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Effect of Castration on the Oviduct in Males and Females of *Rana pipiens*.*

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Rana pipiens is unique among all frog species for the surprisingly well developed oviducts in the male, although in the male they do not undergo the cyclical changes so characteristic of the female. From anterior to posterior, 4 parts are differentiated in the oviduct: a funnel opening, the *ostium tubae*; then a short, straight tube, the *pars recta*; a convoluted, glandular portion, the *pars convoluta*; and lastly, the uterus. The anterior parts of the oviducts of the male are less developed than the posterior parts. This difference distinguishes the oviducts of the male from those of the female.

Oviducts have been found in male toads and in hermaphroditic frogs and toads^{1, 2} but in these cases, the existence of the oviduct is clearly dependent upon some development of ovarian structures. This was suggestive therefore of an investigation to discover if the unusual growth of the oviducts in the male leopard frog also is correlated with hermaphroditic tendencies in the development of the male gonad. The embryological study showed, however, that as a rule the testes are typically differentiated before the time of metamorphosis which may even be before the first appearance of the primordia of the oviduct.

The oviducts in young frogs, both males and females, are similar in their gross structure except for the slightly larger size in the females. In microscopic sections, the size variance is somewhat more evident. In second year frogs, the sex differences in the oviducts are rather striking.

It appears then that 2 phases exist: (1) a period of self-differentiation in both sexes, and (2) in the female only, a period under the control of the ovary in which the oviducts enlarge to their final size and become functional. In the male, further development stops.

To test further the effects of the gonads on the oviducts of adult males and females, females were completely spayed and males were completely castrated in 2 series of frogs. A third series were kept as controls.

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¹ Witschi, Emil, *Arch. Entw. Mech.*, 1921, *xlvi*, 316.

² Crew, F. A. E., *J. Genetics*, 1921, *xi*, 141.

The spayed females, consisting of 50 frogs in all, were kept from 3 to 8 months. Those kept until the end of 3 months showed a noticeable regression in the oviducts especially in the median part of the *pars convoluta* where the small tubules indicated the beginning of a marked degeneration. After 5 months these degenerative changes had included nearly all parts of the *pars convoluta*. The animals at the end of 8 months exhibited degenerative changes in all parts of the oviduct and in their appearance they come to resemble the oviducts in normal female frogs in the second season. A normal sexually mature female control has the oviducts nearly as large as an adult female caught in nature at this time (breeding season).

The castrated males, a total of 36 individuals, were also kept from 3 to 8 months. After being kept for 3 months the oviducts in these frogs showed no changes, and even at the end of 8 months, the castrated males do not vary in the condition of the oviducts from that found in control males.

In both castrated males and spayed females, there is a noticeable regeneration of the fat bodies.

The results obtained in these series of experimental animals confirm the idea that the female oviducts maintain their normal development and undergo their cyclical changes under the influence of the ovary. Since there is such a marked regression in the oviduct of the spayed female and since in the male there seems to exist no relationship between the gonads and the oviduct, it can be reasoned that the oviduct of the male simply represents the state of development which the oviducts may attain in either sex without a gonadal control. While the ovary causes a further growth beyond this condition, it seems that the testis does not exert the slightest influence.

These findings contradict the claim of Bogucki³ that in frog females (*Rana esculenta* and *Rana fusca*) the growth and functioning of the oviducts are fully independent of the ovary.

³ Bogucki, M., *Bull. Acad. Sci. Cracovie*, 1919, 165.