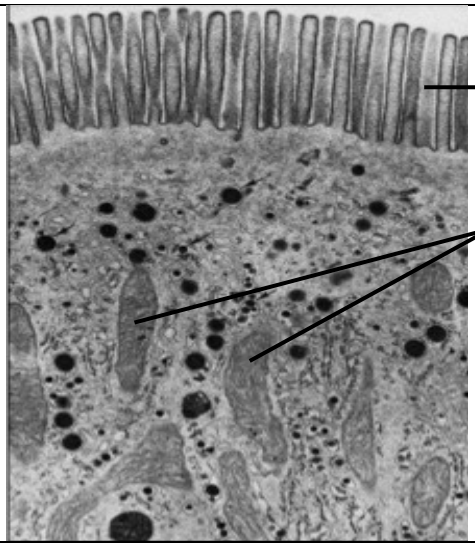
1. GLANDS

- There are **two** types of gland: **exocrine** and **endocrine**.
- **Exocrine** glands **secrete** through a **duct** onto the **surface** of the **body** or **into** the **gut lumen**.
- **Endocrine** glands are **ductless** and **secrete hormones** directly into the **blood**.

EXOCRINE GLANDS SECRETE DIGESTIVE JUICES

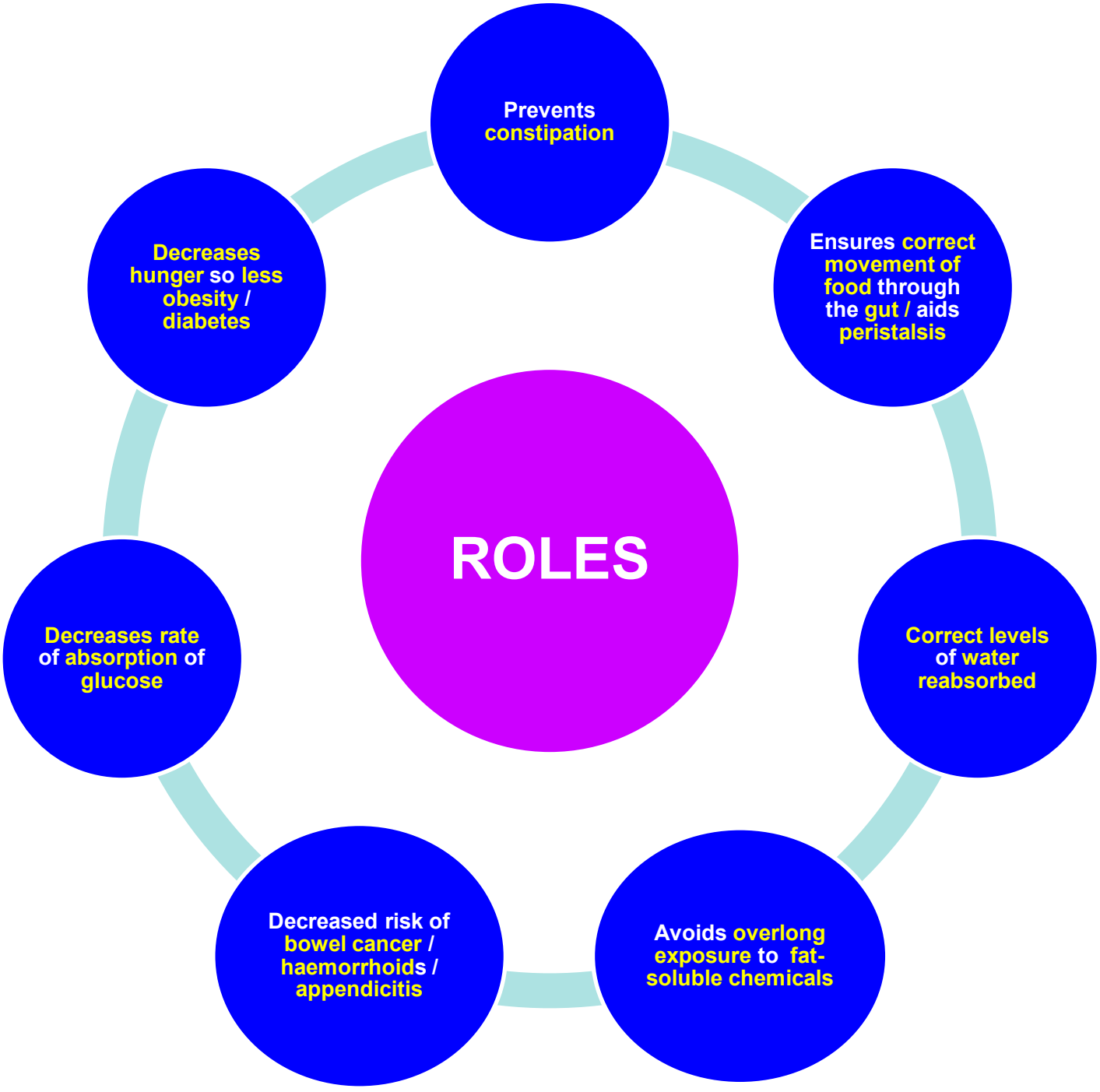
2. ULTRASTRUCTURE OF EXOCRINE GLAND CELLS & VILLUS EPITHELIAL CELLS

