calcium) metabolism after thyroid-parathyroidectomy similar results ought to follow Eck fistula or ligation of the hepatic artery.

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The relation of ptyalin concentration to the diet and to the rate of salivary secretion.

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I. *The relation of ptyalin concentration to the diet.*

a. In Man. — 1. In the fall of 1908 the diastatic power of the parotid saliva of three individuals (A. J. C., A. L. C., C. C.) designated for convenience as *A*, *B*, and *C*, was compared daily for a period of ten days. The saliva of *A* was uniformly slightly stronger than that of *B*, and considerably stronger than that of *C*. At the end of the ten-day period *B* and *C* were put on an exclusive vegetarian diet, that is, meat was excluded and the carbohydrates greatly increased, for ten days, while *A* continued on the ordinary mixed diet. The diastatic power of the parotid salivas was tested daily and *there was no increase in B and C as checked against A.*

2. The diastatic power of the parotid saliva of a man who for four years had been a consistent vegetarian was checked (for seven days) against that that of *A* and *B*. *It was uniformly less than A and practically the same as B.*

3. The parotid or mixed saliva of a boy of 14 years, a "congenital" vegetarian, never eating meat, was checked against the corresponding salivas of *A* and *B*. It showed *uniformly less diastatic power than A, and about the same as B.*

Thus, contrary to Nielson's results, there is no evidence that in man *even years of exclusion of meats and greatly increased carbohydrates in the food will appreciably increase the ptyalin concentration in the saliva.*

b. In Other Mammals. — It is conceivable that while shorter periods of meat exclusion and carbohydrate increase in the diet of man may not effect an increase in the ptyalin, generations of vegetarianism might be effective. This could be tested on the saliva of

orthodox Hindus, but we were not able to secure this material. The experiment has, however, been carried out in nature on a large scale in the case of the herbivora.

1. Carnivora. — There is no ptyalin in the saliva of the dog, the cat and the fox (6 individuals). The slight diastatic power of the saliva of these animals is due to traces of blood and lymph diastases.

2. Herbivora. — The diastatic power of the parotid and mixed saliva of monkeys (7 individuals) is the same or less than that of man. The ptyalin concentration in the rabbit's parotid saliva is the same or slightly greater than that of man. But the parotid and mixed saliva of the goat (6 individuals) and the horse (13 individuals) has no diastatic power.

3. Thus, while the absence of ptyalin in the saliva of many (probably all) carnivora and its presence in rodents and primates may suggest adaptation, the absence of it in some herbivora nullifies such a conclusion. The saliva of monkeys ought on the adaption hypothesis to have greater ptyalin concentration than that of man. But we do not wish to be understood as holding that the ptyalin producing processes have been evolved without any relation to the nature of the food, because we must have data from all the mammalian groups before we are in position to determine whether the absence of ptyalin signifies atrophy or incipient evolution.

II. *The relation of ptyalin concentration to the rate of secretion of the saliva.*

1. Weak acids (acetic) in the mouth are a more efficient stimulus to the secretion of the parotid than mechanical stimuli (dry sand, crackers, flour, cotton) and within limits the stronger the acid the greater the rate of secretion. The concentration of the human parotid saliva varies directly with the rate of secretion, just as is the case of lower mammals.

2. The concentration of the ptyalin in the parotid saliva of the rabbit varies directly with that of the organic solids in the case of gland anemia and on stimulation of the cervical sympathetic nerve (Carlson and Ryan). Since in the rested gland the organic solids increase with the rate of secretion we would expect the rapidly secreted parotid saliva to contain more ptyalin than the slowly

secreted saliva. This is the case in the individuals (man) who respond readily with varying secretion rates to stimuli of varying strength (different strength of acids, or sand and acids). Thus the slowly secreted saliva obtained on placing sand in the mouth contains less pytalin than that secured on stimulation with acid. But this direct relation between ptyalin concentration and secretion rate is not a close one, hence a great difference in secretion rate is required in order to demonstrate the difference in diastatic power. But this is also true of the organic solids. We have not yet been able to demonstrate this relation in the case of the rabbit's parotid saliva, probably because of the rapid fatigue of the gland under experimental conditions.

3. Qualitatively different stimuli (acid, salt, sweet, bitter, mechanical, agreeable, disagreeable) yield no constant difference in the ptyalin concentration of the parotid saliva in man. But these data are not conclusive owing to the practical impossibility of keeping the secretion rate uniform.

4. In varying directly with the organic solids and the secretion rate it seems that the processes of ptyalin secretion differ from the ferment-secreting processes in the other digestive glands. This may be of significance in view of the fact that ptyalin seems to be superfluous in digestion; but, again, it is not plain whether this condition signifies atrophy or incipient evolution.

Pawlow's findings that in the dog dry sand in the mouth causes a rapid secretion of a very dilute saliva seem not to apply to man. In man the secretion rate varies directly with the strength of the stimulus in the mouth and the saliva concentration depends — within limits — on the secretion rate. There may be some difference in different mammalian groups as regards the efficacy of the different reflex stimuli in the mouth, as acids in the mouth do not produce a copious salivary flow from the rabbit's parotid.

Unless the factor of secretion rate is controlled in all work on saliva concentration and ptyalin concentration under different reflex stimuli and dietary conditions, the results obtained are not conclusive.