



**Journée d'Automne  
8 octobre 2015**

**RAPPEL SUR LES MECANISMES  
D'ABSORPTION**

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# Mr J. B., 51 ans

- Diarrhées chroniques depuis 6 mois
- Fréquence de selles 3-5x/j
- Perte de 7kg (actuellement 60kg/173cm)
- Pas d'opérations
- Pas de médicaments
- Pas de sucres artificiels
- Consommation régulière de OH

# Mr J. B., 51 ans

Examens par médecin de famille

- culture de selles négative
- VIH négatif
- pas de parasites dans les selles
- US abdominal normal (surprojection aérique, pancréas pas visible)
- OGD et iléo-coloscopie normales

# Quels examens à faire?

- A) Collection des selles pendant 3 jours
- B) Scanner abdominal
- C) Entéro-IRM
- D) PCR des selles sur M. Whipple

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# Résultats

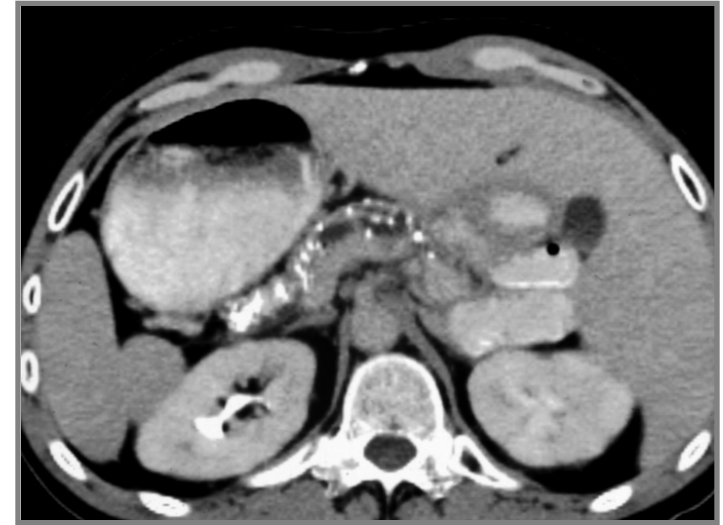
## Collection des selles

- volume 310gr/j
- graisses 13% (normal <6%)
- elastase 109 $\mu$ g/g
- calprotectine normale

HbA1c normal

## Scanner abdominal

- multiples calcifications du pancréas

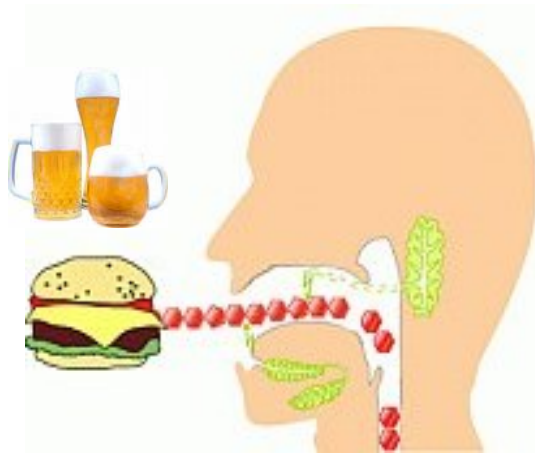


**Insuffisance pancréatique exocrine**

# Questions à répondre

1. Mécanisme de l'absorption des lipides, protéines et glucides?
2. Maldigestion et malabsorption: s'agit-il de la même chose?
3. Mécanisme qui amène aux diarrhées chroniques dans l'insuffisance pancréatique exocrine?

# Transepithelial transport



Proteins

Fat

Carbohydrates

Vitamins

Minerals

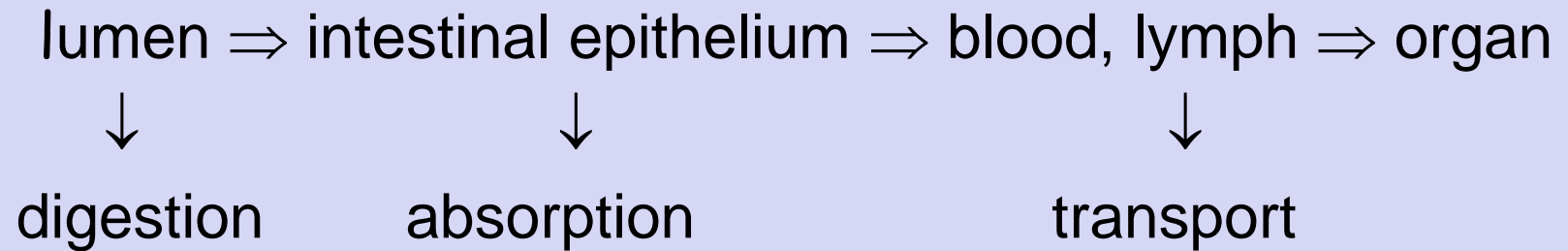
Water

Electrolytes

Synthesis  
Maintenance  
Function  
Tissue repair



# Transepithelial transport



# Transepithelial transport problems

## I. Food

(maldigestion, malabsorption)

