

Rachel's Environment & Health News

#323 - New Perspectives On Toxics -- Part 2: Male Reproductive System Is Harmed By Toxic Exposures February 02, 1993

The ancient Greeks observed that men heavily exposed to lead became sterile. But this knowledge was not passed to the Romans, who stored their drinking water and their wine in lead-lined containers. Romans also added lead to some of their drinks as a sweetener. Based on examination of lead in Roman bones, some historians conclude that the Roman upper classes probably couldn't reproduce themselves, contributing to the fall of Rome.[1]

Until very recently, scientists paid little attention to the effects of environmental agents on human reproduction. The modern period began in 1941 when blindness, deafness and death were reported among the offspring of pregnant women exposed to rubella (German measles). The thalidomide catastrophe in 1954-1961 brought home the potential dangers of chemicals, in this case a prescription drug. (See RHWN #322.) The birth of nearly 20,000 defective children following a Rubella epidemic in the early 1960s confirmed the association of environmental factors and birth defects.[2]

As recently as the early 1970s, few state governments were maintaining records of birth defects. In 1974 the federal government established the first national register of birth defects, monitoring hospital records that account for about 15% of all births.[3] Even today this program monitors only birth defects observed in newborns, which probably represent only about a sixth of the total defects that actually occur because many defects do not become apparent for several years.[2]

As of 1980, approximately 200,000 birth defects were estimated to have occurred in the U.S., accounting for about 7 percent of all live births. In addition, more than 560,000 infant deaths, spontaneous abortions, stillbirths and miscarriages were recorded due to defective fetal development.[2]

In 1990, the federal Centers for Disease Control (CDC) reported trends in birth defects between 1979 and 1987 in the U.S. They looked at 38 specific defects and found that 29 of the 38 had increased, two had decreased and 7 had remained stable.[3] The largest increases (29 percent and 20.2 percent) occurred in defects of the heart; no doubt some of this increase is due to better detection methods. However, there was also a 9.6 percent increase in eye defects and a 2.7 percent increase in cleft lip, so it seems likely that real increases are occurring.

As we reported last week, the traditional view of birth defects highlights the role of women and disregards the role of men, even when there is good evidence showing men exposed to toxic chemicals father defective children. The traditional reason for ignoring such research is that, until recently, there has been no satisfactory theory to explain how male exposures could affect offspring, so a cause-and-effect relationship could not be established. The argument was that women are born with all the eggs they will ever have, so each egg can be exposed to toxins over a long period. Men on the other hand, produce new sperm constantly, so any individual sperm has only a brief opportunity to be exposed to toxins.

Another reason for ignoring the effect of toxins on male reproduction was the "macho sperm" theory, which said that only the fittest sperm were hardy enough to go the distance necessary to fertilize an egg.[4] According to this theory, defective sperm could never reach an egg to fertilize it, so men couldn't be responsible for producing defective children. Now research has shown that the female reproductive tract has ways of moving sperms along whether they are healthy or defective.

Researchers used to believe that there was an effective barrier between blood vessels and the tissues where sperm originates in the testes. It is now known that the barrier is not effective against many chemicals.

Then of course there's a cultural bias, reaching back to the Salem

witch trials, to blame women for trouble. "You don't have to be Sigmund Freud to figure out that there are cultural factors to say why we have paid so much attention to the female and so little to the male," says Dr. Devra Lee Davis, an epidemiologist with the National Research Council.

Research during the past decade has shown that there are two basic ways that chemicals can affect male reproduction.[5],6 Chemicals can directly affect the testes, where sperm originates. The numbers of sperm can be diminished, or some sperm can be damaged, or sperm may even carry toxins directly into the egg. Alternatively, toxins can attack the male nervous system, or endocrine system, affecting the flow of hormones that act as messengers regulating the complex chemical processes that must all work well for conception to occur.

No matter what the mechanism of damage may be, there is a growing body of evidence showing that male exposure to toxins can produce defective children. Here is a sampling:

** A nationwide study of 99,186 pregnancies in Finland showed an increased likelihood of spontaneous abortion if the father was occupationally exposed to rubber chemicals, solvents used in the manufacture of rubber products, solvents used in oil refineries, or ethylene oxide.[7]

** A study of 22,192 children born with birth defects in British Columbia showed that paternal occupation as a fire fighter was related to the occurrence of heart defects. Fire fighters are often heavily exposed to carbon monoxide and to polycyclic aromatic hydrocarbons (PAHs)--the nasty chemicals in smoke and soot.[8]

