Food for Thought

Pesticide residues in the School Fruit and Vegetable Scheme (SFVS)

September 2017

PESTICIDE ACTION NETWORK UK

Contents

Executive Summary*

> *"While the intake of fruit and vegetables should not be decreased, existing studies support the ideal of reduced dietary exposure to pesticide residues, especially among pregnant women and children."* [1]
>
> Report from the European Parliament, December 2016.

Children in England are being exposed to a cocktail of pesticide residues in the fresh produce they receive through the Department of Health's School Fruit and Vegetable Scheme (SFVS). These pesticides have documented potential to harm human health, especially the health of young children who are particularly vulnerable to their impacts.

The produce being provided to children through the scheme generally contains more pesticide residues than their mainstream equivalents. For example, in 2015, 90 percent of SFVS apples given out in schools contained the residues of multiple pesticides, while for conventional apples found on the supermarket shelves this figure was just under 60 percent.

It doesn't have to be this way. For just over 1p extra per child per day, all produce in the scheme could be sourced from organic farmers. This would better protect children's health and also support the growth of the British organic sector.

PAN UK is in no way trying to be alarmist by publishing this research. Rather we are aiming to provide the public, in particular parents, with information that can help them make informed decisions. We also hope that parents and other concerned members of the public will use this information to lobby the UK government to do more to protect children from pesticides.

* *Unless stated otherwise, references for the points made in this section can be found in the main body of the report and in the spreadsheets available at: www.pan-uk.org/food-for-thought*

The SFVS launched across England in 2004 and reaches approximately 2.3 million children. It is funded by the Department of Health, costing £40 million per year to provide every four to six-year-old with one item of fruit or vegetable every day of the school year. The scheme is undoubtedly well-intentioned and PAN UK is extremely supportive of its objective to encourage children to develop healthier eating habits, despite our concerns about pesticide residues present in the produce.

PAN UK analysed the results of government testing of pesticide residues found in produce given out through the SFVS between 2005 and 2016. A pesticide residue is the detectable trace of any pesticide that remains on or in food. Due to the systemic nature of many pesticides, residues are contained within the body of the produce itself and therefore washing the surface won't remove them.

In total, we found residues of 123 different pesticides, including 43 suspected endocrine (hormone system) disruptors. Imazalil, a 'probable carcinogen' and developmental toxin, was the most frequently detected pesticide. Second most frequent, and present in a fifth of all samples, was chlorpyrifos, a pesticide which has almost no permitted uses in the UK. It is well documented to have negative impacts on children's cognitive development.

123 different pesticides were detected

Of the 2238 samples tested by the government, two-thirds contained residues of multiple pesticides and large numbers of different residues were detected in individual samples. For example, one sample of apples from 2016 was found to contain the residues of eleven different pesticides. Despite the likelihood that these multiple substances do interact with each other, there has been little research into the combinatory effects of exposure to pesticides. Maximum Residue Levels – legal permitted limits supposedly always set below levels that could harm human health – are only set for individual pesticides. In reality, we know very little about the impacts of the wide variety of chemicals we are exposing our children to on a daily basis.

There is an ever-growing body of evidence showing that children are one of the groups most vulnerable to the impacts of pesticides. Their bodies are still forming and pesticide exposure can interfere with the development of particular organs. The capacity of children's bodies to break down toxins from their systems is far less developed than that of adults. Endocrine disruptors are of particular concern for children's health since they have been associated with the development of learning disabilities, severe attention deficit disorder and cognitive and brain development problems.

Given the huge uncertainty around how exposure to multiple pesticides through food residues impacts upon children's health, we should be taking a precautionary approach. But instead, we are giving children produce that is generally worse in terms of pesticide residues than you find in supermarkets. This approach urgently needs to change. Until we can say with complete certainty that these pesticides are not in any way harmful, we should not be exposing our children to them unnecessarily.

For many years PAN UK has been trying to get the issue of pesticides on the radar of the Department of Health and there is clearly a role for it to play in reducing the health impacts of pesticides. In the first instance, we would like to see a commitment that all produce supplied through the SFVS will be sourced from organic farmers or those taking concrete steps to reduce their pesticide use.

With Brexit looming, the UK has a choice. We can lower our pesticide standards, thereby increasing our exposure to potentially harmful chemicals. Or we can use Brexit as an opportunity to move away from pesticides and instead increase support to British organic farmers. This would better protect human health and enable a genuinely-sustainable agriculture sector to flourish.

Key findings*

Foods provided to children through the SFVS and therefore tested for pesticide residues by the UK government are as follows: apples, bananas, carrots, cucumbers, mango, melon, pears, pineapple, raisins, soft citrus (mandarins, satsumas), strawberries, sugar snap peas, and tomatoes.

