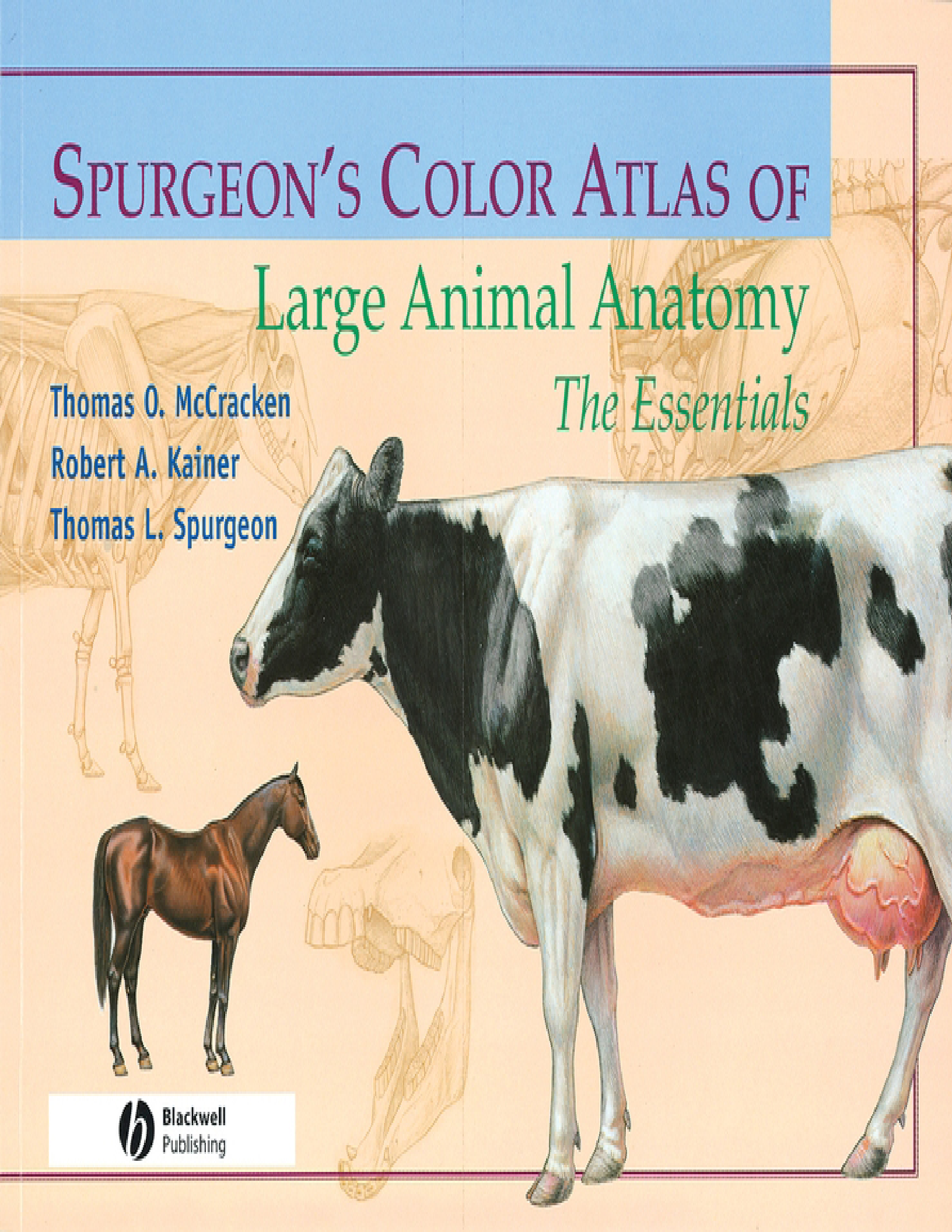
Spurgeon's Color Atlas of Large Animal Anatomy

The Essentials

Thomas O. McCracken
Robert A. Kainer
Thomas L. Spurgeon



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Thomas Spurgeon

TO OUR COLLEAGUE AND FRIEND

Dr. Thomas L. Spurgeon, exceptionally well-trained anatomist, superb teacher, and educational innovator, devoted his professional life to the advancement of anatomic education through scientific investigation and the dissemination of anatomic knowledge.

Following service to his country in the United States Air Force, Thomas L. Spurgeon entered college. Upon completion of his doctorate in anatomy in the School of Veterinary Medicine at the University of Califomia-Davis, Dr. Spurgeon accepted a faculty position in the College of Veterinary Medicine at Washington State University. His record as an excellent anatomist at that institution led to a position in the College of Veterinary Medicine and Biomedical Sciences at Colorado State University.

His broad knowledge of both human and veterinary anatomy was utilized fully at Colorado State. Students requiring courses in basic human anatomy as well as those majoring in veterinary medicine and various animal sciences profited from the instruction provided by this well-rounded anatomist who possessed outstanding pedagogic skill. His expertise was equally appreciated by the graduate students he mentored, particularly those in the biomedical illustration program.

Dr. Spurgeon, a pioneer in the computer-assisted instruction of anatomy, was continually seeking new methods of presentation. He and his colleague and close friend, Thomas O. McCracken, conceived the unique anatomic presentation used in this atlas.

Tragically, Dr. Spurgeon's untimely death in an automobile accident in 1997 brought a halt to his brilliant career. Dr. Spurgeon's devoted sons, Aaron and Kyle, are indeed proud of their father's accomplishments. Countless students mourn the passing of a man who, as teacher and friend, contributed so much to their lives.

ACKNOWLEDGMENTS

Many talented individuals contributed to the production of *Spurgeon's Color Atlas of Large Animal Anatomy: The Essentials.* Foremost among them were the artists, Conery Calhoon, Molly Babich, Gale Mueller, and Sandra Mullins, who colored Thomas McCracken's original drawings of anatomic specimens. They employed manual and digital techniques to reproduce the subtle colors of tissues and organs.

Consultants, who authored plates drawn by Thomas McCracken, selected clinical conditions and husbandry applications based on their anatomic significance. The consultants were Dr. Gayle Trotter for the horse; Dr. Frank Garry for the ox; Dr. Joan Bowen for the sheep and goat; Dr. LaRue Johnson for the llama and alpaca and the swine; and Dr. John Avens for the chicken. These specialists reviewed the plates on the various species, enhancing the accuracy of the presentations. Their contributions are gratefully acknowledged.

Carroll Cann, Executive Editor of Teton-New Media, was an enthusiastic supporter of the concept of the atlas. We thank him for his suggestions and encouragement.

Special thanks are due the late Dr. Patricia Brooks who supported her husband, Dr. Spurgeon, and frequently assisted him in his work. She, too, was a contributor to this atlas.

We greatly appreciated the reliable assistance of Dennis Madden, pathology technician in the College of Veterinary Medicine and Biomedical Sciences at Colorado State University. His procurement of specimens and his dissection skills were essential to the production of this atlas.

We thank Mark Goldstein for a student's viewpoint. His assistance with compilation of the index and his review and comments on the plates were most helpful.

We are grateful to Dr. Michael Smith from the School of Veterinary Medicine at Ross University for his careful review of the final proofs. His knowledge of anatomy, his fine teaching skills, and his critical eye well qualified him for this arduous task.

Acknowledgment is due the Department of Anatomy and Neurobiology and the Department of Clinical Sciences at Colorado State University for the use of their facilities and for providing living an-imals, skeletons, embalmed specimens, and necropsy specimens. Dr. Robert Lee prepared and was most helpful in providing anatomic specimens. We acknowledge the kindness of exhibitors at the National Western Stock Show and Midnight Valley Friesens for permission to photograph their animals.

We thank Alpine Publications, Inc. of Loveland, Colorado, for permission to use drawings from our book, *Horse Anatomy, A Coloring Atlas*. Permission from Pfizer Animal Health Group to use drawings of the chicken's anatomy from *Anatomical Atlas* is also appreciated.

INTRODUCTION

S*purgeon's Color Atlas of Large Animal Anatomy: The Essentials* is not a complete, detailed anatomic atlas. Instead, it presents topographic relationships of the major organs of the horse, ox, sheep, goat, llama, alpaca (a smaller species with long, lustrous hair), swine, and chicken in a simple yet technically accurate format. As an important food animal, the chicken is included with the large domestic animals in this atlas. Throughout the *Atlas*, most male and female of a given species are on facing pages. The majority of the plates contain information on the entire body Some plates are confined to a region; a few contain organs isolated from the rest of the body. Whereas most systems (e.g., digestive and reproductive) are presented for each animal, other systems are included only for some species to illustrate general anatomic patterns. Structures common to the various animals are labeled several times; other structures are labeled on only one or two species, usually emphasizing specific anatomy (the anatomy peculiar to a certain species). Animal specialists authored plates illustrating selected clinical or husbandry applications that reflect the anatomy of the organs involved.

The *Atlas* is intended for use by individuals at different stages of their education, serving as a survey of the specific anatomy of the different animals. Advanced 4-H club members, high school vocational agriculture students, and college students studying veterinary medical technology, veterinary medicine, animal science, and wildlife biology can use this *Atlas* as an introduction to the anatomy of common farm animals. The *Atlas* can also serve as a reference for horse breeders and trainers, as well as livestock and poultry producers. It will provide a quick review for persons with previous training in anatomy and will be an invaluable aid for the professional—e.g., a veterinarian or animal scientist—in explaining to a client some aspect of anatomy that pertains to an animal's condition and needs.

The following introductory pages provide the reader with a background in nomenclature and anatomic orientation.

NOMENCLATURE AND ANATOMIC ORIENTATION

ANIMAL CLASSIFICATION

The horse (*Equus caballus*) is classified as an odd-toed ungulate (hoofed mammal) in the order Perissodactyla, suborder Hippomorpha, and family Equidae. Members of this family are termed equids. “Equine” is an adjective. Equine characteristics include the grouping of limb muscles close to the trunk with tendons extending over long third metacarpal and metatarsal bones to the digits, providing leverage for sustained, rapid locomotion. Because this leverage arrangement does not develop great force, the heavy draft horse must rely on body weight to perform pulling tasks. Another equine characteristic is the horse’s extensive large intestine, the site of final microbial digestion and absorption of nutrients.

Cloven-hoofed ungulates that walk on their third and fourth digits are in the order Artiodactyla. Domestic ungulates in the suborder Ruminantia include those in the family Bovidae, subfamily Bovinae—the ox (*Bos taurus*) and zebu (*Bos indicus*)—and subfamily caprinae, the sheep (*Ovis aries*) and goat (*Capra hircus*). The noun “bovids” (after Bovidae) is usually reserved for cattle, bison, yak, and water buffalo; sheep are ovids and goats are caprids, named according to each genus. Adjectives end in -ine: bovine, ovine, and caprine, respectively.

The llama (*Lama glama*) and alpaca (*Lama pacos*) are cud-chewing artiodactyls from South America called camelids, named after the family Camelidae in the suborder Tylopoda. South American camelids are also called lamoids. Both ruminants and camelids have large, compart-mented stomachs essential for the microbial digestion of cellulose. Feed is more finely divided by rumination, a physiologic sequence of regurgitation of stomach contents, remastication (chewing), and redeglutition (swallowing).

Swine (pigs are young; hogs are mature) are artiodactyls in the suborder Suiformes, family Suidae. Domestic swine (*Sus scrofa domesticus*) are

descended from the European wild boar with some input from the smaller *Sus indica* from China. The adjective “porcine” is derived from the Latin *porcinus,* from porcus, a hog. Reflecting its omnivorous diet, the swine’s digestive tract is somewhat simpler than those of ruminating animals.

The chicken or domestic fowl (*Gallus gallus domesticus*) is classified with other comb-bearing gallinaceous birds in the order Galliformes. Descended from the Red Junglefowl of southeast Asia, the chicken is in the family Phasianidae.

GENERAL TERMINOLOGY

With some exceptions, particularly for most muscles wherein traditional Latin names are used, the terminology in this *Atlas* conforms to English translations of Latin terms in the *Nomina Anatomica Veterinaria (N.A.V.)*, 3rd ed., 1983. There are some departures from N.A.V., however. For example, according to N.A.V., the hoof includes the underlying corium (dermis) with the horny epidermis, whereas in common usage hoof refers only to the horny epidermal structure. In compliance with the intent of N.A.V., nomenclature will be consistent for all species. Common terms and meat-packing terms are used on some plates. Abbreviations for organs in this *Atlas* include: a, artery; b, bone; j, joint; lig., ligament; In, lymph node; m, muscle; n, nerve; v, vein. Double letters indicate the plural form of these words (e.g., aa, arteries). Positional and directional terms, body planes, and the extent of body cavities are used to indicate the location of parts of the body and functional changes in position. The extent of diseased regions is defined using this anatomic terminology.

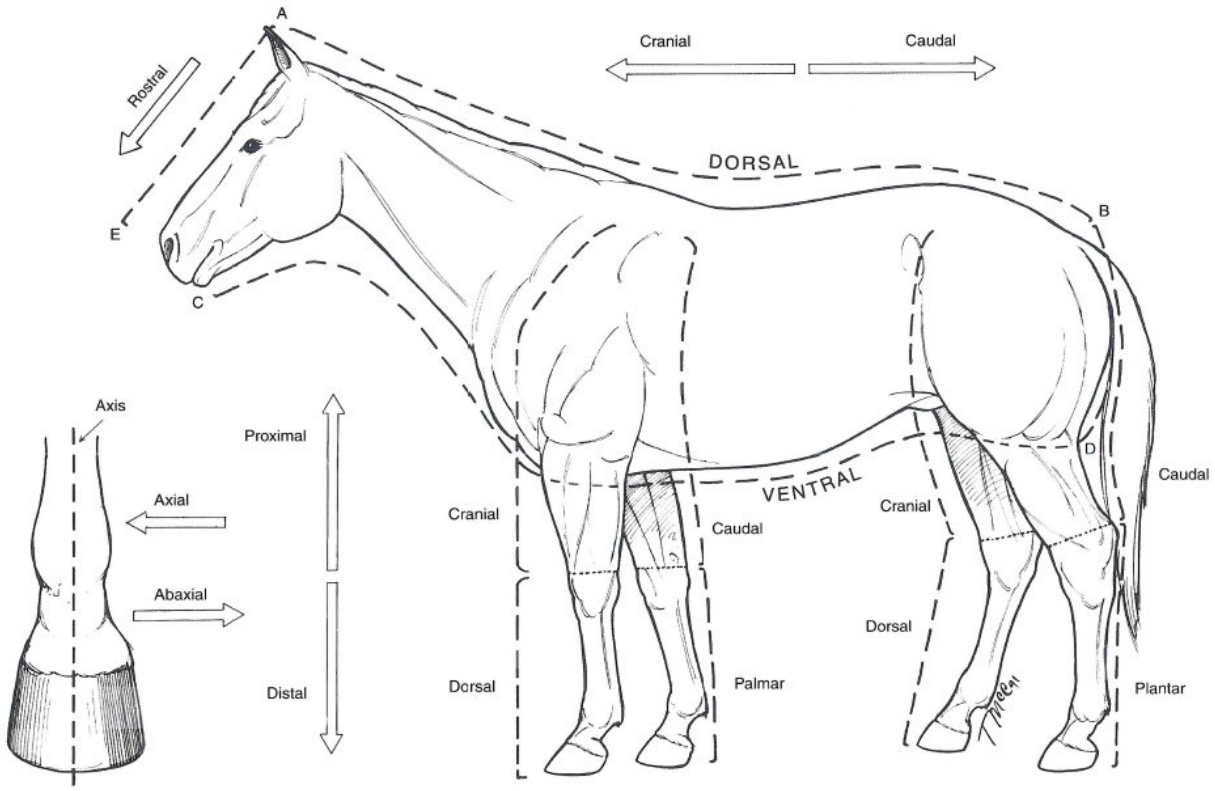
POSITIONAL AND DIRECTIONAL TERMS

The following terms are illustrated on the accompanying drawing of a horse. **Dorsal** and **ventral** are opposite terms indicating relative locations toward the back (L., dorsum) or belly (L., venter). Above the knee (carpus)

and hock (tarsus) and from the belly to the back, a structure located closer to the cranium (skull case) is **cranial** to another structure, and a structure located toward the tail (L., cauda) is **caudal** to another. On the head, the term **rostral** indicates a structure closer to the nose (L., rostrum).

Proximal indicates a location toward the attached end of a limb; **distal** indicates a location toward the free end of a limb, that is, further from the trunk. Distal to and including the carpus, **dorsal** replaces cranial; **palmar** replaces caudal. Distal to and including the hock, dorsal replaces cranial, but **plantar** replaces caudal.

On a frontal view of the distal end of a limb, notice that an **axial** structure is located toward the **axis.** An **abaxial** structure is located away from it.



BODY PLANES

Drawings of a horse are used to illustrate body planes. The **median plane** (L., medius, middle) divides the animal body into right and left halves. A **sagittal plane** (L., sagitta, arrow) is any plane parallel to the median plane. **Medial** and **lateral** (L., latus, side) are directional terms relative to the

median plane. Medial structures are located closer to the median plane. Lateral structures lie away from the median plane, that is, toward the side. A **transverse plane** passes through the head, trunk, or limb perpendicular to the part's long axis. A **dorsal plane** (also called a **frontal plane)** is a longitudinal plane that passes through the body parallel to its dorsal surface at right angles to the median plane.

Figure 1

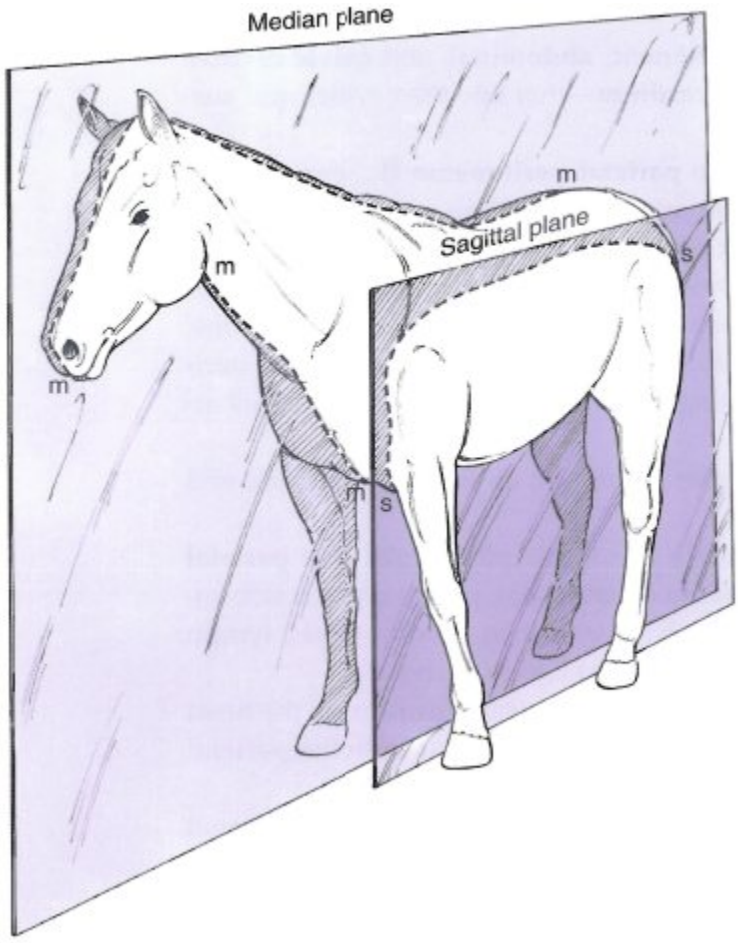


Figure 2

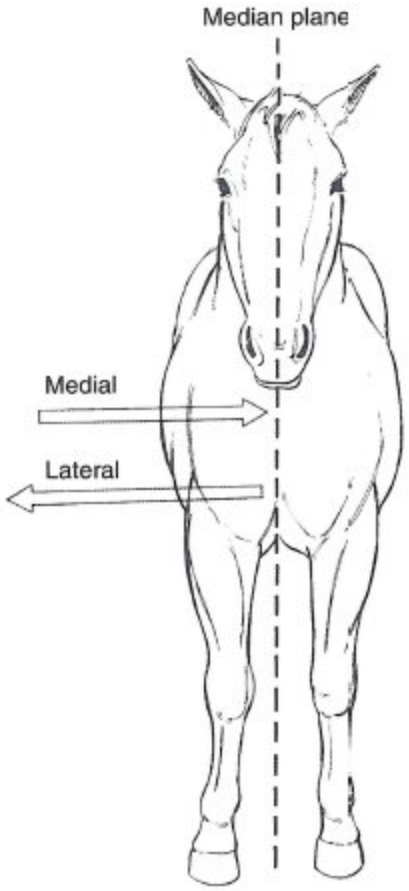
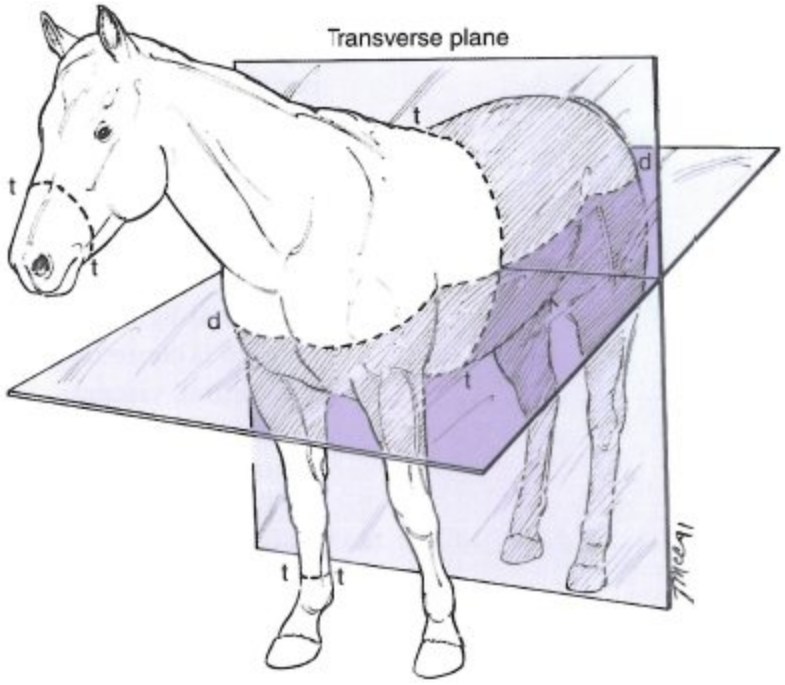


Figure 3



BODY CAVITIES AND MEMBRANES

A diagrammatic drawing of a mare’s trunk illustrates the **thoracic, abdominal,** and **pelvic cavities** and the serous membranes—**peritoneum, pleura,** and pericardium—that line the cavities and suspend organs.

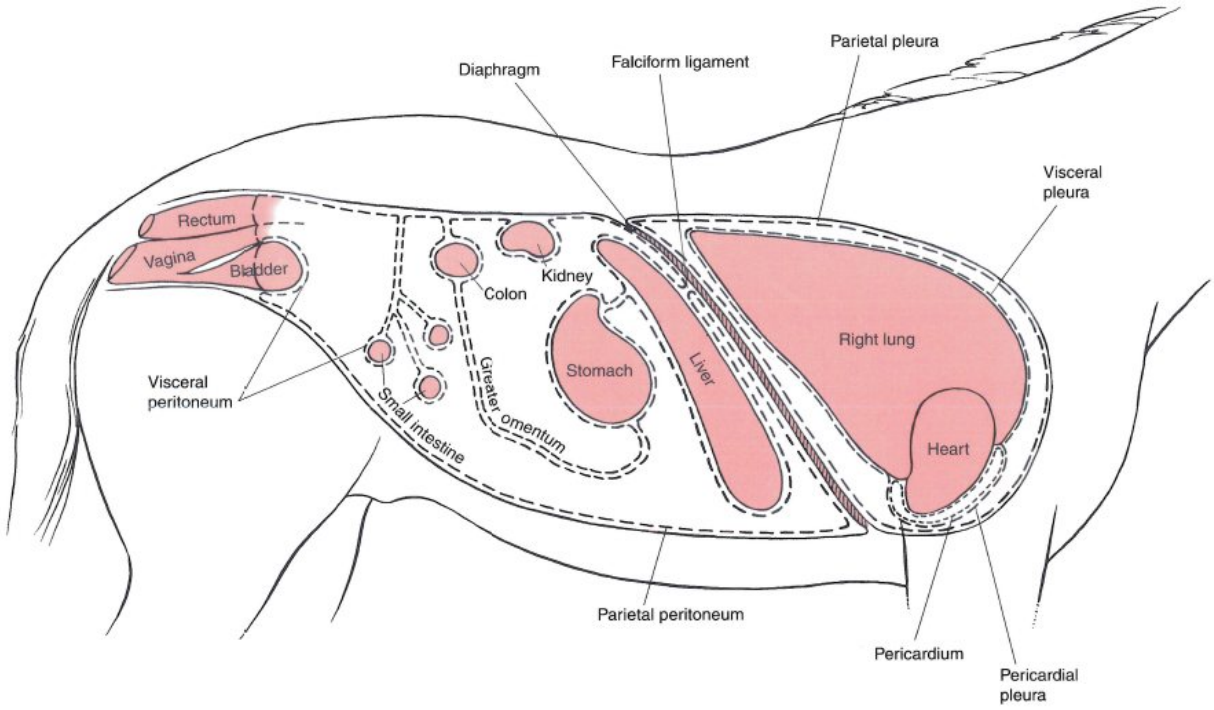
The peritoneum consists of three continuous parts. The **parietal peritoneum** (L., paries, wall) lines the abdominal cavity and the cranial part of the pelvic cavity. **Connecting peritoneum** reflects from the parietal peritoneum and suspends organs in a double fold containing vessels and nerves as it extends to an organ. The connecting peritoneum is indicated by mes- (G., mesos, middle) plus the Latin or Greek name of the organ. An example is mesentery: mes- plus G., enteron, small intestine. Peritoneal ligaments suspend and support—e.g., the falciform ligament of the liver. **Visceral peritoneum** is continuous with connecting peritoneum, encircling a viscus (Latin for a large, internal organ; plural, **viscera**).

The musculomembranous **diaphragm** is covered with peritoneum on its abdominal surface and pleura on its thoracic surface.

The **pleurae** are two continuous serous membranes, each forming a pleural sac. The **parietal** pleura lines each half of the thoracic cavity. **Mediastinal pleura** is connecting pleura on each side enclosing the mediastinum, a space containing the heart, esophagus, trachea, blood vessels, lymph nodes and ducts, thymus, nerves, and adipose tissue. **Visceral pleura** covers each lung.

The pericardium is the heart sac. **Visceral pericardium** (also called epicardium) covers the heart and reflects around the base of the heart and great vessels to become continuous with the **parietal pericardium**.

The serous cavities—**peritoneal cavity, pleural cavity**, and **pericardial cavity**—are potential spaces between parietal and visceral membranes containing lubricating serous fluids named for each cavity.


Diaphragm
Falciform ligament
Parietal pleura
Visceral pleura
Rectum
Vagina
Bladder
Colon
Kidney
Stomach
Liver
Right lung
Heart
Visceral peritoneum
Small intestine
Greater omentum
Parietal peritoneum
Pericardium
Pericardial pleura

SECTION 1 THE HORSE (*Equus caballus*)

PLATES

PLATE 1.1 Right lateral view of a stallion.

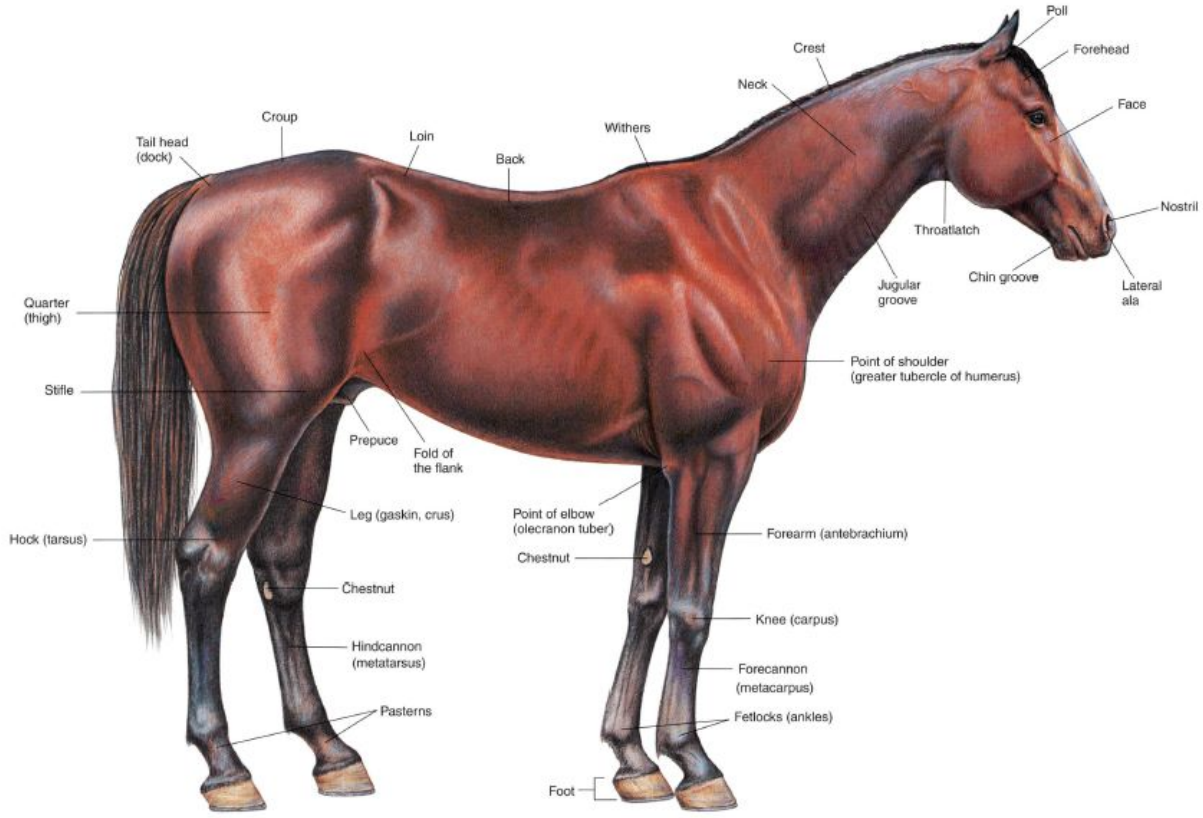


PLATE 1.2 Left lateral view of a mare.

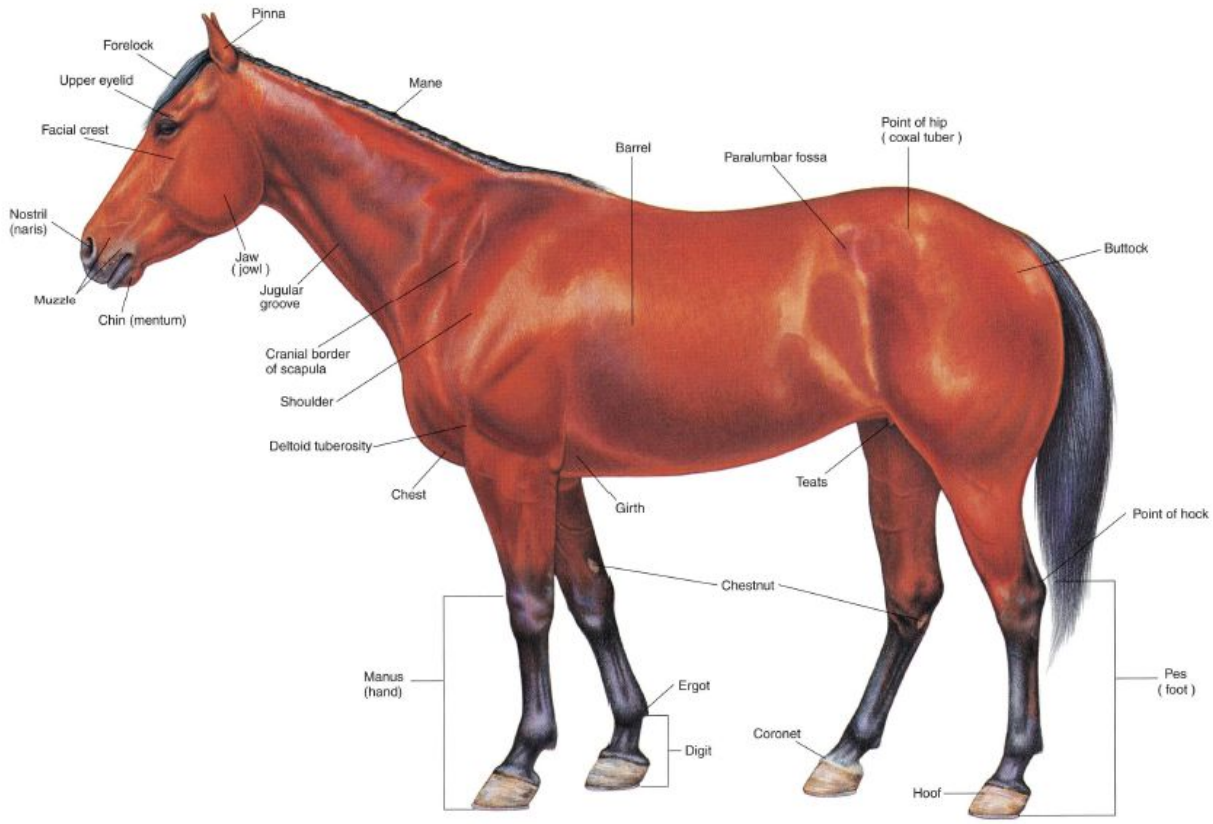


PLATE 1.3 Body regions of the horse. Right lateral view.

