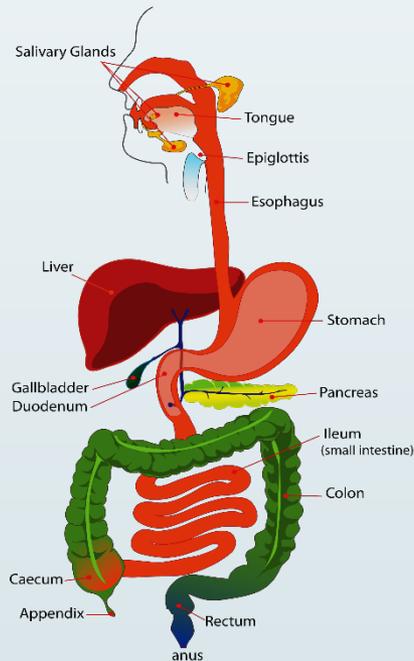




## 6. ABSORPTION IN GIT.



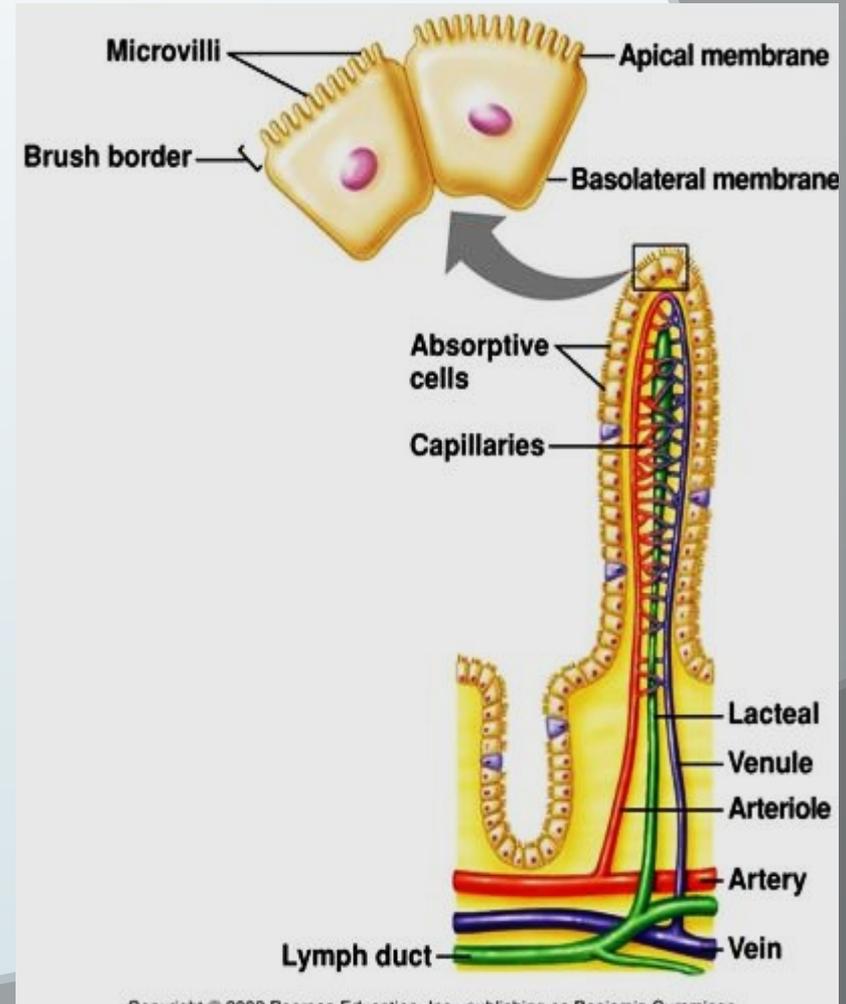
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# Gastro intestinal absorption

The total quantity of fluid that must be absorbed = 2 lit. (ingested) + 7 lit. (secreted) = 9 lit. /day. Mainly via the villi of small intestine.

## -The Villus :

- It is finger – like projection – 0.5-1 mm. Long.
- Covered by single layer of epithelium.
- It has smooth muscle to help its movements.
- It has a brush border of minute microvilli to increase the absorption surface to 200 m<sup>2</sup>.
- The life span of mucosal cells is 3-5 days.
- It has 2 types of movements :
  - Lashing : from side to side.
  - Lumping : shortening & elongation.



