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COW REPRODUCTIVE ANATOMY NOTES

Cow Reproductive Anatomy Notes: Ovary to Vulva (PDF)

The female tract of the cow lies unusually far back, because the fetal ovary of a ruminant descends further than in any other domestic species and drags the uterine horns back with it — which is why the whole tract can be reached by a hand in the rectum. This guide runs the tract in order: the ovary, with no ovulation fossa and follicles anywhere on its surface; the uterine tube in the wall of the ovarian bursa; the horns, and the three-centimetre body hidden inside what looks like a long one; the caruncles that become placentomes; the cervix that is the hardest structure in the pelvis; the vagina, vestibule and vulva; the broad ligament; and the three arteries. It ends with a normal examination per rectum, described as five landmarks in the order a hand meets them. Inside: Fourteen labelled figures, eleven reference tables and a 112-question self-test.

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The 13 sections of this guide, in order.

IN SHORT

The female tract of the cow lies unusually far back, because the fetal ovary of a ruminant descends further than in any other domestic species and drags the uterine horns back with it. That one fact is why the whole tract can be reached by a hand in the rectum, and it is where these cow reproductive anatomy notes begin. They then run the tract in order: the ovary, which carries follicles and corpora lutea anywhere on its surface and has no ovulation fossa; the uterine tube in the wall of the ovarian bursa; the horns, and the 3 cm body hidden inside what looks like a long one; the caruncles that become placentomes; the 8 to 10 cm cervix that is the hardest structure in the pelvis and the handle the whole examination is built on; the vagina, vestibule and vulva with the suburethral diverticulum in the floor; the broad ligament that suspends all of it; and the three arteries that reach it. Section 11 then describes a normal examination per rectum as a sequence of five landmarks, in the order a hand meets them. The oestrous cycle, breeding management and pregnancy diagnosis as a procedure are deliberately left to the pages and books that own them.

KEY POINTS

1. **The tract sits far back because the fetal ovary descended further.** In the ruminant the ovaries descend to the most caudal part of the abdomen — a greater descent than in any other domestic species — and the horns, anchored to them, are drawn back toward the pelvic inlet instead of ranging forward. Everything else on this page is a consequence: the horns curl instead of extending, the ovaries are palpable, the cervix ends up in the pelvis, and the whole tract can be reached per rectum.
2. **The ovary is small, firm and read all over.** About 4 × 2.5 × 1.5 cm, lying near the ventral part of the shaft of the ilium level with the bifurcation of the uterus. Follicles and corpora lutea may project from **any part** of its surface, and there is **no ovulation fossa** — which is exactly why the cow's ovary is palpated all over and the mare's is not.
3. **The uterine tube is long but folded, so its two ends lie close together.** Infundibulum, fimbriae, ampulla, isthmus, in that order from ovary to horn, with the ampulla about twice the length of the isthmus. It runs in the wall of the ovarian bursa, the peritoneal pocket made by the mesovarium and the mesosalpinx together.
4. **The body is only 3 cm long, and most of what looks like a body is not one.** The apparent body is furnished by the two horns lying side by side within shared serosal and muscular coats, with a dorsal groove marking the seam — the pseudobody. Each horn is about 35 cm and roughly a third of it is bound up in that arrangement.
5. **The cow has two intercornual ligaments and a pocket between them.** A dorsal and a ventral ligament bridge the diverging horns, and an index finger placed in the pocket lets the examiner draw the whole tract caudally toward the pelvis. Small ruminants have a single ligament and no pocket, so this is a bovine manoeuvre.
6. **Caruncle, cotyledon, placentome are three different tissues.** The caruncle is maternal and present in the non-pregnant uterus — about 40 of them, in four rows in the wider part of each horn. The cotyledon is fetal. The placentome is the two locked together, which is why a ruminant placenta is called cotyledonary. The cow's are raised and mushroom-shaped; the ewe's and doe's are dish-shaped.

7. **The cervix is the hardest thing in the pelvis and the landmark for everything else.** Eight to ten centimetres of thick-walled tissue — about three times the length of the body it guards — occluded by three or four interlocking circular folds, with longitudinal folds radiating at the external ostium like the segments of an orange and an annular fornix surrounding the whole projecting end.
8. **The vagina and vestibule are in a ratio of about 3 : 1**, and the boundary is the external urethral orifice, a few centimetres in front of the ischial arch — not the vulva. The suburethral diverticulum lies in the floor of the vestibule just behind that orifice, which is why a catheter advanced along the floor enters the pouch rather than the urethra.
9. **The broad ligament has three parts, each named for what it suspends.** Mesovarium for the ovary, mesosalpinx for the uterine tube, mesometrium for the uterus and cranial vagina. Its two serosal layers are separated by a considerable amount of smooth muscle continuous with the myometrium, so it supports the uterus **actively** rather than passively.
10. **Three arteries, one from the aorta and two from the internal iliac.** The ovarian artery is a direct aortic branch with an extraordinarily convoluted course; the uterine artery is the largest and reaches the mesometrial border, leaving the antimesometrial border less well supplied; the vaginal artery runs over the dorsolateral surface of the vagina. Uterine branches from the first and third anastomose with the second, making one continuous chain.
11. **The examination has an order, and it starts at the cervix.** Cervix, then bifurcation and intercornual pocket, then horns, then ovaries, then — in a pregnant cow — the uterine artery for fremitus. You find the cervix first because it is the only firm structure in the pelvis, and every other landmark is then reached by direction from it.
12. **Pregnancy is asymmetry, then descent, then fremitus.** The conceptus is almost invariably confined to one horn, so asymmetry comes first. By the third month the uterus slips forward over the abdominal floor, and at about the fifth it passes out of reach altogether — which is as informative as finding it. And the uterine artery enlarges from a few millimetres to a centimetre or more, carrying a palpable thrill against the ilium.

> **About the images**
>
> Twelve figures are reproduced for educational reference: eleven from Mansour and colleagues' *Guide to Ruminant Anatomy*, 2nd ed. (Fig.s 4.14 (a), 4.14 (b), 4.15, 4.16 (a, b), 4.18, 4.19, 4.21, 4.22, 4.23 (a, b), 4.20 and 4.14 (c)) and one from *Spurgeon's Color Atlas of Large Animal Anatomy* (Fig. Plate 3.16 (B)). Each is credited beneath it and copyright remains with the original authors and publishers. The other two figures are diagrams of our own, drawn for this guide from the sources named under them.

01 What this page covers, and what it hands on

This page is about **structures and where to find them**. It runs from the ovary to the vulva, naming every part of the female bovine tract in the order it comes. Then it does the thing most accounts of this subject leave out: it describes what your hand actually meets, in the order it meets it, when you carry out a normal examination **per rectum** — that is, through the wall of the rectum, with the arm introduced through the anus.

That emphasis is deliberate. There is no shortage of writing on the reproductive tract of the cow, but almost all of it is written for someone managing a herd rather than for someone examining an animal. Very little of it is written for the person standing behind a cow for the first time with an arm in a rectum and no idea which of the things they can feel is the cervix. These cow reproductive anatomy notes are for that person, and for the student who will be that person in a few months.

> **What this page owns, and what it hands on**
>
> This is the **female tract of the cow, structure by structure**, from the ovary to the vulva, together with the landmarks of a normal examination per rectum. Three subjects are deliberately left out. The **oestrous cycle** and its hormones are on our page on the heat cycle, written for the dog but built on the same framework. **Breeding management** — insemination, synchronisation, embryo transfer — is not anatomy and is not here. And the **rest of the cow** is on our bovine anatomy page for vet students.

What you should be able to do at the end

Twelve objectives, and every section below carries one or two of them. You should be able to:

1. **Name** every part of the tract in order, ovary to vulva.
2. **Say why** the ruminant tract lies as far back as it does, and what that does to the position of the horns.
3. **Describe the ovary**: its size, its shape, what projects from its surface, and why that makes it readable with a fingertip.
4. **Explain the ovarian bursa**, and trace the uterine tube from the infundibulum to the tip of the horn.

5. **Explain the pseudobody** — why the bovine uterus looks as though it has a long body when it does not — and name the intercornual ligaments.
6. **Describe a caruncle**, and say what a placentome is made of.
7. **Describe the cervix**: its length, its folds, its fornix, and why it is the structure the whole examination is built on.
8. **Name the parts** of the vagina, vestibule and vulva, including the suburethral diverticulum, and say why that pouch matters.
9. **Explain what suspends the tract**: the broad ligament and its three named parts.
10. **Trace the blood supply**, and say what fremitus is and where it is felt.
11. **Describe a normal examination per rectum** as a sequence of landmarks, and say what each one feels like.
12. **Say how the tract changes** with pregnancy, with age, and between the cow, the ewe and the doe.

Three things are deliberately absent

First, **the oestrous cycle**. Nothing on this page explains a structure by reference to a day of the cycle or a hormone. Where a structure changes with the cycle — and several do — this page says so and stops there. The cycle as a concept, with the phases and what drives them, is covered on the page linked in the panel above; it is written for the dog, but the framework is the same one you will apply to the cow, and the cattle detail belongs to the reproduction textbooks rather than to an anatomy page.

Second, **breeding management**: no artificial insemination technique, no synchronisation, no embryo transfer. Section 7 explains why passing anything through a bovine cervix is difficult, because that difficulty is a fact about the folds, and then it stops.

Third, fertility and the business of establishing whether an animal is in calf are left to the textbooks that exist for them. Section 12 covers pregnancy the way the rest of the page covers everything else — as a change in structure. What gets bigger, what moves, what a hand can and cannot reach.

What is left is the anatomy, and the anatomy is the part that does not change when the technology does. The rest of the animal — the skeleton, the abdomen, the udder, the limbs — belongs to the whole-cow survey this system sits inside, which is the second page linked in the panel above.

02 The plan of the tract, and why it sits so far back

Start with the shape of the thing before any of its parts have names.

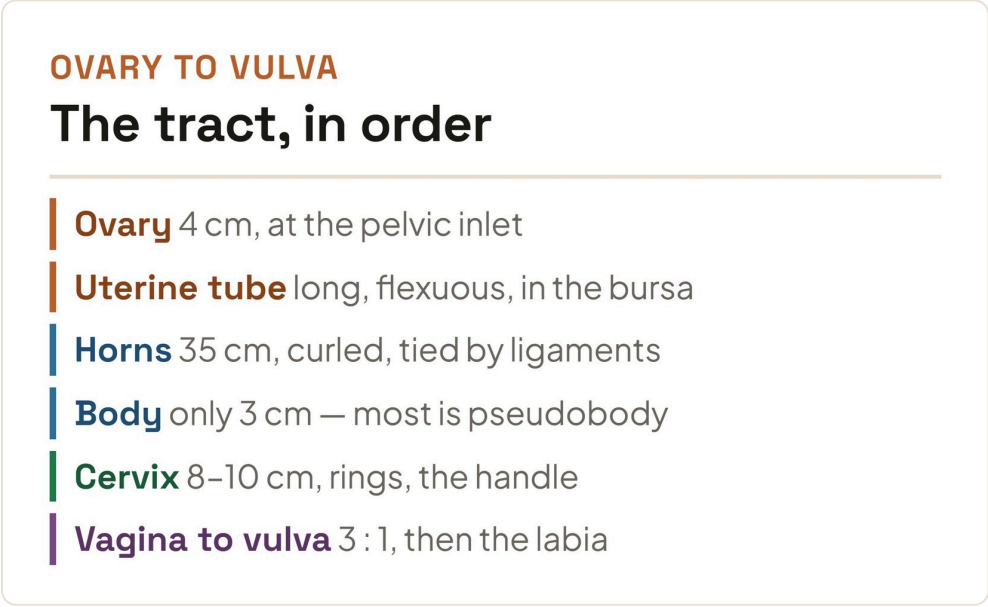

Fig 1 — The tract, in order, with the one thing to carry about each part Six rows, and every section below is one of them. Read down the list before you read anything else: **ovary**, **uterine tube**, **horns**, **body**, **cervix**, **vagina to vulva**. Two of the six lines are where students lose marks and where a beginner's hand gets lost. The **body is only 3 cm** — almost all of what looks like a body is the two horns bound together inside one coat, which section 5 calls the pseudobody. And the **cervix is 8 to 10 cm of hard, ringed tissue**, which makes it the one unmistakable thing in the pelvis and the handle the whole examination is built on.

Diagram — Vet-eBooks.com, drawn for this guide. Data from Dyce KM, Sack WO, Wensing CJG. Textbook of Veterinary Anatomy, 5th ed., ch. 29, and Mansour M, Wilhite R, Rowe J, Hafiz S. Guide to Ruminant Anatomy, Dissection and Clinical Aspects, 2nd ed. Wiley Blackwell, ch. 4.

Every mammal's female tract is the same series: a pair of ovaries, a pair of tubes, a uterus, a cervix, a vagina, a vestibule and a vulva. What differs between species is the proportions — how long the horns are, how much of a body there is, how the cervix is built — and, crucially for the cow, **where the whole assembly sits**.

PART	WHERE IT IS	THE ONE THING TO CARRY
Ovary	At or just in front of the pelvic inlet, near the ventral part of the shaft of the ilium, level with the bifurcation of the uterus	About 4 × 2.5 × 1.5 cm, and follicles and corpora lutea project from **any part** of its surface
Uterine tube	In the wall of the ovarian bursa, in the free edge and lateral wall of the mesosalpinx	Long, but so flexuous that its two ends lie close together
Uterine horns	Curled ventrally on themselves and drawn back toward the pelvic inlet, tips reaching just beyond the pelvic brim	About 35 cm each, and roughly a third of that length is bound into what section 5 calls the **pseudobody**
Uterine body	In the pelvic cavity, immediately in front of the cervix	Only about **3 cm** long — far shorter than it looks
Cervix	Close to the midline of the **pelvic floor**, inside the pelvis. In a heifer, about half way between the caudal border of the pubis and the pelvic brim; in an older cow it may lie just behind, on, or over the brim	8 to 10 cm of thick, firm tissue with interlocking rings: the hardest structure in the pelvis and the landmark everything else is found from
Vagina	From the fornix back to the external urethral orifice	About three times the length of the vestibule, and greatly distensible
Vestibule	From the external urethral orifice back to the labia, sloping ventrally, penetrating the urogenital diaphragm	Carries the suburethral diverticulum in its floor and the major vestibular gland in its wall
Vulva	The external opening, between the labia	Dorsal and ventral commissures; the clitoral fossa lies just inside the ventral one

The one fact everything else follows from

In the embryo, the ovary of every mammal begins high in the abdomen, near the kidney, and migrates caudally. In the ruminant that migration goes **further than in any other domestic species**: the fetal ovaries descend to the most caudal part of the abdomen. Because the horns of the uterus are anchored to the ovaries, they are dragged backwards with them, and the result is a uterus that sits at the pelvic inlet instead of ranging forward into the abdomen. Except in advanced pregnancy, the tract of a cow does not go far into the belly at all.

Hold on to that, because at least four things on this page are consequences of it:

1. **The whole tract can be reached by a hand in the rectum.** This is not true of every species and it is the single reason bovine reproductive work is done the way it is.
2. **The horns are curled rather than extended.** Pulled back toward their ovarian attachments and with nowhere to go, each horn curls ventrally on itself, and the tips reach only just beyond the **pelvic brim** — the front edge of the pelvic inlet, and the landmark the whole examination is measured against. ⚠️ Dyce calls its pubic part the *pubic brim*, and some texts the *pecten pubis*. They are the same edge; this page says **pelvic brim** throughout, because that is what you will hear from someone standing behind the same cow.
3. **The ovaries are palpable.** They sit near the ventral part of the shaft of the ilium, level with the bifurcation of the uterus — which is to say, within easy reach.
4. **The cervix ends up in the pelvis**, on the pelvic floor, where it becomes the first thing a hand meets and the landmark for everything else.

