



Recent coverage of women who have elected to have their healthy breasts removed in a desperate bid to avert breast cancer emphasizes the great fear that this disease generates. And no wonder, breast cancer is a killer: each year in Britain over 30,000 women are diagnosed with breast cancer and 15,000 will die of the disease.

The women who underwent “preventive mastectomy” knew they were prone to a particularly deadly type of breast cancer that develops early in life (breast cancer is rare in women under 50), spreads swiftly and is inherited. They had lost sisters, aunts or mothers to the disease.

Advances in medicine mean that women can now be screened for the genetic errors that might put them at risk from this form of breast cancer, but although heralded as a medical breakthrough, only five percent of all cases of breast cancer are caused by such genetic misprints. Even when all other risk factors are taken into account, nearly two-thirds of all cases of breast cancer go unexplained.

Scientists thus started looking for the missing pieces in the breast cancer puzzle: they turned to our environment and pinpointed certain chemicals—substances that mimic the natural hormone estrogen—that might be to blame.

Environmental estrogens are hardly a new health scare. Fifty years ago it was first realized that the pesticide DDT (dichlorodiphenyltrichloroethane) renders

Environmental Estrogens: are they harming our health?

sheep and minks infertile. DDT was subsequently banned from use. Up until the '70s, millions of women had taken a drug called diethylstilbestrol (DES) to prevent miscarriage—and there has subsequently been a higher incidence of reproductive cancers and infertility in their children than those of women who did not take DES. What DDT and DES have in common are estrogen-like effects on the body—they are known as xenoestrogens.

The evidence is amassing that these might not be the only xenoestrogens we are exposed to. Chemicals in fuels, paints, insecticides, detergents and plastics may contain chemicals with similar actions.

XENOESTROGENS AROUND US

There are both “good” and “bad” types of xenoestrogens. This list of potentially “bad” estrogens makes disturbing reading. It includes: compounds in exhaust fumes and industrial chemicals (e.g. dioxin and PCBs); chemicals called APEs (produced in sewage plants by the bacterial digestion of household detergents and toiletries) which are added to some plastics and weed killers; chemicals called phthalates that make plastics flexible and are used to make paints and glues and organochlorine pesticides (DDT, aldrin). Most of the synthetic estrogens from the birth control pill are excreted into the urine and so end up in the environment. As a sobering figure, it has been suggested that 300,000 tons of APEs are used by industry every year, and more than half this will end up in our rivers and lakes.

The “good” xenoestrogens are found in vegetables such as broccoli, cauliflower, brussel sprouts and soy products. These natural xenoestrogens counteract the harmful action of bad estrogens in the body and have some anticancer action. The critical difference between the “good” and “bad” xenoestrogens depends on their

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different effects on estrogen production. Two types of estrogen are produced in the body; one has a stronger (and potentially more harmful) action on the body—only one of the two can be made at any time. The “bad” xenoestrogens appear to instruct the manufacture of more of the stronger estrogen, while the reverse applies to the “good” xenoestrogens. “Good” xenoestrogens can, in this way, reverse the action of the “bad” estrogens in the body.

A ROLE FOR HORMONES IN BREAST CANCER

In order to grasp why scientists think xenoestrogens might increase the risk of breast cancer, it is first necessary to understand a little about how breast cancer arises.

Many of the cells in our body—such as those of the skin and bone—are continually dividing and multiplying to allow for growth and repair. In women, specifically during the menstrual cycle, the cells lining the uterus multiply to provide a favorable bed in which a fertilized egg can settle and grow. The cells that line the milk ducts in breast tissue also multiply each month; indeed, many women get noticeably swollen and tender breasts just before menstruation. In both cases, the proliferation of cells is controlled by hormones—predominantly estrogens.

Each time a cell divides, however, it runs the risk of creating mistakes in its genetic blueprint. On these rare occasions, the errors may disrupt the cell’s multiplying machinery—releasing the “brake” in the system that keeps a check on the rate at which cells are allowed to divide. If the self-restraint is lost, cells grow wildly and a tumor develops. (Note: on most occasions breast lumps are NOT cancerous, but you should always get them checked.)

Since cells in the breast multiply on such a regular basis, they are at greater risk of accumulating the genetic errors that can lead to cancer. Estrogen is the hormone that encourages breast cells to grow: women who are exposed to estrogen for a long time thus have a greater chance of developing breast cancer. If you started your periods early, entered menopause late, had no chil-

dren, don’t breast feed or have been on the Pill for a long time, you have a greater chance of developing cancer. The incidence of breast cancer in women over 50 is, indeed, much higher than in younger women. The risk is also increased by a high-fat diet (fat retains estrogen in the body) and drinking too much alcohol (alcohol stimulates the body to produce estrogen). The finger points squarely at estrogen being a culprit in breast cancer.

