

PINEAL GLAND

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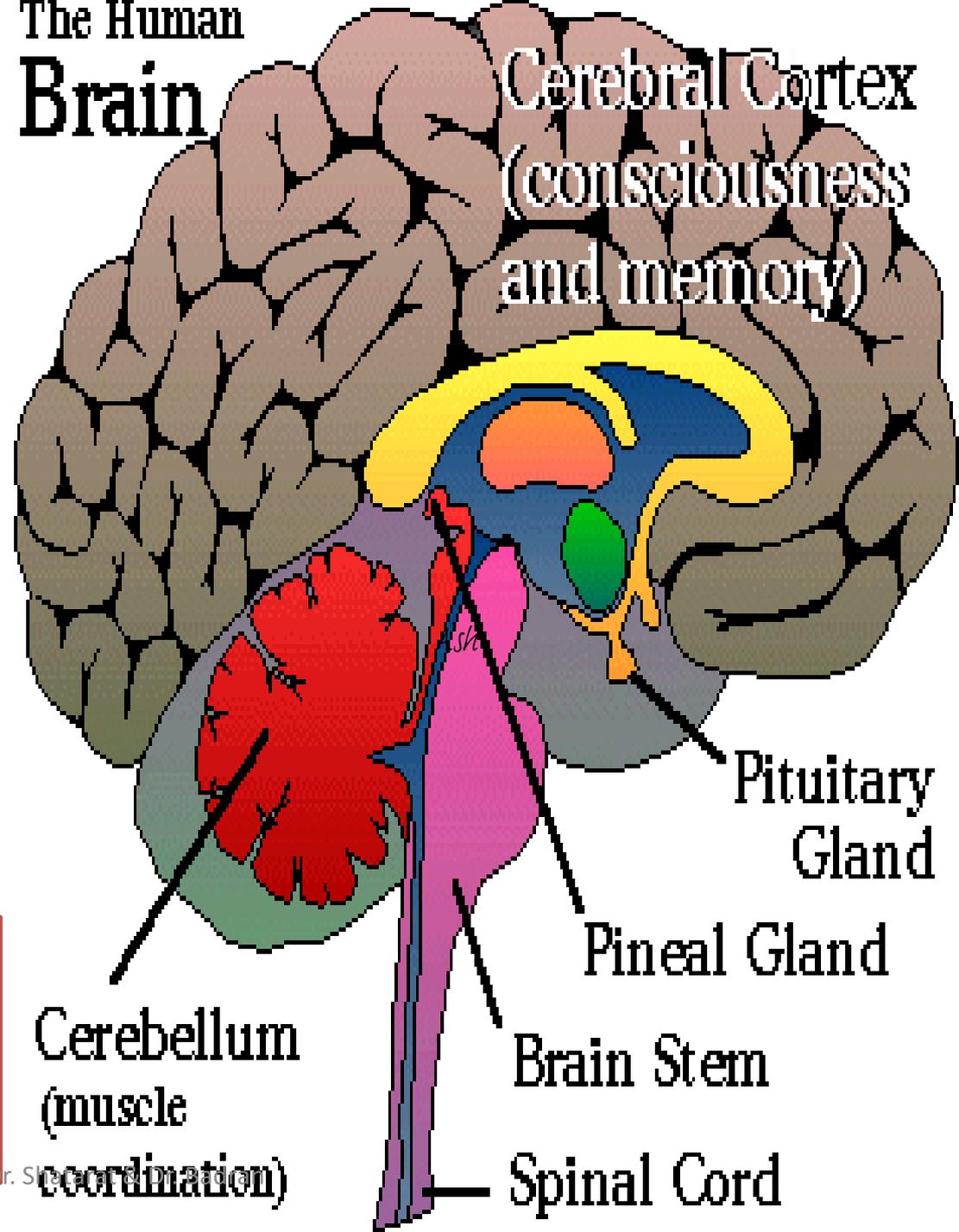
Also called pineal body, epiphysis cerebri is an endocrine or neuroendocrine gland that regulates daily body rhythm.

It develops from **neuroectoderm of the posterior portion of the roof of the diencephalon and remains attached to the brain by a short stalk.**

In humans, it is located at the posterior wall of the third ventricle near the center of the brain.

The pineal gland is a flattened, pine cone-shaped structure
It measures 5 to 8 mm high and 3 to 5 mm in diameter and weighs between 100 and 200 mg.

The Human Brain



The pineal gland contains two types of parenchymal cells:

Pinealocytes
Interstitial (glial) cells.

Pinealocytes are the chief cells of the pineal gland. They are arranged in clumps or cords within lobules formed by connective tissue septa that extend into the gland from the pia mater that covers its surface.

