Inside a Villus

Connect tissue structure to absorption in the small intestine

HAP.2 "Students will demonstrate an understanding of the relationship of cells and tissues that form complex structures of the body. Analyze the characteristics of the four main tissue types: epithelial, connective, muscle, and nervous..."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB As you read, underline one structural feature of each of the four tissue types. Circle a phrase that explains what each feature helps the villus or intestinal wall do.

A Team of Tissues at Work

1. After a meal, the inner wall of the small intestine absorbs nutrients. Its surface rises into tiny fingerlike villi, which add area for absorption. Each villus has a lining of epithelial cells pressed close together. The side facing food has microvilli, even smaller folds of the cell surface. This crowded border creates many places for dissolved nutrients to cross from the intestine into the body. Cells in the lining also form a selective barrier, so the contents of the intestine do not simply leak between the cells.

2. Beneath the lining, connective tissue supports each villus and holds small blood vessels called capillaries. Glucose and some other absorbed nutrients enter these vessels. A villus also contains a lymph vessel called a lacteal. Most absorbed dietary fats enter the lacteal instead of the blood capillaries. Smooth muscle fibers extend into the villus from the intestinal wall. When they contract, they move the villus and help lymph flow out of its lacteal. The blood vessels, lacteal, and muscle fibers all fit inside the connective tissue core, close to the absorbing surface.

3. The intestinal wall also contains nervous tissue. Networks of neurons send signals that help coordinate smooth muscle contractions and the release of digestive fluids. These actions keep food moving and help prepare nutrients for absorption. A stained microscope slide can reveal how the tissues are arranged: closely packed epithelial cells form the villus border, while vessels lie within its connective tissue core. Muscle fibers extend into that core, and nerve networks lie deeper in the wall. A useful model must show more than tissue names. It must show where the tissues sit and how their positions support their jobs.

2 ANSWER WITH EVIDENCE

Use the passage

1. How do the shape of a villus and the microvilli on its epithelial cells work together to support absorption?

2. Why does a villus need both blood capillaries and a lacteal in its connective tissue core?

3. How does the position of smooth muscle fibers in a villus help the lacteal do its job?

4. A microscope slide shows nerve networks deeper in the intestinal wall than the villus lining. How can those networks still support absorption?

3 YOUR TURN

Your own words

In the box, sketch a cutaway model of one villus and the intestinal wall beneath it. Label all four tissue types, show a capillary and lacteal in the villus core, add arrows showing where glucose and most absorbed dietary fats go, and write two sentences explaining how two tissue arrangements support absorption or movement.

ANSWER KEY

Inside a Villus

PART 1 · READ AND MARK

As you read, underline one structural feature of each of the four tissue types. Circle a phrase that explains what each feature helps the villus or intestinal wall do. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	How do the shape of a villus and the microvilli on its epithelial cells work together to support absorption?	**Villi add area to the intestinal surface, and microvilli add area to epithelial cells. Together, they provide more places for dissolved nutrients to cross.**
2	Why does a villus need both blood capillaries and a lacteal in its connective tissue core?	**Glucose and some other absorbed nutrients enter the blood capillaries, while most absorbed dietary fats enter the lacteal.**
3	How does the position of smooth muscle fibers in a villus help the lacteal do its job?	**The fibers extend into the villus core. Their contractions move the villus and help lymph flow out of the lacteal.**
4	A microscope slide shows nerve networks deeper in the intestinal wall than the villus lining. How can those networks still support absorption?	**The neurons help coordinate muscle contractions that move food and the release of digestive fluids that prepare nutrients for absorption.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

The sketch labels epithelial tissue around the villus, connective tissue in its core, smooth muscle fibers extending into the core, and nervous tissue deeper in the intestinal wall. It shows a capillary and lacteal in the core, with a glucose arrow pointing to the capillary and a most absorbed dietary fats arrow pointing to the lacteal. The epithelial lining and its microvilli provide a large surface for nutrients to cross. Smooth muscle fibers inside the villus help move lymph out of the lacteal when they contract.

Accept models that place the four tissues accurately and distinguish the capillary route from the lacteal route. Students may show additional nutrient routes if they do not claim that all absorbed nutrients enter blood capillaries.