National Food Monitoring 1996

Joint report of the Federal Republic of Germany and the Federal Länder

Published by:
Federal Institute for Health Protection of Consumers and Veterinary Medicine (BgVV)

Foods examined in 1996

- Butter
- Pork liver
- Lamb liver
- Fat from pig's belly
- Kidney fat of lamb
- Herring
- Fillet of saithe (*Pollachius virens*)
- Rainbow trout

- Endive var.
- Iceberg lettuce
- Green beans
- Pickling cucumber
- Kohlrabi
- Radish
- Radish, small
- Strawberries
- Red currants
- Orange
- Lemon
- Apple juice
- Pistachio

National Food Monitoring 1996

Published by:
Federal Institute for Health Protection of Consumers and Veterinary Medicine (BgVV)

Editors:
Centre for Recording and Health Evaluation of Environmental Chemicals (ZEBS)

Table of Contents

1. Introduction: What does food monitoring mean?

Food monitoring is a system of repeated examination, measuring and evaluation of levels in and on food of harmful and therefore undesirable substances, such as pesticides, heavy metals and other contaminants. It is the aim of food monitoring to obtain informative data for the representative description of the occurrence of undesirable substances in food in Germany on the one hand and to recognize early any potential risks posed by these substances on the other. In the long run, food monitoring is to demonstrate chronological trends in the contamination of foods and to provide a sufficient amount of data as a basis for calculations of the dietary intake of undesirable substances by the consumer.

Food monitoring is an independent task within the framework of official food control. Thus, it works as an additional instrument to improve prevention in the interest of health protection of consumers.

Annually, the Federal Ministry for Health issues a detailed plan for the performance of the monitoring procedure which is based on cooperative efforts of officials of the Federal Government and the Länder. This plan is published in the form of General Administrative Regulations.

As a rule, the examinations encompass a total amount of ca. 4700 samples, which are collected each year from the 16 federal Länder proportional to their population figures.

Within a period of 5 years, ca. 100 foods are to be examined in order to provide representative data about the occurrence of undesirable substances in foods. The results gained from this general review are to provide data on the dietary intake of undesirable substances.

Sampling and analyses of the foods are performed by the competent authorities and food control laboratories in the individual federal Länder.

The tasks of organization of the monitoring, recording and maintenance of data and evaluation of monitoring results as well as reporting have been assigned to the Federal Institute for Health Protection of Consumers and Veterinary Medicine (BgVV).

The data forming the basis of this report have been published in a special brochure available from the BgVV: Lebensmittel-Monitoring, Tabellen-Band zum Bericht über das Jahr 1996 (Food Monitoring Tables: Supplement to the 1996 Report).

2. Summary

Under the food monitoring programme of 1996, 4 692 samples of domestic and imported foods were examined comprising the following 8 foods of animal and 13 of vegetal origin:

- Butter
- Pork liver
- Lamb liver
- Fat from pig's belly
- Kidney fat (suet) of lamb
- Herring
- Filet of saithe (*Pollachius virens*)
- Rainbow trout

- Endive var.

- Iceberg lettuce
- Green beans
- Pickling cucumber
- Kohlrabi
- Radish
- Radish, small var.
- Strawberry
- Red currants
- Orange
- Lemon
- Apple juice
- Pistachio

Depending on the food, the samples were examined for residues of pesticides (insecticides, fungicides, herbicides, etc.), environmental contaminants (e.g. chlorinated hydrocarbons including PCB and the heavy metals, lead, cadmium and mercury) as well as nitrate and mycotoxins (aflatoxins, patulin). Some of the foods in question had been investigated already under the monitoring programme of 1995 covering almost the same spectrum of substances so that it was possible to make a comparison between the contamination levels in both years.

In most of the samples, no residues of pesticides or only traces of them were detected.

In 1995, 262 of the 4 363 samples (= 6 %) showed contents exceeding maximum levels or guide values while in 1996 this was the case in 124 of the 4 692 samples (= 2.7 %) only. The few cases in which maximum levels or guide values were exceeded were restricted to a low number of substances; essentially, these were bromocyclen and some PCB components in foods of animal origin and chlorpyrifos, chlorpyrifos-methyl, dithiocarbamate, vinclozolin, aflatoxins, nitrate and lead in foods of vegetal origin.

The following **conclusions** can be drawn from the results of the monitoring programme of 1996, also in conjunction with those of 1995:

1. The 1996 monitoring results have again confirmed that the contamination of foods with undesirable substances is generally low. In view of a preventive health protection of consumers, the situation has proved to be satisfactory in the case of most of the foods examined. Even if, occasionally, the legal maximum residue levels were exceeded for some pesticides, a health risk could be excluded as a rule since maximum levels have been fixed taking into account adequate safety margins.

2. Some vegetables (radishes, kohlrabi and salad greens) showed high nitrate levels. Although these levels do not present a direct health risk, they should be avoided for reasons of preventive health protection. Therefore, measures should be taken to improve the agricultural conditions of cultivation in order to reduce nitrate levels. These measures should include the fixation of maximum levels within the EU for nitrate in other vegetables and salad greens.

3. Also in 1996, contamination of pistachios with aflatoxins which originated from mould was frequent. Concentrations were, in part, considerably above the maximum levels. The present results have revealed that this trend persists. The official steps undertaken with the government of Iran, being the country with the highest share in the imports, have not yet resulted in improved conditions of harvesting, storage and transport. Recent examination has shown that also in pistachios of other origin, e.g. from the USA, maximum levels may be exceeded. Therefore, continued monitoring of the contamination of pistachios is necessary.

Recommendations for the consumer:
On the basis of the present results, the foods listed here can be consumed without being concerned about the presence of undesirable substances. However, consumption of foods should be balanced and varied. For a balanced diet, it is important to avoid a preferential consumption of certain foods, e.g. of vegetables rich in nitrate.

Due to the aflatoxin contamination levels established, consumption of pistachios cannot be recommended at present.

3. Monitoring Design 1996

3.1 Selection of foods and substances

On the one hand, the selection of foods and substances has to comply with the aim of the monitoring scheme. On the other hand, the resources of the institutions performing the examinations must be taken into account.

In 1996, 8 foods of animal and 13 of vegetal origin were included in the monitoring design. Some of these foods had already been examined under the monitoring scheme for 1995. They were again included in the monitoring design in 1996 in order to establish possibly existing trends.

Substances were selected on the basis of food-specific aspects. The selection also includes substances on whose qualitative or quantitative presence no sufficient knowledge was available at the time of planning or which have been rated as particularly important due to their potential toxicity. These include: pesticides, environmental contaminants, nitrate and mycotoxins.

Tables 1 and 2 provide an overview of foods and substances or substance groups included in the 1996 monitoring programme. In the tables, foods and substance groups which were already represented in the 1995 monitoring scheme have been marked correspondingly.

Foods of animal origin - reasons for selection

Butter
Butter was included in the monitoring programme as the most important milk fat product. Milk fat is known to accumulate fat-soluble compounds, particularly chlorinated hydrocarbons. Among milk products, butter is therefore to be regarded as a food typical of the occurrence of these substances.

Meat
Edible offals (lamb liver, pork liver)
Liver is an organ accumulating heavy metals. Therefore, the results of examinations of this organ for heavy metals can also provide information on the contamination of products of the animal species concerned.

Fat tissue (fat from pig's belly, kidney fat of lamb)
In the fat tissue, there is an increased accumulation of fat-soluble compounds like chlorinated hydrocarbons. To gain information on the contamination with these compounds of the animal species concerned, fat tissue is the most appropriate test material.

Fish

Marine fish (herring, fillet of saithe)

Typical representatives of marine fish are herring and saithe (*Pollachius virens*) which are consumed frequently.

The habitats of the herring, which is counted amongst the high-fat marine fish species, include areas of the Baltic Sea and the North Sea, where environmental contamination is relatively high in some regions.

Saithe, which has a low fat content, lives in the north Atlantic in fishing grounds situated far from the coast and therefore less exposed to environmental contamination. There is a great variety of industrially processed foods made from this fish species.

Freshwater fish (rainbow trout)

From the number of freshwater fish used for consumption, the rainbow trout is very popular. It has a low fat content and is mainly farmed under controlled conditions.

These three species were examined under the monitoring scheme in 1995 as well as in 1996 due to their relatively high share in the total consumption of fish.

Table 1: Foods of animal origin and substances / substance groups

Foods of animal origin	Substances and substance groups
1. Butter	Environmental contaminants: chlorinated hydrocarbons including PCB, musk compounds, bromocyclen
2. Pork liver	Environmental contaminants: chlorinated hydrocarbons including PCB, musk compounds, bromocyclen, heavy metals
3. Fat from pig's belly	Environmental contaminants: chlorinated hydrocarbons including PCB, musk compounds, bromocyclen
4. Lamb liver	Environmental contaminants: chlorinated hydrocarbons including PCB, musk compounds, bromocyclen, heavy metals
5. Kidney fat of lamb	Environmental contaminants: chlorinated hydrocarbons including PCB, musk compounds, bromocyclen, heavy metals
6. Herring*	Environmental contaminants: chlorinated hydrocarbons including PCB and camphechlor, musk compounds, heavy metals
7. Rainbow trout*	Environmental contaminants: chlorinated hydrocarbons including PCB, musk compounds, bromocyclen, heavy metals
8. Fillet of saithe (*Pollachius virens*)*	Environmental contaminants: chlorinated hydrocarbons including PCB and camphechlor, musk compounds, heavy metals

* Also examined under the 1995 monitoring scheme

Foods of vegetal origin - reasons for selection

Fresh vegetables
In a wholesome and balanced diet, vegetables are particularly important. Vegetables are available in a large variety and serve as a versatile and important source of dietary fibre, vitamins, nutrients and minerals in the human diet.

