

## THE MICROSCOPY OF POWDERED, DESICCATED THYROID AND SUPRARENAL.\*

BY HEBER W. YOUNGKEN.<sup>1</sup>

The steady increase in the employment of powdered desiccated endocrine glands within recent years in the treatment of diseases resulting from a deficiency in or an unbalanced condition of the internal secretions has resulted in a greatly increased production of these products and the consequent need of biological and microscopical methods of valuation for them.

It has become evident that biological assays alone would not entirely satisfy the purity nor the identity standards of these materials and that without microscopic descriptions of them, they would be prone to adulteration with undesirable organic cellular materials by unscrupulous persons.

In December 1933, the author published the results of some preliminary studies made upon the microscopy of a number of these glandular products. Since that time additional desiccated endocrine glands and their powders have been studied by the writer. It is the purpose of this paper to outline the results of these studies upon powdered desiccated suprarenal and powdered desiccated thyroid glands.

## MATERIALS AND METHODS.

The glandular products examined consisted of preserved and desiccated suprarenal and thyroid glands of cattle and hogs, powdered desiccated suprarenal glands of cattle and hogs, and the powdered, desiccated thyroid glands of cattle, sheep and hogs. Some of the glands were imbedded in celloidin, stained with Delafield's hematoxylin and studied under the compound microscope in comparison with figures and descriptions in recognized texts on animal histology for the purpose of establishing the relationship of regions and tissues.

The desiccated glands were macerated in water and these and the preserved glands were then dissected and representative regions teased apart and examined under the microscope separately in water and in other temporary mounts with various reagents and stains. The histological elements observed in them were compared with similarly stained and mounted materials of the powdered desiccated glands.

The reagents and stains employed were the following: Delafield's hematoxylin, Mallory's stain, equal parts of Mallory's stain and 1% phosphotungstic acid solution, chromic acid T.S., hematoxylin and eosin, alcoholic eosin and water.

It was found necessary to dilute the hematoxylin stains with water, especially when the fragments were large, in order to make out the cellular regions clearly. It was also found good practice to mount small portions of the powders, distributing their fragments as uniformly as possible in the mounting medium beneath the cover slip. Alike with these and other powdered endocrine products previously discussed, it is frequently necessary to examine a number of mounts to find the less numerous histological elements of the gland. This is owing to the finely comminuted and altered state of some of the histological elements.

---

\* Scientific Section, A. Ph. A., Portland meeting, 1935.

<sup>1</sup> Massachusetts College of Pharmacy, Boston, June 1, 1935.

## THE THYROID GLAND.

The thyroid body is a ductless, compound tubular gland, and consists of two large almond-shaped lateral lobes united by a narrow bank, the middle lobe, or isthmus and forming a projection on the ventral surface of the trachea.

This gland is surrounded by a capsule of dense white fibrous tissue that sends in trabeculæ, which divide the gland into lobes and lobules. These divisions are irregular, and the lobules are composed of a number of short tubules, sometimes called follicles, that vary considerably in diameter. Each tubule is lined by cuboidal epithelial cells that rest upon a basement membrane; outside of this is the intra-lobular, or intertubular, connective tissue that supports the blood vessels. The cells are of two kinds, namely, the chief cells and the colloid cells. The chief cells are said to become the colloid cells, and these in turn change into the colloid substance that is supposedly the result of the activity of the cells. It has a yellowish color,

