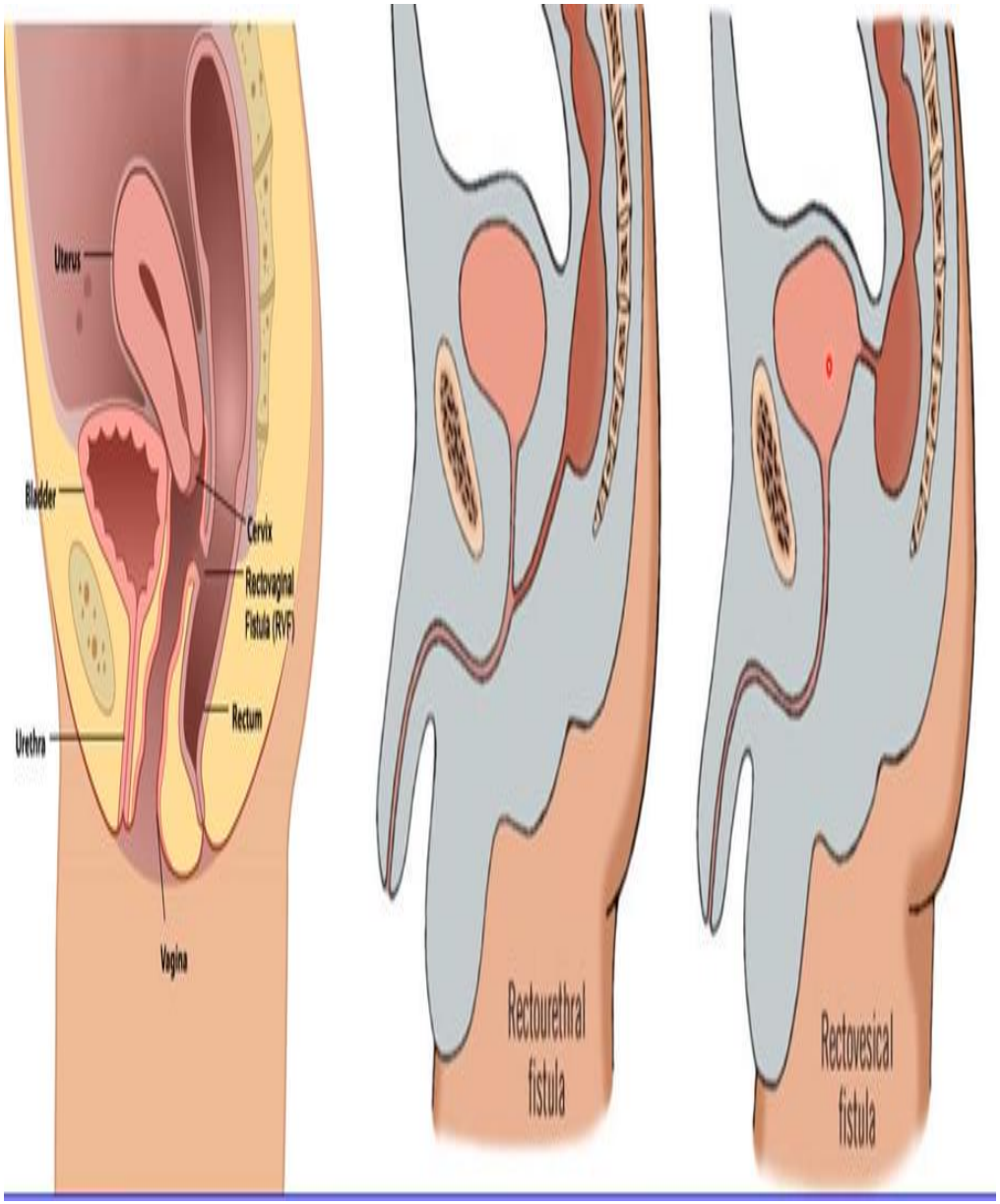
DEV. OF INT. , RECTUM & ANAL CANAL



BY

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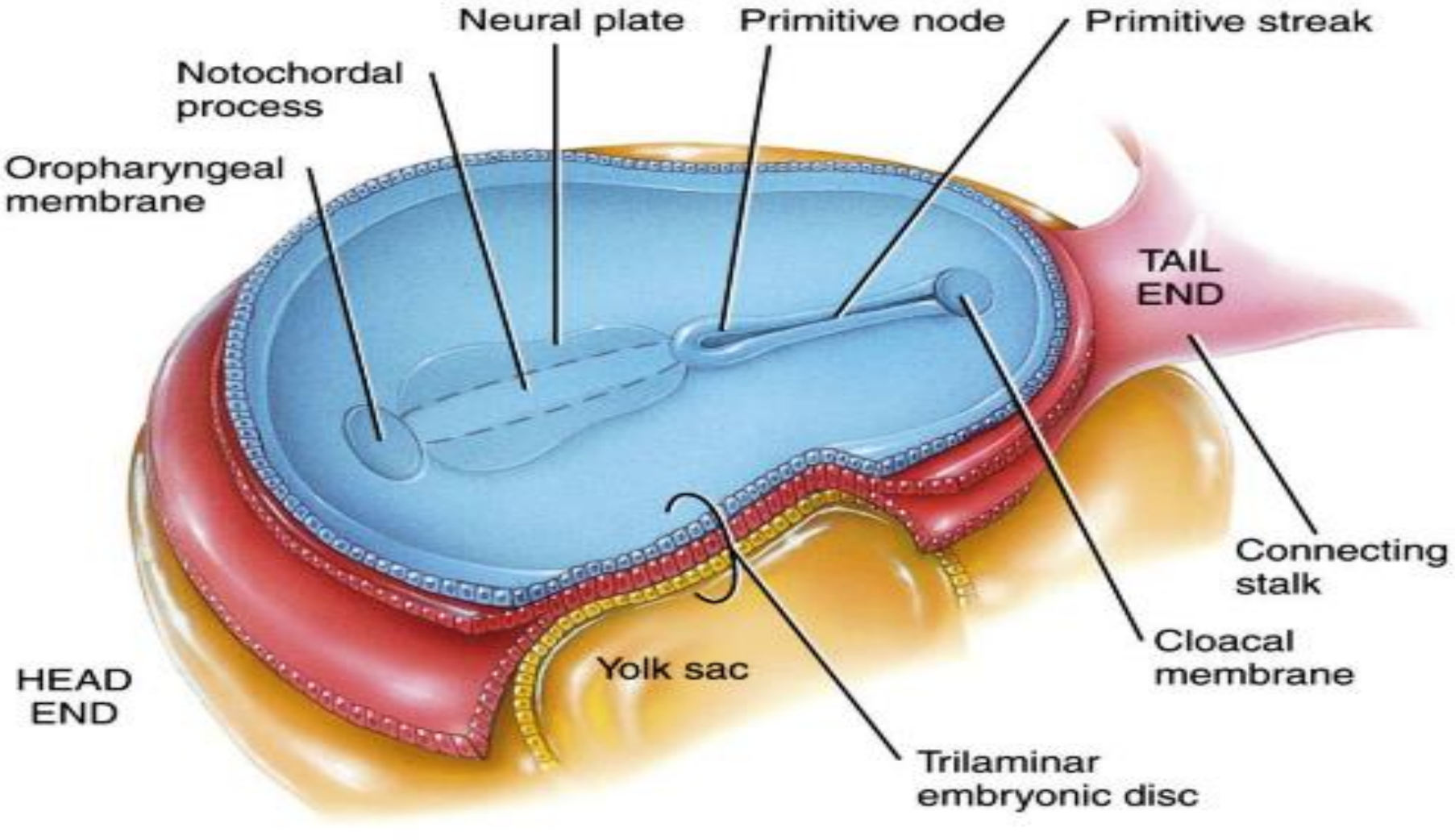
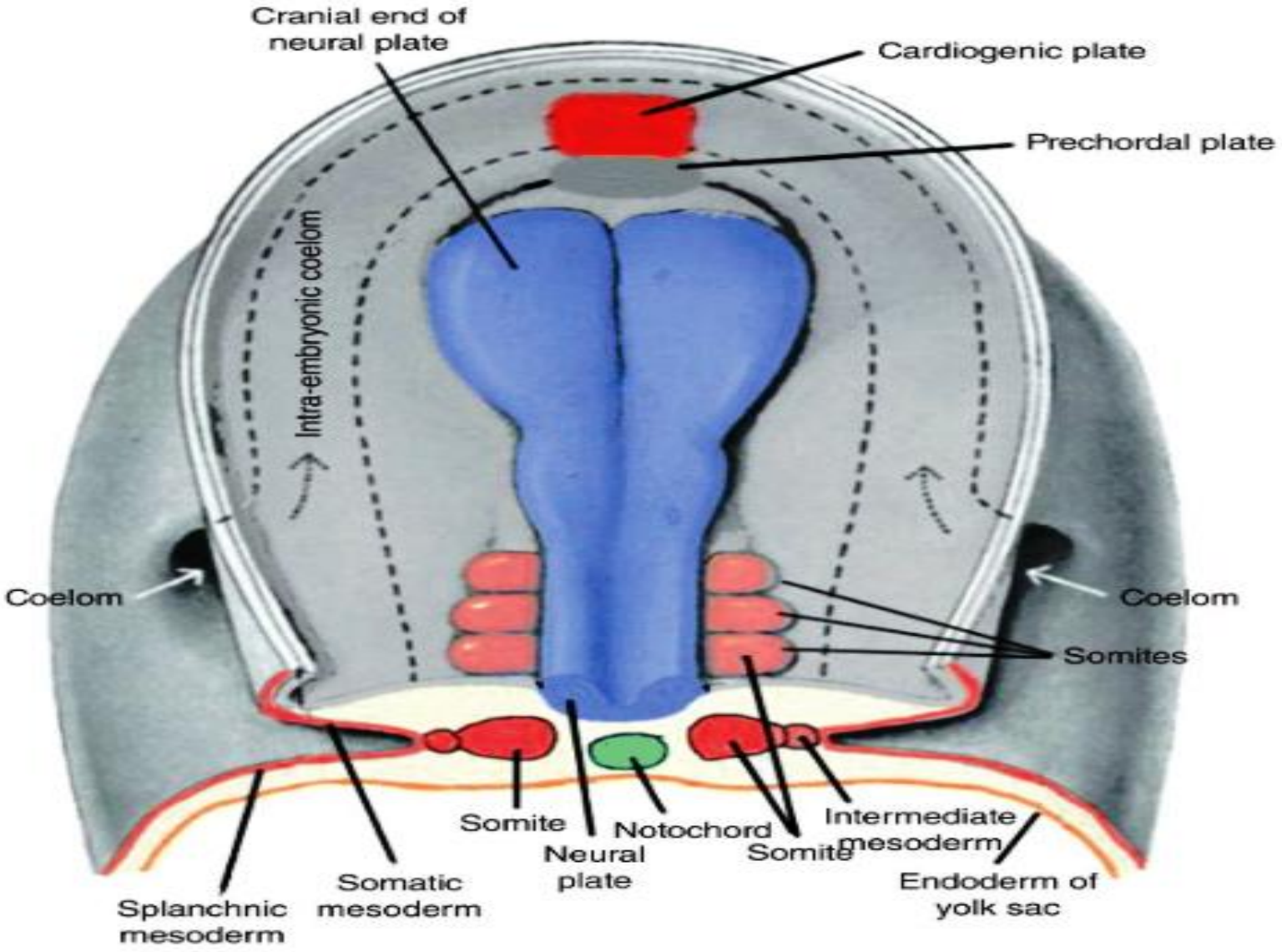
REV.

