

Should we worry about endocrine disruptors?

- Endocrine active substances are chemicals that can interfere with the body's hormone system and may have the potential to cause harm.
- They are used in everyday objects including furniture, building materials, cosmetics and food packaging.
- Endocrine active substances are also naturally occurring, for example phytoestrogens which can be found in soya.
- The risk to humans from these chemicals is uncertain. Some scientists argue that they may be a cause of higher rates of illnesses and disorders; others argue that our exposure to the chemicals is too low to cause a problem.
- Animal studies have shown that high doses of some of these chemicals can cause adverse health effects, but our real-life exposure is much lower than the amounts used in these studies.
- Some scientists are convinced that even the low level exposure that we experience can cause adverse health effects. This hypothesis is not universally accepted. It is vigorously debated and is the reason for much of the controversy in this area.

What are endocrine disruptors?

An endocrine active substance is a chemical that has the ability to interact with the body's hormone system. Endocrine disruptors are a subset of endocrine active substances. They are chemicals that have the ability to interfere with the body's hormone system, and thereby cause harm.

It is possible for a chemical to interact with the endocrine system without any resulting harmful effects.

Scientists and policy-makers agree that in order to be classified as an endocrine disruptor, a chemical needs to be shown to be able to interfere with the endocrine system, and as a result of this cause harm. There are plenty of chemicals that interact with the hormone system without causing harm. For example, when we eat sugar, the system responds by increasing the secretion of the hormone insulin by the pancreas

Endocrine Disruptors are often sensationally referred to in the media as 'gender-bending chemicals'.



Did you know?

According to the World Health Organisation, a substance should be regarded as an endocrine disruptor if it causes an adverse effect in an intact organism or (sub) population, by an endocrine mode of action.

Wide variety of uses

We are widely exposed to many chemicals that are suspected endocrine disruptors in our homes, offices, cars and environment in general. For example: phthalates, which are chemicals that are used in the manufacture of polyvinyl chloride (PVC) plastic. PVC is used to make many household items (including toys), and it is also used in cars and building materials.

Links with illnesses & disorders

It is generally accepted that the link between these chemicals and health problems has not been conclusively proven. This remains a contentious topic and there is little agreement in the scientific community about the extent of the issue.

However, some scientists are convinced that our exposure to certain chemicals causes a wide range of illnesses and disorders including cancer, autism and reproductive problems as a result of their interaction with the hormone system.

How do endocrine disruptors work?

Hormones are chemicals that act as messengers in the body. They control various functions, including growth, development, reproduction, metabolism and mood.

Endocrine active substances and endocrine disruptors can affect or 'interfere' with the hormone system in different ways. Some can mimic natural hormones, although usually only very weakly. Others block or prevent the normal action of hormones.

Should we worry about endocrine disruptors?

It is difficult to say with certainty whether endocrine disruptors should be a cause for great concern.

There are some scientists who consider endocrine disruptors in our homes and environment pose a great threat to human health. Others feel that there is not enough evidence that these chemicals are harmful, and that more research is needed to understand their effects.

Many scientists and campaigners have linked increased incidence of health effects such as cancer, obesity and fertility problems with increased exposure to certain chemicals in our environment.

However, it is difficult for scientists to prove or disprove that endocrine disrupting chemicals cause higher rates of such illnesses.

It should be noted that in addition to the potential human health risks, endocrine disrupting chemicals are thought to cause damage to wildlife as well.

Did you know?

Foetuses, babies, infants and children are considered to be most at risk to the potential harmful effects of endocrine disruptors. This is because they are still developing and growing, and the hormone system is central to this process.



Did you know?

Sometimes chemicals are purposefully designed to interact with the hormone system. For example: the synthetic oestrogens used in the oral contraceptive pill mimic natural oestrogen.

Why is there so much uncertainty?

There are many factors that can contribute to illnesses and disorders, such as lifestyle, diet and genetics. It is difficult to single out one factor from all the others. The fact that we are exposed to such a huge variety of chemicals also makes it difficult to pinpoint one chemical (or group of chemicals) that may be causing a problem.

What is the evidence?

In animal studies, it has been shown that exposure to high levels of some endocrine disrupting chemicals can result in various health effects, including fertility and developmental issues.

This is a cause for concern, but does not necessarily mean that these chemicals are posing a risk to humans. This is because under normal circumstances, humans are not exposed to high levels of endocrine disrupting chemicals.

However, some scientists argue that these chemicals do not behave in the same way as other chemicals, and that they can cause problems even at the extremely low levels that we are exposed to day to day, and below levels at which no effects were shown. This is known as the 'Low Dose Hypothesis'.

A Controversial Debate

In 2012, an informal expert group of academics produced a review on the State of the Science of Endocrine Disrupting Chemicals (Bergman et.al.) This was published, although not officially endorsed by WHO. It concluded that the evidence supports the idea that exposure to endocrine disruptors plays a role in the increased incidences of reproductive diseases, certain cancers, behavioural problems such as ADHD and maybe even obesity and diabetes.

