Department for Environment, Food and Rural Affairs

The Expert Committee on Pesticide Residues in Food (PRiF)

Report on the pesticide residues monitoring programme: Results of Quarters 4 2020

This publication is available at Expert Committee on Pesticide Residues in Food

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Introduction and summary results

Introduction to the work of the Expert Committee on Pesticide Residues in Food (PRiF)

The PRiF's role is to give Ministers, the Director of the Health and Safety Executive (HSE) and the Chief Executive of the Food Standards Agency (FSA) independent advice on the UK government's national rolling programme of surveys, in particular:

- the planning of surveillance programmes for pesticide residues in the UK food supply and the evaluation of the results;
- procedures for sampling, sample processing, new methods of analysis, the assessment of variability of pesticide residues in food and related issues.

The Expert Committee on Pesticide Residues in Food was established in 2011. Our members have a broad range of expertise relating to the food supply industry. The main function of the Committee is to advise on the Government's £2 million pesticide residues surveillance programme. Previously this work was carried out by the Pesticide Residues Committee.

Our Chair, Ann Davison has worked in consumer affairs for most of her career, running consumer organisations and networks. The committee also includes members with expertise in food science, food production and supply as well as two public interest experts.

Information on the membership of the PRiF is also available on the PRiF's website: Expert Committee on Pesticide Residues in Food

National Monitoring Programme

HSE, working under Defra's authority, has official responsibility to organise a monitoring programme of UK food for pesticide residues. The programme is made up of a risk-based national rolling programme of surveys and includes participation in EU-wide monitoring. It is a surveillance programme, which is designed based upon evidence gathered in the previous year including previous results, PRiF advice and border control information. It is not an enforcement programme but if we find residues which might have resulted from illegal use, we pass them back to the HSE for investigation and, if appropriate, follow-up. Its design is not generally adjusted during the year.

HSE is also responsible for considering the safety of people who eat the food (in co-operation with the Food Standards Agency if necessary) and for following up adverse or unexpected results. They are also responsible for determining whether food is compliant with the law, specifically, whether any pesticide residue found is within the Maximum Residue Level. Maximum Residue Levels (MRLs) reflect levels of pesticides that could occur in food, which has been treated in accordance with good agricultural practice. Where pesticides do not give rise to readily detectable residues, or do not have plant protection products (PPPs) authorised for use on particular commodities, MRLs are set at the lowest level which can be identified in routine laboratory analysis. This provides a mechanism for statutory controls on pesticides in food which is put into circulation and for monitoring the correct use of these chemicals.

Chair's summary of results

This is our Quarter 4 report for 2020.

Collection of samples of food for testing as part of the national pesticide residue in food programme 2020 was influenced by the measures in place to restrict the spread of the COVID-19 virus and the need to protect workers. HSE took the decision to restrict the collection of samples by using online and click and collect options for sampling. Special consideration was given to the choice of samples to be collected to ensure the integrity and scope of the programme would be maintained. We are aware however that sampling in this way can lead to some suppliers being sampled more frequently than others due to the availability of supply. We will be noting this in our consideration of the results. This report analyses samples taken and tested by the HSE between July and December 2020.

During this year's surveillance programme, we are looking for a range of up to 370 pesticides in the fruit and vegetable surveys. Quarter 4 programme surveyed 751 samples of 25 different foods (see contents page for a full list).

14 of the 751 samples surveyed contained residues above the legal Maximum Residue Level (the maximum permitted levels by law). These results are detailed in the survey reports. A summary table of all results can be found on page 9.

HSE undertakes a screening risk assessment for every residue found, to determine whether the residues could lead to intakes above the relevant short-term and long-term reference (safety) doses. HSE also produces detailed risk assessments for every case where the actual residue level found could lead to an intake above the safety levels.

We have considered the following surveys in more detail; beans with pods, dried fruits (grapes), grapes, oranges and pears.

This is the first full quarter of results where new, higher chlorate MRLs have been in effect. We have detected no residues above those MRLs but we have included an updated note on chlorate in Section 4.

Full details of suppliers and retailers of the food sampled, and full analytical results, are available on data.gov.uk as ODF (Open Document Format) spreadsheet files. We hope this data format is useful for people wanting to look at the individual results in more detail.

We asked suppliers and the authorities of the exporting countries of samples with possible compliance issues for an explanation of our findings. Any responses we have received specifically for publication are available in Section 2 sample details and supplier responses.

Ann Davison
Chair of the Expert Committee on Pesticide Residues in Food

Summary of Table of Results

Food	Analysed	With residues at or below the MRL	With residues above the MRL	With residues of non- authorised pesticides (UK only)	With multiple residues	Organic samples tested	Organic samples with residues
Beans with pods	24	13	3	1	10	3	1
Bread	66	53	0	0	16	2	0
Carrot	30	15	0	0	6	10	0
Cauliflower	31	11	1	1	1	4	0
Cheese (Hard)	61	2	1	0	0	6	0
Courgette	30	10	0	0	5	13	1
Dried fruits (grapes)	36	30	0	0	27	6	0
Fish (oily)	30	5	0	0	0	0	N/A
Grapes	22	22	0	0	20	2	2
Kiwi Fruit	17	3	0	0	1	4	0
Lamb	11	1	0	0	0	2	0

Food	Analysed	With residues at or below the MRL	With residues above the MRL	With residues of non- authorised pesticides (UK only)	With multiple residues	Organic samples tested	Organic samples with residues
Liver	25	1	1	0	0	2	0
Mango	22	5	0	0	0	1	0
Milk	54	0	0	0	0	15	0
Okra	25	8	3	0	5	0	0
Onions	22	7	0	0	5	12	0
Oranges	28	24	0	0	22	6	2
Pate (fish)	24	6	0	0	0	0	N/A
Pears	18	11	1	0	11	6	0
Peas (edible pods)	31	25	2	0	16	0	0
Potatoes	38	18	0	0	1	0	0
Poultry meat	18	0	0	0	0	2	0
Pumpkin and squash	24	2	2	0	1	2	0

Food	Analysed	With residues at or below the MRL	With residues above the MRL	With residues of non- authorised pesticides (UK only)	With multiple residues	Organic samples tested	Organic samples with residues
Rye	41	25	0	0	22	14	0
Sweet Potatoes	23	3	0	0	1	9	0

Summary of MRL Exceedances

Sample ID	Food Type	Country of Origin	Pesticide Detected	Residue Detected (mg/kg)	MRL (mg/kg)	MRL exceedance after allowing for measurement uncertainty
Beans with pods						
2546/2020	Green Beans	Kenya	DDAC (sum)	0.2	0.1	No
4314/2020	Speciality Beans	Malaysia	amitraz (sum)	0.09	0.05*	No
			chlorfenapyr	0.1	0.01*	Yes
			diafenthiuron	0.1	0.01*	Yes
			dithiocarbamates	2.4	1	Yes
4678/2020	Speciality Beans	India	kresoxim-methyl	0.06	0.01*	Yes
Cauliflower						
4634/2020	Fresh	UK	flonicamid (sum)	0.1	0.03*	Yes
Cheese (Hard)						
1522/2020	Taleggio	Italy	BAC (sum)	0.5	0.1	Yes
Liver						
3511/2020	Cattle/Cow	UK	BAC (sum)	0.2	0.1	No
Okra						
4315/2020	Fresh	India	flonicamid (sum)	0.1	0.03*	Yes
4521/2020	Fresh	Jordan	pyridaben	0.2	0.01*	Yes
4745/2020	Fresh	Ghana	flubendiamide	0.05	0.01*	Yes

Sample ID	Food Type	Country of Origin	Pesticide Detected	Residue Detected (mg/kg)	MRL (mg/kg)	MRL exceedance after allowing for measurement uncertainty
			thiacloprid	0.03	0.01*	Yes
			Pears			
4515/2020	Conference Pears	Belgium	chlormequat	0.2	0.07	Yes
			Peas (edible pods)			
1339/2020	Mange Tout	Peru	captan (sum)	0.04	0.03*	No
1377/2020	Mange Tout	Kenya	BAC (sum)	0.2	0.1	Yes
			Pumpkin and squash			
0596/2020	Pumpkin	UK	Dieldrin (sum)	0.06	0.03	Yes
2105/2020	Squash	Spain	permethrin (sum)	0.07	0.05*	No

*** Maximum Residue Levels set at the LOD (LOD MRL):** These MRLs are set at a default level, i.e. at the limit of determination (LOD) where analytical methods can reasonably detect the presence of the pesticide. Either insufficient trials data are available on which to set a maximum residue level or there may be no use of the pesticide on that crop in the EU. However, they may be permitted elsewhere.

Chlorate residues above the LOD MRL in place at the time of sampling have not been marked as exceedances, see Section 4 for explanation.

Section 1: findings by food

Beans with Pods

Summary of results

In a survey of 24 samples of beans with pods collected between October and November 2020, three samples contained a pesticide residue above the MRL. These results were reviewed by the Expert Committee on Pesticide Residues in Food (PRiF).

Comments by the PRiF

DDAC

One sample of organic green beans contained a residue of DDAC. DDAC is widely used as a biocide (disinfectant) during food preparation and processing. This is the most likely source of the residue.

Monocrotophos

One sample contained a residue of monocrotophos at 0.008 mg/kg. The MRL is 0.01 mg/kg.

Monocrotophos is an insecticide that has not been authorised for use in the EU since 2003; the toxicological data package for monocrotophos is old, and HSE has used the JMPR assessment of these data. At this level of 0.008 mg/kg the intake is below the ADI and the ARfD. Nevertheless, because of uncertainty about the potential for genetic damage (genotoxicity) at low doses, on a precautionary basis any findings of monocrotophos in food are not desirable.

Due to concerns about potential toxicological issues, for 2020 onwards, we have reduced the reporting limit for monocrotophos. We wish to determine how prevalent it is in food. A more detailed explanation is with the risk assessments on page 71.

Survey design

Beans with pods surveys are reported more regularly throughout the year as part of rolling reporting.

The samples were collected by either Animal and Plant Health Agency's Horticultural Marketing Inspectors from a range of points in the supply chain (wholesalers, retail depots, ports and import points) or they were bought by a market research company online from retail outlets across the UK by home delivery or collection at the store.

Full sample details, including brand name information, pesticides sought and residues found are available in an accessible format at Pesticide Residues in Food Quarterly Data

Samples tested

24 samples were tested for up to 366 pesticide residues

Dwarf Beans

- 2 samples came from the UK

Fine Beans

- 1 sample came from the UK
- 4 samples were imported from outside the EU

Green Beans

- 3 samples came from the UK
- 4 samples were imported from outside the EU

Runner Beans

- 2 samples came from the UK
- 1 sample was imported from outside the EU

Speciality Beans

- 6 samples were imported from outside the EU
- 1 sample came from the EU

Pesticide residues detected from those sought

8 samples contained no residues from those sought

16 samples contained residues above the reporting limit

3 samples contained residues above the MRL

3 samples were labelled as organic.1 contained residues from those sought

Multiple residues

10 samples contained residues of more than one pesticide

- 6 samples contained 2 residues
- 1 sample contained 3 residues
- 1 sample contained 4 residues
- 1 sample contained 9 residues
- 1 sample contained 11 residues

Residues measured above the MRL

The laboratory detected 6 residues above the MRL in beans with pods

- 1 sample from Kenya contained a residue of DDAC (sum) at 0.2 mg/kg. The MRL is 0.1* mg/kg
- 1 sample from Malaysia contained residues of
    - amitraz (sum) at 0.09 mg/kg. The MRL is 0.05* mg/kg
    - chlorfenapyr at 0.1 mg/kg. The MRL is 0.01* mg/kg
    - diafenthiuron at 0.1 mg/kg. The MRL is 0.01* mg/kg

* **Maximum Residue Levels set at the LOD (LOD MRL):** These MRLs are set at a default level, i.e. at the limit of determination (LOD) as specified in EC Regulation 396/2005.

    - dithiocarbamates at 2.4 mg/kg. The MRL is 1 mg/kg
- 1 sample from India contained a residue of kresoxim-methyl at 0.06 mg/kg. The MRL is 0.01* mg/kg

Risk assessments

One sample of Guar beans from India, contained a residue of monocrotophos. Monocrotophos is an insecticide that has not been authorised for use in the EU since 2003; the toxicological data package for monocrotophos is old, and HSE has used the JMPR assessment of these data. At this residue level of 0.008 mg/kg the intake is below the ADI and the ARfD. Nevertheless, because of uncertainty about the potential for genetic damage (genotoxicity) at low doses, on a precautionary basis any findings of monocrotophos in food are not desirable. Therefore, for 2020 onwards we have reduced the reporting limit for this active as we wish to determine how prevalent it is in food. A more detailed explanation is with the risk assessments on page 71.

For the remaining findings of individual residues or combined residues detected by the laboratory an effect on health is not expected.

Combined risk assessments

Some samples contained residues of more than one pesticide. Some of these residues are from pesticides which belong to similar chemical groups and may have similar toxicological effects. So, the risk assessors needed to consider their possible impacts on human health, both on their own and in combination.

HSE carried out a combined risk assessment of the relevant samples. We would not expect any of these combinations to have an effect on health.

Follow up actions

Letters sent

The secretariat has written to the suppliers of the samples with residues above the MRL. Any response received are in Section 2.

Organic samples with a residue

The Secretariat has written to the supplier of the sample of organic green beans from Kenya with a residue of DDAC (sum). Its use as a plant protection product is not permitted in organic food production. Defra's Organic Farming branch and the organic certification organisation were also informed.

Further investigation: Suspected unauthorised use

We have passed to HSE details of one sample from the UK that contained a residue of chlorpyrifos. The investigation has now concluded and no further investigation was required.

Bread

Summary of results

In a survey of 66 samples of bread collected between October and November 2020, none of the samples contained a pesticide residue above the MRL. These results were reviewed by the Expert Committee on Pesticide Residues in Food (PRiF).

Comments by the PRiF

None of the residues detected would be expected to have an effect on health.

Survey design

The bread samples were bought by a market research company online from retail outlets across the UK by home delivery or collection at the store.

Full sample details, including brand name information, pesticides sought and residues found are available in an accessible format at Pesticide Residues in Food Quarterly Data.

Samples tested

66 samples were tested for up to 366 pesticide residues

Ordinary Bread: Brown
- 1 sample came from the UK

Ordinary Bread: Other
- 3 samples came from the UK

Ordinary Bread: White
- 16 samples came from the UK

Ordinary Bread: Wholemeal
- 9 samples came from the UK

Speciality Bread: Ciabatta
- 5 samples came from the UK

Speciality Bread: Flat Bread
- 3 samples came from the UK

Speciality Bread: Focaccia
- 1 sample came from the UK

Speciality Bread: Garlic Bread
- 4 samples came from the UK

Speciality Bread: Naan
- 7 samples came from the UK

Speciality Bread: Olive Bread

- 1 sample came from the UK

Speciality Bread: Pitta (other)

- 3 samples came from the UK
- 3 samples came from the EU

Speciality Bread: Rye (other)

- 1 sample came from the EU

Speciality Bread: Rye (wholemeal)

- 1 sample came from the EU

Speciality Bread: Soda

- 1 sample came from the EU

Speciality Bread: Wraps (other)

- 7 samples came from the UK

The country of origin of samples may not be the same as the country where the bread was produced. It may be where the bread was processed, where they were packed for consumer purchase or the address of the brand owner.

Pesticide residues detected from those sought

13 samples contained no residues from those sought

53 samples contained residues above the reporting limit

None of the samples contained residues above the MRL

2 samples were labelled as organic. Neither contained residues from those sought

Multiple residues

16 samples contained residues of more than one pesticide

- 15 samples contained 2 residues
- 1 sample contained 4 residues

Risk assessments

None of the individual residues or combined residues detected by the laboratory would be expected to have an effect on health.

Combined risk assessments

Some samples contained residues of more than one pesticide. Some of these residues are from pesticides which belong to similar chemical groups and may have similar toxicological effects. So, the risk assessors needed to consider their possible impacts on human health, both on their own and in combination.

HSE carried out a combined risk assessment of the relevant samples. We would not expect any of these combinations to have an effect on health.

Carrot

Summary of results

In a survey of 30 samples of carrots collected between October and November 2020, none of the samples contained a pesticide residue above the MRL. These results were reviewed by the Expert Committee on Pesticide Residues in Food (PRiF).

Comments by the PRiF

None of the residues detected would be expected to have an effect on health.

Survey design

This year carrots are being surveyed across the EU as part of the EU Co-ordinated Multi Annual Control Programme.

The samples were collected by either, Animal and Plant Health Agency's Horticultural Marketing Inspectors from a range of points in the supply chain (wholesalers, retail depots, ports and import points) or they were bought by a market research company online from retail outlets across the UK by home delivery or collection at the store.

Full sample details, including brand name information, pesticides sought and residues found are available in an accessible format at Pesticide Residues in Food Quarterly Data

Samples tested

30 samples were tested for up to 370 pesticide residues

Fresh

- 27 samples came from the UK
- 2 samples came from the EU

Frozen

- 1 sample came from the UK

Pesticide residues detected from those sought

15 samples contained no residues from those sought

15 samples contained residues above the reporting limit

None of the samples contained residues above the MRL

10 samples were labelled as organic. None contained residues from those sought

Multiple residues

6 samples contained residues of more than one pesticide

- 3 samples contained 2 residues
- 2 samples contained 3 residues
- 1 sample contained 4 residues

Risk assessments

None of the individual residues or combined residues detected by the laboratory would be expected to have an effect on health.

Combined risk assessments

Some samples contained residues of more than one pesticide. Some of these residues are from pesticides which belong to similar chemical groups and may have similar toxicological effects. So, the risk assessors needed to consider their possible impacts on human health, both on their own and in combination.