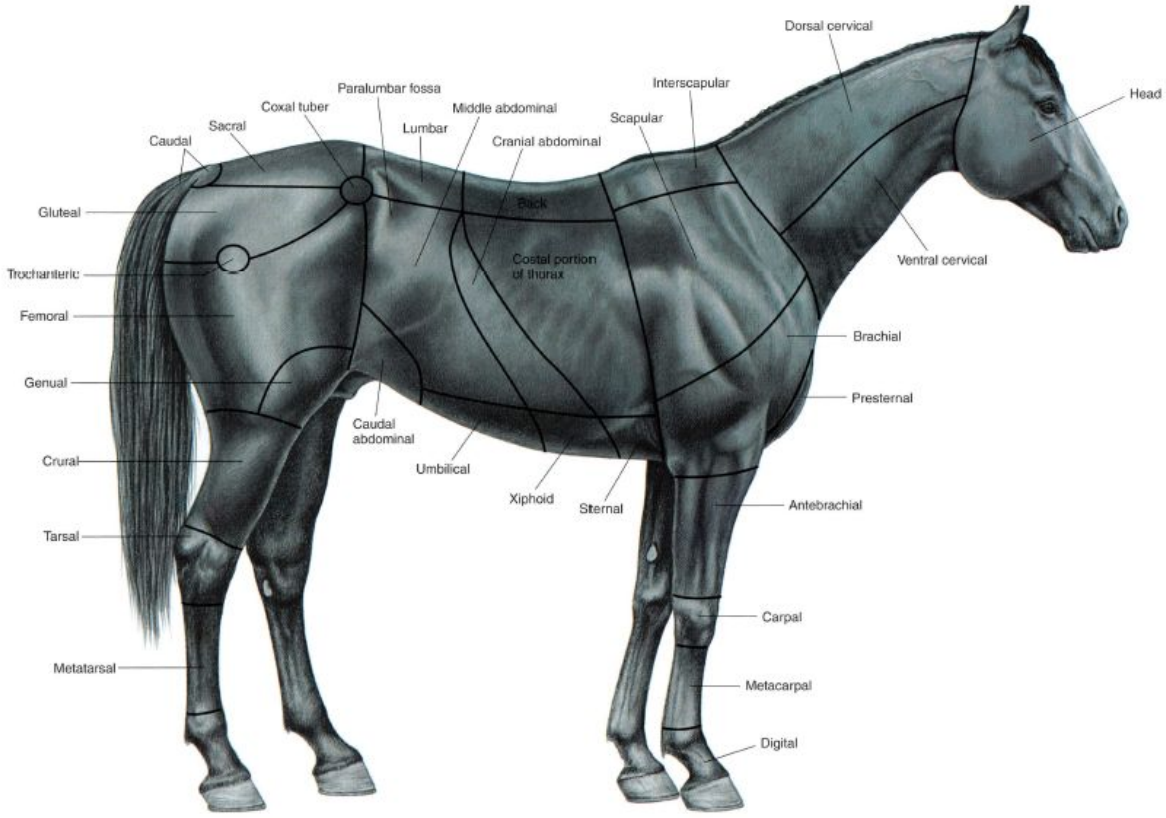


PLATE 1.4 Skeleton of the horse. Left lateral view. C = cervical vertebra, T = thoracic vertebra, L = lumbar vertebra, b = bone

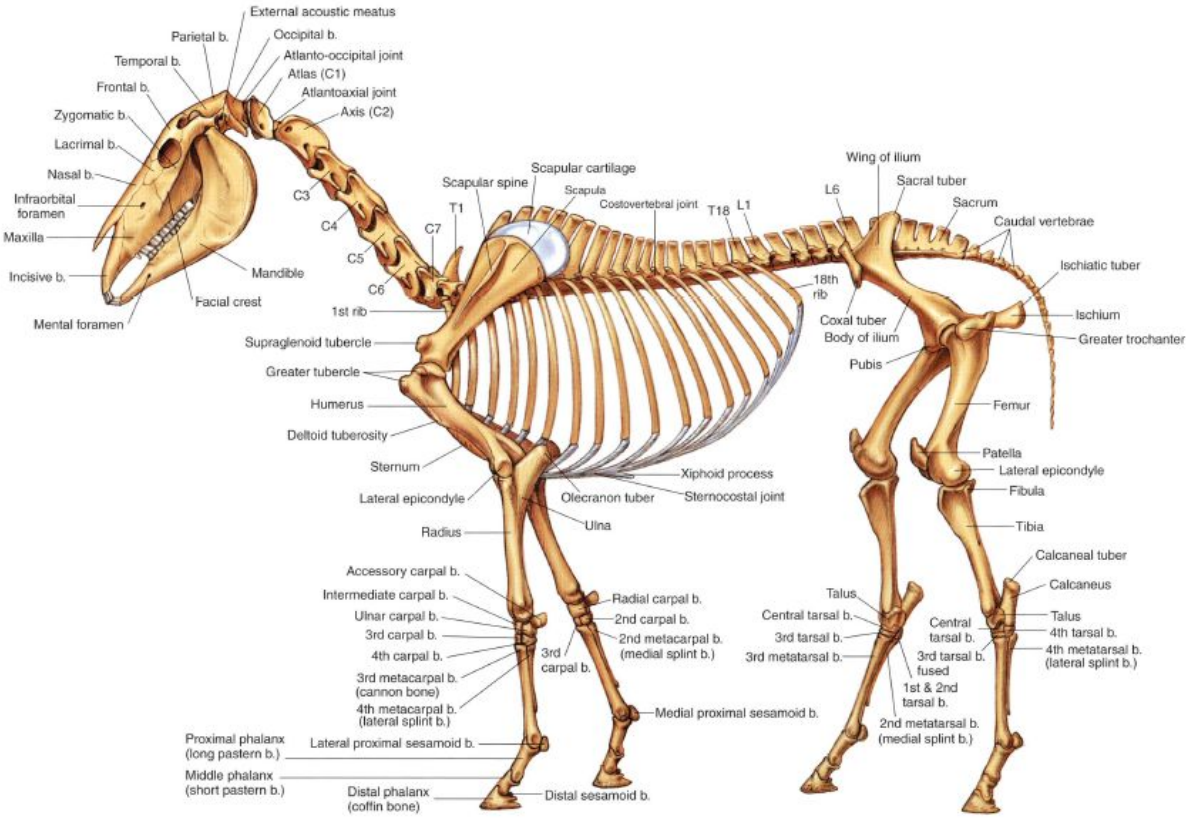


PLATE 1.5 Cutaneous muscles and major fasciae of the stallion. Right lateral view, m = muscle

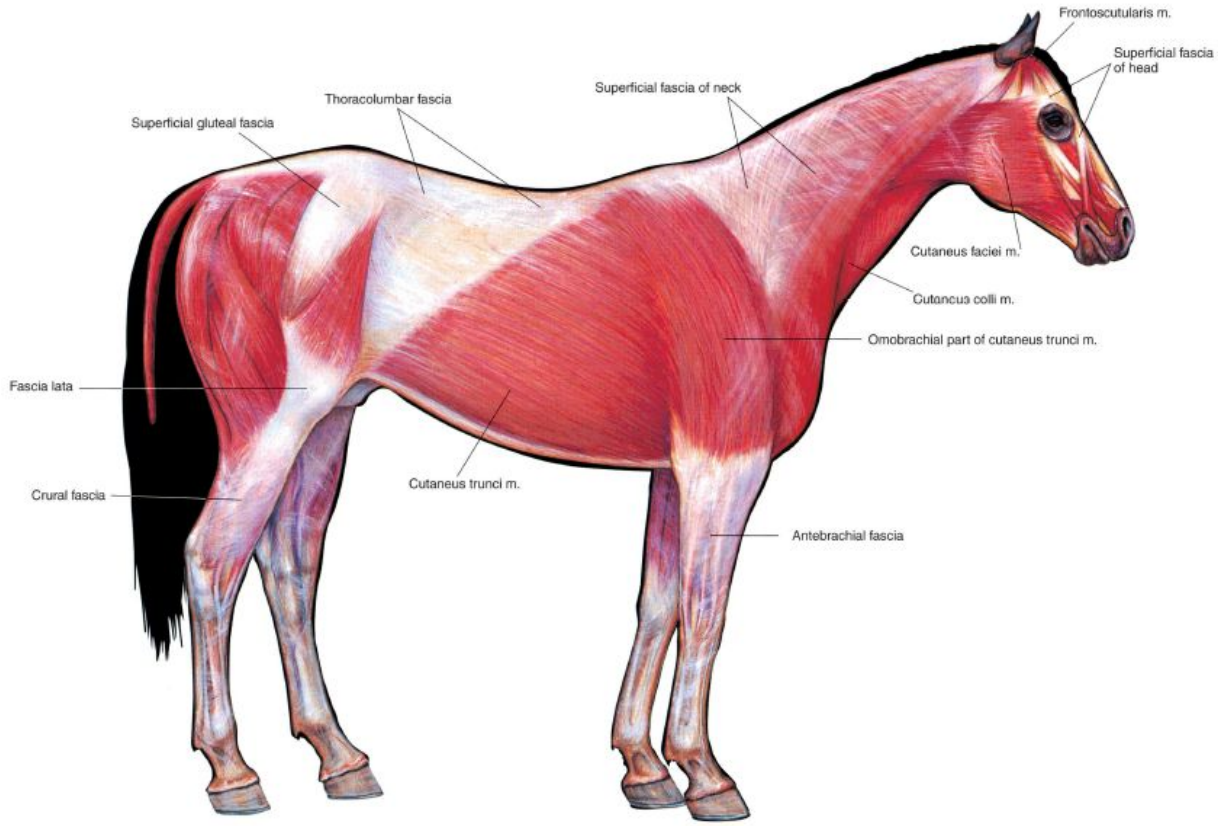


PLATE 1.6 Superficial muscles and veins of the mare. Left lateral view. m = muscle, n = nerve, v = vein

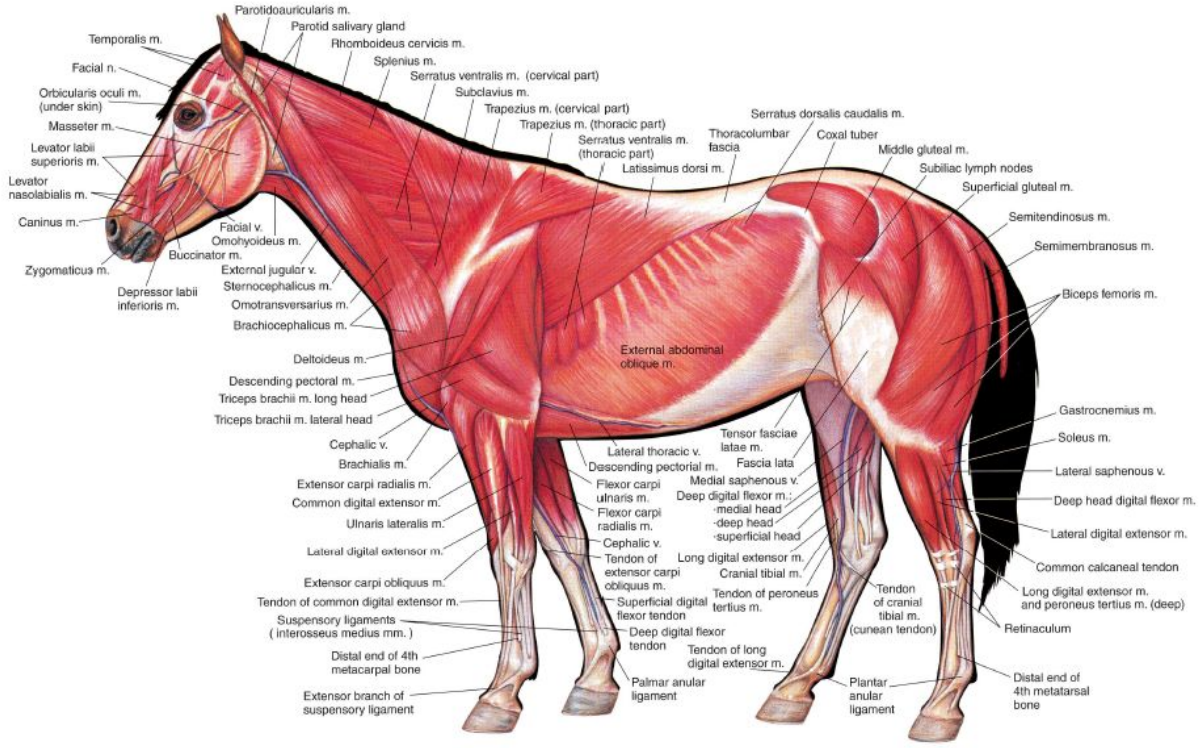


PLATE 1.7 **A**. Parasagittal section of the equine digit. **B**. Palmar (plantar) view of major structures of the equine digit. Navicular bursa obscures joining of collateral sesamoidean ligaments on the navicular bone, b = bone

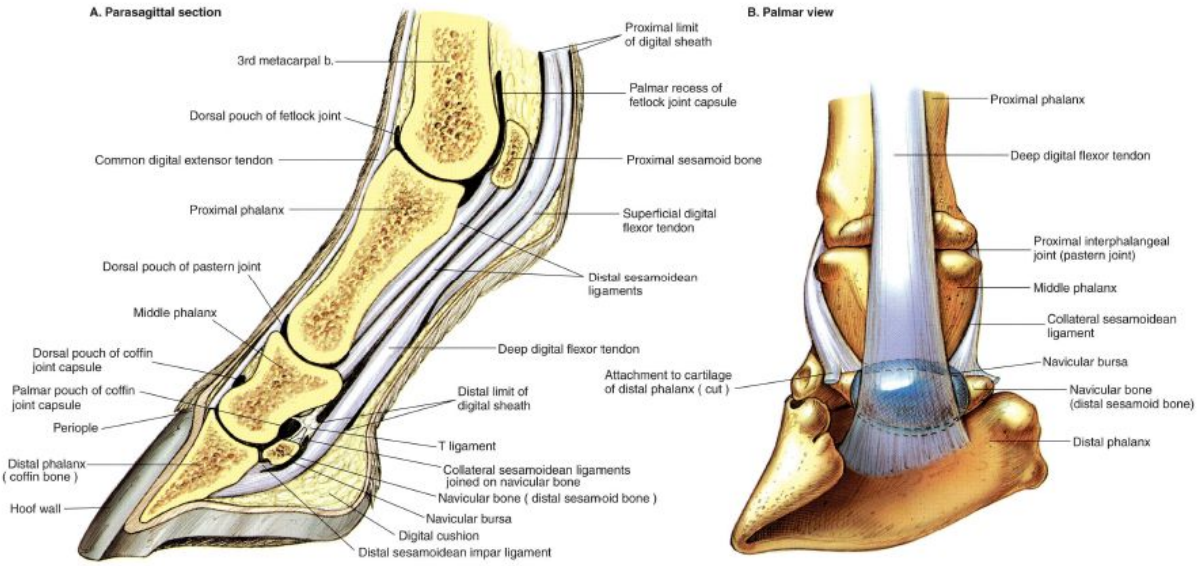


PLATE 1.8 Relations of the hoof. **A**. Separation of the hoof to show its relations to regions of the coriuni. **B**. Three-dimensional dissection to show relations of the hoof wall, coronary and laminar corium, and distal phalanx. **C**. Solar surface of the hoof.

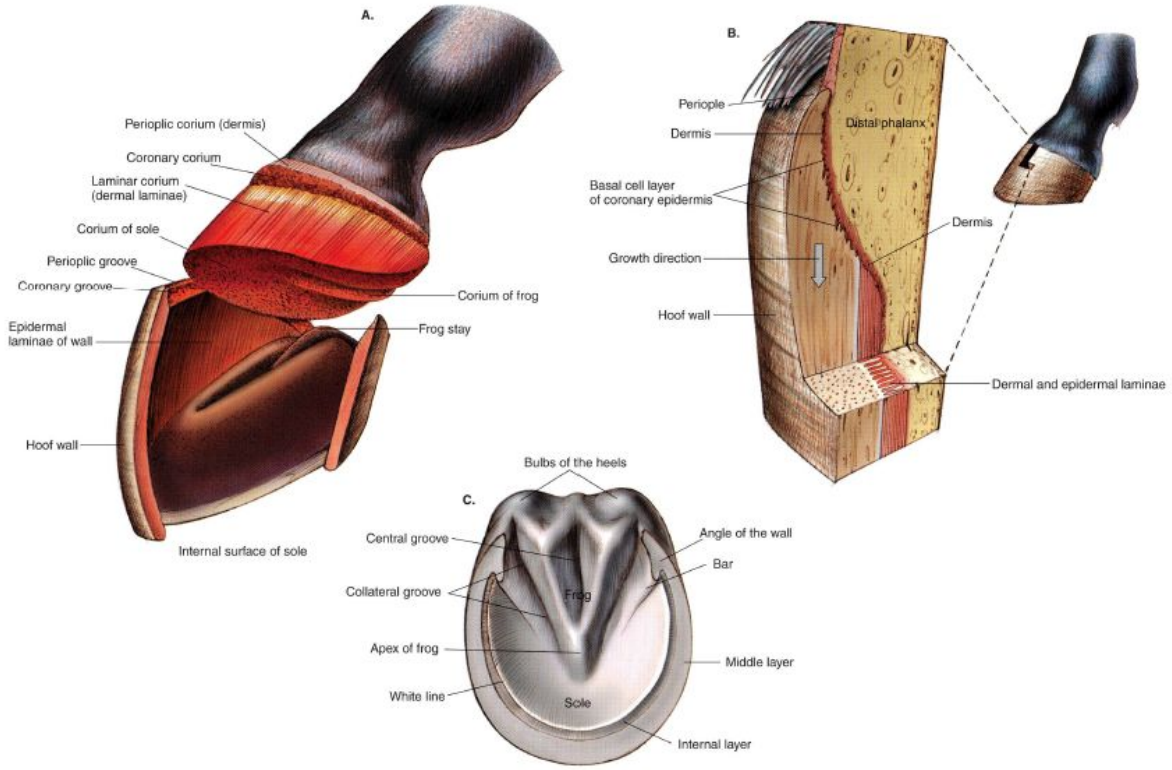


PLATE 1.9 Stay apparatus of the equine forelimb. The continuum of tendons and ligaments with minimal muscular activity stabilizes joints of the forelimb in the standing position, m = muscle

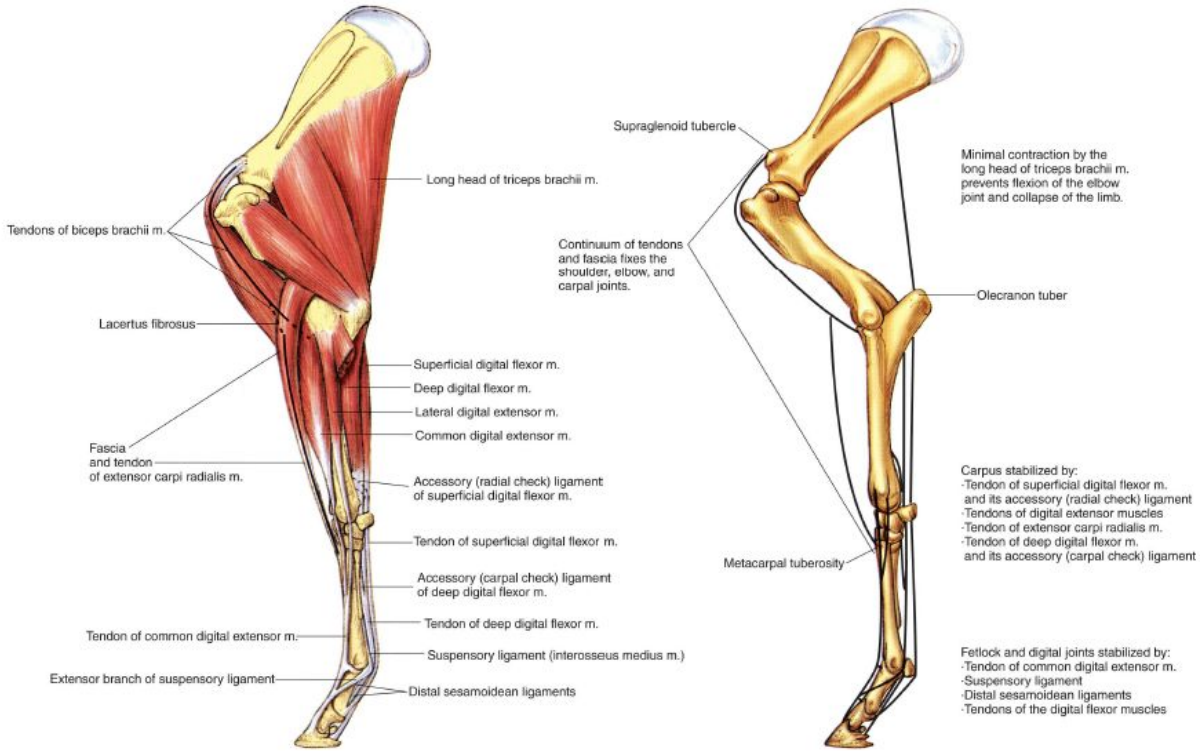


PLATE 1.10 Slay apparatus and reciprocal apparatus of the hindlimb. **A**. One hindlimb partly flexed with its toe on the ground, and the foot of the opposite limb fixed with minimal muscular activity by the stay apparatus. **B**. Stay apparatus of the hindlimb. **C**. The reciprocal apparatus, m = muscle

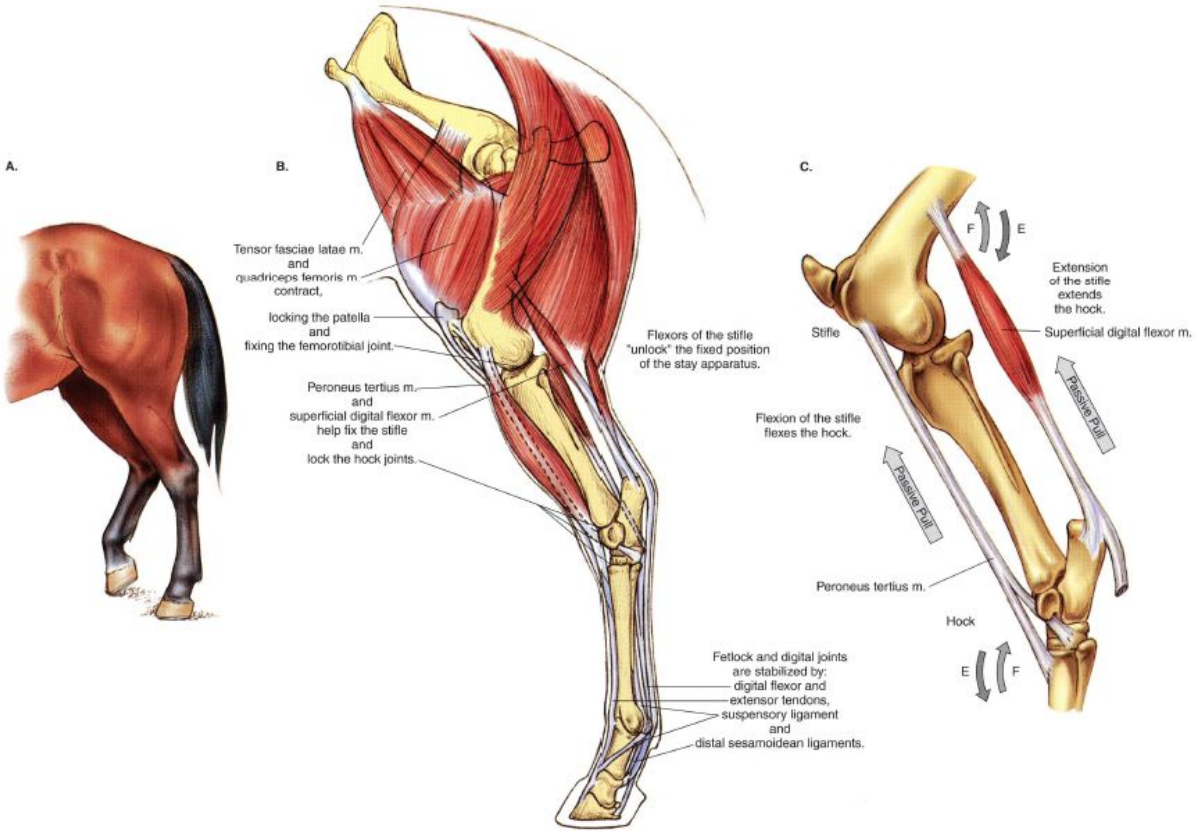


PLATE 1.11 Deep muscles and *in situ* viscera of the stallion Right lateral view, m = muscle, b = bone

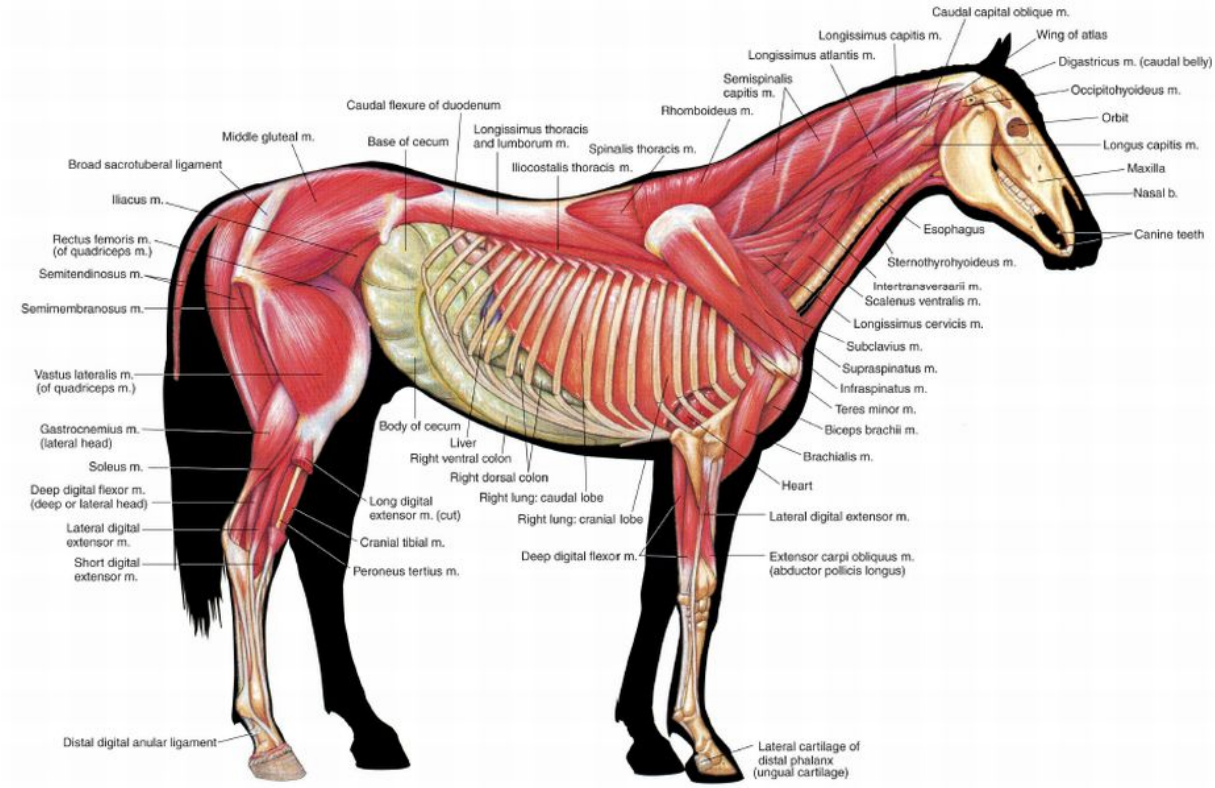


PLATE 1.12 Deep cervical muscles, major joints, and *in situ* viscera of the mare. Left lateral view, n = nerve, v = vein, m = muscle, a = artery, j = joint, lig = ligament

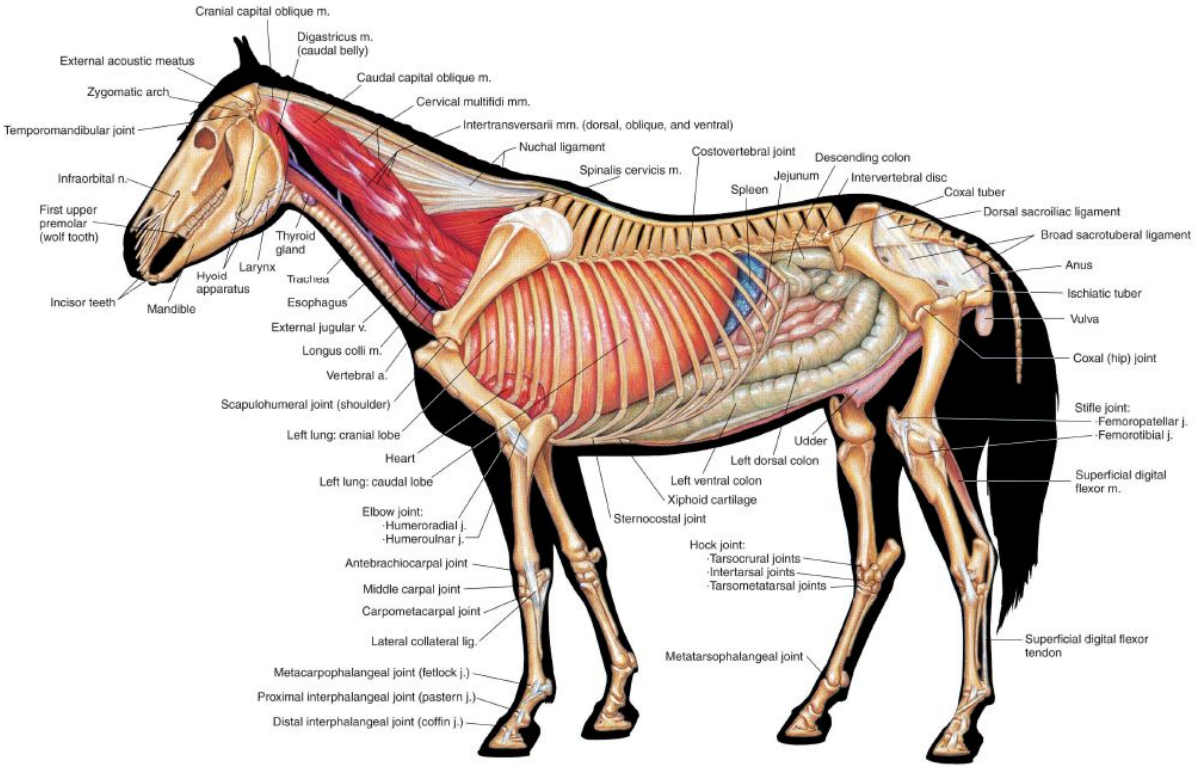


PLATE 1.13 Median section of the horse's head. Nasal septum mostly removed, b = bone, m = muscle

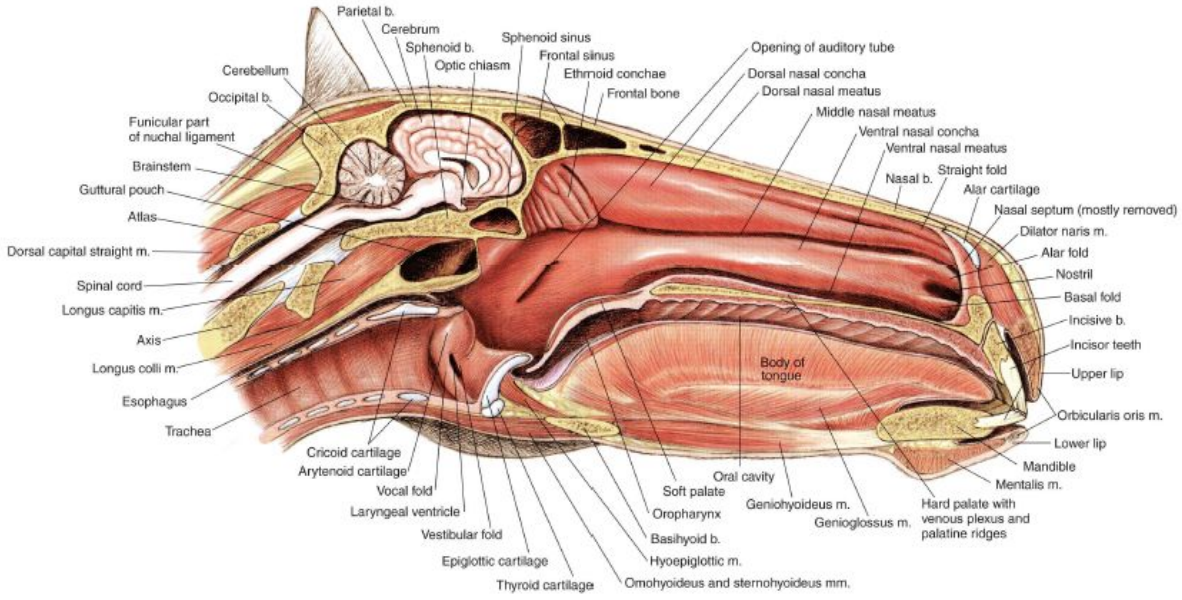


PLATE 1.14 **A**. Occlusal (grinding) surfaces of an equine lower first incisor tooth related to continuous eruption and wear. Approximate levels at advancing ages indicated on a longitudinal section. **B**. Complete dentition of the male horse circa 5 years of age.

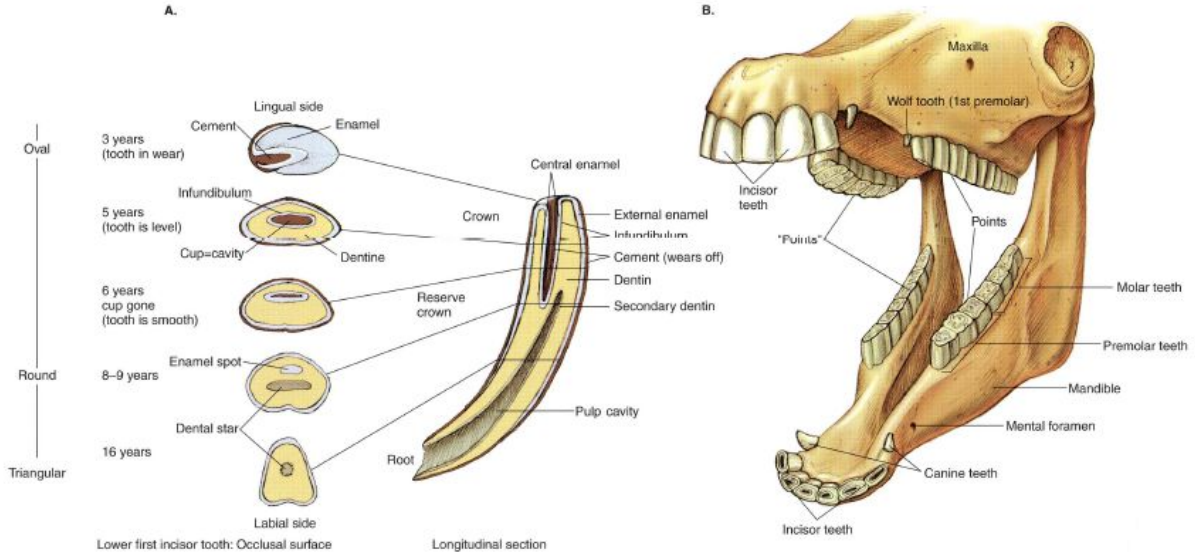


PLATE 1.15 Isolated stomach and intestines of the horse.

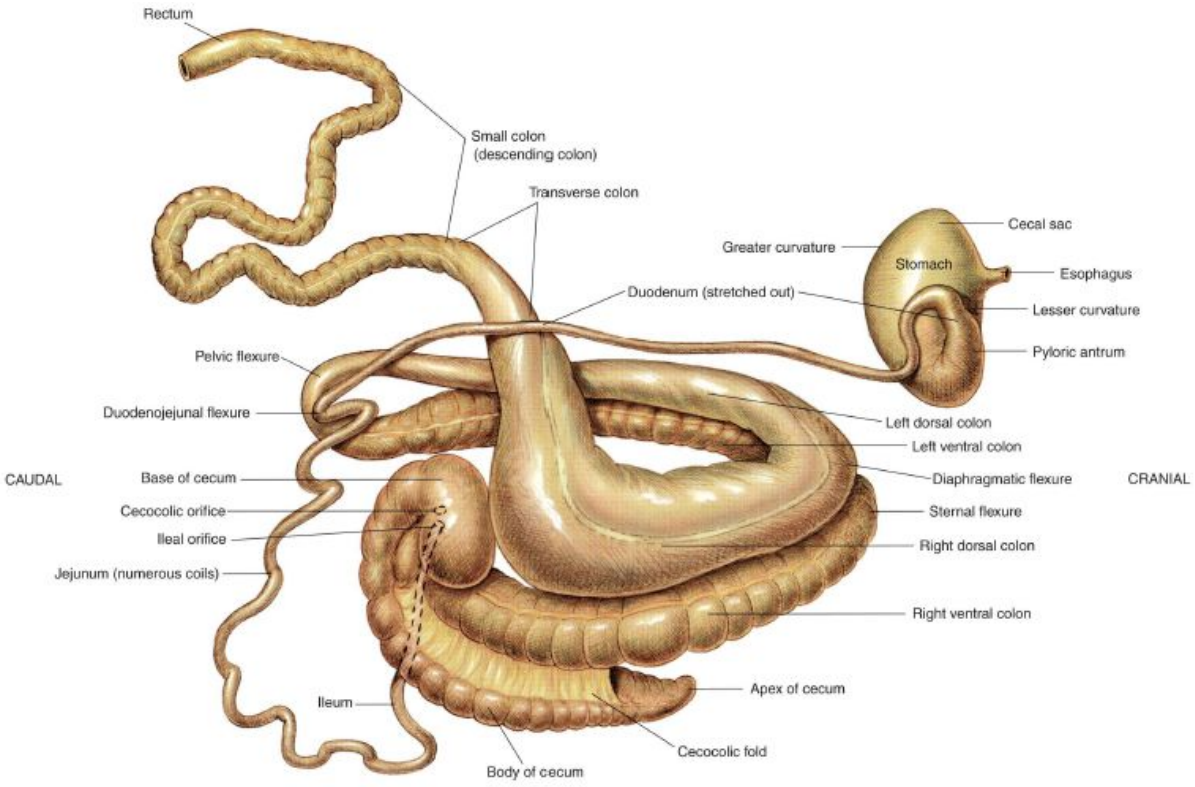


PLATE 1.16 Equine cecum, large (ascending) colon, and transverse colon *in situ*. **A**. Right lateral view. **B**. Left lateral view.

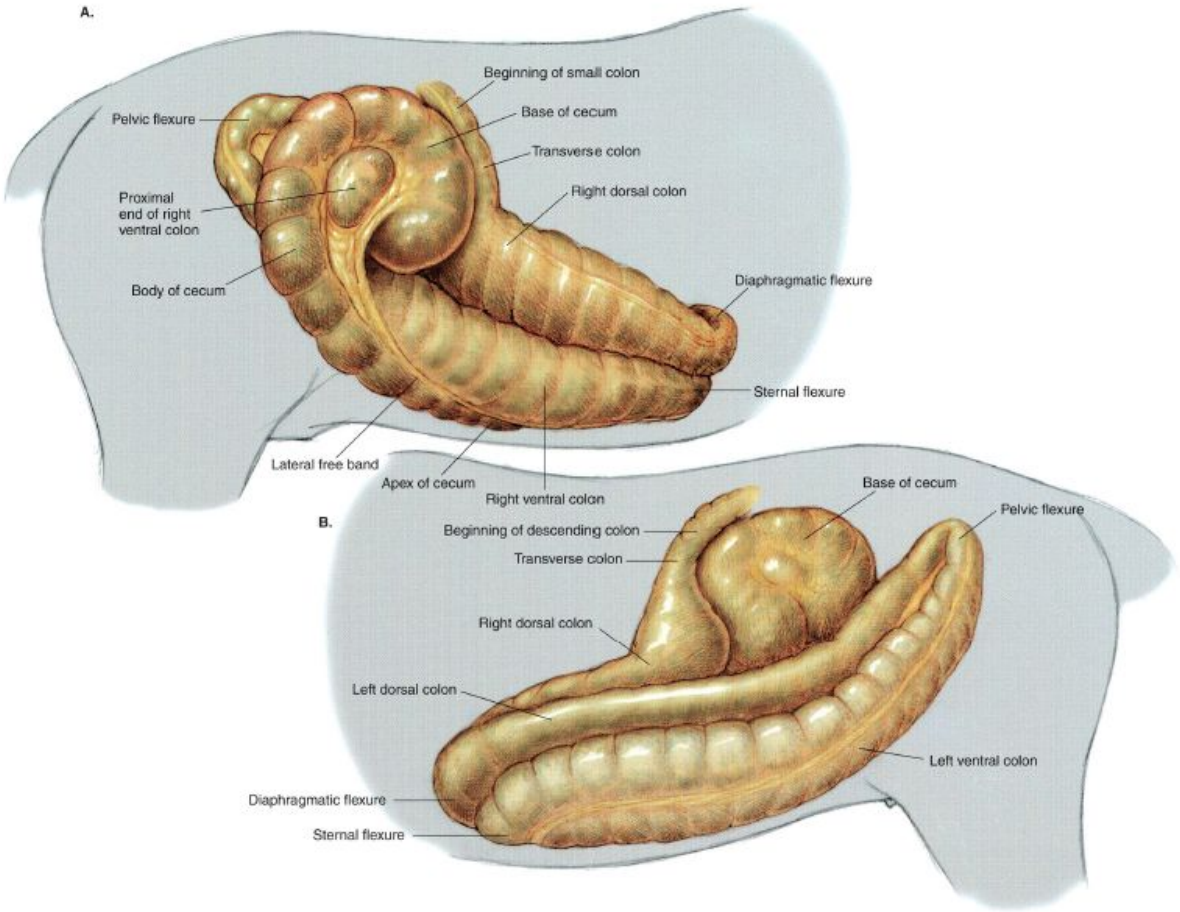


PLATE 1.17 Clinical condition: Right dorsal displacement of the large colon. **A**. Right lateral view. **B**. Dorsal view. This displacement is a common cause of colic in adult horses. Most commonly, the large colon moves from the left side of the abdomen, courses caudad between the right body wall and the cecum, and comes to lie again in the left portion of the abdomen with the pelvic flexure facing toward the diaphragm. In many cases, the pelvic flexure will not migrate that far craniad and will instead be located in the caudal aspect of the abdomen on either side of the body or the median plane.

