Effects of Low Levels of Zinc on Reproductive Performance of Rats


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The effects of zinc chloride (ZnCl₂) on the reproductive performance of rats were evaluated in a single-generation pilot breeding study. Male and female rats were administered 0.0, 7.5, 15.0, and 30.0 mg/kg/day of ZnCl₂ for 77 days prior to mating. At the end of the pre-mating dosing period, males and females were paired within the same dose groups. Dosing was continued for both sexes throughout mating. All males were euthanized at the conclusion of mating. Dosing was continued in females throughout gestation and lactation.

The evaluation of reproductive performance included fertility, viability index, weaning index, litter size, and the body weights of pups on days 0, 4, 7, 14, and 21 of lactation. The fertility indices in all dose groups were significantly lower than those of the control group. Also, pup viability indices on days 0 and 4 for the high-dose group were significantly lower than those of the control group. Additionally, the body weights of pups in the highest dose group on days 14 and 21 were significantly lower than in the control group. There were no effects on weaning indices or sex ratios. These results suggested that ZnCl₂ has only mild effects on the reproductive performance of rats. ZnCl₂-treated male and female (highest dose) rats accumulated more zinc than control rats. In parental males, the increases were predominantly in the thymus and pancreas, while in parental females, the increases were predominantly in the spleen, thymus, ovaries and uterus. Also, the thymus, stomach content and ovaries of F₁ pups from the highest dose group accumulated more zinc than those in the control group. Selected clinical pathology, organ weights and anatomic pathology parameters were also evaluated in order to determine the toxicity of ZnCl₂ in reproductive and non-reproductive target organs. There were no significant ZnCl₂-related changes observed in the clinical pathology parameters. Analysis of organ weight data showed ZnCl₂-treatment related decreases in ovarian weight and an increase in the brain weights of males. Evaluation of histopathology revealed ZnCl₂-treatment-associated thymic atrophy, depletion of lymphoid tissue in lymph nodes, splenic hemosiderosis, and prostatic acinar atrophy. All pathologic effects related to treatment with the test compound were mild. Therefore, lesions noted in the reproductive organs probably precluded any adverse effects upon reproduction.