



Lecture title: Embryonic development of digestive system / Development of stomach and intestine

Lecturer Affiliation: *Naziha Sultan Ahmed, BVMS, MSc*

Scientific degree(Assistant Prof.), Department of Anatomy, College of Veterinary Medicine, University of Mosul, Mosul, Iraq

<https://orcid.org/0000-0002-2856-8277>

https://www.researchgate.net/profile/Naziha_Ahmed

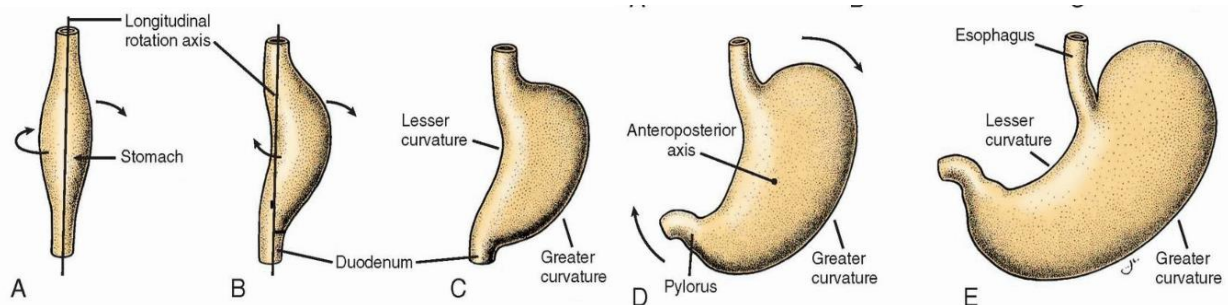
Development of stomach and intestine

Development of stomach

The simple stomach derived from a tubular segment of foregut caudally to septum transversum as a fusiform dilation suspended to the dorsal wall of abdominal cavity via a dorsal mesogastrium which connect the convex part (future greater curvature) with the spleen while the ventral mesogastrium connect the concave part of stomach (future lesser curvature) with the liver which will derive from the foregut-midgut junction .

The stomach rotation :

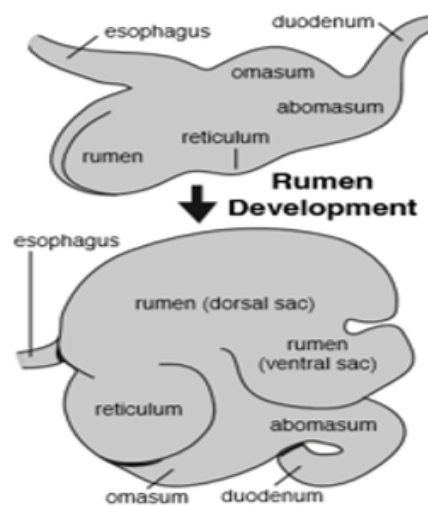
The stomach rotates 90° to the left ,so it's dorsal part faces the left side , while it' ventral part faces the right side .The long axis becomes transverse as growth of the liver pushes the cranial end of the stomach to the left side . The greater curvature drops ventrally when the stomach is filled.



Development of ruminant stomach :

The early development ruminant stomach is the same as the simple stomach .The rumen develops as an expansion of the fundus , and a caudo-ventral pocket of the developing rumen forms the reticulum..

The omasum develops as a bulge along the lesser curvature .The rest of the stomach become the abomasum . Later in the development , the rumen is flipped caudally , so it comes to lay on the top of the abomasum with the reticulum situated cranially .



The midgut derivatives:

Small intestine, cecum , ascending colon, most of transverse colon.

All these derivatives are supplied with blood by the cranial mesenteric artery.

As the midgut elongates , it forms a ventral loop projects into the extra-embryonic coelom through the umbilical cord then a physiological umbilical herniation occur which is a natural perforation of the midgut



loop through the umbilical cord .

The midgut loop have cranial limb that elongated rapidly and caudal limb that distinguished by the cecal diverticulum .

