

# Introduction

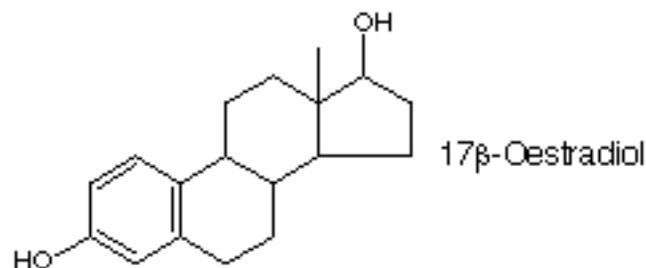
These pages are intended to provide an introduction to the effects of oestrogenic chemicals on man and the environment. They are aimed at anyone interested in the subject, and include references to other research and reviews for those interested in investigating the field further.

Some sections are more detailed than others, depending on how much time I have been able to spend on them. As time goes on I intend to increase and update the information available at this site. If you have any suggestions, please e-mail them to me, my address is at the base of this page.

These pages were last updated on the 5th of September 1995.

## Oestrogenic toxicity

Oestrogens are the hormones that influence the development and maintenance of female sex characteristics, and the maturation and function of the sex organs. The most important oestrogen is oestradiol (below, in the USA: estradiol, estrogenic etc.), and it is now becoming clear that a wide variety of both man-made and natural chemicals are capable of mimicking this hormone:



The strict definition of an oestrogenic chemical is a chemical which can imitate an oestrogen, normally 17-b-oestradiol. However, the phrase is also frequently used to refer to chemicals which are able to disrupt the hormonal systems of males or females. Where possible, the mode of action of the chemicals described in these pages will be defined.

Most of the evidence for oestrogenic toxicity has come from studies on animals or on cell cultures, including human cell culture. There is little data available on human effects, partly because of the unacceptability of doing deliberate experiments on humans.

## Oestrogenic chemicals

The chemicals which have oestrogenic effects can be divided into several groups, each of which are described on separate pages:

### [Phthalates](#)

These chemicals are very widely used as plasticisers, but they are also testicular toxins and can imitate oestradiol.

### [Alkylphenols](#)

Alkylphenols and their derivatives have a variety of uses, including as industrial detergents, and [in the USA](#) as domestic detergents. They have been shown to be oestrogenic in many systems.

### [Bisphenol A](#)

An ingredient of lacquers that are used to coat metal containers such as food cans. It has recently been shown to leach from these cans into vegetables, and it is oestrogenic to human breast cancer cell cultures.

## [Organochlorine pesticides](#)

Including Lindane, atrazine and DDT. Atrazine is the commonest pesticide found in UK drinking water, whilst DDT has been banned in the developed world for many years. Recent evidence suggests that they may aggravate breast cancer, and DDT metabolites have recently been shown to block the action of male hormones.

## [Polychlorinated biphenyls \(PCBs\) and Dioxins](#)

Dioxins are often produced during incineration, and also by some industrial processes, such as the production of chlorinated hydrocarbons and paper production. PCBs were used in electrical equipment such as transformers, but were banned some years ago. However, a large quantity of PCBs are still around in transformers and capacitors.

## **Others**

A variety of other chemicals have also been shown to have oestrogenic effects, including the dye phenol red and the fungicide vinclozolin.

## **What could be the effects on humans?**

### **Men**

[Sperm counts are known to be falling and testicular cancer is increasing](#)

### **Women**

Higher than normal oestrogenic activity could affect ovarian and oviduct function and fertility, and could encourage proliferation of uterine and breast tissue leading to cancer. There is specific evidence suggesting that [organochlorine pesticides](#) may make breast cancer worse .

## **What is being done about it?**

The regulatory authorities in many countries are beginning to be concerned about these chemicals, and have held a variety of meetings in the past few years. In recent months there have been international scientific workshops convened by the Danish Environmental Protection Agency, the German Federal Environment Agency and the United States Environmental Protection Agency. In the UK the Government's Department of the Environment commissioned a [report](#), which has just been published. The line coming out of most Governments is that more research is needed to provide evidence of human harm. As far as I know, no Government has yet banned a chemical because of its oestrogenic effects on humans (excluding pharmaceuticals such as diethylstilberol).

## **What can an individual do?**

- If possible, use products that do not contain oestrogenic compounds, e.g. chocolate bars from Mars (avoiding phthalates), or, in the USA, detergents that do not contain alkylphenol ethoxylates.
- Ask companies whether their products contain oestrogenic chemicals, e.g. ask the big food

- companies if their packaging products leak phthalates (many companies now have free helplines)
- Write to chemical companies, asking whether they are producing alternatives to oestrogenic compounds
  - Write to your Government or elected representative to ask what they are doing about this issue - if anything.

## A personal view

I believe that many of the chemicals suspected of having oestrogenic effects on humans should be phased out. In addition to the possible effects on human health, evidence of damage to other organisms can also be used to justify banning chemicals, as has been done in the case of damage to whelks from the use of tributyl tin. One problem has been that many Government statements have treated the chemicals as one big group, rather than looking at each chemical separately, establishing whether there are alternatives available, and then deciding whether to phase them out. As I made clear in my two [letters](#) to the press following the publication of the latest [UK report](#), I believe many of the suspect chemicals could, and should, be phased out now. Others may take longer, but it should be made clear that all the suspect chemicals are 'on trial', and the chemical industry should be encouraged to develop replacements. These replacements should be:

- Readily biodegradable, both in the environment and in the body
- Lipophobic if possible, so they do not accumulate in fat
- Non-oestrogenic when tested in cell culture

Too many chemicals in current use have not had adequate toxicology testing and badly need to be replaced. This is where the chemical industry should be concentrating its efforts, and they'll be plenty of profit available for those companies that do manage to produce safer alternatives.

## Other WWW sources of information

I don't know of any other sites covering oestrogenic substances at the moment. The best European sites I've found for environmental information and links to other sites are those at [Friends of the Earth \(England, Wales and Northern Ireland\)](#), and at [Greenpeace International](#). A good site for UK environmentalism is run by [Nick Fiddes](#).

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The material in these pages has been written and produced by Dr Michael Warhurst, an Environmental Chemist at the [University of Edinburgh](#), Edinburgh, UK (brief CV [here](#)). Every effort has been made to ensure the accuracy of the information, but no liability is accepted for any errors. It would be appreciated if any reproduction of information from these pages is also accurate and includes a citation of this work or the original source. This project is not relevant to my research post, so I have limited time to devote to these pages, however if you find any errors, research that I have missed, or have suggestions for this site, please e-mail the details to me: [Michael.Warhurst@ed.ac.uk](mailto:Michael.Warhurst@ed.ac.uk)