HSE carried out a combined risk assessment of the relevant samples. We would not expect any of these combinations to have an effect on health.

Cauliflower

Summary of results

In a survey of 31 samples of cauliflower collected between October and November 2020, one sample contained a pesticide residue above the MRL. These results were reviewed by the Expert Committee on Pesticide Residues in Food (PRiF).

Comments by the PRiF

None of the residues detected would be expected to have an effect on health.

Survey design

This year cauliflower is being surveyed across the EU as part of the EU Co-ordinated Multi Annual Control Programme.

The samples were collected by either, Animal and Plant Health Agency's Horticultural Marketing Inspectors from a range of points in the supply chain (wholesalers, retail depots, ports and import points) or they were bought by a market research company online from retail outlets across the UK by home delivery or collection at the store.

Full sample details, including brand name information, pesticides sought and residues found are available in an accessible format at Pesticide Residues in Food Quarterly Data

Samples tested

31 samples were tested for up to 369 pesticide residues

Fresh

- 23 samples came from the UK
- 4 samples came from the EU

Frozen

- 4 samples came from the EU

Pesticide residues detected from those sought

19 samples contained no residues from those sought

12 samples contained residues above the reporting limit

1 sample contained residues above the MRL

4 samples were labelled as organic. None contained residues from those sought

Multiple residues

1 sample contained residues of more than one pesticide

- 1 sample contained 2 residues

Residues measured above the MRL

The laboratory detected 1 residue above the MRL in cauliflower

- 1 sample from UK contained a residue of flonicamid (sum) at 0.1 mg/kg. The MRL is 0.03* mg/kg

Risk assessments

None of the individual residues or combined residues detected by the laboratory would be expected to have an effect on health.

Combined risk assessments

One sample contained residues of more than one pesticide. We do not expect these residues to have an effect on health, either separately or in combination. The pesticide residues found in each sample do not include more than one of the pesticides from the groups that the Health and Safety Executive (HSE) consider separately.

Follow up actions

Letters Sent

The secretariat has written to the suppliers of the samples with residues above the MRL. Any response received are in Section 2.

Further investigation: Suspected Unauthorised use

We have passed to HSE details of one sample from the UK that contained a residue of flonicamid (sum) which does not have a plant protection product (PPP) with that active, authorised in the UK for use on cauliflower. HSE is investigating the source of the residue; brand name details will not be published until the investigations are complete.

* **Maximum Residue Levels set at the LOD (LOD MRL):** These MRLs are set at a default level, i.e. at the limit of determination (LOD) as specified in EC Regulation 396/2005.

Cheese (hard)

Summary of results

In a survey of 61 samples of cheese (hard) collected between July and November 2020, one sample contained a pesticide residue above the MRL. These results were reviewed by the Expert Committee on Pesticide Residues in Food (PRiF).

Comments by the PRiF

None of the residues detected would be expected to have an effect on health.

BAC

One sample of cheese contained a residue of BAC, this substance is widely used as biocides (disinfectants) during food preparation and processing. This is the most likely source of the residue.

Survey design

The cheese samples were bought by a market research company online from retail outlets across the UK by home delivery or collection at the store.

Full sample details, including brand name information, pesticides sought and residues found are available in an accessible format at Pesticide Residues in Food Quarterly Data

Samples tested

61 samples were tested for up to 110 pesticide residues

Cheddar
- 32 samples came from the UK

Double Gloucester
- 4 samples came from the UK

Edam
- 7 samples came from the EU

Gouda
- 3 samples came from the EU

Parmesan
- 2 samples came from the EU

Red Leicester
- 10 samples came from the UK

Stilton
- 2 samples came from the UK

Taleggio
- 1 sample came from the EU

The country of origin of samples may not be the same as the country where the cheese was produced. It may be where the cheese was processed, where they were packed for consumer purchase or the address of the brand owner.

Pesticide residues detected from those sought

58 samples contained no residues from those sought

3 samples contained residues above the reporting limit

1 sample contained a residue above the MRL

6 samples were labelled as organic. None contained residues from those sought

Multiple residues

No samples contained residues of more than one pesticide

Residues measured above the MRL

The laboratory detected 1 residue above the MRL in cheese (hard)

- 1 sample from Italy contained a residue of BAC (sum) at 0.5 mg/kg. The MRL is 0.1 mg/kg

Risk assessments

None of the residues detected would be expected to have an effect on health.

Follow up actions

Letters sent

The secretariat has written to the suppliers of the samples with residues above the MRL. Any response received are in Section 2.

Courgette

Summary of results

In a survey of 30 samples of courgette collected between October and November 2020, none of the samples contained a pesticide residue above the MRL. These results were reviewed by the Expert Committee on Pesticide Residues in Food (PRiF).

Comments by the PRiF

None of the residues detected would be expected to have an effect on health.

Survey design

The courgette samples were bought by a market research company online from retail outlets across the UK by home delivery or collection at the store.

Full sample details, including brand name information, pesticides sought and residues found are available in an accessible format at Pesticide Residues in Food Quarterly Data

Samples tested

30 samples were tested for up to 368 pesticide residues

2 samples came from the UK

28 samples came from the EU

Pesticide residues detected from those sought

20 samples contained no residues from those sought

10 samples contained residues above the reporting limit

None of the samples contained residues above the MRL

13 samples were labelled as organic.1 contained residues from those sought

Multiple residues

5 samples contained residues of more than one pesticide

- 1 sample contained 2 residues
- 4 samples contained 3 residues

Risk assessments

None of the individual residues or combined residues detected by the laboratory would be expected to have an effect on health.

Combined risk assessments

Some samples contained residues of more than one pesticide. We do not expect these residues to have an effect on health, either separately or in combination. The pesticide residues found in each sample do not include more than one of the pesticides from the groups that the Health and Safety Executive (HSE) consider separately.

Follow up actions

Organic samples with a residue

The Secretariat has written to the supplier of the sample of organic courgette from Spain with a residue of spinosad (sum). Although this is legally permitted in organic food production we inform Defra's Organic Farming branch and the organic certification organisation of any pesticide findings because they have responsibility for this area.

Dried Fruit (Grapes)

Summary of results

In a survey of 36 samples of dried fruit (grapes) collected during November 2020, none of the samples contained a pesticide residue above the MRL. These results were reviewed by the Expert Committee on Pesticide Residues in Food (PRiF).

Comments by the PRiF

Dimethoate

One sample of sultanas contained a residue of dimethoate where the effect on health needed to be considered in more detail.

In 2018[1] EFSA reviewed dimethoate and concluded that no toxicological reference values could be determined for dimethoate, due to a lack of a fully supporting toxicological database. We think that, at the anticipated highest exposures following consumption of this sultana sample, an effect on health is not expected based on short term toxicity. In terms of long-term adverse health effects, it is unclear whether dimethoate can damage genetic material (is genotoxic).

Based on the full risk assessment performed by HSE (see page 72), on a precautionary basis any findings of dimethoate are undesirable due to the uncertainty regarding genotoxicity. However, we consider any effect on health unlikely at the levels of exposure anticipated.

Dimethoate is not approved for use in the UK.

Survey design

The dried fruit (grapes) samples were bought by a market research company online from retail outlets across the UK by home delivery or collection at the store.

Full sample details, including brand name information, pesticides sought and residues found are available in an accessible format at Pesticide Residues in Food Quarterly Data.

Samples tested

36 samples were tested for up to 368 pesticide residues

Currants

- 1 sample came from the UK
- 3 samples came from the EU

Raisins

- 17 samples were imported from outside the EU

[1] EFSA (European Food Safety Authority), 2018. Conclusion on the peer review of the pesticide risk assessment of the active substance dimethoate. *EFSA Journal* 2018;16(10):5454, 29 pp. https://doi.org/10.2903/j.efsa.2018.5454

Sultanas

- 3 samples came from the UK
- 12 samples were imported from outside the EU

The country of origin of samples may not be the same as the country where the dried fruit was produced. It may be where the dried fruit was processed, where it was packed for consumer purchase or the address of the brand owner.

Pesticide residues detected from those sought

6 samples contained no residues from those sought

30 samples contained residues above the reporting limit

None of the samples contained residues above the MRL

6 samples were labelled as organic. None contained residues from those sought

Multiple residues

27 samples contained residues of more than one pesticide

- 1 sample contained 2 residues
- 2 samples contained 6 residues
- 1 sample contained 7 residues
- 2 samples contained 8 residues
- 2 samples contained 9 residues
- 1 sample contained 11 residues
- 1 sample contained 13 residues
- 3 samples contained 15 residues
- 3 samples contained 16 residues
- 4 samples contained 17 residues
- 2 samples contained 18 residues
- 1 sample contained 19 residues
- 4 samples contained 21 residues

Note – Although there appear to be high number of individual residues detected in the dry fruit samples, this may not mean that any individual grape crop had been treated with each pesticide. Each sample tested would contain fruit from multiple growers or sources.

Risk assessments

One sample required a detailed evaluation of risk and this is summarised below. For the remaining findings of individual residues or combined residues detected by the laboratory an effect on health is not expected.

Dimethoate

One sample of sultanas (sample 2057/2020) contained residues of dimethoate of 0.004 mg/kg (MRL 0.01mg/kg).

EFSA (2018)[2] for dimethoate, has indicated that no toxicological reference values could be determined for dimethoate, due to a lack of a fully supporting toxicological database.

Short term effects: We think that at the anticipated highest exposures following consumption of this sultana sample containing this low level residue (0.004 mg/kg of dimethoate), an effect on health is not expected based on short term toxicity. Although EFSA did not formally set an ARfD, they indicated a hypothetical toxicological reference value for short term exposure which is considered precautionary. Based on the residue level found, all the calculated dietary intakes for the consumer groups are within this hypothetical toxicological reference value, and a short term effect on health is not expected.

Long term effects: It is unclear whether dimethoate can damage genetic material (is genotoxic); however, this is unlikely at the exposure level estimated in this assessment.

Based on the full risk assessment performed by HSE (see page 72), on a precautionary basis any findings of dimethoate are undesirable due to the uncertainty regarding genotoxicity. However, we consider any effect on health unlikely at the highest levels of exposure anticipated.

Combined risk assessments

Some samples contained residues of more than one pesticide. Some of these residues are from pesticides which belong to similar chemical groups and may have similar toxicological effects. So, the risk assessors needed to consider their possible impacts on human health, both on their own and in combination.

HSE carried out a combined risk assessment of the relevant sample. We would not expect any of these combinations to have an effect on health.

[2] EFSA (European Food Safety Authority), 2018. Conclusion on the peer review of the pesticide risk assessment of the active substance dimethoate. *EFSA Journal* 2018;16(10):5454, 29 pp. https://doi.org/10.2903/j.efsa.2018.5454

Fish (oily)

Summary of results

In a survey of 30 samples of fish (oily) collected between October and November 2020, none of the samples contained a pesticide residue above the MRL. These results were reviewed by the Expert Committee on Pesticide Residues in Food (PRiF).

Comments by the PRiF

None of the residues detected would be expected to have an effect on health.

BAC and DDAC

Two samples of seabass contained a residue of DDAC, this substance is widely used as biocides (disinfectants) during food preparation and processing. This is the most likely source of the residue.

DDT

One sample of salmon and two samples of seabass contained residues of DDT.

The use of DDT is banned or heavily restricted in many countries because the residues take a long time to break down in the environment and can accumulate in fatty tissue.

An interpretation of the analytical results shows that the DDT residue found was in the form of DDE which indicates historical use. More detailed information about DDT residues is in section 4 of this report.

Survey design

The fish samples were bought by a market research company online from retail outlets across the UK by home delivery or collection at the store.

Full sample details, including brand name information, pesticides sought and residues found are available in an accessible format at Pesticide Residues in Food Quarterly Data.

Samples tested

30 samples were tested for up to 38 pesticide residues

Mackerel

- 3 samples came from the UK
- 1 sample was imported from outside the EU
- 1 sample came from the EU

Monkfish

- 1 sample came from the UK

Salmon

- 5 samples came from the UK
- 6 samples were imported from outside the EU

Seabass

- 1 sample came from the UK
- 10 samples were imported from outside the EU
- 2 samples came from the EU

Where no sea area information is available, the country of origin on the packaging does not necessarily indicate where the fish was caught or farmed. It could be where it was landed or processed or where it was packed for retail sale.

Pesticide residues detected from those sought

25 samples contained no residues from those sought

5 samples contained residues above the reporting limit

None of the samples contained residues above the MRL

None of the samples were labelled as organic.

Multiple residues

No samples contained residues of more than one pesticide

Risk assessments

None of the residues detected would be expected to have an effect on health.

Grapes

Summary of results

In a survey of 22 samples of grapes collected between October and November 2020, none of the samples contained a pesticide residue above the MRL. These results were reviewed by the Expert Committee on Pesticide Residues in Food (PRiF).

Comments by the PRiF

A residue was found of an insecticide which indicated the presence of either lambda-cyhalothrin or gamma-cyhalothrin. These residues are indistinguishable by conventional analysis and in the past have been assessed for risk on the basis that the pesticide residue arose from lambda-cyhalothrin. Recently a lower acute reference dose has been established for gamma-cyhalothrin, so on a precautionary basis when assessing consumer risk. HSE have assumed that the residues are the more toxic form. At a residue of 0.05 mg/kg, assumed to be gamma-cyhalothrin, based on the full risk assessment performed (see page 73), we consider an effect on health unlikely.

Survey design

This year grapes are being surveyed across the EU as part of the EU Co-ordinated Multi Annual Control Programme and as part of the rolling reporting.

The samples were collected by either, Animal and Plant Health Agency's Horticultural Marketing Inspectors from a range of points in the supply chain (wholesalers, retail depots, ports and import points) or they were bought by a market research company online from retail outlets across the UK by home delivery or collection at the store.

Full sample details, including brand name information, pesticides sought and residues found are available in an accessible format at Pesticide Residues in Food Quarterly Data

Samples tested

22 samples were tested for up to 368 pesticide residues

8 samples were imported from outside the EU

14 samples came from the EU

Pesticide residues detected from those sought

All samples contained residues

None of the samples contained residues above the MRL

2 samples were labelled as organic. Both contained residues from those sought

Multiple residues

20 samples contained residues of more than one pesticide

- 1 sample contained 2 residues

- 7 samples contained 3 residues
- 4 samples contained 4 residues
- 1 sample contained 5 residues
- 1 sample contained 6 residues
- 3 samples contained 7 residues
- 1 sample contained 8 residues
- 1 sample contained 10 residues
- 1 sample contained 17 residues

Risk assessments

Lambda cyhalothrin, Gamma cyhalothrin

One sample of grapes contained a residue of lambda-cyhalothrin at levels of 0.05 mg/kg where the effect on health needed to be considered in more detail.

Residues of lambda-cyhalothrin are indistinguishable analytically from gamma-cyhalothrin, and the residue could have arisen from application of either gamma-cyhalothrin or lambda-cyhalothrin. As a worst case, it is assumed that the residues in the sample are possibly derived from application of gamma-cyhalothrin to the crop, and therefore this assessment has used the specific ARfD for gamma-cyhalothrin (which is two-fold lower than that for lambda-cyhalothrin). However, it is recognised that the residue could have arisen from the different isomeric form (lambda-cyhalothrin) with is less toxic than gamma-cyhalothrin.

HSE's assessment of risk concludes that an effect on health is unlikely. Full risk assessment is available at page 73.

Combined risk assessments

Some samples contained residues of more than one pesticide. Some of these residues are from pesticides which belong to similar chemical groups and may have similar toxicological effects. So, the risk assessors needed to consider their possible impacts on human health, both on their own and in combination.

HSE carried out a combined risk assessment of the relevant samples. We would not expect any of these combinations to have an effect on health.

Follow up actions

Organic samples with a residue

The secretariat has written to the suppliers of two samples of organic grapes from Italy with a residue of spinosad (sum). Although this is legally permitted in organic food production we inform Defra's Organic Farming branch and the organic certification organisation of any pesticide findings because they have responsibility for this area.

Kiwi Fruit

Summary of results

In a survey of 17 samples of kiwi fruit collected between October and November 2020, none of the samples contained a pesticide residue above the MRL. These results were reviewed by the Expert Committee on Pesticide Residues in Food (PRiF).

Comments by the PRiF

None of the residues detected would be expected to have an effect on health.

Survey design

This year kiwi fruit is being surveyed across the EU as part of the EU Co-ordinated Multi Annual Control Programme.

The samples were collected by either, Animal and Plant Health Agency's Horticultural Marketing Inspectors from a range of points in the supply chain (wholesalers, retail depots, ports and import points) or they were bought by a market research company online from retail outlets across the UK by home delivery or collection at the store.

Full sample details, including brand name information, pesticides sought and residues found are available in an accessible format at Pesticide Residues in Food Quarterly Data

Samples tested

17 samples were tested for up to 370 pesticide residues

7 samples were imported from outside the EU

10 samples came from the EU

Pesticide residues detected from those sought

14 samples contained no residues from those sought

3 samples contained residues above the reporting limit

None of the samples contained residues above the MRL

4 samples were labelled as organic. None contained residues from those sought

Multiple residues

1 sample contained residues of more than one pesticide

- 1 sample contained 2 residues

Risk assessments

None of the individual residues or combined residues detected by the laboratory would be expected to have an effect on health.

Combined risk assessments

One sample contained residues of more than one pesticide. We do not expect these residues to have an effect on health, either separately or in combination. The pesticide residues found in each sample do not include more than one of the pesticides from the groups that the Health and Safety Executive (HSE) consider separately.