PAN UK has analysed the results of the government's testing on nine of the thirteen fruit and vegetables provided through the SFVS between 2005 and 2016. We did not analyse results for cucumbers, mangos, melons and pineapple because the sample sizes tested by the government were too small to draw any reliable conclusions. Our findings are as follows:

- Through the SFVS across all fruit and vegetables, a total of 2238 samples were tested;
  - 84% tested positive for one residue.
  - 66% tested positive for multiple residues.
- According to government figures from 2015, the foods provided through the SFVS generally contain more pesticide residues than their mainstream equivalents. For example;
  - 97.5% of apples through the SFVS tested positive for one residue while for non-SFVS apples this figure was 67.71%. For multiple residues, 90% of SFVS apples tested positive in contrast to 59.38% to non-SFVS apples.
  - 100% of raisins given out through the SFVS tested positive for multiple residues in contrast to 63.27% for non-SFVS raisins.
- Raisins were the worst performing produce with 100% testing positive for multiple residues.
- Soft citrus, pears, strawberries and raisins all tested over 85% for multiple residues.
- Residues of 123 different pesticides were detected (*note that some of the pesticides fall into more than one of the categories listed below*);
  - 62 insecticides, 50 fungicides, 5 herbicides, 4 insect growth regulators, 4 plant growth regulators, 2 microbiocides.
  - 9 organophosphate insecticides known to have negative impacts on children's cognitive development.
  - 24 'known carcinogens', 2 'probable carcinogens', 26 'possible carcinogens'.
  - 43 suspected endocrine disruptors which interfere with hormone systems and can cause cancerous tumours, birth defects, and other developmental disorders.
  - 25 neurotoxins which have negative impacts on the nervous system and nerve tissue.
  - 15 developmental or reproductive toxins which have adverse effects on sexual function and fertility in adults.
  - 62 PAN Highly Hazardous Pesticides classified as meeting one or more of the following criteria: high acute toxicity, long term toxic effect at chronic exposure, high environmental concern and known to cause a high incidence of severe or irreversible adverse effects.

- Imazalil was the most frequently detected pesticide and was found to be present in 32% of samples (725 samples). It is a probable human carcinogen and developmental toxin. For more information on imazalil see page 12.
- Despite having almost no authorised uses in the UK, chlorpyrifos was found to be the second most frequently detected pesticide, being present in 20% of samples (450 samples). It is a suspected endocrine disruptor and neurotoxin. It has been found to be associated with delayed psychomotor and mental development in children in the first three years of life, poorer working memory and full-scale IQ at seven years of age, and structural changes in the brain of children at school age. For more information on chlorpyrifos see page 8.
- Large numbers of different pesticide residues were detected in individual samples. This is of concern because these multiple substances do interact with each other in some way yet there has been little research into the combinatory or 'cocktail' effects of exposure to pesticides. Here are some examples of the multiple residues we found;
  - One sample of raisins from spring 2015 contained residues of 13 different pesticides (origin Turkey).
  - One sample of apples from spring 2016. contained residues of 11 different pesticides (origin Portugal).
  - One sample of pears from spring 2016 contained residues of 9 different pesticides (origin Portugal).
- None of the food supplied or tested was organic.

Switching to organic fruit and vegetables would dramatically reduce exposure to pesticide residues for four to six-year-olds eating the produce provided through the SFVS.

PAN UK has calculated how much it would cost the Department of Health to implement a precautionary approach and switch the core produce provided through the SFVS to organic. **This could be done for an additional £5.6 million which works out as just over 1p per child per day**. For more detail on these costings see page 11.

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Recommendations

What should the UK government do?

The Department of Health (DoH) should:

- Source all produce for the SFVS from farmers using minimal pesticides, including organic and Fairtrade farmers.
- Ensure that all produce provided as part of the SFVS that can be grown in the UK is sourced from British organic farmers. Maintain the SFVS's provision of seasonal produce.
- Fund and conduct research into low dose and combinatory effects of pesticides, particularly on children.
- After the UK leaves the EU, establish systems for monitoring the human health impacts of pesticide residues in food, particularly on vulnerable groups such as children.

The House of Commons Health Select Committee should:

- Hold an inquiry into why the Department of Health is not working to understand or reduce the negative impacts on human health caused by pesticides.

The Department for Environment, Farming and Rural Affairs (DEFRA) should:

- Lead research into alternatives to fungicides for storage and transportation of fruit and vegetables, with a priority focus on eliminating the use of carcinogens, endocrine disruptors and neurotoxins.
- After the UK leaves the EU, provide financial and technical support to UK agriculture to reduce overall pesticide use.
- After the UK leaves the EU, provide better support to develop the British organic sector.

