

The effects of toxic agents on reproduction

Post-partum toxicants, environmental agents to which a newborn may be exposed and suffer adverse effects, can be related to parental occupational exposure.

Although the incidence of birth defects, spontaneous abortions and stillbirths among the human population is quite high, with as many as 7% of all newborns born with birth defects in the United States annually¹, the cause of the vast majority of these defects is not known.

It has been estimated that as many as 70% of all defects are of unknown origin². At the same time that hundreds of agents capable of causing reproductive failure or of inducing germinal and/or somatic mutation have been recognized, the actual magnitude of their effect on human reproductive health has not been quantified.

It should be noted at the outset that reproductive failure in the form of stillbirth, spontaneous abortion or birth defects alone is not an adequate measure of the extent of reproductive hazard from toxic agents among human beings.

Toxic agents can manifest themselves in a variety of ways, including adversely affecting the male or female reproductive cycle, possibly leading to infertility; causing the production of insufficient or defective sperm; preventing the successful implantation of fertilized ova; or inducing functional defects not readily observed at birth and, hence, not associated with reproductive failure.

It is the purpose of this paper to review briefly aspects of the toxicology of human reproduction with a particular emphasis on the effects of those toxic agents which may be

encountered in the modern workplace environment.

MODES OF DYSFUNCTION A schematic presentation of some of the modes of reproductive dysfunction is given in Figure 1, which also shows which parent, male or female, may be at risk. Examples of toxic agents capable of inducing each mode of dysfunction are readily available. It should be apparent, however, that not all agents can be easily classified and some will fall into more than one category.

For example, the synthetic hormone diethylstilbesterol (DES)^{3,4} is capable of inducing organ dysfunction in the

adult male and female, and must also be classed as a gestational toxicant since it is a transplacental carcinogen.

Adult male workers occupationally exposed to synthetic estrogen were found to develop gynecomastia and experience a decreased libido and infertility.⁵ Female workers with similar exposures were observed to experience intermenstrual bleeding.

DES has induced carcinoma of the vagina in young females exposed *in utero*, as well as experimentally in the mouse and hamster.⁶

PATERNAL FACTORS Manson has recently reviewed the influence of environmental agents on male reproductive failure.⁷ Several modes of action are possible. There may be direct damage of male germ cells leading to mutation and/or infertility.

SOME POTENTIAL MODES OF REPRODUCTIVE DYSFUNCTION

TYPE OF EFFECT

ORGAN DYSFUNCTION

insufficient/defective sperm
an ovulation/defective ova

implantation defects

spontaneous abortion

GENETIC DEFECTS

GESTATIONAL TOXICANTS

pre-embryonic

embryonic

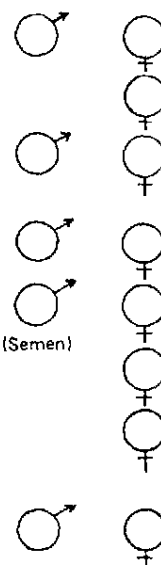
fetal

POST-PARTUM TOXICANTS

via lactation

via inhalation

PARENT AT RISK



By Jeanne M. Stellman, PhD, Division of Occupational Health and Toxicology, American Health Foundation, New York.