EXOCRINE GLAND CELLS	VILLUS EPITHELIAL CELLS
	
• Large numbers of **rough endoplasmic reticulum** for **protein (enzyme) synthesis** • Large numbers of **Golgi apparatus** for **modifying proteins** • Large numbers of **secretory vesicles** for **exocytosis**	• Large numbers of **microvilli** create a **large surface area** for **fast absorption** of **digested food** • Large numbers of **mitochondria** to produce **lots of ATP** for **fast absorption** of **digested food** by **active transport**

- In exams, do not be 'put off' if a pancreas exocrine gland cell is shown and the **secretory vesicles** are a **different colour**. They could use a different stain, which makes them appear **white**.

3. FIBRE AND FAECES

- **Fibre is not digested or absorbed. It passes through the intestines and is egested.**
- **Examples of fibre: cellulose, lignin, pectin and chitin.**

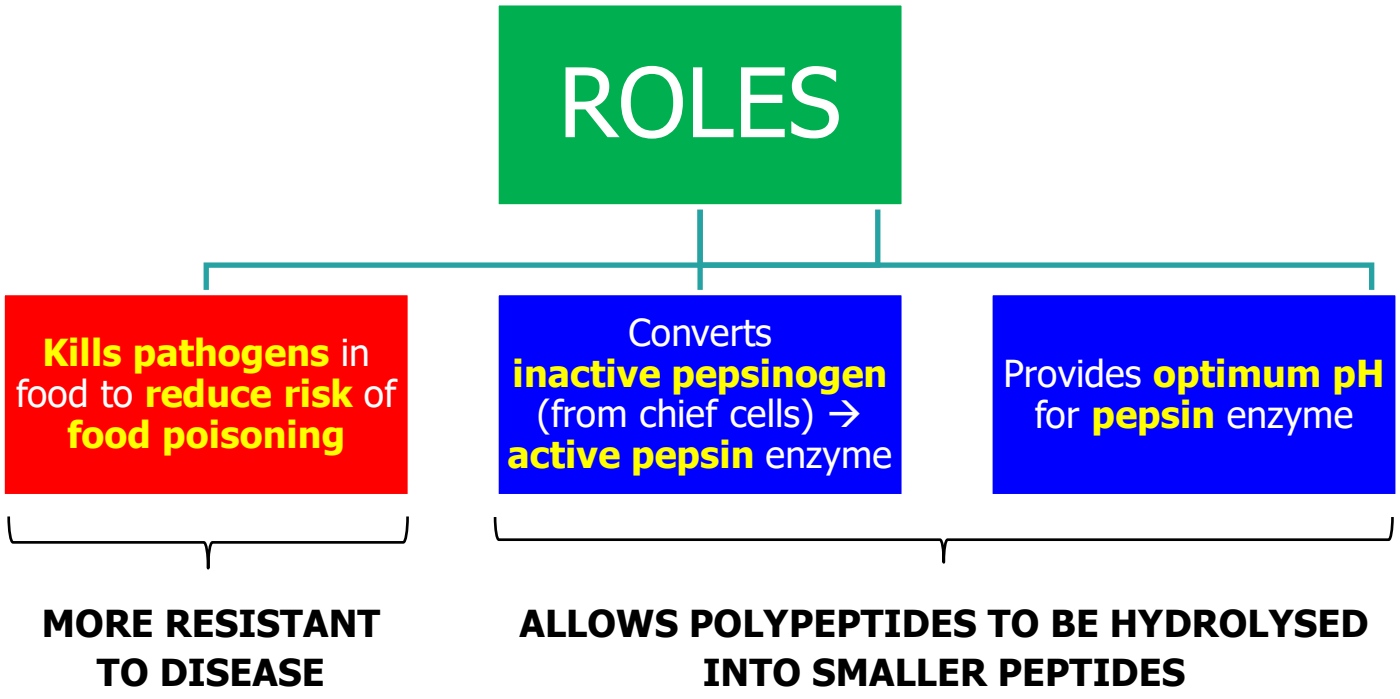


Reasons For A Correlation Between A Low-Fibre Diet & Gastrointestinal Problems

1. The **density/hardness** of the **stool** can make it **harder** to **egest** causing **damage** to **tissues**
2. **Increases constipation** which can put **pressure** on **tissues**
3. **Increases interaction/contact time** with **intestine wall** and **undesirable food chemicals**

4. ROLES OF GASTRIC JUICE

- Secreted by **epithelial cells** that **line** the **stomach**.
- **H^+** ions are secreted by **parietal cells**.
- This makes the stomach acid contents **pH 1-3**.



5. CONTROL OF GASTRIC JUICE SECRETION

- The **volume** and **composition** of **gastric juice** is controlled by **nerves** and **hormones**.
- There are **two** main stages: **gastric juice formation** and **changing** its **composition**.

1. FORMATION OF GASTRIC JUICE

STIMULUS =
sight or **smell**
of **food**

Causes **MEDULLA OBLANGATA** of **BRAIN**

