Pesticides in schools: a short guide

Pesticides may be found in schools, pre-schools, and nurseries. They may be used in the school grounds and in the buildings or be present as residues in the food brought in.

This briefing, from the Health and Environment Alliance, provides a short guide to what these pesticides may be and what health effects they could have. The briefing concludes with further useful information including guides on pesticide alternatives and links to useful organisations.

Given the rising health concerns about pesticide exposure particularly concerning children, Local Authorities need to minimise children's risk whilst in their care and ensure that pesticide exposure is minimised in schools.[1]

We hope to demonstrate to the government that school authorities want to take action to minimise exposure, and that the new Government pesticide National Action Plans should be helping them to do that. In Canada and the USA new policies are being applied to restrict pesticide exposure in schools; the UK should be doing the same to minimise exposure [see More Information]

Why pesticides, why now?

Pesticides have the potential to cause health effects such as damage to the nervous, hormonal and other systems. Scientific evidence also increasingly points to links between cancer and exposure to certain chemicals, including pesticides. Pesticides may play a role in many types of cancer – including some affecting children, and non-Hodgkin's lymphoma, breast cancer, prostate cancer, some brain cancers, pancreatic cancer and testicular cancer - many of which are rising in incidence (see More Information). This means we need to know what pesticides are being used particularly where vulnerable groups are exposed.

Children, staff and families may be exposed to pesticides in schools in several ways, such as:

- Grounds Maintenance i.e. weed control
- Public health pest control i.e. control of rodent and insect pests such as ants, mice, cockroaches fleas and seasonal pest such as wasps and bees
- Contractors and farmers spraying grounds or fields next to schools
- Food supplied to the school or in lunchboxes

The health effect of pesticides can be acute (immediate poisoning) and chronic (more subtle, longer term harm such as cancer or damage to hormone and immune systems, arising from continued or repeated exposure to lower doses of pesticides).[i]

[1] The Health and Environment Alliance's Sick of Pesticides Campaign is also undertaking a survey of school authorities to determine what pesticides are present/used in schools and what Local Authorities or schools themselves may want to do about this. See www.pesticidescancer.eu

Most people are aware of the danger of acute poisoning and the need to keep children away from poisons, but there is less awareness of the potential for chronic effects. Chronic effects are harder to measure as it is extremely difficult to assess the multiple causes of chronic diseases.

There are no surveys of pesticide use and exposure in schools, making the assessment of children's exposure to pesticides difficult. This in itself is worrying.

The UK Government has no plans to measure children's exposure yet there are many good reasons why assessing it is necessary. For example, children's organs are still developing and they eat far more food in proportion to their weight compared to adults(see the More Information section).

What chemicals may be used and what are the hazards?

The following sections describe some of the pesticides that may be being used or are present in schools. It is possible that other pesticides are being used that are not listed here. These can be checked against the data provided by Pesticide Action Network UK list of pesticides at List of Lists 2009.

1) Pesticides used in school grounds maintenance and nearly

Pesticides are used on school grounds, often by external contractors, to clear weeds, manage wildlife (such as rodents) and maintain the amenities such as floral displays, sports grounds and playing areas. Long term exposure to the chemicals may result in chronic health impacts such as cancers and neurological problems.

Sprays may also be used near the school. The 2006 Government Codes of Practice for Using Plant Protection Products (UK Government, 2006a) states that particular care should be taken when applying pesticides near schools adding that,

> "*children may come to the boundary of their play areas to watch you. In these cases, you should assess if you need to tell the person in charge of the premises that you are going to apply pesticides and, if necessary, agree any extra precautions that you and they should take*."

There is little evidence that adequate limits are applied for chemical spraying/use actually in schools or where children play.[2]

Box: Health Hazards – the data and sources
The toxicity and cancer hazard data in the Tables below is drawn from PAN *List of Lists 3rd Edition 2009*. This cites The World Health Organisation WHO classification measures mammalian acute **toxicity**. The **cancer** hazard is listed following classification by three bodies: the International Agency for Research on Cancer; the US EPA; and the European Union. Other sources include *FOOTPRINT: creating tools for pesticide risk assessment and management in Europe: see also* http://sitem.herts.ac.uk/aeru/footprint/en/index.htm. and *Determining the Usage and Usage Patterns of Amenity Pesticides Across the UK PS2230* Report for the Pesticide Safety Directorate 2008. http://www.amenity.org.uk/_Attachments/resources/69_s4.pdf. There are over 240 possible and known carcinogenic pesticides. More detailed tables are available.

