

Pesticides and human health

Pesticides do not only affect the environment but can be a cause of severe human health harms. This briefing provides a summary of some of the main concerns relating to pesticides and human health.

The World Health Organisation (WHO) estimates that over [350,000 people die](#) every year from acute pesticide poisoning.

Moreover, this figure does not include deaths from cancer or other chronic diseases caused by pesticide exposure. In addition, the WHO estimates that long-term exposure may result in upwards of 750,000 people suffering from specific chronic defects and cancers each year.

As of August 2023, the UK has:

- 468 approved active substances
- 2900 approved pesticide products
- 73 approved active substances that are classified by [PAN International as HHPs](#) – meaning they pose a health risk to the public, farmers and workers and / or the environment.

Routes of exposure:

There are many routes of exposure to pesticides. In terms of indirect exposure, pesticides can be found in the air we breathe, the water we drink and [the food we consume](#). We can also come into direct contact with pesticides by being close to areas where they are applied, or by using them ourselves in the garden.

The examples of active substances given in the below sections only include pesticides that are actually approved for use in the UK. In reality, we are exposed to many active substances that have been banned in the UK due to concerns about their impacts on human health but which still appear as residues in and on the food we eat. This is because active substances that are banned for use domestically continue to be used in many other countries that export food to the UK. As a result, the UK public is likely to be exposed to residues of potentially harmful pesticides through their daily diets.

Who's health is impacted by pesticide exposure?

Different groups of UK citizens are exposed to pesticides in a variety of ways.



Farmers and farmworkers

Farmers, farmworkers and their families are one of the groups most vulnerable to both the long-term and short-term impacts of pesticide exposure due to their daily proximity to the many different types of pesticide used in mainstream agriculture. Numerous studies have shown higher incidence of pesticide-related ill health among this group including depression, a variety of cancers, asthma and Parkinson's. (1) (2) (3)

Rural residents

Rural residents can be subjected to repeated, long-term exposure to pesticides as a result of spray drift from nearby fields. As crops are often treated with numerous different pesticides in one growing season, rural residents are regularly exposed to cocktails of pesticides. Pesticide mixtures have been associated with a range of health problems including obesity, impaired liver function, the creation of cancer cells and disruption of the endocrine system, even when the doses of individual chemicals are below the safety levels set by regulators. (4)

Urban residents

People that live, work, study or play in our towns and cities are also directly exposed to pesticides on a regular basis. Councils and other land managers spray pesticides in parks, playgrounds and other green spaces, road verges, around train stations, pavements and around shopping centres, care homes and schools mostly to deal with unwanted vegetation. Pesticides used in UK urban towns and cities include developmental and reproductive toxins, neurotoxins and possible carcinogens. (5)

Children, women and those who are pregnant/breastfeeding

Women and people who are pregnant and/or breastfeeding [are particularly vulnerable](#) to the impacts of certain pesticides which can affect the health of unborn babies. Similarly, children are more at risk from pesticides because they have higher exposure rates than adults and are more vulnerable to their effects. Incidents of pesticide exposure that would be tolerated by adults, can cause irreversible damage to foetuses, infants and adolescents whose brains and bodies are still developing. (6)

Studies have shown increased risk in breast cancers in farmers' female spouses from exposure to organophosphates, and female agricultural workers with their duration of agricultural work. An elevated risk of breast cancer was found in women who reported being in fields during or shortly after pesticide applications and among women who had ever been employed in fruit and vegetable farming. (7) (8) (9)

Chronic and acute toxicity:

Acute toxicity

Pesticides can be acutely toxic. This means that they can cause harmful or lethal effects after a single episode of ingestion, inhalation or skin contact. Acute toxicity describes the adverse effects of an active substance that result either from a single exposure or from multiple exposures in a short period of time (usually under 24 hours). Effects of acute poisoning can range from itchy eyes and breathing difficulties to death. They can present as:

- respiratory tract irritation, sore throat and/or cough
- allergic sensitisation
- eye and skin irritation
- nausea, vomiting, diarrhoea
- headache, loss of consciousness
- extreme weakness, seizures and/or death

Examples of common pesticides used widely in the UK that are acutely toxic include:

- Abamectin – insecticide – 10 products approved for use in the UK. It is used on aubergine, peppers, chilli, strawberry, tomato and ornamental plants.
- Fluazinam – fungicide – 46 products approved for use in the UK. It is only approved for use on potatoes.

Chronic (or long term) toxicity

Pesticides can cause harmful effects over an extended period, usually following repeated or continuous exposure at low levels. Low doses don't always cause immediate effects, but over time, they can cause very serious illnesses.

Long term pesticide exposure has been linked to the development of Parkinson's; asthma; depression and anxiety; attention deficit and hyperactivity disorder (ADHD); and cancer, including leukaemia and non-Hodgkin's lymphoma.

How pesticides can impact our health (10):

It is important to note that if a substance is classified as a 'Carcinogen' (for example) it does not 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.