Lamb

Summary of results

In a survey of 11 samples of lamb collected between October and November 2020, none of the samples contained a pesticide residue above the MRL. These results were reviewed by the Expert Committee on Pesticide Residues in Food (PRiF).

Comments by the PRiF

None of the residues detected would be expected to have an effect on health.

BAC

One sample of lamb contained a residue of BAC, this substance is widely used as biocides (disinfectants) during food preparation and processing. This is the most likely source of the residue.

Survey design

The lamb samples were bought by a market research company online from retail outlets across the UK by home delivery or collection at the store.

Full sample details, including brand name information, pesticides sought and residues found are available in an accessible format at Pesticide Residues in Food Quarterly Data.

Samples tested

11 samples were tested for up to 38 pesticide residues

Lamb

- 11 samples came from the UK

The country of origin of samples may not be the same as the country where the lamb was produced. It may be where the lamb was processed, where it was packed for consumer purchase or the address of the brand owner.

Pesticide residues detected from those sought

10 samples contained no residues from those sought

1 sample contained residues above the reporting limit

None of the samples contained residues above the MRL

2 samples were labelled as organic. Neither contained residues from those sought

Multiple residues

No samples contained residues of more than one pesticide

Risk assessments

None of the residues detected would be expected to have an effect on health

Liver

Summary of results

In a survey of 25 samples of bovine liver collected between October and November 2020, one sample contained a pesticide residue above the MRL. These results were reviewed by the Expert Committee on Pesticide Residues in Food (PRiF).

Comments by the PRiF

None of the residues detected would be expected to have an effect on health.

BAC

Two samples of liver contained a residue of BAC, this substance is widely used as biocides (disinfectants) during food preparation and processing. This is the most likely source of the residue.

Survey design

This year liver is being surveyed across the EU as part of the EU Co-ordinated Multi Annual Control Programme.

The liver samples were bought by a market research company online from retail outlets across the UK by home delivery or collection at the store.

Full sample details, including brand name information, pesticides sought and residues found are available in an accessible format at Pesticide Residues in Food Quarterly Data.

Samples tested

25 samples were tested for up to 110 pesticide residues

Calf

- 12 samples came from the UK
- 1 sample came from the EU

Cattle/Cow

- 2 samples came from the UK

Ox

- 10 samples came from the UK

The country of origin of samples may not be the same as the country where the liver was produced. It may be where the liver was processed, where it was packed for consumer purchase or the address of the brand owner.

Pesticide residues detected from those sought

23 samples contained no residues from those sought

2 samples contained residues above the reporting limit

1 sample contained residues above the MRL

2 samples were labelled as organic. Neither contained residues from those sought

Multiple residues

No samples contained residues of more than one pesticide

Residues measured above the MRL

The laboratory detected 1 residue above the MRL in liver

- 1 sample from UK contained a residue of BAC (sum) at 0.2 mg/kg. The MRL is 0.1 mg/kg

Risk assessments

None of the residues detected would be expected to have an effect on health.

Follow up actions

Letters sent

The secretariat has written to the suppliers of the samples with residues above the MRL. Any response received are in Section 2.

Mango

Summary of results

In a survey of 22 samples of whole, fresh, prepared and frozen mango collected between October and November 2020, none of the samples contained a pesticide residue above the MRL. These results were reviewed by the Expert Committee on Pesticide Residues in Food (PRiF).

Comments by the PRiF

None of the residues detected would be expected to have an effect on health.

Survey design

The mango samples were bought by a market research company online from retail outlets across the UK by home delivery or collection at the store.

Full sample details, including brand name information, pesticides sought and residues found are available in an accessible format at Pesticide Residues in Food Quarterly Data.

Samples tested

22 samples were tested for up to 370 pesticide residues

Fresh

- 9 samples came from the UK
- 6 samples were imported from outside the EU
- 5 samples came from the EU

Frozen

- 2 samples came from the UK

The country of origin of samples may not be the same as the country where the mango was produced. It may be where the mango was processed, where it was packed for consumer purchase or the address of the brand owner.

Pesticide residues detected from those sought

17 samples contained no residues from those sought

5 samples contained residues above the reporting limit

None of the samples contained residues above the MRL

1 sample was labelled as organic. It did not contain any residues from those sought

Multiple residues

No samples contained residues of more than one pesticide

Risk assessments

None of the residues detected would be expected to have an effect on health.

Milk

Summary of results

In a survey of 54 samples of milk collected between October and November 2020, none of the samples contained a pesticide residue above the MRL. These results were reviewed by the Expert Committee on Pesticide Residues in Food (PRiF).

Comments by the PRiF

No pesticide residues detected.

Survey design

The milk samples were bought by a market research company online from retail outlets across the UK by home delivery or collection at the store.

Full sample details, including brand name information, pesticides sought and residues found are available in an accessible format at Pesticide Residues in Food Quarterly Data

Samples tested

54 samples were tested for up to 109 pesticide residues

Cows milk

- 29 samples came from the UK

Goats milk

- 25 samples came from the UK

Pesticide residues detected from those sought

54 samples contained no residues from those sought

None of the samples contained residues above the reporting limit

None of the samples contained residues above the MRL

15 samples were labelled as organic. None contained residues from those sought

Multiple residues

No samples contained residues of more than one pesticide

Risk assessments

The laboratory did not detect any residues, so we did not carry out a risk assessment.

Okra

Summary of results

In a survey of 25 samples of okra collected between October and November 2020, three of the samples contained a pesticide residue above the MRL. These results were reviewed by the Expert Committee on Pesticide Residues in Food (PRiF).

Comments by the PRiF

None of the residues detected would be expected to have an effect on health.

Survey design

Okra surveys are reported more regularly throughout the year as part of rolling reporting.

The samples were collected by either, Animal and Plant Health Agency's Horticultural Marketing Inspectors from a range of points in the supply chain (wholesalers, retail depots, ports and import points) or they were bought by a market research company online from retail outlets across the UK by home delivery or collection at the store.

Full sample details, including brand name information, pesticides sought and residues found are available in an accessible format at Pesticide Residues in Food Quarterly Data

Samples tested

25 samples were tested for up to 365 pesticide residues

Fresh

- 24 samples were imported from outside the EU

Frozen

- 1 sample came from the UK

Pesticide residues detected from those sought

14 samples contained no residues from those sought

11 samples contained residues above the reporting limit

3 samples contained residues above the MRL

None of the samples were labelled as organic.

Multiple residues

5 samples contained residues of more than one pesticide

- 2 samples contained 2 residues
- 3 samples contained 3 residues

Residues measured above the MRL

The laboratory detected 4 residues above the MRL in okra

- 1 sample from India contained a residue of flonicamid (sum) at 0.1 mg/kg. The MRL is 0.03* mg/kg
- 1 sample from Jordan contained a residue of pyridaben at 0.2 mg/kg. The MRL is 0.01* mg/kg
- 1 sample from Ghana contained residues of
    - flubendiamide at 0.05 mg/kg. The MRL is 0.01* mg/kg
    - thiacloprid at 0.03 mg/kg. The MRL is 0.01* mg/kg

Risk assessments

None of the individual residues or combined residues detected by the laboratory would be expected to have an effect on health.

Combined risk assessments

Some samples contained residues of more than one pesticide. We do not expect these residues to have an effect on health, either separately or in combination. The pesticide residues found in each sample do not include more than one of the pesticides from the groups that the Health and Safety Executive (HSE) consider separately.

Follow up actions

Letters sent

The secretariat has written to the suppliers of the samples with residues above the MRL. Any response received are in Section 2.

* **Maximum Residue Levels set at the LOD (LOD MRL):** These MRLs are set at a default level, i.e. at the limit of determination (LOD) as specified in EC Regulation 396/2005.

Onions

Summary of results

In a survey of 22 samples of onions collected between October and December 2020, none of the samples contained a pesticide residue above the MRL. These results were reviewed by the Expert Committee on Pesticide Residues in Food (PRiF).

Comments by the PRiF

None of the residues detected would be expected to have an effect on health.

Survey design

This year onions are being surveyed across the EU as part of the EU Co-ordinated Multi Annual Control Programme.

The samples were collected by either, Animal and Plant Health Agency's Horticultural Marketing Inspectors from a range of points in the supply chain (wholesalers, retail depots, ports and import points) or they were bought by a market research company online from retail outlets across the UK by home delivery or collection at the store.

Full sample details, including brand name information, pesticides sought and residues found are available in an accessible format at Pesticide Residues in Food Quarterly Data

Samples tested

22 samples were tested for up to 363 pesticide residues

Fresh

- 6 samples came from the UK
- 16 samples came from the EU

Pesticide residues detected from those sought

15 samples contained no residues from those sought

7 samples contained residues above the reporting limit

None of the samples contained residues above the MRL

12 samples were labelled as organic. None contained residues from those sought

Multiple residues

5 samples contained residues of more than one pesticide

- 5 samples contained 2 residues

Risk assessments

None of the individual residues or combined residues detected by the laboratory would be expected to have an effect on health.

Combined risk assessments

Some samples contained residues of more than one pesticide. We do not expect these residues to have an effect on health, either separately or in combination. The pesticide residues found in each sample do not include more than one of the pesticides from the groups that the Health and Safety Executive (HSE) consider separately.

Oranges

Summary of results

In a survey of 28 samples of oranges collected between October and December 2020, none of the samples contained a pesticide residue above the MRL. These results were reviewed by the Expert Committee on Pesticide Residues in Food (PRiF).

Comments by the PRiF

Several samples of orange contained residues where a detailed risk assessment was undertaken assuming a situation where the peel was not eaten (the basis of EU MRL assessment) and where it was eaten (a more precautionary assessment). Based on the Health and Safety Executive's risk assessment of the residues detected we consider that an effect on health is not expected if the peel is not consumed.

In the event that all of the peel is eaten when consuming large portions (97.5th percentile consumption) of oranges, the assessments are more precautionary. On this basis, HSE concluded for the highest residue of imazalil found in this report (1.8 mg/kg) and thiabendazole (1.1 mg/kg), that an effect on health would be unlikely. For propiconazole, based on assessment at the highest residue of 0.9 mg/kg, HSE concluded that an effect on health is not expected for either consumption of unpeeled or peeled fruit.

Imazalil, propiconazole and thiabendazole are fungicides that can be applied to citrus fruits post-harvest.

A residue of dithiocarbamates was detected at a level within the MRL where a detailed risk assessment was required. Laboratory analysis indicated that the residue found was not sourced from use of ziram, thiram or propineb.

Therefore, HSE undertook a consumer risk assessment based on the assumption that metam was used as the next most acutely toxic form of the dithiocarbamates. Based on this worst-case assumption for the highest level found in this report (0.7 mg/kg) it was concluded that an effect on health would be unlikely.

The full risk assessments can be found on page 74.

Survey design

This year oranges are being surveyed across the EU as part of the EU Co-ordinated Multi Annual Control Programme.

The samples were collected by either Animal and Plant Health Agency's Horticultural Marketing Inspectors from a range of points in the supply chain (wholesalers, retail depots, ports and import points) or they were bought by a market research company online from retail outlets across the UK by home delivery or collection at the store.

Full sample details, including brand name information, pesticides sought and residues found are available in an accessible format at Pesticide Residues in Food Quarterly Data

Samples tested

28 samples were tested for up to 366 pesticide residues

18 samples were imported from outside the EU

10 samples came from the EU

Pesticide residues detected from those sought

4 samples contained no residues from those sought

24 samples contained residues above the reporting limit

None of the samples contained residues above the MRL

6 samples were labelled as organic. 2 contained residues from those sought

Multiple residues

22 samples contained residues of more than one pesticide

- 2 samples contained 2 residues
- 2 samples contained 3 residues
- 3 samples contained 4 residues
- 9 samples contained 5 residues
- 3 samples contained 6 residues
- 2 samples contained 7 residues
- 1 sample contained 8 residues

Risk assessments

Based on the HSE assessment of risk, if the oranges are consumed without the peel an effect on health is not expected.

Assuming oranges are eaten whole, including all of the peel, some samples of orange contained a residue of pesticides at levels where the effect on health needed to be considered in more detail. HSE always undertake assessments that consider both when the peel is not eaten, as per the EU MRL assessment, and where it is assumed that the peel is eaten. These assessments are details on page 74 and should be consulted for the full assessment of risk.

Imazalil

Assuming the orange peel is consumed with the fruit, some samples contained a residue of imazalil at levels where the effect on health needed to be considered in more detail. HSE have provided an assessment for the highest residue of 1.8 mg/kg. If all the peel is consumed then HSE's assessment of risks concludes that an effect on health is unlikely. However, if the peel is not consumed then only 7% of the residue remains and based on this lower intake an effect on health is not expected.

Propiconazole

Assuming the orange peel is consumed with the fruit, some samples contained a residue of propiconazole at level where the effect on health needed to be considered in more

detail. HSE have provided an assessment for the highest residue of 0.9 mg/kg. In this case if all the peel is consumed then HSE's assessment of risks concludes that we do not expect an effect on health (as is the case where the peel is removed before consumption). We conclude that an effect on health is not expected, as when the whole orange is consumed including all of the peel, the low exceedance of the ARfD is for infants only and the observed adverse effects in the toxicity studies were not relevant to infants. Details of the full risk assessment are on page 77.

Thiabendazole

Assuming the orange peel is consumed with the fruit, some samples contained a residue of thiabendazole at level where the effect on health needed to be considered in more detail. HSE have provided an assessment for the highest residue of 1.1 mg/kg. If all the peel is consumed then HSE's assessment of risks concludes that an effect on health is unlikely. However, if the peel is not consumed then only 2% of the residue remains and based on this lower intake an effect on health is not expected. Details of the full risk assessment are on page 76.

Dithiocarbamates

A residue of dithiocarbamates was detected at a level within the MRL where the effect on health needed to be considered in more detail. Laboratory analysis indicated that the residue found was not sourced from use of ziram, thiram or propineb.

Therefore, HSE undertook a consumer risk assessment based on the assumption that metam was used as the next most acutely toxic form of the dithiocarbamates.

A specific peeling factor for metam is not available. Some data is available for dithiocarbamates suggesting that around 90% of the residue remains in the pulp indicating that a small amount of the residue is removed with the peel. Assuming that consumers eat all the peel and that the residue is derived from metam, the HSE's assessment of risk concludes that an effect on health is unlikely. The highest level detected was 0.7 mg/kg. Details of the full risk assessment are on page 76.

Combined risk assessments

Some samples contained residues of more than one pesticide. We do not expect these residues to have an effect on health, either separately or in combination. The pesticide residues found in each sample do not include more than one of the pesticides from the groups that the Health and Safety Executive (HSE) consider separately.

Follow up actions

Organic samples with residues

The Secretariat has written to the suppliers of two samples of organic oranges from Spain with residues of pyriproxifen and imazalil, which are not permitted in organic food production. Defra's Organic Farming branch were also informed.

Pate (fish)

Summary of results

In a survey of 24 samples of pate (fish) collected between October and December 2020, none of the samples contained a pesticide residue above the MRL. These results were reviewed by the Expert Committee on Pesticide Residues in Food (PRiF).

Comments by the PRiF

None of the residues detected would be expected to have an effect on health.

BAC

6 samples (2 of salmon pate and 4 of tuna pate) contained a residue of BAC, this substance is widely used as biocides (disinfectants) during food preparation and processing. This is the most likely source of the residue.

Survey design

The pate samples were bought by a market research company online from retail outlets across the UK by home delivery or collection at the store.

Full sample details, including brand name information, pesticides sought and residues found are available in an accessible format at Pesticide Residues in Food Quarterly Data

Samples tested

24 samples were tested for up to 38 pesticide residues

Crab

- 1 sample came from the UK

Mackerel

- 4 samples came from the UK

Salmon

- 12 samples came from the UK

Tuna

- 7 samples came from the UK

The country of origin of samples may not be the same as the country where the pate was produced. It may be where the pate was processed, where it was packed for consumer purchase or the address of the brand owner.

Pesticide residues detected from those sought

18 samples contained no residues from those sought

6 samples contained residues above the reporting limit

None of the samples were labelled as organic.

Multiple residues

No samples contained residues of more than one pesticide

Risk assessments

None of the residues detected would be expected to have an effect on health.

Pears

Summary of results

In a survey of 18 samples of pears collected between October and November 2020, one sample contained a pesticide residue above the MRL. These results were reviewed by the Expert Committee on Pesticide Residues in Food (PRiF).

Comments by the PRiF

Risk assessments needed to be considered in more detail for two of the residues found (captan and dithiocarbamates). Based on the Health and Safety Executive's risk assessment of these residues detected (see risk assessments in Section 3) we consider that an effect on health is unlikely.

Survey design

This year pears are being surveyed across the EU as part of the EU Co-ordinated Multi Annual Control Programme.

The samples were collected by either, Animal and Plant Health Agency's Horticultural Marketing Inspectors from a range of points in the supply chain (wholesalers, retail depots, ports and import points) or they were bought by a market research company online from retail outlets across the UK by home delivery or collection at the store.

Full sample details, including brand name information, pesticides sought and residues found are available in an accessible format at Pesticide Residues in Food Quarterly Data

Samples tested

18 samples were tested for up to 370 pesticide residues

3 samples came from the UK

1 sample was imported from outside the EU

14 samples came from the EU

Pesticide residues detected from those sought

6 samples contained no residues from those sought

12 samples contained residues above the reporting limit

1 sample contained residues above the MRL

6 samples were labelled as organic. None contained residues from those sought

Multiple residues

11 samples contained residues of more than one pesticide

- 3 samples contained 2 residues

- 2 samples contained 3 residues
- 1 sample contained 4 residues
- 2 samples contained 5 residues
- 1 sample contained 6 residues
- 1 sample contained 7 residues
- 1 sample contained 10 residues

Residues measured above the MRL

The laboratory detected 1 residue above the MRL in pears

- 1 sample from Belgium contained a residue of chlormequat at 0.2 mg/kg. The MRL is 0.07 mg/kg

Risk assessments

Dithiocarbamates

A residue of dithiocarbamates was detected at a level of 1.2 mg/kg where the effect on health needed to be considered in more detail. Laboratory analysis indicated that the residue found was not sourced from use of ziram, thiram or propineb.