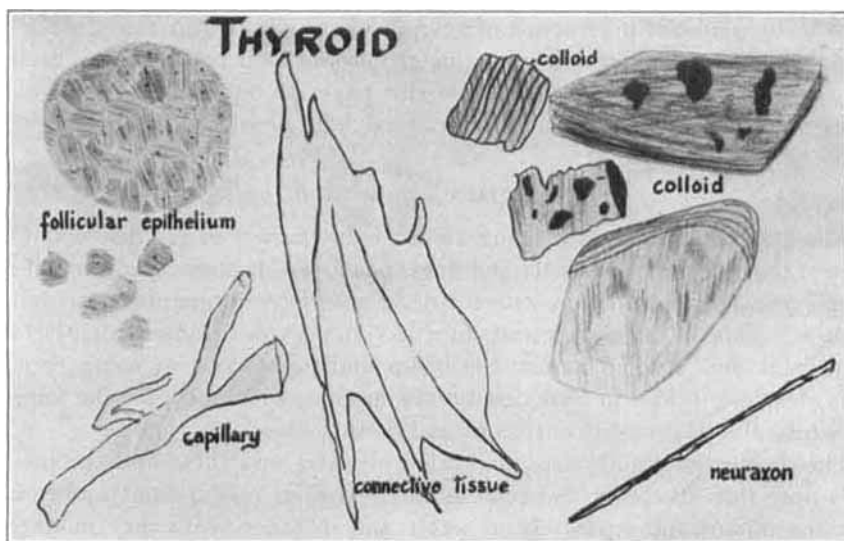


Fig. 1.—Histological elements found in Powdered Desiccated Thyroid.

and as blood cells are frequently seen in it, the color may be due to the hemoglobin from these. Sometimes the colloid material is shrunken, and then its edges are crenated; in such tubules, the epithelial cells are drawn away from the basement membrane. Blood vessels are numerous, and dense plexuses are formed around the tubules. It is thought that the colloid substance may represent an internal secretion that is absorbed by the blood vessels, or perhaps by lymphatics. The lymphatics are numerous, and lie between the tubules. They often contain some of the colloid substance.

The lobes of the thyroid are separately removed from the recently slain animal deprived of enveloping connective tissue and fat, sliced or minced and rapidly dried in a current of warm air. They are then reduced to a coarse powder which is treated with petroleum ether for the partial removal of fatty matter present. The powder is then dried in a desiccator. The final product should be a yellowish or buff-colored amorphous powder having a slight, characteristic, meat-like odor and saline taste.

## POWDERED DESICCATED THYROID.

When suitably mounted and examined under the microscope, it shows numerous smooth to striated, hyaline fragments of colloid, of angular to irregular shape which are colorless to pale yellow in water mounts, brown in Mallory's stain and pink in eosin solution, some of these fragments containing granules, minute vacuoles, crystalloidal bodies and cells; numerous irregular fragments of follicular epithelium staining brown or orange-brown with Mallory's stain, the individual cells more or less polygonal to rounded-angular or irregularly cuboidal, often with prominent nuclei staining dark blue, their cytoplasm purplish with Delafield's hematoxylin; slender glistening segments of neuraxons; numerous aggregates of particles of intercellular substance and slender, mostly straight, connective tissue fibres staining blue to greenish blue with a mixture of Mallory's stain and 1 per cent solution of phosphotungstic acid, the bundles of fibres often appearing reddish in plain Mallory's stain; few glistening fragments of blood vessels with serrated or crenated ends as viewed in water mounts.

## THE SUPRARENAL GLANDS.

The suprarenal or adrenal glands are more or less pyramidal shaped ductless glands, one being situated on the upper pole of each of the kidneys. Each gland

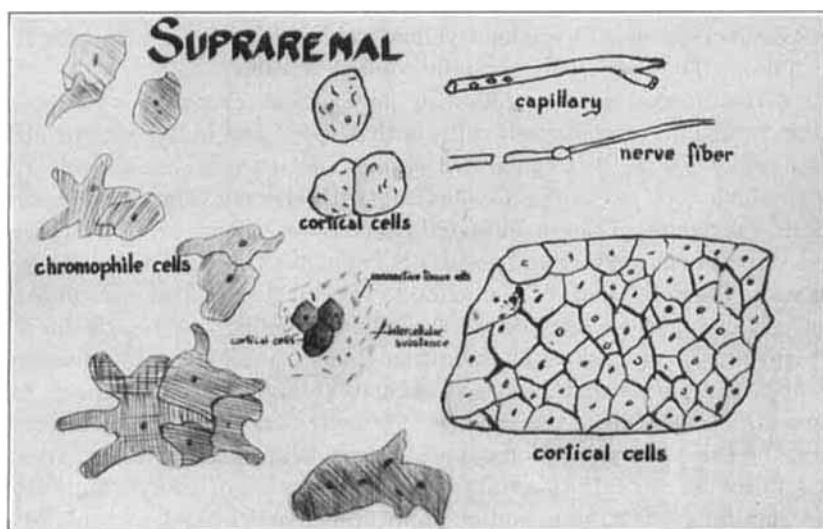


Fig. 2.—Histological elements found in Powdered Desiccated Suprarenal.

is surrounded by a thin capsule of white fibrous connective tissue and presents for examination two regions, the cortex and the medulla.

