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Position Paper

Environmental Oestrogens and Endocrine Modulators

The Issue

Some recent scientific papers suggest that certain chemicals may exert hormone-disrupting effects on humans and animals, leading to various health effects, including male infertility, birth defects and cancer. The chemicals alleged to be involved include some plastics additives, lubricants, pharmaceuticals and agrochemicals. This controversial hypothesis - an area of considerable scientific uncertainty and debate - is also the subject of a new book. *Our Stolen Future - Are We Threatening Our Fertility, Intelligence and Survival ?* by Dr Theo Colborn, Dr John Peterson Myers and Dianne Dumanoski has attracted significant media attention in the US. It was published in Europe during May 1996. Greenpeace has attempted to capitalise on the European launch by publishing a report *Taking Back Our Stolen Future - Hormone Disruption and PVC Plastic*.

Key Messages

The European chemical industry's products are safe if handled correctly. Before new products can be marketed, they must pass a systematic and detailed checking procedure, including physical, toxicological and ecotoxicological tests.

The "oestrogen hypothesis" is an unproven theory. *Our Stolen Future* is largely speculation, based on some very inconclusive data. Much published research contradicts the authors' theories.

The chemical industry takes this hypothesis seriously and is supporting independent research. A task force has been set up within the European Chemical Industry Council (CEFIC) to co-ordinate an industry-wide effort to address possible endocrine mimics.

What is an Oestrogen?

Oestrogen is a female hormone, which plays a role in sexual maturation in many animal species, including humans. It is found in both females and males. Too much or too little oestrogen at critical stages of development can lead to reproductive disorders.

What are Oestrogen Mimics?

Studies of cell behaviour suggest that many substances may mimic the action of hormones such as oestrogen. Examples include natural and man-made compounds such as microbial and plant steroids, some organochlorine pesticides (DDT, dieldrin), pharmaceuticals (diethylstilbestrol) and PCBs. It has been suggested that several other products have weak oestrogenic properties, such as bisphenol A, phthalate esters and certain alkylphenols.

Concerns have been raised that man-made chemicals in the environment could bind to oestrogen receptors in man and wildlife, causing health effects. Despite receiving wide media coverage, this so-called "oestrogen hypothesis" remains a hypothesis which has still to be proven or discounted.

What are the Key Sources of Exposure?

For humans, diet is a major source of both natural and man-made compounds with possible oestrogenic effects. Increased consumption this century of dairy products, meat and some processed plant products - all of which contain natural oestrogens - has led to increased exposure to natural compounds. Overall, our food is believed to contain several orders of magnitude more natural oestrogens than man-made ones. Other possible sources of exposure include pharmaceuticals (including oral contraceptives and hormone replacement treatments), natural or man-made chemicals in the environment, and possibly certain plastics.

For wildlife, exposure is also of environmental or dietary origin. Persistent Organic Pollutants such as some chlorinated pesticides, PCBs and dioxins have been alleged to be the cause of reproductive disorders.

What is the Scientific Evidence?

Only scientific hypotheses prevail in this area. The specific theories presented by the authors of *Our Stolen Future* are unproven. Indeed, independent scientists have published research, which contradicts the theories, causing them to disagree with the claims made in this book.

To clarify this issue, thorough scientific investigation is merited. A basic principle worth emphasising in this debate is the need for a good risk assessment process to evaluate individual products. The fact that naturally

occurring compounds found in the environment can act as oestrogen mimics must be taken into account in this evaluation.

Some Recent Scientific Studies

- The total oestrogenic activity of man-made compounds in the environment is 40 million fold lower than that of natural compounds in the average diet (Safe, Environmental Health Perspectives, 103, 346-351 (1995))
- In the US, rates of infertility have remained constant during the past three decades (at 8-11 % of all couples) and male infertility has accounted for around one-third of cases. The available data show no decline in male fertility (R J Sherins, New England Journal of Medicine, 332, 327-328 (1995))
- Data collected in the US between 1938 and 1977 shows no evidence for a decline in sperm counts or semen quality (F M Wittmaack, Fertility and Sterility 91, 477-479 (1992))
- The recent dramatic increase in prostate cancer in the US is the result of increased screening (A L Potosky et al, Journal of the American Medical Association, 273, 548-552 (1995))
- Much of the recent increase in cancer rates can be explained by known factors. Improved detection appears to account for most of the increase in breast cancer among young women (S S Devesa et al, Journal of the National Cancer Institute, 87, 175-182 (1995))
- The hypothesis that human exposure to environmental levels of DDT, PCBs or other organochlorines would cause an increase in breast cancer, endometrial cancer or endometriosis is not supported by existing in vitro, animal and epidemiological evidence (U G Ahlborg et al, Critical Reviews in Toxicology, 25, 463-531 (1995))

What do Others think?

- Our Stolen Future is "based on lousy science" - Prof Bruce Ames, Dept of Biochemistry and Molecular Biology, University of California at Berkeley.
- "With its selective use of data, dubious logic and relentless hype, Our Stolen Future ends up doing a serious disservice to its own cause" - Business Week (April 8, 1996).
- The book is "a hypothesis masked as fact" - Michael A gale, Robert Wood Johnson Medical School, New Brunswick, New Jersey.
- "Existing information is insufficient to resolve whether emerging fears are well founded ... long-term research programmes will be necessary to obtain answers" - Harvard Center for Risk Analysis.
- "The relationship (between environmental oestrogens and reproductive ills) remains debatable and unproved" - Prof Stephen Safe, Texas A&M University.
- "Exposure to oestrogenic chemicals in the environment may be contributing to the increase in reproductive problems in men.

However, there is no conclusive evidence to show that this is correct. We therefore believe that it is premature to call for a ban on these chemicals before more research is done to establish whether or not there is any factual basis for this in humans" - Prof Niels Skakkebaeck, Rigshospitalet, Copenhagen; Dr Richard Sharpe, MRC Reproductive Biology Unit, Edinburgh; and Dr John Chr Larsen, Danish National Food Agency.

- "Environmental pollution containing oestrogen-like effects cannot be blamed for the increase in testicle cancer (in Norway) among men or breast cancer among women. There is no scientific evidence to support such claims" - Prof Tore Sanner, Oslo Radiumhospitalet, Norway.

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