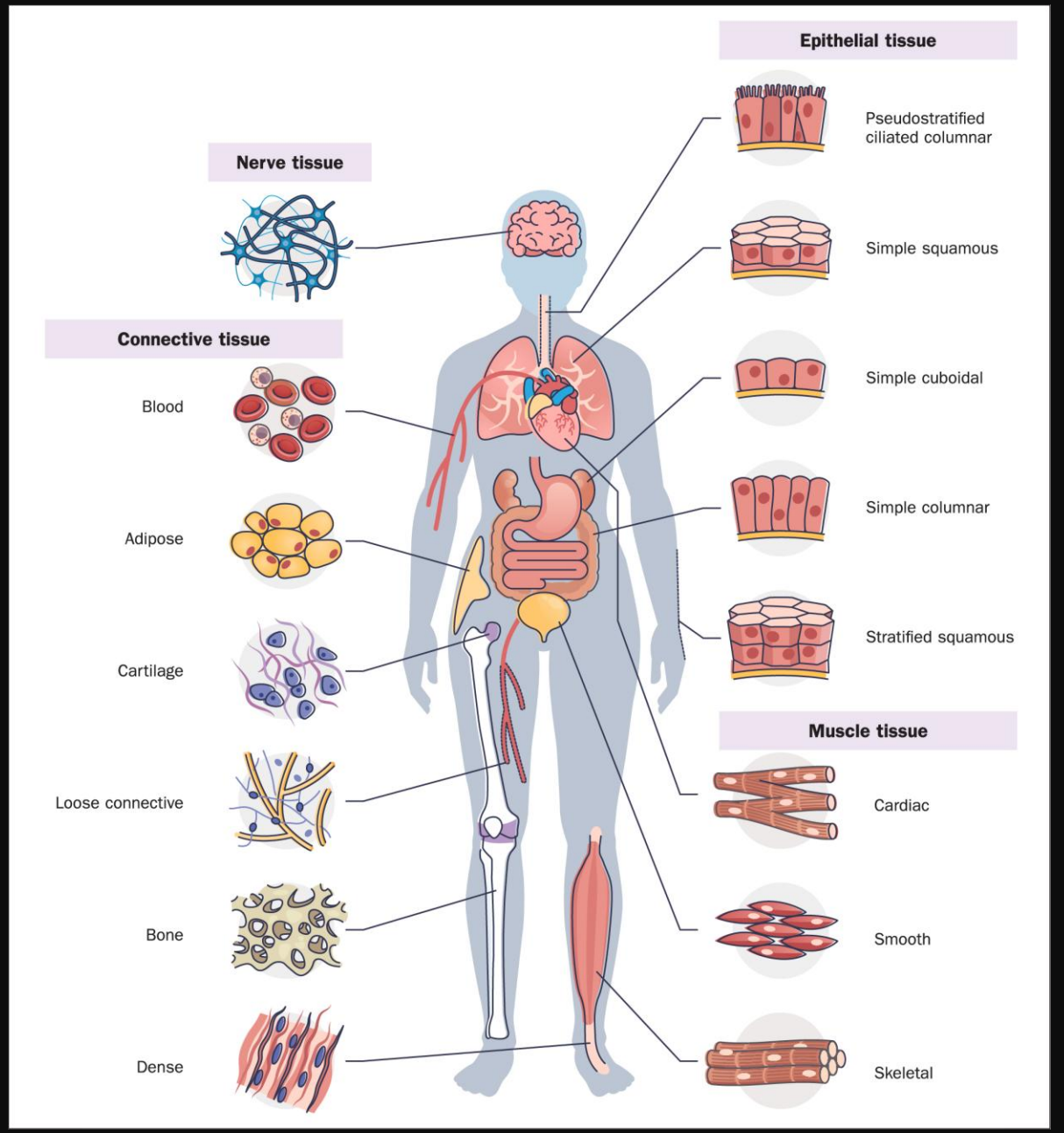
Cell Differentiation
Morphological Diversity, Genetic Unity

The cell as the functional unit of the organism

Function determines form, but form is always at the service of function.

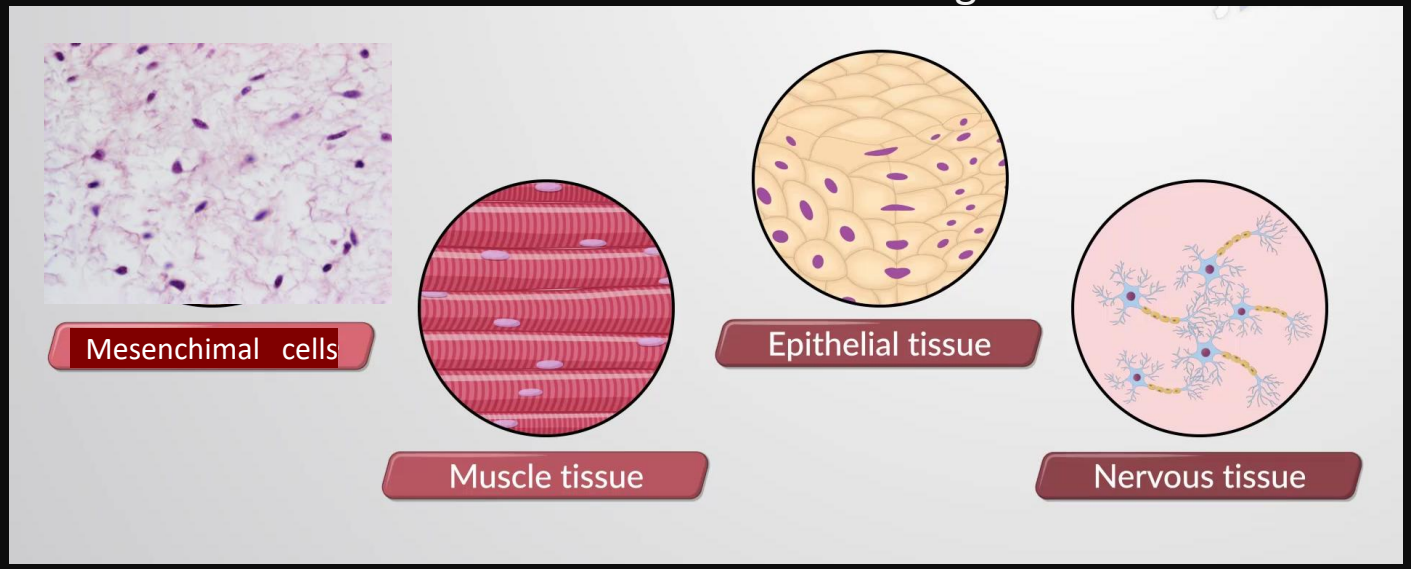


DIFFERENZIAZIONE CELLULARE E SPECIALIZZAZIONE FUNZIONALE

Le cellule si possono classificare, in modo molto ampio, in quattro categorie funzionali principali:

- **Cellule di conduzione e controllo** → nervosa
- **Cellule contrattili** → muscolari
- **Cellule di rivestimento e assorbimento** → epiteliali
- **Cellule secretorie** → endo- ed esocrine

Cell mesenchimali da cui originera il connettivo

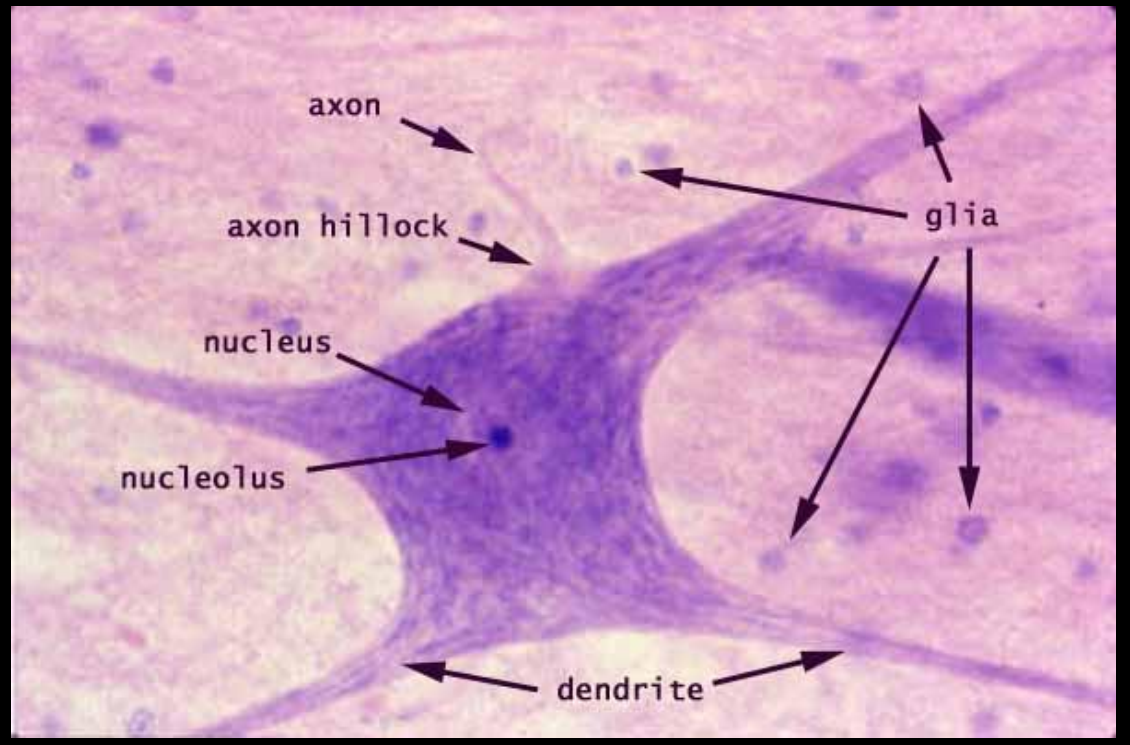


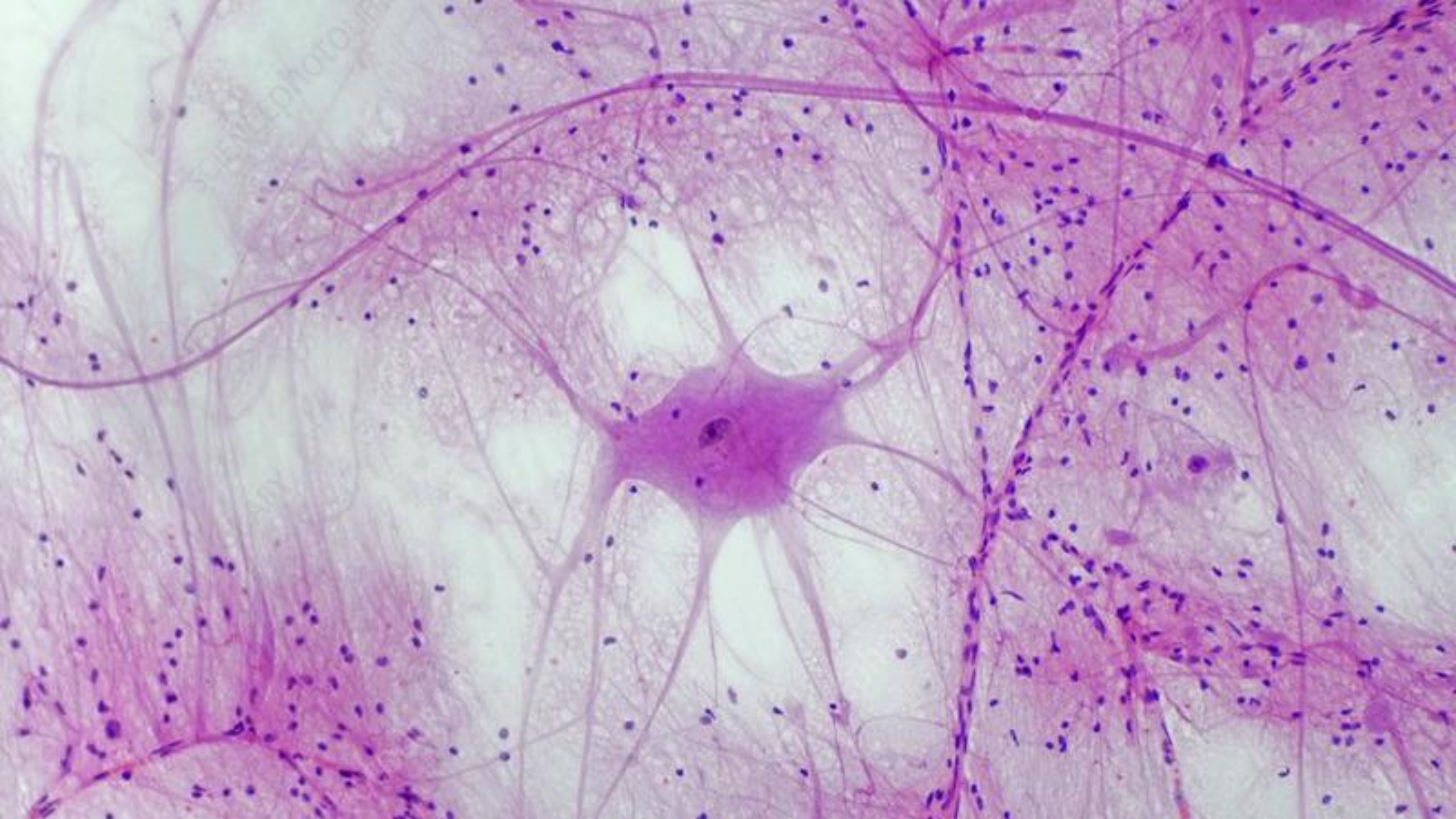
OVERVIEW OF THE MAIN TYPES OF DIFFERENTIATED CELLS

