Human nutrition lecture 3

❖ **Chyle** is an alkaline slurry which contains various nutrients ready for absorption.

❖The nutrients are absorbed and undigested remains are transported to large intestine.

mucosa of large intestine
produces mucus but no enzymes.

Some carbohydrates and proteins do enter the large intestine.

large intestine contains some good bacteria

Function of bacteria

1. To Synthesize several vitamins like vitamins B and vitamin K.

2. Carbohydrates are fermented by bacterial action and hydrogen, carbon dioxide and methane gas are produced in colon

3. Protein digestion in large intestine ends up into production of substances like indole,skatole and H2S

These are the reason for the odour of faeces

Absorption

The passage of end products of digestion through the mucosal lining of alimentary canal into blood and lymph is called absorption.

Absorption takes place by various ways like

1.simple diffusion,

2. osmosis,

3. facilitated transport

4. active transport.

1.simple diffusion

The movement of molécules from region of their
Higher concentration to region of their lower concentration
Without expenditure of energy

Alongconcentration gradient

Absorption of
part of glucose, amino
acids and some electrolytes like chloride ions
are absorbed by simple diffusion depending on
concentration gradient

2. osmosis

It's diffusion of water

Water is absorbed along the concentration gradient.

3. facilitated transport

Facilitated diffusion is the process of spontaneous passive transport of molecules or ions across a biological membrane via specific transmembrane integral proteins.

Some amino acids as well as substances like fructose are absorbed by facilitated transport. In this method, carrier ions like Na+ bring about absorption.

4. active transport.

active transport is the movement of molecules across a cell membrane from a region of lower concentration to a region of higher concentration—against the concentration gradient. Active transport requires cellular energy to achieve this movement.

Some ions are absorbed against concentration gradient.
It requires energy.
This type of absorption of mineral like sodium is called active transport.

About 90% of absorption takes place in the small intestine and the rest in
mouth, stomach and large intestine.

Mouth:

Absorption takes place through mucosa of mouth and lower side of tongue into the blood capillaries. e.g. Some drugs like certain painkillers.

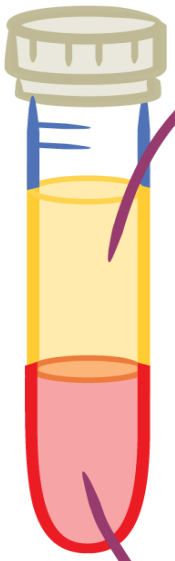
Stomach:

Gastric mucosa is impermeable to most substances hence nutrients reach unabsorbed till small intestine. Little water, electrolytes, alcohol and drugs like aspirin get absorbed in stomach.

Small Intestine:
Glucose, fructose, galactose, amino acids, minerals and water soluble vitamins are absorbed in blood capillaries in villi. Lipids and fat soluble vitamins (A, D, E, K) are absorbed in lacteals.

Large intestine:
Absorption of water, electrolytes like sodium and chloride, drugs and some vitamins

Blood Composition



55% Plasma

- 90% Water
- 10%
  - Proteins
    - Albumin
    - Immunoglobins
    - Fibrinogens
  - Electrolytes
  - Metabolic nutrients
  - Metabolic waste products
  - Hormones

45% Formed Elements

- 98-99% Erythrocytes
- 1-2%
  - Leukocytes
    - Granulocytes
    - Agranulocytes
  - Platelets

lacteal

the lymphatic vessels of the small intestine which absorb digested fats.

Lymph = blood plasma + w.b.c

Digestion of Fats

Buccal Cavity

Saliva contains no lipase, therefore no fat digestion occur in buccal cavity.

Stomach

Gastric lipase hydrolyses only small amount of fat into monoglycerides and fatty acids.