Therefore, HSE undertook a consumer risk assessment based on the assumption that metam was used as the next most acutely toxic form of the dithiocarbamates.

HSE risk assessment concluded that an effect on health is unlikely. Full risk assessment is available at page 78.

Captan

A residue of captan was detected at a level of 6.4 mg/kg where the effect on health needed to be considered in more detail. HSE risk assessment concluded that an effect on health is unlikely. Full risk assessment is available at page 79.

Combined risk assessments

Some samples contained residues of more than one pesticide. Some of these residues are from pesticides which belong to similar chemical groups and may have similar toxicological effects. So, the risk assessors needed to consider their possible impacts on human health, both on their own and in combination.

HSE carried out a combined risk assessment of the relevant samples. We would not expect any of these combinations to have an effect on health.

Follow up actions

Letters sent

The secretariat has written to the suppliers of the samples with residues above the MRL. Any response received are in Section 2.

Peas with pods

Summary of results

In a survey of 31 samples of peas with pods collected between October and November 2020, two of the samples contained a pesticide residue above the MRL. These results were reviewed by the Expert Committee on Pesticide Residues in Food (PRiF).

Comments by the PRiF

None of the residues detected would be expected to have an effect on health.

BAC

One sample of peas with pods contained a residue of BAC, this substance is widely used as biocides (disinfectants) during food preparation and processing. This is the most likely source of the residue.

Survey design

The pea samples were bought by a market research company online from retail outlets across the UK by home delivery or collection at the store.

Full sample details, including brand name information, pesticides sought and residues found are available in an accessible format at Pesticide Residues in Food Quarterly Data.

Samples tested

31 samples were tested for up to 367 pesticide residues

Mange Tout

- 17 samples were imported from outside the EU

Sugar Snaps

- 14 samples were imported from outside the EU

Pesticide residues detected from those sought

4 samples contained no residues from those sought

27 samples contained residues above the reporting level

2 samples contained residues above the MRL

None of the samples were labelled as organic.

Multiple residues

16 samples contained residues of more than one pesticide

- 7 samples contained 2 residues
- 4 samples contained 3 residues
- 3 samples contained 4 residues
- 1 sample contained 6 residues

- 1 sample contained 7 residues

Residues measured above the MRL

The laboratory detected 2 residues above the MRL in peas with edible pods

- 1 sample from Peru contained a residue of captan (sum) at 0.04 mg/kg. The MRL is 0.03* mg/kg
- 1 sample from Kenya contained a residue of BAC (sum) at 0.2 mg/kg. The MRL is 0.1 mg/kg

Risk assessments

None of the individual residues or combined residues detected by the laboratory would be expected to have an effect on health.

Combined risk assessments

Some samples contained residues of more than one pesticide. Some of these residues are from pesticides which belong to similar chemical groups and may have similar toxicological effects. So, the risk assessors needed to consider their possible impacts on human health, both on their own and in combination.

HSE carried out a combined risk assessment of the relevant samples. We would not expect any of these combinations to have an effect on health.

Follow up actions

Letters sent

The secretariat has written to the suppliers of the samples with residues above the MRL. Any response received are in Section 2.

* **Maximum Residue Levels set at the LOD (LOD MRL):** These MRLs are set at a default level, i.e. at the limit of determination (LOD) as specified in EC Regulation 396/2005.

Potatoes

Summary of results

In a survey of 43 samples of potatoes collected between September and December 2020, none of the samples contained a pesticide residue above the MRL. These results were reviewed by the Expert Committee on Pesticide Residues in Food (PRiF).

Comments by the PRiF

None of the residues detected would be expected to have an effect on health.

Survey design

This year potatoes are being surveyed across the EU as part of the EU Co-ordinated Multi Annual Control Programme.

Potato surveys are reported more regularly throughout the year as part of rolling reporting and were surveyed in all quarterly reports of 2020.

The samples were collected by either, Animal and Plant Health Agency's Horticultural Marketing Inspectors from a range of points in the supply chain (wholesalers, retail depots, ports and import points) or they were bought by a market research company online from retail outlets across the UK by home delivery or collection at the store.

Full sample details, including brand name information, pesticides sought and residues found are available in an accessible format at Pesticide Residues in Food Quarterly Data

Samples tested

43 samples were tested for up to 367 pesticide residues

43 samples came from the UK

Pesticide residues detected from those sought

24 samples contained no residues from those sought

19 samples contained residues above the reporting limit

None of the samples contained residues above the MRL

None of the samples were labelled as organic.

Multiple residues

1 sample contained residues of more than one pesticide

- 1 sample contained 2 residues

Risk assessments

None of the individual residues or combined residues detected by the laboratory would be expected to have an effect on health.

Combined risk assessments

One sample contained residues of more than one pesticide. We do not expect these residues to have an effect on health, either separately or in combination. The pesticide residues found in each sample do not include more than one of the pesticides from the groups that the Health and Safety Executive (HSE) consider separately.

Poultry meat

Summary of results

In a survey of 18 samples of poultry meat collected between October and November 2020, none of the samples contained a pesticide residue above the MRL. These results were reviewed by the Expert Committee on Pesticide Residues in Food (PRiF).

Comments by the PRiF

No pesticide residues were detected.

Survey design

This year poultry meat is being surveyed across the EU as part of the EU Co-ordinated Multi Annual Control Programme.

The poultry samples were bought by a market research company online from retail outlets across the UK by home delivery or collection at the store.

Full sample details, including brand name information, pesticides sought and residues found are available in an accessible format at Pesticide Residues in Food Quarterly Data.

Samples tested

18 samples were tested for up to 110 pesticide residues

Chicken

- 12 samples came from the UK

Duck

- 1 sample came from the UK

Turkey

- 5 samples came from the UK

The country of origin of the samples may not be the same as the country where the poultry meat was produced. It may be where the poultry meat was processed, where it was packed for consumer purchase or the address of the brand owner.

Pesticide residues detected from those sought

18 samples contained no residues from those sought

None of the samples contained residues above the reporting limit

None of the samples contained residues above the MRL

2 samples were labelled as organic. Neither contained residues from those sought

Multiple residues

No samples contained residues of more than one pesticide

Risk assessments

The laboratory did not detect any residues, so we did not carry out a risk assessment.

Pumpkin and squash

Summary of results

In a survey of 24 samples of pumpkin and squash collected between October and November 2020, two samples contained a pesticide residue above the MRL. These results were reviewed by the Expert Committee on Pesticide Residues in Food (PRiF).

Comments by the PRiF

None of the residues detected would be expected to have an effect on health.

Dieldrin

One sample of pumpkin contained a residue of dieldrin at 0.06 mg/kg.

The use of dieldrin is banned or heavily restricted in many countries because the residue takes a long time to break down in the environment and can accumulate in fatty tissue.

Dieldrin is known to be picked up by plants in the cucurbit family (such as pumpkins and squashes) through their long roots from historic residues in the environment.

Survey design

The pumpkin and squash samples were bought by a market research company online from retail outlets across the UK by home delivery or collection at the store.

Full sample details, including brand name information, pesticides sought and residues found are available in an accessible format at Pesticide Residues in Food Quarterly Data

Samples tested

24 samples were tested for up to 364 pesticide residues

Pumpkin

- 5 samples came from the UK

Squash

- 6 samples came from the UK
- 13 samples came from the EU

Pesticide residues detected from those sought

20 samples contained no residues from those sought

4 samples contained residues above the reporting level

2 samples contained residues above the MRL

2 samples were labelled as organic. Neither contained residues from those sought

Multiple residues

1 sample contained residues of more than one pesticide

- 1 sample contained 4 residues

Residues measured above the MRL

The laboratory detected 2 residues above the MRL in pumpkin and squash

- 1 sample from UK contained a residue of dieldrin (sum) at 0.06 mg/kg. The MRL is 0.03 mg/kg
- 1 sample from Spain contained a residue of permethrin (sum) at 0.07 mg/kg. The MRL is 0.05* mg/kg

Risk assessments

None of the individual residues or combined residues detected by the laboratory would be expected to have an effect on health.

Combined risk assessments

One sample contained residues of more than one pesticide. We do not expect these residues to have an effect on health, either separately or in combination. The pesticide residues found in each sample do not include more than one of the pesticides from the groups that the Health and Safety Executive (HSE) consider separately.

Follow up actions

Letters sent

The secretariat has written to the suppliers of the samples with residues above the MRL. Any response received are in Section 2.

* **Maximum Residue Levels set at the LOD (LOD MRL):** These MRLs are set at a default level, i.e. at the limit of determination (LOD) as specified in EC Regulation 396/2005.

Rye products

Summary of results

In a survey of 41 samples of rye products collected between October and November 2020, none of the samples contained a pesticide residue above the MRL. These results were reviewed by the Expert Committee on Pesticide Residues in Food (PRiF).

Comments by the PRiF

None of the residues detected would be expected to have an effect on health.

Survey design

This year rye and its products are being surveyed across the EU as part of the EU Co-ordinated Multi Annual Control Programme.

The rye product samples were bought by a market research company online from retail outlets across the UK by home delivery or collection at the store.

Full sample details, including brand name information, pesticides sought and residues found are available in an accessible format at Pesticide Residues in Food Quarterly Data

Samples tested

41 samples were tested for up to 368 pesticide residues

Crisp Bread

- 23 samples came from the UK
- 3 samples came from the EU

Rye Flakes

- 1 sample came from the UK
- 1 sample came from the EU

Rye Flour

- 13 samples came from the UK

The country of origin of samples may not be the same as the country where the rye product was produced. It may be where the rye or rye product was processed, where it was packed for consumer purchase or the address of the brand owner.

Pesticide residues detected from those sought

16 samples contained no residues from those sought

25 samples contained residues above the reporting limit

None of the samples contained residues above the MRL for rye

14 samples were labelled as organic. None contained residues from those sought

Multiple residues

22 samples contained residues of more than one pesticide

- 18 samples contained 2 residues
- 4 samples contained 3 residues

Risk assessments

None of the individual residues or combined residues detected by the laboratory would be expected to have an effect on health.

Combined risk assessments

Some samples contained residues of more than one pesticide. Some of these residues are from pesticides which belong to similar chemical groups and may have similar toxicological effects. So, the risk assessors needed to consider their possible impacts on human health, both on their own and in combination.

HSE carried out a combined risk assessment of the relevant sample. We would not expect any of these combinations to have an effect on health.

Sweet potatoes

Summary of results

In a survey of 23 samples of sweet potatoes collected between October and November 2020, none of the samples contained a pesticide residue above the MRL. These results were reviewed by the Expert Committee on Pesticide Residues in Food (PRiF).

Comments by the PRiF

None of the residues detected would be expected to have an effect on health.

Survey design

The sweet potato samples were bought by a market research company online from retail outlets across the UK by home delivery or collection at the store.

Full sample details, including brand name information, pesticides sought and residues found are available in an accessible format at Pesticide Residues in Food Quarterly Data

Samples tested

23 samples were tested for up to 365 pesticide residues

1 sample came from the UK

16 samples were imported from outside the EU

6 samples came from the EU

Pesticide residues detected from those sought

20 samples contained no residues from those sought

3 samples contained residues above the reporting limit

None of the samples contained residues above the MRL

9 samples were labelled as organic. None contained residues from those sought

Multiple residues

1 sample contained residues of more than one pesticide

- 1 sample contained 2 residues

Risk assessments

None of the individual residues or combined residues detected by the laboratory would be expected to have an effect on health.

Combined risk assessments

One sample contained residues of more than one pesticide. These residues are from pesticides which belong to similar chemical groups and may have similar toxicological effects. So, the risk assessors needed to consider their possible impacts on human health, both on their own and in combination.

HSE carried out a combined risk assessment of the relevant sample. We would not expect any of these combinations to have an effect on health.

Section 2: Sample details and supplier responses

Sample details

The sample details are published on Pesticide Residues in Food Quarterly Data as a dataset in ODS format.

About sample information

The following information is available on each sample collected this quarter:

- Date and place of collection
- Description (e.g. ‘runner bean’, organic milk);
- Country of origin or manufacture;
- Brand name and packer/manufacturer; and
- Residues detected (results shown in green indicate residues above the MRL).
- Where the brand name of a sample is given the produce involved may have been on sale in other retail premises at the same time.

The description and country of origin are taken from labelling on the food or at the point of sale. The country of origin of processed food may not be the country where the unprocessed produce was produced. This is true even of food that has undergone minimal processing, such as meat that has been butchered or frozen vegetables.

Samples with residues above the MRL are in bold, green text.

Some brand name details have been withheld – these will be published once enquiries are complete.

The Government’s ‘brand naming’ policy

The Government has decided that brand name information should be published as part of the Government food chemical surveillance programme. Brand names have been published for most pesticide residue surveys since 1998. Certain samples are excluded from the release of brand name information. These include samples taken as part of any pesticide residues enforcement programme and those taken as part of surveys to study individual people/farms. This policy was reviewed in 2000/1, when Ministers agreed to its continuation.

Where we find residues above an MRL or the presence of pesticides where a PPP is not authorised brand owners/retailers/ growers are notified of the result in advance of publication of reports and given four weeks to comment.

Interpreting brand name information

There is no ready definition of what constitutes a brand in all cases. For clearly branded produce like breakfast cereals or biscuits the “brand owner” is shown. In the case of “own brand” goods this may be one of the multiple retailers. For fruit and vegetables, the retailer is generally shown. For meat, milk and most other animal products the retailer is also

generally shown. Finally, for all commodities the country of origin is shown where this was displayed either on the produce or in the store.

Our programme takes samples of produce in approximate proportion to the market share of the main retailers. This has been done to ensure we obtain an accurate representation of a sector (e.g. fruit and vegetables).

Individual programmes are not capable of generating statistically valid information on residues in particular crops from particular retailers. This would require the collection of a much larger number of samples: either substantially increasing costs or greatly reducing the range of different foods sampled in any one year. Therefore, results from an individual survey cannot be taken as a fair representation of the residues status of any particular brand.

However, we do collect samples from a variety of outlets in a range of locations, over a period of years. Successive programmes should therefore help generate information on the typical residues profile of particular types of produce and on major trends in the incidence and levels of pesticides. It should be noted that this quarterly report is not intended to give a comprehensive comparison with previous surveys of the same commodities.

A particular issue arises in relation to the country of origin of fruit and vegetables. The origins included in the reports are those recorded either on the produce or in the store. However, it is not uncommon for mixing to occur on shop shelves. We have responded by increasing the proportion of pre-packed goods sampled. However, pre-packed samples are not available for some produce in some stores and it could also introduce bias to surveys if loose produce were not sampled. Loose produce is therefore sampled but the origin of the sample should be interpreted with a degree of caution.

Action taken by HSE

HSE wrote to:

- The suppliers of all samples containing residues above the MRL
- The authorities of the exporting countries of all samples containing residues above the MRL
- The suppliers of UK samples that contained residues of actives which do not have a plant protection product authorised for that crop.
- The Organics branch of Defra about samples that were labelled as organic and contained any residues of pesticides.
- The suppliers and certification organisation of all organic samples containing any residues of pesticides.

Recipients of the letters are given 4 weeks to provide a statement for inclusion in the report. The Expert Committee on Pesticide Residues in Food reviews any replies received.

Supplier responses

None of the suppliers who responded requested for their replies to be published.

Section 3: HSE assessment of risk

The surveillance programme is designed to enable the regulatory authorities to check that:

- specified pesticide MRLs are being respected;
- users of pesticides are complying with conditions of use specified in the authorisation;
- Dietary intakes of residues are within acceptable limits.

This section details how risks from dietary intakes are assessed.

When assessments are carried out

A screening assessment is done for each residue and commodity combination to identify residue levels that would lead to intakes above the relevant reference doses. Further information on this screening approach is available on request from HSE. Detailed assessments are then produced for every case where the actual residue level found could lead to an intake by any group above the reference dose.

Assessing Dietary intakes

Assessing the acceptability of dietary intakes is complicated. Consumer risk assessments are carried out for both short-term (peak) and long-term intakes. These assessments use information on food consumption collected in UK dietary surveys in conjunction with the residue levels we find. Occasionally, additional pesticide specific information on the losses of residues that occur during preparation and/or cooking of food is also used.

How the assessment is carried out

Short-term intakes (also called NESTIs) are calculated using consumption data for high-level consumers, based on single-day consumption values and the highest residue found in a food commodity. The residue found is multiplied by a variability factor to take account of the fact that residues may vary between individual items that make up the sample analysed. The estimated intake is compared to the Acute Reference Dose (ARfD). This is done for ten consumer groups; adults, infants, toddlers, 4-6 year olds, 7-10 year olds, 11-14 year olds, 15-18 year olds, vegetarians, elderly living in residential homes and elderly living in their own homes.

Long-term intakes (NEDI) are also calculated for high-level consumers, but in this case the consumption data are high-level long-term values rather than peak single-day events, and similarly the residue values used reflect long-term average levels rather than occasional high values. Again, these estimates are made for the ten consumer groups. In this case the estimated intake is compared to the Acceptable Daily Intake (ADI). More information on intake assessments is available on HSE's website: The HSE Pesticide Website then search for Consumer Exposure. Here you will find information and further links.