1. NERVE CELL (NEURON)

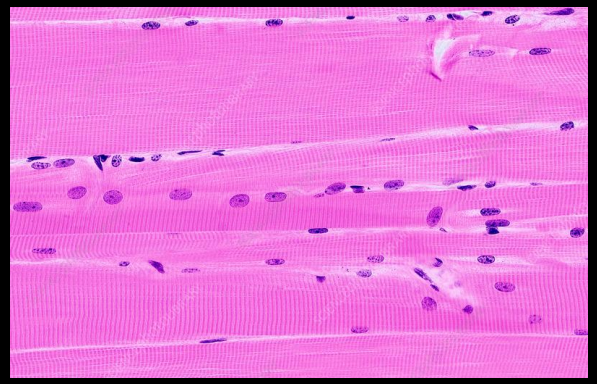
A. Morphological specializations

B. Function





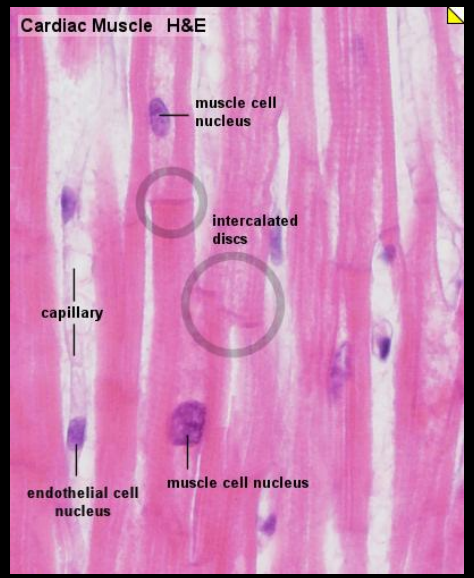
2. MUSCLE CELL



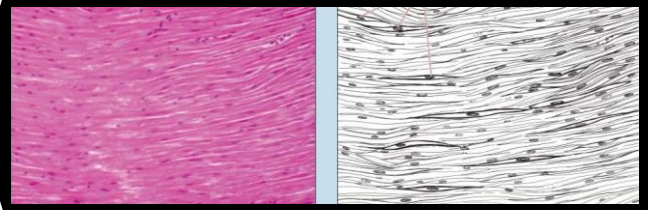
Skeletal striated muscle
(voluntary contraction, multinucleated fibers, striated))

