Department for Environment, Food and Rural Affairs

The Expert Committee on Pesticide Residues in Food (PRiF)

Report on the pesticide residues monitoring programme: Quarter 3 2017

March 2018

This publication is available at www.gov.uk/government/groups/expert-committee-on-pesticide-residues-in-food-prif

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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.

More information about PRiF

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 also includes participation in EU-wide monitoring. HSE is also responsible for considering the safety to people who eat the food (in co-operation with the Food Standards Agency if necessary) and 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 produce, which has been treated in accordance with good agricultural practice. Where pesticides do not give rise to readily detectable residues, or are not approved 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 produce which is put into circulation and for monitoring the correct use of these chemicals.

Chair's summary of results

This is our third quarterly report for 2017. During this year's surveillance programme we are looking for a range of up to 369 pesticides in the fruit and vegetable surveys. This quarter's programme surveyed 981 samples of 30 different foods (see contents page for a full list).

27 of the samples contained residues above the legal Maximum Residue Level (the maximum permitted levels by law). These results are in the surveys of beans with pods, infant formula, okra, oranges, potatoes, prepared fresh fruit, raspberries, rice, speciality dried beans, speciality fruit and yogurt. A summary table of all the results is below.

HSE undertakes a screening risk assessment for every residue found, to determine whether the residues could lead to intakes above the relevant 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 looked carefully at all of these findings including the risk assessments. In most cases the presence of the residues found would be unlikely to have had any effect on the health of the people who ate the food. In the case of oranges, we found residues in some samples where short-lived effects were possible if people ate all of the peel as well as the flesh, but not when the fruit was peeled before eating.

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. There is no change to the level of detail or data structure previously included in our reports, but we hope the new 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 for an explanation of our findings. Any responses we have received are available in section 2.

Dr Paul Brantom
Chairman of the Expert Committee on Pesticide Residues in Food

Summary table of all results

Food	Analysed	With residues at or below the MRL	With residues above the MRL	With residues of non- approved pesticides (UK only)	With multiple residues	Organic samples tested	Organic samples with residues
Apples	31	29	0	2	21	2	0
Beans with pods	24	9	7	0	11	0	0
Bread	143	131	0	0	47	0	0
Carrots	24	5	0	0	2	6	0
Cauliflower	25	4	0	0	0	1	0
Cheese (hard)	36	0	0	0	0	3	0
Cherries	48	46	0	0	39	1	0
Cucumber	24	17	0	1	11	6	0
Fish (oily)	30	7	0	0	1	0	0
Grapes	32	30	0	0	27	0	0
Kiwi fruit	29	15	0	0	5	4	0
Lamb and mutton	18	1	0	0	0	2	0
Lettuce	18	2	0	0	1	2	0
Milk	72	0	0	0	0	18	0
Okra	24	8	1	0	3	0	0
Onions	29	20	0	0	2	1	0
Oranges	24	21	1	0	21	1	0
Pears	24	23	0	0	22	1	0
Peppers	25	9	0	0	5	2	0
Potatoes	22	6	1	0	2	0	0
Poultry	24	0	0	0	0	0	0

Prepared fresh fruit	25	2	5	0	0	0	0
Raspberries	36	31	1	1	22	0	0
Rice	24	6	6	0	11	1	0
Shellfish	24	0	0	0	0	1	0
Soya products	51	7	0	0	3	15	0
Speciality beans (dried)	18	1	2	0	1	0	0
Speciality fruit	21	10	2	0	2	0	0
Spring greens and kale	20	17	0	5	13	0	0
Yogurt	36	0	1	0	0	6	1

Summary of Rapid Alert Notifications sent to FSA

Sample ID	Date of Sampling	Description	Country of Origin	Retail Outlet	Address	Brand Name	Packer / Manufacturer	Pesticide residues found in mg/kg (MRL)
Speciality beans (dried)								
3361/2017	**16/07/2017**	**Mung Beans**	**China**	**Eastern Chinese Supermarket**	**26 Tudor Street, Cardiff CF11 6AH**	**Zheng Feng Brand**	**Interlink Direct Ltd 402 - 404 Roding Lane, South Woodford Green, Essex IG8 8EY**	**dithiocarbamates 3.6 (MRL = 0.1)**

*** 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.

Summary of samples with residues over the MRL

PRiF Sample ID	Food	Country of Origin	Pesticide Detected	Residue Detected (mg/kg)	MRL (mg/kg)	MRL exceedance after allowing for measurement uncertainty
Beans with pods						
0699/2017	Speciality Beans	India	triazophos	0.02	0.01*	No
0702/2017	Speciality Beans	India	dimethoate (sum)	0.03	0.02*	No
0781/2017	**Speciality Beans**	**Kenya**	**profenofos**	**0.4**	**0.01***	**Yes**
0786/2017	**Speciality Beans**	**India**	**captan (sum)**	**0.2**	**0.03***	**Yes**
			profenofos	**0.04**	**0.01***	**Yes**
			propiconazole	**0.02**	**0.01***	**Yes**
0809/2017	**Speciality Beans**	**Malaysia**	**methamidophos**	**0.04**	**0.01***	**Yes**
			methomyl (sum)	**0.5**	**0.1**	**Yes**
0958/2017	**Speciality Beans**	**Kenya**	**profenofos**	**0.9**	**0.01***	**Yes**
1106/2017	**Speciality Beans**	**Kenya**	**carbendazim (sum)**	**0.5**	**0.2**	**Yes**
Okra						
3838/2017	**Frozen**	**Egypt**	**BAC (sum)**	**3.5**	**0.1**	**Yes**
Oranges						
1183/2017	Valencia Oranges Loose	South Africa	methidathion	0.03	0.02*	No
Potatoes						
0112/2017	Maincrop	UK	pencycuron	0.2	0.1	No
Prepared fresh fruit						
3660/2017	Mango	UK	chlorate	0.03	0.01*	No
3677/2017	Melon	UK	chlorate	0.02	0.01*	No
2140/2017	Mixed	UK	chlorate	0.03	0.01*	No

2307/2017	Mixed	UK	chlorate	0.05	0.01*	No
4557/2017	Mixed	Belgium	chlorate	0.03	0.01*	No
Raspberries						
1855/2017	Fresh	UK	chlorpyrifos	0.02	0.01*	No
Rice						
2068/2017	**Basmati**	**UK**	carbendazim (sum)	0.02	0.01*	No
			thiamethoxam	**0.04**	**0.01***	**Yes**
2214/2017	**Basmati**	**UK**	**acephate**	**0.2**	**0.01***	**Yes**
			carbendazim (sum)	**0.03**	**0.01***	**Yes**
			methamidophos	**0.03**	**0.01***	**Yes**
5166/2017	**Basmati**	**UK**	**carbendazim (sum)**	**0.02**	**0.01***	**Yes**
4510/2017	**Brown**	**Greece**	**tricyclazole**	**0.04**	**0.01***	**Yes**
3157/2017	**Other**	**Spain**	**tricyclazole**	**0.02**	**0.01***	**Yes**
4901/2017	**White**	**UK**	**hexaconazole**	**0.03**	**0.01***	**Yes**
			tricyclazole	**0.05**	**0.01***	**Yes**
Speciality beans (dried)						
2445/2017	Mung Beans	Myanmar	methamidophos	0.02	0.01*	
3361/2017	**Mung Beans**	**China**	**dithiocarbamates**	**3.6**	**0.1**	**Yes**
Speciality fruit						
1060/2017	Pomegranates	Spain	lambda-cyhalothrin	0.03	0.02*	No
1251/2017	**Pomegranates**	**Egypt**	**lambda-cyhalothrin**	**0.09**	**0.02***	**Yes**
Yogurt						
3403/2017	**Organic Breakfast Yoghurt**	**UK**	**BAC (sum)**	**1.4**	**0.1**	**Yes**

* **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.

Section 1: findings by food

Apples

Summary of results

In a survey of 31 samples of apples collected between July and September 2017, none of the samples contained a pesticide residue above the MRL. Details of 2 UK samples were passed to HSE Enforcement as they contained a residue that is no longer approved for use on apples in the UK. These results were reviewed by the Expert Committee on Pesticide Residues in Food (PRiF).

Comments by the PRiF

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

Survey design

The apple samples were bought by a market research company from retail outlets across the UK

Full sample details, including brand name information, pesticides sought and residues found are available in an accessible format at https://data.gov.uk/dataset/pesticide-residues-in-food

Samples tested

31 samples were tested for up to 366 pesticide residues

Cooking

- 12 samples came from the UK

Eating

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

Pesticide residues detected from those sought

2 samples contained no residues from those sought
29 samples contained residues above the reporting level
None of the samples contained residues above the MRL
2 samples were labelled as organic. Neither contained residues from those sought

Multiple residues

21 samples contained residues of more than one pesticide

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

Risk assessments

2 samples of apples contained a residue of dithiocarbamates at levels where the effect on health needed to be considered in more detail. The highest level detected was 0.8 mg/kg. HSE’s risk assessment for both samples concluded that an effect on health would be unlikely. Full risk assessment is available at page 80.

One of the risk assessments were carried out assuming the residue detected resulted from the use of ziram, the most toxic dithiocarbamate as no information was available to refine the risk assessment. More information about how the dithiocarbamate risk assessment is carried out is available at page 77.

Combined risk assessments

Some samples contained residues of more than one pesticide. The pesticide residues found are not chemically related to each other and do not have the same toxicological effects. Following the Health and Safety Executive (HSE)'s risk assessment, we do not expect these residues to have an effect on health, either separately or in combination.

Follow up actions

Further investigation: Suspected illegal use

We have passed details of 2 samples from the UK that contained a residue of paclobutrazol which is no longer approved for use on apples in the UK to HSE Enforcement. HSE Enforcement is investigating; brand name details will not be published until the investigations are complete.

Beans with pods

Summary of results

In a survey of 24 samples of beans with pods collected between July and September 2017, 7 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

Based on the Health and Safety Executive's risk assessment of the residues detected we consider an effect on health to be unlikely (see risk assessments in Section 3).

Survey design

The beans with pod samples were either collected by the Rural Payment Agency's Horticultural Marketing Inspectors from a range of points in the supply chain (wholesalers, retail depots, ports and import points) or bought by a market research company from retail outlets across the UK.

Full sample details, including brand name information, pesticides sought and residues found are available in an accessible format at https://data.gov.uk/dataset/pesticide-residues-in-food

Samples tested

24 samples were tested for up to 364 pesticide residues

Green Beans

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

Speciality Beans

- 12 samples were imported from outside the EU

Pesticide residues detected from those sought

8 samples contained no residues from those sought
16 samples contained residues above the reporting level
7 samples contained residues above the MRL
None of the samples were labelled as organic.

