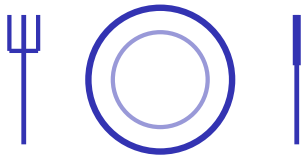
Human Nutrition

IGCSE Biology ▪ Topic 7

IGCSE Biology



What we will cover

1. A balanced diet
2. The digestive system
3. Teeth & physical digestion
4. Enzymes & chemical digestion
5. Stomach acid & bile
6. Absorption & villi

teeth and physical digestion

A balanced diet

A balanced diet supplies all nutrients

Vitamins and deficiency

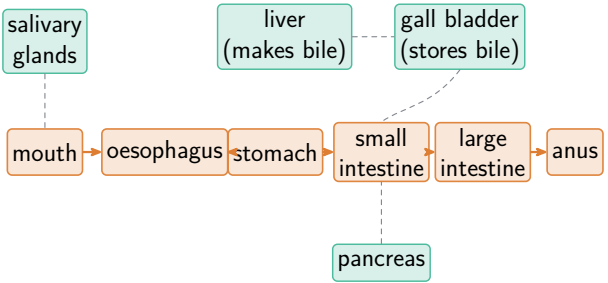
vitamin C

fruit & veg; shortage → **scurvy** 坏血病

vitamin D

helps absorb calcium; shortage → **rickets** 佝偻病

The digestive system

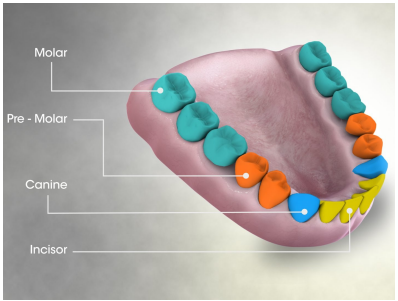


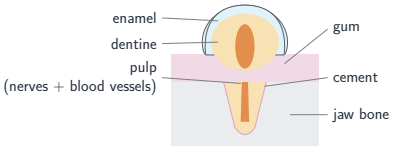
Food travels the **alimentary canal** 消化道: mouth → **oesophagus** 食道 → **stomach** 胃 → **small intestine** 小肠 → **large intestine** 大肠. The **liver** 肝脏, **pancreas** 胰腺 & glands add juices.

Five processes

Take in → break down → into blood → used by cells → waste out. Egestion (faeces) is not excretion.

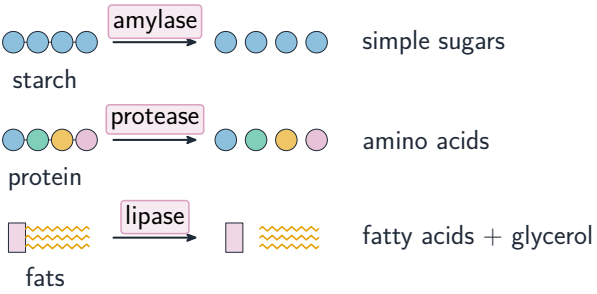
Teeth and physical digestion





Incisors 门齿 cut, **canines** 犬齿 tear, **premolars** 前臼齿 & **molars** 臼齿 grind. A tooth: hard **enamel** 牙釉质 over **dentine** 牙本质, a soft **pulp** 牙髓. Chewing makes more surface for enzymes.

Enzymes and chemical digestion



Enzymes break big **insoluble** 不溶性 molecules into small **soluble** 可溶性 ones:

- **amylase** 淀粉酶: starch → sugars
- **protease** 蛋白酶: protein → amino acids
- **lipase** 脂肪酶: fat → fatty acids + glycerol

Stomach acid and bile

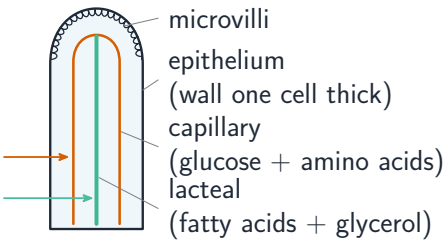
stomach acid

hydrochloric acid 盐酸
kills microbes & sets a low pH for **pepsin** 胃蛋白酶

bile 胆汁

emulsifies 乳化 fat (more surface) & neutralises the acid

Absorption and villi



a villus (huge surface area for absorption)

Millions of **villi** 绒毛 line the small intestine.

- huge surface area; wall one cell thick
- **capillaries** 毛细血管 take glucose & amino acids
- a **lacteal** 乳糜管 takes fats

Worked example – matching enzyme to food

A person's pancreas makes no lipase. Which food is affected, and what is seen?

- Lipase digests fats: fat → fatty acids + glycerol.
- No lipase ⇒ fat is not broken into small enough molecules to absorb.
- Undigested fat stays in the gut and passes out in the faeces.
- Starch and protein are unaffected – amylase and protease still work.

Three to know: amylase starch → maltose; protease protein → amino acids; lipase fat → fatty acids + glycerol.

Topic 7 – key takeaways

1 Diet

vitamin C → scurvy; vitamin D → rickets

2 Processes

ingest, digest, absorb, assimilate, egest

3 Enzymes

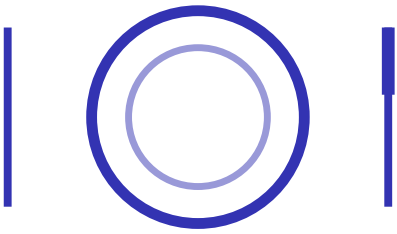
amylase, protease & lipase make it soluble

4 Villi

big surface, thin wall – fast absorption

Check yourself

1. Which deficiency causes scurvy?
2. Which process is NOT excretion: egestion or sweating?
3. What does lipase break fat into?
4. Why do villi have a thin wall?



Answers **1.** too little vitamin C **2.** egestion **3.** fatty acids & glycerol **4.** a short distance for fast absorption