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In cooperation with JRC Ispra, IHCP, Food Products and Consumer Goods and DG SANCO E1

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Monitoring of Pesticide Residues in Products of Plant Origin in the European Union and Norway

1998 Report

This report on "Monitoring of Pesticide Residues in Products of Plant Origin in the European Union and Norway - Report 1998" was forwarded to the Standing Committee on Plant Health for agreement on publication on 21 November 2000. The Standing Committee agreed that publication of the report was desirable and noted that this was also the view of Norway.

Enquiries concerning this report should be addressed to the contact points listed in the Annex.

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1. INTRODUCTION

This report covers the national situations in the 15 EU Member States and Norway for the calendar year 1998. It is evident that this document can only give an overall view on monitoring of pesticide residues. Each Member State and Norway have been invited to contribute a short national statement (in English) for inclusion in this document. More detailed information about the situation in individual countries is available from the respective national monitoring authorities and should be requested from them. The issue of pesticide residues in foodstuffs of animal origin, as regulated in Council Directive 86/363/EEC[1], is not covered by this report.

2. LEGAL BASE

In Council Directives 86/362/EEC[2] and 90/642/EEC[3], as amended, maximum levels are fixed for pesticide residues in and on products of plant origin. Member States are asked to check regularly the compliance of foodstuffs with these levels. Inspections and monitoring should be carried out in accordance with the provisions of Council Directive 89/397/EEC[4] on the official control of foodstuffs, and Council Directive 93/99/EC[5] on additional measures concerning the official control of foodstuffs. Sampling should be carried out in accordance with Council Directive 79/700/EEC[6].

Besides national monitoring programmes, the Commission services recommended, via Commission Recommendation 97/822/EC[7], the participation of each Member State in a specific EU coordinated monitoring programme. Those programmes have existed since 1996. Their aim is to work towards a system which makes it possible to estimate actual dietary pesticide exposure throughout Europe. The monitoring programme is designed as a rolling programme, which will have covered all major pesticide-commodity combinations by the end of 2003. The choice of commodities includes the major components of the Standard European Diet of the World Health Organisation.

Article 7 of Council Directive 86/362/EEC and Article 4 of Council Directive 90/642/EEC, as amended by Council Directive 97/41/EC[8], require Member States to report to the Commission the results of the monitoring programme for pesticide residues carried out both under their national programme and under the EU coordinated programme. A format for the reports on the Community programme was agreed (Doc. XXIV/1425/99-EN). The Commission is required to compile and collate this information annually.

Since 1 April 2000 a new Monitoring Regulation (Commission Regulation (EC) No 645/2000[9]) has been in force, which provides for detailed implementing rules for the

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[1] Official Journal No L 221, 07/08/1986 p. 0043 - 0047.
[2] Official Journal No L 221, 07/08/1986 p. 0037 - 0042.
[3] Official Journal No L 350, 14/12/1990 p. 0071 - 0079.
[4] Official Journal No L 186, 30/06/1989 p. 0023 - 0026.
[5] Official Journal No L 290, 24/11/1993 p. 0014 - 0017.
[6] Official Journal No L 207, 15/08/1979 p. 0026 - 0028.
[7] Official Journal No L 337, 09/12/1997 p. 0014 - 0017.
[8] Official Journal No L 184, 12/07/1997 p. 0033 - 0049.
[9] Commission Regulation (EC) No 645/2000 of 28 March 2000, Official Journal No. L 78, 29/03/2000, p. 0007 - 0009.

monitoring provisions of Directives 86/362/EEC and 90/642/EEC. However, for the year 1998, this regulation was not yet applicable.

3. MAXIMUM RESIDUE LIMITS (MRL), ACCEPTABLE DAILY INTAKES (ADI) AND ACUTE REFERENCE DOSES (ACUTE RFD)

Pesticide residue levels in foodstuffs are generally regulated in order to:

- minimise the exposure of consumers to the harmful or unnecessary intake of pesticides;
- control the correct use of pesticides in terms of the authorisations or registrations granted (application rates and pre-harvest intervals);
- permit the free circulation of products treated with pesticides as long as they comply with the MRLs fixed.

A maximum residue limit (MRL) for pesticide residues is the maximum concentration of a pesticide residue (expressed in mg/kg) legally permitted in or on food commodities and animal feed. MRLs are based on Good Agricultural Practice (GAP) data. Food derived from commodities that comply with the respective MRLs are intended to be toxicologically acceptable. Exceeded MRLs are indicators of violations of Good Agricultural Practice. If MRLs are exceeded, comparison of the exposure with ADIs and/or acute RfDs will then indicate whether or not there are possible chronic or acute health risks respectively.

The acceptable daily intake (ADI) is the estimate of the amount of a substance in food, expressed on a body-weight basis, that can be ingested daily over a lifetime without appreciable health risk to the consumer. The ADI is based on the no observed adverse effect levels (NOAEL) in animal testing. A safety factor that takes into consideration the type of effect, the severity or reversibility of the effect, and the problems of inter- and intraspecies variability is applied to the NOAEL. The ADI therefore reflects chronic toxicity.

The acute Reference Dose (acute RfD) is the estimate of the amount of a substance in food, expressed on a body-weight basis, that can be ingested over a short period of time, usually during one meal or one day, without appreciable health risk to the consumer. It therefore reflects the acute toxicity. At present, acute Reference Doses have been fixed for certain pesticides.

4. NATIONAL MONITORING PROGRAMMES

4.1. Monitoring results for 1998

The results of the 16 national monitoring programmes are shown in Table 1. About 44 000 samples were analysed for, on average, 147 different pesticides (ranging from 83 to 275). Analysis is usually performed by multi-methods capable of detecting up to 100 or more pesticides. This means that at least an estimated 4.4 million individual determinations were carried out. 61 % of the samples contained no detectable pesticide residues. Detectable residues at or below the MRL were found in 36 % of the samples. In 3.1 % of the samples, the residues exceeded MRLs (both national or EU-MRLs). It was confirmed[10] that EU-MRLs were exceeded in 2.1 % of all samples.

The results for fruits and vegetables are shown in Table 2. In fruit and vegetables around 148 pesticides were analysed for, out of which 38 % were detected on average. For cereals (Table 3) around 78 pesticides were analysed for, 6% of them were detected on average.

The total result is dominated by the results for fruit and vegetables, since the number of fruit and vegetable samples was considerably higher than the number of cereal samples (38 000 samples compared to 2 000 samples). In addition the results varied significantly between the different countries. It is important to note that differences in the monitoring programmes rather than differences in the presence of pesticide residues in food could account for these differences. Several factors can be mentioned:

- The choice of pesticides investigated.
- Sampling, e.g. more random or more targeted; the proportion of domestic and imported foodstuffs; the choice of crops.
- Methods used, e.g. the addition of single methods to detect specific, often problematic pesticides.
- Analytical capabilities of the laboratories (differences in reporting levels).
- Definition of exceeded levels (e.g. including or excluding analytical uncertainties).
- Differences in national MRLs, leading to differences in exceeded levels reported.

Most of the exceeded levels were reported for fruit and vegetables. The percentages from the three tables cannot be compared directly, as not all countries reported separately for cereals and fruit and vegetables. Some countries reported separately only on parts of the data. However, it is clear that fruit and vegetables showed a higher percentage of samples with detectable residues and the contents of residues exceeded the MRLs more often than in cereals. It can also be stated that the percentage of pesticides found in fruit and vegetables was considerably higher than in cereals.

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[10] The definition of confirmed exceedances varies between Member States, this includes, for example, cases where the analytical laboratory has certified an exceedance when applying its quality assurance system, cases where official warnings have been issued or where legal or administrative consequences have followed.

Table 1: Results of the sixteen national monitoring programmes for pesticide residues (including fruit, vegetables and cereals)

	No. of samples analysed	No. of pesticides and meta-bolites analysed for	No. of different pesticides found	% found from sought	No. of samples without detec-table residues	%	No. of samples with residues ≤ MRL	%	No. of samples with residues > MRL (national or EU MRLs)	%	No. of samples with confir-med residues > EU-MRLs	%
B	1947	122	55	45	986	51	818	42	143	7.3	32	1.6
DK	2164	131	76	58	1503	69	598	28	63	2.9	62	2.9
D	6696	--*	--*	--*	4122	62	2279	34	295	4.4	--*	--*
EL	1164	93	41	44	888	76	224	19	52	4.5	50	4.3
E	3202	169	--*	--*	1971	62	1159	36	72	2.2	2	0.1
F	4058	224	106	47	1899	47	2159	53	--*	--*	276	6.8
IRL	329	93	42	45	142	43	174	53	13	4.0	13	4.0
I	8779	--*	--*	--*	5974	68	2698	31	107	1.2	56	0.6
L	230	94	31	33	156	68	66	29	8	3.5	8	3.5
NL	4976	275	108	39	2818	57	1865	38	293	5.9	107	2.2
A	322	83	41	49	181	56	131	41	10	3.1	10	3.1
P	455	100	28	28	278	61	161	35	16	3.5	11	2.4
FIN	2539	173	97	56	1390	55	1078	43	71	2.8	49	1.9
S	3499	--*	--*	--*	2285	65	1144	33	70	2.0	42	1.2
UK	976	151	51	34	555	57	392	40	29	3.0	26	2.7
Nor-way	2756	144	60	42	1677	61	1016	37	63	2.3	39	1.4
EU + Nor-way	**44092**	**142**	**61**	**43**	**26825**	**61**	**15962**	**36**	**1305**	**3.3**[11]	**783**	**2.1**[12]

