

2-ADHERENS JUNCTIONS

Anchoring junction

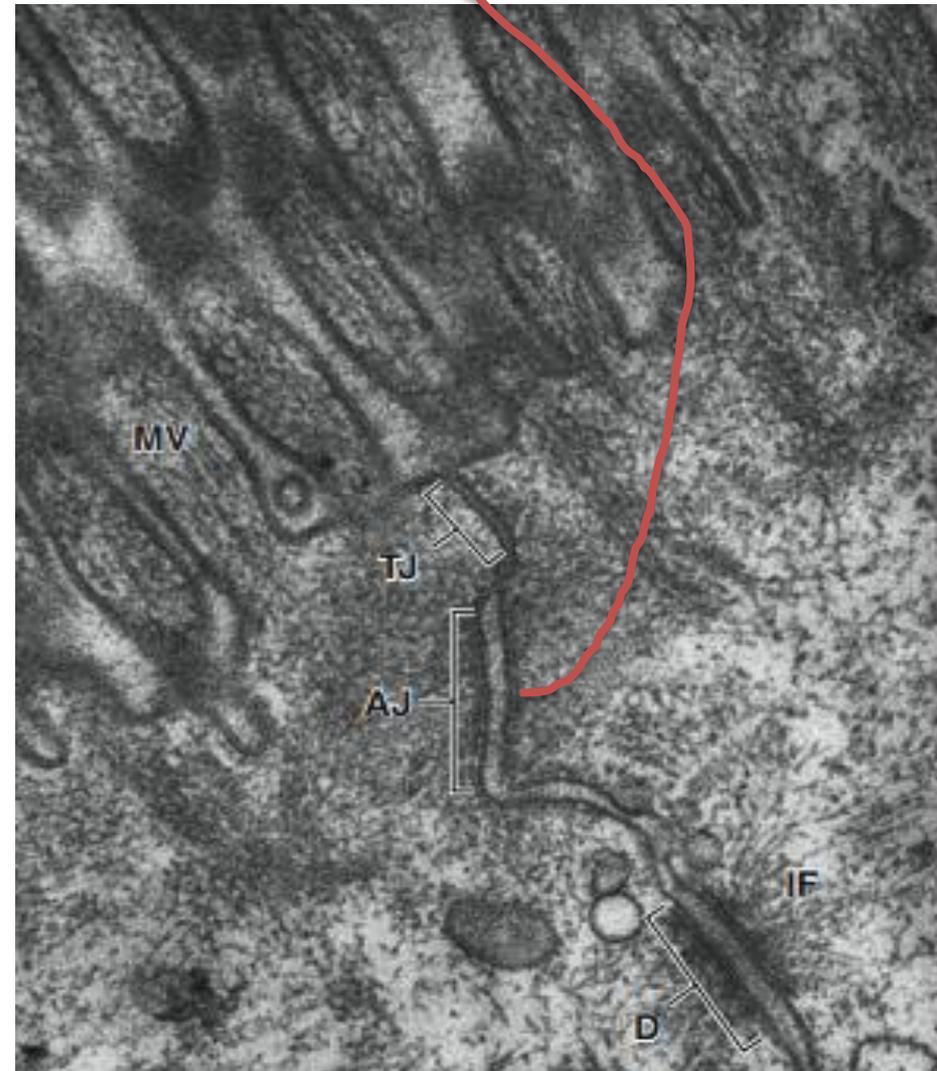
Function:

(Firmly anchoring a cell to its neighbors)

❖ Usually immediately below the tight junction.

ADHERENS junctions help epithelial surfaces resist separation during various contractile activities as when food moves through the intestines

Cell adhesion is mediated by
Cadherins



ADHERENS JUNCTIONS

contain a dense layer of proteins on the inside of the plasma membrane that attaches both to membrane proteins and

To Actin

microfilaments of the cytoskeleton.

Transmembrane glycoproteins called

cadherins

join the cells

Each cadherin inserts into the plaque from the opposite side of the plasma membrane, partially crosses the intercellular space

(the space between the cells), and connects to cadherins of an adjacent cell.

Adjacent plasma membranes

Microfilament (actin)