Carcinogenic substances

Carcinogens are capable of causing different types of cancer, including Leukaemia and Non-Hodgkin's Lymphoma. A substance is considered carcinogenic when there is evidence that it can cause cancer. There are many different types of cancer, but all of them can be characterised by the development of abnormal cells that begin to divide without control and spread into surrounding tissues. Single exposure events rarely cause cancer but repeated contact (whether through ingestion or the eyes, skin or lungs) with the carcinogenic substance, even at very low doses, can lead to cancer.

Examples of common pesticides used widely in the UK that are carcinogens include:

- Glyphosate – herbicide – 273 products approved for use in the UK. It is widely used in the amenity sector for weed control and in agriculture for all edible crops including arable, fruit and vegetables.
- Difenoconazole – fungicide – 37 products approved for use in the UK. Used on carrot, leek, potato, strawberries etc.

Endocrine disruptors

The term endocrine disruptor (EDCs) refers to substances that interfere with hormones and hormone balance. Hormones are the chemical messengers of the body. They are necessary to regulate different functions, in particular growth and reproductive functions.

The endocrine effects can be activated by very low concentrations of chemicals. They can manifest as:

- reduced semen quality with consequent decreased fertility, genital malformations, testicular and prostate cancer
- early puberty, appearance of cysts in the ovaries, uterus anomalies, breast cancer, pregnancy complications with early abortions, decreased fertility
- diabetes and obesity
- neurological disorders, especially disorders in brain development, and degenerative conditions, such as Parkinson's
- hyper and hypothyroidism and thyroid tumours.

Examples of common pesticides used widely in the UK that are EDCs include:

- 2,4-D – herbicide – 81 products approved for use in the UK. Used in the amenity sector and for arable and managed grassland.
- Tebuconazole – fungicide – 169 products approved for use in the UK. Used on arable crops and managed amenity turf such as sports pitches.

Developmental or reproductive toxins

Developmental or reproductive toxins have adverse effects on sexual function and fertility in both adults and children, and can reduce the number and functionality of sperm and cause miscarriages.

Examples of common pesticides used widely in the UK that are developmental or reproductive toxins include:

- Imazalil – fungicide – 7 products approved for use in the UK. Used to treat barley seeds and also frequently appears as residues on fruit.

- Myclobutanil – 2 products approved for use in the UK. Used on apples, blackberries, pears, strawberries and wine grapes.

Cholinesterase Inhibitors

Cholinesterase Inhibitors reduce the ability of nerve cells to pass information to each other and can impair the respiratory system and cause confusion, headaches and weakness.

Examples of common pesticides used widely in the UK that are cholinesterase inhibitors include:

- Pirimicarb – insecticide – 6 products approved for use in the UK. Used on broad beans and peas.
- Tri-allate – herbicide – 2 products approved for use in the UK. Used on barley and wheat.

The cocktail effect

One of the most worrying issues related to pesticide exposure is the growing body of evidence that pesticides can become more harmful when combined, a phenomenon known as [the 'cocktail effect'](#). Despite this, the regulatory system designed to protect us from pesticides looks at individual chemicals and safety assessments are only carried out for one pesticide at a time, ignoring the potential risks to human health associated with pesticide mixtures.

Assessments of safe levels of pesticide residues in our food are also based on analysis of individual chemicals. This not only ignores the potential risks to human health associated with pesticide mixtures found on one item (an apple, for example) but also those found in one dish (such as a fruit salad) let alone an entire day's worth of food. Add to this the likelihood that both rural and urban residents are exposed to other pesticides which are directly applied in their locality (be it for agriculture in the countryside or weed control in towns and cities), and it becomes apparent that the UK government is not doing enough to protect our health from pesticides.

References:

(1) "High Rates of Suicide, Depression Linked to Farmers' Use of Pesticides", Environmental Health News, October 2014 - <https://www.scientificamerican.com/article/high-rates-of-suicide-depression-linked-to-farmers-use-of-pesticides/>

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(3) “Nitration of microtubules blocks axonal mitochondrial transport in a human pluripotent stem cell model of Parkinson’s disease.”, The FASEB Journal, 2018; fj.201700759RR DOI: 10.1096/fj.201700759RR

(4) PAN UK and the Soil Association, The Cocktail Effect, 2019, <https://www.pan-uk.org/the-cocktail-effect>

(5) Amenity Pesticide Use Survey 2016 – Fera – April 2018 – Hertfordshire University, Pesticide Properties DataBase (PPDB), <https://sitem.herts.ac.uk/aeru/ppdb/en/>

(6) Unicef, Understanding the impacts of pesticides on children, 2018, https://www.unicef.org/csr/files/Understanding_the_impact_of_pesticides_on_children- Jan 2018.pdf

(7) “Insecticide Use and Breast Cancer Risk among Farmers' Wives in the Agricultural Health Study”, 2017, <https://pubmed.ncbi.nlm.nih.gov/28934092/>

(8) “Breast cancer risk in relation to occupations with exposure to carcinogens and endocrine disruptors: a Canadian case-control study”, 2012, <https://ehjournal.biomedcentral.com/articles/10.1186/1476-069X-11-87>

(9) “Occupation and risk of female breast cancer: A case-control study in Morocco”, 2019, <https://pubmed.ncbi.nlm.nih.gov/31380573/>

(10) PAN International HHP list: For a more comprehensive list of pesticides and the health effects they can cause, see the [PAN International List of HHPs](#).