Endocrine Disrupting Chemicals

**What are endocrine disrupting chemicals (EDCs)?**

An Endocrine Disrupting Chemical (EDC) or Endocrine Disruptor (ED) is any chemical that can interfere with normal hormone functions in humans and/or animals (1). The human endocrine system is a collection of glands which secrete different types of hormones, (including oestrogen) that regulate the body’s growth and metabolism, sexual development, and behaviour. Naturally occuring hormones are usually active at very low doses. A healthy endocrine system is essential to the normal functioning of the human body.

**Where are EDCs found?**

Some EDCs are present in our natural environment including phytoestrogens (found in plants), however, most EDCs are synthetic compounds (2). Almost 1000 compounds are known or suspected to be EDCs (3). Only a small fraction of these has been investigated in tests capable of identifying endocrine effects in intact organisms.

EDCs are present in a wide variety of products including plastics, pesticides, cosmetics, fragrances, food, kitchen cleaners, adhesives, paints, clothing, medical equipment, and toys.

EDCs are widespread in the environment, in rivers, estuaries, soil, sewage treatment systems, drinking water and in polluted air (4). Mostly they originate from human activity such as wastewater effluent, agricultural runoff; leaching from landfill and industrial pollution.

EDCs are commonly detected in wild-life and human body fluids and tissues (5). EDCs enter the human body principally through ingestion of contaminated food and water, or through skin from personal care products and exposure to soil or dust particles.

**Why should we be concerned?**

There is now a large amount of scientific data that strongly suggests that exposure to EDCs could be causing long term, and in some cases, irreversible damage to wildlife, our environment and human health. Many synthetic EDCs are persistent organic pollutants, such as polychlorinated biphenyls (PCBs), and decompose very slowly. Their concentrations increase constantly up the food chain and will be highest amongst those at the top (including humans).

The detrimental effects of EDCs amongst wildlife are well documented. They include reproductive disorders including “testicular feminisation” in fish (6,7), cancers, adrenal and bone disorders (8), reduced biodiversity, population decline (9,10,11), greater susceptibility to infection (12,13), neurotoxicity and thyroid problems (14,15). The demonstrable effects of EDCs in wildlife could be indicative of long
term effects in the human population. Whilst it is more difficult to demonstrate their effects, there is now strong scientific evidence that EDCs could be linked to a range of adverse health problems amongst humans. This is also the view of the UN environment agency, the World Health Organisation (16), the European Environment Agency (17) and many research scientists worldwide (18).

Some EDCs have been reported to cause adverse effects at very low dose levels. There is also concern that exposure to multiple EDCs can cause ‘combination effects’. Therefore, even when each individual chemical is present at a level below the threshold considered to cause harm, in combination with others they could form a hazardous cocktail in the human body (19,20).

Links to breast cancer

High levels of natural oestrogens, which stimulate growth and differentiation of mammalian epithelial tissue, are an important factor in breast cancer risk (21). Synthetic oestrogens are known to be associated with increased breast cancer risk (22). Hormone replacement therapy (oestrogen plus progesterone or oestrogen alone) used by postmenopausal women increases breast cancer risk significantly, as does the birth control pill (although to a much lesser degree).

Diethylstilbestrol (DES) a synthetic oestrogen used by pregnant women to prevent miscarriage, was the first synthetic EDC shown to affect human health. After several decades of use it was found that it enhanced breast cancer rates significantly in both exposed woman and their children (23). DES was withdrawn from use in the UK in 1974.

We remain exposed to many other EDCs which have been linked to breast cancer. For example, bisphenol A (24), phthalates (25,26,27,28,29), including monoethyl phthalate (30), parabens (31), a number of metals, known as “metalloestrogens”, (32), cadmium (33) and aluminium salts (34) have all been linked to adverse effects on the mammary gland.

There is also considerable evidence that exposure to EDCs during critical moments of development, for example in the womb, during early infancy, childhood or during puberty, could also increase the risk of developing breast cancers later in life (See full Background Briefing (https://www.breastcanceruk.org.uk/uploads/BCUK_Fact_Sheet_EDCs_(print).pdf) for references or separate webpage on In-utero exposures (https://www.breastcanceruk.org.uk/science-and-research/background-briefings/in-utero-exposures)).

Whilst it should be noted that not all scientists believe EDCs contribute to breast cancer incidence (35), the evidence that they play some part in increasing our vulnerability to the disease is starting to mount up.

The regulation of EDCs

The regulation of EDCs across the European Union is complex and inconsistent. The result is that EDCs continue to be used relatively widely across Europe in a range of different products.

Recently, the EU chemicals agency, ECHA, classified BPA and 4 phthalates as substances of very high concern (SVHC) due to their endocrine disrupting properties (36). Listing a chemical as an SVHC is the first step to more stringent regulatory measures governing its use and so is welcome news. Manufacturers will now have to notify ECHA of the presence of these compounds in all imported or manufactured items and must also inform consumers, upon request, when items contain these
substances. Inclusion on the SVHC list means that uses may be limited and subject to granting of a temporary, renewable authorisation.

Under the chemicals regulation REACH (EC 1907/2006) substances with endocrine disrupting properties for which there is evidence of probable serious effects to human health or the environment require authorisation and/or replacement. However, the vast majority of chemicals have never been tested for their endocrine disrupting properties and as a result very few are subject to the REACH authorisation procedure. A further complication is that currently, EDCs are treated differently under different EU legislation.

In an effort to introduce greater consistency in the authorisation of EDCs, the European Commission has been working on a proposal for EDC science-based criteria. A clearer definition of EDCs, based on sound scientific assessments, is the first step to ensuring EDCs are properly regulated and removed from products. Unfortunately the criteria is still not published, despite being several years overdue.

Breast Cancer UK is working with partners in Europe to press for a robust definition of EDCs and an EDC strategy which promotes the phase out of potential and suspected EDCs and their replacement with safer alternatives. See our EDC Policy page for more information on our work in this area.

**Breast Cancer UK position**

- Breast Cancer UK is calling for the regulation of chemicals to be strengthened and improved, based on the precautionary principle, to pro-actively protect public health;
- Hazardous chemicals, including EDCs, to be recognised as preventable risk factors for breast cancer in all UK National Cancer Plans;
- The extension of EU Article 60 (3) of the REACH Regulation, to ensure EDCs are, by default, classed as Substances of Very High Concern (SVHC), for which no safe thresholds can be determined;
- An increase in the proportion of cancer research funding for prevention and the investigation of the environmental and chemical causes of breast cancer.

**Further Resources:**


**References**

15. UNEP/WHO (2013). op.cit.,
16. UNEP/WHO (2013). ibid.,

A variety of environmentally persistent chemicals, including some phthalate plasticizers, are weakly estrogenic. (http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1519124/) Environmental Health Perspectives 103: 582-587.


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