Plasmodesmata

In neighboring plant cells, the plasma membranes cannot touch one another because they are separated by the cell walls surrounding each cell. **Plasmodesmata** are channels that pass between the cell walls of adjacent cells. They connect the cytoplasm of adjacent plant cells, which enables signal molecules and nutrients to be transported from cell to cell (Figure 4.33). These junctions between neighboring cells always remain open, and therefore, materials are continuously being shared amongst cells.

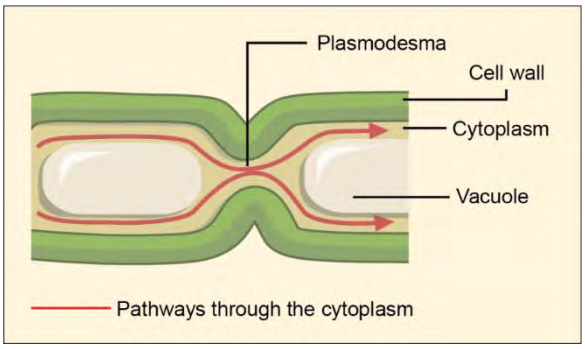

Figure 4.33 A plasmodesma is a channel between two adjacent plant cells' cell walls. (credit: Clark et al. / Biology 2E OpenStax).

Tight junctions

A **tight junction** is a watertight seal between two adjacent animal cells (Figure 4.34). Proteins hold the cells tightly against each other. This tight adhesion prevents materials from leaking between the cells. Tight junctions are typically found in the epithelial tissue that lines internal organs and cavities. For example, the tight junctions of the epithelial cells lining the urinary bladder prevent urine from leaking into the extracellular space. Tight junctions are also found between cells of the skin and play an essential role in preventing materials from the external environment from quickly moving into the body.

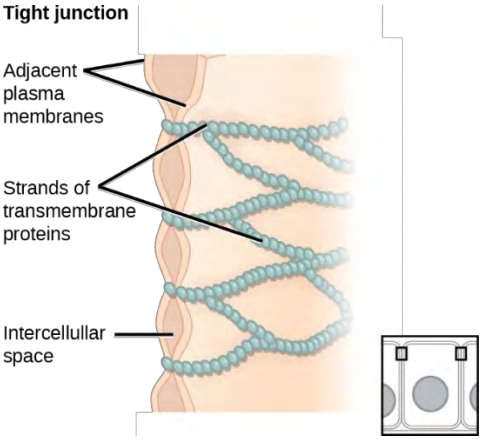

Figure 4.34 Tight junctions form watertight connections between adjacent animal cells. (credit: modification of work by Mariana Ruiz Villareal / Biology 2E OpenStax)

Demosomes

Desmosomes are another type of junction found associated with animal cells. **Desmosomes** are a type of anchoring junction, which provides strong and flexible connections (Figure 4.35). Desmosomes occur in patches on the membranes of cells. These connections are especially important in holding cells together. They keep cells together in a sheet-like formation in organs and tissues that stretch, like the skin, heart, and muscles.

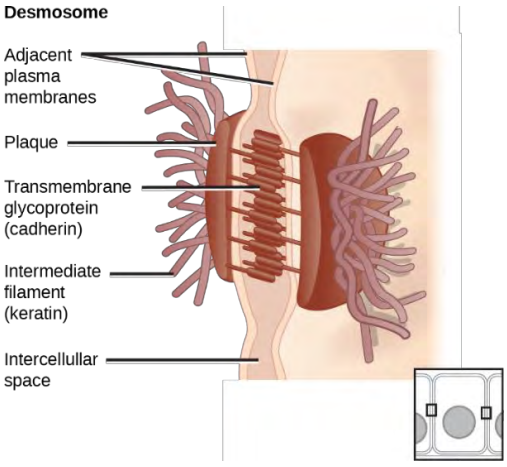

Figure 4.35 A desmosome forms a very strong spot weld between cells. (credit: modification of work by Mariana Ruiz Villareal / Biology 2E OpenStax)

Gap junctions

Gap junctions in animal cells are like plasmodesmata in plant cells. They are channels between adjacent cells that allow for the transport of ions, nutrients, and other substances that enable cells to communicate (Figure 4.36). These junctions allow the electrical and metabolic coupling of adjacent cells. This is important because it coordinates function in large groups of cells and lets them work synchronously. Structurally, however, gap junctions and plasmodesmata differ in that gap junctions are not always "open." This allows cells to control somewhat when materials are shared amongst one another.