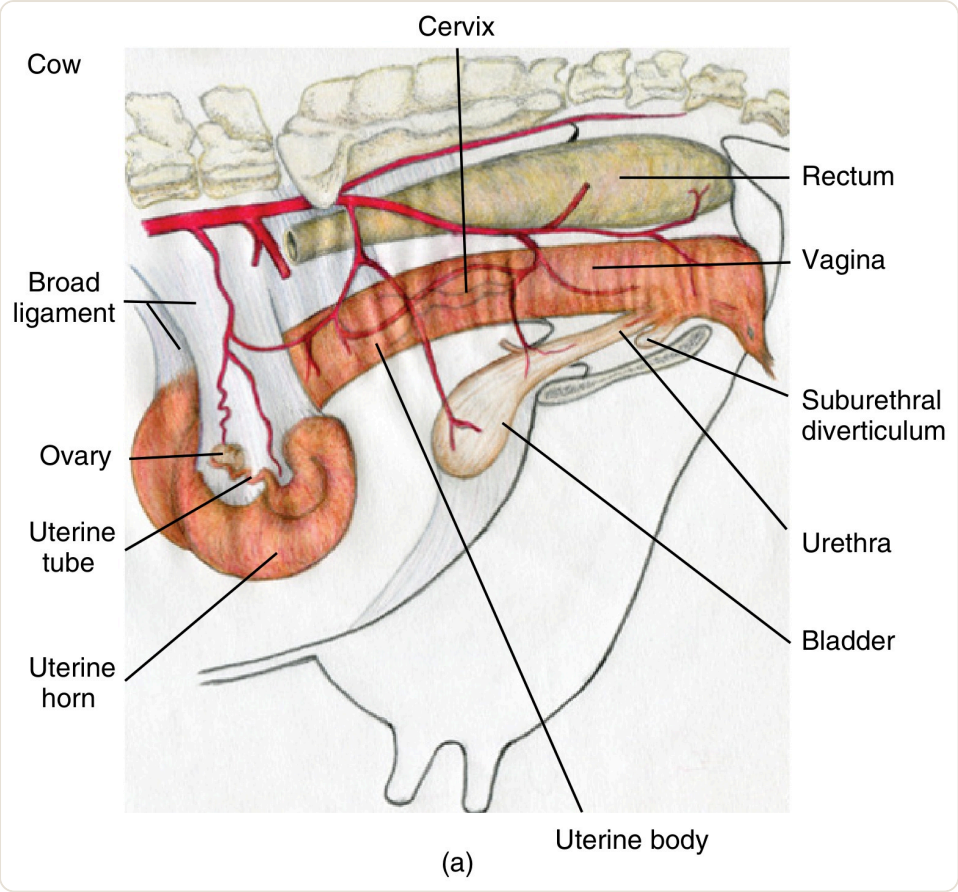

Fig 2 — Everything you will palpate, and everything it lies against This is the whole of the rest of the page in one drawing. Give it a few minutes. Note four relationships and you have the section. The **rectum lies directly above the tract** — which is why an arm in the rectum can reach all of it. The **bladder lies below and in front**, so a full bladder is the first thing a beginner mistakes for a pregnant horn. The **horn is curled ventrally on itself** rather than running forward, which is the consequence of the descent described below. And the **broad ligament comes down from the roof of the abdomen**, carrying the arteries with it — every vessel in section 10 arrives inside that sheet. The **suburethral diverticulum**, the blind pouch labelled at the bottom right, is section 8's problem and the reason passing a urinary catheter in a cow is not the simple act it is in a mare.

Image — Mansour M, Wilhite R, Rowe J, Hafiz S. Guide to Ruminant Anatomy, Dissection and Clinical Aspects, 2nd ed. Wiley Blackwell — Fig. 4.14 (a), an in-situ overview of the bovine reproductive tract. Reproduced for educational reference.

How to hold the picture in your head

Three planes and one direction will keep you oriented for the rest of the page. The **rectum is above**. The **bladder is below and in front**. The tract lies between them, slung from the roof of the abdomen by a curtain of peritoneum — the broad ligament of section 9 — which also carries every artery, vein and nerve that reaches it.

The direction is **caudal to cranial**, because that is the direction your hand travels: in through the vulva or the anus, and forward. The sections below run the other way, ovary to vulva, because that is the order in which the parts make sense as a sequence. Section 11 then reverses it and runs the examiner's order instead. You need both: one to understand the tract, the other to examine it. If you find the anatomical terms of position awkward, the anatomy terminology page and the guide to anatomical planes set them out.

One last piece of orientation. This tract is a **tube with one closed end and one open end**, and the closed end is not quite closed: the infundibulum of each uterine tube opens into the peritoneal cavity. That is a peculiarity of the female genital system in every mammal, and it is the reason the peritoneal relations in section 9 repay the attention they ask for. The general behaviour of serous membranes — what a peritoneal fold is, how a cavity is lined — is covered on our page on body cavities and serous membranes.

03 The ovary

The bovine ovary is a **firm, rather irregular ovoid body**, and it is **small in relation to the size of the animal**: about **4 × 2.5 × 1.5 cm** in the mature, non-pregnant cow. Roughly, the size and shape of the last joint of a large thumb. It is included in the broad ligament, and it lies near the ventral part of the shaft of the ilium, level with the bifurcation of the uterus.

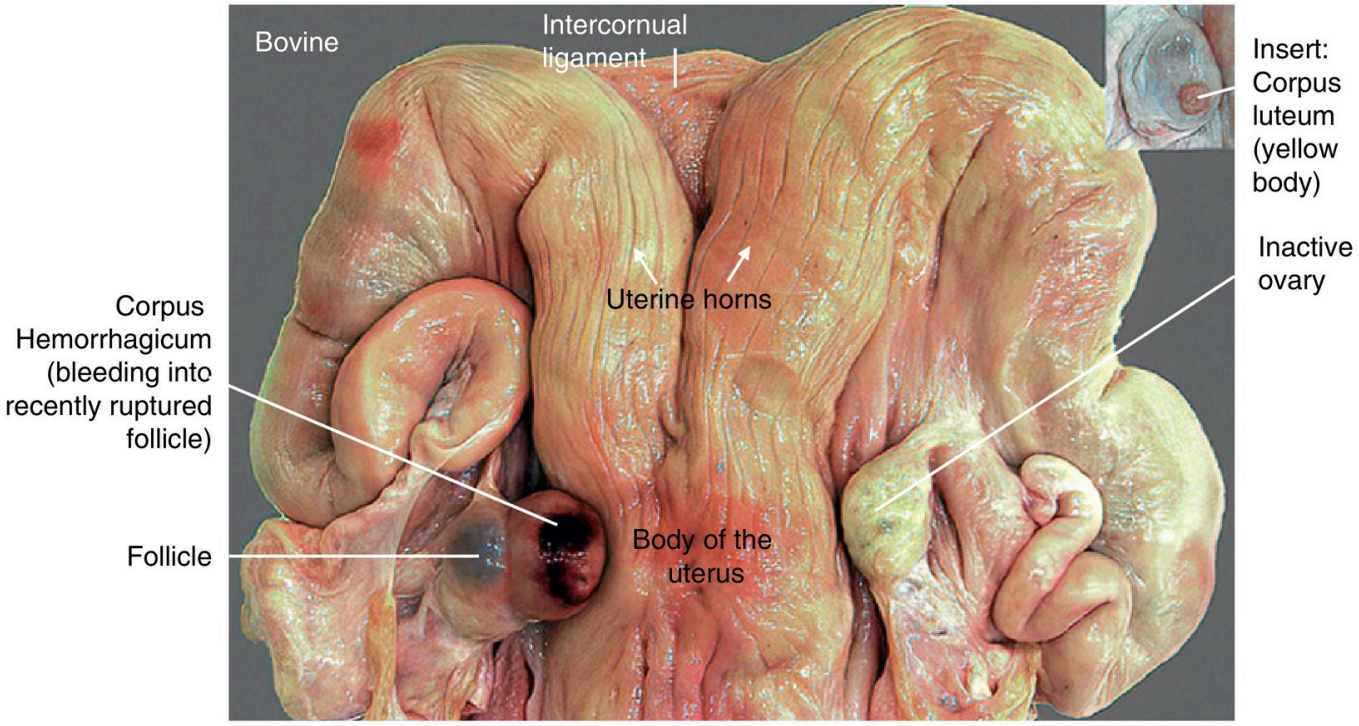

Fig 3 — One ovary busy, the other quiet — and both of them normal The two ovaries in this specimen do not match, and that is the ordinary state of affairs rather than a finding. On one side a **follicle** bulges from the surface and beside it sits a **corpus haemorrhagicum**, the blood-filled structure that occupies a follicle which has recently ruptured. The other ovary is labelled **inactive** and has a smooth, even surface. The inset shows a **corpus luteum** raised on an otherwise intact ovary — the yellow body that the corpus haemorrhagicum becomes. What matters for section 3 is where these things are: **on the surface, and anywhere on it**. That is the whole reason the bovine ovary can be read with a fingertip. Note also the **intercornual ligament** running between the two horns, which section 5 comes back to.

Image — Mansour M, Wilhite R, Rowe J, Hafiz S. Guide to Ruminant Anatomy, Dissection and Clinical Aspects, 2nd ed. Wiley Blackwell — Fig. 4.14 (b), the isolated bovine uterus and ovary. Reproduced for educational reference.

FEATURE	IN THE COW	WHY IT MATTERS
Shape	A firm, rather irregular ovoid body	It is read by feel, and an irregularity is a structure rather than a fault
Size	About 4 × 2.5 × 1.5 cm — small for the size of the animal	Small enough to be cupped in the fingers through the rectal wall
Position	Near the ventral part of the shaft of the ilium, level with the bifurcation of the uterus, close to the pelvic inlet	Close enough to the pelvis to be reached routinely per rectum, which is not true of every domestic species
Attachment	Suspended in the broad ligament by the mesovarium; tied to the tip of the uterine horn by the *proper ligament of the ovary*	Find the horn tip and the ovary is a fingertip away
Surface	Follicles and corpora lutea may project from **any part** of the surface	The whole surface is informative — there is no single place to look
Ovulation fossa	**Absent.** The mare has one; the cow does not	In the mare, follicles migrate to a single indented site; in the cow they can be anywhere, which is exactly why the cow's ovary is palpated all over
Largest follicles	Up to about 2 cm across	A structure of that size is unmistakable through the rectal wall
Smallest detectable	Follicles as small as about 5 mm *may* be detected per rectum	"May be detected" is the source's wording and the honest claim; 5 mm is the limit of what a good hand finds, not a guarantee

Why the surface is what matters

In the cow, **follicles and corpora lutea may project from any part of the ovarian surface**. That single sentence is the whole reason the bovine ovary is examined the way it is: you run the structure between fingers and thumb and you feel for irregularities anywhere on it, because there is no privileged site to check.

Compare the mare, where the follicles migrate as they enlarge toward a single indented site — the **ovulation fossa** — and ovulation occurs there and nowhere else. The cow has **no ovulation fossa**. In practice that means a mare's ovary is interrogated at one place and a cow's is interrogated all over, and it is one of the clearest examples on this page of a small anatomical difference dictating a different technique.

What you can expect to feel

The **largest follicles reach about 2 cm** in diameter, which is a large and unmistakable structure to meet through a rectal wall. At the other end of the range, follicles **as small as about 5 mm may be detected on palpation per rectum** — and the word *may* is the source's, not a hedge added here. Five millimetres is what a practised hand can find under good conditions, not something that can be promised.

A **corpus luteum** feels different from a follicle: a follicle is a fluid-filled bulge with some give in it, and a corpus luteum is a firmer, more solid projection. And only a small part of a fully developed corpus luteum actually stands above the surface: **most of the structure is embedded in the ovary**, and what your fingertip meets is the tip of it. That is why a corpus luteum looks so much larger on a cut face, or on an ultrasound image, than it feels. Know that before the first time you find one, and it will not mislead you.

Between those two structures sits a third, which Figure 3 labels and most accounts skip: the **corpus haemorrhagicum**, the blood-filled body that occupies a follicle immediately after it has ruptured, before it organises into a corpus luteum. Learn the name, and meeting one will not surprise you.

What this page will not tell you about the ovary

How these structures succeed one another in time, what drives them, and what any of them tells you about where an individual animal is in her cycle: all of that is **cycle physiology**, and it is out of scope here by design. The structural point that this page is willing to make is the one that follows from the anatomy: because the surface can carry a follicle and a corpus luteum at once, an ovary that has one of each is a normal ovary and not a puzzle. For the cycle itself, see our page on the heat cycle.

Where the ovary is anchored

The ovary hangs in the **mesovarium**, the most cranial part of the broad ligament, and is tied to the tip of the uterine horn by the short **proper ligament of the ovary**. Further forward, the **suspensory ligament of the ovary** forms the cranial boundary of the broad ligament and runs on toward the last ribs. Section 9 takes those attachments apart properly; what matters here is the practical consequence, which is that **the ovary and the tip of the horn travel together**. Find one and you have found the other. That is the basis of step 4 in section 11.

04 The ovarian bursa and the uterine tube

The ovary does not lie loose in the abdomen. It sits in a pocket of peritoneum called the **ovarian bursa**, and the **uterine tube** — also called the **oviduct**, and known outside veterinary teaching as the fallopian tube — runs in the wall of that pocket. This page uses *uterine tube* throughout, because that is the term the anatomy books and the nomenclature use.

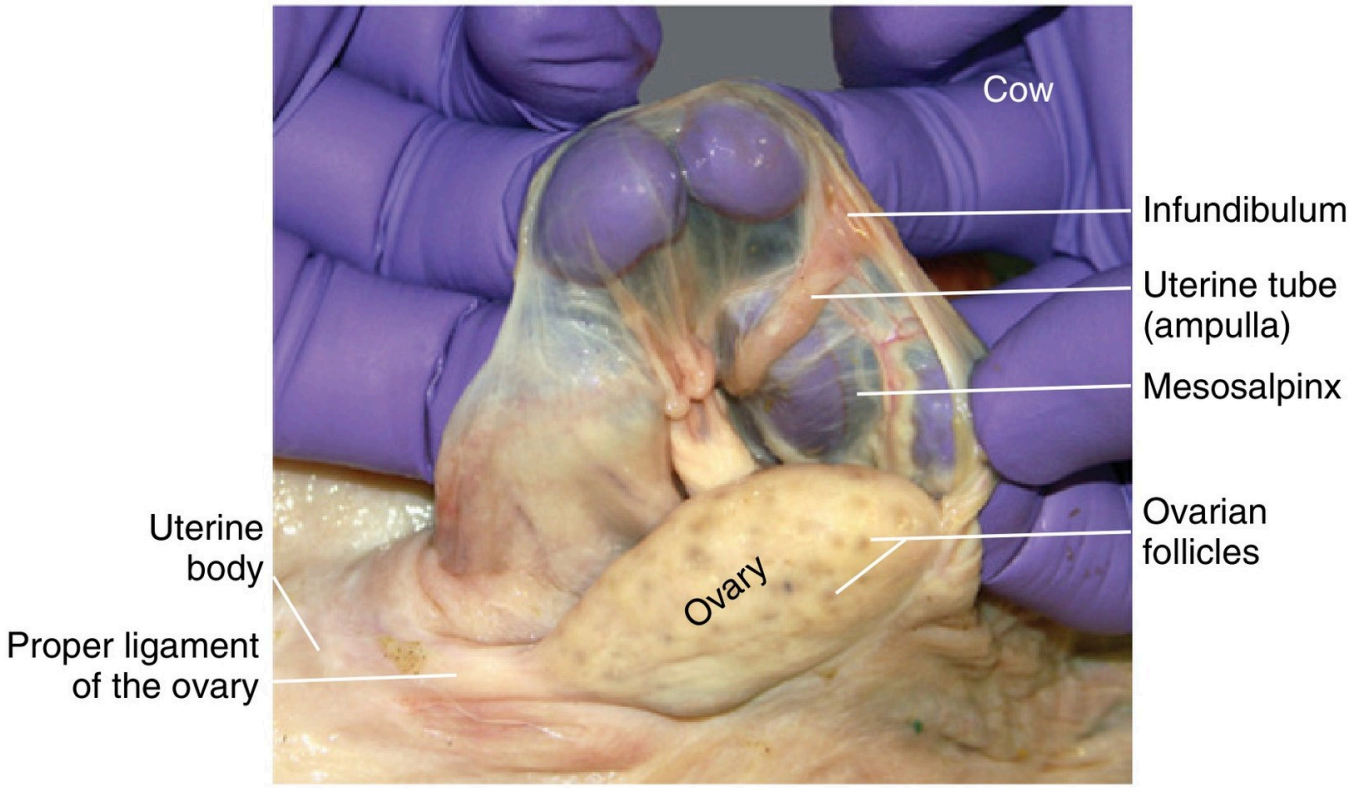

Fig 4 — The bursa is a pocket, and the tube runs in its wall The **ovarian bursa** is not a separate organ. It is the pocket formed where the **mesosalpinx** — the fold that carries the uterine tube — swings out from the mesovarium and back, so the ovary comes to lie inside a peritoneal purse. Follow the tube in this photograph from the right-hand end: the **infundibulum** is the open funnel lying against the ovary, the **ampulla** is the wider stretch that follows it, and beyond the frame the narrow isthmus reaches the tip of the horn. The **proper ligament of the ovary** is the short cord tying the ovary to that horn tip, and it is the reason the two structures are always found together.

