



# NEET Biology

## Short Notes

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## DIGESTION AND ABSORPTION

### Introduction

The humans show tube-within-tube type of body plan. The bones and the muscles make-up the outer tube and the organs of alimentary canal make up the inner tube, made up of several parts that allow ingestion, digestion, absorption, assimilation and egestion of the food.

### Organs and Accessory Glands of the digestive system

Mouth (Buccal Cavity)	Teeth	They perform the mastication of food.
	Tongue	It allows saliva to mix-up with ingested food. It also helps in swallowing
	Salivary Glands	These secrete saliva containing the salivary amylase, water and ions and helps in digestion of starch.
Oesophagus		It moves the bolus from the mouth to the stomach through the peristaltic movements.
Stomach		It stores the food for 4-5 hours and digests the proteins.
Intestines	Small Intestine	These are the sites of major digestion and absorption of the food. The acidic food coming from the stomach is subjected to alkaline environment to proceed with chemical digestion.
	Large Intestine	It absorbs the water and stores the undigested food in the form of faecal matter
Anus		It ejects the faecal matter out of the alimentary canal.
Pancreas	Acini Cells	The exocrine region called the Islet of Langerhans secretes the pancreatic juice containing digestive enzymes. These bring about the digestion of food in the duodenum, jejunum and ileum of the small intestine.
Liver	Gall Bladder and Hepatocytes	The bile is made in hepatocytes and stored in gallbladder. Bile helps in digestion of fats through emulsification.

### Histology of the Alimentary Canal:



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Starting from the oesophagus, stomach, intestines and anus, there are the following layers that can be seen from the body wall to the lumen of the alimentary canal:

1. Outer most layer is called Visceral Peritoneum (serosa).
2. It is followed by the Muscularis, that contains two layers of muscles as circular and longitudinal. In stomach, additional oblique muscles can be seen.
3. It is followed by Sub-Mucosa having the blood vessels and nerves.
4. It is followed by the Mucosa having epithelial layer and lamina propria.

### Hormonal Control of Digestion

The enteroendocrine glands are those endocrine glands that are present in the organs of alimentary canal. They exercise the hormonal control over the process of digestion through the following hormones:

HORMONES	GLAND	FUNCTION
Gastrin	G-Cells in the pyloric region of the stomach	<ul style="list-style-type: none"> <li>• Arrival of bolus in the stomach stimulates the secretion of gastrin. The role of gastrin is to allow the secretion of HCl by the parietal cells of the gastric glands present in the mucosa of the stomach.</li> <li>• The low pH after a while will send feedback to stop the secretion of gastrin.</li> </ul>
Secretin	Intestinal glands	<ul style="list-style-type: none"> <li>• It is released in response to the incoming acidic chyme from the stomach.</li> <li>• The bicarbonates from the pancreas are made to release by it and maintains the alkaline medium in the small intestine.</li> </ul>
Cholecystokinin (CCK)	Intestinal Glands	<ul style="list-style-type: none"> <li>• It acts on the gallbladder in response to the acidic chyme and the amount of fats.</li> </ul>



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		<ul style="list-style-type: none"> <li>It allows the release of stored bile from the gallbladder.</li> </ul>
Gastric Inhibitory Peptide (GIP)	Intestinal Glands	It acts on the stomach and inhibits the churning so that the emptying of stomach can be slowed down and fats can be digested in the regions of small intestine.
Motilin	Intestinal Glands	It speeds-up the peristalsis and also allows chief cells to release the pepsinogen.
Ghrelin	Gastric Glands	It signals the hunger to the pituitary gland.
Insulin	Pancreas	It decreases the level of glucose absorbed by the blood from the small intestine.

### Absorption of Digested Products

After the breakdown or digestion of the food in the small intestine, the nutrients are made to be taken up by the blood and lymph through a process called absorption. The small intestine shows the finger-like projections in the mucosa, called the villi. Each villus is supplied with the blood vessels and lacteals to perform the absorption. Jejunum is the main absorptive area of the small intestine. The iron absorption is restricted to the duodenum and Vitamin B12 is majorly absorbed in jejunum.

### Absorption of Glucose and Fructose

The glucose which is produced after digestion in the small intestine is taken up by the mucosa through sodium-dependent transporter protein called SGLUT. From the epithelial cells, the glucose moves to the underlying blood vessels.

Fructose is absorbed from the lumen into the cells through GLUT proteins. It does not need sodium ions for absorption.

