EFFECTS OF LETHAL YELLOW AND MAHOGANY MUTATIONS ON REPRODUCTION IN FEMALE MICE

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ABSTRACT

In previous studies, black (a/a) and yellow (Ay/a) mice were found to significantly differ in their reproductive capabilities. The presence of the lethal yellow gene (Ay) increases the production of agouti protein, which has long been associated with obesity and infertility, in the yellow mice. A mutation (mahogany or mg) has been found to suppress the effects of obesity in yellow mice. The objective of this study was to determine the effects of this mutation on fertility in female mice. We wanted to determine if the infertility of the yellow mouse could be reversed by the presence of the mg mutation.

Overall, three experiments were conducted (qualitative histological analysis of ovaries, ovulation rates of prepubertal mice, and progesterone assays) using four genotypic combinations of Ay and mg: +/+ a/a (black), +/+ Ay/a (yellow), mg/mg a/a (mahogany black), mg/mg Ay/a (mahogany yellow). Following superovulation, histological analysis of the ovaries of mice aged 25-26 days suggested that mg enhances follicular development (ovary function estimate) in control but not superovulated mice. Superovulation of 48 females 25-26 days old indicated significant difference between black females and the other three genotypes. Analysis of serum progesterone levels (ELISA, ALPCO Diagnostics) showed that the mg mutation significantly lowered progesterone levels in black and yellow females ($P<0.05$) compared to +/+ black and yellow females on days five and 12 of placement with a male. Time to copulation, total progeny per litter, progeny weight, and progeny survival (alive on day 30) were also measured as reproductive parameters.

Analyses of all four compound genotypes of mice indicate that reproduction in females is affected by the mg mutation as well as the Ay mutation. This project was supported by funds from the SDSU Agricultural Experiment Station – Project numbers SD-60H and SD-191H (NHG/TNO), Biology Department of Augustana College (MRD), and the FOE's Ehrmann Cancer Fund (NHG).