** A study of paternal occupation among 149 patients with Wilm's tumor (a childhood cancer of the kidney) showed that a significantly greater number of the fathers were exposed to lead on the job, compared to fathers of a control group of children without the disease.[9]

** A study of 6000 men in Finland showed that paternal exposure to organic solvents nearly tripled the likelihood of spontaneous abortion as a pregnancy outcome, compared to controls not exposed to organic solvents. Painters, wood workers (for example, carpenters in the construction, furniture industry and the boat industry) were found to be at risk. The solvent toluene stood out as a particularly bad actor in his study.[10]

** A study of anesthetists in the West Midlands region of England (half men, half women) showed that, during a 20-year period, 9.3% of their children were born with defects, and 31% of the anesthetists reported having trouble begetting children. Furthermore nearly all the children were born underweight. The gender of the anesthetists did not affect the likelihood of problems in their children, but female children seems to suffer greater birth defects.[11]

** A recent review of several studies of paternal occupational exposures in relation to childhood cancer in the offspring showed consistently that work in hydrocarbon-related occupations (the petroleum and chemical industries), especially exposure to paint, is associated with brain cancer. Male exposure to paint is also linked to leukemias in offspring.[12]

What does all this evidence mean? It means neither men NOR women can be safely exposed to toxic chemicals. Instead of banning women from the workplace, the workplace should be cleaned up.

--Peter Montague

=====

[1] S.C. Gilfillan, "Lead Poisoning and the Fall of Rome," JOURNAL OF OCCUPATIONAL MEDICINE Vol. 7 (Feb. 1965),

pgs. 53-[60.]60.

[2] Raymond D. Harbison, "Teratogens," in John Doull and others, editors, CASARETT AND DOULL'S TOXICOLOGY 2nd edition (N.Y.: Macmillan, 1980), pgs. 158-175.

[3] Larry D. Edmonds and Levy M. James, "Temporal Trends in the Prevalence of Congenital Malformations at Birth Based on the Birth defects Monitoring Program, United States, [1979-1987.]" MORBIDITY AND MORTALITY WEEKLY REPORTS CDC SURVEILLANCE SUMMARIES Vol. 39, No. SS-4 (December, 1990), pgs. 19-23.

[4] Sandra Blakeslee, "Research on Birth Defects Turns to Flaws in Sperm," NEW YORK TIMES (January 1, 1991), pgs. 1, 36.

[5] Lowell Sever and Nancy A. Hessol, "Toxic Effects of Occupational and Environmental Chemicals on the Testes," in J.A. Thomas and others, editors, ENDOCRINE TOXICOLOGY (N.Y.: Raven Press, 1985), pgs. 211-248.

[6] Harold Zenick, "Mechanisms of Environmental Agents by Class Associated With Adverse Male Reproductive Outcomes," in REPRODUCTION: THE NEW FRONTIER IN OCCUPATIONAL AND ENVIRONMENTAL HEALTH RESEARCH (N.Y.: Alan R. Liss, Inc., [1984,]) pgs. 335-361.

[7] Marja-Lusa Lindbohm and others, "Effects of Paternal Occupational Exposure in Spontaneous Abortions," AMERICAN JOURNAL OF PUBLIC HEALTH (August, 1991), pgs. 1029-1033.

[8] Andrew F. Olshan and others, "Birth Defects Among Offspring of Firemen," AMERICAN JOURNAL OF EPIDEMIOLOGY Vol. 131 (1990), pgs. 312- 321.

[9] Arlene F. Kantor and others, "Occupations of fathers of patients with Wilm's tumour," JOURNAL OF EPIDEMIOLOGY AND COMMUNITY HEALTH Vol. 33 (1979), pgs. 253-256.

[10] Helena Taskinen and others, "Spontaneous abortions and congenital malformations among the wives of men occupationally exposed to organic solvents," SCANDINAVIAN JOURNAL OF WORK, ENVIRONMENT AND HEALTH Vol. 15 (1989), pgs. 345-352.

[11] P. J. Tomlin, "Health problems of anesthetists and their families in the West Midlands," BRITISH MEDICAL JOURNAL (24 March, 1979), pgs. 779-784.

[12] David A. Savitz and Jianjua Chen, "Parental Occupation and Childhood Cancer: Review of Epidemiological Studies," ENVIRONMENTAL HEALTH PERSPECTIVES Vol. 88 (1990), pgs. 325-337.

Descriptor terms: reproductive hazards; health; birth defects; lead; rubella; endocrine disrupters; solvents; pahs; occupational safety and health; males; fathers; children; spontaneous abortion; petroleum industry;