However, as a consequence of technical measures in the production process, vegetables may contain substances undesirable from the viewpoint of preventive consumer protection. These include: residues of pesticides, nitrate and the heavy metals, lead and cadmium.

In order to examine the contamination levels in vegetables of the substances/substance groups mentioned, a number of typical representatives were selected from the following aspects:

Leafy vegetables (endive var., iceberg lettuce)
Salad greens are consumed in large quantities especially by consumers who are particularly interested in healthy foods. Salad greens are amongst the varieties rich in nitrate. Therefore, nitrate levels were examined in addition to residues of pesticides. Endive var. and iceberg lettuce were also examined under the 1995 monitoring programme.

Fruiting vegetables (green beans, pickling cucumber)
These vegetables were already included in the 1995 monitoring scheme.

Stalk vegetables (kohlrabi)
For kohlrabi, the reasons stated under the varieties mentioned above apply correspondingly.

Roots (radishes)
Also the varieties of radishes are amongst the vegetables rich in nitrate. In order to evaluate contamination trends, they were examined under the monitoring scheme in 1995 as well as in 1996.

Fresh fruit
Fruit is an important constituent of a balanced diet. Therefore, the consumption of fruit as well as of vegetables has been particularly recommended for a wholesome diet. This is why continued monitoring of the qualitative and quantitative contamination with undesirable substances is necessary.

Berries (strawberries, red currants)
Berries are delicate and easily perishable. Therefore, an extensive use of pesticides prior to and after harvesting had to be expected which contributed to the decision to include these fruits in the monitoring scheme. The examination of strawberries from plantations where the berries are harvested by consumer self-service was aimed at gaining representative results about the contamination of strawberries with pesticides within this special marketing concept.

Citrus fruit (orange, lemon)
Residue levels in these kinds of fruit were to be examined as they are imported from countries where a relatively large spectrum of pesticides is used.

Fruit products (apple juice)
Like under the 1995 monitoring scheme, apple juice was examined for contamination with the mycotoxin, patulin. Patulin is a toxic and carcinogenic substance forming on spoiled apples. For the production of apple juice, only fresh apples should be used. Certain levels of patulin detected in this food suggest an illegal use of spoiled apples.

Testing results are also supposed to help in discussions so that a uniform EU maximum level for patulin can be established on the basis of well-founded data.

Hard-shelled dry fruit (pistachio)

Due to inadequate conditions during harvesting, storage and transport, pistachios may develop mould which forms toxic substances, i.e. aflatoxins. Therefore, measures had been demanded to avoid mould development. As these were obviously not always put into practice, legal maximum levels were repeatedly and considerably exceeded. This is why pistachios were examined for aflatoxins under the monitoring scheme in 1995 as well as in 1996.

Table 2: Foods of vegetal origin, substances and substance groups

Foods of vegetal origin	Substances and substance groups
1. Endive var.*	Pesticides, nitrate, heavy metals
2. Iceberg lettuce*	Pesticides, nitrate, heavy metals
3. Kohlrabi	Pesticides, nitrate, heavy metals
4. Pickling cucumber*	Pesticides, heavy metals
5. Green beans*	Pesticides, heavy metals
6. Radish*	Nitrate
7. Radish, small var.*	Nitrate
8. Strawberry	Pesticides
9. Red currants	Pesticides
10. Orange	Pesticides
11. Lemon	Pesticides
12. Apple juice*	Patulin, pesticides
13. Pistachio*	Aflatoxins

* Also examined under the 1995 monitoring scheme

3.2 Sampling and quality of analysis

The sampling of foods was performed according to a sampling design developed by the Federal Institute for Health Protection of Consumers and Veterinary Medicine (BgVV) which allows representative statements about contamination levels in foods as sold on the German market. Samples were taken in commerce or at the producers' premises.

Sampling as well as chemical analysis have been assigned to the competent authorities and laboratories of the official food control in the 16 Länder of Germany.

In the laboratories, the food samples are prepared for analysis (e.g. washing, cleaning, peeling) according to standardized methods in order to get comparable results. The analytical methods chosen had to ensure comparability of the results and compliance with the criteria for validation of Council Directive 85/591/EEC[*)]. In order to be able to examine the food samples for the sometimes very large spectrum of substances, mainly multiple methods as required by the collection of methods under § 35 of the German Foods and Other Commodities Act (LMBG) were used, e.g. methods developed by the Deutsche Forschungsgemeinschaft (DFG). The reliability of test results was ensured by additional laboratory measures as e.g. the use of appropriate reference material or interlaboratory comparison.

[*)] Council Directive 85/591/EEC of 20 December 1985 concerning the introduction of Community methods of sampling and analysis for the monitoring of foodstuffs intended for human consumption. Official Journal of the European Communities No L 372/50, 31/12/1985.

4. Number and origin of samples

In 1996, a total of 4 692 samples were analyzed which had been taken from 8 foods of animal and 13 of vegetal origin (cf. Fig. 1):

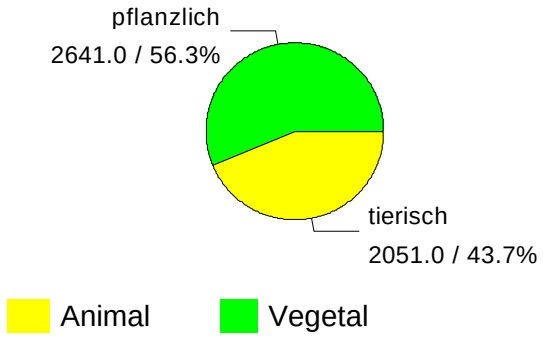


Fig. 1: Shares of foods of animal and vegetal origin

Sampling included domestic as well as foreign products. In some cases, the origin of the samples was unknown. Fig. 2 shows the numbers of samples and their shares according to origin.

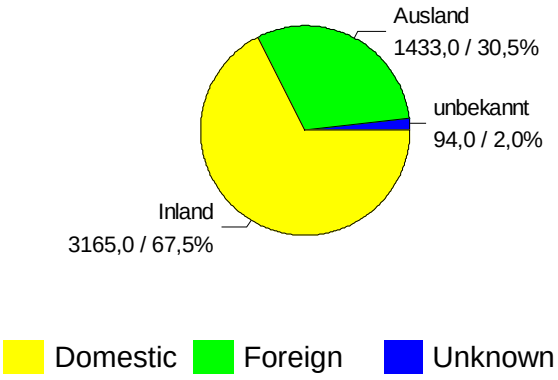


Fig. 2: Shares of samples according to origin (domestic, foreign, unknown)

Table 3 lists numbers of samples for each of the 21 foods according to their origin as stated above.

Table 3: Numbers of samples by origin: domestic, foreign, unknown

Food item	Domestic		Foreign		Unknown		Total
	No	%	No	%	No	%	No
Butter	134	69.1	59	30.4	1	0.5	194
Pork liver	283	92.2	15	4.9	9	2.9	307
Fat from pig's belly	278	91.7	17	5.6	8	2.6	303
Lamb liver	291	97.0	9	3.0			300
Kidney fat of lamb	301	97.1	9	2.9			310
Herring	76	39.6	98	51.0	18	9.4	192
Rainbow trout	209	94.1	12	5.4	1	0.5	222
Fillet of saithe (*Pollachius virens*)	90	40.4	111	49.8	22	9.9	223
Pistachio			31	100			31
Endive var.	94	50.5	84	45.2	8	4.3	186
Iceberg lettuce	63	28.0	160	71.1	2	0.9	225
Kohlrabi	120	53.3	102	45.3	3	1.3	225
Cucumber	209	92.5	11	4.9	6	2.7	226
Green beans	75	38.3	116	59.2	5	2.6	196
Radish	120	68.6	53	30.3	2	1.1	175
Radish, small	93	46.5	102	51.0	5	2.5	200
Strawberry	306	100					306
Red currant	194	93.7	13	6.3			207
Orange			224	100			224
Lemon			203	100			203
Apple juice	229	96.6	4	1.7	4	1.7	237
Total	**3165**	**67.5**	**1433**	**30.5**	**94**	**2.0**	**4692**

5. Contamination levels in foods

In this chapter, information is given on the foods examined under the 1996 monitoring scheme. Results are depicted for typical groups of foods.

5.1 Foods of animal origin

5.1.1 Butter

194 samples of butter were examined for 24 substances. These substances included persistent chlorinated hydrocarbons including PCB, musk compounds and bromocyclen.

Fig. 3 illustrates the shares of residue-free samples and of samples containing residues below maximum levels in summarized form for all substances concerned.

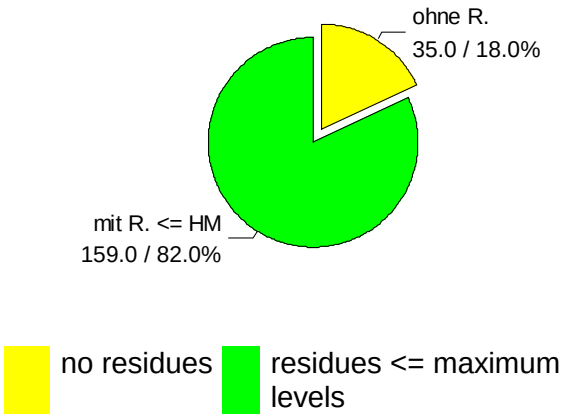


Fig. 3: Contamination levels in butter

Relatively frequently, i.e. in more than 50 % of the samples, residues of the following substances were detected:

DDT
HCB
Lindane
PCB 153

All residue levels detected were far below the maximum levels fixed for these substances. For many substances, no residues were found in the samples.

Conclusion:
Butter was contaminated to a relatively low degree with the substances examined. There were no conspicuous findings.