A. Morphological specializations

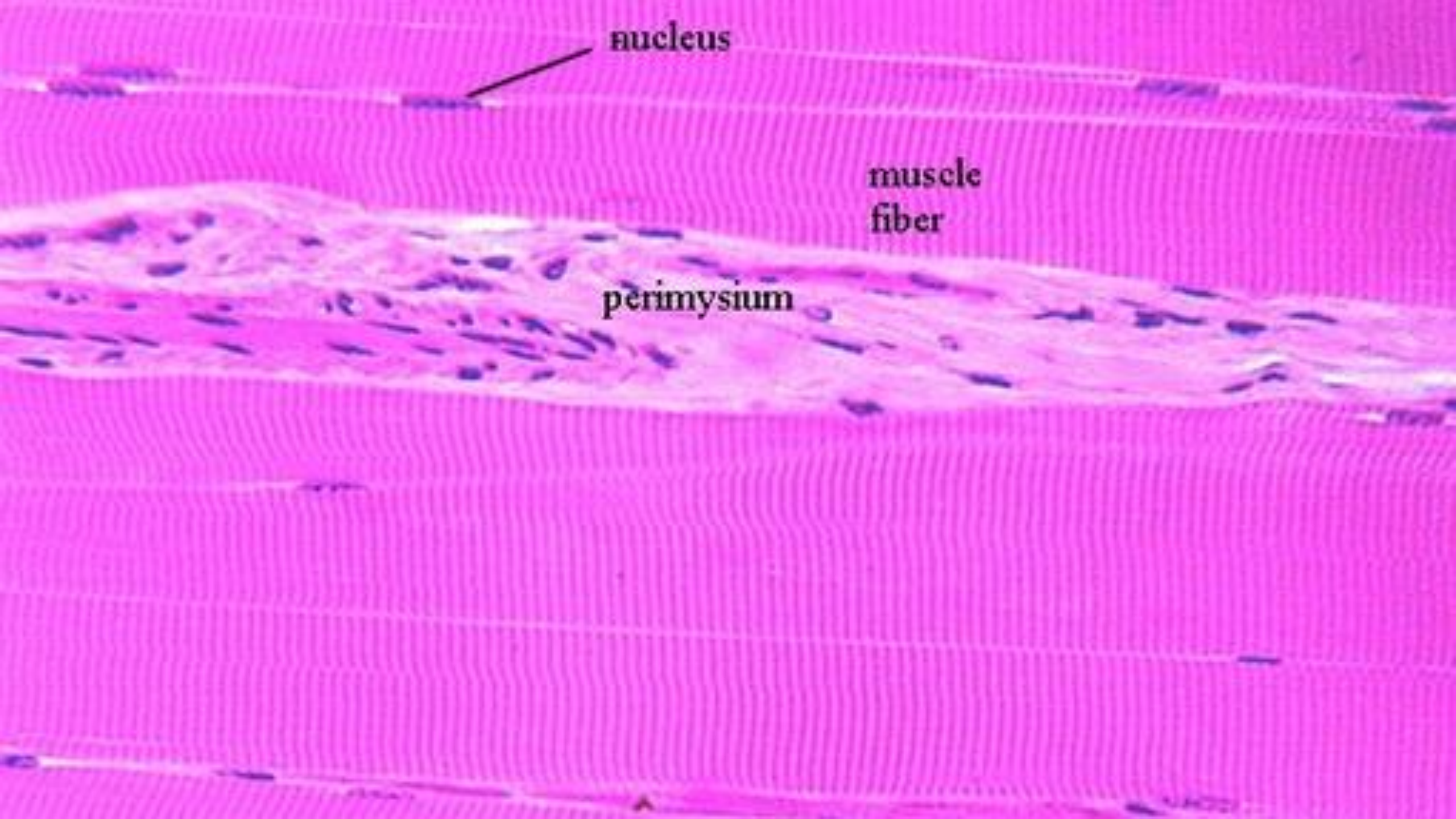
B. Function



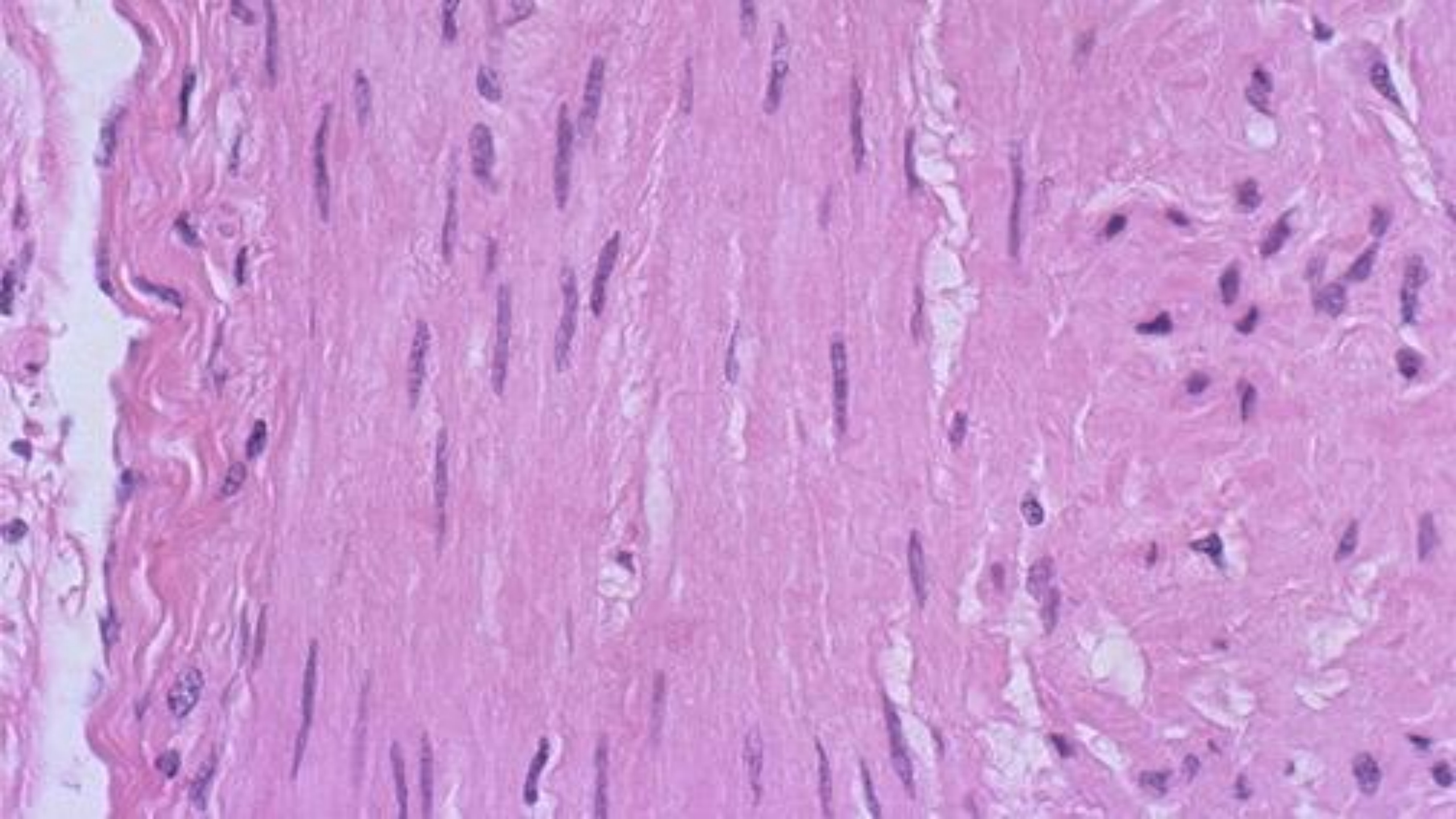
Cardiac striated muscle
(automatic contraction, intercalated discs, functional syncytium)



