THE TOPOGRAPHY OF THE HYPOPHYSIS IN THE XENARTHRA

GEORGE B. WISLOCKI
Department of Anatomy, Harvard Medical School, Boston

FOUR PLATES (TWELVE FIGURES)

The present study gives an account of the topography of the pituitary gland in representatives of the three families of the Xenarthra. The hypophysis in these three groups of mammals is in some respects so unusual that it deserves to be described.

MATERIAL AND METHODS

The material comprises the adult pituitary glands from three two-toed sloths (Choloepus hoffmanni), three three-toed sloths (Bradypus griseus griseus), one anteater (Tamandua tetradactyla), and three armadillos (Dasypus novemcinctus). All of these animals were collected in the Republic of Panama, excepting the armadillos which were obtained from Texas.[1]

The material was prepared for study by methods designed primarily to give information regarding the topography of the various parts of the gland, as well as to show their relationship to the brain. For this purpose the brain attached to the base of the skull was fixed in 10% formalin. The specimens were decalcified in 4% trichloracetic acid, next embedded in celloidin and then cut serially in 20 μ sections in the sagittal plane. The sections were stained with haematoxylin and

[1] This investigation is incidental to work undertaken in tropical America on the reproduction of monkeys, under a grant from the Committee on Sex of the National Research Council. For aid in obtaining the material, the writer is greatly indebted to Mr. J. B. Shropshire. My sincere thanks are due, as well, to Dr. James Zetek and Dr. Herbert Clark who placed the facilities of their respective institutes, namely, the Barro Colorado Island Laboratory and the Gorgas Memorial Institute, at my disposal.

eosin. The material so obtained shows the pituitary gland lying in situ within the shallow sella turcica and attached by the infundibulum to the base of the brain.

OBSERVATIONS

Two-toed sloth (Choloepus hoffmanni). Figures 1 to 3. It will be noted that the pituitary gland of the two-toed sloth lies in a relatively shallow depression in the sphenoid bone. The gland is markedly flattened and consists of a well-defined, dark staining anterior lobe and a less deeply stained neural lobe.

The neural lobe is a long drawn out structure consisting of a lengthy stalk and a large but somewhat flattened infundibular process. An infundibular recess from the third ventricle extends throughout the length of the stalk into the infundibular process.

The epithelial portion of the gland is differentiated into a large pars distalis and a small pars intermedia, but shows no signs of the presence of a pars tuberalis. Moreover, the epithelial hypophysis does not enfold the neural lobe, but is attached only to a relatively small portion of the ventral surface of the stalk and to the antero-ventral aspect of the infundibular process. The neural stalk and process are lodged in a shallow groove upon the dorsal surface of the buccal pituitary. The pars intermedia, although not readily visible in the photographs, consists of a narrow strip of uniformly blue-staining cells bordering the infundibular process. A small residual lumen may or may not be present. In the specimen shown in figures 1 and 2 no residual lumen is visible, but in another specimen (fig. 3) a small crescentic space is seen separating a narrow strip of intermedia from the pars distalis. In the first specimen, which lacks a residual cleft, the pars intermedia is not sharply set off from the distal portion of the gland. The line of demarcation between the neural lobe and the pars intermedia, on the contrary, is exceedingly sharp and even (figs. 1 and 2), appearing almost as though a narrow, but distinct, capsule of connective tissue separated the two. This interpretation is supported by the find-

ing of scattered melanophores at the line of junction of the two tissues. In figure 3, of a specimen in which the blood vessels have been injected with India ink, the injected vessels obscure, more or less, the sharp contour of the line of contact of the pars intermedia and the neural tissue. Moreover, the dark strands extending upward from the pars distalis into the ventral part of the infundibular stalk, which might readily be taken in the photograph for epithelial strands, are in reality composed solely of blood vessels which, in this specimen, were filled with India ink by vascular injection.

A pars tuberalis appears to be completely lacking, the epithelial pituitary lying wholly within the sella beneath the sellar diaphragm. There is no evidence whatsoever of the presence of epithelial cells extending upward along the infundibular stalk to constitute a pars tuberalis as described in other mammals. Instead of a mantle of epithelial cells investing the infundibulum and the tuber cinereum, these regions are covered solely by a sheet of highly vascular leptomeninges. The blackish tongue of tissue (lm) in figure 1, situated on the surface of the ventrorostral aspect of the infundibular stalk which might be assumed at this low magnification to consist of pars tuberalis, is composed solely of leptomeninges which stain darkly because of the presence of numerous blood vessels as well as melanophores.

A further characteristic of the hypophysis of the two-toed sloth is the relatively heavy sheath of dura by which it is encapsulated. The dura consists of a mural portion lining the sella and of a diaphragmatic portion which forms an extremely heavy shelf overlying the entire infundibular process. The free edge of this shelf borders the infundibular stalk posteriorly. A lesser and more delicate dural fold adheres tightly to the dorsal surface of the anterior lobe and forms the anterior margin of the dural aperture transmitting the infundibular stalk. Moreover, the dura is adherent to the neural lobe as well as to the pars anterior, forming a capsule for the gland.

