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on

Naiomyth's Membrane

by

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The reason I have chosen the consideration of Nasmyth's Membrane is that the subject to which it is associated, namely "Dental Anatomy" is one which has within the last few years made very important strides and more recently, by the intervention of parliament, it has been placed on a distinctly legal footing, hence that the Dentist of the future will have a considerably higher status than his brother practitioners of the past.

Having devoted a considerable amount of time and attention to all that belongs to the Dental Art, with which I have been more immediately connected since graduating in July 1877, it occurred

to me, that a subject, within the sphere of Dentistry, would not be inappropriate and after a considerable amount of hesitation I concluded that a subject which has given rise to so much controversy as Nasmyth's Membrane would not be out of place.

In quoting the different views held by the various scientific men, who have from time to time devoted the most painstaking attention to this subject I have endeavored to give each view as carefully as possible and has stated the view which I myself, after patient consideration of the whole subject would adopt.

In man Cementum, is present on the crowns of his teeth in a rudimentary condition known as Nasmyth's Membrane or enamel cuticle, or persistent Dental Capsule. Regarding this structure there has been much diversity of opinion expressed.

Professor Huxley regarded it as identical with the structure he described as the Membrana Preformativa a membrane, which he holds, lies between the enamel organ and the Dentine Papilla, and relying upon the fact that a continuous sheet of tissue or membrane can be raised from the surface of the developing enamel he concluded that this was the original Membrana Preformativa; and that it afterwards became the Nasmyth's

Membrane; hence that enamel was developed without the direct participation of the enamel organ, seeing that a membrane separated the two. Kölliker strongly affirmed the existence of the Membrana Preamortua and in the first edition of his Histology held that it became converted into Nasmyth's Membrane; though now while he admits some uncertainty as to its nature he is inclined to regard it as a continuous and structureless layer furnished by the enamel cells after their work of forming the fibrous enamel was complete.

Another important theory regarding this Cuticula Dentis is that of Waldeyer, who considers the external epithelium of the enamel organ to be

the source of Nasmyth's Membrane,
and not that it is a rudimentary
Cementum.

But that this membrane is rudi-
mentary Cementum there is consider-
able evidence to show. In the first
place there is its structure. On ac-
count of its extreme thinness it
would be impossible for it to con-
tain lacunae, or present any
of the lamination seen in ordinary
Cementum; yet when the tissue
is seen in sufficient thickness,
as in the pits in the crowns of
bicuspid and molar teeth, there
are frequently found one or more
lacunae, with or without canaliculi.
The lacunae found in these pits
are usually of the nature of eucap-
suled lacunae.

In the calcification of formative osteoblasts their contours ordinarily become lost, some are entirely calcified, and many stop short of entire obliteration, and the remnant of such an osteoblast is contained in the so called lacuna or space. But encapsuled lacunae are those structural elements in which the contours of the formative osteoblasts have not become obliterated, so that they exist as bodies, with or without a central space, having a contour or capsule which occasionally presents a fibrous-like appearance. They are almost always of brownish color, and the branched spaces when found in their centres vary in size and form from mere fissures to full sized lacunal cavities.

Encapsuled lacunae are also occasionally found in human Cementum when thickened by disease, as exostosis, and also in the Cementum of herbivorous animals.

Secondly, in sections of unrooted teeth, ground thin and then treated with Hydrochloric acid, we may occasionally be fortunate enough to get a specimen when the membrane is shown to be continuous with the cementum on the root of the tooth. Again, specimens of human teeth are at times met with in which the cementum is continued over the outside of the enamel, and where it contains lacunae and canaliculi. Such a specimen was illustrated by Mr Massey himself and another specimen is

illustrated by Mr. Lomes.

Thirdly, this leads to another evidence found in comparative Anatomy. The Cementum has been called the most external hard tooth tissue, and it forms a covering not only over the roots, but in some animals notably the elephant, ruminants, and herbivora generally, also over the crowns of teeth.

Now a tissue in the position of Nasmyth's Membrane, and occasionally presenting lacunae, as it does in human teeth, when thick enough, points to its being analogous, though in a rudimentary condition, with the Cemental covering on the crowns of the teeth of herbivorous animals.

There is yet another fourth consideration

that of development.

The external epithelium of the enamel organ is composed of cells cubical or rounded in form.