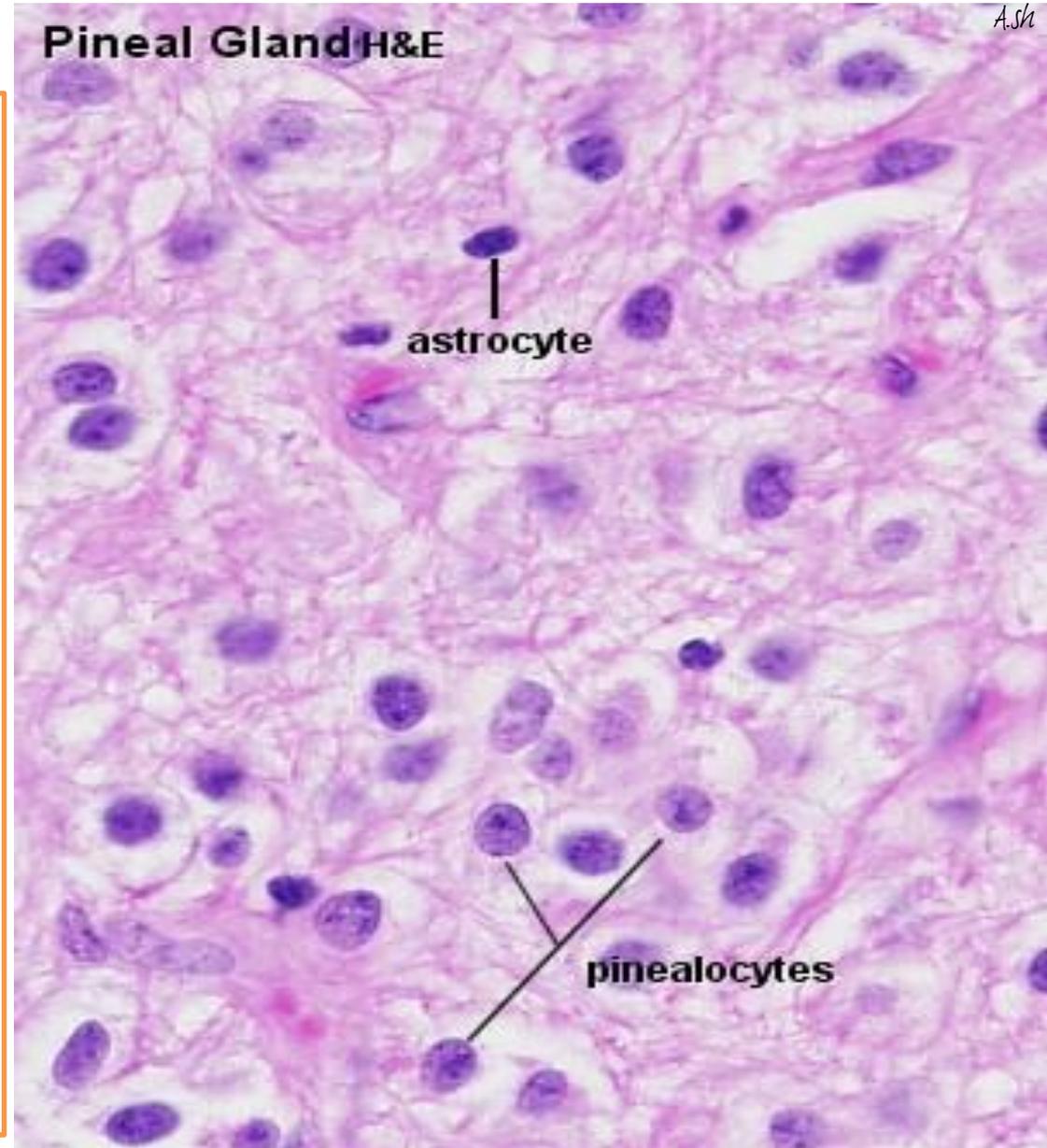


FIGURE 21.11 • Photomicrograph of infant pineal gland. This H&E-stained section is from a median cut through the pine cone-shaped gland. The conical anterior end of the gland is at the top of the micrograph. The arrows indicate the part of the gland that connects with the posterior commissure. The gland is formed by an evagination of the posterior portion of the roof of the third ventricle (diencephalon). The dark areas indicated by asterisks are caused by bleeding within the gland. ×25.

Read only

The parenchyma of the pineal gland looks rather homogeneous at low magnification. A few blood vessels are visible criss-crossing through the gland. At higher magnification three types of nuclei can be distinguished.

Small dark nuclei belong to the astrocytes found in the pineal gland. Pinealocytes have larger, lighter and round nuclei, which are surrounded by a broad rim of light cytoplasm. Most nuclei present are the nuclei of pinealocytes. Endothelial cell nuclei are found in association with the vessels and capillaries traversing the tissue. Both pinealocytes and astrocytes have long processes which give the tissue between the nuclei its "stringy" appearance.



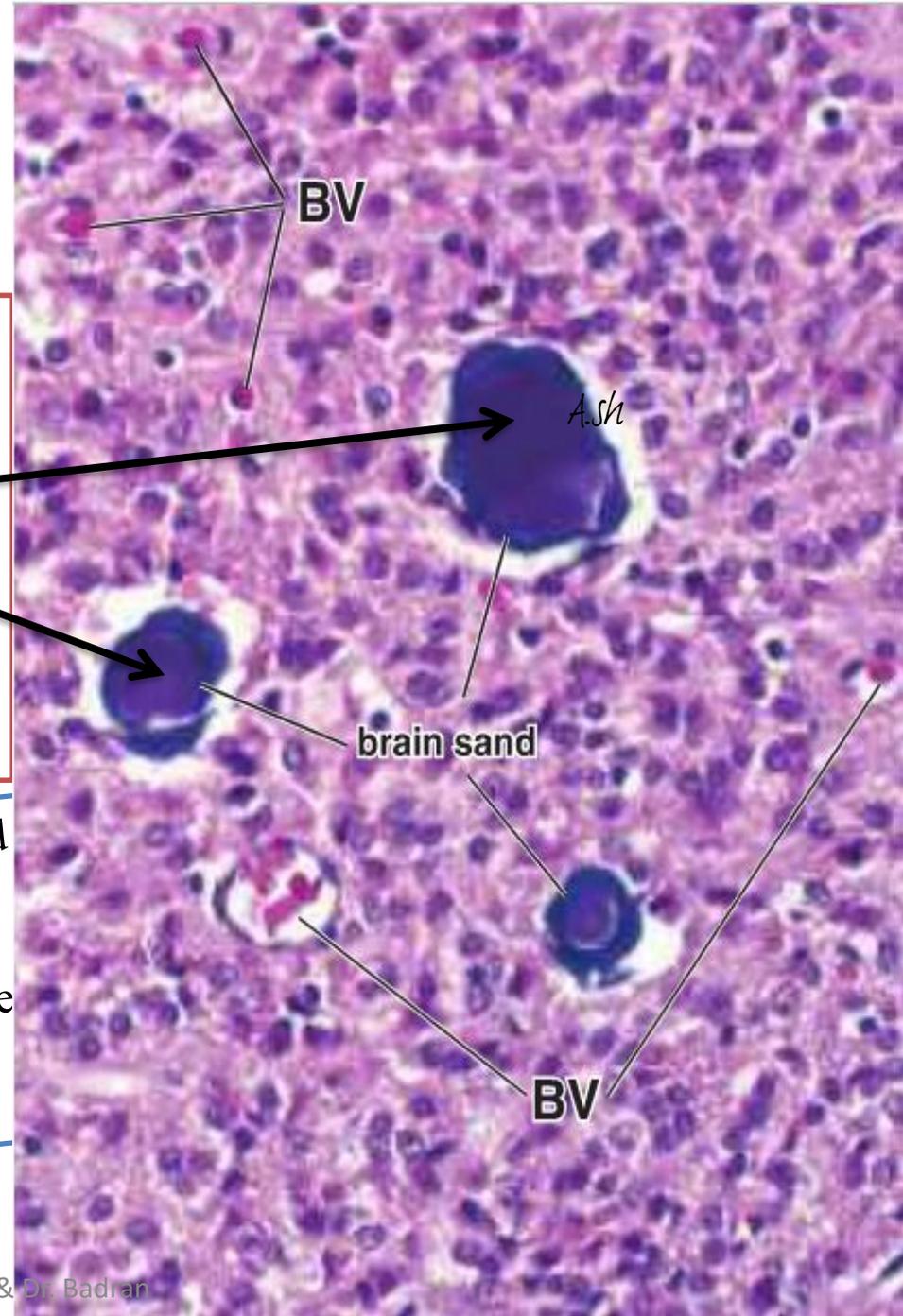
The interstitial (glial) cells constitute about 5% of the cells in the gland.