Multiple residues

11 samples contained residues of more than one pesticide

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

- 1 sample contained 4 residues
- 1 sample contained 7 residues
- 1 sample contained 11 residues

Residues measured above the MRL

The laboratory detected 10 different pesticide residues above the MRL in speciality beans with pods

- 1 sample from Malaysia contained residues of:
    - methamidophos at 0.04 mg/kg, the MRL is 0.01* mg/kg.
    - methomyl at 0.5 mg/kg, the MRL is 0.1 mg/kg
- 2 samples from Kenya contained a residue of profenofos at 0.4 mg/kg and 0.9 mg/kg. The MRL is 0.01* mg/kg
- 1 sample from Kenya contained a residue of carbendazim at 0.5 mg/kg. The MRL is 0.2 mg/kg
- 1 sample from India contained residues of:
    - captan at 0.5 mg/kg, the MRL is 0.2 mg/kg
    - propiconazole at 0.02 mg/kg, the MRL is 0.01* mg/kg
    - profenofos at 0.04 mg/kg, the MRL is 0.01* mg/kg
- 1 sample from India contained a residue of triazophos at 0.02 mg/kg. The MRL is 0.01* mg/kg.
- 1 sample from India contained a residue of dimethoate at 0.03 mg/kg. The MRL is 0.02* mg/kg.

Risk assessments

None of the individual 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. 1 sample contained carbofuran, methamidophos and methomyl. HSE's combined risk assessment on this combination showed that an effect on health is unlikely. Full combined risk assessment is available at page 88.

* **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.

Follow up actions

Letters sent

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

Bread

Summary of results

In a survey of 143 samples of bread collected between April and September 2017, 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 by the laboratory would be expected to have an effect on health.

Survey design

The bread samples were bought by a market research company from retail outlets across the UK

Full sample details, including brand name information, pesticides sought and residues found are available in an accessible format at https://data.gov.uk/dataset/pesticide-residues-in-food

Samples tested

143 samples were tested for up to 365 pesticide residues

Ordinary Bread: Brown

- 1 sample came from the EU

Ordinary Bread: Other

- 8 samples came from the UK

Ordinary Bread: White

- 58 samples came from the UK

Ordinary Bread: Wholemeal

- 31 samples came from the UK

Speciality Bread: Cheese Bread

- 19 samples came from the UK

Speciality Bread: Garlic Bread

- 6 samples came from the UK

Speciality Bread: Herb Bread

- 1 sample came from the UK

Speciality Bread: Olive Bread

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

Speciality Bread: Other

- 1 sample came from the UK

Speciality Bread: Tomato Bread

- 3 samples came from the UK

The country of origin on the packaging does not necessarily indicate where the wheat was grown. It may be where the bread was made or where it was packed for consumer purchase.

Pesticide residues detected from those sought

12 samples contained no residues from those sought
131 samples contained residues above the reporting level
None of the samples contained residues above the MRL. We have taken account of how processing (milling and baking) affects residue levels by adjusting the relevant grain MRLs using processing factors (see p92 for details).
None of the samples were labelled as organic.

Multiple residues

47 samples contained residues of more than one pesticide

- 38 samples contained 2 residues
- 8 samples contained 3 residues
- 1 sample contained 6 residues

Risk assessments

None of the individual 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.

Carrots

Summary of results

In a survey of 24 samples of carrots collected between July and September 2017, 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 by the laboratory would be expected to have an effect on health.

Survey design

The carrot samples were bought by a market research company from retail outlets across the UK

Full sample details, including brand name information, pesticides sought and residues found are available in an accessible format at https://data.gov.uk/dataset/pesticide-residues-in-food

Samples tested

24 samples were tested for up to 366 pesticide residues

Fresh

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

Frozen

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

Pesticide residues detected from those sought

19 samples contained no residues from those sought
5 samples contained residues above the reporting level
None of the samples contained residues above the MRL
6 samples were labelled as organic. None contained residues from those sought

Multiple residues

2 samples contained residues of more than one pesticide

- 1 sample contained 2 residues
- 1 sample contained 4 residues

Risk assessments

None of the individual 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. The pesticide residues found are not chemically related to each other and do not have the same toxicological effects. Following the Health and Safety Executive (HSE)'s risk assessment, we do not expect these residues to have an effect on health, either separately or in combination.

Cauliflower

Summary of results

In a survey of 25 samples of cauliflower collected between July and September 2017, 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 by the laboratory would be expected to have an effect on health.

Survey design

The cauliflower samples were bought by a market research company from retail outlets across the UK

Full sample details, including brand name information, pesticides sought and residues found are available in an accessible format at https://data.gov.uk/dataset/pesticide-residues-in-food

Samples tested

25 samples were tested for up to 359 pesticide residues

Fresh

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

Frozen

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

Pesticide residues detected from those sought

21 samples contained no residues from those sought
4 samples contained residues above the reporting level
None of the samples contained residues above the MRL
1 sample was labelled as organic. It didn't contain any residues from those sought

Multiple residues

None of the samples contained residues of more than one pesticide

Risk assessments

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

Cheese (hard)

Summary of results

In a survey of 36 samples of cheese collected between July and September 2017, none of the samples contained a pesticide residue. These results were reviewed by the Expert Committee on Pesticide Residues in Food (PRiF).

Comments by the PRiF

No residues were detected at or above the reporting limit.

Survey design

The cheese samples were bought by a market research company from retail outlets across the UK

Full sample details, including brand name information, pesticides sought and residues found are available in an accessible format at https://data.gov.uk/dataset/pesticide-residues-in-food

Samples tested

36 samples were tested for up to 98 pesticide residues

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

The country of origin on the packaging may not be where the milk used to make the cheese was from. It may be where the cheese was made or where it was packed for consumer purchase.

Pesticide residues detected from those sought

36 samples contained no residues from those sought
None of the samples contained residues above the reporting level
3 samples were labelled as organic. None contained residues from those sought

Risk assessments

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

Cherries

Summary of results

In a survey of 48 samples of cherries collected between June and September 2017, 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 by the laboratory would be expected to have an effect on health.

Survey design

The cherry samples were either collected by the Rural Payment Agency's Horticultural Marketing Inspectors from a range of points in the supply chain (wholesalers, retail depots, ports and import points) or bought by a market research company from retail outlets across the UK.

Full sample details, including brand name information, pesticides sought and residues found are available in an accessible format at https://data.gov.uk/dataset/pesticide-residues-in-food

Samples tested

48 samples were tested for up to 359 pesticide residues

- 26 samples came from the UK
- 6 samples were imported from outside the EU
- 16 samples came from the EU

Pesticide residues detected from those sought

2 samples contained no residues from those sought
46 samples contained residues above the reporting level
None of the samples contained residues above the MRL
1 sample was labelled as organic. It didn't contain any residues from those sought

Multiple residues

39 samples contained residues of more than one pesticide

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

- 1 sample contained 9 residues
- 2 samples contained 10 residues

Risk assessments

None of the individual 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. The pesticide residues found are not chemically related to each other and do not have the same toxicological effects. Following the Health and Safety Executive (HSE)'s risk assessment, we do not expect these residues to have an effect on health, either separately or in combination.

Cucumber

Summary of results

In a survey of 24 samples of cucumber collected between July and September 2017, none of the samples contained a pesticide residue above the MRL. Details of 1 UK sample were passed to HSE Enforcement as it contained a residue that is not approved for use on cucumber in the UK. These results were reviewed by the Expert Committee on Pesticide Residues in Food (PRiF).

Comments by the PRiF

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

Survey design

The cucumber samples were bought by a market research company from retail outlets across the UK

Full sample details, including brand name information, pesticides sought and residues found are available in an accessible format at https://data.gov.uk/dataset/pesticide-residues-in-food

Samples tested

24 samples were tested for up to 361 pesticide residues

- 10 samples came from the UK
- 14 samples came from the EU

Pesticide residues detected from those sought

7 samples contained no residues from those sought
17 samples contained residues above the reporting level
None of the samples 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

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

Risk assessments

None of the individual 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. The pesticide residues found are not chemically related to each other and do not have the same toxicological effects. Following the Health and Safety Executive (HSE)'s risk assessment, we do not expect these residues to have an effect on health, either separately or in combination.

Follow up action

Further investigation: Suspected illegal use

We have passed details of 1 sample from the UK that contained a residue of fluopyram which is not approved for use on cucumber in the UK to HSE Enforcement. HSE Enforcement is investigating; brand name details will not be published until the investigations are complete.

Fish (oily)

Summary of results

In a survey of 30 samples of fish collected between July and September 2017, 7 of the samples contained a pesticide residue. These results were reviewed by the Expert Committee on Pesticide Residues in Food (PRiF).

Comments by the PRiF

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

DDT
7 samples contained a residue of DDT. The use of DDT is banned or heavily restricted in many countries because the residues take a long time to breakdown in the environment and can accumulate in fatty tissue.

An interpretation of the analytical results shows that the only DDT residues found were 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 from retail outlets across the UK

Full sample details, including brand name information, pesticides sought and residues found are available in an accessible format at https://data.gov.uk/dataset/pesticide-residues-in-food

Samples tested

30 samples were tested for up to 36 pesticide residues

Herring
- 1 sample was imported from outside the EU

Mackerel
- 2 samples came from the UK
- 6 samples were imported from outside the EU

Monkfish
- 2 samples were imported from outside the EU

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

Sardine
- 1 sample came from the UK

- 2 samples were imported from outside the EU

Tilapia

- 1 sample was imported from outside the EU

Trout

- 1 sample came from the UK

Tuna

- 2 samples were imported from outside the EU

Whitebait

- 1 sample was imported from outside the EU

The country of origin on the packaging does not necessarily indicate where the fish was caught. It may be where it was processed or where it was packed for consumer purchase.

Pesticide residues detected from those sought

23 samples contained no residues from those sought
7 samples contained residues above the reporting level
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 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. The pesticide residues found are not chemically related to each other and do not have the same toxicological effects. Following the Health and Safety Executive (HSE)'s risk assessment, we do not expect these residues to have an effect on health, either separately or in combination.

Grapes

Summary of results

In a survey of 32 samples of grapes collected between July and September 2017, 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 by the laboratory would be expected to have an effect on health.

Survey design

The grape samples were collected by the Rural Payment Agency's Horticultural Marketing Inspectors from a range of points in the supply chain (wholesale markets, retail depots, ports and import points).

Full sample details, including brand name information, pesticides sought and residues found are available in an accessible format at https://data.gov.uk/dataset/pesticide-residues-in-food

Samples tested

32 samples were tested for up to 367 pesticide residues

- 18 samples were imported from outside the EU
- 14 samples came from the EU

Pesticide residues detected from those sought

2 samples contained no residues from those sought
30 samples contained residues above the reporting level
None of the samples contained residues above the MRL
None of the samples were labelled as organic.

Multiple residues

27 samples contained residues of more than one pesticide

- 11 samples contained 2 residues
- 6 samples contained 3 residues
- 3 samples contained 4 residues
- 3 samples contained 5 residues
- 4 samples contained 6 residues

Risk assessments

None of the individual 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. The pesticide residues found are not chemically related to each other and do not have the same toxicological effects. Following the Health and Safety Executive (HSE)'s risk assessment, we do not expect these residues to have an effect on health, either separately or in combination.

Kiwi fruit

Summary of results

In a survey of 29 samples of kiwi fruit collected between July and September 2017, 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 by the laboratory would be expected to have an effect on health.

