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B5 Animal nutrition

B5.01 Diet

Diet: food an animal eats => balanced diets => make energy

- Carbohydrates
- Protein
- Fats
- Vitamins
- Minerals
- Water
- Fibre

Nutrients

1. Vitamins

Vitamin	Foods	needs	Deficiency
C	Oranges, limes	To make stretchy protein collagen Keep tissues in good repair	Scurvy Bleeding gum
D	Butter, egg yolk, sunlight	Helps calcium to be absorbed for making bones and teeth	rickets Bones become soft

2. Minerals

Inorganic substances, small amount needed

Mineral	Foods	needs	Deficiency diseases
Ca	Milk, bread	For bones and teeth For blood clotting	Brittle bones and teeth Poor blood clotting
Fe	Liver, red meat	For making haemoglobin	anaemia Oxygen delivery x

3. Fibre

- Help to keep alimentary canal working properly(소화관)
- Needs for **peristalsis** => muscle contract and squeeze
- Keeps the digestive system in good working order and helps to prevent constipation(변비)
- Fruits, vegetables have a lot
 - Plant have cellulose - human can't digest
- Cereal, grain, oats, wheat

4. Fat and heart disease

- Fat deposits build up on the inside of arteries - make narrower
- **Coronary heart disease**
 - If happens in coronary arteries -> not enough blood can get through
 - Heart muscle run short of oxygen and cannot work properly
- How to prevent
 - Avoid saturated fat products(dairy products)
 - Vegetable & fish oil is ok

5. Obesity

- Get more energy than use

- Higher chance for heart disease
- Joint & knee problems
- How to prevent - Eat balanced meals with regular exercise

6. Starvation and malnutrition

- Starvation => **malnutrition**
- **Kwashiorkor** - lack of protein in the diet (thin but swollen stomach)
- Caused by poverty
- **Marasmus** - body weight much lower than normal

B5.02 Digestion

ORDER OF digestion

1. Ingestion - food is taken into the alimentary canal
2. Digestion - large insoluble molecules of food are broken down to smaller molecules
3. Absorption - small molecules are absorbed into the blood
4. Egestion - food which could not be digested or absorbed is removed from the body

Digestion of fat

1. Teeth break down large pieces into smaller ones
2. **Bile** salts break down large drops of fat into smaller ones
3. **Lipase** breaks down fat molecules to **fatty acid and glycerol** molecules

Digestion of proteins

1. Teeth break down large pieces of food into smaller ones
2. Water in digestive juices dissolves some food
3. **Protease** break down protein to **polypeptide** molecule
4. **Peptidase** break down polypeptides to **amino acid**

Carbohydrate

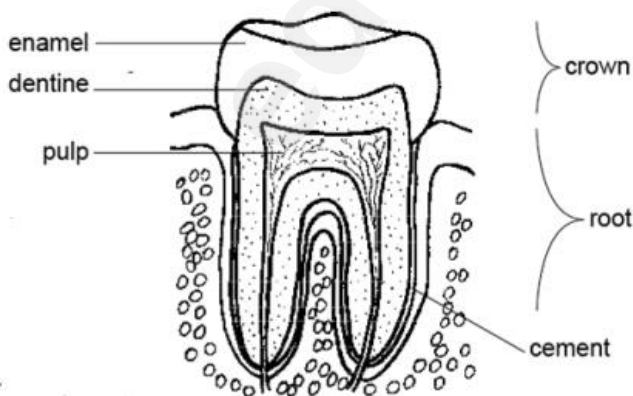
1. Teeth break down large pieces of food into smaller ones
2. Water in digestive juices dissolves some food - starch molecule
3. **Amylase** breaks starch to **maltose**
4. **Maltase** breaks maltose to **glucose**

1. Mechanical and chemical digestion

- **Mechanical digestion** - breakdown of food into smaller pieces
 - broken by teeth, churning movements of alimentary canal
- **Chemical digestion** - large molecules are broken down into small one
 - Enzymes are involved

B5.03 Teeth

Teeth: Chop&crush&grind - give food larger surface area & dissolved easily - react with enzyme well



- **enamel** : hardest substance made by animals
 - Dissolved by acids
- **Dentine**: like bone
 - Having living cytoplasm
- **Pulp cavity**: contain nerves, blood vessels
 - Supply dentine with food & oxygen
- **Cement** - fibres growing out of it
 - Attach tooth to the jawbone
 - Allot teeth to move slightly