Rotation of midgut loop :

The midgut loop within the umbilical cord rotates 90° clock-wise around axis formed by the cranial mesenteric artery , so that , the cranial limb become to the right and the caudal limb become to the left. Within the 10th week , the intestine is rapidly return to the abdomen in a process called the reduction of midgut hernia , so , the small intestine (cranial limb) return first passing caudally to cranial mesenteric artery and occupy the central part of abdomen . The cecum become the largest part of the intestine and pass later to occupy the right part of abdomen caudally to liver . As the intestine returns to abdominal cavity , it passes through 180° rotation counter clockwise .

In ruminants , a secondary loop of ascending colon formed distal to the cecum and this loop forming the spiral loop .



In horse , the cecum enlarges , so that , the proximal colon is incorporated within the cecum. It elongates and rotates then return to the abdominal cavity.

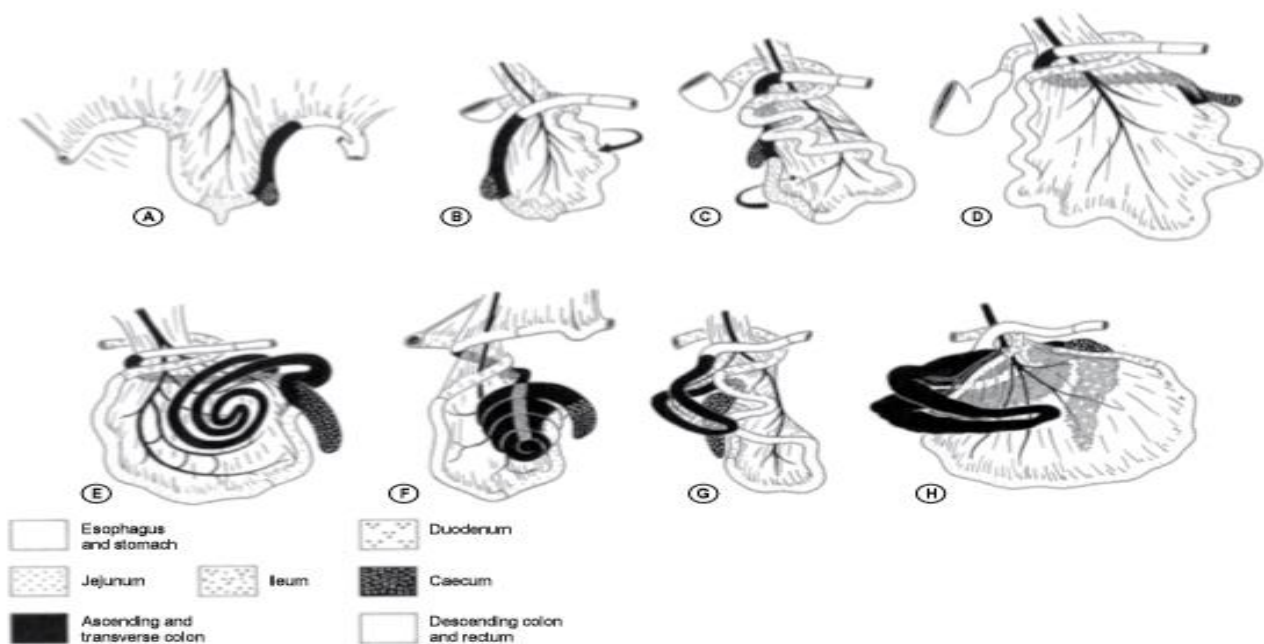
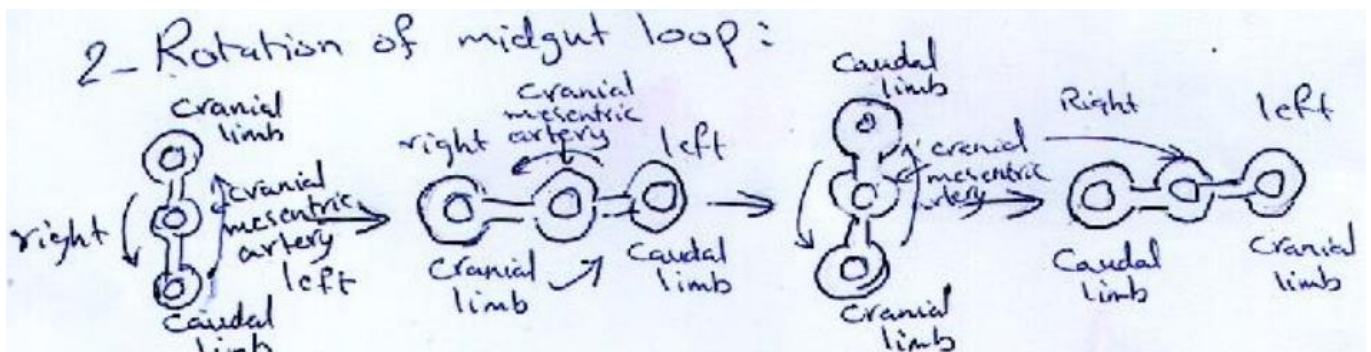


