sociation state of certain amphoteric components of the membranes. The position and sharpness of the reversal points is strongly suggestive of these ampholytes being proteins. The conclusion seems warranted that proteins probably constitute an important part at least of the material of which the membrane cell surfaces are composed.

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SELACHIAN "DENTICLES" IN THE CAT[1]

IT is now well known that the human lips at birth possess an inner zone beset with "long, soft, villus-like outgrowths." In a few weeks, these villi largely disappear, though the zone itself remains more or less distinctly marked throughout life. Denuded of their epithelium, Ruysch figured them as "papillae," in 1707. Luschka (1863) was the first to describe them with modern precision, and since then they have been the subject of important studies by Neustätter, Stieda, Ramm and others. The portion of the lip which bears the villi is clearly distinguishable to the naked eye, and the individual projections, with their vascular cores, may be seen on low magnification. Neustätter, in 1895, remarked that so far as his investigations showed, human lips alone are provided with this double zone—the outer of which is smooth, and the inner, villous—and he rather fantastically ascribed the condition to the shortness of the nipples and flatness of the central area of the breasts in women. Thus human infants require a special "Greifapparat" for an airtight contact!

Rejecting this interpretation—of "non-skid" lips, as his assistant called them—and after reviewing the literature in the way here outlined, Dr. F. T. Lewis proposed a different interpretation (Buffalo meeting of the American Association of Anatomists, April 16, 1924). He showed photographs of the labial "villi" in man, and others of the teeth of the skate, both intact and in sections, and proposed to regard them as homologous structures. That is to say, he considered the human labial villi, notwithstanding their small size, their tendency to point outward and their lack of dentine, as actual denticles or potential selachian teeth. In the human oral region, then, in addition to the gill clefts, there would be another striking suggestion of the ichthyoid plan of development.

The present account is intended to report the finding of bilaterally arranged papilliform structures on the inner surface of the upper lip in the newborn kitten. These are very clearly the equivalents of the villi or denticles of the human lip, though the inner zone which they form is not exposed at the oral margin; they are wholly within the lips.

On the upper lip of the kitten they are arranged in three groups in the specimens studied—a median group, and on either side, a lateral group.

The median group consists of a single row of four large incisor-like papillae, which might possibly be mistaken for teeth, but the well-defined dental ridge is further within the mouth, and these papillae have no connection with it. Of these four papillae those next the midline are the largest and measure 1.0 mm in height by 0.75 mm in width at the base. They are flattened in the same plane as the human incisors. Their free margins are somewhat rounded and are without serrations. The lateral members of this group are very similar though a little smaller.

On either side of the median group is a lateral group of from twenty to thirty smaller papillae, bluntly conical in shape and arranged in poorly defined rows. Those in one row may partially overlap the units in the next row. These papillae do not stand erect, but their tips are turned somewhat forward and toward the median line. Beyond the lateral groups, in the direction of the corners of the mouth, a portion of the lip is quite smooth.

The papillae in all the groups consist of connective tissue cores covered with a very thick epithelium, much thicker than the epidermis. In these respects they are like the papillae of the human lips, but they are neither so slender nor so vascular. No dentine has been observed.

The location of the villi would seem to preclude the possibility of their serving to strengthen the animal's grasp upon the nipple. Without assigning to these rather remarkable structures any function, I would regard them, provisionally at least, as "denticles," for superficially their resemblance to selachian teeth is very striking.

During the month that this report has been in press, 130 kittens and cats have been examined, and although the villi early disappear in man, in the cat they are found to be retained throughout life. Their number diminishes, and those of the median group become merely moundlike masses limited by furrows. In the lateral groups, however, the loss in number is accompanied by an increase in size, and the acquisition of a more definitely pointed character, in those which remain. They may attain a length of 2.75 mm. and a breadth of 1.25 mm. In general they point downward and outward, but instances are not rare in

[1] A study conducted as Medical Fellow of the National Research Council.

which they project upward or even directly backward into the oral cavity. The further study of these remarkable "denticles" is in progress.

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SEPTEMBER, 20, 1924

THE AMERICAN CHEMICAL SOCIETY

DIVISION OF BIOLOGICAL CHEMISTRY

R. A. Dutcher, *secretary*
W. T. Bovie, *chairman*

A Study of the Nutritive Value of Gelatin: THOMAS B. DOWNEY. The results of an investigation of the supplementary value of gelatin as a protein where fed with a number of foods common to the dietary, and of the influence of the colloidal properties of gelatin upon the digestion and absorption of various dairy products. Feeding tests with the albino rat have shown that gelatin, as a protein, supplements the protein deficiency of wheat, wheat products, oats, rye, barley and barley products. Gelatin does not, however, increase the food value of navy beans or corn. Further observations have demonstrated that gelatin by virtue of its colloidal properties increases the nutritive value of dairy products, such as cow's whole milk, egg and milk, and ice cream (typical commercial formulas).

