



GIS-Anatomy

Sheet #10

11-04-2019

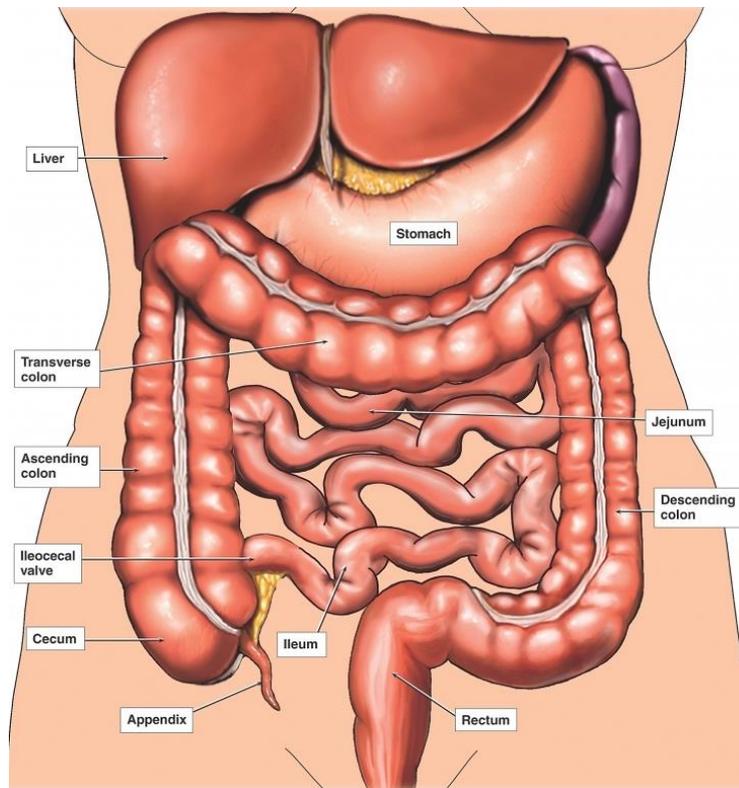
Lecture title: Anatomy & Histology of The large intestine

By: Hala Hani

{ this sheet includes everything in the slides }
Sheet correction link: bit.ly/gitanatomy

Anatomy & Histology of The large intestine

Large intestine start from ileocecal valve, ascending colon, transverse colon, descending colon, sigmoid colon, rectum and anal canal.

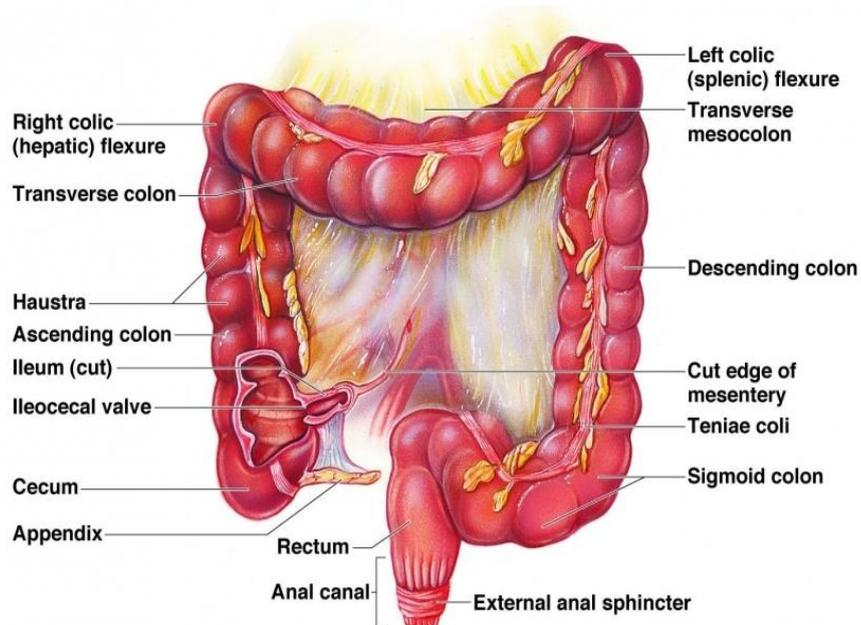


First part of Large intestine is the cecum.

Cecum

- ✓ Cecum measures 3 inch in length and 3 inch in width
- ✓ covered by peritoneum from all sides (intraperitoneal)

cecum is a blind-ended pouch that is setting on the right iliac fossa. **Large intestine** is **sacculated** because the longitudinal muscle fiber is shorter than the actual length of intestine (The **teniae coli** run the length of the colon. Because the **taenia coli** are shorter than the colon, the colon becomes sacculated between the **teniae coli**, forming the haustra and giving colon segmented appearance).

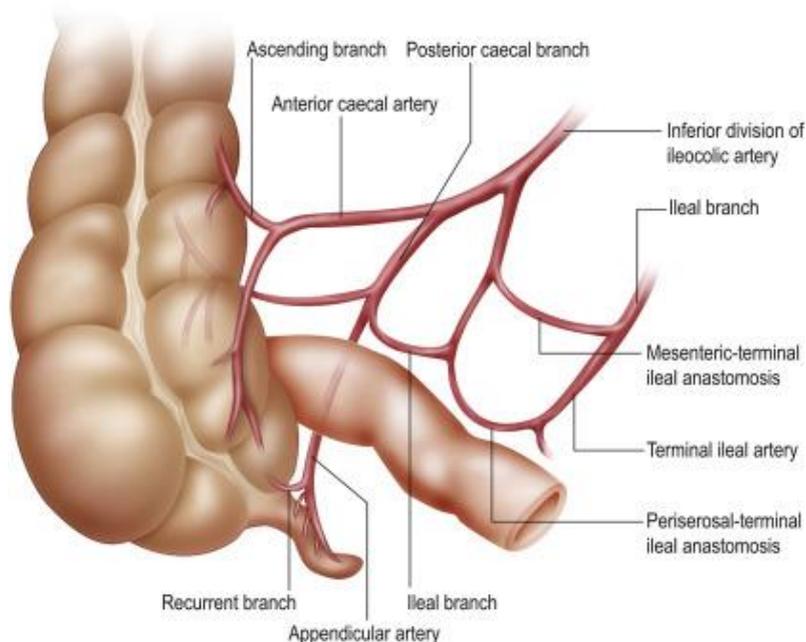


The intestine composed of :

- inner circular muscle
- outer longitudinal layer.