Survey design

The kiwi fruit samples were bought by a market research company from retail outlets across the UK

Full sample details, including brand name information, pesticides sought and residues found are available in an accessible format at https://data.gov.uk/dataset/pesticide-residues-in-food

Samples tested

29 samples were tested for up to 360 pesticide residues

- 29 samples were imported from outside the EU

Pesticide residues detected from those sought

14 samples contained no residues from those sought
15 samples contained residues above the reporting level
None of the samples contained residues above the MRL
4 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 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. The pesticide residues found are not chemically related to each other and do not have the same toxicological effects. Following the Health and Safety Executive (HSE)'s risk assessment, we do not expect these residues to have an effect on health, either separately or in combination.

Lamb

Summary of results

In a survey of 18 samples of lamb collected between July and August 2017, 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 by the laboratory would be expected to have an effect on health.

DDT
1 sample contained a residue of DDT. The use of DDT is banned of heavily restricted in many countries because the residues take a long time to breakdown in the environment and can accumulate in fatty tissue.

An interpretation of the analytical results shows that the only DDT residue founds 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 lamb samples were bought by a market research company from retail outlets across the UK

Full sample details, including brand name information, pesticides sought and residues found are available in an accessible format at https://data.gov.uk/dataset/pesticide-residues-in-food

Samples tested

18 samples were tested for up to 36 pesticide residues

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

The country of origin on the packaging does not necessarily indicate where the lamb was from. It may be where the meat was prepared or where it was packed for consumer purchase.

Pesticide residues detected from those sought

17 samples contained no residues from those sought
1 sample contained residues above the reporting level
None of the samples contained residues above the MRL
2 samples were labelled as organic. Neither contained residues from those sought

Multiple residues

None of the samples contained residues of more than one pesticide

Risk assessments

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

Lettuce

Summary of results

In a survey of 18 samples of lettuce collected between July and September 2017, 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 by the laboratory would be expected to have an effect on health.

Survey design

The lettuce samples were bought by a market research company from retail outlets across the UK

Full sample details, including brand name information, pesticides sought and residues found are available in an accessible format at https://data.gov.uk/dataset/pesticide-residues-in-food

Samples tested

18 samples were tested for up to 365 pesticide residues

Iceberg

- 9 samples came from the UK

Little Gem

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

Other

- 2 samples came from the UK

Romaine

- 1 sample came from the UK

Round

- 2 samples came from the UK

Pesticide residues detected from those sought

16 samples contained no residues from those sought
2 samples contained residues above the reporting level
None of the 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 8 residues

Risk assessments

None of the individual 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. The pesticide residues found are not chemically related to each other and do not have the same toxicological effects. Following the Health and Safety Executive (HSE)'s risk assessment, we do not expect these residues to have an effect on health, either separately or in combination.

Milk

Summary of results

In a survey of 72 samples of milk collected between July and September 2017, none of the samples contained a pesticide residue. These results were reviewed by the Expert Committee on Pesticide Residues in Food (PRiF).

Comments by the PRiF

No residues were detected at or above the reporting limit.

Survey design

The milk samples were bought by a market research company from retail outlets across the UK

Full sample details, including brand name information, pesticides sought and residues found are available in an accessible format at https://data.gov.uk/dataset/pesticide-residues-in-food

Samples tested

72 samples were tested for up to 98 pesticide residues

Cows milk

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

Goats milk

- 10 samples came from the UK

Pesticide residues detected from those sought

72 samples contained no residues from those sought
None of the samples contained residues above the reporting level
18 samples were labelled as organic. None contained residues from those sought

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 24 samples of okra collected between July and September 2017, 1 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 by the laboratory would be expected to have an effect on health.

Survey design

The okra samples were collected by either the Rural Payment 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 from retail outlets across the UK.

Full sample details, including brand name information, pesticides sought and residues found are available in an accessible format at https://data.gov.uk/dataset/pesticide-residues-in-food

Samples tested

24 samples were tested for up to 364 pesticide residues

Fresh

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

Frozen

- 12 samples were imported from outside the EU

Pesticide residues detected from those sought

15 samples contained no residues from those sought
9 samples contained residues above the reporting level
1 sample contained a residue above the MRL
None of the samples were labelled as organic.

Multiple residues

3 samples contained residues of more than one pesticide

- 3 samples contained 2 residues

Residues measured above the MRL

The laboratory detected one pesticide residues above the MRL in okra

- 1 sample of frozen okra from Egypt contained a residue of BAC at 3.5 mg/kg. The MRL is 0.1 mg/kg.

Risk assessments

None of the individual 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. The pesticide residues found are not chemically related to each other and do not have the same toxicological effects. Following the Health and Safety Executive (HSE)'s risk assessment, we do not expect these residues to have an effect on health, either separately or in combination.

Follow up actions

Letters sent

The secretariat has written to the supplier of the sample with a residue above the MRL. Any response received is in Section 2.

Onions

Summary of results

In a survey of 29 samples of onions collected between July and September 2017, 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 by the laboratory would be expected to have an effect on health.

Survey design

The onion samples were bought by a market research company from retail outlets across the UK

Full sample details, including brand name information, pesticides sought and residues found are available in an accessible format at https://data.gov.uk/dataset/pesticide-residues-in-food

Samples tested

29 samples were tested for up to 360 pesticide residues

- 17 samples came from the UK
- 12 samples came from the EU

Pesticide residues detected from those sought

9 samples contained no residues from those sought
20 samples contained residues above the reporting level
None of the samples contained residues above the MRL
1 sample was labelled as organic. It didn't contain any residues from those sought

Multiple residues

2 samples contained residues of more than one pesticide

- 2 samples contained 2 residues

Risk assessments

None of the individual 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. The pesticide residues found are not chemically related to each other and do not have the same toxicological

effects. Following the Health and Safety Executive (HSE)'s risk assessment, we do not expect these residues to have an effect on health, either separately or in combination.

Oranges

Summary of results

In a survey of 24 samples of oranges collected between July and September 2017, 1 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

Based on the Health and Safety Executive's risk assessment of the residues detected (see risk assessments in Section 3) we consider that an effect on health is unlikely 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 all containing the highest level of imazalil found in this report, we consider that the levels of imazalil found in 18 samples, might cause some people to experience loss of appetite or nausea. Such effects would be expected to be minor, short-lived and reversible. Similarly if all the peel is eaten when consuming large portions (97.5th percentile) of oranges containing the highest level of thiabendazole found in the this report, we consider that the levels of thiabendazole found in 8 samples, might cause some people to experience a loss of appetite. Such effects would be expected to be minor, short-lived and reversible.

Survey design

The orange samples were collected by the Rural Payment Agency's Horticultural Marketing Inspectors from a range of points in the supply chain (wholesale markets, retail depots, ports and import points).

Full sample details, including brand name information, pesticides sought and residues found are available in an accessible format at https://data.gov.uk/dataset/pesticide-residues-in-food

Samples tested

24 samples were tested for up to 366 pesticide residues

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

Pesticide residues detected from those sought

2 samples contained no residues from those sought
22 samples contained residues above the reporting level
1 sample contained a residue above the MRL
1 sample was labelled as organic. It didn't contain any residues from those sought

Multiple residues

21 samples contained residues of more than one pesticide

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

Residues measured above the MRL

The laboratory detected 1 residue above the MRL in oranges

- 1 sample from South Africa contained a residue of methidathion at 0.03 mg/kg. The MRL is 0.02* mg/kg.

Risk assessments

Chlorpyrifos

1 sample of oranges contained a residue of chlorpyrifos at a level where the effect on health needed to be considered in more detail. The highest level detected was 0.07 mg/kg. HSE's risk assessment concluded that an effect on health would be unlikely. Full risk assessment is available at page 82.

Imazalil

18 samples of oranges contained a residue of imazalil at levels where the effect on health needed to be considered in more detail. The highest level detected was 3.4 mg/kg. If all the peel was consumed then some people might experience nausea after eating large portions (97.5th percentile) of oranges containing the highest level found in this report, such effects would be minor, short lived and reversible. However, if the peel is not consumed then an effect on health is not expected. Full risk assessment is available at page 82.

Propiconazole

2 samples of oranges contained a residue of propiconazole at levels where the effect on health needed to be considered in more detail. The highest level detected was 3.7 mg/kg. HSE's risk assessment concluded that an effect on health would be unlikely. Full risk assessment is available at page 82.

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* **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.

Thiabendazole

8 samples of oranges contained a residue of thiabendazole at levels where the effect on health needed to be considered in more detail. The highest level detected was 2.7 mg/kg. If all the peel was consumed then some people might experience a loss of appetite after eating large portions (97.5th percentile) of oranges containing the highest level found in this report, such effects would be minor, short lived and reversible. However, if the peel is not consumed then an effect on health is not expected. Full risk assessment is available at page 82.

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. 1 sample contained chlorpyrifos and methidathion. HSE's combined risk assessment on this combination showed that an effect on health is unlikely. Full combined risk assessment is available at page 88.

Follow up actions

Letters sent

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

Pears

Summary of results

In a survey of 24 samples of pears collected between July and September 2017, 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 by the laboratory would be expected to have an effect on health.

Survey design

The pear samples were bought by a market research company from retail outlets across the UK

Full sample details, including brand name information, pesticides sought and residues found are available in an accessible format at https://data.gov.uk/dataset/pesticide-residues-in-food

Samples tested

24 samples were tested for up to 369 pesticide residues

- 2 samples came from the UK
- 7 samples were imported from outside the EU
- 15 samples came from the EU

Pesticide residues detected from those sought

1 sample contained no residues from those sought
23 samples contained residues above the reporting level
None of the samples contained residues above the MRL
1 sample was labelled as organic. It didn't contain any residues from those sought

Multiple residues

22 samples contained residues of more than one pesticide

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

Risk assessments

None of the individual 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. The pesticide residues found are not chemically related to each other and do not have the same toxicological effects. Following the Health and Safety Executive (HSE)'s risk assessment, we do not expect these residues to have an effect on health, either separately or in combination.

Peppers

Summary of results

In a survey of 25 samples of peppers collected between July and September 2017, 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 by the laboratory would be expected to have an effect on health.

Survey design

The pepper samples were either collected by the Rural Payment Agency's Horticultural Marketing Inspectors from a range of points in the supply chain (wholesalers, retail depots, ports and import points) or bought by a market research company from retail outlets across the UK.

Full sample details, including brand name information, pesticides sought and residues found are available in an accessible format at https://data.gov.uk/dataset/pesticide-residues-in-food

Samples tested

25 samples were tested for up to 365 pesticide residues

Fresh

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

Pesticide residues detected from those sought

16 samples contained no residues from those sought
9 samples contained residues above the reporting level
None of the samples contained residues above the MRL
2 samples were labelled as organic. Neither 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 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. The pesticide residues found are not chemically related to each other and do not have the same toxicological effects. Following the Health and Safety Executive (HSE)'s risk assessment, we do not expect these residues to have an effect on health, either separately or in combination.

Potatoes

Summary of results

In a survey of 22 samples of potatoes collected between July and September 2017, 1 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 by the laboratory would be expected to have an effect on health.

Pencycuron
A residue of pencycuron was found above the MRL. Pencycuron is used as a fungicide treatment on seed potatoes only. However residues can occur from cross-contamination if boxes used to store the ware potatoes had previously been used to store treated seed potatoes, or by close contact of daughter tubers with their parent seed tuber, or if the remainder of a parent tuber had not been removed at harvest. There are no risk issues with this finding and the supplier has been informed. We have asked HSE to bring this exceedance to the attention of the approval holder as good production practice should minimise the occurrence of the residue in the harvestable edible potato.