The dura, in two out of three specimens, is rather heavily pigmented due to the presence of melanophores. These are especially abundant in the dura at the rostral tip of the anterior lobe, and in the anterior dural lip of the diaphragmatic aperture. Melanophores are also present in the pia-arachnoid which surrounds the infundibular stalk, occurring especially in the adventitial sheaths of the larger pial vessels. Melanophores also penetrate the substance of the gland in places. A few are also encountered between the infundibular process and the pars intermedia, as well as in the neural stalk and in the tissue of the pars distalis.

Three-toed sloth (Bradypus griseus griseus). Figures 4 to 7. The hypophysis of the three-toed sloth is an extremely flattened structure lying in a slight hollow in the sphenoid bone. The neural lobe is similar to, but even more elongated than, that of the two-toed sloth. It possesses an extremely long, slender stalk, containing a commodious infundibular recess which extends into the flattened infundibular process.

In contact with the entire ventral surface of the neural stalk and its process lies the exceedingly flattened buccal portion of the gland. The latter consists of an anterior lobe separated from the neural portion of the gland by a thin sheet of pars intermedia. The pars intermedia is partially set off from the anterior lobe by several isolated, slender clefts which represent the residual lumen. The pars intermedia differs from that of the two-toed sloth by the fact that it extends far backward, forming a thin mantle adherent to the convex ventral surface of the infundibular process. At the extreme caudal tip of the neural lobe the pars intermedia exhibits a local enlargement. In the region of the middle portion of the neural stalk, the pars intermedia forms small flanges of tissue which embrace the sides of the stalk. Compared with the two-toed sloth, the boundary between the neural lobe and the pars intermedia is not distinct. This is due to penetration, to a slight degree, of the cells of the pars intermedia into the substance of the neural lobe, and the apparent absence of any special condensation of connective tissue between them.

The pars distalis consists of a thickened anterior mass lying ventral to the infundibular stalk, and of a thin shell-like portion which extends backward and is nearly co-extensive with the intermedia, excepting the above-mentioned caudal enlargement of the intermedia which is free. In the region of the middle third of the length of the horizontal infundibular stalk, both the pars intermedia and the pars distalis curve upward on the sides of the stalk, forming slight lateral cushions or flanges. Consequently the dorsal surface of the buccal hypophysis assumes the form of a shallow excavation in which the neural lobe rests.

The hypophysis of the three-toed sloth, similar to that of the two-toed sloth, is embedded in a stout dural capsule. The dura splits at the posterior pole of the pituitary into a mural sheet which lines the sella and into a heavy diaphragmatic sheet which adheres to the upper surface of the neural lobe. The latter extends forward for an extraordinarily long distance to terminate as the posterior border of the diaphragmatic aperture. At the rostral pole of the pituitary, where the anterior lobe extends forward like the bow of a boat, the dura cleaves similarly into dorsal and ventral components which encapsulate the gland. Melanophores are not observed in the hypophyseal meninges in the three-toed sloth.

Anteater (Tamandua tetradactyla). Figures 8 to 10. The hypophysis of the anteater is in general shape much like that of the two-toed sloth although in volume it is approximately twice as large. It lies in a long trough-like excavation of the sphenoid bone. The neural lobe is much elongated and the stalk is in the main solid, although a narrow infundibular recess with small diverticula, creating a crenellated appearance, extends approximately one-third of its length. In addition to this irregular passage communicating with the third ventricle, the stalk and infundibular process contain a number of small cavities situated more distally, some of which may communicate with the infundibular recess but the majority of which appear to be closed spaces. These minute cavities are lined by distinct ependymal cells. They contain abundant

secretion which stains deeply with eosin, besides numerous free cells which are basophilic. In the photographs the largest of these small cavities are at the limit of visibility.

Each lateral half of the anterior lobe gives rise to a mass of cells which encircles the neural stalk to fuse with a similar projection from the opposite side. In consequence the neural stalk just anterior to the expanded infundibular process is encircled by a conspicuous bridge composed of epithelial tissue. The main mass of this pontine structure consists of cells identical with the elements of the pars distalis. It possesses, however, a thin inner shell or covering of pars intermedia which separates the outer circumferential mass of granular cells from the neural stalk.

