

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

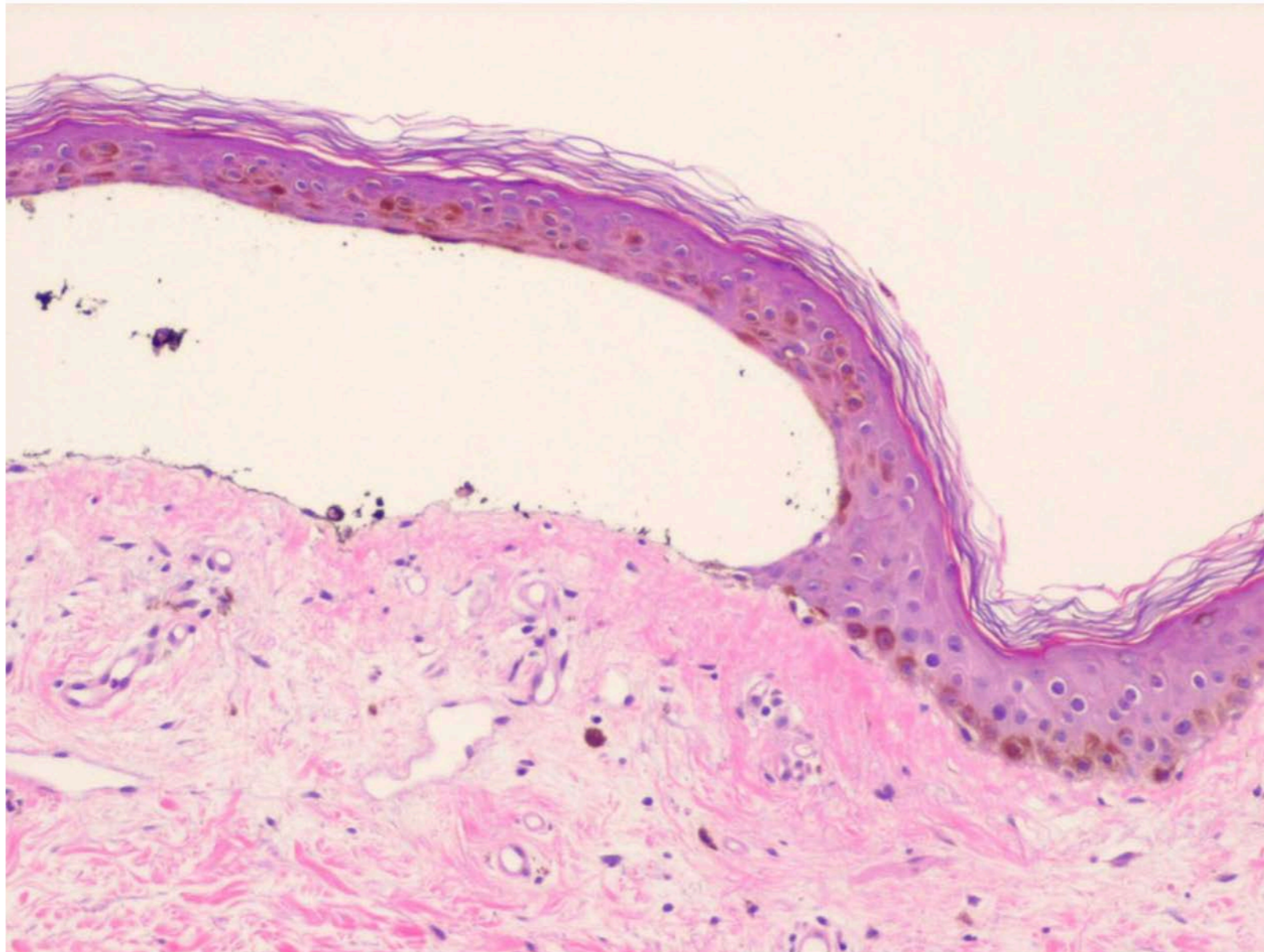
3. Which change would be the most fastest and efficient mechanism to decrease epithelial resistance?
- A. Depolymerize actin filaments
 - B. Increase endocytosis of membrane proteins
 - C. Generate tension with myosin and actin filaments
 - D. Decrease expression of claudin genes

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 discover a family with hypercholesterolemia. You sequence the LDL receptor in the family and discover a mutation in the coding region. 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. What mechanisms account for the location of the receptor to the apical surface? In which domain of the protein would you expect to find the mutated amino acid?