In addition to the two cell types, the human pineal gland is characterized by the presence of calcified concretions called

brain sand

It appears to be derived from precipitation of calcium phosphates and carbonates on carrier proteins that are released into the cytoplasm when the pineal secretions are exocytosed

The concretions are recognizable in childhood and increase in number with age. Because they are opaque to X-rays and located in the midline of the brain, they serve as convenient markers in radiographic and computed tomography (CT) studies



Hormone	Composition	Source	Major Functions
Melatonin	Indolamine (<i>N</i> -acetyl-5-methoxytryptamine)	Pinealocytes	Regulates daily body rhythms and day/night cycle (circadian rhythms); inhibits secretion of GnRH and regulates steroidogenic activity of the gonads particularly as related to the menstrual cycle; in animals, influences seasonal sexual activity

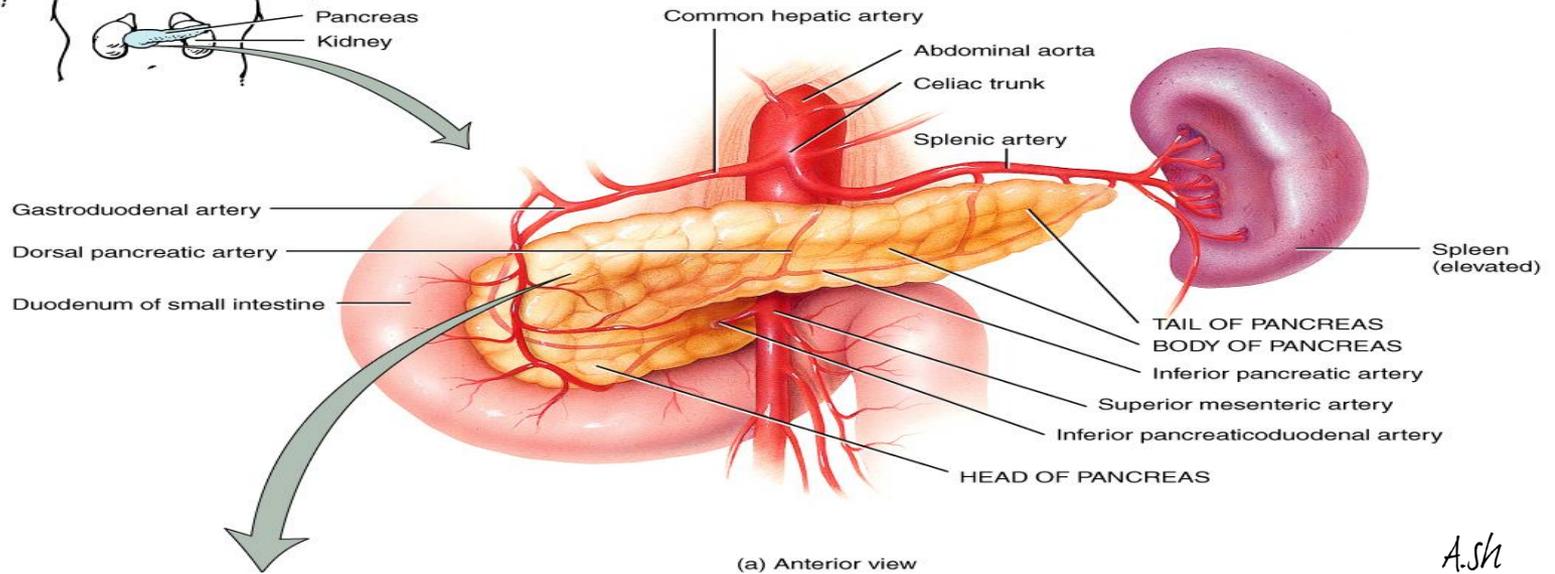
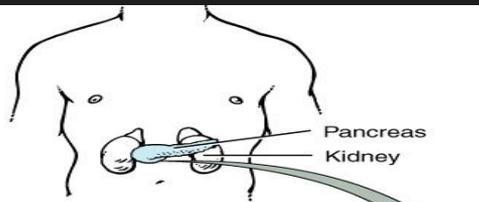
The pineal gland is a photosensitive organ and an important time keeper and regulator of the ^{Ash} day/night cycle (circadian rhythm). It obtains information about light and dark cycles from the retina via the **retinohypothalamic tract**

