

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.

C. S. McEuen, H. Selye and J. B. Collip.

From the Department of Biochemistry, McGill University, Montreal, Canada.

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, 5} 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.

Four of them received 200 γ of testosterone* in oil subcutaneously daily beginning treatment immediately after operation, while in the remaining 5, treatment with the same dose was initiated 21 days after the operation so as to leave time for atrophy of the mammary gland to occur. In both these groups, treatment was continued for 19 days. At that time histological examination of the mammary glands showed no stimulation under the effect of testosterone, while similar treatment invariably caused growth and development of the mamma in normals.

In another group of 11 hypophysectomized male rats of the same age as the previous group, 100 units of anterior pituitary-like hormone of pregnancy urine were given subcutaneously during a period of 19 days. In 6 animals of this group, treatment was initiated immediately following the operation, and in 5 an intermediate period of 21 days was allowed. At autopsy on the 19th day of treatment, only very slight development of the mammary gland was observed in the group in which treatment was initiated immediately (probably due to incomplete involution) and no development was observed in the other group. The interstitial tissue of the testis showed marked development in both A.P.L. treated groups, the seminal vesicles and prostates were hypertrophic, but the seminal epithelium showed atrophy. It appears from these experiments that testosterone, whether it is injected directly in the form of the synthetic product or whether it is liberated from the testis under the influence of A.P.L., has no effect on the development of the mammary tissue, for the proliferation of which a pituitary stimulus is essential.

This conclusion receives further support from a third series of 10 hypophysectomized male rats of the same age as the previous groups receiving daily subcutaneous injections of one cc. of an anterior pituitary gonadotropic extract.† Six animals received treatment immediately after operation and 4 after a period of 21 days. In both groups the testis was found normal and the mammary gland developed to the extent to which it usually develops in normal male rats when examined on the 19th day of treatment.

The weight of the testis was not appreciably influenced by the testosterone treatment in either group. The average was 505 mg. in untreated hypophysectomized rats 19 days after operation and 552 mg. in testosterone-treated ones in which treatment was begun

* The authors are indebted to Dr. Schwenk of the Schering-Kahlbaum Company for a generous supply of testosterone.

† The strength of this extract was such that 1/40 cc. given thrice daily for 3 days enlarged the ovaries of immature rats to an average weight of 50 mg.

immediately after the operation and continued for 19 days. It was 264 mg. in untreated controls on the 40th day after operation as compared with 285 mg. in the group in which testosterone was given for 19 days after an intermediate period of 21 days between the operation and the initiation of treatment. This is of interest in connection with the publication of Walsh, *et al.*,⁶ and Nelson and Gallagher,² who conclude that hypophysectomized rats receiving "male sex hormone" prepared from urine show no testicular atrophy and could not be distinguished from the normal even histologically.

Summary. Testosterone, which causes mammary gland development in normal rats, has no effect on the mamma after hypophysectomy. The maintenance of the normal testis structure which has been obtained in hypophysectomized rats by the administration of male sex hormone preparations prepared from human urine is not due to testosterone, for the synthetic product does not prevent testis atrophy.

9176 P

Phospholipids as Oxygen Carriers.

W. R. BLOOR AND R. H. SNIDER.

From the Department of Biochemistry and Pharmacology, The University of Rochester School of Medicine and Dentistry, Rochester, New York.

One of the early hypotheses^{1, 2} regarding the function of the phospholipids was that they took part in the oxidation processes of the living cell, the belief being based on their well-known ability to take up oxygen. It was assumed, without however any evidence to support the assumption, that the oxidized phospholipids could act as oxidizing agents or oxidases, passing on their oxygen to other substances in the living cell.

The ability of the phospholipids to take up oxygen under approximately physiological conditions has been satisfactorily established.³⁻⁶

⁶ Walsh, E. L., Cuyler, W. K., and McCullagh, D. R., *Am. J. Physiol.*, 1934, **107**, 508.

¹ Koch, W., *Z. physiol. Chem.*, 1903, **37**, 181.

² Fränkel, S., and Dimitz, L., *Wien. klin. Wochschr.*, 1909, **22**, 1777.

³ Meyerhof, O., *Arch. ges. Physiol.*, 1923, **199**, 531.

⁴ Hopkins, F. G., *Biochem. J.*, 1925, **19**, 787.

⁵ Tait, H., and King, E. J., *Biochem. J.*, 1936, **30**, 285.

⁶ Page, I. H., and Bülow, M., *Z. physiol. Chem.*, 1935, **231**, 10.