[2] See *Determining the Usage and Usage Patterns of Amenity Pesticides Across the UK PS2230* Report for the Pesticide Safety Directorate 2008

There are health hazards associated with some of the chemicals being used, but unfortunately there is no central list of all pesticides. Table 1 below, lists the active ingredients used in general amenities by public authorities. Pesticide operators will be able to identify the brand names using these ingredients.

Table 1: Pesticides used in public areas and their possible hazards (see Box on data and sources)

Pesticide	Use	Hazards
Glyphosate	A herbicide used in a wide range of cropping, utility and industrial situations to control annual and perennial grasses and broad-leaved weeds	**Recent studies suggest possible cancer and endocrine disruptor risk. see Endnote[ii]** **Skin irritant, Eye irritant**
Dichlobenil	A herbicide for woody crops, non-crop uses and in, for example, established orchards. Can also be a pesticide degradation product	**Possible carcinogen** **Eye irritant**
Diuron	A pre-emergence residual (long lasting) herbicide for total control of weeds and mosses in non-crop areas and woody crops (approval being withdrawn for use due to aquatic toxicity)	**Possible carcinogen** **also possible endocrine disruptor see Footnote [3]** **Skin irritant, Eye irritant** **Respiratory tract irritant**
2,4-D	A herbicide for use in cereals, grass and amenity use. Can also be a product left as pesticide degrades	**Possibly carcinogenic** **potential endocrine disruptor** **Reproduction / development effects** **Neurotoxicant, Skin irritant, Eye irritant, Respiratory tract irritant**
Glufosinate-ammonium	A herbicide used to control a wide range of annual and broad-leaved weeds and grasses	**May impair fertility and possible risk of harm to unborn child**
Amitrole	A herbicide used to control a wide range of perennial grasses and broad-leaved weeds	**Possible risk of carcinogen** **probable endocrine disruptor**
MCPA	A herbicide for control of annual and perennial broad-leaved weeds. Can also be a pesticide degradation product	**Carcinogenicity possible** **Eye irritant**
Dicamba	A herbicide for control of annual and perennial broad-leaved weeds and brush species	**Skin irritant, Eye irritant**
Diquat	A non-residual herbicide and crop desiccant, normally used as the dibromide salt, to control broad-leaved weeds	**Toxic Moderately Hazardous** **Skin irritant, Eye irritant** **Respiratory tract irritant**
Diflufenican	A herbicide used to control grasses and broad-leaved weeds often used in mixtures	**Eye irritant**
Mecoprop-P	A herbicide for control of broad-leaved weeds	**Carcinogenicity possible**

[3] Some pesticides are suspected of being endocrine (hormone) disruptors. These can lead to birth defects, sexual abnormalities, reproductive failure and may increase the risk of cancers of reproductive organs. http://www.endo-society.org/journals/ScientificStatements/upload/EDC_Scientific_Statement.pdf

	especially cleavers, chickweed, clover and plantains	**Skin irritant, Eye irritant Respiratory tract irritant**
Dichlorophen	A fungicide, bactericide and algicide used to control moss, red thread, Fusarium patch and other diseases in non-crop situations (approval being withdrawn)	**Possible carcinogen**
Picloram	A persistent herbicide for the control of broad-leaved weeds on non-crop and utility areas	**Probably endocrine disruptor Eye irritant Respiratory tract irritant**
Sulfosulfuron	A herbicide for annual grass and broad-leaved weed control in cereals	**Probable Carcinogen Eye irritant**
Triclopyr	A herbicide for perennial broad-leaved and woody weed control on uncultivated areas, grassland.	**Eye irritant**
Carbendazim	A fungicide used to control a range of diseases including Septoria, Fusarium and Sclerotina. Can also be a pesticide degradation product	**Possible Carcinogen possible endocrine disruptor Reproduction / development effects**
Thiophanate-methyl	A fungicide effective against a broad spectrum of diseases in fruit, vegetables, turf and other crops including eyespot, scab, powdery mildew and grey mould and also earthworm control	**Likely carcinogen Reproduction / development effects Respiratory tract irritant**
Chlorothalonil	A fungicide used to control a wide range of diseases on a broad range of crops. Also used as a wood preservative.	**Probable carcinogen Skin irritant, Eye irritant Respiratory tract irritant**
Iprodione	A fungicide used to control Botrytis, Minilia, Sclerotinia and other diseases in a wide range of crops	**Possible carcinogen possible endocrine disruptor Skin irritant, Eye irritant Respiratory tract irritant**