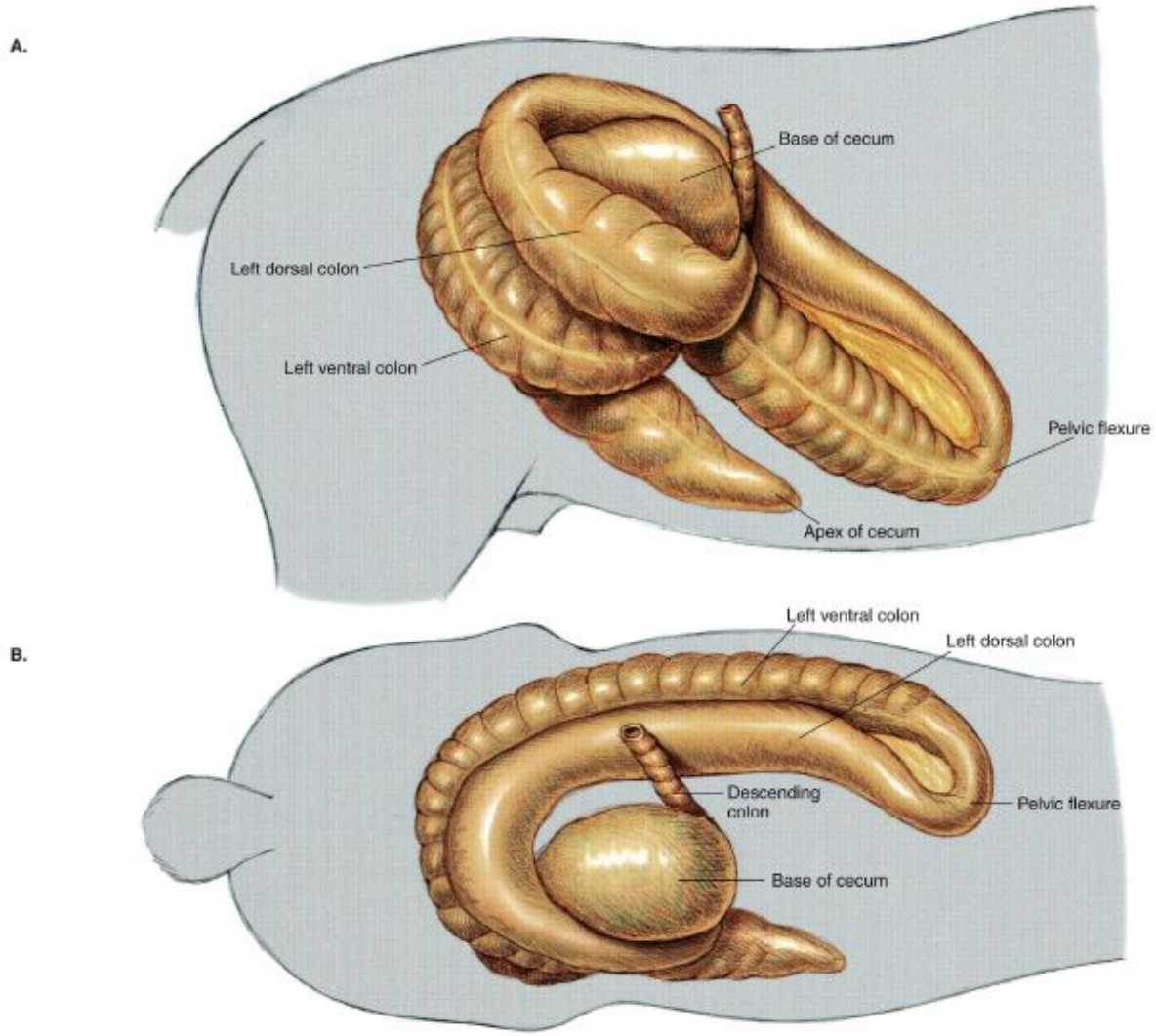


PLATE 1.18 Clinical condition: Left dorsal displacement of the large colon. **A**. Left lateral view. **B**. Cross-section of the left side of the abdomen, Caudocranial view. **C**. Dorsal view. In this displacement, the left colon moves dorsad and becomes entrapped over the nephrosplenic ligament The abnormal position of the left colon can often be confirmed by rectal examination, and, many times, left dorsal displacement can be corrected by anesthetizing and rolling the horse to free the entrapment.

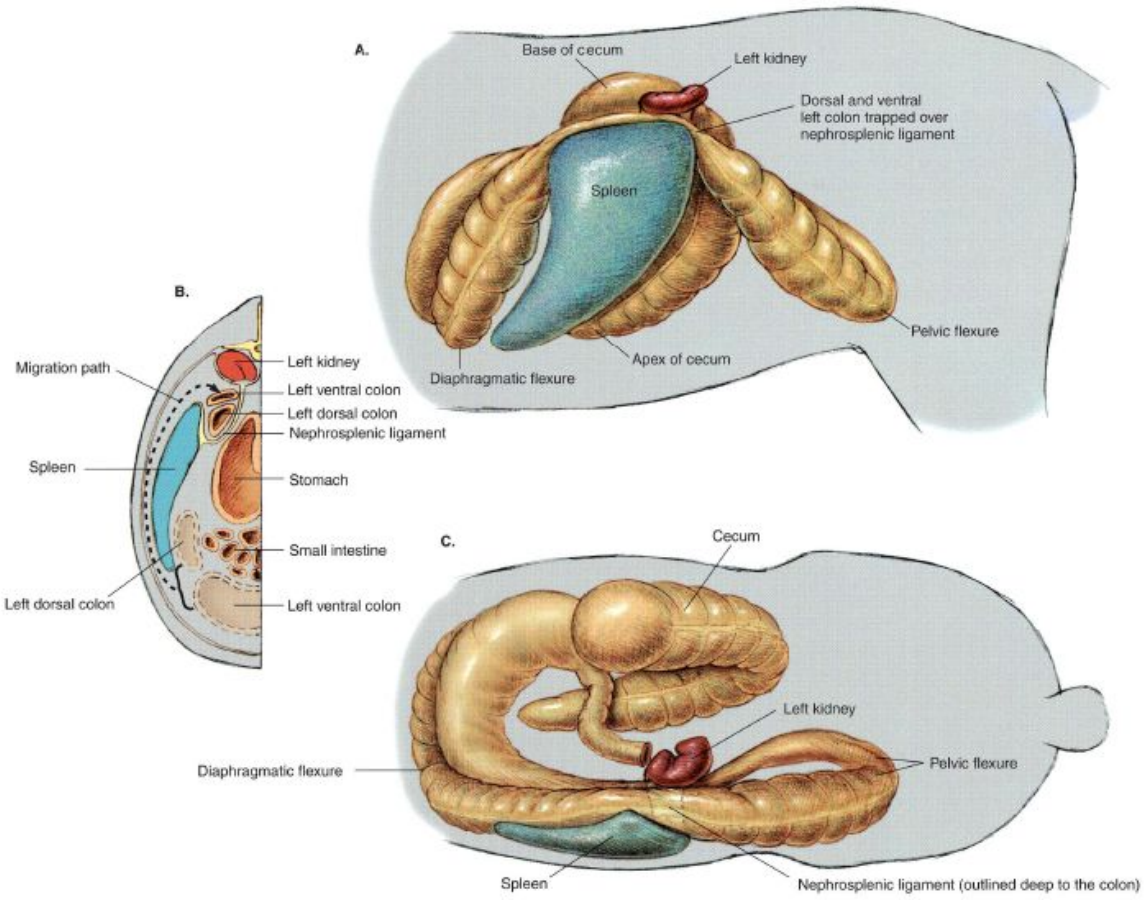


PLATE 1.19 Reproductive organs, urinary organs, liver, heart, and adjacent major vessels related to the skeleton of the stallion. Intestines and lungs are removed. Right lateral view, v = vein, a = artery, m = muscle

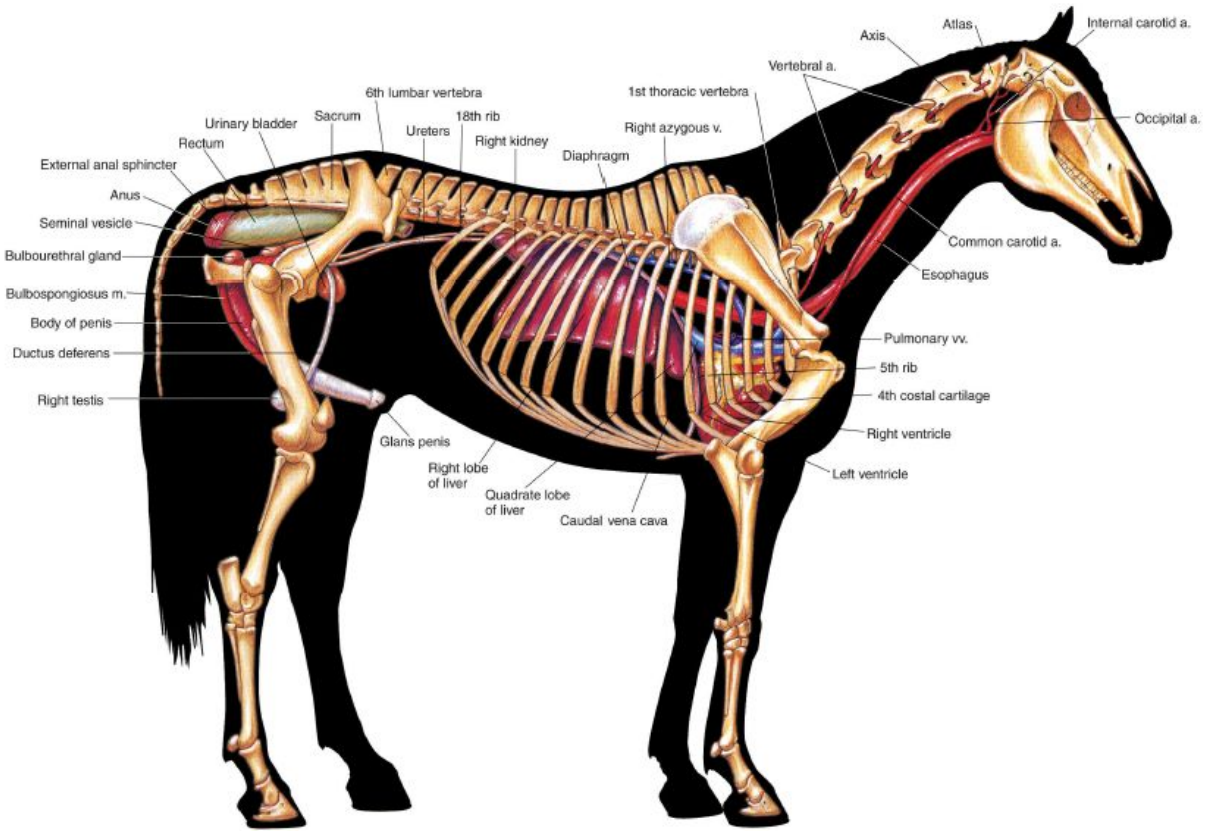


PLATE 1.20 Heart and some adjacent major vessels, abdominal and pelvic viscera, and udder (mammary glands) of the mare. Intestines and lungs arc removed. Left lateral view, a = artery, v = vein, m = muscle

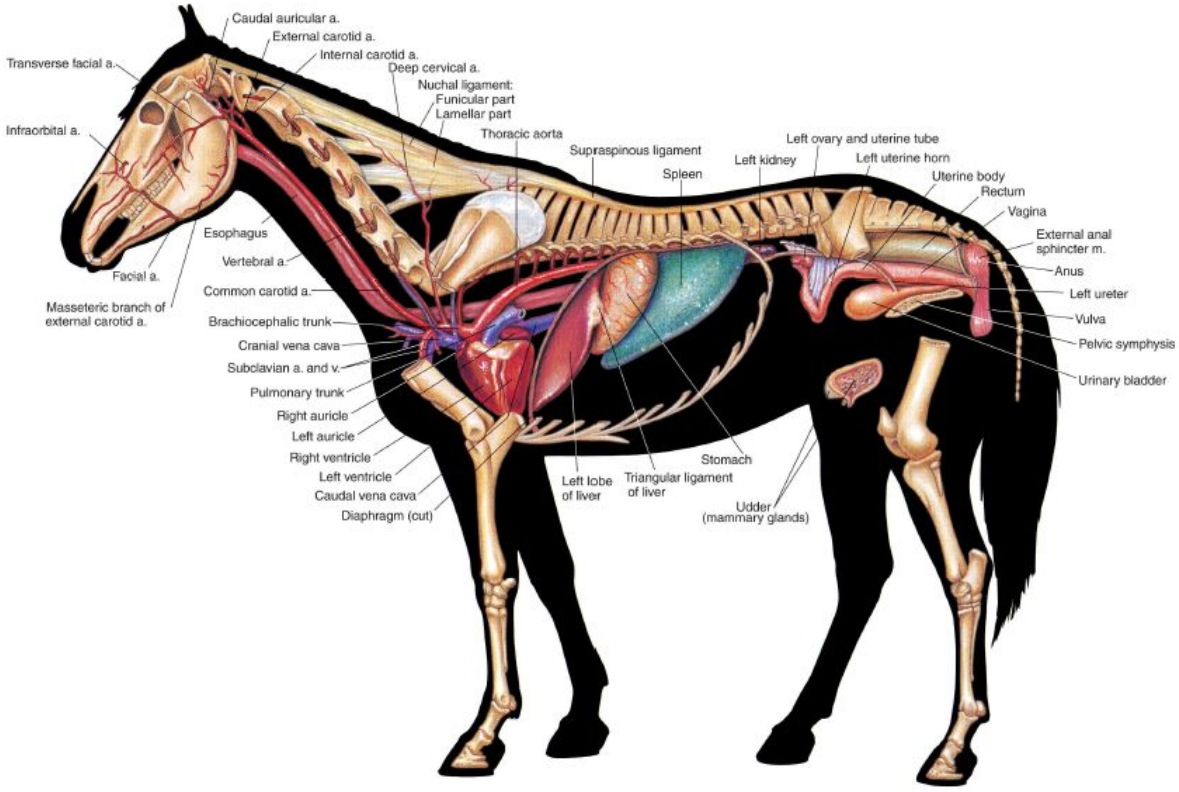


PLATE 1.21 Relations of the reproductive organs of the stallion. Median section, right lateral view, m = muscle

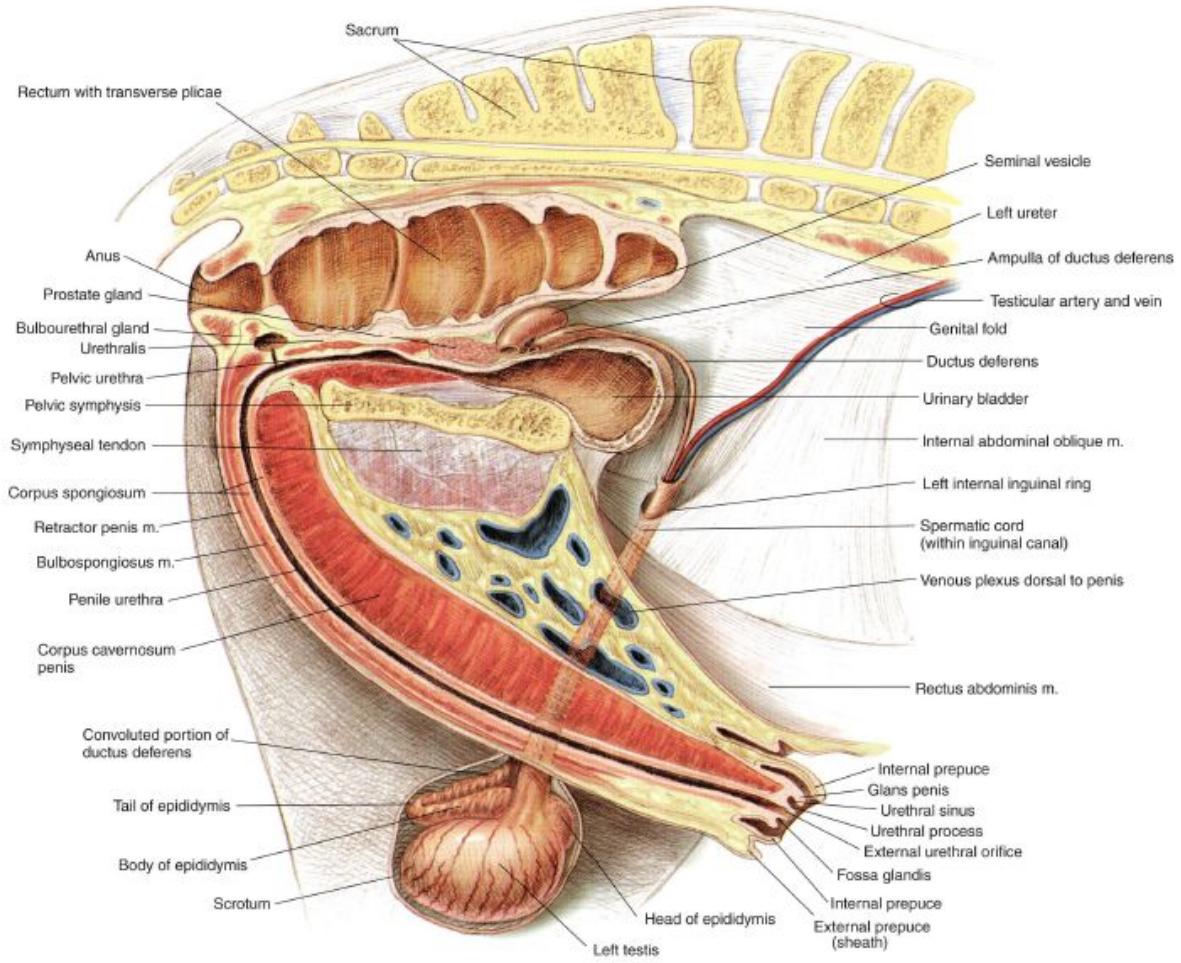


PLATE 1.22 Relations of the reproductive organs of the mare. Partial median section. l.eft lateral view, m = muscle

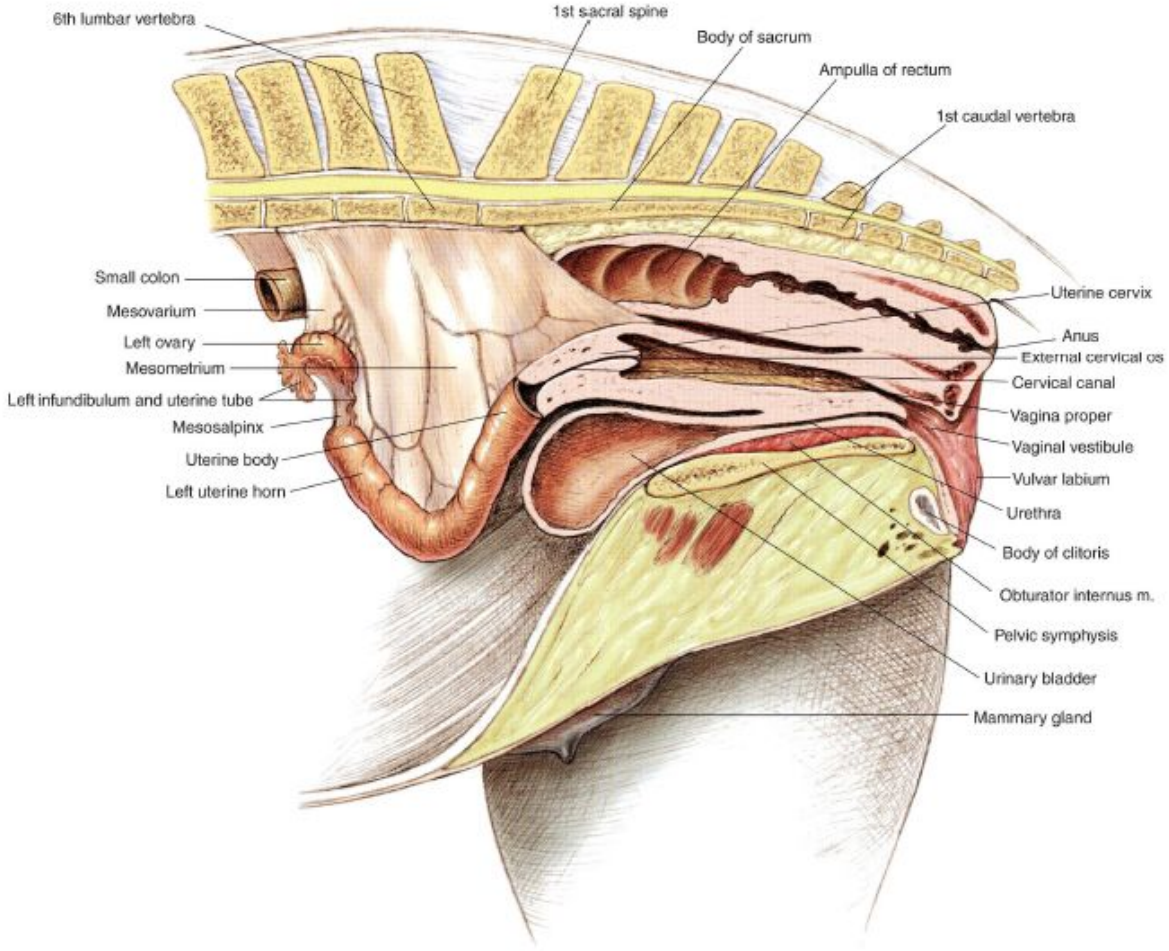


PLATE 1.23 Neonatal organs of the foal. Left lateral view.

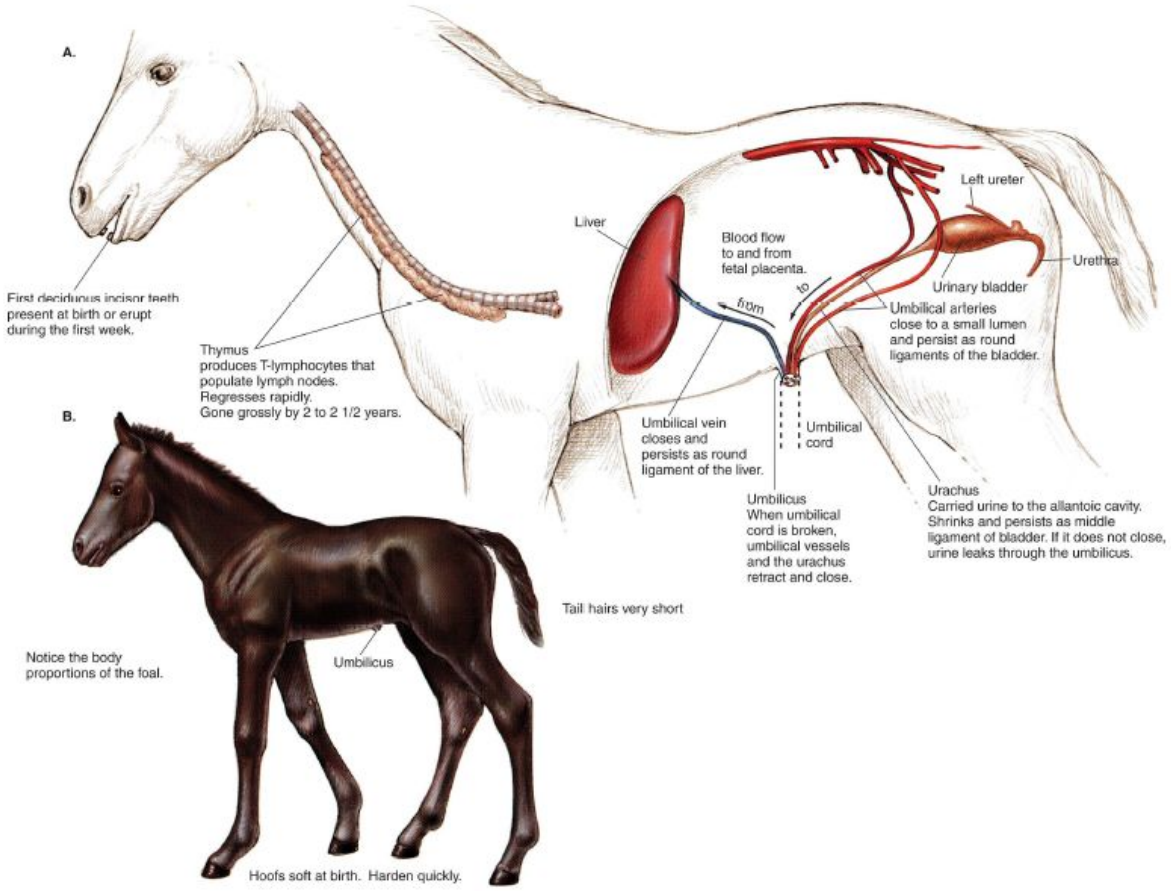


PLATE 1.24 Major arteries of the marc. Left lateral view, a = artery

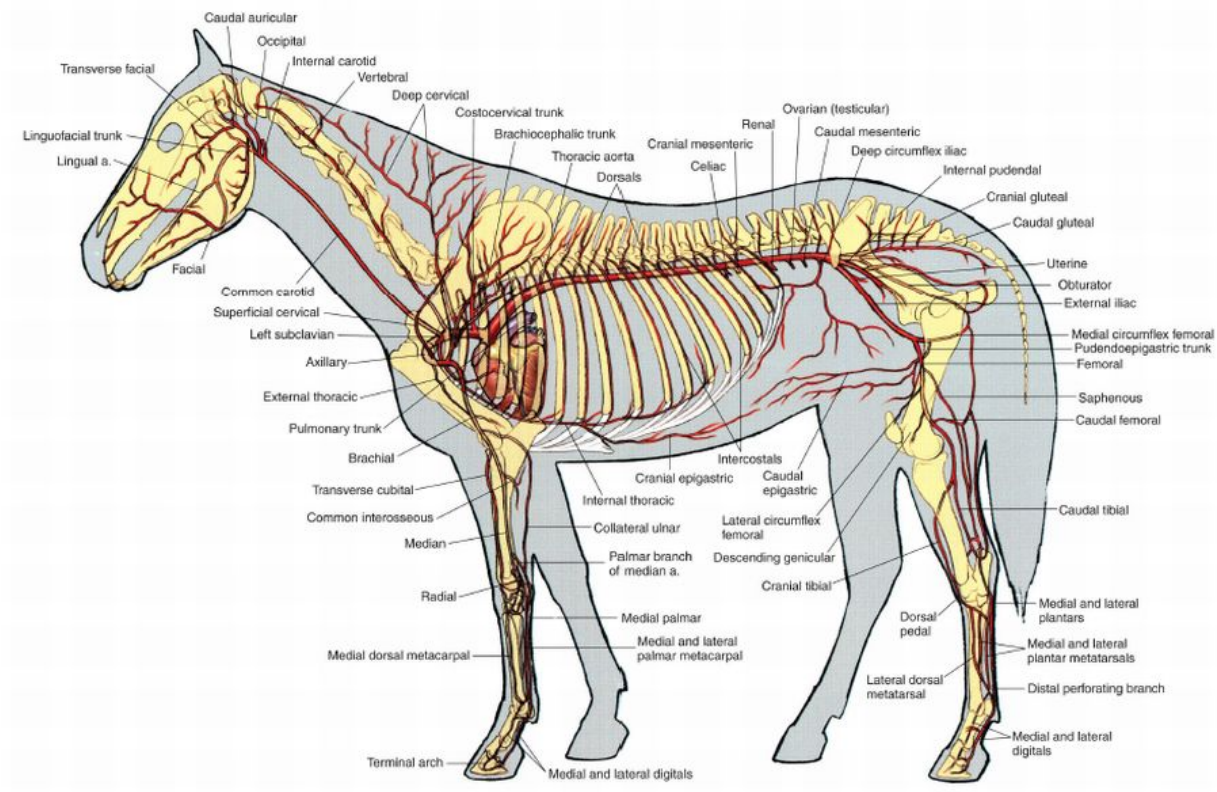


PLATE 1.25 Major veins of Ihe stallion. Portal system excluded. Right lateral view.

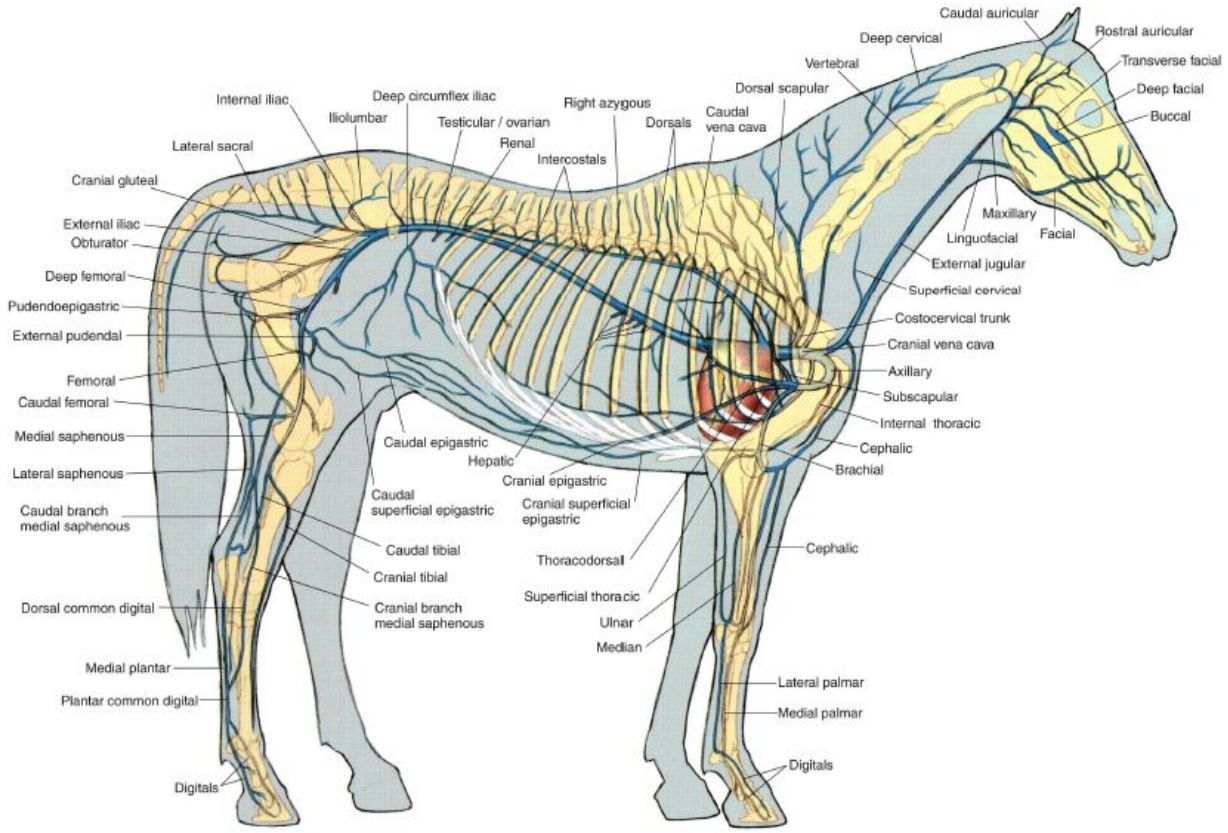


PLATE 1.26 Lymph nodes and vessels of the horse. Right lateral view. *Arrows* indicate the flow of lymph. Lymph node groups in the horse consist of up to dozens of lymph nodes ranging in size from a few millimeters to 2 centimeters in diameter. In = lymph node

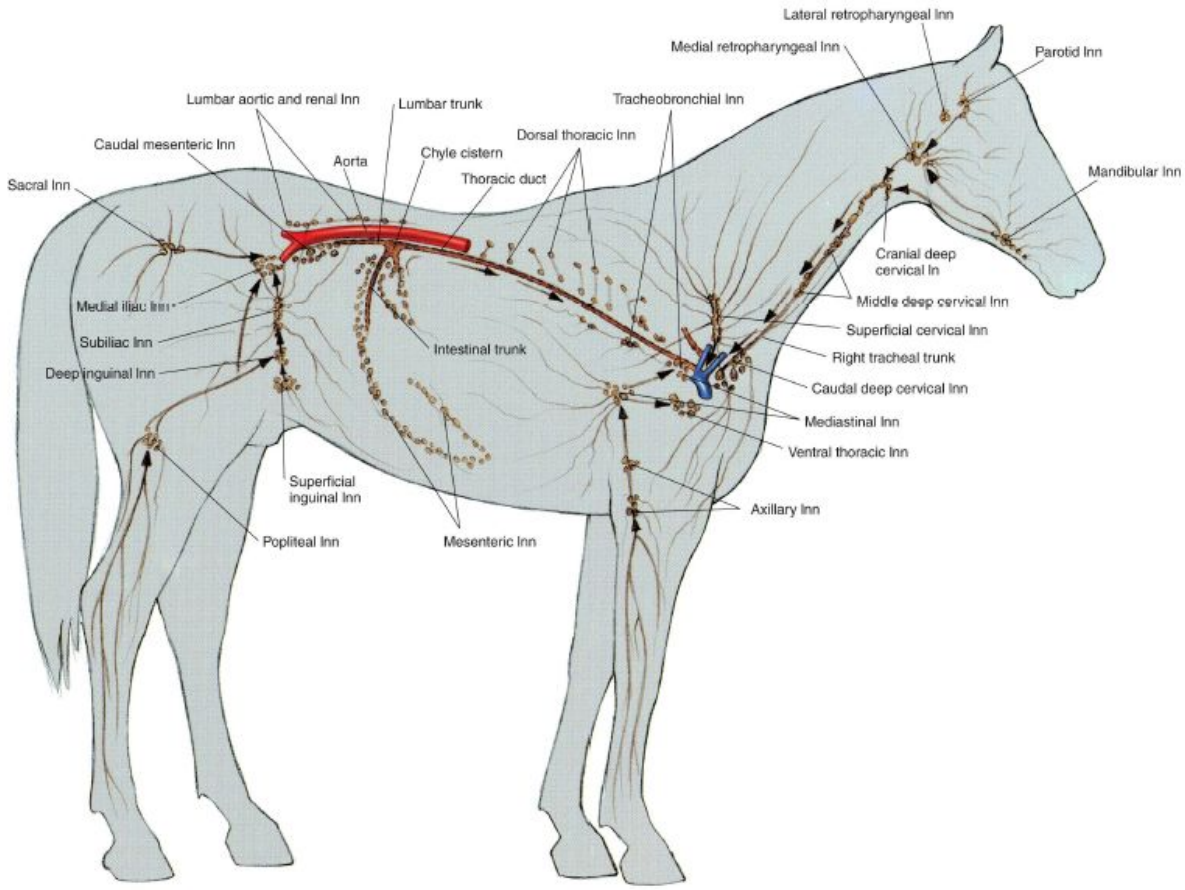


PLATE 1.27 Central and somatic nervous system of the stallion. Right lateral view.

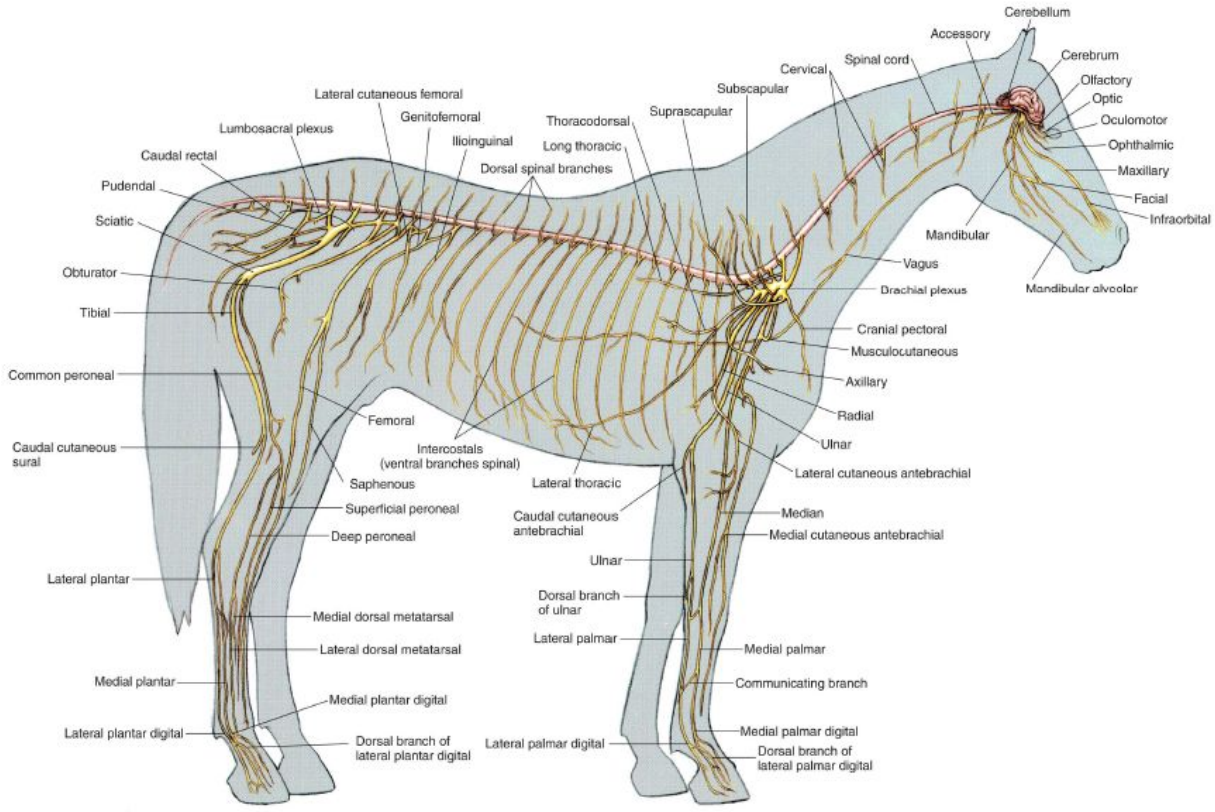
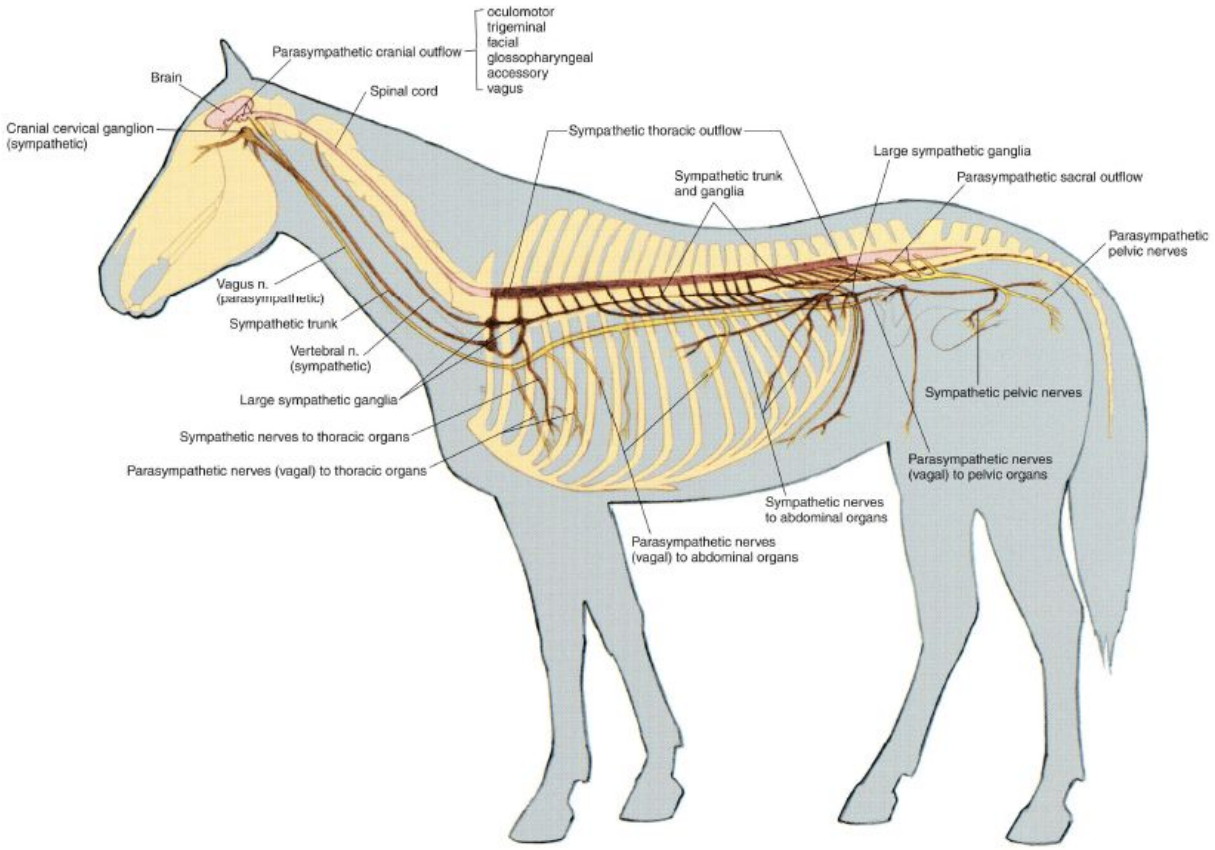


PLATE 1.28 Autonomic nervous system of the mare. Left lateral view, n = nerve


oculomotor
trigeminal
facial
glossopharyngeal
accessory
vagus
Parasympathetic cranial outflow
Brain
Spinal cord
Cranial cervical ganglion (sympathetic)
Sympathetic thoracic outflow
Large sympathetic ganglia
Sympathetic trunk and ganglia
Parasympathetic sacral outflow
Parasympathetic pelvic nerves
Vagus n. (parasympathetic)
Sympathetic trunk
Vertebral n. (sympathetic)
Large sympathetic ganglia
Sympathetic nerves to thoracic organs
Parasympathetic nerves (vagal) to thoracic organs
Sympathetic pelvic nerves
Parasympathetic nerves (vagal) to pelvic organs
Sympathetic nerves to abdominal organs
Parasympathetic nerves (vagal) to abdominal organs

SECTION 2 THE OX (*Bos taurus*, also *Bos indicus*)

PLATES

PLATE 2.1 Right lateral view of a beef bull.