Image — Mansour M, Wilhite R, Rowe J, Hafiz S. Guide to Ruminant Anatomy, Dissection and Clinical Aspects, 2nd ed. Wiley Blackwell — Fig. 4.15, the bovine ovary with the ovarian bursa opened. Reproduced for educational reference.

How the pocket is made

The bursa is formed by two parts of the broad ligament working together. The **mesovarium** comes down to the ovary; the **mesosalpinx** extends laterally from the mesovarium, carrying the uterine tube in its free edge, and then curves back. Between the two folds a purse is created, and the ovary projects into it.

The size and the completeness of that purse vary a great deal between species — in carnivores the bursa encloses the ovary entirely, while in the mare it cannot hold the ovary at all — and the cow lies between the two. What matters for the cow is that the arrangement puts **the open funnel of the uterine tube immediately over the surface from which the ovum is released**, which is what the whole structure is for.

Following the tube

The uterine tube of the cow is **rather long, but so flexuous that its beginning and its end lie close together**. It has four named regions and they are easy to confuse, so trace them in one direction only — ovary to horn — with Figure 4 beside you.

PART	WHAT IT IS	WHAT HAPPENS THERE
Infundibulum	The thin-walled funnel at the free end, lying over the lateral surface of the ovary in the free margin of the mesosalpinx	Receives the ovum released from the ovarian surface
Fimbriae	Finger-like projections on the free edge of the infundibulum	Their movement helps draw the newly released ovum into the funnel
Ampulla	The wider part of the tube beyond the infundibulum, about twice the length of the isthmus	The site of fertilisation
Isthmus	The narrower, thicker-walled part running on to the horn	Passes the conceptus on to the uterine horn; the transition to the horn is gradual and marked by a thickening of the muscle

The **infundibulum** is the thin-walled funnel at the free end, lying over the lateral surface of the ovary in the free margin of the mesosalpinx, with the fringe of **fimbriae** around its rim. From there the tube narrows and winds within the lateral wall of the bursa to reach the tip of the uterine horn. Along that course it is divided into **ampulla** and **isthmus** in a ratio of roughly **2 : 1** — although the distinction between them is only obvious at certain times, so do not expect to see a clear boundary on every specimen. Fertilisation occurs in the ampulla.

At the far end, the transition from isthmus to horn is **gradual, and marked by a thickening of the muscle** rather than by any sudden change of calibre. That junction has its own name — the **tubouterine junction** — and it is labelled on Figure 14.

A note for the dissection room

The uterine tube **can be hard to identify on a non-pregnant tract**. It is a fine, pale, tightly wound structure buried in a fold of peritoneum, and on an isolated specimen it is easy to tear before you find it. The reliable approach is to work from the two ends that are obvious — the infundibulum over the ovary, and the tip of the horn — and open the mesosalpinx between them. In an ordinary dissection there is no need to identify the ampulla and isthmus as separate structures; recognising the tube, its funnel and its fimbriae is the achievable objective.

05 The uterus: two horns and a body that is not one

This is the section where most readers have already been misled, usually by a diagram. The bovine uterus **gives a misleading impression of consisting of a relatively long body followed by two divergent, tapering horns**. That impression is wrong, and it gets a section of its own because almost everything a clinician does with the uterus depends on the correction.

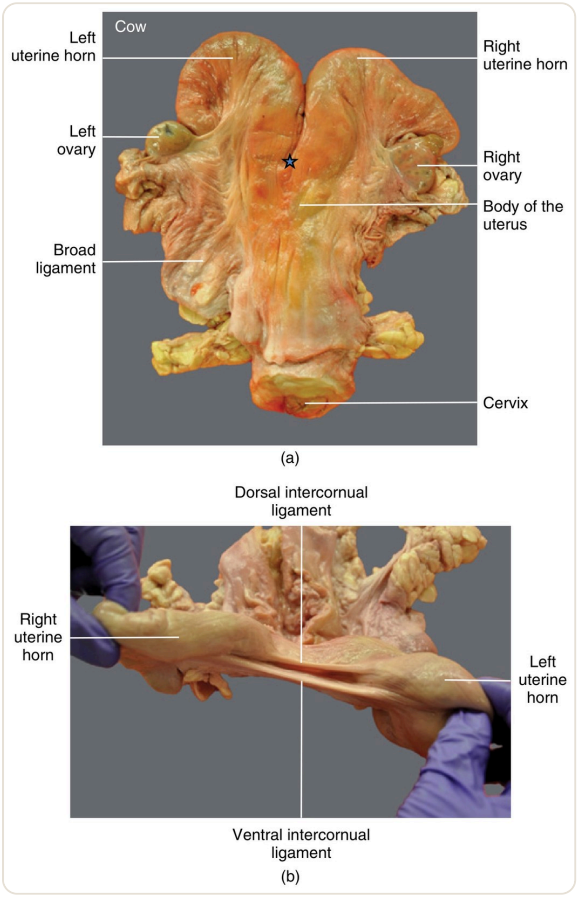

Fig 5 — The body that is not a body, and the two ligaments that bridge the horns Panel **(a)** is the whole isolated uterus from above and it tells the lie this section exists to correct: there appears to be a long **body** with two horns diverging from its far end. Panel **(b)** looks at that divergence from in front, and shows what is actually there — the two horns lie side by side inside one shared coat for most of that distance, and the visible groove along the top is the seam between them. Bridging the point where they separate are **two** ligaments in the cow, a **dorsal intercornual ligament** and a **ventral** one, with a small pocket between them. That pocket takes a finger, and section 11 explains what the finger is for.

Image — Mansour M, Wilhite R, Rowe J, Hafiz S. Guide to Ruminant Anatomy, Dissection and Clinical Aspects, 2nd ed. Wiley Blackwell — Fig. 4.16 (a, b), the isolated bovine uterus and the dorsal and ventral intercornual ligaments. Reproduced for educational reference.

The pseudobody, in three sentences

What it looks like: a bovine uterus appears to have a long body with two horns diverging from its far end. **What is actually there:** most of that apparent body is the two horns themselves, lying side by side inside a shared serosal and muscular coat, with a groove along the top marking the seam and an internal septum between them. **Why it matters:** the true body is only about 3 cm long, so anything passed through the cervix reaches the pseudobody — and therefore one horn or the other — almost immediately.

What is actually there

The apparent body is **furnished by the two horns themselves**, lying side by side within shared serosal and muscular coats. From outside, the seam between them shows as a **dorsal groove** running along the top. From inside, a septum separates them, and in the cow that septum runs

back almost as far as the cervix — which is to say, along nearly the whole length of what looks like a body. So the structure that looks like a body is two tubes in one wrapper, and the name for it is the **pseudobody**.

The real body is short. Memorise these exactly: they are the numbers you will be asked for, and the ones that make the point:

STRUCTURE	LENGTH IN THE MATURE, NON-PREGNANT COW	THE TRAP
Uterine **body**	About **3 cm**	The apparent body is several times longer than that; almost all of it is pseudobody
Each uterine **horn**	About **35 cm**	Roughly a third of each horn is incorporated into the pseudobody, so what you can see as a free horn is not the whole horn
Cervix	**8 to 10 cm**	It is longer than the body it leads into — by a factor of about three
Vagina to **vestibule**	About **3 : 1**	The boundary is a few centimetres in front of the ischial arch, not at the vulva
Caruncles	About **40**, in four rows	They thin to a double line toward the tip of the horn, so a count taken from one region misleads

Read that table once more. The **cervix is roughly three times the length of the body it leads into**. Each **horn is about 35 cm**, of which **about a third** is bound up inside the pseudobody. And the **body itself is about 3 cm** — barely more than a thumb's width.

Why it matters that you cannot feel where the body ends

The cervix is hard, so its **cranial limit is easy to find by touch**: the firmness stops and something softer begins, and that is the caudal limit of the uterine body. But there is **nothing to indicate the body's cranial limit**. Where the body ends and the pseudobody begins cannot be felt from outside at all, and it cannot be seen on an intact specimen either — the dissection is what reveals that the body is a mere 3 cm.

The practical consequence follows immediately. Anything introduced through the cervix and passed "into the body of the uterus" has only a few centimetres of body to be in before it is in one horn or the other. That is a fact about the anatomy, and it is the reason the depth of insertion is treated so carefully in every technique that involves passing something through a bovine cervix.

The intercornual ligaments, and the pocket between them

Where the two horns finally diverge, the superficial tissues bridge the gap between them as the **intercornual ligaments**. The cow has **two**: a **dorsal** and a **ventral** intercornual ligament, drawn from in front in panel (b) of Figure 5. Small ruminants have a **single** one.

Those two short ligaments create a **small pocket, open cranially**, and that pocket is one of the most useful structures in the pelvis. An examiner can **insert an index finger into the space between the dorsal and ventral intercornual ligaments and draw the whole tract caudally** toward the pelvic cavity. Structures that were out of reach come back to the hand. It is the difference between an examination that works and one that does not, and it is available in the cow and not in the ewe.

The uterus firms up while you are examining it

One more feature belongs here because it surprises people the first time. The tight winding of the horns is **not constant**. It results from stimulation of the muscle of the uterus and of the broad ligament, so the organ **becomes more definite and firmer in the course of a rectal examination** — an effect that is most noticeable at oestrus.

In other words, the thing you are palpating changes under your hand while you palpate it, and it changes in a helpful direction: an indistinct tract becomes easier to define the longer you work with it. This is a mechanical response of smooth muscle to handling and to the state of the tract at the time; what governs that state through the cycle is deliberately left to the pages and books that own it.

The wall itself has the three coats you would expect: an outer serosa continuous with the broad ligament, a thick muscular **myometrium** whose longitudinal fibres continue into the ligament, and the **endometrium**, which is section 6.

06 The lining: caruncles and the cotyledonary placenta

Open a bovine uterus and the endometrium is not uniform. Scattered over it, in rows, are dozens of discrete raised areas: the **caruncles**. They are the most characteristic feature of the interior of the ruminant uterus, and they are present in the non-pregnant animal — they are not something pregnancy creates.

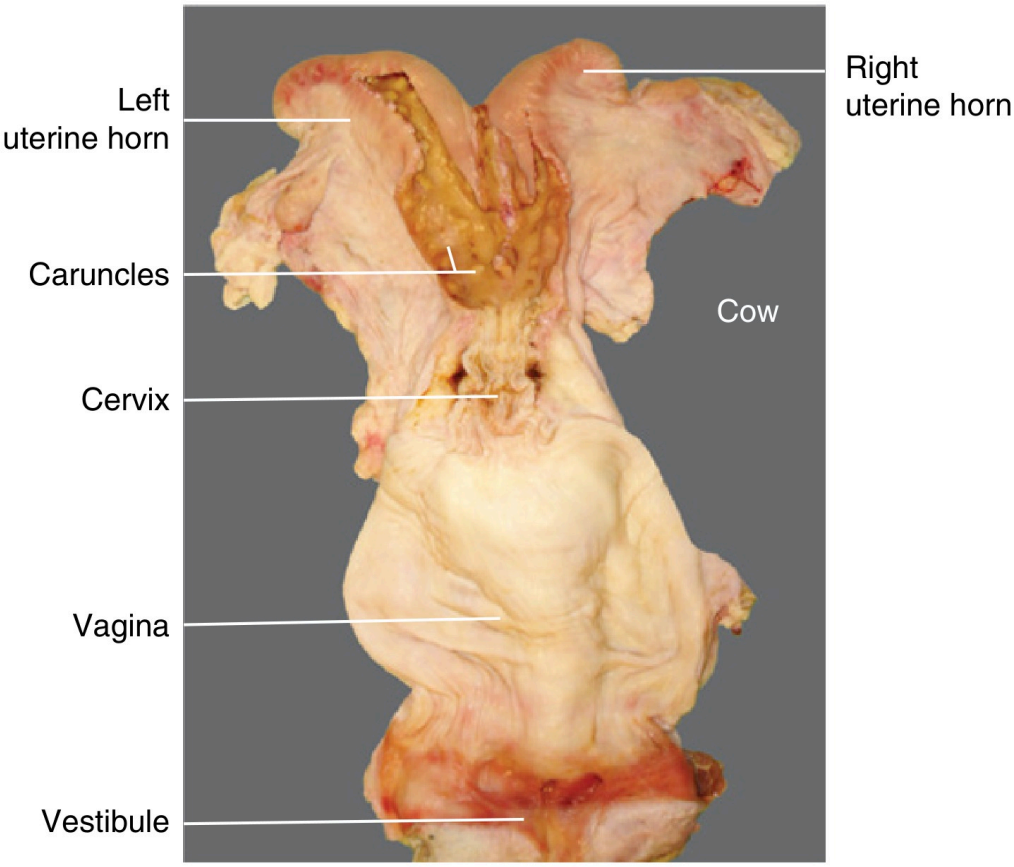

Fig 6 — About forty raised buttons, in rows, and nothing between them The tract has been laid open along its back so that the whole inner surface faces you, and the striking thing is how little of the lining is involved. The **caruncles** are discrete, raised, roughly circular buttons arranged in rows — four rows in the wider part of each horn, thinning to a double line toward the tip — and the endometrium between them is smooth and takes no part in attachment. Follow the specimen caudally and the sequence of the next three sections is written along it: **cervix**, then **vagina**, then **vestibule**.

Image — Mansour M, Wilhite R, Rowe J, Hafiz S. Guide to Ruminant Anatomy, Dissection and Clinical Aspects, 2nd ed. Wiley Blackwell — Fig. 4.18, the bovine reproductive tract with the uterus opened dorsally. Reproduced for educational reference.

The count, and where they are

About 40 caruncles are arranged in **four more or less regular rows** in the wider parts of each horn, **reducing to a double line toward the tip**. The endometrium between them is smooth and plays no part in attachment.

Two cautions about that number. It is approximate — caruncles are not counted out like teeth — and because the arrangement thins toward the tip of the horn, a count made in one region does not scale to the whole uterus.

Caruncle, cotyledon, placentome

Three words are used for what is nearly the same region, and mixing them up is the commonest error in this part of the subject. They are not synonyms. Each names a different tissue:

TERM	WHOSE TISSUE	WHAT IT IS
Caruncle	Maternal	A discrete raised area of endometrium, present in the non-pregnant uterus. About 40 of them, in four rows in the wider part of each horn
Cotyledon	Fetal	The corresponding tufted area of the chorion, which interdigitates with a caruncle in pregnancy
Placentome	Both	The functional unit formed by one caruncle locked together with one cotyledon. A ruminant placenta is classified as *cotyledonary* for this reason
Shape in the **cow**	—	Raised and mushroom-shaped, on a stalk in late pregnancy

TERM	WHOSE TISSUE	WHAT IT IS
Shape in the **ewe and doe**	—	Dish-shaped — the free surface is concave, most obviously in the ewe

Said in one sentence: **the caruncle is the mother's, the cotyledon is the fetus's, and the placentome is the two of them locked together**. Because attachment happens only at those discrete sites and not over the whole surface, the ruminant placenta is classified as **cotyledonary**.

What a caruncle looks like, and how the species differ

In the non-pregnant cow, a caruncle is a low, smooth-surfaced, rounded elevation — the button you can see in Figure 6, and the ones visible at the cranial end of Figure 7. In the **cow**, the caruncle is described as **raised and mushroom-shaped**. In the **ewe and the doe**, it is **dish-shaped**: the free surface is concave, and that concavity is most obvious in the ewe.

Both descriptions come from the two principal sources used for this page and they agree in substance — the small ruminant's caruncle is cupped, and the cow's stands proud. If you have handled both, the ewe's are unmistakable.

What happens to these structures in pregnancy — the growth from low bumps to large pedunculated swellings pitted for the chorionic villi — is section 12, where it belongs with the rest of the structural change. The development of the fetal membranes themselves is embryology, and this page does not cover it.

07 The cervix

If you learn one structure on this page properly, learn this one. The bovine cervix is the hardest thing in the pelvis, the landmark the whole examination is built on, and the single greatest obstacle to getting anything into the uterus.

