

mals with water is appreciably influenced only by very severe degrees of anoxemia. It also seems that anemic anoxia is more effective in depressing gastric secretion than is anoxic anoxia.

9174 P

Studies on Zinc.

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Young rats weighing between 40 and 50 gm. were placed in groups of 5, three females and 2 males, in screen bottom cages. Food and water were supplied *ad libitum*. C. P. zinc carbonate was incorporated in the growing ration at 3 levels, corresponding to 0.10, 0.50, and 1.00% of zinc. The growing ration is a mixture of naturally occurring foods, and has served this laboratory well, during many years, for the growth and reproduction of rats. The zinc salt contained as a maximum the following impurities: arsenic 0.000%, chloride 0.002%, iron 0.01%, lead 0.002%, nitrate 0.000%, and sulphate 0.01%. Hemoglobin was determined by the Newcomer method.

Growth was normal on the rations containing 0.10 and 0.50% of zinc. The animals were vigorous when the experiment terminated, and there was practically no difference in the weight of the rats receiving zinc and those on the stock diet. The limit of tolerance to zinc carbonate lies between 0.50 and 1.0% of zinc in the diet. The animals on the 1% zinc diet failed to grow in the majority of cases, although some individuals weighed 140 to 160 gm. after 10 to 12 weeks. Some of the animals began dying within 4 weeks after being placed on this diet; some were partly eaten.

Growth and reproduction on the lowest level of zinc were normal. Several generations of these rats on the same zinc diet have shown no abnormalities. Reproduction was markedly affected, when the animals received 0.50% of zinc. The females on this diet became pregnant between the fourteenth and seventeenth weeks. One female had 3 young and lost 30 gm. at parturition. Another female had 3 young (one born dead) but lost 40 gm. at parturition. Another female when observed had 5 dead young weighing 24 gm. The young appeared white and bloodless. The females with the live young mothered them satisfactorily. The young averaged 30 gm.

at 21 days of age. The original females again mated when returned to their cages. The young were dead in every case and no live young were born after the first pregnancy. A total of 23 still born rats were counted and others were undoubtedly consumed by the mothers. The females on 0.50% zinc ceased to become pregnant after 5 months on the ration, although their weights and outward appearances were normal. No reproduction occurred on the 1% zinc level.

TABLE I.
Effect of Zinc Carbonate on Hemoglobin and Red Cells of the Rat.

Lot No.	Zinc Intake %	Initial Hemoglobin gm. per 100 cc.	Final Hemoglobin gm. per 100 cc.	Initial R.B.C. millions per cu.mm.	Final R.B.C. millions per cu. mm.	Weeks on Ration
1	0.10	14.5	14.7	8.4	9.1	39
2	0.50	13.9	10.2	8.6	8.5	39
3	1.00	14.2	6.1	8.5	6.6	12-16
4	1.00	13.6	6.5	7.8	6.5	10-16
5	1.00	13.7	6.8	8.0	6.8	12-16
6	1.00	13.5	7.8	8.1	5.8	10
7	0.00	14.1	14.1	7.8	8.9	34
8	0.00	14.6	15.1	—	—	30

Table I shows that normal hemoglobin values were found in the group of rats receiving 0.10% of zinc after 39 weeks on this diet. That there was something organically wrong with the animals on the 0.50% zinc level was first made evident from observations on their reproductive behavior. At the age of initial reproduction of these females the hemoglobin values were only slightly lower than those of the control group. They were still within the limits given by some investigators as normal, but when the rats were kept longer on the ration they became anemic. The average hemoglobin value at 30 weeks was 10.2 gm. No change in the number of R.B.C. was observed. Both hemoglobin and red blood corpuscles were diminished on the 1% zinc diet. Hemoglobin values in this lot usually started to decrease after 3 to 5 weeks on the ration. Low values of 4 gm. % were sometimes observed. Rats often lived for 5 weeks with hemoglobin values below 6 gm. %, while others succumbed with the hemoglobin only slightly below normal. The blood cell picture of the animals on 1% of zinc was interesting. Although the red cells became irregular in size and shape within 5 weeks after being placed on this diet, the number was not appreciably diminished until after 8 to 10 weeks on this regime. There was apparently an excess of white and immature red blood corpuscles in every case.

Normal females gave average blood hemoglobin values at 7 days

and one day before parturition of 14.6 and 12.6 gm. per 100 cc. respectively. At parturition and one week after, the corresponding values were 12.26 and 14.2. We believe that this normal anemic condition is so increased by zinc, when ingested at a 0.50% level, that normal reproduction is impossible, although growth is not impaired. Hemoglobin and reproduction became normal in the animals on 0.50% zinc, when the salt was removed from the ration. The same is true of the hemoglobin of rats on 1% zinc; whether reproduction is permanently impaired on the highest level of zinc is not known.

9175

Rôle of Pituitary in Effect of Testosterone on the Mammary Gland.

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It has been found that the administration of testosterone causes development and secretion of the mammary gland both in the male and in the female normal or castrate rat¹ and similar findings have more recently been reported by Nelson and Gallagher² following treatment with Androstene-diol and Androstene-dione.) It appears that the trophic action of the testis hormone on the mammary gland has physiological significance, for the mamma of male rats is normally fairly well developed at any time after puberty and shows atrophy following the removal of the testis.³ Since oestrin has a similar stimulating effect on the growth of the mammary gland in normal or castrate male or female rats, but has no effect in the absence of the hypophysis,⁴ it appeared of interest to establish whether the presence of the pituitary is also essential for the mammary gland stimulating effect of testosterone.

Nine male rats, 38 to 42 days of age, were hypophysectomized.

¹ Selye, H., McEuen, C. S., and Collip, J. B., *Proc. Soc. Exp. Biol. and Med.*, 1936, **34**, 201.

² Nelson, W. O., and Gallagher, T. F., *Science*, 1936, **84**, 230.

³ McEuen, C. S., Selye, H., and Collip, J. B., *Proc. Soc. Exp. Biol. and Med.*, 1936, **34**, 56.

⁴ Selye, H., Collip, J. B., and Thomson, D. L., *Proc. Soc. Exp. Biol. and Med.*, 1935, **32**, 1377.

⁵ Selye, H., and Collip, J. B., *Endocrinol.*, 1936, **20**, 667.