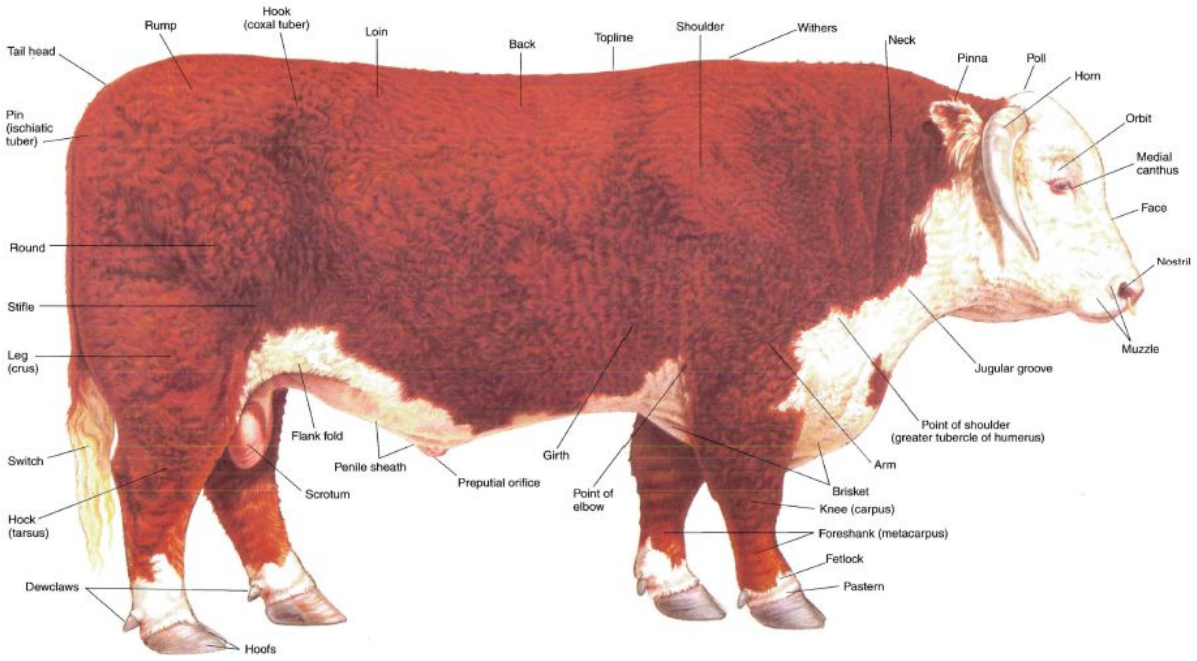


PLATE 2.2 Left lateral view of a diary cow. Dorsal vertebral regions indicated.

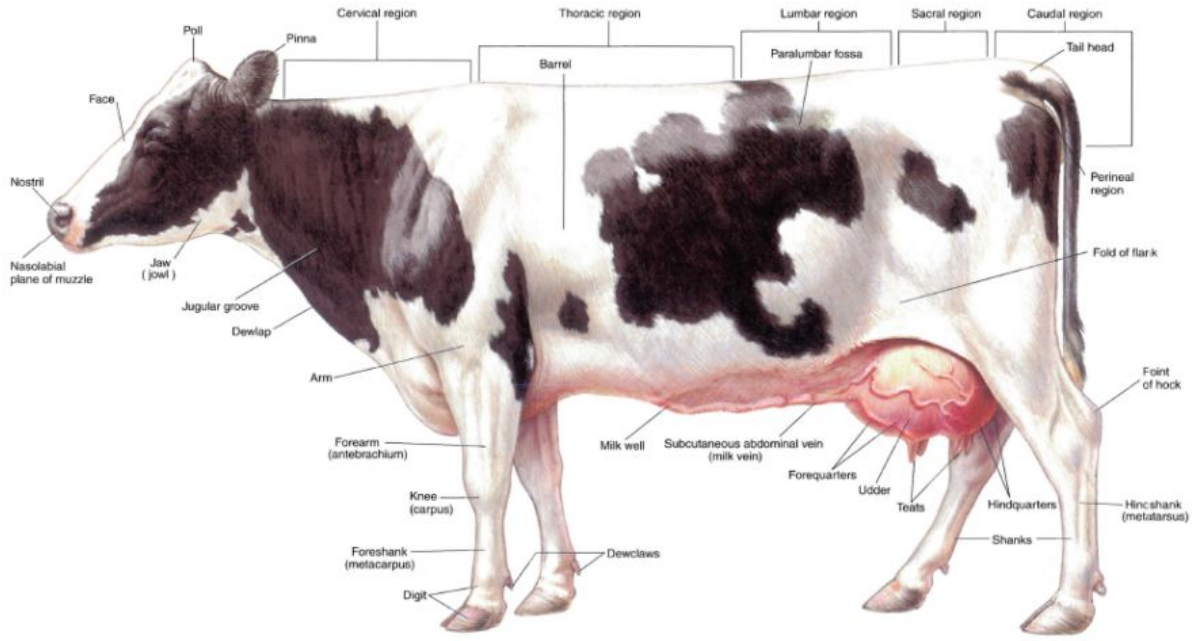


PLATE 2.3 Body regions of the ox. Right lateral view.

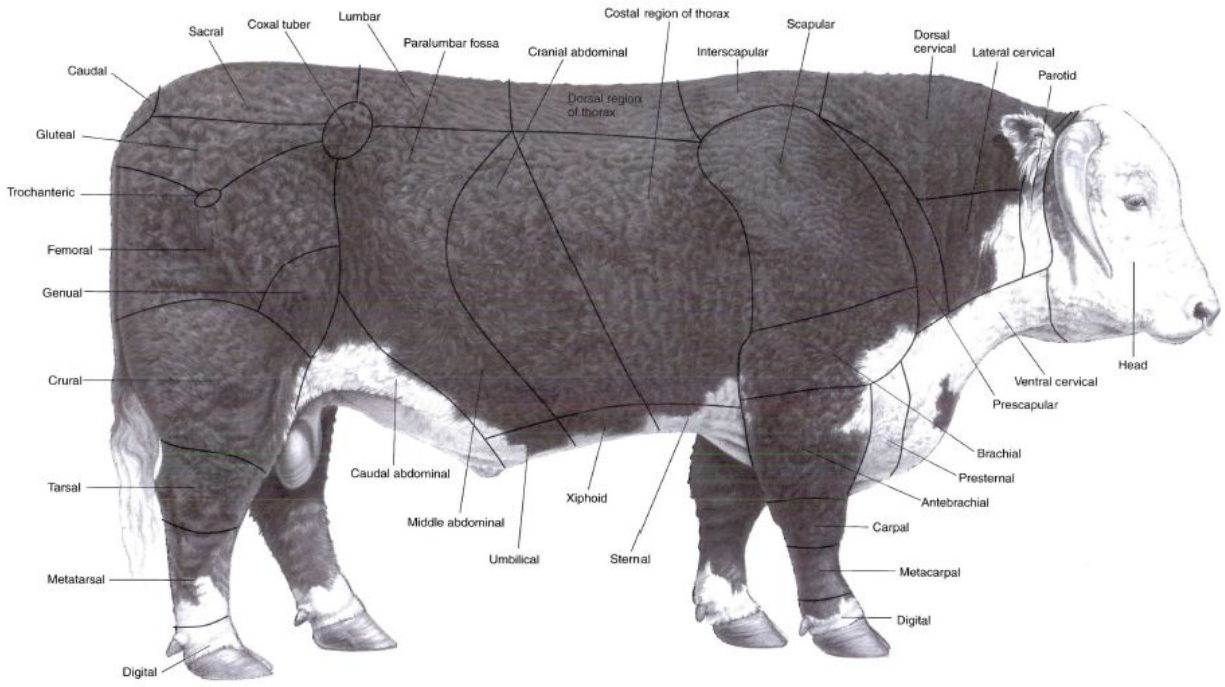


PLATE 2.4 Skeleton of the ox. Left lateral view C = cervical vertebra, T = thoracic vertebra, L = lumbar vertebra, b = bone

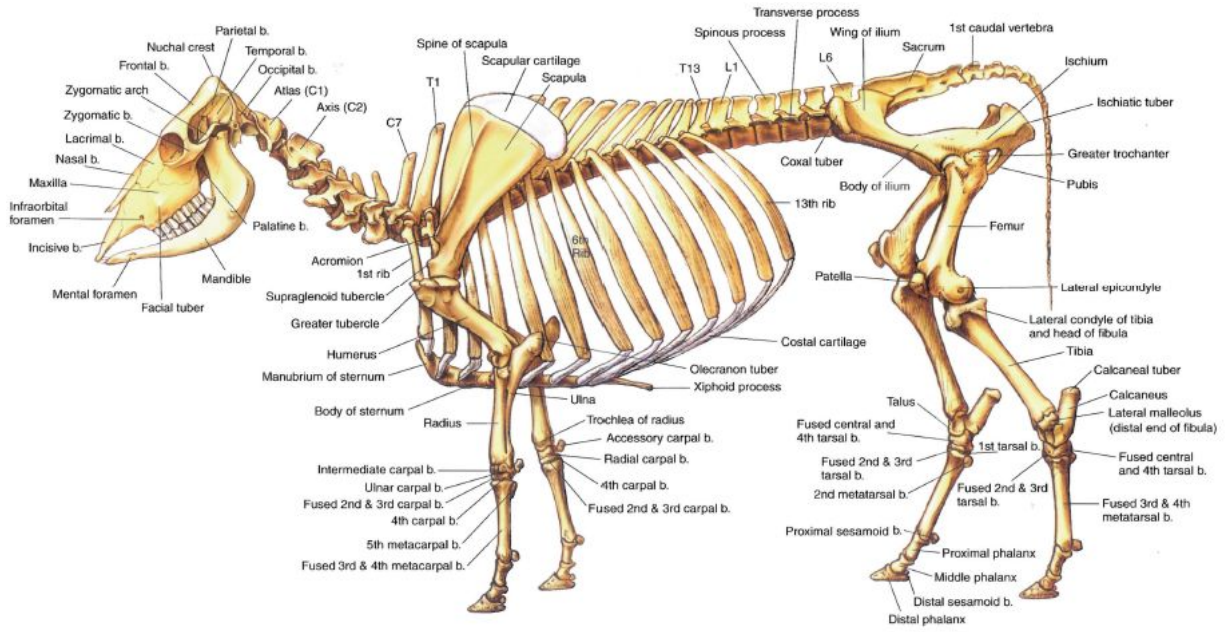


PLATE 2.5 Cutaneous muscles and major fasciae of the bull. Right lateral view. n = nerve, m = muscle

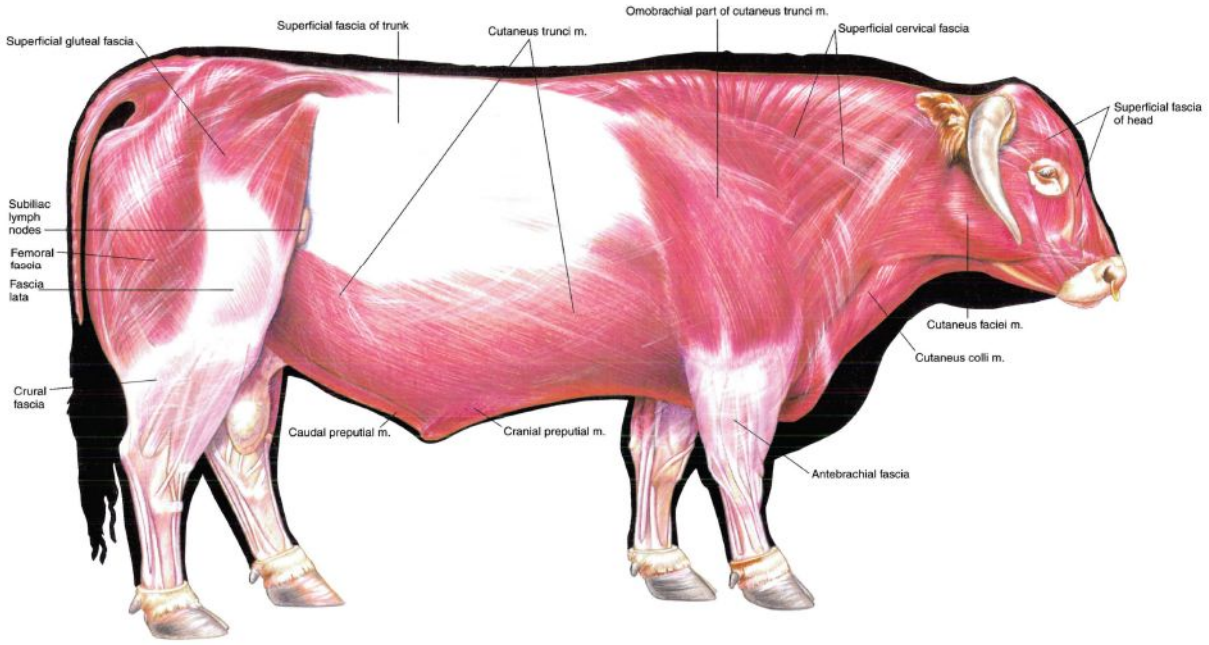


PLATE 2.6 Superficial muscles and veins of the cow. Left lateral view. m = muscle, v = vein, a = artert, n = nerve

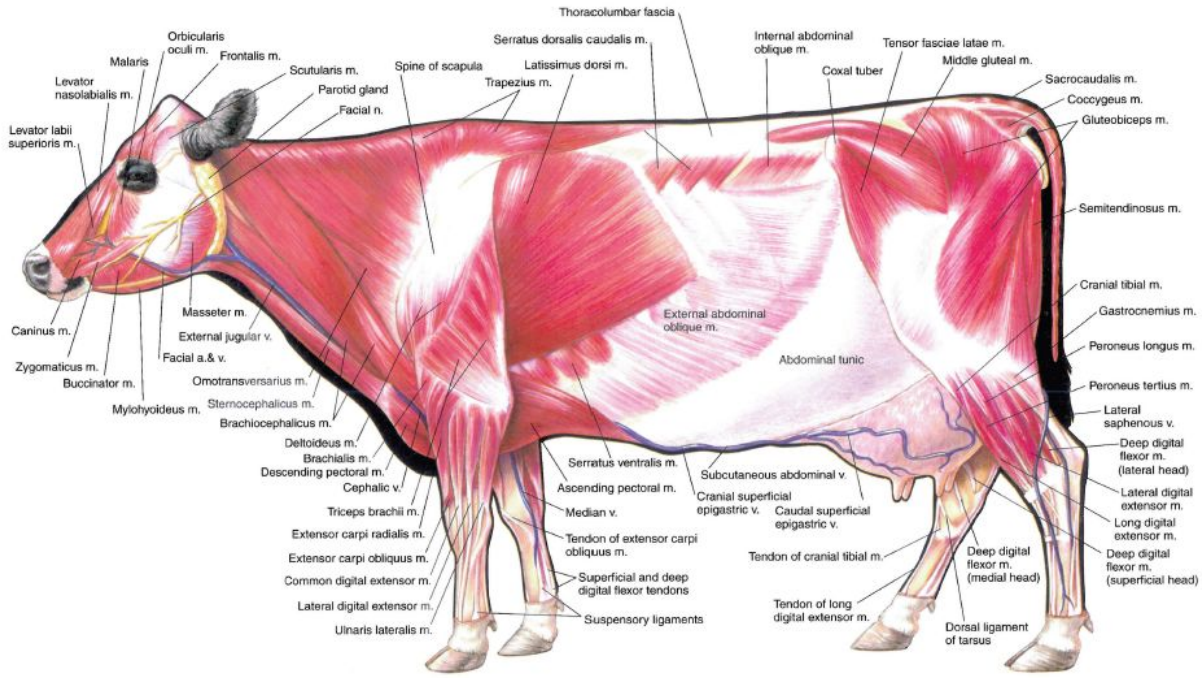


PLATE 2.7 Deep cervical muscles and *in situ* viscera of the bull. Greater omentum removed. Right lateral view. m = muscle, n = nerve

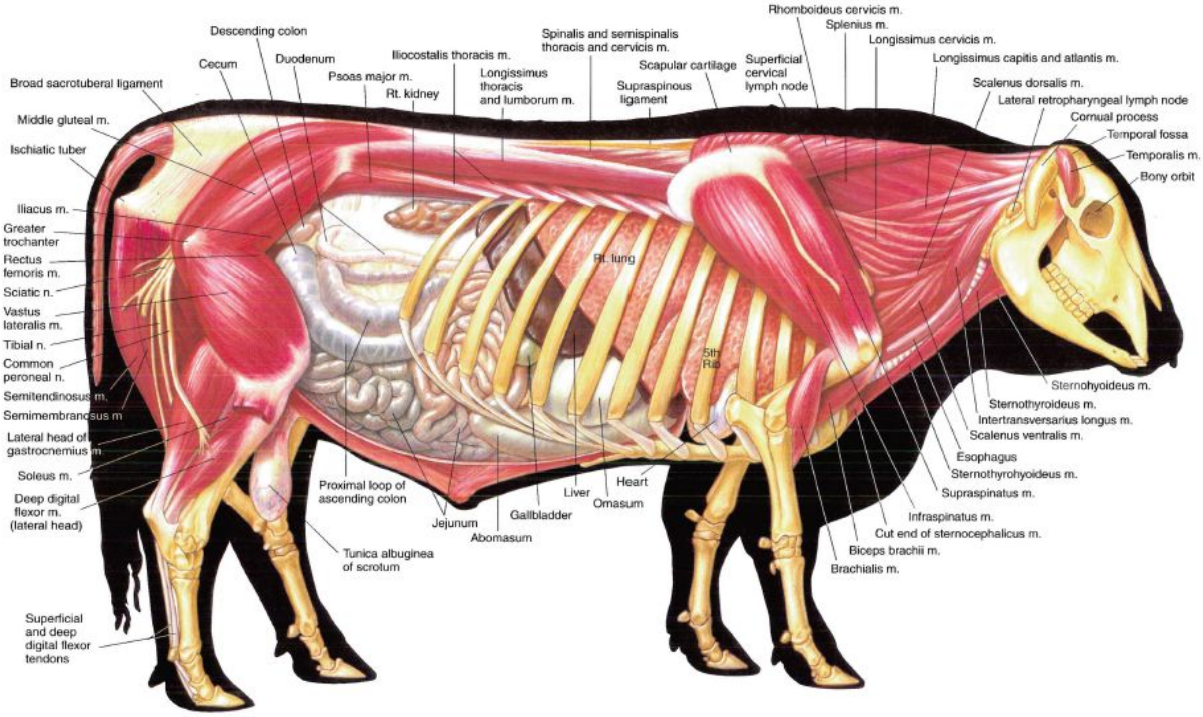


PLATE 2.8 Deep cervical muscles, major joints, *in situ* viscera, and udder of the cow. Left lateral view. m = muscle, lig = ligament

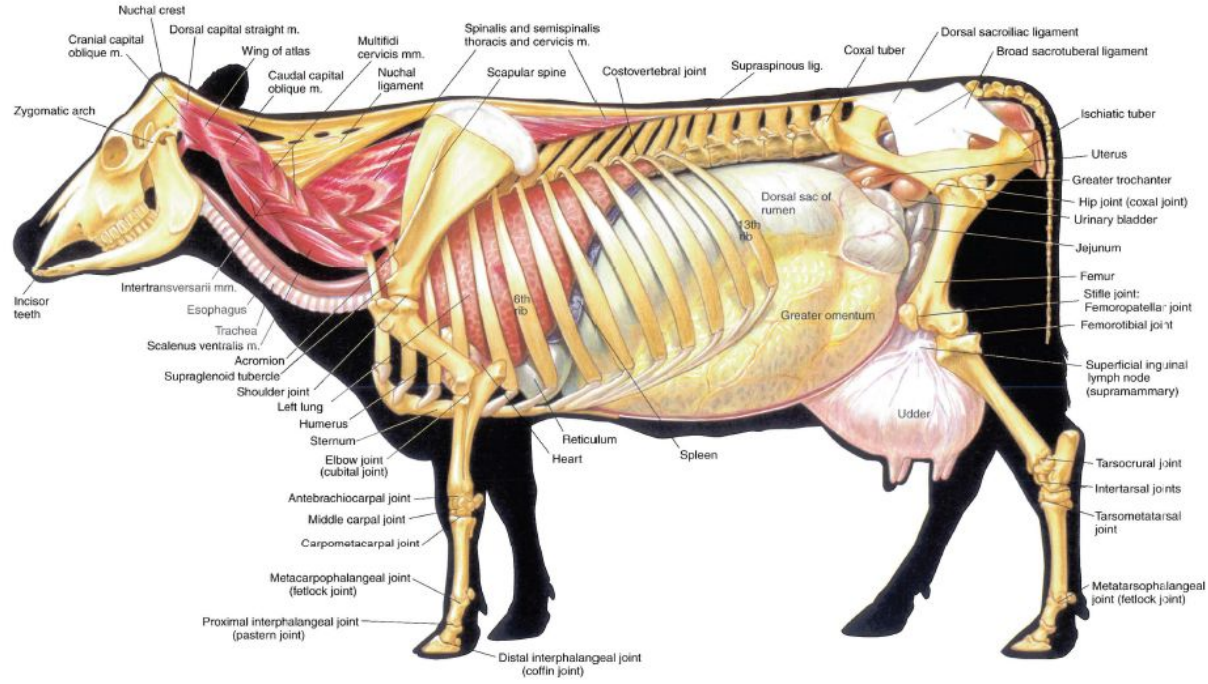


PLATE 2.9 Meidan section of the head and left lateral view of the respiratory system of the ox. b = bone

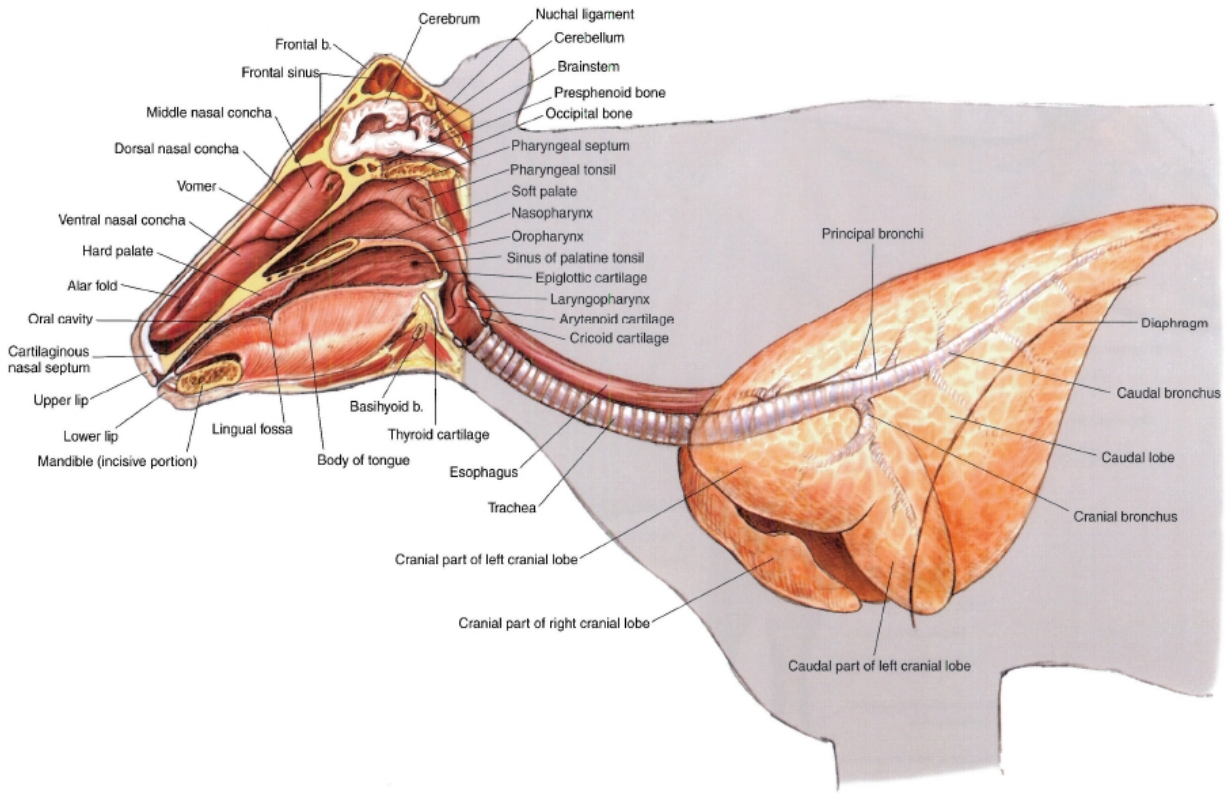


PLATE 2.10 Interior of the rumen and reticulum of the cow. Left lateral view.

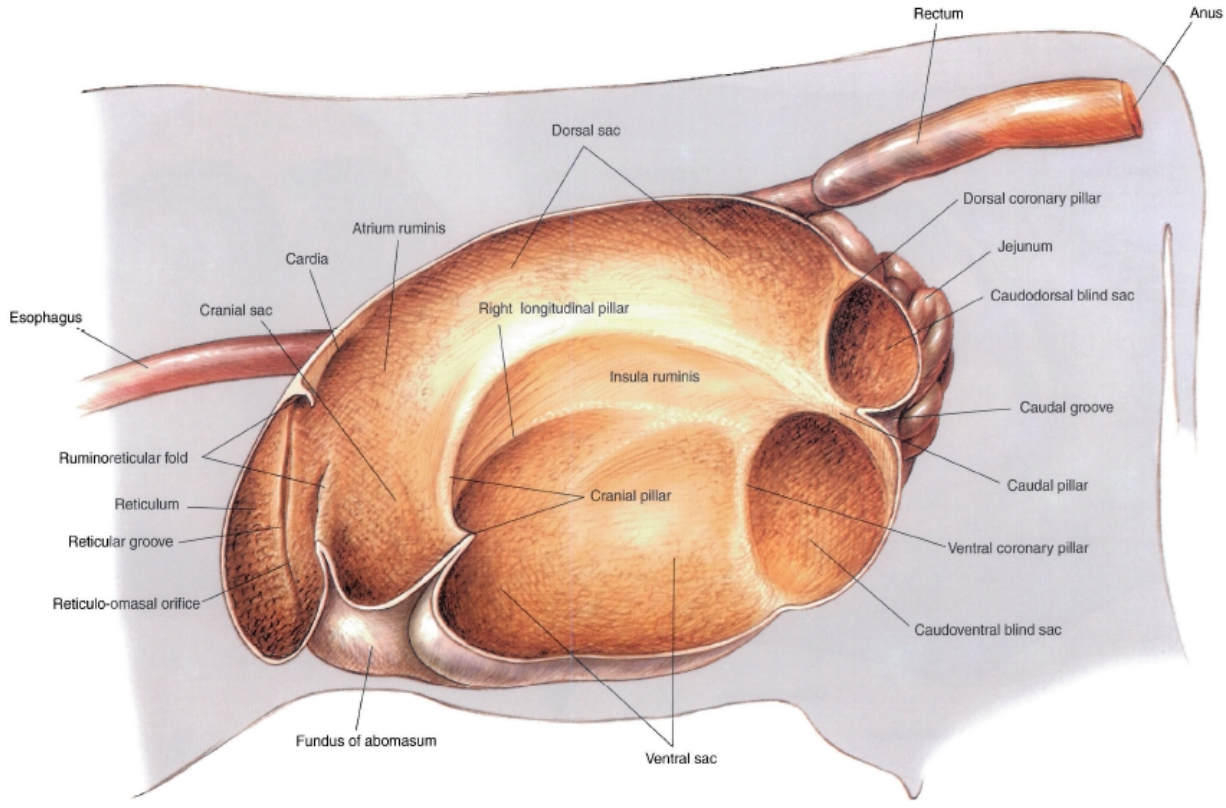


PLATE 2.11 Clinical condition: Right volvulus of the abomasum in a bull. **A.** Right lateral view. **B.** Cross-section. Caudocranial view. This problem occurs in cattle of varying types and ages. The long axis of the abomasum rotates dorsad and caudad, moving the greater curvature of the abomasum counterclockwise and toward the pelvis. This abnormal configuation displaces the liver mediad and draws the pyloric antrum and duodenum around the cranial aspect of the omasum.

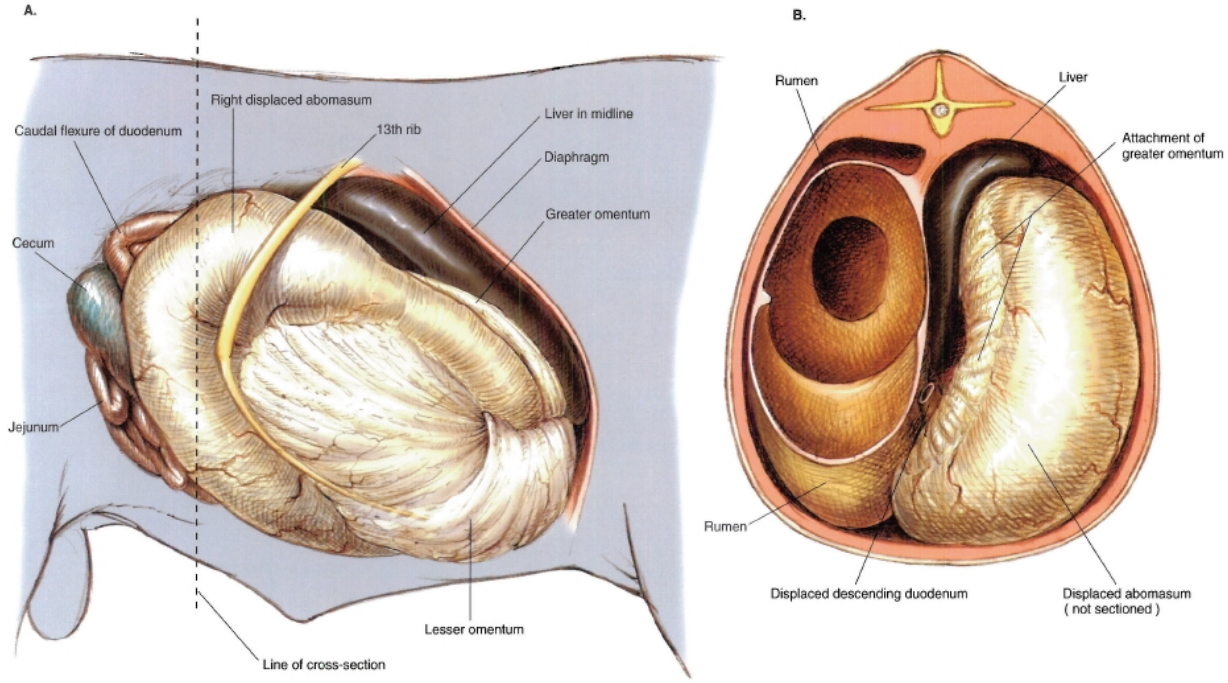


PLATE 2.12 Clinical condition: Left displacement of the abomasum in a cow. **A.** Left lateral view. **B**. Cross-section. Caudocranial view. This problem can occur commonly in lactating dairy cattle during the first month postpartum and less frequently during other times or in other types of cattle. The gas-filled abomasum moves to the left and dorsad in the abdomen. It displaces the partially filled rumen mediad and distorts the normal position and orientation of the reticulum, omasum, and cranial rumen.

