Epithelial Structure and Transport

Readiness Assessment Questions

1. You perform immunofluorescence on intestinal epithelium with an antibody to the sodium-glucose transporter. Where would expect to find the strongest fluorescence signal?

   A. Tight junctions

   B. Adhering junctions

   C. Apical surface

   D. Basolateral surface

2. The electrical resistance across the intestinal epithelium decreases significantly during a meal. What accounts for the change in resistance?

   A. Weaker tight junctions

   B. Weaker adhering junctions

   C. More Na^+-glucose transporters

   D. More Na^+-K^+ pumps

3. Which change would be the most fastest and efficient mechanism to decrease epithelial resistance?

   A. Depolymerize actin filaments

   B. Increase endocytosis of membrane proteins

   C. Generate tension with myosin and actin filaments

   D. Decrease expression of claudin genes

4. In a carcinoma (epithelial tumor), metastasis is likely preceded by an increase in the expression of which protein?

   A. Claudin

   B. Beta-catenin

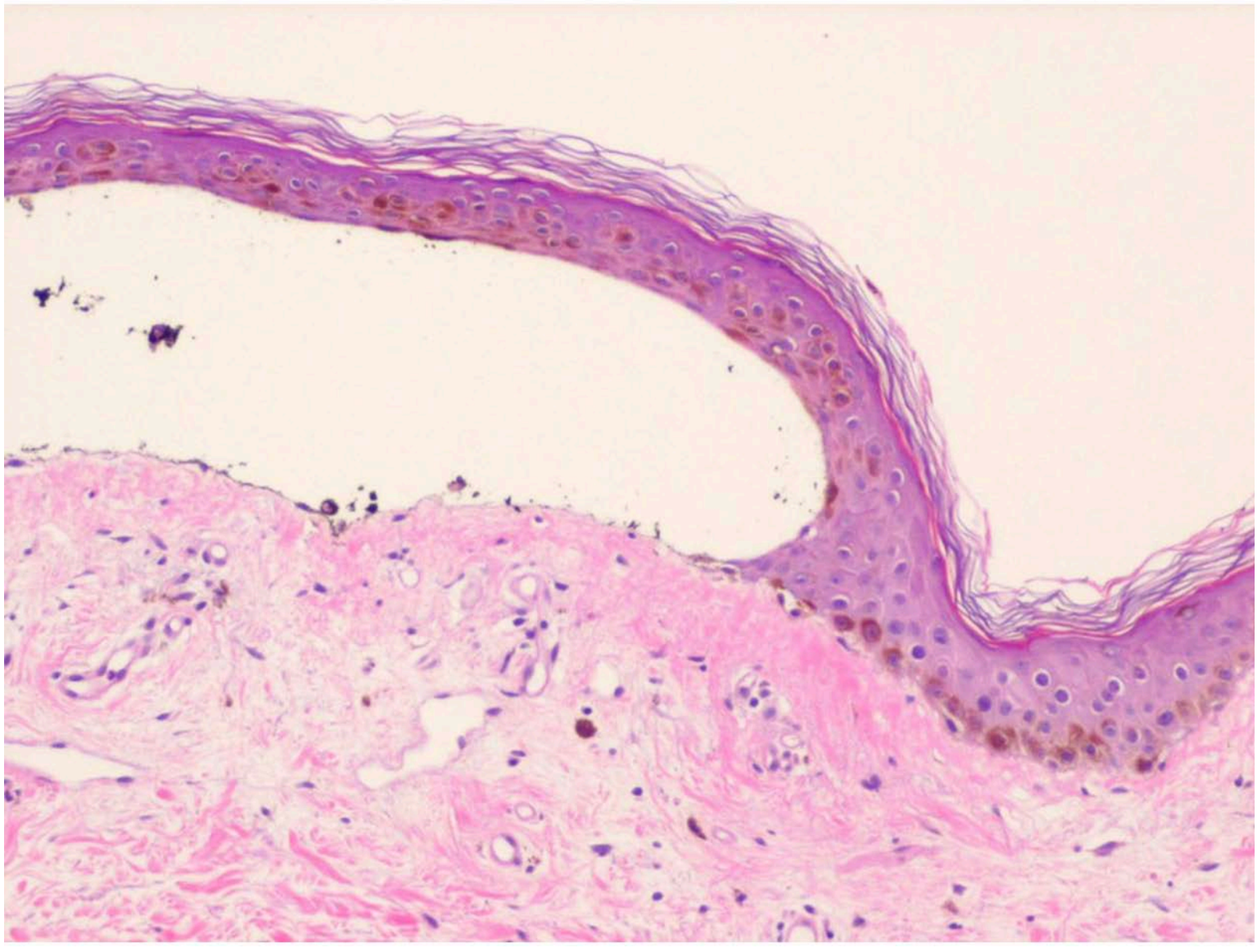
   C. Myosin

   D. Type IV collagen protease

Application Questions