The configuration of the pars intermedia and of the residual lumen of the epithelial hypophysis is peculiar in the anteater. Besides being present in relationship to this bridge, the intermedia extends backward as a thin lamina lying between the anterior lobe and the ventral surface of the neural process, to the extreme caudal tip of the infundibular process, where it forms a thickened mass of cells, similar to that described in this region in the three-toed sloth. More extensive even than in the three-toed sloth, the intermedia can be traced around the sides and over the dorsal surface of the neural process. There is only a relatively small area upon the dorsal surface of the infundibular process that is not covered by a thin mantle of pars intermedia. In consequence of these peculiarities the pars intermedia of the anteater is extremely extensive and complex. Furthermore, the rostral part of the pars intermedia, associated with the above-mentioned bridge of epithelial tissue, differs in character from the part which covers the infundibular process. In the former locality the cells of the intermedia tend to be arranged to a considerable extent in minute follicles reminiscent of the histological appearance of pars tuberalis, whereas in the latter regions the cells are uniformly dispersed. A discussion of whether the rostral portion of the pars intermedia in the anteater should be homologized with the pars tuberalis of other mammals will be

presented in a later paragraph. Certainly the region in question does not coincide topographically with the location of the pars tuberalis in other mammals. The border line between the pars intermedia and the neural lobe is irregular, due to some infiltration of the neural tissue by epithelial cells of the intermedia.

As in the two sloths, no evidence can be found of the presence of tuberal prolongations of the buccal hypophysis along the neural stalk toward the base of the brain. The dark tissue (lm) seen in this region in figure 8 is composed solely of richly vascularized leptomeninges which contain many melanophores. The epithelial hypophysis lies entirely beneath the dural diaphragm spanning the sella. The dura, intimately fused with the surface of the hypophysis, is exceedingly thick and shows a topography similar to that encountered in the sloths. The dura throughout the basal region of the brain, but especially the sellar diaphragm, is quite deeply pigmented due to the presence of melanophores. The larger vessels traversing the leptomeninges are accompanied by numerous pigmented cells.

Armadillo (Dasypus novemcinctus). Figures 11 and 12. The hypophysis of the armadillo differs markedly in structure from that of either sloths or anteaters. It lies embedded in dura in an exceedingly shallow sella turcica. In mid-sagittal view it is seen to be somewhat ovoid in shape and not especially flattened. In contrast to sloths and anteaters the anterior lobe and the neural lobe are about equal in size. The neural stalk is relatively short and possesses no central lumen. The pars distalis of the epithelial hypophysis is attached to the antero-ventral surface of the neural lobe without any discernible intervening pars intermedia or residual lumen. The absence of pars intermedia is exactly the reverse of sloths and anteaters in which this portion of the gland is extremely well developed. Moreover, the pars distalis is sharply demarcated from the neural lobe, where the surfaces of the two are in apposition, indicating that no infiltration of the infundibular process by epithelial cells has taken place. Indeed, spindle-shaped cells, of the character of fibroblasts, appear to form a

delicate but continuous sheet intervening between the anterior and neural lobes. The dorsal surface of the anterior lobe exhibits a shallow excavation in which part of the ventral surface of the neural lobe rests. Near the junction of the infundibular stalk and process the anterior lobe creates a low flange of tissue on either side of the infundibular stalk. This is reminiscent of the complete bridge of epithelium enclosing the stalk in this region in the anteater and of the flange-like structures observed in the three-toed sloth. In complete contrast to the preceding animals, the armadillo possesses an extensive pars tuberalis which forms a mantle surrounding the infundibulum and extends well onto the surface of the tuber cinereum. On the anterior surface of the neural stalk especially, a sheet of epithelial cells extends rostrally to end in a conspicuous, wedge-shaped mass of cells attached to the tuber cinereum. Posteriorly the stalk is partially covered by the pars tuberalis, noticeable particularly as a wedge of epithelial cells in the angle between the infundibulum and the membranous floor of the ventricle contiguous to the mammillary body. Histologically the elements of the pars tuberalis are arranged in minute follicles. The dura is not quite so thick in the armadillo as in the sloths and anteaters. It encapsulates the body of the gland, however, as completely as in the previous animals. Melanophores are not visible in the meningeal coverings of the specimens of the armadillo.

DISCUSSION

The denial of the presence of a pars tuberalis in sloths and anteaters is based chiefly upon the failure to find a sheet or mantle of epithelial tissue which extends upward from the body of the pituitary, through the aperture in the sellar diaphragm, to surround the infundibulum and to spread out upon the surface of the tuber cinereum. Applying topographical criteria in the search for this portion of the gland, a pars tuberalis is certainly absent. The meaning of the term 'tuberal' part of the hypophysis obviously implies a portion of the epithelial tissue which is related to the tuber cinereum.

In all other mammals of which accounts exist, including various species of Marsupialia, Insectivora, Ungulata, Cetacea, Carnivora, Rodentia, Chiroptera, and Simiae, such an extension upward, compatible with the sense of the term 'tuberal,' has invariably been found. Heretofore, the absence of a pars tuberalis has been recorded only in certain lower vertebrates (Cameron, '29, fishes, some snakes and lizards).

