

BASIC SCIENCES • ANATOMY

— STUDY NOTES

Veterinary Splanchnology Notes: The Viscera and How Their Walls Are Built (PDF)

Splanchnology is the branch that studies the **viscera**. What makes four systems one branch is that every viscus has a lumen or a duct system communicating with the **outside**. A hollow viscus is built in coats — mucosa, submucosa, muscularis, then a serosa or an adventitia — and which outer coat it wears says what it is in contact with. A solid viscus runs on stroma and parenchyma instead, with a capsule and a hilus. These notes are the general plan; individual organs belong to the species pages.

INSIDE THESE NOTES

- What the branch is, and what it is not
- The wall of a hollow viscus
- Solid organs, and the two-question test
- Species, and the naming rule
- What makes an organ a viscus
- The outer coat, and what it predicts
- Motility and mobility

LEVEL

Vets & veterinary students

EDITION

2026-09-05

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LEARNING OBJECTIVES

After working through these notes you will be able to:

- ✓ **State** the property every viscus shares, and **explain** why it makes four systems one branch.
- ✓ **Distinguish** splanchnology from topographical anatomy by how each organises the same organs.
- ✓ **Name** the coats of a hollow viscus from the lumen outwards, and **identify** which source counts three and which counts four.
- ✓ **Predict**, from an organ's outer coat, whether it has a free face in a serous cavity or is bound into the tissue around it.
- ✓ **Classify** any viscus by answering two questions — is there a lumen, and what is on the outside.
- ✓ **Explain** what decides an organ's mobility, and **distinguish** a mesentery from a serosal ligament and a serosal fold.

TL;DR

Splanchnology is the branch that studies the **viscera**. What makes four systems one branch is that every viscus has a lumen or a duct system communicating with the **outside**. A hollow viscus is built in coats — mucosa, submucosa, muscularis, then a serosa or an adventitia — and which outer coat it wears says what it is in contact with. A solid viscus runs on stroma and parenchyma instead, with a capsule and a hilus. These notes are the general plan; individual organs belong to the species pages.

AT A GLANCE

A VISCUS IS	An organ with a lumen or a duct system that communicates with the outside
THE FOUR SYSTEMS	Digestive · respiratory · urinary · genital (the nomenclature adds endocrine)
THE COATS, INSIDE OUT	Tunica mucosa · tela submucosa · tunica muscularis · tunica serosa or adventitia
THE MUCOSA ITSELF	Epithelium · lamina propria mucosae · (lamina muscularis mucosae, in some organs)
MUSCLE LAYERS	Inner circular (<i>stratum circulare</i>) · outer longitudinal (<i>stratum longitudinale</i>)
FIVE OUTER COATS	Serosa · adventitia · tunica fibrosa · tunica albuginea · capsula adiposa
A SOLID VISCUS	Not a coated tube — stroma + parenchyma · a capsule · a hilus
THREE SEROSAL PREFIXES	peri- parietal · epi- visceral · meso- connecting

01 What the branch is, and what it is not

- **Splanchnology** studies the viscera. Greek *splanchnon*, an internal organ; *viscera* is the plural of *viscus*.
- It is organised **by organ system**. Topographical anatomy takes the same organs **by body region**. That is the whole difference.
- **Restricted sense:** digestive, respiratory, urinary and genital organs. **Broad sense:** those four plus spleen, heart and the endocrine glands.
- The nomenclature lists **digestive, respiratory, urogenital and endocrine** under *Splanchnologia*. Give that if you are asked.
- One anatomist argued in 1939 that the word should be struck from the terminology because a rigorous definition was too hard to write. The committees kept it.

02 What makes an organ a viscus

Digestive

opens at the mouth
and the anus

Respiratory

opens at the nostril

Urinary

opens at the urethra

Genital

opens at the vulva or
the prepuce

WHY THESE FOUR ARE ONE BRANCH

Every viscus opens to the outside

A viscus has a lumen, or a duct system, that reaches the body surface. Four canals, four openings — and that is why a scope can reach them without a scalpel.

Fig 1 — the four systems and the opening each one reaches. Diagram — Vet-eBooks.com, drawn for this guide.