## II. Electrolytes and water

(diarrhea)

# Breakdown of food = digestion



Fat



⇒ fatty acids



Proteins



⇒ aminoacids



Carbohydrates



⇒ glucose



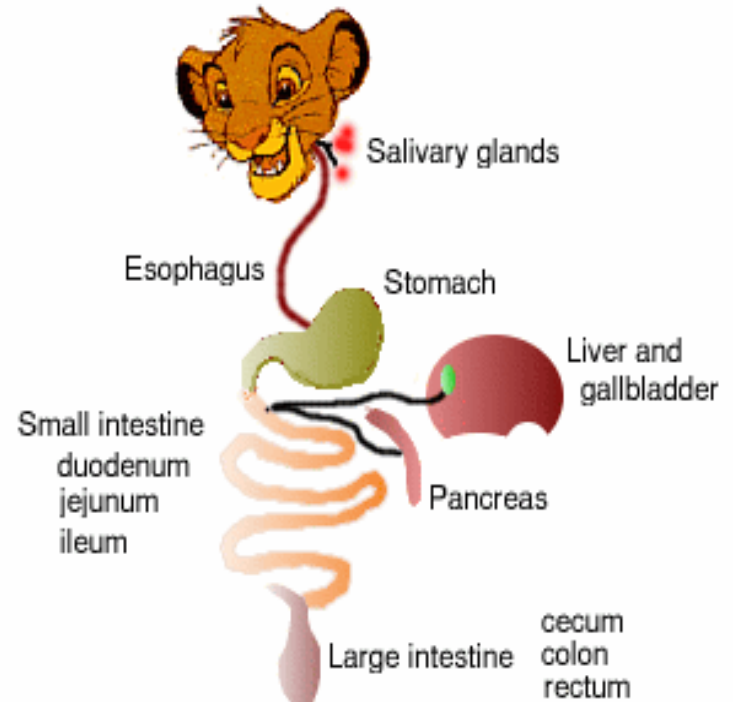
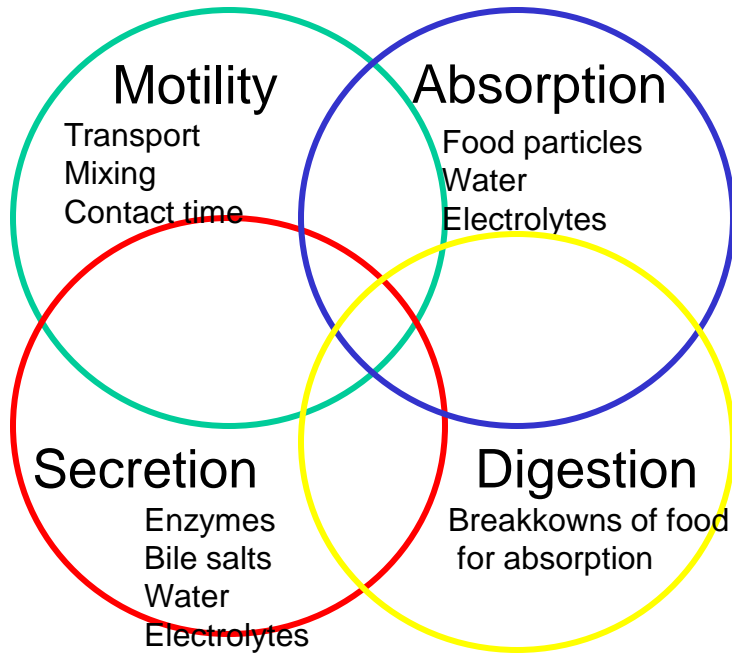
absorption