It is possible, however, that cells equivalent to pars tuberalis might conceivably be found elsewhere in the pituitary complex of sloths and anteaters than in the customary location in other mammals. The diagnosis in this case would have to be made solely upon histological grounds without reference to topography. Adopting a purely histological criterion, the sloths present no signs of the epithelial pituitary being divided other than into a pars distalis and a pars intermedia, confirming our conclusion, on this ground as well, that the sloths do not possess a pars tuberalis.

In the anteater, on the contrary, the rostral part of the pars intermedia, which separates the conspicuous bridge of pars distalis from the enclosed infundibular stalk, is histologically different from the pars intermedia surrounding the infundibular process. This rostral portion between pars distalis and the neural lobe displays numerous minute follicles composed of cells which stain uniformly with haematoxylin and contain a droplet of eosin-stained colloid in the centers. Now the presence of such small follicles is one of the more constant histological features of the pars tuberalis of other mammals, so that it is probably valid to homologize this region in the anteater with the pars tuberalis of other mammals—accepting the histological evidence, although the topographical criteria do not coincide. In the sloths, on the contrary, in which this bridge of tissue is wholly lacking (two-toed sloth), or represented merely by two low flanges bordering the neural lobe (three-toed sloth), histological evidence of any epithelial tissue that can be homologized with the pars tuberalis appears to be totally wanting.

The fact that the pars tuberalis is lacking in both of the sloths points to their close kinship. Moreover, although present in the anteater, the pars tuberalis is distinctive in its topography from all other mammals which have been investigated. Finally, in the armadillo the pars tuberalis is present and well developed, possessing the customary topography of other mammals.

Interesting regarding the armadillo is the absence, on the other hand, of a pars intermedia, whereas the pars tuberalis is well represented. The fact that the armadillo's pituitary has no pars intermedia was already known to Mrs. M. R. Lewis, although the observation has never been published. I have a photograph of a dissection of the entire hypophysis of the armadillo, given to me by Mrs. Lewis, indicating quite clearly that there is no pars intermedia between the anterior and posterior lobes.

Other vertebrates in which a pars intermedia is lacking are known. In birds the pars intermedia is described as being reduced or absent, while in one group of mammals, the Cetacea, it is totally lacking (Wislocki, '29; Wislocki and Geiling, '36; Valsö, '34). Nevertheless, the whale's pituitary possesses other striking features, such as complete separation of the neural lobe from the pars anterior by the subdural space and a heavy fold of dura, which distinguish it from the hypophysis of the armadillo. The latter resembles more nearly in its topography the arrangement in birds in which the anterior lobe and neural lobes are in contact with one another, being separated at most by a delicate intervening film of spindle-shaped connective tissue cells.

These observations on the absence of a pars tuberalis in sloths, and on the lack of a pars intermedia in the armadillo and whale, indicate how variable the structure of the mammalian pituitary may be. The only constant portion of the pituitary appears to be the pars distalis. Physiologically this suggests that the main functions of the epithelial hypophysis reside in the anterior lobe and that whatever functions are assumed as being controlled by either pars inter-

media or pars tuberalis are either unessential in certain animals or are taken over by other parts of the organ which substitute for the absent part.

It is worth pointing out that in sloths and anteaters, in which the mantle of pars tuberalis surrounding the infundibulum is lacking, the rich blood supply, which is characteristic of the pars tuberalis in other mammals, is maintained in the form of an equally rich vascular plexus located in the sheath of leptomeninges surrounding the infundibulum. Thus the blood supply reaching the pituitary gland via the stalk appears to be independent of the presence or absence of the pars tuberalis.

The embryology of the pituitary of neither the Xenarthra nor the Cetacea being known, it would be unjustifiable to assume that neither the pars tuberalis nor the pars intermedia had ever developed. It is quite possible that they are formed initially in the early growth period, but that one or the other, as the case may be, undergoes subsequent reduction.

Finally we wish to call attention in the Xenarthra to the relations of the dura to the hypophysis. Compared to the majority of mammals—cat, dog, rhesus monkey, or man, for example—the dura investing the pituitary gland is exceedingly heavy and thick. This circumstance makes it very easy to distinguish the dura and to ascertain its relationship to the gland. It is apparent that the dura completely encapsulates the hypophysis and is adherent to it, without the intervention of the subarachnoid space or the leptomeninges. The latter are confined solely to that portion of the hypophyseal stalk located between the base of the brain and the diaphragm of the sella. These observations afford substantiating evidence for the conclusion reached in a previous study of other mammals (Wislocki, '37 a), to the effect that the subarachnoid space and typical leptomeninges do not surround the body (intrasellar portion) of the pituitary gland.

In conclusion a few remarks are necessary concerning the occurrence of melanophores in the hypophyseal region of the two-toed sloth and anteater. We attach no significance, as regards the hypophysis, to the presence of melanophores in the meninges surrounding the pituitary gland. In our experience melanophores are frequently encountered in variable numbers in the meninges of mammals, especially in the basal region. For example, in the pig and sheep the meninges are macroscopically black in appearance over large areas, while in the cat and rhesus monkey, although seldom visible grossly, melanophores can frequently be seen upon microscopic examination in the meninges at the base of the brain. These pigmented cells tend to occur in greatest numbers in the adventitial tissue accompanying the vessels coursing through the meninges.

