THE EFFECT OF THE INJECTION OF ALCOHOL INTO THE MALE MOUSE UPON THE SECONDARY SEX RATIO AMONG THE OFFSPRING

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BLUHM (1921) found that in the mouse the injection of alcohol into the male parent was followed by a remarkable rise in the sex ratio among the offspring. The results of Danforth (1926), who administered alcohol in the form of vapour, confirmed this finding, as did those of Parkes and Bellerby (1926). MacDowell and Lord (1926) and Crew (1926) found that severe exposure of the male to alcohol fumes was not followed by any disturbance of the secondary sex ratio. In view of this disparity, it was suggested to me by Dr Crew that the difference in results might possibly be but a reflection of the difference in the method of exhibiting the alcohol and that it would be a profitable study actually to repeat Bluhm's work, using her technique.

It is established that in the mouse there are two forms of spermatozoa, one differing from the other in the matter of chromatin content. It is known that alcohol is a cell poison and it is reasonable to assume that under certain conditions this might act differentially upon the motility or vitality of the sperm, one kind being embarrassed in its activity or even severely damaged, the other kind, being more resistant, escaping.

Albino mice from the departmental stock were used. Experimental and control mice, litter mates in each generation, were kept under constant and similar conditions. All pregnant females were isolated before parturition and when the young were born their sex was noted and the record confirmed by a later examination. The experimental males were injected subcutaneously with 0.2 c.c. (later with 0.25 c.c.) of 20 per cent. ethyl alcohol on alternate days throughout the period of experimentation.

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Number of litters: $A = 51; B = 33$.

Mean percentage of $\delta\delta$ in litters of $A = 56.13 \pm 1.644$

Mean percentage of $\delta\delta$ in litters of $B = 41.54 \pm 2.159$

Difference $14.59 \pm 2.714$
The above figures indicate that in this experiment the secondary sex ratio was significantly disturbed by the injection of alcohol into the male parent. The results obtained by Bluhm, Parkes and Bellerby, and Danforth are confirmed. It is to be noted that of those who used the inhalation method, Danforth alone exposed the males to this treatment for prolonged periods, twice a day for at least an hour. The others kept the males in the atmosphere of alcohol fumes until they were stupefied. The effect would seem to depend upon the thoroughness and severity of the treatment. It was found in the course of this experiment that if instead of 0.2 c.c. of 20 per cent. ethyl alcohol the same dose of 25–30 per cent. ethyl alcohol was injected, the dose proved to be lethal.

The sex ratio of the controls is notably low. However, it agrees very closely with that of the general colony stock of the department for the period of the experiment; genetic and seasonal factors are probably responsible for the figure. It is reasonable to assume that the disturbance of the secondary sex ratio is the reflection of a selective effect of the alcohol upon the $X$-chromosome-bearing spermatozoa, these being more susceptible to the action of this particular cell poison than the $Y$-chromosome-bearing sperm which, when fertilising eggs, give rise to males. It is of interest to note, however, that all the "male-determining" sperms are not affected equally, for the litters did not consist solely of males. It would seem that the $X$-chromosome-bearing sperms are embarrassed in their functional activity but are not rendered uniformly impotent, and that the $Y$-chromosome-bearing sperms are relatively unaffected and take what advantage they can of this favourable handicap.

It should be stated that it is possible, but by no means probable, that a selective elimination of the sexes by the parturient mother took place in many instances because the young were not counted immediately after birth.

I wish to express my thanks to Dr Crew for his help during the course of this study.

SUMMARY.

The subcutaneous injection of alcohol into male mice is followed by a significant disturbance of the sex ratio among their offspring.

REFERENCES.