### Absorption of Fatty Acids

Fatty acids are absorbed by the lacteals (lymphatic vessels). The fatty acids form the micelles which get surrounded by the proteins, so forming the chylomicrons. These are taken in by the lacteal, absorbed in the lymph and released in the blood later.

### Absorption of Amino Acids

Amino acids are absorbed by the activity of sodium-dependent transporter proteins. The dipeptides are transported along with the H<sup>+</sup> ions.

### Energy-yielding Nutrients and their Deficiency Disorders

NUTRIENTS	SOURCE	DEFICIENCY DISORDERS
Carbohydrates (ATP giving food)	Cereals, Millets, Fruits, Honey, Nuts etc.	1. Hypoglycaemia, resulting in tiredness, weakness, etc.



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		2. Ketosis, resulting in joint-pain, kidney stones etc.
Proteins (Body Building food)	Pulses, Milk, Eggs, Meat etc.	1. Marasmus, resulting in growth retardation, muscle wasting, diarrhoea etc. 2. Kwashiorkor, resulting in oedema, mental retardation etc.
Fats	Butter, Fish oil, Vegetable oil etc.	1. Scaly dermatitis 2. Bone disorders

### Vitamin Deficiency Disorders

Vitamins are not needed in ample amounts but their small concentration is essential for normal physiological performance of the body. The different vitamins and their deficiency disorders are tabulated below:

VITAMINS	SOURCE	DEFICIENCY DISORDERS
Vitamin-A	Carrots, meat, eggs and cheese etc.	1. <b>Night blindness</b> : reduced vision in dim light. 2. <b>Xerophthalmia</b> : build-up of keratin and drying up of cornea; blindness. 3. <b>Squamous Metaplasia</b> : replacement of squamous epithelium from the respiratory and urinal tract to keratinized epithelium.
Vitamin B-Complex: Vitamin B1- Thiamine Vitamin B2- Riboflavin Vitamin B3- Niacin Vitamin B6- Pyridoxine Vitamin B5- Pantothenic Acid Vitamin B7- Biotin Vitamin B9- Folic Acid	Sunflower seeds, Yeast, spinach, cereals, eggs, meat etc.	Vitamin B1 deficiency: <b>Beriberi</b> - affects heart and nerves; paralysis  Vitamin B2 deficiency: <b>Cheilosis</b> - drying and cracking of lining of mouth. <b>Seborrheic dermatitis</b> - scaly scalp, dandruff, itching.  Vitamin B3 deficiency: <b>Diarrhoea, Dermatitis, Pellagra</b>  Vitamin B6 deficiency: <b>Microcytic anaemia, Dermatitis</b>



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Vitamin B12- Cobalamin		Vitamin B12 deficiency: <b>Pernicious anaemia</b> - inability to synthesize RBCs.
Vitamin C (Ascorbic Acid)	Citrus fruits, Green peppers, tomatoes etc.	<b>Scurvy</b> : bleeding gums, falling of teeth, haemorrhage, healing defects
Vitamin D (Calciferol)	Made in body from the precursor in skin.	<b>Rickets</b> : derangement of bones in children. <b>Osteomalacia</b> : derangement of bones in adults.
Vitamin E (Tocopherol)	Fruits, vegetables and nuts	<b>Heart and skin disorders</b>
Vitamin K (Phylloquinone)	Green leafy vegetables, eggs, milk etc.	<b>Defect in blood coagulation, haemorrhage</b>

### Disorders of the Digestive System

1. Gastroesophageal Reflux Disease (GERD): Acid reflux into the oesophagus resulting in burning sensation, tooth decay, nausea and chest pain. In severe cases, surgery is performed for treatment. Normally, avoidance of oily foods and carbonated drinks brings relief to the situation.
2. Gallstones: When bile contains a fair concentration of cholesterol and when the gallbladder remains filled with bile for longer duration, stones can develop. The treatment occurs through medications and surgical removal of the gallbladder.
3. Crohn’s Disease: It affects the ileum and causes bleeding, diarrhoea, weight loss etc. It is a congenital disorder. Treatment occurs through the immunosuppressants and surgery
4. Ulcerative Colitis: It is an illness of large intestine. The symptoms include the blood in stool, abdominal pain and diarrhoea. It is treated with surgical removal of affected colon.
5. Haemorrhoids: It occurs due to the inflammation of the blood vessels of the digestive system. The symptoms include constipation, blood in stool, abdominal pain and sometimes diarrhoea. The surgical process called haemorrhoidectomy is performed as a treatment in severe conditions.

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