Read and enjoy

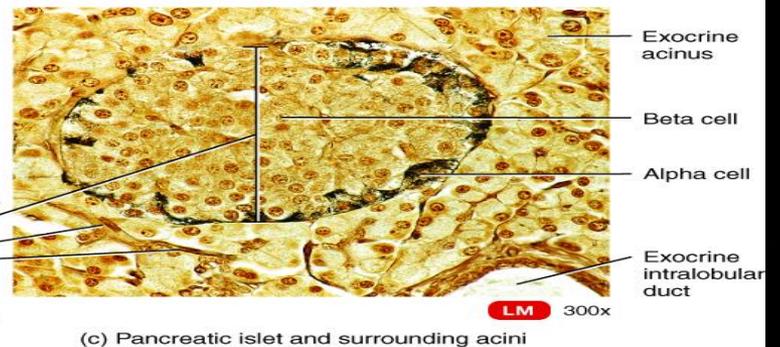
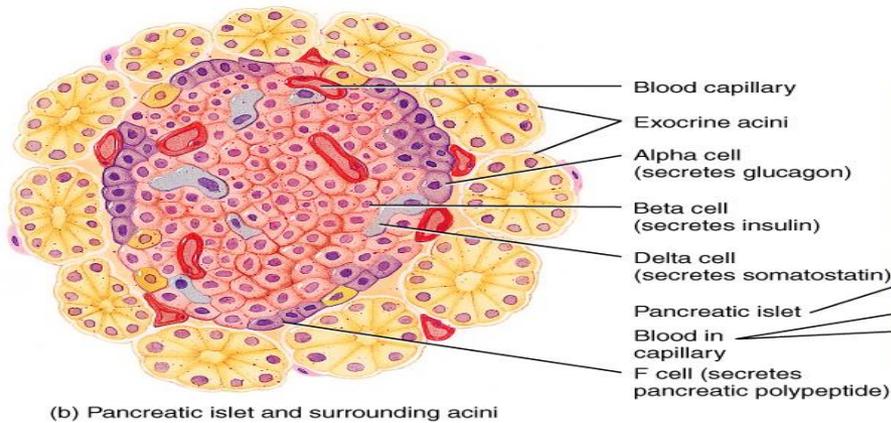
Melatonin

- is released in the dark and regulates reproductive function in mammals by inhibiting the steroidogenic activity of the gonads *Ask*
- Production of gonadal steroids is decreased by the inhibitory action of melatonin on neurosecretory neurons located in the hypothalamus (arcuate nucleus) that produce GnRH.
- Inhibition of GnRH causes a decrease in the release of FSH and LH from the anterior lobe of the pituitary gland. In addition to melatonin, extracts of pineal glands from many animals contain numerous neurotransmitters, such as serotonin, norepinephrine, dopamine, and histamine, and hypothalamic-regulating hormones, such as somatostatin and TRH.
- Clinically, tumors that destroy the pineal gland are associated with precocious (early-onset) puberty.
- Animal studies demonstrate that information relating to the length of daylight reaches the pineal gland from photoreceptors in the retina.
- The pineal gland thus influences seasonal sexual activity. Recent studies in humans suggest that the pineal gland has a role in adjusting to sudden changes in day length, such as those experienced by travelers who suffer from jet lag.
- In addition, the pineal gland may play a role in altering emotional responses to the reduced length of day during winter in temperate and subarctic zones known as seasonal affective disorder (SAD)

Endocrine Pancreas (Islets of Langerhans)



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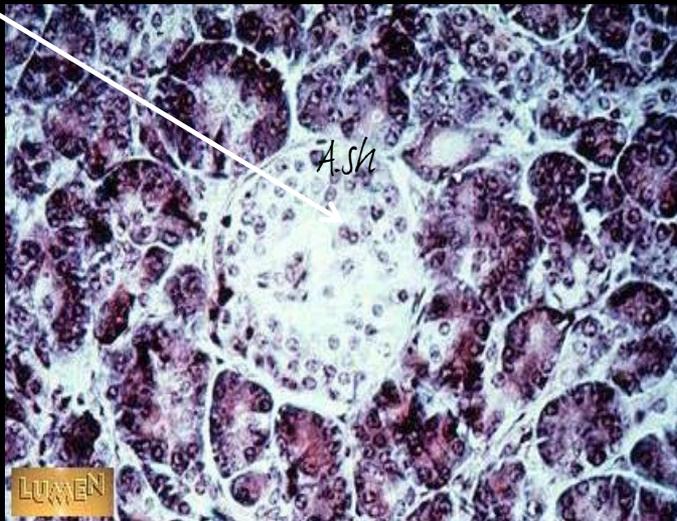
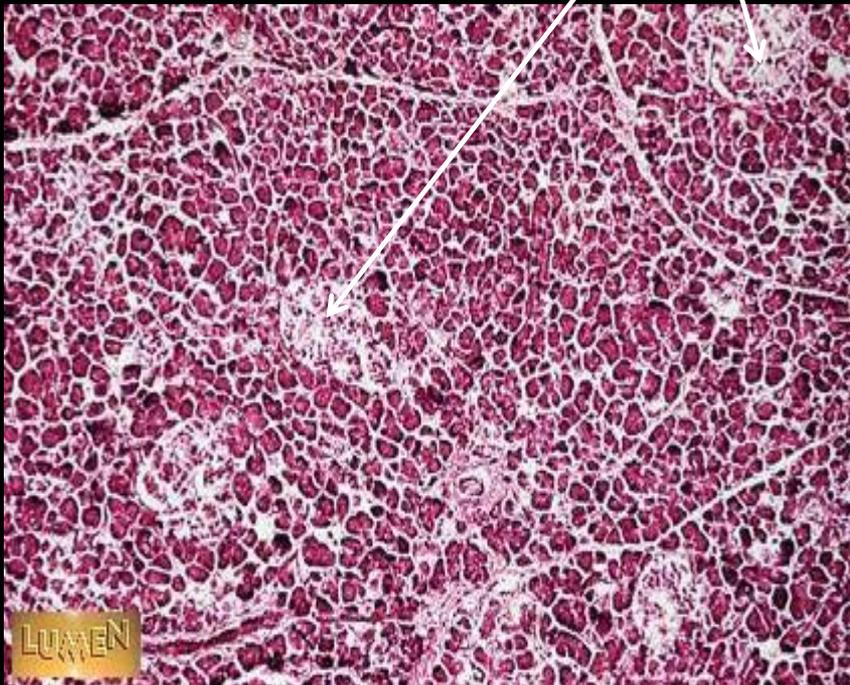


