A lengthy new report from the National Institute of Environmental Health Sciences [NIEHS], a federal agency, describes serious deterioration of the male reproductive system in many regions of the world and suggests it may be caused by environmental chemicals that interfere with hormones.[1] The report begins by describing negative trends in men's reproductive health, then describes similar findings among wildlife, and finally reviews evidence that certain chemicals could cause the observed problems. The report ends by describing a research agenda that would help scientists understand these problems better and would provide additional support for public health officials taking action to protect future generations.

Here is part of the summary provided by the authors of the new study:

"Male reproductive health has deteriorated in many countries during the last few decades. In the 1990s, declining semen quality has been reported from Belgium, Denmark, France, and Great Britain. The incidence of testicular cancer has increased during the same time. Incidences of hypospadias [a birth defect of the penis] and cryptorchidism [undescended testicles] also appear to be increasing. Similar reproductive problems occur in many wildlife species. There are marked geographic differences in the prevalence of male reproductive disorders. While the reasons for these differences are currently unknown, both clinical and laboratory research suggest that the adverse changes may be inter-related and have a common origin in fetal life or childhood. The authors say they strongly suspect that the common origin is exposure to environmental chemicals (pesticides, plastics, detergents, and others) that interfere with hormones.

The authors emphasize that chemicals that interfere with hormones may not be the ONLY cause of the recent decline in male reproductive health. Other chemicals may poison men by a mechanism that does not involve hormones: "For example," they say, "some chemicals that are now known as occupational toxicants were shown to affect the semen quality of the workers through a toxic action on the gonads, without any apparent estrogenic effects." Estrogen is the main female sex hormone. [For a superb, clear, down-to-earth discussion of both male and female reproductive health, see GENERATIONS AT RISK: HOW ENVIRONMENTAL TOXINS MAY AFFECT REPRODUCTIVE HEALTH IN MASSACHUSETTS from Greater Boston Physicians for Social Responsibility, which we will review in the next few weeks. Anyone concerned about these problems should own a copy of GENERATIONS AT RISK.[2]]

Sperm Quality

The authors review recent studies showing declining sperm quantity and quality among men in many countries, and a few studies that show no such declines. In general, they see declines in urban areas and no declines in rural areas. Rural France and Finland, in particular, seem not to be experiencing a sperm decline. Still, the authors summarize the situation as "decreasing sperm quality worldwide" (pg. 743) and they see an urgent need for understanding the causes: "Follow-up of semen quality is very important, since the sperm concentration has decreased drastically during the last two generations and the declining trend appears to be continuing." (pg. 760)

Testicular Cancer

Here, too, there are geographical differences. Increases in testicular cancer are apparent in the U.S., England and Wales, Scotland, the Nordic and Baltic countries, Australia, and New Zealand. Finland seems to be an exception. The authors suggest that good, steady sperm quality and the low testicular cancer rate in Finland, a mostly rural country, may be somehow linked. Within countries there are differences; whites in the U.S. are three times as susceptible to testicular cancer as are African Americans.

Conclusion: "...it is obvious that there is a worldwide trend toward an increased incidence of testicular cancer...", the authors of the report conclude. (pg. 743)

Conclusion: "Other disorders of the male reproductive tract may also be increasing in incidence, with several European countries reporting a progressive rise in hypospadias [a birth defect of the penis]... and an apparently emerging trend toward an increasing incidence of testicular maldescent [undescended testicles]." (pg. 768)

Similarly, male reproductive problems can be observed among wildlife. Gastropods (periwinkles and whelks), best known for the sea shells they live inside, worldwide have shown sex reversal because of exposure to a compound of the metal tin. Tributyltin, widely used in paint to keep seaweed and barnacles from growing on the bottoms of boats and ships, is now known to change male gastropods into female gastropods. (pg. 748)

Alligators and turtles have had their sex lives disrupted by exposure to pesticides in Florida and in laboratory experiments. The sex of turtles is normally determined by the temperature at which their eggs incubate. Eggs incubated at 26 degrees Celsius (78.8 Fahrenheit) turn out 100% male. However, eggs incubated at male-producing temperatures but painted with PCBs produce female turtles instead. (pg. 749) PCBs are industrial chemicals, banned in this country in 1976, but still found everywhere in the environment. The same PCB-induced sex reversal can be seen in alligator eggs. Furthermore, alligators in pesticide-contaminated lakes in Florida have such small penises that they are sexually incompetent --a result of exposure to hormone-disrupting pesticides. (pg. 749)

Male fish exposed to hormone-disrupting chemicals discharged by sewage treatment plants begin to produce a protein called vitellogenin, which is normally only produced by female fish as a step toward making eggs. Male fish normally produce vitellogenin but in England and Wales male fish produce vitellogenin when they are caged in river waters below sewage treatment plants. (pg. 750) The river water has become estrogenic.

