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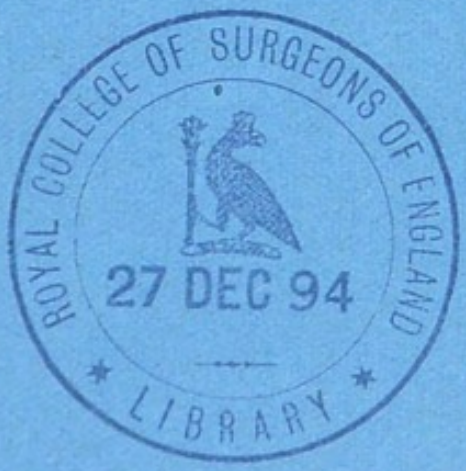
9

1891

FROM THE

JOURNAL OF ANATOMY & PHYSIOLOGY

VOL. XXV.



OBSERVATIONS ON SOME MAMMALIAN TASTE-ORGANS.

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THE present communication contains the result of an examination of certain gustatory areas in some embryos and new-born individuals. The forms studied were *Mus musculus*, *Arctomys monax*, and *Mephitis mephitica*, the material consisting in each case of several specimens. No examination of the papillæ foliatæ was attempted.

Mus musculus (new-born).

The tongue possesses the general characters of the adult organ. Near the base, and situated in the median line, is a single, deeply-set, circumvallate papilla. The papilla is not as yet completely differentiated, nor is the trench wholly free from epithelial debris. The epithelium protecting the upper surface is, as in later life, thicker than that covering the lateral area. Both mucous and serous glands are present; but the latter, which are still in process of formation, only sparingly so. Glands of the serous type are not very abundant in the adult form. The ducts, as in the adult, open into the trench at its deeper part. The mucous glands are more plentiful, and are further advanced in their development, than the serous; and their ducts, which are nearly straight, lead directly to the free lingual surface. The taste-bulbs are few in number, and in their development are still incomplete. They are scattered quite irregularly at the upper part of the papilla, and lie partly in the stroma of the mucosa and partly in the epithelium. Here and there in the basal epithelium of the lateral area, as well as in the mucosa underlying, structural modifications of the cells and stroma were very evident, though no true bulbs were discernible. These changes suggest, and in all probability represent, the early stages in the development of the bulbs. I looked for similar changes in the corresponding region of the outer wall of the trench (bulbs being normally present here in

the adult form), but did not succeed in detecting any. The epiglottis and larynx were not examined.

Arctomys monax (new-born).

The main characteristics of the adult tongue were exemplified in all the specimens. They were all distinctly bifid at the tip, and their upper surface was impressed anteriorly by a deep median groove. In none of the specimens did there appear to be above three circumvallate papillæ, the number in the adult ranging from three to five. The width of the papillæ is about double the height, and their exposed area is covered with a thin layer of epithelium. They show many of the characters of later embryonic life. The differentiation is incomplete, the papillary and outer walls being still united throughout in most instances. Serous glands and ducts are not very plentiful in the adult form, and no traces of either were detected in these specimens. A few bulbs, more or less subepithelial in position, are present at the upper part of the papillæ, but none were observed on the lateral area. The total number of bulbs in the adult *Arctomys* is below the mean of the Mammalia. Some of the bulbs, judging wholly from their external structure, are quite well advanced, but much smaller than in the adult. One of the largest measured 0·021 mm. transversely, the mean of the same dimension in the fully-formed bulb of the adult being 0·032 mm. Only a few bulbs were observed in the fungiform papillæ, and they were for the most part small and immature. Bulbs were present in the epiglottis and elsewhere in the larynx, some of them being well developed and of good size for this period of life. They lie partly in the epithelium and partly in the mucosa. Mucous glands were quite abundant in this region, and were further advanced than those of the tongue.

Mephitis mephitica (embryo).

These embryos were apparently very near the term of their intrauterine life.