5.1.2 Edible offals (pork liver, lamb liver)

Organic substances
In the year under report, 307 samples of pork liver and 300 samples of lamb liver were examined. Of these, 206 samples of pork liver and 276 samples of lamb liver were examined for 24 organic compounds. These compounds included persistent chlorinated hydrocarbons including PCB, musk compounds and bromocyclen.

Fig. 4 gives a summary overview of the shares of samples containing no residues, samples containing residues below maximum levels and samples containing residues above maximum levels.

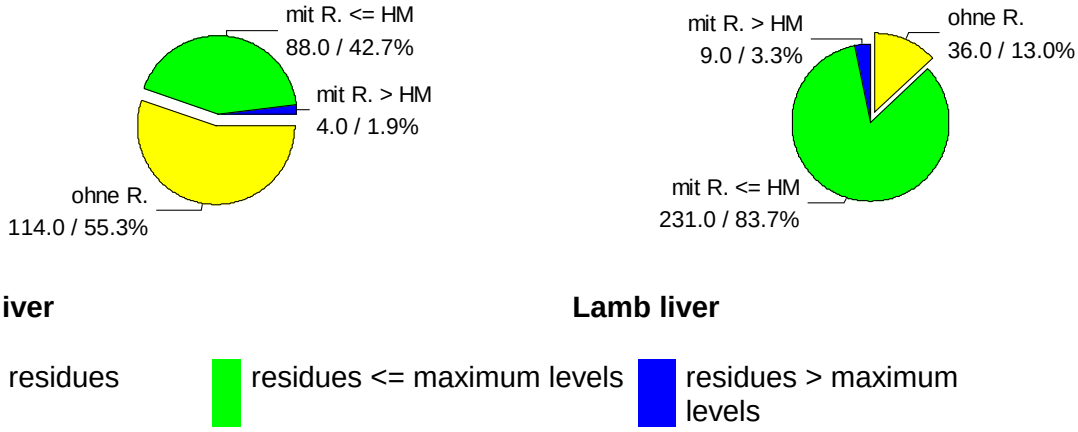


Fig. 4: Contamination levels in pork and lamb liver

Lamb liver was contaminated with organic substances to a higher degree than pork liver. In single cases, maximum levels were exceeded, which applied almost exclusively to some higher chlorinated PCB components.

Heavy metals
Liver is an organ accumulating heavy metals. A positive result was established in so far as levels of heavy metals were found to be low in pork as well as in lamb liver. This is probably due to a lower exposure of feeds to environmental factors and more effective controls of imported feeds. In the table below, the levels detected are stated along with the respective guide values.

Median levels of heavy metals as compared to guide values, in mg/kg fresh substance

	Lead	Cadmium	Mercury
Pork liver	0.02 (0.5)*	0.03 (0.3)*	0.005 (0.1)*
Lamb liver	0.09	0.04	0.005

* Guide value

In pork liver, no cases of exceeded guide values were found. For lamb liver, no guide values exist at the moment. With reference to the high levels of heavy metals, particularly of cadmium, detected in the past, it can now be stated that according to these results, pork and lamb liver appear no longer to belong to the group of foods being highly contaminated with heavy metals.

In particular, levels of cadmium and mercury had prompted special recommendations for the consumption of liver and kidney in the past. Though these recommendations are maintained

for precautionary reasons, they may prove unnecessary for the liver from the animal species examined if these results are confirmed by future examinations.

Conclusion:
The contamination of pork and lamb livers with ubiquitous organic substances was found to be low to moderate. In single cases, maximum levels were exceeded mainly for some PCB components. The contamination with heavy metals as well can be regarded as low.

5.1.3 Fat tissue (fat from pig's belly, kidney fat of lamb)

Organic substances
Fat from pig's belly and kidney fat of lamb (ca. 300 samples each) were examined for persistent chlorinated hydrocarbons including PCB components, for bromocyclen and musk compounds. The examination comprised a spectrum of 24 organic substances.

Fig. 5 gives a summary overview of the shares of samples containing no residues, samples containing residues below maximum levels and samples containing residues above maximum levels.

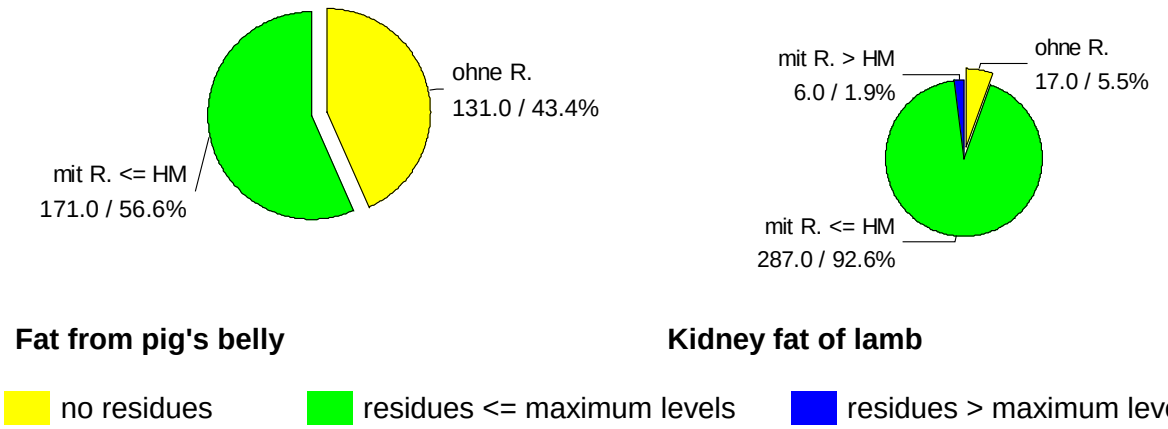


Fig. 5: Contamination levels in fat from pig's belly and kidney fat of lamb

Like fat in general, fat from belly and kidney fat accumulate fat-soluble substances, for which the samples were examined. It is therefore a favourable result that in 43.4 % of the samples of fat from pig's belly no residues were detected. The level of residues detected was low, i.e. within the lowest measurable quantities. Maximum levels were not exceeded. The results suggest that these findings can be extrapolated to all kinds of pork products.

Contrary to the low contamination in fat from pig's belly, kidney fat of lamb was found to be contaminated with a considerably higher number of residues. Only 5.5 % of the samples were free from residues. There was a high detection frequency of residues of the following substances:

DDT
HCB
PCB 138
PCB 153
PCB 180

In most samples, the levels of these substances were low.

Although lindane was not among the frequently detected substances, one sample of kidney fat of lamb of domestic origin showed a conspicuously high maximum level of 4.7 mg/kg (fat basis). This could be due to a treatment for ectoparasites on lambs.

The contamination of kidney fat of lamb with residues of ubiquitous organic substances was moderate but slightly higher than that of fat from pig's belly.

As a consequence, in a small number of samples of kidney fat of lamb, maximum levels for PCB components, bromocyclen and lindane were exceeded, which was not the case in the samples of fat from pig's belly.

Except for lindane, the spectrum of substances in kidney fat of lamb for which maximum levels were found to be exceeded was identical with that found in lamb liver.

Conclusion:
Fat from pig's belly was not or only to a minor degree contaminated with residues of ubiquitous organic substances. Kidney fat of lamb was moderately contaminated. In one sample only, a conspicuously high level was found for lindane.

5.1.4 Fish (herring, fillet of saithe, rainbow trout)

Organic substances
192 samples of herring,
223 samples of fillet of saithe (*Pollachius virens*),
222 samples of rainbow trout
were examined for 26 organic substances (residues of pesticides, PCB components, bromocyclen and musk compounds).

Fish
Marine fish grows in seas where contamination levels change only very slowly due to the gigantic volumes of water. Throughout its lifetime, fish is subject to continuous intake of contaminants. The accumulation of fat-soluble substances is higher in high-fat species, as e.g. herring, than in low-fat species, as e.g. saithe. The contamination levels in marine fish are mainly determined by the species and age, not so much by the character of the fishing grounds. There is, however, a relationship between fishing grounds and contamination levels in fish originating from the Baltic Sea. This is caused by the fact that the sea region concerned has only little exchange of water and contaminants with the open sea. The contamination levels of fish farmed under controlled conditions, which constitutes the major part of commercial freshwater fish, depends mainly on the quality of feeds and the water quality in the production plant. Therefore, minimization of contamination can be achieved by appropriate measures.

Fish is among those foods of animal origin whose levels of contamination with residues of organic substances reflect the corresponding situation of the animals' environment.

The herring, being a high-fat fish, has a correspondingly high accumulating capacity for fat-soluble substances. Its origin, mostly being the North Sea and the Baltic Sea, is another reason for the fact that herring showed the highest number of measurable residues as compared with other fish species. In 1996, no more than 5 (= 2.6 %) of 192 samples of herring were found to be free from residues.

Saithe, having a low fat content and living in marine regions situated far from the coast and therefore being less contaminated, shows a correspondingly low contamination. 34 % of the samples did not contain any measurable residues.

The rainbow trout is a low-fat fish farmed under controlled conditions, which needs water of a good quality. 13 % of the samples were free from residues. The remaining 87 % of samples showed residue levels within the lowest measurable quantities.

The examinations of the three fish species had also been performed under the 1995 monitorng scheme for an almost identical spectrum of substances and involved a similarly high number of samples. Therefore, a comparison could be made between the results for both reporting years report.

Fig. 6 gives an overview, for each fish species, of the relative shares of residue-free samples, samples containing residues below maximum levels and samples containing residues exceeding maximum levels, for 1995 and 1996. The total number of samples is to be found in parenthesis behind the year.

