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Normal Development and Experimental Treatment of the Opossum Mammary Gland Primordium.*

DOROTHY WELLS PLAGGE. (Introduced by Carl R. Moore.)
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The mammary primordia may be clearly seen in serial sections of pouch areas from 1 day opossum pouch young *(Didelphys virginiana)*. The primordia become visible to the naked eye at about 12 days and may be affected experimentally with female sex hormones by the 18th day and with male hormones by the 30th day.

Normal Development. The development of the normal mammary gland from 1 day to 100 days was studied in 18 females, 11 males, and 3 animals too young to be sexed. It was found to be similar to that described by Bresslau[1] for *Didelphys marsupialis*. At one day the mammary primordium in *D. virginiana* is visible under low power magnification as a small, oval thickening of the epidermis extending into the underlying derma and surrounded by concentric layers of cells from this stratum. The oval thickening enlarges and extends deeper into the corium and then assumes a typical flask shape with the neck of the flask attached to

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[1] Bresslau, Ernst, *Z. f. Morphol. und Anthropol.*, 1902, **4**, 261.

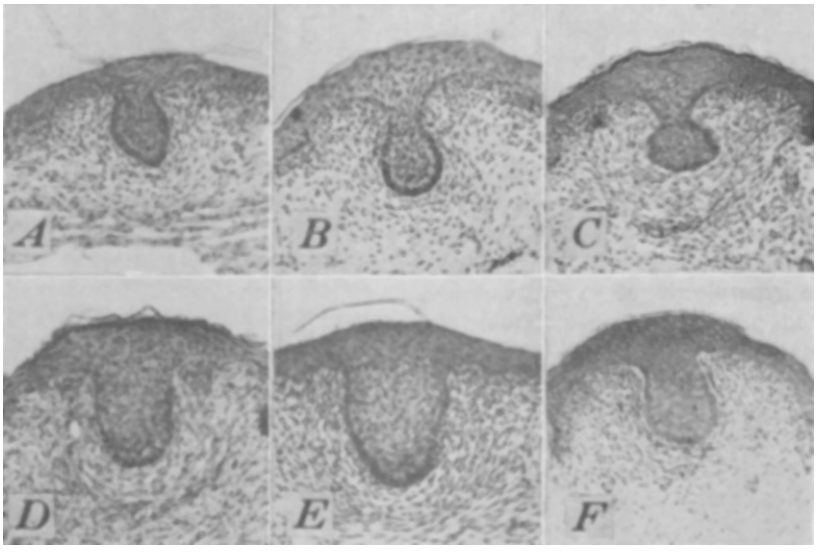

FIG. 1.
Mammary Primordia of Opossum Pouch Young, × 99.
A. 32-day normal male.
B. 32-day normal female.
C. 32-day female, testosterone propionate ointment days 16-31.
D. 30-day male, estradiol ointment days 6-29.
E. 30-day female, estradiol ointment days 6-29.
F. 32-day female, testosterone ointment days 3-31.

TABLE I.
Effects of Sex Hormones on Immature Opossum Mammary Gland.

No. of Animals	Sex	Age at death (days)	Treatment (days prior to autopsy)	Mammary gland response
				Estrogens.*
5	F	18-24	12-18	Hyperplasia, Abnormal forms.
1	M	30	24	" " "
2	F	30-31	10-24	" " " Indication of precocious branching
3	F	35-46	29-40	" " " Definite precocious branching
				Androgens†
2	F	16-25	11-13	Normal size. Normal forms
5	F	30-41	16-32	" " Abnormal forms. No branching
1	F	45	42	Taller than normal. Abnormal forms. No branching
1	F	62	22‡	Abnormal forms. Branches smaller than normal

*Treated with estradiol ointment.
†Treated with testosterone ointment, testosterone propionate ointment, testosterone propionate injections or combinations of the three.
‡Treated for 22 days followed by 31 days without treatment.

the epidermis, the round body extending into the underlying mesenchyme (Fig. 1,B). This primordium shows the first signs of branching in the 49-day female and by 83 days the primary milk hairs, milk ducts and sebaceous glands are present.

The development of the mammary primordium in the normal male follows the same general lines as that of the female although the embryonic male mammary gland seems somewhat smaller and less developed than that of the female in most of the stages compared (Fig. 1,A and B).

Experimental Treatment. After daily treatment with estradiol in ointment form all the mammary primordia of 10 females and one male between the ages of 18 and 46 days showed stimulation. These treated primordia were hyperplastic, of abnormal shape and exhibited precocious branching (Table I). A 30-day male (Fig. 1,D) included in this series showed a response like that of the treated female of the same age (Fig. 1,E) except for the absence of premature branching.

The response of the female mammary primordium to androgenic treatment was not nearly as striking as in animals treated with estradiol. Nine female pouch young were preserved at ages between 16 and 62 days after treatment with testosterone and testosterone propionate in ointment form and subcutaneous injections of t-propionate in sesame oil. A 16-day and a 25-day female showed little if any mammary stimulation. The primordia of the older animals, however, all responded by development of abnormal shapes (Fig. 1, C and F),

Equine gonadotropin (1 or 5 R. U. daily of gonadogen or gonadin) when injected from 7 to 23 days before autopsy did not affect the mammary primordia of 5 females between the ages of 17 and 100 days, and one male of 30 days. In these same animals, Moore[2] found only slight evidence of testicular response in the male and no effects on the ovaries in the females.

Summary. A study was made of the normal development of the mammary gland in the male and female opossum up to the age of 100 days. It was found possible to modify the normal growth pattern of the mammary primordia by treatment with estradiol, testosterone and testosterone propionate. Gonadotropic substances at the ages and dosages used did not affect the development of the glands.

[2] Moore, Carl R., *Physiol. Zool.*, 1941, **14**, 1.