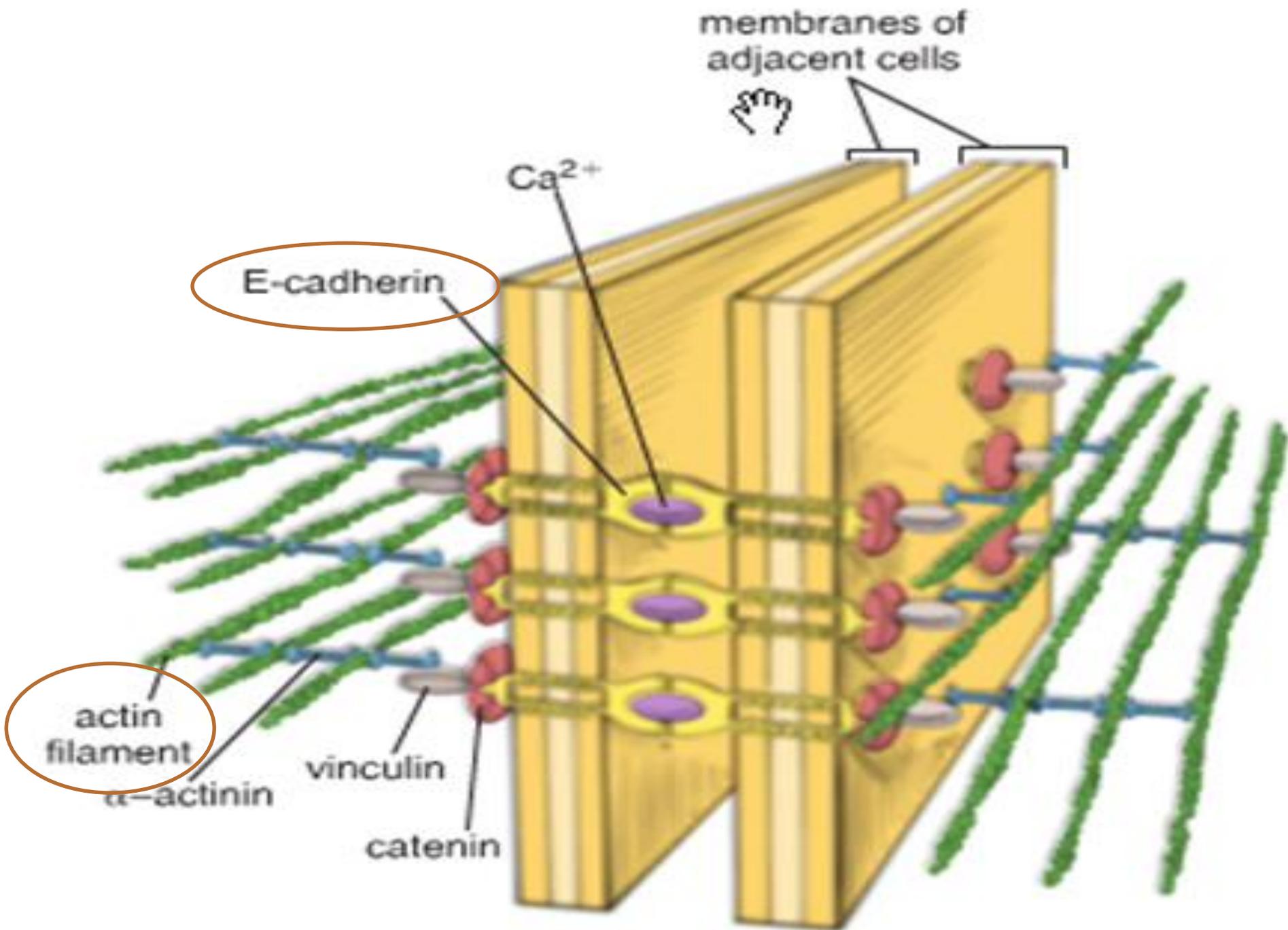
Plaque

Transmembrane glycoprotein (cadherin)