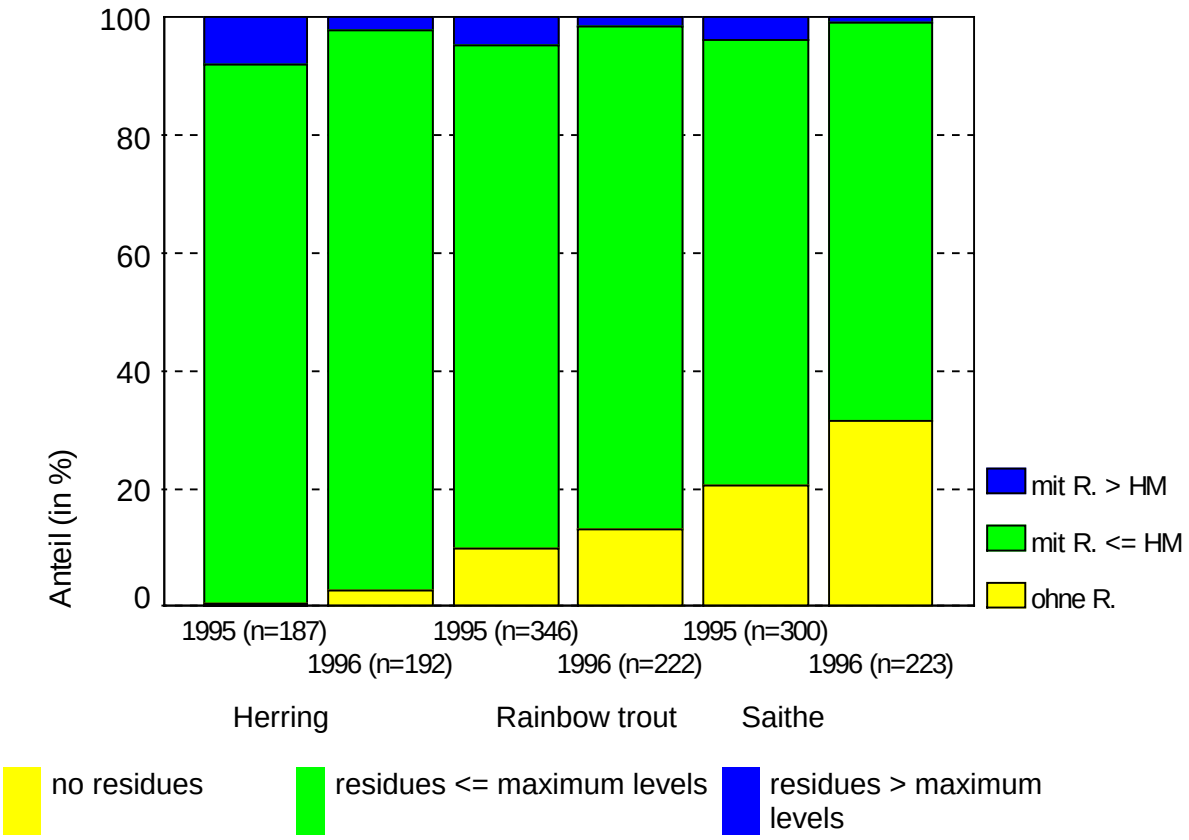


Fig. 6: Contamination levels in fish in 1995/1996 (shares in %)

The graphical representation of the results in Fig. 6 shows that there has not been any essential change in the contamination levels of these fish species between 1995 and 1996. Nevertheless, it becomes evident that the number of samples containing residues exceeding maximum levels has slightly decreased and the number of residue-free samples has increased in fish.

Among the foods of animal origin fish is the one in which residues of substances were quantified most frequently. Table 4 gives an overview of the substances most often quantified in fish in 1995 and 1996. Absolute numbers of samples in which the substances were detected are stated along with their relative shares (%) among the samples examined for that particular substance.

Table 4: Frequency of occurrence of specific substances in fish in 1995 and 1996

Substance	Herring				Saithe				Rainbow trout			
	1995		1996		1995		1996		1995		1996	
	No	%	No	%	No	%	No	%	No	%	No	%
Chlordane	99	55.6	109	56.8	121	40.3	77	34.5	163	47.1	75	34.1
DDT	184	98.3	62	96.9	205	68.3	114	64.6	295	85.7	182	82.7
Dieldrin	163	96.4	55	85.9	125	42.8	99	44.4	189	56.7	112	50.9
HCB	171	91.4	59	92.9	176	58.6	111	49.8	236	68.4	129	58.6
Lindane	161	86.0	36	56.3	174	58.0	54	24.2	247	71.3	114	51.8
Xylene musk	47	26.4	12	18.8	89	31.3	50	22.4	188	57.4	96	43.6
PCB 138	171	91.9	177	92.2	179	59.6	111	49.8	269	77.7	164	74.5
PCB 153	179	96.2	182	94.8	192	64.2	116	52.0	283	81.7	171	77.7
PCB 180	140	78.6	133	69.3	138	46.0	72	32.3	238	68.9	95	43.2
Bromocyclen									123	37.2	41	18.8

The substances of which residues were detected frequently were identical in the three types of fish in 1995 and 1996. A comparison between the fish species reveals that residues (except for xylene musk) occur most frequently in herring. This applies to both reporting years. In addition, the results for 1996 provided statistical evidence for some selected substances (PCB components, DDT and lindane) proving that the contamination of herring from the Baltic Sea was slightly higher than that of herring from the North Sea.

Musk compounds

Musk is the name of a glandular secretion of the musk deer living in the East Asian highlands. For reasons of economy and in order to protect the musk deer species endangered by excessive hunting, musky fragrances are mainly produced synthetically today.

Synthetically produced musky fragrances as e.g. the nitro musks fragrances, xylene musk and ketone musk, are produced in great amounts and used to improve the olfactory characteristics of e.g. cosmetics, detergents and cleansers.

Residues of the fragrances in sewage will enter rivers and other surface waters and eventually also the seas. As these compounds are highly fat-soluble and little degradable, they accumulate in fish and other aquatic organisms as e.g. algae, daphniae and shellfish. Musk compounds also accumulate in human fat and breast milk. Their presence in the human body can be attributed not only to the food intake but also to absorption through the skin.

In order to reduce the contamination of the environment by these undesirable yet ubiquitous substances, many manufacturers of detergents and cosmetics have restricted their use of xylene musk on a voluntary basis since 1993.

Residues of xylene musk (cf. box for further information about musk compounds) were detected most frequently in the freshwater fish, rainbow trout. In marine fish, the share of samples containing measurable residues of these compounds was markedly lower in both years (cf. Table 4). On the whole, levels of xylene musk were low. In none of the samples of

marine fish, levels above 0.0025 mg/kg fresh substance were measured. In rainbow trout, levels were slightly higher with a maximum level detected of 0.01 mg/kg fresh substance.

The presence of camphechlor components (Parlar 26, 50, 62) was examined in samples of herring and saithe for the first time in 1996. The results have shown that camphechlor components were more or less similar to PCB components concerning both the frequency of their presence and the levels found in the samples.

Levels above fixed maximum levels

Despite the great variety of quantified residues (cf. Fig. 6), there were only 3 samples of herring (= 1.6 %) in which the detected levels exceeded the fixed maximum level for chlordane and only 2 samples of herring (= 1 %) in which the detected levels exceeded the fixed maximum level for heptachlor. In 1995, levels exceeding fixed maximum levels were detected for chlordane only, which applied to 8 % of the samples.

In fillet of saithe, fixed maximum levels were exceeded in no more than 1 % of the samples, both in 1995 and 1996.

For bromocyclen that had been examined in **rainbow trout** only, the maximum level (established not earlier than in 1997) was exceeded in a mere 3 samples in both years.

Heavy metals

In the types of fish examined, the heavy metals, lead, cadmium and mercury were quantified in low concentrations. There was only one sample in which the guide value for lead, which had been examined in 220 samples of trout, was exceeded. These results were similar to those of the 1995 monitoring.

Median levels of heavy metals as compared to guide values, in mg/kg fresh substance

	Lead (0.5)*	Cadmium (0,1)*	Mercury (0.5)**
Herring	0.01	0.003	0.049
Fillet of saithe	0.0075	0.002	0.057
Rainbow trout	0.01	0.0015	0.022

* Guide value

** Maximum level

Conclusion:

There were no conspicuous levels of ubiquitous organic substances found in herring. However, the spectrum of the most frequently quantified substances was the broadest in this type of fish, though the levels found were low. In saithe and rainbow trout, the number of substances quantified most frequently was slightly smaller. In a summarized view, contamination with ubiquitous organic substances and heavy metals of the types of fish examined could be rated as being low to moderate. This statement is in line with the results of evaluation of the 1995 monitoring.

5.2 Foods of vegetal origin

5.2.1 Leafy vegetables (salad greens: endive var., iceberg lettuce)

Pesticides
Endive var. (186 samples) and iceberg lettuce (225 samples) were examined for 36 pesticides. Both types of salad greens were represented in the 1995 monitoring scheme that covered an almost identical spectrum of substances.

Fig. 7 shows the shares of residue-free samples, samples containing residues below maximum levels and samples in which maximum residue levels were exceeded for the individual types of salad greens.

The diagram in Fig. 7 comparing the results for 1995 and 1996 illustrates that, in 1996, more samples of endive as well as of iceberg lettuce were found to contain residues of pesticides than in 1995.