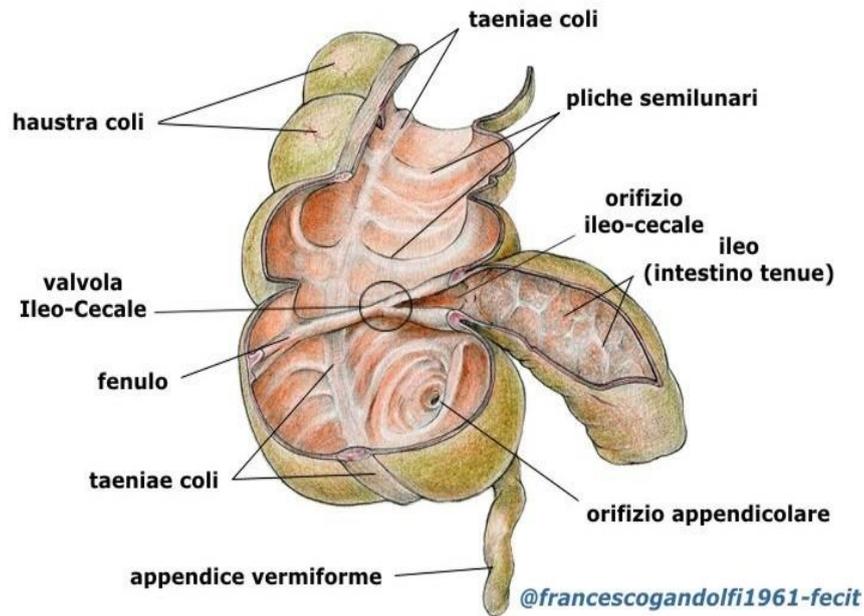
The longitudinal muscle is restricted to three flat bands, the *teniae coli*, which converge on the base of the appendix (at the junction of the appendix and cecum) and provide for it a complete longitudinal muscle coat. Bands :

- Anterior band
- Posteromedial band
- Posterolateral band



Cecum meet the ileum at the ileocecal valve. **Ileocecal valve**: opening with 2 folds where the terminal ilium join the cecum.

Appendix which is 3 cm below the ileocecal valve on the **posteromedial side**. On **Medial side**: ileocecal valve and the posterior tenia coli join the anterior tenia coli at the site of attachment of the appendix with the cecum.



Relation of cecum :

Posteriorly: The psoas, the iliacus muscles and the lateral cutaneous **nerve** of the thigh. (++ the femoral nerve, **not mentioned by the doctor**)

Medially: femoral **nerve** and common iliac vein and artery (or you can say external iliac artery and vein)

Anteriorly: coils of small intestine. (sometimes part of the greater omentum, and the anterior abdominal wall in the right iliac region. **not mentioned by doctor. Source: Snell p862**)

Note : prof said that femoral nerve is found medially but in the book it's on the posterior side.

Extra figure

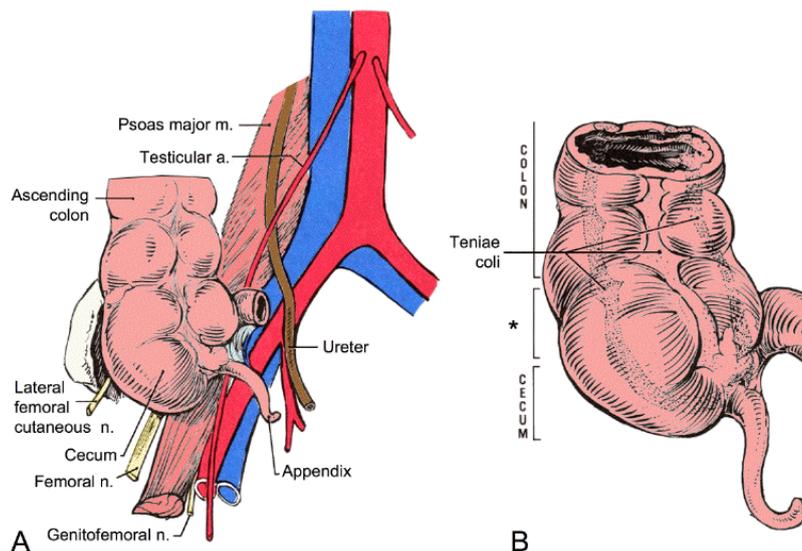


Figure from slides

Posterior Relations (CECUM – ASCENDING & DESCENDING COLONS)

□ Cecum:

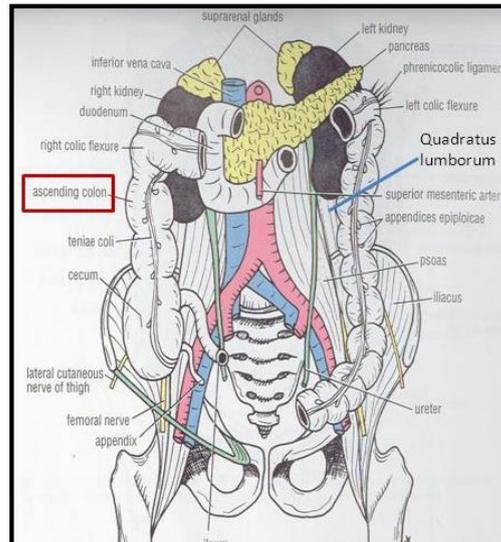
1. Psoas major
2. Iliacus

□ Ascending colon:

1. Iliacus
2. Quadratus lumborum
3. Right kidney.

□ Descending colon:

1. Left kidney
2. Quadratus lumborum
3. Iliacus



Ascending Colon

- ✓ The ascending colon is about 15 cm.

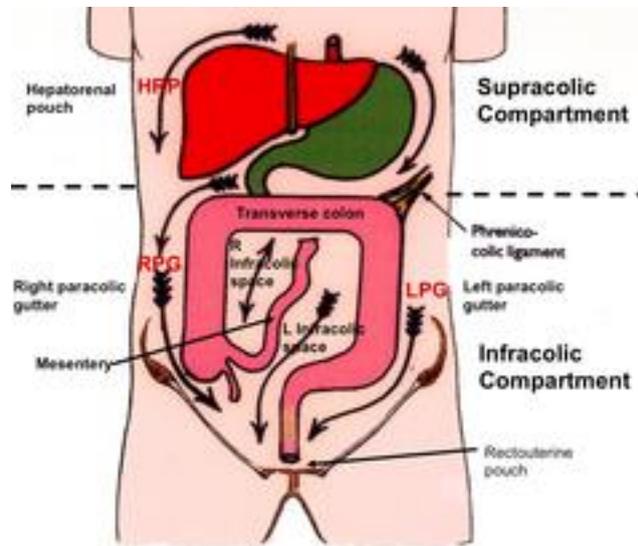
Found in front of **iliacus muscle** and **quadratus lumborum**, it ascend up to **lower part of the right kidney** and rotate to left to form hepatic flexure (right colic flexure).