The reference doses (ADI, ARfD) are set by the Advisory Committee on Pesticides (ACP), or agreed within the EC (an increasing proportion of UK pesticide authorisations are now carried out in accordance with harmonised EU processes). However, where neither the UK nor the EC has set a reference dose, levels set by regulatory authorities in other countries may be used. For a small number of pesticides, the reference doses used have been

determined by HSE. These have not been independently peer-reviewed and should therefore be regarded as provisional.

Although MRLs are not safety levels, an MRL would not be established if the residue concentrations measured in the supervised trials used to support the MRL would give rise to health concerns. In most cases residues present at the MRL result in intakes below the ARfD and the ADI. So even if the MRL is exceeded this does not always lead to an intake above the ARfD or ADI.

In addition, an estimated intake that exceeds the ADI or ARfD does not automatically result in concerns for consumer health, because a protective approach is used in setting the ADI and ARfD. In the unusual circumstance of an intake exceeding the ADI or ARfD, an evaluation of the toxicological data is made, and details of this assessment would be presented.

Most consumer intake assessments are for short-term exposure rather than chronic exposure. This is because in most cases the monitoring data show the majority of samples to contain residues below the reporting limit and so chronic exposure would not present a concern. Long-term risk assessments have been carried out on a case-by-case basis but are not routinely reported. Long-term exposure assessments are done using median residue levels, rather than using the highest residues found. Therefore, long-term risk assessments would only need to be carried out where data indicated a high proportion of samples contained residues above the MRL (this would result in a higher median residue level than that previously assessed when setting the MRL), or where there is no MRL and acute toxicology is not considered relevant for the particular pesticide concerned.

Where intakes exceed a reference dose, it is necessary for the underlying toxicological studies (animal studies) to be considered to enable the significance of such an exceedance to be understood. Toxicological studies supplied by the registrants in the regulatory data packages are conducted using different doses to determine the nature of any ill health effects as well as the levels at which such effects can be expected to occur.

Toxicological studies that we refer to and use in the HSE risk assessments are conducted using test animals to identify the highest experimental dose that causes no detectable adverse effects (the NOAEL). Where there is more than one relevant toxicological study, the lowest appropriate NOAEL for the most sensitive adverse effect is typically used. There is some uncertainty in extrapolating between animals and people and it is therefore important to use a ‘safety factor’ to account for sources of variation. This safety factor is incorporated (by dividing the NOAEL by the safety factor) in deriving a reference dose, either an ADI or an ARfD, to which consumer intakes are compared. A safety factor therefore extrapolates from the animal testing to the general population. Factors in the order of x100 are commonly used, x 10 for animal to humans, and x10 for within human population differences in sensitivity. However, toxicologists may propose different values (e.g. from 5 to 1000) based on scientific reasoning in accordance with study designs and the quality of the data that has been generated from the studies.

In order to ensure exposures to pesticides do not pose unacceptable risk to humans a wide range of investigations are performed. Most of these are performed on experimental animals because the only end-points that can be examined in human volunteers are those involving observation or blood and urine sampling. Human volunteer studies involving pesticides are not generated in current regulatory work. There is debate at the international level as to whether human studies that have been generated should be used for risk

assessment purposes. In the EU, the policy is not to use these data in assessments; the JMPR chose to apply judgement in the appropriate use of these data if available. The HSE risk assessments will usually refer to test animal species, such as dog, rat, and rabbit. All toxicological work is undertaken based on principles of minimising animal distress. Where scientifically valid human data are available the risk assessments will refer to these as they reduce the uncertainty in the assessment. Therefore, human data is only referred to in more limited circumstances.

Acute (short term) toxicology is not a concern for all pesticides, as some are not acutely toxic. In terms of the pesticides that have been found in fruit and vegetables through the surveillance programme an acute risk assessment would not be necessary on the following: tecnazene, maleic hydrazide, diphenylamine, furalaxyl, iprodione, kresoxim-methyl, pendimethalin, propargite, propyzamide, quintozene and tolclofos-methyl.

As the surveillance programme monitors residues in all types of food, from raw commodities (e.g. potatoes) to processed (e.g. wine), dried (e.g. dried fruit) and composite foods (e.g. fruit bread), consumer risk assessments are specifically tailored to address processed and mixed food products. MRLs are generally set for raw commodities, although when MRLs are established the assessment of dietary intakes takes into account the potential for residues to remain in processed foods produced from the raw agricultural commodities. MRLs have been set for processed infant foods, and in future may be extended to other processed food products.

MRLs apply to all traded foods, including foods used as ingredients. The law specifies the level to apply to foods as they are traded. For almost all foods that means their raw, unprocessed form. But MRLs also apply to prepared and processed foods in which case the effect of processing needs to be taken into account.

To check that prepared and processed foods were made with ingredients that complied with MRLs, we use appropriate processing factors, based on scientific studies of the effect of preparation and processing. Different forms of processing remove, concentrate or dilute residues and the effect may also vary depending on the food and pesticide concerned.

The use of processing factors enables checks that the original ingredient was compliant with MRLs. Food manufacturers should have information on how they check their ingredients and also on their recipes and preparation techniques – for instance, how much water is added or removed, or how much of an ingredient is used to make a food. We always contact them when there is possible non-compliance so that they can share their own information about processing factors.

It is not expected that consumers will always eat peel, and further data are being generated to better understand the circumstances, to include frequency and amounts, when peel is consumed.

Probabilistic Modelling

The standard calculations of consumer exposure use realistic consumption data and residue levels. However, they tend to overestimate intakes in most circumstances. This is due to the assumptions used; fruit and vegetables would contain high levels of residue in an individual unit and that these would be consumed by high-level consumers. They do not take into account the possible range of residue levels and consumption distributions that may occur in reality. These possible combinations of residues and consumption levels can be taken into account using modelling/simulation techniques to produce probability

distributions of residue intake levels to indicate the range of consumer intakes, presented as a probabilistic assessment of consumer exposure. These techniques are not yet routinely used to estimate dietary intakes of pesticide residues in the EC.

Multiple residues

The risk assessment process is not standing still. We are aware that some consumers are concerned by the 'cocktail effect'- the possible implications of residues of more than one chemical occurring in, say, a single portion of fruit or vegetables or the interaction between mixtures of pesticides and veterinary medicines at residue levels.

Where more than one pesticide residue is found in a sample, we produce a separate table which identifies each sample and what was found. If more than one triazole, or more than one organophosphate/carbamate is found or the following combinations captan/folpet, BAC/DDAC, chlormequat/mepiquat, we will undertake an additional risk assessment. If the combination of pesticides found is either unusual or gives cause for concern then this will be detailed in the report.

The Food Standards Agency (FSA) asked the Committee on Toxicity of Chemicals in Food, Consumer Products and the Environment to assess these concerns. Their report "Risk Assessment of Mixtures of Pesticides" was published in 2002. Foods Standards Agency Risk Assessment of Mixtures of Pesticides

The Committee concluded that the probability of any health hazard from exposures to mixtures is likely to be small. Nonetheless, it identified areas of uncertainty in the risk assessment process and made recommendations for further work. These fell under the broad headings of regulatory, surveillance, research and public information issues. An action plan to take forward the recommendations was published by the FSA. A number of research projects were commissioned by the FSA to help progress the action plan.

Scientific methodologies have yet to be developed to deal with mixtures from groups of pesticides identified by the Committee. However, the Advisory Committee on Pesticides (ACP) has developed an approach for the anticholinesterase compounds. They have also recommended an approach for assessing compounds that might have combined toxicity. This includes a consideration of the proportion of the respective reference doses taken up by the predicted exposures to each active substance. If this is only a small proportion (e.g. <50% if there are two components; <33% for 3 etc.) then assuming simple additivity the risks would still be acceptable. However if exposures to each active substance represent a high proportion of the respective reference doses and the total exceeds 100% a more detailed consideration is needed. Further information is available on: The HSE Pesticide Website. Search for the Data Requirements Introduction and Index and follow the links.

We are keen to ensure our reports reflect consumer concerns. We therefore now regularly assess findings showing multiple residues of organophosphate and carbamate pesticides. Combined assessment is a new development in risk assessment, which is being taken forward at the international level, e.g. the European Food Safety Authority (EFSA) held a colloquium in 2006 and has set-up two working groups to help develop the methodology EFSA Scientific Colloquium N°7: Cumulative Risk Assessment of Pesticides to Human Health: the Way forward 2006

EFSA's The EFSA's 7th Scientific Colloquium Report - Cumulative Risk Assessment of pesticides to human health: The Way forward 2008;

EFSA Opinion of the Scientific Panel on Plant Protection products and their Residues;

EFSA Scientific Opinion on Risk Assessment for a Selected Group of Pesticides from the Triazole Group).

Further advances in risk assessment methodology will be taken into account in developing the approach to multiple risk assessments in the future.

Assessment of Risk to Human Health

Risk Assessment- dietary intake assessments

Screening assessments have been done for all acutely toxic and potentially acutely toxic pesticides to check that predicted intakes are within the ARfD (or ADI, as appropriate, where an ARfD is not available). An acute exposure assessment is not done for pesticides which are not acutely toxic where it has been established that an ARfD is not required. Toxicological endpoints can be found in the DG SANCO EU Pesticides database which is available at EU Pesticide database.

The screening assessment uses the internationally agreed approach to long-term (chronic) and short-term (acute) consumer exposure assessment with UK food consumption data as detailed within the UK NEDI and NESTI models which are available on the HSE website at https://www.hse.gov.uk/pesticides/pesticides-registration/data-requirements-handbook/consumer-exposure.htm.

For the Q4 (2020) assessments, the following approaches have been taken to refine these assessments according to case-by-case issues and to ensure that appropriate consumption values are used for less frequently consumed commodities where available food consumption data may be limited:

- Data on beans with pods were used for okra and all forms of green beans, including speciality beans.
- Data on bread were used for all forms of bread, including speciality bread.
- Data on peas with pods were used for mange tout and sugar snap peas.
- Data on fish were used for all forms of oily fish and fish pate.
- Data on meat excluding poultry and offal data were used for lamb.
- Data on cheese were used for all forms of cheese.
- Data on liver available for all forms of liver were used.
- Data on potato were used for sweet potato.
- Data for courgette, together with a unit weight of >1000 g and a variability factor of 5, were used for pumpkin and butternut squash.
- Data on dried grapes were used for all forms of dried grapes, including raisins, sultanas and currants.
- Data on rye were used for all forms of rye, including crispbread, flakes and flour.

Monocrotophos

Monocrotophos was found in beans with pods (Guar beans) at a level of 0.008 mg/kg which gives a highest estimated short term intake of 0.00004 mg/kg bw/day for infants and toddlers. Authorisations for uses in the EU were withdrawn in 2003 and EU reference values have not been set. The EFSA use JMPR reference values, set in 1995, to assess risks from monocrotophos residues. This intake is less than both the

ARfD of 0.002 mg/kg bw/day and ADI of 0.0006 mg/kg bw/day. However, studies in laboratory animals at doses orders of magnitude higher which were toxic to the animals have indicated that monocrotophos can damage genetic material. It is not known if lower doses which are not toxic also have this effect. Monocrotophos did not increase cancer incidence in long term feeding studies in rats or mice or cause dominant lethal mutations in mice and these findings provide some reassurance that any risks from exposure are likely to be small. Nevertheless, because of uncertainty about the potential for genetic damage at low doses, on a precautionary basis any findings of monocrotophos in food are not desirable.

Dried fruit (grapes)

Crop	Pesticide	Highest residue (mg/kg)	Intake (mg/kg bw/day)		ARfD (mg/kg bw/day)	Source
			Adult	Critical group†		
Dried fruit (sultanas)	Dimethoate	0.004	0.0000027	0.000013 (toddler) 0.000010 (elderly–own home) 0.0000095 (elderly–residential) 0.0000086 (4-6 year old child) 0.0000050 (vegetarian) 0.0000045 (11-14 year old child) 0.0000039 (7-10 year old child) 0.0000027 (adult) 0.0000025 (15-18 year old child)	Not established	EU, 2019
Comment on risk assessment						

The EFSA Conclusion (2018) for dimethoate has indicated that no toxicological reference values could be determined for dimethoate, due to a lack of a fully supporting toxicological database. Dimethoate has been recommended for non-renewal of approval in the EU, (EU, 2019), and pesticide products containing dimethoate are currently subject to withdrawal from the marketplace in the UK and the EU.

Short term effects: For dimethoate, EFSA (2018) stated an indicative value for a hypothetical toxicological reference value for short term exposure of 0.0001 mg/kg bw/day. Using this indicative value, all the estimated dietary intakes of dimethoate for all the consumer groups do not exceed this reference value. This indicative toxicological reference value is a precautionary value intended to protect the nervous system in the developing foetus and child, which has been set well below intakes which caused no observed effects in animal studies. The JMPR (September 2019) established an ARfD for dimethoate of 0.02 mg/kg bw; this supports the view that the proposed hypothetical reference value from the EFSA Conclusion is precautionary. Based on the low short term intakes, HSE concludes that a short term effect on health is not expected.

Long term effects: It is unclear whether dimethoate can damage genetic material in people (is genotoxic), however this is unlikely at the exposure level estimated in this assessment. The currently recommended follow up studies, that may clarify the genotoxic potential *in vivo*, have not been performed. There is some reassurance that risks of developing ill health effects over the long term following single and even repeat exposures are likely to be low, since dimethoate did not cause cancer in studies with repeat daily doses in mice over their life-span. The doses used in both the genotoxicity tests and the cancer studies were orders of magnitude higher than the exposures estimated in this assessment. Nevertheless, because of the uncertainty, on a precautionary basis any findings of dimethoate in food are undesirable.

Overall, although on a precautionary basis any findings of dimethoate are undesirable, we conclude that any risks of an effect on health are unlikely after eating large portions (97.5th percentile consumption) of dried fruit (sultanas) containing the levels found in this report.

Grapes

Crop	Pesticide	Highest residue (mg/kg)	Intake (mg/kg bw/day)		ARfD (mg/kg bw/day)	Source
			Adult	Critical group†		
Grapes	Lambda-cyhalothrin or gamma-cyhalothrin	0.05	0.00099	0.0031 (toddler)	0.0025 (ARfD for gamma-cyhalothrin)	EU, 2014
Comment on short term risk assessment Residues of lambda-cyhalothrin are indistinguishable analytically from gamma-cyhalothrin, and the residue could have arisen from application of either gamma-cyhalothrin or lambda-cyhalothrin. As a worst case, it is assumed that the residues in the sample are possibly derived from application of gamma-cyhalothrin to the crop, and therefore this assessment has used the specific ARfD for gamma-						

cyhalothrin (which is two-fold lower than that for lambda-cyhalothrin). However it is recognised that the residue could have arisen from the different isomeric form (lambda-cyhalothrin) with is less toxic than gamma-cyhalothrin.

The intakes for toddlers exceeded the ARfD.

If toddlers ate/drank large portions of grapes containing lambda-cyhalothrin at 0.05 mg/kg, their intake of lambda-cyhalothrin could be 122% of the Acute Reference Dose of 0.0025 mg/kg bw/d. This intake is 164 times lower than a dose which caused no observed adverse effect in a 1- year oral toxicity study in dogs with lambda-cyhalothrin. The European Food Safety Authority used this study as the basis of the ARfD.

Toxicologists usually apply a factor of 100 to this dose to take into account uncertainties caused by using animal data and possible differences in susceptibility between people. However, the factor used for gamma-cyhalothrin was two-fold greater (200) to reflect the greater toxicity of gamma-cyhalothrin compared to lambda-cyhalothrin. We consider the reduced factor of 164 still enough to make an effect on health unlikely.

Oranges

Crop	**Pesticide**	**Highest residue (mg/kg)**	**Intake (mg/kg bw/day)**		**ARfD (mg/kg bw/day)**	**Source**
			Adult	**Critical group**[†]		
Oranges	Imazalil	1.8	0.041	0.24 (infant) 0.18 (toddler) 0.13 (4-6 year old child) 0.065 (11-14 year old child) 0.055 (15-18 year old child)	General population 0.1 Pregnant and nursing females 0.05	EFSA, 2007

Comment on short term risk assessment

Orange flesh after peeling

The EU MRL risk assessment assumes that oranges are peeled before consumption. After peeling only 7% of the residue remains (EFSA, 2018), the highest intake is below 0.05 mg/kg bw/d, and there are no exceedances of either ARfD.

However, assuming that consumers eat all the peel, intakes for infants, toddlers and 4-6 year old children exceed the acute reference dose of 0.1 mg/kg bw/day (for the general population). In consumer groups aged over 11 years intakes for 11-14 year old child and 15-18 year old

child groups exceed the acute reference dose of 0.05 mg/kg bw/day (for pregnant and nursing females) with 11-14 years old being the critical consumer.

Whole orange, including all the peel

Pregnant and nursing females

The intakes for 11-14 year old children and 15-18 year old children exceed the acute reference dose of 0.05 mg/kg bw/day (for pregnant and nursing females). The highest intake was for 11-14 year old children.

If 11-14 year olds ate or drank large portions of orange containing imazalil at 1.8 mg/kg their intake could be 131% of the Acute Reference Dose of 0.05 mg/kg bw/d. This intake is 77 times lower than a dose which caused no observed adverse effects in a 13 day repeat dose rabbit developmental study. (The ARfD is based on a NOAEL of 5 mg/kg bw/day for fetal toxicity (increased resorptions; a marker of early foetal deaths)). The European Food Safety Authority used this study as the basis of the ARfD.