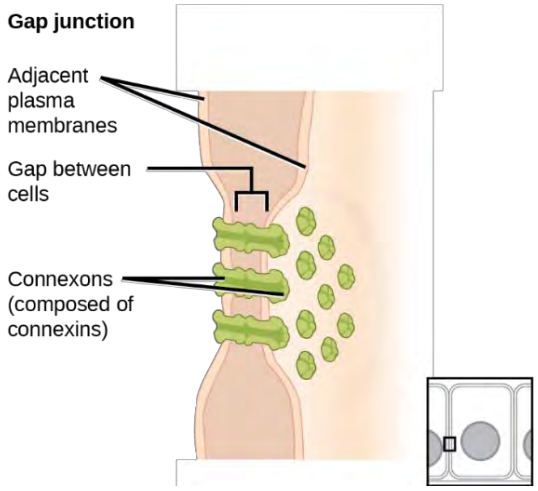

Figure 4.36 A gap junction allows water and small molecules to pass between adjacent animal cells. (credit: modification of work by Mariana Ruiz Villareal / Biology 2E OpenStax)

Extracellular Matrix

Most animal and plant cells release materials into the extracellular space. In animal cells, the major components released are glycoproteins and the protein collagen. In plant cells, the extracellular matrix is primarily composed of carbohydrates. Collectively, these noncellular materials are called the **extracellular matrix** (Figure 4.37). The extracellular matrix holds the cells together to form a tissue. It also allows animal cells within the tissue to communicate with each other.

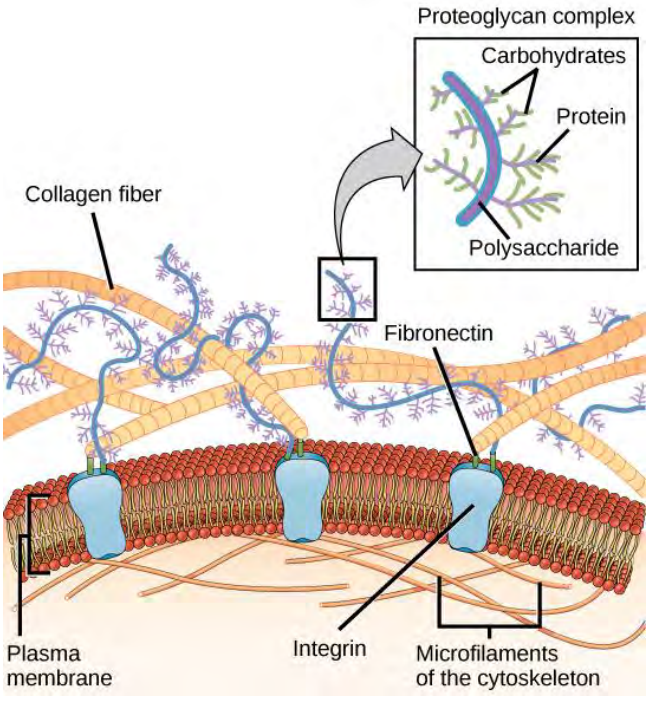

Figure 4.37 Animal cell-extracellular matrix consists of a network of substances secreted by cells. (credit: Fowler et al. / Concepts of Biology OpenStax)

Components of Prokaryotic and Eukaryotic Cells (Animal and Plant Cells) and Their Functions

Cell Component	Function	Present in Prokaryotes?	Present in Animal Cells?	Present in Plant Cells?
Plasma membrane	Separates cell from the external environment; controls passage of organic molecules, ions, water, oxygen, and wastes into and out of the cell	Yes	Yes	Yes
Cytoplasm	Provides structure to cell; site of many metabolic reactions; medium in which organelles are found	Yes	Yes	Yes
Nucleoid	Location of DNA	Yes	No	No
Nucleus	A cell organelle that houses DNA and directs the synthesis of ribosomes and proteins	No	Yes	Yes
Ribosomes	Protein synthesis	Yes	Yes	Yes
Mitochondria	ATP production/cellular respiration	No	Yes	Yes
Peroxisomes	Oxidizes and breaks down fatty acids and amino acids, and detoxifies poisons	No	Yes	Yes
Vesicles and vacuoles	Storage and transport; digestive function in plant cells	No	Yes	Yes
Centrosome	Unspecified role in cell division in animal cells; organizing center of microtubules in animal cells	No	Yes	No
Lysosomes	Digestion of macromolecules; recycling of worn-out organelles	No	Yes	No
Cell wall	Protection, structural support, and maintenance of cell shape	Yes, primarily peptidoglycan in bacteria but not Archaea	No	Yes, primarily cellulose
Chloroplasts	Photosynthesis	No	No	Yes