By the same argument, xenoestrogen might increase the risk for breast cancer. Xenoestrogens could do this by mimicking the action of natural estrogens or by interfering with the way they normally function. Alternatively, some xenoestrogens are thought to directly damage the cells’ genetic information, and yet others may encourage the growth of tumors by increasing their blood supply.

THE EVIDENCE AGAINST XENOESTROGENS

But what evidence is there that xenoestrogens are actually contributing to the rising incidence of breast cancer? The first question to ask is whether women with breast cancer had absorbed more of the miscreant substances than those free of the disease. Four out of the six studies on women showed that there were indeed increased levels of the PCBs and DDT in the breast tissue or blood of those suffering from breast cancer. In the other two studies, the levels were identical. There has been much criticism of the studies showing a positive correlation—the question of a link between environmental estrogens and breast cancer is far from being conclusively settled.

More anecdotal evidence against xenoestrogens comes from looking at the incidence of breast cancer among different races. Asian women are five times less likely to get breast cancer than their European, American and African-American counterparts—perhaps diet, rich in vegetables and thus “good” xenoestrogens, is the basis for this difference. Indeed, these women appear to produce more of the “weaker” estrogen described above. The Japanese, too, eat a lot of soy foods, which may underlie the low incidence of most cancers in this population.

A THREAT TO MALE FERTILITY

Ironically, it has been feared that environmental estrogens might be wrecking havoc on male fertility that has raised, once again, the ugly question about the risk associated with xenoestrogens. It was the males of the animal kingdom that first raised the alarm. Over ten years ago, fishermen started catching fish with rather ambiguous genitalia. A British scientist placed cages of male rainbow trout at various spots in British rivers: those fish placed in areas close to sewage outlets started

producing egg protein usually made only by female trout. Across the Atlantic, in Florida swamps, male alligators started growing abnormally small penises and became infertile after a massive accidental spillage of a DDT-like compound. In California, male gulls started shunning females and deserting their nests—the nesting area was found to be contaminated with PCBs—and in Massachusetts, terns laid eggs in which the male embryos appear to be “intersex,” having characteristics somewhere between male and female.

The human male may not be exempt. In the past year, the medical press have claimed that more men than ever are contracting testicular cancer, and more boys are being born with misshapen penises or testicles. Today's male, it seems, may also be less fertile than his predecessors; one study suggested that Danes produce only half the sperm they did 40 years ago. Although other studies have contradicted this finding—saying, even, that fertility of men is higher than it has ever been—it is of note that men have become the cause of infertility in 1 out of 4 infertile couples, compared to 1 in 10 couples in past years. Is this the start of the feminization of males?

IN DEFENSE OF XENOESTROGENS

In theory, xenoestrogens might be causing the current epidemics of breast cancer, testicular cancer and male infertility worldwide.

But many do not favor this view. First, they will point out that many compounds asserted to be xenoestrogens do not, on testing, have such activity. Second, they will argue that women on the Pill or hormone replacement therapy take each day much higher levels of estrogens that they would get from the environment. Some synthetic estrogens, it seems, may even act as “good” xenoestrogens: less breast cancer was reported in women in Seveso, a region contaminated by an industrial pollutant which has “good” xenoestrogen properties, despite being highly toxic and causing immediate widespread illness and the deaths of an estimated 70,000 animals. With regard to the “chemical castration” of men, it is known that the critical point at which the “maleness” of a child is determined is in the womb; here, unavoidably, the baby boy is bombarded with his mother's hormones, which during pregnancy are much higher than he would confront outside the womb.

THE XENOESTROGEN RISK—FACT OR FICTION?

Amid the “scare” reports from the media and environmental agencies, the scientific evidence against xenoestrogens seems scant. But more questions have been raised than answered. Birds and animals do, it seems, directly suffer the effects of human chemical

waste; as humans are at the top of the food chain, we will inevitably be exposed to whatever is harming birds and animals. Xenoestrogens are very stable substances and remain with us for decades; although DDT was banned in the '70s, it is likely that we all have some in our bodies. Xenoestrogens accumulate in body fat—who knows what their cumulative effects may be?

No one has, as yet, investigated whether infertile men have been exposed to higher levels of xenoestrogens than fertile men. New techniques to test for estrogen-like chemicals are needed, as existing ones are just not sensitive enough. More worryingly, it appears that ex-

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posure to a combination of xenoestrogens may have a much more damaging effect than contact with them individually—this is closer to the situation we find ourselves in now with the diversity of plastics, detergents, fuels and paints around. We need a better understanding of how xenoestrogens work—perhaps traces of these synthetic compounds are significantly more disruptive than larger amounts of the “real thing.”