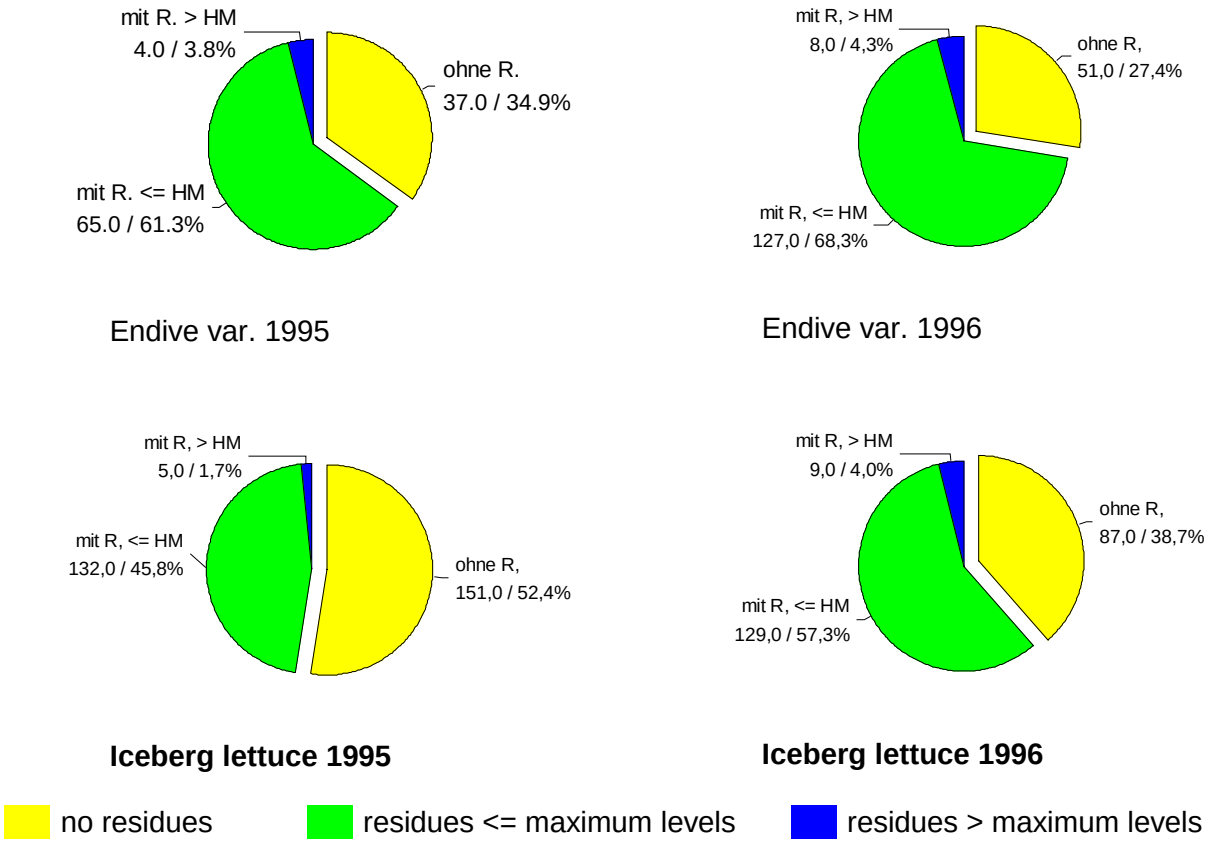


Fig. 7: Contamination levels in salad greens in 1995 and 1996

Table 5 lists the substances most conspicuous concerning the frequency of the presence of quantified residues in both types of salad greens as compared to the 1995 results. Absolute numbers of samples in which the substances were detected are stated along with their relative shares (%) in the number of samples examined for this substance. Except for bromide, these substances were fungicides.

Table 5: Frequency of the presence of certain substances in salad greens

Substance	Endive var.				Iceberg lettuce			
	1995		1996		1995		1996	
	no	%	no	%	no	%	no	%
Bromide *	30	48.3	76	41.5	48	35.8	70	35.5
Dithiocarbamates	17	18.0	41	22.5	30	12.3	18	8.2
Iprodione	18	17.4	31	16.7	16	5.7	10	4.4
Procymidone	7	6.6	23	12.4	28	10.0	38	16.8
Vinclozolin	12	12.6	18	9.7	17	6.6	13	5.8

* cf. chapter on Terminology

Levels above fixed maximum levels

The number of samples in which maximum levels were exceeded can be seen in Fig.7. In 1996, maximum levels were exceeded for 6 substances. Substances for which maximum levels were exceeded in 1995 and 1996 are listed in Table 6. A comparison between 1995 and 1996 shows that the spectrum of these substances has barely changed. The shares of samples concerned are very low.

Table 6: Substances whose maximum levels were exceeded in salad greens

Substance	Endive var.				Iceberg lettuce			
	1995		1996		1995		1996	
	no	%	no	%	no	%	no	%
Bromide					1	0.7		
Captan/folpet							2	0.9
Chlorpyrifos			1	0.5			2	0.9
Chlorthalonil	3	2.8	2	1.1	1	0.4	3	1.3
Dithiocarbamates	1	1.1	2	1.1			1	0.5
Iprodione					1	0.4		
Metalaxyl			2	1.1			1	0.4
Methamidophos					2	0.8		
Vinclozolin			1	0.5				

Heavy metals

The two types of salad greens were examined for the toxic heavy metals, lead and cadmium. The results demonstrate that the heavy metals considered do not constitute a contamination problem in endive var. and iceberg lettuce. The median values were between 0.01 and 0.02 mg/kg and thus identical with those in 1995.

Among the total number of 411 samples of salad greens, guide values were exceeded in five samples (= 1.2 % of samples) of endive only. In two of them, this applied to cadmium and in three of them, to lead. The guide values were exceeded to a low degree only.

Nitrate

The salad greens considered in this study are amongst the vegetables rich in nitrate. The level of nitrate can be influenced in particular by the time of harvesting, by climatic and weather conditions and also by fertilization.

Nitrate in vegetables

The level of nitrate in vegetables depends not only on fertilization and the influence of light (also cf. chapter on Terminology). Some types of vegetable accumulate nitrate while others do not tend to do so. Therefore, vegetables can be classified into the following groups by their nitrate levels:

High nitrate levels (1 000 - 4 000 mg/kg fresh weight)

Iceberg lettuce, endive var., lamb's lettuce, fennel, round lettuce, spinach, chard, chinese cabbage, beetroot, radish, kohlrabi

Medium nitrate levels (500-1 000 mg/kg fresh weight)

Carrots, celery, cauliflower, white cabbage, kale, red cabbage, savoy cabbage, leek, aubergine, zucchini (courgette)

Low nitrate levels (up to 500 mg/kg fresh weight)

Pea, green bean, cucumber, paprika, tomato, brussels sprouts, garlic, onion, fruit, grain, potato

How to minimize nitrate intake:

- The composition of the human diet should be diversified also as far as nitrate levels in vegetables are concerned. Exclusive consumption of vegetables rich in nitrate is not recommended. Instead, vegetables containing less nitrate should be regularly included in the diet.
- It is possible to avoid undesirably high nitrate intake by abstaining from the consumption of extremely high quantities of fresh vegetables rich in nitrate, e.g. during special diets requiring the daily consumption of big portions of vegetables.
- Fresh vegetables rich in nitrate should be stored in the refrigerator.
- Fresh vegetables rich in nitrate should not be fed to infants younger than 6 months. For the preparation of processed baby foods, only specially selected vegetables having low nitrate levels are used.

Table 7 informs about the median and maximum nitrate levels of the two types of salad greens in 1995 and 1996.

Table 7: Nitrate contamination of salad greens examined in 1995 and 1996

Type	Year	Number	Level of nitrate (mg/kg)		
			Median	90th perc.	Maximum
Endive var.	1996	183	629	1752	4100
	1995	102	836	2016	2880
Iceberg lettuce	1996	274	764	1296	5400
	1995	224	792	1300	2834

Legend:

Median - value below which half of the levels measured lie

90th perc. - 90th percentile - value below which 90 % of the levels measured lie

Maximum - the highest level detected

The nitrate levels in both types of salad greens were approximately the same. Differences, if any, were to be attributed to seasonal factors (time of harvesting). Thus, irrespective of the

country of origin, nitrate contamination was always higher in the winter months, which provide less daylight, than in the months providing more daylight. For endive var., however, it could be proved in a statistically confirmed way that nitrate levels detected in samples originating from Italy were always markedly lower than those in samples of domestic origin, irrespective of the time of harvesting.

Measures taken for reasons of preventive health protection of consumers aim at avoiding nitrate levels markedly above 3 000 mg/kg. High nitrate levels do not involve a direct health risk for the consumer as nitrate itself has no toxic effect. However, in the human body, reduction of nitrate to nitrite and chemical reactions with amines may result in the formation of so-called nitrosamines which have produced carcinogenic effects in animal experiments.

Within the framework of food monitoring, more examinations for nitrate will be conducted in the next few years as a critical follow-up of contamination levels. At the same time, the aim of the monitoring activities is to support the competent EU bodies in their intent to issue regulations concerning legally fixed maximum levels by providing them with representative data.

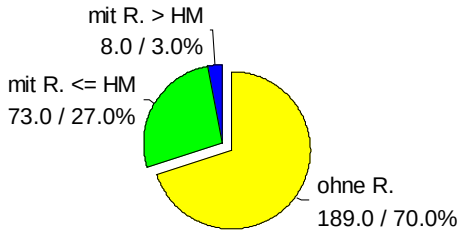
Conclusion:
Endive var. and iceberg lettuce are moderately contaminated with residues of pesticides. Median nitrate levels are not conspicuous as far as usual levels in leafy vegetables are concerned. The levels of lead and cadmium detected may be rated as low.