Survey design

The potato samples were collected by the Animal and Plant Health Agency's Plant Health and Seed Inspectors from a range of points across the supply chain (wholesalers, potato processors, ports and import points).

Full sample details, including brand name information, pesticides sought and residues found are available in an accessible format at https://data.gov.uk/dataset/pesticide-residues-in-food

Samples tested

22 samples were tested for up to 365 pesticide residues

Maincrop

- 13 samples came from the UK

New

- 9 samples came from the UK

Pesticide residues detected from those sought

15 samples contained no residues from those sought
7 samples contained residues above the reporting level
1 sample contained a residue above the MRL
None of the samples were labelled as organic.

Multiple residues

2 samples contained residues of more than one pesticide

- 2 samples contained 2 residues

Residues measured above the MRL

The laboratory detected 1 residue above the MRL in potatoes

- 1 sample from UK contained a residue of pencycuron at 0.2 mg/kg. The MRL is 0.1 mg/kg.

Risk assessments

None of the individual 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. The pesticide residues found are not chemically related to each other and do not have the same toxicological effects. Following the Health and Safety Executive (HSE)'s risk assessment, we do not expect these residues to have an effect on health, either separately or in combination.

Follow up actions

Letters sent

The secretariat has written to the supplier of the sample with a residue above the MRL. Any response received is in Section 2.

Poultry

Summary of results

In a survey of 24 samples of poultry collected between July and September 2017, none of the samples contained a pesticide residue. These results were reviewed by the Expert Committee on Pesticide Residues in Food (PRiF).

Comments by the PRiF

No residues were detected at or above the reporting limit.

Survey design

The poultry samples were bought by a market research company from retail outlets across the UK

Full sample details, including brand name information, pesticides sought and residues found are available in an accessible format at https://data.gov.uk/dataset/pesticide-residues-in-food

Samples tested

24 samples were tested for up to 98 pesticide residues

Chicken

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

Duck

- 1 sample came from the UK

Turkey

- 9 samples came from the UK

The country of origin on the packaging does not necessarily indicate where the bird was from. It may be where it was processed or where it was packed for consumer purchase.

Pesticide residues detected from those sought

24 samples contained no residues from those sought
None of the samples contained residues above the reporting level
None of the samples were labelled as organic.

Risk assessments

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

Prepared fresh fruit

Summary of results

In a survey of 25 samples of prepared fresh fruit collected between July and September 2017, 5 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 by the laboratory would be expected to have an effect on health.

Chlorate
We found chlorate over the default MRL in 5 samples. However we do not think that these finding should be treated as breaches of the legislation, and we have not highlighted them as such in the brand name annex.

We are testing a limited number of foods for chlorate in 2017, to provide evidence on consumer safety and confirm that it is necessary to review the existing default MRL in order to take account of non-pesticide sources. In particular, chlorine-based treatments of drinking and irrigation water as well as chlorine-based surface disinfectants which are widely used to ensure microbiological safety. We agree with HSE and the FSA that the current MRL does not take account of these often unavoidable sources.

This adds to a growing body of evidence, from both official monitoring across the EU and from the food and farming industries.

Following the HSE's risk assessment, we do not expect any of the residues we found to have an effect on health. The residues are more likely to come from key microbiological safety practices rather than pesticide use, so we do not think any change in production practice by the brand-owners or manufacturers is needed in response to these findings. More information on chlorate is available in section 4.

Survey design

The prepared fresh fruit samples were bought by a market research company from retail outlets across the UK

Full sample details, including brand name information, pesticides sought and residues found are available in an accessible format at https://data.gov.uk/dataset/pesticide-residues-in-food

Samples tested

25 samples were tested for up to 3 pesticide residues

Mango

- 1 sample came from the UK

Melon

- 1 sample came from the UK

Mixed

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

Pineapple

- 3 samples came from the UK

Watermelon

- 2 samples came from the UK

The country of origin on the packaging does not necessarily indicate where the fruit was grown. It may be where the fruit was prepared or where it was packed for consumer purchase.

Pesticide residues detected from those sought

18 samples contained no residues from those sought
7 samples contained residues above the reporting level
5 samples contained residues above the MRL
None of the samples were labelled as organic.

Multiple residues

None of the samples contained residues of more than one pesticide

Residues measured above the MRL

The laboratory detected 5 residues above the MRL in prepared fruit

- 4 samples from UK contained a residue of chlorate at 0.02, 0.03, 0.03 and 0.05 mg/kg. The MRL is 0.01* mg/kg.
- 1 sample from Belgium contained a residue of chlorate at 0.03 mg/kg. The MRL is 0.01* mg/kg.

We do not think that these findings of chlorate should be treated as a breach of the legislation – see our comments above.

Risk assessments

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

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* **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.

Follow up actions

Letters sent

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

Raspberries

Summary of results

In a survey of 36 samples of raspberries collected between July and September 2017, 1 sample contained a pesticide residue above the MRL. Details of 1 UK sample were passed to HSE Enforcement as it contained a residue that is not approved for use on raspberries in the UK. These results were reviewed by the Expert Committee on Pesticide Residues in Food (PRiF).

Comments by the PRiF

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

Survey design

The raspberry samples were bought by a market research company from retail outlets across the UK

Full sample details, including brand name information, pesticides sought and residues found are available in an accessible format at https://data.gov.uk/dataset/pesticide-residues-in-food

Samples tested

36 samples were tested for up to 363 pesticide residues

Fresh

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

Frozen

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

Pesticide residues detected from those sought

4 samples contained no residues from those sought
32 samples contained residues above the reporting level
1 sample contained a residue above the MRL
None of the samples were labelled as organic.

Multiple residues

22 samples contained residues of more than one pesticide

- 8 samples contained 2 residues
- 6 samples contained 3 residues
- 5 samples contained 4 residues

- 1 sample contained 6 residues
- 1 sample contained 7 residues
- 1 sample contained 8 residues

Residues measured above the MRL

The laboratory detected 1 residue above the MRL in raspberries

- 1 sample of fresh raspberries from UK contained a residue of chlorpyrifos at 0.02 mg/kg. The MRL is 0.01* mg/kg.

Risk assessments

None of the individual 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. The pesticide residues found are not chemically related to each other and do not have the same toxicological effects. Following the Health and Safety Executive (HSE)'s risk assessment, we do not expect these residues to have an effect on health, either separately or in combination.

Follow up actions

Further investigation: Suspected illegal use

We have passed details of 1 sample from the UK that contained a residue of chlorpyrifos which is not approved for use on raspberries in the UK to HSE Enforcement. HSE Enforcement is investigating; 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.

Rice

Summary of results

In a survey of 24 samples of rice collected between July and August 2017, 7 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 by the laboratory would be expected to have an effect on health.

Tricyclazole residues
The MRL for tricyclazole was lowered to 0.01 mg/kg on 30 June 2017 for all rice except basmati rice. However, under the terms of the Commissions Implementing Regulation 2017/983 transitional provisions apply, meaning that products that were imported or placed on the market before 30 June 2017 are subject to the previous MRL of 1 mg/kg

Where we have detected a residue of tricyclazole above the current MRL, we have requested confirmation of when it was imported, where evidence has been provided that this was before 30 June 2017, the previous MRL has been applied.

Survey design

The rice samples were bought by a market research company from retail outlets across the UK

Full sample details, including brand name information, pesticides sought and residues found are available in an accessible format at https://data.gov.uk/dataset/pesticide-residues-in-food

Samples tested

24 samples were tested for up to 368 pesticide residues

Basmati

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

Brown

- 2 samples came from the UK
- 2 samples were imported from outside the EU
- 2 samples came from the EU

Other

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

White

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

The country of origin on the packaging does not necessarily indicate where the rice was grown. It may be where it was processed or where it was packed for consumer purchase.

Pesticide residues detected from those sought

12 samples contained no residues from those sought
12 samples contained residues above the reporting level
6 samples contained residues above the MRL
1 sample was labelled as organic. It didn't contain any residues from those sought

Multiple residues

11 samples contained residues of more than one pesticide

- 3 samples contained 2 residues
- 2 samples contained 4 residues
- 2 samples contained 5 residues
- 1 sample contained 6 residues
- 1 sample contained 8 residues
- 1 sample contained 9 residues
- 1 sample contained 12 residues

Residues measured above the MRL

The laboratory detected 12 pesticide residues above the MRL in rice

- 1 sample of basmati rice from UK contained residues of
    - carbendazim at 0.02 mg/kg, the MRL is 0.01* mg/kg
    - thiamethoxam at 0.04 mg/kg, the MRL is 0.01* mg/kg
- 1 sample of basmati rice from UK contained residues of
    - acephate at 0.2 mg/kg, the MRL is 0.01* mg/kg
    - carbendazim at 0.03 mg/kg, the MRL is 0.01* mg/kg
    - methamidophos at 0.03 mg/kg, the MRL is 0.01* mg/kg
    - thiamethoxam at 0.1 mg/kg, the MRL is 0.01* mg/kg
- 1 sample of basmati rice from UK contained a residue of carbendazim at 0.02 mg/kg. The MRL is 0.01* mg/kg.
- 1 sample of brown rice from Greece contained a residue of tricyclazole at 0.04 mg/kg. The MRL is 0.01* mg/kg.

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* **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.

- 1 sample of paella rice from Spain contained a residue of tricyclazole at 0.02 mg/kg. The MRL is 0.01* mg/kg
- 1 sample of white rice from UK contained residues of
    - hexaconazole at 0.03 mg/kg, the MRL is 0.01* mg/kg
    - tricyclazole at 0.05 mg/kg, the MRL is 0.01* mg/kg

Risk assessments

None of the individual 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 responses received are in Section 2.

Shellfish

Summary of results

In a survey of 24 samples of shellfish collected between July and September 2017, none of the samples contained a pesticide residue. These results were reviewed by the Expert Committee on Pesticide Residues in Food (PRiF).

Comments by the PRiF

No residues were detected at or above the reporting limit.

Survey design

The shellfish samples were bought by a market research company from retail outlets across the UK

Full sample details, including brand name information, pesticides sought and residues found are available in an accessible format at https://data.gov.uk/dataset/pesticide-residues-in-food

Samples tested

24 samples were tested for up to 36 pesticide residues

Crayfish

- 1 sample was imported from outside the EU

Langoustines

- 1 sample came from the UK

Mussels

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

Prawns

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

Scallops

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

The country of origin on the packaging does not necessarily indicate where the fish was caught. It may be where it was processed or where it was packed for consumer purchase.

Pesticide residues detected from those sought

24 samples contained no residues from those sought
None of the samples contained residues above the reporting level
1 sample was labelled as organic. It didn't contain any residues from those sought

Risk assessments

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

Soya products

Summary of results

In a survey of 51 samples of soya products collected between May and June 2017, 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 by the laboratory would be expected to have an effect on health.

