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Nature of the Goiter Producing Substance in Cabbage.*

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In the course of our attempts[1, 2] to isolate the substance in cabbage that produces goiter in rabbits we found that: (1) Cabbage was entirely inactivated by drying in air at 25-35°C., or *in vacuo* at a higher temperature. (2) Cabbage extracted with various solvents such as ether, alcohol, acetone, etc., was quite inactive. (3) These extracts concentrated *in vacuo* and fed to rabbits were likewise ineffective.

Since the substance in whole cabbage is not injured by prolonged boiling in air, by acid and alkali hydrolysis, and by autoclaving at 150°C., we concluded that these negative results might be due to volatilization. During the past year we have tested this assumption as follows:

1. Four rabbits were fed on cabbage, steamed in bulk for 35 minutes; 4 additional rabbits were fed on raw hashed cabbage that was steamed in a thin layer for 35 minutes. The rabbits on cabbage steamed after hashing had hyperplastic thyroids after 4 weeks' feeding, but definitely less marked than those on cabbage steamed in bulk. 2. Attempts were made to distil cabbage in various ways and to feed the volatile portion. Some methods gave negative results. With others a product was obtained which caused slight thyroid hyperplasia. 3. Since the agent in cabbage that causes goiter could be removed by several organic solvents, and we thought it might be volatile, we next attempted to remove it with ethyl ether. After removal of nearly all of the ether at atmospheric pressure, the "cabbage fat" (ether extract) was fed to 4 rabbits for 30 days, in which time definite thyroid hyperplasia had developed, while an equal number of control animals showed normal thyroids.

Another lot of "cabbage fat" obtained from the ether extract was distilled. A small amount of the residue was fed daily for 5 weeks to 3 rabbits. Three other rabbits were fed with about 0.5 cc.

* Aided by a grant from the Ella Sachs Plotz Foundation.

[1] Marine, D., Baumann, E. J., and Cipra, A., PROC. SOC. EXP. BIOL. AND MED., 1929, **26**, 822.

[2] Marine, D., Baumann, E. J., Webster, B., and Cipra, A., PROC. SOC. EXP. BIOL. AND MED., 1930, **27**, 1025.

of the distillate daily for the same time. The distillate contained a considerable amount of ether and the amount eaten corresponded to the distillate from only one half the amount of residue that was fed. Three rabbits were used as controls. The diet of all was alfalfa and oats. The thyroids of the control rabbits were practically normal, while those of the animals receiving the "cabbage fat" residue were definitely hyperplastic as were also the thyroids of the rabbits fed on the distillate, although the amount of distillate fed was comparatively small.

These experiments we believe indicate that the goiter-producing substance in cabbage is extractable with ether and is volatile.

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Effect of Medulla Transplantation.

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The experiments recently reported on the transplantation of parts of the central nervous system indicate that cellular hyperplasia can be induced in regions of the cord which normally have a low motor content. Heterotopic transplantations of the cord show conclusively that extensive hyperplasia, both motor and sensory, can be obtained. Previous experimentation by the author[1] has indicated that, with the cord in its normal location, there is a direct dependent relationship between the cellular content of the trunk segments of the cord and that of the regions anterior to it. These experiments are in direct confirmation of Detwiler's results.[2]

The present series of experiments deals with the transplantation of an additional medulla just posterior to the normal medulla oblongata of the urodele embryo. A transverse section is made at the lower part of the medulla and the parts of the nervous system separated. The transplant which includes the ear capsules with the portion of the medulla in close association with them is then placed between the separated parts. The tissue contains Mauthner's cell area and the regions of the ninth and part of the tenth cranial nerves.

The transplanted ear capsules fuse with the normals, giving rise to a large mass of cartilaginous tissue which increases the proportions of the head and apparently permits the interpolated portions to

[1] Nicholas, J. S., *Roux's Arch. f. Entw. Mechanik*, 1929. Bd. 118.

[2] Detwiler, S. R., *J. Exp. Zool.*, 1925, **41**.