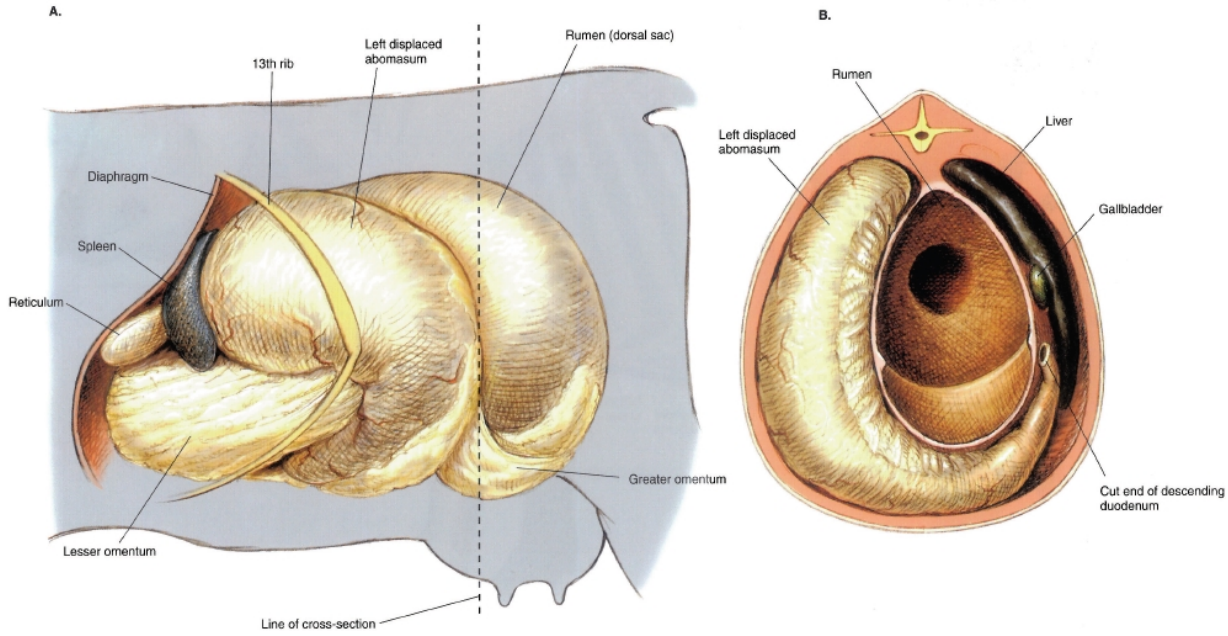


PLATE 2.13 Reproductive organs, urinary organs, liver, heart, and adjacent major vessels related to the skeleton of the bull Stomach, intestines, and lungs are removed. Right lateral view, a = artery, v = vein, m = muscle

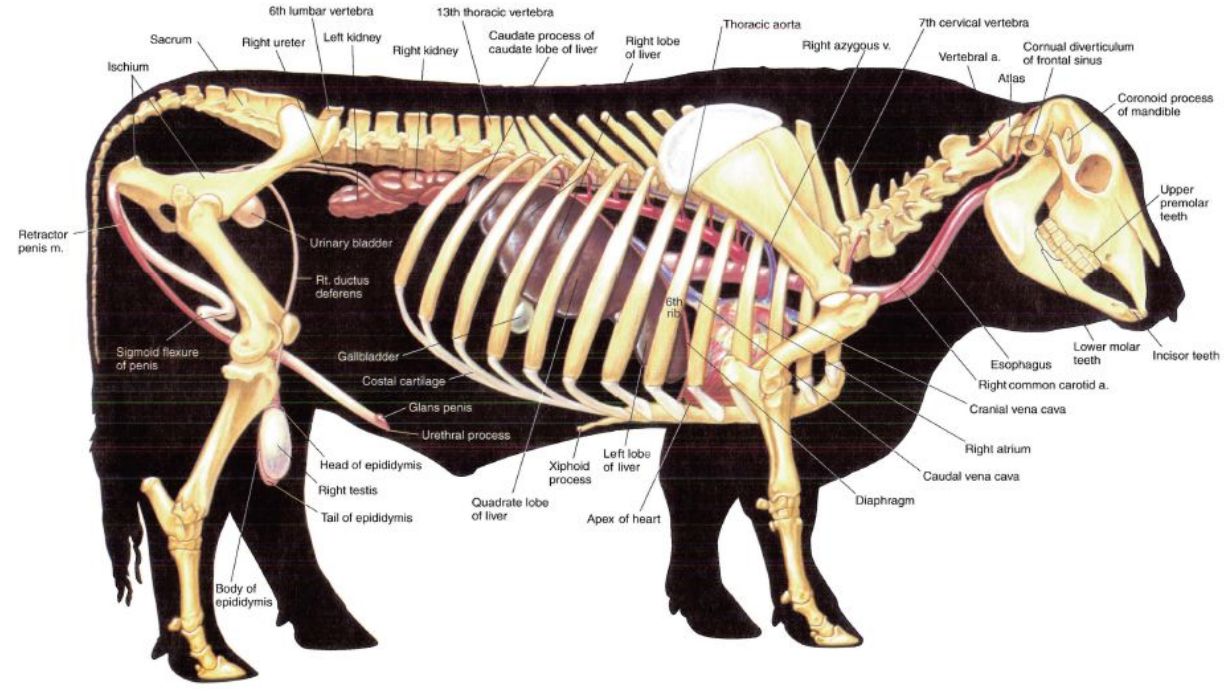


PLATE 2.14 Heart and adjacent major vessels, abdominal and pelvic viscera, and udder (mammary glands) of the cow. Lungs and intestines are removed. Left lateral view, v = vein, a = artery

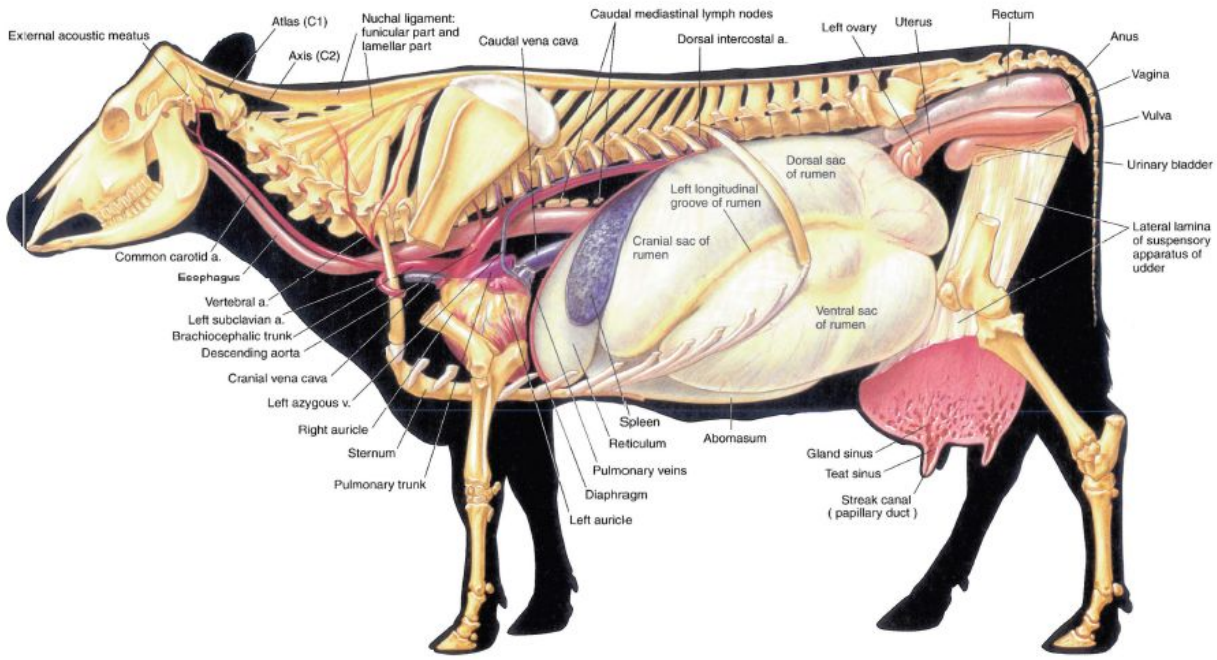


PLATE 2.15 Relations of the reproductive organs of the bull. Median section, m = muscle

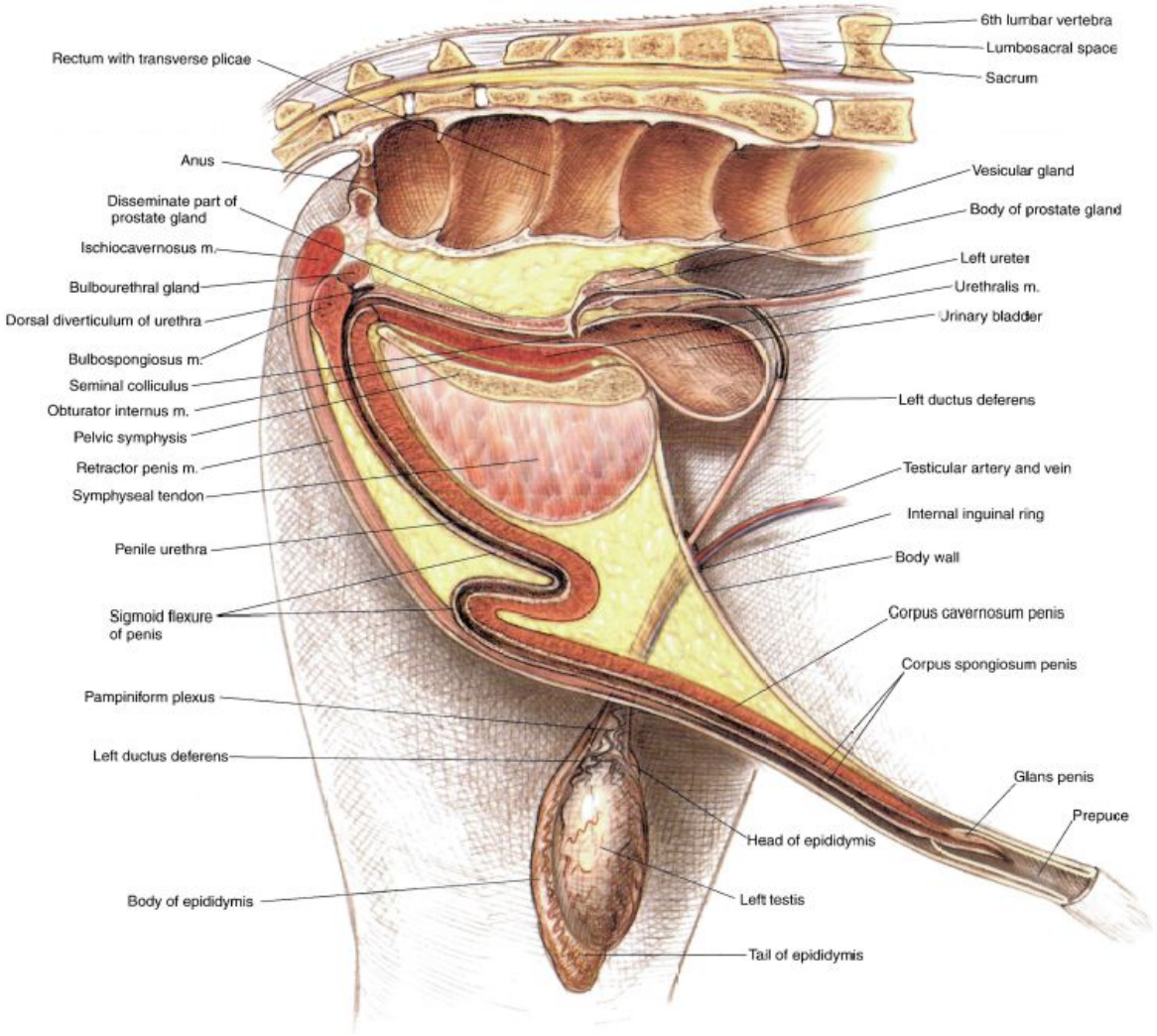


PLATE 2.16 Relations of the reproductive organs of the bull. Median section, m = muscle

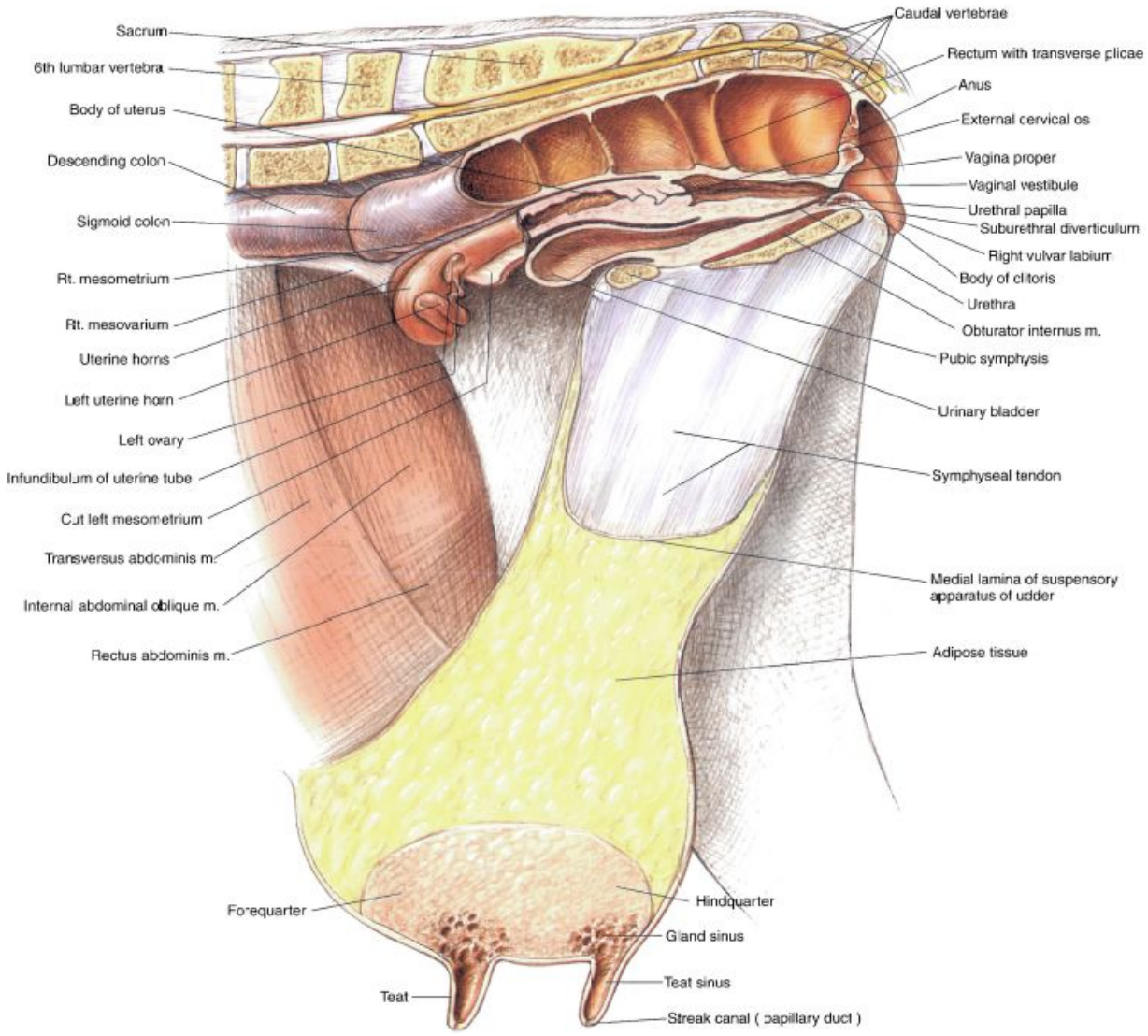


PLATE 2.17 Major veins of the bull. Right lateral view.

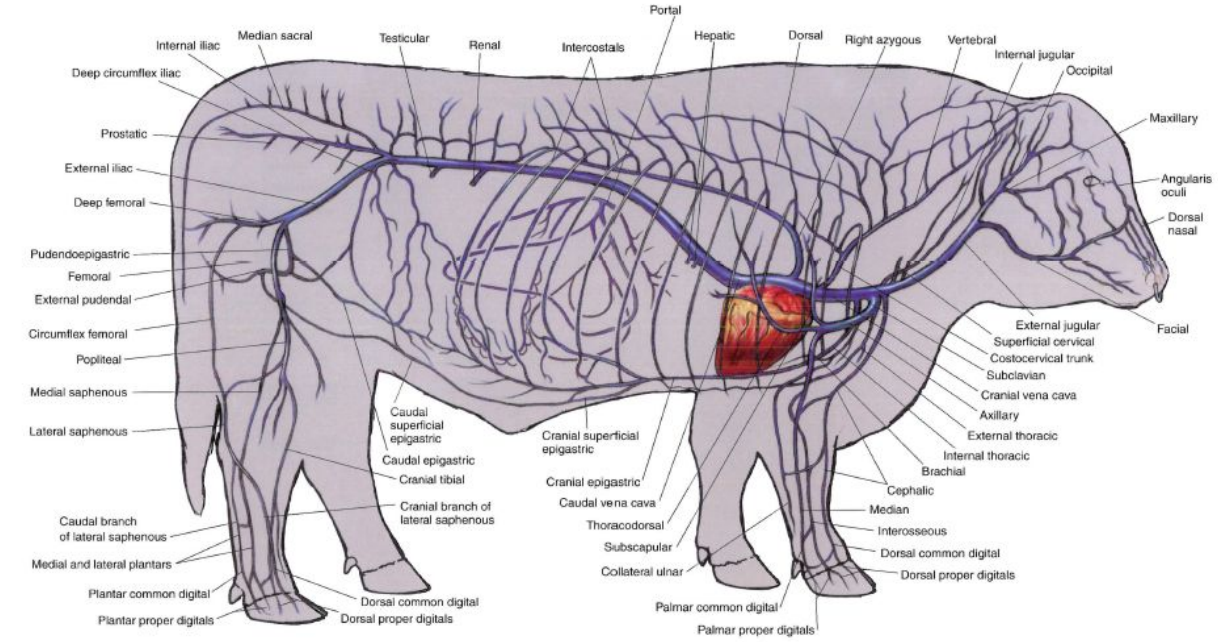


PLATE 2.18 Major arteries of the bull. Left lateral view.

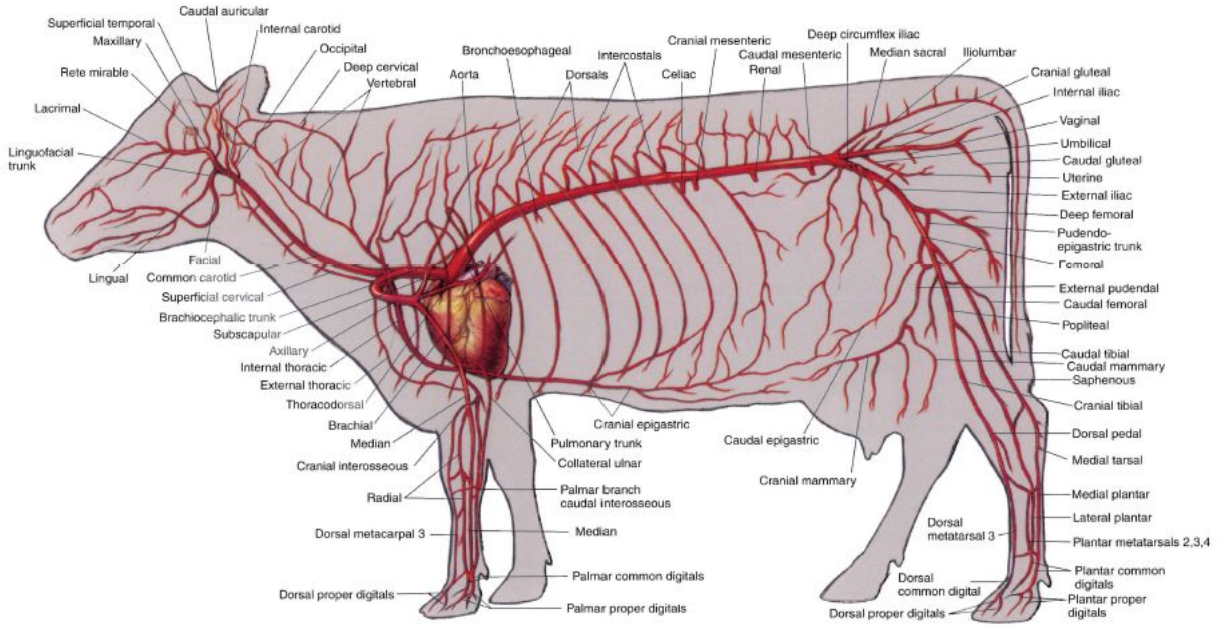


PLATE 2.19 Central nervous system and principal nerves of the peripheral nervous system of the bull. Right lateral view.

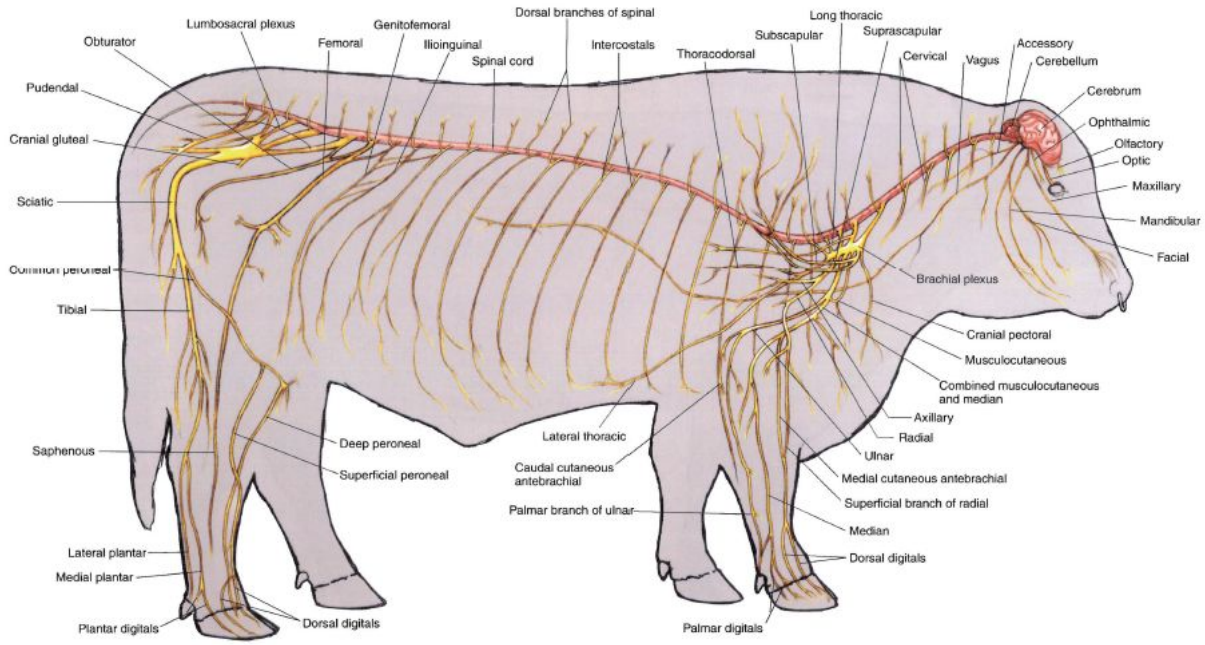
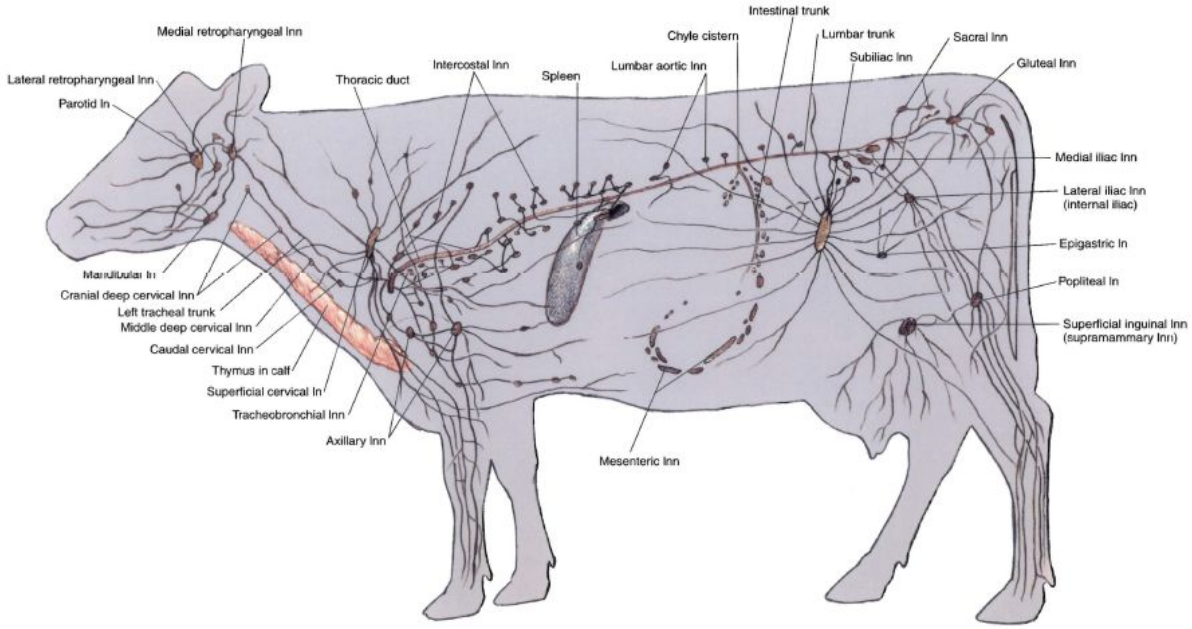


PLATE 2.20 Significant lymphatic organs of the cow. Left lateral view. ln = lymph node



SECTION 3 THE SHEEP (*Ovis aries*)

PLATES

PLATE 3.1 Right lateral view of a ram.

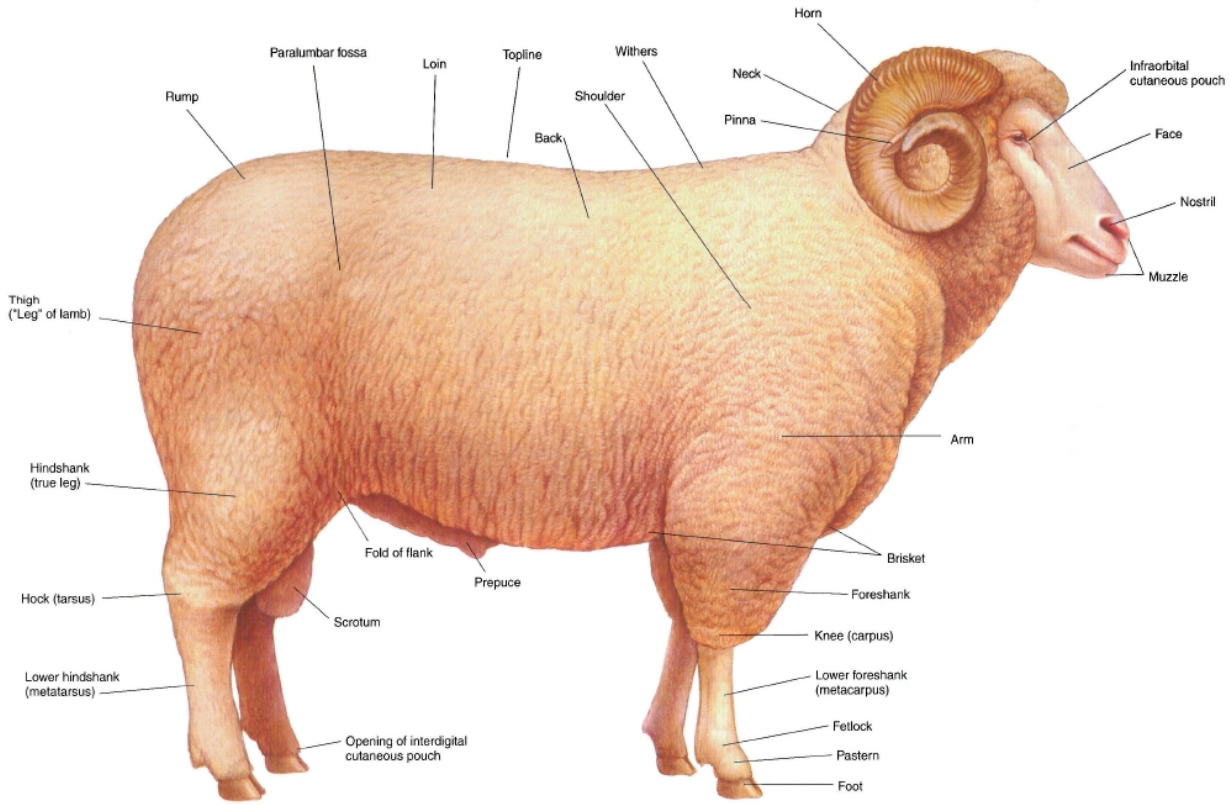


PLATE 3.2 Left lateral view of an ewe.

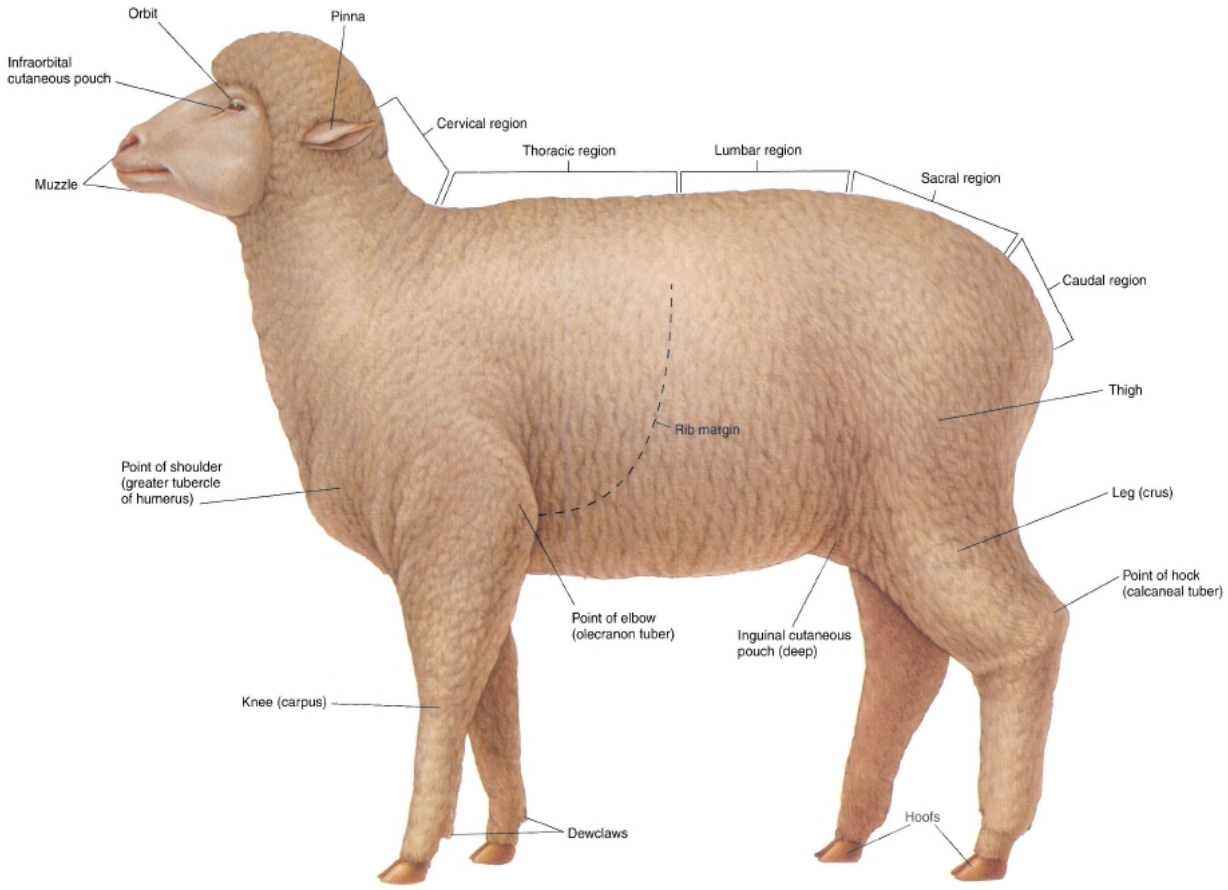


PLATE 3.3 Carcass cuts of the lamb, m = muscle

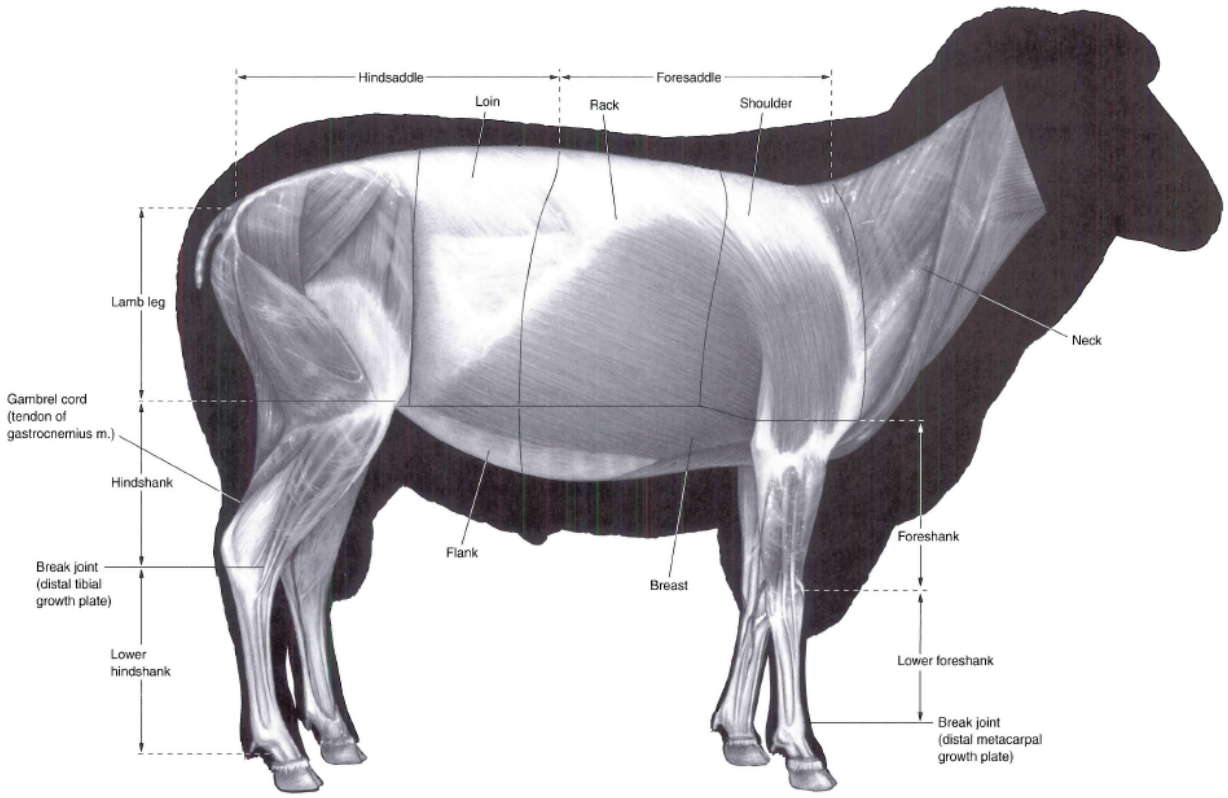


PLATE 3.4 Skeleton of the sheep, b = bone, C = cervical vertebra, T = thoracic vertebra, L = lumbar vertebra

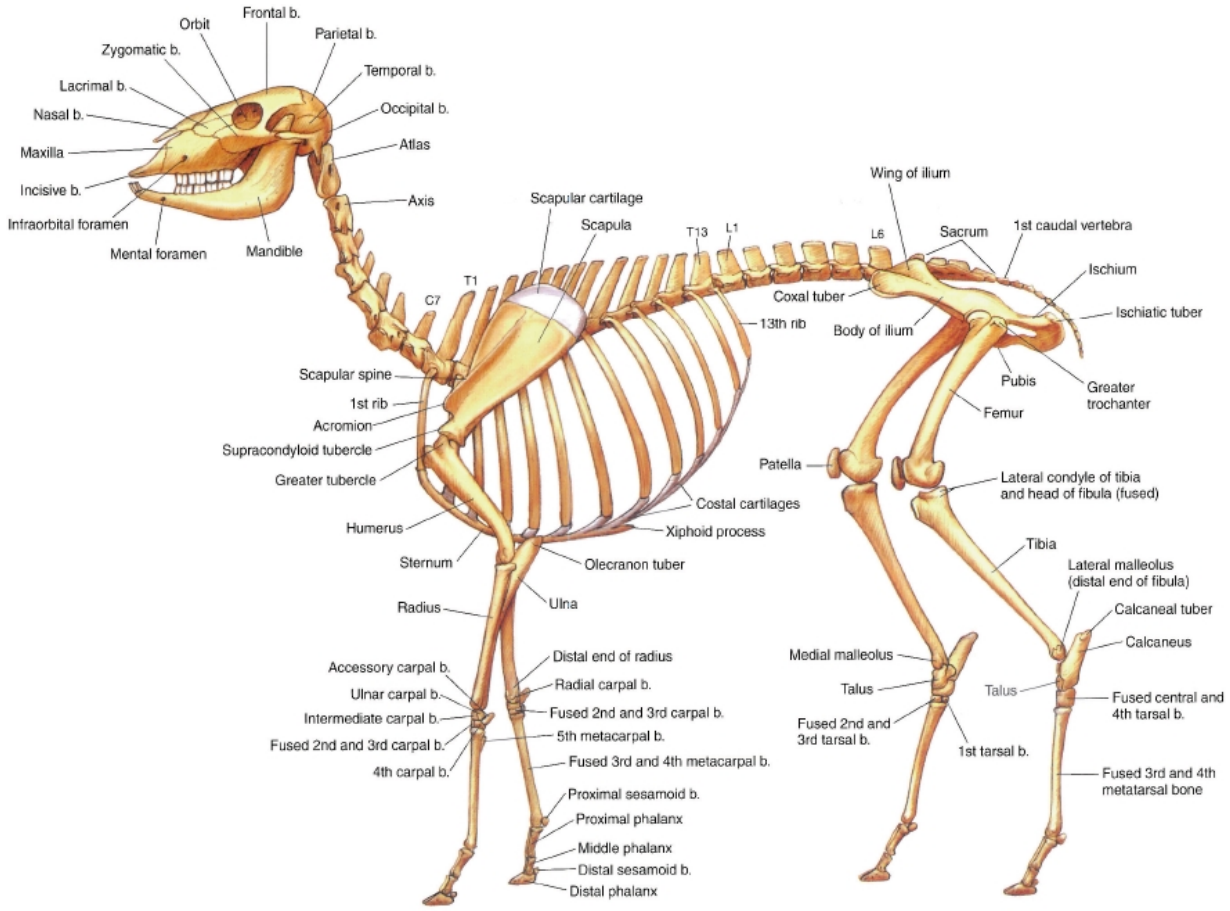


PLATE 3.5 Skeleton of the sheep, b = bone, C = cervical vertebra, T = thoracic vertebra, L = lumbar vertebra

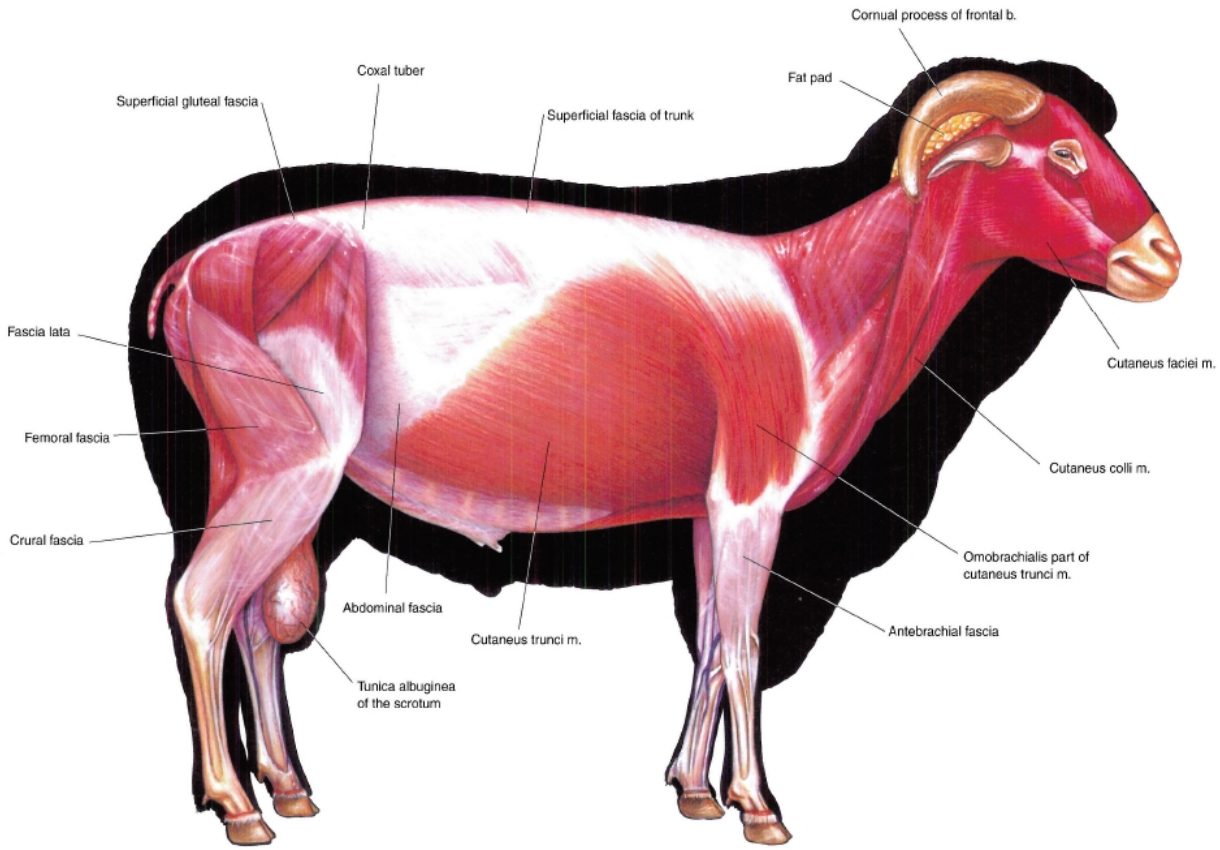


PLATE 3.6 Cutaneous muscles and major fasciae of the ram. Right lateral view, m = muscle, b = bone