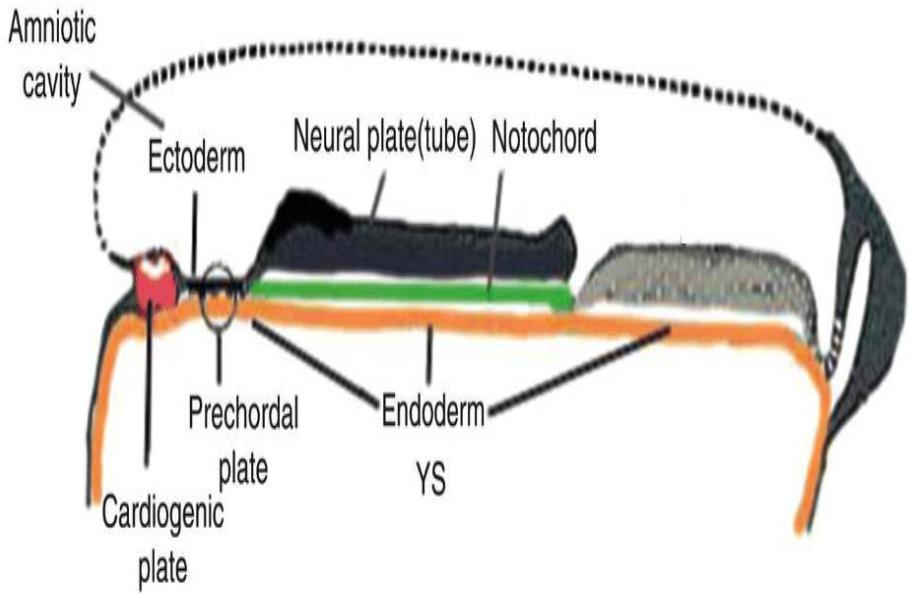


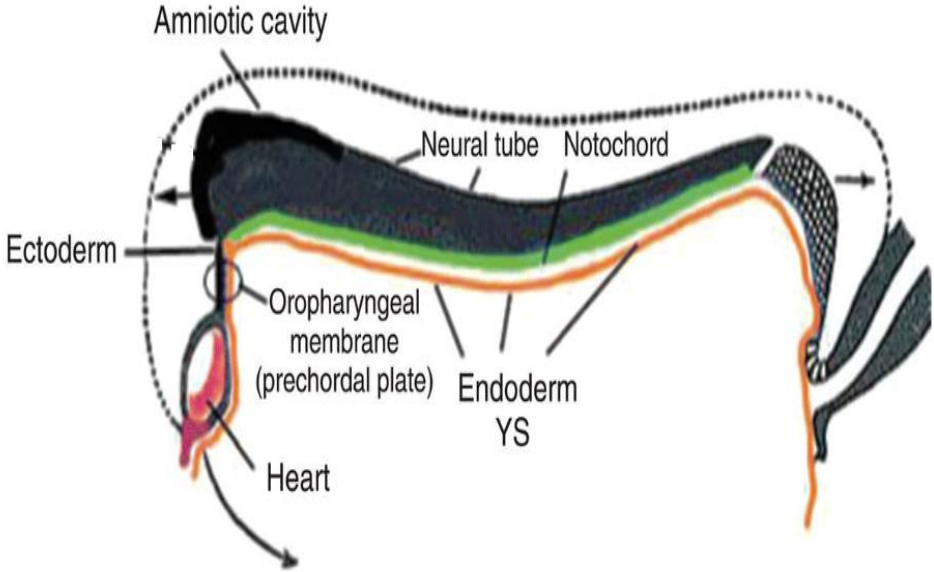
(a) Dorsal and partial sectional views of trilaminar embryonic disc, about 16 days after fertilization

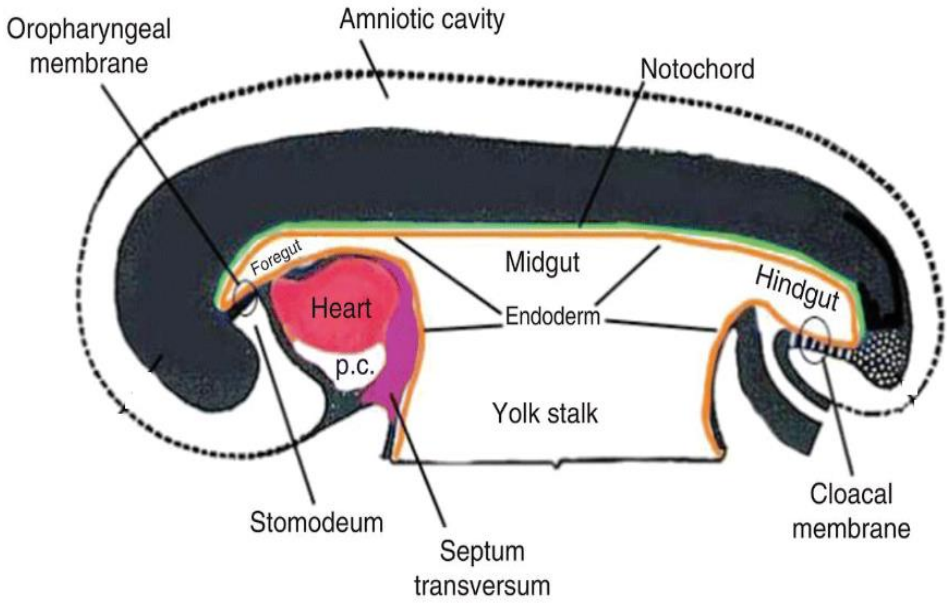
REV.

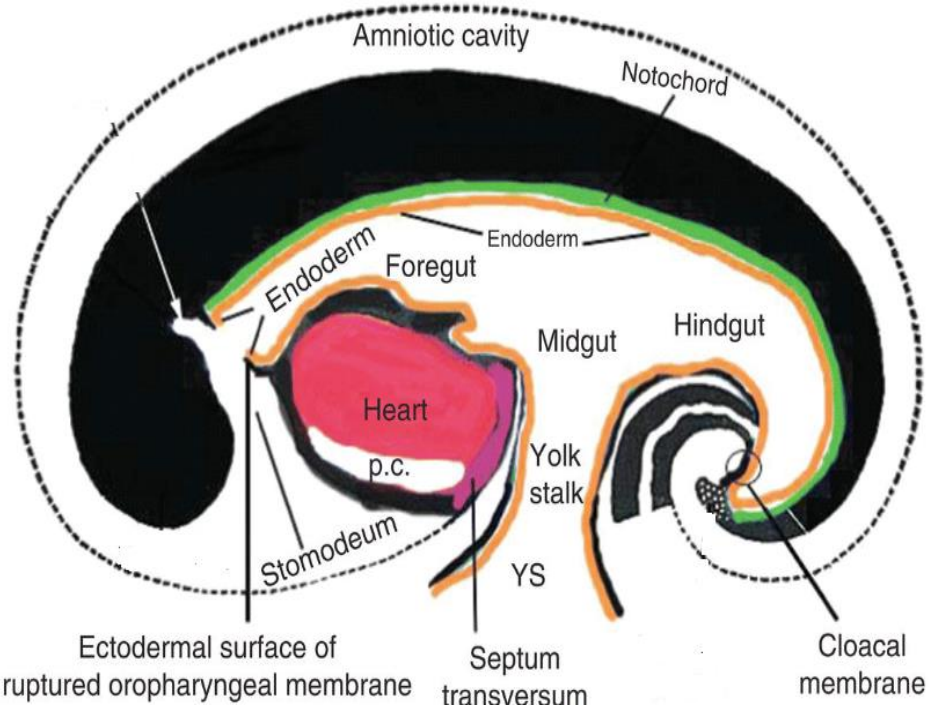

Cranial end of neural plate
Cardiogenic plate
Prechordal plate
Intra-embryonic coelom
Coelom
Coelom
Somites
Somite
Notochord
Neural plate
Somite
Intermediate mesoderm
Splanchnic mesoderm
Somatic mesoderm
Endoderm of yolk sac

REV.


Amniotic cavity
Ectoderm
Neural plate(tube)
Notochord
Prechordal plate
Endoderm
YS
Cardiogenic plate


Amniotic cavity
Neural tube
Notochord
Ectoderm
Oropharyngeal membrane (prechordal plate)
Endoderm
YS
Heart

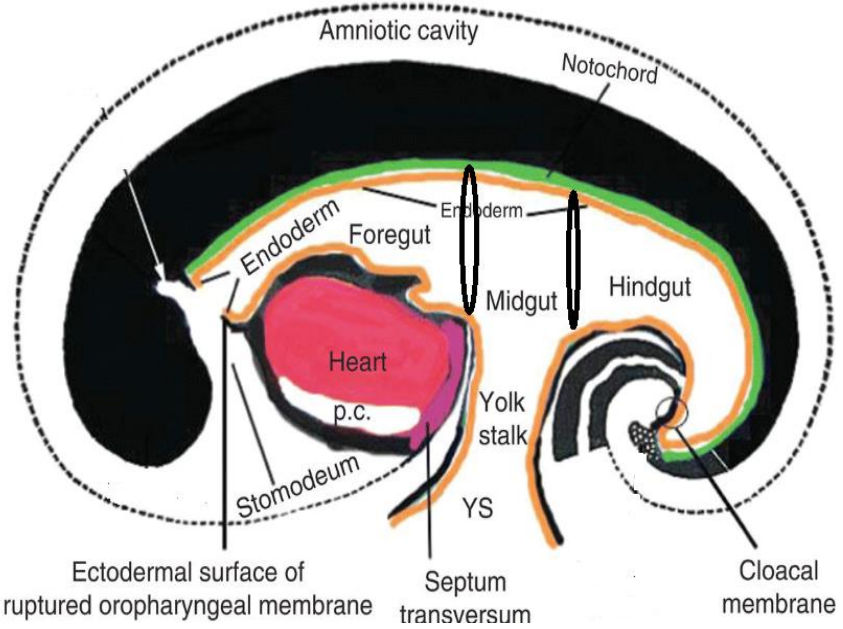

Oropharyngeal membrane
Amniotic cavity
Notochord
Foregut
Midgut
Hindgut
Heart
Endoderm
p.c.
Yolk stalk
Stomodeum
Septum transversum
Cloacal membrane


Amniotic cavity
Notochord
Endoderm
Endoderm
Foregut
Midgut
Hindgut
Heart
p.c.
Yolk stalk
Stomodeum
YS
Ectodermal surface of ruptured oropharyngeal membrane
Septum transversum
Cloacal membrane

DIVISIONS OF GUT

-folding of embryonic disc leading to incorporation of large part of the yolk sac (lined by endoderm) inside embryo leading to formation of the primitive gut

primitive gut is divided into 3 parts:



1- foregut: included in head fold & ends blindly by BPM

2- hindgut: included in tail fold & ends blindly by CM

3-midgut: middle part & is connected to the yolk sac by vitellointestinal (vitelline) duct

ant. intestinal portal: junction ( ) foregut and midgut

post. intestinal portal: junction ( ) midgut and hindgut.