What should schools do?

- Keep participating in the SFVS.
- Lobby the Department of Health to ask that it switches the SFVS to organic.
- Join up with other local schools local to pressure the Department of Health.

What can parents do?

- Keep their children eating the fruit and vegetables they are given through the SFVS.
- Sign and share PAN UK's petition calling on the Department of Health to switch to providing organic produce through the SFVS. Visit www.pan-uk.org/advocacy.
- Urge their children's school to lobby the Department of Health to switch to providing organic produce through the SFVS.
- Provide more organic items to their children at home.
  (*PAN UK understands that some families won't be able to afford to go totally organic. One way of making it more cost-effective is to switch to organic only for the produce identified either as having the highest levels of pesticide residues or those with the most different residues present. Details of which products to try and avoid can be found at www.pan-uk.org/our-food)*

Table 1 – a comparison of pesticide residues in produce supplied through the SFVS with their mainstream equivalents. All data taken from 2015 PRiF monitoring reports:

	% with single residue	% with multiple residues
Apples SFVS	97.50	90.00
Apples non-SFVS	67.71	59.38
Bananas SFVS	80.56	69.44
Bananas non-SFVS	71.76	58.82
Pears SFVS	95.45	86.36
Pears non-SFVS	93.75	87.50
Raisins SFVS	100.00	100.00
Raisins non-SFVS	83.67	63.27

What does the data tell us?

What the data clearly shows is that there is a large number of potentially harmful pesticide residues contained in the food that is being provided to our four to six-year-old children through the SFVS.

Why is PAN UK publishing this information?

PAN UK is in no way trying to be alarmist by providing the findings of our research. Rather we are aiming to provide the public, in particular parents, with information that is publicly available but is currently buried within technical reports on the website of the Expert Committee on Pesticide Residues in Food (PRiF). Our hope is that by providing these findings to parents in an accessible way we can help them make informed decisions about what they and their children are eating. We also hope that parents and other concerned members of the public will use this information to lobby the UK government to do more to protect children from exposure to pesticide residues.

How do items provided under the SFVS compare to their mainstream equivalents?

Further research conducted by PAN UK indicates that the produce given to children through the SFVS contains more pesticide residues than the equivalent food items supplied to the general public. Table 1 on the left shows the results of produce tested in 2015 by the Expert Committee on Pesticide Residues in Food (PRiF). It compares produce given to children through the SFVS with the same products on sale to the general public, contrasting the percentage of items found to have single or multiple residues. The figures for the non-SFVS residues are taken from the PRiF annual report for 2015 published in July 2016.[2] The four fruits in table 1 were the only ones included in the PRiF's general testing for 2015 and therefore the only ones it was possible to compare.

Which SFVS items contain the most pesticide residues?

Some items provided through the SFVS are much worse than others in terms of pesticide residues. The Department of Health should prioritise those with the most residues for switching to organic.

Table 2 - the percentage of SFVS products which contain the residues of multiple pesticides:

		Number of samples tested (2005-2016)	Samples with multiple residues total %
1	Raisins	94	100%
2	Soft citrus	416	97%
3	Pears	205	91%
4	Strawberries	35	89%
5	Apples	510	74%
6	Bananas	421	58%
7	Carrots	363	26%
8	Tomatoes	105	22%
9	Sugar snap	51	16%

Table 3 – the number of different pesticide residues found in samples of SFVS products tested between 2005 and 2016:

	Number of different pesticides found in samples tested (2005-2016)
Apples	64
Soft Citrus	48
Raisins	45
Pears	41
Tomatoes	27
Strawberries	23
Bananas	19
Carrots	12
Sugar snap	11

For more results and a breakdown of this data, see the spreadsheets on which these findings are based at www.pan-uk.org/food-for-thought.

CHLORPYRIFOS

Second most frequently detected residue over all samples combined. Appearing in 20% of samples

Type of pesticide: Insecticide, organophosphate

Used for: Killing a wide range of insects in a variety of crops

Found on SFVS samples of: 78% raisins - 42% soft citrus - 18% apples – 18% bananas - 17% pears - 4% tomatoes

Harmful effects: There is a body of work around the negative impacts of chlorpyrifos (and other organophosphates) on various aspects of children's cognitive development. Chlorpyrifos has been well-studied in animal models and has been shown to cause a range of neurodevelopmental effects, such as impacting genes that control essential processes in developing brain cells.[3] Exposure to low levels of chlorpyrifos has been shown to negatively impact various aspects of cognitive development in humans in several studies. In fact, the US Environmental Protection Agency (EPA) banned the use of chlorpyrifos from household use due to the risk to children's cognitive development.[4]

In multiple epidemiological studies, chlorpyrifos exposure during gestation or childhood has been linked with lower birth weight and neurological changes such as slower motor development and attention problems. Exposure to organophosphate pesticides in general is increasingly associated with changes in children's cognitive, behavioural and motor performance. Chlorpyrifos is also a suspected endocrine-disrupting compound.