* No data available

[11] Excluding F from the calculation, detailed figures for F available in the Annex

[12] Excluding D from calculation, as no data available

Table 2: Results of fifteen national monitoring programmes for pesticide residues in fruit and vegetables

	No. of samples analysed	No. of pesticides and meta-bolites analysed for	No. of different pesticides found	% found from sought	No. of samples without detec-table residues	%	No. of samples with residues ≤ MRL	%	No. of samples with residues > MRL (national or EU MRLs)	%	No. of samples with confir-med residues > EU-MRLs	%
B	1920	122	53	43	982	51	795	41	143	7.4	32	1.7
DK	2000	128	73	57	1382	69	555	28	63	3.2	62	3.1
D	6040	81	50	62	3763	62	1985	33	292	4.8	180	3.0
EL	1164	93	41	44	888	76	224	19	52	4.5	50	4.3
E	2932	169	50	30	1741	59	1121	38	70	2.4	2	0.1
F[13]	--	--	--	--	--	--	--	--	--	--	--	--
IRL	285	93	37	40	125	44	147	52	13	4.6	13	4.6
I	8498	280	39	14	5714	67	2677	32	107	1.3	56	0.7
L	210	--*	--*	--*	138	66	64	31	8	3.8	8	3.8
NL	4938	275	--*	--*	2795	57	1850	38	293	5.9	107	2.2
A	321	83	41	49	180	56	131	41	10	3.1	--*	--*
P	446	100	26	26	276	62	155	35	15	3.4	10	2.2
FIN	2442	173	97	56	1313	54	1061	43	68	2.8	48	2.0
S	3225	231	78	34	2025	63	1130	35	70	2.2	42	1.3
UK	732	107	--*	--*	--*	--*	--*	--*	--*	--*	--*	--*
Nor-way	2686	142	60	42	1618	60	1005	37	63	2.3	39	1.5
EU[14] + Nor-way	**37839**	**148 (average)**	**54 (average)**	**36**	**22940**	**62[15]**	**12900**	**35[16]**	**1267**	**3.4[17]**	**649**	**1.8[18]**

* No data available

[13] Figures for France are available in the Annex
[14] Excluding F from the calculation, detailed figures for F available in the Annex
[15] Excluding UK from the calculation, as no data available
[16] Excluding UK from the calculation, as no data available
[17] Excluding UK from calculation, as no data available
[18] Excluding A, P, UK from calculation, as no data available

Table 3: Results of fifteen national monitoring programmes for pesticide residues in cereals

	No. of samples analysed	No. of pesticides and meta-bolites analysed for	No. of different pesticides found	% found from sought	No. of samples without detec-table residues	%	No. of samples with residues ≤ MRL	%	No. of samples with residues > MRL (national or EU MRLs)	%	No. of samples with confir-med residues > EU-MRLs	%
B	27	8	5	63	4	15	23	85	0	0	0	0
DK	164	25	5	20	121	74	43	26	0	0	0	0
D	656	--*	--*	--*	359	55	294	45	3	0.5	--*	--*
EL[19]	--	--	--	--	--	--	--	--	--	--	--	--
E	270	50	10	20	230	85	38	14	2	0.7	0	0
F[20]	--	--	--	--	--	--	--	--	--	--	--	--
IRL	44	69	7	10	17	39	27	61	0	0	0	0
I	281	53	6	11	260	93	21	7.5	0	0	0	0
L	20	--*	--*	--*	18	90	2	10	0	0	0	0
NL	38	275	2	1	23	61	15	40	0	0	0	0
A	1	16	0	0	1	100	0	0	0	0	--*	--*
P	9	100	5	5	2	22	6	67	1	11	1	11.1
FIN	97	173	4	2	77	79	17	18	3	3.1	1	1.0
S	274	83	6	7	260	95	14	5.1	0	0	0	0
UK	244	37	--*	--*	--*	--*	--*	--*	--*	--*	--*	--*
Nor-way	70	46	3	7	59	84	11	16	0	0	0	0
EU[21] **+ Nor way**	**2195**	**78**	**5**	**6**	**1431**[22]	**73**	**511**	**26**[23]	**9**	**0.46**[24]	**2**	**0.16**[25]

* No data available

**No samples analysed

[19] No samples analysed
[20] Figures for France are available in the Annex
[21] Excluding F from the calculation, detailed figures for F available in the Annex
[22] Excluding EL, UK from calculation, as no data available
[23] Excluding EL, UK from calculation, as no data available.
[24] Excluding EL, UK from calculation, as no data available.
[25] Excluding D, EL, A, P, UK from calculation, as no data available.

4.2. Results of the 1998 national monitoring programmes compared to the 1996 and 1997 results

Figures 1-3 give an overview of the residue situation of 1998 compared to the previous years. Figure 1 shows that the percentage of samples with detectable residues below or at the MRL was 37 % in 1996. It decreased slightly to 36 % in 1997 and remained at about this level in 1998. The percentage of samples exceeding the MRL showed a level of 3.0 % in 1996 and increased slightly in 1997 (3.4 %). In 1998 the level of MRL exceedances was 3.3 %.

Figure 2 and 3 show the situation for fruit/vegetables and cereals respectively for the years 1997 and 1998. In 1996 no separation between fruit, vegetables and cereals had been made.

It can be stated that no significant changes were observed during the last three years.

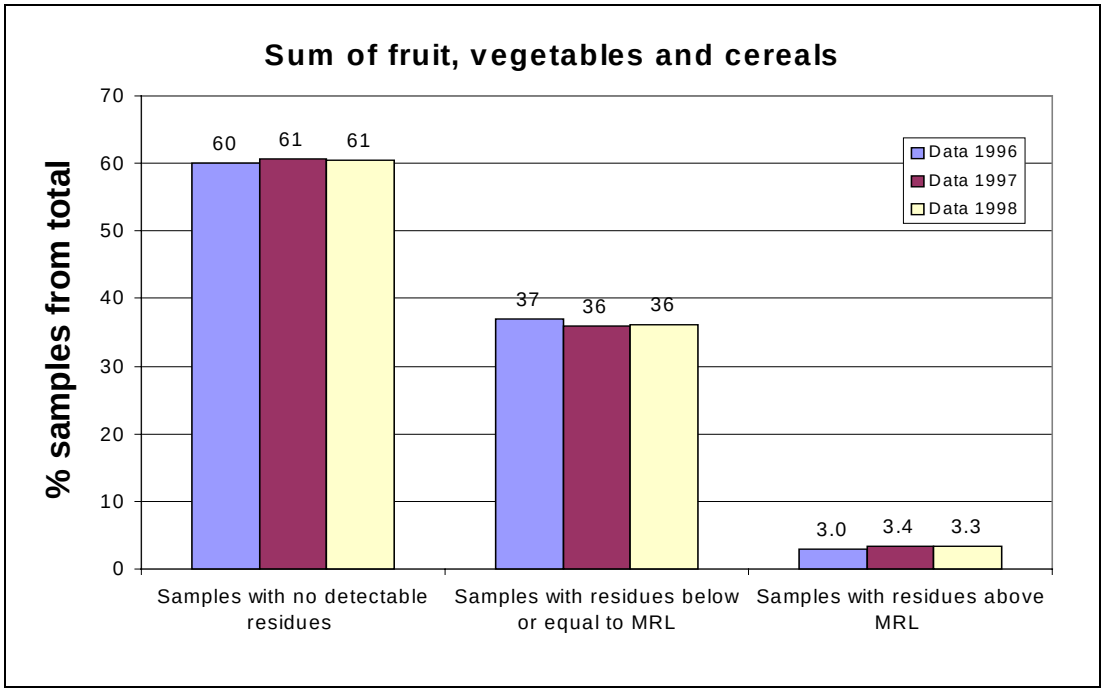

Figure 1: National monitoring results 1996 - 1998 for fruit, vegetables and cereals