Small Intestine

Fat $\xrightarrow{\text{Bile}}$ Emulsified fat

Emulsified fat $\xrightarrow[\text{lipase}]{\text{Pancreatic}}$ Fatty acid + Diglyceride

Diglyceride $\xrightarrow[\text{lipase}]{\text{Pancreatic}}$ Fatty acid + Monoglyceride

Monoglyceride $\xrightarrow[\text{lipase}]{\text{Pancreatic}}$ Fatty acid + Glycerol

Emulsified fat $\xrightarrow[\text{lipase}]{\text{Intestinal}}$ Monoglycerides + Fatty acids

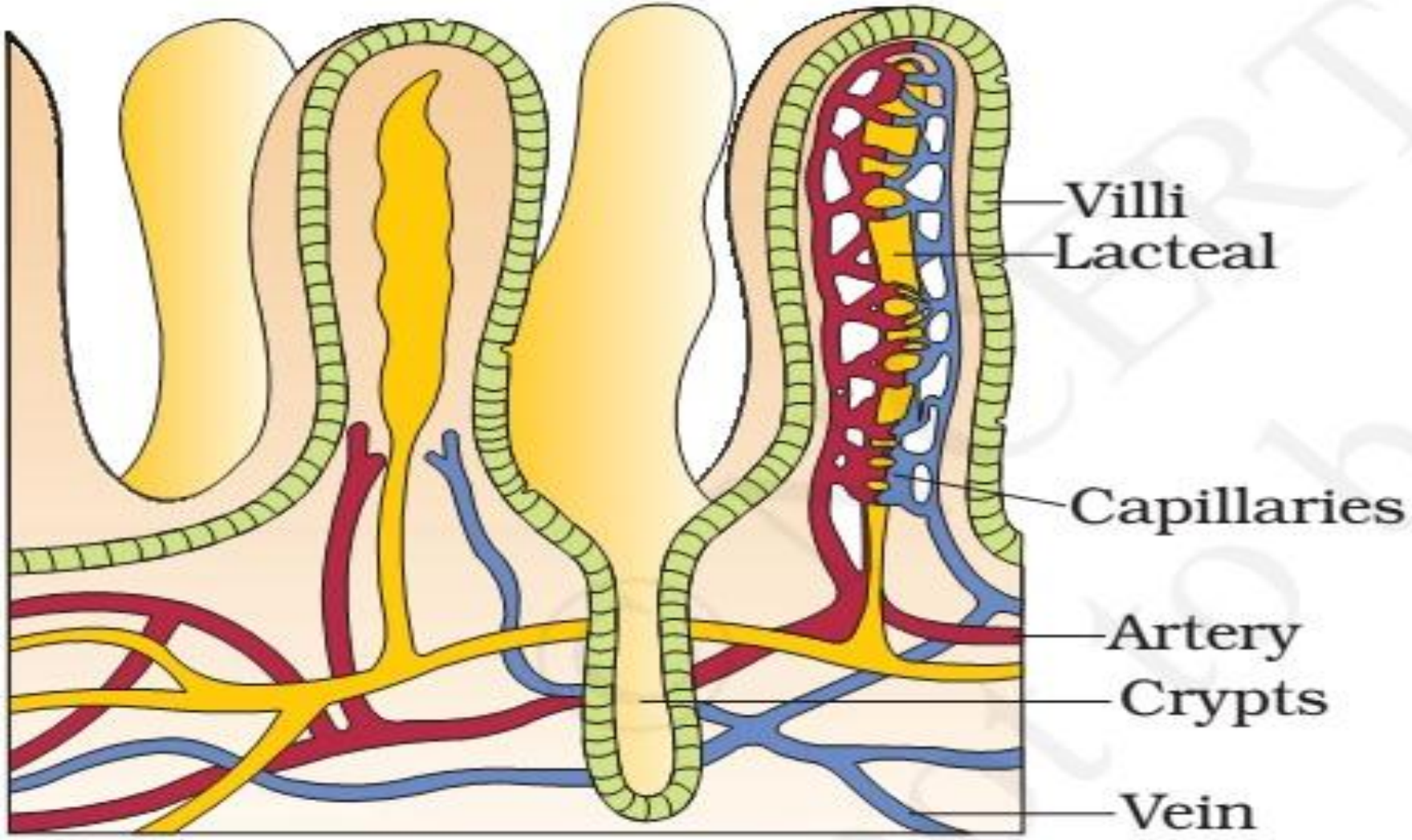
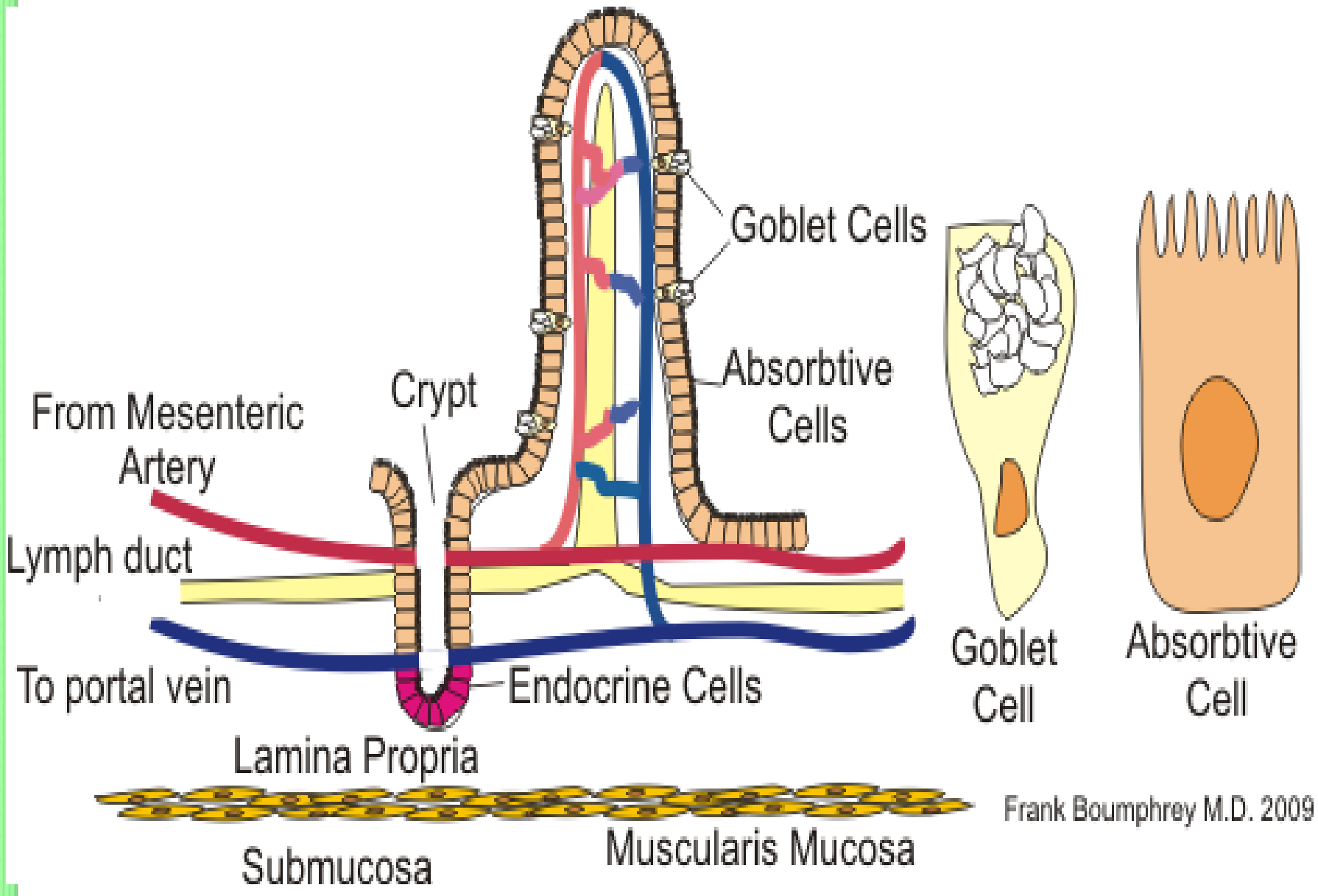
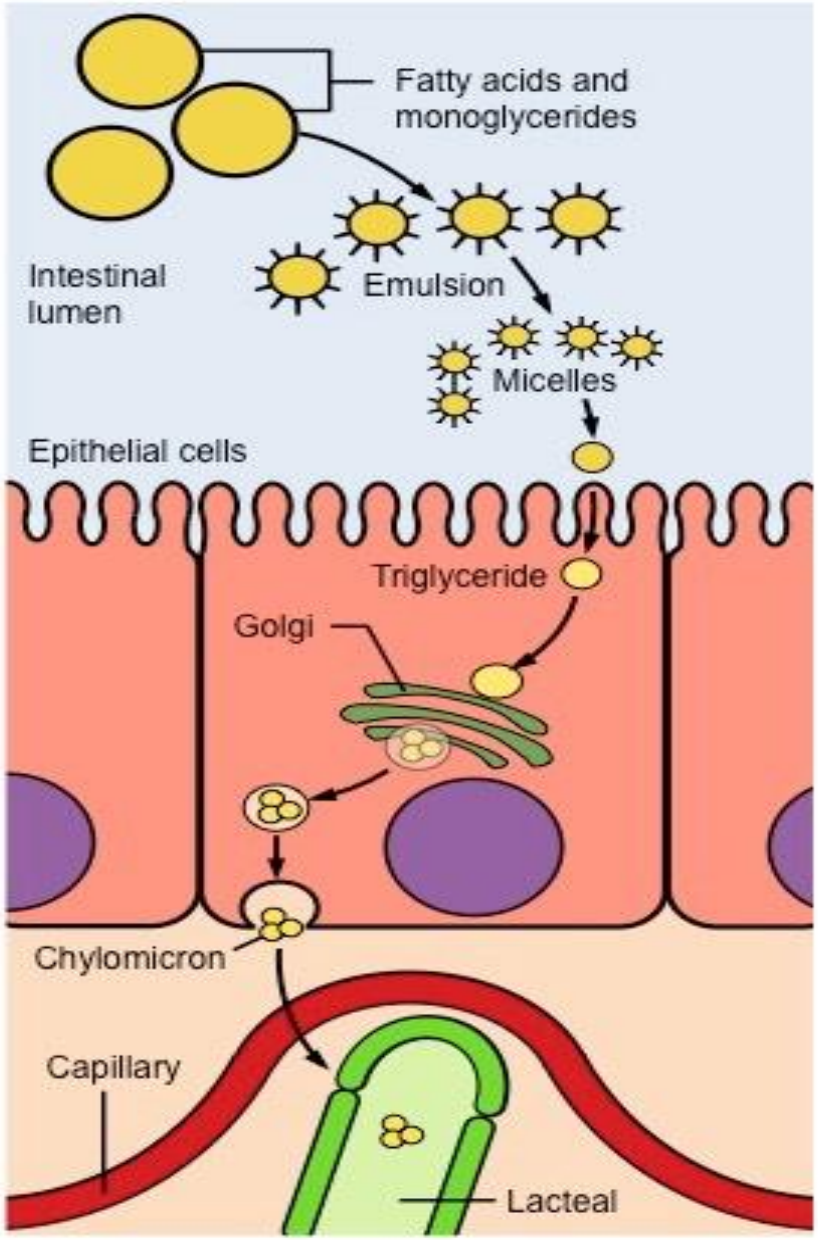


