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VETERINARY SPLANCHNOLOGY NOTES

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

Splanchnology is the branch of anatomy that studies the viscera. This guide is the branch's general plan: what makes an organ a viscus, the coats its wall is built from, what its outer covering tells you about its neighbours, and what decides how far it can move. Inside: five labelled figures, five reference tables and an 18-question self-test.

Illustrated Guide · 13 sections · 6 plates · 5 tables

Contents

The 11 sections of this guide, in order.

IN SHORT

Splanchnology is the branch that studies the viscera — and what makes those four systems one branch is that every one of them opens to the outside. This page is the general plan rather than a tour of the organs: what a viscus is, the coats its wall is built from, what its outer covering tells you about its neighbours, what decides how far it can move, and where the standard textbooks disagree.

KEY POINTS

1. **A viscus is an organ that communicates with the outside** through a lumen or a duct system — through the mouth, nose, anus or urogenital openings. That single property is why the digestive, respiratory, urinary and genital organs are one branch.
2. **Splanchnology is taught by organ system; topographical anatomy is taught by body region.** That is the whole difference between them, and it is the one a viva tests.
3. **The word has a restricted and a broad sense**, and the books differ. The nomenclature lists the digestive, respiratory, urogenital and endocrine systems under *Splanchnologia* — that is the answer to give.
4. **A hollow viscus is built in coats, from the inside out**: tunica mucosa, tela submucosa, tunica muscularis, and then a tunica serosa or a tunica adventitia.
5. **Whether the submucosa is one of the coats or part of the mucosa is disputed.** König and the nomenclature put it outside; Sisson and Grossman put it inside. Name the source you are following, and the disagreement stops being a mistake.
6. **The outer coat is about the organ's neighbours.** A serosa gives it a free face in a serous cavity, and the coat *is* the visceral peritoneum, pleura or pericardium. An adventitia binds it into the surrounding tissue — without necessarily immobilising it.
7. **Solid organs run on stroma and parenchyma**, defined in terms of each other, with a capsule outside and a hilus where the vessels enter and the stroma becomes a mesentery.
8. **Mobility is set by the fold that suspends the organ.** Its length and thickness decide how far the organ can move and whether it is called a mesentery, a serosal ligament or a serosal fold.

About the images

Three figures are reproduced for educational reference: one from *Veterinary Anatomy of Domestic Animals: Textbook and Colour Atlas*, 7th edition, by König and Liebich; one from Dyce, Sack and Wensing's *Textbook of Veterinary Anatomy*, 5th edition; and one from Nickel, Schummer and Seiferle's *The Viscera of the Domestic Mammals*. Each is credited beneath it and copyright remains with the original authors and publishers. The three diagrams are our own, drawn for this guide from the sources named under them.

01 What splanchnology actually is

Splanchnology is the study of the viscera — the internal organs. The name comes from the Greek *splanchnon*, an internal organ, and *viscera* is simply the plural of the Latin *viscus*. It is one of the classical headings that systematic anatomy is filed under, next to osteology, arthrology, myology and angiology; if you want the whole map rather than this one branch, that is what our veterinary anatomy notes are for.

The most useful sentence anyone will give you about this branch is König and Liebich's, because it draws the line against the subject students most often confuse it with. Splanchnology is **taught by organ system**. Topographical anatomy takes a **body region** and asks what is in it and how those things interact. Same animal, same organs, two different ways of cutting the material up.

Where the branch gets genuinely awkward is its own boundary, and it is worth knowing that before a viva rather than during one. Sisson and Grossman's chapter on general splanchnology sets out two readings of the word. In the **restricted** sense it covers only four systems: digestive, respiratory, urinary and genital. In the **broad** sense it also takes in organs of the vascular system — the spleen and the heart — and the endocrine glands.

READING OF THE WORD	WHAT IT TAKES IN	WHERE THAT READING COMES FROM
Restricted	The digestive, respiratory, urinary and genital organs — the systems that maintain the individual and continue the species	Sisson & Grossman, Vol. I, ch. 6. Nickel, Schummer and Seiferle's volume on the viscera covers exactly these four and no others
Broad	The four above, and in addition organs of the vascular system — the spleen and the heart — and the endocrine glands	Sisson & Grossman, Vol. I, ch. 6, giving both senses side by side
What the nomenclature lists	Digestive, respiratory, urogenital and endocrine	The heading *Splanchnologia* as the international committees settled it — the answer to give if you are asked for one

The disagreement was serious enough that one anatomist, Stieve, argued in 1939 that the word should be struck from the official terminology altogether, on the grounds that a rigorous definition was too hard to write and that the organs are all filed under systems anyway. The committees kept it. Under the heading *Splanchnologia* they list the digestive, respiratory, urogenital and endocrine systems, which is the practical answer to give if you are asked for one. If it is the eleven body systems you are after rather than this branch, our guide to the body systems of domestic animals is where they are set out.

What this page covers, and what it hands on

This is the branch's **general plan**: what makes an organ a viscus, the coats its wall is built from, what its outer covering predicts, and how much it can move. It is deliberately not a tour of the organs. The serous sacs themselves — how many there are, how they form, what happens when one fills — have their own page, the individual organs belong to the species and clinical pages, and the heart, vessels and lymphatics are angiology, not splanchnology.

02 What makes an organ a viscus

Start with the property that turns four different systems into one branch, because everything else on this page comes out of it.

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 — What makes four systems one branch. Every viscus has a lumen or a duct system that communicates with the outside. The digestive, respiratory, urinary and genital organs are the four canal systems that do, which is why they are studied together — and why a scope can be passed into them without opening the animal.

Diagram — Vet-eBooks.com, drawn for this guide. Data from Nickel, Schummer and Seiferle's The Viscera of the Domestic Mammals, 2nd rev. ed., Introduction, and König and Liebich, 7th ed., p. 66.

