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1. Freed, S. C., Rosenman, R. H., and Friedman, M., *Ann. N. Y. Acad. Sci.*, 1953, v56, 637.

2. Perera, G., *J. Clin. Invest.*, 1953, v32, 633.

3. Rosenman, R. H., Freed, S. C., and Smith, M. K., *Am. J. Physiol.*, 1954, v177, 325.

4. Freed, S. C., Rosenman, R. H., and Smith, M. K, *ibid.*, 1954, v178, 85.

5. Page, I. H., and Taylor, R. D., *ibid.*, 1949, v156, 412.

6. Masson, G. M. C., Page, I. H., and Corcoran, A. C., PROC. SOC. EXP. BIOL. AND MED., 1950, v73, 434.

7. Friedman, M., and Freed, S. C., *ibid.*, 1949, v70, 670.

8. Rosenman, R. H., Freed, S. C., and Friedman, M., *Circulation*, 1952, v5, 412.

9. Ashton, N., and Cook, C., *Brit. J. Exp. Pathol.*, 1952, v33, 445.

10. Wyman, L. C., Gulton, G. P., Shulman, M. H., and Smith, L. L., *Am. J. Physiol.*, 1954, v176, 335.

11. Kurland, G. S., and Freedberg, C. S., PROC. SOC. EXP. BIOL. AND MED., 1951, v78, 28.

12. Williams, C. D., Kingsbury, G. H., and Ebert, R. H., *J. Lab. Clin. Med.*, 1954, v44, 210.

13. Griffith, G. C., Wallace, W. B., Cochran, B., Jr., Nerlich, W. E., and Frasher, W. G., *Circulation*, 1954, v9, 527.

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Effect of Selenium on Reproduction in Rats.* (21362)

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The effect of selenium on reproduction in mammals has not been fully investigated. Many investigators noted decreased fertility and malformations during selenium intake in different species of animals. Munsell, DeVaney and Kennedy(1) studied the effect of wheat containing selenium in diets of rats. They reported that wheat selenium had detrimental effect on growth and reproduction in direct proportion to the selenium intake. Franke and Potter(2) used toxic selenized wheat in the diet of rats and studied the survival and reproduction in white rats. They observed that rats which survived the toxic diets for a long time showed subnormal growth and distinct loss in reproductive power. Our studies were initiated to obtain data on the effect of varying concentration of inorganic selenium in drinking water on reproduction in successive generations of rats, this report presents the results of these studies.

Method. Wistar strain white albino rats were used as experimental animals. All animals were fed with Purina laboratory chow during the experiment. Groups of 5 pregnant females were placed on selenium at the beginning of the experiment. Selenium was added as potassium selenate to drinking water in the following concentrations: 1.5; 2.5; and 7.5 ppm of Se. Five pregnant rats served as controls. All animals at the beginning of the experiments were approximately the same age and weight. The experiments were continued for one year. Each control and experimental animal was bred 5 times during the experiment. The selenium content of the water in each group was maintained at the same concentration during the entire experiment.

Results. Rats on 1.5 and 2.5 ppm of Se in water had normal litters. This concentration of selenium in water had no effect(1) on the reproduction of breeding rats, (2) the number of young reared by the mothers, or (3) on the reproduction of two successive generations of males and females. The second generation of selenium rats which received 2.5 ppm of Se in water had normal offspring but the number of young reared by the mothers decreased about

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TABLE I. The Effect of Selenium on Reproduction.

Group	No. rats ♂	No. rats ♀	Duration Se intake (mo) ♂	Duration Se intake (mo) ♀	Se intake (ppm) ♂	Se intake (ppm) ♀	Total: No. offspring	Total: No. survived	Remarks
I	2	5	0	0	0	0	250	230	Controls mated 5 times.
II	3	5	1	1	7.5	7.5	60	8	Selenium given 5-8 days before parturition.
III	3	5	8	1	7.5	7.5	21	4	Selenized ♂* mated with ♀ which received selenium during mating and after parturition.
IV	3	5	8	0	7.5	0	55	38	Selenized ♂* mated with normal ♀.
V	3	5	1	8	7.5	7.5	0		♂ received selenium during mating with selenized ♀.*
VI	3	5	0	8	0	7.5	0		Normal ♂ mated with selenized ♀.*

* Males and females received 7.5 ppm Se since birth.

50 per cent. The weight of the females in this generation was 20 ± 10 g less than that of normal rats of the same age.

As the concentration of selenium was increased to 7.5 ppm in water, there was decrease in fertility, decrease in the number of survivals, reduction in the rate of growth in the young, loss in weight in the adult animals, and finally death due to chronic selenium poisoning.

