

THYMUS AND THYROID

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AT THE present time there are many theories regarding the rôle of the thymus gland, some of which are fairly plausible. An endeavor is hereby made to reassemble certain experimental facts in a new hypothesis which seems to give a more workable basis for an explanation of possible functions.

The work of Alexis Carrell and others proved that in tissue culture one element is necessary to keep the cells alive and another to make growth or reproduction of cells possible. The first substance is more or less unstable, resembling somewhat in its behavior what we call complement in the blood serum, and may support an oxidation phenomenon. The second substance is cellular. Leucocytic extracts or embryonic tissue juices contain it in workable quantities. Washed suspensions of lymphocytes contain it. Thus it is not presuming too strongly to suppose that the lymphocyte, especially the common so-called "small" type, carries a growth promoting factor. This is the first premise of our hypothesis.

The next step is to show that it is possible for lymphocytes to be impregnated by the active principle of the thyroid gland before circulating generally. In adults we have the lymphocytes poured into the subclavian veins through the thoracic ducts just *before* the contents of these veins receive blood from the thyroid vein. This seems to be a rather circuitous route for the thoracic ducts unless there is some definite reason for it. May that reason not be for the purpose of impregnating the contents of the thoracic ducts with thyroidin?

Third, if the lymphocytes carry the growth promoting factor it would seem that during the period of growth from fetal life to adolescence a state of relative lymphocytosis should exist. This we know to be a fact. During the same period, in order to meet the demand for a large supply of lymphocytes, the body could find use for a special lymphocyte producing organ. The thymus may fulfill this demand. To facilitate matters this gland pours its venous contents into the subclavian vein directly under the thyroid, while some of the thymic veins empty into the thyroid veins themselves. It looks as though nature placed the thymus where it is for the definite purpose of furnishing lymphocytes to carry the thyroid principle.

When we try to prove these premises by animal or human experimentation we encounter difficulties because nature has very wisely tucked away extra depots that can be used in emergencies. For instance, when we remove the thymus in a young animal, we often get stunted growth, but not always, because the lymph glands and spleen can function as lymphocyte producing centers. To remove every lymphocyte producing center would be impossible. The same is true in thyroidectomy. If we remove the thyroid we usually get physical

types resembling cretins, though often the anterior pituitary with its colloid producing cells acts vicariously as a thyroid.

Experimental gland feeding has shown that in cases of delayed union of fractures or of old unhealed operation wounds, where the blood shows a normal lymphocyte count, good results follow the feeding of thyroid extract. This may mean that the thyroid gland has been exhausted to a point where all the thyroidin produced is used for repair of tissues more vital than the unhealed wound and that the thyroid gland deficit can be brought to normal by thyroid feeding, thereby making it possible to impregnate all the lymphocytes with the growth promoting factor. That the lymphocytes are necessary for the proper healing and rebuilding of tissues would seem indicated by the ever-present small round cell infiltration found in traumatized or diseased areas during the stage of repair. On the other hand if we feed thyroid to patients with a leucopenia, as in cases of exophthalmic goiter, typhoid fever, influenzal bronchopneumonia, tuberculosis and certain psychoses we aggravate their distress and cause a more rapid loss of weight. Does this mean that when there are not enough lymphocytes to carry thyroidin it becomes possible to have an uncombined thyroidin circulating freely in the blood stream and that this results in a most serious "toxic" catabolism and upsets the balance of the other endocrines?

As far as thymus feeding is concerned it is pretty generally conceded that it has little effect. In the fresh state its nucleoproteins would probably have the same nutritive value as pancreas, liver or kidney. Most proteins contain the phosphorous and other elements necessary for the synthesis of nucleoprotein. The craving for protein so common in the hyperthyroid states may give us a clue toward solving the riddle of improving the lymphatic organs.