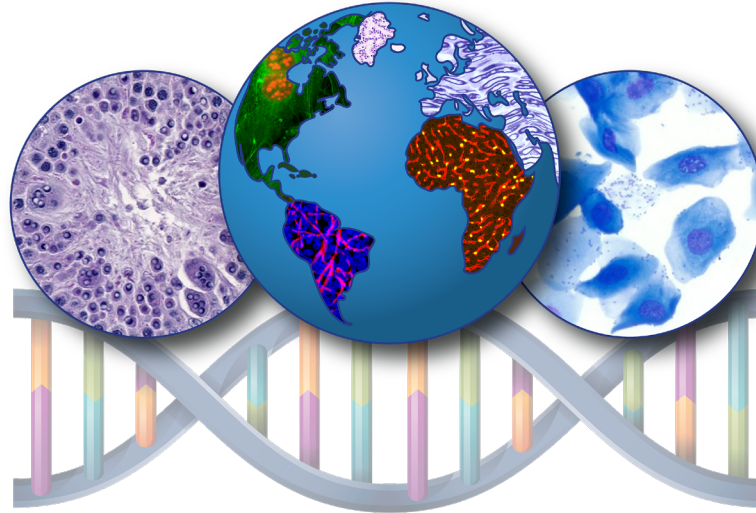


Anatomy and Histology of the Normal Rodent Parathyroid Gland



Division of Translational Toxicology Global Toxicologic Pathology Training Program

Overview

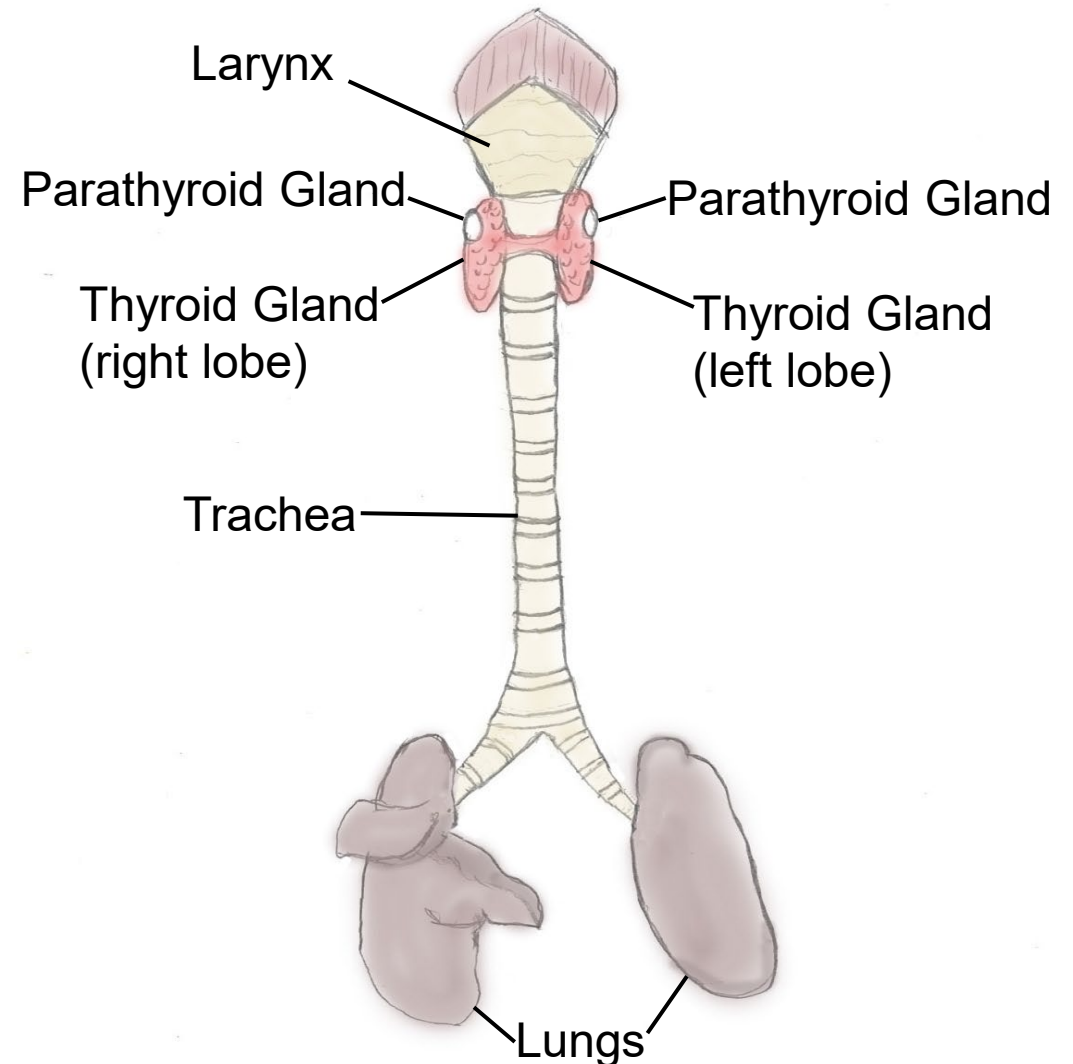
- Embryology and Development
- Gross Anatomy
- Cutting and Trimming
- Histology
- Common Congenital Lesions

Parathyroid Gland: Embryology and Development

- Usually only one pair of parathyroid glands in mice and rats, unlike many other mammals with two pairs
- Derived from the endoderm of the third pharyngeal pouch in mice and rats
- The parathyroids and thymus are both derived from the third pharyngeal pouch
- Gestation day 11.5 in mice and day 13 in rats – the parathyroid glands appear along the dorsal surface of the third pharyngeal pouch
- Gestation day 15 in mice and rats – the parathyroid glands come into contact with the thyroid gland and migrate to their definitive position by day 15.5 in mice and day 16 in rats