Smooth muscle
(slow, involuntary contraction, visceral control)


nucleus
muscle
fiber
perimysium

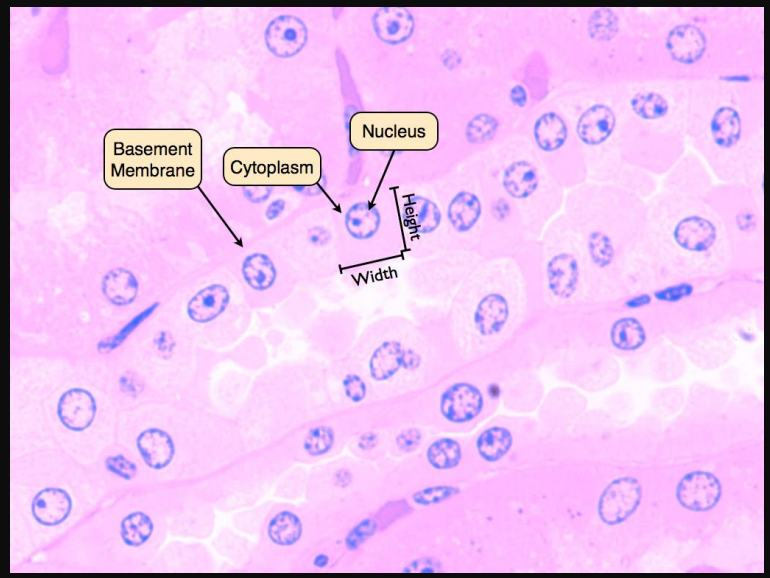

intercalated disk



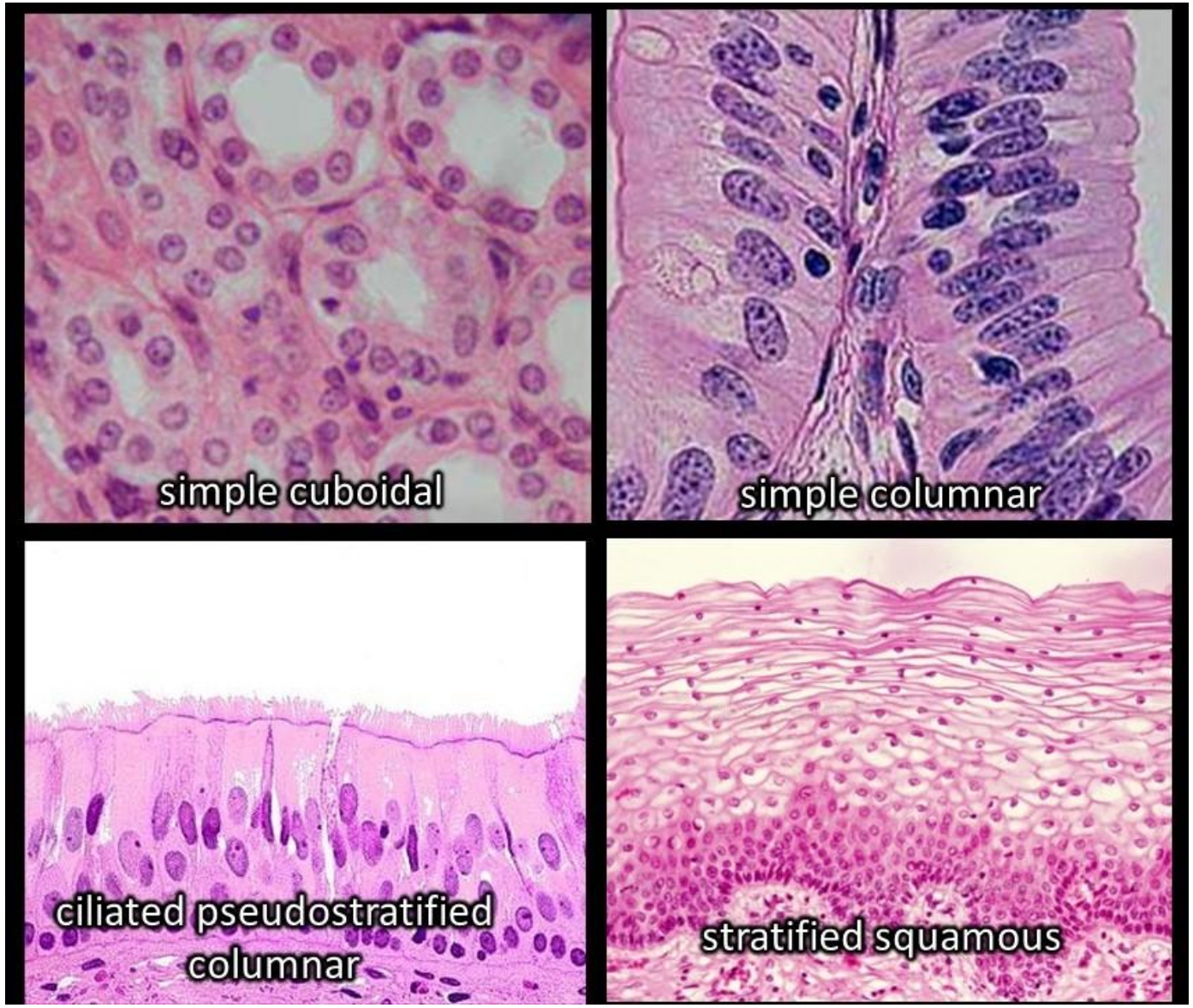
3. EPITHELIAL CELL

A. Morphological specializations

B. Function

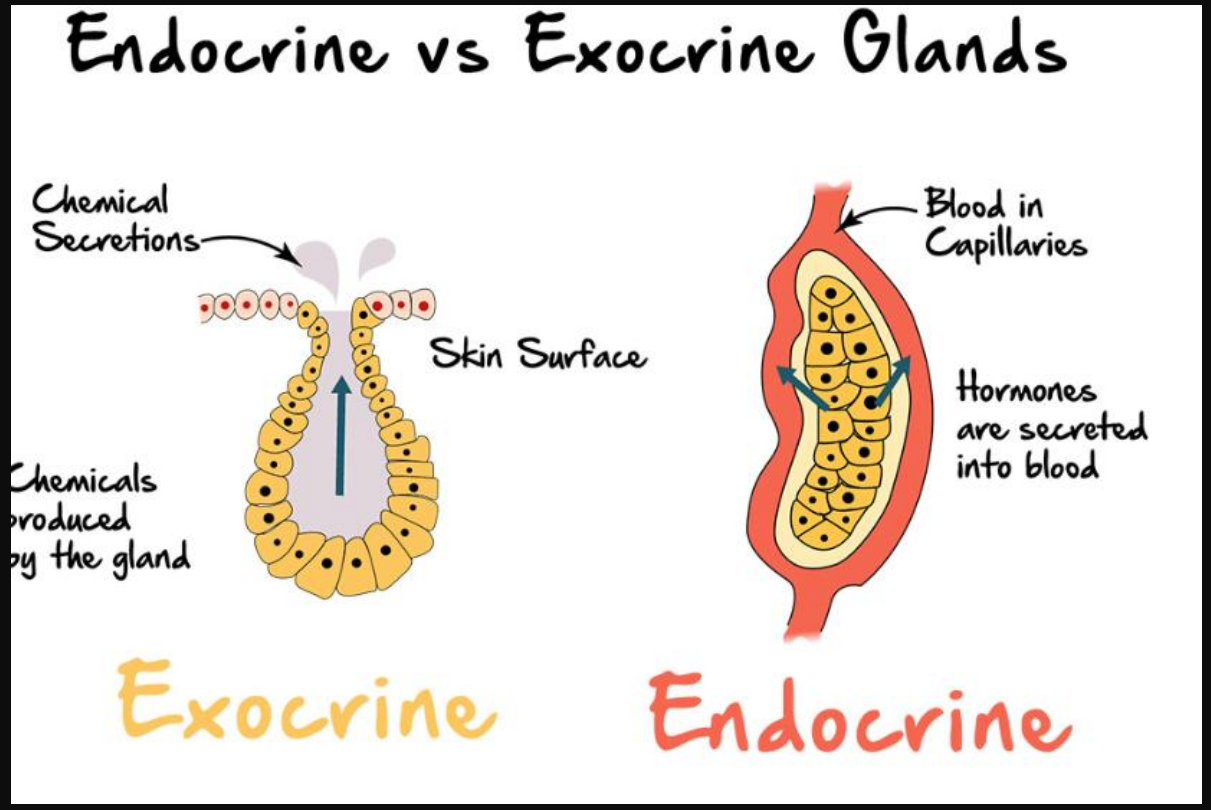


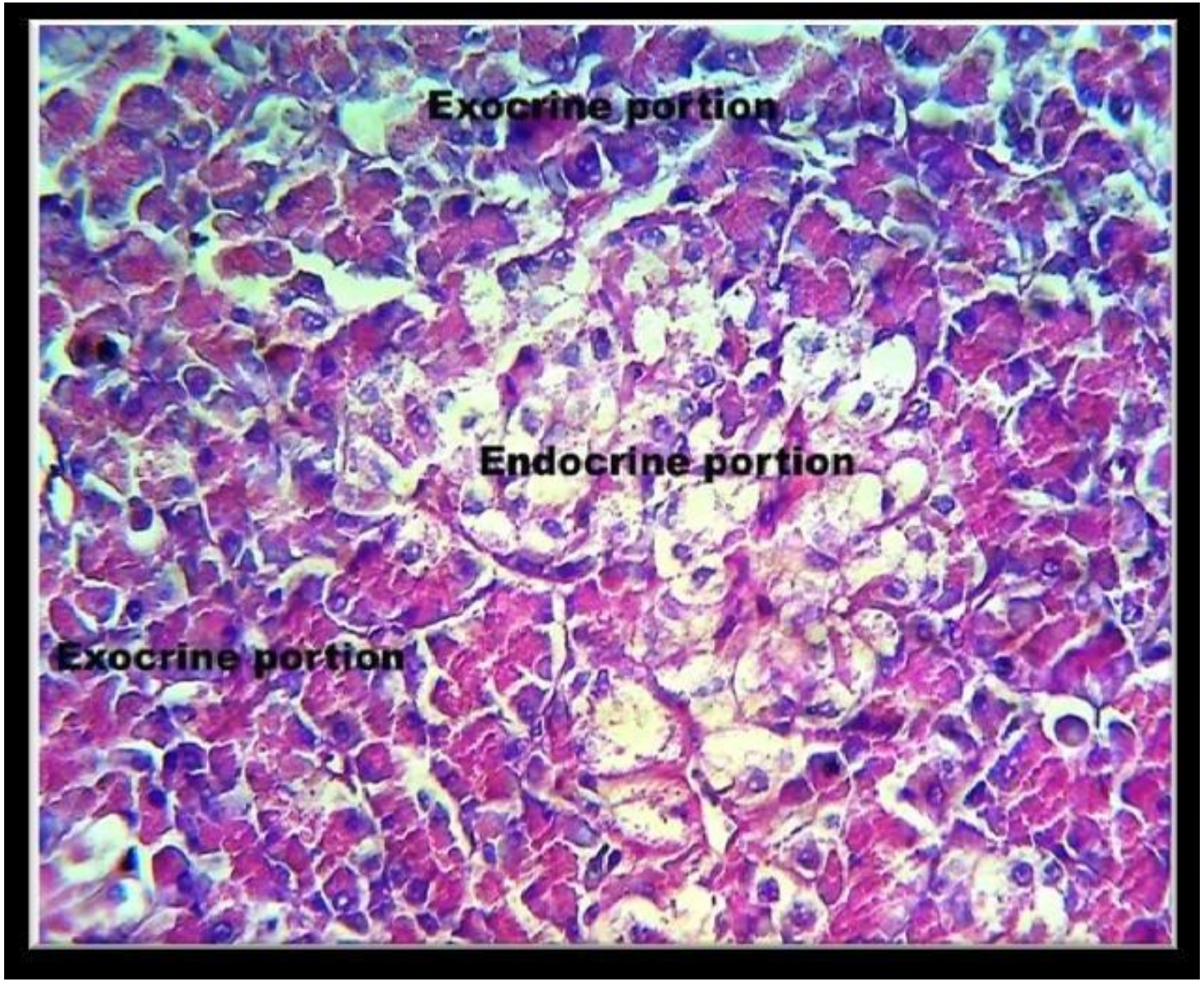
As cells of stratified squamous epithelium are pushed up toward the apical surface, they gradually flatten and take on a squamous shape and become densely packed together. Many of the stratified squamous cells also become metabolically inactive and die as they move toward the apical surface where they are eventually shed (or sloughed off) by mechanical forces.


simple cuboidal
simple columnar
ciliated pseudostratified columnar
stratified squamous

4 ENDOCRINE AND EXOCRINE CELLS:
a bridge between structure and function

SECRETORY CELLS represent a particular form of highly differentiated epithelium..