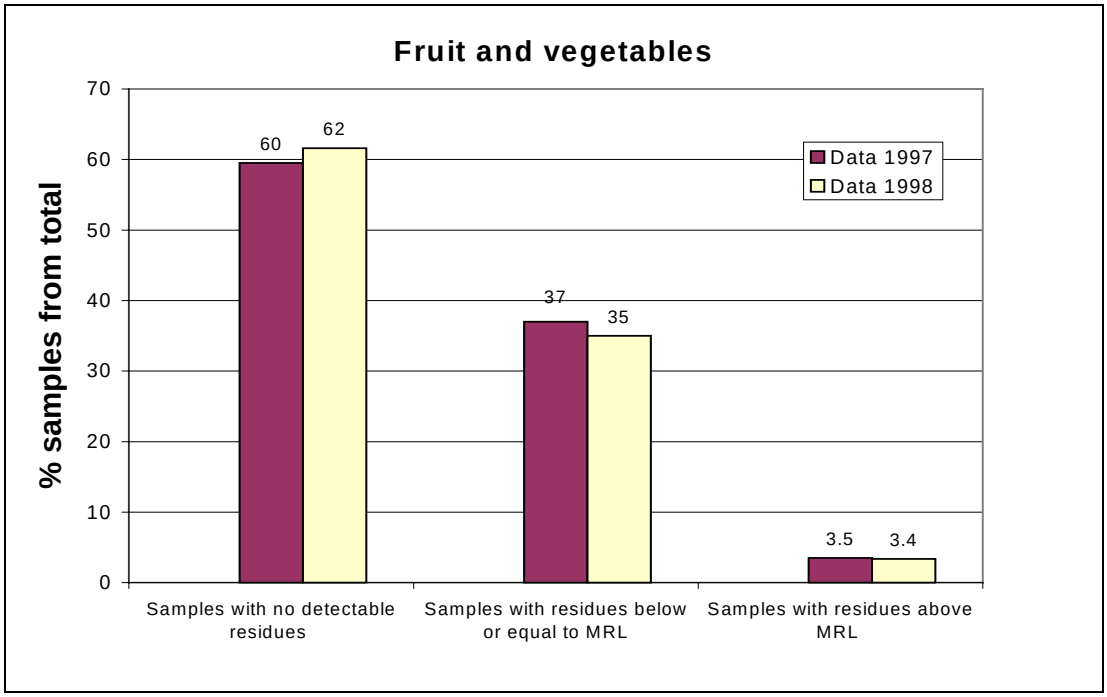

Figure 2: National monitoring results 1997 and 1998 for fruit and vegetables

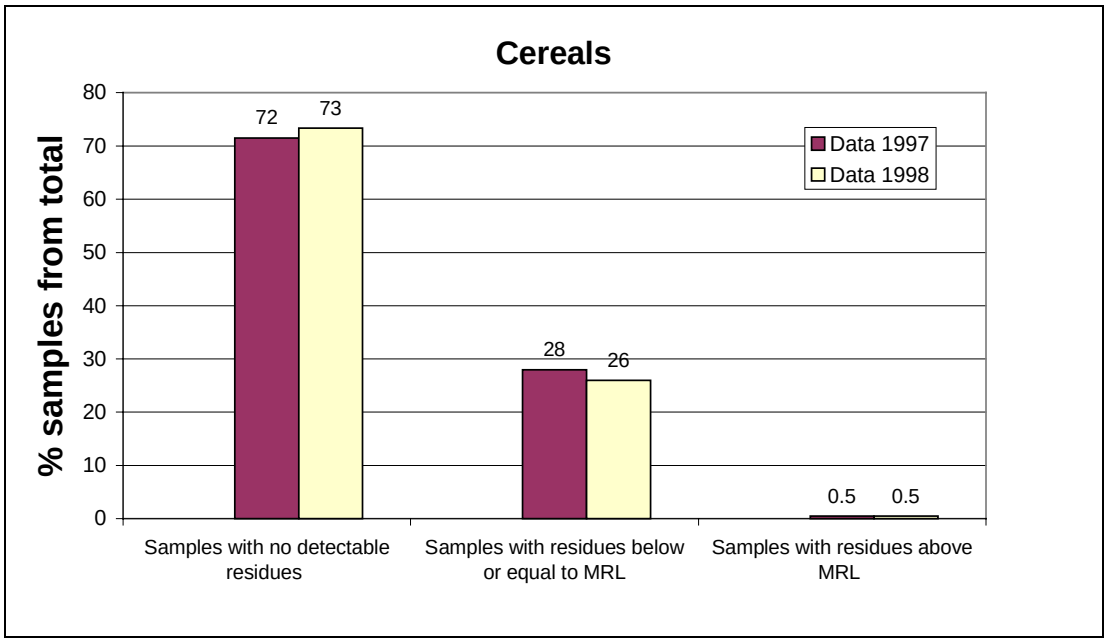

Figure 3: National monitoring results 1997 and 1998 for cereals

4.3. Samples with multiple residues

Table 4 summarises samples in which more than one pesticide residue had been found. Residues of more than one pesticide were found in about 14 % of the analysed samples. In most of these cases (8.4 %), residues of two pesticides were found, followed by 3.3 % of samples containing three residues. In 2.0 % of the samples, residues of four or more different pesticides were found.

Table 4: Samples with residues of more than one pesticide

	No. of samples analysed	**2**	**3**	**4**	**5**	**6**	**7**	**8 and more**	**No. of samples with multiple residues**	**%**
B	1947	103	47	22	7	1	0	0	180	9.2
DK	2164	153	53	16	2	1	0	0	225	10
D	6696	571	201	61	26	2	3	0	864	13
EL	1164	95	26	8	2	1	0	0	132	11
E*	166	6	1	0	0	0	0	0	7	4.2
F	4058	540	269	126	50	20	8	3	1016	25
IRL	329	36	10	3	0	0	0	0	49	15
I	8779	229	35	9[26]					273	3.1
L	230	19	6	3	4	0	0	0	32	14
NL	4976	359	155	55	17	13	2	1	602	12
A	322	43	15	2	0	0	0	0	60	19
P	455	26	14	7	2	0	0	0	49	11
FIN	2539	345	165	65	30	10	3	1	619	24
S	3499	348	120	59	23	4	3	0	557	16
UK	976	258	118	60	29	6	1	0	472	48
Norway	2756	289	104	45	17	4	0	1	460	17
EU + Norway[27]	**40890**	**3414**	**1338**	**541**	**209**	**62**	**20**	**6**	**5590**	
%		**8.4**	**3.3**	**1.3**	**0.51**	**0.15**	**0.049**	**0.0014**	**14**	

* Spain only reported samples of the coordinated programme

[26] Includes samples with 4 and more residues

[27] Excluding Spain from calculation as only samples from the coordinated programme have been reported

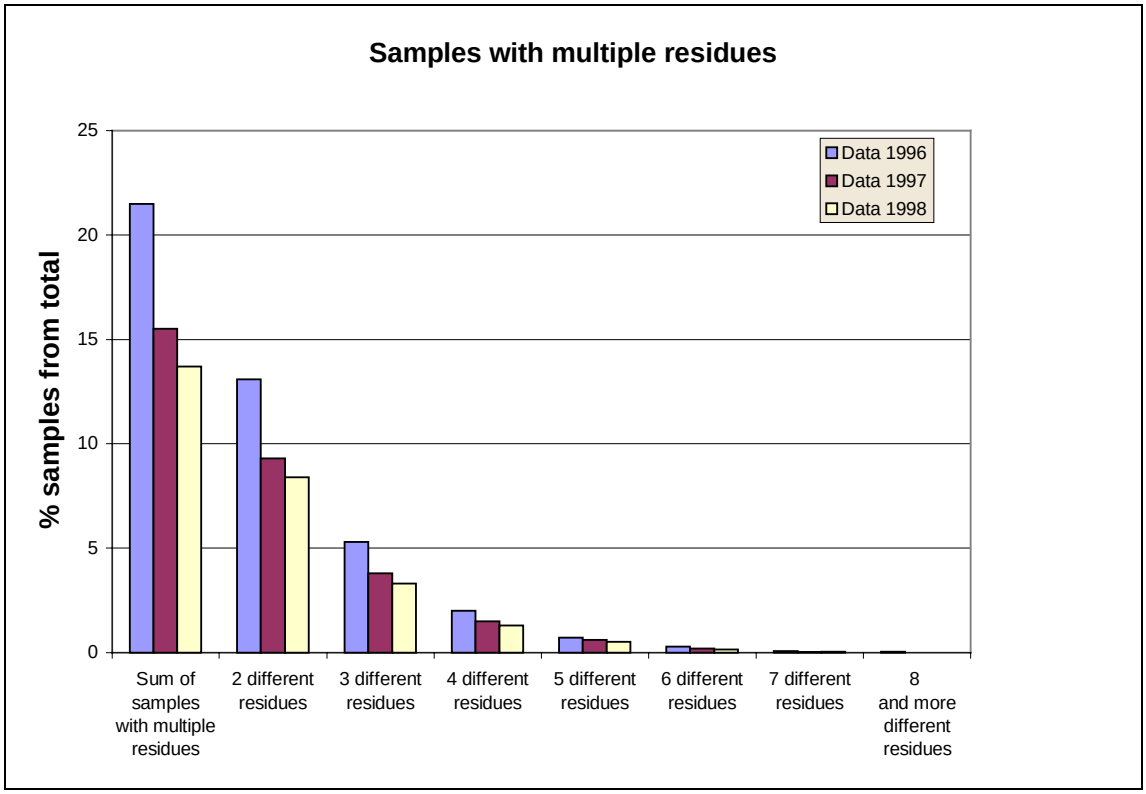

Figure 4: Samples with multiple residues - Comparison of the years 1996 - 1998

Figure 4 gives an overview over the distribution of samples with multiple residues in the years 1996 to 1998. It can be stated that the samples with multiple residues decreased considerably from 1996 to 1998, which is shown throughout the different groups (e.g. samples with 2 residues, samples with 3 residues, etc.). However, it has to be taken into account that in 1996 only eleven countries delivered data. The 1996 results are therefore not directly comparable with those of 1997 and 1998. In 1997 and 1998 fifteen countries delivered data for this overview.

4.4. Pesticides found most often

The pesticides, which were found most often in the national monitoring programmes are shown in Table 5. Member States and Norway were asked to prepare a list of the ten most frequently found pesticides in decreasing order of findings. The data received have been included as reported by the Member States.