Nickel, Schummer and Seiferle put it in a single sentence at the front of the volume that is still the reference work for this branch: **all viscera have either a lumen or an internal duct system with which they communicate, directly or indirectly, with the outside** — through the mouth, the nose, the anus or the urogenital openings. A **lumen** is simply the space inside a tube or a sac.

That is not a tidy coincidence. It is the reason the digestive, respiratory, urinary and genital organs are studied together while the brain and the femur are not. Each of the four is a canal system that reaches the body surface, and König makes the practical consequence explicit: because those canals open outwards, the organs can be examined without cutting the animal open. Endoscopy exists because of this one anatomical fact.

Read the other way, it is also why these are the organs that get infected. An open canal is an open door, and the branch's clinical vocabulary — enteritis, cystitis, metritis, bronchitis — is a list of what happens at the far end of one.

The formal definition adds the second half. Sisson and Grossman define the viscera as “organs with or without a cavity, always surrounded by and, if hollow, lined by special layers.” Two claims are being made there: a viscus may be hollow **or** solid, and either way it is wrapped in something. Those two clauses are the next four sections.

One note on the word itself, because it catches people out in writing. The nomenclature lists *viscus, visceris* as the singular and records that it is used only in the plural; in practice you will meet *viscus* in speech and *viscera* everywhere in print. The adjective is **visceral**, and its opposite is **parietal**, from *paries*, a wall. Visceral means belonging to the organ; parietal means belonging to the wall around it. That pair runs through every remaining section.

03 The wall that every hollow viscus is built from

Sisson and Grossman describe typical viscera as following two structural principles: **tubulation** and **stratification**. They are tubes, and their walls are built in layers. Learn the layers once and you have the plan of the oesophagus, the stomach, the small intestine, the ureter, the bladder, the uterus and the ductus deferens — because it is the same plan every time, with the proportions changed. The airway is built to it too, with one addition this list does not need: König records hyaline cartilage in parts of the laryngeal, tracheal and bronchial walls, holding those tubes open.

Each layer is a **tunic** (Latin *tunica*, a coat), and they are named from the inside out.

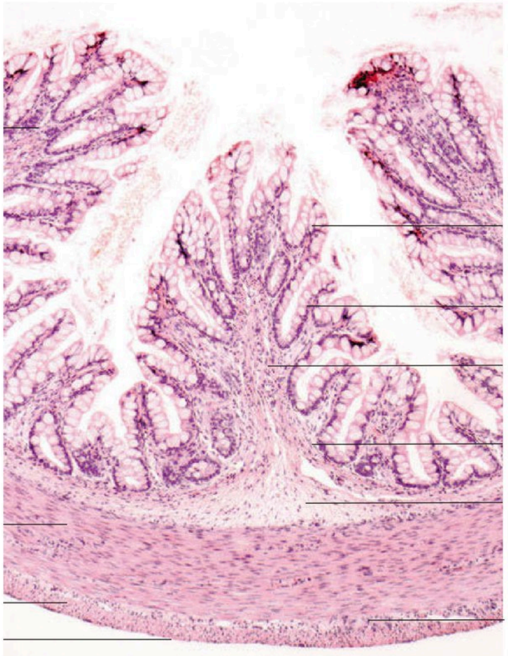

Fig 2 — The coats of a hollow viscus, in one section. A section through the wall of the pig's colon with every coat labelled in the terms this page uses. Reading from the lumen outwards: the epithelium and its mucous cells, the lamina propria mucosae, the lamina muscularis mucosae, the tela submucosa, then the inner circular and outer longitudinal muscle with the myenteric plexus between them, and the tunica serosa on the outside.

Image — König HE, Liebich H-G. Veterinary Anatomy of Domestic Animals: Textbook and Colour Atlas, 7th ed. Thieme — Fig. 1.58, histological section of the colon of a swine. Reproduced for educational reference.

The **tunica mucosa** is the lining, and it is called that because it normally produces mucus. König sets out two obligatory parts and one that is present only in certain organs: an **epithelium** facing the lumen, an underlying layer of loose connective tissue called the **lamina propria mucosae**, and — in the alimentary canal, which is the example he gives — a third thin sheet of smooth muscle, the **lamina muscularis mucosae**, beneath the lamina propria. That thin muscle is what throws the empty organ's lining into folds.

Outside the mucosa comes the **tela submucosa**, loose connective tissue carrying the larger vessels, lymphatics and nerves; then the **tunica muscularis**, which moves the contents; then whatever the organ wears on the outside, which is the next section.

COAT	IN ENGLISH	WHAT IT IS MADE OF	WHAT IT DOES
Tunica mucosa	Mucous membrane	An epithelium facing the lumen and a lamina propria mucosae beneath it; in some organs a third thin sheet of smooth muscle, the lamina muscularis mucosae The alimentary canal is the example König gives for the third layer	Lines the lumen. Secretes, absorbs and protects — and the thin muscle throws the lining of the empty organ into folds
Tela submucosa	Submucosa	Loose connective tissue	Carries the larger vessels, lymphatics and nerves, and lets the lining move over the muscle as the organ fills and empties
Tunica muscularis	Muscular coat	An inner circular layer (*stratum circulare*) and an outer longitudinal layer (*stratum longitudinale*) of smooth muscle	Moves the contents along. Where the circular layer thickens at an opening it becomes a sphincter

COAT	IN ENGLISH	WHAT IT IS MADE OF	WHAT IT DOES
Tunica serosa or *tunica adventitia*	Serous coat or outer connective coat	Serosa: a **mesothelium** — a single layer of flat cells — on a thin connective-tissue lamina, with a tela subserosa beneath it. Adventitia: fibrous connective tissue, and no mesothelium	Serosa gives the organ a free wet face inside a serous cavity; adventitia binds it into the tissue around it

Three coats or four? Two of your books disagree

König and Liebich, and the nomenclature's own list of general terms, treat the *tela submucosa* as a layer in its own right, lying **outside** the mucosa: the nomenclature defines it as loose connective tissue **under the mucous membrane**, and defines the lamina muscularis mucosae as the deepest layer **of a mucous membrane**. That gives four coats. Sisson and Grossman count the tela submucosa **inside** the tunica mucosa, alongside the lamina propria and the lamina muscularis mucosae — and the regional gross anatomy textbook takes the same line, giving three tunics. Nobody is miscounting; they are drawing the boundary of "mucosa" in two places. Name the source you are following, and the disagreement stops being a mistake.