Survey design

The soya product samples were bought by a market research company from retail outlets across the UK

Full sample details, including brand name information, pesticides sought and residues found are available in an accessible format at https://data.gov.uk/dataset/pesticide-residues-in-food

Samples tested

51 samples were tested for up to 363 pesticide residues

Soya Cream

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

Soya Mince

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

Soya Protein

- 2 samples came from the UK

Soya Spread

- 7 samples came from the UK

Soya Yoghurt

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

Tofu

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

The country of origin on the packaging does not necessarily indicate where the soya bean was grown. It may be where the product was processed or where it was packed for consumer purchase.

Pesticide residues detected from those sought

44 samples contained no residues from those sought
7 samples contained residues above the reporting level
None of the samples contained residues above the MRL. All residues have been checked against the soya bean MRL.
15 samples were labelled as organic. None contained residues from those sought

Multiple residues

3 samples contained residues of more than one pesticide

- 3 samples contained 2 residues

Risk assessments

None of the individual 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. The pesticide residues found are not chemically related to each other and do not have the same toxicological effects. Following the Health and Safety Executive (HSE)'s risk assessment, we do not expect these residues to have an effect on health, either separately or in combination.

Speciality beans (dried)

Summary of results

In a survey of 18 samples of speciality dried beans collected between July and September 2017, 2 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

Based on the Health and Safety Executive's risk assessment of the residues detected we consider an effect on health to be unlikely (see risk assessments in Section 3).

Survey design

The dried speciality bean samples were bought by a market research company from retail outlets across the UK

Full sample details, including brand name information, pesticides sought and residues found are available in an accessible format at https://data.gov.uk/dataset/pesticide-residues-in-food

Samples tested

18 samples were tested for up to 364 pesticide residues

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

The country of origin on the packaging does not necessarily indicate where the bean was grown. It may be where it was processed or where it was packed for consumer purchase.

Pesticide residues detected from those sought

15 samples contained no residues from those sought
3 samples contained residues above the reporting level
2 samples contained residues above the MRL. There are specific MRLs for dried beans. So we did not have to take separate account of processing (drying).
None of the samples were labelled as organic.

Multiple residues

1 sample contained residues of more than one pesticide

- 1 sample contained 3 residues

Residues measured above the MRL

The laboratory detected 2 residues above the MRL in speciality dried beans

- 1 sample from Myanmar contained a residue of methamidophos at 0.02 mg/kg. The MRL is 0.01* mg/kg.
- 1 sample from China contained a residue of dithiocarbamates at 3.6 mg/kg. The MRL is 0.1 mg/kg.

Risk assessments

Dithiocarbamates

1 sample of dried mung beans contained a residue of dithiocarbamate at a level where the effect on health needed to be considered in more detail. The highest level detected was 3.6 mg/kg. HSE's risk assessment concluded that an effect on health would be unlikely. Full risk assessment is available at page 81.

This risk assessment was carried out assuming the residue detected resulted from the use of ziram, the most toxic dithiocarbamate as no information was available to refine the risk assessment. More information about how the dithiocarbamate risk assessment is carried out is available at page 77.

Combined risk assessments

One sample contained residues of more than one pesticide. The pesticide residues found are not chemically related to each other and do not have the same toxicological effects. Following the Health and Safety Executive (HSE)'s risk assessment, we do not expect these residues to have an effect on health, either separately or in combination.

Follow up actions

Letters sent

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

RASFFs issued

HSE sent a draft notification for the following samples to FSA to raise through the EC's Rapid Alert System for Food and Feed (RASFF) (see glossary for more details)

- 1 sample from China containing dithiocarbamate at 3.6 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.

Speciality fruit

Summary of results

In a survey of 21 samples of speciality fruit collected between July and September 2017, 2 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 by the laboratory would be expected to have an effect on health.

Survey design

The speciality fruit samples were either collected by the Rural Payment Agency's Horticultural Marketing Inspectors from a range of points in the supply chain (wholesalers, retail depots, ports and import points) or bought by a market research company from retail outlets across the UK.

Full sample details, including brand name information, pesticides sought and residues found are available in an accessible format at https://data.gov.uk/dataset/pesticide-residues-in-food

Samples tested

21 samples were tested for up to 364 pesticide residues

Figs

- 2 samples were imported from outside the EU

Lychees

- 1 sample was imported from outside the EU

Papaya

- 2 samples were imported from outside the EU

Passion fruit

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

Pomegranates

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

Sharon Fruit

- 3 samples were imported from outside the EU

Starfruit

- 1 sample was imported from outside the EU

Pesticide residues detected from those sought

9 samples contained no residues from those sought
12 samples contained residues above the reporting level
2 samples contained residues above the MRL
None of the samples were labelled as organic.

Multiple residues

2 samples contained residues of more than one pesticide

- 1 sample contained 2 residues
- 1 sample contained 4 residues

Residues measured above the MRL

The laboratory detected 2 residues above the MRL in pomegranates

- 1 sample from Egypt contained a residue of lambda-cyhalothrin at 0.09 mg/kg. The MRL is 0.02* mg/kg.
- 1 sample from Spain contained a residue of lambda-cyhalothrin at 0.03 mg/kg. The MRL is 0.02* mg/kg.

Risk assessments

None of the individual 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. The pesticide residues found are not chemically related to each other and do not have the same toxicological effects. Following the Health and Safety Executive (HSE)'s risk assessment, we do not expect these residues to have an effect on health, either separately or in combination.

Follow up actions

Letters sent

The secretariat has written to the suppliers of the samples with residues above the MRL. Any responses 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.

Spring greens and kale

Summary of results

In a survey of 20 samples of spring greens and kale collected between July and September 2017, none of the samples contained a pesticide residue above the MRL. Details of 5 UK kale samples were passed to HSE Enforcement as they contained residues that are not approved for use on kale in the UK. These results were reviewed by the Expert Committee on Pesticide Residues in Food (PRiF).

Comments by the PRiF

Based on the Health and Safety Executive's risk assessment of the residues detected we consider an effect on health to be unlikely (see risk assessments in Section 3).

Survey design

The spring green and kale samples were bought by a market research company from retail outlets across the UK

Full sample details, including brand name information, pesticides sought and residues found are available in an accessible format at https://data.gov.uk/dataset/pesticide-residues-in-food

Samples tested

20 samples were tested for up to 359 pesticide residues

Kale

- 13 samples came from the UK

Spring Greens

- 7 samples came from the UK

Pesticide residues detected from those sought

3 samples contained no residues from those sought
17 samples contained residues above the reporting level
None of the samples contained residues above the MRL
None of the samples were labelled as organic.

Multiple residues

13 samples contained residues of more than one pesticide

- 3 samples contained 2 residues
- 6 samples contained 3 residues
- 4 samples contained 4 residues

Risk assessments

Lambda-cyhalothrin

2 samples of kale contained a residue of lambda-cyhalothrin at levels where the effect on health needed to be considered in more detail. The highest level detected was 0.2 mg/kg. HSE’s risk assessment concluded that an effect on health would be unlikely. Full risk assessment is available at page 81.

Combined risk assessments

Some samples contained residues of more than one pesticide. The pesticide residues found are not chemically related to each other and do not have the same toxicological effects. Following the Health and Safety Executive (HSE)'s risk assessment, we do not expect these residues to have an effect on health, either separately or in combination.

Follow up actions

Further investigation: Suspected illegal use

We have passed details of 5 samples of kale from the UK that contained a residue of linuron which is not approved for use on kale in the UK to HSE. HSE is investigating; brand name details will not be published until the investigations are complete.

Yogurt

Summary of results

In a survey of 36 samples of yogurt collected between July and September 2017, 1 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 by the laboratory would be expected to have an effect on health.

Survey design

The yogurt samples were bought by a market research company from retail outlets across the UK

Full sample details, including brand name information, pesticides sought and residues found are available in an accessible format at https://data.gov.uk/dataset/pesticide-residues-in-food

Samples tested

36 samples were tested for up to 98 pesticide residues

- 31 samples came from the UK
- 5 samples came from the EU

The country of origin on the packaging does not necessarily indicate where the milk used to make the yogurt was from. It may be where the yogurt was made or where it was packed for consumer purchase.

Pesticide residues detected from those sought

35 samples contained no residues from those sought
1 sample contained a residue above the MRL
6 samples were labelled as organic.1 contained a residue from those sought

Multiple residues

None of the samples contained residues of more than one pesticide

Residues measured above the MRL

The laboratory detected 1 residue above the MRL in yogurt

- 1 sample from UK contained a residue of BAC at 1.4 mg/kg. The MRL is 0.1 mg/kg.

Risk assessments

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

Follow up actions

Letters sent

The secretariat has written to the suppliers of the sample with a residue above the MRL. Any response received is in Section 2.

Organic sample with a residue

The Secretariat has written to the supplier of the sample of organic yogurt from UK with a residue of BAC which is not permitted in organic food production. Defra's Organic Farming branch and the organic certification organisation were also informed.

Section 2: Sample details and supplier responses

Sample details

The sample details are published on data.gov.uk 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.

UK samples with residues of pesticides not approved for use on that food in the UK in bold, blue text

Organic samples with residues of pesticides not permitted for use in organic food production are in bold 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 non-approved pesticides 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 that were not approved for that crop.
- The Organics branch of Defra about samples that were labelled as organic and contained residues of pesticides not approved for organic production
- The suppliers and certification organisation of all organic samples containing residues of pesticides not approved for organic production.
- 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

Sample number 0112/2017: Potato with residue of pencycuron above the MRL
Response from LambWeston

We have undertaken a full investigation as the grower is as concerned as we are regarding crop protection residues
The material pencycuron was applied to seed potatoes as Monceren DS in line with label recommendations to the potato crop at planting
After consultation with Bayer to discuss the matter we believe that a seed potato tuber may have been included in the sample as the most likely scenario for this level of detection
At the time of sampling in July it is not unusual for seed tubers to remain intact and while every effort is made to remove at harvest, they can be delivered to the factory as raw material
Subsequent processes in the factory ensure the seed potato tubers do not enter the final product that would be delivered to the consumer.
I hope you trust we take detections like this very seriously and continuously work with suppliers to ensure our products meet all regulatory requirements

Sample number 2068/2017: Rice with residues above the MRL
Response from Asda

I wish to confirm that we do take any non-compliance extremely seriously, and with the support of our supplier, we have completed a thorough investigation.
Our supplier has confirmed that the residue was detected and identified at its in-market test laboratory. The normal process would be to check the result against the relevant results and either reject or accept the batch of rice. In this instance, our supplier has recognised that although this occurred, the test laboratory used an incorrect MRL (in your letter

accompanying the notification you highlight that a recent change in MRL had occurred) and released the material for shipment.
No further check of the batch of rice or verification of the MRL used was completed by either the inmarket laboratory or our supplier/importer. Clearly, there has been a breakdown in communications and compliance systems between the in-market laboratory, the importer, processor and packer.
Our supplier has attempted to address this shortcoming; by firstly, sharing the detail of this incident with the two other contract laboratories used to screen rice, making them fully aware of this incident and the potential consequences. Secondly, our supplier now has written confirmation that the correct MRL's are used for residue detection at each laboratory. Thirdly, the supplier is up-skilling their own colleagues responsible for checking certificates by providing training in assessment of MRL's and to manage approval of pesticide certificates rather than rely solely on a third party. Fourthly, our supplier has upgraded their Horizon Scan capabilities to provide a source of reliable and verifiable information to support approval activities.
Please be assured that Asda is committed to resolving this matter and would not knowingly sell food that has been produced without reference to relevant legislation.
We will continue to work with our supplier regarding this issue to improve systems and compliance measures.