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



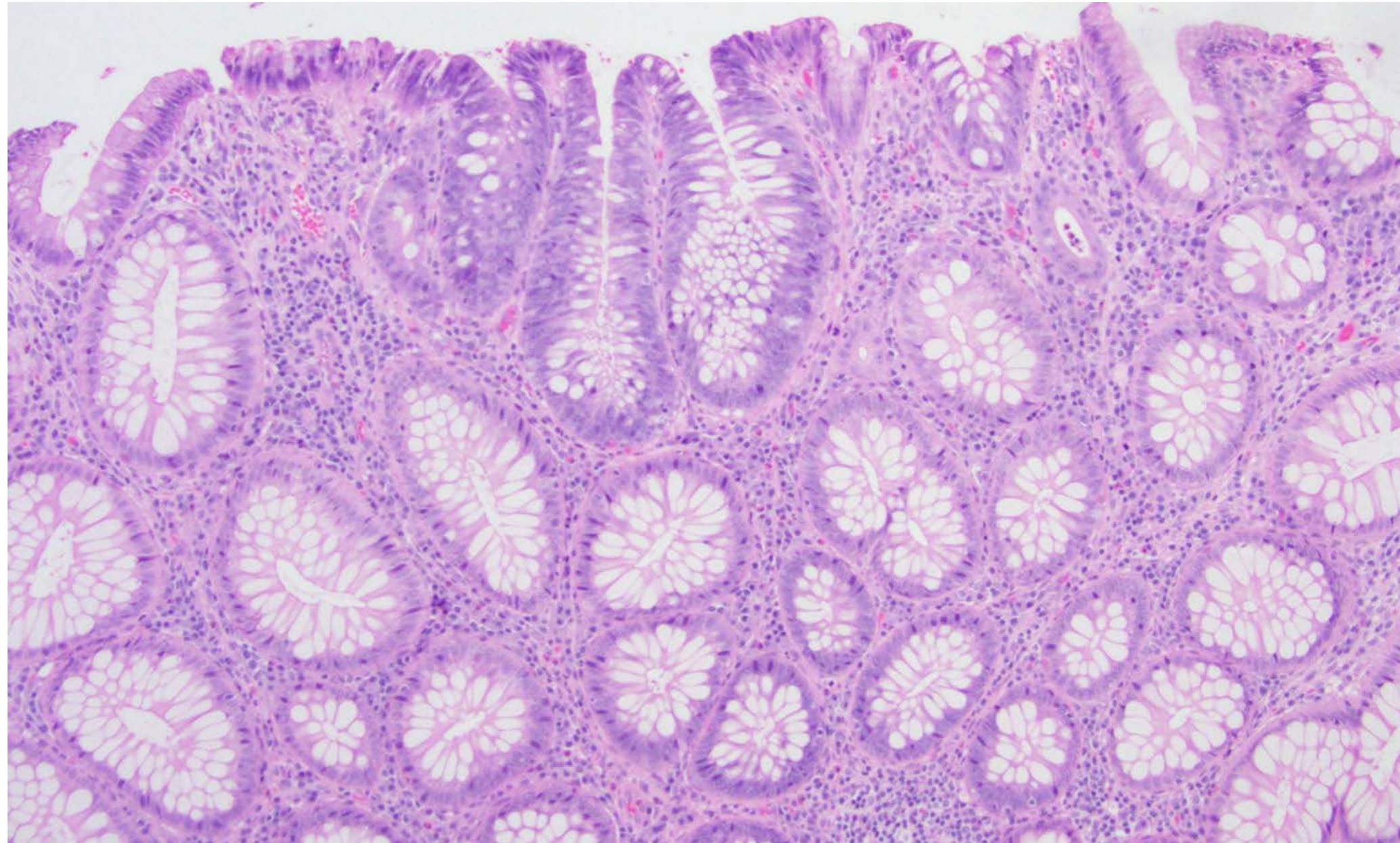
3. Below is a biopsy from a patient's colon that was obtained during a colonoscopy. The biopsy was taken because of a suspected adenoma. If the sample was stained with antibodies to specific proteins, which would show the largest change in amount compared to a normal amount?