Current status: All use approvals for products containing chlorpyrifos, apart from limited use as a seedling drench on brassicas (such as cabbage, broccoli and cauliflower), have been withdrawn in the UK – effective from 1st April 2016.[5] It is still approved in the EU though is not in wide use. In the USA there are moves to ban the use of chlorpyrifos in agriculture. In a lawsuit that has been brought by six US States to try and secure a ban, one of the prosecutors stated, "It is the Environmental Protection Agency's responsibility to protect Americans from unsafe chlorpyrifos residues on food because of the potential neurodevelopmental and other adverse health effects caused by exposure".

Given there are almost no permitted uses for chlorpyrifos in the UK and the growing concerns surrounding its use in the USA, PAN UK would like to see a complete ban on its use in agriculture.

Why are we concerned?

Pesticides are poisons designed to kill living organisms. However, they do not just have an effect on the organism that they are targeted to kill but can affect non-target organisms too – including people. Pesticides, as poisons, have known and documented potential to harm human health. What has not always been known, and in many cases is still not understood, is just how harmful pesticides can be. Various regulatory agencies, such as the European Commission and US Environmental Protection Agency (EPA), attempt to regulate pesticides to ensure that the risk to human health is minimised. But, as circumstances have proven time and time again, the regulatory system is insufficiently robust to protect people from the harm that pesticides can and do cause.

Why are children more vulnerable to the health impacts of pesticides?

Certain groups of people are more susceptible to the effects of pesticides. Amongst the most vulnerable are young children whose bodies are still forming. Exposure to certain pesticides at critical stages in their development can interfere with the development of particular organs and their functions, which can in turn lead to health complications in later life. The capacity of children's bodies to break down or eliminate toxins from their systems is far less developed than that of adults. In addition, compared to adults, children incur a higher dietary intake of pesticides. Per kilogram of body weight, children consume six times more fruit and double the amount of vegetables. This higher rate of consumption means that children will receive higher doses of the contaminants present in their food.

In addition, children exhibit different eating habits to adults which again can increase their intake of food contaminants such as pesticide residues. Their diets are generally less diverse and this may mean that they consume greater quantities of produce of concern, such as apples. As a consequence of these various factors it is clear that diet is a major source of pesticide exposure for children and that this exposure poses a greater threat to their health than that of adults.

There is a huge amount of information available on why children are more vulnerable to the impacts of pesticides. For links to more resources please visit the PAN Asia-Pacific website at www.panap.net/publications/protect-our-children and PAN North America website at www.panna.org/human-health-harms/children.

Endocrine disruptors (EDCs)

Of particular concern are those chemicals, not just pesticides, which are suspected to be endocrine system disruptors. Endocrine disrupting chemicals can affect hormone systems in the body, and have been associated with the development of learning disabilities, severe attention deficit disorder, cognitive and brain development problems. If exposed at a young age to endocrine disruptors there can be an increased risk of negative health outcomes including childhood cancers.[6] There were 43 suspected endocrine disrupting pesticides found on the SFVS samples.

Other negative health impacts

It is not just endocrine disruptors that are of concern. In the residues found on the SFVS samples there were 24 known carcinogens, 2 probable carcinogens, 26 possible carcinogens, 25 neurotoxins, 15 developmental or reproductive toxins and at least nine organophosphates, a category of chemicals which have been found to have negative impacts on children's cognitive abilities.[7] Chlorpyrifos, the second most frequently found substance in the SFVS produce, when concentrated in umbilical cord blood has been found to be associated with delayed psychomotor and mental development in children in the first three years of life[8] and poorer working memory and full-scale IQ at seven years of age.[9] Based on these studies, chlorpyrifos has been categorised as a human developmental neurotoxicant.[10] See page 8 for more information on chlorpyrifos.

