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Alcohol and white rats: a study of fertility.

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This paper deals with the effect of alcohol fumes upon the size and number of litters produced by white rats and their descendants. Details of the administration of the alcohol have been published.[1] The treatment was given from the age of 28 days through the lives of the rats, with the exception of the females on the 28 days following the birth of a litter. After mild initial doses, each rat was left in the fume tank each day until it was completely anesthetized. Brothers and sisters of the treated males and females were used as controls. The matings were all between treated males and treated females or their descendants, and between the controls. Each group of test matings in each generation had its own control group raised at the same time and under the same conditions of environment. The data came from four main groups of rats: those treated, their treated children, their untreated children, and their untreated grand children from the untreated children.

Size of Litters.—The average size of all the litters produced by the treated rats was 10 per cent. less than the control average. Nine pairs of treated offspring from these treated rats gave litters that were 10.3 per cent. smaller than their control litters. Ten pairs of untreated rats from the treated parents gave litters that were 11.2 per cent. smaller than the controls. And eleven pairs

[1] MacDowell and Vicari, *Jour. Exp. Zoöl.*, 1921, xxxiii, 209.

of untreated rats from untreated parents and treated grandparents gave litters that were 13.3 per cent. smaller than their control litters. So there appears to be a reduction in the average litter size in each generation that is about ten per cent. of the respective controls. However, in no case is the reduction statistically significant. This is probably due to the small size of each sample, since the combination of all the generations gives a difference that is 3.6 times its probable error and so is to be considered significant. Alcohol appears to have caused a modification in litter size that persists for two generations after the original treatment and is not increased by a second generation of treatment. This is the result to be expected from a definite germinal modification.

Number of Litters.—The numbers of litters are based upon the production during equal periods of the test pairs and their own particular control pairs. In some cases the period was longer than in others, but opportunities for the tests and controls to produce litters were equal in each case and therefore equal in the totals. The number of litters is, accordingly, purely relative. 44 treated pairs produced 32 litters, whereas on the basis of their controls 91 litters were expected. This was a reduction of 65 per cent. ± 3.37 which is 19.2 times its probable error and so, significant beyond all question. Treated rats from treated parents produced 14 litters when 22 were expected on the basis of their controls. This is a reduction of 35 per cent. ± 6.91 and is 5 times its probable error. Untreated rats from treated parents produced 33 per cent. ± 8.20 *more* litters than the controls, and the untreated rats from untreated parents and treated grandparents 55 per cent. ± 8.4 *more* litters than the expectation. Both these differences are fully significant. The number of litters was strongly reduced when the rats themselves were treated, but, just as soon as the alcohol was further away, the number of litters at once increased and the test animals produced significantly more litters than their controls. The obvious interpretation of this result is that alcohol has acted as a selective agent by preventing those females from having litters that bore weaker determinants for the production of litters. This accounts for the apparently odd fact that two generations of treatment made less difference than a single generation of treatment. The offspring of treated animals are a selected

lot. Genetically they have higher litter-producing powers than the controls; when alcohol is given to them it causes a reduction in the number of their litters, but this reduction is half as great as the reduction caused by the treatment of their parents which were genetically equal to the controls. The alcohol has sorted out differences already present.

This is a very different result from that given by litter size, which demands the assumption of alcohol modifications. It is to be concluded, then, that alcohol works upon the size of litters and the number of litters through different channels. This leads to two generalizations: first, that fertility is a complicated character whose different measures are not all manifestations of the same factors; second, that the action of alcohol upon animals is very complicated; it may act through different channels and in different ways, so that the end results in any special case are due to the interaction of different tendencies. Students of experimental alcoholism must recognize the complex nature of their problem, and, leaving behind the familiar method of generalizing from end results, focus attention upon the problem of the channels through which alcohol may work.

37 (1784)

Experiments with B. enteritidis (murium)[1] on normal and immune mice.

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These experiments were undertaken to ascertain varieties and degrees of resistance of normal and immune mice to fixed doses of *B. enteritidis (murium)*.

1. If live cultures of this organism are injected intrapleurally or intraperitoneally into normal mice, there occurs an initial lag in the rate of bacterial multiplication lasting a few hours followed by a rapid and continued acceleration of growth until the death of the animal.

If live cultures of this organism are given *per os* to normal mice, there occurs an incubation period of 5–6 days, after which the

[1] A serological and cultural description of this organism will appear in the *Journal of Experimental Medicine.*