

Homework 5 (Cell Biology, 2017)

1. TRUE / FALSE

Decide whether each of these statements is true or false, and then explain why.

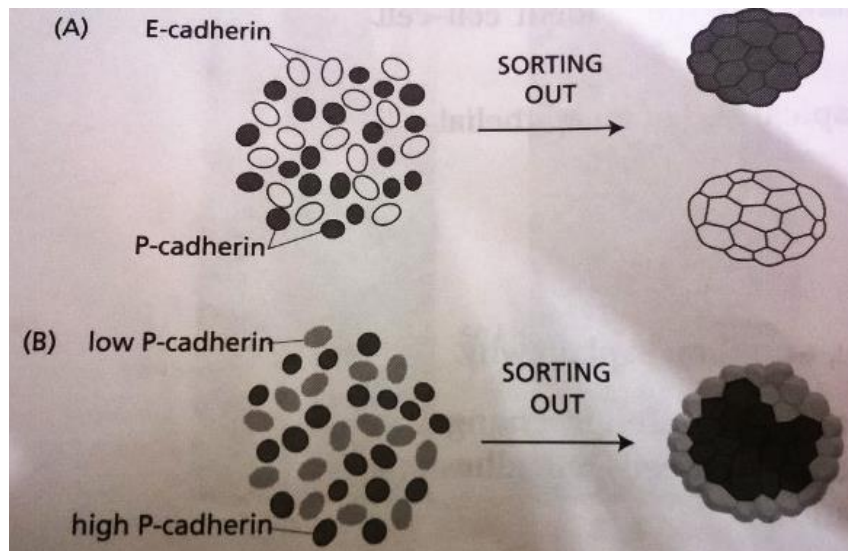
A. Cadherins promote cell-cell interactions by binding to cadherin molecules of the same or closely related subtype on adjacent cells.

B. Although cadherins and Ig family members are frequently expressed on the same cells, the adhesion mediated by Ig molecules is much stronger and thus, are largely responsible for holding cells together.

2. Mouse L-cells have proven to be an extremely useful model system for investigating the properties of cadherins because they do not normally express any cadherins. If different populations of L-cells are transfected with vectors expressing one or the other of two different cadherins, and are then dissociated and mixed together, they segregate into two separate balls of cells, each held together by a different cadherin. If two populations of cells expressing different levels of the same cadherin are mixed, they segregate into a single ball of cells, with the low-expressing population on the outside (Figure 19-2).

A. Why do you suppose populations of cells expressing different levels of the same cadherin segregate with this characteristic layered structure? Why don't they segregate into two separate balls? Or a mixed ball? Or a ball with the low-expressing population on the inside?

B. What sort of final architecture might you expect if you were to mix together two populations of cells that expressed P-cadherin in common, but, in addition, one population expressed E-cadherin and the other expressed N-cadherin?



3. DEFINITIONS (Connexin connexon typeIV collagen plasmodesmata Basal lamina Laminin-1)

Match each definition below with its term from the list above.

- A. Communicating cell-cell junctions in plants in which a channel of cytoplasm lined by plasma membrane connect cells through a small pore in their cell walls.
- B. Water-filled pore in the plasma membrane formed by a ring of six protein subunits, which link to an identical assembly in an adjoining cell to form a continuous channel between the two cells.
- C. Extracellular matrix protein found in basal lamina, where it forms a sheet like network.
- D. Thin mat of extracellular matrix that separates epithelial sheets, and many other types of cells such as muscle or fat cells, from connective tissue.

4. THE EXTRACELLULAR MATRIX OF ANIMAL CONNECTIVE TISSUES

TERMS TO LEARN	
collagen	glycosaminoglycan (GAG)
collagen fibril	hyaluronan
elastin	matrix metalloprotease
elastic fiber	proteoglycan
fibril-associated collagen	RGD sequence
fibrillar collagen	serine protease
fibroblast	type III fibronectin repeat
fibronectin	

DEFINITIONS

Match each definition below with its term from the list above.

- A. Fibrous protein rich in glycine and proline that, in its many forms, is a major component of the extracellular matrix and connective tissues.
- B. General name for long, linear, highly charged polysaccharides composed of a repeating pair of sugars, one of which is always an amino sugar, which is found covalently linked to a protein core in the extracellular matrix.
- C. Type of collagen molecule that assembles into ropelike structures and larger, cable like bundles.
- D. Extracellular matrix protein that binds to cell-surface integrins to promote adhesion of cells to the matrix and to provide guidance to migrating cells during embryogenesis.
- E. Hydrophobic protein that forms extracellular extensible fibers that give tissues their stretchability and resilience.
- F. Common cell type in connective tissue that secretes an extracellular matrix rich in collagen and other extracellular matrix macromolecules.

5. TRUE / FALSE

Decide whether each of these statements is true or false, and then explain why.

- A. The extracellular matrix is relatively inert scaffolding that stabilizes the structure of tissues.
- B. One of the main chemical differences between proteoglycans and other glycoproteins lies in the structure of their carbohydrate side chains: proteoglycans mostly contain long, unbranched polysaccharide side chains, whereas other glycoproteins contain much shorter, highly branched oligosaccharides.
- C. Breakdown and resynthesis of collagen must be important in maintaining the extracellular matrix; otherwise, vitamin C deficiency in adults would not cause scurvy, which is characterized by a progressive weakening of connective tissue due to inadequate hydroxylation of collagen.

D. The elasticity of elastin derives from its high content of α helices, which act as molecular springs.

6. DEFINITIONS (Carcinogen tumor initiator tumor promoter)

Match each definition below with its term from the list above.

A. A chemical that is itself not mutagenic but whose repeated application can stimulate tumor formation by mutant cells.

B. An agent that can cause cancer.

8. TRUE / FALSE

Decide whether each of these statements is true or false, and then explain why.

A. Many of the most potent carcinogens are chemically inert until after they have been modified by cytochrome P-450 oxidases in the liver.

B. Viruses and other infectious agent play no role in human cancers.

C. The main environmental causes of cancer are the products of our highly industrialized way of life such as pollution and food additives.

7. FINDING THE CANCER-CRITICAL GENES

TERMS TO LEARN		
cancer-critical gene	<i>Rb</i> gene	Src
oncogene	Rb protein	transformation
proto-oncogene	retinoblastoma	tumor suppressor gene
<i>Ras</i>	retrovirus	tumor virus

Match each definition below with its term from the list above.

A. General term for a mutant gene whose overactive form causes cancer.

B. The conversion of normal cells to abnormally proliferating cells with cancerous properties.

C. General term for a normal gene in which a gain-of-function mutation can drive a cell toward cancer.

D. Rare type of human cancer in which cells of the retina are converted to a cancerous state by an unusually small number of mutations.

E. Any one of a number of genes whose mutation frequently contributes to the causation of cancer.

F. General term for a normal gene in which a loss-of-function can contribute to cancer.

8. THOUGHT PROBLEMS

Rb is one example of a category of anti-proliferative genes in humans. Typically, when both copies of such genes are lost, cancers develop. Do you suppose that cancer could be eradicated if tumor suppressor genes such as Rb could be expressed at abnormally high levels in all human cells? What would be the effect on the human? Explain your answers.