-The wall of gut is formed of endodermal lining & covering of visceral (splanchnic) mesoderm.

FOREGUT

Extents:

from buccopharyngeal membrane BPM
to ant. intestinal portal (origin of liver bud).

Parts & derivatives :

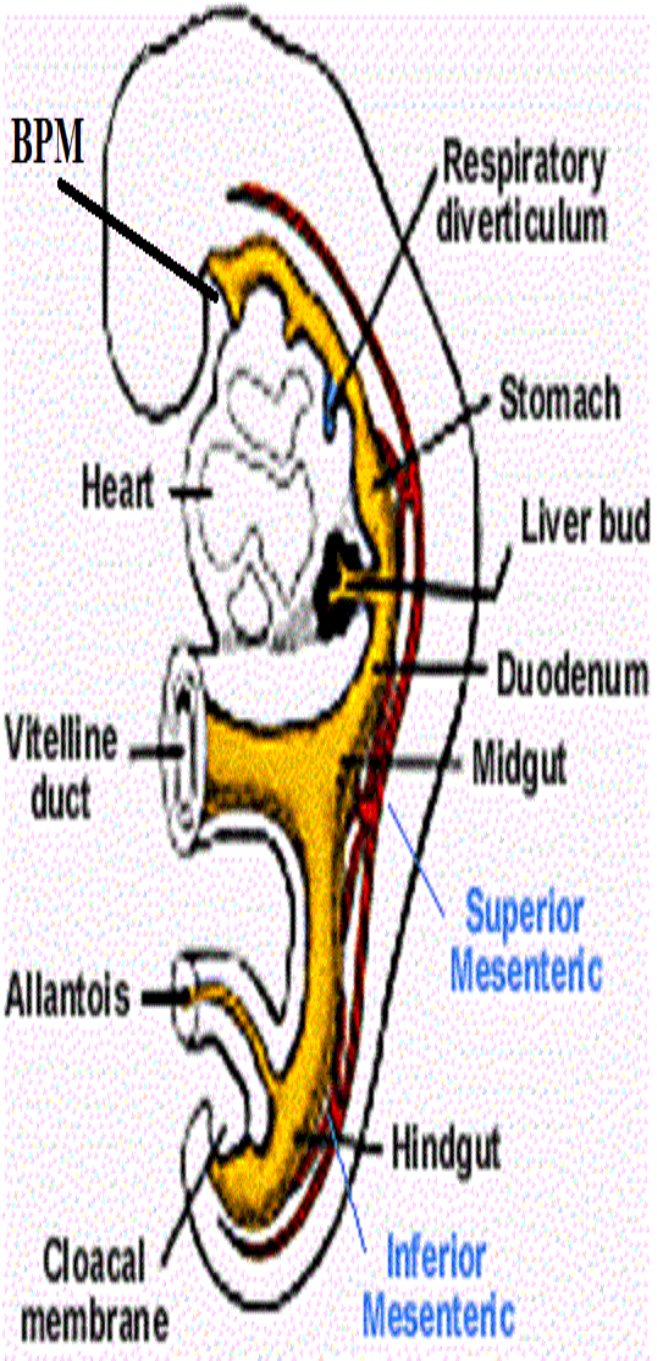
divided by laryngeotracheal(respiratory) diverticulum into:

1- cranial (pharyngeal) part:

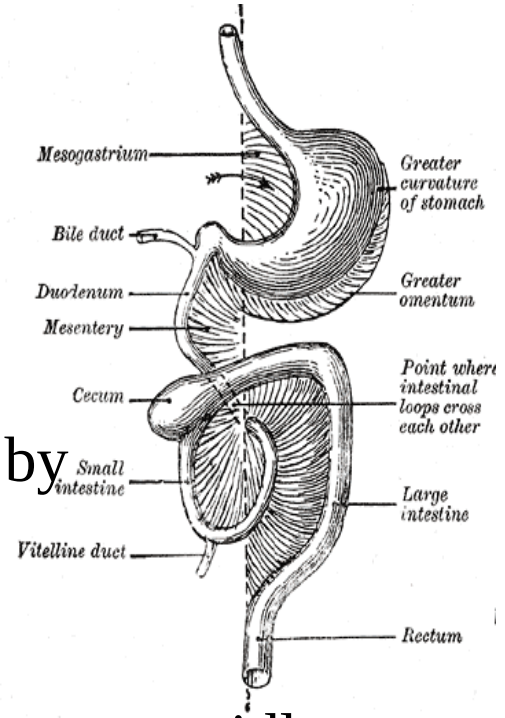
- from the BPM to
- the laryngeotracheal diverticulum
- will form: post. Part mouth cavity and pharynx

2- caudal part:

-from the laryngeotracheal diverticulum to origin of liver bud
-will form esophagus, stomach , upper half of duodenum
liver, pancreas and biliary system



DUODENUM



developmental sources:

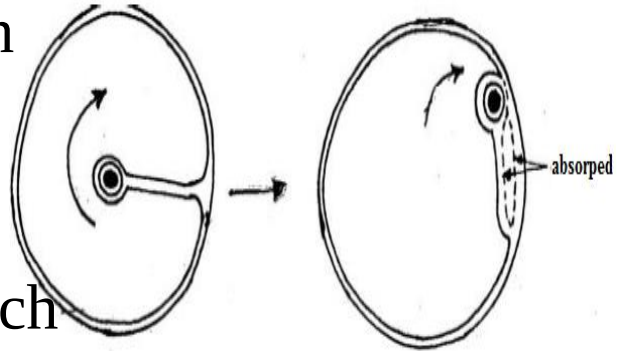
1- upper part from terminal part of foregut

2- lower part from proximal part of midgut

N.B: junction ( ) foregut & midgut is marked in adult by opening of bile duct in second part of duodenum

development:

- terminal part of foregut & proximal part of midgut grow rapidly formation of u shaped duodenal loop that is convex ant. &covered by peritoneum & attached to post. abd. wall by mesoduodenum
- loop rotate 90 o to Rt due to rotation of stomach convexity become to Rt
- Fixation: Mesoduodenum degenerate
- duodenum become retroperitoneal except 1st inch



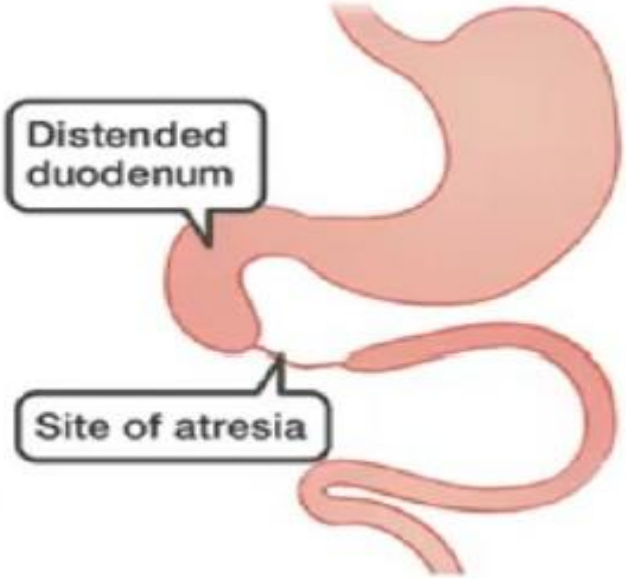
DUODENUM

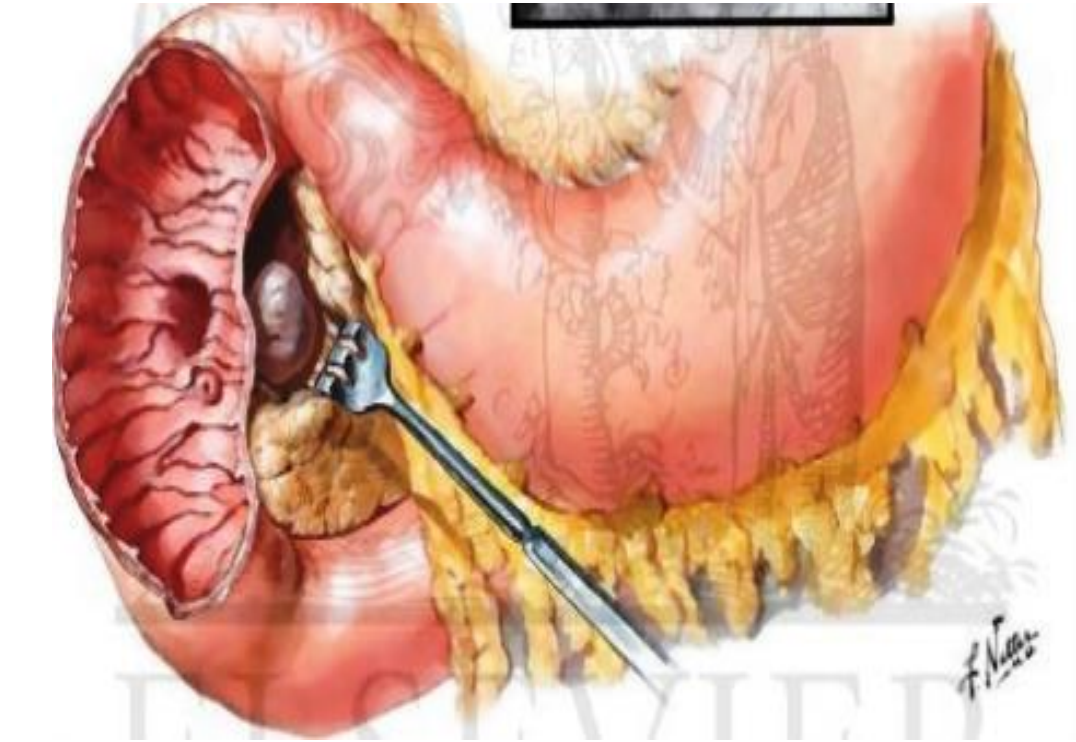
Congenital anomalies:

1- atresia &stenosis

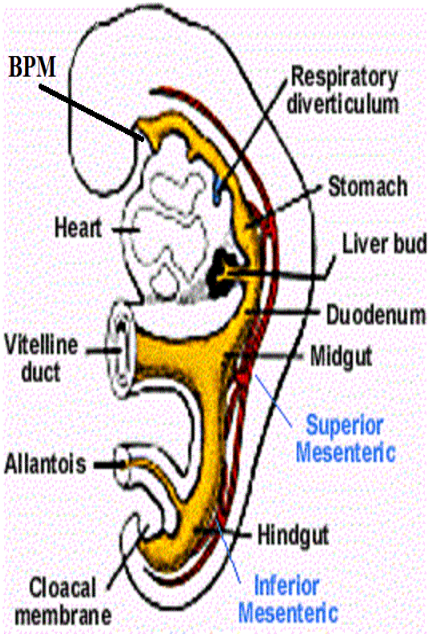
2-diverticulae

3-persistence of mesoduodenum





MIDGUT



Extent:

from ant. intestinal portal

(site of liver bud)

(in adult opening of CBD in duodenum)

to post. intestinal portal

(In adult junction of Rt 2/3 & Lt 1/3 of transverse colon).

it is connected with yolk sac by vitelline (vitellointestinal) duct

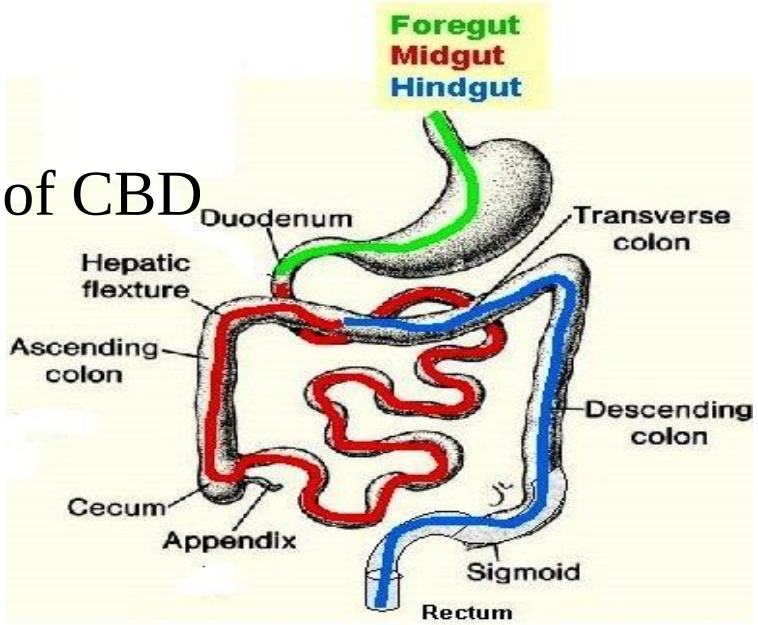
Derivatives (fate):

It gives

- lower half of duodenum caudal to opening of CBD

-jejunum , ilium , appendix , caecum ,

ascending colon & Rt 2/3 of tr. colon



MIDGUT

Development:

▯ primary midgut (intestinal) loop:

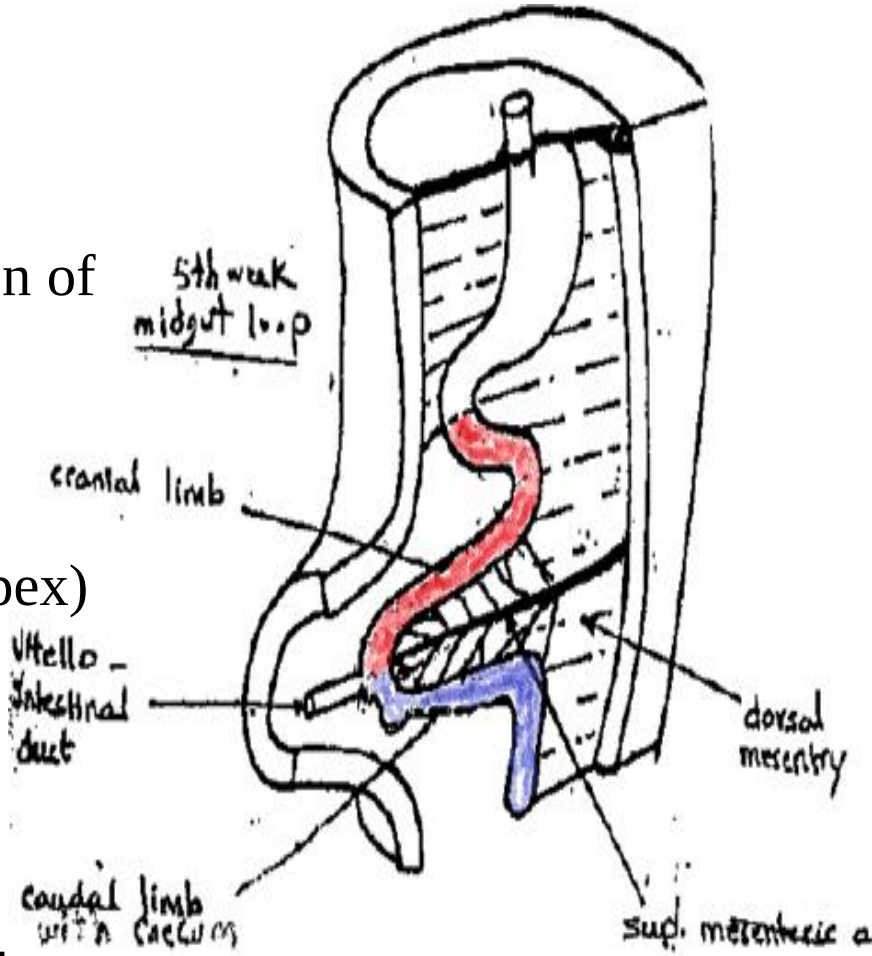
midgut grows rapidly in length ⟶ formation of U shaped loop that is formed of

1- cranial limb

2- apex connected to vitelline duct

3- caudal limb with swelling (close to the apex) that will form caecum

4- superior mesenteric art. along its axis (in its dorsal mesentery)



▯ physiological umbilical hernia:

-at 6th week of dev., the rapidly elongating loop herniate into umbilical cord through umbilical orifice

-herniation is due to inability of abd. cavity to accommodate rapidly growing mid gut due to

1-slow growth of abd. cavity

2-development of liver & kidney

MIDGUT

Development:

- **While the loop in the umbilical cord**

-The cranial limb form

the lower 1/2 of duodenum,

jejunum and greater part of ileum

-The caudal limb also form

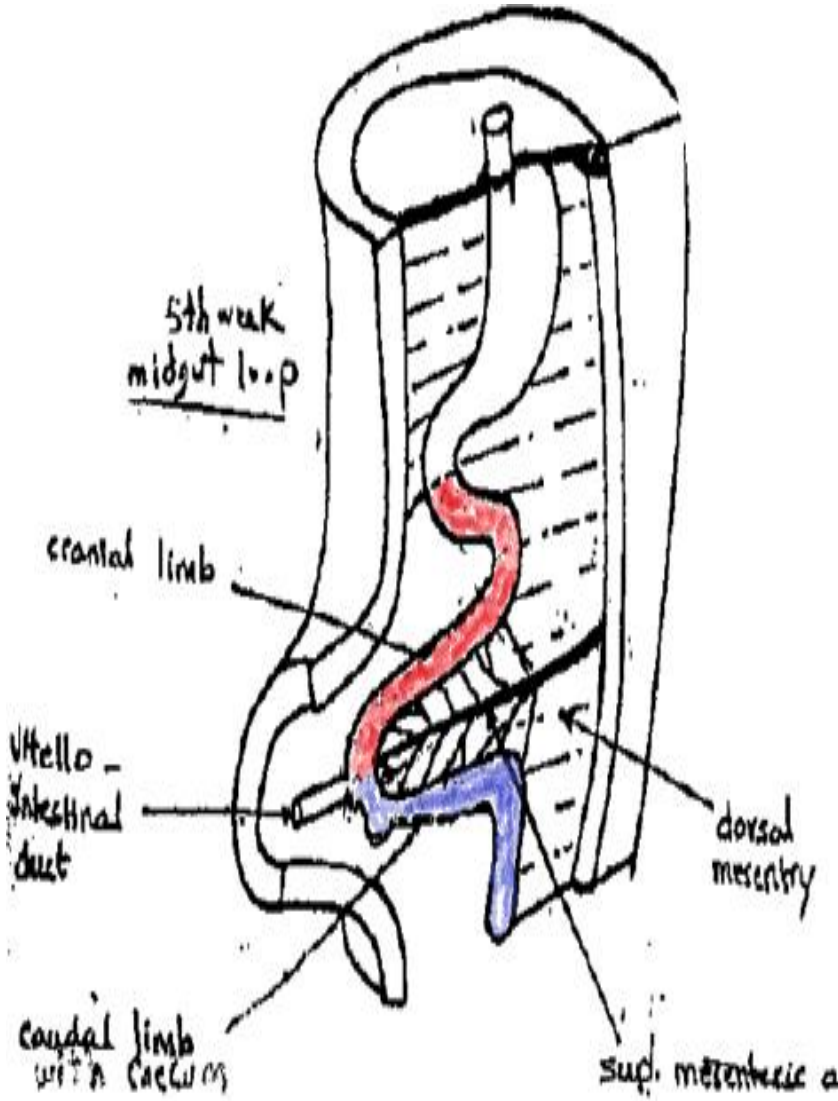
the distal part of ileum,

caecum,

appendix,

ascending colon

and Rt 2/3 of transverse colon



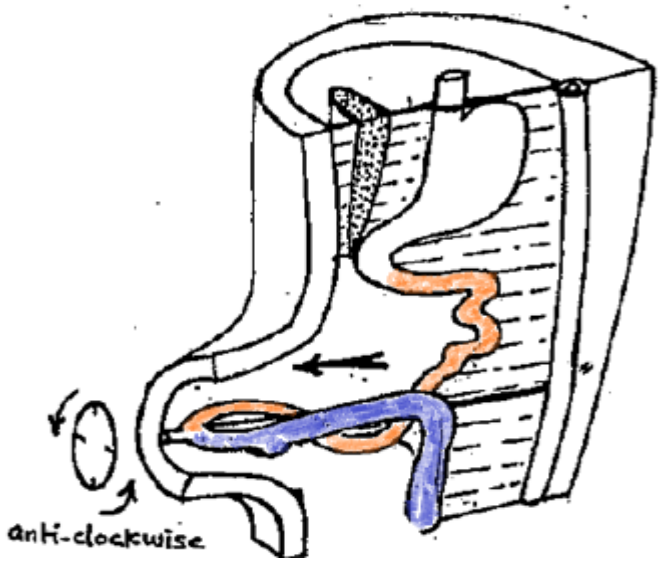
MIDGUT

Development:

rotation of the intestinal loop

-Due to further elongation of loop.

