Development of the Baculum of the Long-tailed Weasel.* (18357)

PHILIP L. WRIGHT. (Introduced by Lemuel D. Wright.)
From the Department of Zoology, Montana State University, Missoula.

It has been shown previously that the male long-tailed weasel *(Mustela frenata)* does not mature sexually until about one year of age. This is in spite of the fact that the animals often reach full body growth in captivity when 3 or 4 months old(1). The baculum remains small during this year of immaturity but develops to adult size when the animal first becomes sexually active. During the winter months when the males are 8 to 11 months of age they may be distinguished from the adults only by differences in the size and appearance of the baculum. The bacula of 16 immature males of *Mustela frenata oribasa* weighed from 14 to 29 mg and those from 18 adults 53 to 101 mg.

It seemed likely that the baculum is stimulated to develop to the adult type by androgens. In the immature hypophysectomized gonadectomized rat the baculum can be induced to develop by the injection of testosterone propionate(2). Experiments were planned to determine the effect of castration on both adult and immature weasel bacula and the effect of androgen treatment on the bacula of immature males.

Materials. Sixteen males were used in these experiments. Dr. Wm. H. Elder donated an entire litter obtained at Delta, Manitoba and 4 males from this litter were used. Four males, apparently littermates, from Kenosha, Wis., were used, and the additional animals were purchased from a trapper at Stevensville, Mont. All of the immature animals were caught during the summer when they can be recognized as immature by their undeveloped testes. The animals were maintained in individual cages and fed a diet consisting of horse meat, liver, and Purina mink chow.

TABLE I. Effect of Castration on Bacula of Adult and Immature Weasels.

Animal No.	Age of animal when castrated	Wt at autopsy, g	Date castrated	Date autopsied	Wt of baculum, mg
140	Adult	253	8/23/44	7/31/45	81.2
144	"	260	4/29/45	7/31/45	59.4
158	Immature	269	12/31/45	7/ 6/46	26.0
159	"	363	10/ 8/45	1/12/47	29.6

Results. The effect of castration on the size of the baculum was investigated as indicated in Table I.

It can be seen that the bacula of the adult males did not regress following castration; even though 11 months elapsed in one case (Fig. 1). This is to be expected since there is no regression of the baculum in normal adults during the winter months when the testes are regressed and androgen production is supposedly at a low ebb. That the immature males fail to develop the adult type baculum following castration when allowed to live considerably beyond the time in which they would have become adults, further suggests that androgens may be necessary for maturation of the baculum.

A preliminary experiment in which one immature male was injected with .5 mg testosterone propionate per day for 20 days indicated that the baculum was definitely under stimulation but did not develop fully in that time. Since a longer period of treatment was indicated and it is difficult to give daily injections to weasels without putting them under anesthetic, in further experiments pellets of androgen were implanted subcutaneously in the shoulder region. Such an experiment was carried out as indicated in Table II. At the end of the experiment the pellets were recovered, stripped of surrounding tissue, air-dried and weighed in order to determine the amount absorbed.

In only one of the 4 experimental animals

* Aided by a Grant-in-Aid from Sigma Xi Research Fund. The pellets of testosterone propionate were kindly furnished by Schering Corporation.

1. Wright, P. L., *J. Mammal.*, 1947, v28, 343.

2. Thyberg, W. G., and Lyons, W. R., PROC. SOC. EXP. BIOL. AND MED., 1948, v69, 158.

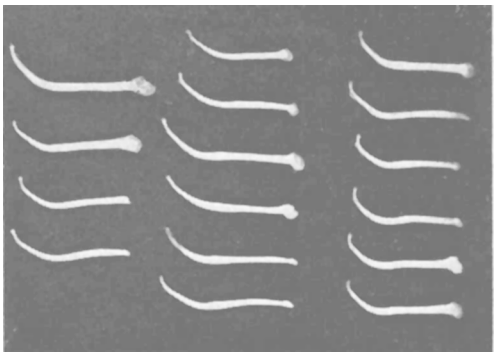

FIG. 1.
Bacula of the experimental animals (×⅔). The distal ends are at the left, the proximal ends at the right. The lateral corpora cavernosa are attached to the proximal end. The urethra lies in a sulcus on the ventral side of the bone. The group on the left show the bacula from Table I, #140 at the top. The group in the center are from Table II and the group at the right from Table III. In all cases the bacula are arranged in the order in which they are listed in the tables.

did the baculum develop to near the adult type. All of them, however, showed some development of the basal bulb of the baculum (Fig. 1). Since the desired effects were only partly realized, the experiment was repeated using testosterone propionate in place of testosterone. Two pellets were implanted per animal, and the animals were allowed to carry the pellets for a longer period. The testes of immature weasels are apparently completely inactive during the fall and winter months but in order to rule out any possible influence all the animals were castrated before the experiment was started.

In all cases the experimental animals developed larger bacula than did the controls. The weights and appearance of the bacula of these experimental animals closely approximate those of normal adults. They might have developed further with more prolonged treatment. Examination of the illustration (Fig. 1) clearly shows that the development of the basal nob is very marked. This seems to be correlated with a striking development of the corpora cavernosa which are attached to this nob. Histological sections of the penis made directly posterior to the baculum of these animals indicates that this portion of the penis is markedly stimulated by the androgen treatment, perhaps more extensively than the baculum.