Neither papilla shows a tendency to become lobate. The trenches are not yet entirely free from epithelium, but the latter

is mostly confined to their deeper part. The serous glands and their ducts are not greatly advanced, nor do they appear to be very abundant. The papillæ bear many bulbs at their upper part, some of them being wholly epithelial in position. Where the trenches are open, the lateral area of the papillæ also contains bulbs; but they are scattered at irregular intervals, their lower portion resting in depressions of the mucosa. The bulbs of the upper surface are as usual the furthest advanced. In shape they are long and narrow, some of them being nearly fusiform, and appear to be more embryonic in structure and character than in position. They are fairly uniform in size, and measure about 0·036 mm. in length and 0·018 mm. in breadth. In the full-grown animal the mean length is 0·045 mm., and the mean breadth 0·028 mm. The papillæ are well supplied with nerves. At the upper part of the papillary axis they form a close network, from which fibrils can be traced directly to the bases of the bulbs, within which the outlines of the sensory cells are distinctly visible in many instances. The fungiform papillæ were fairly numerous, and most of those examined bore one or more bulbs at their upper part; but the latter are smaller and less advanced than those of the circumvallate papillæ. The bulbs, when single, lie vertically, directly in the long axis of the papilla. Where two are present they are disposed obliquely near the summit, with their apices directed upwards and outwards. In many of the papillæ the nerve-plexus is quite clearly defined; it is, however, less rich and somewhat coarser in texture than that of the circumvallate papillæ. There are certainly indications of bulb-like structure in the epiglottis, though a clearly outlined bulb I failed to detect.

These results in the main confirm and emphasise those already derived from the study of embryo and new-born rabbits. And they further show that the appearance of bulbs in the larynx is probably simultaneous with their development in the papillæ of the tongue, soft palate, and uvula. The existence of bulbs in the larynx of fœtuses and young children is denied by Kanthack[1]; but despite his surprising and somewhat sweeping assertions to the contrary, they are nevertheless present in the

[1] *Virchow's Archiv*, Bd. cxix. (1890), pp. 333, 334.

larynx of both.[1] I pass his first conclusion by without discussion (viz., "Wir schmeckensowohl an der Larynxschleimhaut wie auch an der Zunge an Theilen, wo diese Gebilde gänzlich fehlen," etc.), as he fails to mention the regions of the tongue and larynx which are endowed with the sense of taste, and yet are unsupplied with taste-bulbs. He mentions further finding similar formations in the mucous membrane of the inferior turbinated bone. He says:—"Wir finden sie hier in den Einsenkungen zwischen zwei Papillen, indem sich die Papillen von den Seiten herüberbengen und mit ihren Spitzen zusammentreffend einen 'knospenartigen' Raum einschliessen, der von den Zellen, welche die sich entgegensehenden Seiten der Papillen ausschmücken, innegehalten wird." This last discovery, he observes, suggested to him the explanation of the bulbs of the larynx, an explanation, certainly, which is sufficient to explain away the very existence of the bulbs themselves. I have no reason to question his finding "bud-like spaces" in the mucous membrane of the inferior turbinated bone; and I believe with him that these are precisely what he did find in his adult larynxes; but that he found any genuine bulbs I very much doubt, particularly as he himself admits that he has never observed them in the larynx of fœtuses or young children. This explanation of the nature of the bulbs of this region is, I think, wholly inadequate, and if for no other reason than that it is based upon a mistaken conception of their true nature. That the bulbs of the larynx are, as a rule, less highly organised than those of the tongue is quite true (though I have occasionally observed perfectly formed bulbs in the former region); but that they are morphologically identical I think there can be scarcely a shadow of doubt.

The important question raised by Kanthack in this connection, and which still awaits a satisfactory solution, is that of function. This I hope to discuss on another occasion.

[1] *Vide* paper by author, *Jour. Anat. Phys.*, vol. xxiii. (1889), pp. 572, 574.