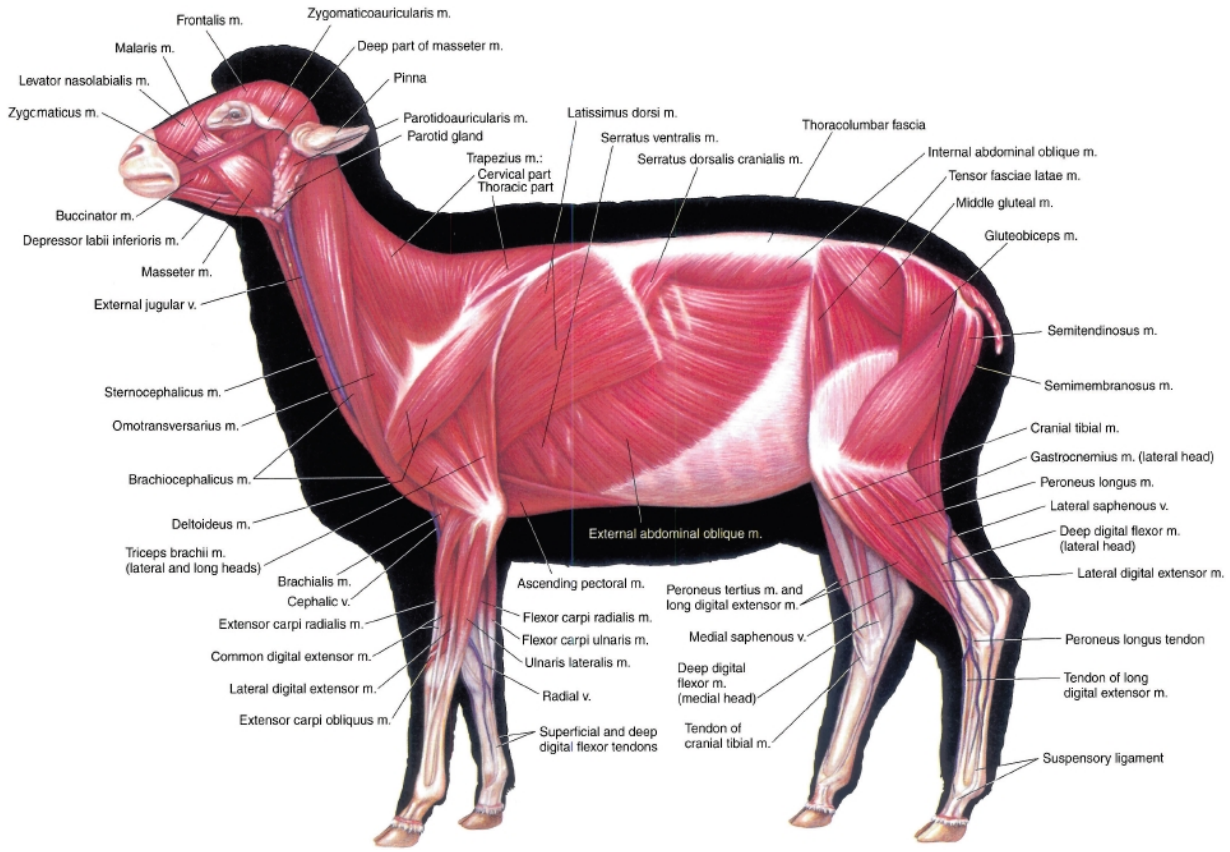


PLATE 3.7 Superficial muscles and veins of the ewe. Left lateral view, m - muscle, v = vein

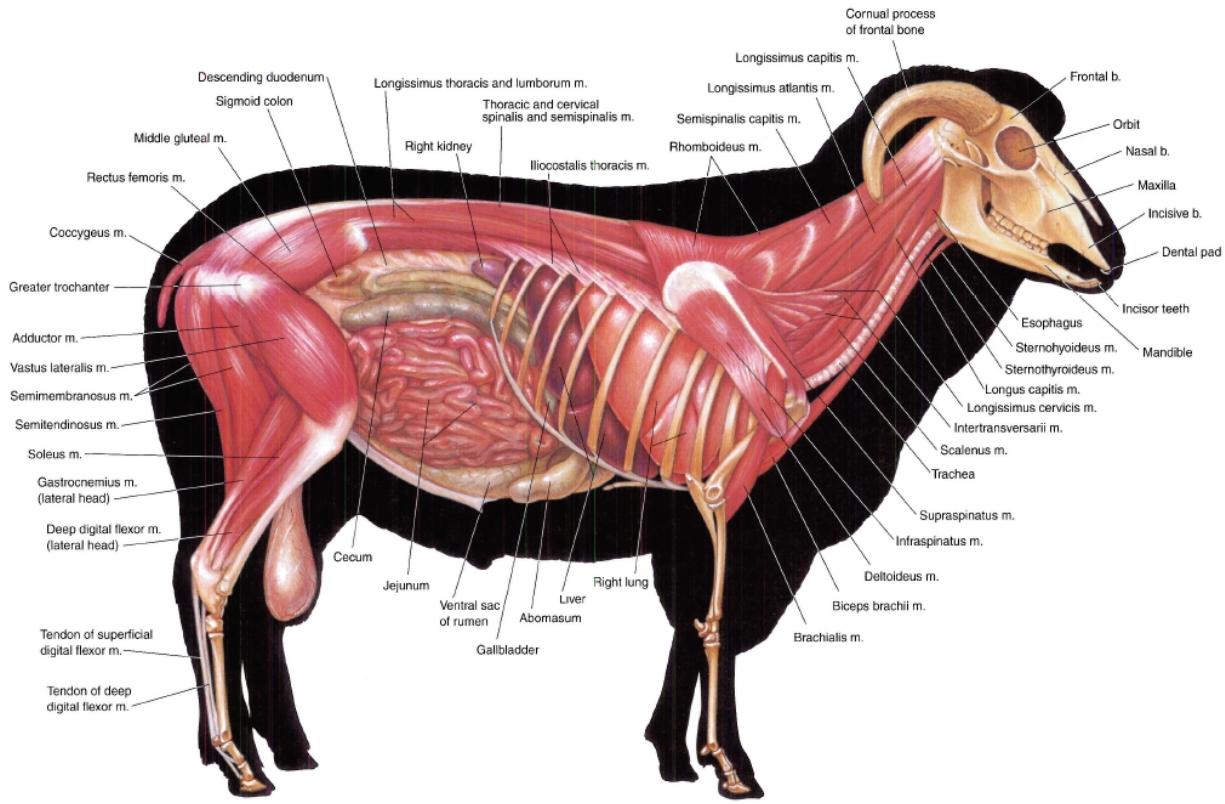


PLATE 3.8 Deep cervical muscles and in situ viscera of the ram. Omentum removed. Right lateral view, m = muscle, b = bone

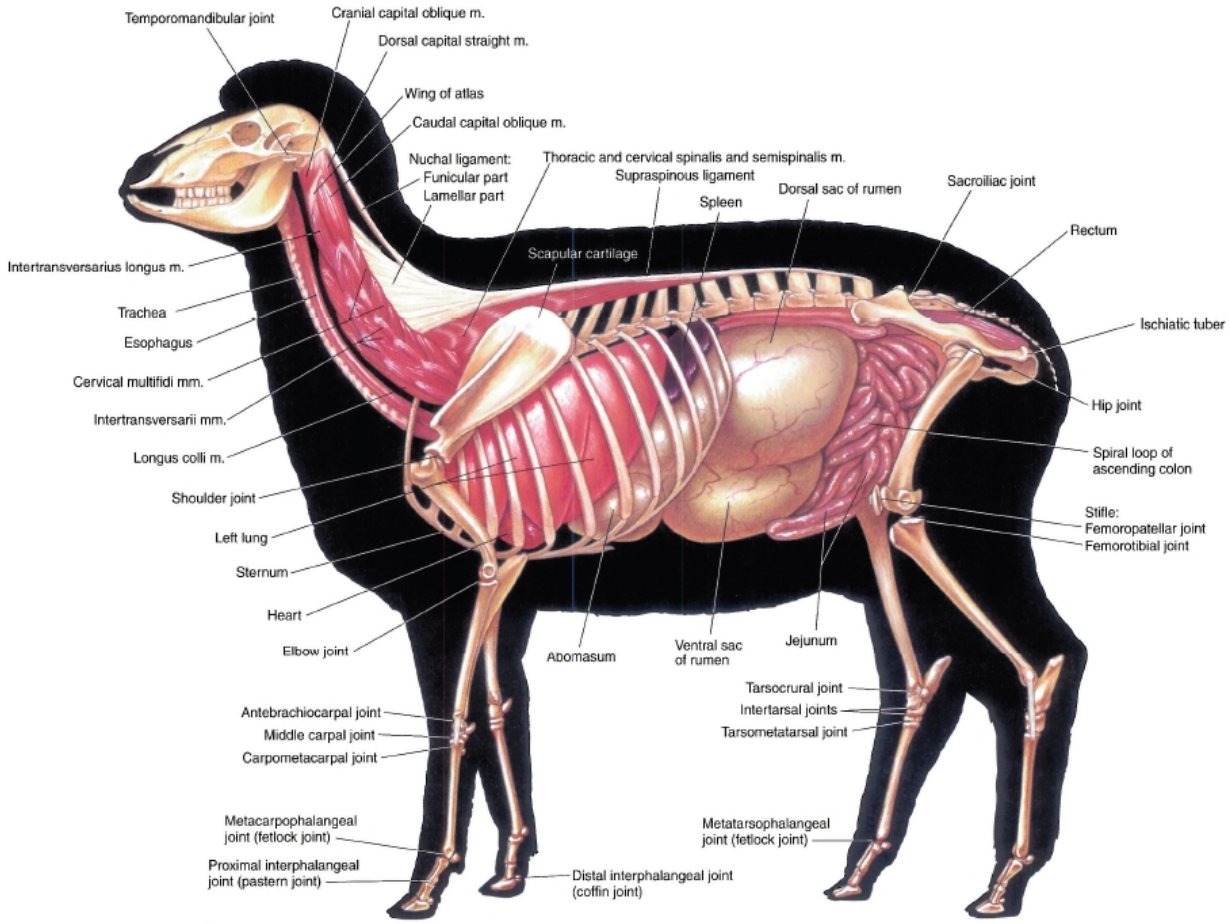


PLATE 3.9 Deep cervical muscles, in situ viscera, skeleton, and major joints of the ewe. Left lateral view, m = muscle

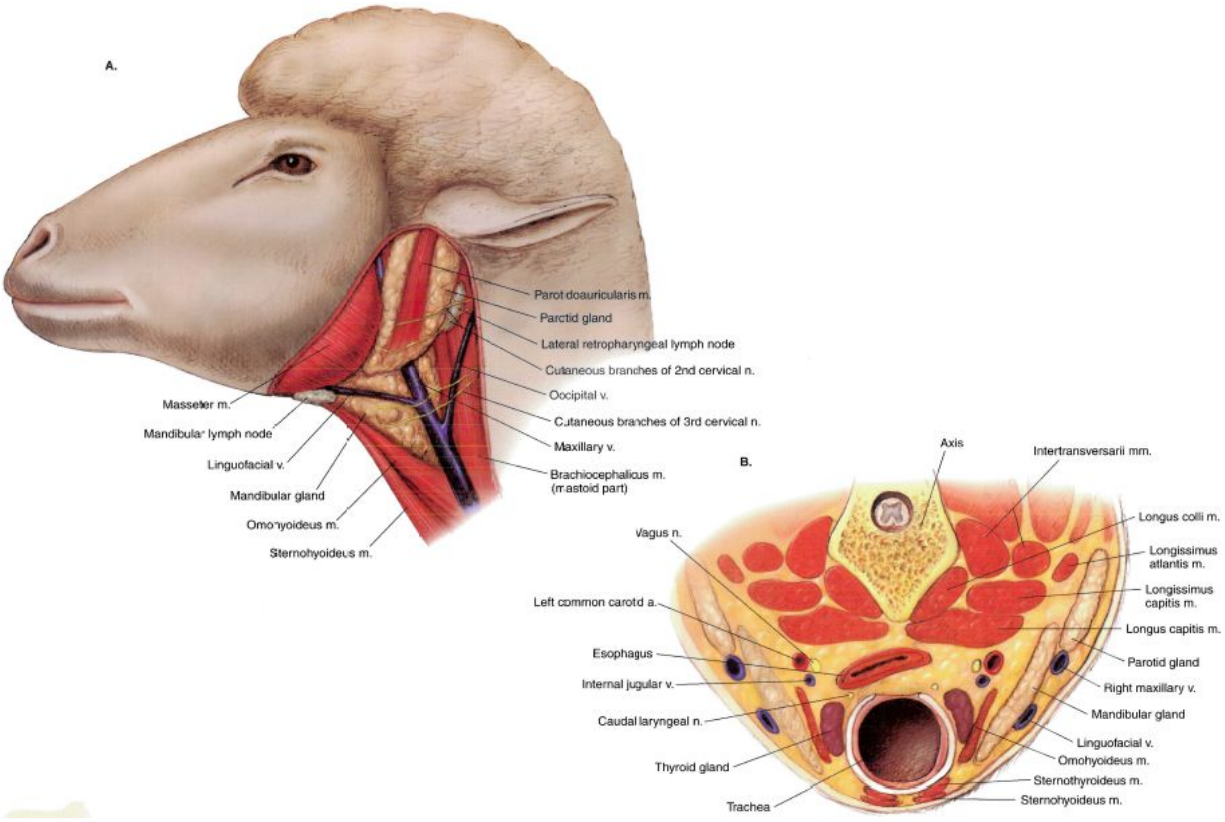


PLATE 3.10 A. Dissection of the parotid region of a sheep. Skin, cutaneous muscles, and fascia are removed. Left lateral view. B. Cross-section of the neck at the level of the thyroid gland. Caudocranial view, m = muscle, v = vein, a = artery, n = nerve

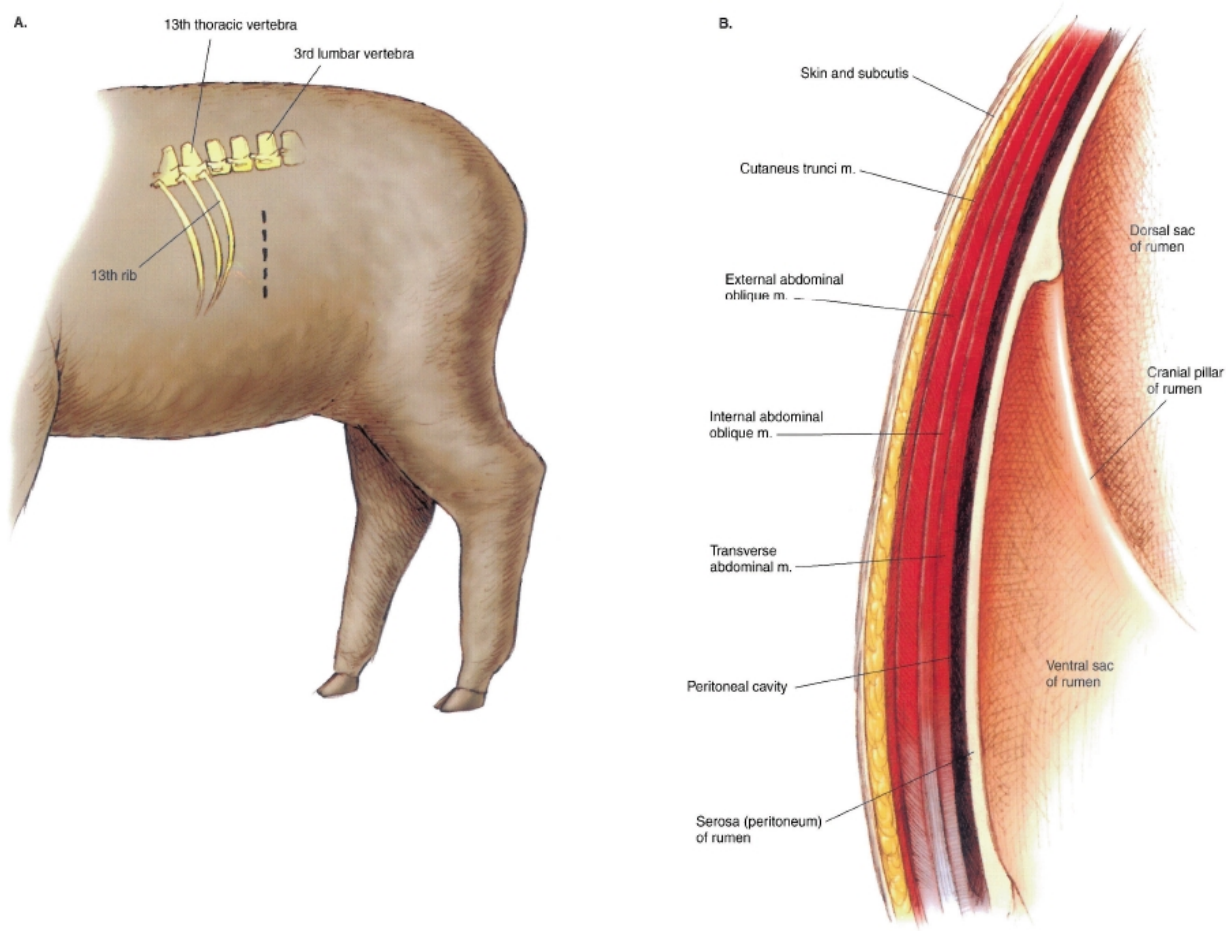


PLATE 3.11 A. Location of the left flank incision: dashed line. B. Cross-section through the left abdominal wall and subjacent ruminal wall. Caudocranial view, m = muscle

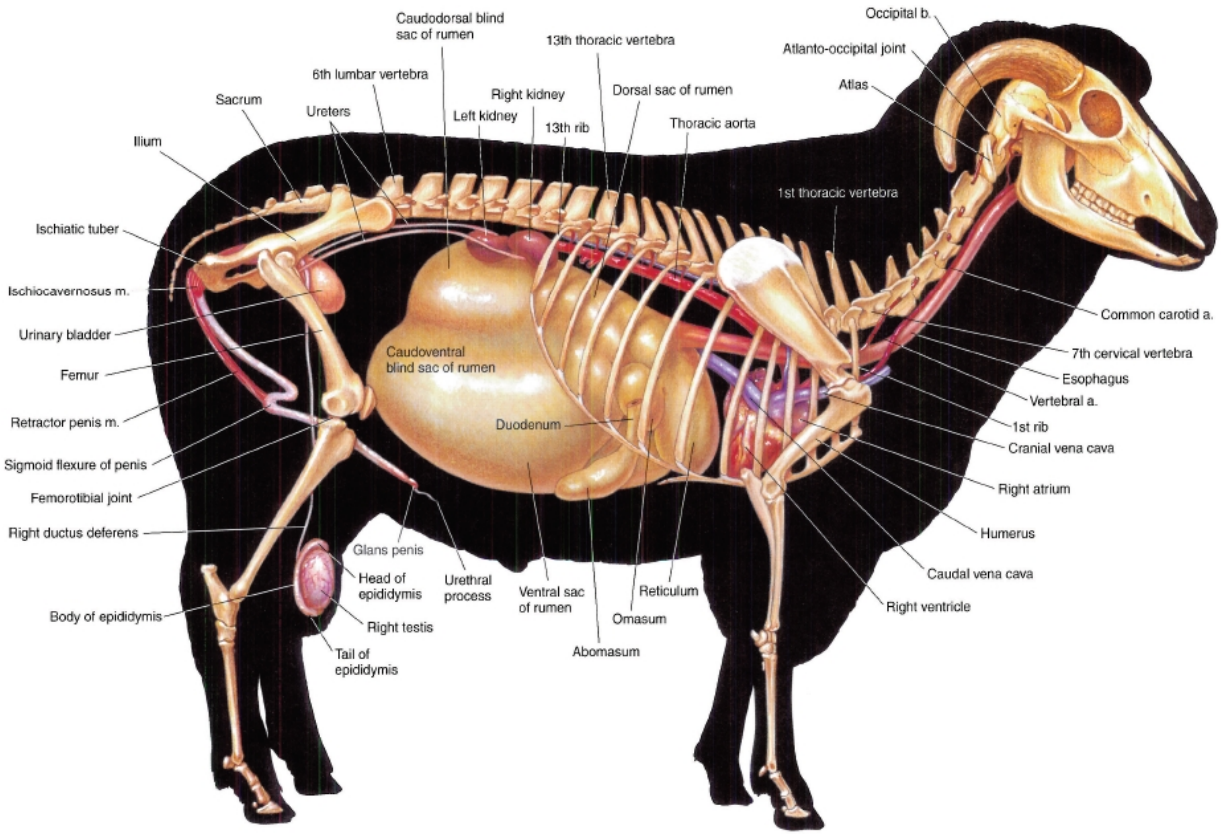


PLATE 3.12 Reproductive organs, urinary organs, esophagus and stomach, heart, and adjacent major vessels related to the skeleton of the ram. Right lateral view, b = bone, m = muscle, a = artery

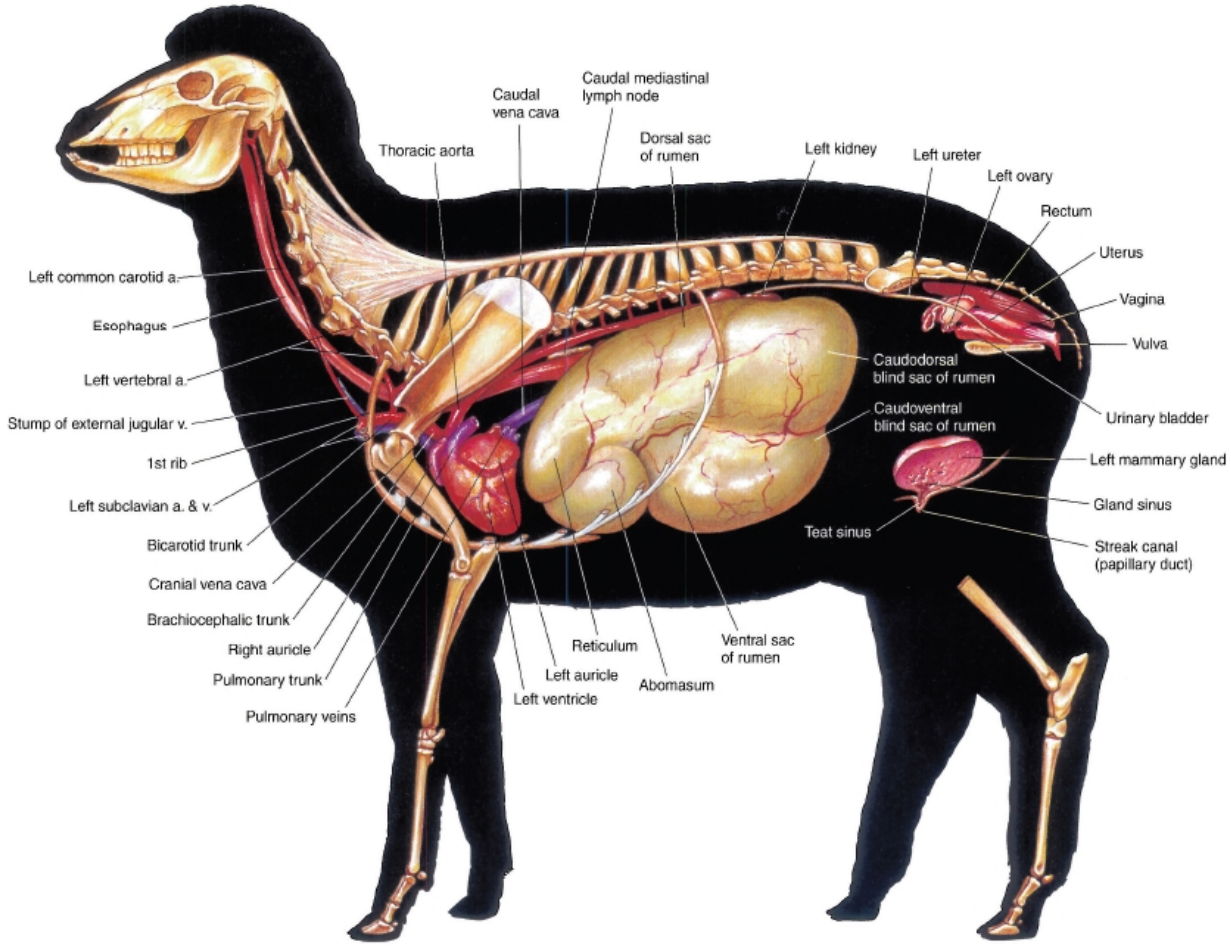


PLATE 3.13 Reproductive organs, urinary organs, heart, and adjacent major vessels, esophagus and stomach of the ewe. Left lateral view, a = artery, v = vein

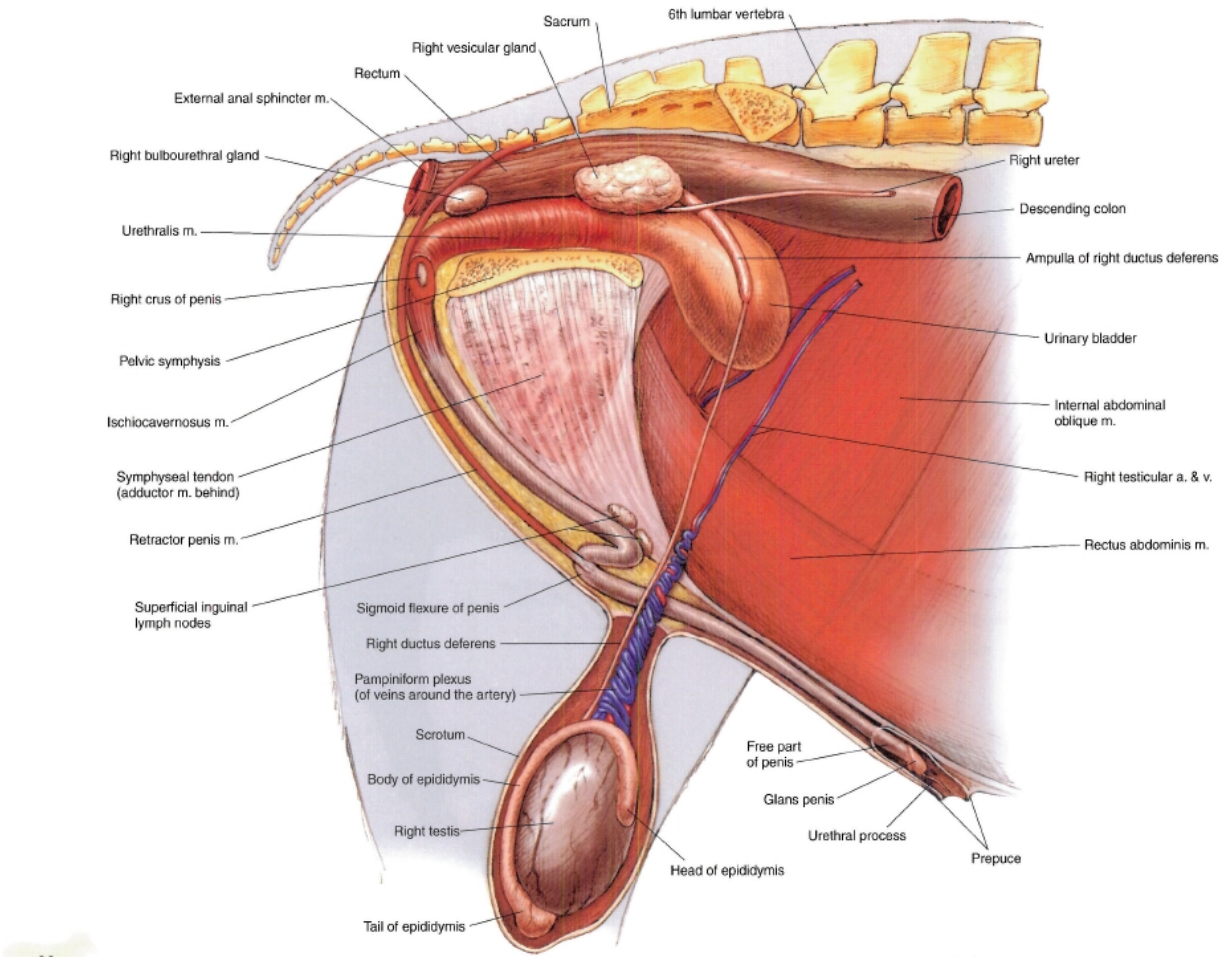


PLATE 3.14 Relations of the reproductive organs of the ram. Right lateral view. Right pelvic limb and body wall are removed. The ram's prostate gland is entirely disseminate; it lies deep to the urethralis muscle, m = muscle, a = artery, v = vein

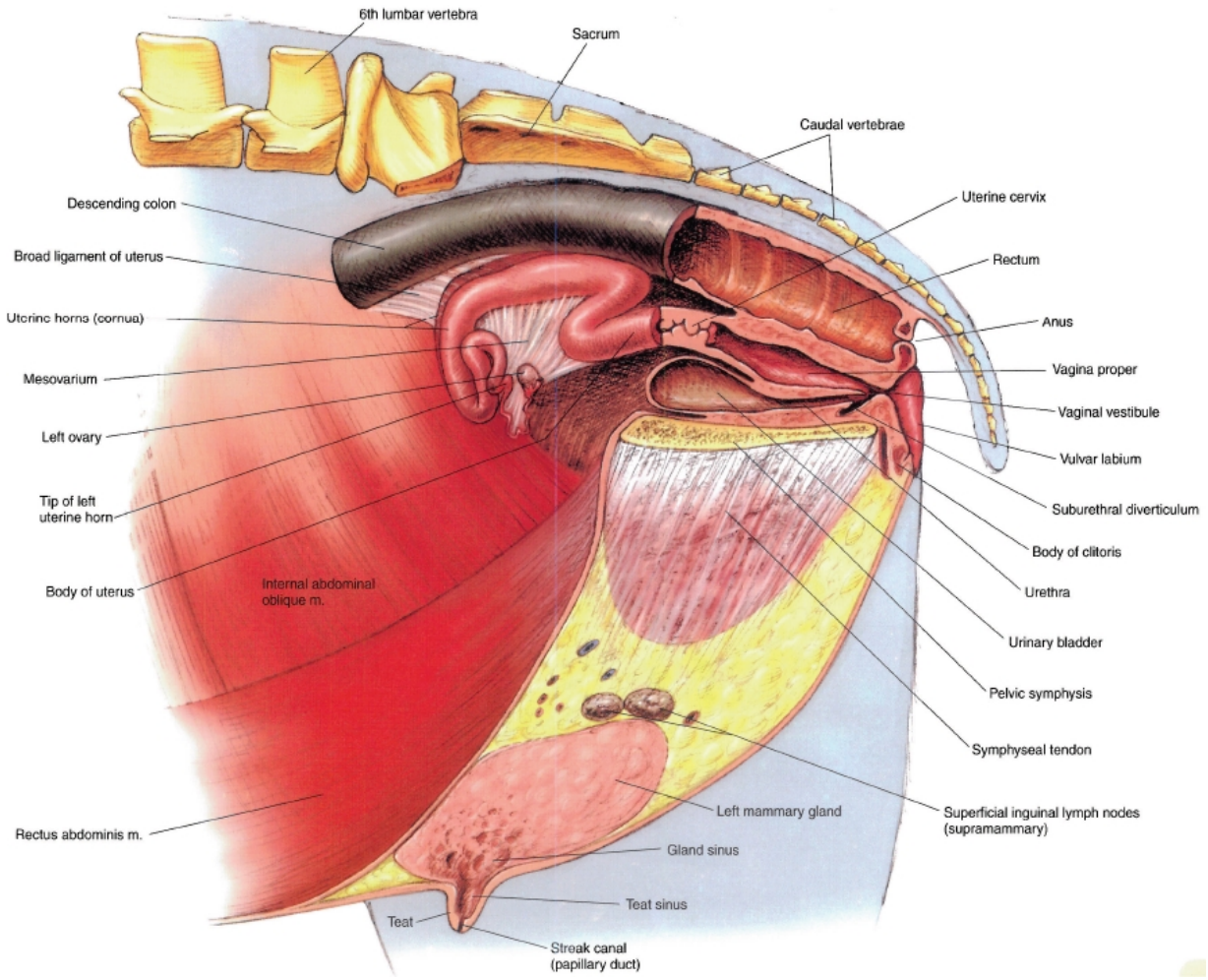


PLATE 3.15 Relations of the reproductive organs of the ewe. Left lateral view with partial median sections of the vagina, uterine cervix, rectum, urinary bladder, and urethra, m = muscle

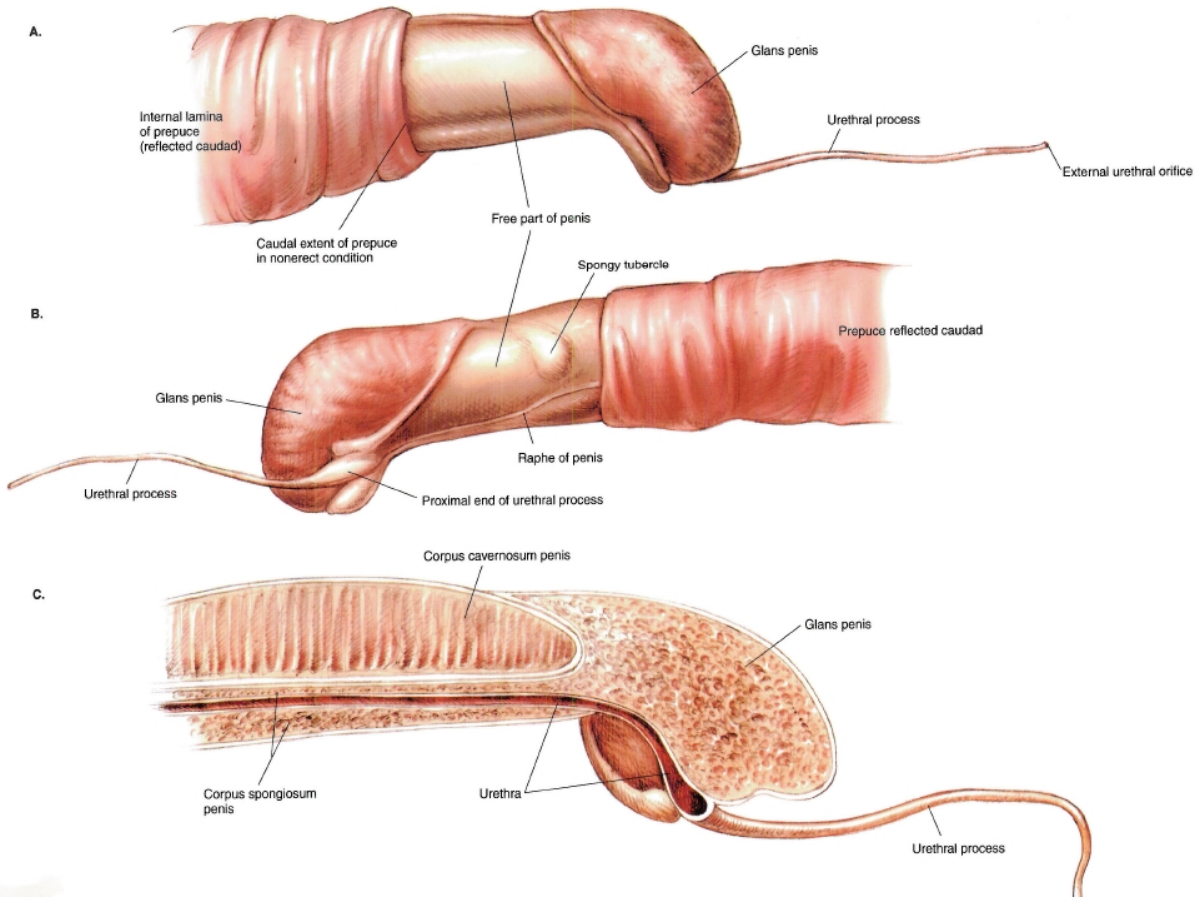
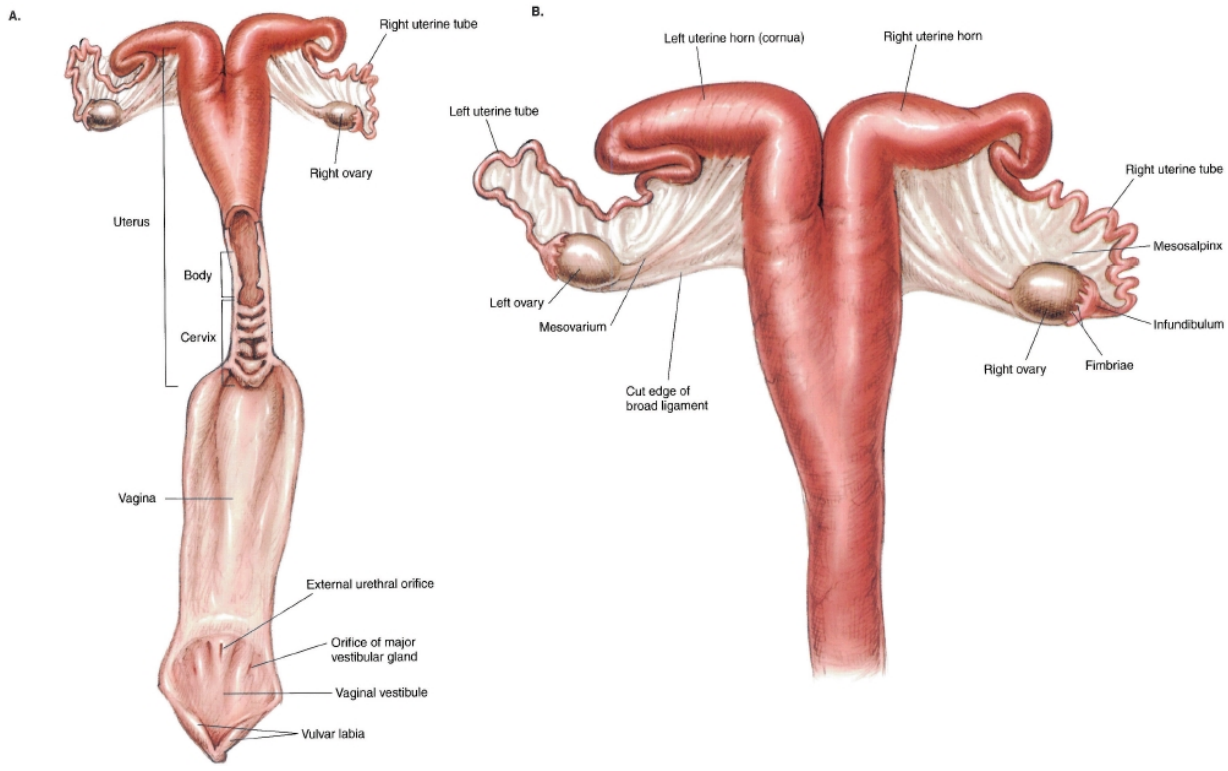


PLATE 3.16 Penis of the ram. A. Cranial portion of the ram's penis. Right lateral view. B. Left lateral view. C. Median section. Right lateral view.


A.
Right uterine tube
Right ovary
Uterus
Body
Cervix
Vagina
External urethral orifice
Orifice of major vestibular gland
Vaginal vestibule
Vulvar labia
B.
Left uterine horn (cornua)
Right uterine horn
Left uterine tube
Right uterine tube
Mesosalpinx
Left ovary
Mesovarium
Infundibulum
Right ovary
Fimbriae
Cut edge of broad ligament

SECTION 4 THE GOAT (*Capra bircus*)

PLATES

PLATE 4.1 Right lateral view of an Angora buck (billy).