Parathyroid Gland: Gross Anatomy

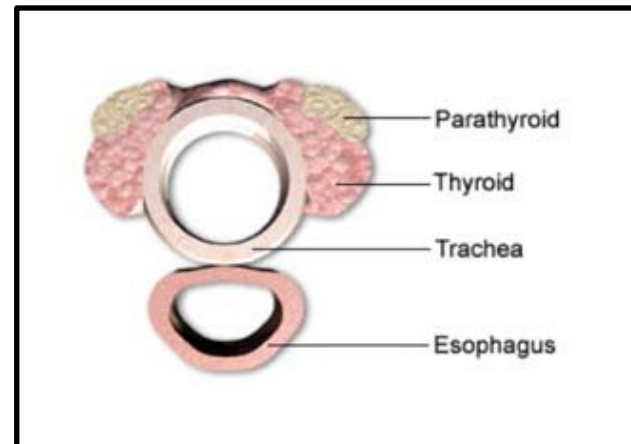
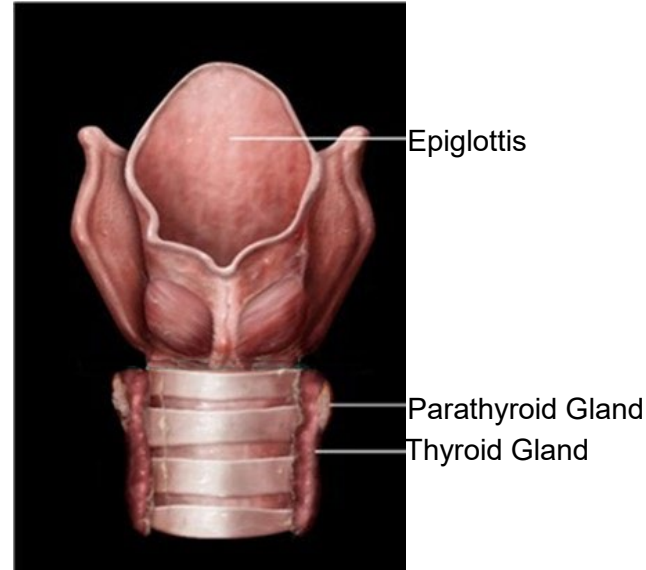
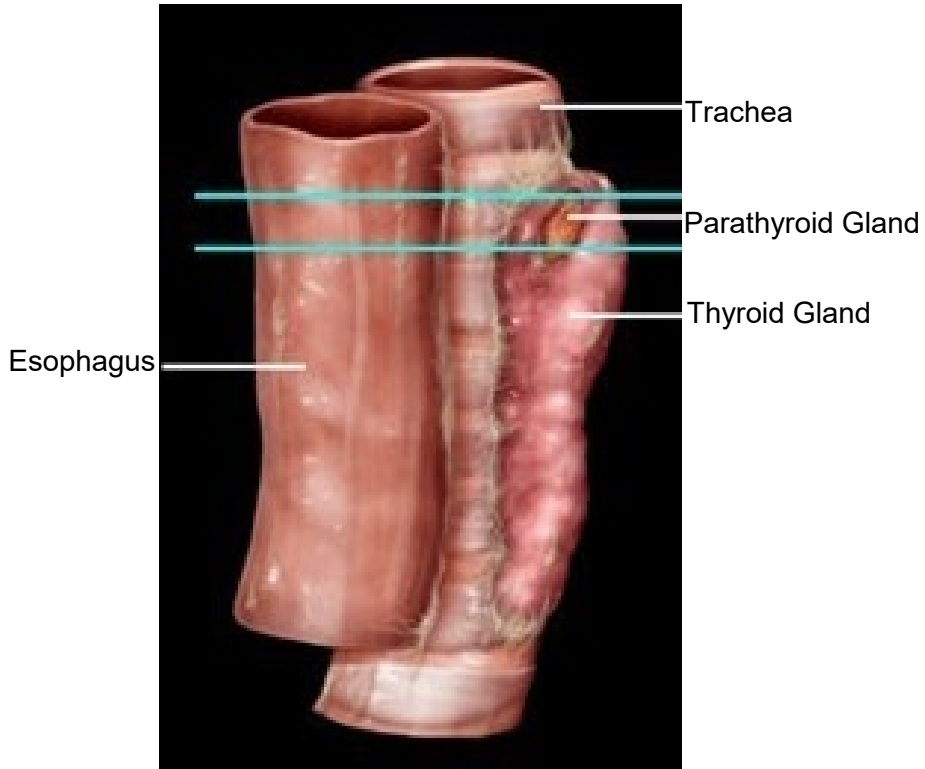
- Paired organs located within the right and left lobes of the thyroid gland in lower neck along the sides of the trachea just caudal to (below) the larynx
 - Each lobe of the thyroid gland contains one parathyroid gland in rats and mice
- Location:
 - Usually on the anterior and lateral aspect of thyroid lobes in rats, but the position may vary
 - Usually on the dorsal and lateral aspect of thyroid lobes in mice, but the position may vary and may be embedded in thyroid
- May be difficult to locate, especially in mice
- Sexual dimorphism in rats:
 - Parathyroid glands are larger in females than males