Table 5: Pesticides found most often in the national monitoring programmes in the European Union and Norway as reported

Country	Pesticides found most often. The last row lists the pesticides mentioned most often from all Member States and Norway
B	Iprodione, inorganic bromide, propamocarb, dithiocarbamates, tolclophos-methyl, tolylfluanid, imazalil, vinclozolin, chlorpyriphos, benomyl group
DK	Dithiocarbamates, thiabendazole, endosulfan, benomyl group, iprodione, procymidone, tolylfluanid, ortho-phenylphenol, vinclozolin, glyphosate
D	Dithiocarbamates, procymidone, thiabendazole, endosulfan, chlorpyriphos, benomyl-group, vinclozolin, iprodione, dicofol, imazalil
EL	Chlorpyriphos, dithiocarbamates, chlorpyriphos-methyl, phosalone, captan, methamidophos, benomyl group, fluvalinate, methidathion, phosmet
E	Imazalil, chlorpyriphos, dithiocarbamates, captan + folpet, benomyl-group, dicofol, fenthion, malathion, procymidone, endosulfan, dimethoat, methidathion
F	Dithiocarbamates, iprodione, thiabendazole, procymidone, imazalil, vinclozolin, phosalone, chlorpropham, benomyl group, oxadixyl
IRL	Thiabendazole, benomyl group, chlorpyriphos, iprodione, captan, chlorfenvinphos, dicofol, omethoate, dimethoate, methidathion, chlorothalonil, endosulfan, deltamethrin, phosmet, tolclophos-methyl
I	Procymidone, vinclozolin, endosulfan, chlorpyriphos, chlorothalonil, methidathion, diazinon, pirimiphos-methyl, chlorpyriphos-methyl, iprodione
L	Iprodione, procymidone, imazalil, endosulfan, folpet, captan, chlorpyriphos, dithiocarbamates, methidathion, pirimiphos-methyl
NL	Iprodione, imazalil, vinclozolin, tolylfluanid, tolclophos-methyl, procymidone, pirimicarb, thiabendazole, pyrimethanil, dithiocarbamates
A	Procymidone, endosulfan, benomyl group, iprodione, dichlofluanid, methamidophos, thiabendazole, vinclozolin, captan, diphenylamine, imazalil, metalaxyl, methidathion
P	Dithiocarbamates, captan, dimethoate, phosmet, phosalone, thiabendazole, folpet, procymidone, dicofol, endosulfan
FIN	Imazalil, chlorpyriphos, thiabendazole, iprodione, endosulfan, procymidone, methidathion, tolylfluanid, malathion, captan
S	Imazalil, thiabendazole, methidathion, azinphos-methyl, chlorpyriphos, captan, dithiocarbamates, dimethoate, diphenylamine, procymidone
UK	Inorganic bromide, iprodione, benomyl-group, dithiocarbamates, imazalil, pirimiphos-methyl, thiabendazole, diphenylamine, 2,4- D, o-phenylphenol
Norway	Iprodione, thiabendazole, imazalil, tolylfluanid, methidathion, chlorpyriphos, procymidone, prochloraz, diphenylamine, captan
EU + Norway	Iprodione, dithiocarbamates, thiabendazole, procymidone, imazalil, chlorpyriphos, benomyl group, captan, methidathion, endosulfan, vinclozolin

The table shows that the pesticides found most often were mainly fungicides. These pesticides were already found most often in the 1997 national monitoring programmes. There is no significant change from 1997 to 1998.

5. THE EU COORDINATED MONITORING EXERCISE

As an EU coordinated monitoring exercise, the Commission recommended in 1998 via Commission Recommendation 97/822/EC[28] that four commodities should be tested (oranges, peaches, carrots, spinach (fresh incl. frozen) for 20 pesticides (acephate, benomyl group, chlorpyriphos, chlorpyriphos-methyl, deltamethrin, maneb-group, imazalil, iprodione, methamidophos, permethrin, vinclozolin, lambda-cyhalothrin, metalaxyl, methidathion, pirimiphosmethyl, thiabendazol, diazinon, endosulfan, mecarbam and triazophos). This differs substantially from the 1997 monitoring exercise, where five commodities were analysed for 13 pesticides.

The benomyl-group comprises three different compounds (benomyl, carbendazim, thiophanate-methyl), which are analysed with the same analytical method and determined as sum, expressed as carbendazim. The maneb-group, by legal definition, comprises five different dithiocarbamates, which are also determined as sum, expressed as CS_2.

All Member States and Norway participated in the EU coordinated programme. Overall, around 5 200 samples were analysed (1 658 orange samples, 1 240 peach samples, 1 429 carrot samples and 913 spinach samples)[29]. However, not all samples were analysed for all 20 pesticides.

5.1. Sampling design applied in the 1998 EU coordinated monitoring programme

5.1.1. Description of the sampling design

In order to achieve reliable information concerning the concentration of pesticides in fruit, vegetables and cereals on the European market a suitable sampling plan is required. According to Commission Recommendation 97/822/EC, each Member State has to take the minimum number of samples specified in the Annex (cf. Table 6).

The sampling design of the coordinated programme is based on a statistical method proposed by Codex Alimentarius[30]. Based on a binomial probability distribution it can be calculated that examination of a total sample number of 459 gives a 99 % confidence of detecting <u>one</u> sample containing pesticides above a specific level if it is anticipated that 1 % of products of plant origin will contain residues above this specific level. This level could be the reporting level[31] or the MRL.

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[28] Official Journal No L 337, 09/12/1997 p. 0014 - 0017

[29] incl. D and UK, which have been excluded from Table 9

[30] Codex Alimentarius, Pesticide Residues in Foodstuffs, Rome 1994, ISBN 92-5-203271-1; Vol. 2, p. 372

[31] The reporting level is the routinely achievable limit of quantification (lowest level at which residues will be reported as absolute numbers) for the monitoring laboratories and normally corresponds to the lowest calibrated level.

The minimum numbers of samples to be taken of each commodity were fixed at a different level for each country, according to their population and consumer numbers, since adjusting the sample size to the largeness of the national markets improves the precision of the sampling design. The required number of samples varied between 12 and 93, resulting in a total of 460 samples for all Member States. This differs from the 1996 and 1997 monitoring exercises, where uniform sample numbers had been taken in each country (30 samples by commodity in 1996, 50 samples by commodity in 1997). In 1998 the recommended number of samples was taken in most cases, in many cases even more samples were taken than recommended. Table 6 shows the required number of samples by Member State compared to the number of samples actually taken.

Table 6: Numbers of samples taken by Member State for each commodity

Country	**Recommen-ded number of samples (for each commodity)**	**Number of samples taken by commodity**			
		Orange	**Peach**	**Carrot**	**Spinach**
B	12	59	36	64	103
DK	12	87	40**	71	20
D*	93	231	298	330	275
EL	12	44	32	27	23
E	45	45	45	45	31
F	66	83	100	90	89
IRL	12	16	5	18	9
I	65	322	421	199	76
L	12	15	15	15	15
NL	17	127	26	101	113
A	12	15	11	11	12
P	12	35	28	35	28
FIN	12	142	12	41	23
S	12	186	79**	185	22
UK*	66	66	72	66	66
Total	**460**	**1473**	**1220**	**1298**	**905**
NOR	12	119	20	131	8

* Numbers of samples also include samples analysed for pesticides other than the 20 pesticides of the coordinated programme.

** Including nectarines.

5.1.2. Statistical evaluation of the results of the coordinated exercise

As described in section 5.1.1. the statistical approach of Codex Alimentarius requires at least one sample of the whole number of samples must contain a specific concentration of a certain pesticide (e.g. above the reporting level or above the MRL) in order to assess the lowest portion of food items containing pesticides above this specific level in the whole population. In the following section this lowest portion shall be estimated on a 95 % confidence level for each of the 20 pesticides.

The portion of samples with residues below or at the MRL (grey columns) or exceeding the MRL (white columns) of the respective pesticide are shown in Figures 5 and 6. The results are presented in a logarithmic scale in order to accommodate a broad range of data in the figures. In addition, the corresponding confidence interval on the 95 % level is shown, reflecting the sampling error. The sampling error, in this context reflects the variability of the data due to the different numbers of samples taken for the determination of the respective pesticide. Other error sources, such as the way how and when the samples were taken are not included in this estimation.

The impact of the sampling error on the final result is illustrated using the reported concentrations of the benomyl group in the food items. 3227 samples have been analysed and 124 of them showed residues below or at the MRL. The number of 3227 samples represents only a part of the whole European market, therefore the calculated fraction of samples with residues below or at the MRL (124/3227 = 3.84 %) is only an estimate for the true but unknown value. The variability of this value can be calculated and is expressed in terms of % samples shown as error bars in Figures 5 and 6. For the example of benomyl this means that the true value of the number of samples with residues at or below the MRL would vary between 103 and 148 samples (or represent 3.84 ± 0.11 % of the total samples).

The relative sampling error increases with decreasing numbers of samples of a certain category. For cases where no samples with exceeding MRLs have been found, those error bars reflect the actual percentage of the specific commodity in the whole population which still could contain residues above the MRL. For example no sample with residues exceeding the MRL for imazalil was found in the coordinated monitoring exercise, but the upper limit of the error range is 0.11 %, which means that still 0.11 % of the specific commodities in the whole population (European market) could have exceeding MRLs for imazalil. This upper limit of the error range is similar for the other pesticides, for which no residues exceeding the MRL have been found (e.g. deltamethrin, lambda-cyhalothrin, mecarbam and pirimiphos-methyl).