5.2.2 Fruiting vegetables (green beans, cucumber)

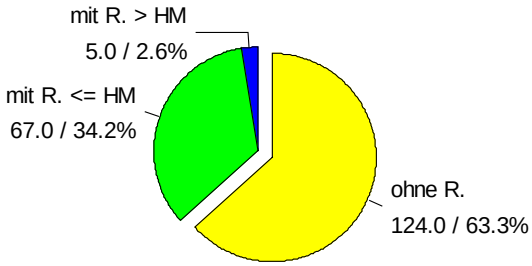
Green beans and cucumbers are among the foods also examined in the 1995 monitoring. However, cucumbers examined in 1996 were pickling cucumbers. Samples were not examined for nitrate as these types of vegetables are kown to contain low nitrate levels of less than 500 mg/kg.

Pesticides
196 samples of green beans were examined for 32 and 226 samples of cucumbers, for 27 residues of pesticides.

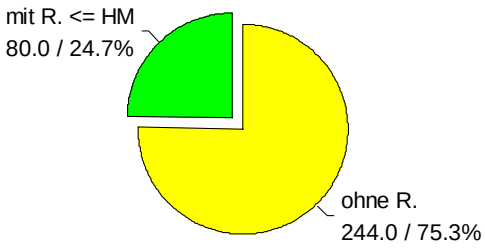
Fig. 8 illustrates the shares of residue-free samples, of samples containing residues below maximum levels and of samples containing levels above maximum levels cumulatively for all substances concerned.



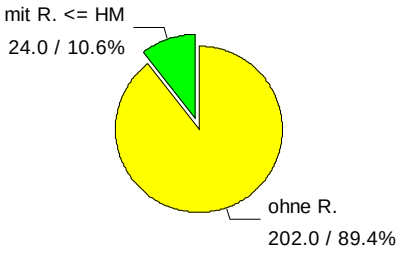
Green beans in 1995



Green beans in 1996



Slicing cucumber in 1995



Pickling cucumber in 1996

no residues residues <= maximum levels residues > maximum levels

Fig. 8: Contamination levels in fruiting vegetables in 1995 and 1996

In both years, green beans as well as cucumbers were largely free from residues. In cucumbers, no case of excessive maximum levels was detected in both years. Only in 2.6 % of the samples of green beans (1995 - 3.0 %), maximum levels were exceeded to a minor degree.

Heavy metals
As in 1995, the median levels of lead and cadmium detected in green beans and cucumbers were very low: 0.01 mg/kg for lead and 0.002 mg/kg for cadmium.

The guide value for cadmium of 0.1 mg/kg was not exceeded in any of the samples. In only 4 of 196 samples of green beans (= 2 %), lead levels exceeded the guide value of 0.25 mg/kg.

Conclusion:
The results gained in two monitoring years have confirmed that cucumbers and green beans are among the foods whose contamination with heavy metals and residues of pesticides is very low.

5.2.3 Stalk vegetables (kohlrabi)

Pesticides
225 samples of kohlrabi were examined for residues of 36 pesticides.

Fig. 9 illustrates the shares of residue-free samples and of samples containing residues below maximum levels, summarized for all substances concerned.

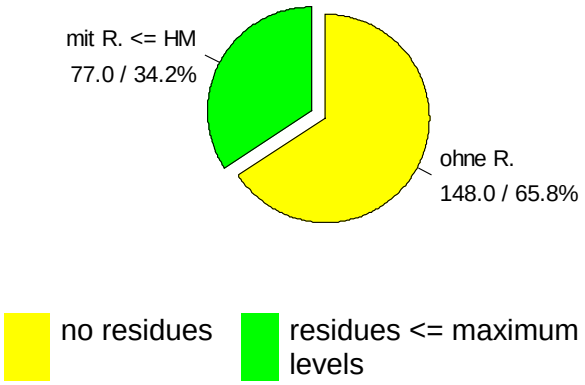


Fig. 9: Contamination levels in kohlrabi

The majority of samples was free from residues. Residues of pesticides were detected in a few samples only. No levels exceeding the maximum levels were detected.

In one sample only, the fungicide, tolclofos-methyl was detected at a very low level (0.007 mg/kg). The degradation product of tolclofos-methyl, 2,6-dichloromethylphenol, causes a penetrating "chemical" taste (phenol) in kohlrabi, which in the past had led to consumer complaints. The use of tolclofos-methyl in kohlrabi is not permitted in Germany, it is, however, permitted in other EU countries.

Nitrate
Given the fact that kohlrabi belongs to the cabbage family, nitrate levels were conspicuous to a certain degree. The median level (calculated from 217 samples) was 1 130 mg/kg, and the detected maximum level, 3 000 mg/kg. There was no statistical confirmation of regional differences but of seasonal ones which became expressed in the well-known higher levels during the season providing less daylight.

Heavy metals
Levels of lead and cadmium in kohlrabi were very low. In one of 223 samples only, the level of lead detected was slightly above the guide value.

Conclusion:
Kohlrabi is among the foods of vegetal origin contaminated with residues of pesticides to a very low degree only. The same applies to heavy metals. Only nitrate levels in this otherwise little contaminated food were slightly higher than expected.

5.2.4 Roots (radishes)

Nitrate
The varieties of radish are amongst the vegetables rich in nitrate. Like in 1995, these vegetables were examined exclusively for nitrate.

For the varieties of radishes, the guide value is 3 000 mg/kg.

Table 8 shows the median and maximum nitrate contamination and the shares of samples containing nitrate levels above 3 000 mg/kg in 1996 as compared with the values measured in 1995.

Table 8: Nitrate contamination of radishes in 1995 and 1996

Vegetables	Year	Number	Level of nitrate (mg/kg)			Samples with levels >guide value	
			Median	90th perc.	Max.	absolute	%
Radish	1996	175	1010	2362	6125	10	5.7
	1995	145	1385	2760	3864	13	9.0
Radish, small var.	1996	200	1803	2940	3850	18	9.0
	1995	149	1404	2406	3170	2	1.3

Legend:
Median - value below which half of the levels measured lie (often stated in biostatistics instead of the arithmetic mean)
90th perc. - 90th percentile - value below which 90 % of the levels measured lie
Max. - the highest level detected

Conclusion:
Results of the two monitoring years have confirmed that radishes are amongst the vegetables rich in nitrate. The relatively higher levels were found, naturally, in the season providing less daylight.

5.2.5 Berries (strawberries, red currants)

Pesticides
Strawberries (306 samples) were examined for residues of 29 pesticides, and red currants (207 samples) for residues of 17 pesticides. The different numbers of substances are due to the potentially different spectrum of pesticides used for these types of berries.

Strawberry samples were taken exclusively from plantations where the berries are harvested by consumer self-service - a special concept of direct marketing.

Fig. 10 illustrates the shares of residue-free samples, of samples containing residues below maximum levels and of samples containing levels above maximum levels, summarized for all substances concerned.

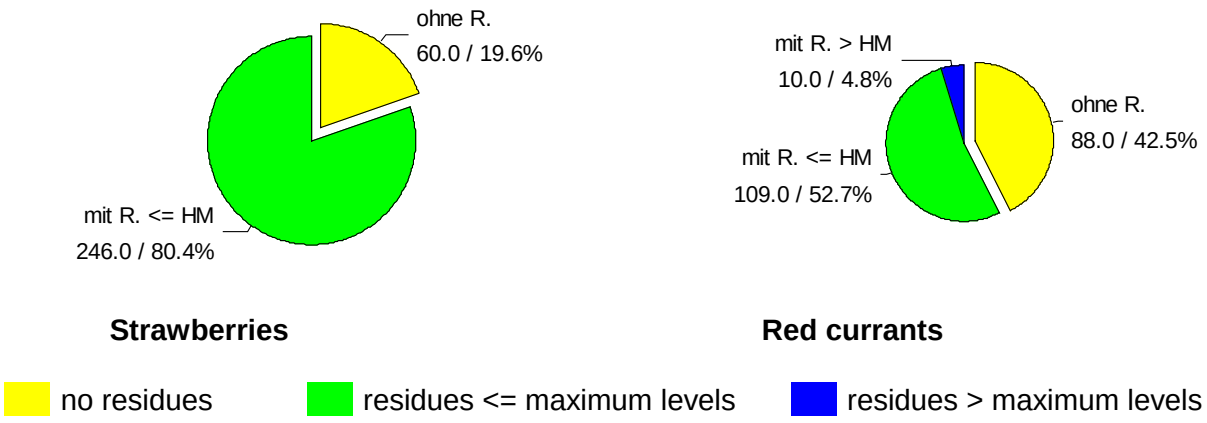


Fig. 10: Contamination levels in berries

As is shown in Fig. 10, almost 20 % of the strawberry samples from the self-service plantations were free from residues. In samples containing residues, the levels were very low. Maximum levels were not exceeded in any of the samples. This result applied to all self-service plantations included in the sampling regardless of the regions.

In red currants - also a perishable kind of fruit - the share of residue-free samples was quite high as well, i.e. 42 %, which can be regarded as a gratifying result. Samples in which residues were detected hardly contained any conspicuous levels except for those of the fungicide, vinclozolin. Vinclozolin levels in some samples were considerably high. Correspondingly, maximum levels were exceeded in some samples of red currants (4.8 %), in contrast to strawberries. The major part of cases of exceeded maximum levels was to be attributed to vinclozolin.

Conclusion:
Strawberries (from plantations with consumer self-service harvesting) can be regarded as fruit hardly contaminated with residues of pesticides. This conclusion applies to all federal Länder as far as this special marketing concept is concerned.

The residue contamination of red currants can be rated as low. Nevertheless, especially in view of the cases of excessive maximum levels, the situation cannot be assessed to be as positive as for strawberries from self-service plantations.

5.2.6 Citrus fruit (orange, lemon)

Pesticides
224 samples of oranges and 203 samples of lemons were examined for residues of 30 pesticides each. Examination in the 1996 monitoring did not include substances used as preservatives for the surface treatment of citrus fruit.