Parathyroid Gland: Cutting and Trimming

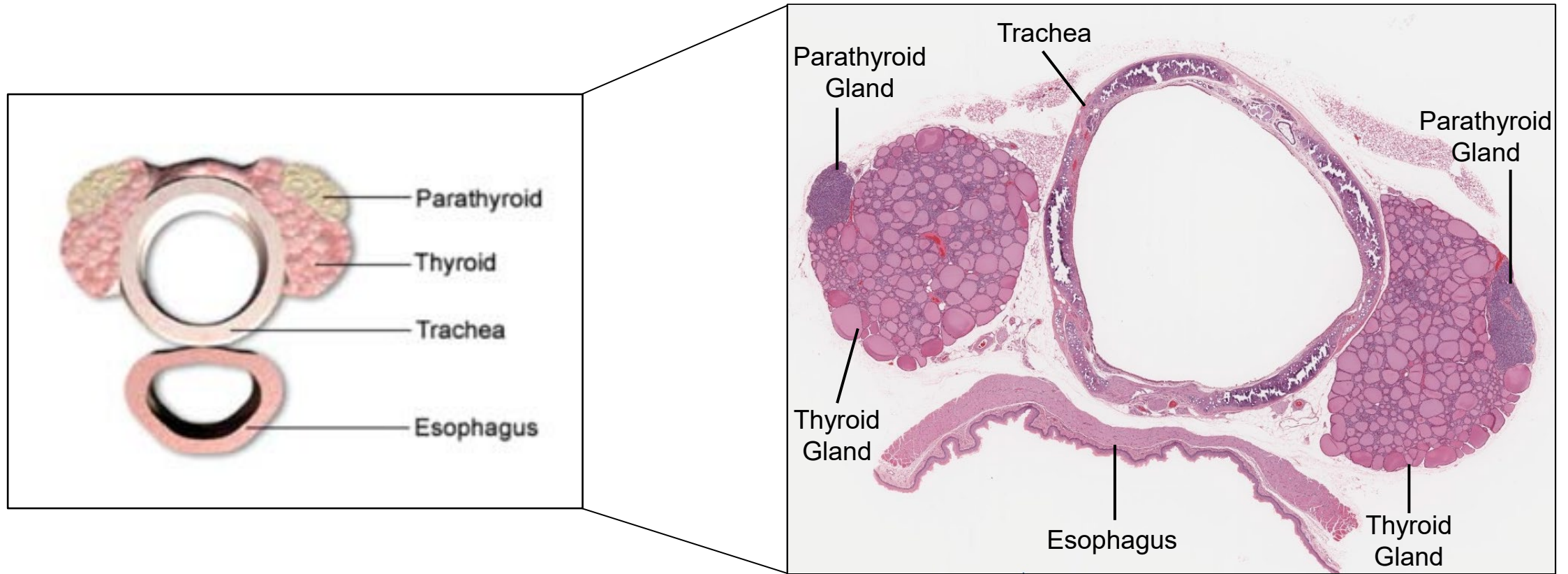
Transverse Sectioning

- Section is taken through the trachea, esophagus, thyroid gland, and parathyroid glands