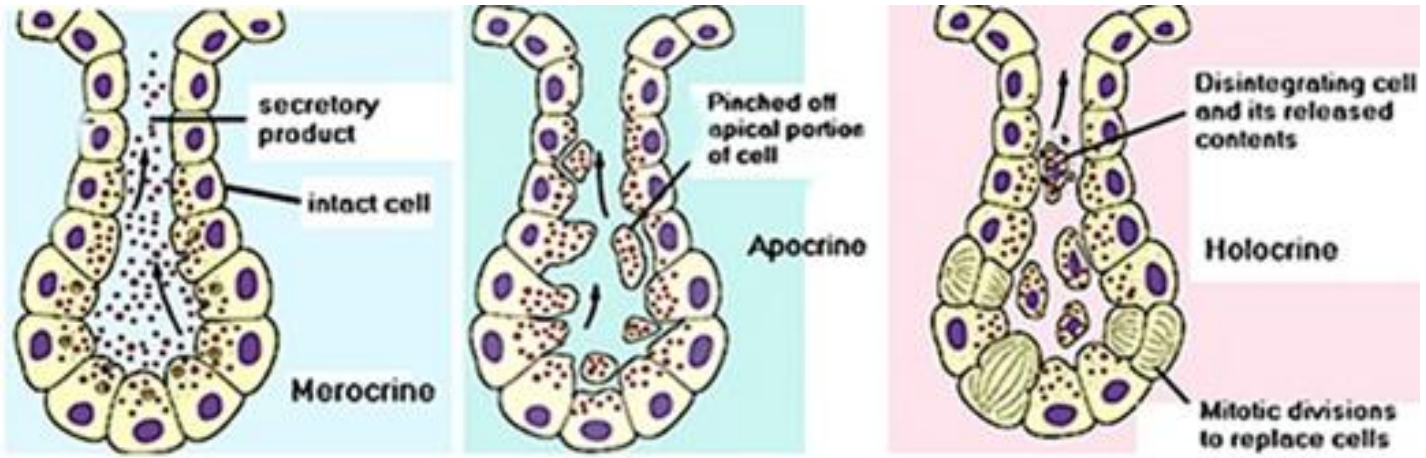


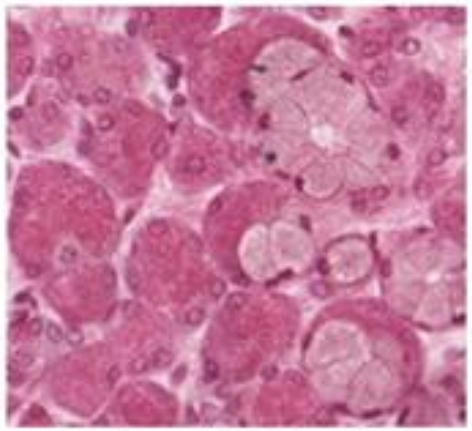

Exocrine portion
Endocrine portion
Exocrine portion

4.1 EXOCRINE CELLS

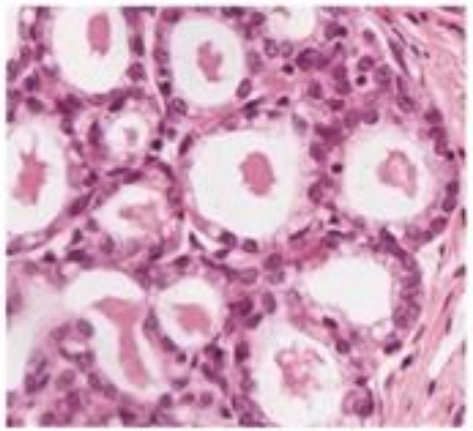
Types of secretion:

- Merocrine (exocytosis)
- Apocrine (release of the apical portion of the cell)
- Holocrine (destruction of the entire cell)