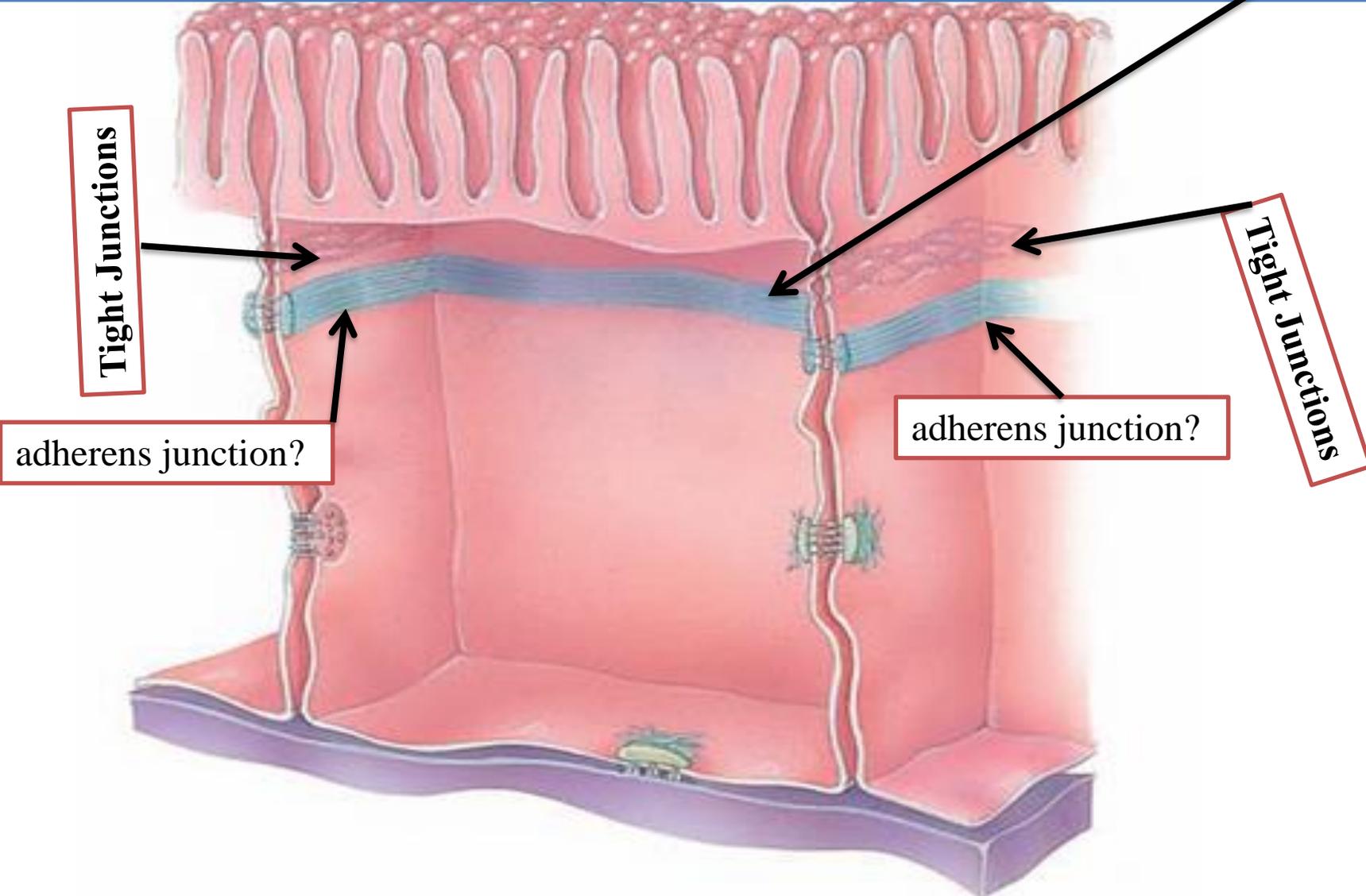
Intercellular space

Adhesion belt

(b) Adherens junction



In epithelial cells, adherens junctions often form extensive zones called **adhesion belts** because they encircle the cell similar to the way a belt encircles your waist.

