products.

## 2.3 Quaternary Ammonium Compounds (QAC)

Samples of pineapple, raspberries, head lettuce, peach/nectarine, leek, rhubarb, white cabbage, white wine, and courgettes contained quantifiable amounts of either didecyl dimethyl ammonium chloride (DDAC) or benzalkonium chloride (BAC), while venison (roe/deer) was found with quantifiable amounts of both.

Apart from two single findings, all concentrations measured were lower than the preliminary maximum residue level of 0.1 mg/kg established in October 2014 by Regulation (EU) No. 1119/2014.

In order to strengthen the data basis needed for a solid risk assessment and review of preliminary maximum levels, BAC and DDAC will continue to be subject to monitoring programmes in the years ahead.

## 2.4 Dioxins and Polychlorinated Biphenyls (PCB)

Muscle tissue of hare/rabbit and liver of pig showed very low concentrations of dioxins, dioxin-like PCB (dl PCB), and non-dioxin-like PCB (ndl PCB). In sheep and lamb liver, the medians of the sum parameter of dioxins and dioxin-like PCB and of the sum of non-dioxin-like PCB were higher, as it was to be expected. Five samples exceeded the maximum level for the sum dioxin parameter, and 6 samples the maximum level for the dioxins and dioxin-like PCB sum parameter.

Although the median of concentrations of dioxins and dioxin-like PCB in calf liver was clearly lower than in sheep/lamb liver, there were still two findings non-compliant with the legal maximum level for the sum parameter of dioxins and dioxin-like PCB in calf liver, too.

Apart from that, findings in 4 samples of calf liver and 2 samples of sheep/lamb liver exceeded the maximum level fixed for the sum of non-dioxin-like PCB.

The findings show that, after the current maximum levels for liver of terrestrial animals have taken legal effect, we have to expect non-compliant findings of dioxins and sum of dioxin-like PCB, in particular in sheep's liver. However, sheep liver is rarely consumed in Germany.

One of the special monitoring projects dealt with dioxins and PCB in beef originating from pastured suckler cows. The findings showed that beef from pastured suckler cows may contain higher concentrations of dioxins and, in particular, dioxin-like PCB than beef produced by other kinds of animal keeping.

Eight per cent of the samples were nominally non-compliant with the EU maximum level for the sum dioxin and dl PCB parameter. All of these findings concerned the cows' offspring.

The project examined in how far the bovine's age at the time of slaughter had an effect on the concentrations found. It turned out that most of the non-compliant findings of sum of dioxins and dl PCB occurred in animals aged up to 15 months at the time of slaughter. This finding should be looked at more closely, such as in a research project, and also with regard to prognosticating the marketability of such beef in future.

Another monitoring project examined dioxins and PCB in herring and eel from the Baltic region. In spite of the persistence and omnipresence of dioxins and PCB, none of the findings exceeded the EU maximum levels. The highest concentrations found were at most about 50 % of the permitted maximum levels. Still, the monitoring of dioxins and PCB in food remains an important contribution to estimating the total human exposure.

## 2.5 Perfluorinated and polyfluorinated Alkyl Substances (PFAS)

No single substance of the range of PFAS looked for was detected in quantifiable amounts in muscle meat samples of hare and rabbit.

Pig's liver contained only low concentrations of the major PFAS perfluorooctane sulfonic acid (PFOS) and perfluorooctanoic acid (PFOA).

## 2.6 Polycyclic Aromatic Hydrocarbons (PAH)

Levels both of quantifiable benzo(a)pyrene and of PAH-4 sums were low in roasted coffee samples. In addition, one can assume that fat-soluble PAH contained in roasted coffee do not migrate to noteworthy extent to the watery phase of the coffee drink. Health risks to consumers from PAH exposure need therefore not be expected. Nevertheless, PAH concentrations in foodstuffs must be *as low as reasonably achievable* ("ALARA" principle) applying good manufacturing practice and fitting processing conditions.

## 2.7 Mycotoxins

### 2.7.1 Ergot alkaloids

Soy products showed clearly lower levels of ergot alkaloids than rye products, which were analysed for these mycotoxins under previous monitoring programmes. Rye bread, rye-wheat mixed breads, and rolls contained less ergot alkaloids than rye flour, as it was to be expected. Ergot alkaloids in rye grains were on average also lower than in rye flour, because grains are partly subjected to a special cleaning procedure before being sold to consumers. In all food groups tested under this monitoring programme, the statistical assessment was dominated by some single samples with heavier ergot alkaloid contamination. The maximum sum of ergot alkaloids found in rye products occurred in a sample of rye whole-meal flour originating from Germany.

The present findings in soy beans and soy products show that ergot alkaloids may be found apart from the known cereal products in other products, too.

One monitoring project examined ground spelt products for ergot alkaloids. These were detected to quantifiable amounts in 16 % of the samples, ergometrine being the alkaloid most frequently found (i.e., in 8.2 % of the samples).

Compared to the findings of the 2013 monitoring project which dealt with ergot alkaloids in bread and baking mixtures, the spectrum of main alkaloid substances found is similar, though with a different frequency distribution pattern.