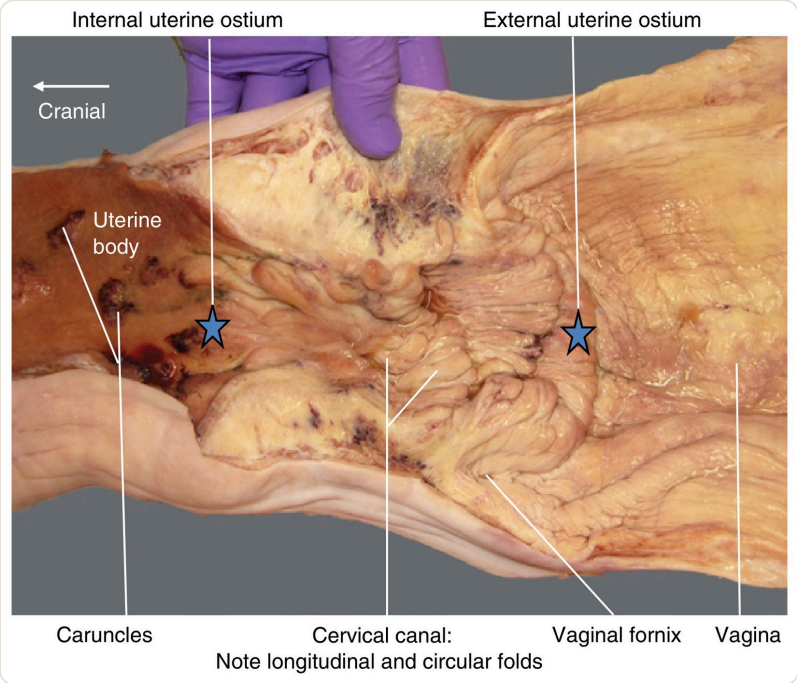

Fig 7 — Why the cervix is a barrier and not a tube This is the single most useful picture on the page. The canal has been cut open from above, so you are looking down into a passage that is normally shut. It runs from the **internal uterine ostium** at the left, where the uterine body ends, to the **external uterine ostium** at the right, where the cervix projects into the vagina. Between those two stars lie 8 to 10 centimetres of interlocking tissue: **circular folds** that dovetail into one another across the lumen, and **longitudinal folds** running the length of it. Nothing here is a smooth-walled tube, and the surrounding recess beyond the last fold is the **vaginal fornix**. Look at the gloved fingertip for scale, then look at the caruncles at the far left: that is the distance a catheter has to negotiate blind.

Image — Mansour M, Wilhite R, Rowe J, Hafiz S. Guide to Ruminant Anatomy, Dissection and Clinical Aspects, 2nd ed. Wiley Blackwell — Fig. 4.19, the bovine cervix opened dorsally. Reproduced for educational reference.

The dimensions

The cervix is **8 to 10 cm long** in the mature cow and thick-walled throughout. It begins at a constriction, the **internal uterine ostium**, and ends by projecting into the vagina as the **vaginal part of the cervix**, where the opening is the **external uterine ostium**. Both are labelled in Figure 7.

Set that length against the 3 cm uterine body from section 5 and the proportions of the tract become clear: **the cervix is about three times as long as the body it guards**. In a sense the cervix is the dominant structure of the bovine tract, not a valve at the end of one.

Why it is a barrier and not a tube

The lumen is not simply narrow. It is **occluded by the interlocking of projections from the walls**, and there are two separate systems of folds doing it:

- **Circular folds. Three or four** annular folds in an animal that has not calved, becoming broken and irregular in one that has. They project into the lumen and fit closely together, interlocking across it.
- **Longitudinal folds.** Running along the mucosa, and on reaching the external ostium they **radiate in a fashion recalling the segments of an orange**. Carry that image: it is exactly what the opening looks like, and it is why the external ostium is recognisable.

Beyond the last fold, the projecting cervix is surrounded by an **annular fornix**, and the last fold itself is sunken into a recess of the vaginal wall. So the entrance is at the bottom of a ring-shaped blind alley that runs all the way round it.

FEATURE	WHAT IS THERE	WHAT IT MEANS FOR A CATHETER
Internal uterine ostium	A constriction where the uterine body ends and the cervix begins	The far end of the journey, and the thing you are trying to reach
Circular folds	Three or four annular folds in a heifer that has not calved; broken and irregular in a cow that has	They interlock across the lumen, so the passage is occluded rather than merely narrow
Longitudinal folds	Running the length of the mucosa, and radiating at the external ostium like the segments of an orange	They create blind runs a catheter tip can enter and stop in
External uterine ostium	The opening into the vagina, on the projecting *vaginal part of the cervix*	The entrance, found by feel through the vaginal wall rather than by sight
Vaginal fornix	The annular recess surrounding the projecting cervix, with the last fold sunken into a recess of the vaginal wall	A ring-shaped dead end all the way round the entrance — the commonest place for a tip to lodge
Overall	8 to 10 cm of thick, firm, folded tissue	Taken together these features make catheterisation of the uterus very difficult, and at many times impossible — which is the source's own assessment, not an exaggeration

> **Why the bovine cervix is so hard to pass**
>
> Four features combine, and no one of them is the whole answer. **Length:** 8 to 10 cm of thick-walled tissue. **Circular folds:** three or four annular folds whose projections interlock across the lumen, so the canal is occluded rather than merely narrow. **Longitudinal folds:** running the length of the mucosa and radiating at the external ostium like the segments of an orange, creating blind runs. **The fornix:** an annular recess surrounding the projecting cervix, with the last fold sunk into a recess of the vaginal wall — a ring-shaped dead end all the way round the entrance. Together these make catheterisation of the uterus very difficult and at many times impossible, which is the source's own assessment. The anatomy is the reason; the techniques used to get round it are not covered on this page.

What the cervix feels like

Through the rectal wall, the cervix is **firm, smooth, cylindrical and distinctly harder than anything around it**. Nothing else in the pelvis of a non-pregnant cow feels like it. It lies **close to the midline of the pelvic floor**, inside the pelvis — in a heifer, whose whole tract is within the pelvis, about half way between the caudal border of the pubis and the pelvic brim; in an older cow it may lie just behind the brim, on it, or over it.

And it **moves**. It can be shifted laterally to a limited extent, which is part of how you confirm you have the right structure. In a pregnant animal that lateral movement becomes very limited, because the weight of the gravid uterus pulls the cervix tightly forwards — and in advanced pregnancy it is carried forward over the brim and down into the abdomen, which section 12 returns to.

Its **size depends on the animal**, and this is where a single figure misleads. Dyce gives 8 to 10 cm for the mature cow, and that is the number to carry. But Jackson and Cockcroft measure a **heifer's** cervix at about **2 cm wide and 4 cm long**, and an older multiparous cow's at **4 to 5 cm**

wide and 8 cm long. A heifer's cervix is roughly half the length of a cow's, so a first-time examiner measuring a heifer against "8 to 10 cm" will think they have hold of something else. Just before and after calving it feels softer and may be 10 cm or more in width.

This is why the cervix is step 1 of section 11's sequence. You are not looking for the uterus first, or the ovaries first. You are looking for the one hard structure, and once you have it between your fingers you have an origin from which every other landmark can be found by direction.

Cervical mucus and the plug

The cervix is normally **closed by a mucous plug**, and it opens only at oestrus and at calving. During pregnancy the plug develops from about the first month and later projects through the external ostium. The activity of the cervical mucosa varies through the cycle, and so does the appearance of the vaginal part — but the reasons for that variation are cycle physiology, and this page deliberately does not cover them. What belongs here is the structural statement: **a cervix you meet is almost always a closed one**.

08 The vagina, the vestibule and the vulva

The remaining part of the tract is divided between the **vagina** and the **vestibule**, in a ratio of approximately **3 : 1**. The boundary between them is a few centimetres in front of the ischial arch, and it is marked by the **external urethral orifice** and the remains of the hymen — not, as people often assume, by anything visible from outside.

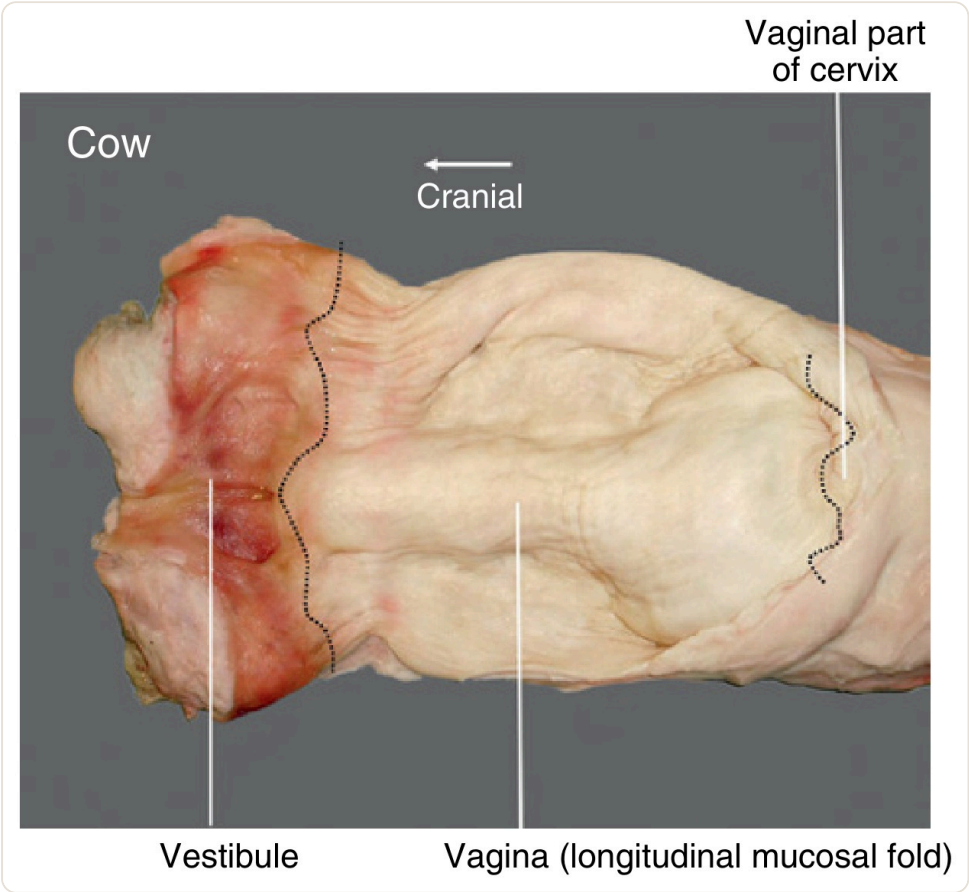

Fig 8 — The roof of the vagina, and the cervix hanging into it The specimen has been cut open along its floor and turned so that you look up at the roof, which is why the arrow points *cranial* to the left. Two things are worth carrying away. The **vaginal part of the cervix** hangs down into the cranial end of the vagina like a stopper in a bottle neck, with the annular fornix around it. And the roof carries a long **dorsal longitudinal fold** running most of the length of the vagina — the lining here is thrown into low folds, both circular and longitudinal, which is what allows a vagina of modest resting size to become a birth canal.

Image — Mansour M, Wilhite R, Rowe J, Hafiz S. Guide to Ruminant Anatomy, Dissection and Clinical Aspects, 2nd ed. Wiley Blackwell — Fig. 4.21, the bovine vagina and vestibule opened. Reproduced for educational reference.

The vagina

Because the vagina is **capable of great expansion**, in length and in diameter, its resting dimensions are of limited significance: this is a structure that has to admit a calf. The lining shows **low folds, both circular and longitudinal**, and Figure 8 shows the large dorsal longitudinal

fold running along the roof. At rest, the lumen is closed by the roof and floor falling together. It is usual to find the caudal part narrowed ventrally, especially in young animals, because of the **urethralis** muscle.

Its peritoneal relations are uneven, and the unevenness has consequences:

- The **cranial two-thirds of the dorsal wall** faces into the **rectogenital pouch**. Caudal to that, the vagina and the rectum are joined by a wedge of tissue.
- The **ventral surface** has a less complete peritoneal covering and is related to the bladder, the urethra and the packing tissue around it.
- The **lateral walls** are largely without peritoneum — included cranially in the broad ligament, and further back sharing in the general retroperitoneal arrangement.

Two things follow. A wound of the vaginal wall does not carry the same implications everywhere, because only part of that wall faces the peritoneal cavity at all. And the peritoneal covering of the **dorsal fornix region** provides a route through which the abdominal cavity can be reached — a route with the advantage of avoiding the large vessels that pass below and to the sides of the vagina.

The vestibule

The vestibule slopes **ventrally** to open between the labia. Register that change of direction: the tract does not run straight out. It is **less distensible than the vagina**, and its side walls are normally in contact.

Draw those walls apart and there are four things to find, from front to back:

1. The **external urethral orifice**, at the cranial end of the vestibule floor.
2. The **suburethral diverticulum**, immediately below and behind it — a blind pouch in the floor, which has a subsection of its own below.
3. The **major vestibular gland**, about **3 cm** long, marked by a large depression caudolateral to the urethral opening and enclosed within the urogenital diaphragm. The mucosa over the gland is generally darker than the mucosa around it.
4. The **clitoral fossa**, at the caudal end, containing the glans of the clitoris.

> **The suburethral diverticulum, and why it catches people out**
>
> The **suburethral diverticulum** is a blind pouch in the floor of the vestibule, immediately below the external urethral orifice and near the cranial-most extent of that floor. It is a normal structure and it is present in every cow. Its practical importance is that a catheter advanced along the floor of the vestibule enters the **pouch** rather than the **urethra**, because the pouch lies directly in the path. One described way to deal with that is to enter the diverticulum deliberately, rotate the catheter through 180° and draw it back very slowly, at which point the tip can be felt entering the urethra. Identify the two openings with a probe on an isolated tract before you ever need to find them in a live animal — and note that the mare has no such pouch, which is why catheterising a cow is not the procedure catheterising a mare is.

The vulva

The **vulva** is the only visible part of the female pudendum, which comprises the vulva, the vestibule and the clitoris. It is made of the left and right **labia**, meeting above at the **dorsal commissure** and below at the **ventral commissure**.

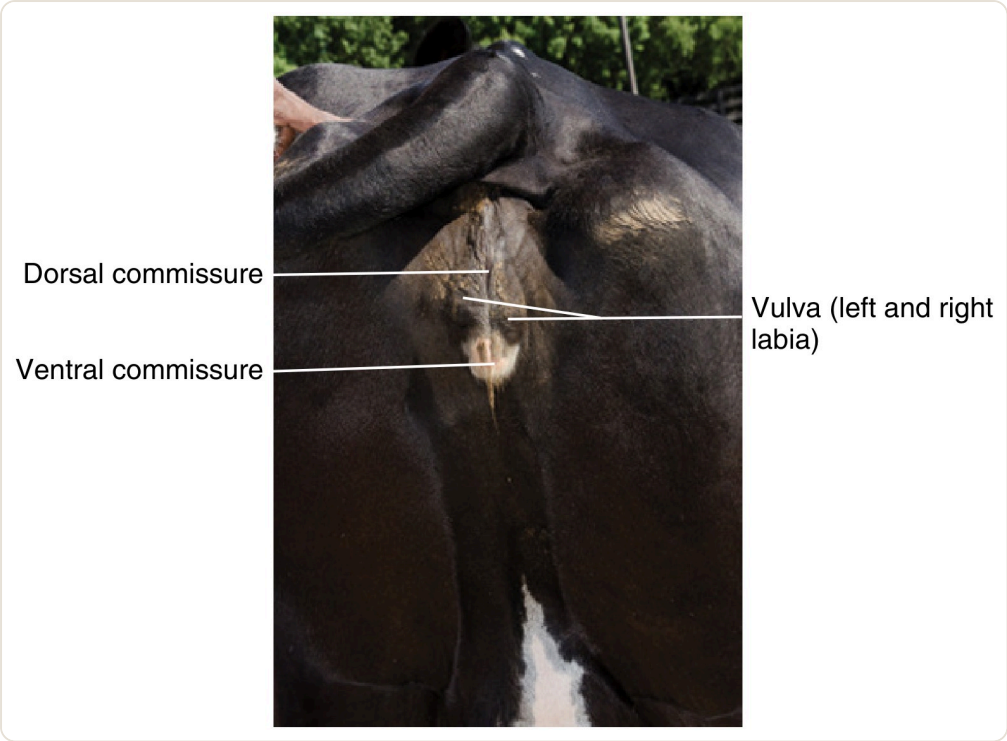

Fig 9 — The only part of the tract you can see from outside Everything else on this page needs a hand, a probe or a scalpel; this is the part you can stand behind and look at. The two **labia** meet above at the **dorsal commissure** and below at the **ventral commissure**, and the fissure between them is the only visible part of the female pudendum. Fix the ventral commissure in particular: the clitoral fossa sits just inside it, and it is the landmark you work from when you go on to find the structures in the floor of the vestibule.

Image — Mansour M, Wilhite R, Rowe J, Hafiz S. Guide to Ruminant Anatomy, Dissection and Clinical Aspects, 2nd ed. Wiley Blackwell — Fig. 4.22, the external genitalia of the cow. Reproduced for educational reference.