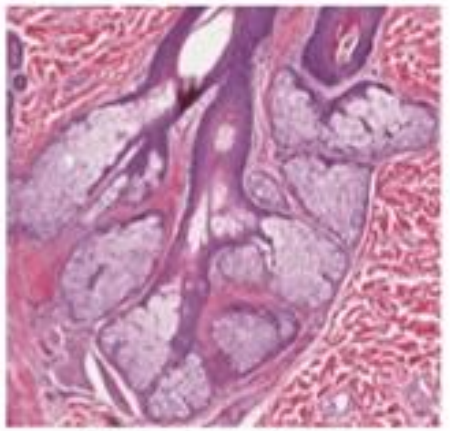




Submandibular gland

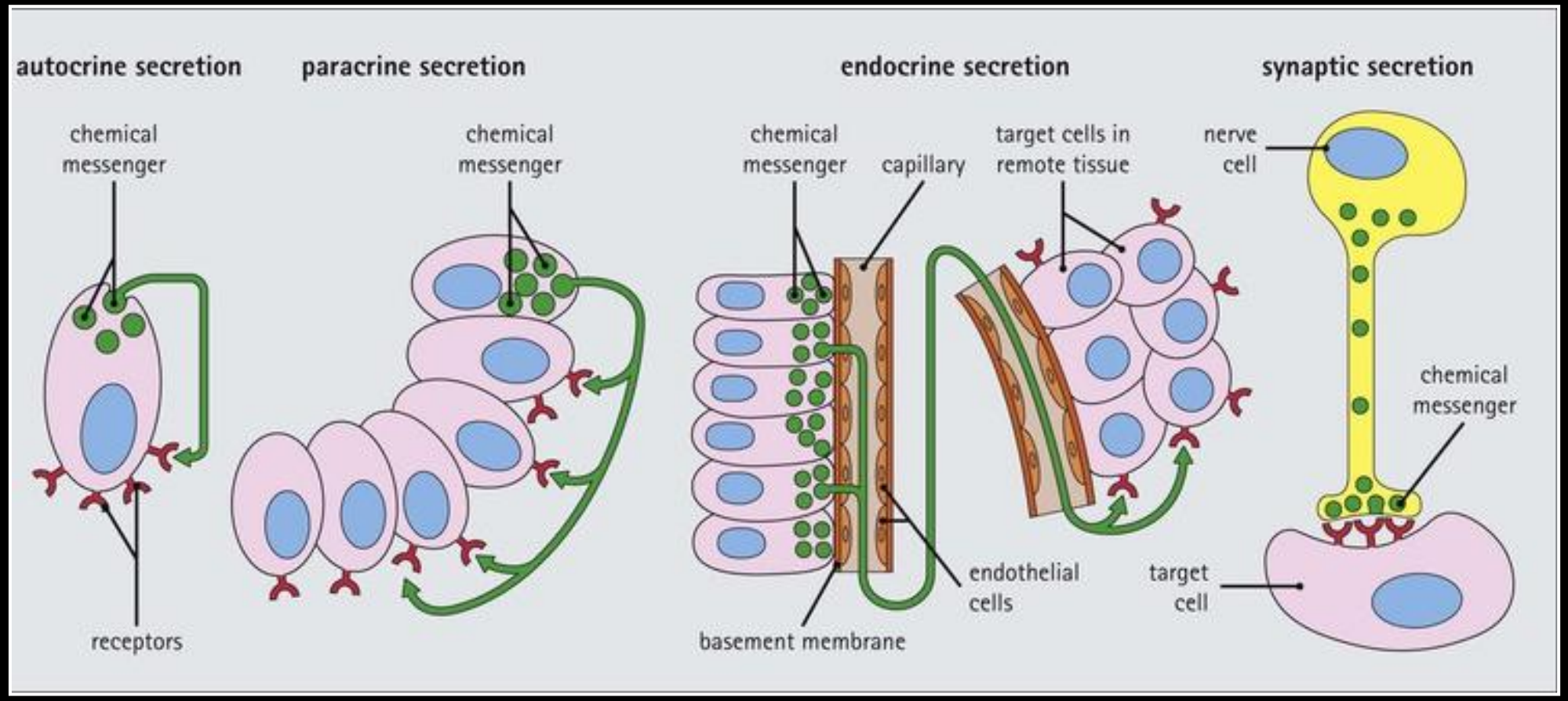


Mammary gland



Sebaceous gland

4.2 ENDOCRINE CELLS



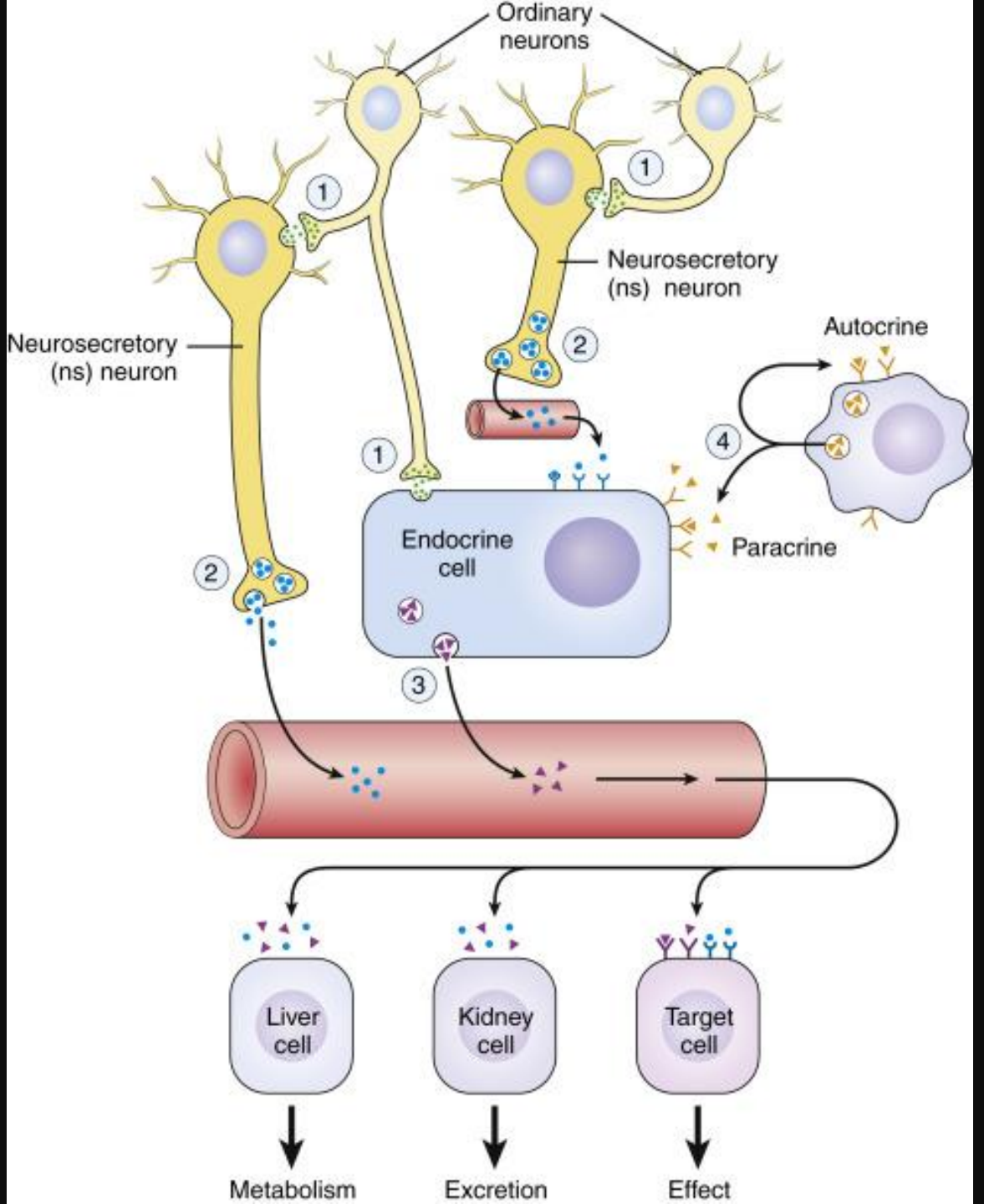
They secrete hormones directly into the bloodstream.

Absence of ducts → close association with fenestrated capillaries..

RELATIONSHIP BETWEEN THE ENDOCRINE EPITHELIUM AND THE NERVOUS SYSTEM

There are **neuroendocrine cells**, such as those in the gastrointestinal system or the hypothalamus.

Integrated communication: **nervous stimulus → endocrine response → muscular or epithelial effect.**



- **CONCLUSIONS“**

The cell is not only the structural unit of life, but the smallest unit capable of expressing a complete physiological function.Every tissue, organ, and system arises from cooperation among differentiated cells, whose interdependence is the key to homeostasis.”

- **PREVIEW**

In the next lessons we will analyze in detail nerve, muscle, and epithelial cells, examining their tissue organization and functional mechanisms..

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