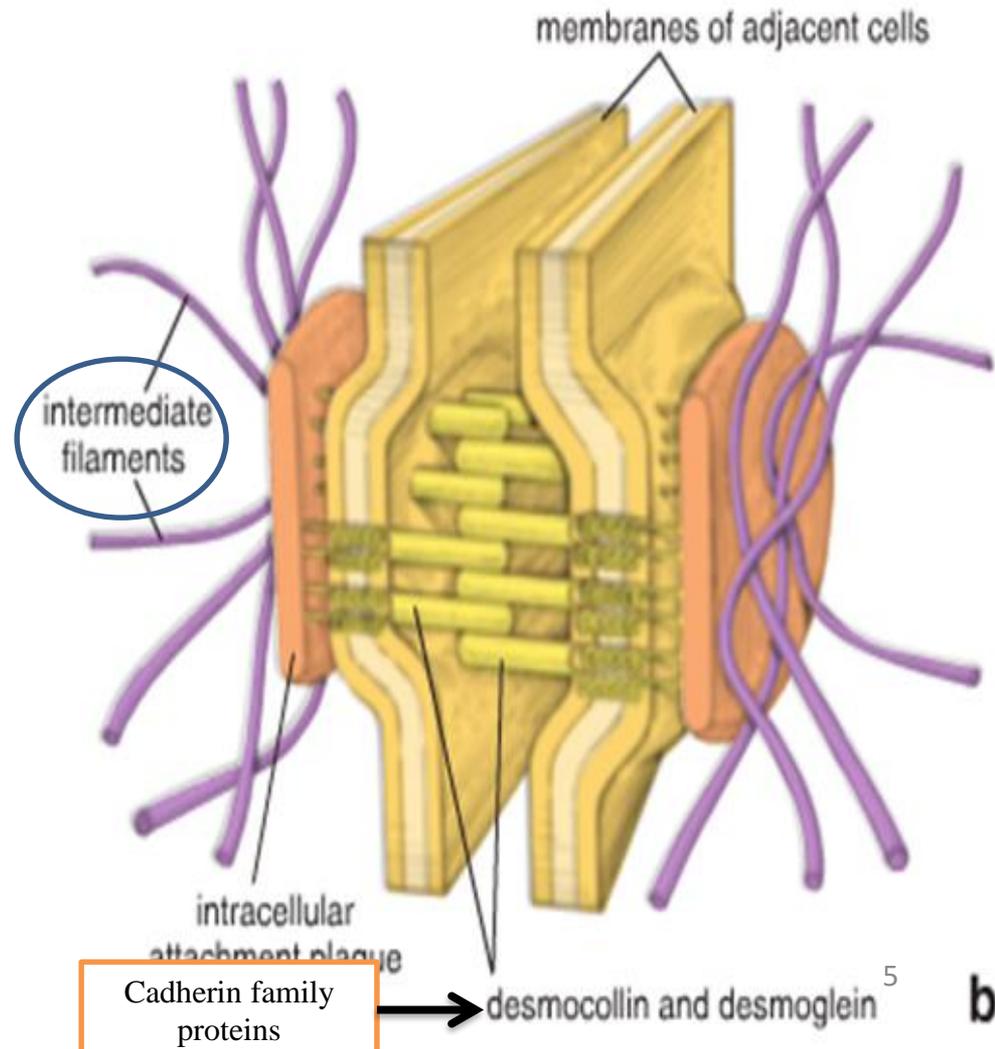


3-Desmosomes

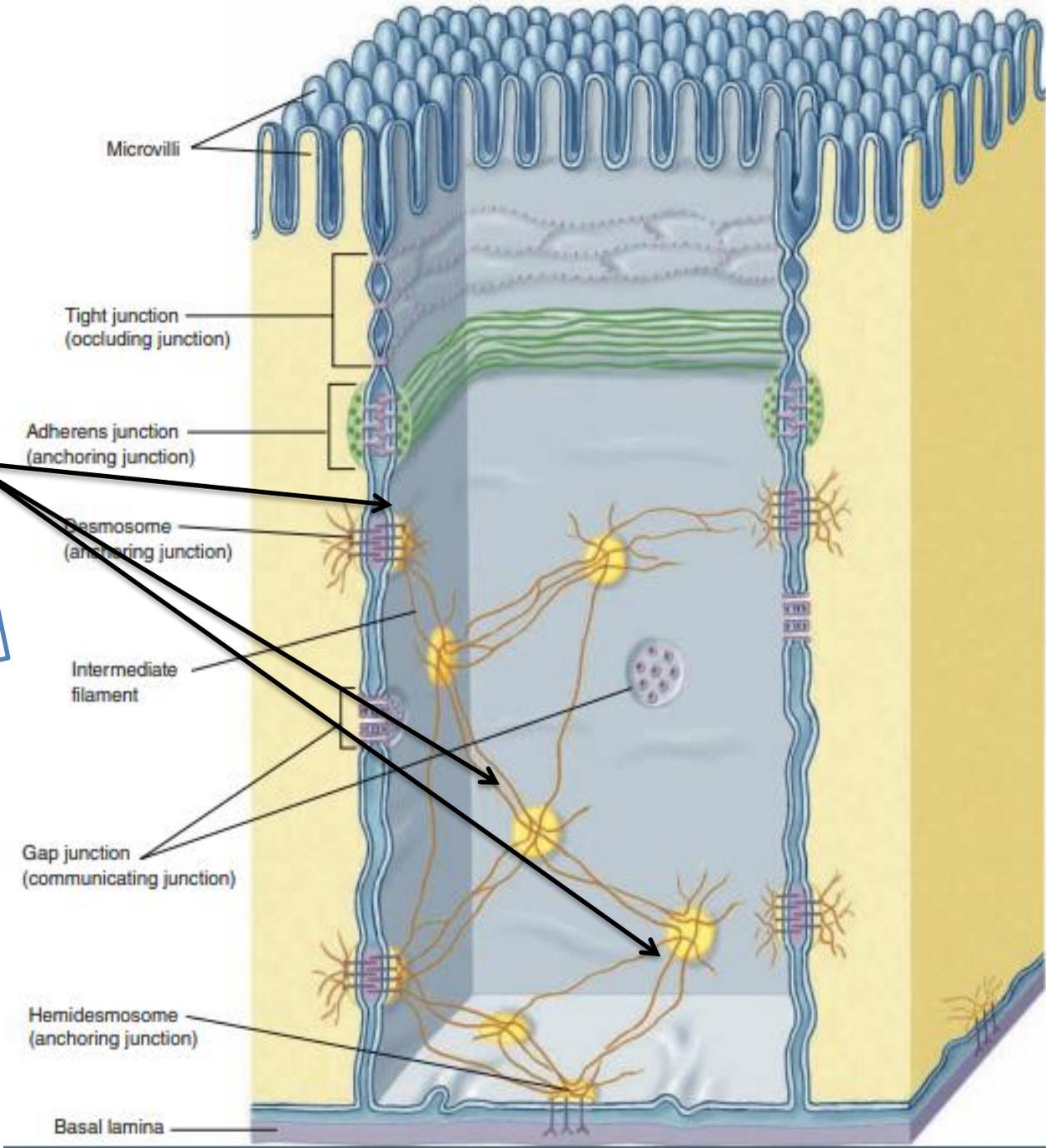
Macula Adherens

Like adherens junctions, **desmosomes** contain plaque and have transmembrane glycoproteins (**cadherins**) that extend into the intercellular space between adjacent cell membranes and attach cells to one another