to send electrical impulses along **VAGUS NERVE** to **PARIETAL CELLS** in stomach lining

PARIETAL CELLS

- secrete H^+ (acid) into the stomach
- secrete Na^+ and Cl^- into the stomach

- **solute concentration** in stomach **increases**
- (so) water **enters** the stomach by **osmosis**
- **gastric juice** is **formed**

2. COMPOSITION OF GASTRIC JUICE

STIMULUS
= food enters the stomach

- **chemoreceptors** in **stomach wall** detect **amino acids**
- **stretch receptors** in **stomach wall** detect **stretching** of **stomach**

They send electrical impulses to the **BRAIN**

electrical impulses sent along **VAGUS NERVE** to

ENDOCRINE CELLS
(IN STOMACH/DUODENUM WALL)

- secrete the hormone **gastrin**
- **gastrin** stimulates **further secretion**
  of (a) H^+ by **parietal cells**
  (b) **pepsinogen** by **chief cells**

- The hormones **secretin** and **somatostatin** **inhibit** secretion of **gastrin** if the **pH** falls **too low**.

6. EARLY RESEARCH INTO GASTRIC JUICE (TOK)

- Alexis St. Martin survived a gunshot wound in 1822.
- The wound healed in such a way that **his stomach** could be **accessed** from **outside**.
- William Beaumont, his surgeon, did an experiment with this over **11 years**.
- Food was tied to a string and its **digestion** in the **stomach** was followed.
- It was shown that samples of **food** could be **digested** by **gastric juice** extracted from the stomach.

Beaumont showed that, in the stomach, digestion is chemical as well as physical.

His research is an example of serendipity – it only took place due to a 'lucky' accident.

7. GASTRIC JUICE v PANCREATIC JUICE

GASTRIC JUICE	PANCREATIC JUICE
Produced by **glands in stomach wall**	Produced by **pancreas**
Low pH / acidic	**High pH / alkaline**
Contains **hydrochloric acid**	Contains **HCO_3^-**
Does not contain amylase/lipase	**Contains amylase/lipase**
Contains mucus	**Does not contain mucus**