Department for Environment, Food and Rural Affairs

The Expert Committee on Pesticide Residues in Food (PRiF)

Annual Report 2019

The Expert Committee on Pesticide Residues in Food oversees a programme that checks food and drink in the UK for traces of pesticide residues.

- We are appointed by the Department for Environment, Food and Rural Affairs (Defra) to advise Defra, the Northern Ireland Executive, the Scottish Government, the Welsh Government, the Health and Safety Executive and the Food Standards Agency on a monitoring programme that checks food and drink in the UK for traces of pesticide residues.
- One of the purposes of the programme is to check whether residues found in food and drink are above the maximum residue levels (MRLs) set by law.
- When we find residues, we assess whether the levels found are likely to impact on human health.
- We assess whether residues might be of concern to particular groups of consumers such as babies, toddlers and the elderly.
- Where more than one pesticide is found with similar modes of action, we assess if the impact of the sum of the residues is of concern.
- When problems are found, we take action including additional testing to find out more information – and if necessary we advise the regulatory authority so that enforcement action can be taken.
- We act as a check that results are as expected by the regulatory regime when the law on using pesticides or on pesticide residues in food were set

The Expert Committee on Pesticide Residues in Food **does not**:

- advise whether pesticides should be approved for use or withdrawn from the market
- set government policy on pesticides
- take account of or assess the impact of pesticides on the environment
- promote the use of pesticides

This is the ninth annual report from the Expert Committee on Pesticide Residues in Food. It summarises the results from monitoring samples collected throughout 2019 and our conclusions about those results. It also describes the work that is being carried out in 2020.

Details of all the samples we have collected and tested are available at: Data.gov.uk

If you have any comments about this report, please send them to prif@hse.gov.uk

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1. Chair's introduction

This is the ninth annual report from the Expert Committee on Pesticide Residues in Food (PRiF). The committee is made up entirely of independent members with a wide range of expertise.

Throughout 2019, PRiF have published quarterly reports on the results of the monitoring programme. We have also reported monthly on beans with pods, grapes, okra, and potatoes as part of our rolling programme. All of these results have been published on GOV.UK. In addition, we publish the results and sample details in an accessible, useable format on: Data.gov.uk to review these results

In 2019, we tested 3,302 samples of food and drink from the UK supply chain for pesticide residues. Excluding chlorate, we tested for up to 372 pesticides in some of the commodities. 49.58% of the samples tested by the laboratory did not have any residues of the pesticides we tested for. The results also show that around 2.88 % of the samples contained a residue above the MRL set by law.

We have reported results for chlorate separately from other residues as we are confident that the residues we are detecting come from use of chlorine-based disinfectants used to maintain microbiological safety (control microorganisms that cause food poisoning), not from use of pesticides used on plants. You will find a detailed explanation of this issue in this report.

Part of the monitoring programme is targeted at foods where we expect to find residues. Our programme uses the latest technology for analysis, which is constantly improving, and means that each year we can look for more pesticides at lower levels. For these reasons we expect to see a rise in the number of samples with residues detected, including some over the MRL. The Health and Safety Executive assesses the risk to consumer health for every sample that contains a residue at any level. From the results of these assessments we can see that even where food contains a residue above the MRL, there is very rarely any risk to the health of people who have eaten the food.

For information about the monitoring programme, please look at our page on GOV.UK:

Pesticide Residues in Food Results of Monitoring Programme

Please contact us if you have any comments: prif@hse.gov.uk

Ann Davison

Chair of the Expert Committee on Pesticide Residues in Food

2. Summary of results excluding chlorate

- 3,302 samples of 37 different types of food were collected in 2019.
- Excluding chlorate 49.58% of the samples contained none of the pesticides we looked for.
- 47.55% contained a residue at or below the MRL.
- 2.88% of the samples tested contained a residue over the MRL.
- We tested for up to 372 pesticides in fruit and vegetables, 366 in animal products, 371 in starchy foods and grains, 365 in infant food and 369 in other groceries.
- All of the samples in which a residue was detected were checked by the Health and Safety Executive (HSE) for risk to the consumers by means of a risk assessment screening mechanism. We published results of 10 detailed short-term risk assessments where we wanted to consider in more detail whether there was a concern for human health.
- We referred five samples to the Food Standards Agency (FSA) as we had concerns about the potential risk to human health of people eating these foods. The FSA notified the Rapid Alert System for Food and Feed about four of these samples.
- We passed six samples of UK produce to HSE's enforcement team which we suspected contained residues of pesticides not approved for use in the UK on those crops. In four of these cases, HSE could not identify an obvious reason for the residues and investigated how these residues could have arisen.
- Residues of chlorate continue not to be treated as breaches of the law. The position on the regulation of chlorate residues, and chlorine-based biocides, is still developing. We have presented results for chlorate separately to other results in Section 13.

3. About us

The pesticide residues surveillance programme monitors pesticide residues in food and drink in the UK supply chain. The term ‘pesticide residue’ means the chemical trace of a pesticide which may be found in or on our food. The agriculture and food industries use pesticides to help protect their crops from pests, including insects, weeds or fungal infections. The agriculture and food industries must comply with specific regulations.

We give advice on:

- setting up monitoring programmes for pesticide residues in UK food
- how to collect and process samples
- methods of analysing samples
- how to assess the results

We regularly publish clear, understandable monitoring results on GOV.UK, and aim to do this as quickly as possible without compromise of integrity.

The Expert Committee on Pesticide Residues in Food was formed in 2011, to carry on the work of the Pesticide Residues Committee (PRC) which ceased to operate in 2010.

Our members have been appointed by ministers from Defra, the Scottish Government, the National Assembly for Wales, and the Department of Agriculture, Environment and Rural Affairs for Northern Ireland.

We give advice on the monitoring programme to:

- ministers
- the Chief Executive of the Food Standards Agency (FSA)
- the Health and Safety Executive’s Chemicals Regulation Division (HSE CRD)

We meet four times a year and representatives from government departments attend our meetings as officials. HSE provides our administration. We open one of our business meetings to the public each year.

The bigger picture

People are concerned about health, the environment and how food is produced. Pesticides used in the incorrect way or in the wrong amounts can harm people, wildlife and the environment, so they must be handled with care. Pesticides can only be used in UK agriculture if they are used in line with the law and guidance controlling their use.

As regulating pesticides is a complicated area, there are a number of different organisations involved. On behalf of Defra and the other UK agricultural departments, the Health and Safety Executive authorises and controls pesticides for use in the UK, as well as monitoring pesticide residues in the UK food supply no matter where the food was produced. The Food Standards Agency has overall responsibility for food safety.

Most residues come from pesticides being used on crops. To work effectively, pesticides must be used in the correct amounts and at the right time. The amount of residue in a food is dependent on:

- how much pesticide was used
- when it was applied in relation to harvest date
- how it is metabolised by plants and animals
- how it breaks down in the environment

In addition to this, residues can sometimes be due to contamination (small amounts of pesticide that remain in the environment after legitimate use). Due to significant technical improvements in laboratory analysis, we now have the capability to detect very low levels of residues. So, it is possible that, as methods become more sensitive, we may find more residues.

Our work and open reporting system has encouraged producers and retailers to be responsible about their use of pesticides in their supply chains. We are transparent about our work and publish the results, including brand names, where samples were obtained and where possible who produced them.

The Expert Committee on Pesticides (ECP)

The Expert Committee on Pesticides (ECP) is responsible in the UK for giving advice on using and handling pesticides and for considering incidents related to the effect pesticides have on wildlife and the environment. The ECP assesses pesticides before they can be sold and used in the UK. It advises the government if a pesticide should be approved, what crops it may be used on, how it may be used and how much can be used on a crop. It takes account of any new information about an approved pesticide to see if it should be used at a reduced rate, under different conditions or withdrawn from sale. We let the ECP know if we see something in our results that falls inside their remit.

Maximum Residue Levels (MRLs)

Maximum Residue Levels (MRLs) are set in law at the highest level of pesticide that the relevant regulatory body would expect to find in that crop when it has been treated in line with Good Agricultural Practice (GAP). When MRLs are set, effects of the residue on human health are also considered. The MRLs are set at a level where consumption of food containing that residue should not cause harm to consumers.

If a food has a higher level of residue than the MRL, it does not automatically mean that the food is not safe to eat. A residue above the MRL may show that the farmer has not used the pesticide properly. Some pesticides may be permitted for use in the country of export but not be permitted for use in the EU, and so the MRL may be set at the lowest level that official laboratories can normally detect.

This is known as the limit of determination (LOD). An LOD MRL is indicated by an asterisk after the level (i.e. 0.01* mg/kg).

The Food Standards Agency (FSA) update

The main objective of the Food Standards Agency (FSA) is to protect public health from risks that may be associated with the consumption of food (including risks caused by the way in which it is produced or supplied) and otherwise to protect the interest of consumers in relation to food. The FSA attends PRiF meetings as an assessor and works closely with us, and with HSE, on pesticide residues issues.

The FSA has responsibility at the border for monitoring pesticides in food coming into the UK from outside the EU. This is delegated by FSA to the Port Health Authorities. Enforcement activity is carried out under Regulation 2019/1793 (previously 669/2009), which stipulates commodities and exporting countries that have a particular concern. Testing of imports at the border is separate to the HSE monitoring programme we oversee. Detailed information about border control testing is published on data.gov.uk (search for “Trade Control & Expert System – Food”).

In 2019, the UK border controls identified 25 incoming consignments of commodities from non-EU countries that contained non-compliant levels of residue associated with a possible risk to health. 11 of the consignments were peppers or chillies from India although these concerned a range of different residues. Otherwise, no more than four consignments were associated with any particular country. Five of the consignments contained non-compliant levels of dimethoate/omethoate, for which MRLs had recently been reduced. A further 45 incoming consignments were rejected due to MRL non-compliances that had no associated health risk. All of the non-compliant consignments were either rejected at the port or seized for destruction, and none entered the food chain.

4. The monitoring programme

We are interested in whether pesticides meet legal trading levels and if there is any risk to people's health.

Collecting and testing samples

The size of the sample and the number of individual units of a food within each sample is set down in regulation. For example, for apples the sample must be made up of at least 10 apples and weigh at least 1 kilogram.

We send samples to the following laboratories to be tested:

- Agri-Food and Bioscience Institute (AFBI) – Belfast
- Fera Science Ltd – York
- Science and Advice for Scottish Agriculture (SASA) – Edinburgh

Residues tested for

We test food for a large list of pesticides in the laboratories.

Over the last 16 years the number of pesticides we test for has risen. The increase is consistent with the current capability of most laboratories which test food for pesticide residues.

The choice of pesticides tested for in a survey depends on:

- which pesticides have been found before
- what we know is being used to grow specific foods, (that is, which pesticides are approved for certain crops)
- what we know about pesticides used in the UK and other countries
- what we know about pesticides being found in tests in other countries
- the risk residues of that pesticide may present
- the maximum residues levels set in law

Why we chose certain foods

There is a wide range of foods available in the UK throughout the year. To make the most of resources and make sure we test a wide range of food, the programme changes from year to year.

When we choose the foods to test, we take account of many factors. Some foods are so common in our diets that even if PRiF normally finds few or no residues, it is right to carry on checking them. Although there have been no recent health concerns we continue to monitor staples like milk and bread because of their role in our diet.

We group the foods into five categories:

- fruit and vegetables
- animal products
- starchy food and grains
- miscellaneous groceries
- infant food

Other foods are less commonly consumed but are important in the diet of some groups of people; speciality fruit and vegetables are a good example. So, we check these to protect those who consume these foods most frequently or in the greatest amount. Some foods that are not staples in our diets are still included most years because we regularly find residues in them that are not compliant with the MRLs.