The limit of 0.11 % is very low, because in the coordinated exercise high numbers of samples (varying from 2500 to 4800 for the individual pesticides) were taken. This ensures sufficient precision of the results and allows for subsequent risk analysis calculations to be carried out.

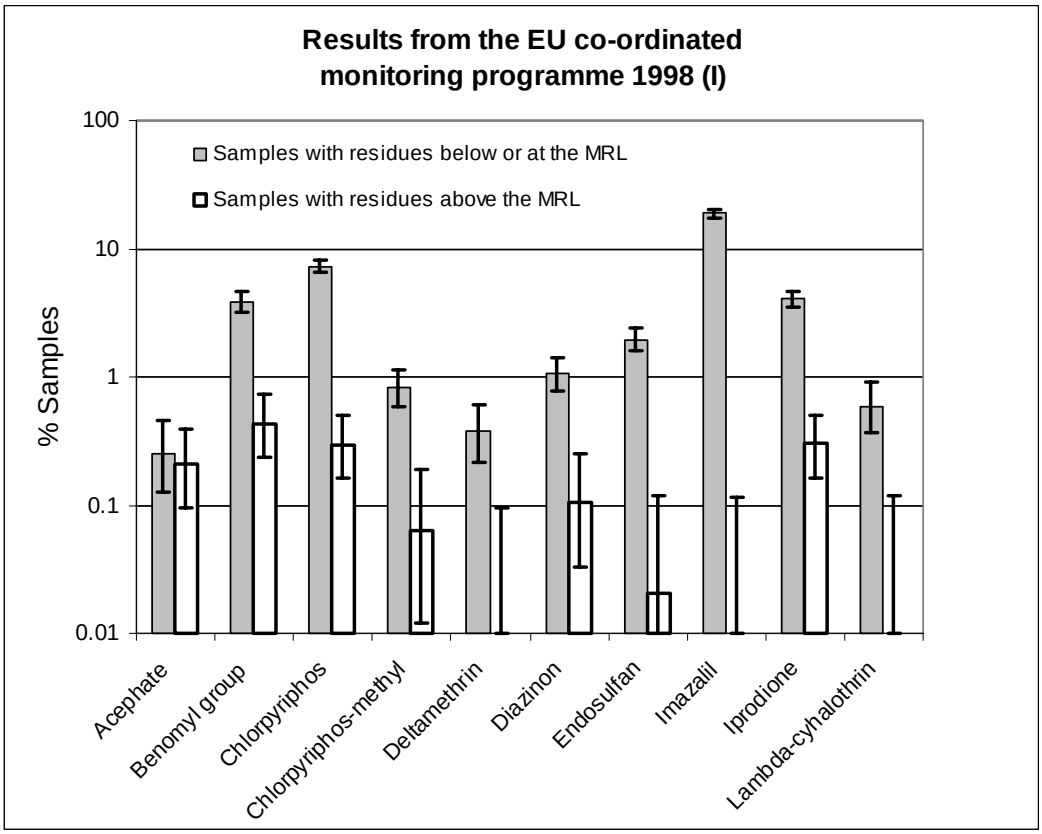

Figure 5: Results of the monitoring programme (I)

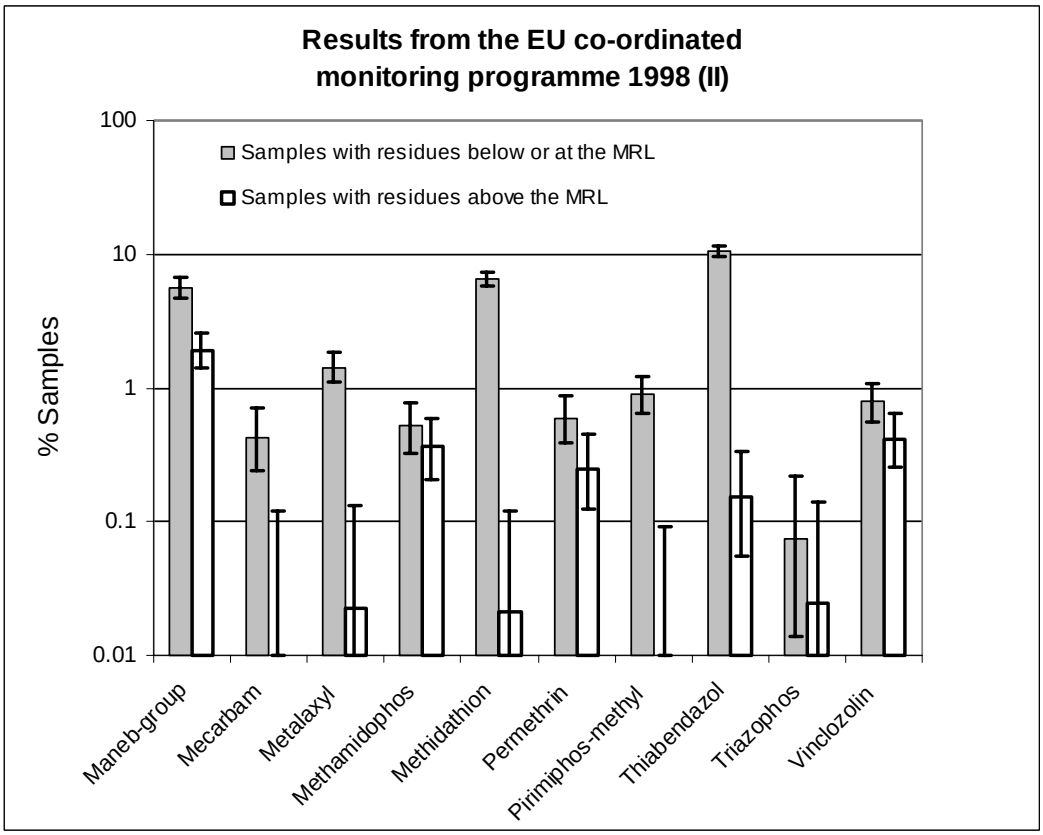

Figure 6: Results of the monitoring programme (II)

5.2. Evaluation by pesticide

The summarised results are given in Table 7 for all twenty pesticides. The table also gives information on the highest residue of a particular pesticide found in this monitoring exercise. More details can be found in Annex II, where the complete results for all Member States and all commodities are given.

The results vary among the twenty different pesticides investigated. In the EU coordinated monitoring programmes, residues of imazalil were found most often (19 % of all samples), followed by thiabendazol (10 %), chlorpyriphos (7.6 %), methidathion, (6.6 %), the maneb-group (7.6 %), iprodione (4.3 %), the benomyl-group (4.2 %), endosulfan (2.0 %), metalaxyl (1.4 %), diazinon (1.2 %) and vinclozolin (1.2 %). Residues of the other pesticides were found in less than 1 % of the samples.

Residues of the maneb-group exceeded MRLs most often (2.1 %), followed by the benomyl-group (0.43 %), vinclozolin (0.41 %), methamidophos (0.36 %) and chlorpyriphos (0.29 %).

The highest residues found were 7.9 mg/kg iprodione on spinach (EU-MRL: 0.02 mg/kg) and 4.9 mg/kg imazalil on oranges (EU-MRL: 5.0 mg/kg).

Table 7: Results from the EU coordinated monitoring programme for pesticide residues for each pesticide analysed for in oranges, peaches, carrots and spinach

Pesticide	**Total No. of samples**	**No. of samples without residues**	**No. of samples with residues ≤ MRL**	**%**	**No. of samples with residues > MRL**	**%**	**Maximum residue found in mg/kg (commodity in which it was found and the EU-MRL in mg/kg)**
Acephate	4332	4313	10	0.23	9	0.21	0.47 (peaches, no EU-MRL fixed[32])
Benomyl group	3227	3089	124	3.8	14	0.43	2.0 (oranges, EU-MRL: 5); 2.9 (peaches[33], no EU-MRL fixed[34]
Chlorpyriphos	4759	4400	345	7.3	14	0.29	0.55 (oranges, EU-MRL: 0.3)
Chlorpyriphos-methyl	4680	4638	39	0.83	3	0.06	0.40 (peaches, no EU-MRL fixed[35])

[32] New MRL according to Council Directive 98/82/EC: 0.2 mg/kg (OJ No. L 290, 29/10/98, p. 0025 - 0054)
[33] Including nectarines
[34] New MRL according to Council Directive 98/82/EC: 1 mg/kg (OJ No. L 290, 29/10/98, p. 0025 - 0054)
[35] New MRL according to Council Directive 98/82/EC: 0.5 mg/kg (OJ No. L 290, 29/10798, p. 0025 - 0054)