Sample number 3403/2017: Organic yogurt with residue above the MRL
Response: Stamfrey Farm Organics

Further to the detection of BAC above the MRL we have investigated the matter thoroughly as we take any non-compliance extremely seriously.
The residue detected was a component of our HiBac Quatsan Combat cleaning agent which we circulated through the pipe work at a high temperature. Whilst we thought a sufficient and thorough cold rinse was completed after each circulation, this would appear not to have been sufficient to flush the BAC residue on this occasion.
After discussing the issue with both our microbiology consultant and the technical director of Cleenol we have changed our cleaning products and NO product with BAC will be used in the dairy as an alternative has been found.
Residue testing has since been completed on the product after a change in regime and this result is satisfactory.
We can therefore make assurances that this event will not reoccur.
We are confident that the new procedure is effective at producing food which is microbiologically safe for consumers and meets all the stringent organic criteria.

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: www.pesticides.gov.uk/guidance/industries/pesticides/topics/pesticide-approvals/pesticides-registration/data-requirements-handbook/consumer-intake-assessments-new-intake-calculation-models.

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. Reference dose values are available on the EU website: http://ec.europa.eu/sanco_pesticides/public/index.cfm?event=activesubstance.selection.

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 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 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 man, 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.

Residues are usually reduced during food processing and occasionally may concentrate. The alteration of residues can be considered in consumer risk assessments, for example, in oil seed rape a fat-soluble pesticide may result in higher residues in the oil compared to

residues in the raw seed. Consumption data are available for many major processed food items such as boiled potatoes, crisps, fruit juice, sugar, bread, and wine. Where such consumption data are not available, the intake estimates are based on the total consumption of the raw commodity, which would represent the worst-case (for example, breakfast cereals consumption would be based on total cereal products consumption). In the case of composite products a suitable worst-case alternative would be used, for example total bread consumption for fruit bread consumption.

Dithiocarbamate residues

Dithiocarbamate residues are determined as carbon disulphide which is a common product from different dithiocarbamate pesticides; for the risk assessment a precautionary approach is taken: the worst case dithiocarbamate residue is calculated by assuming the residue is derived from ziram ((a molecular weight conversion is applied to estimate the level of residue based on ziram) and this is compared to the ARfD for ziram. Where it can be confirmed that a specific dithiocarbamate was applied the equivalent residue of the specific active substance is estimated and the intake compared to the appropriate reference dose. We only present a detailed risk assessment when either the worst case assessment of intake (based on ziram) leads to an exceedance of the ziram ARfD and it has not been possible to further identify the dithiocarbamate source of the residues, or, when further refined assessments based on a specific knowledge of the dithiocarbamate pesticide applied in practice still lead to an exceedance of the ARfD for the known dithiocarbamate pesticide.

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 (see Appendix D). If more than one

organophosphate/carbamate is found 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 and Veterinary Medicines" was published in 2002. 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 has been published on the FSA website at:

http://www.food.gov.uk/safereating/chemsafe/pesticides/pestmixbranch/. A number of research projects have been commissioned by the FSA to help progress the action plan; details can be found at http://www.food.gov.uk/multimedia/pdfs/ressurprjlistsep07 and http://www.food.gov.uk/science/research/researchinfo/researchportfolio/

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 (www.pesticides.gov.uk/guidance/industries/pesticides/topics/pesticide-approvals/pesticides-registration/data-requirements-handbook/toxicity-assessment-of-combinations-of-2-or-more-compounds-in-a-formulation).

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 (http://www.efsa.europa.eu/en/events/event/colloque061128.htm; http://www.efsa.europa.eu/en/supporting/pub/117e.htm; http://www.efsa.europa.eu/en/efsajournal/pub/705.htm; http://www.efsa.europa.eu/en/efsajournal/pub/1167.htm). 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: Short-term intake estimates

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 http://ec.europa.eu/food/plant/protection/evaluation/database_act_subs_en.htm

The screening assessment uses the internationally agreed approach to short-term (acute) consumer exposure assessment with UK food consumption data as detailed within the UK NESTI model which is available on the HSE website at http://www.pesticides.gov.uk/approvals.asp?id=1687.

A paper to explain the assessment of acute intakes can be found on our website:
http://www.pesticides.gov.uk/Resources/CRD/PRiF/Documents/Other/2013/PRiF%20Intake%20Assessments%20290113.pdf

For the Q3 (2017) assessments, the following approaches have been taken to refine the NESTI 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 head cabbage were used for spring greens and kale.
- Data on dried beans (pulses) were used for all forms of speciality dried beans.
- Data on both blackberries and raspberries were considered for the screening assessment for raspberries as there are low numbers of consumers of raspberries in some groups. Data on raspberry alone were used for adults, toddlers, vegetarians, and elderly in own home, where the numbers are sufficient, with data from both commodities used for the remaining groups. Although there are low numbers of consumers in the infant and 4-6 year old children groups for both commodities, use of these data was considered reasonable after comparison with alternative data.
- Data on beans with pods were used for okra and all forms of speciality beans with pods.
- Data on onions were used for all forms of onions and shallots
- Data on fish were used for all forms of oily fish.
- For all forms of pre-prepared fruits, data on apples without the use of a variability factor were used for screening purposes. As fruit pieces are small, a whole fruit consideration which takes account of unit to unit variability is not considered relevant; the consumption values for apple are likely to be reasonably protective compared to a number of different fruits consumed in this way.
- Data on meat were used for all forms of lamb/mutton.
- Data on meat were used for soya mince and protein.
- Specific consumption data available for pomegranate were used.
- Data on kiwi fruit were used for passion fruit.

- Data on pineapples with a unit weight of 196.5 g and a variability factor of 7 were used for papaya
- Data for yoghurt were not currently available. A worst case screen was performed assuming that 500 g yoghurt were consumed as a daily portion. This value seems reasonable when considering alternative data (the German VELs 2005 consumption model for 2-4 year olds indicates a 97.5Th %le acute consumption value of 300 g on a person basis per day**.**
- For apples/pears and captan a variability factor of 3 was used, based on specific residues variability data for individual apples (EFSA, 2014).
- For potato/chlorpropham the default variability factor of 7 was used, from the EFSA Conclusion (EFSA, 2017).

Apple risk assessment

Crop	Pesticide	Highest residue (mg/kg)	Intake (mg/kg bw/day)		ARfD (mg/kg bw/day)	Source
			Adult	Critical group		
Apples	Dithiocarbamate (as ziram[$])	1.6	0.024	0.16(infant) 0.12 (toddler) 0.089 (4-6 year old child)	0.08	EU, 2004
Comment on risk assessment The usual non-specific approach for dithiocarbamates indicated a potential intake above the ARfD for ziram. The intakes for infants, toddlers and 4-6 year olds exceeded the ARfD. The highest intake was for infants. If infants ate or drank large portions of apples containing dithiocarbamates (as ziram) at 1.6 mg/kg, their intake could be 196 % of the Acute Reference Dose. This intake is 51 times lower than a dose that caused no observed adverse effect in a ten day rat developmental study, and maternal effects, used as the basis of the ARfD. The EU 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 51 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**		
Apples	Dithiocarbamate (as propineb[~])	1.5	0.022	0.15 (infant) 0.11 (toddler)	0.1	EU, 2003
Comment on risk assessment The usual non-specific approach for dithiocarbamates indicated a potential intake above the ARfD for ziram. However for one of the sample the grower confirmed several dithiocarbamates pesticides were applied so the residue could come from either propineb, mancozeb or metiram use. Therefore, a refined assessment was done for each of these pesticides. The assessments for mancozeb and metiram did not indicate an intake						

above the ARfD. The respective toxicological reference value was used specific to propineb. The assessment for propineb indicated potential intakes above the ARfD. The intakes for infants and toddlers exceeded the ARfD. The highest intake was for infants.

If infants ate or drank large portions of apples containing dithiocarbamates (as propineb) at 1.5 mg/kg, their intake could be 147 % of the Acute Reference Dose. This intake is 67 times lower than a dose that caused no observed effect in a ten day rat developmental study used as the basis of the ARfD. The EU 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.

Kale risk assessment

Crop	Pesticide	Highest residue (mg/kg)	Intake (mg/kg bw/day)		ARfD (mg/kg bw/day)	Source
			Adult	Critical group		
Kale	Lambda-cyhalothrin	0.2	0.0024	0.0086 (infant) 0.0064 (4-6 year old child) 0.0051 (toddler)	0.005	EU 2016

Comment on risk assessment
The intakes for infants, toddlers and 4-6 year old children exceeded the ARfD. The highest intake was for infants.

If infants ate large portions of kale containing lambda-cyhalothrin at 0.2 mg/kg, their intake of lambda-cyhalothrin could be 172 % of the Acute Reference Dose. This intake is 58 times lower than a dose that caused no observed adverse effect in a one year study in dogs. 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 58 still enough to make an effect on health unlikely.

Speciality beans (dried) risk assessment

Crop	Pesticide	Highest residue (mg/kg)	Intake (mg/kg bw/day)		ARfD (mg/kg bw/day)	Source
			Adult	Critical group		
Speciality beans (mung beans)	Dithiocarbamate (as ziram)[$]	7.2	0.040	0.13 (infant) 0.089 (toddler) 0.084 (4-6 year old child)	0.08	EU 2004

Comment on risk assessment
The usual non-specific approach for dithiocarbamates indicated a potential intake above the ARfD for ziram. The intakes for infants, toddlers and 4-

6 year olds exceeded the ARfD. The highest intake was for infants.

If infants ate large portions of speciality dried beans (mung beans) containing dithiocarbamates (as ziram) at 7.2 mg/kg, their intake could be 165 % of the Acute Reference Dose. This intake is 61 times lower than a dose that caused no observed adverse effect in a ten day rat developmental study, and maternal effects, used as the basis of the ARfD. The EU 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 61 still enough to make an effect on health unlikely.

Oranges risk assessment

Crop	Pesticide	Highest residue (mg/kg)	Intake (mg/kg bw/day)		ARfD (mg/kg bw/day)	Source
			Adult	Critical group		
Oranges	Chlorpyrifos	0.07	0.0016	0.0093 (infants) 0.0070 (toddler)	0.005	EU 2015

Comment on risk assessment

The risk assessments detailed below refer to the EU acute Reference Dose 2015 value but also consider the risks based on the existing JMPR value which was based on data which examined impacts upon humans. HSE accept that relevant human toxicology data can be used to calculate the possible impacts of residues in food on humans and based on this assessment do not expect an effect on health.

Assessment A using the ARfD set in the EU

Orange flesh after peeling

EU MRL risk assessment usually assumes that oranges are peeled before consumption. After peeling only 2% of the residue remains (EFSA, 2017), the highest intake is below 0.005 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 0.005 mg/kg bw/day.

Whole orange, including all the peel

The intakes for infants and toddlers exceed the acute reference dose of 0.005 mg/kg bw/day. The highest intake was for infants.