1. You are treating a family whose members have serum cholesterol concentrations of 400 - 500 mg/dL. Based on your knowledge that mutations in the *LDL* receptor gene lead to hypercholesterolemia in other people, you sequence the *LDL* receptor gene in the family members and discover a mutation in the coding region. In subsequent tests, you find that the mutation does not affect binding to LDL. You express the mutated receptor in an epithelial cell line and discover that the receptor localizes to the apical surface of the cells. Provide an explanation why the family members exhibit hypercholesterolemia. In which domain of the protein would you expect to find the mutated amino acid?

2. You examine a patient who has numerous skin blisters but reports no exposure to chemicals or other external trauma. A biopsy of a skin blister results in the image below. Based on the histologic image, what is causing the blister? A genetic mutation in which gene(s) might explain the blistering?



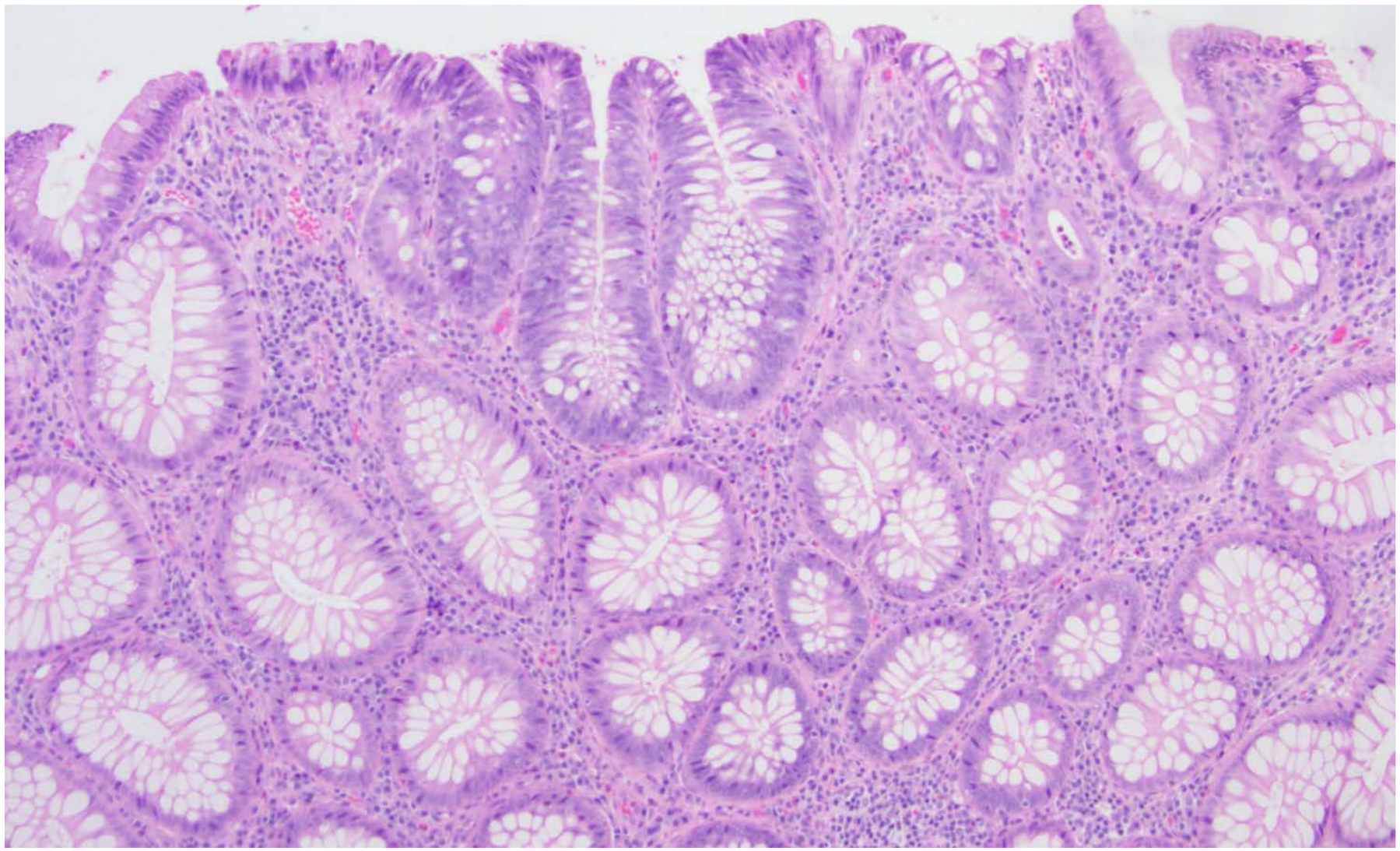
3. Below is a biopsy from a patient's colon that was obtained during a routine colonoscopy. The biopsy was taken because of a suspected adenoma, which is benign tumor of glandular origin. If the sample was stained with antibodies to specific proteins, which would show the largest change in amount compared to a normal colon tissue?

