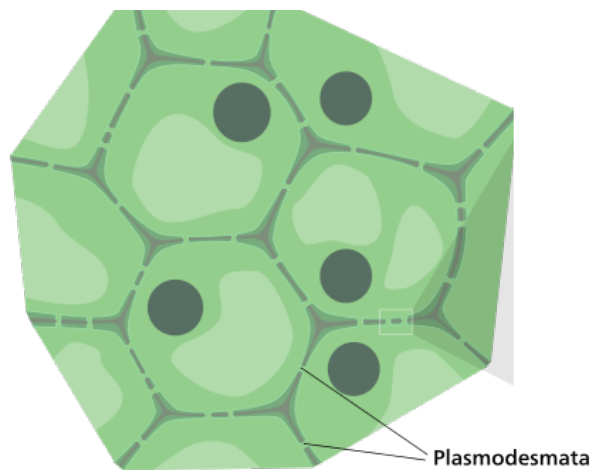
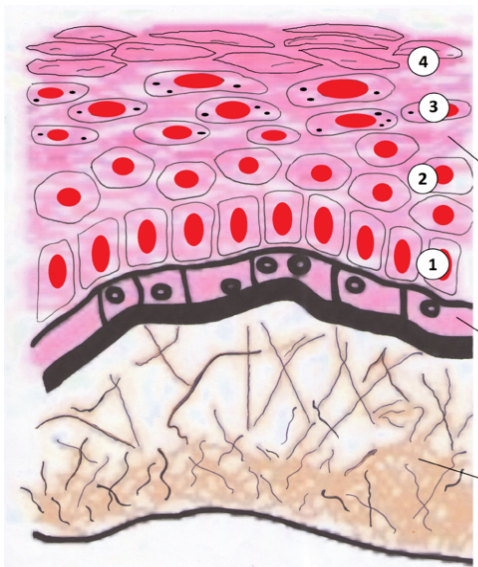


CONCEPT: EVOLUTION OF TISSUE STRUCTURE:

Cells to Tissues

- Cell-cell interactions led to the _____ of an **extracellular matrix** and the first multicellular organisms
 - **Metazoans** (multicellular organisms) evolved from small colonies of cells around 1 billion years ago
 - Cell-adhesion proteins or molecules (CAM) attach animal cells together
 - **Plasmodesmata** (cytoplasmic bridges) connect plant cell walls
 - Matrix composed of multiple proteins (**basal lamina**) provides support and structure for groups of epithelial cells

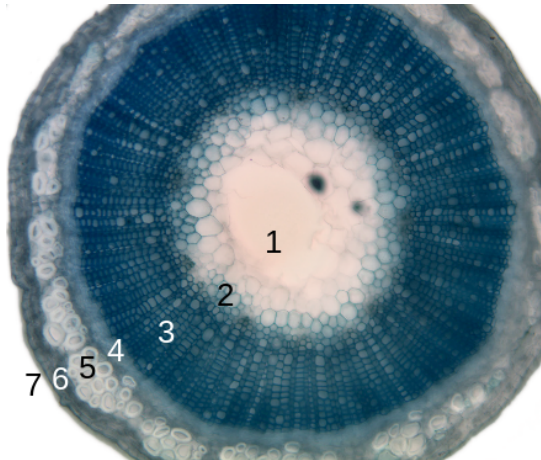
EXAMPLE: Extracellular matrix extends from epithelial cells. Plant cell walls are connected by plasmodesmata.



- Organized groups of _____ form **tissues**
 - Plant cells are organized into three tissue types
 - **Ground Tissue:** Area of metabolic reactions
 - **Dermal Tissue:** Forms protective coat and place for nutrient absorption
 - **Vascular Tissue:** Transports water and nutrients throughout the plant
 - Animal cells are organized into five tissue types
 - **Epithelial:** Forms sheets that cover the body and internal organs for protection

- **Connective:** Provides support to the body. Includes bone tissue
- **Blood:** Transport of oxygen and white blood cells
- **Nervous:** Responsible for signal transmission throughout the body
- **Muscle:** Involved in movements