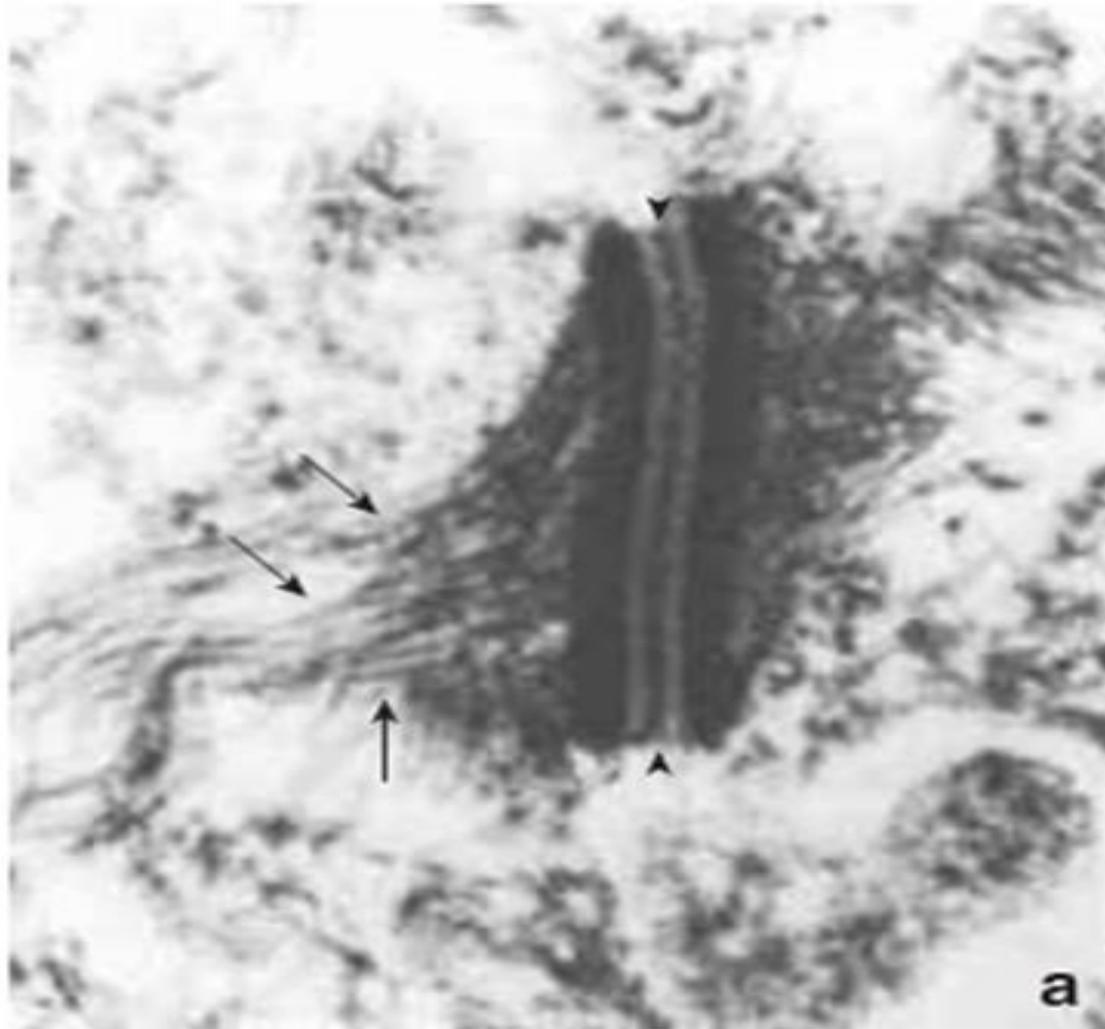
However, unlike adherens junctions, the plaque of desmosomes does not attach to **microfilaments**. **Instead,** a desmosome plaque attaches to elements of the cytoskeleton known as **intermediate filaments**, which consist of the **protein keratin**.