We also keep an eye out for new trends in diets, like the increased interest in and broader range available of gluten free food or meat substitutes such as soy or tofu in recent years. We bear in mind different shopping habits in our sampling, like buying from street markets, greengrocers or supermarkets.

We also take account of monitoring data from other countries as well as information from the Rapid Alert System for Food and Feed (RASFF). EU member states use the RASFF to share notifications of foods which could be a risk to human health.

Each year we contribute to Europe-wide surveys of main food groups collected to an agreed timetable. In 2019 our results for apples, cabbage, lettuce, milk, peaches and nectarines, pork and gammon, spinach, strawberries and tomatoes formed part of this larger survey. These results are then shared with the European Food Safety Authority (EFSA), who compile and publish a single annual report.

Each year we publish our proposed list of foods to be sampled. In 2017, we developed in conjunction with HSE, a monitoring matrix ranking tool which helps determine the priority of the relative surveys. We hope this will enable a more objective approach: PRiF Residues in Food Minutes and Papers

We publish detailed results from the programme every three months. In 2017, we changed the way our reports were published, to make them easier to navigate and to be more user friendly to readers. We carried on with this format in 2019.

The reports are published in two parts. The first is the Quarterly Summary report which details the findings, risk assessments that were carried out and any comments from the committee. This part of the report is published on GOV.UK: Pesticide Residues in Food results-of Quarterly Reports

The other part of the report provides all the sample details, such as brand name information, what was detected in each sample, and what residues were sought and not found in each survey. This part of the report is published in an accessible format at: Pesticide Residues in Food Quarterly Data

Report	Sample Collection	Report Published
Quarter 1 2019	January-March 2019	September 2019
Quarter 2 2019	Up to June 2019	January 2020
Quarter 3 2019	Up to September 2019	April 2020
Quarter 4 2019	Up to December 2019	June 2020

Food and drink being monitored in 2020

The 2020 programme started in January 2020.

Since March 2020 sample collection has been disrupted by lockdown measures in response to the COVID-19 pandemic. Initially retail sampling was suspended. By June sample collection started again using internet shopping and concentrating on higher priority surveys. Further adjustments will be made as the situation changes. Some technical changes were made to usual requirements to enable testing of food available to UK consumers to start again. We will update on these changes through the year and include more details in our 2020 annual report.

2020 Programme

Asparagus	Dairy Substitute	Liver	Pears
Avocado	Dried fruit	Mango	Peas with edible pods
Beans (dried)	Fish (oily)	Meat substitute	Peas without edible pods
Beans with pods	Grapes	Milk	Potatoes
Bread	Herbs	Okra	Poultry meat
Carrots	Infant formula	Onions	Pumpkin & squash
Cauliflower	Kiwi fruit	Oranges	Rice
Cheese (hard)	Lamb	Orange juice	Rye
Courgette	Lettuce	Pate (fish)	Sweet potatoes

HSE is planning the programme for 2021. A proposed list of commodities for 2021 will be published for comments as a paper of a future PRiF meeting.

5. Where the samples were collected in 2019

Each year, samples are collected from different places throughout the UK. Two towns or cities are chosen from each government region. In 2019, we bought over 3,302 samples from retail outlets in 24 towns or cities in the UK. Government inspectors collected around 660 of the total sample numbers from places such as wholesalers, ports, supermarket distribution depots and processor factories. This allows samples to be collected from non-retail sources making the surveys more representative of the food chain.

6. Foods tested in 2019

As some foods are available at different times throughout the year from different parts of the world, we may collect samples of these foods over three, six, nine or twelve months. We sometimes report results of tests every six months rather than every three months. We do this when there are only a small number of samples in a survey or when we do not expect there to be many residues of interest in the results because analysing larger batches of samples is more economical.

We publish detailed results from the programme every three months. Reports for 2019 are available at: Pesticide Residues in Food Quarterly Data

Q1 report (January to March 2019, published September 2019)	Q2 report (up to June 2019, published December 2019)	Q3 report (up to September 2019, published April 2020)	Q4 report (up to December 2019, published June 2020
Apples	Apples	Apples	Apples
Beans with pods	Barley	Beans with pods	Barley grain
Cabbage	Beans with pods	Bread (ordinary)	Beans with pods
Chillies	Butter	Bread (savoury)	Bread (ordinary)
Cooked Meats	Cabbage	Cabbage	Bread (gluten free)
Fish (sea)	Cheese	Chocolate	Butter
Grapes	Fish (sea)	Cooked meats	Cabbage
Lemons	Grapes	Curry leaves	Cheese (processed)
Lettuce	Honey	Fish (sea)	Chillies
Milk	Lemons	Grapes	Fish (sea)
Okra	Milk	Infant food (savoury)	Grapes
Peaches and nectarines	Oats	Lemons	Honey
Peppers	Okra	Lettuce	Lemons
Pork	Pasta	Milk	Milk
Potatoes	Peach and Nectarines	Okra	Oats
Rice	Peppers	Pasta	Okra
Shellfish	Plums	Peaches and nectarines	Peaches and nectarines
Spinach	Potatoes	Peppers	Peppers
Strawberries	Pre Packed Salad	Plums	Plums
Tomatoes	Shellfish	Pork	Pork
	Spinach	Potatoes	Potatoes
	Strawberries	Potatoes (processed)	Potatoes (processed)
	Tomatoes	Spices (turmeric)	Rice
	Wine	Spinach	Salad leaves
		Strawberries	Shellfish
			Spinach
			Strawberries
			Tomatoes

7. Results from the 2019 programme excluding chlorate

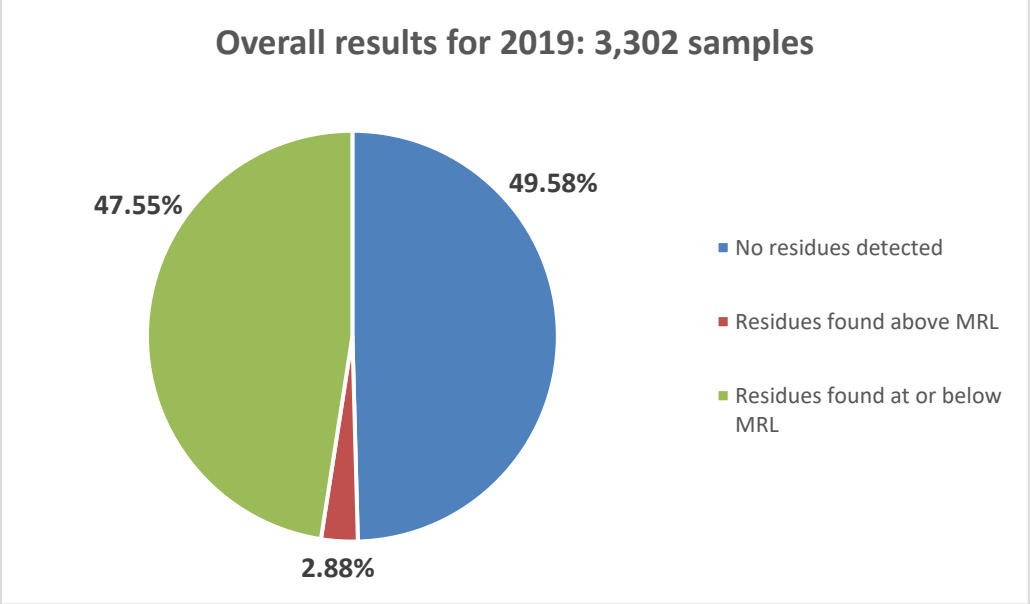
Results for chlorate are presented separately in Section 13

In 2019, we tested 3,302 samples. We tested each sample for many different pesticides. In total we tested around 928,000 food and pesticide combinations.

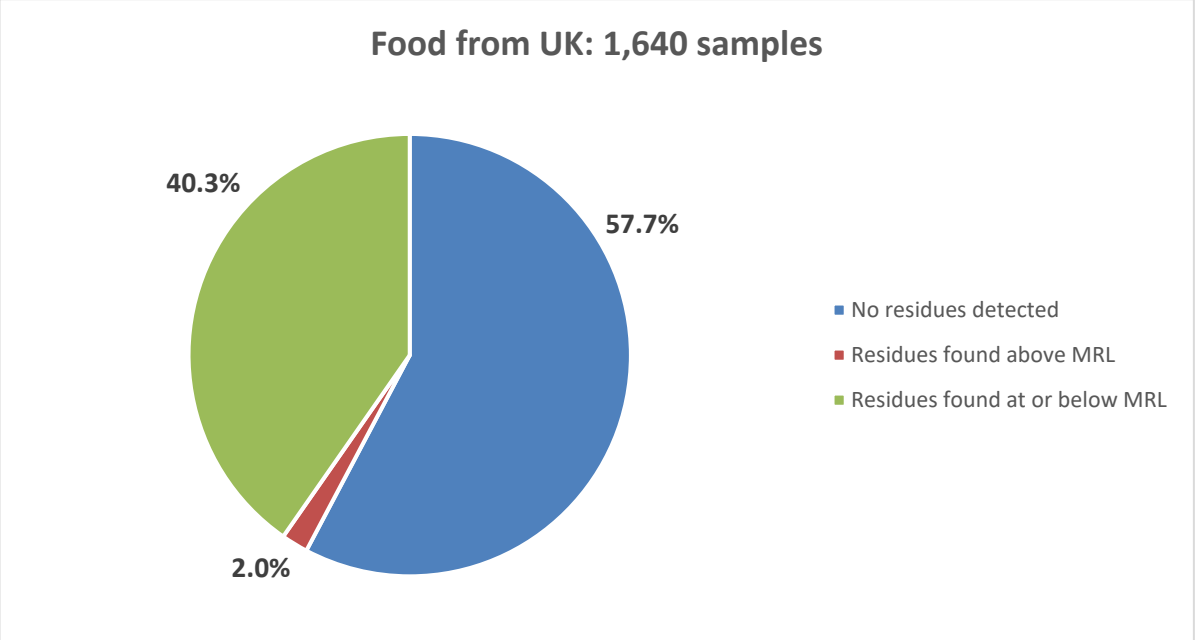
Of the pesticides we looked for we found that:

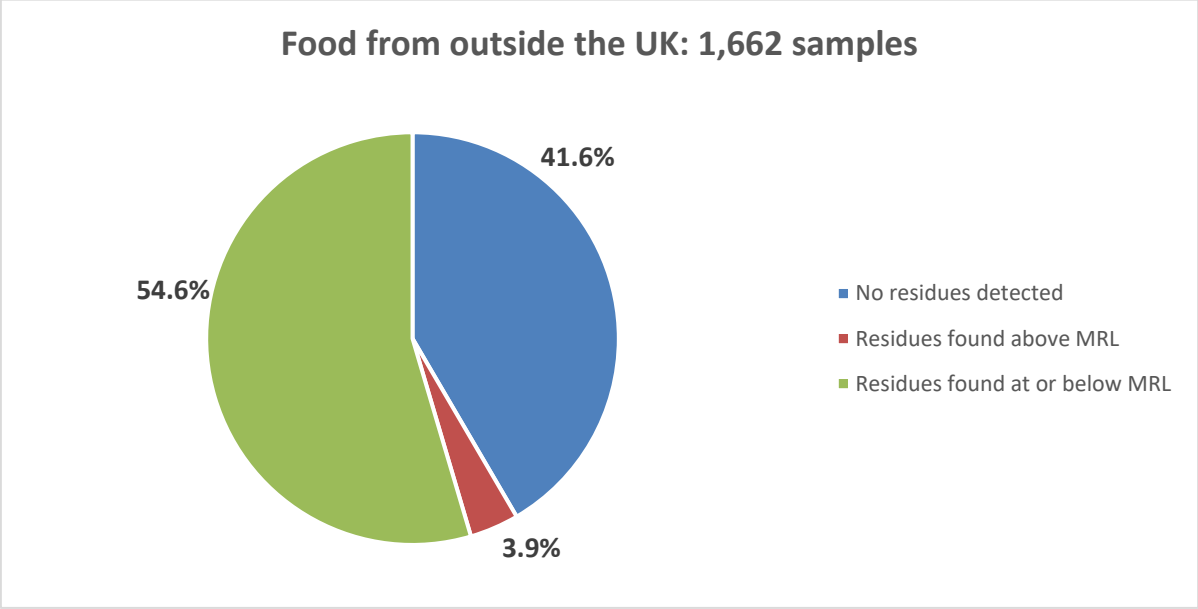
- 49.58% of samples contained none of the pesticides we looked for
- 47.55% of samples contained a residue at or below the MRL
- 2.88% of samples contained a residue over the MRL

The monitoring programme looks at those foods in which we expect to find residues. Because of this, we cannot say that the results represent the UK food supply as a whole.