What becomes of these cells is still a matter of discussion, Waldenyer holds that after the disappearance of the enamel pulp and the stratum intermedium, they become applied to the enamel cells, and on the completion of the enamel become cornified and converted into Nasmyth's membrane. Kölliker, Legros, Magitot and Jones differ from Waldenyer in this view.

The view I would support is that the "Dental Capsule" surrounds and entirely encloses the developing tooth; and, as the cementum on the roots of human teeth, and on

the roots and crowns of the teeth of herbivora, is developed from the Dental capsule, the argument is thereby strengthened that Nasmyth's Membrane, the analogous tissue to the coronal cementum in herbivora, is the homologue of the Cementum upon the roots of human teeth, that the Dental capsule probably, is the source of Nasmyth's Membrane.

Besides being exceedingly thin, Kölliker attributing to it a thickness of only one twenty thousandth of an inch it is very indestructible, and only capable of demonstration by the use of acids.

Nasmyth's Membrane is very resisting to the action of either Nitric or hydrochloric acid and when boiled in caustic potash it only swells slightly.

When treated with Nitrate of silver it is stained, and a reticulate pattern may be brought out, as though it were made up of epithelial cells.

The inner surface is pitted for the reception of the enamel prisms, and it is supposed this may have something to do with its reticulate appearance when treated with Nitrate of silver.

The property of resisting the destructive action of reagents we find a characteristic of tissues on the borderland of calcification, and such would appear to be the condition of Nasmyth's Membrane; nevertheless though, it resists the action of acids, it is not so hard as the enamel, for it becomes worn

Off shortly after the tooth has taken its place in the mouth. The yellow colour which characterises Nasmyth's Membrane after treatment with Nitric Acid, and its resistance to the destructive action of acids, are conditions to be observed on similarly treating the outermost and yet unfinished layers of Cementum in herbivorous animals.

That these conditions are produced upon the surface of the Cementum, and not between the Cementum and Enamel, indicate that such is not developed from the external epithelium of the enamel organ; also, that the acid resisting part of the homologue of Nasmyth's Membrane in herbivora is not

continuous with the whole thickness of the Cementum, but with the outermost and yet imperfectly calcified layer of Cementum.

M^r Charles Jones says that precisely a similar membrane may be raised from the worn teeth of many fish which have no enamel, and sets this fact forward to disprove the hypothesis that Nasmyth's Membrane is developed from the external epithelium of the enamel organ. Yet against this it can be said that those fishes had an enamel organ which became aborted, and the result of that abortion may have been the formation of Nasmyth's Membrane.

The evidence advanced in favour

of Nasmyth's Membrane being
Cementum, although strong, is
not universally accepted as
proof. I will therefore briefly en-
umerate the other explanations
of its nature which have been
advanced.

Nasmyth, who first called at-
tention to its existence, regarded
it as "persistent dental capsule"
which view does not differ
much from what I have already
advanced.

Waldeyer holds that Nasmyth's
Membrane is a product of part
of the enamel organ. After the
completion of the formation
of the enamel he believes that
the cells of the external epithel-
ium of the enamel organ become

applied to the surface of the enamel and these become corruified; in this way be accounts for its resistance to reagents, and for its peculiar smell when burnt. Its extreme thinness so far as it goes, is an objection to this supposition; a more weighty argument against it is the absence of analogy for such a peculiar change, by which one portion of the organ is calcified, and the rest corruified, and again, what becomes of these cells in those teeth in which Cereutum is deposited over the surface of the enamel? According to the statement of Dr Mayhew, the layer of cells in question, that is, the external

epithelium of the enamel organ, is atrophied before the completion of the enamel; which statement, if confirmed will completely upset Waldenyer's explanation. Professor Husley described Nasmyth's Membrane as identical with the Membrana Preformativa, that is to say with a membrane which covered the Dentine Papilla prior to the occurrence of calcification, and which afterwards came to intervene between the formed enamel and the enamel organ, but the great majority of those who have given close attention to the development of the various dental tissues deny that there is any such true membrane as this Membrana Preformativa

in this place.

Hölliker who differs very materially from Walden's, though he is far from being certain as to its exact nature, is inclined to regard it as a continuous and structureless layer furnished by the enamel cells after their work of forming the fibrous enamel was complete; but the occurrence of lacunae in it would not be accounted for by this theory.

David Taylor.