Florida panthers, which get a large dose of hormone-disrupting chemicals by eating raccoons (who get these chemicals from the fish they eat), have undescended testicles, poor sperm production, and other reproductive problems. (pg. 751)

The NIEHS report then reviews the experience of male children whose mothers were exposed to DES (diethylstilbestrol). DES is a synthetic sex hormone. Between the late 1940s and the early 1970s, DES was given to 5 million pregnant women to prevent abortion and pregnancy complications. The sons of these women thus became a "natural experiment," offering an opportunity to study the effects of hormone exposure to hormone-disrupting chemicals while in the womb. Here is the authors' summary: "Exposure to DES during pregnancy results in increased risk for several male reproductive disorders, such as cryptorchidism [undescended testicles], urethral abnormalities [including hypospadias, pg. 753], epididymal cysts [cysts in the sperm reservoir of the testicle], and testicular hypoplasia [lack of growth of the testicles, i.e., small testicles]. In addition, the semen quality of DES sons is worse than that of controls. Incidence of testicular cancer is approximately doubled among DES sons compared to the general population but whether this represents a true increase of the cancer risk is equivocal [i.e., not certain]." (pg. 754)

In sum, the authors say, "Reproduction is a major concern because disturbances of this process rapidly threaten populations as a whole. The male reproductive system is very sensitive to the influence of an excess of estrogen; therefore, estrogenlike effects in the environment are a primary suspect for causing the increased reproductive disorders of men and wildlife animals." (pg. 760)

And: "Male reproductive health has received remarkably little
attention considering that subfertility affects 5% or more of men and that prostatic hypertrophy [enlargement of the prostate gland] or cancer is a major problem for older men. It is now evident that several aspects of male reproductive health have changed dramatically for the worse over the past 30 to 50 years. The most fundamental change has been the striking decline in sperm counts in the ejaculate of normal men; recent evidence from Paris indicates that this decrease amounts to about 2% per year over the last two decades. The result is that many otherwise normal men now have sperm counts so low that their fertility is likely to be impaired....

"These observations suggest that male reproductive health has declined progressively since the Second World War as a result of changes in environmental or lifestyle factors. While the etiologies [causes] underlying these apparent changes are currently unclear, both clinical [i.e., human] and laboratory [i.e., animal] research suggests that all of the described changes in male reproductive health appear interrelated and may have a common origin in fetal life or childhood. This means that the increase in some of the disorders seen today originated 20 to 40 years ago, and the prevalence of such defects in male babies born today will not become manifest for another 20 to 40 years or more.

"Trends in the reproductive health of species other than man also raise the possibility of environmental factors as partial etiologic [causal] contributions in a decline noted in male reproductive health of wildlife." The report then mentions the Florida panther, the male fish in England and Wales producing vitellogenin, "fish-eating birds in the United States" whose "male hatchlings were apparently feminized," and the male turtles turning into female turtles because of PCB exposure of their eggs in the laboratory. And: "A recent report of lactating male fruit bats suggested that the males were, in some way, exposed to a female sex hormone." In sum, "Taken together, this growing body of evidence suggests that environmental factors that resemble female sex hormones may be having an adverse effect on the reproductive capacity and well being of diverse species...."

"The reproductive health trends in men are consistent with this hypothesis. While exposure levels to estrogenic chemicals are not at all well known for humans, the large number of chemicals in numerous environmental categories suggests adequate availability. For example, environmental chemicals reported to be estrogenic include, but are not limited to, some ubiquitous [i.e., found everywhere] chlorinated hydrocarbons, such as PCBs and DDT; some products of detergent and surfactant manufacture, such as the alkylphenols; and some products released from plastics such as bisphenol-A and some phthalates. Many other compounds in our natural and synthetic [human-created] environment demonstrate estrogenic activities and more are being discovered as the search continues." (pgs. 768-769)

--Peter Montague (National Writers Union, UAW Local 1981/AFL-CIO)


CORRECTION
In the electronic edition of RACHEL'S #513, we wrote: "One set of nuclear long johns contained enough plutonium to provide one trillion (one million million) 'maximum permissible lung burdens' of plutonium..." It should have said "...one trillion (one million million)...

Descriptor terms: niehs; male reproductive health; testicular cancer; hormone disrupters; wildlife; sperm count; sperm quality; hypospadias; cryptorchidism; undescended testicles; birth defects; teratogens; pesticides; plastics; detergents; estrogen; france; finland; gastropods; tributyltin; alligators; turtles; pebs; penis size; vitellogenin; florida panthers; des; prostate cancer; children; alkylphenols; phthalates; bis-phenol-A; DDT; organochlorines; Rachel's Environment & Health News is a publication of the Environmental Research Foundation, P.O. Box 160, New Brunswick, NJ 08903-0160; Phone: (732) 828-9995; Fax: (732) 791-4603; E-mail: erf@rachel.org; http://www.rachel.org. Unless otherwise indicated, Rachel's is written by Peter Montague.