Fig. 11 gives a summary overview of the occurrence of residues.

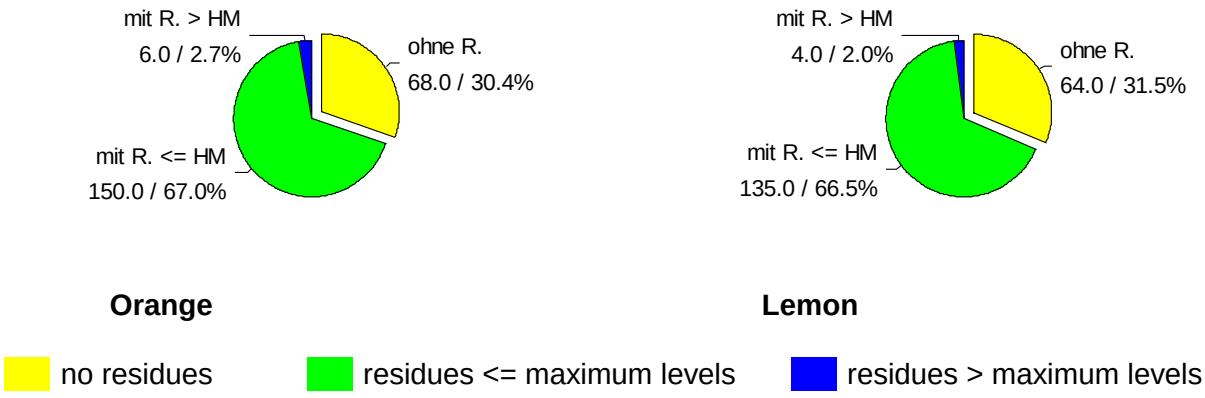


Fig. 11: Contamination levels in citrus fruit

In ca. 31 % of samples of oranges and lemons, no residues were detected. Among the levels measured, there were no conspicuous findings. Maximum levels were exceeded in 2.7 % of samples of oranges and 2.0 % of samples of lemons. In compliance with the provisions of the regulations concerning maximum residue levels, the fruit was examined including the peel. Therefore, the results are appropriate for the revision or possible modification of established maximum levels in the first place rather than for the description of a potential consumer exposure.

Conclusion:
If any residues were detected in oranges and lemons, levels were low, as a rule. This is also demonstrated by the fact that maximum levels were exceeded in very few cases only. According to general knowledge, it can be assumed that pesticide residues and thus the substances for which maximum levels were exceeded are located mainly in the peel. This means that, in general, there is no risk of intake.

5.2.7 Fruit juices (apple juice)

Pesticides
Like in 1995, apple juice proved to be practically residue-free (cf. Fig. 12).

This statement is based on the examination of 237 samples of apple juice for residues of 27 pesticides.

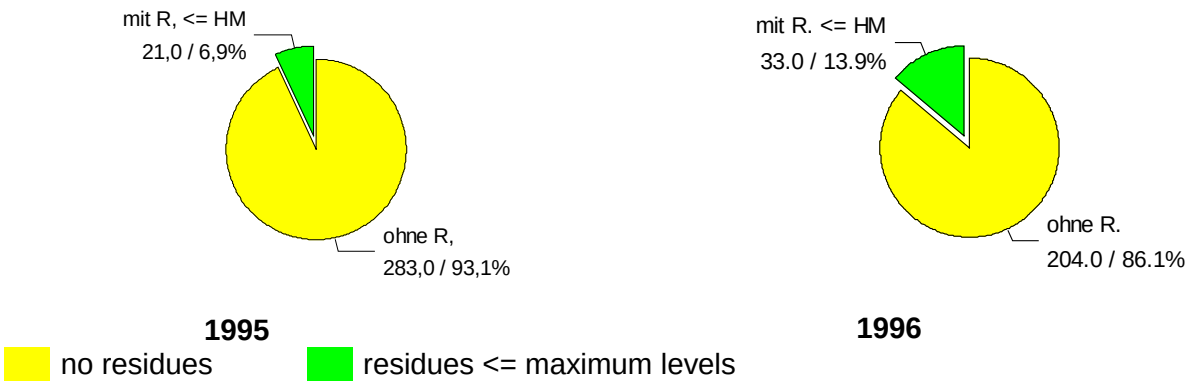


Fig. 12: Contamination levels in apple juice in 1995 and 1996

Patulin
The contamination of apple juice with the mycotoxin, patulin, in 1995 and 1996 is presented in Table 9.

Table 9: Patulin contamination levels in apple juice in 1996 and 1995

Year	Total number	Samples with patulin		Patulin level (mg/l)		Samples with levels >0.05 mg/l
		Number	%	90th perc.	Max.	Number
1996	207	31	15,0	0,005	0,067	1
1995	289	16	5,5	**	0,074	1

90th perc. - 90th percentile - value below which 90 % of the levels measured lie
** in up to 90 % of samples, no contamination was detected
Max. - the highest level detected

Patulin occurs in apple juice due to the presence of mould-affected, i.e. partly or totally rotten, apples among the fruit processed.

While in 1995, patulin levels were detected in 5 % of the samples only, the percentage was 15 % in 1996. Along with many other causes, this difference may be due to a different degree of processing of apples affected by mould in the two years. The levels detected and the frequency of levels above 0.05 mg/l was almost identical in 1995 and 1996. At present, the maximum level being discussed by the competent EU authorities is still 0.05 mg/l. According to the prevailing toxicological view, however, this maximum level should be lowered to 0.025 mg/l.

This will improve the situation for the preventive health protection of consumers because manufacturers will use unspoiled raw material only as required by the relevant regulations.

Conclusion:
The results of two monitoring years have confirmed that, as far as pesticides are concerned, apple juice is almost residue-free. For patulin, a maximum level of 0.025 mg/l is recommended for the purpose of a preventive health protection of consumers.

5.2.8 Hard-shelled dry fruit (pistachio)

Aflatoxins
The examination of pistachios for aflatoxins was already included in the 1995 monitoring. Also in 1996, pistachios (31 samples) originating mainly from Iran were examined to determine the level of contamination with mycotoxins (aflatoxins B1, B2 and G1, G2). Pistachio batches containing aflatoxin are not evenly contaminated. In single cases, the total contamination may be caused by only one highly contaminated single pistachio which may contain levels of up to 1 000 µg per pistachio. In order to ensure the representative character of the single samples each sample to be examined had to consist of 30 kg of pistachios.

Pistachios
Like e.g. almonds and hazelnuts, pistachios are classified under hard shelled dry fruit. The fruit has a sharp-edged seed shell of 2-3 cm length. The shell protects the edible seed kernel, which is of a mostly light-green colour. The kernel is covered with a skin of brownish, violet or deep-red colour depending on the variety. In 1996, more than 95% of pistachios imported into Germany originated from Iran. Other countries of origin are the US, Turkey and Italy. The fruit grows on small trees. It is mature as soon as the shell splits open showing the kernel. In a wet environment, the still humid shell in which the edible kernel is embedded is prone to moulding or rotting. This occurs particularly if the fruit is left lying on the (wet) ground for a longer period. Therefore, it is important to make sure that the fruit is dried and processed immediately after maturing. Otherwise, in addition to a loss of quality, moulding can be the consequence. Metabolic products produced by moulds can be toxic, as e.g. aflatoxins. Pistachios are available in a fresh, salted and/or roasted state. Their taste is sweetish and almond-like but also spicy and piquant. Like all types of hard-shelled dry fruit, pistachios have a high protein and oil content. In addition, they contain high levels of magnesium and calcium. **Recommendation for consumers:** Since the consumer is not in a position to identify aflatoxin-contaminated pistachios, the consumption of pistachios - particularly those originating from Iran - cannot be recommended at present for preventive reasons.

Fig. 13 gives an overview of the shares of aflatoxin-free samples, of samples containing levels below the maximum level and of samples in which levels exceeded the maximum level.

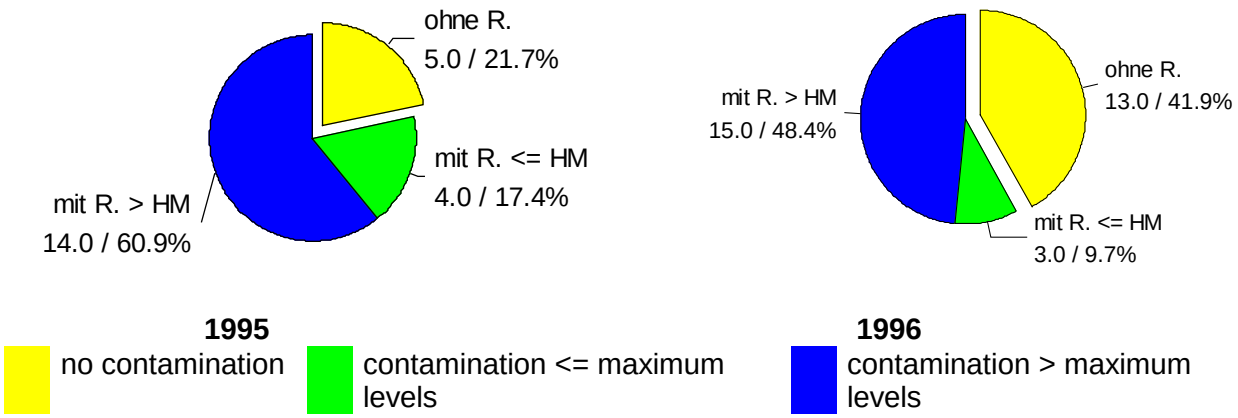


Fig. 13: Contamination levels in pistachios in 1995 and 1996

As is demonstrated in Fig. 13, the shares of pistachio samples containing measurable aflatoxin levels as well as the share of samples in which the maximum level was exceeded tended to be lower in 1996 than in 1995. Nevertheless, the unsatisfactory result is that in 1996, too, the maximum aflatoxin level was exceeded in almost half the pistachio samples (=48.4 %). Again, undesirably high maximum levels were detected, as e.g. 77 µg/kg for aflatoxin B1 and 87 µg/kg for total aflatoxin. For comparison: The fixed maximum level for aflatoxin B1 is 2 µg/kg and for total aflatoxin, 4 µg/kg.