The **tunica muscularis** is where the plan becomes mechanical. König describes the characteristic arrangement in a hollow viscus as two strata: an **inner circular** layer (*stratum circulare*) and an **outer longitudinal** layer (*stratum longitudinale*). Circular fibres narrow the tube, longitudinal fibres shorten it, and running one after the other along its length they are peristalsis. Where the circular layer thickens at an opening it becomes a sphincter — Sisson states the general principle plainly, that circular musculature can block the entrance or the exit of an organ's cavity.

The stomach is the exception worth knowing, because it carries a third, innermost oblique layer that the standard two do not account for. Exceptions are easier to hold on to once you know what they are exceptions to.

04 The outer coat, and what it tells you

This is the part of the general plan that earns its keep clinically, and it is the part most revision notes skip. The inner layers of a viscus are about its **contents**. The outer layer is about its **neighbours**.

Sisson and Grossman list what the outermost coat of a viscus may be: a **tunica serosa** with its *tela subserosa*, an **adventitia**, a fibrous capsule (*tunica fibrosa*), or a **tunica albuginea**. Which one an organ wears is not arbitrary.

OUTER COAT	A WORKED EXAMPLE	WHAT IT MEANS FOR THAT ORGAN
Tunica serosa	The jejunum, in the peritoneal cavity	A free, moist surface facing a serous cavity. The coat **is** the visceral peritoneum, pleura or pericardium of that cavity — not merely something like it
Tunica adventitia	The cervical part of the oesophagus	No free surface. Fibrous continuity with the neighbours — loose enough, Nickel notes, to let the tube move while the animal swallows and bends its neck
Tunica fibrosa (a capsule)	The thyroid gland	A definite fibrous capsule around a discrete body
Tunica albuginea	The testis, and the ovary	An inextensible white capsule. The nomenclature names both organs in the same entry
Capsula adiposa	The kidney, outside its fibrous capsule	A fatty envelope lying on top of the fibrous one — two coats, not one

A **tunica serosa** means the organ has a free surface inside a serous cavity. And it is not merely *like* the lining of that cavity: Sisson is explicit that the tunica serosa **is** the visceral peritoneum, the visceral pleura or the visceral pericardium, depending on which cavity the organ sits in. On the uterus the same membrane has its own name, the **perimetrium**. For the sacs themselves — how many there are, how they form, and what happens when one fills with fluid or air — the body cavities and serous membranes is the page, and this one deliberately hands that over.

An **adventitia** means the opposite: no free surface, because the organ is bound into the connective tissue of whatever surrounds it. Sisson's examples are the cervical part of the oesophagus and, as a fibrous capsule, the thyroid gland; the kidney has a fibrous capsule and, lying on top of it, a fatty one (*capsula adiposa*).

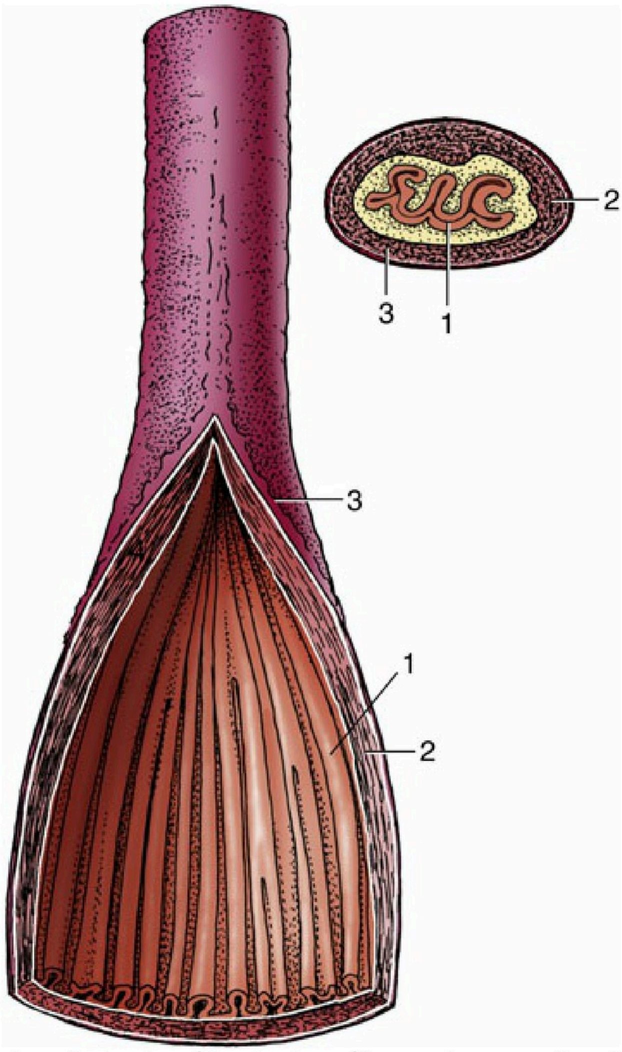

FIG. 3.30 Semischematic drawing of the structure of the esophagus, sectioned longitudinally and transversely. *1,* Mucosa; *2,* muscular layer (longitudinal and circular); *3,* adventitia.

Fig 3 — The same plan, in an organ whose outer coat is an adventitia. The oesophagus, opened lengthways and shown in cross section. The key numbers three things: 1 the mucosa, 2 the muscular layer with its longitudinal and circular fibres, and 3 the **adventitia**. What the plate shows is an outer coat labelled adventitia; which part of the tube is drawn is not stated on it, and it is Dyce's text, not this figure, that tells the neck and the thorax apart.