1. Types of teeth

INCISOR	CANINE	PREMOLAR	MOLAR
			
Rectangular shape, sharp for cutting and biting	Sharp-pointed for holding and cutting	Blunt for chewing and crushing	Blunt for chewing and crushing. Two roots

2. Dental decay

Plaque: bacteria + saliva -> form sticky film

- Easy to remove at first, but hardens afterward

Process

1. Particles of sugary foods get trapped in cracks in the teeth
2. Bacteria feeding on the sugar form acids, which dissolve a hole in the enamel and dentine
3. There are nerves in the pulp cavity, so the tooth becomes very painful
4. Infection can spread rapidly through the pulp cavity

How to prevent

1. Do not eat too much sugar
2. Use fluoride toothpaste regularly - make teeth more resistant to decay
3. Go dentist

B5.04 The alimentary canal

1. The mouth

- Teeth bite and grind the food into a smaller pieces, increasing its surface area
- Saliva from salivary glands
 - Has the enzyme **amylase**: starch => maltose
- Mucus - helps the food to bind together and slide easily down the esophagus

2. The oesophagus

- Takes food down to the stomach
- **epiglottis**

3. The stomach

- Has strong, muscular walls
- Muscle - contract and relax to mix food with enzymes and mucus
 - Mixture = **chyme**
- **Pepsin** - proteins to polypeptides
 - Work in acid condition - help kill bacteria
 - Protect from harmful microorganism
- Store food for long time