Anterior to the ascending colon you can find coils of the small intestine(ileum and jejunum). On the Lateral side of ascending colon there is gutter or sulcus that is connected with the sub-diaphragmatic space.

Paracolic gutters are spaces between the colon and the abdominal wall.

There are two paracolic gutters:

- The right lateral paracolic gutter.
- The left medial paracolic gutter. **limited by transverse colon**



Ascending colon is **extraperitoneal**, covered by peritoneum from the *anterior* side, *medial* side and *lateral* side and its sticking to the posterior abdominal wall.

Relations (*recap/ not all are mentioned by doctor just the bold one*)

Anteriorly: Coils of the small intestine, the greater omentum, and the anterior abdominal wall

Posteriorly: The **iliacus**, the iliac crest, the **quadratus lumborum**, the origin of the transversus abdominis muscle, and the **lower pole of the right kidney**. The iliohypogastric and the ilioinguinal nerves cross behind it.

Transverse Colon

Main characteristic of large intestine is the presence of **tenia coli**, 3 bands of longitudinal muscles, and there is fatty sacs → **epiploic appendices** or **appendices epiploicae** which are small pouches of the peritoneum filled with fat and situated along the colon, but are absent in the small intestine.

The transverse colon is about 50cm long. Extend between **hepatic flexure** (*right colic flexure below the right lobe of the liver*) and **splenic flexure** (*left colic flexure below the spleen and its higher than hepatic flexor*).

Transverse colon suspended by the **transverse mesocolon** → it is **intrapertoneal organ** and **has mesentery** hanged it to posterior abdominal wall. (*ascending colon* → *extraperitoneal*)

Mesentery of transverse colon (transverse mesocolon)

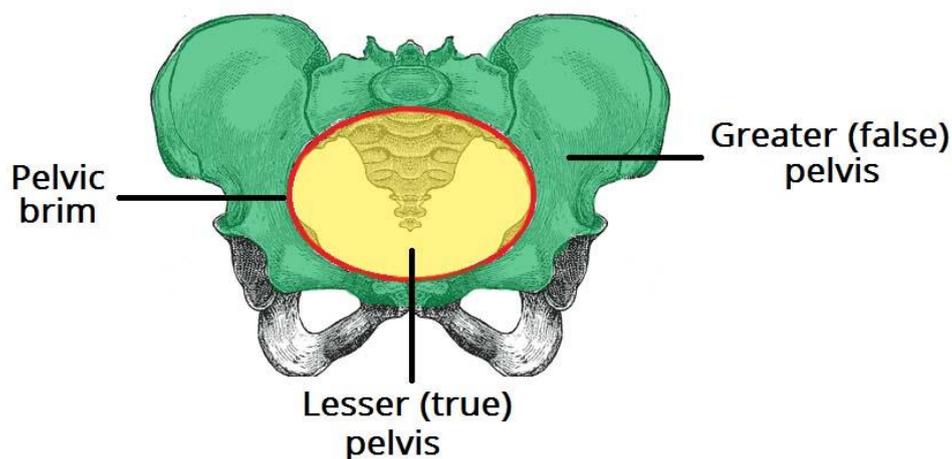
From the Descending part of the duodenum (second part of duodenum) and attached in front of the head of the pancreas and body of the pancreas.

Descending Colon

- ✓ The descending colon is about 30cm long.
- ✓ it is **longer** and **narrower** than the ascending colon.
- ✓ Descending colon is **extra-peritoneal** covered by peritoneum *anteriorly, medially and laterally* and binds it to the posterior abdominal wall.

It extend downward from **splenic flexure** in front of left kidney **to the front of quadratus lumborum, psoas and iliacus muscle** to reach the **pelvic brim**, where it becomes continuous with the **sigmoid colon**. Anteriorly there is the coils of small intestine.

Pelvic brim → edge of the pelvic inlet. It divides the internal part of the pelvis (pelvic cavity) into the false or greater pelvis and the true or lesser pelvis.
The false pelvis → above that plane/ part of the abdomen.
The true pelvis → below the plane/ contain pelvic organs.



© teachmeanatomy
The #1 Applied Human Anatomy Site on the Web

Recap (extra note) Relations:

Anteriorly: Coils of small intestine, the greater omentum, and the anterior abdominal wall.

Posteriorly: The lateral border of the left kidney, the origin of the transversus abdominis muscle, the **quadratus lumborum**, the iliac crest, the **iliacus**, and **the left psoas**.

Sigmoid colon

1、 ascending colon

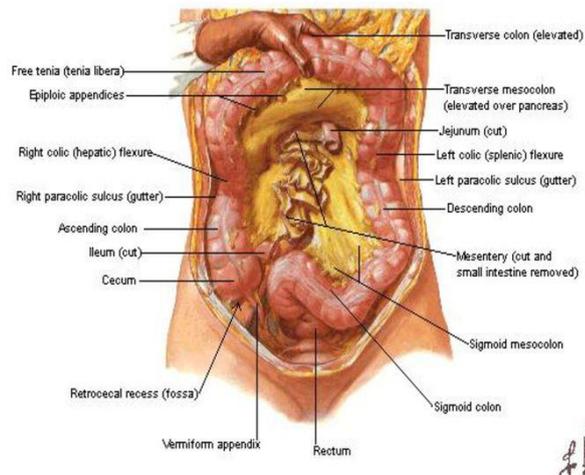
2、 transverse colon

3、 descending colon

4、 sigmoid colon

right colic flexure(hepatic)

left colic flexure(splenic)