ENDOCRINE PANCREAS

Islets of Langerhans

Low power

High power



ENDOCRINE PANCREAS

- Cells in the islets of Langerhans
 - Alpha – secrete glucagon
 - Beta – secrete insulin
 - Delta – secrete somatostatin and gastrin
 - PP – secrete pancreatic polypeptide

First described by Langerhans in 1869 (as an observation on the urine of pancreatectomized dogs).

In 1893 Gustave-Edouard Laguesse (1861-1927) attached the name Langerhans to the structures. Langerhans did not suggest any function for them. The book has been reprinted with an English translation by H. Morrison.

Spherical-oval cellular masses between the acini of the pancreas.

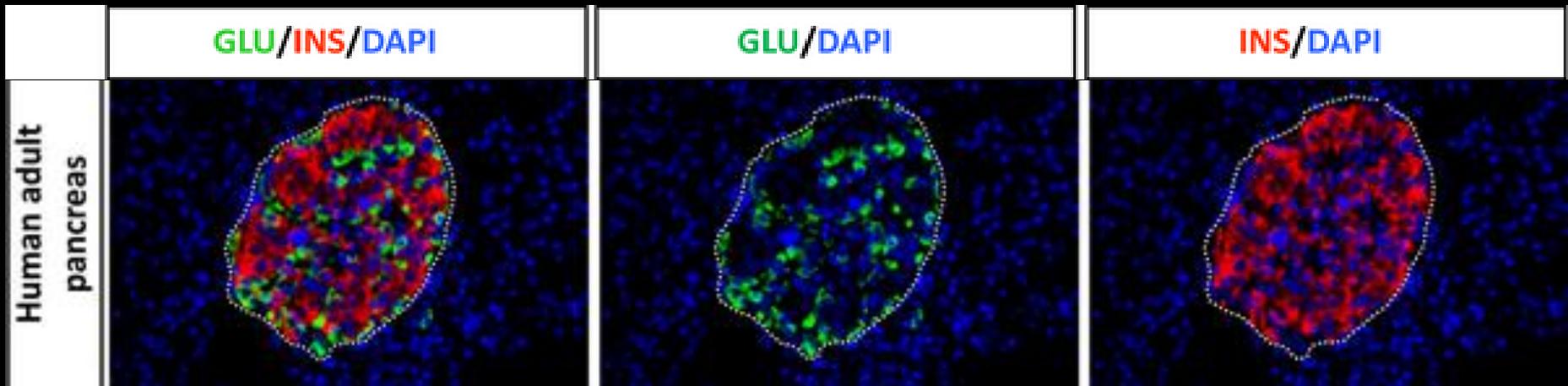
Variable in size and number of cells in them.

They form ~ 1 million secretory units.

Not homogeneously distributed and increase in number towards the tail.

Surrounded by a very thin capsule.

They have the same embryological origin as the rest of the pancreas (endoderm).



Section of an adult human pancreas stained for glucagon (green) and insulin (red)

In H & E cells show variation in staining reaction between acidophilia and basophilia.

E.M. shows typical poly peptide secreting cells with variable amount of granules.