Image — Dyce KM, Sack WO, Wensing CJG. Textbook of Veterinary Anatomy, 5th ed. Elsevier — Fig. 3.30, the structure of the oesophagus. Reproduced for educational reference.

Be careful with the obvious shorthand here, because it is wrong. It is tempting to say that a serosa slides and an adventitia anchors — but Nickel writes that the oesophageal adventitia "loosely connects the esophagus to the neighboring structures and **allows it freedom to move** during swallowing and when the animal bends its neck." An adventitia binds an organ into its surroundings; it does not immobilise it. The honest version is that a serosa gives an organ a free, wet, low-friction face against a cavity, while an adventitia gives it fibrous continuity with its neighbours — and the two behave differently when you cut.

The cleanest way to see the point is that one organ can wear both. Follow the oesophagus down the neck and into the chest and the covering changes on the way.

Follow one tube and the coat changes — but the books differ on where

Dyce, Sack and Wensing write that the oesophagus's outer coat is loose connective tissue (adventitia) in the neck, "but this is largely **replaced by serosa** in the thorax and abdomen." Nickel, Schummer and Seiferle describe the wall as having an adventitia and add that "the adventitia of the thoracic part of the esophagus is **covered to some extent with pleura**." The two agree that the cervical part has an adventitia and that the short abdominal part has a serosa. They differ on what to call the thoracic part, and that is a real difference, not a wording one.

05 The organs with no lumen at all

Half of the definition is still outstanding: viscera are organs **with or without** a cavity. The liver, the kidney, the spleen, the pancreas and the testis are not tubes: their bulk is working tissue, not a wall built in coats around a lumen. Some of them do enclose a space — the renal pelvis leaves the kidney at its hilus — but that space is the head of a duct, not a coated wall. They are built on a different plan, and that plan has only two components.

König describes two kinds of connective tissue inside one organ. The **stroma** — also called the interstitium — is the non-specific framework: it holds the shape and carries the vessels and nerves in, but it is not what the organ is for. The **parenchyma** is the organ-specific tissue that **defines what the organ does**. Liver parenchyma makes bile; kidney parenchyma makes urine. Organs built this way are called **parenchymatous organs**, and the nomenclature defines the pair in terms of each other: parenchyma is the substance of the organ, supported by stroma; stroma is the framework, supporting the parenchyma.

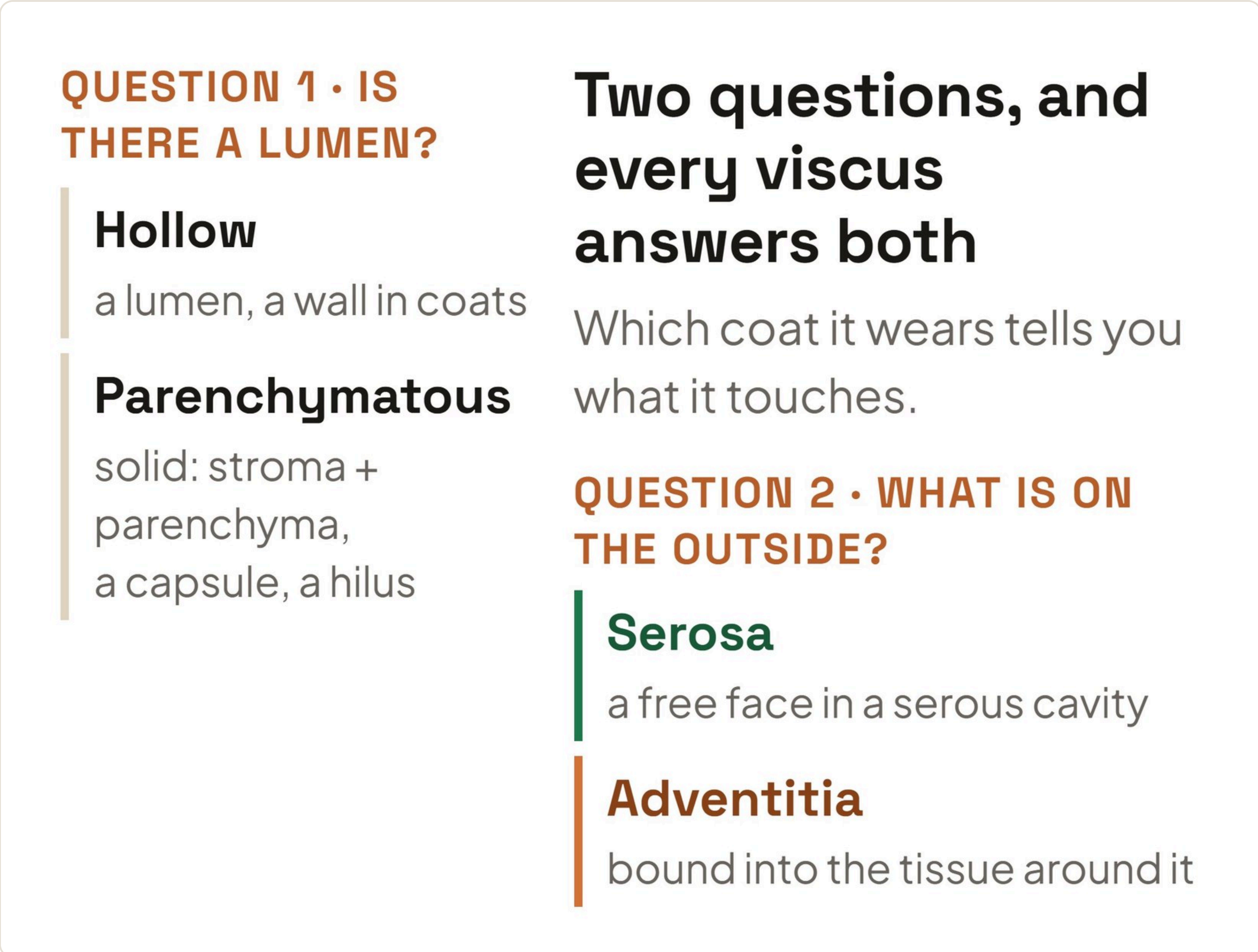

Fig 4 — Two questions that place any viscus. Every viscus answers both. The first asks whether there is a lumen, which separates the hollow organs from the solid, parenchymatous ones. The second asks what the organ wears on the outside, which says whether it has a free face in a serous cavity or is bound into the tissue around it. The two answers are independent, and both are visible on a cut surface.