The labia are **rounded and rather low**, and in a cow that has calved they are often marked by trauma from previous calvings. Simple inspection exposes relatively little of the **clitoris**, which is slender and whose glans is fused with the prepuce — so the clitoris of a cow is mostly a structure you know is there rather than one you see.

The urogenital diaphragm and the muscles

The vestibule penetrates the **urogenital diaphragm**, also called the perineal membrane, which fills the gap between the rectovaginal septum and the pelvic floor. Its fascia arises from the pelvic floor, bends round and attaches to the wall of the vestibule, and merges with the rectovaginal septum, the lower edge of the pelvic diaphragm and the parietal pelvic fascia.

The importance of that arrangement is **anchorage**. The diaphragm holds the genital tract against two enormous pulls: the drag of the gravid uterus as it sinks into the abdomen, and the backward drag during calving.

Two named muscles are associated with this region and both appear on a dissection of the perineum. The **constrictor vestibuli** is the more important of the two. It incorporates fascicles continuing from the levator ani which form the perineal body; it runs over the wall of the vestibule caudal to the diaphragm and passes below it to join its fellow, and on contraction it narrows the genital passage and raises a ridge in its floor. The **constrictor vulvae**, through its insertion into the vulva and the adjacent skin, may cause the opening to gape. Around them lie the rest of the perineal muscles — the coccygeus, the levator ani, the external anal sphincter and the retractor clitoridis — with the ischiorectal fossa filled with fat lateral to the whole group.

09 What holds it up: the broad ligament and the pouches

Everything described so far is suspended from the roof of the abdomen and the walls of the pelvis by one structure: the **broad ligament**, a paired double fold of peritoneum. It is the reason the tract stays where it is, and it is the route by which every vessel and nerve reaches it.

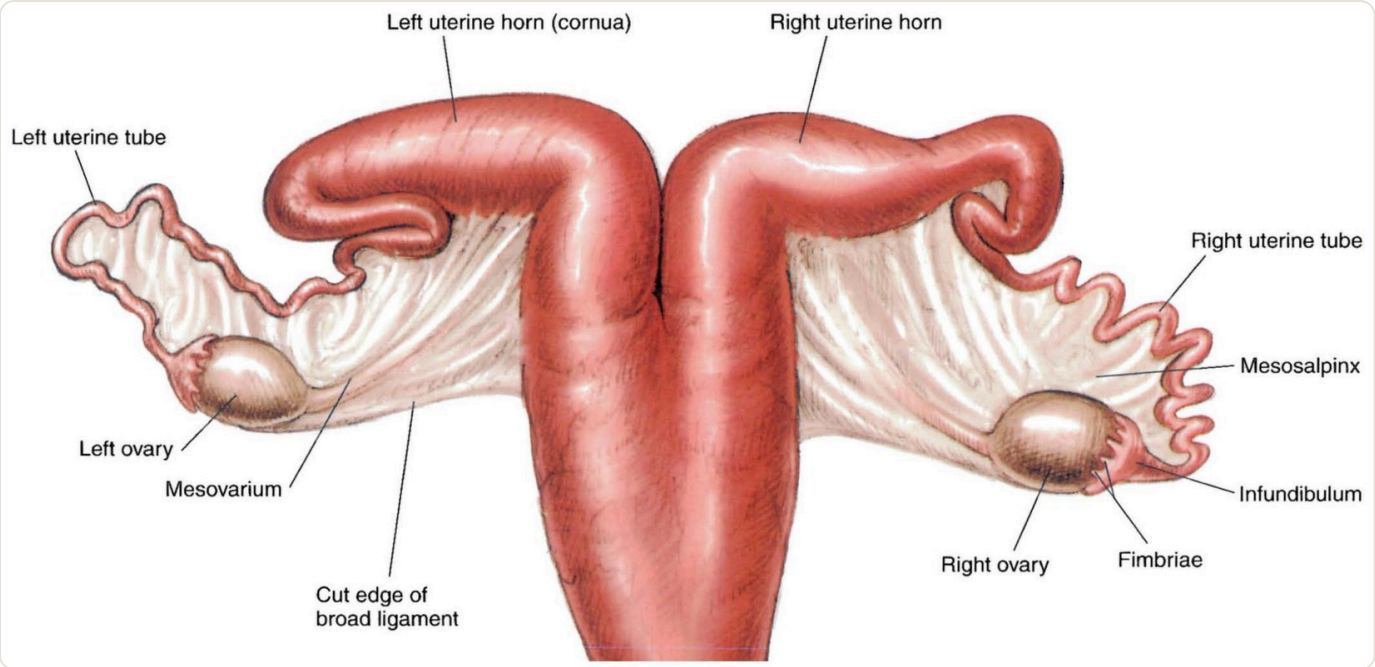

Fig 10 — The broad ligament, named part by part — in the ewe ⚠️ This specimen is a **ewe**, not a cow, and it is used here for one reason: it is the clearest picture available of the three named parts of the broad ligament in one frame. The **mesovarium** is the part reaching each ovary. The **mesosalpinx** is the fold carrying each uterine tube, arching out and back to make the wall of the bursa. The **cut edge of the broad ligament** along the bottom is where the sheet was severed from the abdominal roof, and the part attaching the uterus itself — the mesometrium — is everything between that cut edge and the horns. Note the **fimbriae**, the fringed rim of the **infundibulum**. The cow's arrangement is the same; her horns are longer and more tightly curled, and she has two intercornual ligaments where the ewe has one.

Image — Spurgeon TL, Ghoshal NG, Kitchell RL. Spurgeon's Color Atlas of Large Animal Anatomy: The Essentials. Wiley Blackwell — Plate 3.16 (B), the isolated uterus, uterine tubes and ovaries of the ewe. Reproduced for educational reference.

Three parts, named for what each suspends

The broad ligament is divided into three parts, and the naming is entirely logical: each part is named for the organ it carries.

PART OF THE BROAD LIGAMENT	WHAT IT SUSPENDS	WHAT RUNS IN IT
Mesovarium	The ovary, from the dorsolateral abdominal wall	The ovarian artery and the ovarian vein
Mesosalpinx	The uterine tube. It extends laterally from the mesovarium and divides it into a proximal and a distal part	The uterine tube itself; with the mesovarium it encloses the ovarian bursa
Mesometrium	The uterus and the cranial part of the vagina. The largest of the three parts	The uterine and vaginal arteries, and the large parametrial venous plexus
Also present:	—	—
Suspensory ligament of the ovary	Forms the cranial boundary of the broad ligament, running from the ovary toward the last ribs	—
Proper ligament of the ovary	Ties the ovary to the cranial end of the uterine horn	—
Round ligament of the uterus	A fibromuscular cord running caudally toward the inguinal canal in a fold detached from the lateral aspect of the mesometrium	—
Intercornual ligaments	Bridge the two horns where they diverge. **Two** in the cow, dorsal and ventral; **one** in the ewe and doe	The pocket between the cow's two is what a finger hooks into

The **mesovarium** is the cranial part and attaches the ovary to the dorsolateral abdominal wall; the ovarian artery and vein run in it. The **mesosalpinx** extends laterally from the mesovarium — dividing it into a proximal part, from the body wall to the mesosalpinx, and a distal part,

from the mesosalpinx to the ovary — and carries the uterine tube. Together those two enclose the ovarian bursa of section 4. The **mesometrium** is the largest part, and it attaches the uterus and the cranial part of the vagina.

One detail distinguishes this ligament from most peritoneal folds and it is easy to miss. The two serosal layers of the broad ligament are **separated by a considerable amount of tissue, mainly smooth muscle continuous with the longitudinal layer of the myometrium**. The broad ligament is therefore not a passive membrane. It **plays an active part in supporting the uterus**, which matters most in a large animal — and it explains something noted in section 5, that the tract firms up under the examining hand: the ligament is contracting too.

The other named ligaments

Three more cords are named in this region and they are commonly confused. The **suspensory ligament of the ovary** forms the cranial boundary of the broad ligament and runs from the ovary toward the last ribs. Continuing caudally from the ovary, the **proper ligament of the ovary** attaches it to the cranial end of the uterine horn. That in turn is continuous with the **round ligament of the uterus**, a fibromuscular cord running caudally toward the inguinal canal within the free margin of a fold detached from the lateral aspect of the mesometrium. And bridging the horns where they diverge are the **intercornual ligaments** of section 5.

If these are structures you have met before, it was probably in the bitch, where the same sheet and the same three cords are what a surgeon identifies, clamps and cuts. Make that comparison deliberately: our step-by-step account of the canine spay traces the same anatomy in the species it is most often divided in.

The pelvic pouches

Because the peritoneum drapes over the pelvic organs from above and behind, it is thrown into a series of recesses. Named from behind forwards, they are:

- The **rectogenital pouch**, between the rectum and the genital tract, with a **pararectal fossa** on each side of the rectum.
- The **vesicogenital pouch**, between the genital tract and the bladder.
- The **pubovesical pouch**, between the bladder and the pelvic floor.

The rectogenital pouch is the one to remember, because it is the deepest, it is the one the cranial two-thirds of the vaginal roof faces into, and it is therefore the part of the tract most directly related to the peritoneal cavity. If the idea of a peritoneal pouch or a serous cavity is unfamiliar, our page on body cavities and serous membranes covers it as a subject in its own right, and the dog's abdomen shows the same principles worked through in a much smaller abdomen.

Finally, note where the peritoneum **stops**. It does not follow the tract to the outside. The caudal vagina, the vestibule and everything beyond are retroperitoneal — which is precisely what section 8's distinction between the cranial and caudal parts of the vaginal wall was about.

10 Blood, nerve and lymph

Three arteries supply the female tract, and the arrangement is unusually easy to learn because they arrive in order along its length. One comes from the aorta; two come from the internal iliac.

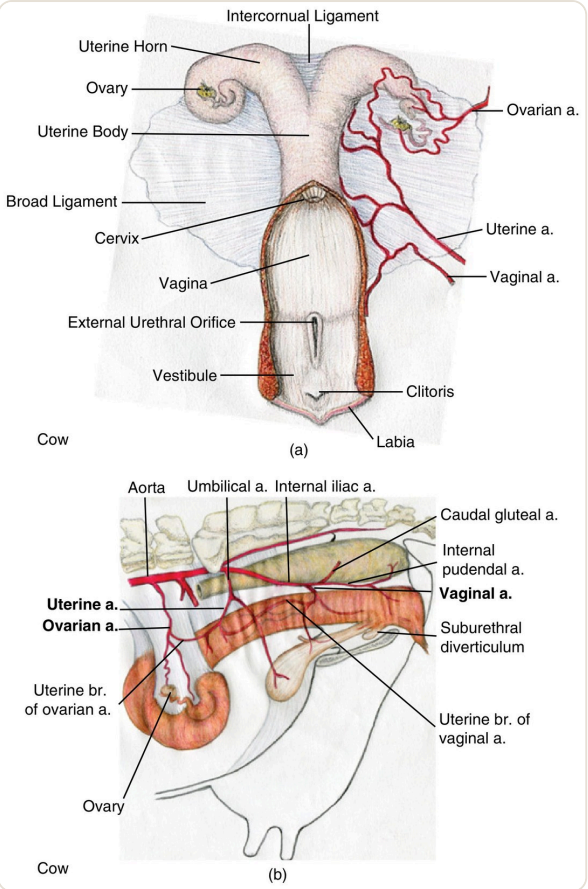

Fig 11 — Three arteries, one from the aorta and two from the internal iliac Panel **(a)** shows where the three arteries end and panel **(b)** shows where they begin, and you need both. The **ovarian artery** leaves the **aorta directly** in cattle, high and far forward, and runs a strikingly coiled course down the front edge of the broad ligament. The **uterine artery** arises much further back, from the internal iliac by way of the umbilical, and is the **largest** of the three. The **vaginal artery** comes off the internal iliac near the ischial spine. The detail that makes them one system rather than three is drawn in panel (b): the ovarian and vaginal arteries each send a **uterine branch** that anastomoses with the uterine artery, so the tract is supplied by a continuous chain running its whole length.

Image — Mansour M, Wilhite R, Rowe J, Hafiz S. Guide to Ruminant Anatomy, Dissection and Clinical Aspects, 2nd ed. Wiley Blackwell — Fig. 4.23 (a, b), the arterial supply of the ruminant reproductive tract. Reproduced for educational reference.

ARTERY	WHERE IT ARISES	WHAT IT SUPPLIES
Ovarian artery	Directly from the **aorta** in cattle	The ovary, the uterine tube and the adjoining part of the uterine horn. It has an extraordinarily convoluted course in the cranial part of the broad ligament and lies in extensive contact with the plexiform ovarian vein
Uterine artery	From the **internal iliac**, entering the pelvis within the broad ligament. It is ostensibly a branch of the umbilical artery, whose flow it very largely appropriates	The uterus. It is the **largest** of the three, dividing into cranial and caudal parts, each giving about half a dozen stem vessels to the mesometrial border
Vaginal artery	From the **internal iliac**, near the ischial spine	The vagina, and by way of branches the caudal tract, the bladder and the urethra. It runs over the dorsolateral surface of the vagina before swinging forward over the lateral wall
Uterine branches	One from the ovarian artery, one from the vaginal artery	Both anastomose with the uterine artery, making the supply a continuous chain rather than three separate territories
Ovarian vein	—	The largest vessel draining the tract, running in the cranial part of the broad ligament. A very large venous plexus lies in the parametrial tissue and over the ventral surface of the uterus and vagina

The ovarian artery

In cattle the **ovarian artery is a direct branch of the aorta**. That is said plainly because it is not the arrangement in every species. It is **relatively small**, and it supplies the ovary, the uterine tube and the adjoining part of the uterine horn.

Its most striking feature is its course: it is **extraordinarily convoluted within the cranial part of the broad ligament**, and it lies in extensive contact with the plexiform ovarian vein wound around it. That contact is not incidental. It is the arrangement that allows substances to pass from the venous blood leaving the uterus into the arterial blood arriving at the ovary — a local exchange that bypasses the general circulation. The consequences of that exchange for the cycle are out of scope here; what belongs here is the structure that makes it possible, and it is unmistakable on a dissection.

The uterine artery

The **uterine artery is the largest of the three** and the one that matters most in practice. It arises from the **internal iliac** and enters the pelvic cavity within the broad ligament; strictly it is a branch of the **umbilical artery**, whose flow it very largely takes over after birth, which is why

some accounts name the umbilical as its parent.

Before reaching the uterus it divides into **cranial and caudal parts**, and each of those gives about half a dozen stem vessels to the **mesometrial border** of the uterus — that is, to the edge where the broad ligament attaches. Branches from these run over the uterine wall on courses that appear to coincide with the positions of the caruncles inside.

That distribution leaves the **antimesometrial border** — the free edge, opposite the attachment — comparatively poorly supplied, and therefore less prone to bleeding if it is incised. It is a good example of an anatomical fact with an immediate practical reading, and the time to have it is before you need it.

The vaginal artery

The **vaginal artery** branches from the internal iliac near the ischial spine, runs over the dorsolateral surface of the vagina, and then swings forward over the lateral wall. Its branches reach the caudal genital tract, the bladder and the urethra. Remember its position on the lateral wall: it puts a substantial artery in the wall of a structure that is stretched severely at calving.

One continuous chain

The three arteries are not three separate territories. The **ovarian artery gives a uterine branch** that anastomoses with the cranial branch of the uterine artery, and the **vaginal artery gives a uterine branch** in the same way at the other end. The result is a continuous arterial chain running the length of the tract, drawn clearly in panel (b) of Figure 11.

Veins, nerves and lymph

The venous drainage is on a scale that surprises people the first time they see it. A **very large and conspicuous venous plexus** lies in the parametrial tissue of the broad ligament and over the ventral surface of the uterus and vagina, partly covered by the outer layers of muscle. It behaves as a blood pool that can drain in several directions. The **ovarian vein** is the largest vessel leaving the tract and runs in the cranial part of the broad ligament; the vaginal veins play a secondary role, and the vein corresponding to the large uterine artery is surprisingly small.

The nerves

The genital tract itself receives both **sympathetic and parasympathetic** supply. But the nerves you will be asked to name are the ones in the pelvis, and they fall into two groups.

The first is the **obturator** and **sciatic** nerves. They are described with the hindlimb rather than here, and they are named at this point for one reason: both are **vulnerable to injury at parturition**.