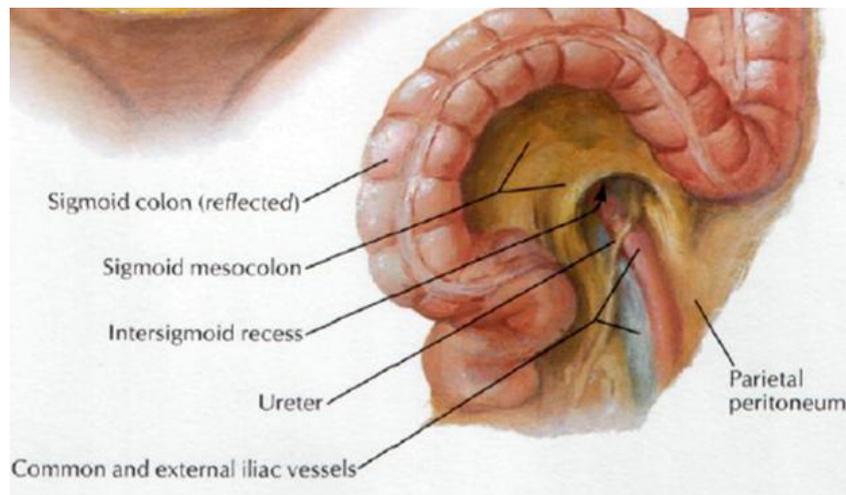


Sigmoid Colon (pelvic colon)

- ✓ Sigmoid colon is about 40 cm.
- ✓ Start from the **brim of the pelvis** to the front of the **third sacral segment**.
- ✓ **Intraperitoneal** and has **mesentery**
- ✓ Mesentery of sigmoid colon → v- shaped

Attachment of the mesentery in front of the **left ureter** and **common iliac artery** where it divide to **internal and external artery**.

(extra figure not from slides)



Relation :

Posteriorly : right ureter, common iliac artery, sacro-iliac joint and third sacral segment

Superiorly : coils of small intestine

Inferiorly the sigmoid is setting on the top of:

- ✓ urinary bladder in male
- ✓ urinary bladder and uterus in female

SIGMOID COLON

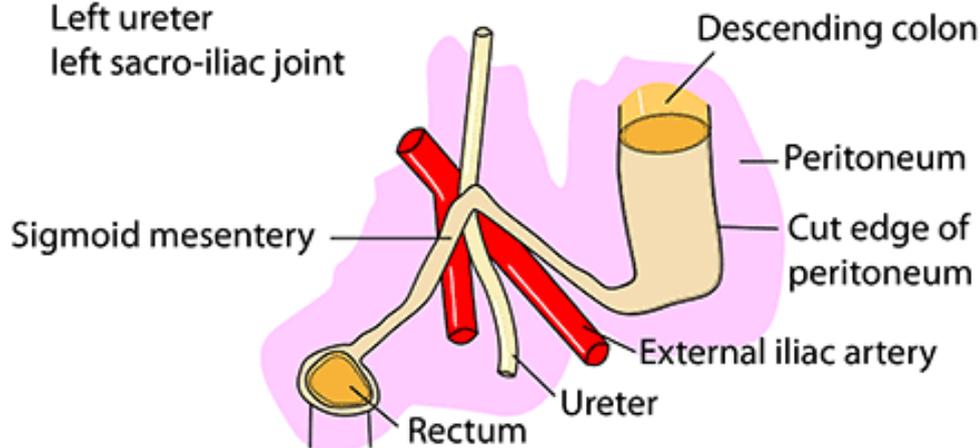
- 40 cm
- From pelvic brim to S3 midline
- On mesentery
- Appendices epiploicae +++
- Taenia become progressively more as a longitudinal coat

Sigmoid colon is excised to expose the base of its mesentery which crosses:

Common iliac artery bifurcation

Left ureter

left sacro-iliac joint

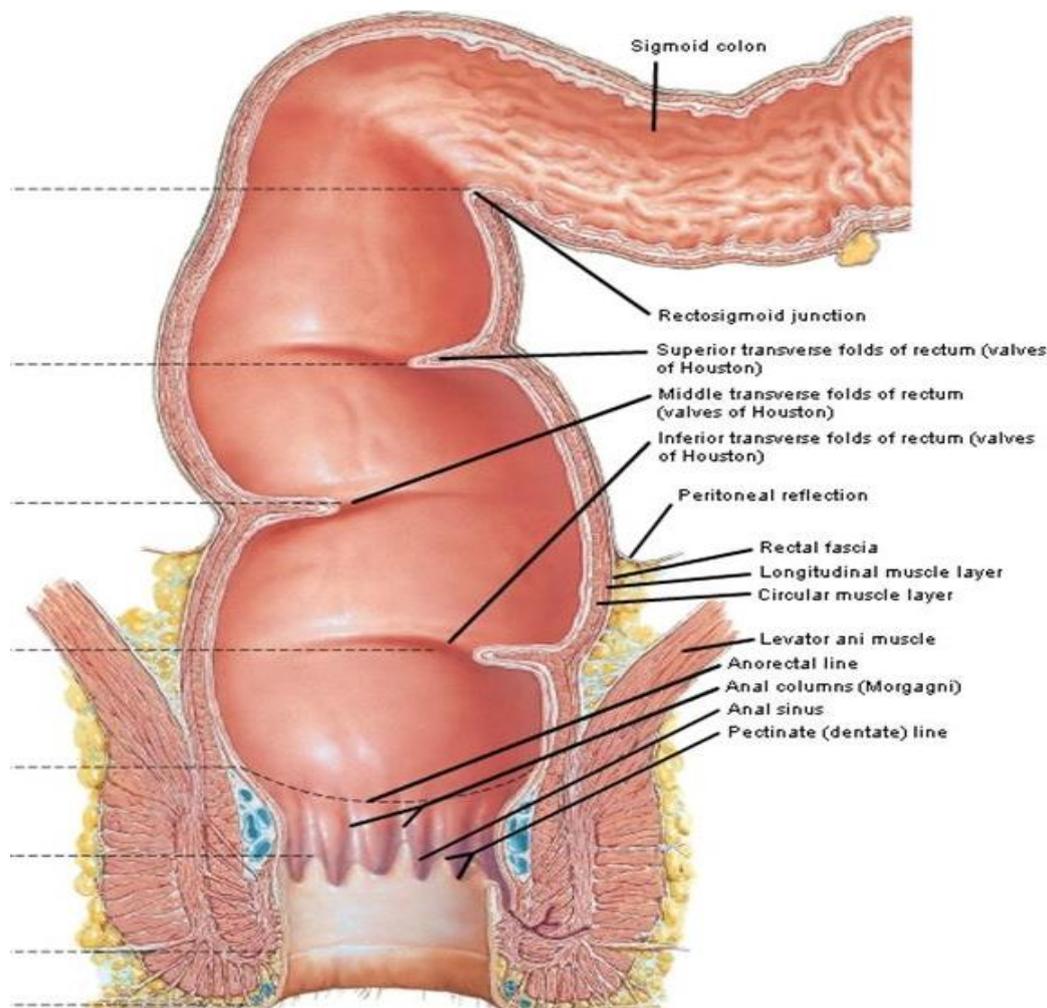


Differences between small & large Intestine

LARGE INTESTINE	SMALL INTESTINE
Wider caliber and shorter 1.5 meter	Narrower and longer 6 meters
Greater part is fixed .	Greater part is mobile .
Villi are absent	Villi are present
Appendices epiploicae except in Caecum. Vermiform appendix & Rectum.	No
Tinea coli are present	No
Hustrations .as the length of tinea coli is shorter than the colon length.	No

