

Effect of Castration and Transplantation on Ventral Gland of the Gerbil.* (30346)

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The Mongolian gerbil, *Meriones unguiculatus*, possesses a specialized mid-ventral sebaceous complex. The gland in females is small and varied in occurrence but in males is observed to hypertrophy and to produce a visible secretion as the animals reach sexual maturity. Because of this observed relationship between glandular function and sexual maturity a study was undertaken to determine: 1. the structure of the gland, 2. the influence of transplantation and 3. the effects of castration and hormone therapy.

Materials and methods. For histological examinations, tissues were fixed in FAA (formalin, alcohol and acetic acid), sectioned in paraffin at 10 μ and stained with Harris' hematoxylin and eosin. Biopsies were made at intervals during the several experiments by surgically excising thin transverse pieces of the ventral skin gland area and suturing the wound. In this way, several histological examinations of the ventral gland of the same animal were possible. Skin transplants were effected (on ten 21-day-old gerbils) by interchanging rectangular shaved areas from the backs with similar areas containing the glands from the ventral surface. Two groups of males were castrated: 5 juveniles, 31 days of age, with no visible gland development and 10 adult males, 16-22 weeks old with visible gland hypertrophy. Uncastrated animals of similar ages served as controls. Biopsies were made at 30 days and 55 days after castration. The adults were maintained for 8 weeks after castration before being used experimentally. Hormone treatment was effected in one group of 5 adult castrates and the 5 juvenile castrates by inserting a 75 mg pellet of crystalline testosterone (Oreton, Schering Co.) under the skin of the dorsal surface of the neck. Animals castrated as juveniles were treated with the testosterone implants at 16 weeks of age. The second group of 5 adult castrates received 4 subcu-

taneous injections of 1.25 mg testosterone propionate in oil (Oreton, Schering Co.) given on alternate days.

Observations. The ventral gland of the adult male gerbil is an orange, elevated fusiform pad in the mid-ventral line. The ventral pelage adjacent to the gland normally obscures it from view. The gland projects approximately 1 mm from the surface and extends from the sternum to near the prepuce averaging 22.2 mm $\times$ 7.4 mm in total length and width (Fig. 2). The sebaceous secretion is visible around the bases of short spine-like hairs which protrude from its surface. This secretion is greasy to the touch, dark orange in color and has a pungent musky odor.

The ventral gland is composed of complexes of enlarged sebaceous acini of the typical holocrine type associated with the hair follicles. The follicular openings are enlarged, duct-like, and filled with glandular secretion (Fig. 3). Gland masses fill the dermis and are responsible for the elevation of the gland. The sebaceous complexes surrounding each follicle are separated by thin connective tissue laminae. The gland is not distinctly demarcated at its margins but differs from the adjoining ventral skin only in the greater size of the sebaceous glands and follicles. Typical sebaceous glands associated with the hair follicles of the general skin can be seen in Fig. 7.

Ventral skin transplants were well tolerated and produced active glands when the animals reached 10-12 weeks of age (Fig. 1). These glands appeared essentially normal except that the ventral pelage remnant was reduced around the edges of the gland. No changes occurred in the dorsal skin transplanted to the ventral position.

Histological examination of ventral skin, taken from juveniles 31 days of age, revealed that normal glandular differentiation was well under way at this time (Fig. 6). Animals castrated as juveniles failed to develop glands

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by 12 weeks of age while the controls all developed active glands. Biopsies of the ven-

tral skin of these castrates revealed involuted glandular epithelium with a reduction in the