-Total 270 anticlockwise around its long axis formed by SMA.



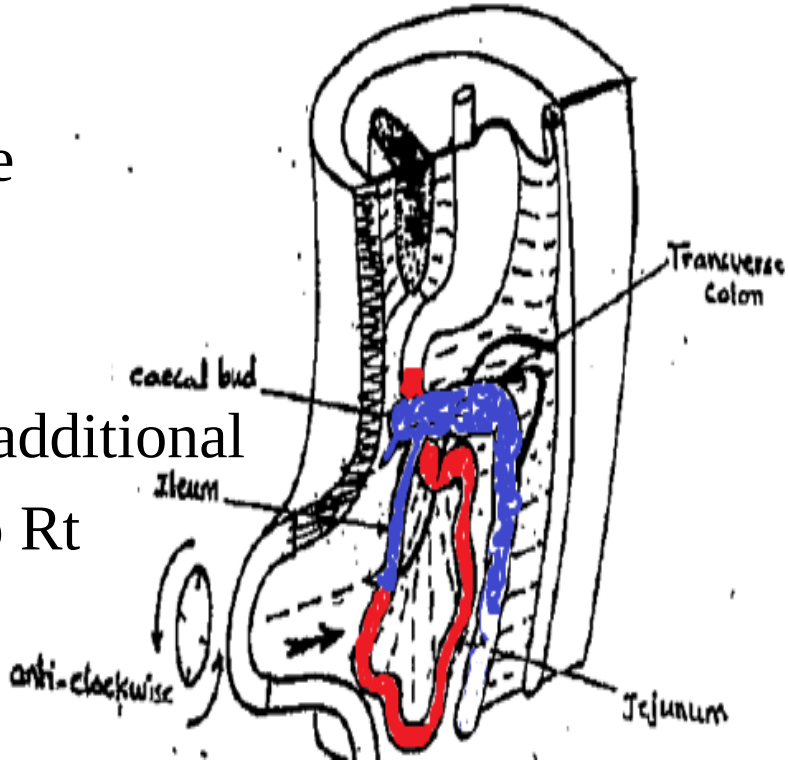
-While in umbilical cord, it rotates:

90 → caudal limb become to Lt & cranial limb become to Rt., then rotate

90 → caudal limb become cranial & cranial limb become caudal

- As the gut returns to abd cavity, it rotates additional

90 → the caudal limb (tr. Colon) become to Rt &crosses (become superficial) to the cranial limb (2nd part of duodenum)



MIDGUT

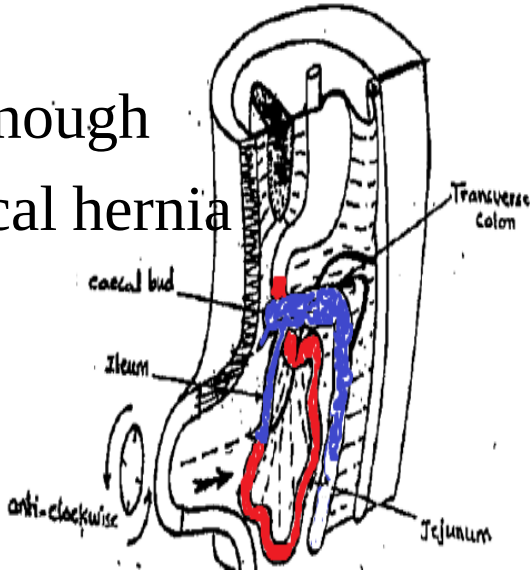
Development:

- **return of the loop:**

-at 10th week of dev., the abd. cavity become wide enough to accommodate the intestine → return of physiological hernia

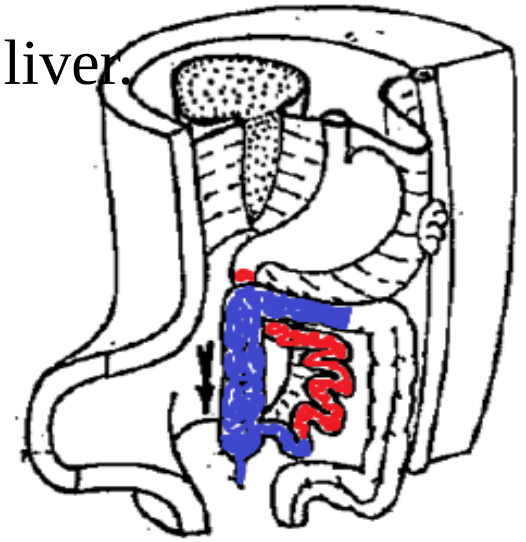
-jejunum is the 1st part to return into abd cavity &lies on the Lt side

-caecum is the last part to return into abd cavity & lies with the appendix on the Rt side , below and in contact with Rt lobe of liver.



- **caecum and appendix descend**

to Rt iliac fossa due to elongation of the segment ( ) caecum & tr. Colon to form Rt colic flexure and ascending colon



MIDGUT

Development

- **change the site of opening of appendix**

from apex of caecum to

its posteromedial wall

by differential growth

- **Fixation of intestine:**

-The mesentery of duodenum,

ascending colon and descending colon

fuse with peritoneum of post. abd wall &

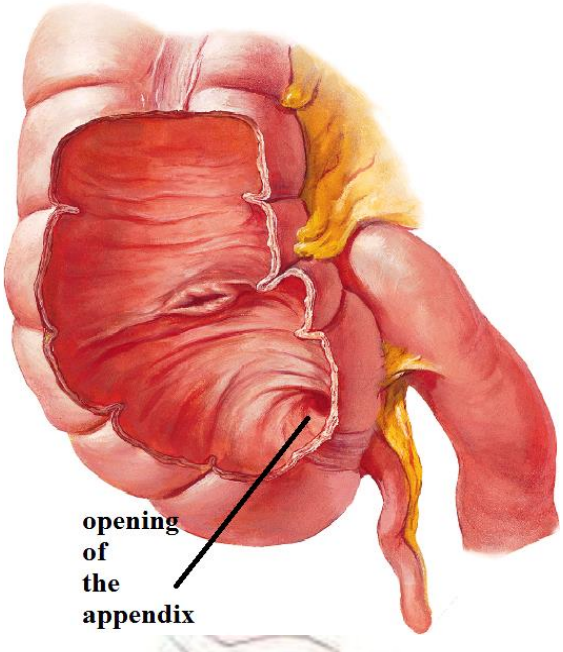
these organs become retroperitoneal

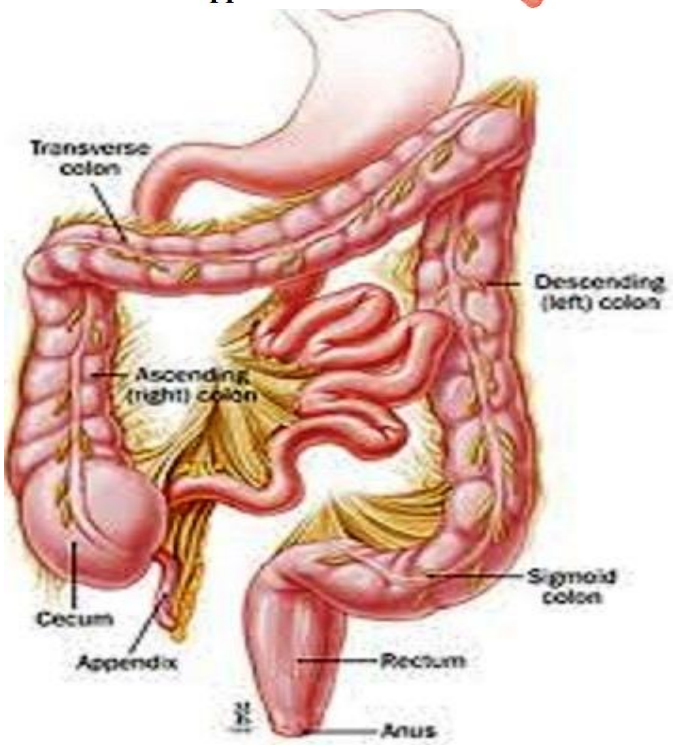
-The other mesenteries persist

- **At 2nd month** the vitelline duct

is obliterated ,

fibrosed and degenerate





MIDGUT

Congenital Anomalies:

of intestine:

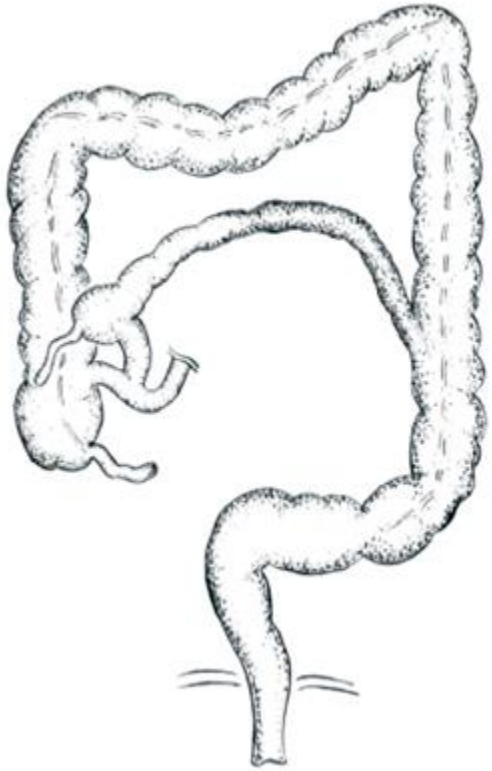
A-of intestinal loop

1- atresia (due to failure of recanalization)

2-stenosis (due to defect in recanalization)