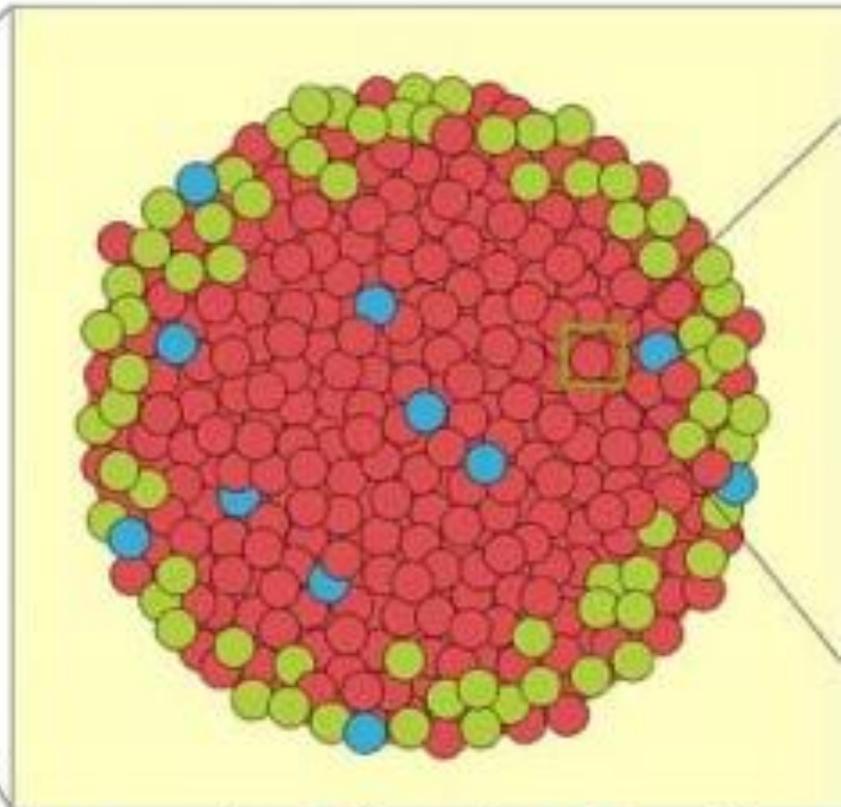
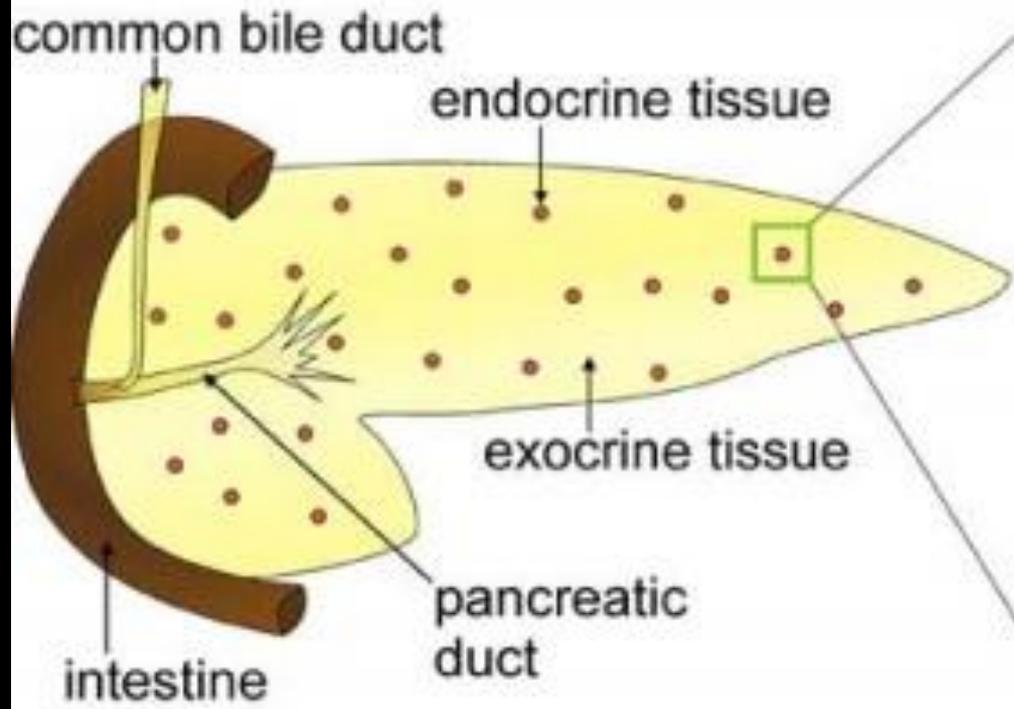
Immunohistochemistry is the only accurate method to differentiate between cells.

Major pancreatic cells cell

Cell	Location	%	Secretion	Function
α	Peripheral	~ 20	Glucagon	<ul style="list-style-type: none"> ↑ Blood glucose level; ↑ glycogenolysis and lipolysis
β	Central	~ 70	Insulin	<ul style="list-style-type: none"> ↓ Blood glucose level
δ	Scattered	5-10	Somatostatin	Inhibits release of other cells
F (PP)	Scattered	<1	Pancreatic polypeptide	<ul style="list-style-type: none"> ↑ activity of chief cells, ↓ bile secretion. ↓ pancreatic enzyme and HCO₃ secretion. ↓ intestinal motility

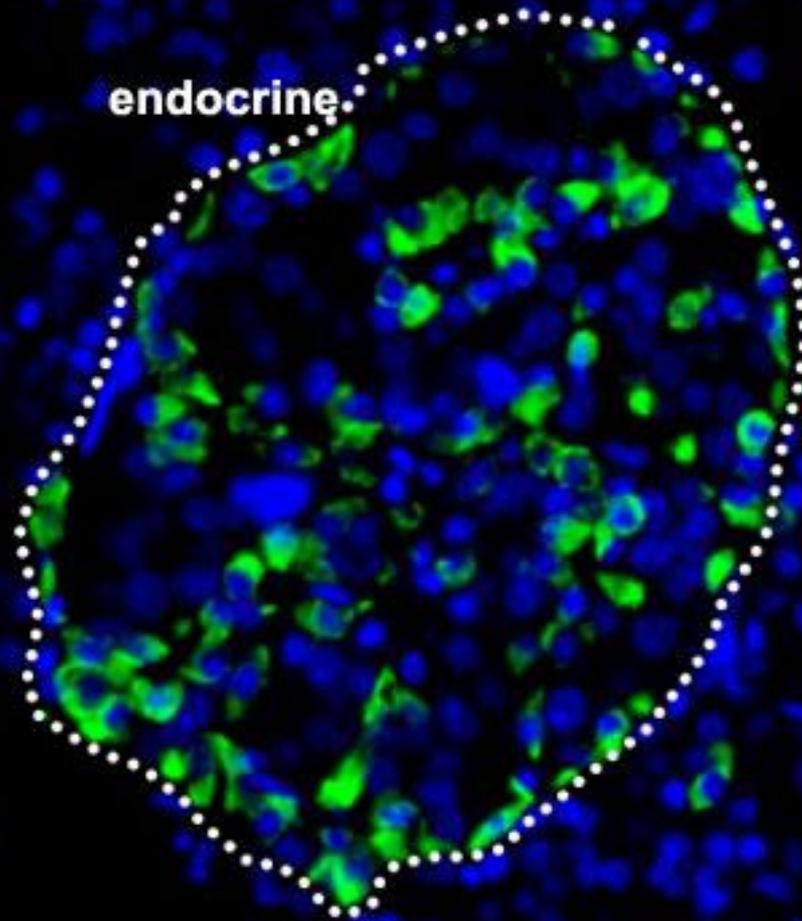
the pancreas

the islet



● α -cell ● β -cell ● δ -cell

Pancreatic Islet (human adult pancreas)