Low doses

We are assured by governments and companies that dietary exposure to pesticides via ingestion of residues presents no unacceptable risk to us and our children due to the very low levels of any given active substance actually present. This assertion is based on the long-held tenet that "the dose makes the poison", in other words that a substance will have harmful, toxic effects only if present in sufficient quantities. However, research in recent years has suggested that this might not hold true for certain chemicals. Of particular concern are the potential effects of endocrine disruptors at low doses. A study from the US National Institute of Environmental Health Sciences (NIEH) states that "…. the effects of low doses cannot be predicted by the effects observed at high doses. In addition, the finding that chemicals have adverse effects on animals and humans in the range of environmental exposures clearly indicates that low doses cannot be ignored."[11]

Links between exposure and health impacts

If a substance is classified as, for example, a 'known carcinogen' it does not automatically mean that exposure to it will definitely result in the development of cancer. The classification simply means that in tests for toxicity the substance can cause a particular effect. In fact, there are many factors that influence our response to chemicals other than just our exposure to them, including genetic susceptibility. The length, quantity and frequency of exposure also affect the likelihood of negative health impacts.

However, we simply do not know enough to be able to categorically state that dietary exposure to carcinogens and other chemicals will not result in negative long-term impacts on human health. PAN UK believes that eliminating exposure to such chemicals where it is possible to do, such as in the SFVS, is the precautionary and correct way to proceed.

Cocktail effect of multiple residues

Also of major concern is the fact that adults and children alike are continually exposed to a vast range of chemicals. Even within this relatively limited research study, some samples have tested positive for residues of up to 13 different pesticides. Despite the likelihood that these multiple substances do interact with each other in some way, there has been little research into the combinatory or 'cocktail' effects of exposure to pesticides.

One recent piece of research from France has shown clearly that combinations of pesticides found in food are more toxic when combined than when present in isolation. The results showed that a combination of five pesticides found in food caused damage to DNA.[12]

The 'cocktail effect' has in fact long-been recognised as an area of concern in the UK. In a 2002 report from the Committee on Toxicity of Chemicals in Food, Consumer Products and the Environment (a group of independent experts which advises the UK government), it was concluded that the UK did not have the tools necessary to investigate whether interactions may occur at the low levels of residues to which consumers are exposed, or sufficient scientific understanding of the toxicology of mixtures to allow such risk assessment. The report also noted that certain groups in the population, notably pregnant women and young children may be at higher risk from possible interactions.[13] However, despite this concern, in the past fifteen years since these findings were published, little has been done to progress the UK's understanding of the human health impacts of food containing multiple residues. At the European Level, the Commission has launched a programme to assess cumulative risk associated with multiple pesticide residues in food.[14] However, this is still in development and therefore not at present able to address the issue.

Overall, 66% of all the food tested from the SFVS contained multiple pesticide residues. One sample of raisins from spring 2015 tested positive for residues of 13 different pesticides. Meanwhile, apples from the SFVS tested in spring 2016 contained residues of 11 different pesticides. Four of those were known carcinogens and five were suspected endocrine disruptors.

Table 4 - the pesticide residues found on a single sample of apples from spring 2016 (apples sourced from Portugal):

Active	Type	Carcinogen	Endocrine disruptors	Neurotoxic	Reprotoxic
Carbendazim	Fungicide	Possible	Suspected		
Chlorpyrifos	Insecticide		Suspected	Yes	
Captan and Folpet	Fungicide	Yes			
Dithiocarbamates	Fungicide		Suspected		
Dithianon	Fungicide	Possible			
Fenoxycarb	Insecticide	Yes	Suspected	Yes	Yes
Fludioxonil	Fungicide				
Imazalil	Fungicide	Yes			Yes
Tebuconazole	Fungicide	Possible	Suspected		
Thiabendazole	Fungicide	Yes			Yes
Thiacloprid	Insecticide	Probable			

What are the cost implications of switching the SFVS to organic produce?

A common response from people when considering switching to an organic diet is that the cost of organic produce is, or can be, too expensive. However, the additional costs need not be prohibitive and certainly not when one factors in economies of scale that can help in keeping prices down, particularly for large state-funded schemes such as the SFVS. At present the scheme costs approximately £40 million per year, roughly equivalent to 10p per child per day.[15]

PAN UK has looked into wholesale prices of the various produce supplied to the SFVS. Our figures look simply at a snapshot of prices for a like-for-like cost per kilogram, comparing the conventional produce given to children through the SFVS to their organic equivalents. As a result, the figures below can be assumed to be the maximum costs given that economies of scale and efficiencies in the supply and distribution chain would bring the cost of supplying organic down even further.

Whilst some organic products are markedly more expensive than their non-organic counterparts, taken overall the difference in cost from our analysis is a mere 14%, including the added cost of switching to Fairtrade bananas. This would add an extra £5.6 million to the annual cost of the SFVS. **This works out as an additional cost of just over 1p per child per day.** All price sources are provided in the FAQ section at www.pan-uk.org/food-for-thought.