4. The small intestine

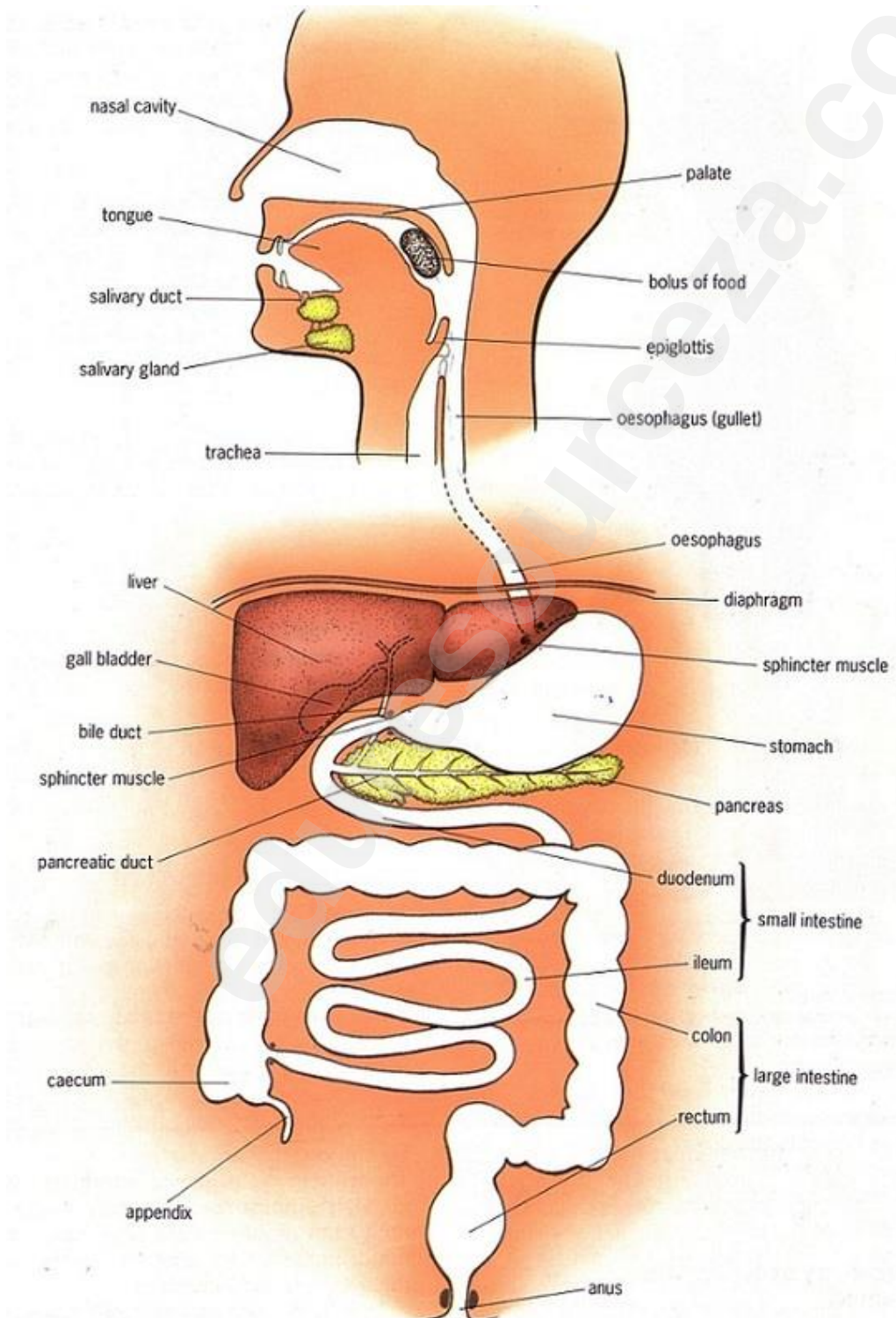
- Enzymes stored in **pancreas**

- Pancreatic duct leads juice into the duodenum
 - **Amylase:** starch => maltose
 - **Trypsin:** protein => polypeptide
 - **Lipase:** fats => fatty acids & glycerol
- Have hydrogencarbonate to neutralise the acid

5. Bile

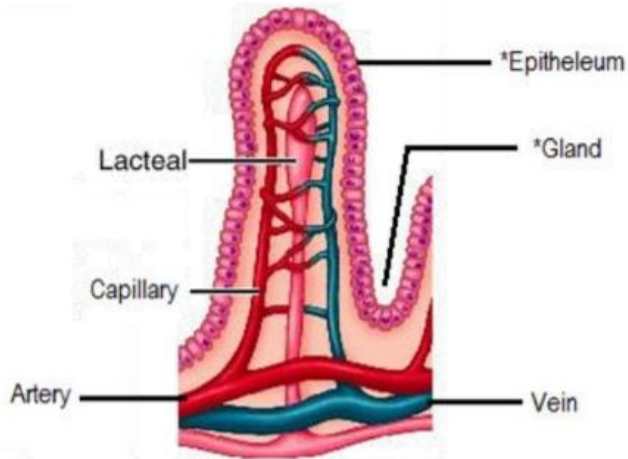
- Neutralise the acidic mixture from the stomach - sodium hydrocarbonate
- Made in the liver, stored in gall bladder, flows to the small intestine
- No enzyme, but help digest fat => **emulsification**
 - Break large drops of fat into very small ones
 - Increase surface area - lipase work more efficiently