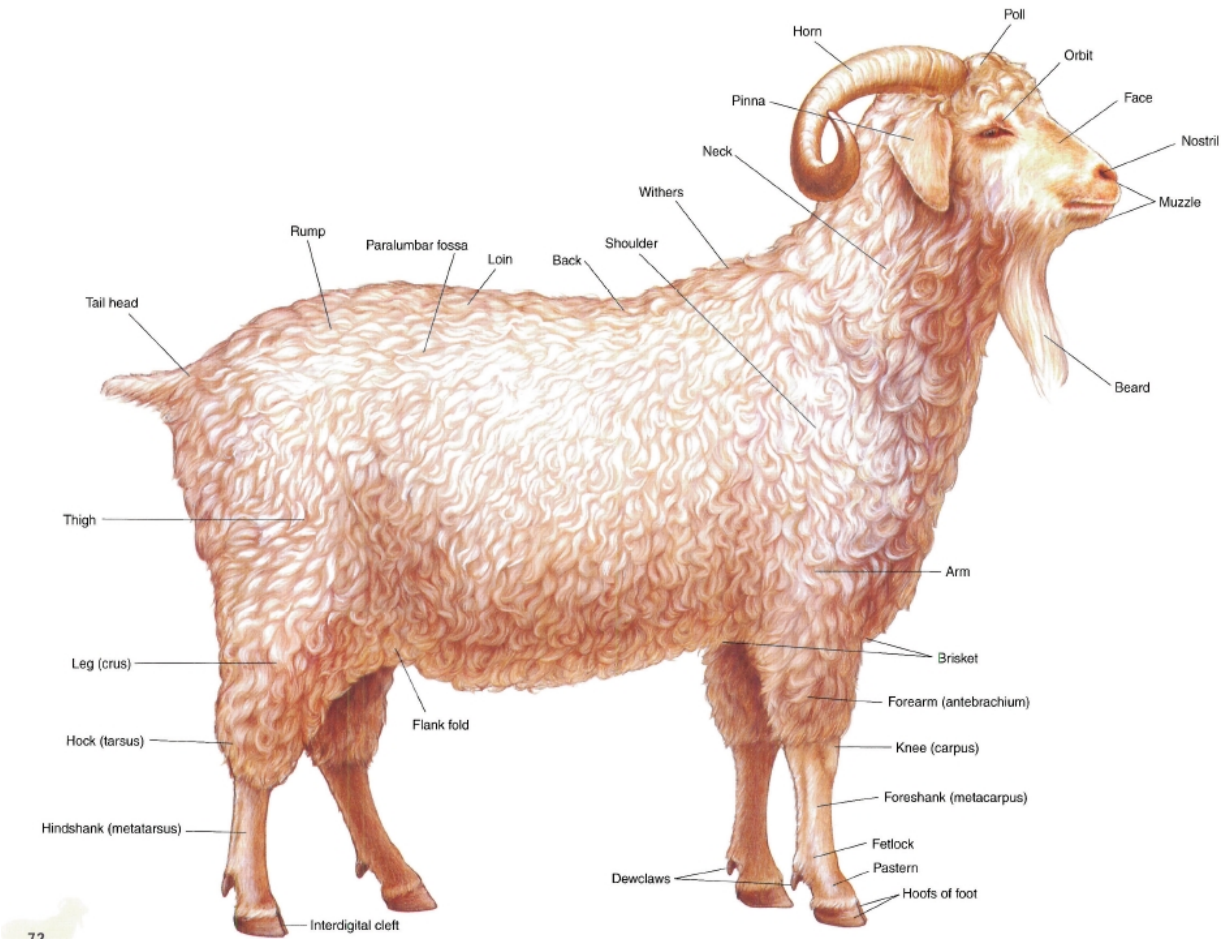


PLATE 4.2 Left lateral view of a Toggenberg doe (nanny). Dorsal vertebral regions are indicated, v = vein

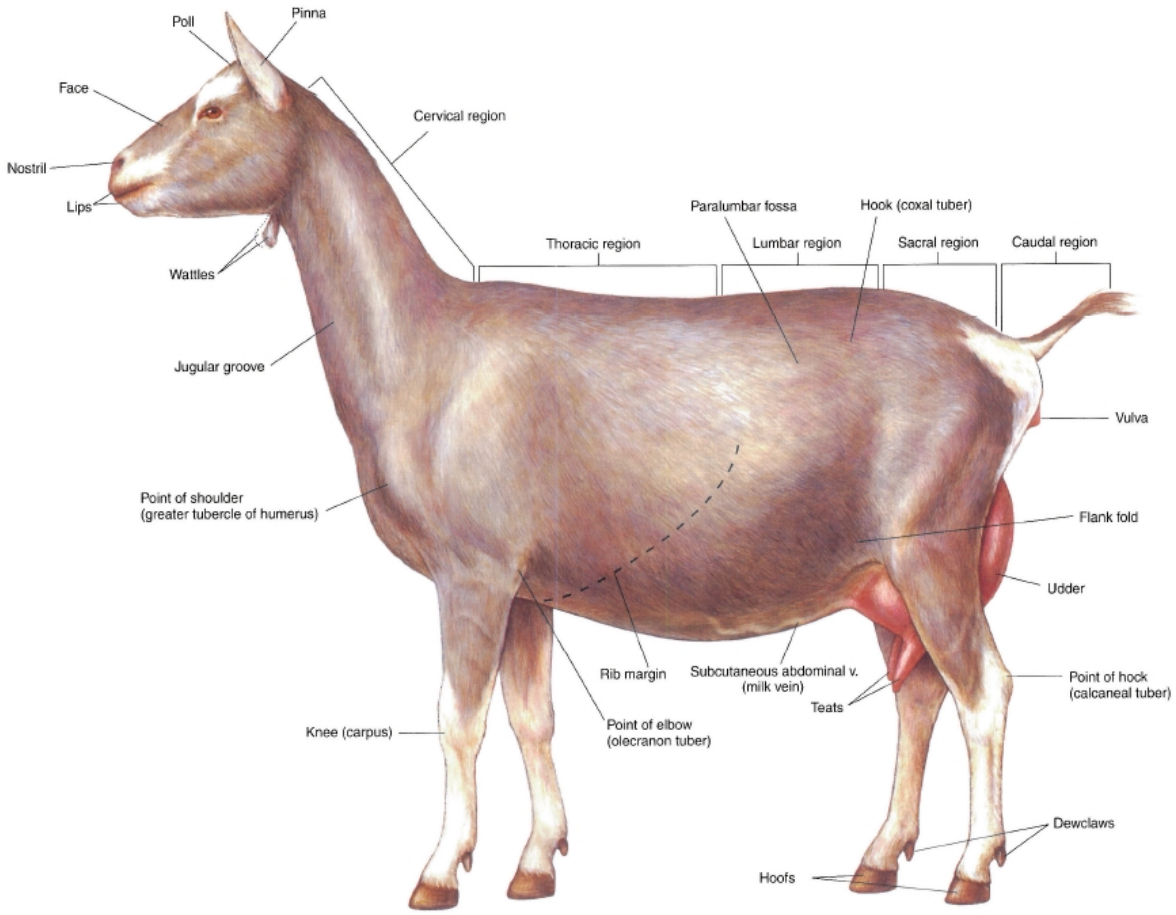


PLATE 4.3 Body regions of the goat. Right lateral view.

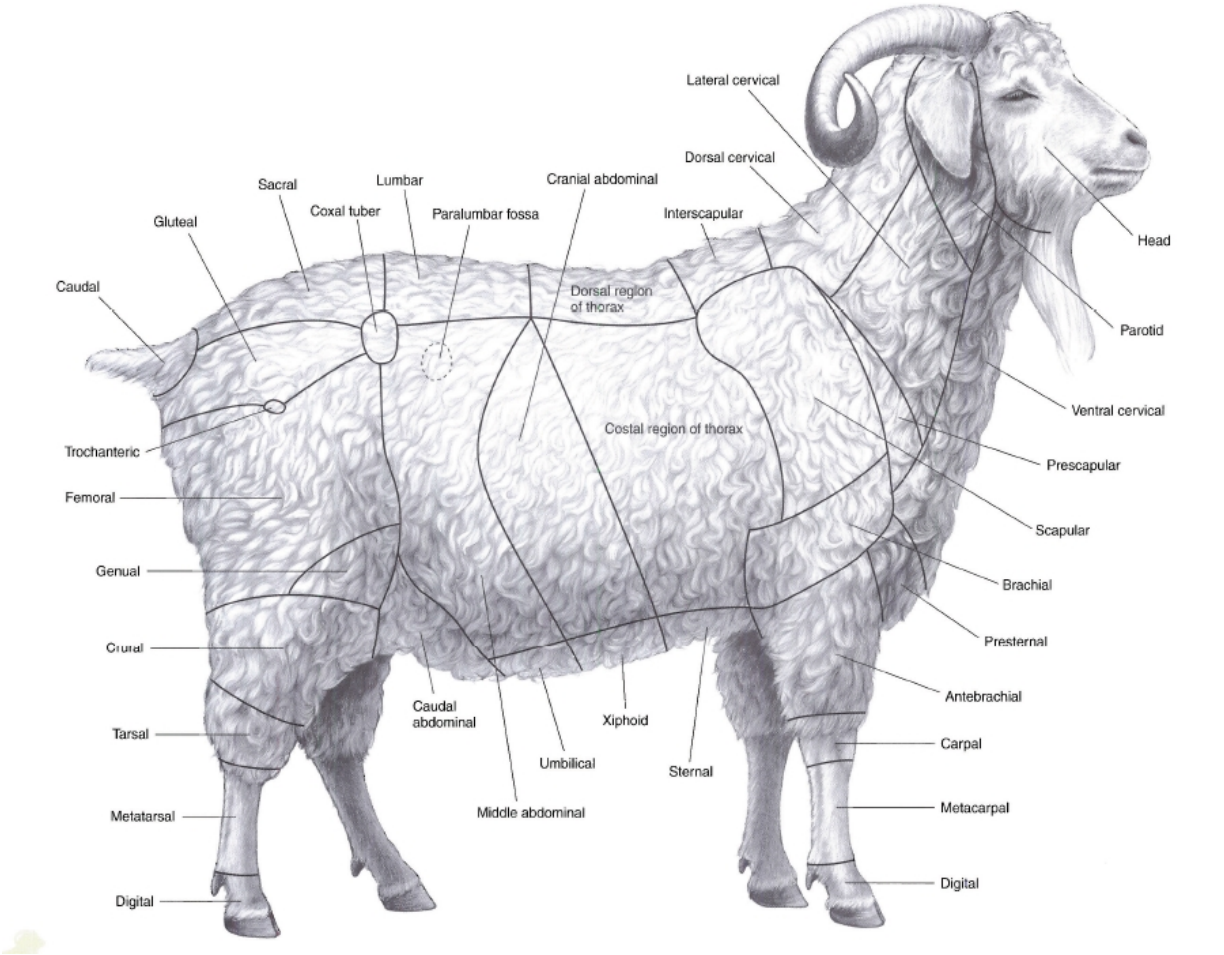


PLATE 4.4 Skeleton of the goat. Left lateral view, b = bone, C = cervical vertebra, T = thoracic vertebra, L = lumbar vertebra

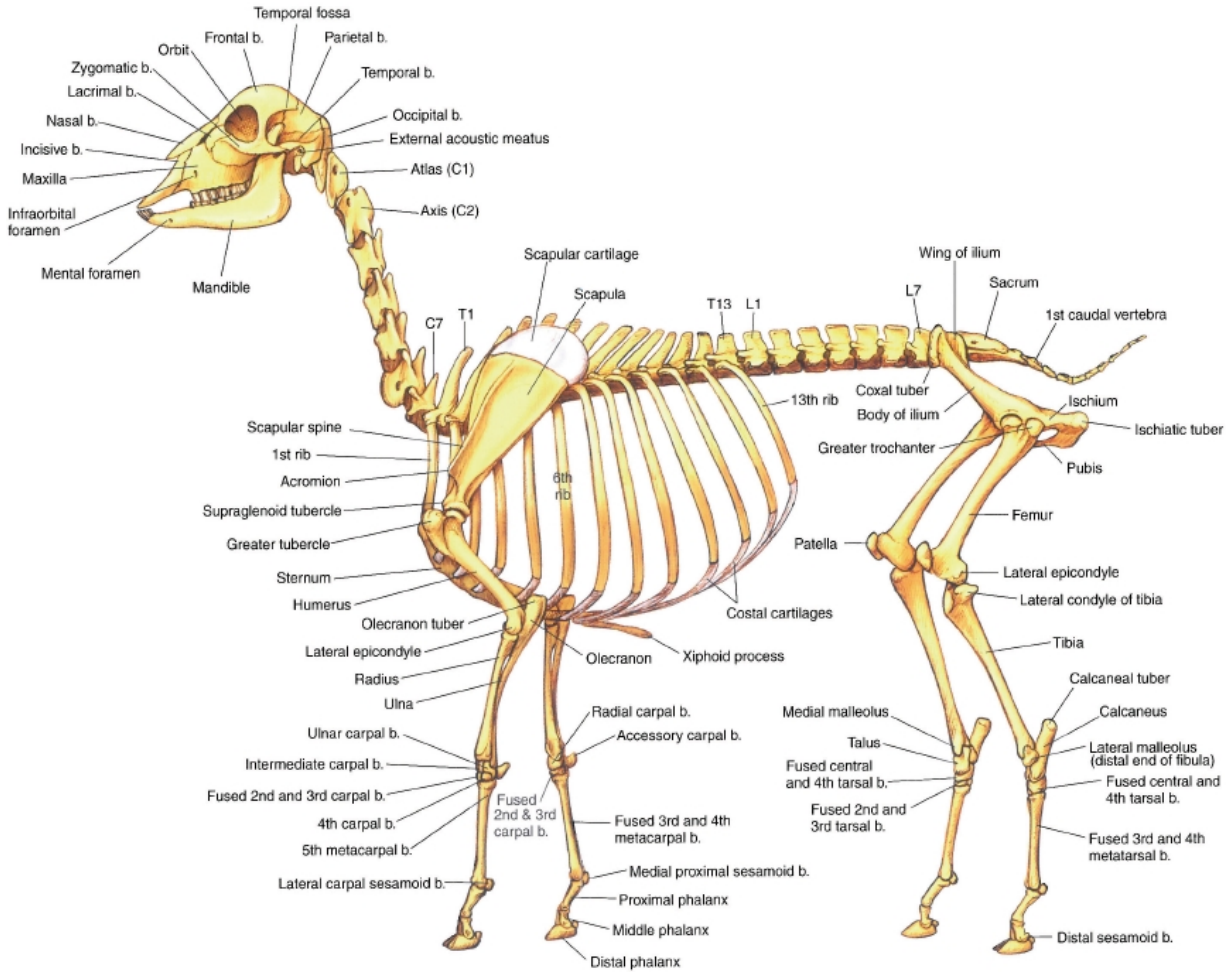


PLATE 4.5 Cutaneous muscles and major fasciae of the buck. Right lateral view, m = muscle

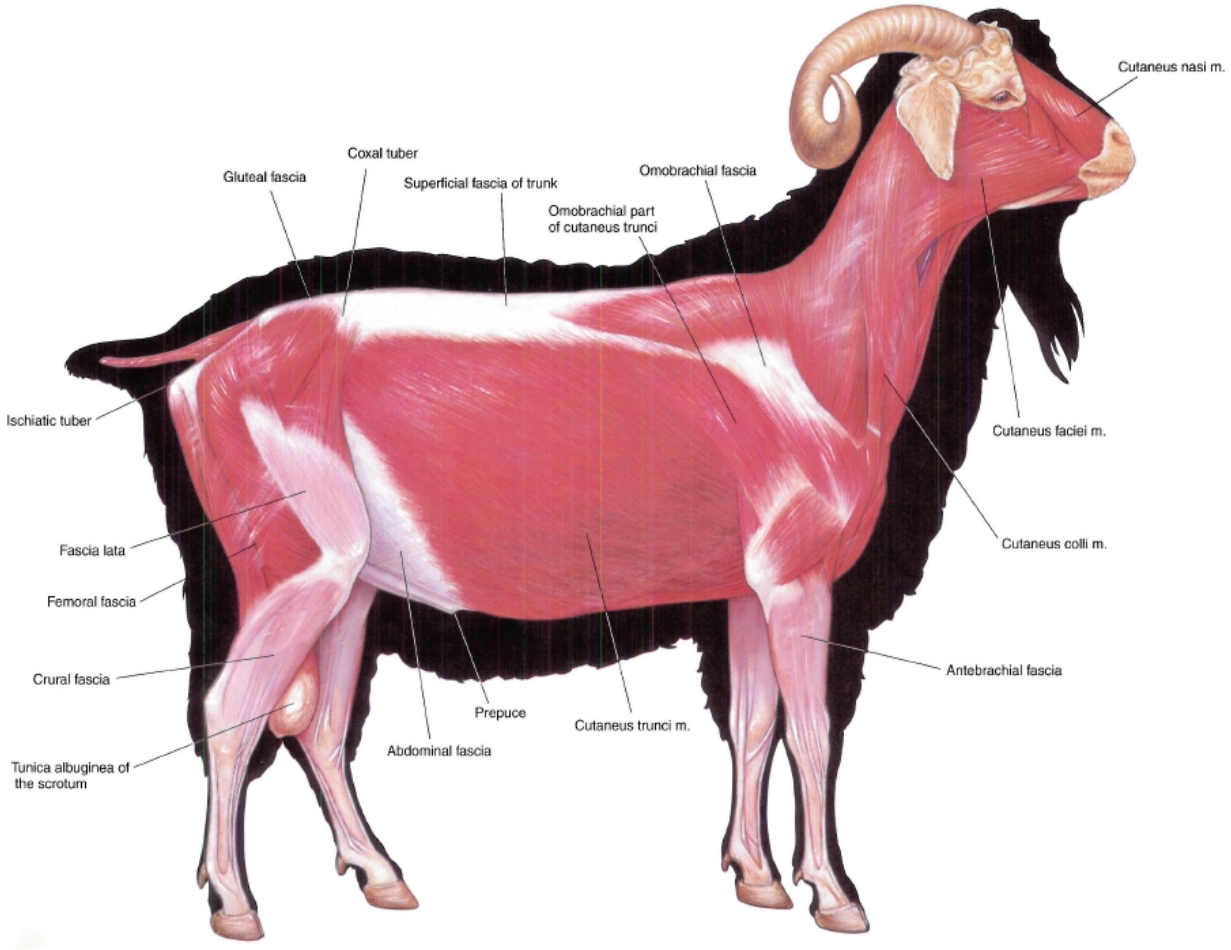


PLATE 4.6 Superficial muscles and veins of the doe. Left lateral view, m = muscle, v = vein

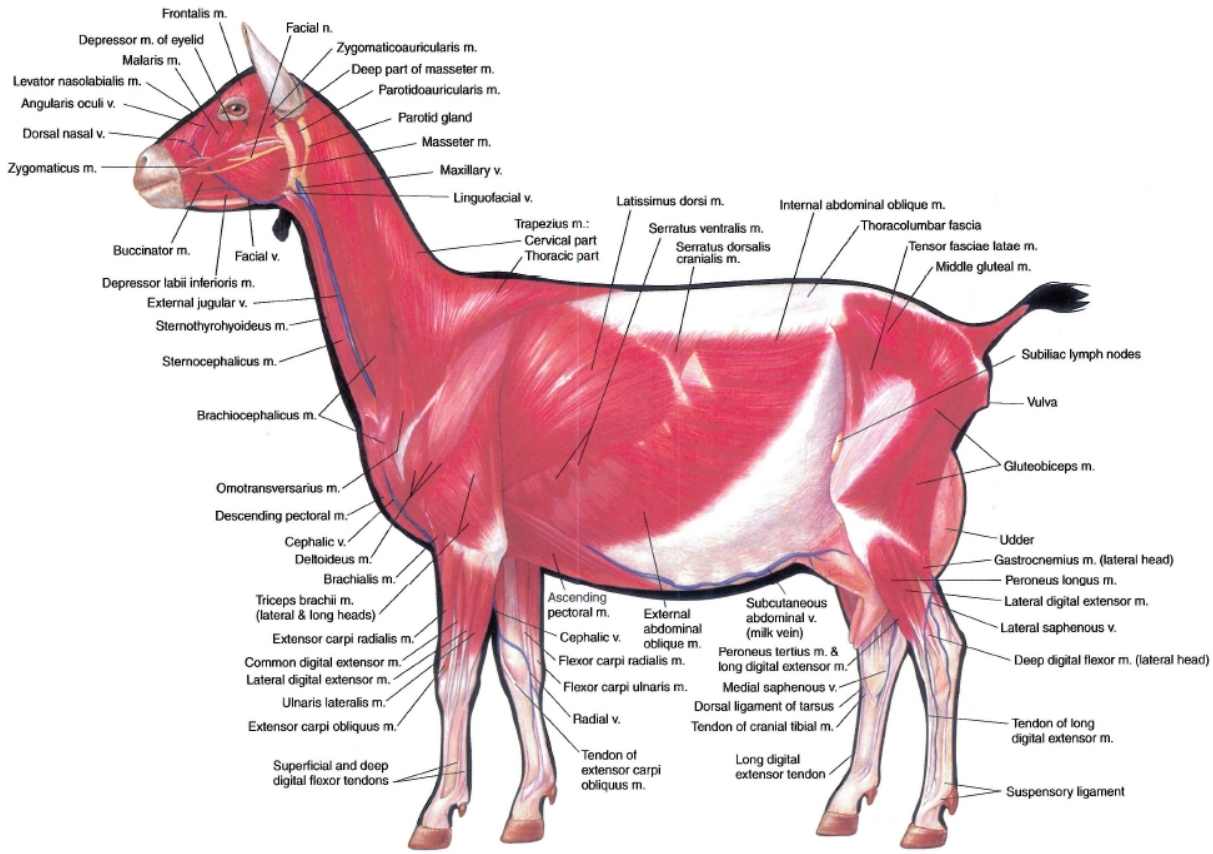


PLATE 4.7 Major structures of the caprine left distal metacarpus and digits. A. Dorsal view, arteries excluded. B. Palmar view, veins excluded, n = nerve, m = muscle, a = artery

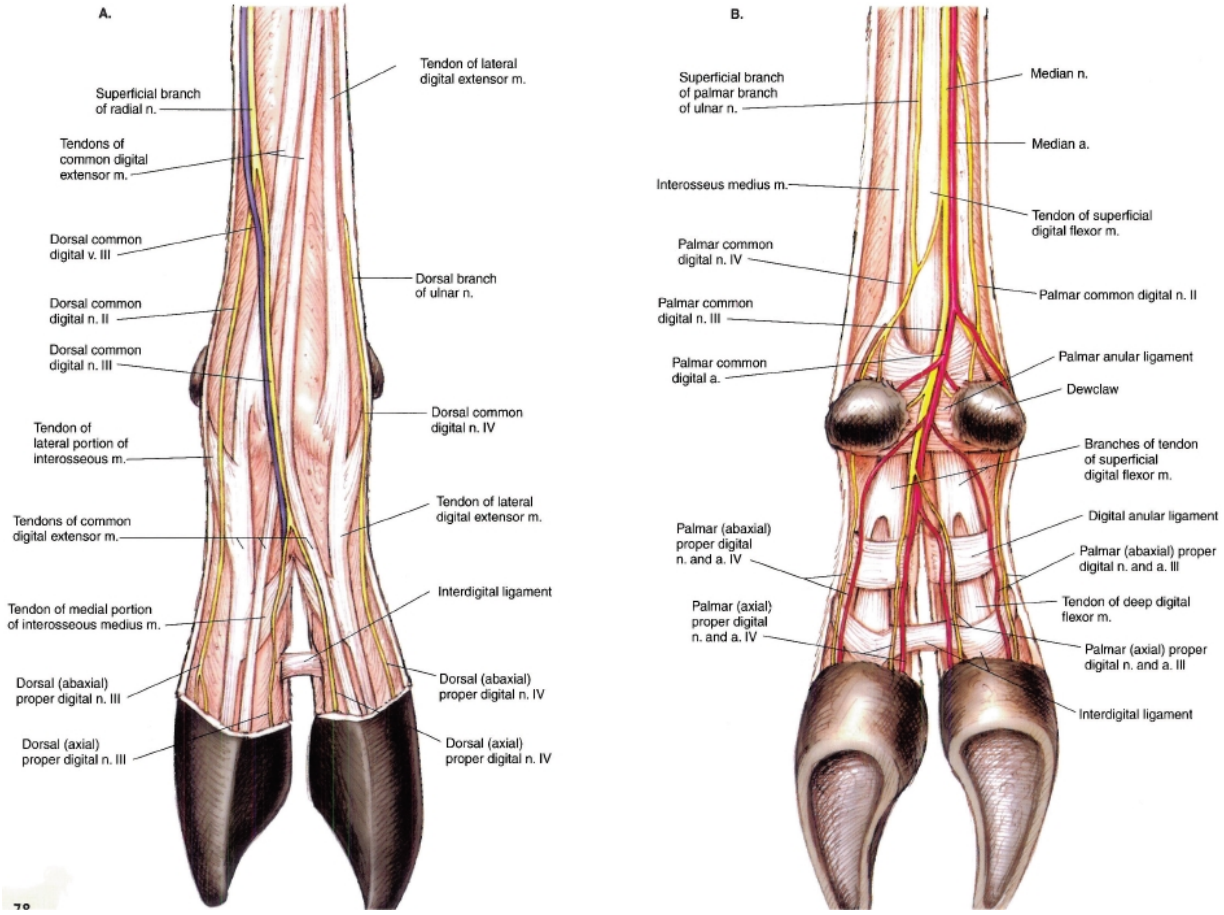


PLATE 4.8 A. Untrimmed hoofs of the goat. B. Trimmed hoofs of the goat. C. Parasagittal section through the fetlock and digit. For artiodactyls, claw is synonymous with hoof. When kept on soft ground, a mature goat's hoofs should be trimmed every 4-5 months, b = bone

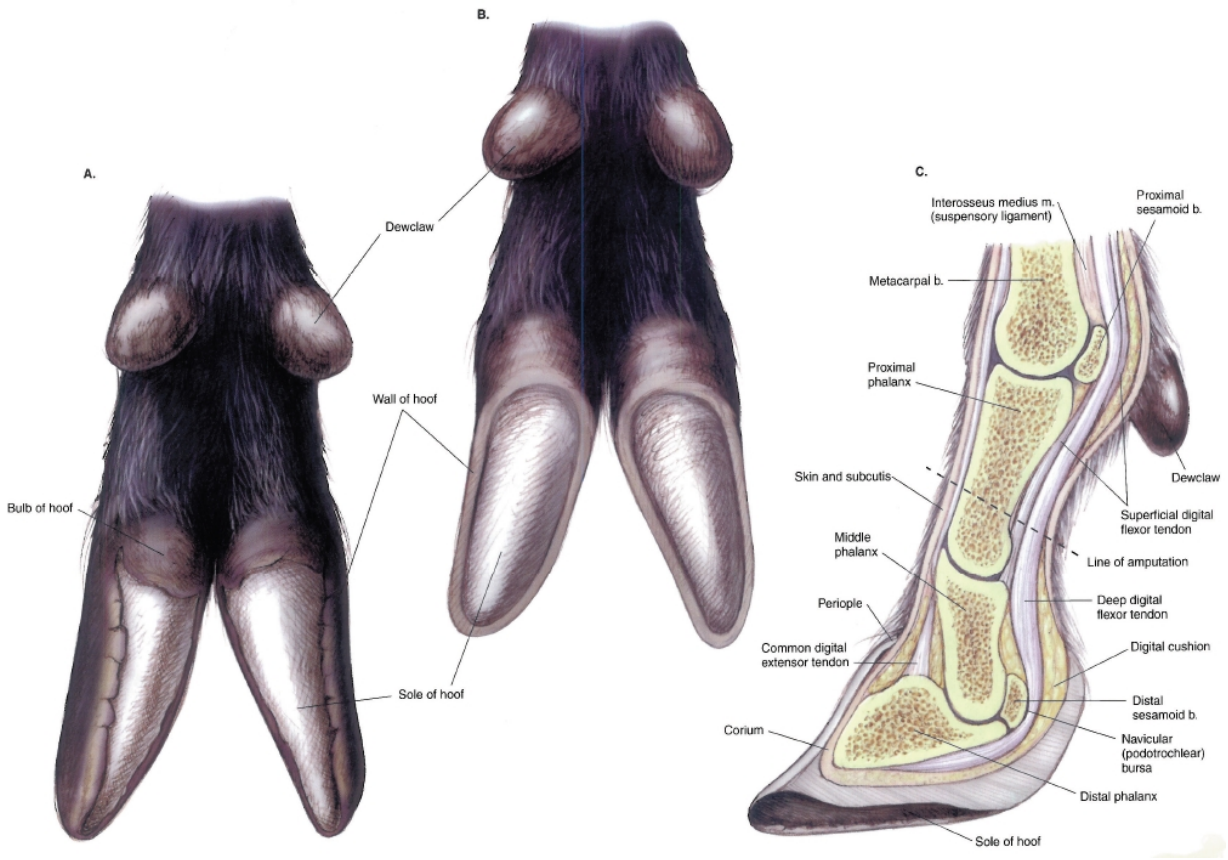


PLATE 4.9 Deep muscles and in *in situ* viscera of the buck. Greter omentum is removed. Right lateral view. m = muscle, n = nerve, a = artery, b = bone

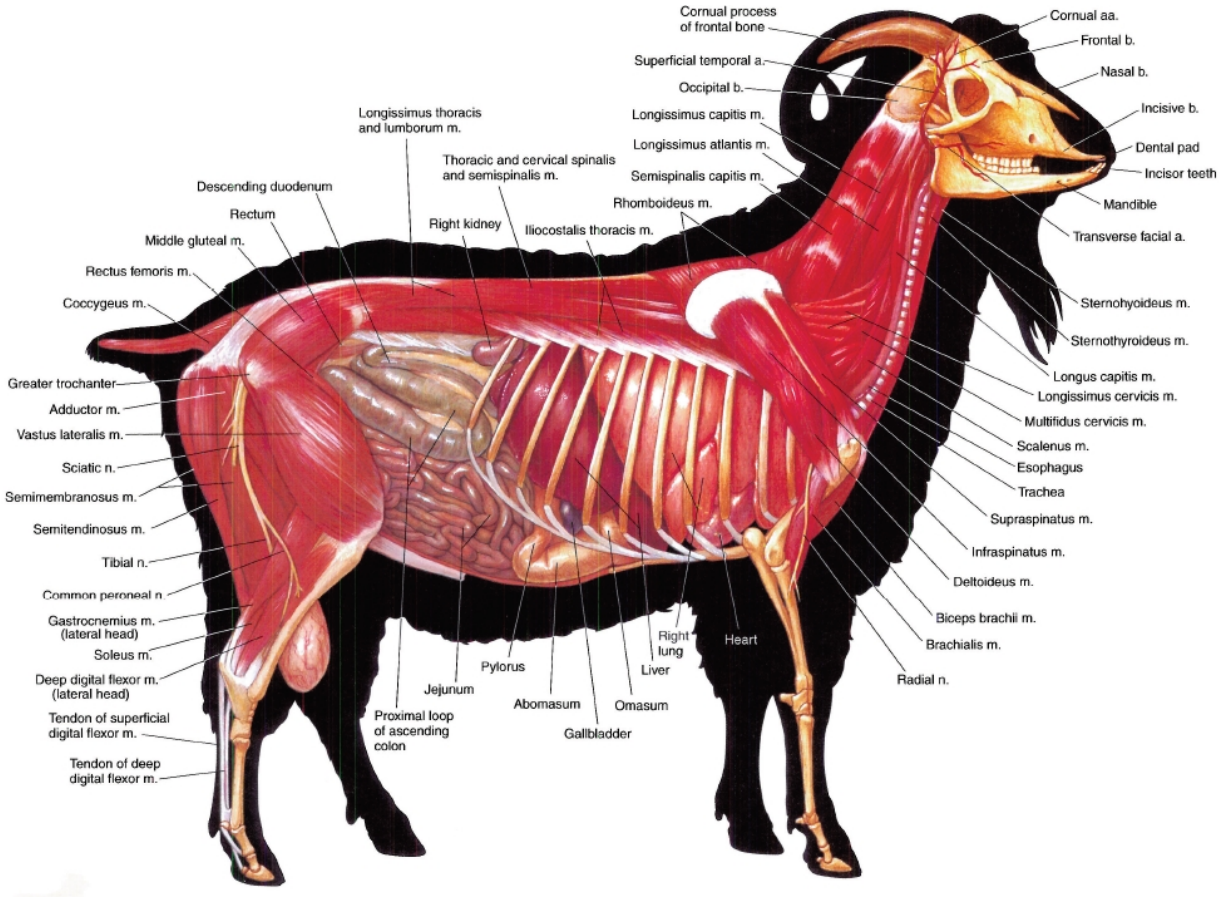


PLATE 4.10 Major structures of the caprine left distal metacarpus and digits. A. Dorsal view, arteries excluded. B. Palmar view, veins excluded, n = nerve, m = muscle, a = artery

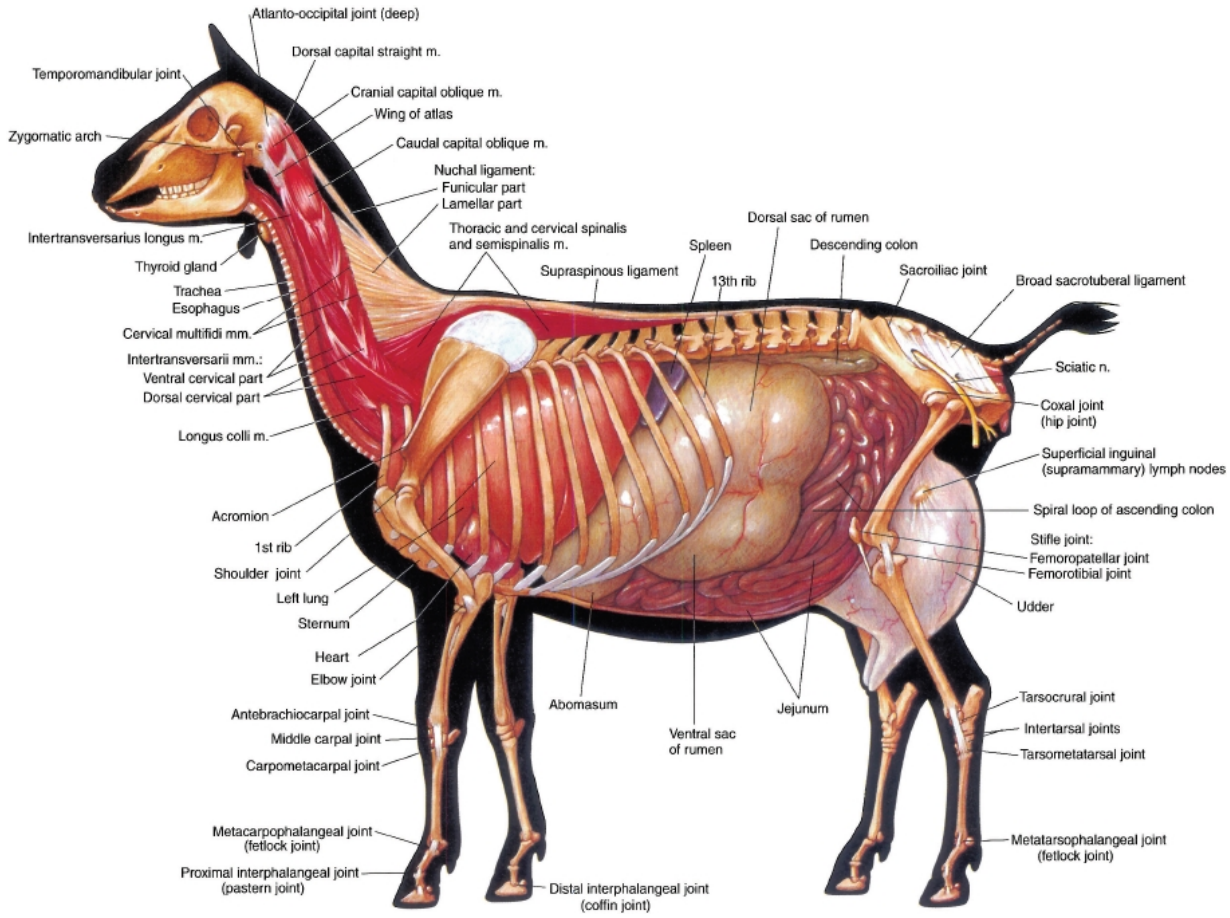


PLATE 4.11 Superficial structures of the goat's head. Dashed line indicates the site of a dehorning incision, a = artery, b = bone, n = nerve, M = molar tooth, P = premolar tooth

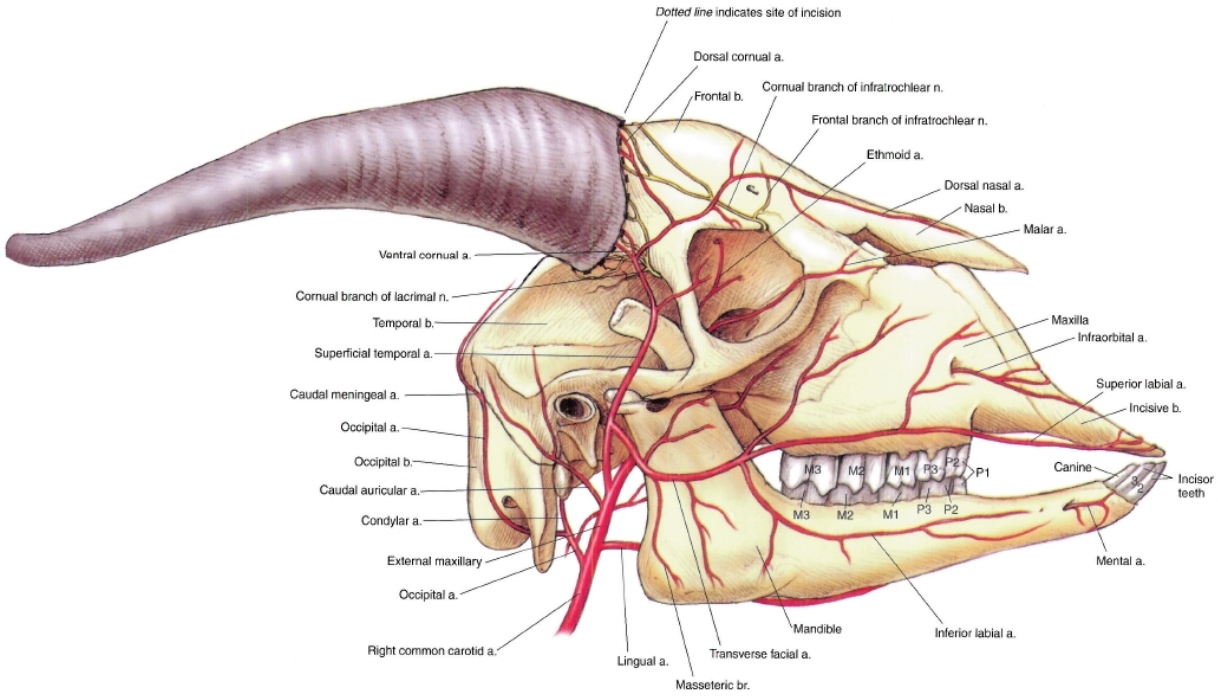


PLATE 4.12 Median section of the caprine head. Most of the nasal septum is removed, m = muscle, b = bone

