

Exposure to dioxins influences male reproductive system

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A dioxin toxin contained in the herbicide Agent Orange affects male reproductive health by limiting the growth of the prostate gland and lowering testosterone levels, researchers at UT Southwestern Medical Center have found in a cohort study of more than 2,000 Air Force veterans who served during the Vietnam War.

The study, published in the November issue of the journal *Environmental Health Perspectives*, indicates that exposure to TCDD, the most toxic dioxin contained in Agent Orange, may disturb the male endocrine and reproductive systems in several ways.

"Until now, we did not have very good evidence whether or not dioxins affect the human reproductive system," said Dr. Amit Gupta, a urologist at UT Southwestern and the study's lead author. "Now we know that there is a link between dioxins and the human prostate leading us to speculate that dioxins might be decreasing the growth of the prostate in humans like they do in animals."

The researchers found that veterans exposed to dioxin had lower incidence rates of benign prostate hyperplasia (BPH), better known as enlarged-prostate disease. BPH is a disease in humans that is caused by an enlargement of the prostate. Patients must strain to pass urine and they also must urinate frequently. BPH can lead to complications such as an inability to urinate and urinary tract infection. Surgery is sometimes needed.

Dr. Claus Roehrborn, professor and chairman of urology at UT Southwestern and a study author, said, "We know that dioxin causes many endocrine disturbances in the human body. The study indirectly proves that BPH is an endocrine disorder."

Regarding the decreased risk for BPH found in the veterans groups, Dr. Gupta cautioned that the finding should not be interpreted as a positive result.

"It may be construed that a decrease in the risk of BPH is not a harmful effect, but the larger picture is that dioxins are affecting the normal growth and development of the reproductive system. Moreover, several effective treatments are available for BPH and thus reduction of BPH by a toxic compound is not a desirable effect."

The study was based on data from the Air Force Health Study (AFHS). The AFHS is an epidemiologic study of more than 2,000 Air Force veterans who were responsible for spraying herbicides including Agent Orange during the Vietnam War. This group is called the Ranch Hand group because the spray program was called Operation Ranch Hand. Agent Orange was contaminated by a dioxin called 2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD).

This study also involved a comparison group comprising veterans who served in Southeast Asia during the same time period, 1962-1971, but were not involved in the spraying program and thus were exposed to dioxins at levels equivalent to the general population.

The veterans were interviewed and underwent physical examinations and lab tests during six examination cycles. The first cycle was conducted in 1982, so the veterans were followed for more than 20 years.

"We found that the risk of developing BPH decreased with increasing

exposure to dioxins in the comparison group," said Dr. Arnold Schecter, professor of environmental sciences at the UT School of Public Health Regional Campus at Dallas and a study author. "The risk of developing BPH was 24 percent lower in the group with the highest dioxin levels compared to the group with the lowest levels. In the Ranch Hand group, the risk of BPH tended to decrease with increased exposure to dioxins, but at extremely high exposure levels there was a tendency for the risk to increase."

In addition, the study shows that higher dioxin exposure is associated with decreased testosterone levels, Dr. Gupta said.

"It is known that lower testosterone levels are associated with decreased sexual function, decreased muscle mass and strength, infertility, increased fatigue, depression and reduced bone density," Dr. Gupta said. "However, we could not conclude from this study that dioxin exposure did lead to any of these adverse affects in the veterans in the study."

The study points out the necessity to conduct additional environmental studies of the impact of dioxins and other toxins on the male reproductive system. Previous research was largely based on animal models, Dr. Gupta said, noting that the urgency of further research is underlined by a rise in disorders of the male reproductive tract over the past several decades.

These include a decrease in sperm production by almost 50 percent, a three- to four-fold increase in testicular cancer, an increase in the incidence of cryptorchidism (undescended testes, a condition where the testes are not in their normal location in the scrotum) and hypospadias (abnormality of the urethra).

The reason for this increase is not known, but it is thought that these disorders might be caused by environmental chemicals that are

estrogenic and have endocrine-disrupting effects, Dr. Gupta said.

Dioxins are among the most toxic substances known and are thought to be partially responsible for this increase in male reproductive tract disorders. They are formed as byproducts of processes such as incineration, smelting, paper and pulp manufacturing and pesticide and herbicide production.

Humans are exposed to these chemicals primarily through consumption of animal fat and dairy products. Babies are exposed to the highest levels of dioxins through breast milk. Dioxins are eliminated extremely slowly from the body and they tend to stay in the body for several years to several decades after exposure.

Source: UT Southwestern Medical Center

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