The Antirachitic Action of Fresh Cod Liver Oil as Compared with that of a Concentrate Prepared from the Oil: HARRY E. DUBIN. Young rats were placed on a rickets-producing diet for a period of 30 days. During this time, one group of rats received daily doses of varying quantities of fresh cod liver oil. Another group was given an equivalent amount of cod liver oil in the form of a concentrate prepared from the oil. A third group acted as controls. At the end of the experimental period, the animals were X-rayed. The controls showed rickets, while those receiving either cod liver or the concentrate remained free from rickets.

The Physiological Activity of Some Synthetic Compounds Closely Related to Thyroxin: E. C. KENDALL and A. E. OSTERBERG. Alpha oxy-indol propionic acid in glacial acetic acid will substitute bromine on its imino group and HBr will then split out between the N and No. 7 carbon. This bond also occurs in all the halogen substituted derivatives of alpha oxy-indol propionic acid. Experiments have demonstrated the great physiological activity of this bond which under the conditions in the animal organism acts as an active hydrogen acceptor. The relation of this finding to thyroxin and oxidation in the animal organism will be discussed.

A New Type of Organic Phosphoric Acid Compound Isolated from Blood: ISIDOR GREENWALD. A compound which appears to consist of two molecules of phosphoric acid united with one molecule of 1-glyceric acid has been isolated from pig blood, in which it forms at least one third of the total "acid-soluble" phosphorus. It is very resistant to acid hydrolysis. A compound of the same nature is present in the blood of man and the dog but not in that of the cow and the sheep.

Quantitative Determination of Vitamin A: H. C. SHERMAN and H. E. MUNSELL. In order to determine the relative amounts of vitamin A in foods, a method has been developed upon the plan proposed by Drummond, Coward, Zilva and their coworkers. Standardized animals are fed a vitamin-A-free, otherwise adequate diet until growth ceases; and then the amount of food which when fed daily will just suffice to permit a gain in weight of approximately 3 grams per week for 8 weeks is ascertained. Standardization of animals, diets, procedure and interpretation is discussed.

Further Experiments upon Vitamin A: H. C. SHERMAN and L. B. STORMS. This investigation deals with (1) the age at which experimental animals (albino rats) attain their maximum body store of vitamin A, (2) the influence of previous feeding upon the relative store of vitamin A in the body at a given age, (3) the influence of variations in body weight at a standard initial age, (4) the influence of family, and (5) the question whether the sexes differ in their capacity to store vitamin A or to endure deprivation of this vitamin.

A Ration Low in Calcium as a Factor in the Production of "Stiffness" in Swine: L. A. MAYNARD, S. A. GOLDBERG and R. C. MILLER. The trouble in pigs variously referred to in popular language as stiffness, paralysis and rickets was produced on a ration low in calcium, consisting of yellow corn, wheat middlings and oil meal, but did not result where the same feeds were supplemented with bone meal and limestone, nor was it produced on a ration of yellow corn, middlings and fish meal. The femurs of the pigs receiving the low calcium ration contained less than two thirds as much calcium and phosphorus as the femurs of littermates on the other two rations. Corresponding differences were found in the structure of the bones on section. On microscopic examination the bones from the pigs on the ration low in calcium showed marked and constant lesions. The data indicate that the stiffness was a result of inadequate mineral nutrition of the bones due to a ration deficient in calcium.

Vitamin B in Evaporated Milks Made by Vacuum and Aeration Methods: R. ADAMS DUTCHER, EMMA FRANCIS and W. B. COMBS. Sterilized and unsterilized evaporated milks, made by vacuum and aeration methods, were fed to rats receiving a ration deficient in Vitamin B. Control groups were fed equivalent amounts of raw herd milk from which the evaporated milks were made. The results indicate that evaporation (by vacuum and aeration methods) did not injure Vitamin B appreciably, although slight destruction took place. After sterilization of the evaporated milks, the destructive effect was more marked, particularly in the evaporated milks made by the aeration method. The destructive effect can hardly be considered of serious nutritive significance.