

ENVIRONMENTAL ISSUES *and* CHALLENGES

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THE ORIGIN OF TOXICOLOGY CAN BE TRACED TO EARLY MAN AS HE LEARNED WHICH PLANTS WERE POISONOUS AND WHICH WERE SAFE TO EAT. THE EMPIRICAL OBSERVATIONS OF THE RELATIONSHIP BETWEEN TOXIC CHEMICALS (TOXICANTS) AND REPRODUCTION IS NOT WELL DOCUMENTED. Early observations were primarily on that of adverse pregnancies. In the Old Testament (Judges 13:7) the woman who was to bear Samson was warned "Behold, thou shalt conceive and bear a son: and drink no wine or strong drink." This citation indicates that there was some knowledge of the effect of alcohol consumption on adverse pregnancy. In 1736 in a report on the "gin epidemic" which was submitted to the English parliament this relationship was again noted:

"The contagion has spread even to the female sex. Unhappy mothers habituate themselves to these distilled liquors, whose children are born weak and sickly..."

Incredibly, fetal alcohol syndrome was not recognized until the mid 1970s. In the fifteenth century, Catharine Deshayes (also known as La Voisine) was noted as a paid poisoner with skills including abortions and love

potions. However, not until this century have the effects of toxicants on pregnancies become an important area of study. This area of research was spurred by the major tragedies resulting from the therapeutic use of thalidomide and the environmental exposure of mercury in Minamata Bay, Japan. These experiences illustrated that human fetuses were at risk due to chemical exposures.

There is less information on male reproductive toxicology than developmental toxicology. In 1775 the English physician, Percival Pott, reported a high incidence of scrotal cancer in chimney sweeps. This observation led to safety regulations in the form of bathing requirements for these workers. This represents one of earliest occupational safety interventions involving the male reproductive system. While male reproductive toxicology had been an area of interest during the intervening 200 years, it was not until the findings by Whorton in 1977, studying the effects of dibromochloropropane (DBCP) on male workers, that this area of human toxicology was firmly established. As early as 1961, animal toxicologists reported that DBCP reduced testicular weights in rodents. However, their report went essentially unnoticed until workers became

infertile and in some cases sterile due to occupational exposure to this pesticide.

In the 25 years since the DBCP discovery several other human male reproductive toxicants have been identified. These include lead, other pesticides, and organic solvents. The most common request to the Reproductive Health Assessment Section of the National Institute for Occupational Safety and Health (NIOSH) is a request for a list of known reproductive toxicants. The requestors are quite surprised to find there is not a list of reproductive toxicants affecting either the male or female. There are lists describing positive studies and there are lists of examples of reproductive toxicants; but there is not an all inclusive laundry list of bad chemicals.

The next question is why is there not a list and why are we not making one. The first reason dates back to the late middle ages. Philippus Aureolus Theophrastus Bombastus von Holhenheim-Paracelsus (1493-1541) introduced the following concept:

What is there that is not poison? All things are poison and nothing (is) without poison. Solely the dose determines that a thing is not a poison. — Paracelsus

This thought is often shortened to the "poison is in the dose". Without discussing the dose of the toxicant (level of exposure) lists can be used, abused, and misunderstood. A trace element like selenium demonstrates this point. Low levels of selenium are needed in a healthy diet. Early research (1935) indicated that selenium was a toxic factor in forage causing disease in cattle and in the early 1950s it was identified as a nutritional essential trace element. Both high and low selenium concentrations in semen have been shown to have a negative effect on the number and motility of human sperm. Does selenium belong on a list reproductive toxicants or not? Again quoting Paracelsus:

The right dose differentiates a poison from a remedy – Paracelsus

The voters in California passed proposition 65 which requires the Governor to publish a list of chemicals that are known to the State of California to cause cancer, birth defects or other reproductive harm. This list must be updated at least once a year. The dose is defined as 1/1000 of the No Observed Adverse Effect Level. This has been a difficult task. The current Proposition 65 list can be found on the internet at: http://www.oehha.ca.gov/prop65/prop65_list/Newlist.html

Groups of chemicals such as heavy metals, pesticides, and solvents containing bromine and/or chlorine may be suspect if a man has significant exposure and is having fertility problems. Industrial accidents and spills may cause acute toxicity

when normal work practices are not hazardous (the poison is in the dose).

There are some sources available to determine if there is known toxicity data on chemicals. The first step should be the Material Safety Data Sheet (MSDS) which the employer

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must supply to employees through the right-to-know laws. The MSDS will often (but not always) describe the known reproductive health effects with references. The availability of many literature searching programs on the internet allows the current literature to be reviewed. You may call NIOSH at 1-800-35-NIOSH (1-800-3564674) for help tracking down toxicity data on a particular chemical.

HOW CAN I PROTECT MYSELF AGAINST REPRODUCTIVE HAZARDS?

Become familiar with the potential reproductive hazards (substances and

agents) used in your workplace. Ask for and read the Material Safety Data Sheet (MSDS).

Participate in all safety and health education, training and monitoring programs offered by your employer.

Learn about the proper work practices, engineering controls, and personal protective equipment (i.e., gloves, respirators, personal protective clothing) that can be used to lessen exposures to these hazardous substances and agents.

Follow your employer's safety and health work practices and procedures that are meant to prevent exposures to reproductive hazards in the workplace.

- Store chemicals in sealed containers when you are not using them.
- Avoid skin contact with chemicals.
- Wash your hands before you eat, drink, or smoke.
- If chemicals get on your skin, follow directions for washing provided in the Material Safety Data Sheet (MSDS).
- If chemicals get on your clothes, change them and wash with soap and water. Do not take your work clothes or shoes home.



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