Some of the samples labelled as being from the UK may not have been produced in the country. The country of origin can be where the raw ingredient was produced, where the food was made, where it was packed from large shipments into smaller packs for retail sale, or it could be the home of the brand owners. Red lentils can be labelled as being from UK, but the red lentils in the bag have been grown for example in Canada or Turkey and then packed in the UK.





8. Fruit and vegetable results

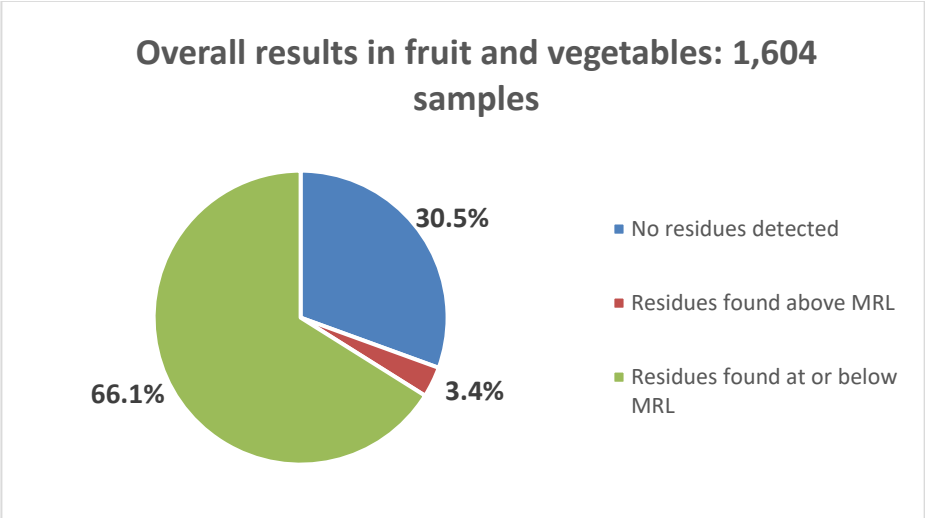
Results for chlorate are presented separately in Section 13

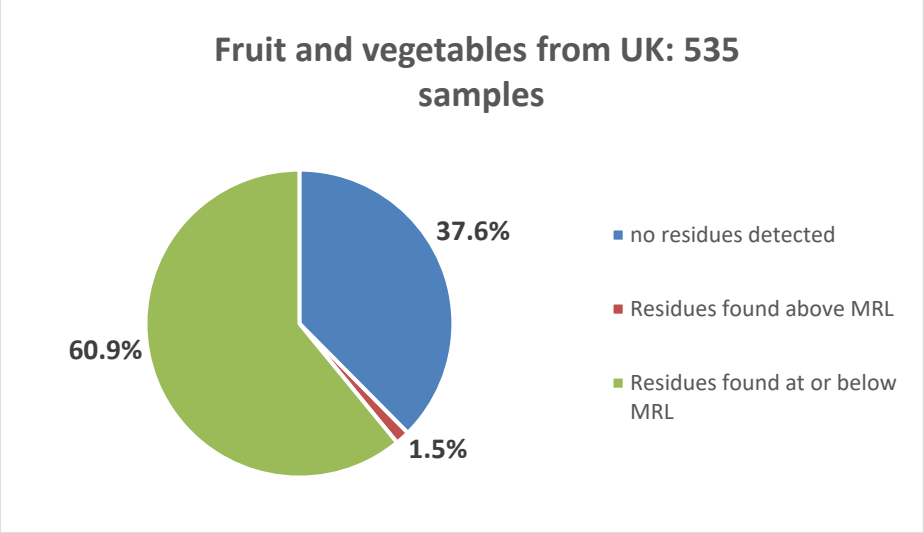
We tested 1,604 samples of fresh or frozen fruit and vegetables for up to 372 pesticides and carried out tests on around 559,000 food and pesticide combinations.

We found residues in 1,060 of those samples (66.1%). 54 (3.4%) of those samples contained a residue above the MRL.

We tested 535 samples labelled as UK fruit and vegetables. We found residues in 326 (60.9%) of those samples, and 8 samples (1.5%) contained a residue above the MRL.

Some of the frozen samples labelled as being from the UK may not have been grown in the country. The country of origin on the label can be where the original ingredient was produced, where the food was frozen, where it was packed from bulk for retail sale – or it could be the home of the brand owners. For example, frozen melon can be labelled as being from the UK, but the melon in the pack would have been grown elsewhere.





Main findings and actions

- We didn't find any residues above the MRL in apples, lettuce, peaches and nectarines, peppers and plums
- Continuing a trend seen in previous years, 16 samples of beans with pods had exceedances over the MRL. These are varieties not commonly grown in Europe so many of the pesticides have MRLs set at the Limit of Determination (LOD). The exceedances were found in samples of 3 fine beans and 1 sample of dwarf beans.
- Similarly okra (including frozen okra) continues to have a relatively high incidence of residues over the MRL. Again, this crop is not commonly grown in Europe so many of the pesticides have MRLs set at the Limit of Determination (LOD).
- We noted that laboratories outside Europe may not be testing for the full residue definition for flonicamid which is essential to judge whether goods are compliant. The full residue definition for all foods in the UK and EU is "sum of flonicamid, TFNA and TFNG expressed as flonicamid". In our finding the metabolites TFNA and TFNG are often a large part of the total residue detected, but we noticed that laboratories outside Europe often do not include them in their tests for flonicamid. Suppliers should ensure that the full UK and EU legal definition is tested for by an accredited laboratory.

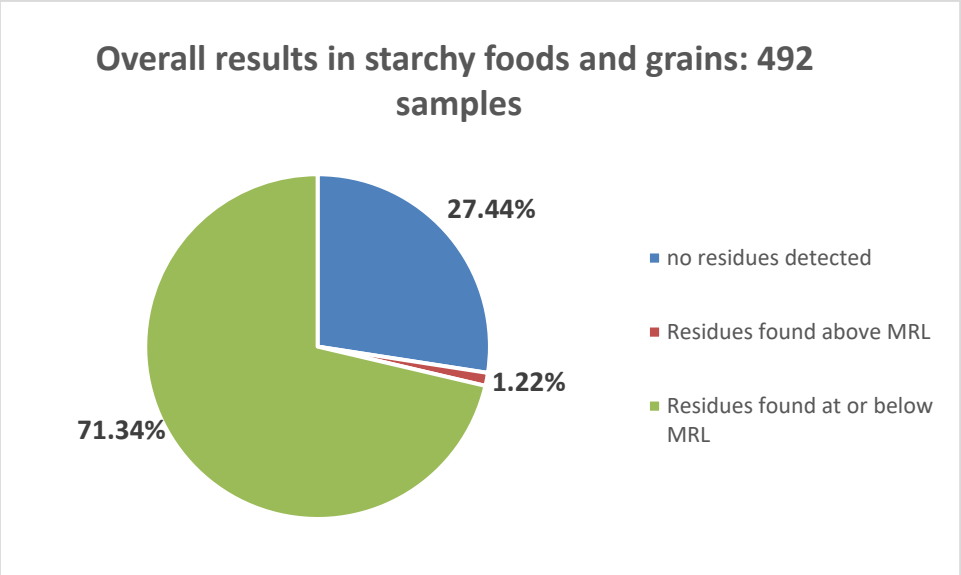
Results by food type 2019

Food sampled	Number of samples tested	Number of samples containing residues at or below MRL	Number of samples containing residues above the MRL	Number of samples containing more than one pesticide
Apples	96	80	0	58
Beans with pods	96	35	16	29
Cabbage	96	56	2	17
Chilli Peppers	49	30	4	28
Curry Leaves	18	4	5	6
Grapes	120	111	1	93
Lemons	96	84	1	79
Lettuce	72	29	0	17
Okra	91	29	17	21
Peach & Nectarines	96	79	0	65
Peppers	122	86	0	48
Plums	96	66	0	25
Potatoes	156	50	3	19
Pre packed salad	88	72	1	55
Spinach	96	71	1	48
Strawberries	120	113	2	107
Tomatoes	96	65	1	44

9. Starchy food and grains results

We tested 492 samples for up to 371 pesticides. We carried out tests on around 181,000 food and pesticide combinations.

We found residues in 351 (71.34%) of these samples. 6 of those samples (1.22%) contained a residue above the MRL.



Bread samples labelled as being from the UK may not necessarily have been made from wheat or rye grown in the country. The country of origin may be only where the bread was baked; the flour could be made from rye or wheat grown elsewhere.

Main findings

- Out of all the samples glyphosate was detected in 43 samples of barley (59%), 48 samples of bread (22%), 60 samples of oats (62%) and 3 samples of pasta (4%) all within the MRL. Glyphosate was looked for in all samples of cereal based food except rice. It will be sought in the 2020 rice survey.
- 1 sample of bread (tortilla wraps) appeared to have been made from wheat containing residues of chlorpyrifos-methyl above the current MRL for wheat. In another case we were able to establish the flour used to make the bread had been produced from wheat harvested before the MRL changed, so we applied the MRL that was in place when the sample was taken.
- We detected residues of tricyclazole in rice above the MRL in 5 samples. Rice growers were given time to comply with the current MRL to take account of the long shelf life, so we are looking to understand why these residues are still occurring.