A. Type IV Collagen

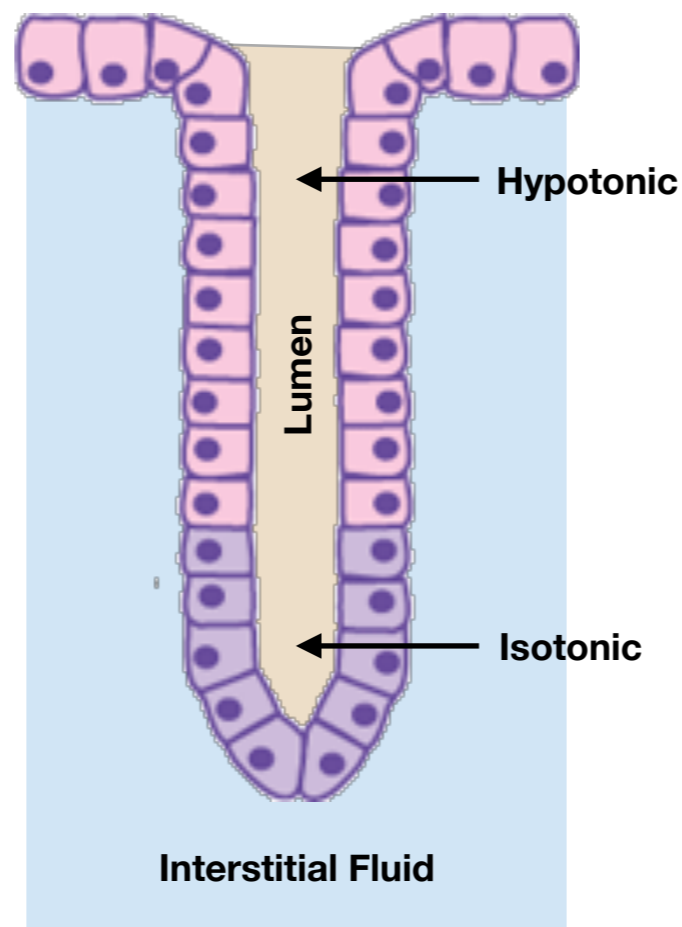
B. β -Catenin

C. Integrin

D. E-Cadherin



Glands are a form of epithelium that secrete fluids that contain specific solutes. They are common in the gastrointestinal system and skin. The cells in the epithelium determine the contents of the fluid produced by the gland through secretion and absorption of solutes and fluid. Often, the epithelial cells in different segments of the gland will have different secretory or absorptive properties that allow the gland to adjust the contents of its luminal fluid. For example, the epithelial cells at the base of the gland secrete a fluid into the lumen that is isotonic with interstitial fluid. Epithelial cells further up the gland will modify the fluid to generate a fluid that is hypotonic.



4. Draw epithelial cells from the base of a hypothetical sweat gland. Label the apical and basal surfaces of the cell. Diagram the cell membrane components of the epithelial cell 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 it would need to convert the isotonic fluid into one that is hypotonic relative to interstitial fluid.

6. You see a patient with exercise-induced abdominal pain and nausea. A blood test reveals hypomagnesium and urinalysis shows elevated levels of magnesium. A genetic analysis shows the patient has mutations in two genes that encode claudins. Through which pathway is magnesium primarily absorbed from urine in the kidney? What is the driving force for magnesium reabsorption and how could it be generated?

5. You are treating a patient who has on regions of his skin erythematous plaques. Skin biopsies of an unaffected area and affected area were obtained and the resulting images from a H&E stain are shown below. Identify the epithelium in both samples. Describe the changes to the epithelium in the affected sample. Discuss likely causes to the change in the epithelial structure.



Unaffected

Affected