3-Diverticulosus:- due to week wall

4-Duplication is common in **ileum**



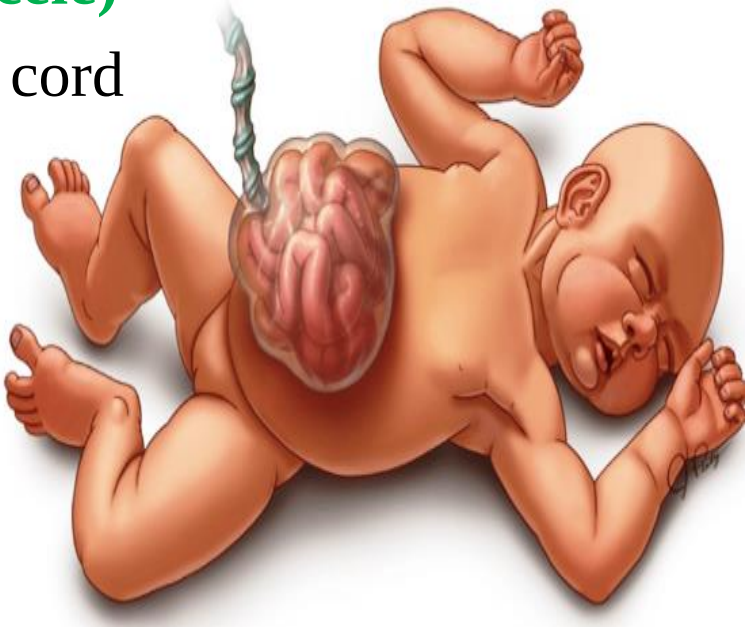
B- congenital umbilical hernia (omphalocele)

-herniation of intestinal loop into umbilical cord

-due to failure of return of

physiological umbilical hernia

or wide umbilical orifice

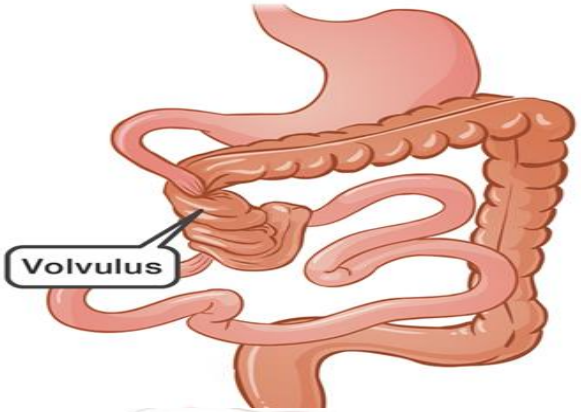


MIDGUT

Congenital Anomalies:

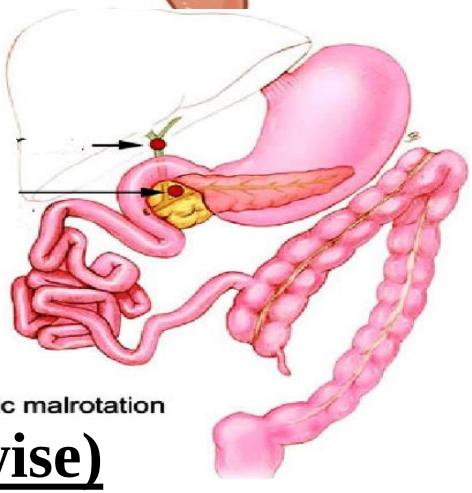
of intestine:

C- of rotation:



1- excessive rotation more than 270

leads to congenital volvulus

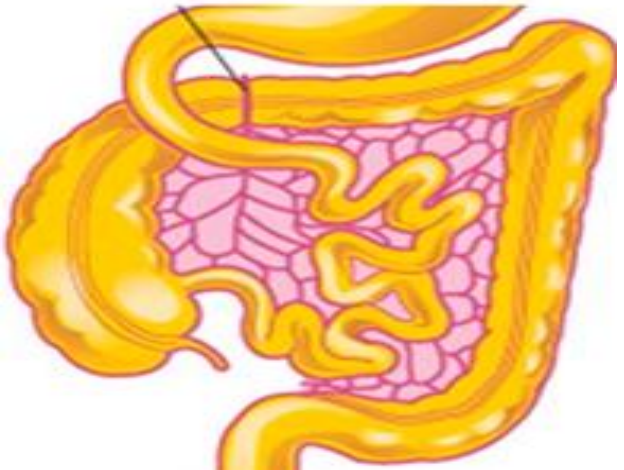


2-incomplete rotation 90 anticlockwise only:

caecum & colon become in Lt side of abdomen while duodenum , jejunum and ileum become in Rt side

3-reversed rotation, 90 in reverse direction (clockwise)

duodenum lies in front transverse colon

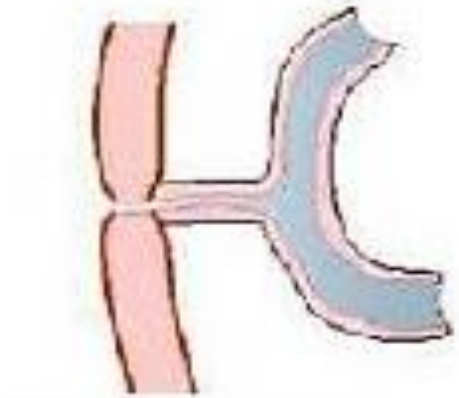


MIDGUT

Congenital Anomalies:

of intestine:

D- of vitelline duct

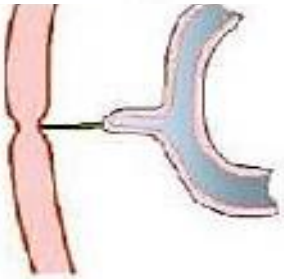


Vitelline fistula

1- vitelline (umbilical faecal) fistula:

-due to persistence of vitelline duct

- with faecal discharge at the umbilicus



Meckel's diverticulum

2- Meckel's diverticulum:

-due to persistence of the proximal part of vitelline duct

-it has the following features:

- in 2% of people , 2 inches (5 Cm) long ,2 feet from ileocaecal valve
- Attach to ant mesenteric border of ileum
- Attached to umbilicus by a fibrous cord
- May contain ectopic gastric or pancreatic tissue
- May cause pain confused with the pain from appendicitis

MIDGUT

Congenital Anomalies:

of intestine:

D- of vitelline duct

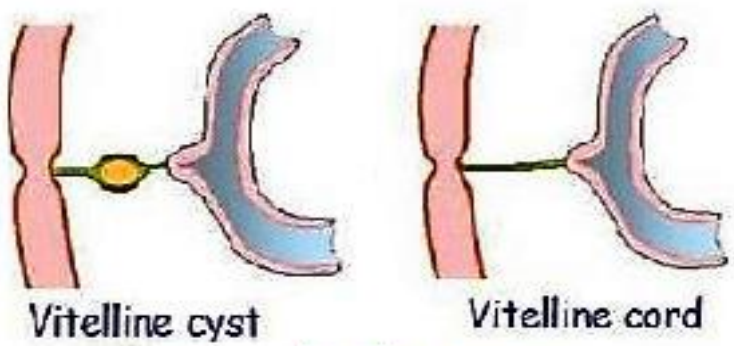
3-vitelline sinus: due to persistence of distal part of vitelline duct

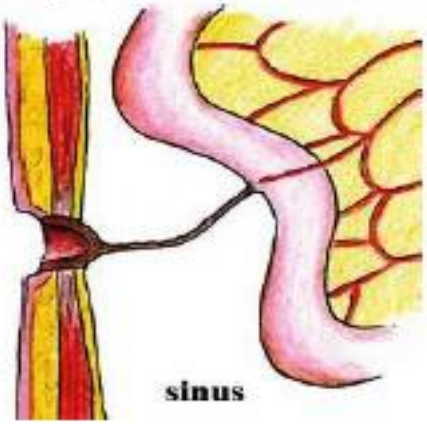
4-vitelline cyst: due to persistence of middle part of vitelline duct

5-fibrous cord:

-due to failure of degeneration of
the obliterated, fibrosed vitelline duct

-a loop of intestine may become wrapped
around it causing intestinal obstruction





MIDGUT

Congenital Anomalies:

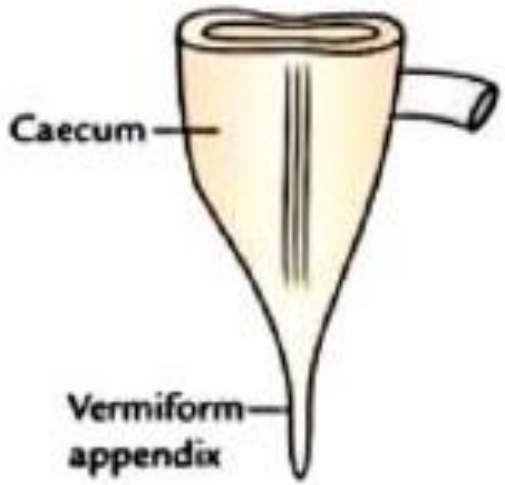
of caecum and appendix:

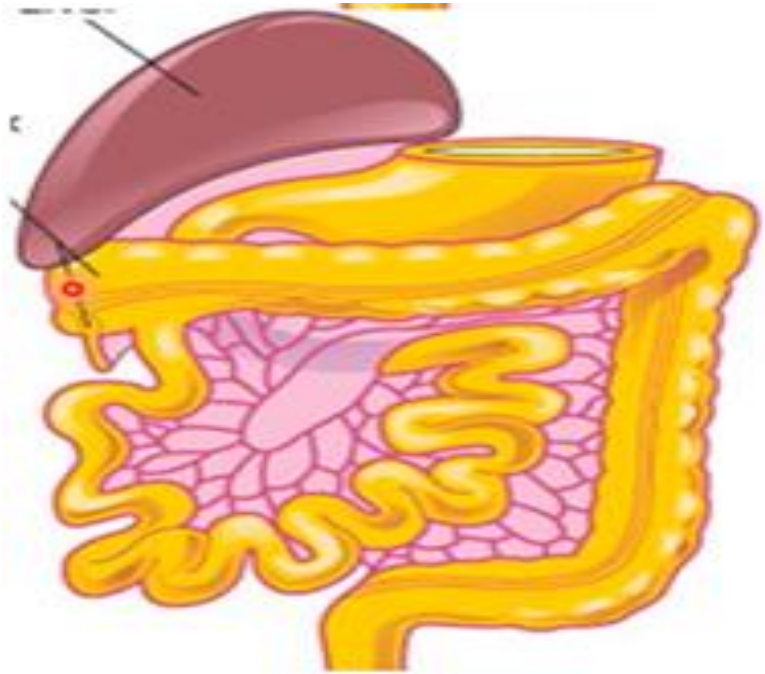
1- Abnormal position:

e.g. sub hepatic, or Rt lumbar caecum and appendix:

Due to failure of descend or arrest during descend

2- Retention of fetal shape with apical appendix.





HINDGUT

DEF.:-

the part of the primitive gut which
is enclosed in the tail fold of the embryo.