Melanophores, in animals in which they occur in the meninges, are frequently seen in sections of the hypophyseal region. Here they may actually penetrate the tissues of the hypophysis, as observed by Benjamin ('35) in the rat, and in the present specimens of the two-toed sloth. This is quite natural and has no special significance beyond the fact that the stroma of the pituitary gland is derived embryologically from the perimedullary mesenchyme of the brain (Benjamin, '35; Wislocki, '37 b). The meninges and the hypophyseal stroma arise from a common formative tissue and consequently have similar histological characteristics. Benjamin has shown that only a certain proportion of rats shows this pigmentation and that the pigment has a hereditary basis. Furthermore, he points out that there is no evidence that the phenomenon is related in any way to the functioning of the hypophysis or that it is concerned in the relations of the pituitary to other glands of internal secretion.

CONCLUSIONS

1. The adult hypophysis of neither the three-toed sloth (Bradypus griseus) nor the two-toed sloth (Choloepus hoffmanni) possesses a pars tuberalis. A well-developed pars intermedia is present in both. The infundibular recess is extremely extensive.

2. In the adult anteater (Tamandua tetradactyla), a pars tuberalis is demonstrable on histological grounds, but its topographical relations are quite atypical. A pars intermedia is elaborately developed. The infundibular recess is extensive.

3. The adult armadillo (Dasypus novemcinctus) possesses a well-developed, typical pars tuberalis. It has, on the other hand, no pars intermedia. The infundibular recess is slight.

LITERATURE CITED

BENJAMIN, T. A., JR. 1935 The occurrence of pigment in the pars intermedia and pars tuberalis of the hypophysis and in the hypophyseal leptomeninges of the rat (domestic and wild). Anat. Rec., vol. 61, pp. 331–338.

CAMERON, G. R. 1929 Die Beziehungen der Pars tuberalis hypophysis zum Hypophysenapparat. Veröff. a. d. Kriegs- u. Constitutionspath., Bd. 5, S. 1–56.

VALSÖ, J. 1934 Der Hormongehalt der Hypophyse des Blauwals (Balaenoptera sibbaldii). Klin. Wochenschr., Bd. 13, S. 1819–1821.

WISLOCKI, G. B. 1929 The hypophysis of the porpoise (Tursiops truncatus). Arch. Surg., vol. 18, pp. 1403–1412.

———— 1937 a The meningeal relations of the hypophysis cerebri. I. The relations in adult mammals. Anat. Rec., vol. 67, pp. 273–294.

———— 1937 b The meningeal relations of the hypophysis cerebri. II. An embryological study of the meninges and blood vessels of the human hypophysis. Am. J. Anat., vol. 61, pp. 95–129.

WISLOCKI, G. B., AND E. M. K. GEILING 1936 The anatomy of the hypophysis of whales. Anat. Rec., vol. 66, pp. 17–41.

ABBREVIATIONS

ar, arachnoid membrane
ef, colloid follicle
d, dura
de, dural capsule
di, diaphragm of sella turcica
int, pars intermedia
ip, infundibular process
ir, infundibular recess
is, infundibular stalk
lm, leptomeninges covering hypophyseal stalk and tuber cinereum and containing blood vessels and melanophores but no epithelial cells
mb, mammillary body
mr, mammillary recess
op, optic chiasma
pd, pars distalis
pt, pars tuberalis
re, small residual cavities of infundibular recess
rl, residual lumen of Rathke's pouch
sa, subarachnoid space
sd, subdural space
te, median eminence of tuber cinereum
v, third ventricle

PLATE 1

EXPLANATION OF FIGURES

1 Medial sagittal section through hypophysis of two-toed sloth. There is no extension upward of epithelial tissue on the surface of the infundibular stalk or tuber cinereum. The epithelial pituitary is situated completely beneath the sellar diaphragm (di). The blackish tongue of tissue (lm), situated on the surface of the rostral aspect of the infundibular stalk, which might be assumed at this low magnification to consist of pars tuberalis, is composed solely of leptomeninges which stain darkly because of the presence of numerous blood vessels as well as melanophores. × 10.

2 Parasagittal section through hypophysis of two-toed sloth. Note that the epithelial hypophysis lies within the confines of a stout dural capsule. × 10.

3 Medial sagittal section through hypophysis of another two-toed sloth. Vascular injection with India ink. Notice in this specimen the small residual lumen which separates a clearly defined strip of pars intermedia from the anterior lobe. By virtue of the presence of blood vessels injected with India ink, the border between the buccal hypophysis and the neurohypophysis does not appear to be so sharply defined as in the previous specimen. The blackish masses seemingly penetrating the anterior border of the infundibular stalk are not upward extensions of cells from the buccal hypophysis but are injected blood vessels. No pars tuberalis is present. × 14.

