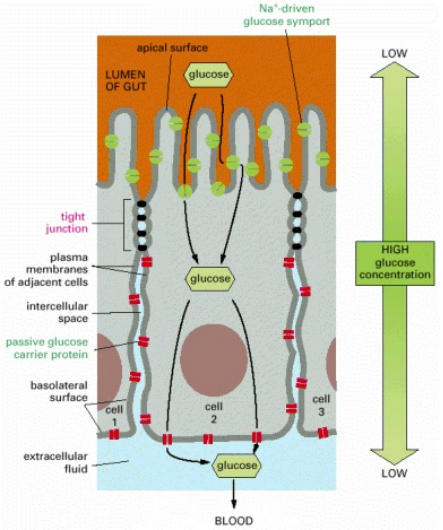
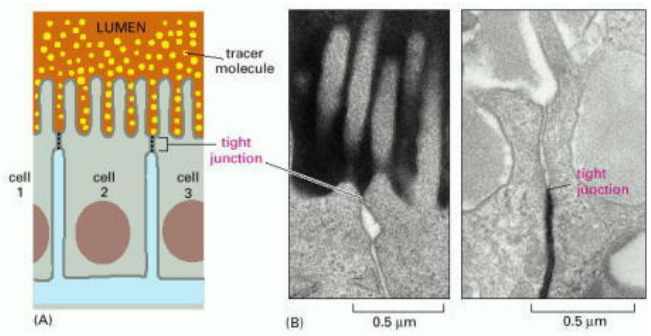
Cell Junctions

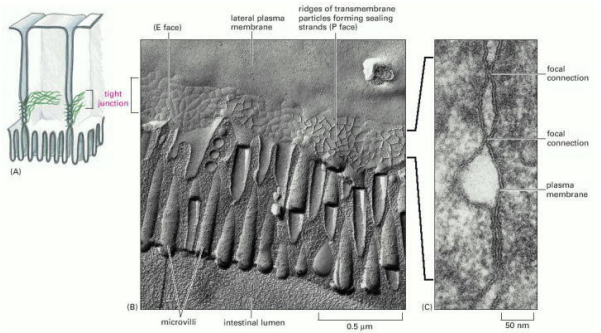
- **Occluding junctions** seal cells together in an epithelium in a way that prevents even small molecules from leaking from one side of the sheet to the other.
- **Anchoring junctions** mechanically attach cells (and their cytoskeletons) to their neighbors or to the extracellular matrix.
- **Communicating junctions** mediate the passage of chemical or electrical signals from one interacting cell to its partner.

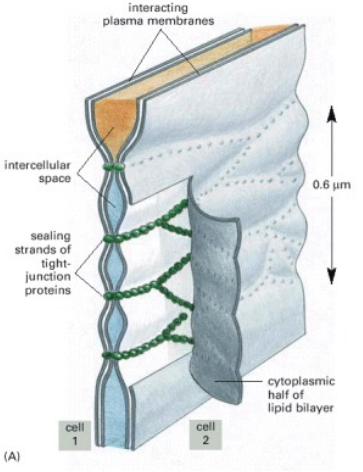
Occluding Junctions

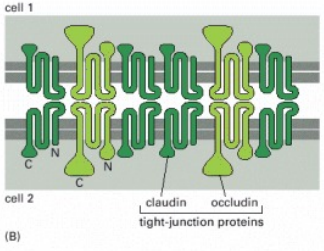
- separating fluids on either side that have a different chemical composition. If a low-molecular-weight tracer is added to one side of an epithelium, it will generally not pass beyond the tight junction
- Although all tight junctions are impermeable to macromolecules, their permeability to small molecules varies greatly in different epithelia.
- major transmembrane proteins in a tight junction are the claudins, ocludins. extracellular Ca2+ is required for tight junction integrity