There are non chemical solutions to most problems that eliminate the risk of exposure to hazardous pesticides [see More Information]

2) Pesticides used in pest control

Pesticides used to control pests in and around buildings present a risk of acute poisoning from direct exposure of children and staff following applications by professional pest control technicians.

Table 2: Some hazardous pesticides used for pest control[4]

Pesticide	Use	Hazards
Bendiocarb (Trade name =	ants	**acutely toxic carbamate Neurotoxicant**

[4] From industry interviews and *Pesticide Usage Survey report 185 Rodenticide Usage by Local Authorities in Great Britain 2001* National Statistics Office, York. The hazard data is from PAN List of Lists 3rd Edition 2009. The World Health Organisation WHO classification measures mammalian acute **toxicity** cited.

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Deltamethrin	fleas	**a suspected endocrine disruptor WHO considered Moderately Hazardous Neurotoxicant**
Bromodilone,	rats & mice	**Anticoagulant – Extremely hazardous** [5]
Difenacoum	Rats and mice	**Anticoagulant considered Extremely hazardous by WHO - Reproduction / development effects**
Brodifacoum	Rats and mice	**Anticoagulants– Extremely hazardous**[6]

3) Dietary exposure to pesticides in foods in school

Food, including meals, ingredients and snacks, brought into the school for pupils, may contain pesticide residues from agricultural use on crops or post-harvest storage. [iii] According to analysis by the UK Government, some 80% of fruits and vegetables given to schoolchildren aged four to six by their Local Education Authorities - as part of the UK's 'School Fruit and Vegetable Scheme' - contain pesticides.[iv] Some of the pesticides found most frequently are among those most hazardous to children's health. See Table 3.

Table 3: Some of the hazardous pesticides detected in fruits and vegetables given to schoolchildren under the UK's School Fruits and Vegetable Scheme [see Box above for health data sources]

Pesticide	Which food items given to schoolchildren were affected?	Hazards
2,4-D	Citrus	**Possible Carcinogen Moderately Toxic potential endocrine disruptor**
captan	apples, pears,	**Suspected carcinogen**
carbendazim *	apples, citrus fruits	**Possible carcinogen potential hormone and reproduction disruptor**
chlorpyriphos	apples, bananas, citrus fruits,	**Moderately hazardous neurotoxin**
epoxiconazole *	bananas,	**Possibly carcinogenic**
imazalil	apples, bananas, citrus fruits, pears	**Moderately hazardous neurotoxin possible carcinogen**
iprodione	carrots	**Possibly carcinogenic potential endocrine disruption**
linuron *	carrots	**Possible carcinogen toxic to reproduction, likely endocrine disruptor**
Malathion	Pears, citrus	**Possible carcinogen suspected endocrine disruptor**
Thiabendazole	Bananas, pears, citrus	**Carcinogen**

* hazardous pesticides tabled for withdrawal under legislation proposed by the European Commission and adopted by the European Parliament

Foods other than fruit and vegetables may also contain pesticide residues including bread, milk, meat, infant foods and oils which are monitored by the Pesticide Residues Committee. For further details (web link to PRC)[v]. For instance, in 2008 fish sampling in 2008, revealed worrying levels of highly hazardous pesticides.[7]

Eating fresh fruit and vegetables is a vital part of a child's diet and so minimizing the risk of pesticide contamination is a priority. The benefits of eating more fruit and vegetables are very well understood, and schools that grow some of their own fruit and vegetables without applying pesticides will contribute to children's improved health - and help them understand how food is grown.

Buying from known organic producers, or those known to have good pesticide reduction policies, will also help schools avoid pesticides. There is lots of advice and support available for the growing and procurement of school food. [see More Information].