Rectum

- ✓ start from the **third sacral vertebra** or segment to the front of the **tip of the sacrum**.
- ✓ filling the concavity of the sacrum .
- ✓ rectum deviates to **left side** and then return back to the **middle line** and ends one inch **in front of sacrum** and its end dilates forming the ampulla of the rectum
- ✓ inside the rectum → mucosa and muscular layer form folds. 2 folds on the left side and 1 fold on the right side.
 - Superior transverse fold of the rectum
 - Middle transverse fold of the rectum
 - Inferior transverse fold of the rectum
- ✓ **No tenia coli** → longitudinal fibers forms 2 bands :
 - Anterior band
 - Posterior band



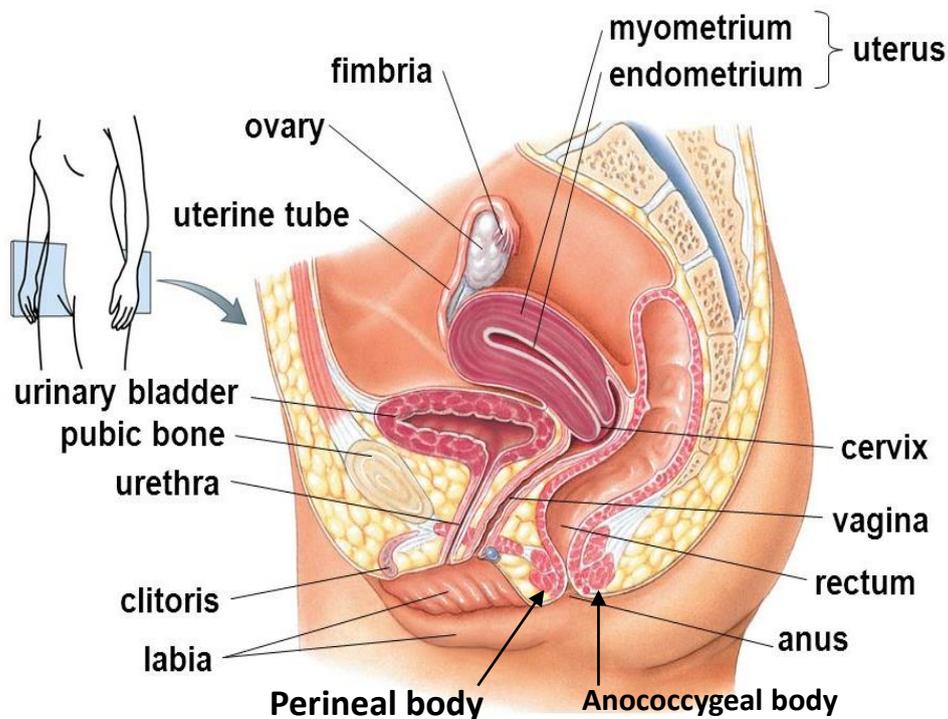
Relation:

Posteriorly : sacrum, piriformis muscle, levator ani muscle , coccygeus muscle and sacral plexuses.

Rectum divided to **3 parts** :

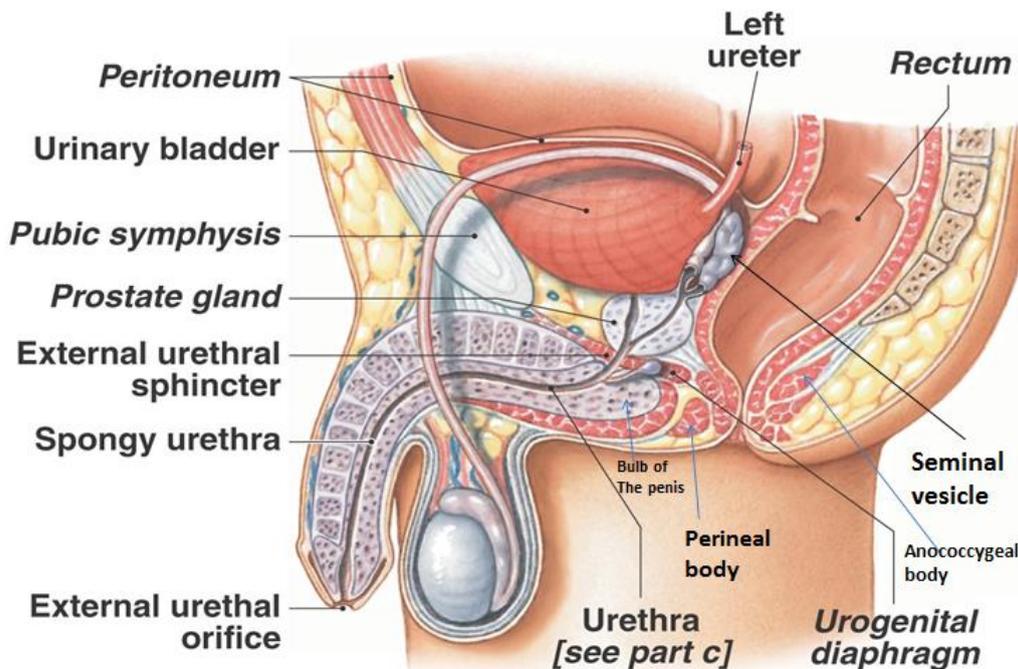
1. Upper third → peritoneum cover the anterior and lateral sides
2. Middle third → peritoneum cover the anterior side only
3. Lower third → no peritoneal cover

The peritoneum from **posterior abdominal wall** cover the **upper two third of rectum** then reflected on the **uterus** and the **bladder** then cover the **anterior abdominal wall**. It form pouch called **rectouterine pouch** it contain coils of small intestine. **Rectouterine pouch** is the extension of the peritoneal cavity between the rectum and the posterior wall of the uterus.



Anterior relation in female: coils of small intestine in **rectouterine pouch**, uterus, urinary bladder and part from the vagina.