Results by food type

Food	Number of samples tested	Number of samples containing residues at or below MRL	Number of samples containing residues above the MRL	Number of samples containing more than one pesticide
Barley	72	56	0	41
Bread	180	168	1	67
Bread (Gluten Free)	36	0	0	0
Oats	96	79	0	70
Pasta	72	40	0	5
Rice	36	8	5	5

Applying processing factors to find MRLs for bread (and other processed foods)

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

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

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

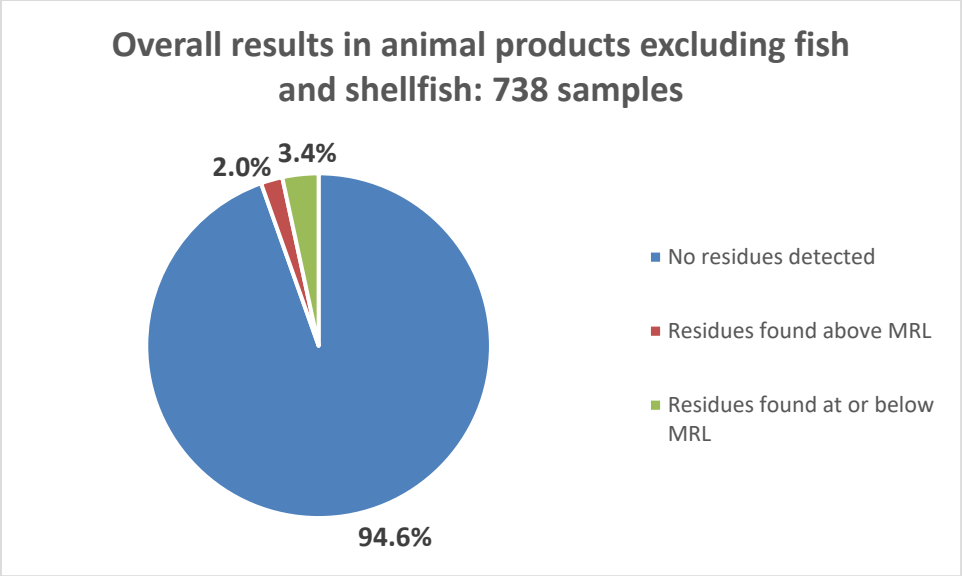
10. Animal products results

Results for chlorate are presented separately in Section 13

We tested in total 906 samples for up to 366 pesticides. We carried out tests on around 96,000 food and pesticide combinations.

Although included in our total figures above, we have not included the results for fish or shellfish in the chart below as these foods have no MRLs, however of the 108 fish samples tested 13 (12%) contained residues. Of the 60 samples of shellfish 5 (8.3%) contained residues.

Omitting fish and shellfish we found residues in 25 (3.4%) of these samples. 15 of those samples (2%) of the total contained a residue above the MRL.



Main findings

- Most of the residues found in animal products were of BAC (Benzalkonium Chloride) or DDAC (Dialkyldimethylammonium Chloride) which are disinfectants widely used during food preparation, processing and butchery. Disinfectants are used for microbiological safety to control microorganisms that cause food poisoning See Section 13.
- We found 10 pesticide residues in honey. The pesticides detected are also used in veterinary medicine used in beehives to treat for mites and other parasites. The levels were on or under the MRLs for both pesticide and veterinary use. In our opinion these findings are consistent with veterinary use: we do not think the residues are from pesticides applied to crops while the bees were foraging or otherwise in their environment outside the hive.
- We detected DDT residues in 2 samples of fish, see the info box below for an explanation of these residues.

Results by food type

Food	Number of samples tested	Number of samples containing residues at or below the MRL	Number of samples above the MRL	Number of samples containing more than one pesticide
Butter	48	0	0	0
Cheese	96	0	0	0
Cooked meats	96	14	14	7
Fish (oily)	108	13*	0	1
Honey	90	10	0	1
Milk	300	1	1	0
Pork	108	0	0	0
Shellfish	60	5*	0	0

* There are no MRLs for fish.

DDT

This year we found DDT in two samples of fish. The levels we found would not be expected to have an effect on health, and overall are consistent with the continued decline of this pesticide in the environment.

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

Due to the bans and restrictions on use, the levels in food have decreased substantially since the 1960s and 1970s. Even so, because it takes a long time to break down we do expect, and do see, occasional DDT residues in our monitoring results. Overall, the incidence and the size of residues have fallen steadily over time, which is what we would expect. In recent years none of our findings were unusual, unexpected or of concern.

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.

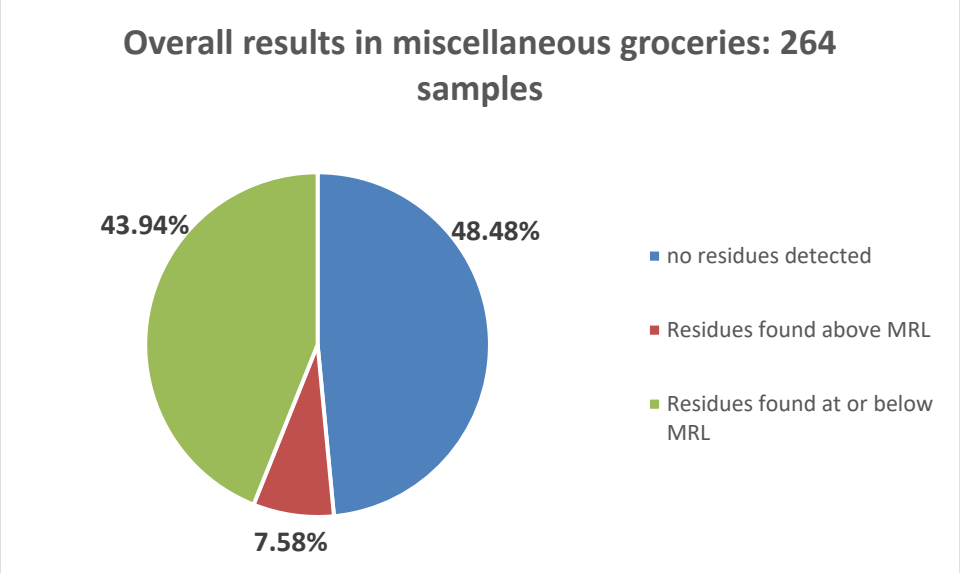
For residues found in fish in 2019, we can tell from the chemical form detected by the laboratories whether the residues are from historic use (which is what we usually find). We explain this every time we publish DDT results to try to make it as clear as we can that the results show food producers are not using DDT today. However, there are occasional media stories about DDT and various links and associations, which do not make this distinction.

11. Miscellaneous groceries results

Results for chlorate are presented separately in Section 13

The miscellaneous groceries that we tested this year were chocolate, curry leaves, processed potatoes, turmeric and wine.

We tested 264 samples for up to 369 pesticides. We carried out tests on around 77,000 food and pesticide combinations. We found residues in 116 (43.94%) of the samples. 20 of those samples (7.58% of samples that have MRLs) contained a residue above the MRL.



Main findings

- We have noted that sourcing turmeric that complies with UK MRLs continues to be challenging. This is not commonly grown in Europe. Applications to set MRLs for this kind of food are made less frequently. So many of the pesticides have MRLs set at the Limit of Determination (LOD).

Results by food type

Food	Number of samples tested	Numbers of samples containing residues at or below MRL	Number of samples above MRL	Number of samples containing more than one pesticide
Chocolate	72	10	0	6
Potatoes (processed)	72	42	0	23
Spices (turmeric)	48	18	20	32
Wine	72	46	0	21

12. Infant food results

Results for chlorate are presented separately in Section 13

Infant food and infant formula (baby milk) have their own MRLs which are set separately. Health departments are responsible for this legislation. However, these foods have been included in the UK's mainland monitoring programme alongside other foods for many years, and more recently EU member states have been required to test a type of infant food every year.

We tested 36 samples of savoury food for infants for 365 pesticides – 13,140 food and pesticide combinations.

Main findings

- Infant food is surveyed across the EU as part of the Multi Annual Control Programme.
- 17 of the samples collected were labelled as organic and none of these contained residues of pesticides from those sought.
- All samples were tested for glyphosate, and no residues were found above the reporting limit.

13. Chlorate and other biocides in food

Summary: We are not advising that food companies change their existing practices as a result of these findings.

Companies should be aware of the ongoing discussion in this area and the new MRLs that came into force for many foods in June 2020.

Biocides are important tools for maintaining microbiological food safety and any changes in practice to comply with current pesticide MRLs need to be carefully considered to ensure food safety is not compromised.

Why we are reporting 2019 chlorate results separately

We have been testing a limited number of foods for chlorate since 2016. This year we have again decided to present our results for this substance separately, as we think doing otherwise will distort the overall picture.

The pesticide sodium chlorate is a residual broad action weed killer that is not authorised for use in the EU. However, we are confident that the residues we are detecting come from use of chlorine-based disinfectants used to maintain microbiological safety (to control microorganisms that cause food poisoning), either at food processing premises, or at public water works (chlorination) and not from use of pesticides used on plants. We are grateful for the information supplied by food producers and suppliers on this topic and, in particular, in response to our findings.

Therefore, because these residues are unavoidable and important for the maintaining of microbiological control measures vital for food safety, we are not treating these results as breaches of the LOD MRL. This reflects an agreement within the EU that, while the default MRL for chlorate remains in place, enforcement should be left to the discretion of member states. The UK approach, in line with that normally taken for environmental or process contaminants, is to require that levels in food are as low as reasonably achievable to ensure the protection of human health.

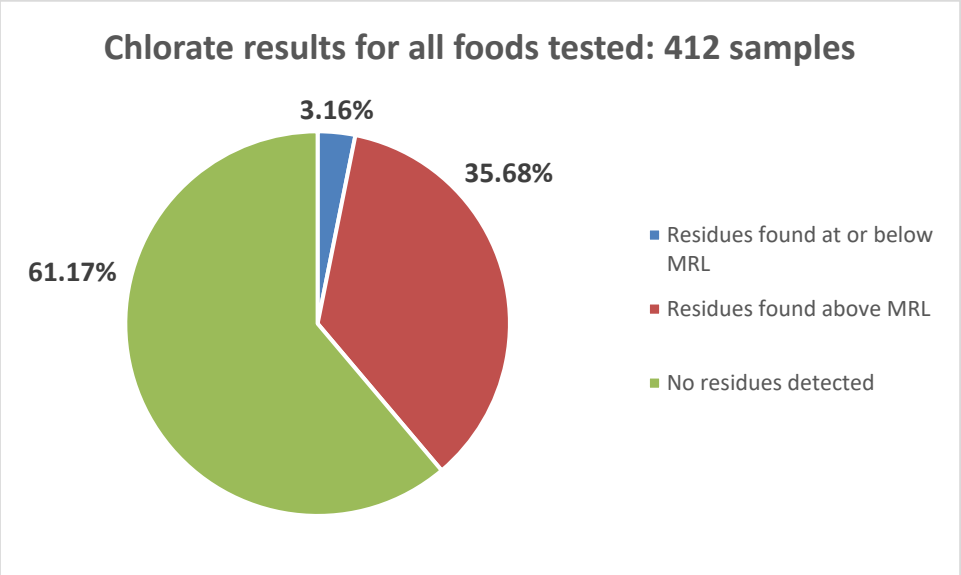
The HSE are only part of the work going on across government and beyond to consider what to do about chlorate residues in food and water.

Our results for chlorate

We tested 412 samples from 5 of our surveys for chlorate as well as our usual range of pesticides.

Testing for chlorate requires a separate test (chlorate is a single-residue method)[1] to the cost-effective tests we use to detect hundreds of pesticides in one test (multi-residue methods). Because we need to keep costs under control, we targeted our testing to foods where we expected to find chlorate residues. Instead of looking for non-compliance, our aim was to collect information on the incidence and source of chlorate residues.

We found chlorate residues in 160 samples, 147 (35.68%) of the total sampled contained a residue above 0.01 mg/kg. This is as low as our test could detect and measure, and also the legal MRL that we chose not to apply.



[1] The test also detects and measures perchlorate, which is a chemically similar substance but not a pesticide residue. Perchlorate is regulated as a food contaminant, so we gave our results to the Foods Standards Agency.

Main findings

- We frequently found residues of chlorate in pre-packed salad, spinach and cooked meats. Evidence from food suppliers and growers established these were associated most often with residues in potable (drinking quality) water supplies.
- Cheese tends to be made from milk sourced locally to the dairy. So we couldn't separate out residues originally in milk or from potable water used in the dairy.