The intermediate filaments extend from desmosomes on one side of the cell across the cytosol to desmosomes on the opposite side of the cell



Desmosomes



Read only

Molecular structure of the macula adherens (desmosome). a. Electron micrograph of a macula adherens, showing the intermediate filaments (*arrows*) attaching into a dense, intracellular attachment plaque located on the cytoplasmic side of the plasma membrane. The intercellular space is also occupied by electron-dense material (*arrowheads*) containing desmocollins and desmogleins. The intercellular space above and below the macula adherens is not well defined because of extraction of the plasma membrane to show components of this structure. $\times 40,000$. (Courtesy of Dr. Ernst Kallenbach.)

Desmosomes junctions are common among the cells that make up

A-The epidermis (the outermost layer of the skin)

Desmosomes prevent epidermal cells from separating under tension

B-cardiac muscle cells

Desmosomes prevent from pulling apart during contraction

4-Gap Junctions

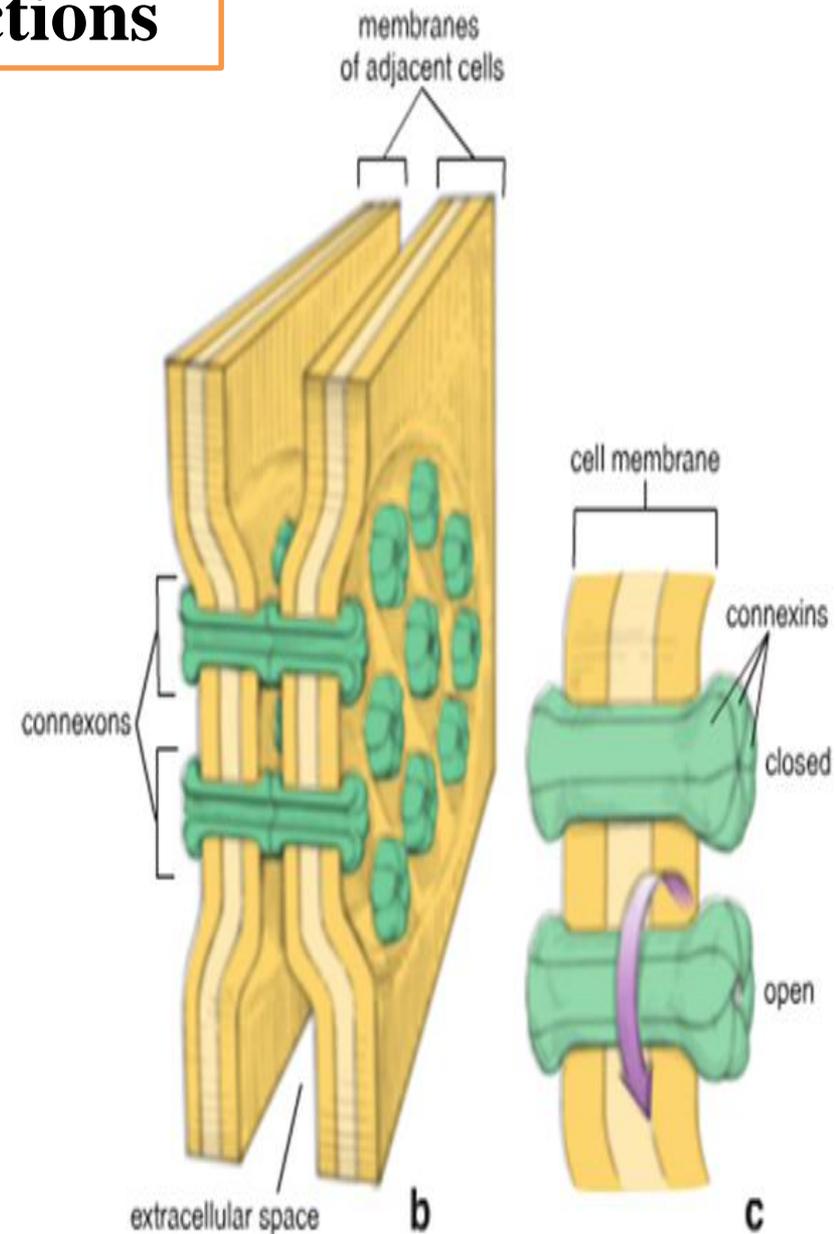
Channel-forming junction

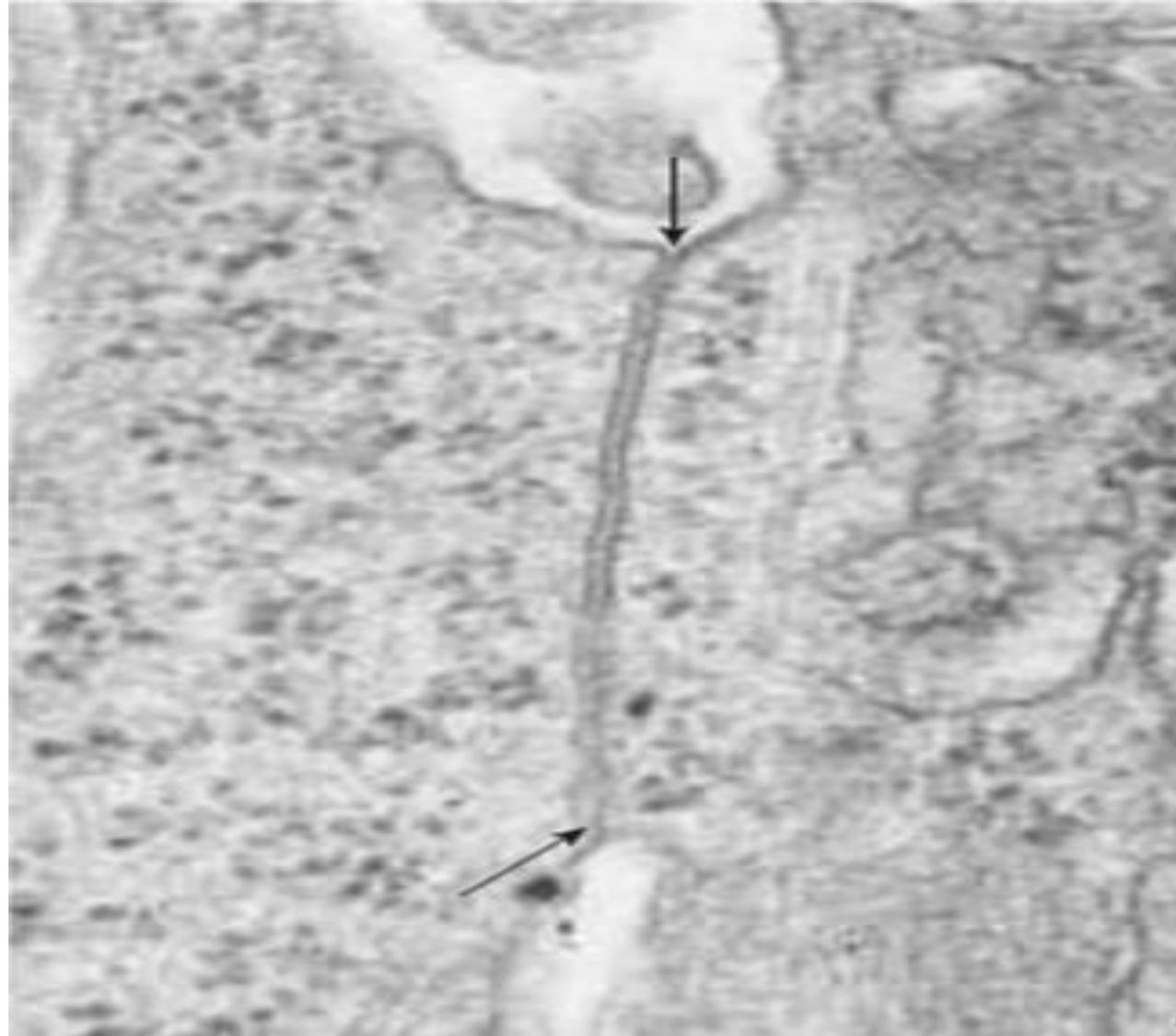
❖ mediate intercellular communication rather than adhesion

At gap junctions, membrane proteins called **connexins** form tiny fluid-filled tunnels called *connexons* that connect neighboring cells. Through the connexons, ions and small molecules can diffuse from the cytosol of one cell to another.

Gap junctions allow the cells in a tissue to communicate with one another.

Gap junctions also enable nerve or muscle impulses to spread rapidly.





Structure of a gap junction. a. Electron micrograph showing the plasma membranes of two adjoining cells forming a gap junction. The unit membranes (*arrows*) approach one another, narrowing the intercellular space to produce a 2-nm-wide gap. $\times 76,000$.