The human digestive system



6. Villi

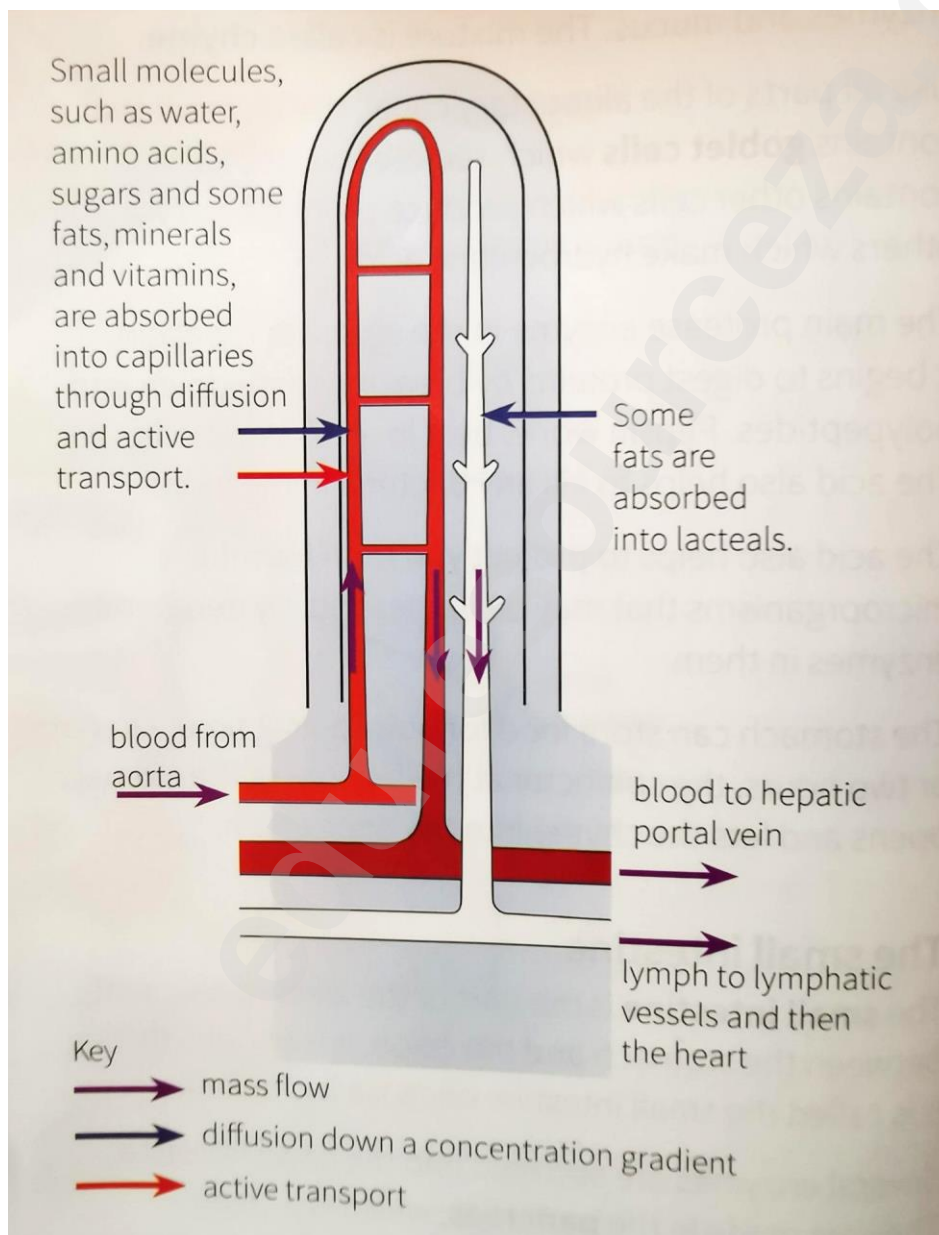
- Inner wall of the small intestine is covered with villi



- Cells covering the villi make enzymes
- Enzymes stay close, complete digestion of food
 - **Amlyse:** starch => maltose
 - **Protease:** polypeptide => amino acids
 - **Lipase:** fats => fatty acids & glycerol
- Goblet cell - makes mucus
- Lacteal - absorb digested fats

7. Absorption of digested food

Absorption: amino acids, simple sugars, fatty acids and glycerol are enough small to pass through the wall of small intestine into the blood



Feature	How this helps absorption
Very long	Gives time for digestion to be completed

	Absorption slowly
Has villi, and each is covered with numerous microvilli	Gives small intestine very large surface area Larger surface area - faster nutrients absorbed
Contain blood capillaries	exchange
Contain lacteal	Fats are absorbed into lacteals
Have walls only one cell thick	Digested nutrients can easily cross the wall

8. The large intestine

- In colon, more water and salt are absorbed
- In rectum, all indigestible food remains, **egestion**

9. Assimilation

- Nutrients are absorbed in small intestine, then goes to liver
- Some can be broken down, some converted into other substances, some stored

Where	Digestive juice	Enzymes	substrate	Products	Other things in juice	Function of other substances
mouth	Saliva from Salivary glands	Salivary amylase	starch	maltose	HCO_3^-	Alkaline
stomach	Gastric juice from glands n wall of stomach	Pepsin (protease)	proteins	peptides	HCl	Acidic Kill bacteria
Small intestine (duodenum)	Pancreatic juice from pancreas	Pancreatic amylase trypsin(protease) lipase	Starch Peptides Emulsified fats	Maltose Amino acid Fatty acids & glycerol	HCO_3^-	Neutralise chyme Alkali
	Bile from liver (stored in Gall bladder)				HCO_3^- Bile salts	Emulsify fats
Small intestine (ileum)	Intestinal juice From cells on villi	maltase	Maltose	Glucose		