Anterior relation in male: **rectovesical pouch** (pocket that lies between the rectum and the urinary bladder in human males) contain coils of small intestine, urinary bladder, seminal vesical, prostate and membranous part of the urethra.



(a) Male pelvis, sagittal section

Copyright © 2009 Pearson Education, Inc., publishing as Pearson Benjamin Cummings.

Rectum

Blood Supply

Arteries: superior, middle and inferior rectal artery.

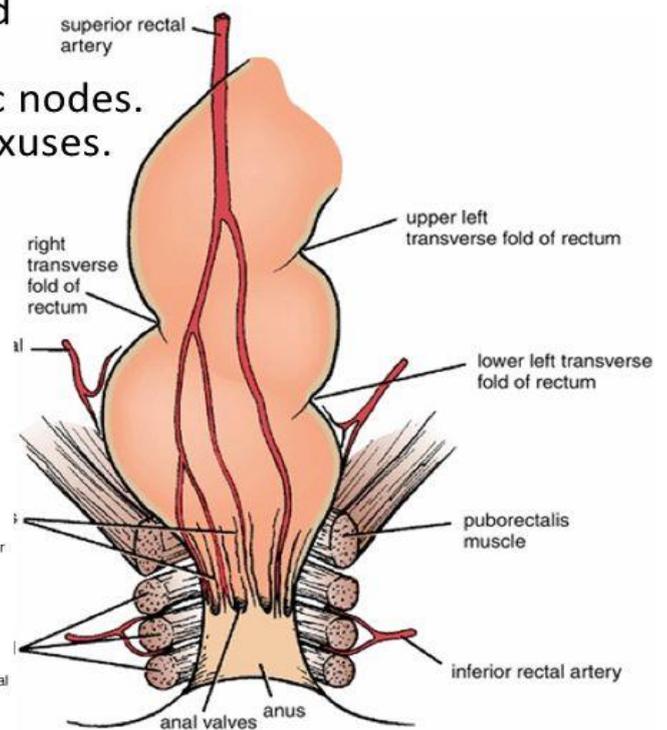
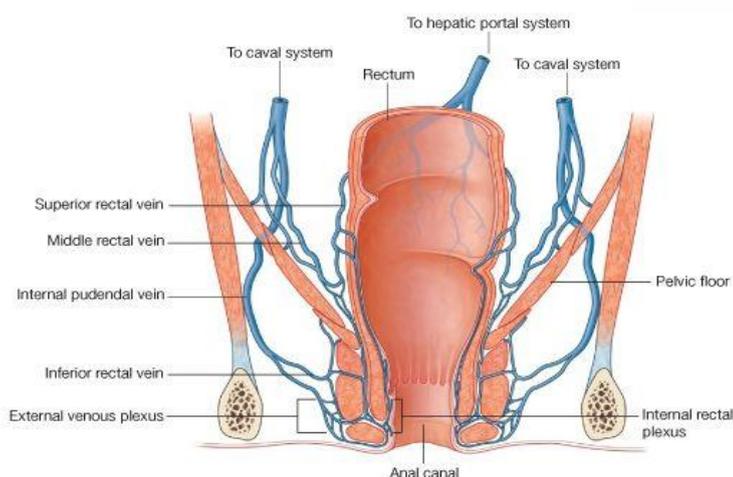
Veins: Superior, Middle and inferior rectal veins.

Lymph Drainage: pararectal nodes and then into inferior mesenteric nodes.

Lower part of rectum into internal iliac nodes.

Nerve Supply: inferior hypogastric plexuses.

Rectum is sensitive only to stretch.



Superior rectal artery branch from **IMA** → supply the **mucous membrane**.

Middle and inferior rectal artery from **internal iliac artery** → supply the **muscles** of rectum.

Superior rectal vein goes to **splenic vein** then to **portal circulation**.

Middle rectal vein and inferior rectal veins go to **systemic circulation**.

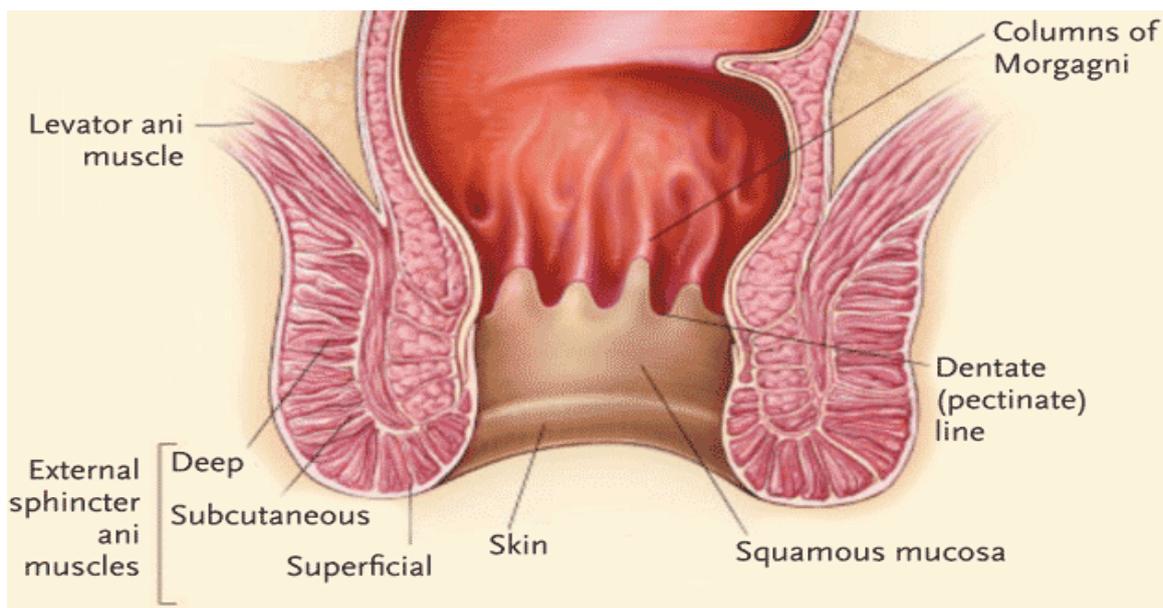
Rectum and anal canal → anastomosis of **portal** and **systemic circulation**.