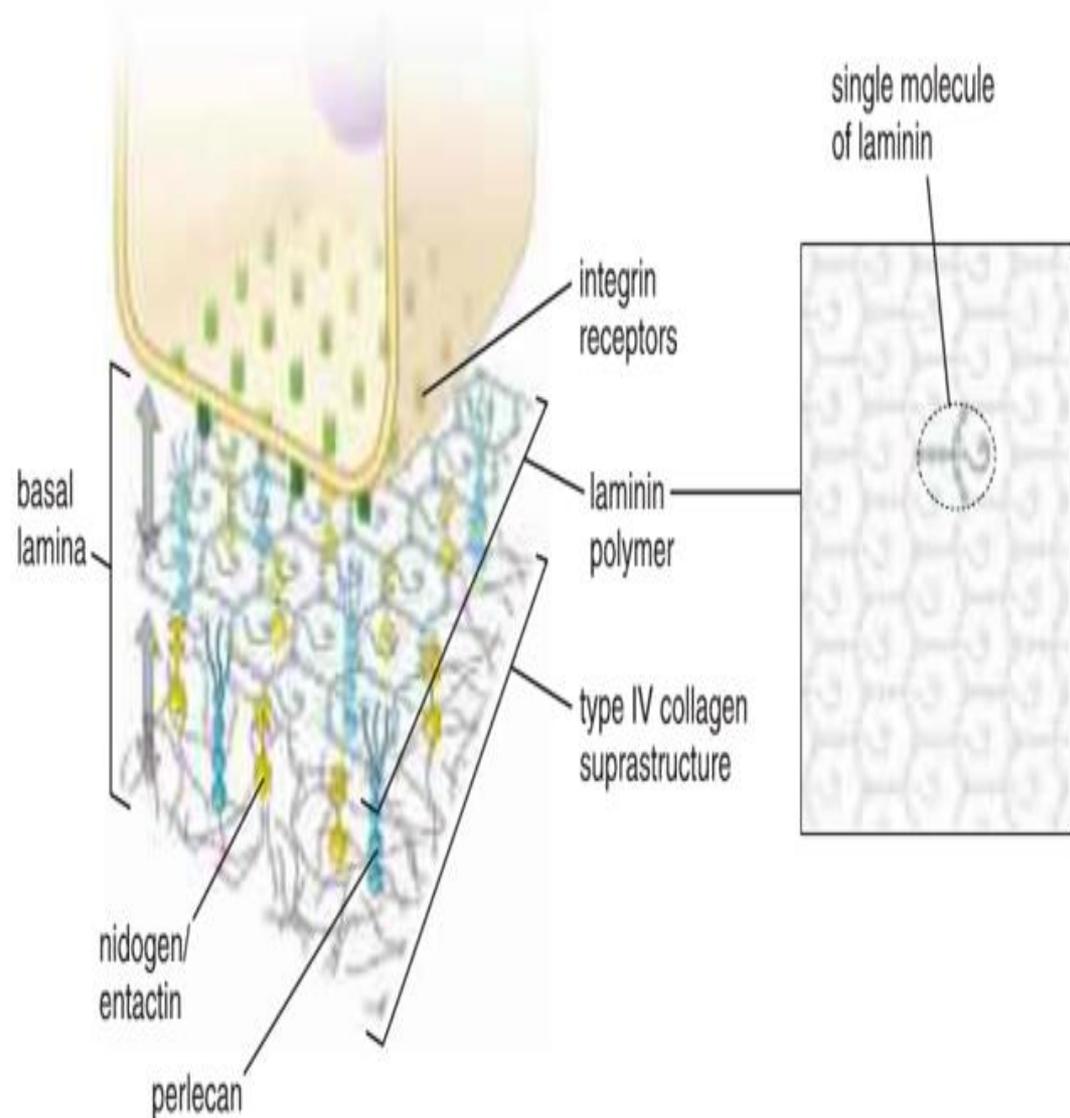
Hemidesmosomes

Hemidesmosomes (*hemi-* half) resemble desmosomes

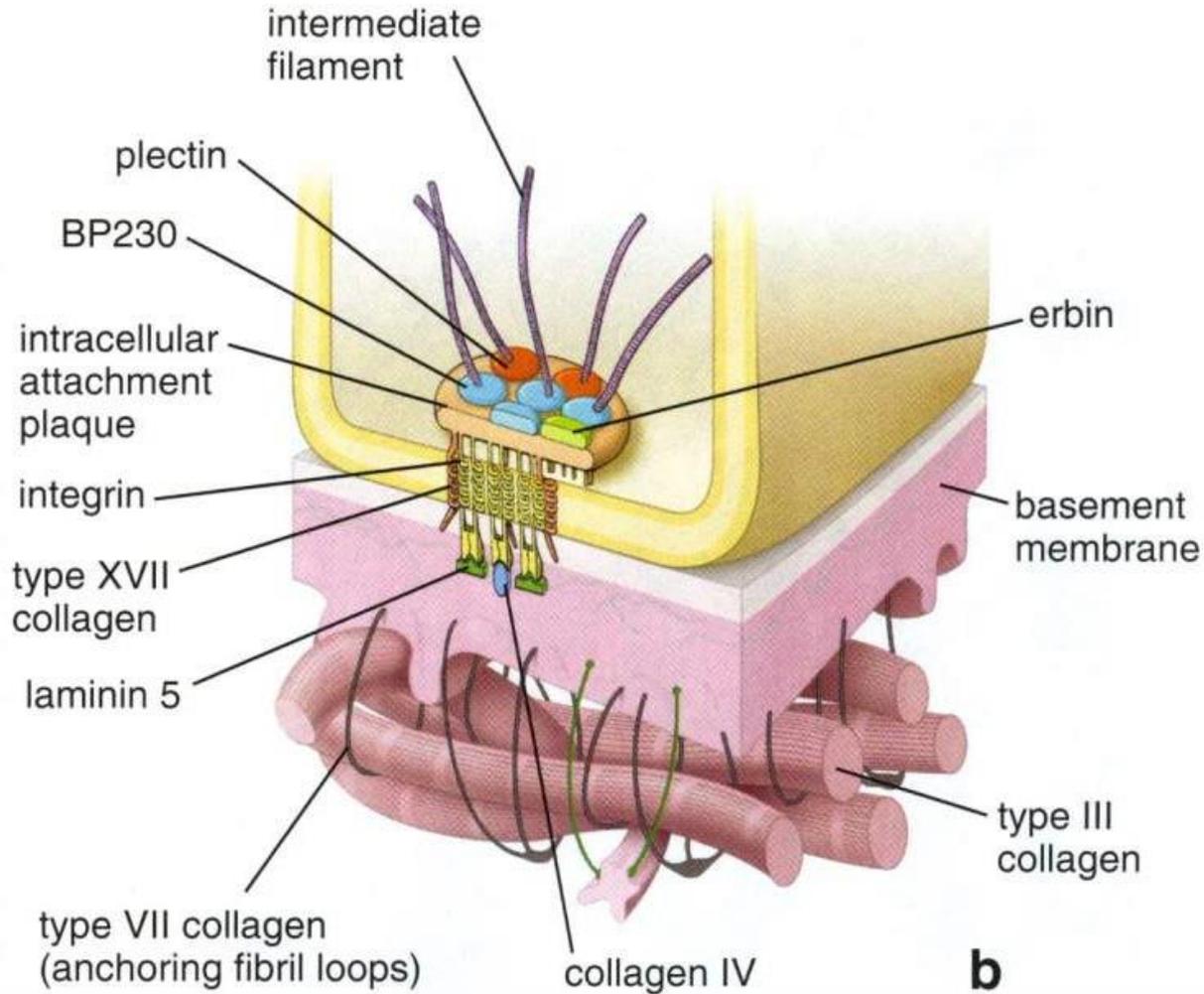
- ❖ they do not link adjacent cells
- ❖ The name arises from the fact that they look like half of a desmosome
- ❖ The transmembrane glycoproteins in hemidesmosomes are