## \* **Mechanism of absorption :**

- Active : with carrier, energy & against gradient.
- Simple : (passive) according to conc. & electrical gradient.

### **(1) Absorption of water :**

- By simple diffusion (osmosis) following absorption of electrolytes and nutrients.

### **(2) Absorption of sodium :**

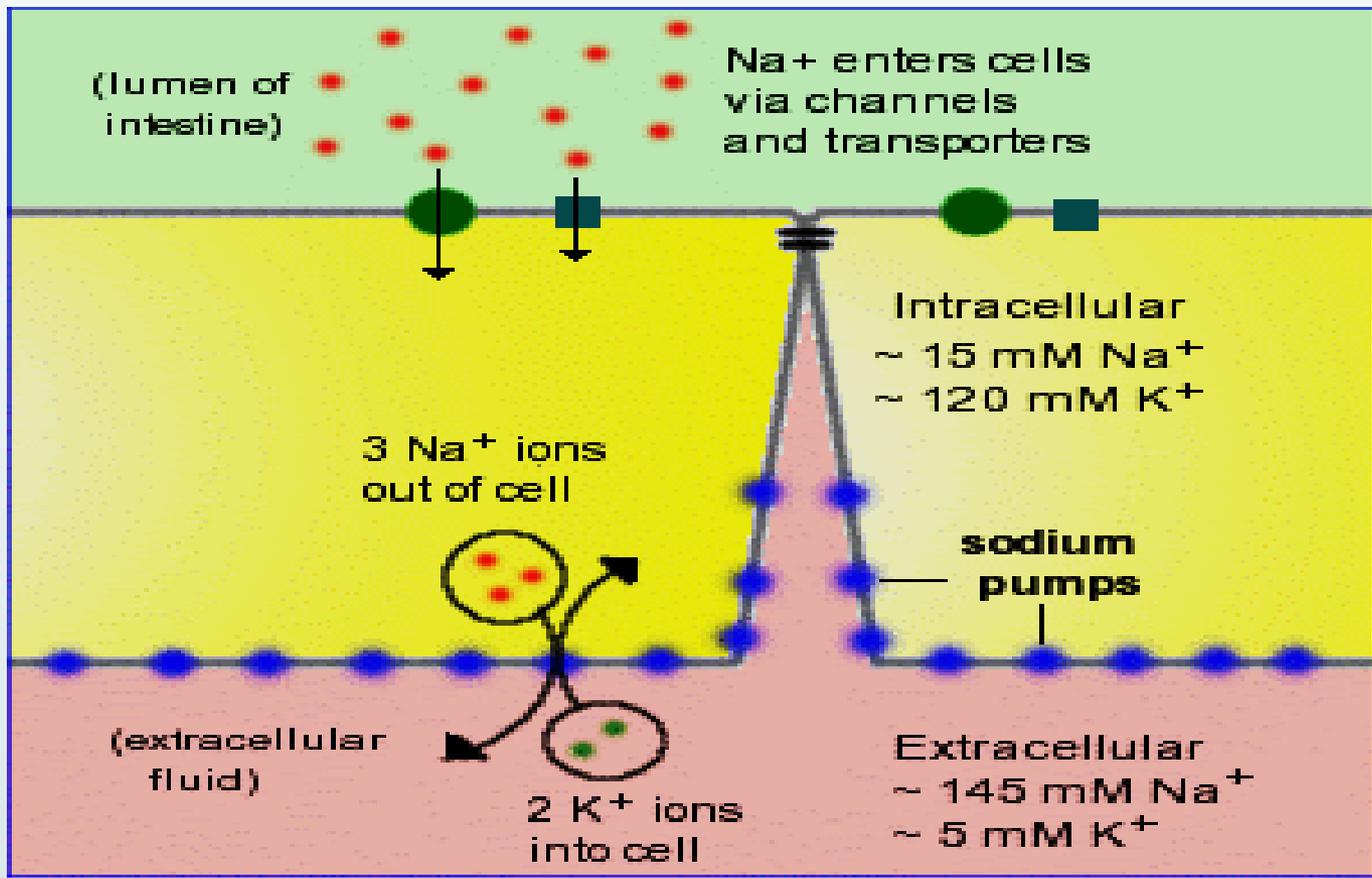
1- By active transport about 25-35 gm sodium/day is absorbed from small intestine. By three mechanisms:

- a. Uniport : Active  $\text{Na}^+$  pump to the blood.
- b. Symport : cotransport of  $\text{Na}^+$  with glucose by common carrier.
- c. Antiport : absorption of  $\text{Na}^+$  in exchange with  $\text{H}^+$  which buffered rapidly by  $\text{HCO}_3^-$ .

2.  $\text{Na}^+$  is actively transported to the interstitial space in exchange with  $\text{K}^+$  (Antiport) so the concentration of  $\text{Na}^+$  intracellular decreased and the sodium in the chyme is transported through the brush border into the cytoplasm.

### **(3) Absorption of $\text{K}^+$ :**

1. It is actively absorbed.
2. Secreted under concentration & electrical gradient.
3. Aldosterone stimulates  $\text{Na}$  abs. and  $\text{K}^+$  sec. by  $\text{Na}^+-\text{K}^+$  pump at the basolateral border of intestinal mucosal cells.



#### **(4) Absorption of chloride & Hco<sub>3</sub> :**

- (1) It passively following active Na<sup>+</sup> abs. (in upper intestine.)
- (2) Actively in exchange of Hco<sub>3</sub> (in lower intestine).

**(5) Absorption of calcium :** Active at basolateral border, Facilitated diffusion at luminal border And controlled by parathormon H & vit D<sub>3</sub>.

**(6) Absorption of iron :** 1. Active at duodenum. 2. Stimulated by erythropoitin.

#### **(7) Carbohydrate absorption: at luminal border:**

- Absorption of glucose is an active sodium depend transport (common carrier for Na<sup>+</sup> & glucose) if Na<sup>+</sup> abs. **Is inhibited by glycosides** → ↓ glucose abs.

- Galactose : the same as glucose.

- Fructose : by facilitated diffusion (passive).

#### **(8) Absorption of proteins :**

- L-Amino acid absorption: the same as glucose by 4 types of carriers for neutral, basic, acidic amino acids. - Absorbed mainly in the jejunum.

- Small amount of proteins is absorbed intact by pinocytosis (endocytosis).

## **(9) Absorption of lipids :**

By aid of conjugated bile salts, lipids are emulsified and form micelles covered with a shell of bile salts. Then micelles enter the intestinal mucosa by simple diffusion. Inside  
the mucosal cell :

-Short F.A pass directly to the portal blood.    -Long F.A are re-esterified to triglycerids.  
-Some cholesterols are re-esterified.            -Triglycerides and cholesterol esters are coated by  
protein, cholesterol and phospholipids in the Golgi complex → chylomicrons → pass into  
lymphatic vessels by exocytosis.

## **(10) Absorption of vitamins :**

-Water soluble vit.: are absorbed from jejunum by simple diffusion. Vit B12 needs intrinsic  
factor for its absorption.  
-Fat soluble vit. : absorbed by simple diffusion depend on fat digestion and absorption.

# The malabsorption syndrome

- If more than 50% of the intestine is removed by resection → signs of malnutrition as:
  - ↓ Abs. of A.A → body wasting & edema.
  - ↓ Abs. of fat → ↓ abs. of fat soluble vit.
  - ↓ Abs. & steatorrhea bleeding tendency.
- Malabsorption may caused by mal-digestion as in :
  - Inadequate lipolysis (↓ pancreatic sec.)
  - Obstructive jaundice → ↓ digestion and absorption of fats & vitamins.
- Malabsorption due to abnormal mucosal transport as in:
  - 1) Non – specific defect:** as in tropics → ↓ folic acid abs. → macrocytic anemia also in **Coeliac disease:** the defect in gluten hydrolase enzyme causes the gluten in wheat changes to Gliaden which causes decrease formation of microvilli → ↓ absorption. Also in **Tropical sprue** there is atrophy of villi
  - 2) Specific:** absence of lactase enzyme at the brush border → milk intolerance.

**Thank You**