- **The definition:** every viscus has a lumen or an internal duct system communicating, directly or indirectly, with the **outside** — mouth, nose, anus, urogenital openings.
- That is why an endoscope reaches them without a scalpel — and why they are the organs that get infected.
- **Formal definition:** organs with or without a cavity, always surrounded by and, if hollow, lined by special layers. Hollow **or** solid; either way, wrapped.
- **Visceral** = belonging to the organ. **Parietal** = belonging to the wall (*paries*). The pair runs through the whole branch.

03 The wall of a hollow viscus

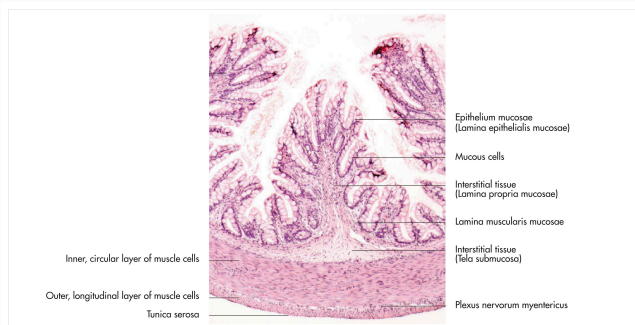


Fig 2 — the coats of a hollow viscus, labelled, in the colon of a swine. Image — König & Liebich, *Veterinary Anatomy of Domestic Animals*, 7th ed. Reproduced for educational reference.

COAT	WHAT IT IS	WHAT IT DOES
<i>Tunica mucosa</i>	Epithelium + lamina propria mucosae (+ lamina muscularis mucosae in some organs)	Lines the lumen; secretes, absorbs, protects
<i>Tela submucosa</i>	Loose connective tissue	Carries the larger vessels, lymphatics and nerves
<i>Tunica muscularis</i>	Inner circular + outer longitudinal smooth muscle	Moves the contents; thickens into sphincters
<i>Tunica serosa or adventitia</i>	Mesothelium + lamina, or fibrous tissue with no mesothelium	Faces a cavity, or binds into the tissue around it

- **Three coats or four?** König and the nomenclature put the tela submucosa *outside* the mucosa — four. Sisson and Grossman put it *inside* — three. Name your source.
- Two structural principles: **tubulation** and **stratification**. Learn the plan once and it fits the oesophagus, stomach, intestine, ureter, bladder, uterus, trachea and bronchi.
- The **stomach** is the exception: a third, innermost oblique muscle layer.

04 The outer coat, and what it predicts

OUTER COAT	EXAMPLE	WHAT IT MEANS
<i>Tunica serosa</i>	Jejunum	A free moist face in a serous cavity. The coat is the visceral peritoneum, pleura or pericardium; on the uterus, the perimetrium
<i>Tunica adventitia</i>	Cervical oesophagus	No free face; fibrous continuity with the neighbours — loose enough to let the tube move as the neck bends
<i>Tunica fibrosa</i>	Thyroid gland	A definite fibrous capsule around a discrete body
<i>Tunica albuginea</i>	Testis, ovary	An inextensible white capsule; the nomenclature names both
<i>Capsula adiposa</i>	Kidney	A fatty envelope <i>on top of</i> the fibrous capsule — two coats

- **The coat can change along one organ.** Dyce: the oesophageal adventitia is “largely replaced by serosa in the thorax and abdomen”. Nickel: the thoracic adventitia is “covered to some extent with pleura”. They agree on the neck and the abdomen and differ on the thorax.
- “Serosa slides, adventitia anchors” is **too simple** — an adventitia binds an organ into its surroundings without immobilising it.

QUESTION 1 - IS THERE A LUMEN?**Hollow**

a lumen, a wall in coats

Parenchymatoussolid: stroma +
parenchyma,
a capsule, a hilus**Two questions, and every viscus answers both**

Which coat it wears tells you what it touches.

QUESTION 2 - WHAT IS ON THE OUTSIDE?**Serosa**

a free face in a serous cavity

Adventitia

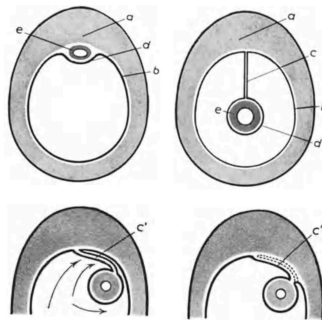
bound into the tissue around it

Fig 3 — the two questions that place any viscus. Diagram — Vet-eBooks.com, drawn for this guide.