Diagram — Vet-eBooks.com, drawn for this guide. Data from König and Liebich, 7th ed., pp. 66–70, and Constantinescu's Illustrated Veterinary Anatomical Nomenclature, 4th ed., p. 573.

The stroma is tissue you have already met under three other names. It is what forms the lamina propria inside a mucosa, what forms an adventitia on the outside of a tubular organ, and what forms the **capsule** around a solid one. Fibres running inwards from that capsule divide the organ up — the trabeculae of the spleen, the septa of the testis — which is why a solid organ has a grain and tears along it.

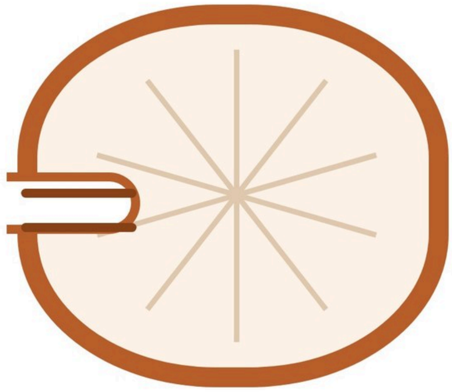

Fig 5 — Inside a solid viscus. A schematic section, not to scale. The capsule and the septa running in from it are stroma; the working tissue between them is parenchyma; and the notch on the left is the hilus, where the vessels and nerves enter together.

Diagram — Vet-eBooks.com, drawn for this guide. Schematic, not to scale. Data from König and Liebich, 7th ed., p. 68.

And because a solid organ has no wall to run vessels through, it needs a door. Vessels and nerves enter together at one point, the **hilus**, and König makes the connection that ties this section to the next: at the hilus, the organ's own stroma becomes the mesentery that carries those vessels on. The hilus is where the framework of the organ turns into the fold that suspends it.

Where the two plans meet

A solid organ still has to get its product out, and the duct that does it is a tubular viscus in miniature — which is why the nomenclature applies the same coat names right across all four systems, from the oesophagus to the ureter to the ductus deferens. The bile ducts and the ureter are the liver's and the kidney's route to the outside, and they are built to the plan in the section above.

06 Why the wall moves, and what keeps moving when the nerves are cut

König gathers the whole of visceral movement under one heading, **visceral motility**, and it is worth taking as one idea rather than as a list of organs. Motility is what controls how much is inside an organ at any moment: it moves the bolus along the gut, empties the gall bladder, expels urine, transports semen and contracts the uterine wall in labour. It also closes sphincters, at the pylorus and at the neck of the bladder.

The muscle doing it is smooth muscle, supplied by the sympathetic and parasympathetic systems, and the movement is peristaltic. König names **two exceptions** in the whole visceral field: the **heart muscle** and the **tongue**, both of which are striated. Cardiac motility, on this reading, is simply the motility of the circulatory system — systole and diastole. The heart itself belongs to angiology, not to this branch.

The third thing worth knowing is why a length of intestine keeps working after it has been taken out of the animal. Hollow viscera carry their own nervous system inside the wall, and König sets it out as three plexuses at three levels: a **subserosal** plexus, a **myenteric** plexus between the two muscle layers, and a **submucosal** plexus. Because that intramural system is complete in itself, peristalsis continues after the autonomic nerves supplying the gut have been cut. The autonomic supply modulates the wall; it does not originate the movement.

You can see the myenteric plexus labelled in Figure 2, sitting exactly where its name says it should — between the circular and the longitudinal muscle.

07 How much a viscus can move, and what decides it

Motility is the organ moving its contents. **Mobility** is the organ moving itself, and it is decided by the fold of serous membrane that suspends it.

Nickel's account is the clearest. The mesenteries are double-layered serosal folds running from the wall to the organ; they carry its blood vessels, lymphatics and nerve supply; and they attach the organ to the body wall without preventing it from moving as it works. Then comes the sentence that is the whole section: **the length and thickness of these mesenteric folds determine the degree of mobility afforded to the suspended organs** — and determine whether the fold is called a mesentery, a serosal ligament or a serosal fold.

So those three names are not three structures. They are one structure at three lengths. A long thin fold gives a jejunum that can be drawn out of the abdomen by the armful; a short thick one gives a ligament that holds an organ where it is. Anyone who has performed an ovariohysterectomy has used both facts in the same procedure.