Pesticide	Total No. of samples	No. of samples without residues	No. of samples with residues ≤ MRL	%	No. of samples with residues > MRL	%	Maximum residue found in mg/kg (commodity in which it was found and the EU-MRL in mg/kg)
Deltamethrin	4525	4508	17	0.38	0	0	0.28 (spinach, EU-MRL: 0.5)
Diazinon	4737	4682	50	1.1	5	0.10	0.89 (carrots, EU-MRL: 0.5)
Endosulfan	4804	4709	94	2.0	1	0.02	0.95 (peaches, EU-MRL: 1.0) 0.67 (spinach, EU-MRL: 1.0) 0.3 (carrots, EU MRL 0.2)
Imazalil	3784	3073	711	19	0	0	4.91 (oranges, EU MRL: 5.0)
Iprodione	4637	4436	187	4.0	14	0.30	7.85 (spinach, EU MRL: 0.02)
Lambda-cyhalothrin	3579	3557	22	0.61	0	0	0.66 (spinach, no EU-MRL fixed[36])
Maneb-group	2435	2251	134	5.5	50	2.1	7.0 (spinach, EU-MRL: 0.05)
Mecarbam	3492	3477	15	0.43	0	0	0.43 (oranges, EU-MRL: 2.0)
Metalaxyl	4407	4343	63	1.4	1	0.02	5.0 (oranges, no EU-MRL fixed[37])
Methamidophos	4435	4396	23	0.52	16	0.36	0.34 (peaches, no EU-MRL fixed[38])
Methidathion	4750	4437	312	6.6	1	0.02	3.5 (oranges, EU-MRL: 2.0)
Permethrin	4424	4387	26	0.59	11	0.25	6.7 (spinach, EU-MRL: 0.05)
Pirimiphos-methyl	4706	4664	42	0.89	0	0	0.49 (oranges, EU-MRL:1.0)
Thiabendazol	3945	3525	414	10	6	0.15	9.7 (oranges, EU-MRL: 6.0)
Triazophos	4062	4058	3	0.07	1	0.02	0.1 (carrots, EU-MRL: 1.0)
Vinclozolin	4776	4718	38	0.81	20	0.41	0.87 (carrots, no EU-MRL fixed[39])

[36] New MRL according to Commission Directive 2000/42/EC: 0.02 mg/kg (OJ No. L 158, 30/0672000, p. 0051 - 0075)
[37] New MRL according to Commission Directive 2000/42/EC: 0.5 mg/kg (OJ No. L 158, 30.06.2000, p. 0051 - 0075)
[38] New MRL according to Council Directive 98/82/EC: 0.05 mg/kg (OJ No. L 290, 29.10.98, p. 0025 - 0054)
[39] New MRL according to Council Directive 98/82/EC: 0.5 mg/kg (OJ No. L 290, 29.10.98, p. 0025 - 0054)

Table 8 shows a comparative overview of pesticides found most often and pesticides exceeding MRLs analysed on different commodities in 1997 and 1998. Eleven pesticides were analysed for in both the 1997 programme and the 1998 programme. They are highlighted in bold letters and only those will be compared in this paragraph.

Diazinon, endosulfan, iprodion and metalaxyl were detected significantly more often with residues below or at the MRL on the 1998 commodities (oranges, peaches, carrots, spinach) than on the 1997 commodities (mandarins, pears, bananas, potatoes), whereas thiabendazol was detected less often on the 1998 commodities.

The pesticides most often exceeding the MRL were also different on the 1997 and 1998 commodities. Acephate and the benomyl-group exceeded the MRL significantly more often on the 1998 than on the 1997 commodities.

Many of the frequently found pesticides in 1998 (e.g. imazalil, maneb-group) were not analysed for on the 1997 commodities.

Overall the comparison of the 1997 and 1998 commodities shows that four out of the eleven pesticides, which were analysed for in both years' programmes, were detected significantly more often with residues below or at the MRL on the 1998 commodities and one pesticide was detected less often than on the 1997 commodities. The remaining six pesticides showed no significant changes in their occurrence on the different commodities of 1997 and 1998.

Table 8: Comparison of pesticides found most often and pesticides exceeding MRLs analysed on different commodities in 1997 and 1998

Commodities	**Mandarins, pears, bananas, beans, potatoes (commodities analysed for in the 1997 programme)**		**Oranges, peaches, carrots, spinach (commodities analysed for in the 1998 programme)**	
	% samples with residues ≤ MRL	**% samples with residues > MRL**	**% samples with residues ≤ MRL**	**% samples with residues > MRL**
Acephate	0.16	0	0.23	0.21
Benomyl group	4.5	0.03	3.8	0.43
Chlorothalonil	0.20	0.09	Not analysed	Not analysed
Chlorpyriphos	6.5	0.24	7.3	0.29
Chlorpyriphos-methyl	Not analysed	Not analysed	0.83	0.06
DDT	0.04	0.02	Not analysed	Not analysed
Deltamethrin	Not analysed	Not analysed	0.38	0
Diazinon	0.55	0	1.1	0.10
Endosulfan	1.3	0	2.0	0.02
Imazalil	Not analysed	Not analysed	19	0.10
Iprodion	1.3	0.13	4.0	0.30
Lambda-cyhalothrin	Not analysed	Not analysed	0.61	0
Maneb-group	Not analysed	Not analysed	5.5	2.1
Mecarbam	Not analysed	Not analysed	0.43	0
Metalaxyl	0.45	0	1.4	0.02
Methamidophos	0.48	0.18	0.52	0.36
Methidathion	5.9	0	6.6	0.02
Permethrin	Not analysed	Not analysed	0.59	0.15
Pirimiphos-methyl	Not analysed	Not analysed	0.89	0
Thiabendazol	18	0.08	10	0.15
Triazophos	0.04	0	0.07	0.02
Vinclozolin	Not analysed	Not analysed	0.81	0.41

5.3. Evaluation by commodity

With regard to all four commodities investigated, about 32 % contained residues of pesticides at or below the MRL, and 2.0 % above the MRL (1.8 % for EU-MRLs, 0.4 % for national MRLs) (Table 9). Residues at or below the MRL were found most often in oranges (67 %), followed by peaches (21 %), carrots (11 %) and spinach (5 %). MRLs were exceeded most often in spinach (7.3 %), followed by peaches (1.6 %) carrots (1.2 %), and oranges (0.7 %).

Table 9: Residues found in the four commodities analysed in the EU coordinated monitoring programme[40]

	Number of samples analysed	Without detectable residues	%	With residues ≤ MRL	%	With residues > MRL	%
Oranges	1361	438	32.2	914	67.2	9	0.7
Peaches	870	672	77.2	184	21.1	14	1.6
Carrots	1033	912	88.3	109	10.6	12	1.2
Spinach	572	499	87.2	28	4.9	42	7.3
SUM	3836	2524	65.8	1235	32.2	77	2.0

Table 10 gives an overview of the individual analytical determinations (pesticide-sample combinations) of the twenty pesticides investigated in the coordinated programme only. Residues were found most often in oranges (7.6 %), followed by peaches (2.4 %), carrots and spinach (1.0 % each). This corresponds to the results given in the previous paragraph for all pesticides. Pesticide residues exceeding the MRL were found most often in spinach (0.34 %), followed by peaches (0.25 %), carrots (0.22 %) and oranges (0.05 %). This also corresponds to the results given in the previous paragraph.

Table 10: Residues found in individual determinations (ind. det.) in the four commodities analysed in the EU coordinated monitoring programme[41]

	Total number of ind. det.	Number of ind. det. without residues	Number of ind. det. where a particular residue was found	%	Number of ind. det. where a residue exceeded the MRL	%
Oranges	26097	24117	1980	7.6	14	0.05
Peaches	18680	18224	456	2.4	46	0.25
Carrots	24511	24260	251	1.0	54	0.22
Spinach	15208	15060	148	1.0	51	0.34
SUM	84496	81661	2835	3.4	165	0.20

[40] Excluding D and UK, as the results are partly related to pesticides other than the 20 pesticides investigated
[41] Including all Member States and Norway

5.4. Evaluation by country

The results cannot be compared between the Member States, as countries reported differently, including or excluding pesticides other than the twenty pesticides from the coordinated programme. With regard to the twenty pesticides and the four commodities of the coordinated programme only, residues at or below the MRL were found in 32 % of the samples. In 1.9 % of the samples these residues exceeded MRLs. Differences between countries can result e.g. from different sampling approaches (relation of compliance and surveillance sampling), amounts of samples analysed for pesticides that are most likely to be found, and reporting levels (cf. chapter 4.1). Table 11 shows the results sorted by country.

Table 11: Residues of pesticides in the four commodities as analysed in the Member States and Norway

	Number of samples analysed	**Without detectable residues**	**%**	**With residues ≤ MRL**	**%**	**With residues > MRL**	**%**
B	262	181	69	71	27	10	3.8
DK	218	148	68	67	31	0	0
D*	1134	721	64	303	27	110	9.7
EL	126	70	56	45	36	11	8.7
E	166	97	58	67	40	2	1.2
F	362	260	72	85	24	14	3.9
IRL	48	29	60	17	35	2	4.2
I	1018	872	86	143	14	3	0.3
L	60	40	67	17	28	3	5.0
NL	367	215	59	144	39	8	2.2
A	49	27	55	17	35	5	10.2
P	126	112	89	12	9.5	2	1.6
FIN	218	60	28	149	68	9	4.1
S	472	297	63	174	37	1	0.2
UK*	270	93	34	172	64	5	1.9
Norway	278	113	41	161	58	4	1.4
EU[42]+ Norway	**3836**	**2521**	**66**	**1235**	**32**	**74**	**1.9**

* The results of D and UK relate to residues of all pesticides investigated, not only the twenty pesticides analysed in the EU coordinated programme. This explains the higher numbers of analysed samples compared with the other countries.

[42] Excluding D and UK

In 1997 detectable residues below or at the MRL were found in 25 % of the samples, and in 0.4 % of the samples residues exceeded MRLs. However, in 1997 only data from 11 countries were included in the calculation.