- Not tubes: liver, kidney, spleen, pancreas, testis. Their bulk is working tissue, not a wall in coats. Built from **stroma** (the framework) and **parenchyma** (the working tissue), defined in terms of each other.
- The stroma is the same tissue that forms a lamina propria, an adventitia and a **capsule**. Fibres running in from the capsule become the splenic trabeculae and the testicular septa — which is why a solid organ has a grain.
- The **hilus** is the door: vessels and nerves in together, and there the stroma becomes the mesentery that carries them on.
- **The two questions:** is there a lumen? and what is on the outside? Both answers are visible on a cut surface, and neither needs the organ's name.

Figs. 2 and 3. Development of the peritoneal coverings and mesenteries in the abdominal cavity.

a Abdominal wall; *b* Parietal peritoneum; *c* Mesentery; *c'* Mesentery, lying against parietal peritoneum; *c''* Union of mesentery with parietal peritoneum; the original parietal peritoneum in this area and one of the layers of the mesentery have disappeared, and the other layer of the mesentery has become parietal peritoneum; *d* Visceral peritoneum; *e* Wall of intestine

*Fig. 2**Fig. 3**Fig 4 — how an organ acquires a mesentery, and how it loses one again. Image — Nickel, Schummer & Seiferle, The Viscera of the Domestic Mammals, 2nd rev. ed. Reproduced for educational reference.*

	MOTILITY	MOBILITY
What moves	The contents	The organ itself
What does it	The tunica muscularis	The serosal fold that suspends it
What sets it	Autonomic supply, modulating an intramural system	The fold's length and thickness

- Visceral muscle is smooth and autonomically supplied. **Two striated exceptions:** the heart muscle and the tongue.
- **Three intramural plexuses** — subserosal, myenteric, submucosal. Because the system is complete in itself, peristalsis continues after the autonomic nerves are cut.
- **Mesentery, serosal ligament, serosal fold** are one structure at three lengths, not three structures.
- **Three end states:** never left the wall (kidneys, retroperitoneal) · kept a long mesentery and stayed mobile · drew one out and re-fused.
- A fourth arrangement uses no fold at all: connective-tissue adhesion to the body wall — the **rumen** in ruminants and the **caecum** in the horse.

07 Species, and the naming rule

SPECIES	OESOPHAGEAL STRIATED MUSCLE	SUBMUCOSAL GLANDS
Dog	Whole length	Whole length
Ruminants	Whole length	Pharyngo-oesophageal junction only
Pig	All but a short smooth part near the cardia	Cranial half
Cat	Cranial two-thirds	Pharyngo-oesophageal junction only
Horse	Cranial two-thirds	Pharyngo-oesophageal junction only

- The epithelium is stratified squamous throughout; its thickness and keratinisation follow the **diet**, most cornified in the herbivores.
- The mesenteries of **cats** carry mechanoreceptors, mostly Vater-Pacini corpuscles.
- **The naming rule:** *peri-* = the parietal layer (pericardium, periorchium); *epi-* = the visceral layer (epicardium, epiorchium); *meso-* = the connecting layer (mesogastrium, mesocolon, mesometrium).

USE IT LIKE THIS

Take any organ on any list you are given and answer the two questions out loud before you say anything else about it: is there a lumen, and what is on the outside? Then name the coats you would expect to cut through. Two organs done that way teach the method for all of them.

KEY TERMS — QUICK GLOSSARY

Viscus (pl. viscera)	An internal organ with a lumen or a duct system that communicates, directly or indirectly, with the outside of the body.
Lumen	The space inside a tube or a sac.
Tunica mucosa	The lining coat: an epithelium facing the lumen, a lamina propria mucosae beneath it, and in some organs a lamina muscularis mucosae.
Tela submucosa	Loose connective tissue outside the mucosa, carrying the larger vessels, lymphatics and nerves.
Tunica serosa	A serous membrane on the organ's outside — a mesothelium on a thin connective-tissue lamina. It is the visceral peritoneum, pleura or pericardium of the cavity the organ sits in.
Tunica adventitia	A fibrous outer coat with no mesothelium, binding the organ into the connective tissue around it.
Parenchyma	The organ-specific tissue that does the organ's work, supported by stroma.
Stroma	The non-specific framework of an organ, supporting the parenchyma.
Hilus	The single point at which vessels and nerves enter a solid organ; there the organ's stroma becomes the mesentery that carries them on.
Retroperitoneal	Lying against the body wall behind the peritoneal sac, covered with peritoneum on the exposed surface only.

