Inside a Wrap

Trace how enzymes prepare food for absorption.

HS-AP10-2 "Construct an explanation for enzymes involved in the processing of, digestion of and absorbance of macromolecules."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Underline each named enzyme and circle the food molecule it cuts. Use your marks to trace how digestion prepares molecules for absorption.

What Happens to a Bean-and-Avocado Wrap?

1. A bean-and-avocado wrap contains starch in the tortilla, proteins in the beans, and fats in the avocado. These macromolecules are too large to cross the lining of the small intestine intact. Digestion cuts them into smaller molecules that cells can take in. As you chew, salivary amylase starts breaking starch into shorter sugar chains. Chewing also mixes food with saliva, giving the enzyme access to more starch. After you swallow, stomach acid slows salivary amylase. In the stomach, acid unfolds some proteins and activates pepsin, an enzyme that cuts proteins into shorter chains called peptides.

2. The partly digested wrap enters the small intestine, where enzymes from the pancreas continue the work. Pancreatic amylase cuts remaining starch into smaller sugars. Pancreatic proteases, including trypsin, cut protein chains into shorter peptides. The pancreas also releases lipase, which breaks fats into fatty acids and monoglycerides. Bile from the liver is not an enzyme: it spreads large fat droplets into tiny droplets so lipase can reach more fat. Each enzyme acts on particular molecules, so one enzyme cannot finish every job. Even after pancreatic enzymes act, some sugar and peptide pieces still need further digestion before cells can absorb them.

3. At the surface of the small intestine, enzymes attached to the lining finish many cuts. Maltase breaks maltose, a two-sugar product of starch digestion, into glucose. Other lining enzymes break small peptides into amino acids. Cells in the intestinal lining absorb glucose and amino acids, which enter nearby blood vessels. Fatty acids and monoglycerides enter lining cells, where most are rebuilt into fats and packaged into particles that move into lymph vessels before reaching the blood. Thus, enzymes make absorbable pieces, but the lining cells and vessels carry those pieces away. Without enough of an enzyme, less of its target macromolecule gets broken down and absorbed.

2 ANSWER WITH EVIDENCE

Use the passage

1. Why does starch digestion in the wrap involve both salivary amylase and pancreatic amylase?

2. Explain how stomach acid and pepsin begin protein digestion and why the process must continue in the small intestine.

3. Why does bile help lipase digest the avocado fat even though bile is not an enzyme?

4. Explain how enzymes at the intestinal lining help products of starch and protein digestion enter the blood.

3 YOUR TURN

Your own words

A student eats rice, tofu, and olive oil but has very little pancreatic lipase. In one paragraph, predict which part of the meal will be hardest to absorb, explain why bile cannot replace the missing enzyme, and compare this with how one other part of the meal is digested and absorbed.

Inside a Wrap

PART 1 · READ AND MARK

Underline each named enzyme and circle the food molecule it cuts. Use your marks to trace how digestion prepares molecules for absorption. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	Why does starch digestion in the wrap involve both salivary amylase and pancreatic amylase?	**Salivary amylase starts cutting starch during chewing. Pancreatic amylase cuts remaining starch after the food enters the small intestine.**
2	Explain how stomach acid and pepsin begin protein digestion and why the process must continue in the small intestine.	**Stomach acid unfolds some proteins and activates pepsin, which cuts proteins into peptides. Pancreatic proteases cut the peptides further, and lining enzymes produce amino acids that cells can absorb.**
3	Why does bile help lipase digest the avocado fat even though bile is not an enzyme?	**Bile spreads fat into tiny droplets, giving lipase access to more fat. Lipase, not bile, cuts the fat into fatty acids and monoglycerides.**
4	Explain how enzymes at the intestinal lining help products of starch and protein digestion enter the blood.	**Maltase cuts maltose into glucose, and other lining enzymes cut small peptides into amino acids. Lining cells absorb these products, which enter nearby blood vessels.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

The olive oil would be hardest to absorb because it contains fat, and too little pancreatic lipase means fewer fat molecules are split into fatty acids and monoglycerides. Bile can spread fat into tiny droplets, but it cannot cut the fat molecules itself. Amylase can still cut the rice starch, and lining enzymes can finish breaking its sugar pieces into glucose. Lining cells absorb that glucose into nearby blood vessels, while fewer products of fat digestion are available to enter the lining cells.

Accept explanations that connect a named enzyme to its target, the smaller products it makes, and absorption. For Part 3, students may compare olive oil with either rice or tofu if they explain that bile cannot perform lipase's cutting action.