Anal canal

- ✓ Length = 4cm
- ✓ Below the **pelvic diaphragm**
- ✓ Rectum dilated forming **ampulla**, changed its direction from **forward to backward**
- ✓ Anal canal directed **downward and backward**
- ✓ Upper half → endoderm (intestine >> columnar epithelium) // lower half → ectoderm (skin >> Stratified Squamous Epithelium)

The junction between the upper 2/3 (Endodermal in origin) and lower third (Ectodermal in origin) of Anal Canal is delineated by the **Pectinate line** (a remnant of the proctodeum). At this line the Endothelial lining changes from Simple columnar to a Stratified Squamous Epithelium.

On top of this line are the Anal Columns (Endodermal in origin), *below it >> anal valves*.



Lateral wall of anal canal : anal canal usually is closed except in defecation, after defecation lateral walls appose each other.

The circular muscle of the anal canal (**layer with dots in the figure below**) form → **internal anal sphincter**:

- ✓ Involuntary sphincter
- ✓ Supplied by sympathetic and parasympathetic innervation

Relation of the anal canal :

Posteriorly : fibrous tissue → **anococcygeal body**

Anteriorly (male): fibrous tissue → **perineal body**, urogenital diaphragm and **Bulb of the penis**.

Anteriorly (female): fibrous tissue → **perineal body**, urogenital diaphragm and the **vagina**

Laterally:

1. area filled with fat → **ischiorectal fossa**: space between levator ani muscle and obturator internus muscle
2. **puborectalis** muscle(part of levator ani muscle)

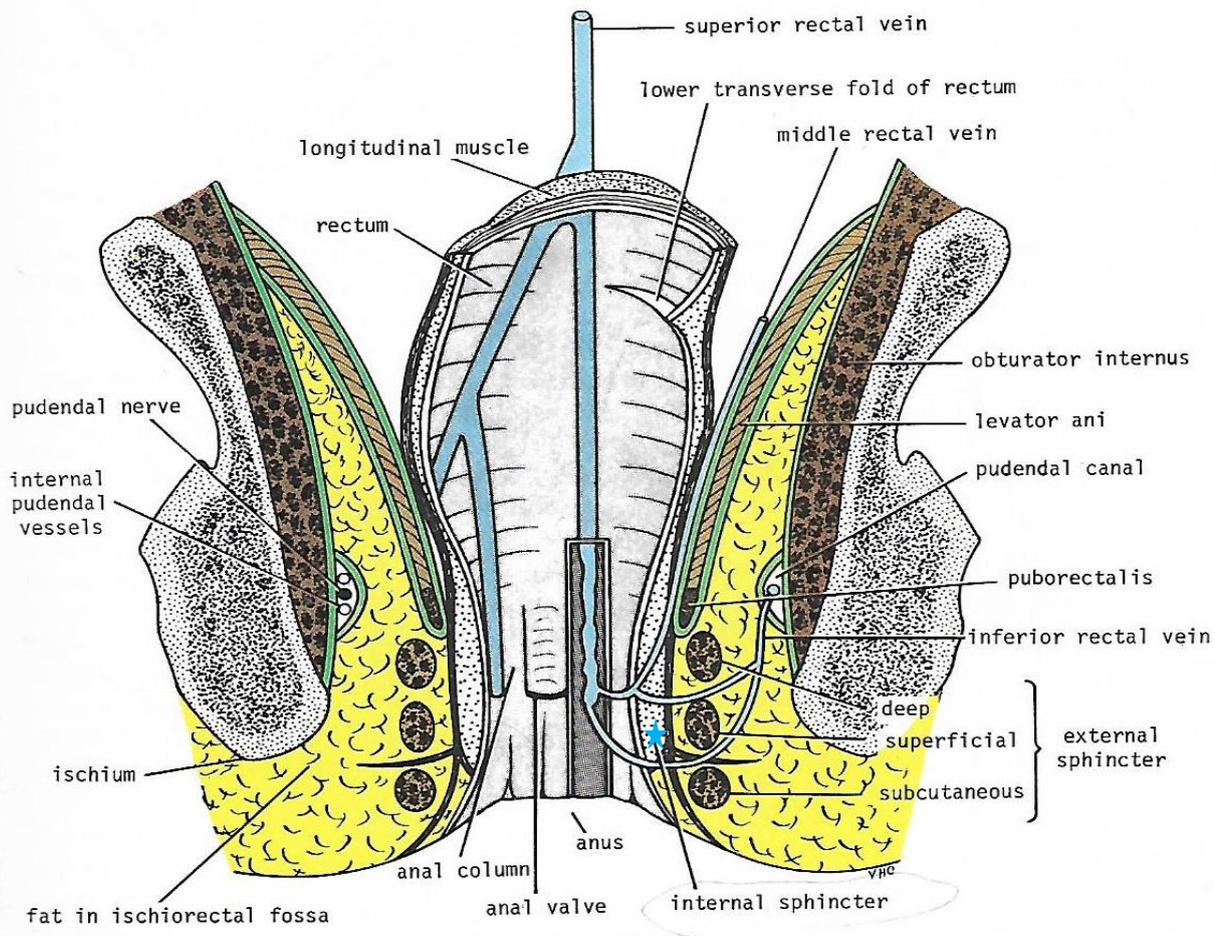


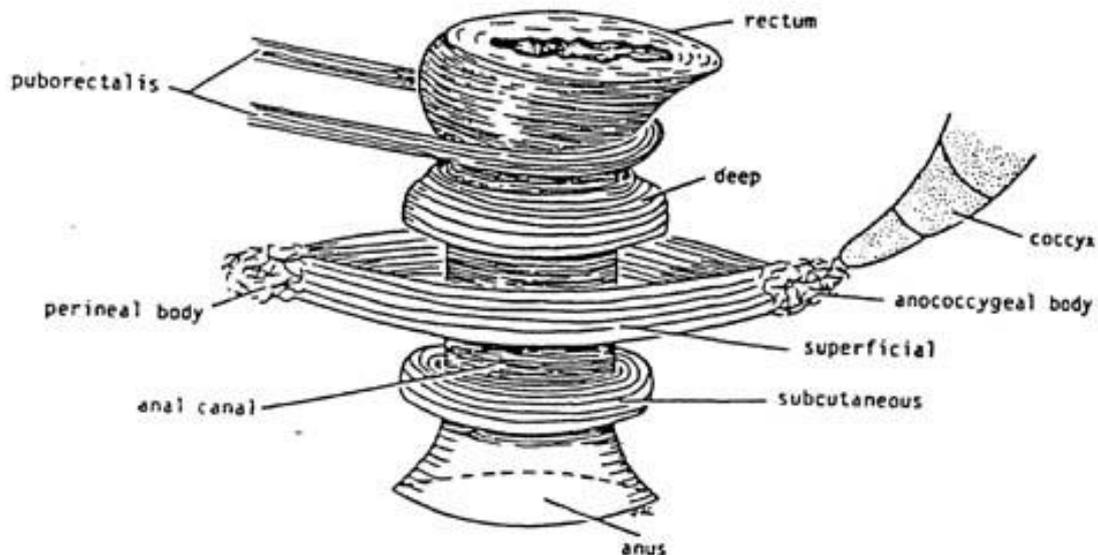
Figure : Coronal section in the pelvis Anal canal and sphincters