# Transepithelial transport

## Digestion and absorption

Mechanical and enzymatic processes

### Key Players



# Transepithelial transport

## Mechanisms

### Active transport

carrier, co-transport, energy  
against electrical / chemical  
gradient

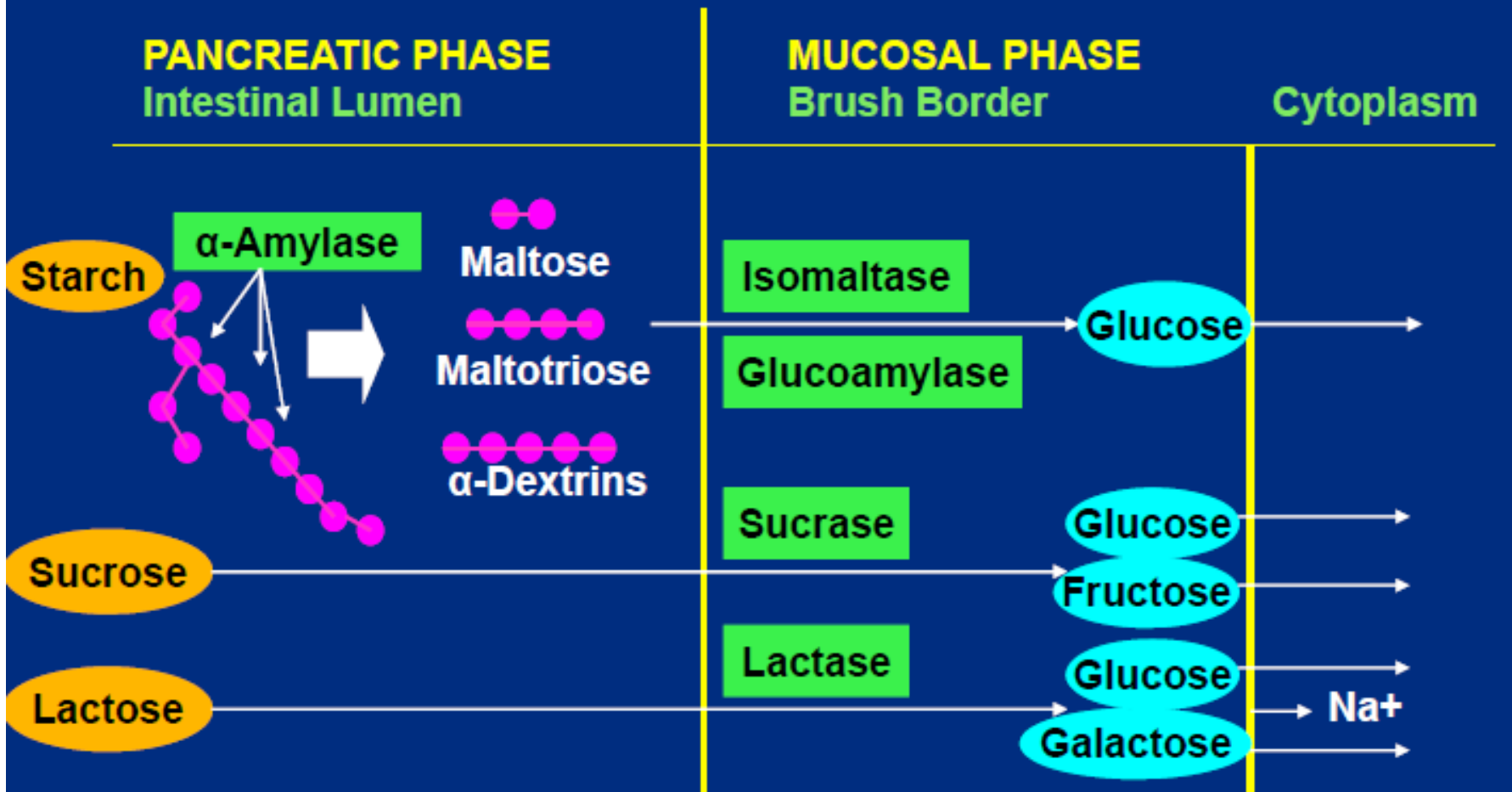
### Passive diffusion

∅ carrier, ∅ energy  
against electrical / chemical gradient  
over membrane, via tight junctions  
H<sub>2</sub>O, glucose, electrolytes

# Definitions

- **Maldigestion:**
  - Defect in hydrolysis of nutrients
- **Malabsorption:**
  - Defect in mucosal absorption of nutrients

