DIGESTION AND ABSORPTION OF LIPIDS
DIGESTION OF LIPIDS

- Major dietary lipids are TGL, cholesterol & phospholipids.
- Normal Indian lipid diet contain 20-30g/day
- In developed countries, 60-150g/day
DIGESTION IN STOMACH

- Digestion of lipids is initiated in the stomach, catalysed by lingual lipase.
  1. SECRETED BY EBNER’S GLAND PRESENT ON THE DORSAL SURFACE OF THE TONGUE
  2. pH RANGE 2.0-7.5 (OPTIMUM 4 TO 4.5)
  3. IN THE STOMACH 30% OF TGL MAY BE DIGESTED
  4. MILK FATS WITH SHORTER FA ARE BEST SUBSTRATE. MORE SPECIFIC FOR ESTER LINKAGE AT 3RD POSITION
- **GASTRIC LIPASE** is acid stable, optimum pH 5.4. secreted by Chief cells. the secretion is stimulated by GASTRIN.

- **ACTION IS NEGLIGIBLE BECAUSE**
  
  1. **NO EMULSIFICATION OF FAT TAKE PLACE IN STOMACH**
  
  2. **LOW pH IN STOMACH IS INFAVORABLE FOR THE ACTION OF GASTRIC LIPASE.**
DIGESTION IN SMALL INTESTINE

- MAJOR SITE OF FAT DIGESTION
- DIGESTIVE ENZYMES PRESENT IN PANCREATIC JUICE ARE RESPONSIBLE FOR DIGESTION
  1. PANCREATIC LIPASE
  2. PHOSPHOLIPASE A₂
  3. CHOLESTEROL ESTERASE
- **PANCREATIC LIPASE**
  - Hydrolyse the FA esterified to the 1\text{st} and 3\text{rd} carbon atoms of glycerol forming 2-monoacylglycerol & 2 molecules of FA.

- **PHOSPHOLIPASES**
  - Are responsible for the hydrolysis of phospholipids.

- **CHOLESTEROL ESTERASES**:
  - Cleaves cholesterol ester to produce cholesterol & FFA.
BILE SALTS

- BILE SALTS HELP BINDING OF LIPASE WITH TWO MOLECULES OF COLIPASE (mw 10000)
- COMBINATION ENHANCES LIPASE ACTIVITY IN THE INTESTINAL PH
- HELPS IN EMULSIFICATION OF FATS.
- CALCIUM PRECIPITATES FFA AS INSOLUBLE Ca SOAPS AND FACILITATES LIPASE ACTION.
ABSORPTION OF LIPIDS

- MIXED MICELLE FORMATION

- BILE SALTS AND SOAPS FORMED IN THE INTESTINAL LUMEN AND BICARBONATE OF PANCREATIC AND INTESTINAL JUICES COLLECT THE HIGHER FA, MONO AND DIGLYCERIDES, LECITHINS, CHOLESTEROL IN THE FORM OF WATER SOLUBLE MOLECULAR AGGREGATES CALLED “MICELLES”.
- Micelles are absorbed mainly from duodenum and jejunum.
- Bile salts are absorbed in the lower part of the intestine and return to liver via portal vein and resecreted into the bile. Known as enterohepatic circulation.
CHYLOMICRONS

- INSIDE THE EPITHELIAL CELL, TRIGLYCERIDES ARE RESYNTHESIZED IN SMOOTH ENDOPLASMIC RETICULUM. PROTEIN COMPONENT (APO-B_{48}) IS SYNTHESIZED IN ROUGH ENDOPLASMIC RETICULUM IS INCORPORATED AND CHYLOMICRONS ARE FORMED.
- Glycerol-free glycerol (22%) released in intestinal lumen is not utilized for resynthesis of TG in intestinal epithelial cell.
- It directly passes to the portal vein and taken to the liver.
- Short chain and medium chain (less than 8 to 10C) and unsaturated FA are absorbed to portal blood directly and taken to liver.
- CHYLMICRONS

- TG87%, PL 8%, FREE AND ESTERIFIED CHOLESTEROL 3% APOPROTEIN 0.05 TO 2%.

- PASS THROUGH CELL MEMBRANE OF BASES AND LATERAL WALLS OF INTESTINAL EPITHELIAL CELLS AND MOVES THROUGH EXTRA CELLULAR SPACES, ENTER LYMPHATIC VESSELS OF ABDOMEN AND LATER GO TO SYSTEMIC CIRCULATION THROUGH THORACIC DUCT.
ABNORMALITIES

1. DEFECTIVE DIGESTION:
   - STEATORRHOEAS
     - INCREASED FAT CONTENT IN FAECES
     - OBSTRUCTIN IN BILE FLOW

2. DEFECTIVE ABSORPTION
   - DUE TO
     - Coeliac disease, sprue, crohn’s disease
     - Surgical removal of intestine
     - Obstruction of bile duct