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## Effect of Testosterone on the Mammary Gland.

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The fact that derivatives of the male hormone may exert an action on the female sex organs is known from the work of Butenandt and Hanisch,[1] who showed that androstenedione which is inactive in castrate females produces vaginal oestrus in the presence of an ovary, and from the work of Parkes,[2] who found that the same is true in the case of androstanediol. The action of these compounds might possibly be explained by a transformation of these substances into oestrin by the ovary. This would seem all the more likely since Collip, Browne and Thomson[3, 4, 5] have shown that the ether-insoluble fraction of oestrin extracted from pregnancy urine (Emmenin) is relatively inactive in the spayed female, while it is much more active in the presence of an ovary. Several compounds of the androsterone-testosterone series, however, do also cause vaginal cornification in ovariectomized female rats, as shown recently by Deanesly and Parkes[6] and Korenchevsky and coworkers,[7] and it is still to be seen whether this is due to a transformation of these compounds in the female organism into female hormones by tissues other than the ovary, or whether male hormone may stimulate the genital organs of the female directly. It seems of interest in this connection that we were able recently to obtain milk secretion, that is the development of a female characteristic even in the male, both normal and castrate, by the administration of testosterone, the most active compound of the male hormone series, first isolated by Laqueur, *et al.*[8] from testes. The same hormone also causes milk secretion in normal and ovariectomized females. In all our experiments we used crystalline synthetic testosterone-benzoate.*

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1 Butenandt, A., and Hanisch, G., *Ber. d. chem. Ges.*, 1935, **68**, 1859.

2 Parkes, A. S., *Chem. and Industry*, 1935, **54**, 928.

3 Collip, J. B., *Proc. Calif. Acad. Med.*, 1930, **1**, 38.

4 Browne, J. S. L., *Can. J. Res.*, 1933, **8**, 180.

5 Collip, J. B., Browne, J. S. L., and Thomson, D. L., *Endocrinol.*, 1934, **18**, 71.

6 Deanesly, R., and Parkes, A. S., *Brit. Med. J.*, 1936, No. 3918, 257.

7 Korenchevsky, V., Dennison, M., and Simpson, S. L., *Biochem. J.*, 1935, **29**, 2534.

8 David, K., Dingemanse, E., Freud, J., and Laqueur, E., *Hoppe-Seylers Ztschr.*, 1935, **238**, 281.

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Four female rats 23 days of age were injected with 200 γ of testosterone-benzoate in corn oil daily subcutaneously for 23 days. At the end of this period their mammary glands showed slight development of acinar tissue and the ducts of the gland were filled with dense milk. Two non-injected controls showed only undeveloped ducts without secretion. The same degree of development was also observed in 4 ovariectomized females treated for 23 days with the same amount of testosterone. The mammary glands of 2 ovariectomized, non-injected animals proved to be negative. Three 25-day-old males, injected with the same daily dose of testosterone

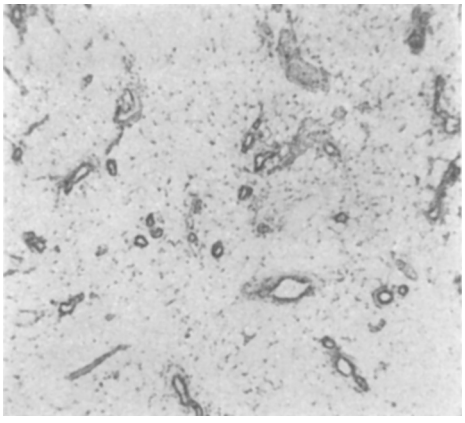

FIG. 1.
Mammary gland of a castrate male control, not injected.

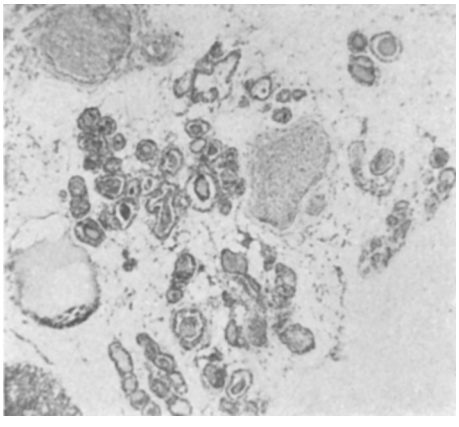

FIG. 2.
Mammary gland of a male injected with 200 γ of testosterone-benzoate for 23 days.

for 14 days, and 3 others injected for 22 days also showed slight development of the mammary gland and more or less abundant milk secretion. The same development and secretion was also obtained in 3 castrate males injected for 14 days, and 3 castrate males injected for 23 days with 200 γ of testosterone-benzoate per day

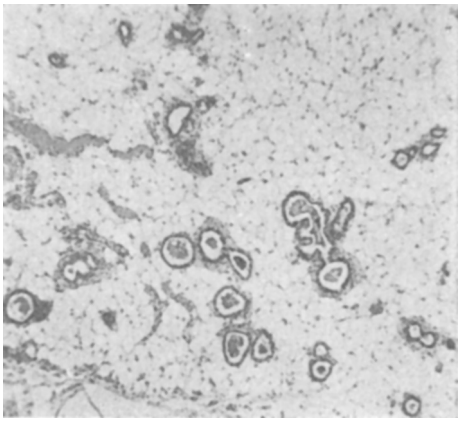

**FIG. 3.**
**Mammary gland of a castrate male injected with testosterone-benzoate for 14 days.**

(Figs. 1, 2, 3). It may be of interest to recall that a similar change in the mammary gland, that is a slight degree of development with marked milk secretion, was observed in rats ovariectomized during gestation. In these rats the vaginal epithelium was not mucified nor cornified and the formation by the placenta of a special mammary gland influencing hormone, other than oestrin, had to be assumed.[9] It remains to be seen whether the milk secretion inducing effect of the male hormone is due to a direct action on the mammary gland or to a stimulation of the hypophysis.

*Summary.* Two hundred γ of synthetic testosterone per day will cause slight development of mammary tissue and marked milk secretion in immature males and females, both in the presence and in the absence of the gonad.

[9] Selye, H., and McKeown, T., *Proc. Roy. Soc.*, B, 1935, **119**, 1.