Another sphincter around the anal canal → **external sphincter** :

- ✓ voluntary
- ✓ supplied by **inferior rectal nerve** which is branch from **sacral plexuses**
- ✓ made up of 3 parts (RINGS):
 - **deep ring** → surround the anal canal// not attached
 - **superficial ring** →
 - **posteriorly** attached to anococcygeal body (fibrous tissue in front of

coccyx)

- **anteriorly** attached to perineal body (fibrous tissue behind the vagina or penis)
- **subcutaneous** (below skin) → not attached



Deep ring + puborectalis (part from levator ani) + **internal sphincter** → form **one bundle** we call this bundle → **anorectal ring**

Histology of the colon

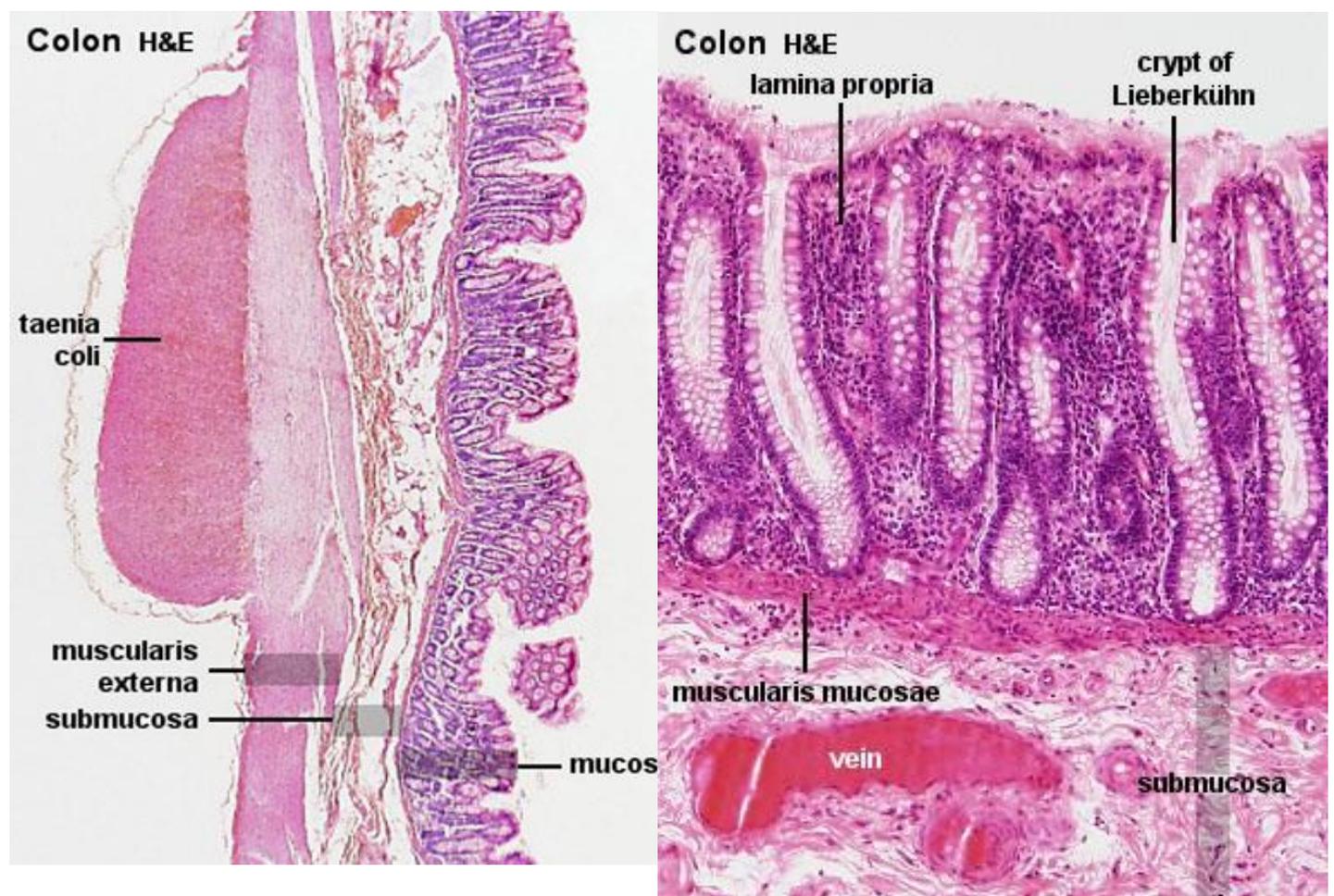
The large intestine completes absorption of **water** and **sodium** from the luminal contents which become fecal residue.

It secretes large amounts of **mucus**, and some **hormones**, but **no digestive enzymes**.

It has thick mucosa with deep crypts, but there are **no villi**. The **epithelium** is formed of **columnar absorptive cells** with **many goblet cells**, **endocrine cells** and **basal stem cells**, but **no Paneth cells**. The surface epithelial cells are sloughed into the lumen, and have to be replaced **around every 6 days**.

The lamina propria and submucosa are similar to the small intestine.

The longitudinal smooth muscle in the muscularis externa is arranged in three longitudinal bands called taenia coli. At the **anus**, the **circular muscle** forms the **internal anal sphincter**.



Histology of the appendix

The arrangement of the layers in its walls is similar to that seen elsewhere in the large intestine. However, the outer longitudinal layer of muscle fibres in the muscularis externa forms a continuous layer.

The most characteristic property of the appendix is the presence of masses of **lymphoid tissue in the mucosa and submucosa**. There are often follicles containing paler germinal centres similar to the follicles of Peyer's patches in the small intestine.

Appendix

Blind sac extending from the caecum

- “Colonic” mucosa (crypts only)
- Note **prominent lymphoid infiltrate** in lamina propria (LP) and submucosa (SM)
- Muscularis externa has complete inner and outer smooth muscle layers (outer layer interrupted in colon)