The second group is **purely sacral** in origin and supplies the pelvic viscera and the perineum: the **pudendal**, the **caudal rectal** and the **pelvic** nerves. The pudendal is the one to know, and it has three significant divisions:

- The **deep perineal branch**, which supplies both visceral and somatic structures of the caudal pelvic region.
- The **distal cutaneous branch**, which supplies the ventral perineum, becomes superficial by emerging from the **ischiorectal fossa**, crosses the **medial process of the ischial tuber**, the pin bone — where it can be palpated — and goes on to the vulva and the perineal skin, with some branches reaching the nearest part of the udder.
- The **continuation of the trunk**, which leaves the pelvis alongside the internal pudendal artery and becomes the **dorsal nerve of the clitoris**.

That palpable crossing on the ischial tuber is the practical point, and it is why the pudendal nerve is the one named in the perineal work a bovine practitioner does. The techniques themselves are not this page's subject; the anatomy that makes them possible is.

Lymph: the lymphatics of the female genital tract drain primarily to the **medial iliac** and **lumbar aortic** lymph nodes, and the organs lying within the pelvic cavity drain to the medial iliac and **sacral** nodes. A lateral iliac node lies near the tract as well.

And the reason all of this is in a clinical section

The uterine artery is not simply plumbing. In advanced pregnancy it enlarges enough to be identified by feel, and that identification is one of the five landmarks of section 11. The sensation has a name — **fremitus** — and the next two sections deal with it.

11 Finding it: the per-rectum landmarks, in order

This is the section the page exists for. Everything above tells you what is there; this tells you what your hand meets, in what order, and what each thing feels like.

The **examination per rectum** — also called **rectal palpation**, and meaning exactly what it says: through the wall of the rectum, with the arm introduced through the anus — is possible in the cow for the reason set out in section 2: the descent of the fetal ovary drew the whole tract back to the pelvic inlet, and the rectum lies directly above it. The rectal wall is thin, and the structures below it can be handled through it.

A HAND IN THE RECTUM

What you meet, in order

1 Cervix firm, on the pelvic floor

2 Bifurcation the groove between the horns

3 Horns curled forward, retract them back

4 Ovaries beside each horn, at the ilium

5 Uterine artery for fremitus, if in calf

The cervix is the handle

It is the only firm thing in there.

Fig 12 — What your hand meets, in the order it meets it A photograph cannot teach this, because a photograph has no order and the whole difficulty of a first examination is knowing what to look for *first*. Work down the five rows. Everything after row 1 depends on row 1: you find the **cervix** because it is the only firm thing in the pelvis, and every other structure is then found by its position relative to it. Section 11 walks through the same five landmarks in prose, with what each one feels like.

Diagram — Vet-eBooks.com, drawn for this guide. Data from Mansour M, Wilhite R, Rowe J, Hafiz S. Guide to Ruminant Anatomy, Dissection and Clinical Aspects, 2nd ed. Wiley Blackwell, ch. 4 boxes 4.12 and 4.16, and Dyce 5e ch. 29.

ORDER	WHAT YOU ARE REACHING FOR	WHAT IT FEELS LIKE
1	The **cervix**	Firm, smooth, cylindrical, distinctly harder than anything around it, close to the midline of the **pelvic floor**. Press down on the floor, rest your fingers on the pubic bones and sweep side to side. It shifts a little when pushed laterally; nothing else there does
2	The **bifurcation** and the intercornual ligaments	Run forward from the cervix along the top of the tract until the single mass divides. The groove between the two horns takes a fingertip, and the pocket between the dorsal and ventral intercornual ligaments takes an index finger
3	The **horns**	Two smooth curved tubes running forward and curling ventrally. Hooking a finger into the intercornual pocket lets you draw the whole tract back toward the pelvis so that the parts beyond your reach come to you
4	The **ovaries**	Small firm ovoids, roughly the size of the top joint of a thumb, one beside the end of each horn near the ventral part of the shaft of the ilium. The surface may be smooth, or may carry a projecting follicle or corpus luteum
5	The **uterine artery**, if the cow is in calf	In advanced pregnancy the enlarged artery carries a characteristic buzzing vibration — **fremitus** — felt against the shaft of the ilium; first on the side of the pregnant horn, and about a month later on both sides

1 · The cervix, because it is the only hard thing there

Do not begin by looking for the uterus. Begin by looking for something **firm**. In a non-pregnant cow, the cervix is the hardest structure in the pelvis by a wide margin: a firm, smooth cylinder lying close to the midline of the **pelvic floor**, quite unlike the soft, mobile, slippery structures around it.

There is a described way to find it, and it is worth following exactly the first few times. **Press gently down on the pelvic floor and rest your fingers on the pubic bones. Then sweep them from one side to the other, keeping that downward pressure, until you meet the cervix.**

You are not searching a volume; you are searching a floor, in one plane, from side to side. Confirm it by **moving it laterally** — it shifts a little, and nothing else there does.

Once you have it, you have an origin. Every other landmark on this list is found by moving in a known direction from the cervix, and a beginner who cannot find the cervix cannot find anything else. If what you have hold of is soft and fluctuant, it is the bladder; if it is doughy and full of material, it is the rectum ahead of your hand.

2 · Forward to the bifurcation

From the cervix, run forward along the top of the tract. The single mass continues for a short distance — that is the pseudobody of section 5 — and then divides. The **dorsal groove** along the top marks the seam while the horns are still bound together, and where they separate you reach the **bifurcation**. The divergence itself is marked dorsally by the **intercornual groove**, which **deepens as it runs forward** — so it is a groove you can follow rather than a single point you have to find.

Here is the manoeuvre that makes the examination work. Slip an **index finger into the pocket between the dorsal and ventral intercornual ligaments** and **draw the tract caudally** toward the pelvis. Practise it deliberately: it converts an examination in which everything is at the limit of reach into one in which the structures are brought to your hand. The ewe and the doe have a single intercornual ligament and no pocket, so this is a bovine technique.

3 · The horns

With the tract retracted, follow each horn forward. They are smooth, curved and tubular, curling ventrally on themselves, and in a non-pregnant cow the two are approximately symmetrical. **Asymmetry is the finding to look for** — section 12 explains why.

Expect the tract to become **more definite while you work with it**. The muscle of the uterus and of the broad ligament responds to handling, so a tract that felt vague at first becomes firmer and easier to define. Give it time rather than pressing harder.

4 · The ovaries

Each ovary lies **beside the end of its own horn**, near the ventral part of the shaft of the ilium and level with the bifurcation. Having followed a horn, you are already next to one; the proper ligament of the ovary ties the two together, which is why finding the horn tip is the reliable way to find the ovary.

An ovary is a small firm ovoid, roughly 4 cm at its longest and about the size of the top joint of a thumb. Run it between fingers and thumb and feel the whole surface, because a follicle or a corpus luteum may project from **any part** of it. A large follicle is a smooth bulge with some give; a corpus luteum is firmer, and only its tip stands above the surface. Small structures — down to about 5 mm — may be detectable, but that is the limit of the technique rather than a promise.

5 · The uterine artery, if she is in calf

The fifth landmark applies only to a pregnant animal. As pregnancy advances, the uterine artery enlarges **from a few millimetres to a centimetre or more**, loses its flexuous character and passes forward into the abdomen, where it can be identified by the characteristic vibration it carries when palpated against the ilium. That vibration is **fremitus**, also called a thrill or a whirl.

> **Fremitus, precisely**
>
> **What it is:** a characteristic buzzing vibration in the greatly enlarged uterine artery of a pregnant cow, also called a thrill or a whirl. **Where:** felt on palpation against the shaft of the ilium, and later at about the middle of the broad ligament. **When:** from around four to five months, first on the **same side as the pregnant horn**, and about a month later on **both** sides. **Why it happens:** the artery expands from a few millimetres to a centimetre or more and loses its flexuous course, so a large volume of blood moves through a relatively straight vessel that lies against bone. It is described here as a structural change, which is what it is; using it as a diagnostic test is a procedure and belongs elsewhere.

What to expect the first time

Three honest observations. The first is that **almost everyone finds the bladder before they find the cervix**, and mistakes it for something else; knowing that in advance saves several minutes. The second is that the tract is **further forward and further down** than a diagram suggests, and the intercornual retraction in step 2 is what solves that. The third is that this is a skill of the fingertips, not of strength, and the structures firm up under gentle, patient handling and disappear under a firm grip.

For the parts of the examination that use a probe rather than a hand, and for what these same structures look like on a screen, our introduction to veterinary abdominal ultrasound covers the principles of abdominal ultrasound in general terms.

12 What pregnancy does to the structures

Pregnancy in the cow is, from an anatomical point of view, a story about **one horn getting much bigger and the whole tract sinking**. Gestation lasts about **280 days** in cattle, 147 in sheep and 154 in goats, and over that period the uterus increases its weight **fifteenfold** — a hundredfold if its contents are counted.

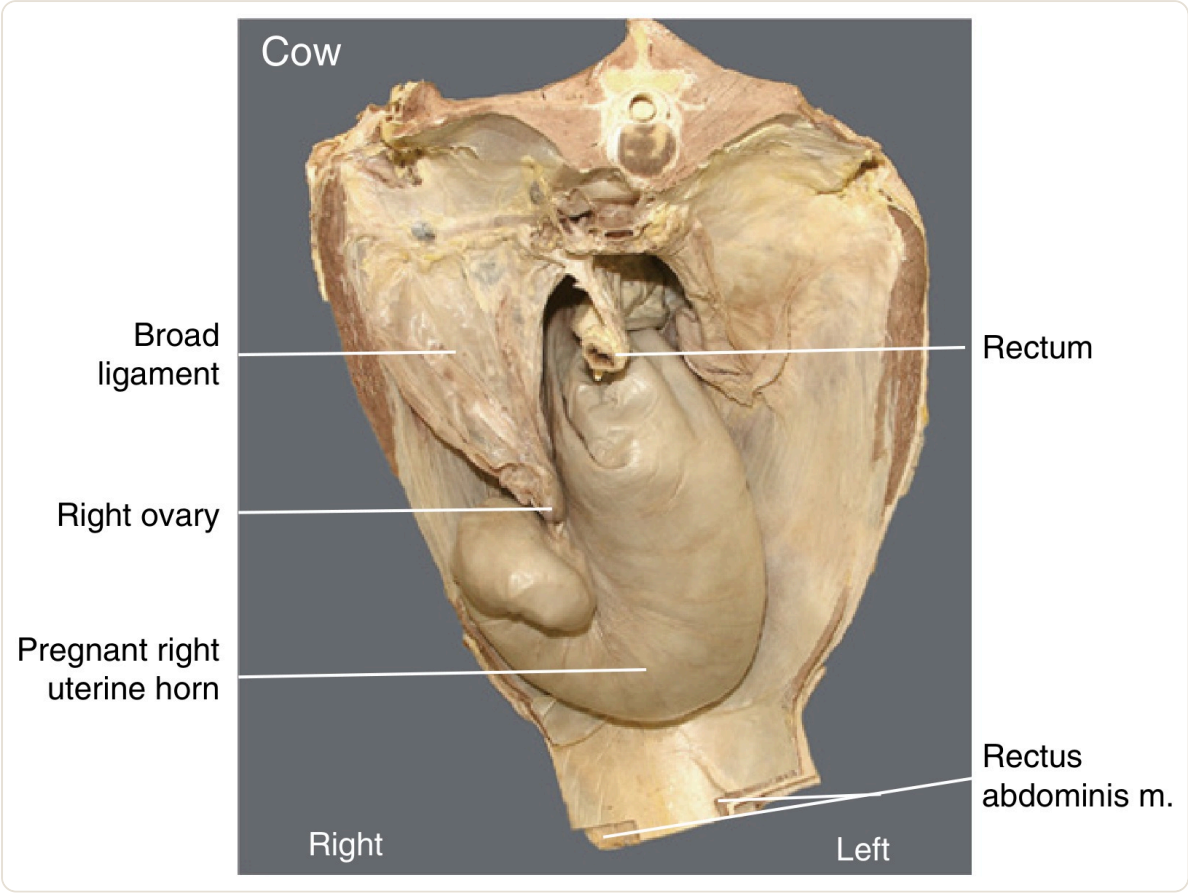

Fig 13 — Pregnancy is a structural change before it is anything else This is what the asymmetry of section 12 actually looks like. The conceptus is essentially always confined to **one horn**, so that horn enlarges while its neighbour does not, and the difference between the two sides is one of the earliest things a hand can detect. Note where the enlargement pushes: forwards and downwards, away from the **mesometrial** border, because the **broad ligament** tethers the lesser curvature and the rest of the horn grows away from it. Note also the **rectum** lying immediately above the whole arrangement.

Image — Mansour M, Wilhite R, Rowe J, Hafiz S. Guide to Ruminant Anatomy, Dissection and Clinical Aspects, 2nd ed. Wiley Blackwell — Fig. 4.20, the bovine pelvic cavity with a pregnancy in the right uterine horn. Reproduced for educational reference.

The section runs in the order the changes happen, and the table collects them:

WHEN	WHAT HAS CHANGED IN THE STRUCTURES
From the start	The conceptus is confined to **one horn**, so the two sides stop matching. The membranes spread into both horns, but the fetus does not
From the 1st month	A **mucous plug** develops in the cervical canal, later projecting through the external ostium
~30 days	The **amniotic sac** becomes palpable
~70 days	The **fetus itself** becomes palpable
By the 3rd month	The broad ligament's resistance is overcome and the uterus begins to **slip forward** over the abdominal floor
End of the 1st trimester	The **vulva** enlarges — in an animal carrying her first calf. In one that has calved several times it is already enlarged

WHEN	WHAT HAS CHANGED IN THE STRUCTURES
4 to 5 months	The uterine artery has enlarged enough to carry **fremitus**, on the **same side** as the pregnant horn
~5 months	The uterus has sunk **out of reach** of the examining hand
~6 months	Fremitus on **both** sides, at about the middle of the broad ligaments
Toward term	Caruncles up to the size of a **clenched fist**; the uterus fills the ventral and usually the right abdomen, raising the rumen and reaching the liver and diaphragm; the cervix is carried forward over the pelvic brim
The last weeks and days	The **sacrosciatic ligament** softens, with insinking beside the tail head; other pelvic ligaments loosen; oedema may make the vulva gape
~280 days	Term. 147 days in sheep, 154 in goats

Asymmetry comes first

Although the membranes soon spread into both horns, the **conceptus itself is almost invariably restricted to one horn**. The developing asymmetry between the two sides is therefore one of the first structural changes there is to find. The amniotic sac becomes palpable at around **30 days** and the fetus itself at around **70**.

The horn changes shape, not just size

The enlargement does not affect all parts of the horn equally, and the reason is mechanical. The **lesser curvature is tethered by the broad ligament** and resists expansion most, so the **greater curvature and the parts next to it grow away from the attachment**. The horn does not simply inflate; it changes shape, bulging away from its mesometrial border.

The caruncles become placentomes

The caruncles of section 6 undergo the most dramatic change of any structure here. In the gravid horn they grow from **low, smooth-surfaced bumps** into **large, pedunculated swellings** whose surfaces are pitted to receive the chorionic villi. **By term the largest may reach the size of a clenched fist.** Those in the non-gravid horn also enlarge later, but to a much smaller degree.

The tract sinks — and then goes out of reach

Early on, hypertrophy of the tissues of the broad ligament restrains the uterus from sinking. That resistance is overcome by about the **third month**, after which the uterus begins to slip forward over the abdominal floor. It usually enters the supraomental recess, though it may slip forward against either flank instead.

This produces one of the most useful facts in the whole subject, and it is a fact about reach rather than about size. As the uterus sinks it **passes out of reach of the examining hand for a time, at about the fifth month**. That inability to reach the uterus is as informative as its palpable enlargement at earlier and later stages. A hand that finds nothing at five months has not necessarily failed.

The descent has two further consequences to carry. It **stretches the vagina**, and it **carries the cervix forward over the pelvic brim** — so the landmark of section 11 moves, and in advanced pregnancy is no longer where you left it. Toward term the uterus occupies most of the ventral and, in the usual arrangement, the right part of the abdomen; it raises the rumen dorsally, crushes the intestines upward, and comes into contact with the liver and the diaphragm.

Fremitus, and the artery that produces it

The blood supply to the gravid uterus increases enormously, and the uterine artery above all: it **expands from a few millimetres to a centimetre or more**. It loses its flexuous character and runs forward into the abdomen, where it is easily identified by the characteristic vibrations — **fremitus** — felt on palpation against the ilium. It is detected first on the **same side as the pregnant horn**, at around four to five months, and about a month later on **both sides**, at roughly the middle of the broad ligaments.

