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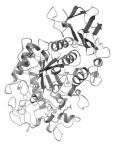
The Digestion Of Rice

Science Inquiry

Introduction

For many cultures in the world rice is a staple food because of its accessibility, affordability and versatility. An estimated 3.5 billion people eat rice as a staple in their diet ***(National Geographic 2022)***. Rice is a common source of protein, enriched with carbohydrates. This inquiry will explore how rice is digested in the body.

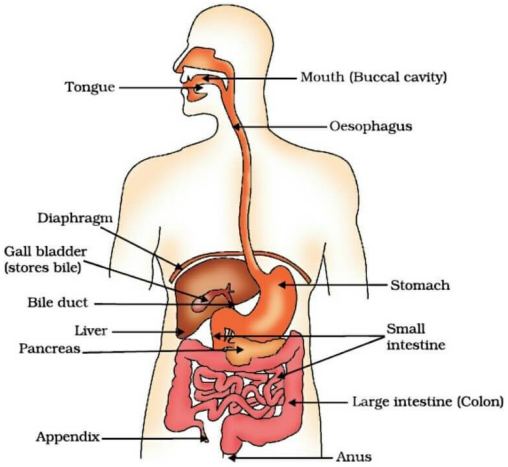
Mouth and Oesophagus



The moment food is placed in the mouth, the process of digestion starts. When rice is in the mouth an enzyme called salivary amylase is triggered. This enzyme aids digestion by assisting in the breakdown of food into smaller molecules for more efficient metabolism; it also is what makes us able to taste. The tongue's role is to mix the rice with the saliva . The teeth chew and grind the rice in a process called mastication which forms the food into a ball shape called bolus. The bolus is moved by the tongue to the Pharynx then along into the oesophagus. Once the rice is in the oesophagus its muscles will contract to push the rice bolus down into the digestive tract this process is called peristalsis.

Stomach

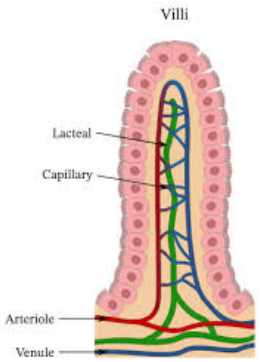
It takes between 30 and 60 minutes for the stomach to digest rice. Once the bolus of rice enters the stomach it will go through mechanical and chemical processes. In chemical processing it will be mixed with gastric secretions (stomach acid). The acid contains hydrochloric acid which breaks down the rice. The other two main secretions in the acid are mucous and pepsinogen. Mucous coats the inside of the stomach to protect it from the acid and pepsinogens break down the rice proteins. Rice proteins are mainly gluten and other prolamins, not all of it is able to be broken down by the stomach. Mechanically the stomach uses smooth muscles to churn the rice, which is now liquidised, into the small intestine.



Small Intestine

Villi

Villi are hair-like structures covered in cells located within the small intestine. They increase the surface area of the cells, allowing them to absorb more nutrients. Villi are further covered in microvilli again increasing surface area. The villi's role in the digestive system is to transfer nutrients into the bloodstream to give the body energy. The sugars and amino acids from the rice are transferred through cellular transportation through epithelium cells into the blood capillary located inside the villus. The lacteal within the villus absorbs the fatty acids and glycerol that cannot enter the bloodstream.



Duodenum

In the duodenum, pancreatic juice is secreted from the pancreas through the pancreatic duct. This juice is made from alkaline and digestive enzymes. It mixes with bile released from the gallbladder and intestinal juice which also breaks down the rice and neutralises hydrochloric acid. Amylase enzymes break down the rice starches into sugars for energy. Along with the chemical digestion mechanical digestion also happens minorly in the duodenum through peristalsis.

Jejunum

The second part of the small intestine is the jejunum. This section is responsible for absorbing the remaining nutrients including sugars, amino acids and fatty acids. The jejunum is lined with ilium that absorb and secrete substances. They secrete digestive enzymes and mucus to further break down the food.

Ileum

The ileum is the last and longest part of the small intestine. Just like the rest of the intestine it breaks down the remaining food substances to provide energy for the body. Villi are much less prominent in the ileum as most of the food is digested before it reaches it. The ileum absorbs bile from the food and vitamin b12. The ileocecal junction connects the ileum with the large intestine.

Material Breakdown And Use

Carbohydrate

Rice is predominantly made up of carbohydrates, mostly starch. Starch is further broken down by the body into glucose called amylose and amylopectin. This provides energy for the body and benefits the immune system.

Rice, brown, long-grain, raw

Nutritional value per 100 g (3.5 oz)	
Energy	1,548 kJ (370 kcal)
Carbohydrates	77.24 g
- Sugars	0.85 g
- Dietary fiber	3.5 g
Fat	2.92 g
Protein	7.85 g
Water	10.37 g
Thiamine (vit. B_1)	0.401 mg (35%)
Riboflavin (vit. B_2)	0.093 mg (8%)
Niacin (vit. B_3)	5.091 mg (34%)
Pantothenic acid (B_5)	1.493 mg (30%)
Vitamin B_6	0.509 mg (39%)
Folate (vit. B_9)	20 µg (5%)
Calcium	23 mg (2%)
Iron	1.47 mg (11%)
Magnesium	143 mg (40%)
Manganese	3.743 mg (178%)
Phosphorus	333 mg (48%)
Potassium	223 mg (5%)
Sodium	7 mg (0%)
Zinc	2.02 mg (21%)

Thiamin (Vitamin B1)

This vitamin helps with the bodies metabolism

Zinc

Zinc helps the body fight off viruses and bacteria as well as helping with development and growth.

Phosphorus

Phosphorus or phospholipids are the body's key energy source. It also helps with growth, repair and maintenance.

Magnesium

Magnesium helps to regulate the body's nervous and muscle system as well as blood sugar levels.

Large Intestine

Once the food goes through the ileocecal valve it enters the ascending colon, the first part of the large intestine. As the now mostly digested rice (chyme) travels through the large intestine electrolytes, water, dead cells and fibre are absorbed through the intestinal wall. This occurs through osmosis. This process turns the chyme into stool. The stool travels through the transverse, descending and sigmoid colon before reaching the rectum.

Elimination And Faeces

After the stool has made its way through the colon it is stored in the rectum. As the amount of stool grows in the rectum it expands. This expansion sends nerve signals to the brain telling you to find a bathroom. Voluntarily your body will use parelastic movements from the rectum to excrete the faeces through the anus.

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