QUICK REVISION — REMEMBER THESE

- 1 Every viscus opens to the outside.** That is the whole reason the four systems are one branch — and why an endoscope can reach them without a scalpel.
- 2 Splanchnology is by organ system; topographical anatomy is by body region.** Same organs, two ways of cutting the material up.
- 3 Three coats or four is a source disagreement, not an error.** König and the nomenclature put the submucosa outside the mucosa; Sisson and Grossman put it inside.
- 4 The outer coat is about the neighbours, not the contents.** Serosa = a free face in a serous cavity. Adventitia = fibrous continuity with what is around it.
- 5 Adventitia does not mean immobile.** The cervical oesophagus has one, and it is loose enough to let the tube move while the animal swallows.
- 6 Stroma and parenchyma are defined in terms of each other.** Parenchyma does the organ's work; stroma is the framework that supports it.

- 7 **Mobility is decided by the fold.** Its length and thickness decide how far the organ moves and whether it is called a mesentery, a ligament or a fold.
- 8 **Two striated exceptions in the whole visceral field:** the heart muscle and the tongue.

MEMORY AIDS

My Sister Makes Soup — the coats of a hollow viscus from the lumen outwards: **M**ucosa, **S**ubmucosa, **M**uscularis, **S**erosa (or adventitia, where there is no cavity to face).

PEM: Parietal, External-on-the-organ, Middle — the three serosal prefixes in the order **peri- epi-meso-**: *peri-* lines the wall, *epi-* sits on the organ, *meso-* is the mesentery in between.

Serosa faces, adventitia binds — the outer-coat rule in three words. A serosa faces a *cavity*; an adventitia binds into *tissue*. Neither word says anything about how far the organ can move.

TEST YOURSELF — ACTIVE RECALL

Cover the answers and try to retrieve each one from memory first — self-testing beats re-reading.

1. What single property do all viscera share?
2. How does splanchnology differ from topographical anatomy?
3. Name the coats of a hollow viscus from the lumen outwards.
4. Your notes say three coats and your friend's say four. Who is wrong?
5. An organ's outer coat is a tunica serosa. What does that tell you?
6. Define stroma and parenchyma without using one to define the other.
7. What decides how far a suspended organ can move?
8. Visceral muscle is smooth almost everywhere. Name the two striated exceptions.

ANSWERS

1. Every viscus has a lumen or an internal duct system that communicates, directly or indirectly, with the outside — through the mouth, nose, anus or the urogenital openings.
2. By how the same organs are organised. Splanchnology is taught by **organ system**; topographical anatomy takes a **body region** and asks what is in it.
3. *Tunica mucosa* (epithelium, lamina propria mucosae, and in some organs a lamina muscularis mucosae), *tela submucosa*, *tunica muscularis*, then *tunica serosa* or *tunica adventitia*.
4. Neither. König and the nomenclature treat the tela submucosa as a layer outside the mucosa — four. Sisson and Grossman count it inside the tunica mucosa — three. Say which source you are using.
5. That it has a free surface inside a serous cavity, and that the coat **is** the visceral peritoneum, pleura or pericardium of that cavity. On the uterus it is called the perimetrium.
6. The **parenchyma** is the organ-specific tissue that does the organ's work — liver parenchyma makes bile. The **stroma** is the non-specific framework that holds the shape and carries the vessels and nerves.
7. The length and thickness of the serosal fold that suspends it — which also decides whether the fold is called a mesentery, a serosal ligament or a serosal fold.
8. The heart muscle and the tongue.

WHEN TO REFER OR ESCALATE

- You are deciding whether an organ can be exteriorised — a serosa means a free face in a cavity, an adventitia means dissecting the tissue it is bound into.
- A body cavity has filled — serous membranes absorb what is put into the cavity and inflame more readily than other tissues, which is why peritonitis behaves as it does.
- You are placing a local block for a laparotomy — the parietal serosa is pain-sensitive and the anaesthetic has to reach the body wall.
- A cadaver's organ positions do not match the live patient's — they are not supposed to; detailed assertions of normal visceral position do not survive imaging.
- You meet an organ you were never taught — ask the two questions: is there a lumen, and what is on the outside.

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