Integrins rather than cadherins.

- ❖ On the inside of the plasma membrane, integrins attach to intermediate filaments made of **the protein keratin**.
- ❖ On the outside of the plasma membrane, the integrins attach to the protein ***laminin, which is present in the basement membrane***
- ❖ Thus, hemidesmosomes anchor cells not to each other but to **the basement membrane**.



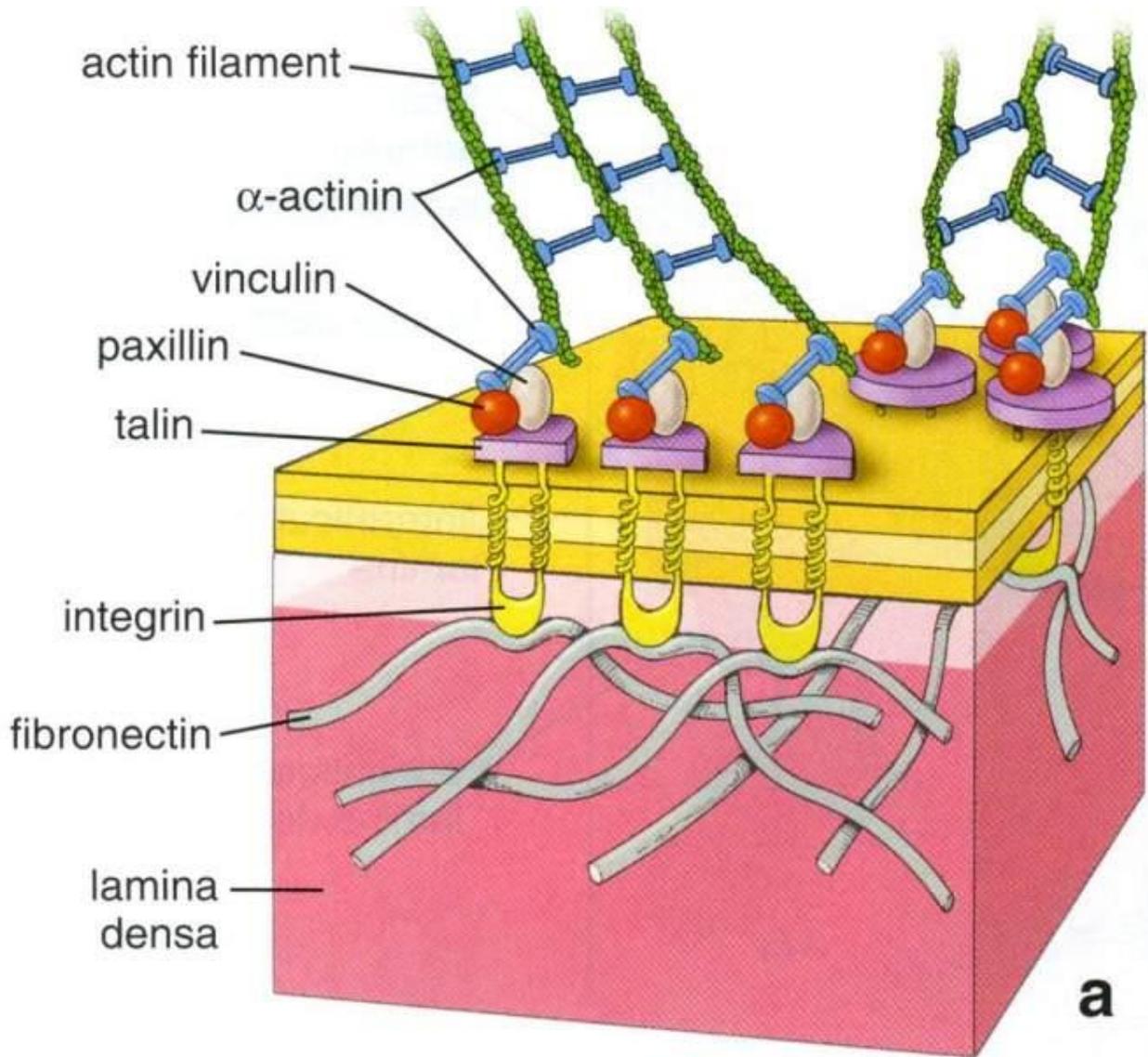
5- Hemidesmosomes



Integrins - membrane protein that "integrates" cell into matrix

The integrins of hemidesmosomes bind primarily to laminin molecules in the basal lamina

6-Focal Adhesions



Another basal anchoring junction found in cells that are moving during epithelial repair or reorganization is the focal adhesion

Fibroblasts attach to extracellular matrix via focal adhesions

Integrins - membrane proteins link actin filaments and matrix

Thank you