Toxicologists usually apply a factor of 100 to this dose to take into account the uncertainties caused by using animal data and possible differences in susceptibility between people. The remaining margin of 77 is considered to still be sufficient to account for these uncertainties; it is not possible because of the way data were reported, to attribute effects at higher doses to single or multiple treatments. Therefore, the ARfD is suitably protective when considering single day exposures and might be overprotective. Based on this assessment an effect on health is unlikely.

General population

The intakes for infants, toddlers and 4-6 year old children exceed the ARfD of 0.1 mg/kg bw/d for the general population. The highest intake was for infants.

If infants ate or drank large portions of orange containing imazalil at 1.8 mg/kg their intake could be 239% of the Acute Reference Dose of 0.1 mg/kg bw/day. This intake is 42 times lower than a dose which caused no observed adverse effects in a rabbit developmental study, used as the basis of the ARfD. (The ARfD is based on a NOAEL of 10 mg/kg bw/day for reduced bodyweight gain and food consumption in dams). The European Food Safety Authority used this study as the basis of the ARfD.

Toxicologists usually apply a factor of 100 to this dose to take into account the uncertainties caused by using animal data and possible differences in susceptibility between people. We consider the reduced factor of 42 still enough to account for these uncertainties, also noting that an ARfD based on maternal toxicity in a developmental study with repeated dosing (13 days) is likely to be very protective for the general population. Based on this assessment an effect on health is unlikely.

Conclusion

In conclusion, we consider that an effect on health is unlikely. This estimate assumes that peel of the fruit is consumed. However, if the peel is not consumed then the risk assessment that is the basis for the MRL applies (see the first paragraph of this assessment) and intakes in all groups are within both ARfDs and an effect on health is not expected.

Crop	Pesticide	Highest residue (mg/kg)	Intake (mg/kg bw/day)		ARfD (mg/kg bw/day)	Source
			Adult	Critical group†		
Oranges	Thiabendazole	1.1	0.025	0.15 (infant) 0.11 (toddler)	0.1	EU, 2017
Comment on short term risk assessment **Orange flesh after peeling** The EU MRL risk assessment assumes that oranges are peeled before consumption. After peeling only 2% of the residue remains (EFSA, 2016), the highest intake is below 0.1 mg/kg bw/d, and there are no exceedances of the ARfD. However, assuming that consumers eat all the peel, intakes for infants and toddlers exceed the acute reference dose of 0.1 mg/kg bw/day. The highest intake is for infants. **Whole orange, including all the peel** If infants ate or drank large portions of orange containing thiabendazole at 1.1 mg/kg, their intake of thiabendazole could be 146% of the EU Acute Reference Dose. This intake is 67 times lower than a dose which caused no observed adverse effects in a developmental study in rats over 11 days. The European Food Safety Authority used this study as the basis of the ARfD. Toxicologists usually apply a factor of 100 to this dose to take into account uncertainties caused by using animal data and possible differences in susceptibility between people. We consider the reduced factor of 67 still enough to make an effect on health unlikely. This estimate assumes that peel of the fruit is consumed. However, if the peel is not consumed then the risk assessment that is the basis for the MRL applies (see the first paragraph of this assessment) and intakes in all groups are within the ARfD and an effect on health is not expected.						
Crop	Pesticide	Highest residue (mg/kg)	Intake (mg/kg bw/day)		ARfD (mg/kg bw/day)	Source
			Adult	Critical group†		
Oranges	Dithiocarbamate	0.7 (0.987 expressed as metam)	0.022	0.13 (infant)	0.1 (for metam)	EU, 2015
Comment on short term risk assessment						

Laboratory analysis indicated that the residue found was not sourced from use of ziram, thiram or propineb. The approach to this risk assessment therefore used metam, as the next most acutely toxic form of the dithiocarbamates.

Orange flesh after peeling

The EU MRL risk assessment assumes that oranges are peeled before consumption. A specific peeling factor for metam is not available. Some data is available for dithiocarbamates suggesting that around 90% of the residue remains in the pulp indicating that a small amount of the residue is removed with the peel, however the residue distribution might be different for different dithiocarbamate pesticides so it is not possible to apply a further specific refinement in this case.

Assuming that consumers eat all the peel, intakes for infants exceed the acute reference dose of 0.1 mg/kg bw/day.

Whole orange, including all the peel

If infants ate or drank large portions of orange containing metam at 0.987 mg/kg, their intake of metam could be 131% of the EU Acute Reference Dose. This intake is 77 times lower than a dose which caused no observed adverse effects in a developmental study in rats. The European Food Safety Authority used this study as the basis of the ARfD.

Toxicologists usually apply a factor of 100 to this dose to take into account uncertainties caused by using animal data and possible differences in susceptibility between people. We consider the reduced factor of 77 still enough to make an effect on health unlikely.

This estimate assumes that peel of the fruit is consumed. However, there is no specific information on the likely reduction from peeling oranges.

Crop	Pesticide	Highest residue (mg/kg)	Intake (mg/kg bw/day)		ARfD (mg/kg bw/day)	Source
			Adult	Critical group†		
Oranges	Propiconazole	0.9	0.020	0.12 (infant)	0.1	EU, 2018

Comment on short term risk assessment

Orange flesh after peeling

The EU MRL risk assessment assumes that oranges are peeled before consumption. After peeling only 1% of the residue remains (EFSA, 2015), the highest intake is below 0.1 mg/kg bw/d, and there are no exceedances of the ARfD.

However, assuming that consumers eat all the peel, intakes for infants exceed the ARfD.

Whole orange, including all the peel

If infants ate or drank large portions of orange containing propiconazole at 0.9 mg/kg, their intake of propiconazole could be 119 % of the EU Acute Reference Dose. This intake is 250 times lower than a dose which caused no observed adverse effects in a developmental study in rats dosed over a ten day period. The European Food Safety Authority used this study as the basis of the ARfD.

Toxicologists usually apply a factor of 100 to this dose to take into account the uncertainties caused by using animal data and possible differences in susceptibility between people. In this case the factor was larger (300) to account for the severity of the effects seen at the LOAEL, and this factor of 300 is reduced to 250. However, the observed effects are not relevant to infants as they concern effects on unborn pups exposed *in utero* (increased incidence of cleft palate, skeletal and visceral variations, and decreases in the number of viable pups) and so would only be relevant to pregnant females. All of the relevant consumer groups by age have intakes that are below the ARfD (and so the factor of at least 300 is maintained for these groups).

Therefore, based on this assessment, we do not expect an effect on health for either consumption of unpeeled or peeled fruit containing the levels of propiconazole found in this report.

Pears

Crop	Pesticide	Highest residue (mg/kg)	Intake (mg/kg bw/day)		ARfD (mg/kg bw/day)	Source
			Adult	Critical group†		
Pears	Dithiocarbamate	1.2 (1.692 expressed as metam)	0.030	0.14 (toddler) 0.12 (infant)	0.1 (for metam)	EU, 2015

Comment on short term risk assessment

Laboratory analysis indicated that the residue found was not sourced from use of ziram, thiram or propineb. The approach to this risk assessment therefore used metam, as the next most acutely toxic form of the dithiocarbamates.

Assuming metam, the intakes for toddlers and infants exceeded the ARfD. The highest intake was for toddlers.

If toddlers ate or drank large portions of pears containing metam at 1.692 mg/kg, their intake of metam could be 144 % of the EU Acute Reference Dose. This intake is 71 times lower than a dose which caused no observed adverse effects in a developmental study in rats. The European Food Safety Authority used this study as the basis of the ARfD.

Toxicologists usually apply a factor of 100 to this dose to take into account uncertainties caused by using animal data and possible differences in susceptibility between people. We consider the reduced factor of 71 still enough to make an effect on health unlikely.

Crop	Pesticide	Highest residue (mg/kg)	Intake (mg/kg bw/day)		ARfD (mg/kg bw/day)	Source
			Adult	Critical group†		

Pears	Captan	6.4	0.11	0.54 (toddler) 0.46 (infant) 0.38 (4-6 year old child)	0.3	EU, 2008
Comment on short term risk assessment The intakes for toddlers, infants and 4-6 year old children exceeded the ARfD. The highest intake was for toddlers. If toddlers ate large portions of pears containing captan at 6.4 mg/kg, their intake of captan could be 181 % of the Acute Reference Dose. This intake is 56 times lower than a dose which caused no observed adverse effect in a teratogenicity study in rabbits. The European Food Safety Authority used this study as the basis of the ARfD. Toxicologists usually apply a factor of 100 to this dose to take into account uncertainties caused by using animal data and possible differences in susceptibility between people. We consider the reduced factor of 56 still enough to make an effect on health unlikely.						

†Highest intake of all ten consumer groups, or intakes for all consumer groups that exceed the ARfD

Multiple Residue assessments

Risk assessments are for samples containing more than one organophosphorus/carbamate or captan/folpet or DDAC/BAC or mepiquat/chlormequat or triazoles or following screening assessment. Some samples contained residues of more than one pesticide. Whenever toxicologists expect these to add to each other's effect, (have the same toxicological mode of action), HSE carries out a risk assessment of the combined results. Where the sum of the individual intakes, expressed as a percentage of the respective ARfDs, is above 100% then the risk assessment is published in full.

The screening assessment of samples, which contained more than one pesticide from the above groups, did not indicate any totals exceeding 100%.

Section 4: issues arising in this report and updates on previous reports

Issues arising in this report

Chlorate

We have been testing a limited number of foods for chlorate since 2016. The pesticide sodium chlorate is a residual broad action weed killer that is not authorised for use in the EU. However, we are confident that the residues we are detecting come from use of chlorine-based disinfectants used to maintain microbiological safety (control microorganisms that cause food poisoning). Because these residues are unavoidable, and important for the maintaining of microbiological control vital for food safety, we are not treating these results as breaches of the MRL. **We are not advising that food companies change their existing practices as a result of our findings, but they should be aware about the ongoing discussion in this area**.

We are only part of the work going on across government and beyond to consider what to do about chlorate residues in food and water.

MRLs after 20 June 2020

After detailed discussion and consultation with stakeholders the EU agreed new MRLs for chlorate that came into force on 20 June 2020. All samples covered by this report were taken after 20 June 2020 when the new, higher MRLs were in place.

The new chlorate MRLs include a footnote referring specifically to taking account of the use of biocides during processing in addition to the MRLs for food as harvested or initially produced. The footnote exceptionally specifies that for considering compliance with chlorate MRLs, simple types of processing that do not affect the other residue levels, such as packing, washing, chopping and freezing can be taken into account.

The responsibility for providing evidence showing that residues from processing can be taken into account, lies with the food business operator, and so we will be interested to see such evidence where appropriate. HSE will decide whether the footnote can be applied and if so this will be reflected in our reports.

The Food and Biocides Industry Group have produced more detailed information and guidance on this topic which is available on the Chilled Food Association's website at https://www.chilledfood.org/fbig/.

Best practice for use

The Food Standards Agency is working with the food industry to develop and promote best practice in the use of sanitisers. This is important because the presence of low-level residues of chlorate in food results from measures taken by the food and water industries to protect food safety by reducing microbiological contamination of food and drink (including drinking water, which is a significant source of chlorate in food). Chlorate itself is

not used as a disinfectant, but chlorine-based sanitisers can contain small amounts of chlorate.

Drinking Water

Defra is also working on the EU recast of its Drinking Water Directive. Discussions are underway about the possible future monitoring of chlorate and the level to be achieved. In national legislation throughout the UK it is already a requirement to keep disinfection by-products as low as possible. This is usually achieved through management of disinfectant dosing and storage.

Advisory Committee on the Microbiological Safety of Food

Microbiological safety of food

The HSE are working with the Advisory Committee on the Microbiological Safety of Food to understand how changes to pesticide MRLs affect biocide use, microbiological food safety, and any change to the overall risk to consumers taking into account both chemical and microbiological safety.

Dietary intakes

Since 2018 the Committee on Toxicity of Chemicals in Food, Consumer Products and the Environment (COT) has been considering chlorate as part of its on-going work looking at the chemicals in the diet of infants and young children (up to 5 years). The European Food Safety Authority's 2015 opinion on chlorate[3] establishes appropriate health-based guidance values for chlorate exposure to protect against acute and chronic risks to health.

DDT

The use of DDT is banned or heavily restricted in many countries. It isn't allowed for use on food crops anymore, but it is still used in some countries outside the EU as a public health insecticide. Residues of DDT take a long time to break down in the environment and can accumulate in fatty tissue which is a major reason that it has been banned in the EU and many other countries.

Due to the bans and restrictions on use, the levels in food have decreased substantially since the 1960s and 1970s. Even so, because it takes a long time to break down we do expect, and do see, occasional DDT residues in our monitoring results. Overall, the incidence and the size of residues have fallen steadily over time, which is what we would expect. In recent years none of our findings were unusual, unexpected or of concern. We can tell from the chemical form that we detect whether the residues we have found are from historic use (which is what we usually find). We explain this every time we publish DDT results to try to make it as clear as we can that the results show food producers are not using DDT today. However, there are occasional media stories about DDT and various links and associations, which do not make this distinction.

The residues we find nowadays are at levels that would not be expected to have any effect on health, either in the short term or in the long term, when checked against today's understanding of the effect of DDT on health. As a committee, we take care to ensure we

[3] EFSA Journal 2015 ;13(6):4135 [103 pp.]
http://ec.europa.eu/food/plant/standing_committees/sc_phytopharmaceuticals/index_en.htm

look thoroughly at this, and the Food Standards Agency is also actively involved in our considerations.

Processing factors

As the surveillance programme monitors residues in all types of food, from raw commodities (e.g. potatoes) to processed (e.g. wine), dried (e.g. dried fruit) and composite foods (e.g. fruit bread), consumer risk assessments are specifically tailored to address processed and mixed food products. MRLs are generally set for raw commodities, although when MRLs are established the assessment of dietary intakes takes into account the potential for residues to remain in processed foods produced from the raw agricultural commodities. MRLs have been set for processed infant foods, and in future may be extended to other processed food products.

MRLs apply to all traded foods, including foods used as ingredients. The law specifies the level to apply to foods as they are traded. For almost all foods that means their raw, unprocessed form. But MRLs also apply to prepared and processed foods in which case the effect of processing needs to be taken into account.

In nearly all cases the MRL is set for the food in its raw, unprocessed form (the form of each food to which MRLs apply is listed in Annex I of Regulation 396/2005). These MRLs can be applied to processed foods using appropriate processing factors. Processing factors take account of the effect of processing on the food as traded. Different forms of processing may remove, concentrate, or dilute residues, and the effect may vary depending on the food and the pesticide concerned. Multiplying the processing factor by the original MRL gives a calculated MRL that can indicate the food was made with an ingredient or ingredients which had residues over the original MRL.

Calculating the MRLs for processed goods is dependent on the information available. HSE will contact the supplier if residues exceed the calculated MRL to give them an opportunity to provide relevant information to support the calculation.

Processing factors and MRLs used for bread

Food type	Pesticide	Processing factor	MRL for unprocessed grain (mg/kg)	Bread MRL (mg/kg)
Wholemeal wheat bread	Chlormequat	0.5	2	1
Wholemeal wheat bread	Chlorpyrifos-methyl	0.47	3	1.4
Wholemeal wheat bread	Deltamethrin	0.84	2	1.68
Wholemeal wheat bread	Glyphosate	0.36	10	3.6

Wholemeal wheat bread	Pirimiphos methyl	0.43	5	2.15
Other wheat bread	Chlormequat	0.3	2	0.6
Other wheat bread	Chlorpyrifos-methyl	0.05	0.05	0.0025
Other wheat bread	Chlorpyrifos-methyl, wheat harvested before 5 December 2018[4]	0.05	3	0.15
Other wheat bread	Deltamethrin	0.14	2	0.28
Other wheat bread	Glyphosate	0.105 ‡	10	1.05
Other wheat bread	Pirimiphos methyl	0.12	2	1.9
Wholemeal rye bread	Chlormequat	0.3	2	0.6
Wholemeal rye bread	Pirimiphos methyl	None found	2	2
Other rye bread	Chlormequat	0.99	2	2
Other rye bread	Pirimiphos methyl	None found	5	5
Pasta	Glyphosate	0.105 ‡	10	1.05
Pasta	Pirimiphos-methyl	0.19‡	5	0.95

‡ This factor is for milling (flour production) only, used because no baking (bread production) factor was available.

[4] The current MRLs for chlorpyrifos-methyl were set in Commission Regulation 686/2018, which included a provisional provision for food produced before 5 December 2018

Processing factors are taken from a compendium of publicly available, authoritative processing factors published by the German regulatory authority for pesticides[5].[6]

Residues below the MRL that exceed the ARfD

When MRLs are agreed at the EU level they are set at levels that are compatible with consumer safety. Occasionally, assessment of PRiF monitoring samples containing residues below or at the MRL will show consumer intakes could potentially be above the ARfD. This situation typically arises because of one of three reasons:

- the ARfD may have been lowered because of new information but there is a delay before MRLs have been reassessed or new MRLs are put in place;
- during the MRLs setting process the risk assessments are currently based on the highest residue level observed in residues trials used to support the MRL which will often be less than the actual MRL (it is expected that most residues found will be below the MRL, and if for this reason there are later samples which give intakes above the ARfD the numbers are expected to be low);
- the agreed EU approach might assume the commodity is peeled and data are used to reduce the intake in the risk assessment at the time of setting MRLs, whereas in the PRiF work risk assessments for the whole commodity are presented as routine and, if information showing the effects of processing on residues level is available to PRiF, a refined assessment is presented.

The first two of these reasons are common to EU assessments and the third represents a difference between the approach used by HSE for the risk assessment and that used at the time the MRL is set. We will highlight how our assessments differ from that done at the EU level so that readers are aware of the basis of the evaluation.