Results by food type

Food	Numbers of samples tested	Numbers of samples containing residues at 0.01 mg/kg	Numbers of samples containing residues above 0.01mg/kg
Cheese	96	1	17
Cooked meats	96	6	26
Infant food	36	1	2
Pre-packed salad	88	1	80
Spinach	96	4	22

HSE and EU – Establishment of MRLs

The Health and Safety Executive is leading UK work in the EU to establish more meaningful statutory levels for chlorate in food to reassure consumers and allow the continued use of disinfectants that are themselves important for safeguarding human health.

Since sodium chlorate is no longer authorised for use as a pesticide, chlorate during 2019 (and until June 2020) was subject to an MRL of 0.01 mg/kg in all foods to which MRLs apply. This level was, in line with normal practice for pesticides that are not currently used, set at the default limit of determination rather than on the basis of an assessment of health risks. Our findings are adding to the evidence that current legal limits are not sufficient to allow for the essential use of disinfectants to protect food and water hygiene.

For some years now, EU member states and the European Commission had agreed only to enforce the default legal limit, and in particular not to block trade in affected products while more enquiries took place. During 2018, the European Commission prepared proposals for MRLs based on monitoring data submitted to the European Food Safety Authority (EFSA), using the same approach as would be used to derive MRLs from the results of residues trials.

During earlier negotiations, the UK and other member states had pointed out that this approach may still not be sufficient to permit essential food and water hygiene uses to continue in line with good practice while a wider review takes place. We responded directly to the European Commission that in our opinion chlorate residues may prove impossible to reduce when the main source of chlorate is likely to be from treated drinking water or the use of legitimate biocides.

Our colleagues from the Advisory Committee on Microbiological Safety of Food made similar comments, stressing our joint concern that the effect on overall food safety – including microbiological safety – should be taken into account. The pesticides MRLs regime is not a useful tool to apply these limits. Comments from across the EU were similarly sceptical.

The European Commission considered it was bound by EU law to proceed with making proposals under pesticide legislation. However, they looked again to alter the proposal based on further monitoring data in particular from food industry sectors, and added additional special provisions intended to minimise the impact on food producers where residues are incurred during food processing. The resulting MRLs, which are higher for many foods, will came into force in June 2020.

Reviews of chlorate safety for consumers

Since 2018, the Committee on Toxicity of Chemicals in Food, Consumer Products and the Environment (COT) has been considering chlorate as part of its ongoing work looking at the chemicals in the diet of infants and young children (up to 5 years). The European Food Safety Authority's 2015 opinion on chlorate[2] establishes appropriate health-based guidance values for chlorate exposure to protect against acute and chronic risks to health.

Food Standards Agency – best practice for the food industry

The Food Standards Agency is working with the food industry to develop and promote best practice in the use of sanitisers. This is important because the presence of low-level residues of chlorate in food results from measures taken by the food and water industries to protect food safety by reducing microbiological contamination of food and drink (including drinking water, which is a significant source of chlorate in food). Chlorate itself is not used as a disinfectant, but chlorine-based sanitisers can contain small amounts of chlorate.

Defra – drinking water

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

The big picture - the Advisory Committee on Microbiological Safety of Food

The HSE is working with the Advisory Committee on the Microbiological Safety of Food to understand how changes to pesticide MRLs affect biocide use, microbiological food safety, and the overall risk to consumers taking into account both chemical and microbiological safety. From the point of view of pesticide residues, this will include considering the wide ranging substances that are covered by pesticide residues rules and also used as biocides around food or water.

[2] EFSA Journal 2015;13(6):4135 [103 pp.] and https://ec.europa.eu/food/plant/standing_committees/sc_phytopharmaceuticals_en

14. Organic samples

In 2019, out of the 3,302 samples that we tested, 194 were labelled as organic. Although we do not specifically target organic foods in all our surveys, they are tested as part of the monitoring programme as they are available for people to buy and are covered by the same MRLs as other food.

Residues in organic samples

Organic farmers and growers are allowed to use a limited number of approved pesticides where other methods of control are inadequate to prevent damage by pests, diseases and weeds.

11 of the organic samples that we tested contained a pesticide residue. All the results were passed to the section within Defra that deals with organic farming. Our role and expertise doesn't include the rules on producing organic food, so we can't comment on these findings in relation to those rules.

The following organic samples contained residues. None of the residues detected would be expected to have an effect on health.

Food	Country of origin	Pesticide residue found	Amount of residue found (mg/kg)	Pesticide residue MRL (mg/kg)
Barley flakes	Austria	pyrethins	0.01	3
Oats	UK	chlormequat	0.2	15
Oats	Ireland	chlormequat	0.09	15
Oats	Scotland	chlormequat	0.03	15
Oats	Ireland	chlormequat	0.03	15
Oats	Ireland	chlormequat	0.03	15
Pre-packed salad	UK	chlorate** dithiocarbamates	0.03 0.07	0.01* 5
Spinach	Italy	BAC (sum)	0.09	0.1
Spinach	Italy	chlorate** spinosad (sum) spinetoram	0.01 0.07 0.02	0.01* 15 1.5
Spinach	UK	chlorate** spinosad (sum)	0.02 0.1	0.01* 15
Spinach		boscalid	0.02	50

* 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.

**See Section 13 for more information on chlorate and biocide residues in food.

15. Suspected unapproved uses in the UK

We are able to check the samples labelled as UK produce to see if they contain residues of pesticides which are not approved for use on those crops in the UK.

Sometimes we do find residues of pesticides which have not been approved for use on particular UK grown crops. There are different reasons this may occur, such as:

- the crop has been grown from imported seed or seedling which was treated legally in another country, and the residue is still detectable in the adult plant
- a food was grown or produced overseas, but the country of origin on the packaging is that of the brand owner or where it was packed (processed foods may be grown in one country but processed in another)
- if the residues are very low, this may have been caused by poor agricultural practice, such as failing to take appropriate steps to control spray drift or equipment not being correctly cleaned between uses
- illegal use
- accidents and unexpected consequences

If we find a residue of a pesticide that has not been approved for use in the UK on that crop, we inform the HSE's enforcement team about our results so they can consider investigating.

We referred 6 samples to HSE enforcement in 2019, following HSE's consideration the below samples required investigation.

Food	Pesticide Residue Found	Amount of Residue Found (mg/kg)	MRL (mg/kg
Baby leaf Spinach	chlorantraniliprole	0.01	20
Salad Leaves	ametoctradin	0.05	40
Baby leaf Spinach	clothianidin	0.01	0.01*
Spinach	clothianidin	0.01	0.01*

* Maximum Residue Levels set at 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.

HSE's investigation into most of these cases found that no illegal use had taken place and the residue was present for another reason. In some cases the investigation is still ongoing and the results will be published in one of our quarterly reports once the investigation has been completed.

16. Assessing the risk to people's health

Since 2008, every result which contained a residue has been checked to see if the residues found could have an effect on human health. We call these checks 'risk assessment screens'.

Risk assessment screening

In nearly all cases the risk assessment screening showed that people would eat:

- less than the acute reference dose (ARfD), which is the amount of pesticide that a person can eat in one day without affecting their health
- less than the acceptable daily intake (ADI), which is the amount of the pesticide that it is safe to eat every day for a lifetime

The risk assessment screening considers the amount eaten by 10 different groups of people based on consumption data supplied by FSA. These groups are infants, toddlers, young people (4 different groups), adults, vegetarians, elderly people living in their own homes, and elderly people living in residential accommodation.

The ARfD and ADI values that we use in risk assessment screens are generally set by international bodies such as the European Food Safety Authority, and the Joint Food and Agriculture Organisation / World Health Organisation Meeting on Pesticide Residues.

HSE assesses the health risk of any residues in food. The assessment is made by assuming someone has eaten near the maximum that we find in consumption patterns, identified from UK government food surveys. HSE takes the 97.5th consumption percentile as representing a high level of consumption. That means for every 100 people, 97 will have eaten less than HSE assumes.

Other assumptions in HSE's assessments tend to overestimate rather than underestimate the risk. For example, for most fruits, a first assessment assumes people have eaten the peel. This is not just for apples and pears which are often consumed including the peel, but also for fruit which is more often eaten after being peeled. Risk assessments may then be refined using registration data about the distribution of residues in that food.

We take account of the more extreme consumption patterns of foods, so we ensure that HSE's risk assessments address the safety of consumers in general.

Detailed risk assessments

We publish risk assessments:

- for all situations where consumption patterns could lead to people eating more than the acute reference dose or acceptable daily intake of specific pesticides
- where a sample contains a residue of more than one organophosphate or carbamate pesticide (or both) or residues of certain pesticides from the same chemical group (e.g. captan and folpet; triazole, quaternary ammonium compounds (BAC/DDAC) chlormequat /mepiquat) each of these pesticide groups can have similar effects on people, so we check what could happen if these effects are added together.

We considered 10 detailed risk assessments during 2019. In each case we considered specific advice on the possible health risks. In most cases we found that risk to people's health was unlikely. Where the risk assessment showed that there may be a risk to health, we informed the Food Standards Agency.

The full text of all the detailed risk assessments is in our quarterly reports which can be downloaded from GOV.UK: Pesticide Residues in Food Quarterly Monitoring Results for 2019

17. Follow-up action

If we find a residue above the relevant MRL it could just be in one sample. However, if we find that several samples contain residues of that particular pesticide above the MRL in one survey or in further surveys of the same food, it suggests that:

- the pesticide's approval is not in line with the MRL (pesticides approved in the UK are rarely out of line with the MRLs, but there may be problems with imported foods)
- the MRL is set at the limit of determination (the lowest amount that can normally be detected and measured by official laboratories), which is a default level that does not take account of the uses not covered by the MRL setting system, in particular in countries outside Europe
- some people who grow or store food are not using pesticides properly

Main actions

- All samples with residues over the MRL were reported to the retailers, suppliers or growers involved. We asked them to explain why the residues were over the MRL. Where they asked us to, we published these explanations in our quarterly reports.
- All UK samples with a residue of a pesticide not approved for use in the UK on that crop were reported to HSE enforcement for further investigation.
- For all non-UK produce with a residue over the MRL, we wrote to the relevant authorities in the countries the produce was exported from.
- When we found a residue that was over the MRL that could be a risk to health, we informed the FSA. They informed the Rapid Alert System for Food and Feed (RASFF). Our quarterly reports include details of RASFF notifications issued as follow up to the monitoring results.
- Any residues detected in organic samples were reported to the team in Defra that deals with organic produce, as well as being copied to the relevant organic control body.
- We can target further monitoring of a food where we have found residues of interest. Examples of this are the continued monitoring of beans with pods and okra.
- Alongside the quarterly reporting we run a programme called 'rolling reporting'. This is for commodities which are sampled and reported on every month throughout the

year. In 2019, the commodities in the programme were beans with pods, grapes, okra and potatoes.

- HSE is able to prosecute growers or suppliers they find breaking the law. If we suspect that pesticides are being used illegally in the UK, HSE may carry out further investigation.

Examples of follow-up action

- HSE has continued to send all non-compliant results of okra and beans with pods to the FSA, to be included in the dataset used when deciding what foods and sources should be included on heightened border controls.
- HSE has liaised with brand owners to provide additional details and technical information to assist with following up results especially where the source of residues was unclear.

