AP Bio FRQ Fridays

2017 #8
Membrane Proteins

FRQ Friday #10

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Estrogens are small hydrophobic lipid hormones that promote cell division and the development of reproductive structures in mammals. Estrogens passively diffuse across the plasma membrane and bind to their receptor proteins in the cytoplasm of target cells.

(a) **Describe** ONE characteristic of the plasma membrane that allows estrogens to passively cross the membrane.

Description (1 point)

- Hydrophobic/nonpolar
- Space between phospholipids

a). Plasma membranes are formed of phospholipid bilayers with a middle region made of hydrophobic tails. Because these are hydrophobic the estrogens can diffuse between the tails & into the cell. This allows small & uncharged (hydrophobic) molecules to diffuse into the cell passively.

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(b) In a laboratory experiment, a researcher generates antibodies that bind to purified estrogen receptors extracted from cells. The researcher uses the antibodies in an attempt to treat estrogen-dependent cancers but finds that the treatment is ineffective. **Explain** the ineffectiveness of the antibodies for treating estrogen-dependent cancers.

Explanation (2 points)

- Antibodies are unable to enter the cell.
- (Extracellular) antibodies will not bind to (intracellular) estrogen receptors.

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(b) In a laboratory experiment, a researcher generates antibodies that bind to purified estrogen receptors extracted from cells. The researcher uses the antibodies in an attempt to treat estrogen-dependent cancers but finds that the treatment is ineffective. **Explain** the ineffectiveness of the antibodies for treating estrogen-dependent cancers.

Explanation (2 points)

- Antibodies are unable to enter the cell.
- (Extracellular) antibodies will not bind to (intracellular) estrogen receptors.

b). Antibodies are unable to cross the plasma membranes of the cells. The receptor proteins are located within the cytoplasm of the cell. Because of this using antibodies to block the receptors would be useless as the antibodies are too large to enter the cell & bind to the receptors.

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