More Information

Pesticides and Cancer

- Pesticides have been associated with many types of cancer - including some affecting children, and non-Hodgkin's lymphoma, breast cancer, prostate cancer and testicular cancer - all of which are rising in incidence.[vi]
- The overall incidence rate of childhood cancers in Europe (based on 77,111 cases) has increased significantly with an average rise of 1.1% every year between 1978 and 1997[vii].
- For a systematic review of papers linking chemicals and pesticides to cancer: see http://201.216.215.170/isde.org/images/pdf/newby&howardenvinflcanceraetiologyjenm2006.pdf[viii]

Why are children more vulnerable to pesticides?

- Unborn children, infants and young children are uniquely vulnerable as their organs are still forming and are vulnerable to negative effects that can affect further development. [ix]
- Compared to adults, children incur a higher dietary intake of pesticides. [x] Per kilogram of body weight, children consume six times more fruit, two times more vegetables and three to five times more cereals.[xi]
- Their behaviour and lifestyle, e.g. playing outside - in parks and on school playing fields or on floors, puts them in frequent contact with many surfaces that may be contaminated with pesticides.[xii]

[7] For an example see http://www.pesticides.gov.uk/uploadedfiles/Web_Assets/PRC/PRC_2008_q4_2008.pdf

- Children's livers and kidneys are unable to detoxify or filter and excrete certain chemicals as quickly as adults, thus contributing to the greater toxicity of some substances to children.[xiii]New research suggests children under 7 are particularly vulnerable.[xiv]
- New research shows that combinations of chemicals (pesticides and others) and exposure at very low doses (below those normally pronounced 'safe'), can have serious effects that are not yet measured or well understood.

Action in the USA and Canada

USA - More than 50 published studies since 1994 have documented pesticide issues in schools including unmanaged pest infestations, unsafe pesticide use and unnecessary pesticide exposures in schools. There are higher levels of interest in this in the US and as a result numerous federal and state activities to address it. The Centres for Disease Control and Prevention provide advice.[xv] The USA government's Environment Protection Agency (EPA) provides materials for schools to operate Integrated Pest Management (IPM).[xvi] In addition there is a new National School IPM Pest Management Strategic Plan. This plan - "*SCHOOL IPM 2015: Reducing Pest Problems and Pesticide Hazards in Our Nation's Schools*" - which could cut school pesticide use by 70% is still pending approval from the USDA and EPA.

Canada – Two Canadian provinces have banned the sale and use of pesticides for cosmetic purposes. The North Okanagan-Shuswap School District passed a policy that bans the cosmetic use of pesticides on school property.[xvii] The Canadian Cancer Society calls for a ban on the use and sale of cosmetic pesticides.[xviii]

How can schools protect children from pesticides?

- Schools grounds and playing fields should be managed without the use of pesticide [contact PAN UK]
- Develop an Integrated Pest Control strategy – [contact PAN]
- Ensuring any pest control near schools is carried out with the minimal or no chemicals and that operations are undertaken when schools are closed
- Food including fruits and vegetables provided to children should be organically sourced when possible. [Food for Life and The Soil Association can provide help]
- Growing fruit and vegetables on school grounds (Garden Organic can provide support and sources of materials)

Who can help?

- **Pesticides Action Network** – www.pan-uk.org - has a detailed briefing on pesticides in schools called *'Pesticides in Schools and how to avoid them*' written by a pest control expert. It can be downloaded from http://www.pan-uk.org/Projects/Local/scholeaf.htm.
- **Soil association** www.soilassociation.org – advice and support about organic food, pesticides and local food
- **Food for Life** www.foodforlife.org.uk – transforming school food culture. Can provide lots of support on changing meals and sourcing organic food.
- **Garden Organic** www.gardenorganic.org.uk – supports schools with growing advice, awards and teaching materials about food and organic growing.
- **Cancer Prevention and Education Society** www.cancerpreventionsociety.org - information and advice about cancer prevention.