However, the report and its conclusions have not been universally accepted. A detailed peer reviewed critique of the report was recently published by another expert group of academics in Regulatory Toxicology & Pharmacology (Lamb et al 2014). This was very critical of the review by Bergman et.al. and raised questions about the conclusions (based on the methodology used). This expert group included two of the authors of the original 2002 WHO Report on this issue and was funded by industry.



Did you know?

Another reason for the uncertainty is that there is a normal process in the body called homeostasis that involves a series of mechanisms which ensure hormone levels are kept within normal ranges. It is argued that this process may prevent endocrine disrupting chemicals from having a significant adverse (or harmful) effect on the hormone system.

Endocrine disruptors and low dose effects

In traditional toxicology 'the dose makes the poison'. This means that there is a lower threshold below which a substance does not cause harm. For example, selenium is a naturally occurring chemical element that is essential to human health in trace amounts. However, at high doses selenium is toxic. In extreme cases, too much of the element can lead to cirrhosis of the liver, pulmonary oedema and even death.

However, some scientists suggest that endocrine disrupting chemicals do not obey the 'dose makes the poison' rule. Their view is that endocrine disruptors can cause health problems at extremely low doses, without any health problems necessarily being seen at higher dose levels. This is known as the 'Low Dose Hypothesis'.

These scientists contend that there is no safe level of endocrine disruptors as there is for other chemicals.

This 'Low Dose Hypothesis' continues to be controversial within the scientific community. The European Food Safety Authority and the Food and Drug Administration in the US agree that existence of low dose effects has not been conclusively established.

Suspected endocrine disruptors

Many suspected endocrine disruptors are used in the manufacture of everyday items. In many cases, the European Union has taken precautionary measures to reduce the exposure of the most vulnerable members of society. Other governments have also taken action to reduce exposure to these substances.



The table below provides details on some of these.

	Uses	What's being done?
Phthalates	Mainly used in PVC plastic. PVC is used in a wide range of items, including food packaging, toys, building materials and medical devices.	Several phthalates are now being phased out in Europe. The use of phthalates in toys has also been restricted.
Bisphenol A (BPA)	BPA is used in the manufacture of polycarbonate plastic which can be found in re-usable kitchenware (plates, mugs etc.). It is also used to produce epoxy resins in the inner lining of food and drink cans.	BPA is not permitted to be used in baby bottles in the EU. Several countries have put in place similar restrictions.
Parabens	Parabens are a group of chemicals used in cosmetics as preservatives. They prevent bacterial growth.	From January 2014, certain parabens will no longer be permitted in cosmetics. Others are still widely used in cosmetics. However, paraben-free cosmetics are also widely available.
Flame Retardants	Flame retardants are chemicals that are used in the manufacture of items such as furniture and electronics to make them less flammable.	There have been concerns about the health effects of some flame retardants which are suspected endocrine disruptors. The most potentially hazardous flame retardants have now been banned in the EU. Older furniture may still contain these.
Dioxins	Dioxins are chemicals that are made unintentionally and released into the environment in certain circumstances during combustion, e.g. from incinerators.	Our exposure to dioxins has decreased significantly over the last 20 years following the introduction of environmental legislation.
Pesticides	Pesticides are used to protect plants and crops from pests. They are important for our food security. However, quite a few chemicals that have been used as pesticides are suspected endocrine disruptors.	The latest EU legislation says that pesticides which are considered to be endocrine disruptors will not be approved for use.
Naturally Occurring	There are many naturally occurring chemicals which would fall under the definition of endocrine disruptor. Phytoestrogens are naturally occurring oestrogens, e.g. isoflavones which are found in soya beans.	Most of us probably regularly eat naturally occurring oestrogens. Some experts suggest that babies and infants should not be fed exclusively with soya milk.

What's being done?

As previously emphasized, there is still a great deal of uncertainty surrounding this subject. The risk (and its extent) is still largely unknown. However, in many cases where there is a perceived higher risk, action has been taken by the European Union and others to reduce our exposure.

Many scientists and campaigners have called on various governments to take precautionary action and restrict or ban the use of many suspected endocrine disruptors.

Other groups of experts have called on governments not to take precautionary action. This is because they feel that there are problems with the scientific evidence and that the banning or restricting of these chemicals would not be justified or proportionate.

Some experts are also concerned about the potential risks associated with replacing suspected endocrine disruptors with chemicals that we know much less about in terms of safety.

However, despite the controversy within the scientific community, it seems likely that in future further legislation will be put in place to ensure that the substances of concern are adequately regulated and the products on the market can continue to be safely used.

Further reading

See also the Environment Health and Safety Committee's notes on phthalates, bisphenol A (BPA) and parabens (www.rsc.org/ehsc).

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