Parathyroid Gland: Cutting and Trimming

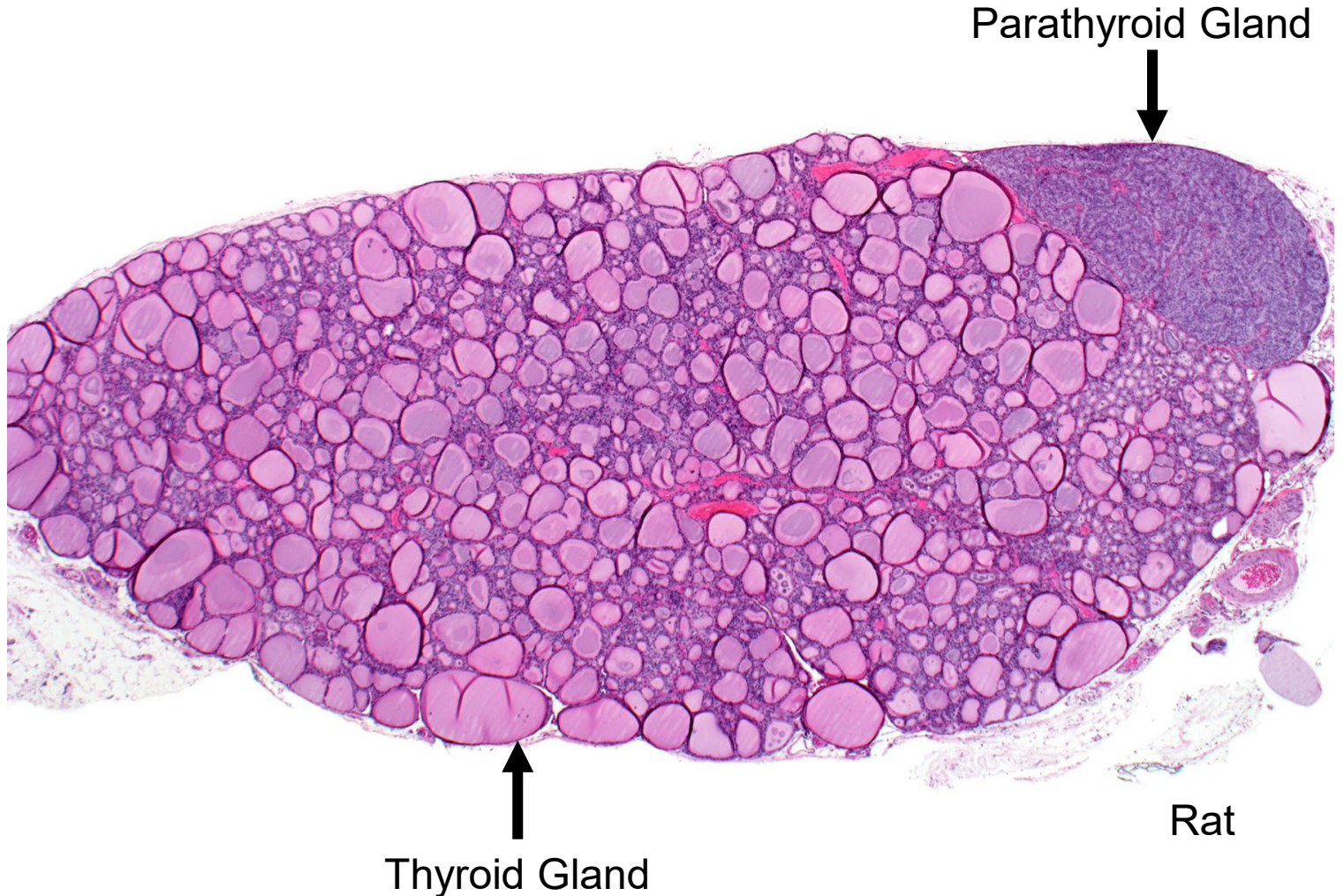
Transverse Sectioning



Parathyroid Gland: Trimming and Histology

Longitudinal Sectioning

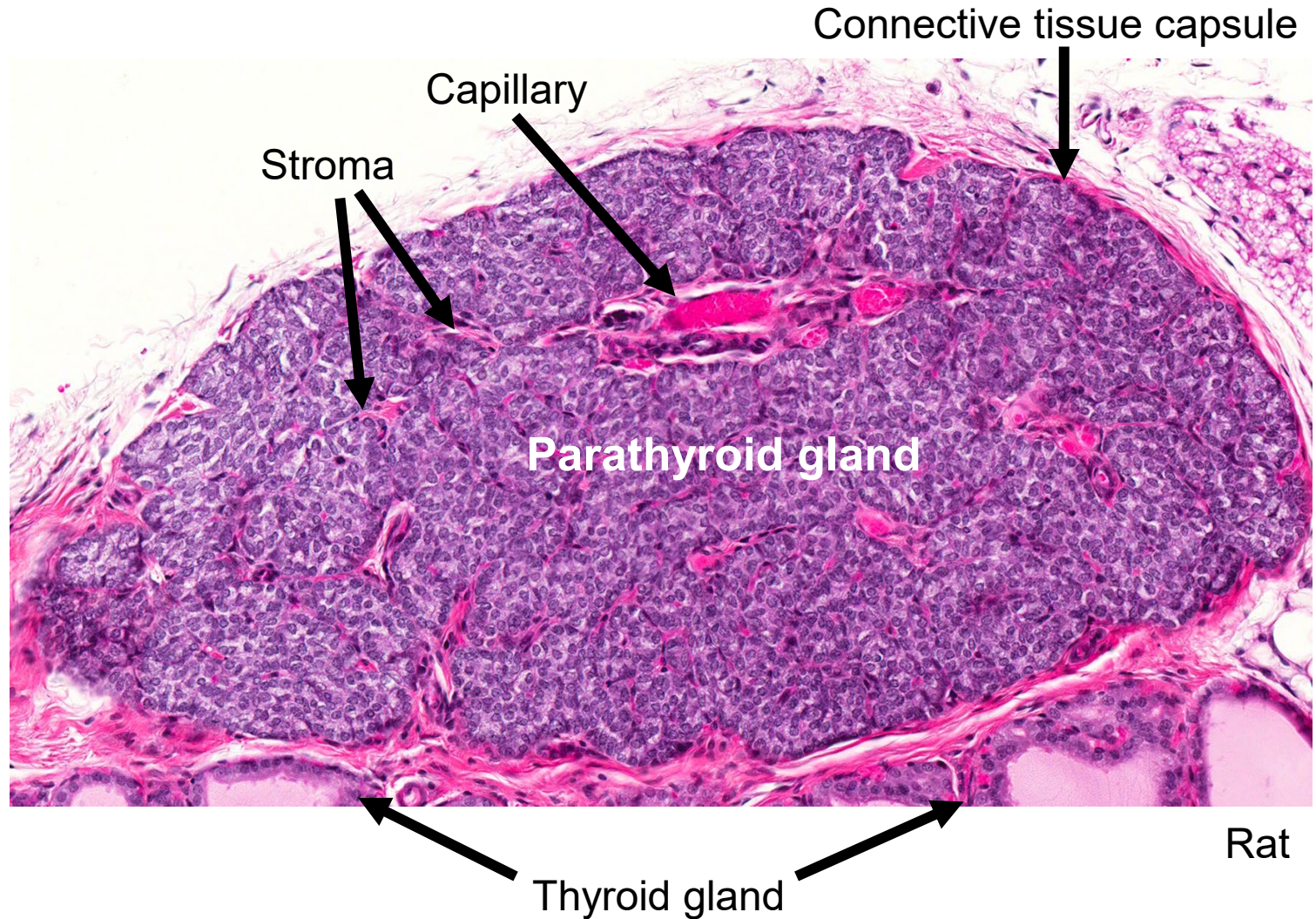
- Longitudinal sections may be necessary when thyroid gland weights are required
- Both lobes of thyroid gland (with parathyroids) are removed and weighed together
- Section is taken through the largest area of thyroid lobe to include the parathyroid gland



Parathyroid Gland: Normal Histology

Normal Rodent Parathyroid

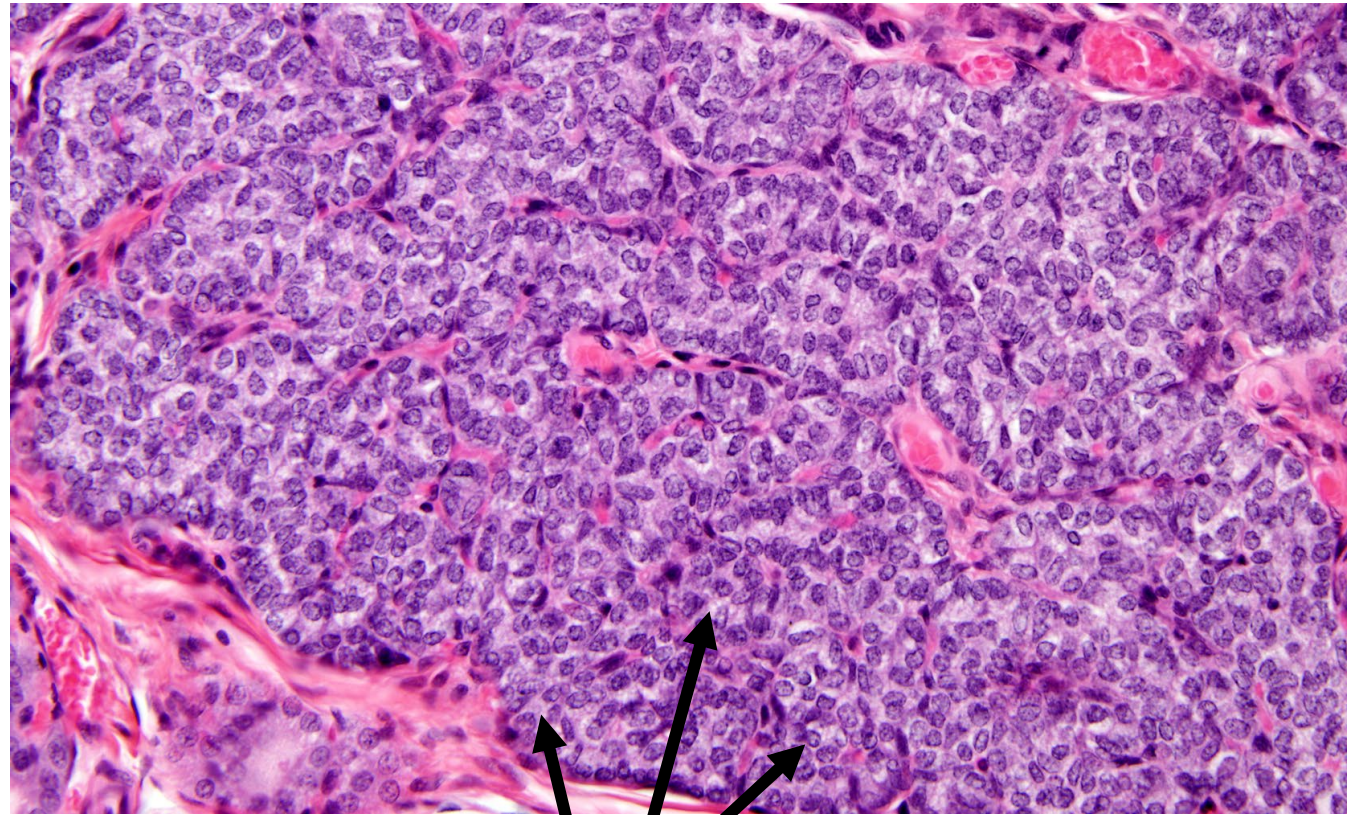
- Parathyroid gland is thinly encapsulated and usually located on the edge of the thyroid gland
- Composed of densely packed clusters and cords of cells separated by stroma of reticular and collagen fibers
- The stroma contains capillaries, lymphatics, and nerves