The results on the effect of selenium on reproduction under varying experimental conditions are given in Table I. Group II in Table I gives the effect of selenium on pregnant rats which received 7.5 ppm Se in water from 5 to 8 days before parturition. The selenium intake at this concentration had no effect on the young before birth. The rats had normal litters but there was a decrease in the number of survivals with the continued selenium intake and only 13 per cent of the suckling rats survived. McConnell(3) reported the passage of selenium into the milk by the use of radioactive selenium.

After the birth of the litters the selenium intake in the mothers was continued for 11 months. These selenized females were mated 5 times with selenized males but failed to reproduce. The females in this group lost considerable weight during the experiment. At the end of 12 months 3 females and one male died from chronic selenium poisoning.

The growth rate in rats which received 7.5 ppm of Se since birth was considerably slower than in normal rats. At the end of 6 months the young females weighed on the average about 125 g and the males 246 g. There was some increase in weight of the young rats but the average weight of females which survived the one year experimental period was 80 ± 20 g less than normal females. The average weight of males was 60 ± 10 g less than that of normal rats of the same age. The males and females in this group were not separated for 8 months, but failed to reproduce. In order to determine whether the failure of reproduction was due to the effect of selenium on the males or females, normal females were mated with selenized males and normal males were mated with selenized females.

The results on the effect of 7.5 ppm of Se in water on the reproduction using selenized males with females which received selenium during mating and parturition and females which received no selenium but were mated with selenized males are given in Table I, Groups III and IV. Two females from the 5 rats which were placed on selenium had litters within 7 to 10 weeks. The newborn rats appeared normal but only 4 of the offspring from the litters were reared by the mothers. Westfall *et al.*(4) demonstrated the placental transmission of selenium in early, midterm, and late pregnancy in rats. Our results indicate that survival of the progeny was influenced by the selenium intake of the mothers.

The young rats in this group also showed decrease in the rate of growth and reduced fertility similar to the earlier group. The above breeding males and females were continued on selenium but they failed to have a second litter and the females lost about 50 g of weight at the termination of the experiment. Normal females mated with selenized males had normal reproduction and survival, as indicated in Table I, Group IV.

When selenized females were mated with normal males whether the selenium intake was continued or whether it was omitted during breeding, the females failed to reproduce as indicated in Table I, Groups V and VI.

These results indicate that at this concentration of selenium the failure of reproduction in the rats was due to the effect of selenium on the females. Fertility in the males was not affected by 7.5 ppm of Se. Whether the inability of females to reproduce was related directly to the greater sensitivity of the females to the toxic effects of selenium and subsequent damage to the reproductive organs or whether it was due to the effect of selenium on the estrus cycle cannot be stated at the present time. Histological sudies on the male and female reproductive organs will be carried out in the near future in order to determine the extent of damage by selenium to these organs.

Summary. Low concentration (1.5 and 2.5 ppm) selenium in drinking water for two generations had no effect on the reproduction in rats. 2.5 ppm of Se reduced the number of young reared by the second generation of mothers. 7.5 ppm selenium prevented reproduction in females but fertility of the males was not affected.

1. Munsell, H. E., DeVaney, J. M., Kennedy, M. H., *U. S. Dept. Agric. Tech. Bull.* 1936, No. 534, pp25.

2. Franke, K. W., and Potter, V. R., *J. Nutr.*, 1936, v12, 205.

3. McConnell, K. P., *J. Biol. Chem.*, 1948, v173, 653.

4. Westfall, B. B., Stohlman, E. F., and Smith, M. I., *J. Pharmacol. and Exp. Therap.*, 1938, v64, 55.

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Comparative Study of Lipids in Vertebrate Testes.*† (21363)

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A variety of lipids are recognized as important constituents of protoplasm and it is possible through histochemical procedures to localize certain of these substances in tissues. According to Gomori(1) histochemistry of lipids is difficult and often illusory. However, the information obtained is useful in evaluating the role of lipids in cellular composition and function. This investigation deals with morphological distribution of various lipid components in the testes of sexually mature individuals representing the classes Mammalia, Aves, Reptilia, Amphibia, and Pisces of the subphylum Vertebrata. A similar comparative study of the periodic-acid reactive carbohydrates has been made by Cavazos and Melampy(2).

Materials and methods. In the class Mammalia, testes were fixed from 2 bulls, 4 rams, one boar, 9 rats, and 2 guinea pigs. Two New Hampshire Red roosters represented Aves. In Reptilia, 8 horned lizards, *Phrynosoma cornutus* (Harlan), were studied. Eighteen grass frogs, *Rana pipiens*, and 12 bluegill fish, *Lepomis macrochirus* Rafinesque, were used as examples of classes Amphibia and Pisces respectively. Tissues were fixed in 10% neutral formalin, washed in tap water for 6 hours, placed in gelatine at 37°C overnight, and embedded

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