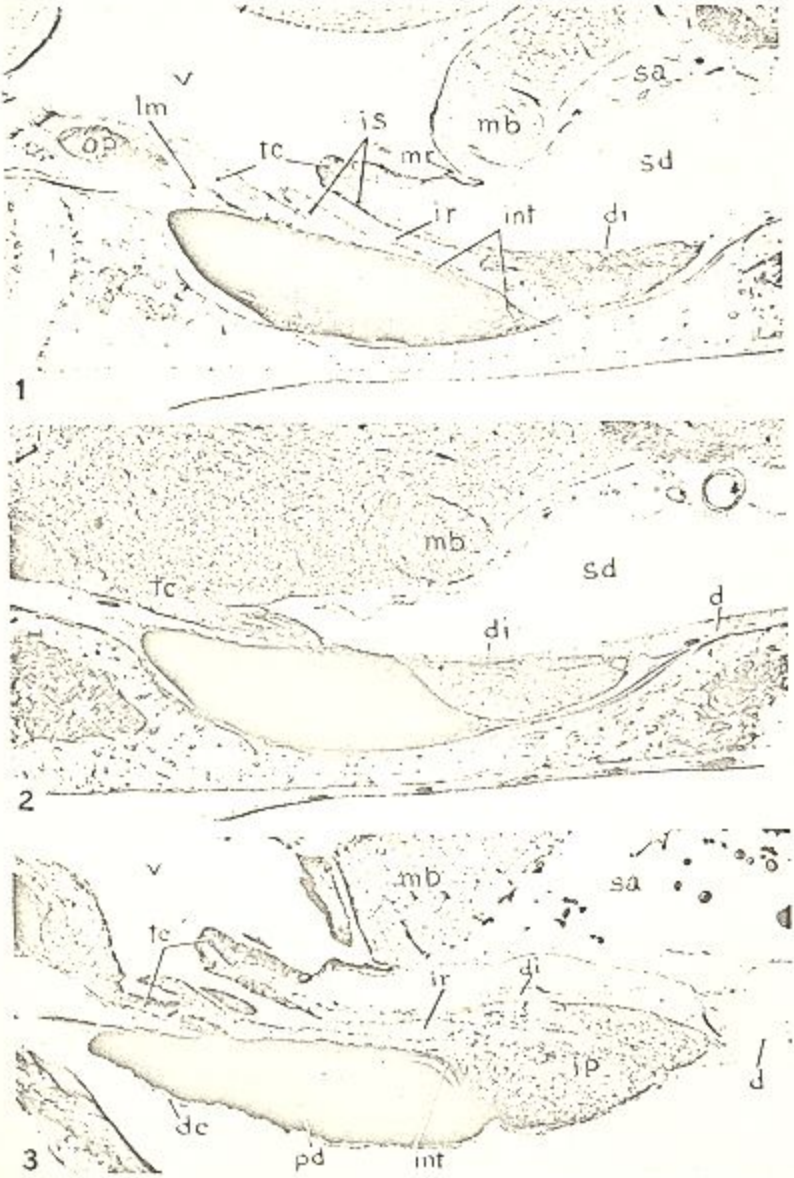

v
lm
op
tc
is
mr
mb
sa
sd
ir
int
di
1
mb
sd
tc
d
di
2
v
mb
sa
tc
ir
di
ip
d
dc
pd
int
3

PLATE 2

EXPLANATION OF FIGURES

4 Medial sagittal section through hypophysis of three-toed sloth. No pars tuberalis is present. The pars intermedia is extensive. A stout dural capsule, including an extensive diaphragm, envelops the hypophysis. The buccal hypophysis possesses no extension upward along the infundibular stalk. × 10.

5 Paramedian section through hypophysis of three-toed sloth, showing how, laterally to the infundibular stalk, the pars distalis and pars intermedia turn upward to form flanges which create a trough in which the stalk rests. × 10.

6 Medial sagittal section through hypophysis of another three-toed sloth. Vascular injection with India ink. Infundibular stalk torn across. The extensive pars intermedia, the thick dural diaphragm and the long infundibular recess are clearly seen. × 10.

7 Parasagittal section of the preceding specimen, taken somewhat more laterally than the section shown in figure 5. × 10.