# Carbohydrate Absorption



Di- and oligo-  
saccharides

monosaccharides

# Carbohydrate Malabsorption

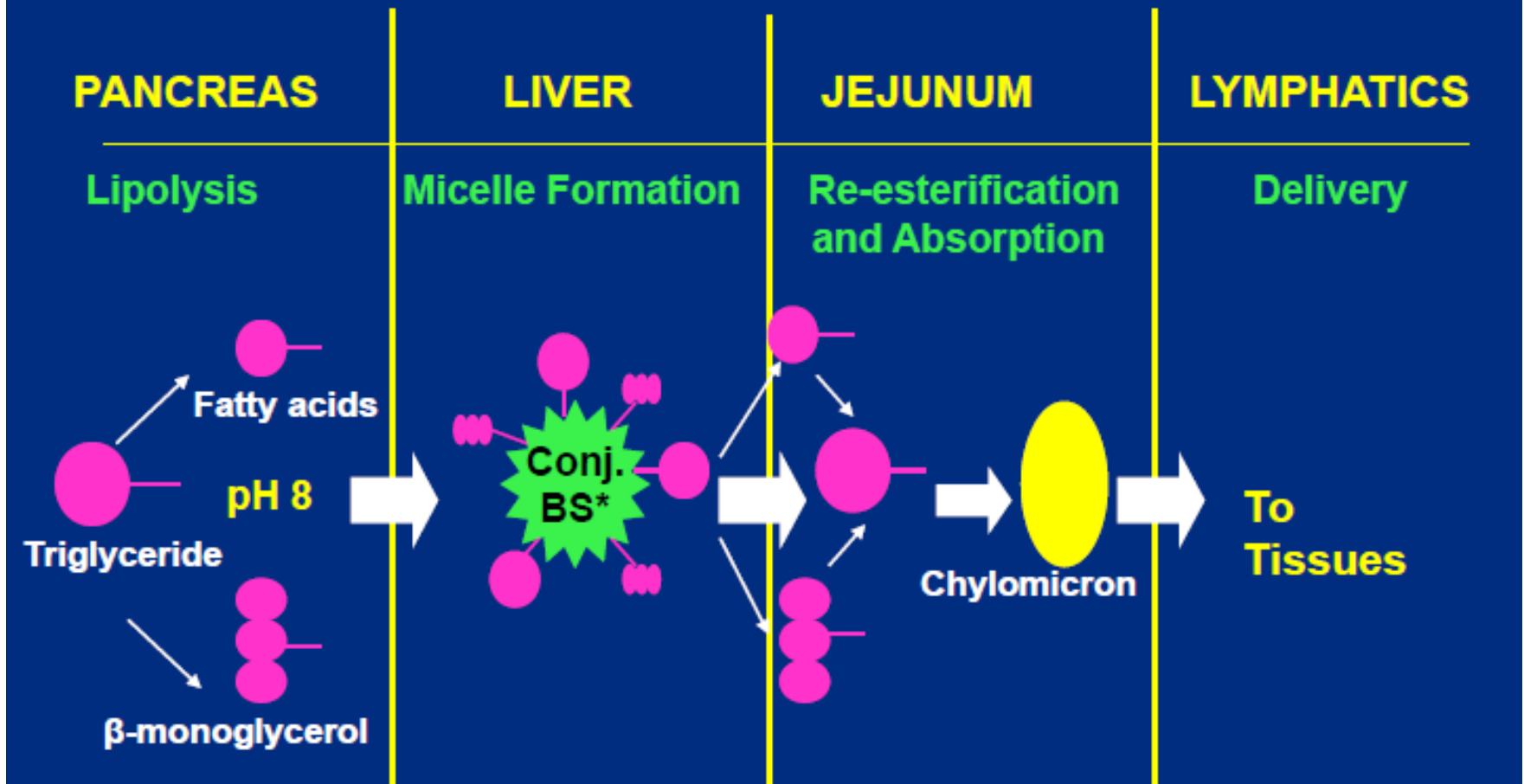
- **Mechanisms:**
  - Reduced mucosal surface area
  - Reduced disaccharidases or transport proteins
- **Most common:** lactose malabsorption
  - Congenital
  - Primary (delayed)
  - Late-onset acquired
    - Intestinal resections
    - Mucosal diseases
    - Post-infectious