5.5. Exposure assessment

5.5.1. Chronic risk

To estimate the chronic risk to the consumer of consuming the commodities investigated in the EU coordinated programme, calculations can be done based on consumption figures from the World Health Organisation (Standard European Diet). A realistic exposure assessment for those pesticides representing a chronic risk should not be carried out with the highest residues found, but more correctly with the average residues or, to consider worst case conditions, on basis of the 90th percentile[43]. The 90th percentile of the amount of residues found in the monitoring exercise is the value below which 90 % of the values are situated. The risk assessment was carried out for an adult with an average bodyweight of 60 kg. The intake of a specific pesticide via a specific commodity was calculated and compared with the ADI. The results (as percentage of ADI) are given in Table 12.

Table 12: Exposure assessment for the chronic risk from the dietary intake of pesticide residues (based on the 90th percentile) in those commodities of the coordinated programme in which the highest residues of the respective pesticides were found, calculated for an adult (60 kg bodyweight)

Compound	**Food item**	**90th percentile** (mg pesticide / kg commodity)	**ADI[44]** (mg pesticide / kg body weight	**Average consumption** (kg commodity / day)[45]	**Intake via specific commodity** (mg pesticide / day / kg body weight)[46]	**Intake in % of the ADI**
Acephate	Peach	< 0.01	0.03	0.0125	--	--
Benomyl group	Peach	< 0.05	0.03[47]	0.0125	0.0000104	0.035
Chlorpyriphos	Orange	< 0.10	0.01	0.0298	0.0000497	0.50
Chlorpyriphos-methyl	Peach	< 0.01	0.01	0.0125	--	--
Deltamethrin	Spinach	< 0.01	0.01	0.002	--	--
Diazinon	Carrots	< 0.01	0.002	0.022	--	--
Endosulfan	Peach	< 0.01	0.006	0.0125	--	--

[43] WHO/FSF/FOS/97.7, p. 14
[44] WHO/PCS/2000.1
[45] Standard European Diet of the World Health Organization
[46] Calculated only if the 90th percentile is above the general reporting limit of 0.01 mg/kg of the agreed format
[47] ADI of carbendazim, as this pesticide has the lowest ADI of the three pesticides (carbenazim, benomyl, thiophanate-methyl) detected as carbendazim

Compound	Food item	90th percentile (mg pesticide / kg commodity)	ADI (mg pesticide / kg body weight	Average consump-tion (kg commodity / day)	Intake via specific commodity (mg pesticide / day / kg body weight)	Intake in % of the ADI
Imazalil	Orange	< 2.0	0.03	0.0298	0.000993	3.3
Iprodione	Spinach	< 0.01	0.06	0.002	--	--
Lambda-cyhalothrin	Spinach	< 0.01	--	0.002	--	--
Maneb-group	Spinach	< 0.01	0.03/ 0.007[48]	0.002	--	--
Mecarbam	Orange	< 0.01	0.002	0.0298	--	--
Metalaxyl	Orange	< 0.01	0.03	0.0298	--	--
Methamidophos	Peach	< 0.01	0.004	0.0125	--	--
Methidathion	Orange	< 0.20	0.001	0.0298	0.0000993	9.9
Permethrin	Spinach	< 0.01	0.05	0.002	--	--
Pirimiphos-methyl	Orange	< 0.01	0.03	0.0298	--	--
Thiabendazol	Orange	< 2.0	0.1	0.0298	0.000993	0.99
Triazophos	Carrots	< 0.01	0.001	0.022	--	--
Vinclozolin	Carrots	< 0.01	0.01	0.022	--	--

As shown by the results in Table 12 the intake of pesticide residues does not exceed the ADI in any case. It is below a percentage of 10 % of the ADI for all pesticides. The exposure ranges from 0.035 % of the ADI for the benomyl group to 9.9 % of the ADI for methidathion.

5.5.2. Acute risk

Currently, there is no universally accepted methodology for evaluating risks from acute exposure. However, as an example, the acute risk can be evaluated by using the UK Consumer Exposure Model, where an exposure assessment is carried out based on the 97.5th percentile of consumption[49]. That means, in order to include consumers with a high consumption of specific commodities, a large portion value is used. The 97.5th percentile is the value below which the consumption of 97.5 % of all consumer is situated. For the 1998 coordinated programme, the evaluation of the acute risk was carried out for those pesticides which have acute toxicity and where acute Reference Doses (acute RfDs) have been set. In order to consider worst case conditions a variability factor of seven[50], taking into account unit-to-unit variability of single units, was used, because the analytical results have been obtained from composite samples. For further refinement of the exposure calculations factors for the edible portion (e.g. based on peel/pulp distribution of the residues for oranges) have been used. Studies have shown that residues of methidathion and chlorpyriphos are concentrated in the

[48] Group ADI for maneb, mancozeb, metiram, zineb: 0.03; ADI for propineb: 0.007.

[49] UK 1998, Technical Policy on the Estimation of Acute Dietary Intakes of Pesticide Residues, AAHL/3/1998, 13 January 1998, PSD, York

[50] 1999 Joint FAO/WHO meeting on Pesticide Residues, Rome 20-29 September 1999, p.11

peel of oranges, but might also appear in the pulp (edible portion) at low levels. A factor of 0.1 for methidathion and 0.05 for chlorpyriphos has been used, as it was shown that ≤ 10 % of the residues of methidathion and ≤ 5 % of the residues of chlorpyriphos were found in the orange pulp[51]. On the basis of those data an exposure assessment has been carried out and the intake of the specific pesticide via a specific commodity was compared with the acute Reference Dose (acute RfD). The results are shown in Table 13.

Table 13: Exposure assessment for the acute risk from the pesticides investigated in the 1998 coordinated programme for the products with the highest residues found in the European Union. The calculation was performed with the UK Consumer Exposure Model for only those pesticides which have acute toxicity and where an acute Reference Dose has been set.

Compound	**Food item**	**Maximum residue found** (mg pesticide / kg commodity	**acute Reference Dose** (mg pesticide / kg body weight	**97.5th percentile of consumption** (kg commodity / day)[52]	**Intake via specific commodity** (mg pesticide / day / kg body weight)	**Intake in % of the acute Reference Dose**
Chlorpyriphos	Oranges	0.55[53]	0.1	0.235	0.00753[54]	0.75
Endosulfan	Peaches	0.95	0.02	0.0958	0.01062[55]	53
Methidathion	Oranges	3.5[56]	0.01[57]	0.235	0.00958[58]	96

As Table 13 shows the intakes for the highest residues of chlorpyriphos, endosulfan and methidathion are all below the acute RfD. They range between 0.75 % of the acute RfD for chlorpyriphos and 96 % of the acute RfD for methidathion.

[51] JMPR-1992, Evaluations Part I, Residues, p. 478, 479, 497, 508 (FAO Plant Production and Protection Paper 118) for methidathion and JMPR-1995, Evaluations, Part I - Residues, p. 63-65, 67-74

[52] Consumer Exposure Model, UK, ref. footnote 42

[53] Determined on the whole unpeeled orange

[54] Calculated with variability factor 7 and a factor of 0.05 for the edible portion

[55] Calculated with variability factor 7

[56] Determined on the whole unpeeled orange.

[57] WHO/PCS/2000.1

[58] Calculated with a variability factor of 7 and a factor of 0.1 for the edible portion

6. SAMPLING

Commission Directive 79/700/EEC established sampling methods for the official control of pesticide residues in and on fruit and vegetables. Member States are supposed to follow these methods for their pesticide residue monitoring. Table 14 shows the information given in the summaries of the national monitoring reports of the Member States and Norway on sampling. In most cases, sampling followed national plans that were often established taking into consideration consumption, production, imported and exported products and risks (e.g. results from previous years).

Only a few Member States reported on the exact relation between the domestic and imported produce sampled. The relation should reflect the situation in the respective Member State. The average ratio from the five Member States reporting on this particular subject was 38:62 domestic:imported produce. More detailed information can be found in the summaries of the national monitoring reports in Annex II.

Samples were taken at different points, such as wholesalers and retailers, local and central markets, points of entry (for imported products), and processing industries.

Table 14: Summary on sampling by the national authorities (information taken from the national reports)

Country	Summary on sampling
B	Sampling was carried out mostly according to Commission Directive 79/700/EEC, at auctions, importers, wholesalers and retailers. The sampling plan took account of average consumption, production figures, results of previous years, and analytical and budgetary possibilities.
DK	The sampling plan took account of dietary consumption, production and import data, results of the previous year. The samples were taken at production level and at wholesalers and importers.
D	Samples were taken at producers, manufacturers, wholesalers, retailers and at restaurants, according to a national sampling protocol published as an official ordinance.
EL	Samples were randomly taken from points of entry, wholesalers and retailers.
E	Samples were taken from domestic crops, following Directive 79/700/EEC. Samples were taken proportional to production.
F	Sampling follows Directive 79/700/EEC. Domestic and imported products were sampled at wholesaler level; sampling took account of dietary intake and results/problems of previous years.