Extent:

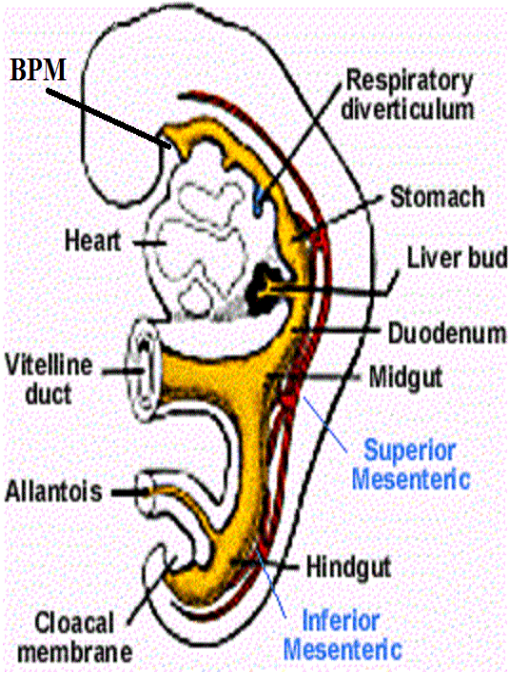
It extends from the posterior intestinal portal until the cloacal membrane.

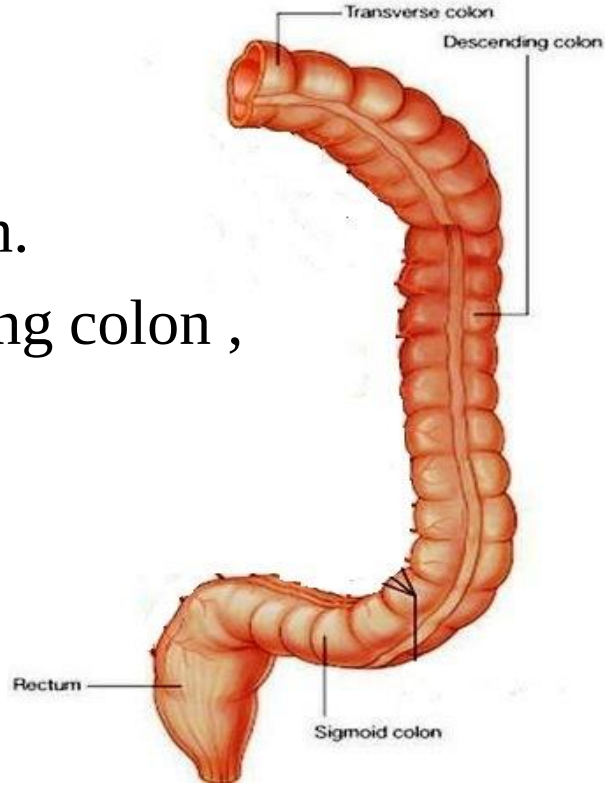
Fate(derivatives):

-left 1/ 3 of transverse colon.

-left colic flexure, descending colon , sigmoid colon, rectum.

-upper 1 /2 of anal canal.





RECTUM

Development source:

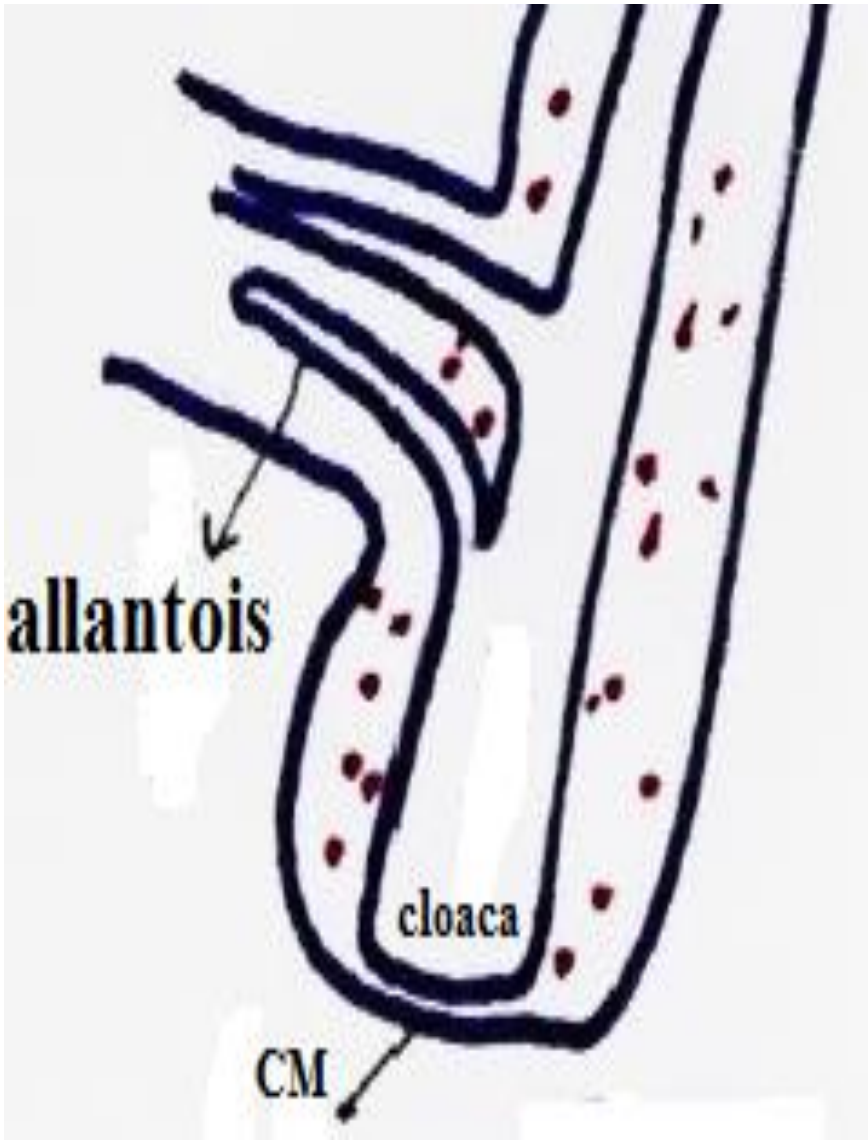
endodermal cloaca of hindgut.

allantois:

diverticulum projecting ventrally from hindgut into umbilical cord

endodermal cloaca:

dilatation in hindgut just distal to origin of allantois, closed caudally by cloacal membrane (that separate the cavity of hind gut from the surface)



RECTUM

Development:

 the mesoderm at the angle ( ) hindgut and allantois proliferate and invaginate the endoderm forming urorectal septum that grows inferiorly in a coronal plane dividing the endodermal cloaca into:

-primitive recto anal canal (dorsal)

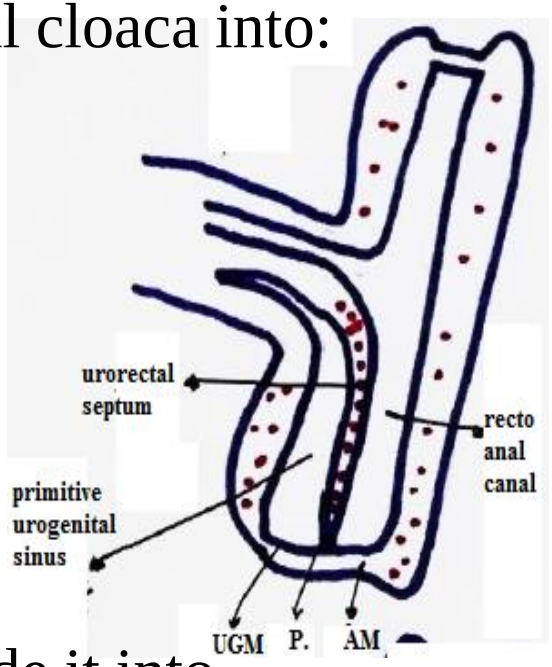
Form rectum

upper part of anal canal.

-primitive urogenital sinus (ventral)

Form urinary bladder & urethra

vagina.



 when septum fuse with cloacal membrane, it divide it into

-anal membrane (dorsal) -urogenital membrane (ventral)

primitive perineum (at site of fusion)

 the muscle of rectum develop from surrounding mesoderm

ANAL CANAL

Development:

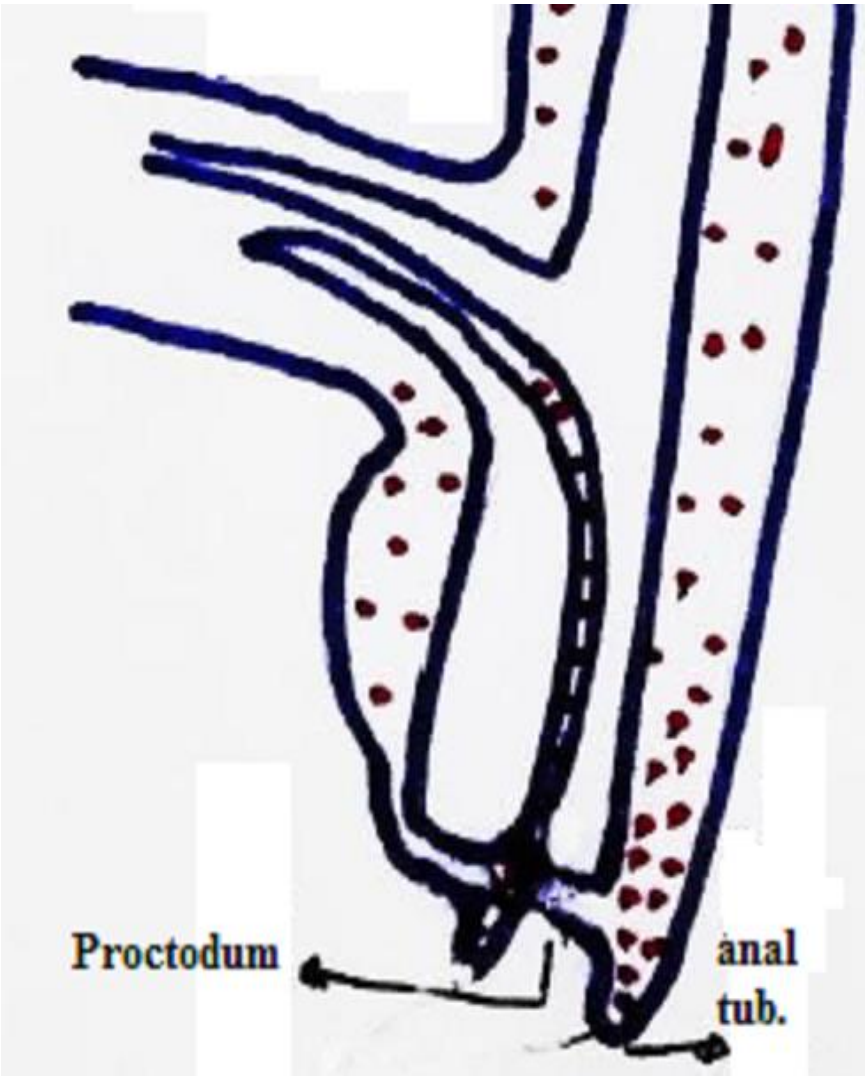
- **upper half:** from rectoanal canal (endodermal)

This part of anal canal is lined by a mucous membrane.