Figure 16.5 A section of small intestinal mucosa showing villi


Goblet Cells
Absorbtive Cells
Crypt
From Mesenteric Artery
Lymph duct
To portal vein
Endocrine Cells
Lamina Propria
Submucosa
Muscularis Mucosa
Goblet Cell
Absorbtive Cell
Frank Boumphrey M.D. 2009



Fatty acids and monoglycerides are emulsified by bile salts to form micelles

Fatty acids enter the epithelial cells and link to form triglycerides

Triglycerides combine with proteins inside the Golgi body to form chylomicrons

Chylomicrons enter the lacteal and are transported away from the intestine

Absorption of fat

1.Monoglycerides and fatty acids can not be absorbed in blood.
2.These dissolve in the centre of spherical aggregates formed by bile salts called micelles.
3 Micelles enter into intestinal villi.
4. Here, they are reformed into chylomicrons.
Chylomicrons are small protein coated fat globules.
5.They are transported into lymph vessels called lacteals.
6. From here, they are transported to blood stream

Assimilation :

The absorbed food material finally reaches the tissue and becomes a part of protoplasm. This is called as assimilation.

Egestion :
Removal of undigested food

Undigested waste is converted to faeces in colon and reaches rectum.

Faeces contain water, inorganic salts, sloughed of mucosal cells, bacteria and undigested food.

Distension of rectum stimulates pressure sensitive receptors that initiate a neural reflex for defecation or egestion.

It is a voluntary process that takes place through anal opening guarded by sphincter muscles.