endocrine

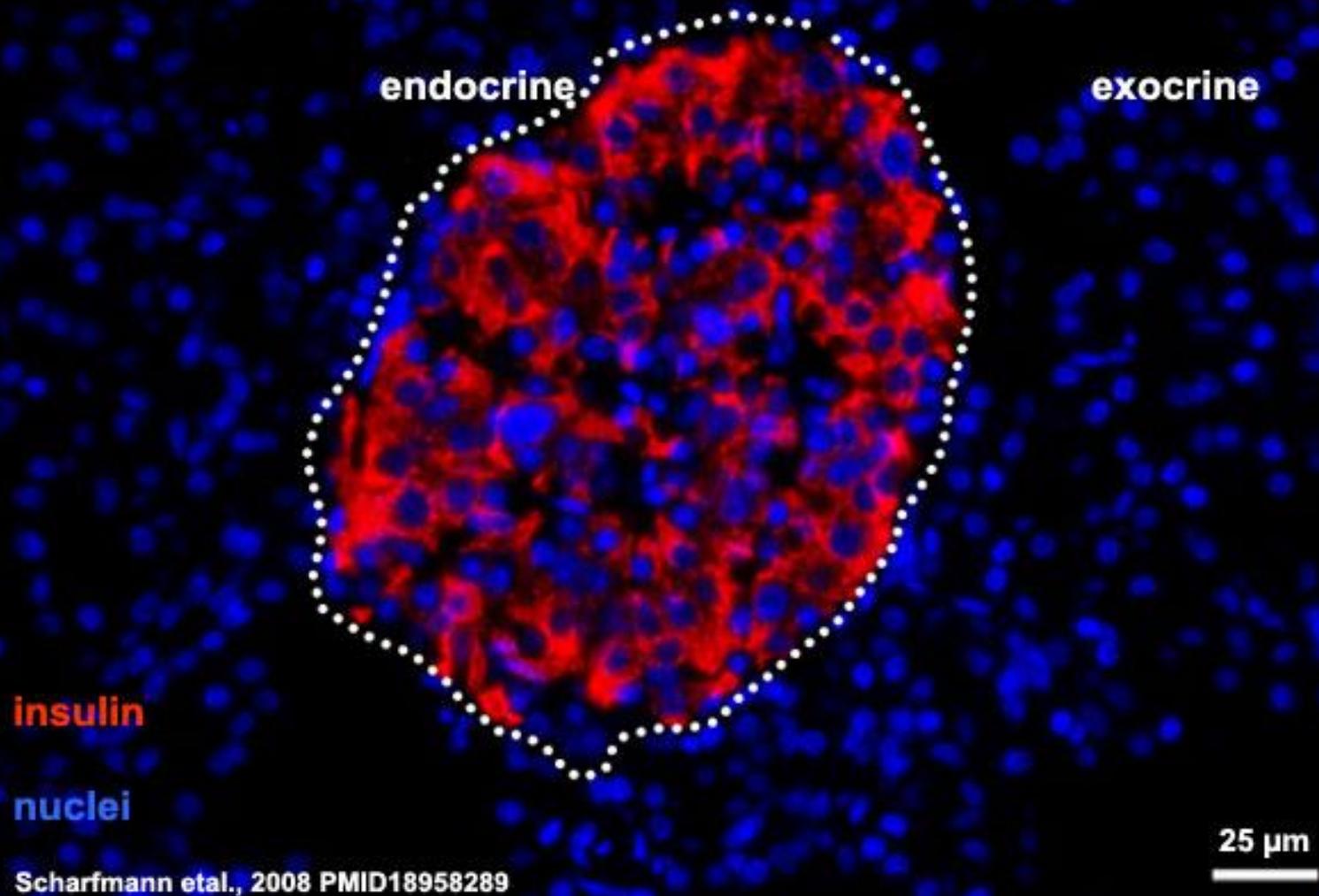
exocrine

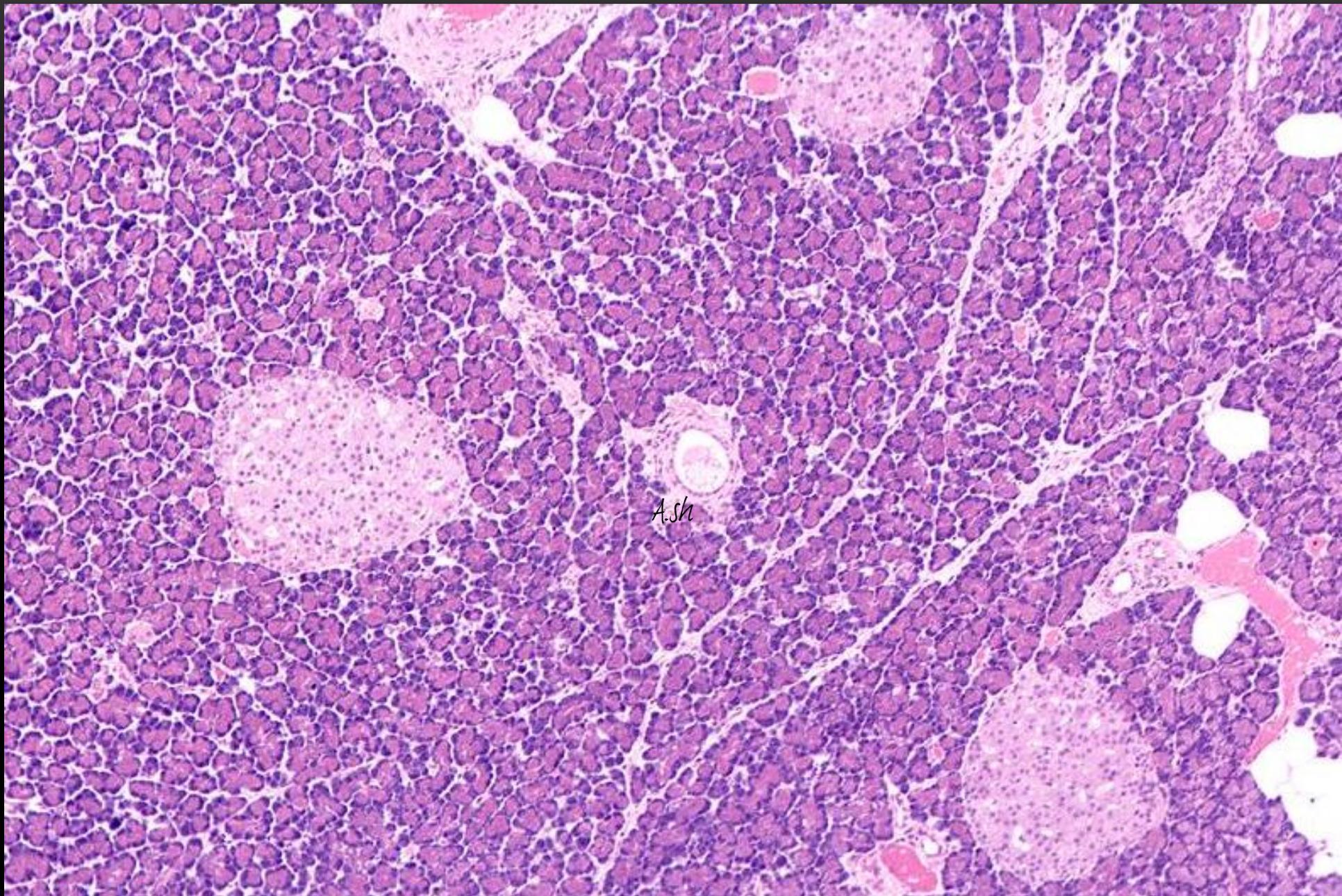
glucagon
nuclei

25 μ m

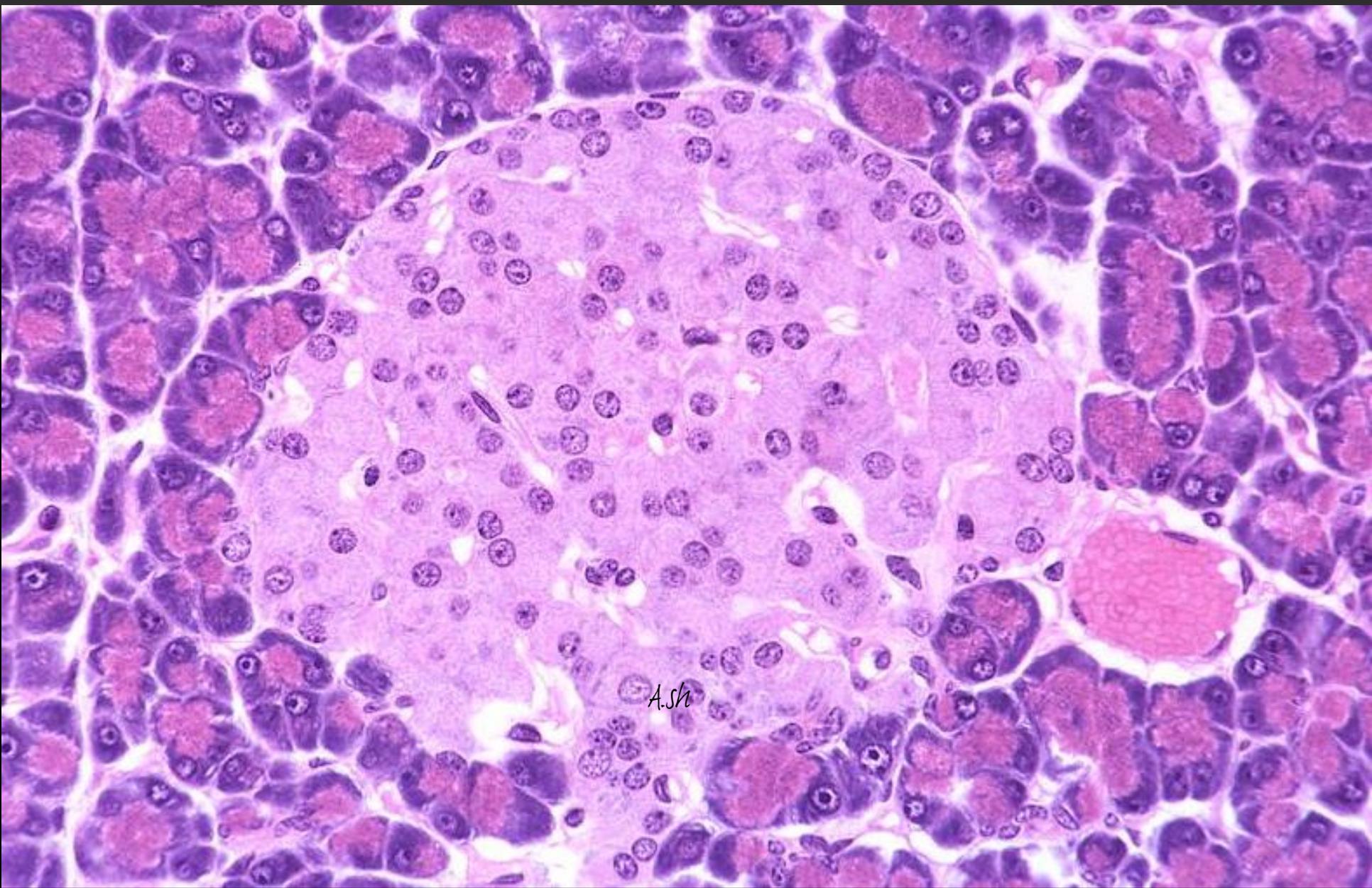
Scharfmann et al., 2008 PMID18958289

Pancreatic Islet (human adult pancreas)





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