[5] *BfR compilation on processing factors for pesticide residues, dated 20.10.2011*
Downloaded from https://www.bfr.bund.de/cm/349/bfr-data-collection-on-processing-factors.pdf

[6] BfR compilation of processing factors for pesticide residues:

https://www.bfr.bund.de/cm/349/bfr-compilation-of-processing-factors.xlsx

Follow-up from Previous Reports

Quarter 3 2020

Beans with pods

Fluazifop-P: Sample number 4325/2020

We passed details of a sample of bobi beans from the UK that contained fluazifop-p (partial sum) to HSE. HSE enquiries are not yet complete and an update will appear in a future report.

In our next report:

In Quarter 1 of 2021 we will look at results for:

Samples collected in GB
Aubergine
Banana
Beans with pods
Beef
Berries & small fruit
Broccoli
Cheese (soft)
Eggs
Grapes
Melon
Milk
Mushrooms
Pepper
Potatoes
Raspberries
Rice

Samples collected in NI
Aubergine
Banana
Beans with pods
Beef
Berries & small fruit
Broccoli
Cheese (soft)
Eggs
Fish
Grapes
Melon
Milk
Mushrooms
Pepper
Potatoes
Raspberries
Rice

Food and drink being monitored in 2021

Apples (TBC)

Asparagus

Aubergine (*)

Banana (*)

Beans with pods

Beef/bovine(*)

Berries; blueberry & small fruit

Bread (morning bakery)

Bread (ordinary)

Broccoli (*)

Cheese (soft)

Edible seeds

Eggs (*)

Fish (white)

Grapefruit (*)

Grapes (*)

Infant food (cereal based) (*)

Melon (*)

Milk

Mushrooms (cultivated) (*)

Nuts

Olive oil (*)

Pepper (processed)

Pepper (sweet) (*)

Potatoes

Raspberries

Rice

Soya milk

Soya products

Spring greens & kale

Wheat flour

(*) Co-ordinated programme required by specific regulation

Section 5: background and reference

Reasons for pesticide residue testing

Food safety is important. Modern food production processes have given us plentiful supplies of a wide range of good quality affordable produce.

In the food industry of today the production environment can be managed from the preparation of seeds used for crops, through to growth, harvesting and storage of the produce.

One of the ways the food industry controls the environment in which foodstuffs are produced is by applying pesticides. They help farmers and growers maximise the production of food stuffs by, for example, preventing weeds inhibiting the growth of the crop, or insects destroying or infesting them. Pesticides can also be used to help protect seeds or prolong the life of crops after they have been harvested. Biological and physical (cultural) controls are also used to protect crops or as part of an integrated system.

As pesticides are used to control unwanted pests, weeds and diseases, they can potentially also harm people, wildlife and the environment. This is why the UK, in common with most other countries, imposes legally enforceable conditions as to how and when pesticides can be used. No pesticide can be supplied or used on a food or ornamental crops in the UK without Government authorisation. To obtain this authorisation the manufacturer of the pesticide must show that it does not present a concern for people's health or the environment. Naturally derived and synthetic pesticides are subject to the same regulation.

Once the authorisation has been granted Government authorities carry out follow up checks to ensure that the authorisation is providing the necessary degree of protection to users, consumers and the environment and that those who use pesticides are complying with conditions specified within it.

The Government authority responsible for checking pesticide residues in foodstuffs is the Health and Safety Executive. Defra's Expert Committee on Pesticide Residues in Food (PRiF) oversees and provides an independent check on this work. We know that the use of pesticides on crops may lead to traces (residues) of these chemicals in food and we expect to find these in our monitoring programme.

Detail of reporting practice

Results by food commodity

- We include information about the survey (for instance where samples came from) for each commodity
- Detailed tabulated results are at the back of this report - these tables are also available for download from our website
- We summarise our findings and any follow-up action taken.

Risk assessments – single residues

- All results are screened by HSE to check for intakes above the Acute Reference Dose (ARfD). HSE assumes a relatively high level of intake and also assumes that most produce is eaten whole including peel/skin even when these are rarely consumed

- Where intakes above the ARfD are identified, we consider a detailed risk assessment prepared by HSE (at section II of this report).
- Our observations and the follow-up action taken are summarised in the section for that food.

Risk assessments – multiple combined residues

- Residues of more than one pesticide from the same category/class of particular categories of pesticides, which have a similar toxicological mode of action, are screened by HSE to check for intakes above the combined Acute Reference Dose (ARfD).
- Where combined intakes above the combined ARfD are identified, we consider a detailed combined risk assessment prepared by HSE (at section II of this report).
- Our observations and any follow-up action taken are summarised in the section for that food commodity.

Risk assessment - conclusions

- Where, in the light of current knowledge and considering the usual level of scientific uncertainty (or precaution) the intake will not cause ill health the conclusion will say no effect on health is expected.
- Where, in the light of current knowledge and considering a slightly higher level of scientific uncertainty (or less precaution) the intake is not likely to cause ill health, the conclusion will be less definite and state that an effect on health is unlikely.
- Where scientific uncertainty is greater more information is provided.

Residues in GB and NI produce of pesticides which do not have a PPP authorised for use on that crop in GB and NI.

- All residues found in foods produced in GB or NI are checked by HSE to make sure there is a PPP containing that pesticide authorised for use on that crop.
- Where there is no GB or NI authorisation is identified, details of the sample are referred to the Enforcement Section for follow up.
- Our observations and any follow-up action taken to date are summarised in the section for that food commodity. We may have to withhold details of samples while investigations are underway, in which case the details will be published in a later report.

Residues above the MRL, after taking into account measurement uncertainty

- Samples containing residues above the MRL are listed at Appendix B, and those which are clearly above the MRL after taking into account measurement uncertainty of plus or minus 50% are highlighted.
- Our observations and any follow-up action taken are summarised in the section for that food commodity.
- The results in our reports are rounded for publication but not adjusted for measurement uncertainty.
- We apply measurement uncertainty only to decide whether to highlight a result as over the MRL in the brand name annex. To do this we use the actual value reported by the laboratory before rounding. If after taking measurement uncertainty into account that value is found to be over the MRL the result will be highlighted in the brand name annex.

For example:

- The lab reports the results of duplicate analysis of a residue above an MRL at 0.023 mg/kg and 0.025 mg/kg giving an average value of 0.024mg/kg. For reporting purpose this value would be 0.02 mg/kg.

- If measurement uncertainty is then applied to the reported value of 0.02 mg/kg it could take the value to between 0.01 - 0.03 mg/kg. If the MRL is 0.01 mg/kg the lower value would be at the MRL and there is no exceedance.
- However, if measurement uncertainty is applied to the measured result, e.g. 0.024 mg/kg the value could then be in the range of 0.012 – 0.036 mg/kg. In this case the lower value is above the MRL and so will be treated as an exceedance.

Residues in organic food

- We monitor pesticide residues in all the UK food supply, including organic food.
- We are not responsible for checking compliance with the rules associated with organic production. However, when we do detect residues in an organic food we explain whether or not those residues indicate a breach of the rules and inform Defra's Organic Farming Branch.

Brand Name Annex

- Full brand name details for samples included in this report are published in a brand name annex. Within this annex, samples with results of interest are highlighted.
- Brand name details are only published when enough follow-up work is completed for us to be reasonably sure whether a breach of the law or good practice has occurred.
- Therefore, sometimes brand name details are withheld pending completion of this work but are published in a later report.

Pesticides analysed as multi-component analytes and their reporting limits

Why some results cover more than one substance

Both the legal controls and our analytical tests are aimed at checking food for the presence of residues of specific pesticides. Residues are the chemical traces left behind after pesticides are used. In most cases the residue of a pesticide is measured by first identifying the pesticide and then measuring the quantity of that pesticide in the food itself. But for some pesticides the residue remaining in the food is known to be chemically different from the original pesticide and so the laboratory needs to look for more than one component. There are various reasons why this happens, for example:

- the animal or plant can change the pesticide into related chemicals
- the pesticide can change in the environment into related chemicals
- some pesticides are mixtures of chemicals, so the relevant components of the mixture need to be checked for
- in the laboratory sample preparation and/or analysis may change pesticides into related chemicals
- related chemicals may be pesticides in their own right

The MRL setting process takes account of all these issues. The EU may set a complex residue definition to ensure that the identity and quantity of the residue found is representative of the pesticide present. A complex residue definition may be set where it is necessary for safety reasons or to be able to accurately identify the pesticide residue present in the food. This definition usually includes the actual pesticide, plus other related chemicals. These residues are usually reported together as a "sum". Sometimes different foods need different definitions because different pesticide residues are known to occur in that food. For instances, plants and animals may metabolise a pesticide differently, which forms different residues.

The full definitions of pesticides that we have found in our surveys are described in the table below. If you would like more detail about a particular residue definition, please get in touch. You can email us at prif@hse.gov.uk and other contact details are on the back cover.

Where the detailed individual analysis results tell us something useful, we mention that in our conclusions.

How we calculate sums

Unless the definition says otherwise, the summed result is a simple addition. For individual components that are not detected that result is treated as a zero.

Where a residue definition says, “expressed as”, that means that the individual component results are adjusted by molecular weight before being added together. The residue definition is set this way so that the final calculated result for the whole definition is an expression of the level of the most toxic component, and so that value can be used directly in consumer risk assessment without further adjustment.

Complex residue definitions used in our reports

There are a large number of pesticides used and types of food in the world. So other complex residue definitions may apply to food/pesticide combinations not yet considered by PRiF. You can look up all the EU MRL definitions for pesticide residues at the European Commission’s pesticide database at EU-Pesticide Database

Short name we use in our reports	Legal residue definition – These definitions apply to all foods unless otherwise stated
2,4-D (sum)	2,4-D (sum of 2,4-D and its esters expressed as 2,4-D)
abamectin (sum)	Abamectin (sum of Avermectin B1a, AvermectinB1b and delta-8,9 isomer of Avermectin B1a)
aldicarb (sum)	Aldicarb (sum of Aldicarb, its sulfoxide and its sulfone, expressed as Aldicarb)
aldrin and dieldrin	Aldrin and Dieldrin (Aldrin and dieldrin combined expressed as dieldrin), aka dieldrin (sum)
Amitraz	Amitraz (amitraz including the metabolites containing the 2,4 - dimethylaniline moiety expressed as amitraz)
BAC (sum)	Benzalkonium chloride (mixture of alkylbenzyldimethylammonium chlorides with alkyl chain lengths of C_8, C_{10}, C_{12}, C_{14}, C_{16} and C_{18})
benthiavalicarb (sum)	Benthiavalicarb (Benthiavalicarb-isopropyl (KIF-230 R-L) and its enantiomer (KIF-230 S-D) and diastereomers (KIF-230 R-L and KIF-230 S-D)
bixan (animal products)	Sum of bixafen and desmethyl bixafen expressed as bixafen This definition applies to animal products only
captan and folpet	Sum of captan and folpet aka captan/folpet

	This definition applies only to pome fruit (fruits such as apples and pears), strawberries, raspberries, currants, tomatoes and beans. For all other foods there are separate MRLs for captan only and for folpet only.
carbendazim (animal products)	Carbendazim and thiophanate-methyl, expressed as carbendazim
Carbendazim (sum)	Carbendazim and benomyl (sum of benomyl and carbendazim expressed as carbendazim)
carbofuran (sum)	Carbofuran (sum of carbofuran and 3-hydroxy-carbofuran expressed as carbofuran)
chlordane (animal products)	Chlordane (sum of cis- and trans-isomers and oxychlordane expressed as chlordane) This definition applies to animal products only
chlordane (sum)	Chlordane (sum of cis- and trans- isomers) This definition applies to all foods except animal products
chlorpropham (potatoes)	Chlorpropham only This definition applies only to potatoes
chlorpropham (sum for animal products)	Chlorpropham and 4-hydroxychlorpropham-O-sulphonic acid (4-HSA), expressed as chlorpropham This definition applies only to animal products
chlorpropham (sum)	Chlorpropham (Chlorpropham and 3-chloroaniline, expressed as Chlorpropham) This definition applies to all foods except potatoes and animal products
DDAC (sum)	Didecyldimethylammonium chloride (mixture of alkyl-quaternary ammonium salts with alkyl chain lengths of C_8, C_{10} and C_{12})
DDT (sum)	DDT (sum of p,p'-DDT, o,p'-DDT, p-p'-DDE and p,p'-TDE (DDD) expressed as DDT)
Dichlorprop	Sum of Dichlorprop, including dichlorprop-p and its conjugates, expressed as dichlorprop
dicofol (sum)	Dicofol (sum of p, p' and o,p' isomers)

Dimethenamid	Dimethenamid–p (Dimethenamid-p including other mixtures of constituent isomers (sum of isomers))
dimethoate (sum)	Dimethoate (sum of dimethoate and omethoate expressed as dimethoate)
disulfoton (sum)	Disulfoton (sum of disulfoton, disulfoton sulfoxide and disulfoton sulfone expressed as disulfoton)
dithiocarbamates	Dithiocarbamates are a group of pesticides that are chemically similar. Testing for them individually in routine analysis is not possible, so MRLs are set for a test for the group.
endosulfan (sum)	Endosulfan (sum of alpha- and beta-isomers and endosulfan-sulphate expresses as endosulfan)
fenamiphos (sum)	Fenamiphos (sum of fenamiphos and its sulphoxide and sulphone expressed as fenamiphos)
fenchlorphos (sum)	Fenchlorphos (sum of fenchlorphos and fenchlorphos oxon expressed as fenchlorphos)
fensulfothion (sum)	Fensulfothion (sum of fensulfothion, its oxygen analogue and their sulfones, expressed as fensulfothion).
fenthion (sum)	Fenthion (fenthion and its oxygen analogue, their sulfoxides and sulfone expressed as parent)
fenvalerate & esfenvalerate (all isomers)	Fenvalerate (any ratio of constituent isomers (RR, SS, RS & SR) including esfenvalerate)
fipronil (infant food)	Sum of fipronil and fipronil-desulfinyl, expressed as fipronil This definition applies to foods for babies only
fipronil (sum)	Fipronil (sum Fipronil and sulfone metabolite (MB46136) expressed as Fipronil) This definition applies to all foods except foods for babies
flonicamid (sum)	Flonicamid (sum of flonicamid, TNFG and TNFA) This definition applies to all food except animal products. The full definition must be sought. Residues found are usually of the metabolites.

fluazifop-p-butyl (sum)	Fluazifop-P-butyl (fluazifop acid (free and conjugate))
Fosetyl (sum)	Fosetyl-Al (sum of fosetyl, phosphonic acid and their salts, expressed as fosetyl)
haloxyfop (sum)	Haloxyfop including haloxyfop-R (Haloxyfop-R methyl ester, haloxyfop-R and conjugates of haloxyfop-R expressed as haloxyfop-R)
Heptachlor (infant food)	Sum of heptachlor and trans heptachlor epoxide This definition applies to foods for babies only
Heptachlor (sum)	Heptachlor (sum of heptachlor and heptachlor epoxide expressed as heptachlor) This definition applies to all foods except infant foods
hexachlorocyclohexane (sum)	Hexachlorocyclohexane (HCH), sum of isomers, except the gamma isomer This definition applies to all foods except animal products (For animal products the alpha and beta isomers have separate MRLs)
Malathion	Malathion (sum of malathion and malaoxon expressed as malathion)
MCPA (animal products)	[Residue definition, animal products] MCPA, MCPB and MCPA thioethyl expressed as MCPA This definition applies to animal products only
MCPA (sum)	MCPA and MCPB (MCPA, MCPB including their salts, esters and conjugates expressed as MCPA) This definition applies to all foods except animal products
Mepanipyrim (sum)	Mepanipyrim and its metabolite (2-anilino-4-(2-hydroxypropyl)-6-methylpyrimidine) expressed as mepanipyrim
methiocarb (sum)	Methiocarb (sum of methiocarb and methiocarb sulfoxide and sulfone, expressed as methiocarb)
methomyl (sum)	Sum of methomyl and thiodicarb expressed as methomyl

Oxydemeton-methyl (sum)	Oxydemeton-methyl (sum of oxydemeton-methyl and demeton-S-methylsulfone expressed as oxydemeton-methyl)
parathion-methyl (sum)	Parathion-methyl (sum of Parathion-methyl and paraoxon-methyl expressed as Parathion-methyl)
Permethrin	Permethrin (sum of isomers)
phorate (sum)	Phorate (sum of phorate, its oxygen analogue and their sulfones expressed as phorate)
phosmet (sum)	Phosmet (phosmet and phosmet oxon expressed as phosmet) This definition applies to all foods except animal products
pirimicarb (sum)	Pirimicarb (sum of Pirimicarb and Desmethyl pirimicarb expressed as Pirimicarb) for certain animal products. Pirimicarb only for fruit and vegetables and some animal products.
Prothioconazole (sum)	Prothioconazole (sum of prothioconazole-desthio and its glucuronide conjugate, expressed as prothioconazoledesthio) This definition applies to animal products only
PTU & propineb	Sum of PTU and propineb This definition applies to food for babies only
quintozene (sum)	Quintozene (sum of quintozene and pentachloro-aniline expressed as quintozene)
Prochloraz (sum)	Prochloraz (sum of prochloraz and its metabolites containing the 2,4,6-Trichlorophenol moiety expressed as prochloraz)
Terbufos (sum)	Terbufos (sum of terbufos, its sulfoxide and sulfone This definition applies only to foods for babies
thiamethoxam (sum)	Thiamethoxam (sum of thiamethoxam and clothianidin expressed as thiamethoxam) There are also separate clothianidin MRLs
tolylfluanid (sum)	Tolylfluanid (Sum of tolylfluanid and dimethylaminosulfotoluidide expressed as tolylfluanid)

triadimefon & triadimenol	Triadimefon and triademenol
vinclozolin (animal products)	Vinclozolin, iprodione, procymidone, sum of compounds and all metabolites containing the 3,5-dichloroaniline moiety expressed as 3,5-dichloroaniline This definition applies to animal products only
vinclozolin (sum)	Vinclozolin (sum of vinclozolin and all metabolites containing the 3,5-dichloraniniline moiety, expressed as vinclozolin) This definition applies to all foods except animal products

Glossary

This is a ‘standard’ glossary which defines the key terms used in the PRiF reports. Not all the terms listed here are used in this particular report.

