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CUMULATIVE GENETIC EFFECTS FROM EXPOSURE OF MALE MICE TO TRITIUM FOR TEN GENERATIONS

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Abstract

Three sublines of C57 Black/6M mice were propagated from three sibling pairs from the same litter. All breeders were weaned at 28 ± 2 days of age. At each generation in experimental lines weaned male breeders aged 35 days either received a single injection of tritiated thymidine (1 μCi/g of body weight) or were exposed for 5 weeks to tritiated drinking water (10 μCi/ml). Control male breeders and all female breeders received tap water. At 10 weeks of age all breeders were sibling-mated. Breeders were allowed to produce one litter. The time of delivery, the litter size and sex ratio was recorded. At each generation the offspring in the three lines were sibling-mated in the same sequence as their parents. At the 6th generation total offspring in the sibling line received tritiated thymidine numbered 108 versus 336 in the sibling line exposed to tritiated water, in contrast with 721 in the control sibling line. At that point it was decided to reduce the subpopulation in all three sibling lines to 20 couples which were assigned to further sibling-matings. The 6th generation couples (20 in either subline) generated at the 9th generation 624 animals in the control subline versus 386 and 476 in the subline exposed to tritium. The data suggest a trend toward reduction in the subpopulation of offspring propagated from male parents exposed to tritiated water or tritiated thymidine. This particular trend repeated itself whenever the various sublines were re-propagated from an equal number of couples. At the 9th generation 50 couples were assigned to a special study on reproductive fitness. The F_1 and F_2 offspring from the 50 couples in each subline were observed to evaluate litter size and infant mortality. The litter size was decreased and infant mortality was increased in experimental sublines (chi-square test, $P < 0.05$). The F_2 offspring was assigned to a separate investigation of the occurrence of dominant lethal mutations. In control, as well as in experimental lines, at 70 days of age males were sibling-mated with their sisters. All animals received tap water and were not exposed at any time to tritiated thymidine of tritiated water. Fifteen days after mating females were sacrificed and the ovaries and uterine content were examined. Preimplantation loss values were significantly increased in experimental versus control sublines (chi-square test, $P < 0.01$). The dose to male sperm over a 35-day period was estimated at 3.7 rads from tritiated water and at 3.9 rads from tritiated thymidine under our experimental conditions.