The cervix, the vagina and the vulva

The **cervical canal is closed by a mucous plug** which develops from about the first month and later projects through the external ostium. In the **vagina**, the first changes are simply the result of traction as the uterus descends; later the wall becomes more elastic and the lumen potentially roomier. Enlargement of the **vulva** is evident by the end of the first trimester in an animal carrying her first calf, but in one that has calved several times the vulva tends to be permanently enlarged, so there may be no obvious change until shortly before birth.

As calving approaches, and afterwards

The structural signs that parturition is near are mostly about **connective tissue softening**. The sacrosciatic ligament softens, with a visible insinking beside the tail head; other pelvic ligaments loosen enough to allow some relaxation of the sacroiliac joints; the connective tissues

of the cervix, the caudal tract, and the vulvar and perineal skin share in the change. Spread over several weeks, these changes intensify markedly in the last few days, and oedema of the soft parts may cause the vulva to gape.

Afterwards, the uterus returns toward its former state — but **some asymmetry usually remains**. A tract that has carried a calf does not become indistinguishable from one that has not, which is a useful thing to know when you are trying to work out what you are holding.

13 Heifer, cow, ewe and doe

Two kinds of difference matter here: how the tract changes with the age of one animal, and how it differs between the ruminant species you will meet.

Heifer to cow

In the very young animal, the reproductive organs grow **isometrically** — in step with the rest of the body and no faster. That changes when the tract begins to respond to ovarian hormones, generally at about **8 to 10 months** of age, and the cumulative effect of the first few cycles is a **striking increase in the dimensions of the tract and a much clearer differentiation of its tissues**. What drives that hormonally is out of scope here; what matters here is that the structures become larger and more distinct.

Calving leaves permanent marks, and three of them are what tell you, on palpation or inspection, which kind of animal you are dealing with:

- The **cervical folds** are three or four regular circular folds in an animal that has not calved, and become **broken and irregular** in one that has.
- The **uterus retains some asymmetry** after a pregnancy, as section 12 describes.
- The **vulva** tends to be permanently enlarged in a cow that has calved several times, and the labia are often marked by trauma from previous calvings.

Cow, ewe and doe

The plan is the same in all three, and most of the differences between them are of little practical importance. Four are not.

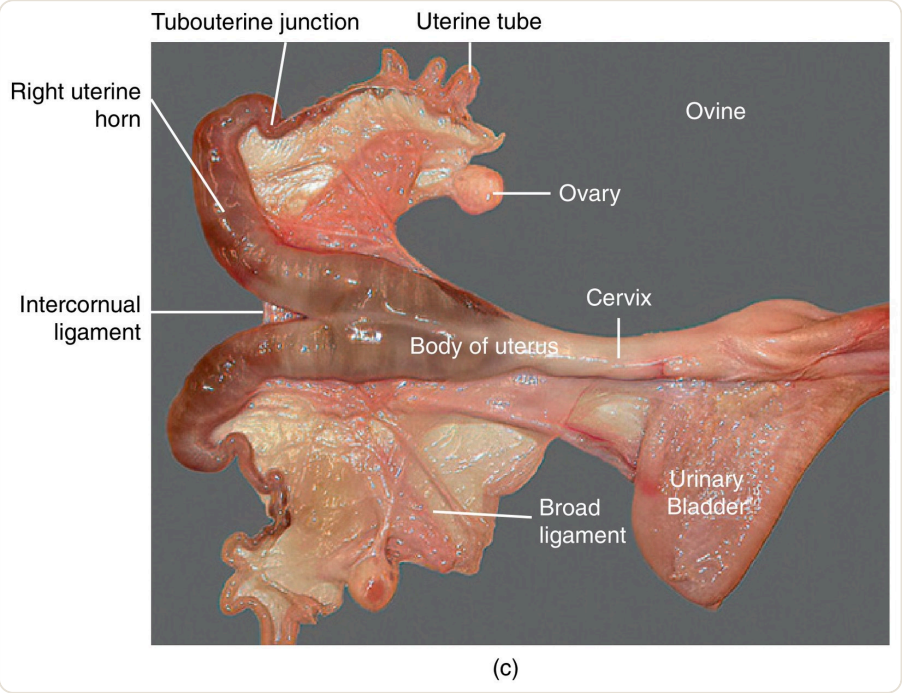

Fig 14 — The same plan, at a smaller scale, with one ligament instead of two Put this beside Figure 5 and the differences are quickly stated. The ewe has a **single intercornual ligament** where the cow has a dorsal and a ventral one, which removes the pocket a finger uses in the cow. Everything else is recognisably the same animal's plan at a smaller scale: two horns, a short body, a firm cervix, the same broad ligament, and the **tubouterine junction** labelled where the uterine tube meets the tip of the horn.

Image — Mansour M, Wilhite R, Rowe J, Hafiz S. Guide to Ruminant Anatomy, Dissection and Clinical Aspects, 2nd ed. Wiley Blackwell — Fig. 4.14 (c), the isolated ovine uterus. Reproduced for educational reference.

	COW	EWE AND DOE	FOR CONTRAST
Ovary	About 4 × 2.5 × 1.5 cm; no ovulation fossa	Very similar to the cow's, allowing for the frequency of twin and multiple pregnancies	The **mare** has an ovulation fossa, to which enlarging follicles migrate
Intercornual ligaments	**Two** — dorsal and ventral, with a pocket between them	**One**	—
Caruncles	Raised, mushroom-shaped	Dish-shaped; the free surface is concave, most obviously in the ewe	—
Horns	About 35 cm, curled ventrally, drawn back toward the pelvis	The same plan at a smaller scale	The **bitch** and **queen** have a short body and two long, slender horns that diverge forward to ovaries just behind the kidneys; the **sow**'s are longer still and resemble loops of intestine
Body	About 3 cm; an internal septum runs back almost as far as the cervix	Short, as in the cow	The **mare** has a genuinely large body and does not have the ruminant's pseudobody
Cervix	8 to 10 cm; lumen obstructed by circular folds	Firm and prominent for the size of the animal	The **mare**, **bitch** and **queen** have longitudinal folds rather than interlocking circular ones, and the mare's cervix is comparatively small
Gestation	About 280 days	About 147 days in sheep, 154 in goats	—

The differences that will actually change what you do are the **single intercornual ligament**, which removes the retraction manoeuvre of section 11, and the **scale**: the tract of a ewe or a doe is not simply a smaller version of the cow's to work with, because an arm that reaches everything in a cow reaches nothing in a ewe. As for the ovaries and the tubes, apart from features associated with the frequency of twin and multiple pregnancies, those of sheep and goats are **very similar** to the cow's.

The contrasts that teach

Two non-ruminants belong beside the cow here, because the contrast makes the cow's own arrangement clearer. The **mare** has a genuinely large uterine body and no pseudobody; her cervix is comparatively small and its folds are longitudinal rather than interlocking rings; and her ovary has an **ovulation fossa**, which the cow does not. The **bitch** has a short cervix and a short body, from which two long, slender horns diverge and run **forward** to reach ovaries lying just behind the kidneys — the opposite arrangement to the cow's short curled horns and long apparent body. For the full comparison across domestic species, see our comparative anatomy page.

The freemartin

Twin pregnancy in cattle is uncommon. But when a heifer calf is born twin to a bull calf, she is very likely to be a **freemartin** — an animal whose reproductive tract has failed to develop normally. The cause is exchange between the two circulations in utero: anti-Müllerian hormone from the male twin reaches the female and causes the paramesonephric ducts to regress.

Anatomically the tract is **abnormally short**: the vagina is almost absent, which is evident on examination of the vestibule, and the vulva is abnormally small and surrounded by unusually long hair. That description is where this page stops. Whether a given animal is one, and what follows from that, is not an anatomical question.

Where to go next

The tract does not exist in isolation. For the rest of the animal it lies in — the pelvis, the abdomen, the udder, the limbs — see our bovine anatomy page for vet students. For the same ligaments as a surgeon meets them, see our step-by-step account of the canine spay. And for the way anatomy is organised as a subject, the survey of the body systems of domestic animals and the veterinary anatomy notes are the general starting points.

14 Test yourself

One hundred and twelve 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 **In one sentence, what does this page cover?**

ANSWER The structures of the female bovine tract from ovary to vulva, and the landmarks of a normal examination per rectum — not the oestrous cycle, not breeding management and not pregnancy diagnosis as a procedure.

2 **Name the parts of the female tract in order from ovary to vulva.**

ANSWER Ovary, uterine tube, uterine horn, uterine body, cervix, vagina, vestibule, vulva.

3 **Why does the reproductive tract of a ruminant lie so far caudally?**

ANSWER Because the **fetal ovaries descend to the most caudal part of the abdomen** — a greater descent than in any other domestic species. The uterine horns, anchored to the ovaries, are drawn back with them toward the pelvic inlet.

4 **Give three consequences of that descent.**

ANSWER The whole tract can be reached by a hand in the rectum; the horns curl ventrally on themselves instead of ranging forward into the abdomen; and the ovaries and cervix lie close enough to the pelvis to be palpated routinely.

5 **Except in one circumstance, how far into the abdomen does the bovine uterus reach?**

ANSWER Not far at all — the tips of the horns reach only just beyond the pelvic brim. The exception is advanced pregnancy.

6 **What lies immediately dorsal to the tract, and what lies ventral and cranial to it?**

ANSWER The **rectum** lies dorsal; the **bladder** lies ventral and cranial.

7 **Which structure suspends the tract, and what else does it carry?**

ANSWER The **broad ligament**, which also carries every artery, vein and nerve reaching the tract.

8 **Give the dimensions of the ovary of a mature, non-pregnant cow.**

ANSWER About **4 × 2.5 × 1.5 cm** — small in relation to the size of the animal.

9 **Describe the shape and consistency of the bovine ovary.**

ANSWER A **firm, rather irregular ovoid body**.

10 **Where exactly does the ovary lie?**

ANSWER Near the **ventral part of the shaft of the ilium**, level with the **bifurcation of the uterus**, close to the pelvic inlet; included in the broad ligament.

11 **From what part of the ovarian surface may follicles and corpora lutea project in the cow?**

ANSWER From **any part** of the surface.

12 **Does the cow have an ovulation fossa?**

ANSWER No. The **mare** has one, and enlarging follicles migrate to it; the cow has none, which is why her ovary is palpated all over rather than at one site.

13 **What diameter do the largest bovine follicles reach?**

ANSWER About **2 cm**.

14 **How small a follicle may be detected on palpation per rectum?**

ANSWER As small as about **5 mm**. Note the wording — such a follicle *may* be detected; it is the limit of the technique, not a guarantee.

15 **Why does a fully developed corpus luteum feel smaller than it looks on a cut surface?**

ANSWER Because only a small part of it projects above the ovarian surface; most of the structure is embedded within the ovary.

16 **What is a corpus haemorrhagicum?**

ANSWER The blood-filled body occupying a follicle that has recently ruptured, before it becomes a corpus luteum.

17 **Which two ligaments anchor the ovary, and to what?**

ANSWER The **mesovarium** suspends it from the dorsolateral abdominal wall, and the **proper ligament of the ovary** ties it to the tip of the uterine horn. The **suspensory ligament of the ovary** runs on forward toward the last ribs.

18 **Why is finding the tip of a uterine horn a reliable way of finding an ovary?**

ANSWER Because the proper ligament of the ovary ties the two together, so they always travel together.

19 **What is the ovarian bursa, and which two peritoneal folds make it?**

ANSWER A peritoneal pocket into which the ovary projects, formed by the **mesovarium** and the **mesosalpinx** together.

20 **Name the four named regions of the uterine tube in order from the ovary.**

ANSWER **Infundibulum** (with its fimbriae), **ampulla**, **isthmus**, then the tubouterine junction with the horn.

21 **What are the fimbriae and what do they do?**

ANSWER Finger-like projections on the free edge of the infundibulum; their movement helps draw the newly released ovum into the funnel.

22 **What is the approximate ratio of ampulla to isthmus?**

ANSWER About **2 : 1** — though the distinction between them is only obvious at certain times.

23 **Where does fertilisation take place?**

ANSWER In the **ampulla**.

24 **How is the transition from isthmus to uterine horn marked?**

ANSWER It is gradual, and marked by a **thickening of the muscle** rather than by any sudden change of calibre. The junction is the **tubouterine junction**.

25 **Why is the uterine tube hard to identify on a non-pregnant tract?**

ANSWER It is fine, pale and tightly wound inside a fold of peritoneum. The reliable approach is to work from the two obvious ends — the infundibulum over the ovary and the tip of the horn — and open the mesosalpinx between them.

26 **What is the pseudobody?**

ANSWER The part of the bovine uterus that **looks** like a long body but is actually the two uterine horns lying side by side within shared serosal and muscular coats, with a dorsal groove marking the seam and an internal septum between them.

27 **How long is the true uterine body of a cow?**

ANSWER About **3 cm**.

28 **How long is each uterine horn, and how much of it is inside the pseudobody?**

ANSWER About **35 cm**, of which roughly **one third** is incorporated into the pseudobody.

29 **You can feel where the uterine body ends caudally but not where it begins cranially. Why?**

ANSWER Because the firmness of the cervix marks the caudal limit clearly, while **nothing** indicates the cranial limit — only dissection reveals that the body is a mere 3 cm.

30 **What practical consequence follows from a 3 cm body?**

ANSWER Anything passed through the cervix has only a few centimetres of body to occupy before it is in one horn or the other.

31 **How many intercornual ligaments does the cow have, and what are they called?**

ANSWER **Two**: a dorsal and a ventral intercornual ligament. Small ruminants have one.

32 **What is the pocket between the two intercornual ligaments used for?**

ANSWER An examiner can insert an **index finger** into it and draw the whole tract caudally toward the pelvic cavity, bringing structures within reach.

33 **Why does a bovine uterus become firmer during a rectal examination?**

ANSWER The tight winding of the horns is not constant: it results from stimulation of the muscle of the uterus and of the broad ligament, so the organ becomes more definite and firmer as you work with it. The effect is most noticeable at oestrus.

34 **Name the three coats of the uterine wall.**

ANSWER An outer serosa continuous with the broad ligament, the muscular **myometrium**, and the **endometrium**.

35 **How many caruncles does a cow have, and how are they arranged?**

ANSWER About **40**, in **four more or less regular rows** in the wider parts of each horn, reducing to a double line toward the tip.

36 **Are caruncles present in the non-pregnant uterus?**

ANSWER Yes. They are a permanent feature of the ruminant endometrium, not something pregnancy creates.

37 **Define caruncle, cotyledon and placentome.**

ANSWER The **caruncle** is the maternal raised area of endometrium; the **cotyledon** is the corresponding fetal tufted area of chorion; the **placentome** is the two interlocked.

38 **Why is the ruminant placenta called cotyledonary?**

ANSWER Because attachment occurs only at those discrete caruncle-cotyledon sites, not over the whole surface.

39 **How does caruncle shape differ between the cow and the small ruminants?**

ANSWER The cow's are **raised and mushroom-shaped**; those of the ewe and doe are **dish-shaped**, with a concave free surface, most obviously in the ewe.

40 **What is the endometrium between the caruncles like?**

ANSWER Smooth, and it takes no part in attachment.

41 **How long is the bovine cervix?**

ANSWER **8 to 10 cm** — about three times the length of the uterine body it guards.

42 **Name the two ostia of the cervix and say what each opens into.**

ANSWER The **internal uterine ostium**, a constriction where the uterine body ends and the cervix begins; and the **external uterine ostium**, which opens into the vagina on the projecting vaginal part of the cervix.

43 **How many circular folds does the cervix of an animal that has not calved have, and what happens to them afterwards?**

ANSWER **Three or four** annular folds, which become **broken and irregular** in an animal that has calved.

44 **Why is the cervical canal described as occluded rather than merely narrow?**

ANSWER Because the projections from the walls **interlock** across the lumen and fit closely together.

45 **What does the arrangement of the longitudinal folds at the external ostium resemble?**

ANSWER The **segments of an orange** — they radiate outward from the opening.

46 **What is the vaginal fornix?**

ANSWER The **annular recess** surrounding the projecting vaginal part of the cervix, with the last cervical fold sunken into a recess of the vaginal wall — a ring-shaped blind alley all the way round the entrance.

47 **List the four features that together make catheterisation of the bovine uterus so difficult.**

ANSWER Its **length** (8 to 10 cm of thick wall); the **interlocking circular folds**; the **longitudinal folds** creating blind runs at the external ostium; and the **annular fornix** surrounding the entrance.

48 **Why is the cervix the first structure you look for per rectum?**

ANSWER Because it is the only firm, hard structure in the pelvis of a non-pregnant cow, and every other landmark is found by direction from it.

