A man's drinking may harm his offspring

For a long time scientists have assumed that if a man drinks heavily, it will not harm his ability to sire genetically healthy offspring. Now research reported in NATURE (Vol. 253, p. 134-6) calls this assumption into question. It suggests that a male's heavy drinking can lead to spontaneous abortions, and perhaps to birth defects as well, presumably by damaging the genes in sperm.

F. M. Badr and Ragaa S. Badr, a husband and wife team at the Worcester Foundation for Experimental Biology, conducted experiments on male mice to determine whether drinking might affect their offspring. In the first experiment, eight male mice were given alcohol once a day for three consecutive days. The amount of alcohol they received was comparable to four drinks a day for humans. Each male mouse was then mated to a different female each week for six consecutive weeks. The offspring from each of the six matings were then examined for litter size, sex ratio and bodily abnormalities.

The offspring from the mice that had been drinking alcohol did not differ in litter size from the offspring of control mice, except for the litters produced from matings that took place 14 days after termination of alcoholic intake. This result suggested that the male mice's alcoholic intake leads to a loss of prenatal life which could be, in large part, the result of genetic mutations induced by alcohol in the male's sperm. The result also suggests that sperm are more sensitive to alcohol at certain stages of their maturation.

Thus, in the second experiment, the biologists tried to pinpoint the effects of male drinking on offspring. This time they gave 19 male mice alcohol at 40 percent or 60 percent concentration, mated them to females at four-day intervals, then sacrificed the pregnant females to see whether they contained aborted fetuses. Controls were used.

This experiment showed no difference in the number of fetuses implanted in females mated with drinking males as compared with those implanted in females mated with nondrinking males. However, there was a significant increase in the number of dead embryos in the females mated with drinking males as compared with nondrinking males, especially in females mated with males 9 to 13 days after drinking. This result again suggests that alcohol could lead to spontaneous abortions, by damaging genetic material in sperm at a particularly sensitive stage of sperm maturation. There were also more aborted fetuses from males who had drunk 60 percent alcohol, as compared with those who had drunk 40 percent alcohol. This result implies that there is a relationship between the amount of alcohol a male drinks and the severity of harm to the offspring he sires.

The experiments also suggest that a male's intake of alcohol might lead to defects in his offspring. One male mouse mated 10 days after drinking sired a mouse with an abnormal bulging of the head. The mouse was underweight for its age and died a few days after birth. The Badrs stress, however, that "it would be premature to conclude that this abnormality was due to alcohol treatment of the father."

As for humans, F. M. Badr, along with Steven Beaton and Robert M. Trudell of St. Vincent's Hospital in Worcester, Mass., have conducted a pilot study on heavily drinking men that suggests that drinking can lead to both spontaneous abortions and birth defects. The scientists studied 52 men who were taking at least four drinks a night. The men were drinking this amount of alcohol six weeks prior to conception. The results included a number of spontaneous abortions or infants with birth defects. The investigators admit, however, that they did not use controls in this pilot study. Nor did they rule out other causative factors that might have led to abortions or birth defects, such as emotional stress.

Studies such as those conducted by the Massachusetts investigators obviously need to be expanded and carried out more rigorously to see precisely how a male's drinking habits can affect his offspring. The sperm of males who drink heavily should undoubtedly also be checked for chromosome breaks or genetic defects, thereby definitively underscoring the link between alcohol and its ability to cause genetic damage.

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A similar study of the offspring of male rats treated with methadone and morphine has produced equally disturbing results—markedly higher infant mortality in virtually all litters. Only 26 percent of offspring sired by rats treated with methadone and 66 percent of those sired after treatment with morphine survived three weeks. The survival rate among offspring in a control population was between 90 and 95 percent.

The work was done by Durwood J. Smith and Justin M. Joffee of the University of Vermont, who also report their results in NATURE (Vol. 253, p. 202-3). The investigators further found that the infant mortality rate depends sharply on the size of methadone dosage given the male parent and that the lethal effect was most prominent when insemination took place within 24 hours of treatment. Smith and Joffee note that 1 to 3 percent of all human infants born suffer some congenital defect that cannot be explained in terms of present knowledge. They conclude that their experiments indicate doctors should not confine themselves to checking on what drugs a woman takes during the prenatal period, but should also consider possible effects of drugs taken by fathers before a child is sired. □

Turn off catalase, wake up seeds

Farmers do not always reap all that they sow, and often reap what they don't sow. They sow plant seeds, but many of them never germinate. They don't sow weed seeds, but these often do germinate and compete with useful crops for space, sunlight and nutrients. One key to both encouraging crops to germinate and controlling unwanted weeds lies in understanding the mechanisms of seed dormancy and germination. One team now reports new information on these mechanisms.

Plant physiologists Sterling B. Hendricks and Ray B. Taylorson of the Agricultural Environmental Quality Institute in Beltsville, Md., report research on breaking seed dormancy in the January PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES. It has been known for several years that in the presence of favorable temperatures and moisture levels, but in the absence of light, many types of seeds can lie dormant for centuries. A weed seed can lie dormant until a plow or a burrowing animal or erosion exposes it to a brief period of sunlight. It is also known that exposure to certain compounds can break dormancy, but the mechanism was unknown until now.

The team exposed dormant lettuce and pigweed seeds to thiourea (CS $(NH_2)_2$), sodium nitrite ($NaNO_2$),