18. Legal controls on pesticide residues

Maximum Residue Levels

It is illegal to sell, supply, distribute or import food with residues above the MRLs. MRLs are set for individual pesticides in specific foods based on the highest level of a residue expected to be in a food when the pesticide is used in line with Good Agricultural Practice (GAP). MRLs are set at levels which may occur when the pesticide is used properly, taking into account worker and environmental safety as well as the level needed to work as a pesticide. MRLs are also set below the level considered to be safe for people eating the food.

For any pesticide/food combination for which a specific MRL has not been set, a default value usually of 0.01 mg/kg applies. Our laboratories' reporting levels (the limit of determination that is the lowest levels our tests are set to measure) when testing samples are line with the default MRL (0.01 mg/kg) unless a lower default level has been established for that pesticide.

Pesticide residue testing

MRL legislation requires an annual pesticide residue testing programme which is representative of the country's food supply market. The programme must take samples close enough to the point where produce enters the food supply market to enable follow-up activity to take place if the food does not comply with the law.

The UK also shares its results with a European-wide monitoring programme. Results are compiled and published by the European Food Safety Authority.

As well as the laws on levels of pesticide residues allowed in food, there are laws on the authorisation, selling, supplying, using, storing, importing and advertising of pesticides. More information is available on the HSE website.

19. Members of the Expert Committee on Pesticide Residues in Food

Dr Paul Brantom, Chairman of PRiF until March 2020

Dr Paul Brantom is a registered toxicologist and has worked in toxicology of food-related chemicals for more than 40 years. He was previously Head of Toxicology at BIBRA International and Manager of the University of Surrey Centre for Toxicology. Following previous research experience, he retains particular interest in toxicological risk assessment including non-animal testing methods and carcinogenicity.
Dr Brantom is currently semi-retired. He has previously been a member of UK Advisory committees on novel foods and processes, veterinary products, veterinary residues, and animal feeding stuffs. He is also a past member of the FEEDAP panel of the European Food Safety Authority and continues to work on a number of their working groups.

Ann Davison, Chair of the PRiF from March 2020, former committee member

Ann Davison began her career at Which? and has worked in consumer affairs and public service roles for most of her career, running consumer organisations and networks such as Foodaware: the Consumers' Food Group. She won the UK Woman of Europe 2000 Award for outstanding voluntary service.

Ann has served as a consumer representative on a number of government committees including Defra Expert Panel on Air Quality Standards, the Adult Learning Committee of the Learning and Skills Council and the Food Standards Agency's Advisory Committee on Animal Feeding Stuffs.

For nearly six years, she was Defra's consumer adviser and ran its consumer representatives' group. Ann co-founded the Fairtrade Foundation and chaired its Certification Committee for 11 years. Ann chairs the PRiF communications sub-committee.

Ann also chaired the World Development Movement, established the Transatlantic Consumer Dialogue and chaired its Trade committee. She served two terms as President of External Relations on the EU Economic and Social Committee.

Ann is a trustee of the National Council of Women, a member of the European Committee of the International Council of Women and a representative of the Commonwealth Women's Network.

Dr Jonathan Blackman

Dr Jonathan Blackman is a graduate of Wye College, University of London and studied for a DPhil at the University of Sussex.

He has worked as an agronomist and technical manager in the horticultural industry for 20 years, and prior to that worked as a Soil Scientist and Research Scientist for ADAS. He holds the BASIS Diploma in Agronomy and his work involves advising growers of fruit, hops and ornamental crops and providing technical support to fellow horticultural agronomists working for H L Hutchinson Ltd.

In addition to growers, he has provided consultancy services to packers, industry bodies such as the Agriculture and Horticulture Development Board and the British Hop Association and sits on the board of several industry committees.

Ian Finlayson

Ian Finlayson has a BSc Hons in Horticulture from Bath University. He was involved in the creation of Good Agricultural Practice standards for the Red Tractor Scheme and the international Global GAP standard during his 16 years as technical manager at Sainsbury's Supermarkets.

Ian was chair of the FLO Standards Committee, where his passion for social justice and working to relieve poverty found an outlet from 2006-2016. His other passion of sustainability was served as director of Footprints4Food which provided cost-efficient carbon foot printing of agricultural products with the aim of reducing their impact on the environment (2014-2017).

He is currently Managing Director of Practical Solutions International which specialises in helping growers and suppliers work effectively with retailers in Europe. This has allowed him to gain extensive experience in Africa working with both small farmers and large export companies.

Ian was Technical Director for World Flowers (2004-2015), Wealmoor in the UK (2012-13) and Produce World (2015-16, 2017-18). He is an expert in food and cut flower supply chains. He has most recently been involved in a US AID funded project developing a smart phone app to improve traceability of fresh produce from small holder green bean growers in Kenya through to the supermarket in Europe.

Dr Stuart Freeman, left the committee December 2019

Dr Freeman is a fellow of the Royal College of Pathologists and an independent toxicology consultant with 25 years' experience of the pharmaceutical and consumer products industries. During this time, he worked at Smith Kline and French, AstraZeneca, where he was Head of the Reproductive and Development Toxicology Group, and GlaxoSmithKline Consumer Healthcare, where he was Head of Toxicology for the worldwide business. Dr Freeman has served on numerous industry committees and published and presented extensively in the field of toxicology

John Points

John Points is an independent consultant, advising food retailers and producers on chemical and authenticity risk management, analytical testing, and interpretation of results. He also works on capacity-building projects for low and middle income countries who need to regulate and test food safety.

His previous career has been with Sainsbury's, and at LGC - one of the UK's national reference laboratories, where he led the teams responsible for food, residues, consumer safety and workplace drugs testing. At Sainsbury's, his role included management of residue monitoring programmes and follow up of results within the own-brand supply chain.

He is an active member of the IFST Scientific Committee, the SCI Food Interest Group, and the RSC Food Group.

Debbie Winstanley

Debbie Winstanley holds a BSc Hons in Agriculture from the University of Wales and is an Associate of the Royal Agricultural Society and a Governor of Harper Adams Agricultural University.

Debbie serves as an examiner for BASIS, an independent body and registered charity which certifies the competence of professionals working with pesticides; she also sits on the steering group of the Allerton project, a charity which champions biodiversity and good farming practice in commercial agriculture. Debbie is a member of the steering group of Cambridge University Potato Growers Association, a charity that supports and guides the work of NIAB CUF, which is the section of NIAB that leads on Potato Agronomy.

Debbie's extensive professional experience includes being a commercial farm agronomist for 20 years before working on potato agronomy at Cambridge University Farm. Debbie has also worked for Co-op Retail, where she worked with fresh produce suppliers and later Sainsbury's. Here she was first the Product Technologist for potatoes and vegetables, and then the Company Agronomist, notably working on pesticide residue reduction. Most recently Debbie's worked as UK Agronomist for PepsiCo where she continues to work part- time on research and development. Debbie provides agronomic support for a large farming business and technical support work for a small fertiliser supply business.

Analytical Sub-Group

The Expert Committee on Pesticide Residues in Food's Analytical Sub-Group (ASG) reviews the results of analysis by the laboratories before they are sent to HSE, to ensure their reliability.

Most of the members of the group are from laboratories. The group members during 2019 were:

- Helen Kyle – HSE's Chemicals Regulation Division (Chairman)
- Dr Sadat Nawaz – National Reference Laboratory (NRL) Representative
- Helen Barker – Fera Science Ltd
- Mark Kearney – Agri-Food and Biosciences Institute (AFBI)
- Kirsty Reid – Science and Advice for Scottish Agriculture (SASA)
- Laura Melton – Science and Advice for Scottish Agriculture (SASA)

Cost of our surveys

The budget for the UK pesticide residues monitoring programme is made up from a charge on the sales of approved pesticides by manufacturers and suppliers in the UK and the rest from the government. The largest proportion of the budget was spent on testing samples for pesticide residues.

HSE pays PRiF members a fee for each meeting attended. HSE also provides support to the committee and the sub-group.

Communicating the results and work of the PRiF

We want as many people as possible to be aware of the official pesticide residue testing programme and to understand what we do. To do this we:

- publish all the monitoring data on data.gov.uk in an accessible format every quarter
- publish the results of our rolling reporting on data.gov.uk every month
- publish an annual report in plain English
- open one of our quarterly meetings each year to the public
- ensure our Chair is available for interviews with the media

We have also prepared some extra background and explanatory information:

- frequently asked questions (FAQs) at Section 21 of this report
- a glossary in each quarterly report

If you would like to receive notifications of publications, please email prif@hse.gov.uk to join our mailing list.

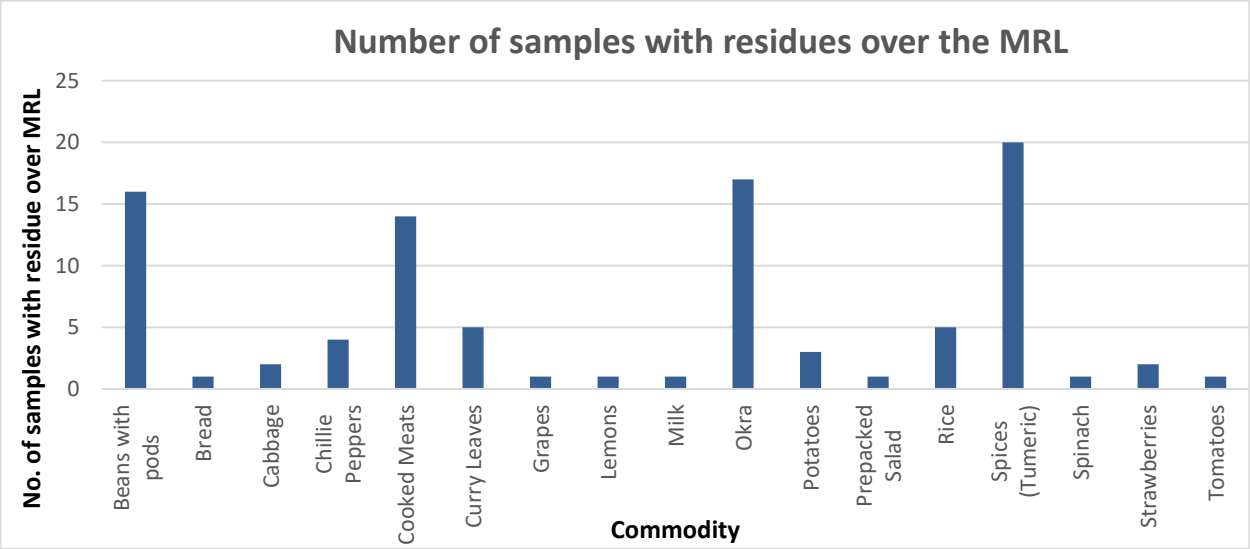
2020 Open Event

Each year the PRiF holds an open event where, as well as explaining our work, we invite speakers from different areas of food and drink production, marketing and regulation. Our aim for the open event is to give the public an opportunity to get a fuller understanding of the work we do and have a chance to ask any questions. Unfortunately due to uncertainty about ongoing restriction arising from the COVID-19 pandemic the PRiF will be unable to host our usual event in 2020.

20. All residues found above the MRL in 2019

Of the 3,302 samples tested, 95 contained one or more residues above the relevant MRL.

MRLs are trading standards rather than safety levels, therefore these results do not automatically mean the levels of residue detected are a risk to people's health. The samples that contained residues above the MRL were mainly fruit and vegetable samples.



Analytical Measurement Uncertainty

No measurement can ever be guaranteed to be exact and this can be caused by many things. Measurement uncertainty is a calculated indicator of our confidence in the accuracy of the amount of pesticide the laboratory detected. It is not expressing a doubt about which pesticides we have found.

