

32 (442)

**The depression of the ammonia destroying power of the liver
after thyroid-parathyroidectomy.**

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Chicago.*]

1. The symptoms produced by intravenous injections of ammonium carbonate and ammonium carbamate in dogs (Marfori) are practically identical with the symptoms of thyroid-parathyroidectomy in dogs, foxes and cats. The same is true of the typical symptoms of poisoning on liberal protein diet in dogs with Eck fistula or after ligation of the hepatic artery (Nencki, Pawlow, Salski, Rothberger, Winterberg, Hawk). After parathyroidectomy in dogs there is an increase in the ammonia content of the blood (MacCallum and Voegtlin). A high protein (meat) diet with its attendant increase of ammonia in the portal blood accelerates and intensifies the tetany in thyroid-parathyroidectomized dogs (Munk, Breisacher, Beebe). MacCallum and Voegtlin succeeded in obtaining tetany in only three dogs when placed on starvation. We find that in thyroid-parathyroidectomized cats the feeding of meat appears to hasten the appearance of tremors and convulsions, and that the symptoms are less severe and life is prolonged in starving animals, but this point can be settled only after very extensive experimentation because of the periodicity of the symptoms. The foregoing facts taken altogether suggest that *the tremors and convulsions usually following thyroid-parathyroidectomy in carnivora may be due to ammonia poisoning.*

2. The results of MacCallum and Voegtlin as regards the increased ammonia content in dog's blood after parathyroidectomy are confirmed on cats and foxes :

100 c.c. blood of normal cats (5 experiments) contain.....	1.54 mgr. ammonia.
100 c.c. blood thyroidectomized cats (6 experiments) contain.....	2.52 " "
100 c.c. blood normal foxes (4 experiments) contain.....	2.50 " "
100 c.c. blood thyroidectomized foxes (4 experiments) contain....	3.50 " "

In no instance was the increase as great as that recorded by MacCallum and Voegtlin for dogs. The ammonia content of normal foxes is considerably higher than that of normal cats.

3. The ammonia destroying power of the liver was determined by perfusing the excised organ for 30 minutes at 40° C. with mixture of blood (75 c.c.) and Ringer solution (225 c.c.) containing 20 mgr. ammonium carbonate per 100 c.c.

Results.	Ammonia destruction
Livers of 15 normal cats.....	39 per cent.
Livers of 10 thyroid-parathyroidectomized cats.....	13 per cent.
Depression.....	<u>26 per cent.</u>
Livers of 3 normal foxes.....	44 per cent.
Livers of 4 thyroid-parathyroidectomized foxes.....	14 per cent.
Depression	<u>30 per cent.</u>

The increase in ammonia in the blood after thyroid-parathyroidectomy is therefore due, at least in part, to depression of the liver rather than to acidosis. The liver depression may be due to changed conditions of the liver cells or to depressor substances in the blood. The diminished power of oxidation and decreased rate of autolysis in the liver after thyroidectomy (Stookey) point to the former alternative. These results support Beebe's hypothesis of derangement of protein metabolism.

4. In the case of the thyroid-parathyroidectomized animals (foxes) that exhibit no typical symptoms (dyspnœa, salivation, tremors, depression) there is no increase in the ammonia content of the blood and no depression of the ammonia conversion power of the liver.

5. We are not prepared to say that the percentage of ammonia increase in the blood after thyroid-parathyroidectomy is the primary factor in producing the symptoms. The increased ammonia in the blood and the loss of calcium by the central nervous system (MacCallum and Voegtlin) would probably work in the same direction as regards the production of tetany, but MacCallum's results are flatly contradicted by Cooke. On the other hand, there is probably an increase in the blood of other poisonous products of protein catabolism besides ammonia, owing to the law of mass action or to the impaired liver activity.

6. The relation of the inorganic salts of the blood and of the internal secretions of the parathyroids to the detoxication processes in the liver cells should be investigated. If the mere increase of ammonia and other protein metabolites in the blood is the cause of the apparent derangement of the magnesium (and perhaps

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

33 (443)

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

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1. 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 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