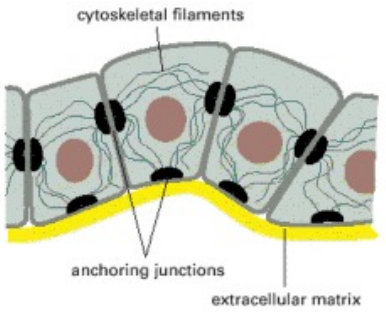






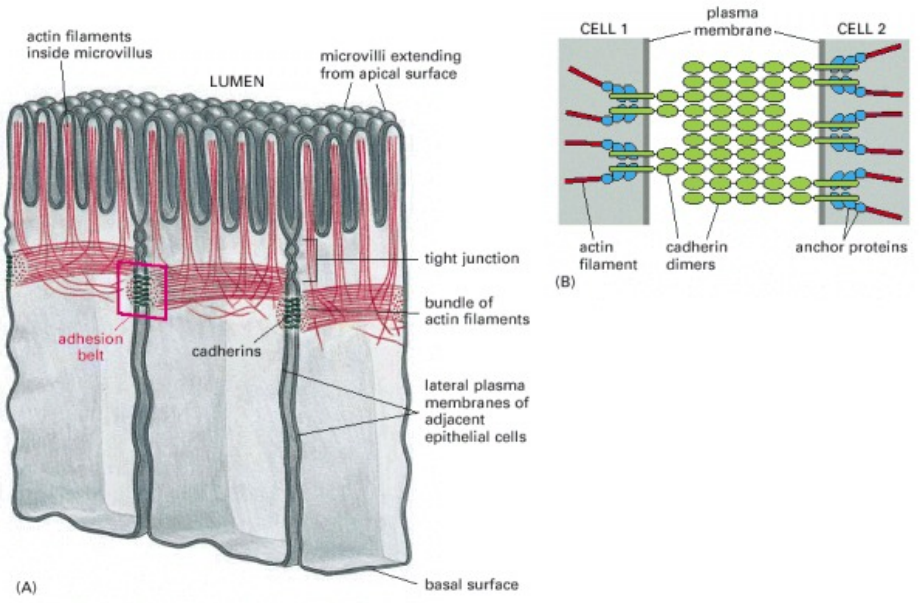
Anchoring Junctions

- Connect the cytoskeleton of two cells with each other or to extracellular matrix (ECM)
- abundant in tissues that are subjected to severe mechanical stress, such as heart, muscle, and epidermis.
- *Intracellular anchor proteins* and *transmembrane adhesion proteins*
- Anchoring junctions occur in two functionally different forms:
  - *Adherens junctions* and *desmosomes* hold cells together and are formed by transmembrane adhesion proteins that belong to the cadherin family.
  - *Focal adhesions* and *hemidesmosomes* bind cells to the extracellular matrix and are formed by transmembrane adhesion proteins of the integrin family.



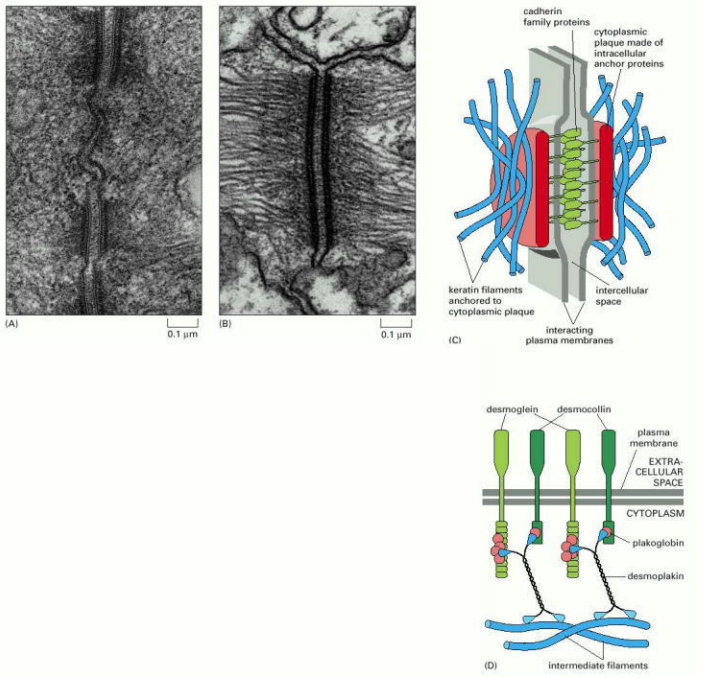
Adherens Junctions

- Connect actin filaments of two cells
- prototypical examples of adherens junctions occur in epithelia, where they often form a continuous adhesion belt (or zonula adherens) just below the tight junctions
- The adhesion belts are directly apposed in adjacent epithelial cells, with the interacting plasma membranes held together by the cadherins that serve here as transmembrane adhesion proteins.
- In each cell, a contractile bundle of actin filaments lies adjacent to the adhesion belt, oriented parallel to the plasma membrane. The actin is attached to this membrane through a set of intracellular anchor proteins, including *catenins*, *vinculin*, and *α-actinin*