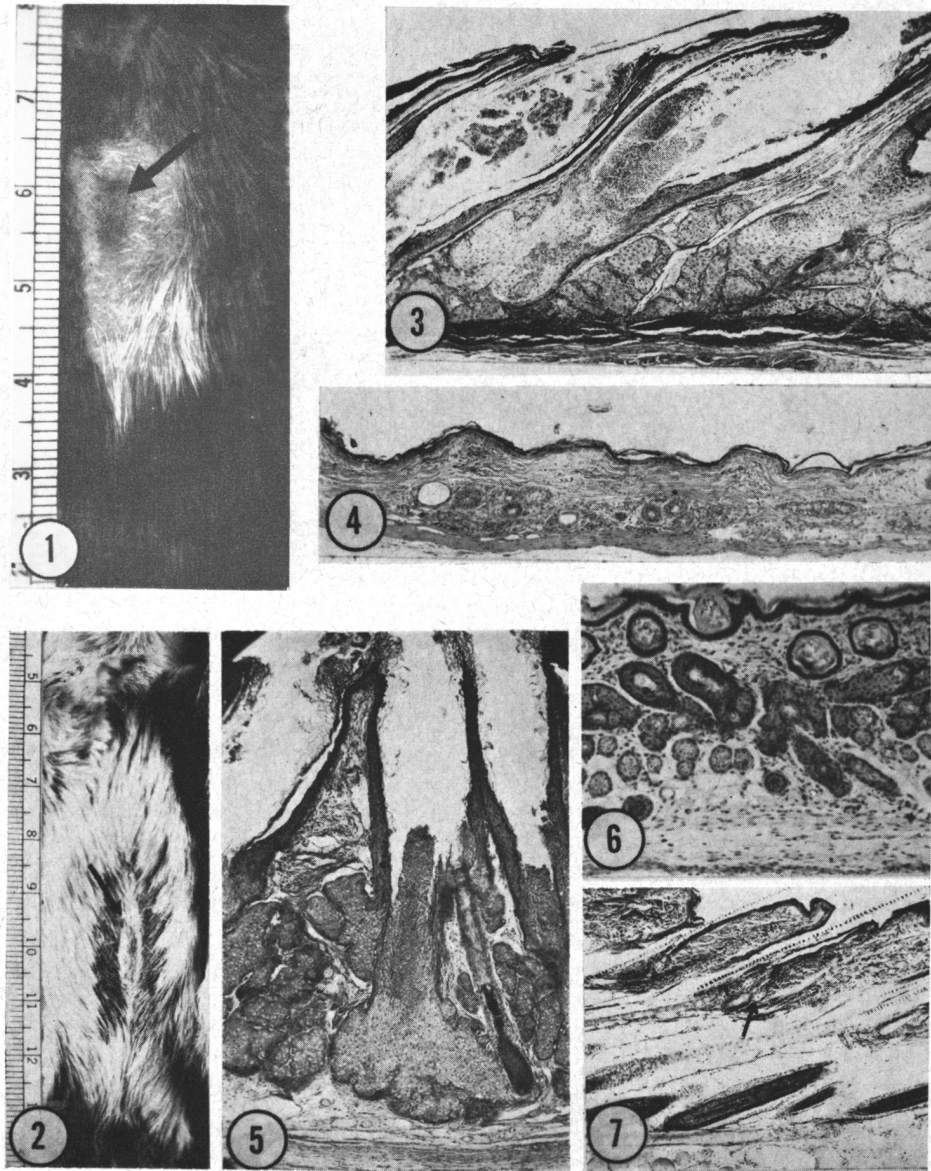


PLATE I.

FIG. 1. Gerbil with active gland implanted in dorsum.

FIG. 2. Ventral gland of a normal adult male gerbil. Hair has been clipped to expose gland.

FIG. 3. Longitudinal section of ventral gland of an adult male gerbil. 50 $\times$, H and E.

FIG. 4. Biopsy of ventral gland of an adult male gerbil 55 days after castration. 50 $\times$, H and E.

FIG. 5. Biopsy of ventral gland 3 weeks after testosterone implant in an adult which had been castrated for 55 days. Cross section, 50 $\times$, H and E.

FIG. 6. Cross section of ventral gland of a 31-day-old male gerbil. Note proliferated sebaceous gland elements. 70 $\times$, H and E.

FIG. 7. Dorsal skin of adult gerbil. Note size of normal skin sebaceous glands indicated by arrow. 50 $\times$, H and E.

width of the dermis. Testosterone implantation resulted in glandular hypertrophy and the appearance of secretion in 2 weeks.

Castration of adults resulted in a slow involution of the ventral gland. While secretion was still visible on the surface of some after 30 days, histological examination revealed that involution of the gland elements had taken place. By 55 days after castration, no secretion was visible and hair obscured the surface of the gland. Biopsies made at this time revealed complete involution (Fig. 4). The follicular ducts were narrowed and the glandular epithelium was reduced to basal elements. Four days after testosterone implantation the ventral glands appeared slightly swollen. Complete hypertrophy with visible secretion occurred in 2 animals in 10 days. Secretion was visible in all 5 animals by the end of 2 weeks. Secretory activity was maintained for at least 3 months after implantation. Microscopic examination of biopsies taken 2 weeks after implantation revealed that the sebaceous glands had hypertrophied and secretory material was visible within the enlarged follicular ducts (Fig. 5). Subcutaneous injection of 1.25 mg of testosterone propionate on alternate days for a total of 4 injections resulted in visible swelling of the gland area by the 3rd injection (5 days). This hypertrophy increased with visible secretion on the 9th day in 2 animals. The 3 remaining animals exhibited markedly swollen gland pads at this time. All 5 animals were producing sebum on the 11th day of the experiment even though injections were terminated after the 4th injection on day 7. Microscopic examination confirmed the hypertrophy of the glands.

Discussion. In rodents, localized sebaceous complexes have been reported from various regions of the body; however, a mid-ventral complex seems to be most common to both Old and New World Cricetidae(1). A ventral gland complex has been reported for such cricetids as the wood rat, *Neotoma*(2), the deer mouse, *Peromyscus*(3), the cotton rat, *Sigmodon*, and all true hamsters(4). Since the gerbil is a member of the family Cricetidae(5), the occurrence of a mid-ventral gland in this species is not unexpected.

The observation of normal glandular activity at sexual maturity and the pronounced effect of castration indicates that the secretory activity of the gland is under the influence of testicular androgens. The subsequent reestablishment of activity with testosterone in the castrate is further evidence of androgenic control and suggests that the active hormone may be testosterone. Further studies are in progress to determine the part testosterone plays in differentiation and growth of the glandular anlagen. These observations indicate that the gerbil gland may provide an interesting biological tool for the study of hormonal action. Similar observations of the effect of the male hormone on sebaceous glands of rodents have been made for the supracaudal glands of the guinea pig(6) and the lateral glands and pigment spots of hamsters(7,8).

Summary. The male gerbil has a mid-ventral gland composed of specialized sebaceous gland units associated with hair follicles. This gland hypertrophies and becomes active at the onset of sexual maturity. In the adult male, the gland is a slightly elevated orange fusiform pad in the mid-ventral line and averages 22.2 mm $\times$ 7.4 mm in length and width. The gland functions equally well when transplanted to another site of the body. Castration causes the gland to involute. However, this is reversible by administration of testosterone. The sebaceous glands of the mid-ventral skin of the gerbil are androgen sensitive.

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