As expected, both the percentage of samples with detectable amounts of alkaloids and the average levels of the single alkaloid samples are lower in ground spelt products than in rye. The total alkaloid content, which was a maximum 441 µg/kg (90<sup>th</sup> percentile: 38.5 µg/kg) in ground spelt products, was also somewhat lower, while some single findings were quite in line with those found earlier in rye flours and baking mixtures.

With spelt wheat becoming increasingly popular – such as other old wheat varieties – more studies should be made in old grain varieties, in order to survey the status quo in this field.

### 2.7.2 Ochratoxin A (OTA)

Ochratoxin A concentrations in type 405/550 wheat flour are very low, and again still lower than found in the 2011 monitoring programme. In apple juice, the ochratoxin A was not quantifiable at all. Findings in the previous monitoring tests of apple juice in 2013 already indicated a very low degree of contamination.

### 2.7.3 T-2 toxin, HT-2 toxin

T-2/HT-2 toxins were not quantifiable in soy beans, which was the same result as in the 2011 monitoring tests. Neither did soy meal have quantifiable findings. Soy meal was tested for the first time under this monitoring programme. Flakes in contrast, contained clearly higher levels of T-2/HT-2 toxins than other soy products. Some single samples even showed high T-2/HT-2 toxin levels. In order to test these findings, soy products should continue to be monitored in future programmes.

The samples of type 405/550 wheat flour and rye flour, which were also tested for T-2/HT-2 toxins, showed as low contamination levels as found in the 2011 monitoring programme.

### 2.7.4 Patulin

Apple juices were repeatedly tested for patulin under the annual monitoring programmes. This year's samples contained low concentrations in the median, comparable to findings in 2008. There were no findings exceeding the legal maximum level.

The small sampling volume did again not allow clarifying questions such as, in how far the juice production method, origin of the apples, or marketing paths have an effect on patulin levels in the juice. This would require raising more data, such as in the framework of research projects.

### 2.7.5 Tropane alkaloids

The monitoring project dealing with tropane alkaloids in infant food showed that atropine in particular plays a certain role. Only 10 in 250 samples were found with quantifiable levels of atropine, and these levels ranged low, between 0.23 µg/kg and 2.6 µg/kg. Still, 2 % of the samples exceeded the legal maximum level of 1.0 µg/kg.

The EU Commission fixed this maximum level for atropine and scopolamine while the monitoring project was in course. The Commission did not, however, adjust the respective minimum performance limit. The present data show that most of the laboratories involved in the project indicated a limit of quantification lower than 1.0 µg/kg, which means that the laboratory findings could be properly assessed in this respect. It is recommended to run a similar project again, but with a risk-oriented approach, such as in the framework of the National Control Plan *BÜp*, after the maximum level has been generally established.

The monitoring findings seem to indicate that the problem of tropane alkaloids is well addressed on the manufacturers' side through HACCP (*Hazard Analysis and Critical Control Point*) programmes. None of the samples was conspicuous for extraordinarily high contents.



## 2.8 Elements

The large majority of samples tested for elements carried only low concentrations in metals and semi-metals. The percentages of samples not complying with the maximum levels fixed for lead, cadmium, and inorganic arsenic in Regulation (EU) No. 1881/2006 are low, apart from very few exceptions.

Compared to other foodstuffs, enhanced levels of lead and cadmium were found in liver, in particular in sheep's or lamb's liver. Non-compliant concentrations were found with mercury in sheep's and lamb's liver, but a health risk to consumers is unlikely with all findings.

Apart from that, enhanced levels of certain heavy metals, namely cadmium, mercury, and nickel, were found in wild mushrooms and soy bean products. A health risk from mercury in mushrooms is still unlikely for consumers with average and high-rate consumption of mushrooms.

Levels of lead and cadmium in infant food were lower than the EU-wide, new maximum levels. This is good, given the increased sensitivity of infants and small children towards lead and cadmium.

Concentrations of lead in calf's and pig's liver, game meat, and wild mushrooms have noticeably declined, compared to findings of earlier monitoring programmes.

As regards arsenic, future monitoring programmes should consider both total and other kinds of arsenic, in order to generate more data for an improved exposure assessment. Inorganic arsenic, which is of higher toxicological importance and has also been considered so far, should receive particular attention.

The monitoring also showed that the processed soy products tested carried higher levels in aluminium, arsenic, copper, nickel, and in particular, cadmium, than unprocessed soy beans. The reasons for that should be investigated in further studies.

## 2.9 Nitrate

Nitrate levels in leek, rhubarb and white cabbage were, overall, lower than in the years before. Head lettuce had the highest levels among the foodstuffs tested. Compared to earlier monitoring programmes, nitrate levels in head lettuce have hardly declined. 4 % of the samples, drawn from open-air crops, did not comply with the EU maximum level, which is 3000 mg/kg. The recommendation remains to take suitable measures to reduce nitrate contents in this food. Consumers should not reduce their consumption of vegetables, but take care to vary their choice of vegetables instead, according to an opinion published by the Federal Institute for Risk Assessment (BfR).