Parathyroid Gland: Normal Histology

Normal Rodent Parathyroid

- Chief cells are the main cell type in the mouse and rat parathyroid gland
 - Synthesize and secrete parathyroid hormone (PTH) in response to decreased ionized calcium in the blood
- Chief cells are round to polygonal cells with cytoplasm that varies from faintly eosinophilic (pink) to amphophilic (pink to purple) to clear, depending on the functional state
 - These functional variants are sometimes referred to as dark or light (or clear) cells
- Oxyphil cells in parathyroid glands of humans and other species are not observed in the mouse and rat

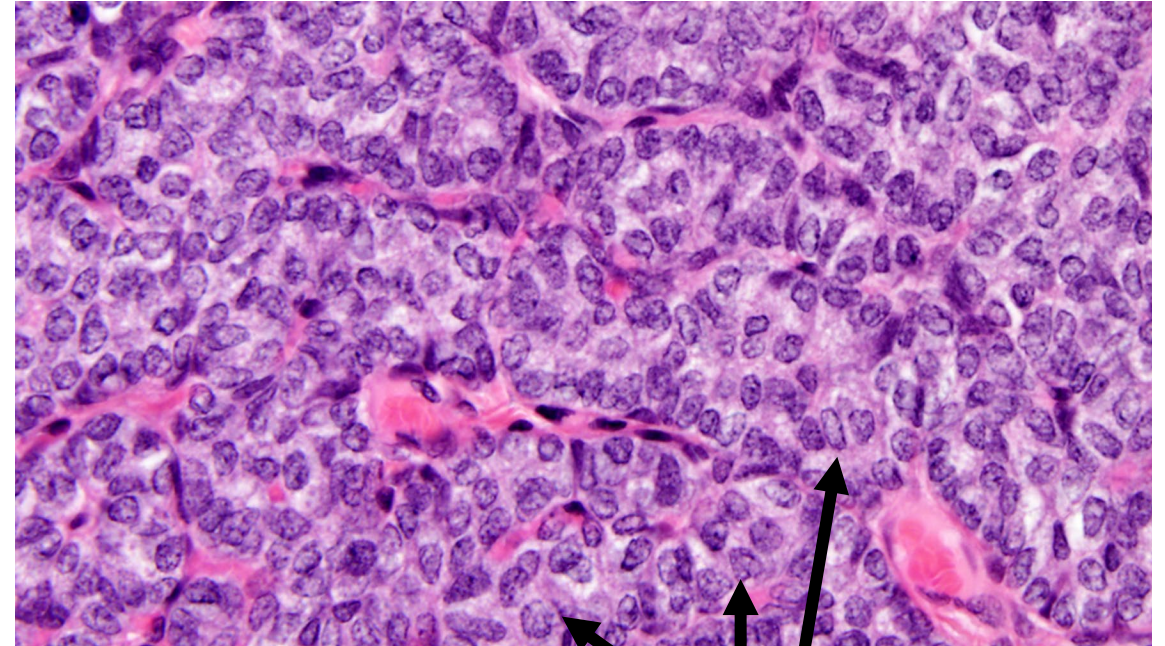
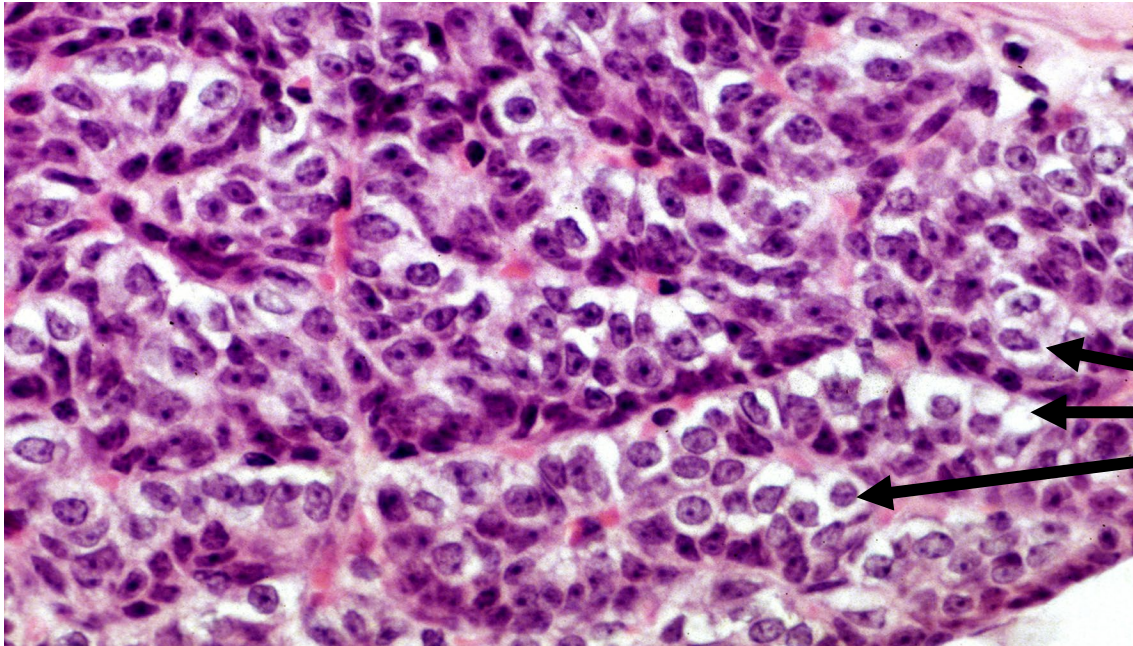