Table 5 - a comparison of organic and non-organic wholesale prices for the produce supplied through the SFVS:

Produce	Non-Organic kg in £	Organic kg in £	Price difference in %
Apples (gala)	1.66	2.32	40%
Bananas (Comparison of Fairtrade vs non-Fairtrade)	1.09	1.25	15%
Carrots (washed)	0.54	1.29	139%
Pears	1.25	2.58	106%
Raisins	4.40	5.67	29%
Strawberries (UK)	1.83	1.73	-5%
Soft Citrus (satsumas)	1.80	3.60	100%
Sugar Snap peas (mangetout)	7.99	5.60	-30%
Tomatoes (cherry)	3.70	3.51	-5%
Overall cost of purchasing 1kg of all produce listed above	**24.42**	**27.55**	**14%**

IMAZALIL

Most frequently occurring residue over all samples combined. Appearing in 33% of samples

Type of pesticide: Fungicide

Used for: Controlling fungi including powdery mildew. Used on citrus, apples, pear, bananas, cucumbers

Found on SFVS samples of: 96% soft citrus - 52% bananas - 45% Pears - 3% apples - 1% raisins

Harmful effects: "Likely to be carcinogenic in humans" under The Environmental Protection Agency's Draft Guidelines for Carcinogenic Assessment. Under California's Proposition 65,[16] imazalil is listed as "known to the State to cause cancer". It also has reproductive or developmental effects[17], is a skin sensitiser and respiratory tract and eye irritant. Classified as EU Category 2: Substances which should be regarded as if they are carcinogenic to humans.

Current status: Approved for use in the EU. Currently four products containing Imazalil are approved for use in the UK.

Why is it present as a residue? Imazalil is used for control of post-harvest disease of citrus, apples, pears and storage diseases in potatoes. It can be applied to the outside of fruit to prevent fungal diseases during post-harvest storage and transportation and remains on the fruit until the point of consumption.

The main justification for using imazalil is associated with the length and complexity of our supply chains, particularly for soft citrus and bananas. However, by ensuring that all the apples and pears are sourced from the UK, storage and transportation times could be significantly reduced and the need for protective fungicides also reduced. By switching to completely organic, where the use of imazalil is not permitted and risk of rot diseases is addressed by non-chemical methods, all residues could be avoided.

Imazalil is on the monitored list for Fairtrade guidelines and growers under the Fairtrade scheme are encouraged to reduce or stop its use. This is not the case with non-Fairtrade bananas, which are supplied to the SFVS. Therefore, switching to Fairtrade bananas could help to reduce the instances of imazalil residues.

The way forward

The precautionary principle

> *"When an activity raises threats of harm to human health or the environment, precautionary measures should be taken even if some cause-and-effect relationships are not fully established scientifically."*[18]

The precautionary principle should form the basis of all decisions made in regard to pesticides with known or suspected hazards. But instead, we are trapped in a cycle in which pesticides are put on the market and the onus is on concerned citizens to prove that they are causing harm. Given the toxicity of pesticides and the potential harm that they can cause, even when used 'correctly', we do not have the luxury of being able to wait until the full potential for harm is proven. Rather, pesticides must be proven to do no harm before they can used.

Pesticide residues in food are a clear example of where the precautionary principle is not being applied. Our intake of residues via dietary exposure is undeniably adding to our overall exposure to pesticides However, the effects of this exposure on human health, particularly over a lifetime, are not clearly understood. Given this uncertainty, it makes sense to try and reduce our exposure to pesticides whenever we can. Yes this is a precautionary approach. But until we can say with complete certainty that these pesticides are not in any way harmful, we should not be exposing our children to them unnecessarily.

Department of Heath's failure to engage in pesticide issues

> *"Unfortunately, the issues outlined within the letter do not fall under the Department of Health's policy area."*
>
> Response from Lord O'Shaughnessy, the UK government's Parliamentary Under-Secretary of State for Health to a request from PAN UK to meet to discuss pesticides in July 2017.[19]

For many years PAN UK has been trying to get the issue of pesticides on the radar of the Department of Health (DoH). In other countries, health agencies are actively involved in protecting the public from the negative impacts of pesticides. The UK government is putting the health of the British public at risk by treating pesticides solely as an issue of agriculture and environment. A wide range of people are poisoned by pesticides, including

those that work with them such as farmers, farm workers and contractors, members of the public that are exposed directly to pesticides used in agriculture, and people using pesticides in their homes and gardens. As already discussed, we do not know how many might be affected by dietary exposure to pesticides in food.