Discussion. Lyons *et al.*(3) have shown that somatotrophin and androgen may synergize to produce a more marked effect on the os penis of the castrated hypophysectomized rat than either hormone alone. It is not known whether somatotrophin might have such an effect in the case of the weasel. Wild-caught adult male weasels average slightly heavier during the summer months than immature males(1). If an increase in body weight occurs at the same time as the onset of sexual maturity, as seems likely, it is possible that somatotrophin might have some minor effect upon the development of the baculum

TABLE II. Immature Weasels Implanted with 75 mg Pellets of Testosterone.

Animal No.	Body wt at autopsy, g	Date of implantation	Date of autopsy	Avg loss of wt of pellets, mg	Wt of baculum, mg
192	287	9/11/47	11/1/47	1.11	23.8
193	311	,,	,,	1.06	31.6
198*	366	,,	,,	0.93	50.2
199*	327	,,	,,	1.03†	31.6
200*	332	Control	,,	—	30.0
201*	294	,,	,,	—	31.4

* No. 198-201 were littermates from Delta, Manitoba. These animals were considerably heavier than the animals from western Montana.

† Pellet was found to have fallen out on September 27, when it was replaced with another.

TABLE III. Immature Weasels Implanted with 2-75 mg Pellets of Testosterone Propionate. All animals castrated November 4, 1948.

Animal No.	Body wt at autopsy, g	Date of implantation	Date of autopsy	Avg loss of wt of pellets per day, mg	Wt of baculum, mg
219	301	12/1/48	2/1/49	0.61	47.4
226	287	Control	,,	—	27.4
230*	234	,,	,,	—	22.8
231*	268	,,	,,	—	31.4
232*	229	12/1/48	,,	0.96	43.6
233*	219	,,	,,	1.08	39.6

*230-233 were probably littermates from Kenosha, Wis. These animals were slightly smaller than those from western Montana and considerably smaller than those from Manitoba used in the previous experiment.

3. Lyons, W. R., Abernathy, E., and Gropper, M., PROC. SOC. EXP. BIOL. AND MED., 1950, v73, 193.

in the weasel. Petrides(4) has recently discussed the problem of aging various fur bearing mammals by such characters as the baculum and the value of obtaining data of this type in the management of these species. If the results of this study do apply to other closely related species such as the marten, fisher, wolverine, badger, etc. whose sexual cycles are not fully understood, it would mean that those animals in the wild with adult type bacula were animals which had been sexually mature during the previous breeding season. This would be of value in estimating age ratios of these animals taken by trappers.

Summary. The bacula of castrated immature male long-tailed weasels developed to the adult type after the animals were implanted with pellets of testosterone propionate. The bacula of untreated castrated immature males did not develop to the adult type after several months. Once the baculum develops to the adult type it does not regress after castration.

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4. Petrides, G. A., *Am. Midl. Nat.*, 1950, v43, 355.

Renal Function in Decompensated Cirrhosis of the Liver.* (18358)

FREDERICK H. EPSTEIN, GERSON T. LESSER, AND EUGENE Y. BERGER.
(With the technical assistance of Roslyn Jackenthal.)

From the Research Service, New York University Medical Division, Goldwater Memorial Hospital, Welfare Island, and Department of Medicine, New York University College of Medicine.

Patients with decompensated cirrhosis of the liver have, as is well known, an impaired capacity for excreting sodium(1-5). Studies of glomerular filtration rate and renal plasma flow have, however, been few and the data obtained contradictory (Table I). The present study was intended to expand existing information and report simultaneous observations on glomerular filtration rate and electrolyte excretion, with a view toward drawing some conclusions concerning the mechanism of salt and water retention in cirrhosis of the liver and to correlate the degree of liver im-

TABLE I. Summary of Inulin, Mannitol, and Para-aminohippurate Clearances in Patients with Cirrhosis of the Liver Reported from Various Laboratories.*

Author	No. of subjects	Accumulating fluid	Presence of ascites	Inulin clearance, ml/min.	Mannitol clearance, ml/min.	PAH clearance, ml/min.
Patek(6)	1	Yes	Yes	91		434
	1	"	"	142		600
	1	"	"	172		709
Leslie(7)	5	"	"	69†		371
	2	No	"	136†		704
	6	"	No	201†		846
Farnsworth(1)	1	Yes	Yes		61	415
	1	"	"		74	476
Goodyer(5)	1	"	"		60	298
	1	"	"		88	449
	1	"	"		94	526
	1	"	"		102	492
	1	"	"		123	418
	1	"	"		124	647

* The data of Patek and Goodyer are corrected to 1.73 sq.m., the data of Leslie and Farnsworth apparently are not corrected for surface area.
† Mean.

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2. Falloon, W. W., Eckhardt, R. D., Cooper, A. M., and Davidson, C. S., *J. Clin. Invest.*, 1949, v28, 595.
3. Eisenmenger, W. J., Ahrens, E. H., Jr., Blondheim, S. H., and Kunkel, H. G., *J. Lab. Clin. Med.*, 1949, v34, 1029.
4. Hilton, J. G., *Am. J. Med.*, 1950, v9, 108.
5. Goodyer, A. V. N., Relman, A. S., Lawrason, F. D., and Epstein, F. H., *J. Clin. Invest.*, 1950, v29, 973.
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7. Leslie, S. H., Johnson, B., and Ralli, E. P., *J. Clin. Endocrin.*, 1949, v9, 682.