The cortex or outer firmer region is yellowish in appearance and when examined microscopically consists of a delicate framework of connective tissue in the meshes of which lie solid columns of epithelial cells. It is subdivided into three zones known in order from without inward as the zona glomerulosa, the zona fasciculata and the zona reticularis. The cells of the zona glomerulosa are mostly large and polyhedral and contain many lipoid granules. In cross sections they appear in irregularly circular to oval groups. The columns of cells are surrounded by a reticu-

lum of connective tissue containing capillaries and nerve fibres. The zona fasciculata consists also of epithelial columns arranged in radial groups which are surrounded by connective tissue containing capillaries and nerve fibres. The epithelial cells of this zone appeared to be larger than those of the other cortical zones and contained lipoid granules. The zona reticularis is composed of a network of small polyhedral epithelial cells with large nuclei and pigmented cytoplasm. It is the darkest tinted of the three zones of the cortex.

The medulla comprises the central portion of the gland. It is soft in texture and brown in color. It consists of numerous polygonal to somewhat lobed and stellate, chromophil or chromaffin cells arranged in irregular groups and anastomosing cords that are surrounded by connective tissue containing blood vessels, blood sinuses, capillaries, nerve fibres and ganglion cells. The chromaffin cells contain material which stains brown with solutions of chromic acid or its salts.

In the preparation of the powdered desiccated drug, the glands are obtained from freshly killed cattle, sheep and hogs, deprived of surrounding connective tissue and fat, sliced or minced and rapidly dried in a current of warm air. They are then reduced to a coarse powder, in some places partially defatted, and dried *in vacuo* at a temperature below 60° C. or by means of a dehydration solvent like acetone.

#### POWDERED DESICCATED SUPRARENAL.

The powders examined were light yellow to brown and possessed a slight characteristic odor. They were only partially soluble in water.

Under the microscope the following histological elements were observed: Numerous chromaffin (chromophil) cells, both isolated and in loose aggregates, the individual cells stellate to irregular with spheroidal to oval nuclei and granular cytoplasm which took a brownish coloration with chromic acid T.S.; numerous clear, jointed segments of non-medullated nerve fibres, the axons of which are colored mauve with hematoxylin and eosin T.S., numerous cortical cells both isolated and in masses, the individual cells cuboidal to irregularly rounded or rounded polyhedral, with spheroidal nuclei, some of the cells containing tiny fat globules, granules or pigment, the chromatin of the nucleus and granules staining blue and the protoplasm red to purple with Delafield's hematoxylin and alcoholic eosin; numerous fragments of connective tissue fibres, fibrocytes and particles of intercellular substance, the fibres wavy, the fibrocytes slender, linear to fusiform, and all colored blue with a mixture of Mallory's stain and a 1% solution of phosphotungstic acid, numerous minute granules of crystalline appearance and irregular form and many isolated nuclei.

#### REFERENCE.

- (1) Youngken, H. W., and Reed, A. W., "A New Field of Investigation in Pharmacognosy: The Microscopy of Glandular Products, *Jour. A. Ph. A.*, 22, 1215-1218 (1933).

---

George Washington University School of Medicine has announced the addition to the faculty of the newly established course in public health teaching of Drs. George W. McCoy, Rolla E. Dyer, Edward Francis, Charles Armstrong and Robert Olesen, all of the U. S. Public Health Service, with the title of professorial lecturer in preventive medicine. The appointment of Ralph W. Harris, Ph.D., as assistant professor of anatomy at the school of medicine, was also announced.