There is clearly a role for the DoH to play in reducing the health impacts of pesticides. In regards to the SFVS it is undoubtedly well-intentioned and PAN UK is extremely supportive of the objectives of the scheme, despite our concerns about pesticide residues present in the produce.

In the first instance, we would like to see the DoH specify that all produce must be organic or from suppliers that are taking concrete steps to reduce pesticide use during production. This would immediately decrease the dietary exposure of four to six-year-olds to pesticides. It is financially viable, as the section on cost implications on page 11 shows, and would immediately eliminate one route of pesticide exposure for a group that are particularly vulnerable to the harmful effects.

In the longer-term, there is a vital need to better understand the effects of pesticides on the public and on children in particular. There needs to be much more research into both low dose and combinatory effects of pesticides and the ways in which dietary exposure to pesticides can affect children. These are areas that the Department of Health, not not the Department for Environment, Food and Rural Affairs (DEFRA), should be leading on.

Implications of Brexit for UK pesticide use

With our exit from the EU looming, the UK is at a crossroads in terms of its relationship to pesticides. The EU's pesticide regulations are among the strongest in the world and there is a real danger that, after Brexit, the government will choose to weaken those standards thereby increasing the exposure of the British public, including children, to potentially harmful chemicals. However, the EU's system is imperfect and Brexit is also an opportunity to move away from the current situation where it is almost impossible to avoid pesticide residues in our food.

After Brexit, the UK government should prioritise human health by supporting British farmers working hard to reduce their pesticide use, particularly those in the organic sector. In this way, the UK can both reduce the exposure of the general public, and children in particular, to pesticides and enable a genuinely-sustainable UK agriculture sector to flourish.

To tell the UK government that after Brexit you want less pesticides in your food, farms and green spaces visit www.pan-uk.org/advocacy.

Background and Methodology

What is the School Fruit and Vegetable Scheme (SFVS)?

The UK Department of Health (DoH) launched its 5-A-Day scheme in the winter of 2002 with the laudable aim of increasing consumption of fruit and vegetables by the population of the UK. One of the stated ambitions of the scheme is to combat the growing levels of chronic illnesses, such as cancer, by increased consumption of fruits and vegetables as part of a healthier diet.[20]

In 2004, as part of the 5-A-Day scheme, the DoH launched the School Fruit and Vegetable Scheme (SFVS) across England. The aim of the scheme is to provide every Key Stage 1 child (age 4-6 years) with one item of fruit or vegetable every day of the school year. The most recent figures indicate that the scheme reaches approximately 2.3 million children in roughly 16,300 schools in England.[21] Figures reported in 2015, state that in the previous academic year the scheme provided fruit and vegetables to pupils on 190 school days, equating to roughly 433 million portions.[22] The scheme, costing approximately £40 million per year[23], is funded by the DoH and managed by the National Health Service (NHS) Supply Chain, an organisation run by private company DHL Supply Chain Ltd on behalf of the NHS Business Services Authority.[24]

As a way of increasing the amount of fruit and vegetables consumed by young children and encouraging healthier eating habits the scheme provides an excellent grounding. PAN UK recognises that the value of eating fresh fruit and vegetables, particularly for young children, cannot be underestimated as a key contribution to a healthier lifestyle and a way of promoting positive eating habits in later life.

However, our findings show that we are not in fact providing the best for our children. Government testing reveals that none of the produce supplied to children is organic and none of the bananas are Fairtrade.[25] Fairtrade standards prohibit the use of certain agrochemicals that are harmful to human health and the environment and work with their suppliers to reduce their use of pesticides.[26] Therefore, by changing to Fairtrade bananas the SFVS could reduce children's exposure to pesticide residues, especially to numerous pesticides known to be Highly Hazardous which are now prohibited by Fairtrade. Currently bananas are the only item provided through the SVFS that are available in sufficient quantities to make this switch. However, in the future, pesticide residues in the SVFS could be further reduced by ensuring that all produce that can't be sourced from the British organic sector at least meets Fairtrade standards.

What does the Expert Committee on Pesticide Residues in Food do?