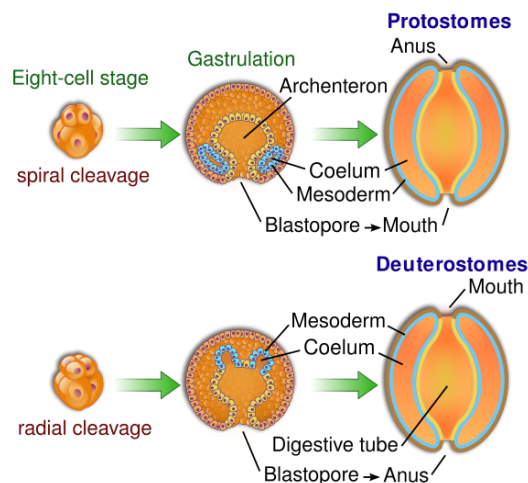
Example: Cross section of a plant reveals the three tissue types



Multicellular development basics

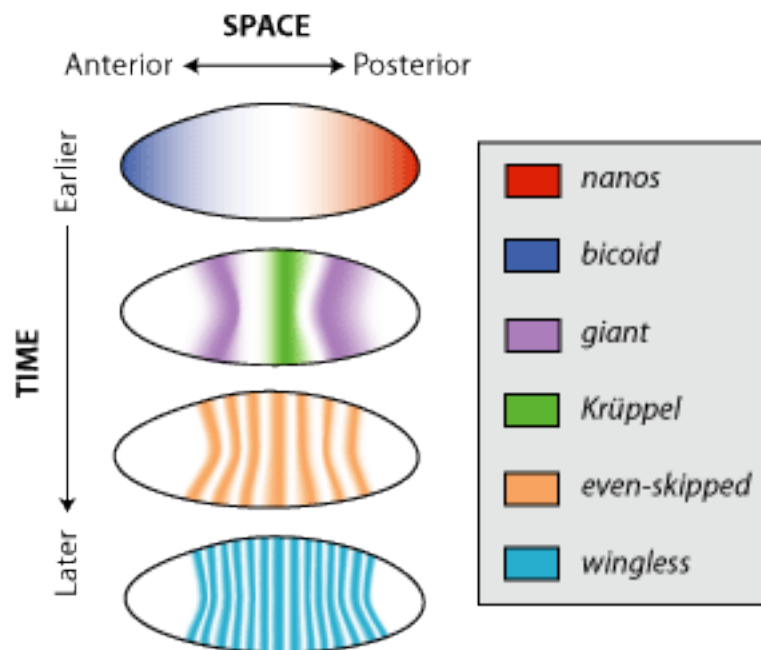
- Formation of tissues happens _____ in the development of the organism
 - In the human body, a single cell (**zygote**) eventually results in 100 trillion cells
 - The earliest pattern depends on the placement of the mouth and anus – include image
 - **Protostomes:** Develop mouth near transient opening; have ventral nerve cord
 - **Deuterostomes:** Develop anus near transient opening; have dorsal central nervous system

EXAMPLE: Formation of protostomes and deuterostomes



- Master regulatory **patterning genes** control the timing and formation of the tissues
 - Symmetry including anterior/posterior or dorsal/ventral
 - Segments including the head, chest, abdomen and tail
- Most patterning genes are highly conserved **transcription factors** that control gene expression
 - Eye development in both flies and humans is initiated by the same gene

EXAMPLE: Expression of pattern formation genes in a zygote



PRACTICE:

1. Choose which of the following is true:
 - a. Protostomes and Deuterostomes describe the formation of eyes during development
 - b. Patterning genes are transcription factors that control the expression of important developmental genes
 - c. Ground tissue is found in animal cells
 - d. Plant cell walls prevent communication and connection between adjacent plant cells

2. Which of the following is not a tissue type in plants?
 - a. Ground Tissue
 - b. Dermal Tissue
 - c. Mesodermal Tissue
 - d. Vascular Tissue

3. Which of the following is the name for the group of genes that control development of different body regions (ex: anterior/posterior, dorsal/ventral)?
- a. Segmental genes
 - b. HOX genes
 - c. Patterning genes
 - d. Dividing genes