These are pressing issues for all women. In the past 10 years, the incidence of breast cancer has escalated—a rise not accounted for totally by better screening programs and education. However, although diagnosis has improved, life expectancy has improved only marginally; there have been no new advances in the treatment for breast cancer over the last decade.

If environmental estrogens are even partly to blame, we need to be protected from them; if they contribute to just a third of all breast cancers, it might be possible to spare 6,000 British women each year the trauma of the disease, not to mention over 3,000 lives.

Many of the xenoestrogen-containing compounds mentioned here are not banned from use, but there are plenty of chemicals around us that were never tested. There seems little room for the complacency shown by industrial and government bodies. We have much to learn from history: only 46 years ago, amid much disbelief, two brave researchers first suggested that there might be a link between smoking and lung cancer. Today we know this is as fact—nearly 100,000 people die each year in Britain as a consequence of their habit. We may not fully appreciate the risks of environmental estrogens, but we cannot afford to ignore their potential.

WHAT YOU CAN DO

1. Change your diet: Try to reduce your intake of ani-

Glossary

Bioaccumulate: The process by which substances accumulate in animal tissues. When the tissue is eaten by another animal, the accumulated substances pass into the second animal and continue to accumulate. DDT sprayed on pasture passes into grazing cows and then into people.

DDE: A breakdown product of DDT found in the human body.

DDT: An estrogenic organochlorine pesticide that was widely used until it was found to bio-accumulate. DDT was first reported in human milk in 1945. We probably have DDT in our bodies. Even penguins in the Antarctic have DDT in their blood.

DES: A synthetic estrogen that was prescribed to pregnant women for nearly 30 years, mainly to prevent miscarriage, but the effects were fertility problems and an increased risk of cancer.

Dioxins: Highly toxic byproducts of organochlorine products and incineration. Dioxins bioaccumulate and disrupt hormone activity even in extreme small quantities.

Endocrine system: Cells and glands in the body that secrete hormones.

Estrogen: Female sex hormone important in menstrual and reproductive functions.

Estrogenic: Having an estrogen-like effect.

Hormone: A chemical messenger that regulates bodily processes. Hormones are produced by the endocrine system and transported by the circulation.

Isomer: A chemical may exist as several forms or isomers, where the atoms that make up the chemical are present in the same number and type but in a different arrangement.

Lindane: An estrogenic organochlorine insecticide used in agriculture, veterinary medicine, indoor pest control and for killing human head lice. Carcinogenic in test animals, lindane can cause spontaneous abortions, bioaccumulates, and is linked with breast cancer.

Organochlorines: Synthetic chemicals that contain combinations of carbon, hydrogen and chlorine. Organochlorines are found in many pesticides, plastics, solvents, detergents, and other everyday products. Organochlorines may be toxic in themselves, and/or they may be estrogenic, or they may interfere in the way that natural estrogen functions in the body.

PCB: An estrogenic organochlorine that was used in many industrial processes until its toxic effects became apparent. PCBs persist in the environment and bioaccumulate in the food chain. PCBs are extremely difficult to destroy, requiring high-temperature incineration.

Pesticide: A substance used to kill or repel pests.

PVC: An organochlorine plastic. Its manufacture is one of the main sources of dioxin in the UK environment. Widely used in packaging.

Xenoestrogen: Estrogen or estrogenic substance introduced into the body from outside, not produced by the endocrine system.

mal fat: eat less cheese, butter, full-fat milk and meat.

2. Eat more whole grains, cereals, soy foods, fruit, green vegetables such as broccoli, cabbage and spinach, and red and yellow vegetables, such as carrots.

3. Processed foods often contain hidden fats—look at the label.

4. Be careful not to lose weight too quickly—pollutants released from fat could burden your liver.

Avoid organochlorine products:

1. Do not buy home or garden products, such as wood treatments and head lice preparations which contain lindane.

2. Minimize use of synthetic chemicals as a precaution. Many common products have not been tested for effects on hormones and persistence in the environment.

3. Read labels on products: avoid chlorine-based products, many of which have *chloro* in their names.

4. Buy in bulk to reduce the amount of packaging.

5. Use less plastic wherever possible.

6. Do not burn rubbish, especially plastic and painted wood.

Be careful of hormonal treatments:

Regard hormone-based treatments (including oral contraceptives and hormone replacement therapy) with healthy skepticism and explore alternative treatments.

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