- **lower half:** from proctodeum (ectodermal) as follows:

mesoderm around anal membrane proliferate to form anal tubercles, and by the 9th week of development, the anal membrane comes to lie at the bottom of a depression called the proctodeum.

This part of anal canal is lined by stratified squamous epithelium (skin).



ANAL CANAL

Development:

- **rupture of anal membrane**

results in continuity( )upper & lower 1/2s

N.B: remnants of anal membrane

are represented in adult by

anal valves &pectinate line

The two parts of anal canal differs

in A.S. , N. S.& V.D. , L.D..

- **muscles of anal canal**

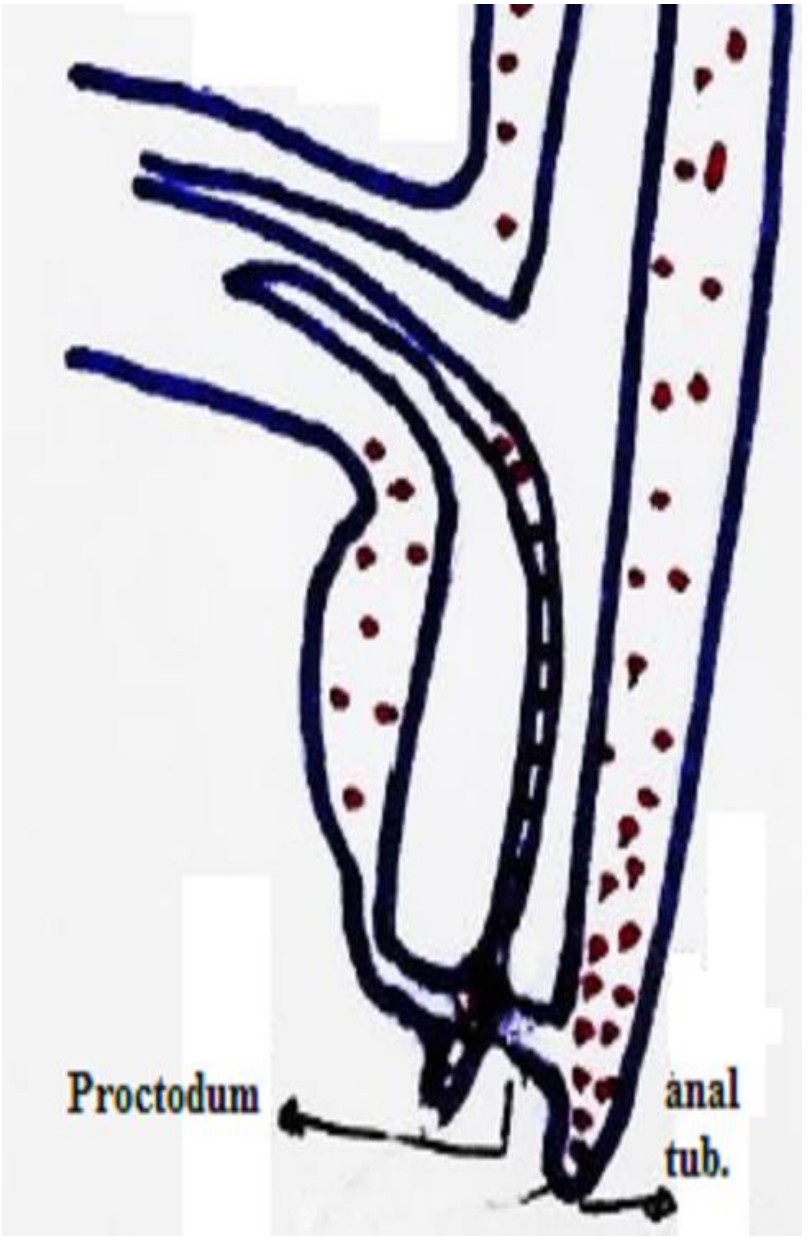
develop from surrounding mesoderm.

In the upper part form

int. anal sphincter (involuntary) , while

In the lower part form

ext. anal sphincter (voluntary)



ANAL CANAL

Congenital anomalies of rectum and anal canal:

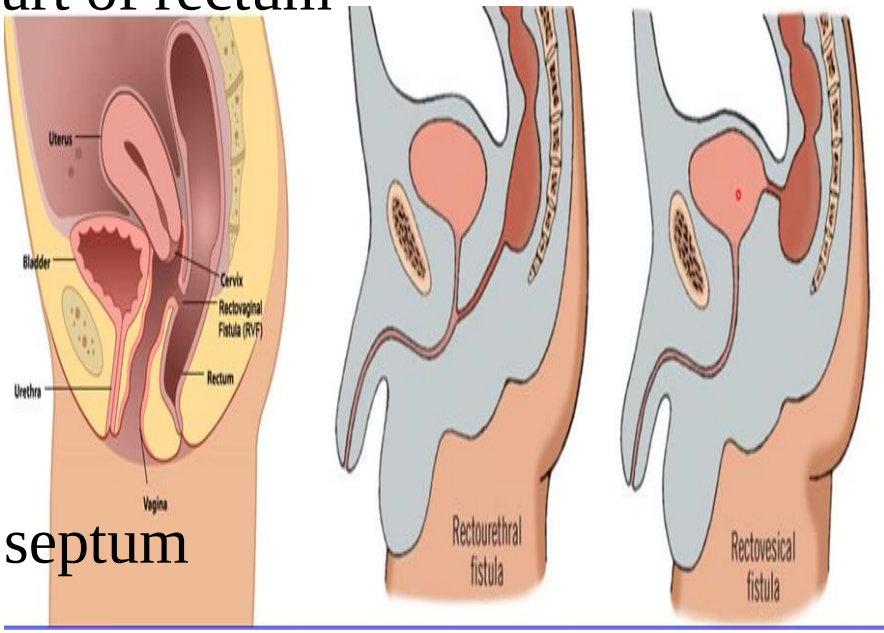
1-rectal atresia: obliteration of lower part of rectum

2-rectal fistulae: recto vesical,

recto urethral,

recto vaginal fistulae

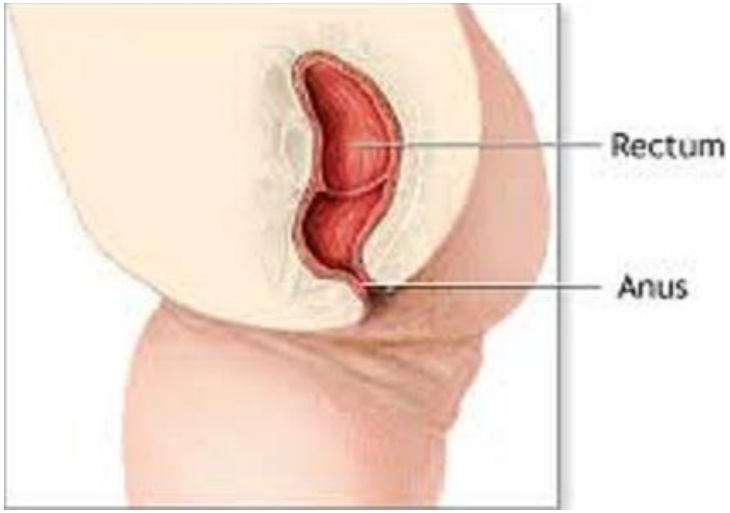
- communication ( ) rectum and either the urinary bladder, urethra or vagina
- due to incomplete growth of urorectal septum



3-imperforate anus:

anal membrane fails to rupture

and persist as a diaphragm stretching across the anal canal at level of anal valves



ANAL CANAL

Congenital anomalies of rectum and anal canal:

4-primary megacolon

(Hirchsprung's disease, aganglionic colon)

-in the 1st few days after birth ,

the child fails to pass meconium

and the abdomen become distended

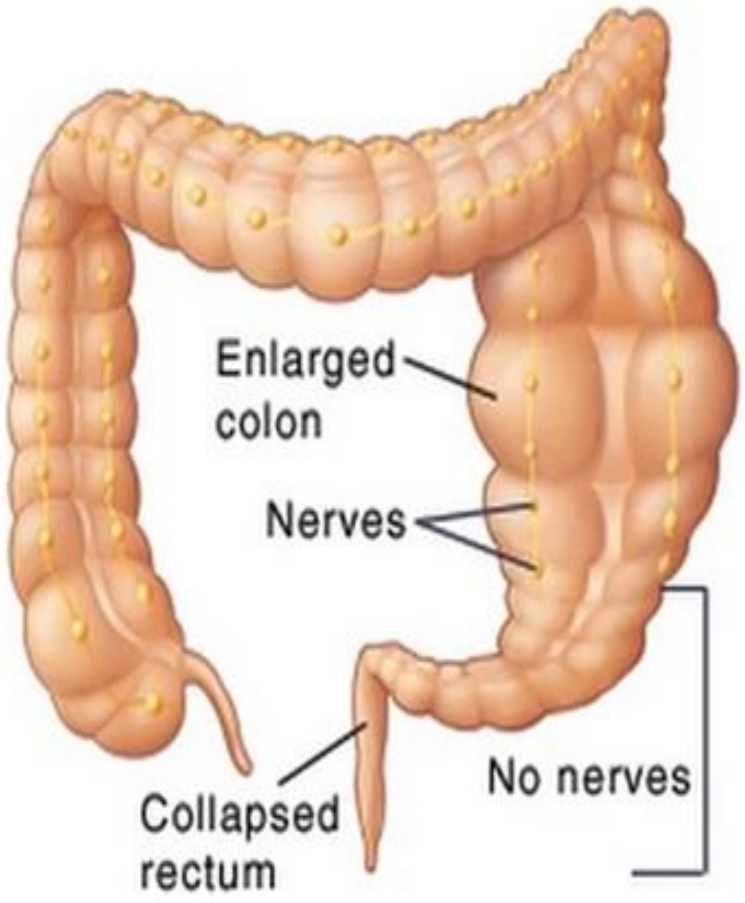
- Rectum & anal canal are constricted
- &sigmoid colon is greatly distended

-Due to failure of migration of

neural crest cells from neural folds

to form parasympathetic ganglia

in wall of bowel



THANQ