and glycosuria were studied after painting the pancreas. In the main we could not confirm these claims, but we wish however to mention here only one striking result. In eight experiments in which the pancreas was so isolated from the peritoneum that none of the adrenalin could enter the peritoneal cavity, the hyperglycemia as well as the glycosuria produced by the painting was insignificant, surely not more than would have occurred if the adrenalin had been given subcutaneously or painted on some part of the peritoneum.

109 (1287)

Studies of dental caries, with special reference to internal secretions in their relation to the development and condition of dental enamel.

By WILLIAM J. GIES and Collaborators.

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A. Do substances in the blood pass from dental pulp into dental enamel of living animals? Hattie L. Heft.

B. Is dental enamel permeable to substances in saliva? Elizabeth C. Franke.

C. Effects of parathyroidectomy and castration on dentition in albino rats. Edgar G. Miller, Jr.

D. Dental effects of feeding glandular tissues to albino rats. Edgar G. Miller, Jr.

E. A new glycoprotein: dentomucoid. Leila Noland.

Decay of teeth, except that arising from trauma, may be due, primarily, to local deficiency in the structure and quality of enamel, or it may result from local specific disintegrative attack on enamel, regardless of normality of the enamel, or it may be caused by both these types of influences. In this series of studies we are endeavoring to ascertain whether "influences from the inside," such as those of a nutritional type and involving internal secretions, may be responsible factors in the incidence of dental caries.

Impairment of normal nutritive and endocrinic influences, *by subtraction*, has been induced by extirpation of various glands in albino rats. There were no effects on dentition after thymectomy, thyro-parathyroidectomy, and castration; deficient calcification of the teeth (incisors) followed parathyroidectomy.

Modification of normal nutritive and endocrinic influences, *by addition*, has been induced by feeding various glands to white rats. Dental calcification appeared to be (*a*) regularly *decreased* by oral administration of lymphatic, salivary, or thyroid, gland; (*b*) regularly *increased* by oral administration of testicle; and (*c*) wholly *unaffected* by oral administration of corpus luteum, parathyroid, pineal, pituitary, spleen, suprarenal, or thymus.

There were no effects on the general condition or dimensions of the teeth in any of the foregoing experiments.

Physiological variation in the composition of the teeth, in albino rats, is relatively slight and not great enough to account for any of the findings that were indecisive.

The well-known *chemical methods* we have employed were found to be adequate to detect significant chemical differences in dentition. Various results of uncertain import have not been due, at any time, to deficiencies in the analytic procedures as such.

Underlying all our experiments on the effects of internal secretions is the assumption that *chemical* changes may take place, *in developing enamel*, through the influence of substances that *originate* outside of, and enter, or superficially affect the cells involved in the production of enamel. If this assumption is unwarranted, it is obvious that internal secretions can have no *direct* chemical effect on the production or condition of enamel. If this assumption is incorrect, internal secretions can have, at most, only *indirect* effects on the development of enamel.

That our assumption in this general regard is correct, however, is shown by the fact that *trypan blue*, after its intraperitoneal injection into *young* rats, rabbits, and dogs, passes freely into the enamel of *developing* teeth, where the blue pigment seems to remain indefinitely; it does not pass from pulp through dentin into enamel of fully *erupted* teeth. (These particular facts were demonstrated at the meeting of the Society.)

That our assumption in this general regard is justified is shown,

also, by the fact that *strontium*, after its oral administration (as the chloride), daily for some time to *young* dogs, accumulates in the solid parts (and is present in the pulp) of the first and second sets of teeth, apparently taking the place of calcium. We have not yet determined whether strontium substitutes calcium, in such experiments, in the enamel of fully *erupted* teeth.

Experiments with *arsenic*, in the forms of salvarsan and arsenite (analogous to those with strontium), in an effort to determine whether arsenic can displace, or associate with, phosphorus in dental calcification, have given us wholly negative results.

Practically all the biochemical results referred to, thus far in this statement, were obtained on teeth *in process of development*. It has been cumulatively evident, as our experiments increased in number and scope, that internal secretions can have little or no effect, directly or indirectly, *on the enamel of fully developed and erupted teeth* (and therefore can have little or no continuing direct bearing on the problem of caries in such teeth) unless one or more *physiological* substances can pass from pulp through dentin into normal enamel, or from oral fluids into such enamel.[1]

We find that water passes freely back and forth through all parts, including the enamel, of fully developed natural extracted teeth. Simple mineral salts, such as sodium chloride, and common organic substances, such as cane sugar, show similar ability to diffuse back and forth through fully developed natural extracted teeth.

Our results in this general relation indicate that, whether or not there is true nutritive or maintenance *metabolism* in normal enamel, there may be physiological or pathological exchange of materials in enamel by *diffusion* from blood through dentin and enamel to oral fluids, and *vice versa*.

In the course of our study of the nature of tooth composition, from the point of view of effects of internal secretions on dentition (in their relation to the problems of cause, control, and prevention, of dental caries), we have found that teeth contain a *glyco-protein* that is closely similar to osseomucoid, and is evidently analogous to, though not the same as, salivary mucin.

[1] This statement ignores provisionally the possibility that caries may occur from changes in dentin that merely *undermine* enamel.

A complete study of the properties of this protein substance, which we have named *dento-mucoid*, is now in progress. We have already learned that it remains in teeth during the process of their acid decalcification. It is extractable, from decalcified teeth, with dilute alkalin solutions. It is precipitated, from such alkalin extracts, by mineral acids such as hydrochloric. It is an acid protein that forms colloidal salts. It yields reducing substance similar to glucosamin after acidic hydrolysis.

All of these studies are in progress, together with inquiries into the effects, on dentition in successive generations of albino rats, of treatment with thyroid, of unbalanced diets, and of toxic malnutrition.

110 (1288)

Diet and renal activity in tartrate nephritis.

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The subject of the experiments were rabbits that were fed oats or young carrots. Tartrate was administered to these animals either by mouth or subcutaneously, and the effect of the single dose as well as of repeated doses on renal activity studied by means of phenolsulphonephthalein. The following is a resumé of the results obtained.

1. When tartrate was given by mouth to rabbits on a diet of oats large doses were required to inhibit the elimination of phenolsulphonephthalein. The effects produced with medium doses were very moderate. Recovery was observed in all cases.

2. Even small doses of sodium tartrate injected subcutaneously into rabbits on a diet of oats caused a very pronounced inhibition of the elimination of dye. Considerable improvement occurred after 3 to 5 days, but complete recovery of function was never observed.

3. Evidence of disturbance of the renal function was seldom obtained with much larger doses of sodium tartrate when injected subcutaneously into rabbits on a diet of fresh young carrots. Large doses showed a decrease of functional activity within a few