

## Development of the gut

- Derived from the endoderm (lining of the gut), and the splanchnic layer of the lateral plate mesoderm (muscle, serous membrane)
- Formed from A-P elongation of the body axis and the elongation of the yolk sac. Lateral expansion of the mesoderm wraps
- Two opening: infolding called stomodaeum with buccopharyngeal membrane and caudal infolding proctodaeum cloacal membrane. Break down of the membrane opens gut to the exterior.

## Gut divisions

- Ring of lymphatic tissue around the mouth — tonsils
- Foregut bud lung buds, liver bud pancreas bud
- Midgut open to yolk sac
- Hindgut umbilical cord containing allantois.

## Division functions

- Foregut:
  - From the mouth down to the first part of duodenum
  - Ingestion, mechanical+chemical break down, lubrication
- Midgut:
  - Rest of the small intestine: jejunum and ileum, ascending and 2/3 of transverse colon
  - Majority of nutrient absorption and water absorption
- Hindgut:
  - Last 1/3 of transverse colon, descending colon, rectum and upper anus
  - Rest of water absorption.

## Blood supply and nervous supply

- Paired aorta and unpaired aorta
  - Unpaired: celiac trunk (foregut), superior mesentery (midgut), inferior mesentery (hindgut)
- Venous drainage: gut capillary to liver capillary
  - Superior mesentery drains midgut
  - Inferior mesentery drains hindgut
  - Splenic vein drains spleen and small set of gastric vein drains the stomach to portal vein
  - Porto-systemic anastomosis: (portal system - systemic circulation): link between liver and surface. Diaphragm region, anterior abdominal vein, rectum. (Liver cirrhosis lead to caput medusae) (oesophageal varices lead to bleeding)
- Nerve supply control the smooth muscle of the gut
  - SYM: splanchnic nerves, synapse in collateral ganglia close to the gut (greater mesentery - coeliac ganglion, lesser mesentery - superior mesentery ganglion - midgut, least mesentery - inferior mesentery ganglion - hindgut)
  - PARA: Craniosacral system (CN3, 7, 9, 10), S2-4. Cranial nerves innervate up to the midgut, sacral nerves (pelvic splanchnic) innervate the hindgut
  - ENS: intrinsic nervous system, controls peristaltic action.
    - Myenteric plexus: controls peristaltic movements
    - Submucosal plexus: controls secretion

Mesentery are folds in the peritoneum, surrounds the organs and blood vessels

- Parietal and visceral peritoneum wrap the peritoneal cavity
- Retroperitoneal structures: outside the peritoneal cavity, such as kidneys, gonads.
- Dorsal mesentery and ventral mesentery
  - Ventral mesentery terminates at the foregut level, with free inferior margin, liver is in the ventral mesentery
  - Umbilical vein runs in the inferior margin of ventral mesentery

Gut herniation and folding

- During development, faster rate of gut growth cause bulging into the midgut
- Rotation and arrangement into the abdominal cavity

Small intestine

- Duodenum: C-shaped around the head of the pancreas 4 parts: horizontal, vertical, horizontal, up and joins jejunum
  - Contains opening to the bile duct and pancreatic duct, marks foregut-midgut boundary
- Jejunum:
- Ileum

Large intestine

- Ascending: start with caecum and appendix
- Transverse: 2/3 supplied by superior mesentery artery
- Descending
- Sigmoid colon
- Rectum
- Upper anus: up to this point supplied by the inferior mesentery artery
- Taenia coli are three longitudinal smooth muscles that is responsible for peristaltic contraction

Fusion of mesentery:

- Duodenum visceral mesentery is fused to the peritoneal wall, free mesentery in the midgut
- Ascending colon have no free mesentery, transverse colon does, descending colon does not, sigmoid does, rectum does not, alternating matter