Chief cells in a normal parathyroid gland from a male F344/N rat from a chronic study

Parathyroid Gland: Normal Histology

Normal Rodent Parathyroid

- Active cells have granular eosinophilic to amphophilic cytoplasm
- Inactive cells have abundant clear cytoplasm and may increase with age



Active chief cells with
amphophilic cytoplasm
in an F344/N rat

Inactive chief cells with
abundant clear cytoplasm
in a B6C3F1 mouse from
a chronic study

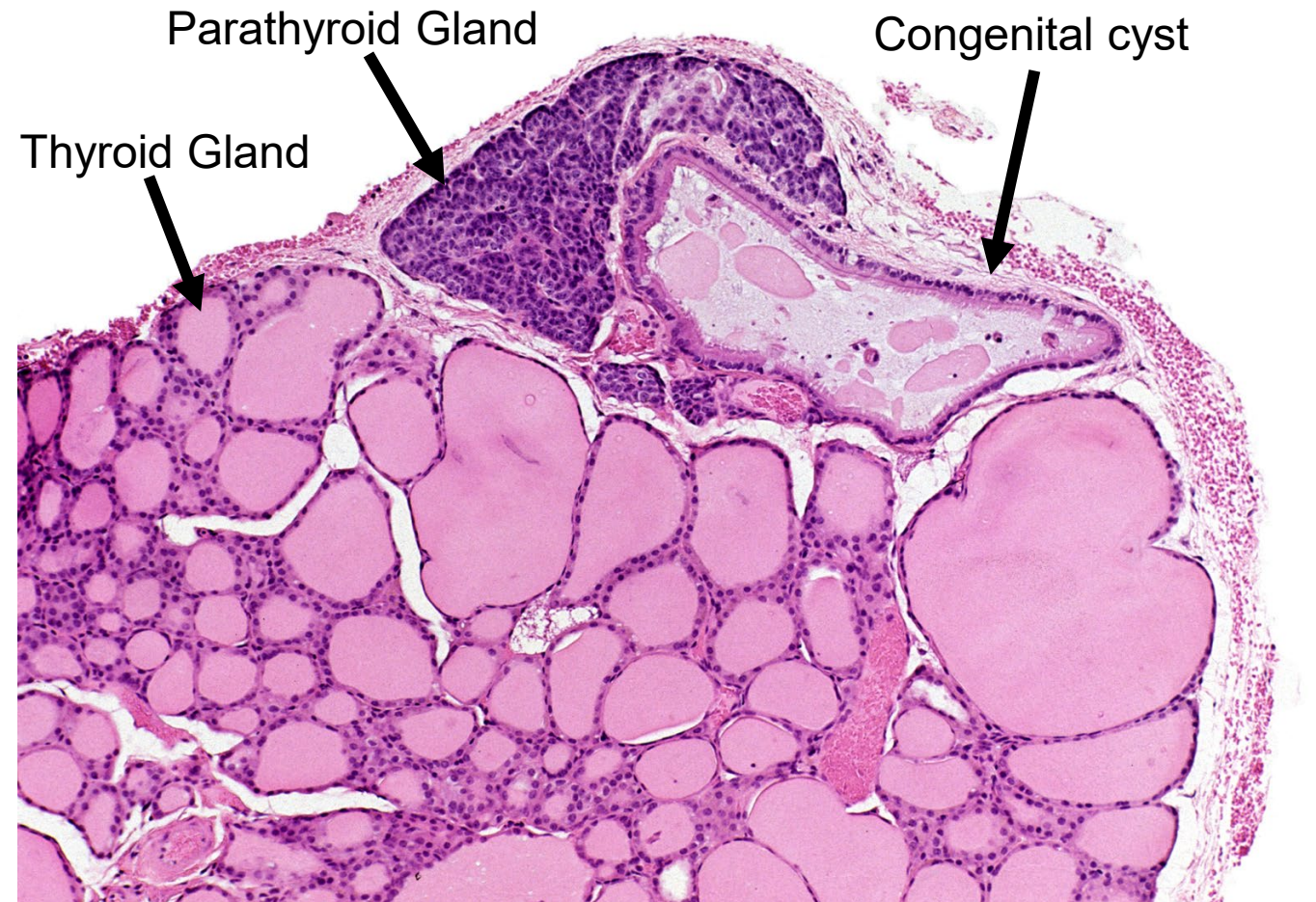
Congenital/Developmental Lesions

- Cyst
- Parathyroid Gland – Ectopic Tissue, Thymus
- Thymus – Ectopic Tissue, Parathyroid Gland