It has been agreed for reporting purposes only that measurement uncertainty will be applied to any result that contained a residue over the MRL. In line with the international guidance, we use a default value of 50% for measurement uncertainty. This means that when a sample has a residue over the MRL we subtract 50% of the reported result (for instance, 10mg/kg becomes 5 mg/kg) and check the adjusted value against the MRL. All residues still over the MRL after 50% measurement uncertainty has been applied are highlighted as breaching the law in our quarterly reports.

Measurement uncertainty can only be applied by a regulatory authority. In the UK, this is the HSE's Chemicals Regulation Division. It should not be applied by the food industry to determine whether a product is compliant with an MRL.

The table below shows all samples in 2019 where we found at least one residue above the MRL. A number of the MRLs have an asterisk (*) next to them, which means that the MRL is set at the limit of determination (the lowest level that can normally be detected by official laboratories). This often means the pesticide has no authorised uses in the EU on those crops. It should be noted the pesticide may be authorised in overseas countries and applied legally there.

Certain foods grown outside the EU (eg. pineapples) may not automatically have an MRL set based on safety data and so default to the LOD MRL. Residues above the MRL do not necessarily mean the farmer did not follow Good Agricultural Practice (GAP). The country of origin for processed (including frozen) food is not necessarily the same as the place the original food was produced (see page 13).

More information on all our samples, including results for all residues tested for and full brand name details are available on data.gov.uk

Sample Reference Number	Food Description	Country of Origin	Pesticide Residue Detected	Residue Detected (mg/kg)	MRL (mg/kg)	Breach of Law after allowing for measurement uncertainty
Beans with Pods						
2318/2019	Dwarf Beans	Morocco	bifenthrin	0.06	0.01*	Yes
0943/2019	Fine Beans	Kenya	acephate	0.05	0.01*	Yes
			methamidophos	0.03	0.01*	Yes
0962/2019	Fine Beans	Zimbabwe	carbendazim (sum)	0.4	0.2	Yes
2715/2019	Fine Beans	Gambia	haloxyfop (sum)	0.06	0.01*	Yes
0330/2019	Speciality Beans	India	chlorpyrifos	0.1	0.01*	Yes
0331/2019	Speciality Beans	India	carbendazim (sum)	0.8	0.2	Yes
			chlorpyrifos	0.02	0.01*	Yes
			monocrotophos	0.04	0.01*	Yes
			profenofos	0.2	0.01*	Yes
5526/2019	Speciality Beans	India	acephate	0.1	0.01*	Yes
			dimethoate	0.07	0.01*	Yes
			methamidophos	0.03	0.01*	Yes
			omethoate	0.04	0.01*	Yes
5754/2019	Speciality Beans	Bangladesh	dimethoate	0.04	0.01*	Yes
			fenpropathrin	0.1	0.01*	Yes
			omethoate	0.02	0.01*	No
5755/2019	Speciality Beans	Bangladesh	dimethoate	0.02	0.01*	Yes
5756/2019	Speciality Beans	Bangladesh	dimethoate	0.05	0.01*	Yes
			omethoate	0.05	0.01*	Yes

5762/2019	Speciality Beans	India	omethoate	0.02	0.01*	No
5770/2019	Speciality Beans	India	monocrotophos	0.05	0.01*	Yes
5835/2019	Speciality Beans	India	dimethoate	0.06	0.01*	Yes
			omethoate	0.02	0.01*	No
			pyridalyl	0.1	0.01*	Yes
5865/2019	Speciality Beans	India	carbendazim (sum)	0.7	0.2	Yes
5984/2019	Speciality Beans	India	monocrotophos	0.06	0.01*	Yes
5985/2019	Speciality Beans	India	chlorpyrifos	0.02	0.01*	No
			monocrotophos	1.1	0.01*	Yes
Bread						
4920/2019	Speciality Bread: Wraps	UK	chlorpyrifos-methyl (parent only)	0.09	0.003	Yes
Cabbage						
2495/2019	Sweetheart Cabbage	Spain	difenoconazole	0.4	0.3	No
3315/2019	Tender Heart Cabbage	UK	fluazifop-p (sum)	0.03	0.01*	Yes
Chilli Peppers						
0994/2019	Chilli Peppers	India	ethion	0.02	0.01*	Yes
			etoxazole	0.04	0.01*	Yes
			fipronil (sum)	0.04	0.005*	Yes
3285/2019	Chilli Peppers	Gambia	clothianidin	0.09	0.04	Yes
4619/2019	Chilli Peppers	Dominican Republic	fipronil (sum)	0.006	0.005*	No
5568/2019	Chilli Peppers	Turkey	etoxazole	0.03	0.01*	Yes
Cooked Meat						
1550/2019	Chicken	Thailand	BAC (sum)	0.6	0.1	Yes
2194/2019	Chicken	Brazil	BAC (sum)	1.7	0.1	Yes
			DDAC (sum)	0.2	0.1	No
2243/2019	Chicken	Thailand	BAC (sum)	2.8	0.1	Yes
			DDAC (sum)	0.2	0.1	Yes
2685/2019	Chicken	Thailand	BAC (sum)	0.9	0.1	Yes
2908/2019	Chicken	Brazil	BAC (sum)	8.2	0.1	Yes
			DDAC (sum)	1.5	0.1	Yes
2910/2019	Chicken	Thailand	BAC (sum)	0.2	0.1	Yes
3482/2019	Chicken	Thailand	BAC (sum)	2.8	0.1	Yes
			DDAC (sum)	0.3	0.1	Yes
4687/2019	Chicken	Brazil	BAC (sum)	2.7	0.1	Yes
			DDAC (sum)	0.5	0.1	Yes
2305/2019	Ham	UK	BAC (sum)	0.2	0.1	Yes

2898/2019	Ham	UK	BAC (sum)	0.4	0.1	Yes
3472/2019	Ham	UK	BAC (sum)	0.2	0.1	Yes
4633/2019	Ham	UK	BAC (sum)	0.7	0.1	Yes
4639/2019	Ham	UK	BAC (sum)	0.2	0.1	Yes
2065/2019	Turkey	UK	DDAC (sum)	0.6	0.1	Yes
Curry Leaves						
4252/2019	Dried	India	bifenthrin	1.3	0.05*	Yes
			ethion	0.1	0.03*	Yes
			hexaconazole	0.2	0.05*	Yes
			monocrotophos	0.2	0.05*	Yes
			Novaluron	0.06	0.03*	Yes
			profenofos	2.1	0.13	Yes
			triazophos	1.7	0.03*	Yes
4376/2019	Dried	India	bifenthrin	1.7	0.05*	Yes
			ethion	0.1	0.03*	Yes
			profenofos	2.3	0.13	Yes
			triazophos	1.4	0.03*	Yes
4897/2019	Fresh	India	diazinon	0.05	0.02*	Yes
			profenofos	0.8	0.05	Yes
			thiamethoxam	0.05	0.02*	Yes
4898/2019	Fresh	India	profenofos	6.7	0.05	Yes
			propargite	0.06	0.02*	Yes
4913/2019	Fresh	India	profenofos	7.2	0.05	Yes
Grapes						
5921/2019	Crimson Seedless Grapes	Chile	captan (sum)	0.07	0.03*	Yes
Lemons						
0991/2019	Enterdonati Lemons	Turkey	BAC (sum)	0.6	0.1	Yes
Milk						
2523/2019	Cows milk	UK	BAC (sum)	0.3	0.1	Yes
Okra						
0316/2019	Fresh	Honduras	dinotefuran	0.03	0.01*	Yes
0863/2019	Fresh	India	flonicamid (sum)	0.4	0.03*	Yes
0872/2019	Fresh	India	fenpyroximate	0.2	0.01*	Yes
0880/2019	Fresh	Jordan	abamectin (sum)	0.05	0.01*	Yes
0945/2019	Fresh	India	flonicamid (sum)	0.06	0.03*	Yes
5547/2019	Fresh	Honduras	tebuconazole	0.07	0.02*	Yes
5663/2019	Fresh	Thailand	clothianidin	0.02	0.01*	No
5719/2019	Fresh	India	flonicamid (sum)	0.08	0.03*	Yes
5758/2019	Fresh	Jordan	dimethoate	0.5	0.01*	Yes
			omethoate	0.4	0.01*	Yes
5822/2019	Fresh	Jordan	clothianidin	0.03	0.01*	Yes
			thiamethoxam	0.07	0.01*	Yes
5852/2019	Fresh	Jordan	acetamiprid	0.4	0.2	Yes
			lufenuron	0.1	0.01*	Yes

5870/2019	Fresh	Jordan	emamectin	0.03	0.02	No
5911/2019	Fresh	India	flonicamid (sum)	0.2	0.03*	Yes
5973/2019	Fresh	Jordan	diflubenzuron	0.03	0.01*	Yes
2889/2019	Frozen	India	DDAC (sum)	0.2	0.1	No
			flonicamid (sum)	0.05	0.03*	No
2909/2019	Frozen	India	flonicamid (sum)	0.04	0.03*	No
2962/2019	Frozen	China	chlorfenapyr	0.02	0.01*	No
			hexaconazole	0.03	0.01*	Yes
			thiamethoxam	0.02	0.01*	No
Potatoes						
0073/2019	New	UK	flonicamid (sum)	0.3	0.09	Yes
0107/2019	New	UK	chlorpropham	13	10	No
0195/2019	New	UK	fosthiazate	0.03	0.02*	No
Pre-Packed Salad						
1150/2019	Watercress	UK	dithiocarbamates	0.4	0.3	No
Rice						
2034/2019	Basmati	UK	tricyclazole	0.03	0.01	Yes
2048/2019	Basmati	UK	tricyclazole	0.02	0.01	Yes
2247/2019	Basmati	UK	tricyclazole	0.03	0.01	Yes
3677/2019	Basmati	UK	buprofezin	0.03	0.01*	Yes
			tricyclazole	0.02	0.01	Yes
1762/2019	Brown	UK	tricyclazole	0.03	0.01*	Yes
Spices - turmeric						
1347/2019	Ground Turmeric	UK	phorate (partial sum)	0.6	0.1*	Yes
1662/2019	Turmeric Powder	India	phorate (partial sum)	0.2	0.1*	No
1673/2019	Turmeric	India	cypermethrin (sum)	0.3	0.2*	No
1900/2019	Ground Turmeric	UK	phorate (partial sum)	0.5	0.1*	Yes
1949/2019	Turmeric Powder	India	phorate (partial sum)	0.2	0.1*	No
1950/2019	Ground Turmeric	UK	phorate (partial sum)	0.6	0.1*	Yes
1966/2019	Ground Turmeric	UK	phorate (partial sum)	0.7	0.1*	Yes
1989/2019	Pure Spices Turmeric Powder	India	carbendazim (sum)	0.2	0.1*	No
			quinalphos	0.2	0.05*	Yes
3141/2019	Turmeric Powder	UK	phorate (partial sum)	0.2	0.1*	Yes
3299/2019	Ground Turmeric	UK	malathion (sum)	0.03	0.02*	No
			phorate (partial sum)	0.5	0.1*	Yes
4091/2019	Ground Turmeric	India	malathion (sum)	0.06	0.02*	Yes

4147/2019	Ground Turmeric	UK	phorate (partial sum)	0.5	0.1*	Yes
4187/2019	Mill Stone Ground Turmeric	UK	phorate (partial sum)	0.5	0.1*	Yes
4220/2019	Heera Turmeric Powder	India	phorate (partial sum)	0.2	0.1*	No
4253/2019	Turmeric Powder	India	phorate (partial sum)	0.8	0.1*	Yes
4320/2019	Ground Turmeric	UK	phorate (partial sum)	0.3	0.1*	Yes
4360/2019	Turmeric Powder	India	phorate (partial sum)	0.3	0.1*	Yes
4439/2019	Turmeric Powder	UK	phorate (partial sum)	6.4	0.1*	Yes
4881/2019	Ground Turmeric	UK	phorate (partial sum)	0.5	0.1*	Yes
4963/2019	TRS Turmeric Powder	India	phorate (partial sum)	0.3	0.1*	Yes
Spinach						
1524/2019	Spinach - Fresh	UK	deltamethrin	0.02	0.01*	No
Strawberries						
2675/2019	Frozen	UK	haloxyfop (sum)	0.02	0.01*	Yes
2698/2019	Frozen	Guatemala	procymidone	0.04	0.01*	Yes
			propamocarb (sum)	0.02	0.01*	No
Tomatoes						
3636/2019	Salad	Morocco	dinotefuran	0.02	0.01*	No

* Maximum Residue Levels set at 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.

