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Cowper's Gland as a Testis Hormone Indicator.*

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Studies on the physiology of the internal secretion of the mammalian testis have been hampered by the lack of standard, easily read, and reliable hormone indicators. Moore,[1, 2] Moore and Gallagher,[3] Moore, Price, and Gallagher,[4] and Moore, Hughes, and Gallagher[5] have used 4 methods of hormone assay on the rat and guinea pig, the spermatozoan motility test, the electric ejaculation test, and the cytological changes that occur in the rat seminal vesicles and prostate gland following castration and also following injections of hormone samples.

In the process of isolating a hormone, there is always the possibility of there being more than one active principle. Therefore it is necessary to study all possible effects of the hormone. This study of Cowper's gland was undertaken to note its relation to the male sex hormone, and to ascertain whether it could be used as an efficient hormone indicator. This problem was suggested by Dr. Carl R. Moore, and is continuing under his guidance.

Over a period of 2 years, 175 white rats and guinea pigs have been utilized. A large number of fixatives have been tried; those most generally used being either Bouin's or Zenker-Formol for histological purposes, and the Mann-Kopsch fixation for the preservation of the Golgi material. Ehrlich's haematoxylin and eosin was the standard stain employed.

Castration of the adult animal has a marked effect on Cowper's gland. In the rat, a noticeable change is seen in 10 days and becomes very marked at 20 days; while in the guinea pig the effect is not clearly seen until about 50 days after the operation. The epithelium of both the rat and guinea pig Cowper's becomes very low.

In the rat, after 20 days castration, a degeneration and merging together of most of the tubules occurs which produces large lumina

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1 Moore, C. R., *J. Exp. Zool.*, 1928, l, 455.

2 Moore, C. R., *Biol. Bull.*, 1928, lv, 339.

3 Moore, C. R., and Gallagher, T. F., *Am. J. Anat.*, 1930, xlv, 39.

4 Moore, C. R., Price, D., and Gallagher, T. F., *Am. J. Anat.*, 1930, xlv, 71.

5 Moore, C. R., Hughes, W., and Gallagher, T. F., *Am. J. Anat.*, 1930, xlv, 109.

filled with great masses of secretion. Within 25 to 30 days there is a collapse of these large tubules and an apparent increase in the amount of inter-tubular connective tissue. Also, there is a marked decrease in the gross size of the organ after 60 days castration. The tubules continue to become smaller and merge with one another so that 150 days after the operation only a few small tubules are left, which usually contain a very low epithelium. The whole gland continues to grow smaller so that often they are extremely hard to locate. No degeneration of the striated muscle capsule was noted.

In the guinea pig, castration changes are neither as rapid nor as pronounced as in the rat. The only significant change is about a 50% decrease in height of the cells 120 days after castration.

The Golgi bodies of the epithelial cells of both the rat and guinea pig do not change greatly after castration. There is a tendency for the reticulum to form a cap over the nucleus, but no significant decrease in the amount of osmiophilic material was found. In the guinea pig, no change in either the number or location of the mitochondria was observed.

The Cowper's glands of normal pre-pubertal animals appears much the same as in the normal adult but smaller in size. Castration of young rats causes a degeneration similar to that of the castrated adult animal.

Injections of testis extract, prepared by Mr. T. F. Gallagher of the Department of Physiological Chemistry, have been made, using the rat as a test animal. Adults were castrated and injected for a period of 20 days, at which time the effects of the hormone are readily noted. It was found that a relatively large amount of hormone is necessary to keep the glands in a normal condition. Animals castrated 8 months and then injected for 30 days with an active extract were found to have the normal type of epithelium in the Cowper's glands; although the gland was not as large as the normal. Injections in adults castrated pre-pubertally cause these glands to return to the normal condition.

Cowper's gland of the white rat has proved to be an efficient qualitative testis hormone indicator. It is sufficiently sensitive so that castration effects are easily discernible 20 days after the operation; however, it is not as sensitive to the testis hormone as the spermatozoan motility, or seminal vesicle cytology tests. A more extensive report of this work will appear elsewhere.