49 **What normally closes the cervix?**

ANSWER A **mucous plug**. The cervix opens at oestrus and at calving.

50 **What is the approximate ratio of vagina to vestibule, and where is the boundary?**

ANSWER About **3 : 1**. The boundary lies a few centimetres cranial to the ischial arch and is marked by the external urethral orifice and the remains of the hymen.

51 **Why are the resting dimensions of the vagina of little significance?**

ANSWER Because it is capable of great expansion in both length and diameter — it has to admit a calf.

52 **Describe the peritoneal covering of the vagina.**

ANSWER The cranial two-thirds of the **dorsal** wall faces into the rectogenital pouch; the **ventral** surface has a less complete covering and relates to the bladder and urethra; the **lateral** walls are largely without peritoneum.

53 **Why is the dorsal fornix region a useful route to the abdominal cavity?**

ANSWER It has a peritoneal covering, and the approach avoids the major vessels that pass below and to the sides of the vagina.

54 **Which muscle narrows the caudal part of the vagina ventrally, especially in young animals?**

ANSWER The **urethralis**.

55 **Name the four structures found in the floor and walls of the vestibule, front to back.**

ANSWER The **external urethral orifice**; the **suburethral diverticulum**; the **major vestibular gland**; and the **clitoral fossa** containing the glans of the clitoris.

56 **What is the suburethral diverticulum and why does it matter?**

ANSWER A **blind pouch in the floor of the vestibule**, immediately below the external urethral orifice. It lies directly in the path of a catheter advanced along the floor, so the catheter enters the pouch rather than the urethra. The mare has no such pouch.

57 **How big is the major vestibular gland, and how would you locate it?**

ANSWER About **3 cm** long, enclosed within the urogenital diaphragm. It is marked by a large depression caudolateral to the urethral opening, and the mucosa over it is generally darkened.

58 **Name the parts of the female pudendum.**

ANSWER The **vulva**, the **vestibule** and the **clitoris**.

59 **What are the dorsal and ventral commissures?**

ANSWER The points where the left and right labia of the vulva meet above and below.

60 **Why does simple inspection reveal so little of the bovine clitoris?**

ANSWER It is slender, and its glans is fused with the prepuce.

61 **What is the urogenital diaphragm and what is its chief importance?**

ANSWER The perineal membrane filling the gap between the rectovaginal septum and the pelvic floor. Its importance is **anchorage** — it holds the tract against the drag of the gravid uterus and the backward drag during calving.

62 **Name the two constrictor muscles of this region and say what each does.**

ANSWER The **constrictor vestibuli**, the more important, narrows the genital passage and raises a ridge in its floor; the **constrictor vulvae** may cause the opening to gape.

63 **Name the three parts of the broad ligament and what each suspends.**

ANSWER **Mesovarium** — the ovary; **mesosalpinx** — the uterine tube; **mesometrium** — the uterus and the cranial part of the vagina, and the largest of the three.

64 **Which vessels run in the mesovarium?**

ANSWER The ovarian artery and the ovarian vein.

65 **Why is the broad ligament said to support the uterus actively rather than passively?**

ANSWER Because its two serosal layers are separated by a considerable amount of **smooth muscle**, continuous with the longitudinal layer of the myometrium.

66 **Name the three cords associated with the ovary and uterus besides the broad ligament itself.**

ANSWER The **suspensory ligament of the ovary**, the **proper ligament of the ovary** and the **round ligament of the uterus**.

67 **Name the three pelvic peritoneal pouches from behind forwards.**

ANSWER The **rectogenital pouch** (with a pararectal fossa each side), the **vesicogenital pouch** and the **pubovesical pouch**.

68 **Which pouch does the cranial two-thirds of the vaginal roof face into?**

ANSWER The **rectogenital pouch**.

69 **From what does the ovarian artery arise in cattle?**

ANSWER **Directly from the aorta.**

70 **Describe the course of the ovarian artery, and what its relationship with the ovarian vein allows.**

ANSWER It is **extraordinarily convoluted** within the cranial part of the broad ligament and lies in extensive contact with the plexiform ovarian vein wound around it. That contact allows substances to pass from the venous blood leaving the uterus into the arterial blood reaching the ovary, bypassing the general circulation.

71 **From what does the uterine artery arise, and why do sources name two parents for it?**

ANSWER It arises from the **internal iliac**, entering the pelvis in the broad ligament. Strictly it is a branch of the **umbilical artery**, whose flow it very largely takes over — which is why some accounts name the umbilical instead.

72 **Which is the largest artery to the female tract?**

ANSWER The **uterine artery**.

73 **Which border of the uterus is less well supplied, and what follows from that?**

ANSWER The **antimesometrial** border — the free edge opposite the attachment — which is therefore less prone to bleeding when incised.

74 **Where does the vaginal artery arise and where does it run?**

> ANSWER From the **internal iliac near the ischial spine**; it runs over the dorsolateral surface of the vagina, then swings forward over the lateral wall.

75 **How do the three arteries form a single continuous chain?**

> ANSWER The ovarian and vaginal arteries each give a **uterine branch**, and both anastomose with the uterine artery.

76 **Describe the venous drainage of the tract.**

> ANSWER A very large and conspicuous **venous plexus** lies in the parametrial tissue of the broad ligament and over the ventral surface of the uterus and vagina. The **ovarian vein** is the largest vessel leaving the tract.

77 **Where does the lymph of the female genital tract drain?**

> ANSWER Primarily to the **medial iliac** and **lumbar aortic** lymph nodes; the organs within the pelvic cavity drain to the medial iliac and **sacral** nodes.

78 **Into which two groups do the nerves within the bovine pelvis fall?**

> ANSWER The **obturator and sciatic** nerves, which are described with the hindlimb; and the **pudendal, caudal rectal and pelvic** nerves, which are purely sacral in origin and supply the pelvic viscera and the perineum.

79 **Which two nerves in the pelvis are vulnerable to injury at parturition?**

> ANSWER The **obturator** and the **sciatic**.

80 **Name the three significant divisions of the pudendal nerve.**

> ANSWER The **deep perineal branch**, to visceral and somatic structures of the caudal pelvic region; the **distal cutaneous branch**, to the ventral perineum, vulva and perineal skin; and the **continuation of the trunk**, which becomes the dorsal nerve of the clitoris.

81 **Where can a branch of the pudendal nerve be palpated?**

> ANSWER The **distal cutaneous branch** becomes superficial by emerging from the **ischiorectal fossa** and crosses the **medial process of the ischial tuber** — the pin bone — where it can be felt.

82 **List the five per-rectum landmarks in the order a hand meets them.**

> ANSWER 1 the **cervix**; 2 the **bifurcation** and the intercornual ligaments; 3 the **horns**; 4 the **ovaries**; 5 the **uterine artery**, for fremitus, if the cow is in calf.

83 **What does the cervix feel like, and where does it lie?**

> ANSWER Firm, smooth and cylindrical, distinctly harder than anything around it, lying close to the **midline of the pelvic floor** inside the pelvis. In a heifer, about half way between the caudal border of the pubis and the pelvic brim; in an older cow it may lie just behind the brim, on it, or over it.

84 **Describe how to find the cervix per rectum.**

> ANSWER Press gently down on the **pelvic floor**, rest your fingers on the pubic bones, and sweep them from side to side keeping that downward pressure until you meet a firm, smooth cylinder. Confirm it by moving it **laterally** — it shifts a little, and nothing else in there does.

85 **How does the cervix of a heifer differ in size from that of an older cow?**

> ANSWER A heifer's is about **2 cm wide and 4 cm long**; an older multiparous cow's is **4 to 5 cm wide and 8 cm long**. Dyce's 8 to 10 cm describes the mature cow, so a heifer's cervix is roughly half that length.

86 **Why is lateral movement of the cervix reduced in a pregnant cow?**

> ANSWER Because the weight of the gravid uterus pulls the cervix tightly forwards.

87 **A beginner finds something soft and fluctuant. What is it likely to be?**

ANSWER The **bladder** — the structure most often mistaken for something else at a first examination.

88 **Describe the retraction manoeuvre at the bifurcation.**

ANSWER Insert an **index finger into the pocket between the dorsal and ventral intercornual ligaments** and draw the tract caudally toward the pelvis, bringing structures that were out of reach to the hand.

89 **Why does that manoeuvre not work in a ewe?**

ANSWER Small ruminants have a **single** intercornual ligament and therefore no pocket.

90 **What should the two horns feel like in a non-pregnant cow, and what is the finding to look for?**

ANSWER Smooth, curved and tubular, curling ventrally, and approximately **symmetrical**. **Asymmetry** is the finding.

91 **How large is an ovary to the hand, and how should it be examined?**

ANSWER Roughly the size of the top joint of a thumb, about 4 cm at its longest. Run it between fingers and thumb and feel the **whole surface**, because a follicle or corpus luteum may project from any part of it.

92 **Should you press harder if the tract feels vague?**

ANSWER No. The tract becomes more definite under gentle, patient handling; it disappears under a firm grip. This is a skill of the fingertips.

93 **How long is gestation in cattle, sheep and goats?**

ANSWER About **280** days in cattle, **147** in sheep and **154** in goats.

94 **By how much does the uterus increase its weight during pregnancy?**

ANSWER **Fifteenfold** — a hundredfold if its contents are included.

95 **Why is asymmetry one of the earliest structural signs of pregnancy?**

ANSWER Because although the membranes soon spread into both horns, the conceptus itself is almost invariably **restricted to one horn**.

96 **When do the amniotic sac and the fetus itself become palpable?**

ANSWER The amniotic sac at about **30 days**, the fetus at about **70**.

97 **Why does a pregnant horn change shape rather than simply inflating?**

ANSWER The **lesser curvature is tethered by the broad ligament** and resists expansion most, so the greater curvature and adjacent parts grow away from the attachment.

98 **What happens to the caruncles of the gravid horn?**

ANSWER They grow from low smooth-surfaced bumps into **large pedunculated swellings** pitted to receive the chorionic villi; by term the largest may reach the size of a clenched fist.

99 **At what stage does the uterus begin to slip forward over the abdominal floor, and why not before?**

ANSWER By about the **third month**. Before then, hypertrophy of the tissues of the broad ligament restrains it.

100 **Why can finding nothing at about five months be informative?**

ANSWER Because as the uterus sinks it **passes out of reach of the examining hand for a time, at about the fifth month** — an inability that is as informative as palpable enlargement earlier and later.

101 **What happens to the position of the cervix in advanced pregnancy?**

> ANSWER The descent of the uterus stretches the vagina and **carries the cervix forward over the pelvic brim**, so the landmark moves.

102 **Define fremitus and say where and when it is felt.**

> ANSWER The characteristic buzzing vibration — also called a thrill or whirl — in the greatly enlarged uterine artery, felt on palpation against the **ilium**. It appears at around four to five months on the **same side as the pregnant horn**, and about a month later on **both** sides.

103 **How much does the uterine artery enlarge in pregnancy?**

> ANSWER From a few millimetres to **a centimetre or more**, and it loses its flexuous course.

104 **What closes the cervical canal during pregnancy?**

> ANSWER A **mucous plug**, developing from about the first month and later projecting through the external ostium.

105 **Name three connective-tissue changes that signal that calving is near.**

> ANSWER Softening of the **sacrosciatic ligament** with insinking beside the tail head; loosening of other pelvic ligaments allowing relaxation of the **sacroiliac joints**; and softening of the connective tissues of the cervix, caudal tract and vulvar and perineal skin, with oedema that may cause the vulva to gape.

106 **Does the uterus return exactly to its former state after a pregnancy?**

> ANSWER No — **some asymmetry usually remains**.

107 **How does the tract grow before puberty, and what changes then?**

> ANSWER It grows **isometrically**, in step with the rest of the body. From about **8 to 10 months** it begins to respond to ovarian hormones, and the first few cycles produce a striking increase in its dimensions and a much clearer differentiation of its tissues.

108 **Name three permanent changes calving leaves in the tract.**

> ANSWER The cervical circular folds become **broken and irregular**; the uterus **retains some asymmetry**; and the vulva tends to be **permanently enlarged**, with labia often marked by previous calvings.

109 **Give the four differences between the cow's tract and the ewe's that matter.**

> ANSWER **One** intercornual ligament instead of two; **dish-shaped** caruncles instead of mushroom-shaped; the whole tract at a much smaller **scale**; and a gestation of about 147 days rather than 280.

110 **How do the ovaries and uterine tubes of sheep and goats compare with the cow's?**

> ANSWER **Very similar**, apart from features associated with the frequency of twin and multiple pregnancies.

111 **Contrast the uterus of the cow with that of the mare and the bitch.**

> ANSWER The **mare** has a genuinely large body and no pseudobody, a comparatively small cervix and longitudinal cervical folds. The **bitch** has a short cervix and body from which two long, slender horns diverge forward to ovaries just behind the kidneys.

112 **What is a freemartin, anatomically?**

> ANSWER A heifer born twin to a bull calf whose tract has failed to develop normally after exchange between the two circulations in utero. The tract is **abnormally short** — the vagina is almost absent, and the vulva is abnormally small and surrounded by unusually long hair.

15 Cow Reproductive Anatomy — frequently asked questions

What are the parts of the female reproductive tract of a cow?

In order from the ovary outwards: the **ovary**, the **uterine tube** (with its infundibulum, ampulla and isthmus), the **uterine horn**, the **uterine body**, the **cervix**, the **vagina**, the **vestibule** and the **vulva**. The ovaries lie close to the pelvic inlet, the horns curl ventrally on themselves rather than ranging forward into the abdomen, and the whole assembly is suspended from the roof of the abdomen by the broad ligament, which also carries its blood supply.

Why does a cow's uterus look as though it has a long body when it does not?

Because most of the apparent body is not body at all. The two uterine horns run side by side for some distance inside a **shared serosal and muscular coat**, with a groove along the top marking the seam and a septum between them inside — an arrangement called the **pseudobody**. The true uterine body of a cow is only about **3 cm** long, while each horn is about 35 cm, roughly a third of which is bound up in the pseudobody. It matters because anything passed through the cervix is in one horn or the other almost immediately.

How long is a cow's cervix, and why is it so hard to pass anything through it?

It is **8 to 10 cm** long — about three times the length of the uterine body it guards — and thick-walled throughout. Four features combine to obstruct it: **three or four circular folds** whose projections interlock across the lumen; **longitudinal folds** that radiate at the external opening like the segments of an orange, creating blind runs; the sheer **length** of the canal; and the annular **fornix** surrounding the projecting end, a ring-shaped dead end all the way round the entrance. Together these make catheterisation of the uterus very difficult, and at many times impossible.

What is the difference between a caruncle, a cotyledon and a placentome?

They are three different tissues, not three words for one. The **caruncle** is maternal: a discrete raised area of endometrium, present even in the non-pregnant uterus, about 40 of them arranged in four rows in the wider part of each horn. The **cotyledon** is fetal: the corresponding tufted area of the chorion. The **placentome** is the functional unit the two form when they interlock in pregnancy. Because attachment happens only at those discrete sites, a ruminant placenta is classified as **cotyledonary**.

What can you feel when you palpate a cow's reproductive tract per rectum?

Five things, in a reliable order. First the **cervix** — firm, cylindrical and distinctly harder than anything around it, close to the midline of the pelvic floor; it is the landmark everything else is found from. Then, moving forward, the **bifurcation** where the horns separate, with a pocket between the dorsal and ventral intercornual ligaments that an index finger can hook into to draw the tract back within reach. Then the two **horns**, smooth and curled. Then the **ovaries**, small firm ovoids beside the end of each horn. And in a pregnant cow, the enlarged **uterine artery**, carrying a characteristic vibration called fremitus.

What is the suburethral diverticulum in a cow, and why does it matter?

It is a **blind pouch in the floor of the vestibule**, lying immediately below the external urethral orifice near the cranial end of that floor. It is a normal structure present in every cow. It matters because it sits directly in the path a catheter takes along the floor of the vestibule, so the catheter enters the pouch instead of the urethra — which is why passing a urinary catheter in a cow is not the straightforward act it is in a mare, which has no such pouch. One described way round it is to enter the diverticulum deliberately, rotate the catheter through 180° and draw it back very slowly until the tip is felt entering the urethra.

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8. Bhamburkar VR. *Veterinary Anatomy: The Regional Gross Anatomy of Domestic Animals*. New India Publishing Agency. The source of the **intercornual groove** and of the observation that it deepens cranially. Its account of the bovine female genital organs also corroborates four of the measurements above independently: a body of 3 to 4 cm that *appears* 12 to 15 cm, horns of 35 to 40 cm, a cervix of about 10 cm with a wall some 3 cm thick, and four annular folds.

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