If infants ate or drank large portions of orange containing chlorpyrifos at 0.07 mg/kg, their intake of chlorpyrifos could be 186% of the EU Acute Reference Dose. This intake is 54 times lower than a dose which caused no observed adverse effects in a single dose rat study. 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 54 still enough to make an effect on health unlikely.

Furthermore, HSE consider that the EU ARfD was derived using a particularly sensitive approach since red blood cell cholinesterase inhibition was used as the end-point. This is a sensitive way to assess adverse effects due to cholinesterase inhibition.

Assessment B with reference to the ARfD set by the JMPR
The intakes for infants and toddlers exceeded the EU ARfD. The highest intake was for infants. If infants ate or drank large portions of orange, including all of the peel, containing chlorpyrifos at 0.07 mg/kg, their intake of chlorpyrifos could be 186% of the Acute Reference Dose. However, the EU ARfD was set without taking into account scientifically valid data from studies using human volunteers. The JMPR (Joint FAO/WHO meetings on pesticides) has recommended a higher Acute Reference Dose (ARfD) of 0.1 mg/kg bw/d using that human data. This value allows an appropriate factor (10) to account for possible differences in susceptibility between people. Intakes in all groups are within the JMPR ARfD. Based on this assessment we do not expect an effect on health.

Crop	**Pesticide**	**Highest residue (mg/kg)**	**Intake (mg/kg bw/day)**		**ARfD (mg/kg bw/day)**	**Source**
			Adult	**Critical group**[†]		
Oranges	Imazalil	3.4	0.077	0.45 (infants) 0.34 (toddlers) 0.24 (4-6 year olds) 0.17 (7-10 year olds) 0.12 (11-14 year olds) 0.10 (15-18 year olds) 0.087 (vegetarians) 0.077 (adults)	General population 0.1 Pregnant and nursing females 0.05	EFSA, 2007

Comment on 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 (EU, 2010), 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, 4-6 year old children, 7-10 year old children, 11-14 year old children and 15-18 year old children exceed the acute reference dose of 0.1 mg/kg bw/day (for the general population excluding pregnant and nursing women).

Whole orange, including all the peel
Pregnant and nursing women

The intakes for 11-14 year old children, 15-18 year old children, vegetarians and adults 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 old children ate or drank large portions of orange containing imazalil at 3.4 mg/kg, their intake could be 247% of the Acute Reference Dose of 0.05 mg/kg bw/day. This intake is 42 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)). 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 make an effect on health unlikely.

This is because an adverse effect on health would rely on

1) a susceptible individual eating or drinking a large quantity of the product, with the peel, which in turn had the highest levels of residue (i.e. 7 times the maximum value found in monitoring) ; and
2) the actual difference in susceptibility between that individual and rabbits used to derive the critical NOAEL, being higher than the factor we are left with in this situation; and
3) the critical NOAEL being close to the actual doses needed to produce an adverse effect in the animals studied.

<u>General population</u>
The intakes for infants, toddlers, 4-6 year old children, 7-10 year old children, 11-14 year old children and 15-18 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 3.4 mg/kg their intake could be 451% of the Acute Reference Dose of 0.1 mg/kg bw/day. This intake is 22 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 uncertainties caused by using animal data and possible differences in susceptibility between people. We consider the likelihood of an effect on health to be low, given the remaining factor of 22.

This is because an adverse effect on health would rely on

1) a susceptible individual eating or drinking a large quantity of the product, with the peel, which in turn had the highest levels of residue (i.e. 7 times the maximum value found in monitoring) ; and
2) the actual difference in susceptibility between that individual and rabbits used to derive the critical NOAEL, being higher than the factor we are left with in this situation; and
3) the critical NOAEL being close to the actual doses needed to produce an adverse effect in the animals studied.

Also it is noted that an ARfD based on maternal toxicity in a developmental study with repeated dosing (13 days) might be over-protective for the general population.

Conclusion
In conclusion, we consider that some people might experience nausea after eating large portions (97.5th percentile consumption) of orange containing the highest levels found in this report, but we consider the likelihood of an effect on health to be low. Such effects would be expected to be minor, short-lived, and reversible.

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	2.7	0.061	0.36 (infant) 0.27 (toddler) 0.19 (4-6 year old child) 0.14 (7-10 year old child)	0.1[£]	EFSA 2014

Comment on 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 either ARfD.

However, assuming that consumers eat all the peel, intakes for infants, toddlers, 4-6 year old children and 7-10 year old children 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 2.7 mg/kg their intake could be 358 % of the EU Acute Reference Dose. This intake is 28 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 the uncertainties caused by using animal data and possible differences in susceptibility between people. We consider this significant reduction in the factor of 100 to 28 undesirable.

In conclusion we consider that some people might experience loss of appetite after eating large portions (97.5th percentile consumption) of orange including all the peel containing the highest levels found in this report. Such effects would be expected to be minor, short-lived, and reversible.

This assessment 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	Propiconazole	3.7	0.084	0.49 (infant) 0.37 (toddler)	0.3	EU 2003

Comment on 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 0.3 mg/kg bw/d, and there are no exceedances of either ARfD.

However, assuming that consumers eat all the peel, intakes for infants and toddlers exceed the acute reference dose of 0.3 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 propiconazole at 3.7 mg/kg, their intake of propiconazole could be 164 % of the EU Acute Reference Dose. This intake is 61 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 uncertainties caused by using animal data and possible differences in susceptibility between people. We consider the reduced factor of 61 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.

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

[$]Dithiocarbamate (ziram) residue calculated as 1.6 mg/kg based on a carbon disulphide residue of 0.8 mg/kg in apples and residue calculated as 7.2 mg/kg based on a carbon disulphide residue of 3.6 mg/kg in speciality dried beans (mung beans) (using a molecular weight conversion of 2.007 for ziram). Dithiocarbamate residues are determined as carbon disulphide which is a common product from different dithiocarbamate pesticides; for the risk assessment a precautionary approach is taken: the worst case dithiocarbamate residue is calculated by assuming the residue is derived from ziram and this is compared to the ARfD for ziram.

[~]Dithiocarbamate (propineb) residue calculated as 1.5 mg/kg based on a carbon disulphide residue of 0.8 mg/kg in apples (using a molecular weight conversion of 1.903 for propineb). Dithiocarbamate residues are determined as carbon disulphide which is a common product from different dithiocarbamate pesticides; for the risk assessment a precautionary approach is taken: the worst case dithiocarbamate residue is usually calculated by assuming the residue is derived from ziram and this is compared to the ARfD for ziram. However in this case, the application records indicated that the source of the dithiocarbamate residues could be from mancozeb, metiram or propineb. Of these three, the worst case dithiocarbamate residue is propineb and so the assessment has assumed the residue is derived from propineb.

[£] In 2014, when EFSA (2014) proposed the new ARfD for thiabendazole, the EU Commission established that the revised reference value "will only trigger review of MRLs and shall only apply to the review of product authorization by the date of application of the legal act of renewal of approval of thiabendazole". EFSA published the MRL review in 2016 however new MRLs are yet to be implemented following this review.

Acute risk assessments for samples containing more than one organophosphorus/carbamate or captan/folpet or triazoles or carbendazim/thiophanate methyl following screening assessment.

Crop/Critical group	Pesticide	Residue mg/kg	Intake				ARfD	Source
			mg/kg bw	%ARfD				
	carbofuran	0.003	0.000015	10	}	Total	0.00015	EFSA, 2009
Beans (with pods)	methamidophos	0.04	0.00020	7	}	117	0.003	EU, 2006
Infant	methomyl	0.5	0.0025	100	}		0.0025	EFSA, 2006
Comment on risk assessment: Methomyl intake for this sample is at the ARfD (for the critical consumers infants and toddlers) rather than an exceedance. Therefore if infants or toddlers ate or drank large portions of beans with pods containing methomyl at 0.5 mg/kg, their intake of methomyl could be 100 % of the Acute Reference Dose (which would not normally be detailed in the risk assessment). This intake is 100 times lower than a dose which caused no observed adverse effect in a study on acute neurotoxicity 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. The presence of carbofuran and methamidophos in the same sample does not have a marked effect to the addition to the intake based on the methomyl residue. Therefore the presence of both carbofuran and methamidophos is considered to reduce the usual factor of 100, however the slight reduction anticipated is such that an effect on health is unlikely.								
Oranges	chlorpyrifos	0.07	0.0093	186	}	Total	0.005	EU, 2015
Infant	methidathion	0.03	0.0040	40	}	226	0.01	JMPR, 1997
Comment on risk assessment: Chlorpyrifos represents a within two fold exceedance of its acute reference dose (see the risk assessment in the table above for the detailed risk assessment for chlorpyrifos in oranges which considers a refinement to the assessment taking account of the peel the oranges not being consumed). The presence of methidathion in the same sample does add to the chlorpyrifos exposure, however the combined assessment would be well within an overall two fold exceedance for the situation where the peel of the oranges is not consumed). If it is assumed that all of the peel of the oranges is consumed, the only consumers where the total exceeds 100% are infants, toddlers, and 4-6 year old children. It is unlikely that these consumers would eat much peel. In these consumer groups, chlorpyrifos remains the largest contributor to the assessment (please refer to the above the conclusion above for chlorpyrifos). As such, the conclusion above for chlorpyrifos is still considered valid for this combined assessment, and that despite a reduction in the safety factor, an effect on health is unlikely.								

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

Issues arising in this report

Chlorate

We are testing a limited number of foods for chlorate for the first time in 2017, to provide evidence that it is necessary to review the existing default MRL in order to take account of non-pesticide sources. The pesticide sodium chlorate is a residual broad action weed killer, which is not authorised for use in the EU.

Far more likely sources in food are from chlorine-based treatments of drinking and irrigation water as well as chlorine-based surface disinfectants, which are widely used to ensure microbiological safety. We agree with HSE and the FSA that the current MRL needs to take account of these often essential and unavoidable sources.

Our results will add to a growing body of evidence, from both official monitoring across the EU and from the food and farming industries

Meanwhile we are advised by HSE that the statutory default level of 0.01 mg/kg applies to chlorate in all foods under Regulation 396/2005, although Member State authorities can exercise judgement on whether goods they find in exceedance of the MRL can be marketed in their territories. Those judgements are based on specific assessments of risk for the consumer, as allowed for in Article 14 of EC Regulation 178/2002 (laying down the general principles of EU food law and food safety). In particular, consideration of the safety of any residues detected will take into account the 2015 opinion of the EFSA Panel on Contaminants in the Food Chain Risks for public health related to the presence of chlorate in food[1]

In the meantime, Member States and trade bodies have submitted sets of monitoring data to support the future setting of substantive MRLs. These data are being considered by the Commission and EFSA. They were due to be discussed at the June meeting of the Standing Committee on Plants Animals Feed and Food (Pesticide Residues section)[2]; but this was not possible due to other pressing issues. Chlorate was posted on the agendas for both the September and November meetings, although there have been no substantial developments reported.

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[1] EFSA Journal 2015;13(6):4135 [103 pp.]
http://ec.europa.eu/food/plant/standing_committees/sc_phytopharmaceuticals/index_en.htm
[2] Agendas and summaries are published by the European Commission at
http://ec.europa.eu/food/plant/standing_committees/sc_phytopharmaceuticals/index_en.htm

The continuing suspension of the enforcement of chlorate MRLs means that more time is available to generate additional data and to refine national positions.