The Expert Committee on Pesticide Residues in Food (PRiF) was established in 2011 to replace the Pesticide Residues Committee (PRC). The main function of the PRiF is to oversee the UK Government funded pesticide residue surveillance programme. Monitoring for pesticide residues in the UK was first started in the 1950s. Quarterly and annual reports of the monitoring results are published by PRiF and are available on their website.[27]

Since 1st January 2005, the Health and Safety Executive (HSE) has undertaken specific monitoring of pesticide residues in produce supplied to the SFVS. Suppliers to the scheme provide samples of the produce on a regular basis. The produce of each supplier is tested at least once per year. The results of the testing are subsequently examined by PRiF and published three times per year to coincide with spring, summer and autumn school terms.[28]

Samples are taken from the various suppliers to the scheme and tested for approximately 370 different pesticides. The results reported are for the whole fruit or vegetable, including the skins of those that might normally be peeled before consumption. Sampling is not done on single items. In most cases a 'sample' must be a minimum number of twelve items weighing at least 1.2kg. These guidelines are set out by European Commission Directive 2002/63/EC.[29]

What is a pesticide residue?

A pesticide residue is the detectable trace of any pesticide (insecticide, herbicide, fungicide etcetera) that remains on or in food after they have been applied to a crop. The application of pesticides might not only be limited to while the crop is growing but can also be applied as a seed treatment, or post-harvest to assist with transportation, storage or the cosmetic look of a particular item. The residues detected on a food item will depend on which pesticides have been used and how persistent they are or, put another way, how long they take to decompose. Some food items will contain the residues of just one pesticide, while in others the residues of multiple pesticides will be detectable. Due to the nature of many of the new systemic type of pesticides, residues are contained within the entire piece of produce rather than just on the surface. As a result, peeling fruit and vegetables before eating is often not enough to prevent exposure to pesticides.

How did PAN UK interpret the data?*

PAN UK reviewed all of the reports of the government's SFVS residue testing available from 2005 to 2016 and went through each sample tested to record, aggregate and analyse the results. We have broken the data down into year–by-year averages for each product, and the percentage of samples that contained single or multiple residues. We have also compiled a total average for each product over the entire testing period 2005-2016. This gives an overall picture of which produce most frequently has pesticide residues present.

The PRiF reports also provide information on which pesticides were detected on which produce. PAN UK has gone through the records and identified the pesticides that appear most frequently as residues overall and on each type of produce. We have also calculated how many times the pesticides were detected as a percentage of the number of samples tested.

After noting how many pesticides were detected, 123 overall, PAN UK then referred to databases of toxicological assessments to determine the possible harmful effects associated with each particular substance. The classifications for carcinogenicity, endocrine disrupting properties, neurotoxins and developmental or reproductive toxins are taken from the classifications provided by a range of regulatory authorities around the world including the European Commission, the US Environmental Protection Agency (EPA), the Global Harmonized System (GHS) and the World Health Organization (WHO). We have taken the definitions that are most widely accepted by regulatory authorities.

Maximum Residue Levels

In its reports the PRiF focuses on Maximum Residue Levels (MRLs), implying that any pesticide residue below the MRL doesn't pose a threat to human health. However, MRLs are set to ensure that food is grown according to good agricultural practice. They do not guarantee that the quantity of pesticide found in the food is safe.

There are in fact two different safety levels for pesticide residues in food: the acute reference dose (ARfD) which is the amount (measured in mg of pesticide per kg bodyweight) that is safe to consume in one meal or in one day, and the acceptable daily intake (ADI) which is the amount that is safe to consume every day of your life.

According to the UK Health and Safety Executive, under EU regulations MRLs are always set below levels that would present a risk to consumers.[30] However, MRLs are only set for individual pesticides and do not take account of the multiple residues of different pesticides which can interact with each other to increase the toxicity of certain produce. As described earlier in this report, this is known as the 'cocktail effect' and there is an increasing body of evidence showing that chemicals are more toxic when combined than alone.

In addition to the cocktail effect, MRLs also fail to take full account of differences in individual diets or how much of a particular food item a person consumes in one day. There is also increasing evidence that certain pesticides could be more harmful to human health, and particularly children, at lower doses. For these reasons, we have not looked at incidences of MRL exceedance in the findings of this report.

"A Who's Who of pesticides is therefore of concern to us all. If we are going to live so intimately with these chemicals eating and drinking them, taking them into the very marrow of our bones - we had better know something about their nature and their power."

Rachel Carson,
Silent Spring

For detail on the concentration of pesticides found on fruit and vegetables given to children through the SFVS, visit the PRiF website at: www.gov.uk/government/publications/pesticides-residues-in-food-school-fruit-and-vegetable-scheme-2016-to-2017.

* *All the raw data and analysis undertaken by PAN UK for this report is available at www.pan-uk.org/food-for-thought.*

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Pesticide Action Network UK

PAN UK is based in Brighton. We are the only UK charity focused solely on addressing the harm caused by chemical pesticides.

We work tirelessly to apply pressure to governments, regulators, policy makers, industry and retailers to reduce the impact of harmful pesticides.

Find out more about our work at:
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