# Carbohydrate Malabsorption

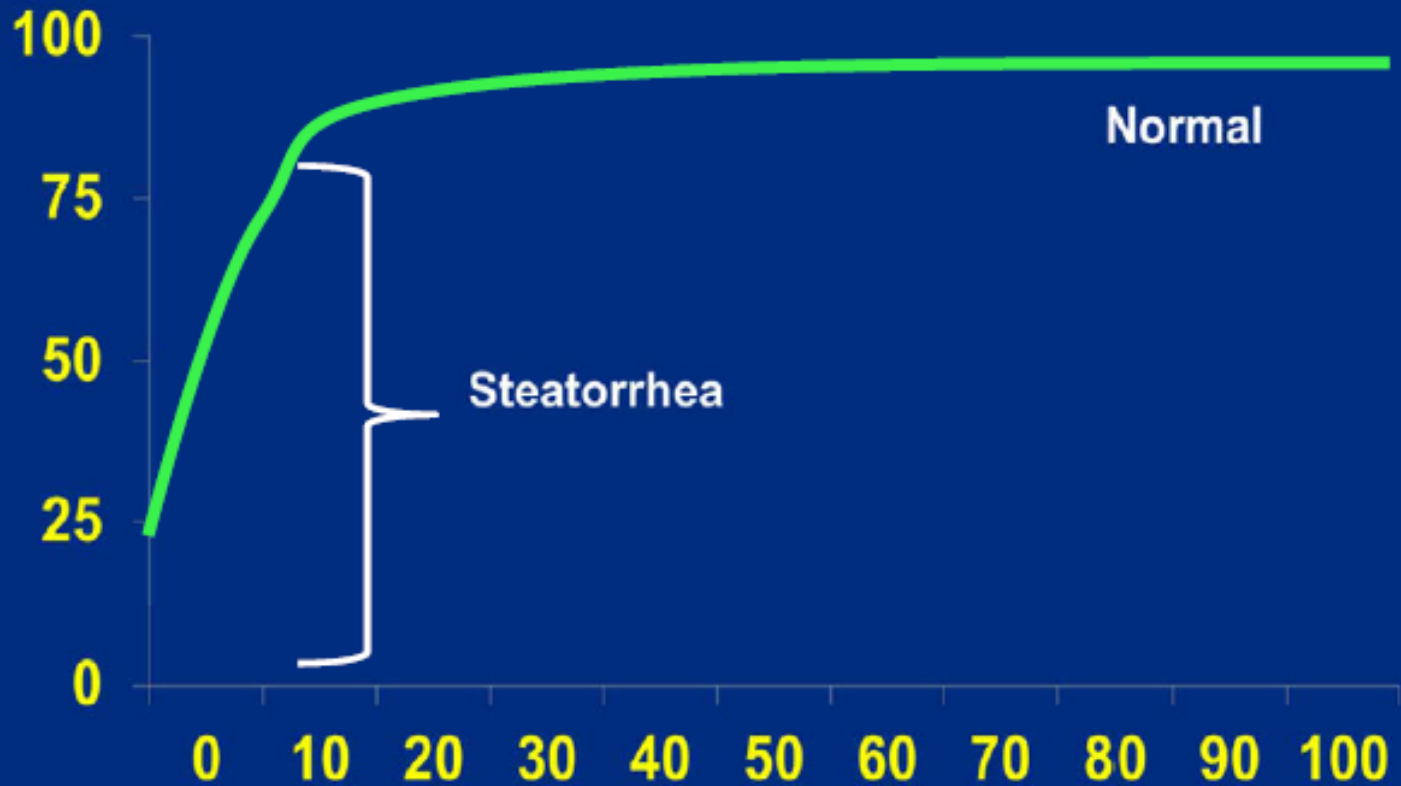
- Clinical features:
  - Odorless gas, bloating, diarrhea
  - No weight loss (in isolation)
- Tests:
  - Stool pH < 6
  - Breath test ( $\geq 20$  ppm)
  - Avoidance trial

# Fat Absorption



# Efficiency of Fat Absorption

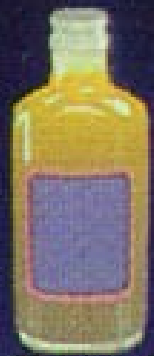
Efficiency of fat absorption (%)