The Sick of Pesticides campaign

The Sick of Pesticides Campaign has been set up by HEAL to provide information and give a voice to concerned citizens, cancer sufferers and their families, health groups and scientists concerning pesticides. A safer and cleaner environment needs strong legislation, especially to protect the most vulnerable groups in society, such as pregnant women and children. The Campaign will encourage the UK Government to set up an ambitious National Action Plan for Pesticide Reduction and to support people and public bodies in reducing their dependence on pesticides. www.pesticidescancer.eu
There is a facebook cause page to join and share -http://www.facebook.com/pages/Sick-of-Pesticides/38411248553. To join the campaign, please send an email with the name of your organisation, contact person and contact details to Vicki@env-health.org

***The Health and Environment Alliance (HEAL)** aims to raise awareness of how environmental protection and sustainability improves health and to empower the health community to contribute their expertise to policy making. Website: www.env-health.org*

September 2009

Notes and References

[i] For more information see http://www.pan-uk.org/Projects/Food/Pesticide%20issues%20in%20the%20food%20chain.pdf
[ii] See four recent articles - Pesticide exposure as risk factor for non-Hodgkin lymphoma including histopathological subgroup analysis http://www3.interscience.wiley.com/journal/120748798/abstract?CRETRY=1&SRETRY=0 and Alteration of estrogen-regulated gene expression in human cells induced by the agricultural and horticultural herbicide glyphosate http://het.sagepub.com/cgi/content/abstract/26/9/747 and Glyphosate Formulations Induce Apoptosis and Necrosis in Human Umbilical, Embryonic, and Placental Cells http://pubs.acs.org/doi/abs/10.1021/tx800218n. Gasniera C, C Dumontb, N Benachoura, E Claira, MC Chagnonb and GE Séralini. 2009. Glyphosate-based herbicides are toxic and endocrine disruptors in human cell lines. Toxicology doi:10.1016/j.tox.2009.06.006.
[iii] Tests reveal over half the fruits and vegetables sold in the UK contain pesticides, while more than one third show more than one pesticide residues. Based on data taken from the 4 most recent quarterly Pesticide Residue Monitoring Reports of the UK Pesticide Residues Committee (2008)
[iv] Based on data taken from the 10 most recent quarterly Schools Fruit and Vegetable Scheme reports of the UK Pesticide Residues Committee (2008 to 2005)
[v] www.pesticides.gov.uk
[vi] http://www.pesticidescancer.eu/spip.php?rubrique2
[vii] Time trends of cancer incidence in European children (1978–1997): Report from the Automated Childhood Cancer Information System project Peter Kaatscha,*, Eva Steliarova-Foucherb, Emanuele Crocettic, Corrado Magnanid, Claudia Spixa, Paola Zambone. European Journal of Cancer 42 (2006) 1961-1971 doi:10.1016/j.ejca.2006.05.014
[viii] PAN UK: Pesticides in schools (2005) cites (Loengart 1987, Buckley 1989, Buckley 2000, Davis 1993, Leiss and Savitz 1995, Meinert 1996, Pogoda and Preston-Martin 1997, Zahm and Ward 1998)
[ix] PAN UK: Pesticides in schools (2005) cites (National Research Council, 1993).
[x] Modelling the Dietary Pesticide Exposure of Young Children' by Emily Diamand, Frank Pennycook, Professor Andrew Watterson and Dr Vyvyan Howard, published in the *International Journal of Occupational and Environmental Health 2004; volume 10, pages 315-320*
[xi] PAN Europe/ HEAL: Cut back on pesticides (2007) cites Hajslova at al (2006), Pesticide residues in food: threats and risks, proceedings of the conference "Pesticides in food" held in Slovakia 23-24 of June 2006.
[xii] PAN UK: Pesticides in schools (2005) cites (Lewis, 1994; Fenske, 1990; Zartarian,1998)
[xiii] PAN UK: Pesticides in schools (2005) cites (National Research Council, 1993).
[xiv] "Children more vulnerable to pesticides until age 7 due to lower enzyme level" http://www.environmentalhealthnews.org/ehs/newscience/children-are-more-vulnerable-to-pesticides-until-age-7/
[xv] http://www.cdc.gov/niosh/docs/2007-150/default.html
[xvi] See http://www.epa.gov/pesticides/ipm.
[xvii] C:\Users\vicki\Favorites\Documents\pesticides\Vernon Morning Star - Parents still seeking pesticide ban.mht
[xviii] http://www.cancer.ca/canada-wide/prevention/specific%20environmental%20contaminants/pesticides/cosmetic%20use%20of%20pesticides.aspx?sc_lang=en