Country	Summary on sampling
IRL	The sampling plan took account of the dietary importance of the foods sampled, the manner in which they were consumed and historical pesticide residue information. Samples of both domestic and imported produce were sampled at wholesale level.
I	Sampling was based on dietary consumption and production; the samples were taken at random from domestic and foreign sources.
L	Samples were taken at central markets. Imported products were sampled at wholesaler level. The sampling plan was based on a rolling annual plan. Sampling was done mostly according to Directive 79/700/EEC.
NL	Sampling was done at auctions, importers, wholesalers and industries processing agricultural products, based on the market situation and previous violative results. Directive 79/700/EEC (as transposed into national law) was respected.
A	Sampling was based on a nationwide sampling plan, taking into account data concerning dietary consumption, production and import of fruit and vegetables, results of former measurements and analytical and budgetary possibilities.
P	Sampling was mainly done at wholesale outlets, wholesaler's warehouses and at farmgates. A small percentage of samples was taken at retail outlets.
FIN	Sampling plan took into account consumption figures and known residue problems. Samples of imported products were taken at wholesalers; samples of domestic products were taken at farms, wholesalers or retail shops.
S	The number of samples taken was roughly proportional to the food's consumption rate and amounted to at least 100 samples for each of the more important foods.
UK	The sampling plan was based on a main commodity rolling programme, taking into account levels of consumption and information on possible levels of residues. The plan ensured that a wide range of products were included; CAC guidelines were followed.
Norway	Samples were taken at wholesalers' warehouses, reflecting their share of the market, but more samples were taken of commodities suspected of retaining residues; compliance samples were taken as follow-up to violative results

7. QUALITY ASSURANCE

Council Directive 90/642/EEC, as amended by Council Directive 97/41/EC, requires Member States to control maximum residue levels according to Council Directives 89/397/EEC and 93/99/EEC. This also means that laboratories have to comply with the European Standard EN 45001 and that Member States are requested to assess the laboratories by applying the criteria as laid down in European Standard EN 45002. Member States shall also apply proficiency testing schemes where appropriate. However, in 1998 it was still possible to submit data from unaccredited laboratories.

Commission Recommendation 97/822/EC suggests that Member States, in the 1998 monitoring reports, provide information about the details of accreditation of the laboratories which carry out the analyses for the monitoring exercise and about the criteria applied in establishing quality assurance measures in those laboratories. Quality assurance measures have been developed and it has been recommended that these should be respected for the 1999 EU coordinated monitoring programme. Workshops on Analytical Quality Control (WAQC) are regularly held in order to review these measures. Proficiency tests, supported by the European Commission, are also regularly organised (so far three proficiency tests have been organised, the last was carried out in 1999).

The new Monitoring Regulation (cf. chapter 2) of the European Commission, in force since April 2000, ensures the financial contribution of the European Commission to the organisation of proficiency tests and Analytical Quality Control workshops. It also confirms and further specifies the requirements for accreditation of monitoring laboratories and their participation in proficiency tests.

Table 15 gives an overview of the situation regarding accreditation of monitoring laboratories and participation in proficiency tests. The table is a summary of the information provided by the Member States in their short written summaries (cf. Annex II for further details).

As shown in the table, laboratories in some countries have achieved full accreditation, but laboratories in other countries are still in the preparatory phase or have only partly accredited their laboratories.

Table 15: Accreditation and participation in proficiency tests of the pesticide residue laboratories

Country	No. of labora-tories	Accreditation (refer to Council Directives 93/99/ECand 97/41/EC)	Participation in proficiency tests	Implementation of Quality Control Procedures
B	2	Accredited for the most important analytical methods and commodities	Both laboratories participated in the European Proficiency Test	Both laboratories take into account the Quality Control Procedures
DK	3	Accredited	No information	No information
D	40	Accredited	No information	No information
EL	6	In preparatory phase	Only the co-ordinated laboratory in Lycovrisi has participated in the EU Proficiency Test	EU-guidelines are followed as close as possible
E	12	3 accredited laboratories, the others are in process of accreditation	Most of the laboratories took part in EU Proficiency Tests	Quality Control Procedures followed to a large extent
F	6	2 laboratories accredited for some pesticides	Participation at BIPEA or CHEK Proficiency Tests	No information
IRL	1	The laboratory did not have accreditation status for 1998	Participation in EU Proficiency Test and FAPAS	Quality Control Procedures are taken into account
I	67	Some are accredited, for others accreditation is still in process	Participation in EU Proficiency Tests I + II (9 laboratories) and III (29 labo-ratories) and in FAPAS Proficiency Tests	No information
L	1	In preparatory phase	No information	Quality Control Procedures taken into account as far as possible

Country	No. of labora-tories	Accreditation (refer to Council Directives 93/99/ECand 97/41/EC)	Participation in proficiency tests	Implementation of Quality Control Procedures
NL	Reduction of labora-tories from 11 to 1 in September 1998	Quality Assurance System complies with EN 45001	CHEK, FAPAS, EU Proficiency test	Centralised laboratory implemented the EU Quality Control Proce-dures to a consi-derable extent
A	3	Accredited since autumn 1998	Participation in Proficiency tests, e.g. CHEK	As necessary for accreditation
P	No information	No accreditation yet	Participation in FAPAS Proficiency tests	No information
FIN	2	Accredited since 1998	Participation in Proficiency Tests	No information
S	1	Accredited by SWEDAC	Participation in intercollaboratory studies and ring test in 1998	No information
UK	5	All laboratories meet requirements of UKAS or GLP	All laboratories participated in Dutch CHEK Monitoring Programme, other international programmes, and FAPAS	No information
Norway	1	Accredited since 1997 (EN 45001 and GLP Nr. 2 and 7)	Regular participation in international Proficiency Tests	No information

8. RAPID ALERT SYSTEM

The Rapid Alert System for Foodstuffs was established by Council Directive 92/59/EEC[59] on General Product Safety.

Products entailing a serious and immediate risk to the health and safety of the consumer are classified as ALERT notifications according to Article 8 of Directive 92/59/EEC. The notifying Member State informs the Commission, which then notifies this to the contact points in all Member States. After receiving an ALERT notification, Member States should take appropriate action.

Notifications which do not fulfil the requirements laid down in Article 8 of Council Directive 92/59/EEC on General Product Safety, but which are nevertheless regarded as important information, are forwarded by the Commission to the contact points in the Member States as information notifications (NON-ALERTS).

In 1998, no ALERT was notified. However, it has to be borne in mind that the notification criteria are at the discretion of the Member States and vary considerably between Member States. Discussion of these criteria is ongoing.

9. SUMMARY

9.1. National Monitoring programmes

All fifteen Member States and Norway monitored pesticide residues in foodstuffs of plant origin. Overall, some 44 000 samples were analysed for, on average, 148 different pesticides.

In 36 % of the fruit, vegetable and cereal samples, residues of pesticides at or below the MRL were detected. In about 3.1 % of all samples, residues above the MRL (both national or EU harmonised MRL) were found, mainly in fruit and vegetables. 61 % of the samples contained no pesticide residues.

In 14 % of the samples, residues of more than one pesticide (multiple residues) were found, and in 2.0 % residues of four or more pesticides were detected. The pesticides found most often were mainly fungicides.

In 1997, pesticide residues below or at the MRL were found in about 36 % of the fruit, vegetable and cereal samples, with MRLs being exceeded in 3.4 % of cases. Multiple residues were detected in 16 % of the samples. Pesticides found most often were about the same in 1997 and 1998.

A comparison of the years 1996 to 1998 shows that the overall residue situation has not changed significantly, whereas it can be stated that there is a decrease in the number of samples with multiple residues from 1996 to 1998. However, it has to be borne in mind that the number of countries contributing data for this evaluation of multiple residues has been only 11 in 1996, compared to 15 in 1997 and 1998.

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[59] Official Journal No. L 228, 11/08/1992 p. 0024 - 0032

9.2. EU coordinated monitoring programme

In a special coordinated programme, four commodities (oranges, peaches, carrots and spinach) were analysed for twenty different pesticides. In this programme, about 5 200 samples were analysed. However, not every sample was analysed for all twenty pesticides. In 32 % of the samples, residues of one of the twenty pesticides below or at the MRL were found, and in 2.0 % of the samples MRLs were exceeded.

In this coordinated programme residues of one of the twenty pesticides were found most often in oranges, followed by peaches, carrots and spinach. However, residues exceeding the MRL were found most often in spinach (7.3 %), followed by peaches (1.6 %), carrots (1.2 %) and oranges (0.7 %). Of the twenty pesticides under the coordinated programme, residues of imazalil were found most often (19 %), followed by thiabendazol (10 %), chlorpyriphos (7.6 %), maneb-group (7.6 %) and methidathion (6.6 %). However, residues of the maneb-group exceeded MRLs most often (2.1 %), followed by the benomyl group (0.43 %) and vinclozolin (0.41 %). The highest residue found in this coordinated programme was 7.9 mg iprodione/kg spinach. Exposure assessments demonstrate that ADIs were not exceeded for these pesticide/commodity combinations nor acute RfDs were exceeded.

9.3. Quality assurance and sampling

Samples for the national and the EU coordinated programmes were taken at different points such as retailers, wholesalers, markets, points of entry and processing industries. National sampling plans exist in most countries, taking into consideration e.g. consumption data, production figures, import/export relation and risks (e.g. results from previous years).

Accreditation of laboratories has been fully completed only in some of the countries, whereas in other countries accreditation has been achieved only for a part of the laboratories. Most of the countries regularly took part in proficiency tests and have started implementation of the current Quality Control procedures. Workshops to further develop those procedures and the organisation of new proficiency tests for laboratories will further improve the situation.