

Effects of Paternal Exposure to Alcohol on Offspring Development

Deficits in the offspring of male alcoholics.

Many studies have indicated that children of alcoholic fathers often demonstrate impaired cognitive¹ skills and are more likely to be hyperactive than are children of non alcoholic biological parents (Hegedus et al. 1984; Tartar et al. 1989). These studies generally adopted controls to ensure the effects were not due to such factors as maternal drug use, socio economic variables, race and psychiatric or medical disorders in the parents. These effects also were observed in children borne of alcoholic biological fathers but raised by non alcoholic adoptive parents. Sons of alcoholics also have abnormal electrical activity in the brain as measured by the electroencephalograph (EEG) (Begleiter and Projesz 1988; Ehlers et al. 1989; Schuckit et al. 1987a). Moreover, it has been shown that sons of alcoholics, when compared to sons of non alcoholic parents, demonstrate abnormal hormonal responses to short term administration of alcohol (Schuckit 1988; Schuckit et al. 1987a,b, 1988). Hence, these data seem to suggest that genetic factors of the biological fathers that relate to their drinking behavior may have a significant effect on the intellectual and behavioral development of their offspring. Women who drink heavily tend to consort with men who also drink heavily (15,21). Although fetal alcohol syndrome (FAS) and alcohol related birth defects (ARBDs) have been attributed exclusively to maternal drinking during pregnancy, about 75% of children with FAS have fathers who are heavy drinkers or alcoholics (1. This high prevalence that some of the anomalies attributed to maternal drinking may be due to, or influenced by , paternal drinking (e.g., 14) For example, evidence is accruing that birth weights of children born to men who drink are decreased significantly compared to those born to non drinkers.

Mechanisms of Paternal Alcohol Effects on Offspring.

The mechanisms underlying the deficits observed in alcohol sired animal offspring are not easily explained. It is, however, clear that the results observed in our studies are due to exclusively to paternal alcohol exposure, because they cannot reasonably be ascribed to the female. Specifically, the females were drug naïve and matched to control animals in terms of their previous capacity to deliver and nurture healthy litters. Moreover, their offspring developed normally with no evidence of fetal mortality, and post mortem evaluation revealed no clinically significant problems in the females that could account for any of the observed effects. These results raise the possibility that paternal alcohol exposure can produce gross changes in offspring addition to functional changes. We are presently examining possible changes in these offspring that may or not be related to these physical changes (e.g., altered immunological function associated with altered spleen size).

Conclusions

Alcohol consumption by male rats appears to have long lasting effects on their ability to produce normal progeny. Studies suggest that alcohol itself may be a direct toxicant to sperm, inducing subtle yet marked deficits in the offspring of alcohol exposed fathers. If true, this will require a reassessment of the numerous studies in humans examining the heritability of specific traits predisposing the offspring to alcoholism. Specifically, it has been assumed that the sons of alcoholics inherit some generic trait that predisposes them to alcoholism, but few investigators have considered the possibility that these deficits could be due to alcohols being a direct gonadal toxicant or teratogenic agent. Results relevant to the paternal effects of alcohol on progeny are still in a very early stage of development. A concerted effort must be

¹ Cognition refers to intellectual functions such as information processing, learning and memory.

made to replicate the findings and to address other important issues, such as: How much alcohol must fathers drink to produce deficits in their offspring? Are the effects observed in the offspring of alcoholic exposed fathers transmitted from one generation to the next? Can these effects be reversed by long term abstinence of the father prior to conception?

References

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