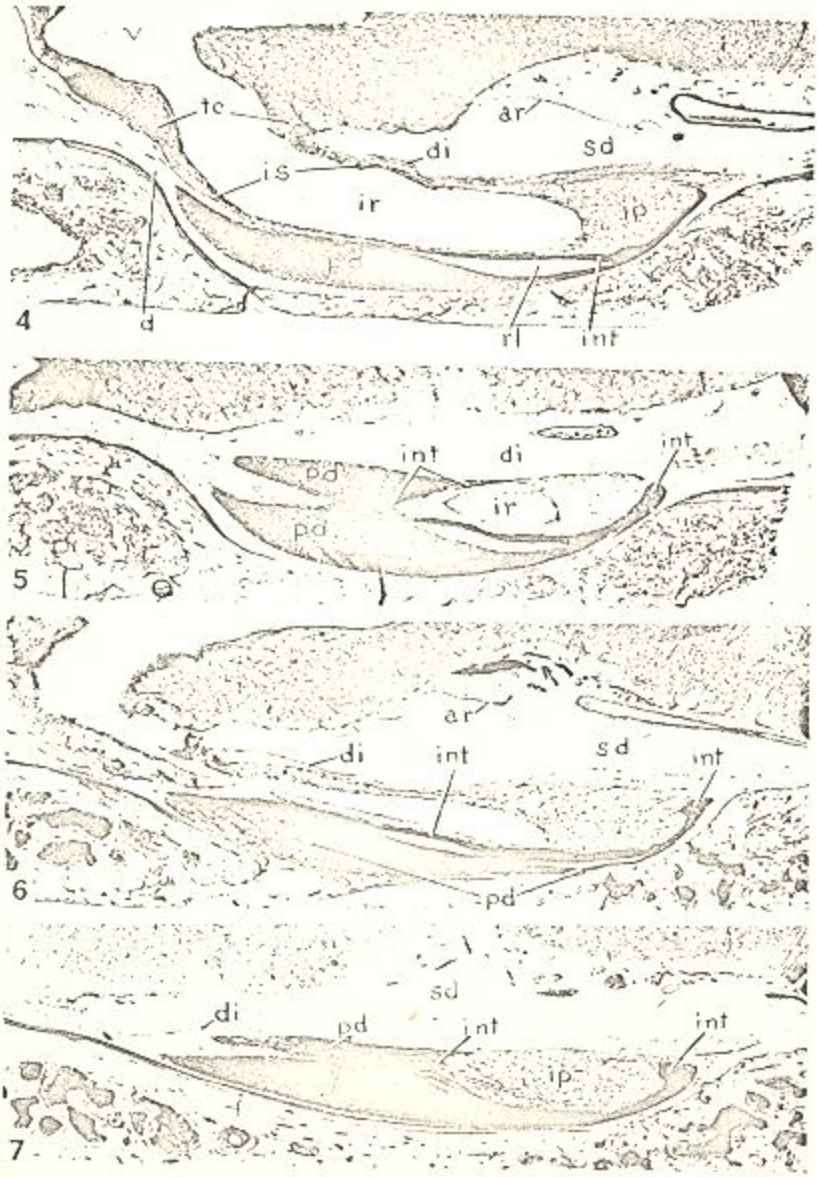

V
tc
ar
di
sd
is
ir
ip
4
d
rl
int
int
di
int
pd
ir
pd
5
ar
di
int
sd
int
6
pd
sd
di
pd
int
int
ip
7

PLATE 3

EXPLANATION OF FIGURES

8 Median sagittal section through hypophysis of anteater. There is no pars tuberalis on the surface of the tuber cinereum (tc). The dark tissue (lm) in this region is composed solely of richly vascular leptomeninges which contain many melanophores. The bridge of the pars distalis, encircling the infundibular stalk, and its relationship to the pars intermedia (int) are shown in this and the following figure. The infundibular recess (ir) extends as an ill-defined cleft into the proximal part of the neural stalk. More distally there are situated in the substance of the stalk minute cavities apparently not continuous with the infundibular recess. The largest of these isolated clefts (rc) are barely visible at the magnification used here. × 10.

9 Paramedian section of the hypophysis of anteater showing further details of the bridge of pars distalis (pd) surrounding the neural stalk. The extensive and complex pars intermedia (int) can also be seen. Noteworthy is the most rostral part of the intermedia in the paramedian position. Labelled "pi" in the figure, we regard this anterior extension of the intermedia, on histological grounds, as equivalent to the pars tuberalis of other mammals. × 10.

10 A section taken still more laterally than the preceding one. It shows how the separate bridge like mass of pars distalis in the two previous photographs is actually connected with the lateral portions of the anterior lobe. × 10.