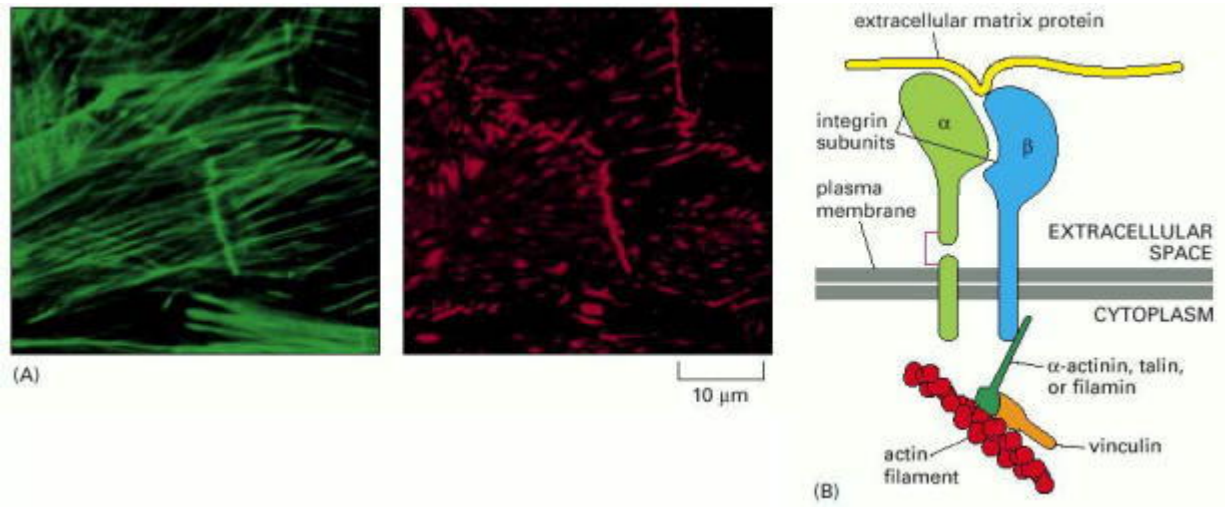
Desmosomes

- Through desmosomes, the intermediate filaments of adjacent cells are linked into a net that extends throughout the many cells of a tissue.
- The particular type of intermediate filaments attached to the desmosomes depends on the cell type: they are *keratin* filaments in most epithelial cells, for example, and *desmin* filaments in heart muscle cells.



Focal Adhesions

- The transmembrane adhesion proteins in these cell-matrix junctions are *integrins*
- *Focal adhesions* enable cells to get a hold on the extracellular matrix through integrins that link intracellularly to actin filaments.
- when cultured fibroblasts migrate on an artificial substratum coated with extracellular matrix molecules, they also grip the substratum at focal adhesions, where bundles of actin filaments terminate.



Hemidesmosomes

- like desmosomes, they act as rivets to distribute tensile or shearing forces through an epithelium. Instead of joining adjacent epithelial cells, however, hemidesmosomes connect the basal surface of an epithelial cell to the underlying basal lamina
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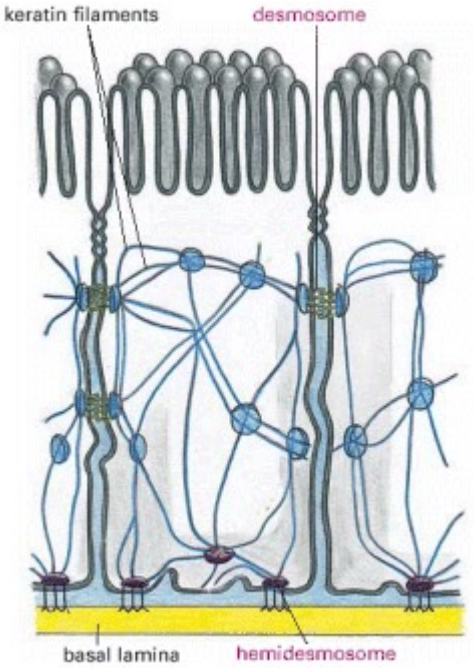

Gap Junctions

- most cells in animal tissues are in communication with their neighbors via gap junctions
- The gap is spanned by channel-forming proteins (connexins). The channels they form (connexons) allow inorganic ions and other small water-soluble molecules to pass directly from the cytoplasm of one cell to the cytoplasm of the other, thereby coupling the cells both electrically and metabolically.
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