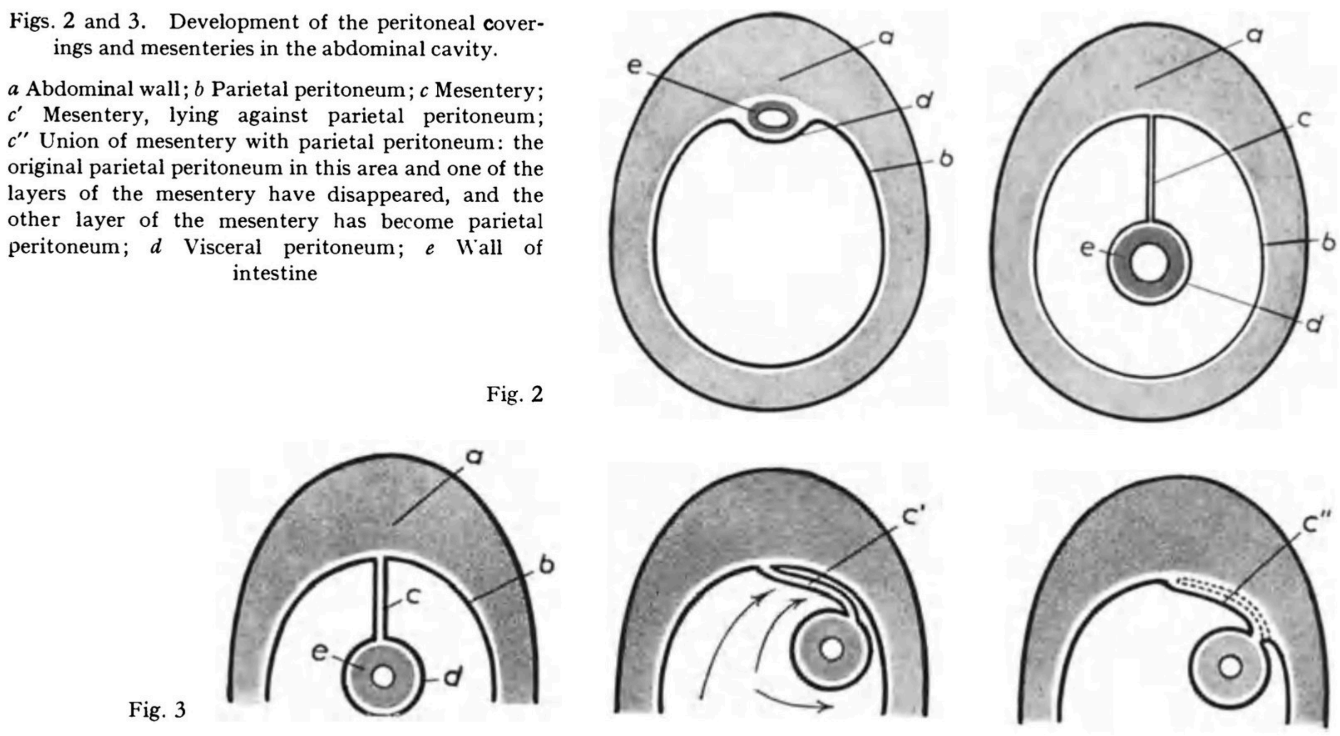

Fig 6 — How an organ gets a mesentery, and how it loses one again. The lettered key, which the figure prints beside the panels, reads: **a** abdominal wall; **b** parietal peritoneum; **c** mesentery; **c'** mesentery lying against parietal peritoneum; **c"** union of the mesentery with parietal peritoneum, where the original parietal peritoneum and one layer of the mesentery have disappeared and the other layer has become parietal peritoneum; **d** visceral peritoneum; **e** wall of intestine.

Image — Nickel R, Schummer A, Seiferle E. The Viscera of the Domestic Mammals, 2nd rev. ed. Verlag Paul Parey — Figs. 2 and 3, development of the peritoneal coverings and mesenteries. Reproduced for educational reference.

Where the fold came from explains the other pattern you will be asked about. Nickel's developmental sketch runs in three steps, and Figure 6 shows all three. An organ begins **retroperitoneally**, lying against the body wall. As it grows into the cavity it draws a covering of peritoneum after it, and the two sheets that follow it meet back to back to become its mesentery. Then, in some organs, that mesentery comes back against the wall and fuses with it, and some of the serosal layers disappear.

That gives three end states, and they account for most of what you will be asked to place. Some never leave the wall at all — Nickel's example is the kidneys, covered with peritoneum on the exposed surface only. Some keep a long mesentery and stay mobile. Some drew one out and then re-fused, which is why a structure that is mobile in the embryo can be fixed in the adult.

There is a fourth arrangement that uses no fold at all. König notes that large hollow organs may be attached to the body wall directly by connective-tissue adhesions, and names two: **the rumen in ruminants and the caecum in the horse**. Both are enormous, both are fixed that way, and in both species that fixation is part of why a displacement of a neighbouring organ is a recognisable clinical entity rather than a shrug. For the first of them, the ruminant stomach is the page.

08 Where the general plan changes between species

The plan is general, but it is not identical in every animal, and the differences that matter at this level are differences **in the plan itself** rather than in the shape of individual organs. The oesophagus is the best worked example, because more than one of the plan's variables changes along a single simple tube. For the organs themselves, the species pages are where to go: the dog, the cat, the horse, cattle and birds, which break several of these rules.

SPECIES	WHERE THE STRIATED MUSCLE STOPS	WHERE THE SUBMUCOSAL GLANDS ARE
Dog	Nowhere — striated along the whole length	Along the whole length of the oesophagus
Ruminants	Nowhere — striated along the whole length	Only at the pharyngo-oesophageal junction
Pig	Almost at the end: a short smooth part near the cardia, where the oesophagus meets the stomach	In the cranial half only
Cat	Two-thirds of the way down — cranial two-thirds striated, caudal third smooth	Only at the pharyngo-oesophageal junction
Horse	Two-thirds of the way down — cranial two-thirds striated, caudal third smooth	Only at the pharyngo-oesophageal junction

Both columns earn a sentence. The muscle type matters because the two halves are controlled differently: Dyce records that the oesophagus's striated muscle answers to the general visceral motor neurons of the vagus, while the smooth portions answer to the intrinsic nervous system with the autonomic supply acting on them only indirectly. Nickel adds the movement that rides on it — the muscular coat drives the bolus toward the stomach or, **during regurgitation in ruminants**, back toward the mouth. The gland distribution matters because it decides how well a species lubricates a dry bolus — and the dog, which bolts its food, is the one with glands along the whole length.

The mucosal epithelium changes with diet rather than with taxonomy. It is stratified squamous throughout — several layers of flat cells, the arrangement that resists abrasion — but Dyce notes that its thickness and degree of keratinisation reflect what the species eats, and Nickel records the cornification as most marked in the herbivores.

One species difference sits outside the gut altogether and is worth carrying: König records that **the mesenteries of cats contain mechanoreceptors**, most often Vater-Pacini corpuscles, which respond to pressure. The same fold, in a different species, is also a sense organ.