Fig. 14-22: Rotation of the gut to its final position in different species. Left view. **A:** Primitive gut loop. **B:** Clockwise rotation by 180° around a dorso-ventral axis. **C:** Clockwise rotation by 270°. **D:** Final location of the gut in the dog after clockwise rotation by 360°. **E:** Final location of the gut in ruminants. **F:** Final location of the gut in the pig. **G:** Location of the gut after clockwise rotation by 270° in the horse. **H:** Final location of the gut in horse after clockwise rotation by 360°. Courtesy Snowsitz and Rüsse (2007).





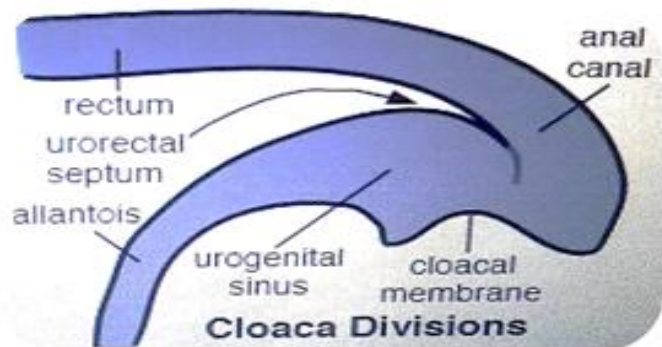
The hindgut derivatives :

Left part of the transverse colon , descending colon , sigmoid colon , rectum , epithelium of urinary bladder , most of urethra and upper part of anal canal .All these derivatives supply with blood from the caudal mesenteric artery .

Cloaca :

A chamber that communicate with the digestive , urinary , genital systems (cloaca persist in adult birds reptiles and amphibians) .

The allantois evaginates from the hindgut at the cranial end of the cloaca .



Rectum :

Rectum is formed when the mesenchyme partition (urorectal junction) divides the cloaca into dorsal and ventral chambers , the dorsal chamber continue with the hindgut to become the rectum and most of anal canal , while , the ventral chamber which is continuous with allantois become the urogenital sinus .

Anal canal :

The cranial part of the anal canal is formed with the rectum , this part lined with mucosal epithelium derived from the endoderm . The caudal part of the anal canal lined with stratified squamous epithelium .



Development of the liver :

Liver arise as hepatic diverticulum from the region of the foregut that will become the descending duodenum within the ventral mesogastrium (foregut-midgut junction).The hepatic diverticulum give rise to multiple branches that become hepatic ducts , cystic duct and pancreatic duct continued growth and branching of hepatic duct primordia form the lobes of the liver .

The gall bladder develops at the end of the cystic duct , while the initial part of hepatic diverticulum from which various branches arose become the bile duct .

Development of the pancreas :

Pancreas originates as two separated endodermal diverticulae , each of which elongates , then divided to branches and then form acini in typical glandular fasion .

One diverticulum arises ventrally as a bud of hepatic diverticulum , which then form the chief pancreatic duct and right lobe of pancreas. The other diverticulum arises dorsally from the duodenum (the minor duodenal papilla) and forms the accessory pancreatic duct and left lobe of pancreas .

As the right and left lobes across each other during development , they fuse to form the body of pancreas . The Endocrine cells (islets of Langerhans) of pancreas develop from the endoderm of the diverticulum .