HSE and FSA continue to encourage those UK trading bodies and individual companies interested in the outcome of the MRL setting process to generate data in support of appropriate MRLs. If additional data are generated they should ideally cover residues arising across the EU rather than limited to the UK and, where possible, data should identify the treatment histories (timing and nature of sanitation practices etc.) that have contributed to the residues arising.

The Commission has indicated that trade bodies will be formally consulted on any substantive levels that are proposed, which may give further opportunities to submit data and/or reasoned arguments. The Commission has not stated when the consultation is likely to take place. HSE and the Food Standards Agency are providing updates on this proc

Both the PRiF and Advisory Committee on Microbiological Safety of Food (ACMSF) are taking an active interest in these on-going developments, as well as the separate discussions on the setting of MRLs for biocides.

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 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.

DDT

The use of DDT is banned or heavily restricted in many countries. It isn't allowed for use on food crops any more 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 breakdown 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 look thoroughly at this, and the Food Standards Agency is also actively involved in our considerations.

BAC (benzalkonium chloride) and DDAC (didecyldimethylammonium chloride)

BAC and DDAC are quaternary ammonium compounds (QAC) widely used as disinfectants. However, such products may also be used as pesticides and so any residues in food are covered by the law on pesticide (plant protection products) residues. Since November 2014 the MRLs for BAC and DDAC in all foods is 0.1 mg/kg.

In the monitoring programme we have looked for QACs in fruit and vegetable surveys and some dairy surveys, we find very few residues of QACs above the MRL in these surveys. 2016 was the first year we looked for QACs in meat products, we expect to find residues of BAC and DDAC due to their use as disinfectants.

Processing factors and MRLs used for bread

Bread type	Pesticide	Processing factor	MRL for unprocessed grain (mg/kg)	Bread MRL (mg/kg)
Wholemeal wheat bread	Chlormequat	0.5	2	1
	Chlorpyrifos-methyl	0.47	3	1.4
	Deltamethrin	0.84	2	1.68
	Glyphosate	0.36	10	3.6
	Pirimiphos methyl	0.43	5	2.15
Other wheat bread	Chlormequat	0.3	2	0.6
	Chlorpyrifos-methyl	0.05	3	0.15
	Deltamethrin	0.14	2	0.28
	Glyphosate	0.105 ‡	10	1.05
	Pirimiphos methyl	0.12	2	1.9
Wholemeal rye bread	Chlormequat	0.3	2	0.6
	Pirimiphos methyl	None found	2	2
Other rye bread	Chlormequat	0.99	2	2
	Pirimiphos methyl	None found	5	5

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

Processing factors are taken from a compendium of publically available, authoritative processing factors published by the German regulatory authority for pesticides[3].

About processing factors

In nearly all cases the EU MRL is set for the food in its raw, unprocessed form (these foods are listed in Annex I of Regulation 396/2005), but is then 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.

[3] *BfR compilation on processing factors for pesticide residues, dated 20.10.2011*
Downloaded from http://www.bfr.bund.de/en/pesticides-579.html on 7 January 2014

Put another way, the use of processing factors enables checks that the original ingredient was compliant with MRLs. Food manufacturers should have information on the composition of their product - for instance, whether water is added/removed – that may assist in identifying appropriate processing factors and also have information on the compliance of the raw ingredients employed (in this case wheat or rye).

Suppliers and manufacturers must ensure that the raw materials and ingredients they supply or use to make processed food comply with MRLs *before processing*. It is an offence to use non-compliant food as a processed food ingredient. Processing cannot be used to make food compliant, and the compliance of processed foods should be checked using MRLs and relevant processing factors. Where processing affects residues, it is not appropriate to check results against unadjusted MRLs.

Follow-up from Previous Reports

Quarter 2 2016

Strawberries

Fluopyram: Sample number 2520/2016

We passed details of a sample of strawberry from the UK that contained fluopyram to HSE Enforcement. HSE's enquiries have not identified a likely origin for this residue. We feel their work on this particular finding has come to an end so have included brand name details for the sample in this report.

Quarter 4 2016

Speciality Vegetables

Prothioconazole and tebuconazole: Sample number 4790/2016

We passed details of a sample of chard from the UK that contained prothioconazole and tebuconazole to HSE. HSE's enquiries have not identified a likely origin for this residue. We feel their work on this particular finding has come to an end so have included brand name details for the sample in this report.

Quarter 2 2017

Apples

Paclobutrazol: Sample number 1742/2017

We passed details of a sample of Braeburn apple from the UK that contained paclobutrazol to HSE. HSE's enquiries confirmed that paclobutrazol was applied legally to the apple before its use was withdrawn in November 2016. HSE actions are complete, so we have included brand name details in this report.

Cucumber

Fluopyram: Sample number 4627/2017

We passed details of a sample of cucumber from the UK that contained fluopyram to HSE. HSE's enquiries are not yet complete; an update will appear in a future report.

Pears

Paclobutrazol: Sample numbers 4705/2017 & 3252/2017

We passed details of 2 samples of pears from the UK that contained paclobutrazol to HSE. HSE's enquiries confirmed that paclobutrazol was applied legally to the pears before its

use was withdrawn in November 2016. HSE actions are complete, so we have included brand name details in this report.

Raspberries

Carbendazim: Sample number 4448/2017

We passed details of a sample of raspberries from the UK that contained carbendazim (sum) to HSE. As this sample was produced in Scotland, HSE referred the details of this sample to the Scottish Government to investigate. An update will appear in a future report.

Brand name details of samples where follow-up action is now complete

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

UK samples with residues of pesticides not approved for use on that food in the UK in bold, blue text

Sample ID	Date of Sampling	Description	Country of Origin	Retail Outlet	Address	Brand Name	Packer / Manufacturer	Pesticide residues found in mg/kg (MRL)
Quarter 2 2016								
2520/2016	**06/06/2016**	**Strawberries**	**UK**	**Robert Brand Fruits**	**Anglia Square, Norwich NR3 1DZ**			**fluopyram 0.04 (MRL = 2)** **thiacloprid 0.01 (MRL = 1)**
Quarter 4 2016								
4790/2016	**01/12/2016**	**Chard**	**UK**	**S Thorogood & Sons**	**Stand 87/88a New Spitalfields Market,1 Sherrin Road, Leyton, London E10 5SL**	**None stated**	**DL Turner & Son Sheepcoat Farm Sheepcoat Lane, Orpington, Kent BR5 4ET**	boscalid 0.4 (MRL = 30) **prothioconazole 0.3 (MRL = 0.01*)** **tebuconazole 0.7 (MRL = 0.02*)**
Quarter 2 2017								
1742/2017	08/05/2017	Braeburn Apples	UK	Sainsburys	Angel Centre, Tonbridge, Kent TN9 1SF	Sainsburys	Sainsburys Supermarkets Ltd 33 Holborn, London EC1N 2HT	boscalid 0.1 (MRL = 2) captan (sum) 0.06 (MRL = 10) chlorantraniliprole 0.01 (MRL = 0.5) myclobutanil 0.02 (MRL = 0.6) paclobutrazol 0.02 (MRL = 0.5) pyraclostrobin 0.03 (MRL = 0.5)
4705/2017	05/06/2017	Conference Pears	UK	Sainsburys	Berryden Road, Aberdeen AB25 3SA	None stated		boscalid 0.2 (MRL = 1.5) captan (sum) 0.09 (MRL = 10) paclobutrazol 0.03 (MRL = 0.5) pyraclostrobin 0.08 (MRL = 0.5)
3252/2017	08/05/2017	Conference Pears	UK	Sainsburys	Cameron Toll Shopping Centre, 6 Lady Road, Edinburgh EH16 5PB	None stated	AC Goatham & Son Flanders Farm, Ratcliffe Highway, Hoo, Rochester, Kent ME3 8QE	boscalid 0.09 (MRL = 1.5) captan (sum) 0.06 (MRL = 10) paclobutrazol 0.02 (MRL = 0.5) pyraclostrobin 0.04 (MRL = 0.5)

In our next report:

In Quarter 4 of 2017 we will look at results for:

- Apples
- Beans (tinned)
- Beans with pods
- Bread
- Carrots
- Cauliflower
- Cheese (hard)
- Cucumber
- Fish (oily)
- Grapes
- Kiwi fruit
- Lamb
- Lemon and limes
- Lettuce
- Milk
- Okra
- Onions
- Oranges
- Parsnips
- Pears
- Peppers
- Potatoes
- Poultry meat
- Poultry meat (products)
- Prepared fresh fruit
- Rice
- Rye flour
- Rye grain
- Speciality beans (dried)
- Speciality fruit

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.

Defra's Expert Committee on Pesticide Residues in Food (PRiF)

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 oversee Government's £2 million pesticide residues surveillance programme. Previously this work was carried out by the Pesticide Residues Committee.

Our Chairman, Dr Paul Brantom is an independent consultant in toxicological risk assessment. The Committee also includes members with expertise in toxicology, 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:

https://www.gov.uk/government/groups/expert-committee-on-pesticide-residues-in-food-prif

Our role is to advise Ministers, the Director of the Health and Safety Executive (HSE) and the Chief Executive of the Food Standards Agency (FSA) on:

- 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.

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 UK produce of pesticides which are not approved for use on that crop in the UK.

- All residues found in UK-produced foods are checked by HSE to make sure the pesticide is approved for use.
- Where no UK approval is identified, details of the sample are referred to HSE's 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 looks 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.

The EU Reference Laboratories for pesticide residues have an e-learning package aimed at analytical chemists on this very technical subject at http://www.eupt.es/e-learning/.

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 http://ec.europa.eu/food/plant/pesticides/pesticides_database/index_en.htm

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 prodcuts
fluazifop-p-butyl (sum)	Fluazifop-P-butyl (fluazifop acid (free and conjugate))
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)
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)	Thiametoxam (sum of thiametoxam and clothianidin expressed as thiametoxam) 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.

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.

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'.

Extension of Authorisation for Minor Uses in the UK (formerly known as 'SOLAs'): For many reasons, label recommendations of authorised PPPs 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 sporadic pests and diseases. If the label recommendations do not address particular needs, users and authorisation holders of PPPs may apply to HSE for an Extension of Authorisation for Minor Uses (EAMU) for an existing PPP. The extension can be given where the use is minor in nature, is in the public interest and all safety aspects of the risk assessment can be satisfied. When an extension of use is given is can appear on the product label in a separate section titled 'extension of use', but where authorisation holders decline to put the extension of use on the product label, it will be available as an extension of use notice that can be obtained from CRD's website.

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 97.5th 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.

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

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 approved 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): 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: www.pesticides.gov.uk/guidance/industries/pesticides/topics/pesticide-approvals/pesticides-registration/applicant-guide/the-applicant-guide-contents.

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: www.pesticides.gov.uk/guidance/industries/pesticides/topics/pesticide-approvals/pesticides-registration/applicant-guide/the-applicant-guide-contents.

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.

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 https://ec.europa.eu/food/safety/rasff_en

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.

Ware: Ware potatoes, sometimes referred to as main crop potatoes, are harvested between August and November, and are available throughout the period August to June because they are stored under controlled temperature after October.