% normal lipase output



Long-chain triglycerides  
**LCT**



Medium-chain triglycerides  
**MCT**

Lipase

LCFA

Bile salts

Micelle

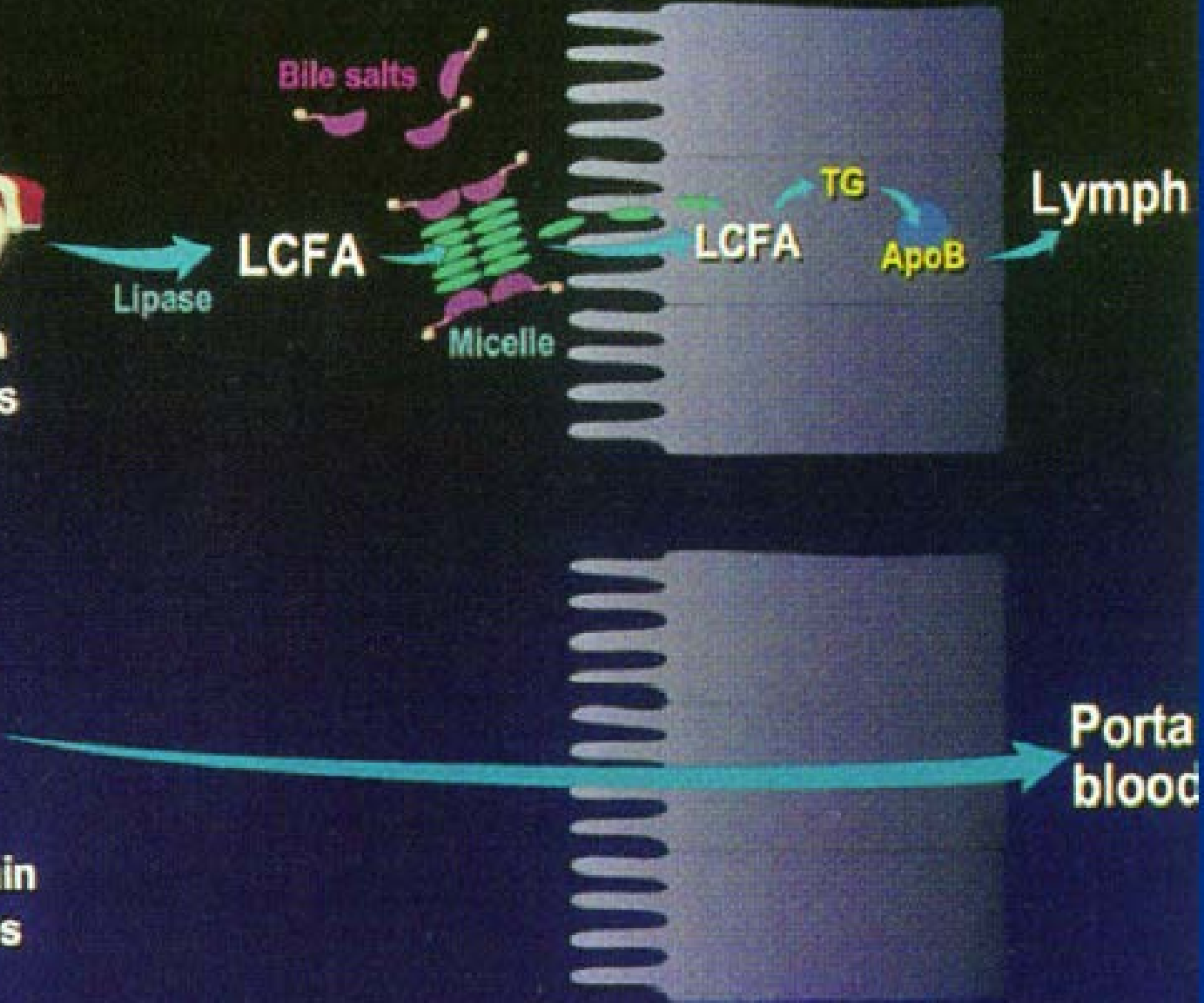
LCFA

TG

ApoB

Lymph

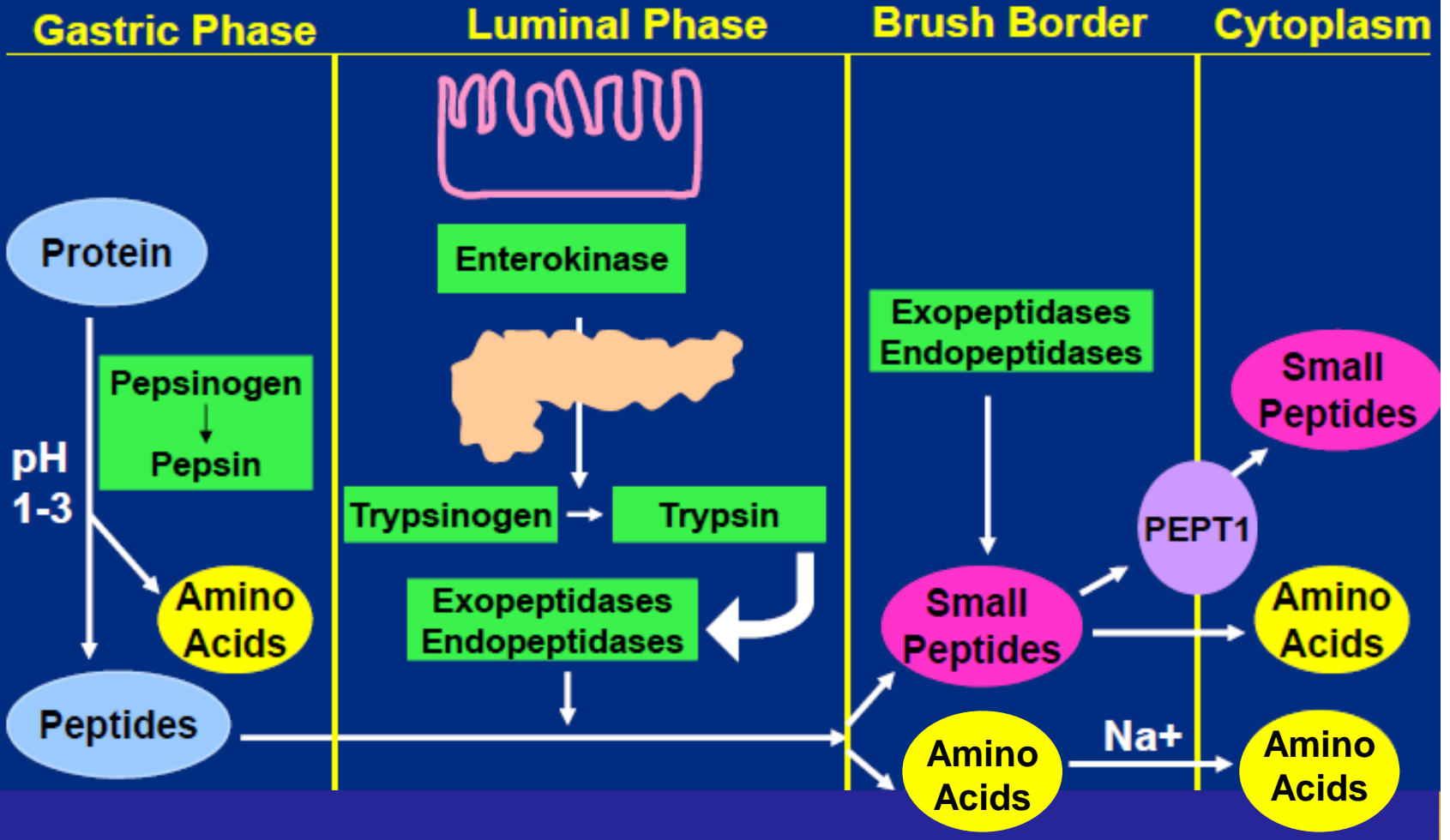
Porta blood



# Fat Malabsorption

- **Symptoms:**
  - Diarrhea, wt loss, ADEK deficiencies
- **Tests:**
  - Qualitative fecal fat (Sudan stain)
    - Low sensitivity/specificity
  - Quantitative fecal fat
    - Normal < 7 g/day (<14 if diarrhea); 48-72 hour
- **Etiology:**
  - Pancreatic, hepatic, mucosal, lymphatic