09 Reading a visceral name and knowing what it is

Splanchnology carries a lot of Latin, and almost all of it is systematic rather than arbitrary. Three prefixes do most of the work, and König sets the rule out explicitly. Note what the first of them actually names: **peri-** is the serous covering of an organ — the sac — while the layer of that sac lying on the organ itself takes **epi-**.

PREFIX	WHAT IT NAMES	READ IT IN PRACTICE
peri-	The serous membrane **covering an organ** — the sac, taken as a whole	*Pericardium* around the heart, *periorchium* around the testis, and *perimetrium* on the uterus
epi-	The **visceral layer** specifically — the part of that membrane actually lying on the organ	*Epicardium*, *epiorchium*. König calls this the more apt name for that layer
meso-	The **mesentery** that reaches the organ — the connecting layer	*Mesogastrium* reaches the stomach, *mesocolon* the colon, *mesometrium* the uterus

Once you have those three, a long list of terms stops needing to be memorised, because the pattern is the same every time — prefix plus the Greek name of the organ. It also settles a pair students routinely swap: the *pericardium* is the whole sac around the heart, and the *epicardium* is the layer of that sac lying on the heart itself.

The coats have the same regularity. If you are learning them, learn them in the nomenclature's own order rather than in an author's paraphrase, because that is the order they are printed in: *tunica mucosa*, *lamina propria mucosae*, *lamina muscularis mucosae*, *tela submucosa*, *tunica muscularis*, *tunica fibrosa*, *tunica albuginea*, *tunica adventitia*, *tela subserosa*, *tunica serosa*, then *parenchyma* and *stroma*.

If the Latin itself is what you are struggling with rather than this branch, veterinary anatomy terminology is the page that takes the naming system apart.

10 What the general plan predicts in the clinic

A general plan is only worth learning if it tells you something about a real animal, so here is what these sections actually buy.

The outer coat predicts what happens when you open the animal. An organ with a serosa has a free surface in a cavity: it can be lifted out through the incision — exteriorised — worked on and returned, and its surface will lie against another serosal surface. An organ with an adventitia is continuous with the tissue around it, and reaching it means dissecting that tissue rather than lifting the organ out of a sac. The cervical oesophagus is the everyday example, and the surgeon's view of the canine abdomen is where the same reasoning is applied one organ at a time.

The serosa is why an infection in a body cavity behaves as it does. Nickel records that serous membranes resorb their own fluid, absorb fluid introduced into the cavity from outside and take up small particles suspended in it — and that when they are injured mechanically or by chemical or other toxic substances they become inflamed more readily and more severely than other tissues. König adds that the serous fluid carries mesothelial cells and macrophages, and that the fluid and the mesothelium together act as a barrier, which he calls extremely important clinically. A large absorptive surface that inflames easily is a fair description of why peritonitis is the emergency it is.

The parietal layer is where the pain is. König notes that the parietal serosa is extremely sensitive to pain, and that for surgical procedures local anaesthetic must be applied to the body wall to make it insensitive. The visceral layer is not comparable.

> **Reading an organ nobody has taught you**
>
> Cut into an organ you have never met and two questions place it. **Is there a lumen?** — that separates a hollow viscus from a parenchymatous one, and tells you whether to look for coats or for stroma and parenchyma. **What is on the outside?** — a smooth wet mesothelial face means a serosa and a serous cavity; a fibrous continuity with the surrounding tissue means an adventitia. Both answers are visible on the cut surface, and neither requires you to know the organ's name.

And the plan tells you what not to expect. Dyce is blunt about it: the assumption that each hollow organ has a fairly constant “normal” form in the living animal has been destroyed by imaging methods, and detailed assertions of normal form and position have no place in describing the hollow organs. What you learned on a fixed cadaver is one arrangement of a mobile system, not the arrangement. If you want what normal actually looks like on ultrasound in a live patient, our guide to abdominal ultrasound is the page that measures it.

11 How to revise this branch

Splanchnology is the branch students most often try to learn as a list of organs, and it is the branch where that works worst — there are too many of them, and every one is taught again in more detail on a species course later. The order that works is the opposite one.

1. **Learn the definition until it is automatic.** A viscus is an organ that communicates with the outside through a lumen or a duct system. Every argument on this page comes out of that sentence.
2. **Learn the coats from the inside out, in Latin, in order.** Then learn the two positions on whether the submucosa sits inside the mucosa or beside it, and which book takes which.
3. **Learn the outer-coat rule**, because it is the one that carries into surgery: a serosa means a free face in a cavity, an adventitia means continuity with the neighbours.
4. **Learn the two-question classification** — hollow or parenchymatous, serosa or adventitia — and then practise it on organs nobody has taught you yet. If you can place an organ you have never met, you have understood the branch.
5. **Only then start on individual organs**, and take them one system at a time.

From here the natural next steps are this branch's neighbours: the whole map of the branches and where this one sits, and the serous cavities in their own right, which handles the sacs in the detail this page deliberately left out. For the species and the individual organs, see the rest of the anatomy articles.

12 Test yourself

Eighteen questions across every section above. Cover the answers first — looking at an answer is not the same as retrieving it, and only one of the two is revision.

1 **What single property do all viscera share, and why does it make four systems one branch?**

> ANSWER 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. The digestive, respiratory, urinary and genital organs are the four canal systems that do.

2 **Splanchnology and topographical anatomy cover the same organs. What is the difference?**

> ANSWER The way the material is organised. Splanchnology is taught by **organ system**; topographical anatomy takes a **body region** and asks what is in it and how those structures interact.

3 **Give the restricted and the broad sense of the word splanchnology.**

> ANSWER **Restricted:** the digestive, respiratory, urinary and genital organs — the systems that maintain the individual and continue the species. **Broad:** those four, plus organs of the vascular system (spleen, heart) and the endocrine glands.

4 **Which systems does the nomenclature actually list under *Splanchnologia*?**

> ANSWER Digestive, respiratory, urogenital and endocrine. One anatomist argued in 1939 that the word should be dropped from the terminology altogether because a rigorous definition was too hard to write; the committees kept it.

