

# ADRENORECEPTOR PROPERTIES OF HASSALL'S CONCENTRIC CORPUSCLES IN THE THYMUS

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The method of Falech and Hillarp in Krokhina's modification, which specifically detects biogenic amines, was used to investigate Hassall's corpuscles in the thymus of cats and rats. Under normal conditions Hassall's corpuscles of the thymus give a dull green fluorescence. After administration of exogenous biogenic amines (noradrenalin and serotonin) the fluorescence of Hassall's corpuscles is intensified to a bright green color, and after administration of reserpine the fluorescence is extinguished. These results demonstrate that Hassall's corpuscles are adrenoreceptor structures.

This paper describes an attempt to obtain new information on Hassall's corpuscles of the thymus by using Krokhina's modification of the method of Falech and Hillarp [2] for the specific detection of biogenic amines.

## EXPERIMENTAL METHOD

The 79 animals used included 43 cats and 36 noninbred albino rats. The animals were anesthetized with ether and the thymus removed. Some material was investigated to show autoluminescence. The rest was treated with paraformaldehyde vapor. Specimens were then studied under the ML-2 luminescence microscope and photographed. At various times before sacrifice some of the animals received reserpine, noradrenalin, and serotonin in doses of 0.01 and 0.005 mg/kg body weight.

## EXPERIMENTAL RESULTS

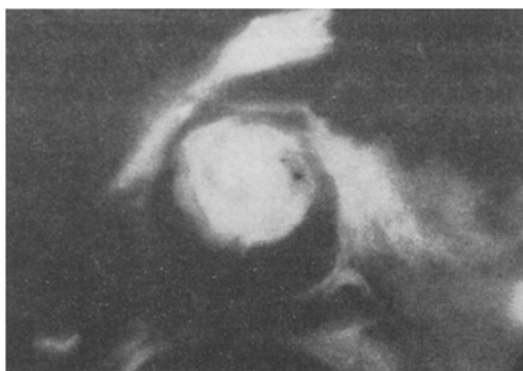


Fig. 1. Fluorescence of Hassall's corpuscle in the cat thymus. Method of Falech and Hillarp, ML-2 microscope, 900  $\times$ .

Under normal conditions in the thymus of all animals of average age investigated, the lobules of the gland and the interlobular septa were clearly defined. Under low power of the microscope the medulla of the lobules appeared empty, free from luminescent structures, while the cortex consisted of large, yellowish cells of different sizes. Some cells in the cortex were orange or yellowish-green, with densely packed granules. Unlike mast cells, no nuclei could be seen in them. In mast cells, on the other hand, the nucleus is well-defined, and the granules are small and round and uniformly distributed throughout the cell when examined under the luminescence microscope.

It was a particularly interesting fact that, by the use of a method revealing catecholamines, the Hassall's corpuscles in the center of the medulla gave a dull green

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fluorescence similar in color to the fluorescence of adrenalin (Fig. 1). Under the immersion objective, tiny fragmented granules, exhibiting a different type of luminescence in different animals, but duller than the granules in the cortex, were clearly revealed in the "empty" region in the medulla. These granules surrounded single Hassall's corpuscles. Double and even triple corpuscles, consisting of many layers of cells, also were found. Considerable differences were detected between the Hassall's corpuscles in animals of different ages. This was particularly clear in cats. In day-old kittens they gave a dull green fluorescence, and the structure of the corpuscles could hardly be distinguished against the dark background of the thymus parenchyma. In old cats in which the thymus had undergone involution, the Hassall's corpuscles were very few in number or absent altogether, probably with extinction of the functional activity of the medullary portion of the lobules.

Differences between the Hassall's corpuscles in animals of different species must also be mentioned. In the rat thymus stained by Faleck's method, under normal conditions fewer Hassall's corpuscles are found and they lack that clear definition of the structures which is characteristic of the cat thymus. It is interesting to note that very frequently in the medulla of the lobules of the rat thymus, where Hassall's corpuscles are usually situated, a nerve glomerulus, consisting of thin, varicose nerve fibers, giving an emerald-green fluorescence, could be seen.

To verify the specificity of the fluorescence the effect of administration of various drugs (noradrenalin, reserpine, serotonin) was investigated.

Administration of noradrenalin changed the fluorescence of the Hassall's corpuscles from the dull green observed normally to a bright green. The structure of the Hassall's corpuscles became clearer. Similar results were obtained by administration of serotonin. It can accordingly be concluded that exogenous catecholamines accumulate in the Hassall's corpuscles and increase the intensity of their fluorescence. Investigation of the thymus after administration of reserpine, a sympatholytic agent, showed a marked decrease in the intensity of fluorescence of the corpuscles. They became indistinct and their structures were ill-defined, dull green in color, and the corpuscles were surrounded by an opaque zone filled with yellowish granules. The impression was obtained that the structures described were apparently discharging their contents in response to the injection of reserpine.

A review of all the facts obtained in the experiments in which noradrenalin, reserpine, and serotonin were given to the animals suggests that the Hassall's corpuscles are typical adrenoreceptors.

#### LITERATURE CITED

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2. B. N. A. Faleck and G. Hillarp, *J. Histochem. Cytochem.*, 10, 348 (1962).