97.5th percentile consumer: Please refer to glossary entry for ‘High level consumer’.

Acceptable Daily Intake (ADI): This is the amount of a chemical which can be consumed every day for a lifetime in the practical certainty, on the basis of all known facts, that no harm will result. It is expressed in milligrams of the chemical per kilogram of body weight of the consumer. The starting point for the derivation of the ADI is usually the ‘no observed adverse effect level’ (NOAEL) that has been observed in animal studies for toxicity. This is then divided by an uncertainty factor (most often 100) to allow for the possibility that animals may be less sensitive than humans and also to account for possible variation in sensitivity between individuals. The studies from which NOAELs and hence ADIs are derived take into account any impurities in the pesticide active substance as manufactured, and also any toxic breakdown products of the pesticide.

Acetylcholine: Acetylcholine is a neurotransmitter, a chemical that carries signals through the nervous system. *See cholinergic*

Acetylcholinesterase: This is an enzyme which degrades acetylcholine and is involved in the regulation of nerve impulses. Inhibition of this enzyme can interfere with this nerve transmission function. This is a short-term effect of concern with organophosphate and carbamate pesticides at levels above the ARfD.

Acute Reference Dose (ARfD): The definition of the ARfD is similar to that of the ADI, but it relates to the amount of a chemical that can be taken in at one meal or on one day without appreciable health risk to the consumer. It is normally derived by applying an appropriate uncertainty factor to the lowest NOAEL in studies that assess acute toxicity or developmental toxicity.

As a matter of policy, the EU does not use NOAELs from tests that involve deliberate administration of pesticides to humans to determine ADIs and ARfDs. However, where such data have been ethically and scientifically derived some authorities, e.g. the World Health Organization, do consider such data. Where human data are used there is usually less uncertainty in the resulting reference value compared to extrapolating from animal tests to humans, and a lower uncertainty factor (most often 10) is used to account for the variation in sensitivity between individuals.

The initial risk assessments in PRiF reports use the agreed EU reference values. However, where intakes are above the EU value and a reference value based on acceptable human data is available a refined assessment, which is a more appropriate indicator of the risk, is also reported.

Analyte: This is the name for the substance that the PRiF surveys look for and measure if present; it could be a pesticide itself or a product from a pesticide when it is degraded, or metabolised.

COLEACP (Europe-Africa-Caribbean-Pacific Liaison Committee): It aims to promote the competitive export of fresh fruit, vegetables, flowers and ornamental plants from the ACP. Its specialised information and advisory services are open to all ACP companies in the horticultural

export sector and are financed by the European Commission. It has two overriding objectives to enable ACP companies to comply with European food safety and traceability requirements and to consolidate the position of small-scale producers in the ACP horticultural export sector.

Cholinergic: In relation to the animal nervous system, processes and structures are cholinergic if they release or use acetylcholine.

Cryogenic Milling: Processing of commodities at very low temperatures can be achieved by milling/grinding pre-frozen samples in the presence of dry ice, a procedure known as 'cryogenic milling'.

Extensions of Authorisations for Minor Use (EAMUs): Users and authorisation holders of agricultural Plant Protection Products (PPP) may apply to have the authorisation of specific PPP's extended to cover uses additional to those authorised and shown on the manufacturer's product label. For many reasons, label recommendations of authorised pesticides do not cover the control of every problem which may arise. This is particularly true for crops that are grown on a comparatively small scale in the UK as well as for pests and diseases that occur less often or which are new to the UK. As part of the process evidence on residues that would arise from the use is required, and consumer safety is evaluated and if necessary a specific MRL set. EAMU is pronounced "emu" these types of authorisations are also informally called "off labels".

Genotoxicity: Genotoxicity is the effect of substances (called genotoxins) which can alter or damage the genetic material (DNA, RNA or chromosomes) within a cell. Cells have the capacity to protect themselves from genotoxic effects by many repair processes and therefore many genotoxic events do not become evident as mutations. Where mutations occur, this can lead to cancer or effects that can be passed to unborn children (e.g. birth defects, inherited diseases).

Good Agricultural Practice in the Use of Pesticides (GAP): The nationally authorised safe uses of pesticides under conditions necessary for effective and reliable pest control (the way products should be used according to the statutory conditions of approval which are stated on the label). GAP encompasses a range of pesticide applications up to the highest authorised rates of use, applied in a manner which leaves a residue which is the smallest practicable. Authorised safe uses are determined at the national level and include nationally registered recommended uses, which take into account public and occupational health and environmental safety considerations. Actual conditions include any stage in the production, storage, transport, distribution and processing of food commodities and animal feed.

High-level Consumer: A term used in UK risk assessment calculations to describe the amount of food consumed by a person. In line with internationally agreed approaches, the PRiF uses the 97.5^{th} percentile value, which is generally about three times the average amount consumed. This takes account of different eating patterns that may occur throughout the population.

Human Data: See under Acute Reference Dose

Import Tolerance: an MRL set for imported products where the use of the active substance in a plant protection product on a commodity is not authorised in the European Community (EC) or an existing EC MRL is not sufficient to meet the needs of international trade. All import tolerances are assessed for consumer safety.

Imported: The tables in the reports record whether the sample was of UK origin, or imported. This can mean different things depending on the commodity. See also 'Origin'. The PRiF report the country from where the produce has been imported only if this is clear from the packaging or labelling.

JMPR: Joint FAO/WHO Meeting on Pesticide Residues, which conducts scientific evaluations of pesticide residues in food.

LOD (Limit of Determination) and LOD MRLs: The Limit of Determination (LOD) is the lowest concentration of a pesticide residue or contaminant that can be routinely identified and quantitively measured in a specified food, agricultural commodity or animal feed with an acceptable degree of certainty by the method of analysis.

LOD MRL (Maximum Residue Levels set at the LOD): For some pesticides and commodities insufficient trials data are available on which to set a maximum residue level or there may be no use of the pesticide on that crop. In these cases, the MRL may be set at a default level i.e.; at the limit of determination (LOD) where analytical methods can reasonably detect the presence of the pesticide. **These MRLs are not based on Good Agricultural Practice (GAP).**

Lowest Observed Adverse Effect Level (LOAEL): The lowest concentration or amount of a substance, found by experiment or observation, which causes detectable adverse alteration of morphology, functional capacity, growth, development or life span of the target organism under defined conditions of exposure.

Off Label: See Extensions of Authorisations for Minor Use (EAMUs)

Maximum Residue Level (MRL): The maximum concentration of a pesticide residue (expressed as mg/kg) legally permitted in or on food commodities and animal feeds. MRLs are based on good agricultural practice data and residues in foods derived from commodities that comply with the respective MRLs are intended to be toxicologically acceptable.

MRLs are intended primarily as a check that GAP is being followed and to assist international trade in produce treated with pesticides. **MRLs are not in themselves 'safety limits'**, and exposure to residues in excess of an MRL does not automatically imply a hazard to health.

The MRLs applicable in the UK are now largely set under EC legislation.

Maximum Residue Levels (MRLs) reflect levels of pesticides that could occur in produce, which has been treated in accordance with good agricultural practice. Where pesticides do not give rise to readily detectable residues, or are not authorised for use on particular commodities, MRLs are set at the lowest level which can be identified in routine laboratory analysis. Thus, they provide a mechanism for statutory controls on pesticides in produce which is put into circulation and for monitoring correct use of these chemicals.

If no use of a pesticide on a crop is identified when MRLs are set the tolerance for that pesticide/crop combination is set at the limit of determination (effectively zero). Limit of determination MRL are marked by a '*'.

MRLs are established under the Pesticides (Maximum Residue Levels in Crops, Food and Feeding Stuffs) (England and Wales) Regulations 1999 (as amended), the Pesticides (Maximum Residue Levels in Crops, Food and Feeding Stuffs) (Scotland) Regulations 2000 and the Pesticides (Maximum Residue Levels in Crops, Food and Feeding Stuffs) Regulations (Northern Ireland) 2002. These Regulations list all statutory MRLs established under UK national or EC procedures. Today, virtually all these MRLs are set under an ongoing EC programme and the Regulations are amended periodically as levels are set for increasing numbers of pesticides.

There are a number of pesticides which do not yet have statutory MRLs. In the absence of such MRLs we advise suppliers to adhere to any appropriate levels established by the Codex Alimentarius Commission (CAC) a United Nations body established to promote global trading

standards. Codex MRLs are not statutory but have been risk-assessed when set and provide a suitable standard in the absence of a statutory MRL.

MRLs may be extended to composite and processed products but levels are not specifically laid down in legislation. They are derived by calculation on an individual basis.

Maximum Residue Levels set at the LOD (LOD MRL): See LOD MRL. For some pesticides and commodities, insufficient trials data are available on which to set a maximum residue level or there may be no use of the pesticide on that crop. In these cases, the MRL may be set at a default level, i.e. at the limit of determination (LOD) where analytical methods can reasonably detect the presence of the pesticide. **These MRLs are not based on Good Agricultural Practice (GAP).**

MRL exceedances: When a residue is found at a level higher than that set for the MRL.

MRL Exceedances and Relationship with the Acceptable Daily Intake (ADI): Before permitting any use of a pesticide, a detailed assessment is made to ensure that residues in foods derived from commodities comply with MRLs and will not give rise to unacceptable risks to consumers. MRLs do take account of consumer safety aspects and, in effect, are set at levels below safety limits. However, MRLs must not be confused with safety limits, which are expressed in terms of the acceptable daily intake (ADI) of a particular pesticide residue from all sources. The ADI (expressed as mg/kg bw/day) is the amount of chemical that can be consumed every day of an individual's entire lifetime in the practical certainty, on the basis of all known facts, that no harm will result. See ADI for further information.

Whenever unexpectedly high or unusual residues occur during monitoring, the risk to consumers, from exposure to residues at the highest levels found, is assessed by comparison of predicted intakes with the ADI or ARfD as appropriate.

No MRL: For certain pesticides an MRL may not have been set.

Metabolite: A degradation or conversion product from a pesticide when it is metabolised.

Multiple Residues: In this report this term is used to describe when more than one pesticide is found in an individual food sample. It may have arisen because the crop was treated at different times with pesticides applied singularly, or when pesticides are applied as mixtures (several pesticides mixed in the spray tank at the same time) or the marketed pesticide product contains more than one pesticide or any combination of these three situations. Mixtures may be used in response to specific pest pressures and also as part of strategies to minimise pesticide resistance building up on pest populations.

NEDI: National Estimate of Daily Intake. An estimate of intake of pesticide in the diet over the long-term to compare to the ADI. The NEDI is based on median or mean residue levels and a high level consumption (97.5th percentile value) for the daily amounts of the food item consumed over the long term. For further details on the calculation of NEDIs please refer to section 3 of the data requirements handbook using the following link: The HSE Pesticide Website then search for Consumer Exposure. Here you will find information and further links.

NESTI: National Estimate of Short Term Intake. An estimate of peak intake of pesticide in the diet to compare to the ARfD. The NESTI is based on the highest residue found multiplied by a variability factor (see glossary description) and a high level consumption (97.5th percentile value) for the amount of the food item consumed over a single day. For further details on the calculation of NESTIs please refer to section 3 of the data requirements handbook using the

following link: The HSE Pesticide Website then search for Consumer Exposure. Here you will find information and further links.

Neurotoxicity: Neurotoxicity is the effect of substances (called neurotoxins) which alter the normal working of an animal's nervous systems and/or damage the nervous tissue.

No Observed Adverse Effect Level (NOAEL): The greatest concentration or amount of a substance, found by experiment or observation, which causes no detectable adverse alteration of morphology, functional capacity, growth, development or life span of the target organism under defined conditions of exposure.

Off Label: See EAMUs

Origin: The brand name annex reports the origins of the samples tested. This can mean different things depending on the commodity. For example, butter is often labelled as 'UK origin'; however, the majority of it comes in bulk from New Zealand and is split into smaller blocks and packaged in the UK. Lettuce is a fresh produce and 'UK origin' usually means that it has been grown and packaged in the UK. Processed commodities such as cereal bars often contain multiple raw ingredients, each of which may come from a different source/origin. Therefore, the origin of the produce usually reflects the place where it was manufactured. The PRiF report the origin as stated on the packaging or labelling of the commodity concerned, unless other more accurate information is available to indicate that the origin is from elsewhere. Some products are listed as 'unknown origin' because the labelling does not give this information.

Parent: The chemical form of a pesticide as applied to plants, as opposed to metabolites and breakdown products.

Percentile: A percentile is a value that divides a sample of measurements at a specific point when they are listed in ascending order of magnitude. For example, the 97.5th percentile from a food consumption survey is a value that is equal to or more than 97.5% of the measurements and equal to or less than 2.5% of the measurements. So, in a sample of 40 daily food consumption values, the 97.5th percentile is equal to or more than 39 of the measurements. Such high percentile estimates of food consumption are used in risk assessments as they are more protective than using average consumption levels.

Permitted Level (PL): The permitted levels (expressed as mg/kg), in specific commodities, of some substances which can be classified as pesticides but are controlled under the Miscellaneous Food Additives Regulations 1995 (S.I. 1995 No. 3187).

Pesticide: A pesticide is any substance, preparation or organism prepared or used for destroying any pest. The majority of pesticides sought by the PRiF in its monitoring are those used to control pests in agricultural crops, although non-agricultural products may be included where there is a specific reason for doing so, e.g. where there are implications in terms of possible intakes of residues.

Probabilistic Modelling: The usual estimates of consumer exposure use single high values for both consumption amounts and residue levels. Whilst these are based on realistic UK dietary survey data and residue levels, they tend to overestimate most representative intakes. This is because they do not take into account actual variations in both amounts consumed and residue levels. Probabilistic modelling is a technique that considers all the possible different combinations of consumption and residue levels. This provides information on the probability of particular intakes occurring.

Rapid Alert System for Food and Feed (RASFF): The European Commission's Rapid Alert System for Food and Feed (RASFF) allows member authorities (EU and EFTA member States) to quickly exchange information about measures taken when responding to risks detected in food or feed. This exchange of information helps authorities in countries inside the European single market to act more rapidly and in a coordinated way in response to a possible health threats caused by food or feed.

RASFFs notifications about pesticide residues are sent when a residue is over the MRL taking into account measurement uncertainty and a potential consumer risk has been identified. For pesticide residues in food traded in the single market this means when a risk assessment has identified that risk to people eating the food cannot be ruled out.

More information is available on the European Commission website at RASFF - Food and Feed Safety Alerts.

Relationship between GAP and MRLs: The MRL can be defined as the maximum concentration of a pesticide residue (expressed as mg/kg) likely to **occur** in or on food commodities and animal feeds, after the use of the pesticide according to the GAP.

Reporting Limit: The reporting limit is the lowest calibrated level employed during analysis to detect residues. The reporting limit may vary slightly from laboratory to laboratory depending on the equipment available and operating procedures used.

'None were detected above the Set RL': This term is used in the Brand Name Annex, where no residues were found above their reporting limit.

Residue: Residues may be present in vegetable and animal products following the application(s) of a pesticide(s). They may not only include the pesticide that was applied but other degradation or reaction products and metabolites that may be of toxicological significance. The levels or amounts of residues present are expressed in milligrams of the chemical in a kilogram of crop/food/commodity (mg/kg), or parts per million.

Risk Assessment: A risk assessment is carried out when residues are found in foods to determine whether, at the levels found, they present a concern for consumer health or not. Consumer risk assessments are routinely conducted as part of the approval process for pesticides and are based on residue trials. Approval of a pesticide is only recommended when the consumer risk is acceptable.

Safety Factor: Values used in extrapolation from experimental studies in animals (usually 100) or humans (usually 10) to the population: for PRiF assessments this represents a value by which the NOAEL is divided to derive an ADI or ARfD. The value depends on the nature of the effect, the dose-response relationship, and the quality of the toxicological information available. The use of such a factor accounts for possible differences in susceptibility between the animal species tested and humans, and for variation between different individuals in the population. The terms 'uncertainty factor' and 'assessment factor' are also sometimes used for this factor; the PRiF will use 'safety factor'.

Sample: The nature of all samples is as designated in the EC's 'sampling' Directive – 2002/63/EC. Examples are: apple – at least 10 apples weighing at least 1 kg; grapes – at least 5 bunches, weighing at least 2 kg.

Technical Exceedances: When an MRL has been set at the LOD because there have been no data to support a higher level. In the context of this report, 'technical exceedances' always relate to produce from third countries.

Variability Factor: A value that describes the variation in residue levels between the highest unit level and the average level in samples made up of many units. Internationally this is agreed to be the 97.5th percentile unit residue level divided by the average of the sum. The variability factor multiplied by the measured residue level from a composite sample (i.e. a sample made up by mixing several units before analysis) gives an estimate of the likely higher residue levels that may have occurred in individual units. These estimated higher levels are used in short-term risk assessments involving fruit and vegetables where consumers eat only a portion of a single item, e.g. melon, or a small number of units e.g. apples and potatoes.