   A. Type IV Collagen

   B. β-Catenin

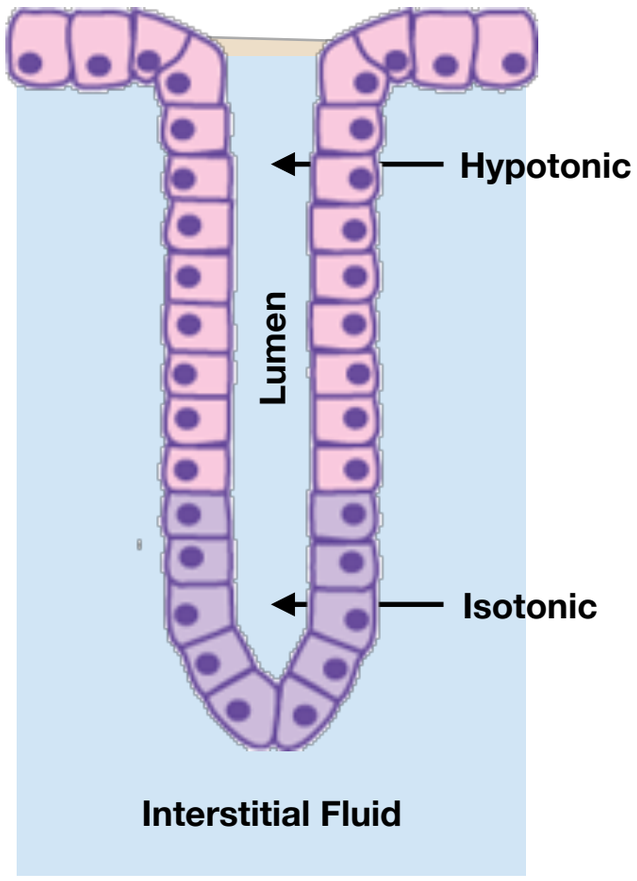
   C. Integrin

   D. E-Cadherin



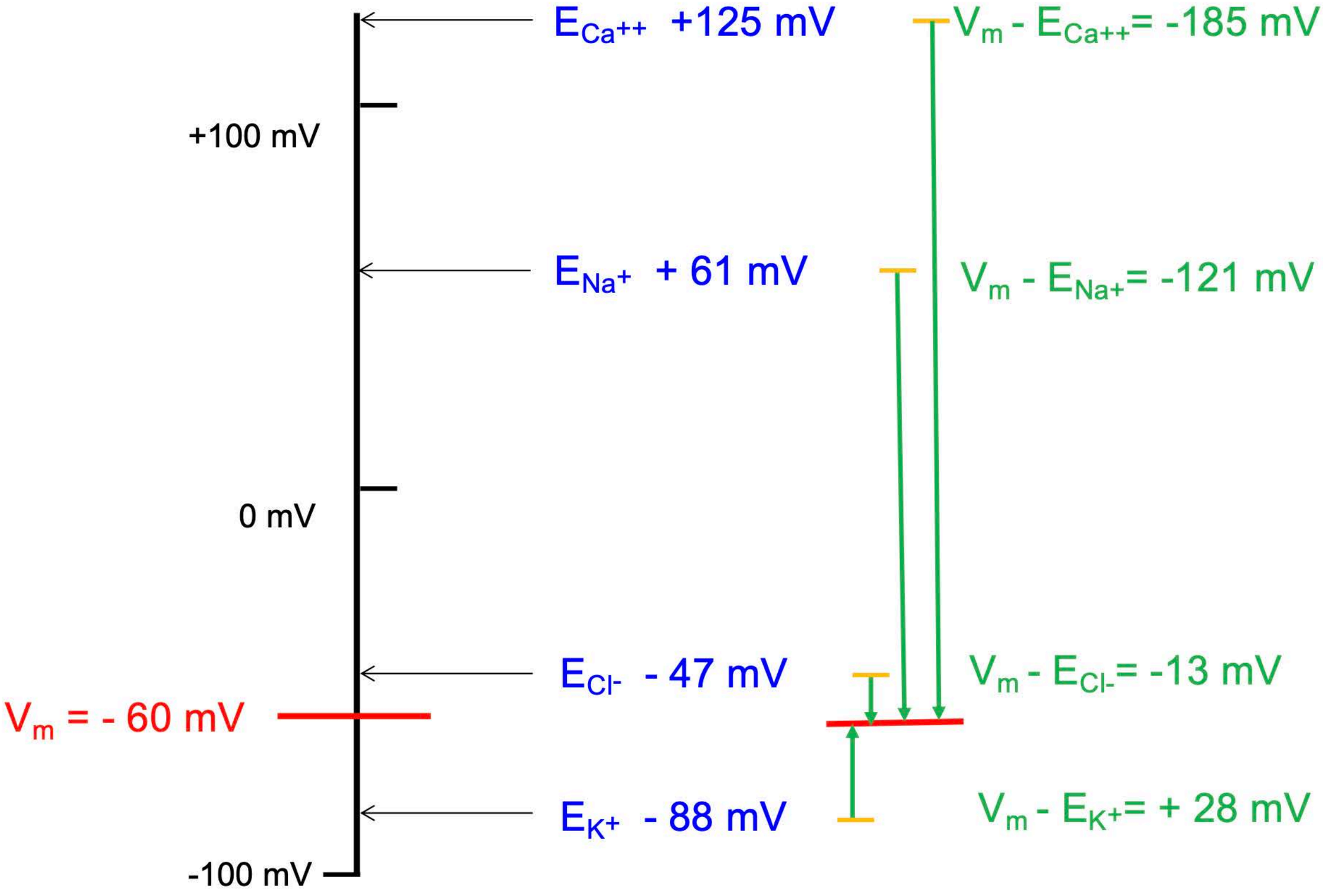
Epithelial often separate two fluid compartments in organs (e.g., GI tract, kidney). Directed movement of solutes across those epithelia are often critical for the physiological functions of the organs and the health of the organism. Here, we will look at a simple example of an epithelium that moves solutes and fluid between compartments. What you learn about this epithelium, we be important for understanding epithelia in more complex organs.

The image below shows a sweat gland which exist throughout our skin. The sweat gland releases a hypotonic (relative to interstitial fluid) fluid onto the surface of the skin which then evaporates to cool the surface of skin. Sweat is produced at the base of gland by epithelial cells that excrete a isotonic fluid into the lumen. As sweat moves up the gland, the epithelia make the fluid in the lumen hypotonic.



4. Draw epithelial cells from the base of a sweat gland. Label the apical and basal surfaces of the cell. Diagram the components in the cell membrane of the epithelial cells that would allow it produce a fluid in the lumen of the gland that is isotonic relative to interstitial fluid.

5. Draw epithelial cells that are located further up the gland and diagram the components in the cell membrane they would need to convert the isotonic fluid into one that is hypotonic relative to interstitial fluid.



Membrane potential - Equilibrium potential = Net electrochemical driving force ($V_m - E_x$)