21. Frequently asked questions (FAQs)

About the results

Where can I find your results?

Our latest reports are on the UK government website: Pesticide Residues in Food results-of Quarterly Reports

Detailed results for individual samples including results of each test are separately available for download in spreadsheet format: Pesticide Residues in Food Quarterly Data

We can send you an email announcing publication of results and other news. We generally send at the most three emails a month. Please let us know if you'd like to join the mailing list by emailing us at prif@hse.gov.uk – all we need is an email address.

Are you finding more residues year-on-year?

Proportionally, the number of residues above the legal MRL and instances of residues which we think are of concern for consumers' health show little variation.

Over the years, as the knowledge and equipment of laboratories improves, we are increasingly able to test for more pesticides at lower amounts and so we do find more. A typical fruit and vegetable survey undertaken in 2003 by PRiF's predecessor, the PRC (Pesticide Residue Committee), looked for just over 150 pesticides, whereas in 2019 we looked for over 371 individual pesticides.

How can residues above the legal limit (MRL) still be safe?

MRLs are legal limits, not safety limits. Residues above the MRL are therefore not necessarily a cause for health concern.

MRLs are set at a level that is consistent with using the pesticide as authorised and in accordance with Good Agricultural Practice. Authorisation considers issues such as the personal safety of those exposed to the pesticide and environment safety, as well as safety for consumers. That means that MRL levels are often set far below levels that might otherwise be set just on consumer safety grounds alone.

All detected residues are screened for safety issues, whether or not they are above the MRL.

Do you consider the risk to children?

Yes. Our risk assessments consider the risk to several different groups of consumers (people who eat the relevant food) which includes various age groups including infants and children. As part of the risk assessment we take account of:

- the different eating habits, including the amounts of food that different people might eat
- people's different sizes (bodyweights and growth stages)

About the survey programme and the samples

Do you test imported food?

Yes. Imported food including food from Europe is part of the monitoring programme because it is part of the UK's general food supply.

We try to include imported samples in all surveys of any food roughly in proportion to the UK market share of the food. For example, when we survey bananas all the samples will be imported, but for swedes and turnips almost all samples will be from the UK.

Do you test baby food and baby milk?

Yes. Every year we test at least one sort of baby food or baby milk. We also take into account the law on pesticides residues in these special foods. They are separate, different legal controls for these foods which are intended to be extra precautionary.

You can find out more about the rules for baby food and baby milk at: GOV UK Pesticide Residues in Infant Formula

Do you test organic food?

Yes. Organic food is part of the monitoring programme because it is part of the UK's general food supply. Our laboratories check many different foods for pesticide residues and organic samples are included among them. We try to include organic samples in all surveys of any food roughly in proportion to the UK market share of that food.

We consider whether any residues found could be a risk to consumer health and if so also consider what action should be taken.

Some pesticides are allowed to be used in organic food production as well as in conventional (non-organic) farming. When we test foods, we test all the samples of the same sort of food for the same range of pesticides.

We are not responsible for checking compliance with organic rules. So, when we find residues of pesticides in organic foods we send those findings through to the relevant organic certification company.

Do you test samples from all across the UK? Who collects your samples?

Yes. All year, every year, we collect samples from retail outlets across the UK. We change the particular locations used every year, as shown in our annual reports. We use market research shoppers at retail outlets for most of our surveys.

For some surveys, government inspectors collect samples from various points in the supply chain (such as ports, depots and pack houses) in England and Wales only. Plant Health and Seed Inspectors collect samples of potatoes, and Horticultural Marketing Inspectors collect samples of fresh fruit and vegetables.

How do you decide which foods to sample at retail (supermarkets and other shops) and which to sample from the food chain including wholesalers?

We tend to use inspectors to collect food at wholesale markets, import points and processing plants for foods that are:

- not routinely stocked by most retailers and even then often not stocked in large enough quantities to buy a sample – examples include okra, eddoes, quince and mooli (daikon)
- often sold loose at retail, which makes it harder for shoppers to collect traceability information – examples include oranges and grapes

We also use inspectors to collect samples of food where previously there have been compliance issues which have led to them being considered as a higher overall priority within the programme.

How do you decide where to get retail samples? Why do you keep coming to my shop?

We ask our shoppers to behave like normal shoppers. Our shoppers are based in a particular location, so that means they will go to the same supermarkets, greengrocers, butchers throughout the year.

Our aim is to get a snapshot that broadly reflects the market share of different chains and types of shops. We broadly collect in line with market share. We check to make sure that no particular retail chain or type of shop has been noticeably over or under represented.

We schedule special shopping trips to independent outlets such as market stalls, independent greengrocers, butchers and bakers, farm shops and so on.

How do you decide where to get samples from the non-retail parts of the food chain, such as wholesale markets and packers?

We ask the Animal and Plant Health Agency inspectors we use to collect samples alongside their normal work.

APHA staff operating as horticultural marketing inspectors make sure that fresh fruit and vegetables are labelled with the right class standard (for instance ‘class 1’). As well as working at wholesale markets they visit ports, airports, packing houses and shops.

APHA staff operating as plant health and seed inspectors have a wide range of duties relating to plant health. This includes checking that potatoes are free of diseases that could spread to growing potatoes and devastate harvests. They visit potato stores, potato packers, ports, airports, processors (for instance crisps and frozen chip factories) and farm shops.

What exactly do you tell shoppers and inspectors to do? What are the protocols for collecting samples?

Our protocols – or instructions to samplers – are based on international guidelines, which tell us everything about taking samples. As well as the size and make-up of the

samples that we have to test, it tells us what a lot is and how many points in the lot we need to sample from.

We produce new sampling instructions every year for that year's programme, and if necessary we update them throughout the year. We don't publish these online as they go out of date so quickly. If you have any detailed questions or particular concern about the way a food is sampled, please do get in touch.

How much is a sample? For instance, is a sample of apples one apple?

To ensure results are comparable, we follow international guidelines on the size and make-up of the samples we test. We slightly increase the amounts recommended, to allow for things like miscounting and variation in weighing scales, otherwise the laboratory would have to reject the samples.

For example, for apples the guidance says a sample must be made up of at least 10 apples and must weigh at least one kilogram. We ask our samplers to get 12 apples and at least 1.2 kilograms to be on the safe side.

How do you prevent cross contamination during sampling and transport?

Our shoppers shop like ordinary shoppers: that includes wrapping and packing foods appropriately. Our shoppers and inspectors also wrap and pack samples with bubble wrap to prevent breakage and leakage in transit. Analysts expect this to be sufficient to prevent contamination. Samples are sent to the laboratory by a next-day courier service. If the laboratory thinks that contamination has occurred or that the contents have deteriorated in transit, then those samples are rejected.

About the tests (analysis)

What pesticides do you test for?

Most years our laboratories increase the number of pesticides they test for. This is driven by changes in the law about pesticides as much as improvements in analytical technology and techniques.

The actual pesticide tested for in each food also depends on the chemistry of that food. Some foods are just harder to analyse than others. They may be fatty, acidic, highly coloured or aromatic, all of which can affect the isolation and identification of the pesticide. Methods of analysis are continuously improved to overcome difficulties.

We publish details of the planned monitoring programme every year which includes information on pesticides we plan to test for. In our quarterly reports, we publish lists of all the pesticides we looked for but didn't find as well of course as the pesticides we did find.

Are your laboratories UKAS accredited? Are they accredited for all the tests they do for the programme?

Yes. Legislation requires all official laboratories to be appropriately accredited. HSE interpret that to mean that all results should be from tests covered by the laboratory's UKAS (United Kingdom Accreditation Service) accreditation under ISO/IEC 17025.

How do you report whether a pesticide residue is present in a sample?

When HSE set up the surveys they determine with the analytical laboratories the ability of their techniques to accurately and precisiely to detect the pesticide and to report the amount found in the sample. The limit of determination (LOD) is the lowest concentration of a pesticide residue that can be routinely identified and quantifvely measured in a specified food, agricultural commodity or animal feed with an acceptable degree of certainty by the method of analysis. HSE expect that all the residue analyses are conducted to decide whether or not the pesticides are present above the LOD or an otherwise agreed higher level. The agreed level is defined for each pesticide/commodity combination and is called the reporting limit (RL).

The results are reported as either:

- No residues detected. This means no residues found above the RL
- Residues detected at or above the MRL- This means residues were found above the RL but below the MRL.
- Residues found above the MRL. This means residues that were found above the legal trading level the maximum residue level.

Do you test for neonicotinoid pesticides?

Yes. Our standard tests for fruit and vegetables include certain neonicotinoid pesticides. Other foods are also tested for certain neonicotinoids where appropriate. Each individual pesticide is tested for and reported separately and each has its own separate MRL.

Do you test for endocrine disrupting chemicals (EDCs)?

Endocrine disruption has only recently been recognised as a potential problem, (although data is already available for the possible effects of pesticides on reproduction including offspring).

The EU's scientific criteria for determining whether something is an endocrine disrupting chemical hasn't been finalised yet. Whatever the definition chosen, it is almost certain that we test for some pesticide residues that will fall into that or indeed other definitions.

Each individual pesticide is tested for and reported separately because each has its own separate MRL.

Where can I find out more about laboratory procedures and practices?

Our laboratories follow the latest version of 'Method Validation and Quality Control Procedures for Pesticide Residues Analysis in Food and Feed' as published by the Reference Laboratories for Pesticide Residues.

UKAS checks that our laboratories are following these rules as part of their accreditation checks.

How do the laboratories make sure the results are not due to cross-contamination or interference?

Our laboratories follow the rules for this in the analytical guidance. Any possible cross-contamination or interference is addressed during our Analytical Sub-Group's consideration of results.

About PRiF

Who are the members and who do they represent? Have they made declarations of interest?

We are appointed by Defra for our expertise to provide independent advice to the government. We do not act as representatives for particular sectors. We receive a basic fee and expenses for this work.

We have published a list of members including our biographical details as well as our declarations of interest.

What are your terms of reference?

Our terms of reference are:

To advise ministers, the Health and Safety Executive (HSE) and 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 and new methods of analysis

The committee will make its findings and recommendations available to government, consumers and the food and farming industries in a way which aims to be comprehensive, understandable and timely.

22. Contact details

Please note that the current COVID-19 crisis is making receipt of, and access to, post extremely problematic. HSE would be grateful if you could avoid sending hard copy mail wherever possible and instead send electronic versions.

Expert Committee on Pesticide Residues in Food (PRiF)

Expert Committee on Pesticide Residues in Food
Chemicals Regulation Division
Health and Safety Executive
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