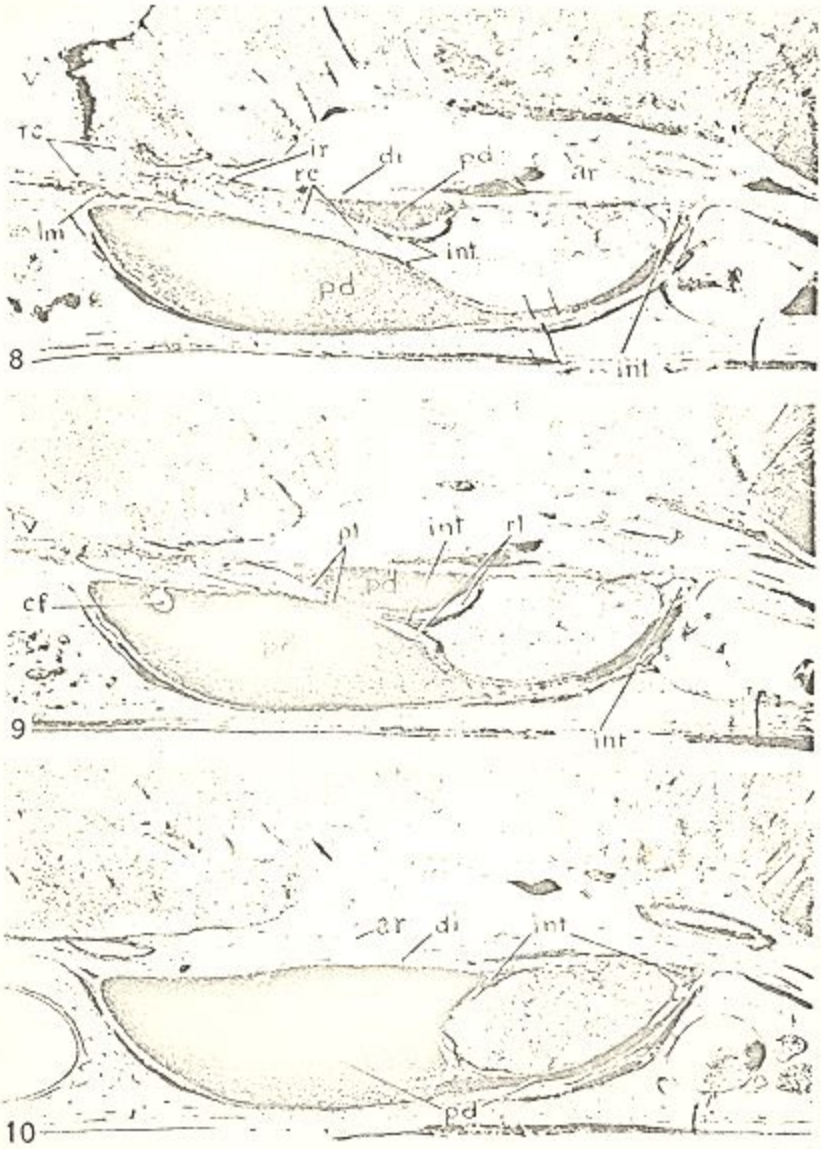

tc
ir
rc
di
pd
ar
lm
int
pd
int
8
v
pl
int
rl
pd
cf
int
9
ar
di
int
pd
10

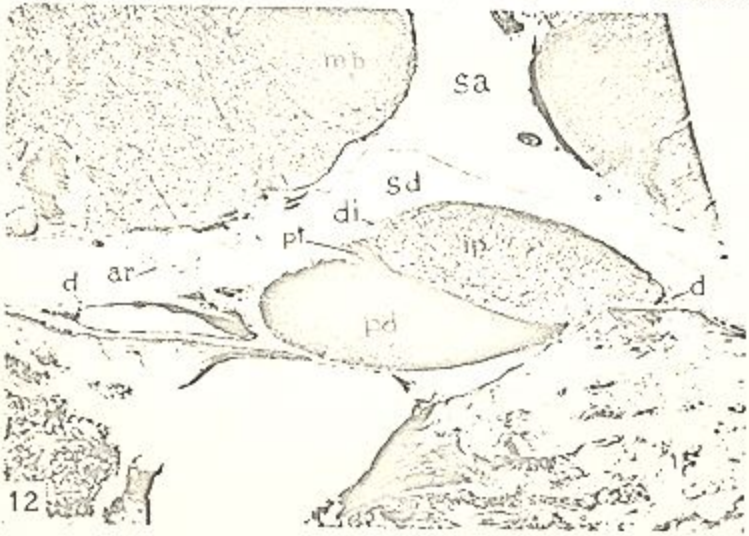
PLATE 4

EXPLANATION OF FIGURES

11 Medial sagittal section of the hypophysis of armadillo. Vascular injection with India ink. Noteworthy is the extensive pars tuberalis (pt) and the total absence of a pars intermedia. The line of demarcation between the epithelial hypophysis (pd) and the neurohypophysis (ip) is very sharp, histological examination indicating the presence of a delicate and distinctive lamina of capsular connective tissue and blood vessels separating the two. × 14.

12 Paramedian section of the hypophysis of armadillo. In this and the preceding photographs the topography of the dura surrounding the gland is well shown. It will be observed that the intimate encapsulation of the gland by the dura precludes the extension of the subarachnoid space around the body of the gland; the leptomeninges, as far as they exist as individual layers enclosing the subarachnoid space, terminate as a collar around the hypophyseal stalk. × 14.


mb
v
sa
tc
op
ar
pt
di
sd
d
pf
ip
pd
11


mb
sa
sd
di
pf
ip
d
ar
d
pd
12