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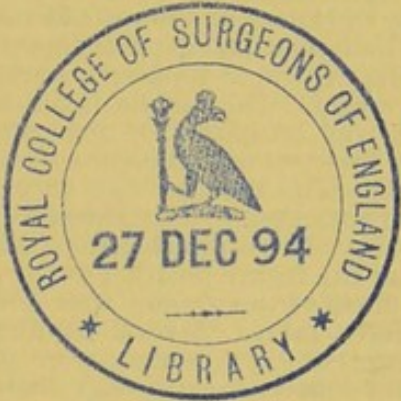
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(BRIEF SUMMARY).

By F. TUCKERMAN.

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THE DEVELOPMENT OF THE GUSTATORY ORGANS IN MAN.

(A BRIEF SUMMARY).

By F. TUCKERMAN.

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Within a short time the writer of the present note published the results of some studies touching the development of the gustatory organs of man, and at the same time offered a few suggestions as to the nature and probable mode of origin of these terminal structures. (*Journ. Anat. Phys.*, xxiii, 1889, pp. 559-582; xxiv, 1889, pp. 130, 131.) The earliest tongue investigated was from an embryo of about the tenth week. In this specimen the gustatory papillæ were wholly undeveloped, nor was it possible to determine with any degree of certainty their future position. In the next tongue examined, that of an embryo of the fourteenth week, the dorsal surface was more or less marked by papillary elevations of the mucous membrane. The elevations varied greatly in size and shape, and the spaces between them were filled for the most part with epithelium. The epithelial covering of the elevations had an average thickness of about 0.024 mm., and was composed of three somewhat indistinct layers. The superficial layer consisted of slightly flattened cells, which, at its deeper part, became blended with those of the middle layer. The middle layer was much thicker than the preceding, and was composed of nucleated spheroidal or polyhedral cells. Below this was a deep layer consisting usually of a single row of columnar cells. The mucosa was very rich in nuclei, and, at short intervals, was penetrated to a considerable depth by the proliferations of the epithelium. These proliferations of the epithelium are of interest, as indicating the future position of the glands and their ducts. The striped muscle-fibres of the tongue were clearly shown, but their striæ were exceedingly faint. Several papillæ of the circumvallate type, in the early stages of development, were present. The trenches, however, were undifferentiated, although their future position was clearly indicated. Fungiform papillæ, in various stages of growth, were scattered over the dorsum, and at the sides of the back of the tongue the lateral gustatory organs were sufficiently advanced to be perceptible. A few taste-bulbs were detected in the circumvallate papillæ of this embryo, but, unfortunately, little could be learned of their structural details. The best marked bulb was spheroidal in shape, and resembled, in some degree, those of the soft palate and epiglottis. It was placed vertically in the long axis of the papilla, with its lower two thirds resting in a cavity of the mucosa. On the tongue of a foetus, at the fourth month of intra-uterine life, were five papillæ of the circumvallate type. One of the smaller of these papillæ bore on its exposed surface a taste-bulb in an early stage of development. This bulb measured 0.0165 mm. in length, and 0.012 mm. in breadth, and was largely subepithelial in position. The tongue of a foetus at the middle of the fifth month showed circumvallate papillæ in process of transition from the fungiform type. The greater number of the circumvallate papillæ, and also many of the fungiform papillæ bore embryonic bulbs on their upper surface. The more advanced among them were mainly epithelial in position, while the less mature were

largely imbedded in the stroma of the mucosa. Medullated nerves were fairly shown in these papillæ. Directly beneath the basal cells of the epithelium was a fine, delicate, reticulated network, from which non-medullated nerve-fibrils passed upwards, penetrating the bulbs and neighboring epithelium. On the tongue of a six months' fœtus the trenches of the papillæ were for the most part differentiated, and a few immature bulbs were detected on their lateral area. In the lateral organs of taste the furrows were quite free from epithelium, save at their lower part, and bulbs were scattered over the upper surface and sides of the folds. In a fœtus at the seventh month, the bulbs had increased greatly on the lateral area of the gustatory papillæ, and there was no apparent decrease in the number of those on the free surface. In a child about a month old the bulbs were quite uniformly disposed at the sides of the papillæ, those of the lower tiers being less regular in arrangement and smaller, and lying partly in the mucosa. In a child four months old, isolated bulbs still occurred on the free upper surface of the papillæ of both gustatory areas. In the circumvallate papillæ of the adult, the bulbs did not appear to have decreased in number, but they had disappeared almost completely from the upper surface. In the adult papillæ foliatæ they were far less numerous than in early life, but were still normally present on the upper area of the folds.

What purpose the temporary taste-bulbs (for such they appear to be) of the free upper surface of the circumvallate papillæ subserve in the embryo, is difficult to comprehend. With the appearance of the bulbs of the lateral area, they gradually disappear, and, from all indications, perish. By the time the bulbs of the free surface of the papillæ have attained their full development, bulbs in early stages of formation make their appearance on the wall, the lowermost bulbs being the most elementary. Were it otherwise, it might be conceivable, as Hermann suggests, that by an unfolding of the papillæ laterally, the bulbs of the free area are shifted to the sides. In the present state of our knowledge, there seems to be no better way than to believe, with Hoffmann, that "the bulbs of the free surface perish through the proliferation of the ordinary epithelium." It is not improbable that, after the bulbs have once disappeared from the upper surface, certain altered conditions of the epithelium prevent, save in rare instances, their recurrence there.

Before concluding this brief summary, the earlier investigations of Hönigschmied, Hoffmann and Lustig should be mentioned. Hönigschmied, in a communication on the microscopic anatomy of the taste-organs (*Zeit. f. wiss. Zool.*, xxiii, 1873), merely remarks that he failed to detect in the circumvallate papillæ of the new-born child any regular arrangement of the bulbs. Hoffmann (*Virchow's Archiv*, lxii, 1875) investigated the human embryo and new-born child for the purpose of studying the distribution of the taste-organs in man. In a fungiform papilla of a four and one half months' fœtus, and also in the papillæ of one at the sixth month, he found taste-bulbs, but he failed to detect them in earlier embryos. He concludes that they are more frequent in embryos and in newly-born than in older individuals; that in embryos and new-born children they occur more frequently and in greater number on the free surface of the papillæ than in the adult, and that in old persons they are but rarely met with in this region. Lustig (*Sitzb. d. k. Akad. d. Wiss. Wien*, lxxxix, iii, 1884) failed to detect bulbs in the papillæ of a fœtus at the end of the fifth month, but in one at the seventh he found them on the free upper surface of both circumvallate and foliate papillæ. While taste-bulbs were wanting in the tongue of a ten weeks' embryo, it is not improbable that they may yet be found in the incipient stages of growth in one of the twelfth week of intra-uterine life.

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