Parathyroid Gland: Congenital Lesions

Cyst

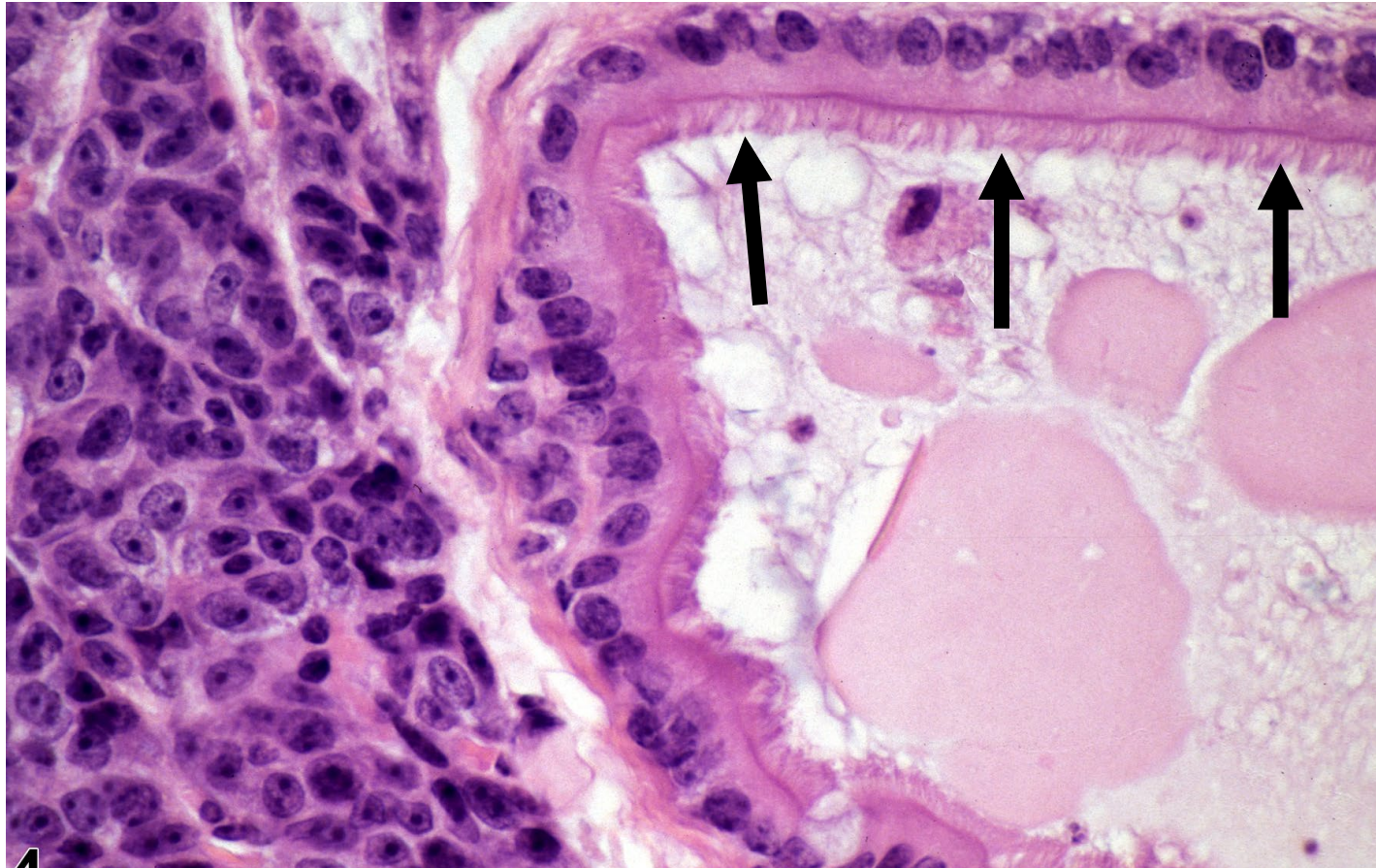
- Usually congenital
- Formed by remnants of embryonal structures
- Lined by simple cuboidal to columnar epithelium that may be ciliated
- May be empty or filled with eosinophilic or mucinous material



Mouse

Parathyroid Gland: Congenital Lesions

Cyst

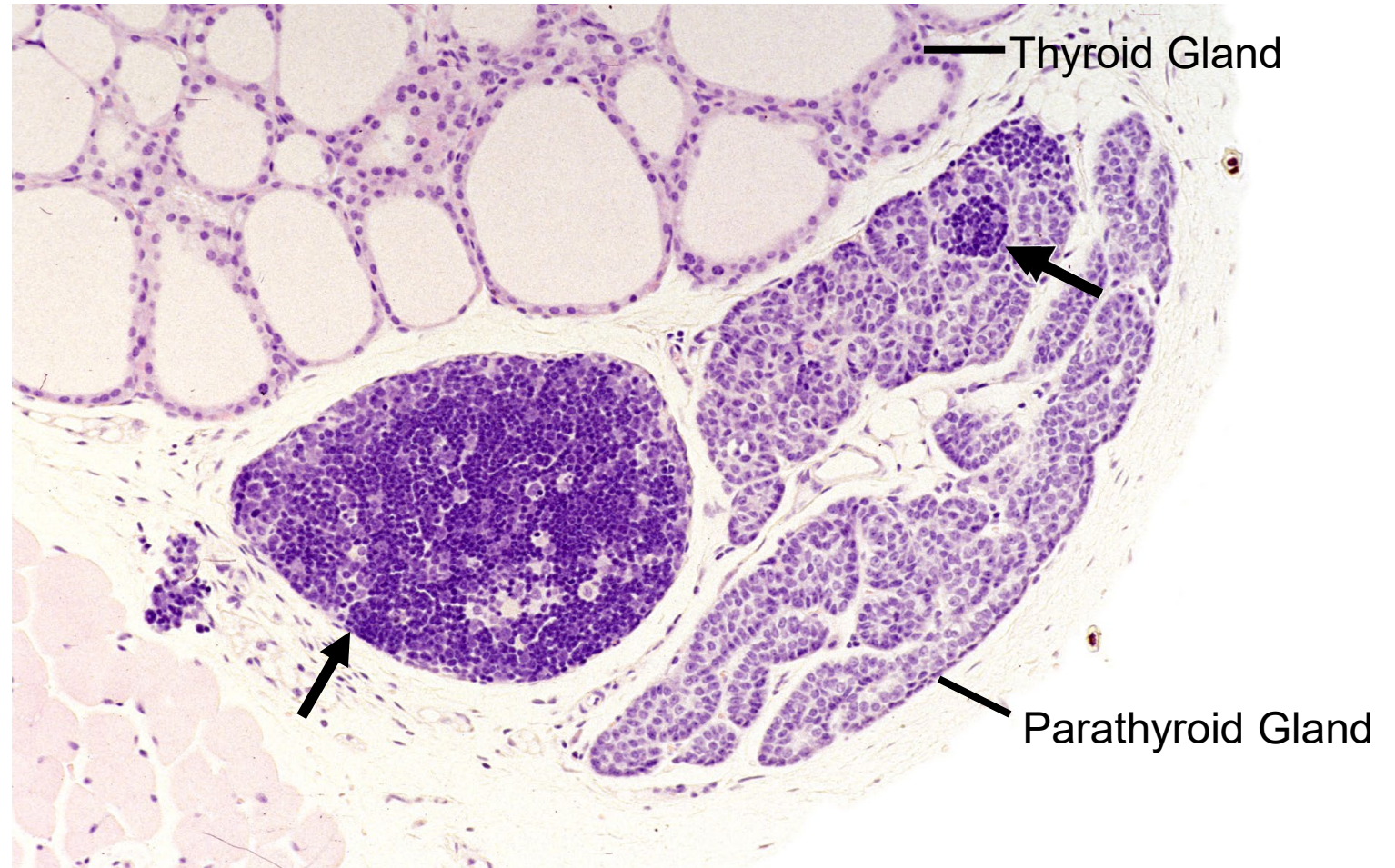


Higher magnification showing ciliated epithelium (arrows), mouse

Parathyroid Gland: Congenital Lesions

Parathyroid Gland – Ectopic Tissue, Thymus

Common congenital lesion that occurs because of the close association of the parathyroid and thymus during embryological development