## 2.10 Perchlorate

The vegetal foodstuffs tested all showed very low perchlorate levels. Both the 90<sup>th</sup> percentile and most of the maximum values determined were markedly lower than the respective EU reference values, and thus very low. Only a few single findings exceeded EU reference values. Given the low levels found, there might be room for lowering EU perchlorate reference values in foodstuffs, in order to encourage further efforts to reduce perchlorate in food, in line with the ALARA principle.

## 2.11 Vitamin A

Vitamin A was analysed in liver under a monitoring project run in Hesse, Mecklenburg-Western Pomerania, and Lower Saxony.

The findings make clear that consumption, namely of pig's liver, of only 10 g per day would already result in a daily vitamin A intake which exceeds the tolerable upper intake level of 3 mg/day, derived for women of birth-giving age and adult men. This is regardless of consumption of other foods. The data leads to the conclusion that the maximum level fixed for vitamin A additives to feed in the Nineties has not had the intended effect as regards reduction of transfer

of vitamin A from feed to foodstuffs of animal origin. Depending on the manufacturing processes, this may also have an effect on the level of vitamin A in sausages, such as liver sausage. We expect to learn more facts on the total intake of vitamin A with foodstuffs from the BfR's MEAL study (dealing with food analysis and exposure assessment). In consequence, the recommendation persists to abstain from consuming liver of all animal species during pregnancy, and to be very sparing in consuming foodstuffs containing liver, both during pregnancy and for little children.

Future monitoring projects should look into the question how Commission Implementing Regulation (EU) 2015/724, which intends to further reduce vitamin A maximum levels in feed, has influenced vitamin A contents in liver intended for human consumption, and in sausages manufactured there from.

## **2.12 Pharmacological active substances**

One monitoring project dealt with antibiotics in veal. All veal samples tested under this project were in line with legal requirements. The fact that only representatives of the tetracyclines group were detected in residue-positive samples may be explained by two facts. On the one hand, tetracyclines are easily available on the market. On the other hand, other antibiotics of high market availability, such as  $\beta$ -lactames, are not detectable in muscle as long as tetracyclines, because of their natural instability resulting from their chemical structure. The origin of the veal had no influence on the percentage of residue-positive samples in this monitoring study.

## 3 Cosmetic Products

### 3.1 UV filters in sunscreen products

There were some findings non-compliant with the maximum concentrations regulated by Regulation (EC) No. 1223/2009, as regards some organic UV filters. Findings in 19 % of the samples exceeded the legal maximum concentration of ethyl hexyl salicylate and 10 % exceeded the maximum concentration allowed for butyl methoxy dibenzoyl methane. Furthermore, there were non-compliant findings of ethyl hexyl triazone, octocrylene, isoamyl-p-methoxy cinnamate, homosalate, ethyl hexyl dimethyl-PABA, and ethyl hexyl methoxy cinnamate. The non-compliant findings concerned a total of 94 samples, out of 368 (corresponding to 25.5 %). The data obtained on total contents in UV filters could serve as a basis for further risk management measures in this regard.

## 4 Commodities/Daily Use Articles

### 4.1 Phthalates in food packaging and food contact products made of paper, carton, and cardboard

Food packaging material and food contact articles made of paper, carton, or cardboard were tested for phthalate concentrations and migration to a simulant product (Tenax). The migration limit values recommended by the BfR for DBP were exceeded in 6 % of the samples tested, and the recommended limit values for di-isobutyl phthalate (DiBP) in 16 % of the samples tested. The recommended limit value for the sum of both phthalates was exceeded in 18 % of the samples. Migration in materials that the specifications said were not recycled did not exceed any recommended limit values. The BfR's recommended migration limit for di-(2-ethyl hexyl)-phthalate (DEHP) was not exceeded in any sample.

### 4.2 Volatile organic compounds (VOC) in toys and commodities with body-contact made from foamed materials

The volatile organic substances acetophenone, 2-phenyl-2-propanol, and  $\alpha,\alpha'$ -dihydroxy-1,3-disopropyl benzol were analysed in shoes made of foamed materials, paddings, and ball game sets. Shoes were found with very high contents in these substances. The Federal Institute of Risk Assessment (BfR) therefore recommended consumers to avoid plastic clogs with strong synthetic smell. The same holds for other daily use products made of foamed synthetic materials.

### 4.3 Photoinitiators in toys made of paper, carton or cardboard

A variety of photoinitiators were found in the paper, carton, and cardboard toys tested. Benzophenone was the predominant finding, being present in 71 % of the samples, and with maximum levels of up to 801 mg/kg. In order to make actual exposure assessments, future studies should concentrate on migration tests rather than measuring concentration levels.

### 4.4 Release of elements from hard plastic toys intended for children aged under 36 months

The monitoring tests showed that there is very little release of elements from hard plastic toys. None of the samples exceeded maximum migration levels required by Directive 2009/48/EC, or the limit value for cadmium set by Regulation (EC) No. 1907/2006.