Conclusion:
Pistachios may be heavily contaminated with aflatoxins. As recent examinations have proved that the problem of heavy aflatoxin contamination to will persist, it will be the subject of follow-up investigations under the monitoring scheme. It has to be added that, in 1997, common EU import restrictions were imposed on pistachios originating from Iran.

Terminology:

Acaricides
Substances intended to destroy mites.

Aflatoxins
Metabolic products of moulds. Formation of aflatoxins is promoted by a warm and humid environment. Aflatoxins are a group of compounds chemically related to each other, which include the aflatoxins B1, B2, G1 and G2. Aflatoxins - particularly aflatoxin B1 - are the mycotoxins having shown the strongest carcinogenic effect in animal experiments. Up to now, no clear and final statement can be made concerning the question whether this aflatoxin has a carcinogenic potential for humans, too. Therefore, maximum levels were fixed (for aflatoxin B1, at 2 µg/kg and for the total amount of aflatoxins, at 4 µg/kg) in order to avoid health hazards caused by food contaminated with aflatoxins. These maximum levels are the lowest in the world.

Bromide
A substance that occurs naturally and is therefore present in all samples, at least in traces. If higher levels are found, these may be caused by fumigating agents containing bromine and used for soil treatment.

Bromocyclen (Trade names: Alugan and Bromodan)
Has been specifically used as an acaricide or insecticide on warm-blooded farm animals. In addition, there is a specific contamination of surface waters from effluents of single wastewater treatment plants. The causes of this contamination have not yet been completely elucidated. Obviously, bromocyclen is able to pass the wastewater treatment stages of these plants. Due to its highly persistent and lipophilic character it can accumulate in the food chain. Therefore, it is found in wild fish from contaminated inland waters as well as in hatchery fish from fish farms that use water from flowing waters contaminated by civilization. Bromocyclen was detected for the first time in food (trout) in earlier stages of the National Food Monitoring scheme.

Camphechlor
Persistent insecticide which, in the past, was widely used in the cultivation of fruit, vegetables and cotton. Meanwhile, its use is no longer admissible. Camphechlor is a mixture consisting of more than 200 components (chlorinated compounds).
Due to its high persistence and broad scope of use it occurs in almost all environments. Particularly high concentrations may occur in high-fat fish.
In the framework of the monitoring scheme, some selected single components of camphechlor are examined. These are the compounds, Parlar 26, Parlar 50 and Parlar 62.

Chlordane
An organochlorine compound belonging to the group of insecticides. In EU countries, its use as a pesticide has been banned for many years.

Contamination
Presence of undesirable substances in foods resulting e.g. from environmental influences.

DDT (Dichlorodiphenyltrichloroethane)
Insecticide (used e.g. to destroy mosquitoes for malaria control, formerly also for plant protection purposes). As a residue, mainly in food of animal origin rich in fat, it can enter the human body where it decomposes very slowly. In EU countries, the use of DDT as a pesticide has been banned for many years. This is why, in the natural environment, DDT occurs practically no longer in another form than that of its metabolites.

The analysis of DDT is done by detection of its metabolites. The sum of metabolites detected is stated as the DDT content of the sample.

Dithiocarbamates
The compounds of this group are used as fungicides.

Environmental contaminants
The presence of these substances, as e.g. heavy metals, PCB or other chlorinated hydrocarbons, bromocyclen etc., in foods is mainly due to environmental influences, not to their intentional use on the food. In the present report, this applies particularly to chlorinated hydrocarbons in foods of animal origin.

Fungicides
Substances inhibiting or preventing the growth of microscopic fungi (e.g. moulds).

Guide value
An orienting value indicating the levels of a substance which are undesirable in foods for reasons of preventive consumer protection. If a guide value has been exceeded, all persons responsible for food quality on the producer's side as well as within the food control authorities should trace the causes of contamination and try to eliminate them.

HCB (hexachlorobenzene)
A persistent organochlorine compound belonging to the group of fungicides. In EU countries, its use as a pesticide (e.g. as seed dressings) has been banned for many years. Contamination of the environment may also be due to industrial processes.

Heavy metals
Well-known representatives are lead, cadmium and mercury. Being naturally occurring substances they are present in all parts of the environment and thus also in foods. Due to its mode of spread and chemical properties, lead occurs mainly on the surface of foods of vegetal origin. Cadmium is taken up by plants into their juice via the soil. Mercury levels, if any, occur on the surface of fruit and vegetables. If at all, detectable or increased levels may be expected to occur in foods of animal origin only (e.g. fish entrails).
High levels may result e.g. from emissions, industrial wastewaters and from waste disposal.

Herbicides
Weed killers.

Insecticides
Substances used for insect control.

Levels of contaminants
The levels of contaminants are stated in mg/kg (milligrams per kilogram) or µg/kg (micrograms per kilogram). For beverages, the unit used is mg/l. 1 mg/kg means that one milligram (the thousandth part of one gram) of a residue is present in one kilogram (or litre) of the respective food. Accordingly, 1 µg/kg means the millionth part of one gram of a residue in one kilogram of the food.

The following examples illustrate the respective amounts:

mg/kg: If e.g. one lump of sugar is dissolved in the amount of liquid filling a middle-sized car tank, the sugar content is 1 mg/kg.
µg/kg: If e.g. one lump of sugar is dissolved in the amount of liquid filling a middle-sized ship tank, the sugar content is 1 µg/kg.

Lindane (gamma-hexachlorocyclohexane)
Insecticide. Restricted use for plant protection and wood preservation purposes, administration as a medicinal product for human and veterinary use. Lindane is less persistent than other organochlorine compounds and it does not accumulate.

Matrix
The sample material examined is referred to as matrix.

Maximum level
Maximum levels are maximum admissible levels of a substance in/on foods which are laid down by law and must not be exceeded when foods are placed on the market. They are fixed on the lowest possible level, based on strict and scientific standards, which are internationally recognized. In addition, safety factors are taken into account which means that if these levels are exceeded occasionally, no risk for the health of consumers will be involved. Responsibility for compliance with fixed maximum levels lies with the manufacturer or, in the case of food of foreign origin, with the importer. The control of compliance with fixed maximum levels in foods sold on the market is exercized by official food control authorities by taking randomly selected samples.

Metabolites
Degradation products of chemical compounds whose formation is triggered by chemical processes or metabolic processes.

Musk compounds
There are nitro musk compounds and polycyclic musk compounds. The substances included in this monitoring scheme, i.e. xylene musk and ketone musk, are nitro musk compounds.
In the meantime, they rank among the ubiquitous contaminants of the aquatic and marine environments. Due to their highly persistent and lipophilic character they can also accumulate in the aquatic food chain.
Similar to bromocyclen, musk compounds were detected first in samples taken under the National Food Monitoring scheme.

Mycotoxins
Metabolic products of moulds. Well-known representatives are aflatoxins and patulin. These substances are harmful to health.

Nitrate, nitrite, nitrosamines (also cf. information box in Chapter 5.2)
Nitrate is a substance naturally occurring in the soil. As the plants need it for their growth, soils are supplied with nitrate mostly by fertilization. If nitrate is supplied in higher amounts, which is the case e.g. when soils are over-fertilized, its level in the plant can be very high.

Nitrate levels can, however, also be influenced by the plant species, the time of harvesting, the weather and climatic conditions. The light factor is of decisive importance. Thus, as a rule, nitrate levels are higher in the months providing less daylight.
In the human body, nitrosamines can form from nitrate by reduction to nitrite and chemical reaction with amines. Nitrosamines have been carcinogenic in animal experiments.

Patulin
Metabolic product of moulds in fruit. It is found particularly in fruit products if spoiled fruit has been used for their manufacture. In animal experiments, patulin causes weight loss and damage to the gastric and intestinal mucosae if ingested in large amounts over an extended period. In addition, there are indications of genotoxic effects.

PCB (polychlorinated biphenyls)
They used to be applied frequently for industrial purposes (e.g. technical oils, heat transmitters, plasticizers). PCB is a mixture consisting of a number of single compounds (components) with different degrees of chlorination.
PCBs are slowly degradable, and they enter the human food chain via soil, water and feeding stuffs. Components frequently found in foods of animal origin are PCB 138, PCB 153 and PCB 180.

Persistent organochlorine compounds (persistent chlorinated hydrocarbons)
Persistent substances which are slowly degradable. Due to their persistence they can occur as residues in foods. Examples are HCB, DDT as well as PCB.

Pesticides
They are used in agricultural production in order to protect plants from pests and diseases. They help protect crops from spoilage and ensure high yields. Consumers are effectively protected by existing regulations on the authorization of products and residue control. The authorization procedures ensure that pesticides used properly do not involve health risks for humans and animals. Excess residue levels occur mainly if pesticides are improperly used. Depending on the target pests or diseases, a distinction is made between insecticides, fungicides, herbicides, acaricides and others.

Reference material
In reference material, the substance to be analyzed in the monitoring samples is contained in a defined concentration. It serves to determine the reliability of the analytical method applied. It should be identical with the samples taken for monitoring as far as the matrix and composition are concerned.

Toxicity / toxic
Poisonousness / poisonous

Ubiquitous
Having the ability to be everywhere, omnipresent