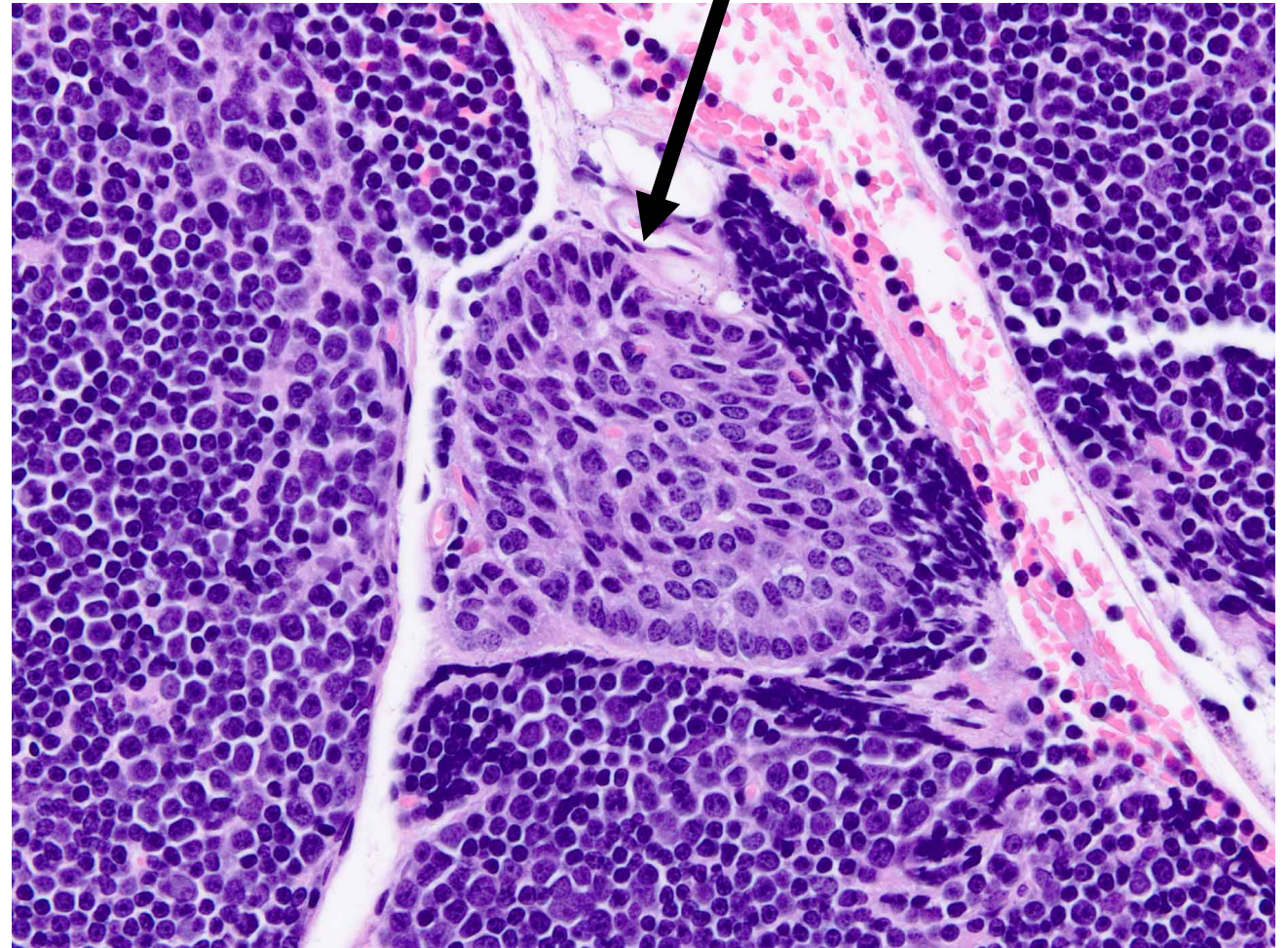


Well-differentiated thymic tissue (arrows) adjacent to and embedded within the parathyroid gland, mouse

Parathyroid Gland: Congenital Lesions

Thymus – Ectopic Tissue, Parathyroid

Ectopic parathyroid tissue often occurs in the thymus because of the close association of the thymus and parathyroid during embryological development



Well-differentiated parathyroid tissue (arrow) is embedded within the thymus, mouse



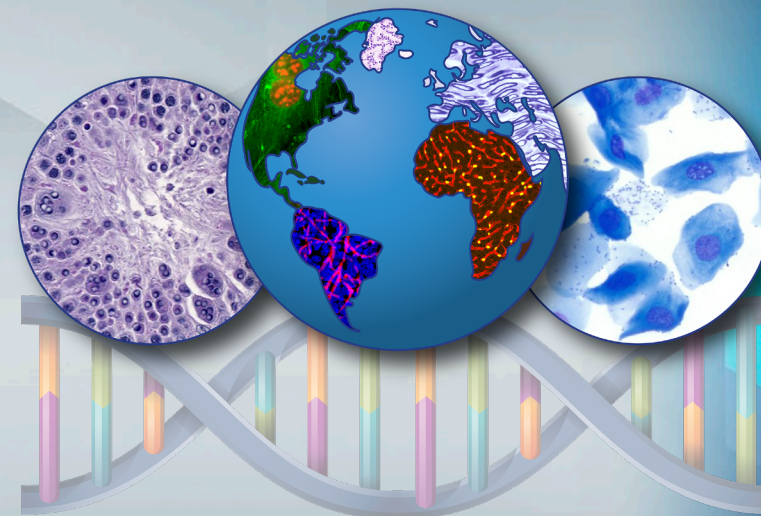
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