5 **Name the coats of a hollow viscus from the lumen outwards.**

> ANSWER *Tunica mucosa* (epithelium, lamina propria mucosae, and in some organs a lamina muscularis mucosae), *tela submucosa*, *tunica muscularis*, then *tunica serosa* or *tunica adventitia*.

6 **Your notes say a hollow viscus has three coats and your friend's say four. Who is wrong?**

> ANSWER Neither. König and the nomenclature treat the *tela submucosa* as a layer of its own outside the mucosa, giving four. Sisson and Grossman count it as a sub-layer of the tunica mucosa, giving three. Say which source you are following.

7 **What are the two muscle strata of a typical hollow viscus, and what does each do?**

> ANSWER An **inner circular** layer (*stratum circulare*), which narrows the tube and thickens into sphincters at openings, and an **outer longitudinal** layer (*stratum longitudinale*), which shortens it. Together, running in sequence, they are peristalsis.

8 **An organ's outer coat is a tunica serosa. What does that tell you?**

> ANSWER That it has a free surface inside a serous cavity — and that the coat **is** the visceral peritoneum, visceral pleura or visceral pericardium of that cavity. On the uterus the same membrane is called the perimetrium.

9 **Which coat does the cervical part of the oesophagus wear, and what does it allow?**

> ANSWER A **tunica adventitia**. It has no free surface; it is bound into the connective tissue around it, and Nickel notes that the connection is loose enough to let the tube move while the animal swallows and bends its neck.

10 **Two textbooks describe the thoracic oesophagus differently. How?**

> ANSWER Dyce says the adventitia is "largely replaced by serosa in the thorax and abdomen". Nickel says the adventitia of the thoracic part is "covered to some extent with pleura". They agree on the neck (adventitia) and on the abdominal part (serosa), and differ on the thorax.

11 **What is the tunica albuginea, and which organs does the nomenclature name for it?**

> ANSWER An inextensible white capsule. The nomenclature's entry names **the testis and the ovary**.

12 **Define stroma and parenchyma without using either word in the other's definition.**

> ANSWER The **parenchyma** is the organ-specific tissue that does the organ's work — liver parenchyma makes bile, kidney parenchyma makes urine. The **stroma** is the non-specific framework that holds the shape and carries the vessels and nerves. The nomenclature in fact defines each in terms of the other.

13 **What is a hilus, and what happens to the organ's stroma there?**

> ANSWER The single point at which vessels and nerves enter a solid organ together. At the hilus the organ's own stroma becomes the mesentery that carries those vessels on — the framework of the organ turns into the fold that suspends it.

14 **Visceral muscle is smooth almost everywhere. Name the two striated exceptions.**

> ANSWER The **heart muscle** and the **tongue**.

15 **Why does a length of intestine keep contracting after its autonomic nerves are cut?**

> ANSWER Because a hollow viscus carries its own nervous system in the wall — a subserosal, a myenteric and a submucosal plexus. The intramural system is complete in itself; the autonomic supply modulates the movement rather than originating it.

16 **What decides how far a suspended organ can move, and what are the three names for the fold?**

> ANSWER The **length and thickness** of the serosal fold that suspends it. The same structure is called a **mesentery**, a **serosal ligament** or a **serosal fold** depending on those dimensions.

17 **Two large hollow organs are held to the body wall without a fold at all. Which, and in which species?**

> ANSWER The **rumen** in ruminants and the **caecum** in the horse, both attached to the body wall directly by connective-tissue adhesions.

18 **Where does the striated muscle of the oesophagus stop in the dog, the cat and the pig?**

> ANSWER In the **dog** it does not stop — the coat is striated along the whole length, as it is in ruminants. In the **cat** the cranial two-thirds are striated and the caudal third smooth, as in the horse. In the **pig** there is a short smooth part near the cardia.

13 Veterinary splanchnology — frequently asked questions

What is splanchnology in veterinary anatomy?

It is the branch of systematic anatomy that studies the viscera — the internal organs of the digestive, respiratory, urinary and genital systems, with the endocrine organs included in the nomenclature's own list. The name is from the Greek *splanchnon*, an internal organ. It is taught by organ system, which is what distinguishes it from topographical anatomy, which is taught by body region.

What is the difference between a viscus and an organ?

Every viscus is an organ, but not every organ is a viscus. The defining property is that a viscus has a lumen or an internal duct system communicating with the outside of the body. The femur and the brain are organs; neither is a viscus.

What are the layers of the wall of a hollow organ?

From the lumen outwards: the *tunica mucosa* (an epithelium, a lamina propria mucosae, and in organs such as the alimentary canal a thin lamina muscularis mucosae), the *tela submucosa*, the *tunica muscularis* with its inner circular and outer longitudinal layers, and then either a *tunica serosa* or a *tunica adventitia*. Sources differ on whether the submucosa is counted as one of the coats or as part of the mucosa.

What is the difference between serosa and adventitia?

A serosa is a serous membrane — a mesothelium on a thin connective-tissue layer — and it gives the organ a free, moist surface inside a serous cavity. An adventitia is fibrous connective tissue with no mesothelium, binding the organ into the tissue around it. The oesophagus carries both: an adventitia in the neck, and a serosa by the time it reaches the abdomen.

What does parenchymatous mean?

That the organ is solid rather than hollow, and is built from a specific working tissue (the parenchyma) held in a non-specific framework (the stroma), usually inside a capsule and with a hilus where the vessels and nerves enter. The liver, kidney, spleen, pancreas and testis are parenchymatous organs.

Is the heart part of splanchnology?

It depends which sense of the word is being used, and the sources genuinely differ. In the restricted sense splanchnology covers only the digestive, respiratory, urinary and genital organs, and the heart is excluded. In the broad sense the heart and spleen are included. The nomenclature files the heart under *Angiologia*, and that is where it is normally taught.

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