# Protein Absorption



# Protein-Losing Enteropathy

## 3 reasons for GI protein loss:

### 1. Increased mucosal permeability

- Menetrier's, H. Pylori, celiac, eosinophilic, vasculitis

### 2. Mucosal erosions

- IBD, C. difficile, ischemia, amyloid, GVHD

### 3. Lymphatic obstruction

- Cardiac, lymphangiectasia, RP fibrosis, lymphoma

# Protein-Losing Enteropathy

- Clinical features:

- Edema, ascites, diarrhea, fat/carb loss

- Labs:

- Low protein, albumin, gamma globulins

- Lymphocytopenia (lymphangiectasia)

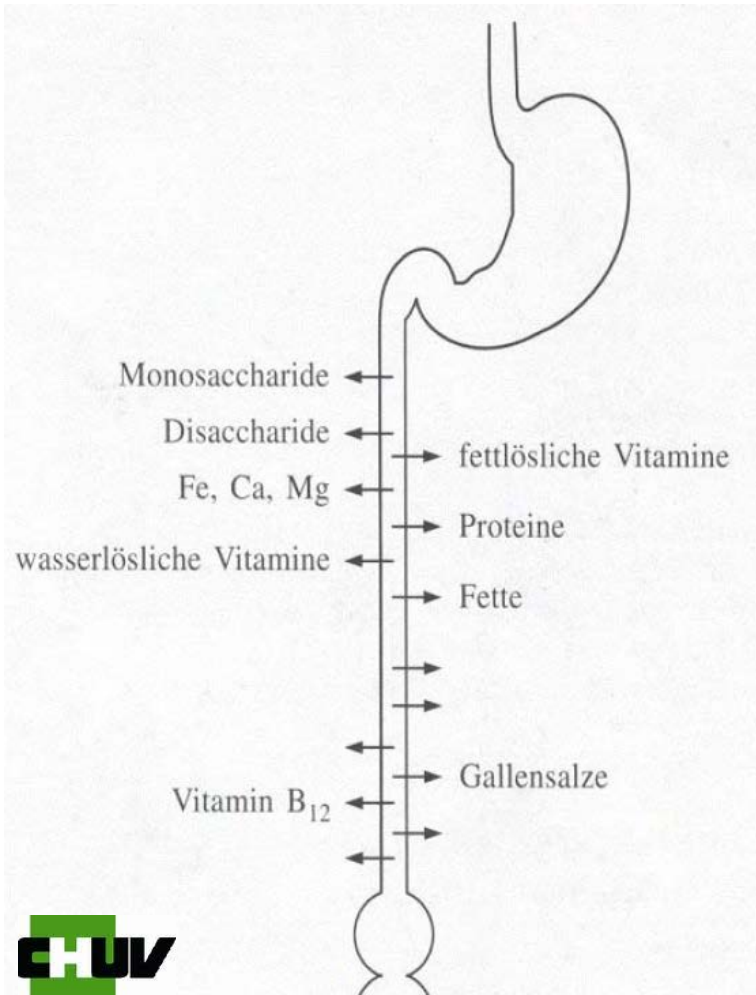
- Test:

- $\alpha$ 1-antitrypsin (AT) clearance test
- $\alpha$ 1-AT not absorbed/secreted; resistant



	<b>Carbs</b>	<b>Fat</b>	<b>Protein</b>
<b>Sxs</b>	<ul style="list-style-type: none"> <li>•Diarrhea</li> <li>•Flatus</li> </ul>	<ul style="list-style-type: none"> <li>•Diarrhea</li> <li>•Weight loss</li> </ul>	<ul style="list-style-type: none"> <li>•Diarrhea</li> <li>•Edema</li> <li>•Ascites</li> </ul>
<b>Tests</b>	<ul style="list-style-type: none"> <li>•Stool pH &lt; 6</li> <li>•Breath test</li> <li>•Avoidance</li> </ul>	<ul style="list-style-type: none"> <li>•Quant fat</li> <li>•? source</li> </ul>	<ul style="list-style-type: none"> <li>•<math>\alpha</math>-1 AT clearance</li> </ul>
<b>DDx</b>	<p>Lactose Fructose Sucrose Trehalose</p>	<p>Pancreatic Hepatic Small bowel Lymphatic</p>	<p>Menetrier's Amyloid C. Difficile Lymphangiectasia</p>

# Location of absorption

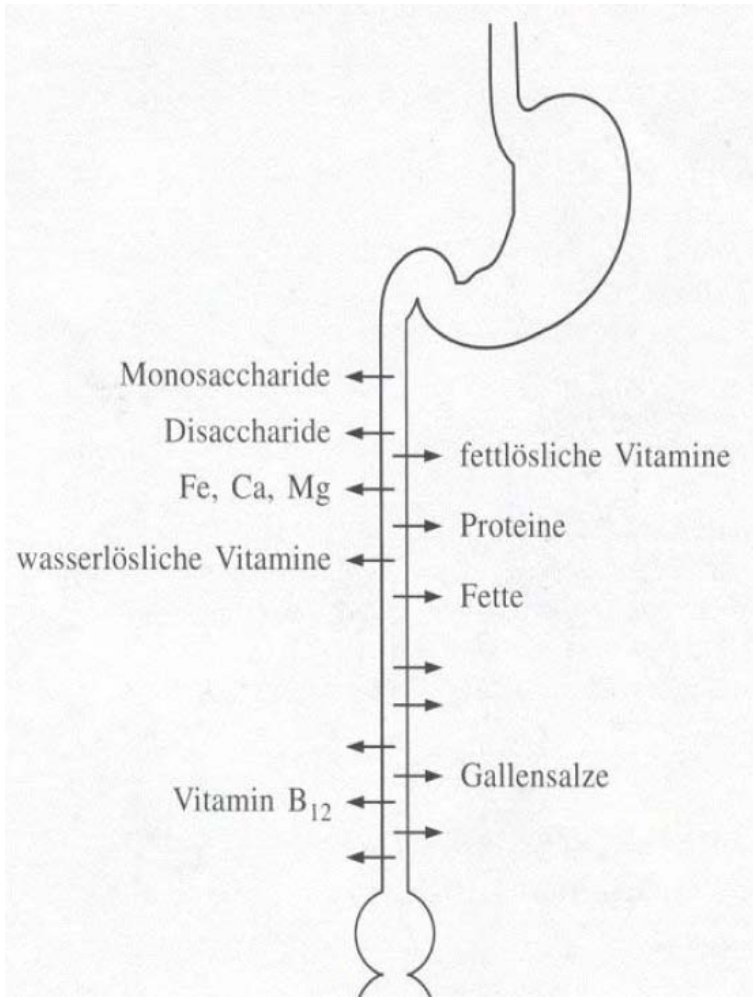


Proximal intestine  
minerals  
fat  
liposoluble vitamins  
carbohydrates

Medium intestine  
carbohydrates  
proteins

Distal intestine  
Vit B<sub>12</sub>  
bile acids

# Gastrointestinal secretion and absorption



1-2l fluid po

6-7l secretion into intestine

~ 80% resorption in intestine

200ml H<sub>2</sub>O excretion in feces

# Take home messages



**Merci bien!**



# Fat Malabsorption

D-xylose?

High urine

Low urine

**Pancreatic**

**Small Bowel**

**Image**

**Secretin/CCK**

**Enzyme trial**

**SIBO**

**Mucosal**

**AXR**

**CT**

**ERCP/MRCP**

**EUS**

**Not**

**widely  
available**

**Aspirates**

**Breath test**

**Biopsies/**

**imaging**