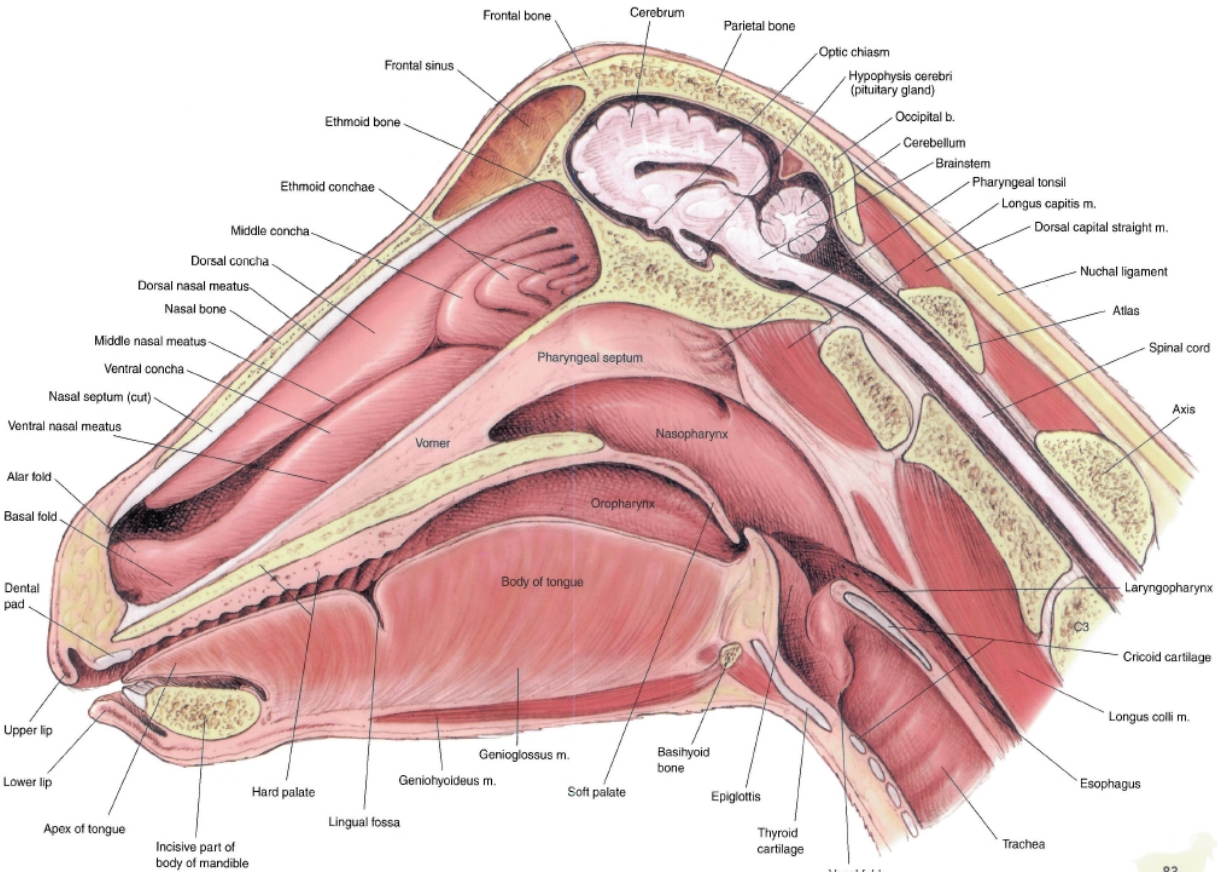


PLATE 4.13 Reproductive organs, abdominal viscera, heart, and adjacent major vessels related to the skeleton of the buck. Intestines and lungs removed. Right lateral view, m = muscle, v = vein, a = artery, b = bone

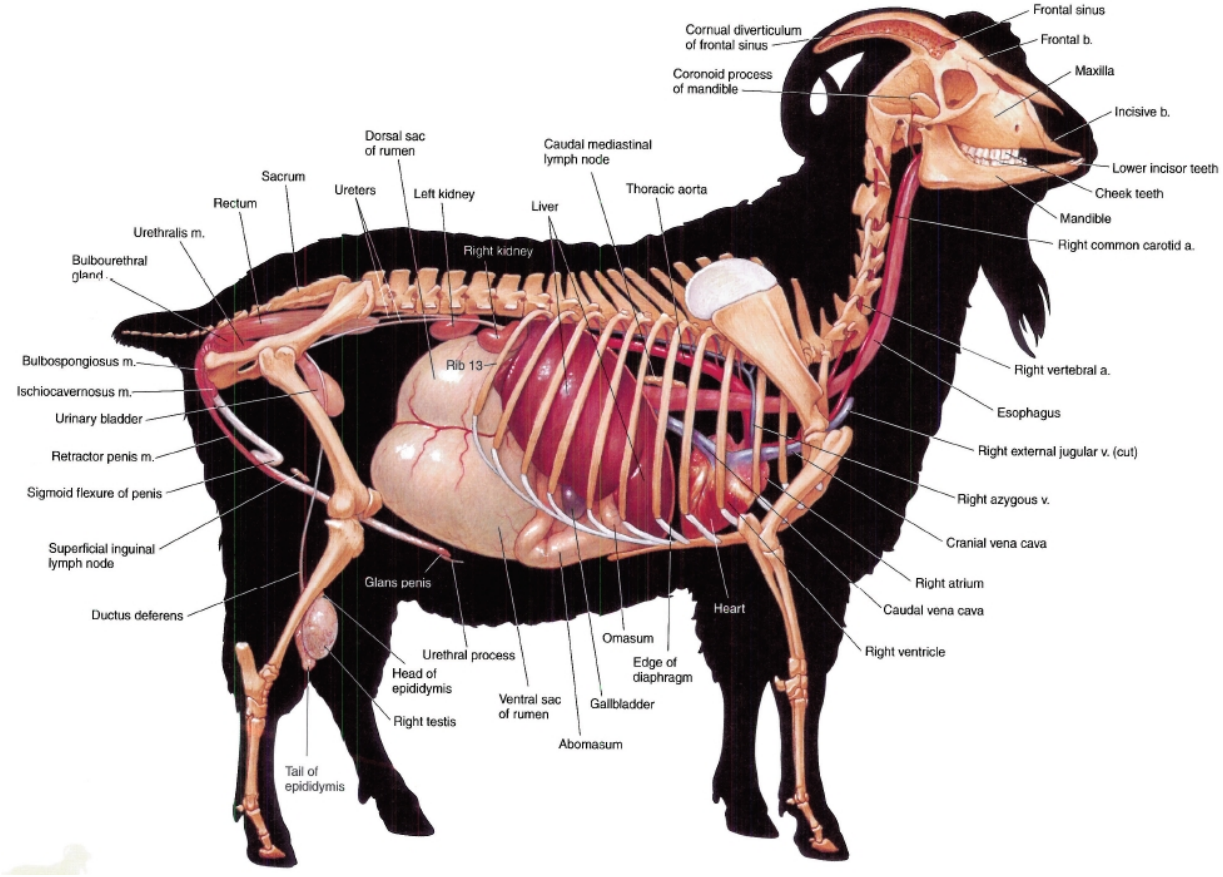


PLATE 4.14 Reproductive organs, abdominal viscera, heart, and adjacent major vessels of the doe. Ribs 2 and 12 and the lungs and intestines are removed. Left lateral view, a = artery, b = bone, v = vein

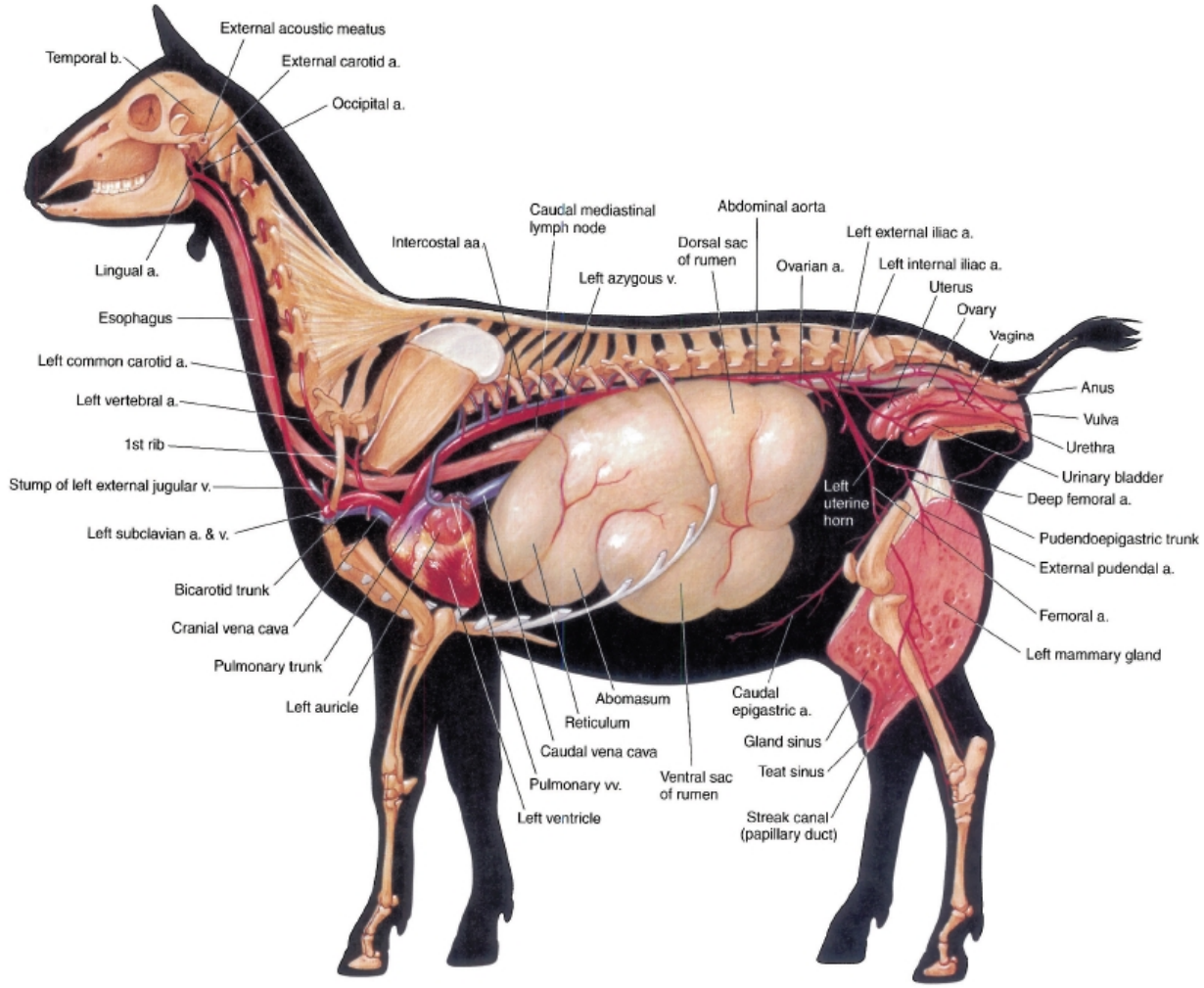


PLATE 4.15 Relations of the reproductive organs of the buck. Right pelvic limb and body wall are removed. Right lateral view, a = artery, m = muscle, v = vein

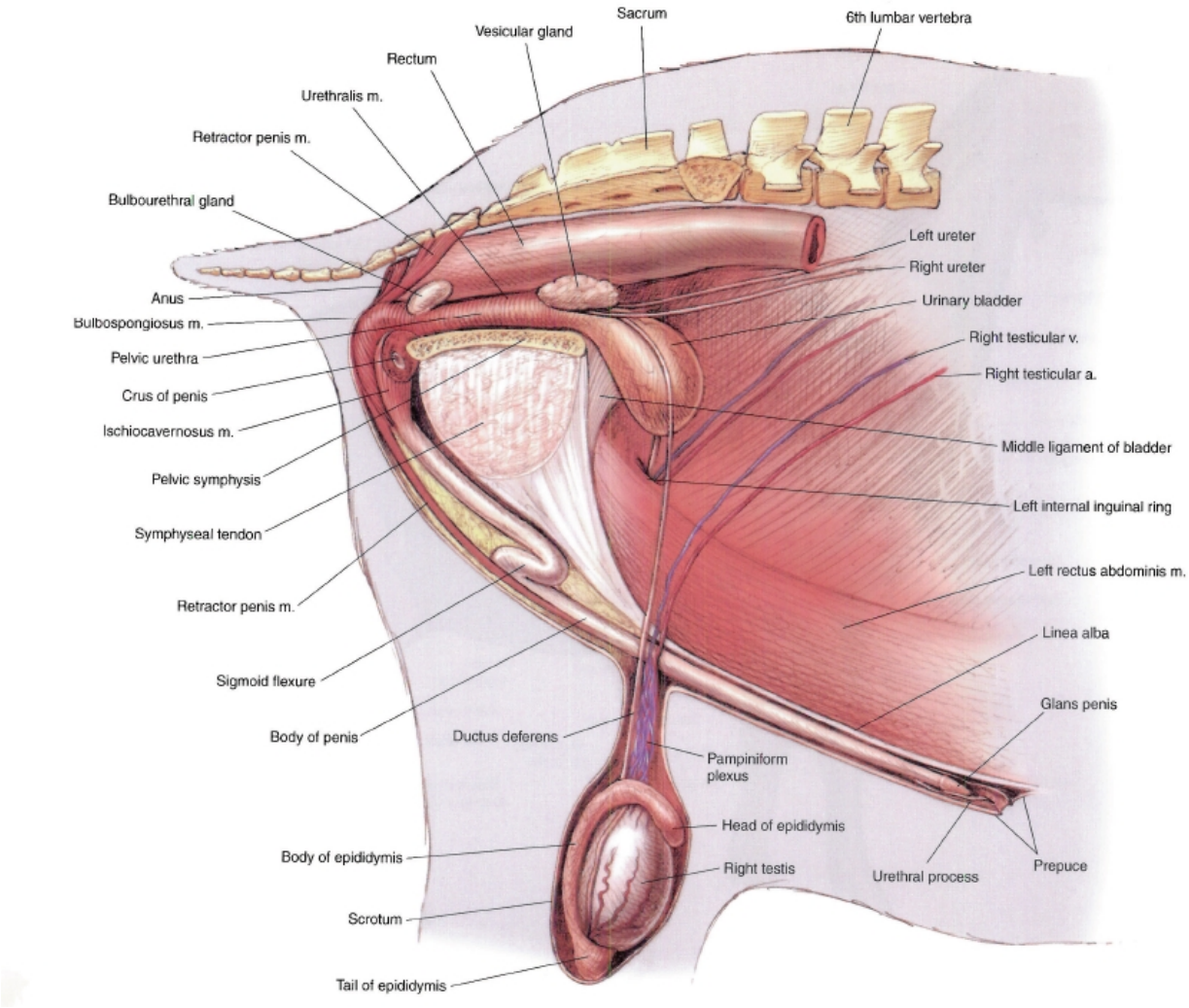
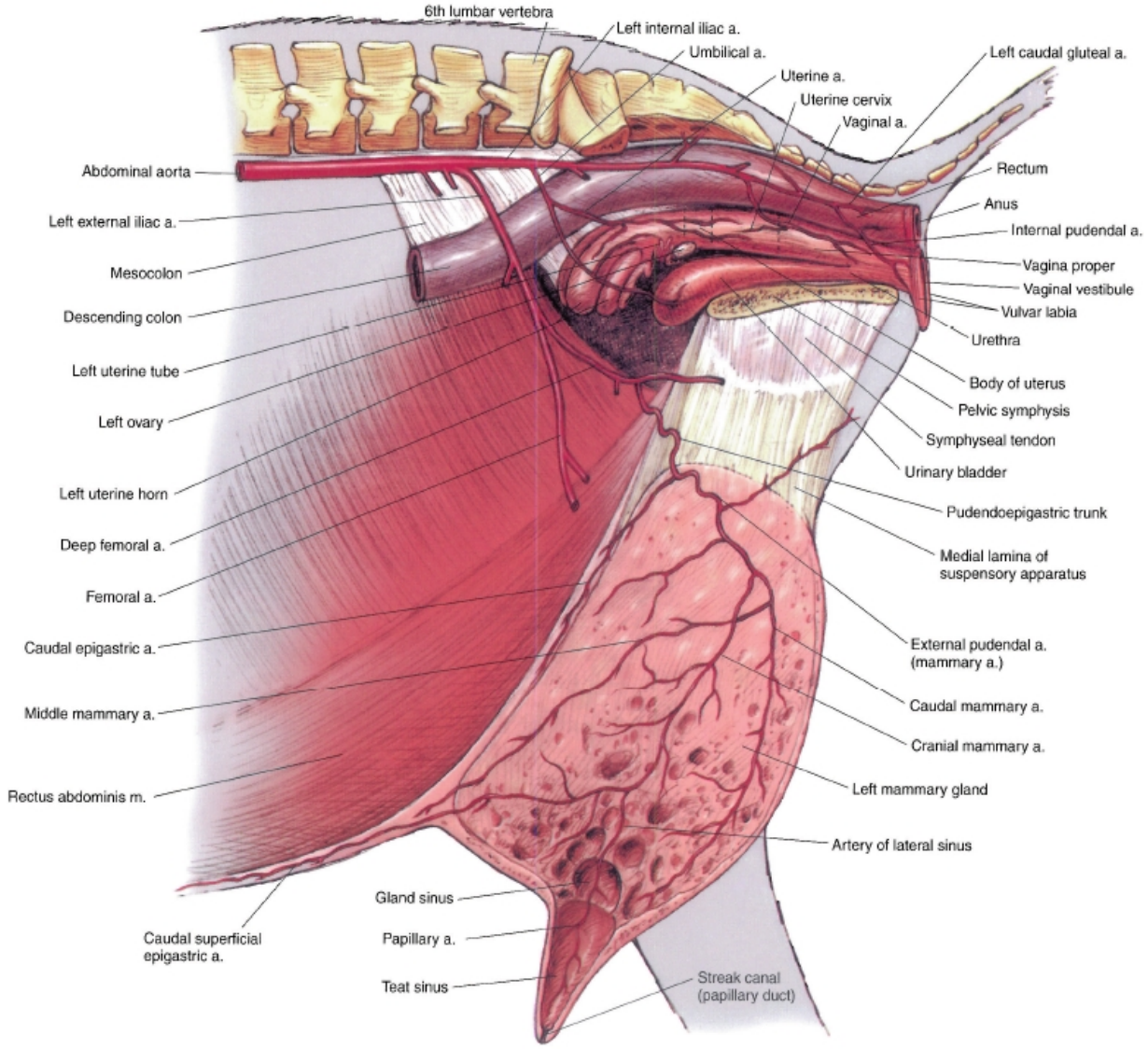


PLATE 4.16 Relations of the reproductive organs of the doe. Median section, a = artery, m = muscle


6th lumbar vertebra
Left internal iliac a.
Umbilical a.
Uterine a.
Uterine cervix
Vaginal a.
Left caudal gluteal a.
Abdominal aorta
Rectum
Anus
Left external iliac a.
Internal pudendal a.
Mesocolon
Vagina proper
Vaginal vestibule
Descending colon
Vulvar labia
Urethra
Left uterine tube
Body of uterus
Pelvic symphysis
Left ovary
Symphyseal tendon
Urinary bladder
Left uterine horn
Pudendoepigastric trunk
Deep femoral a.
Medial lamina of suspensory apparatus
Femoral a.
Caudal epigastric a.
External pudendal a. (mammary a.)
Middle mammary a.
Caudal mammary a.
Cranial mammary a.
Rectus abdominis m.
Left mammary gland
Artery of lateral sinus
Gland sinus
Caudal superficial epigastric a.
Papillary a.
Teat sinus
Streak canal (papillary duct)

SECTION 5 THE LLAMA AND ALPACA (*Lama glama* and *Lama Pacos*)

PLATES

PLATE 5.1 Right lateral view of a male llama.

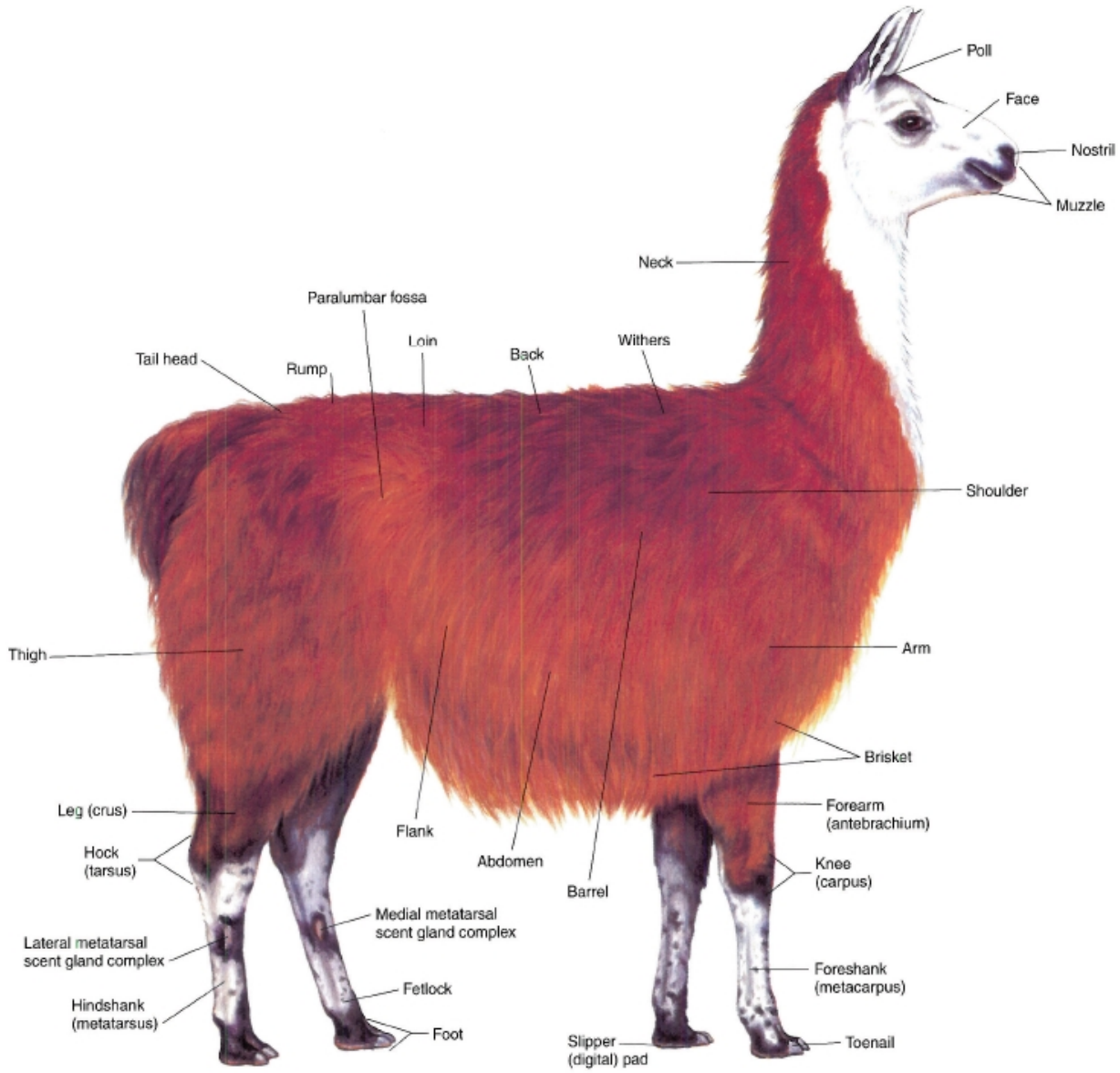


PLATE 5.2 Left lateral view of a female huacaya alpaca. Dorsal vertebral regions are indicated.

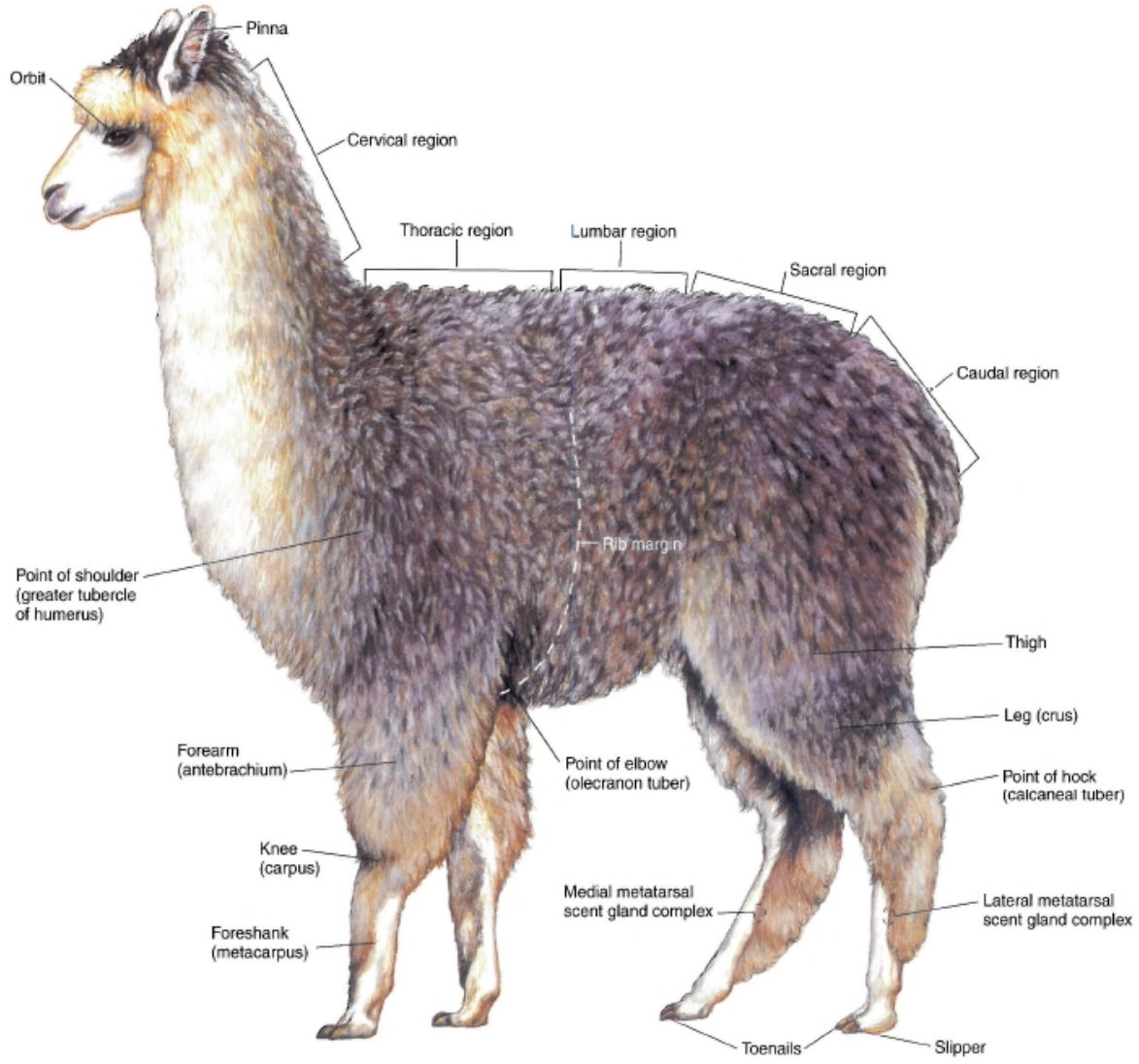


PLATE 5.3 Body regions of the llama

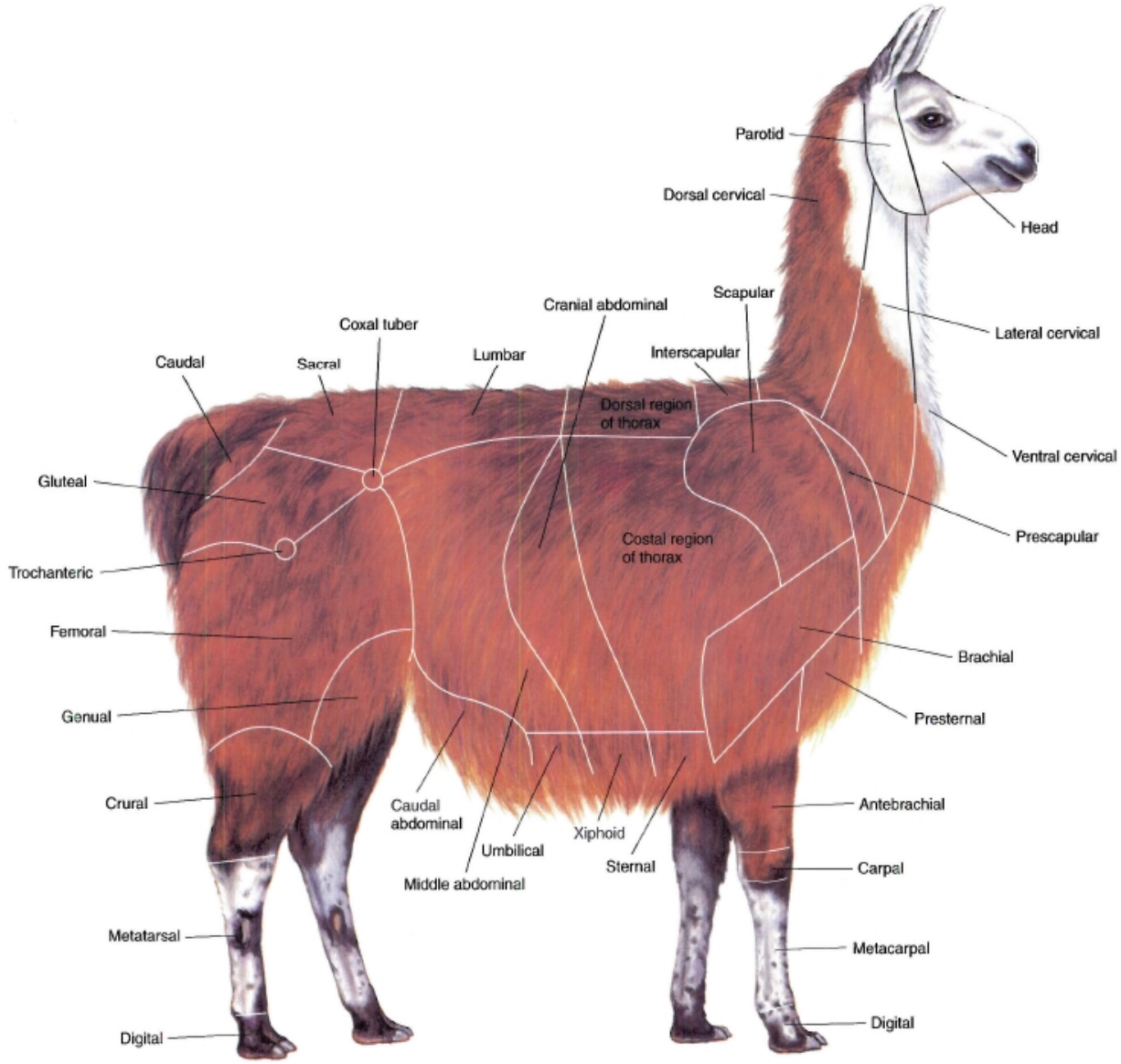


PLATE 5.4 Skeleton of the llama. Right lateral view. C = cervical vertebra, T = thoracic vertebra, L = lumbar vetebra, b = bone

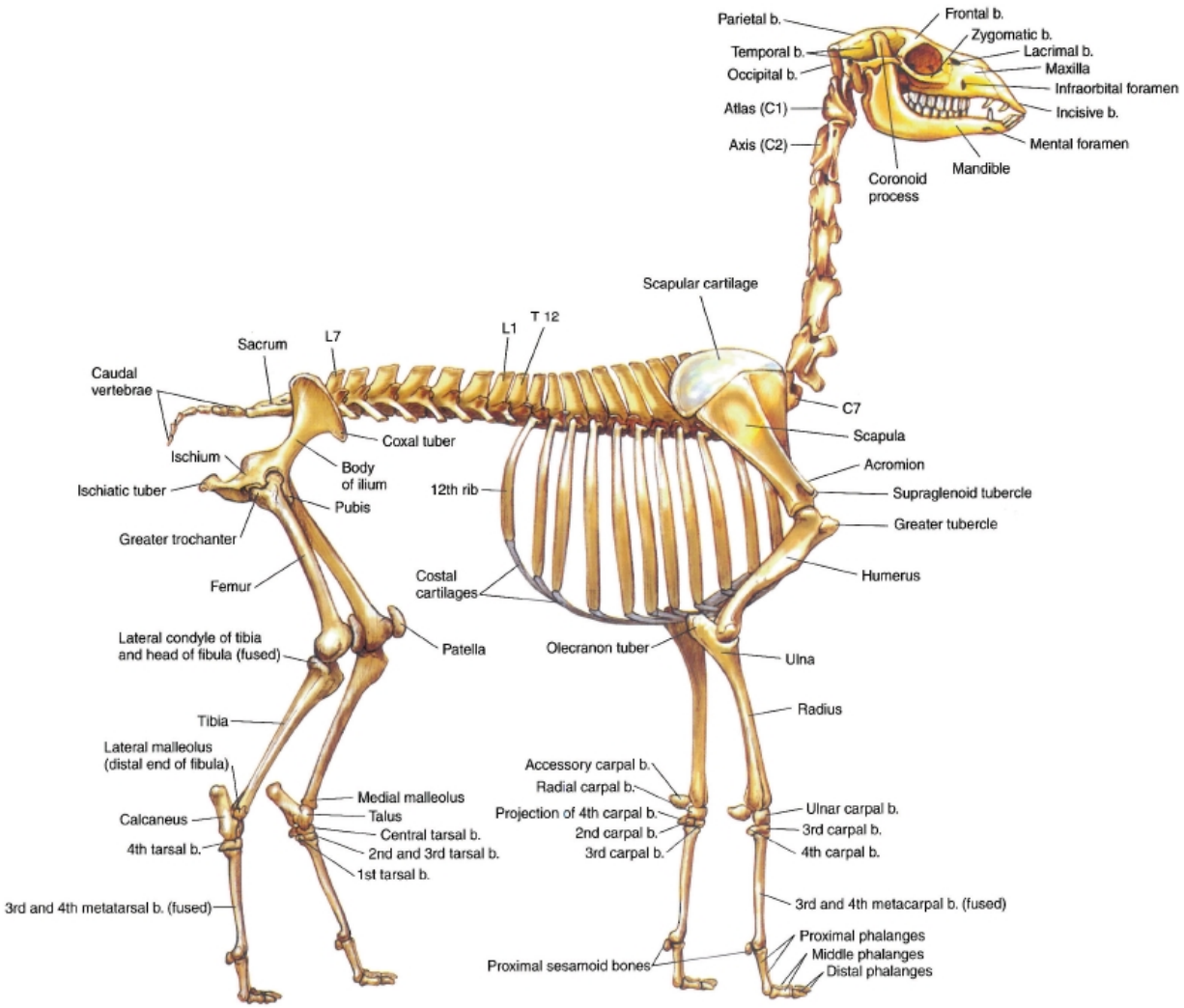


PLATE 5.5 Cutaneous muscles and major fasciae of the male llama. Right lateral view, m = muscle

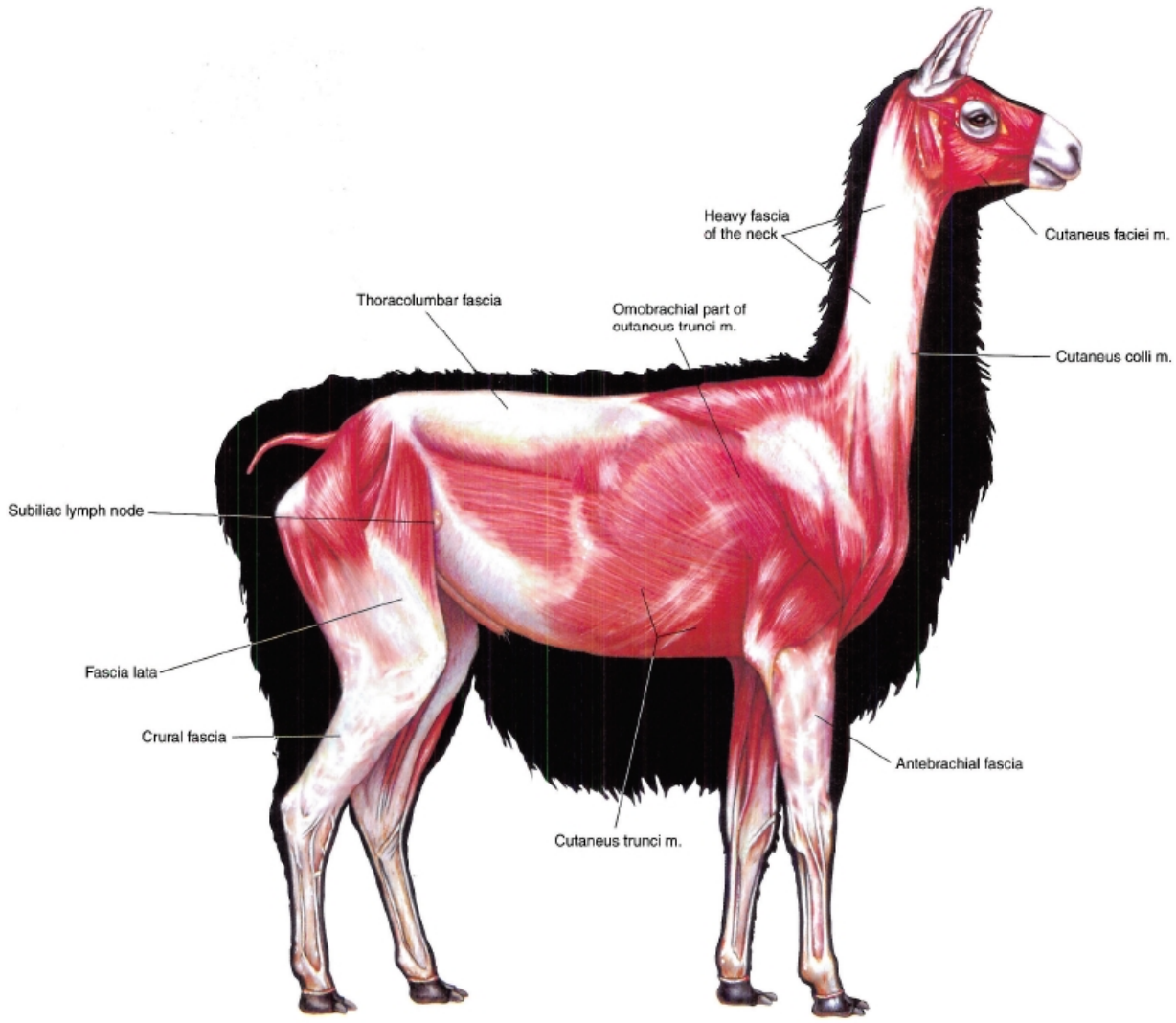


PLATE 5.6 Superficial muscles of the female alpaca. Left lateral view, m = muscle

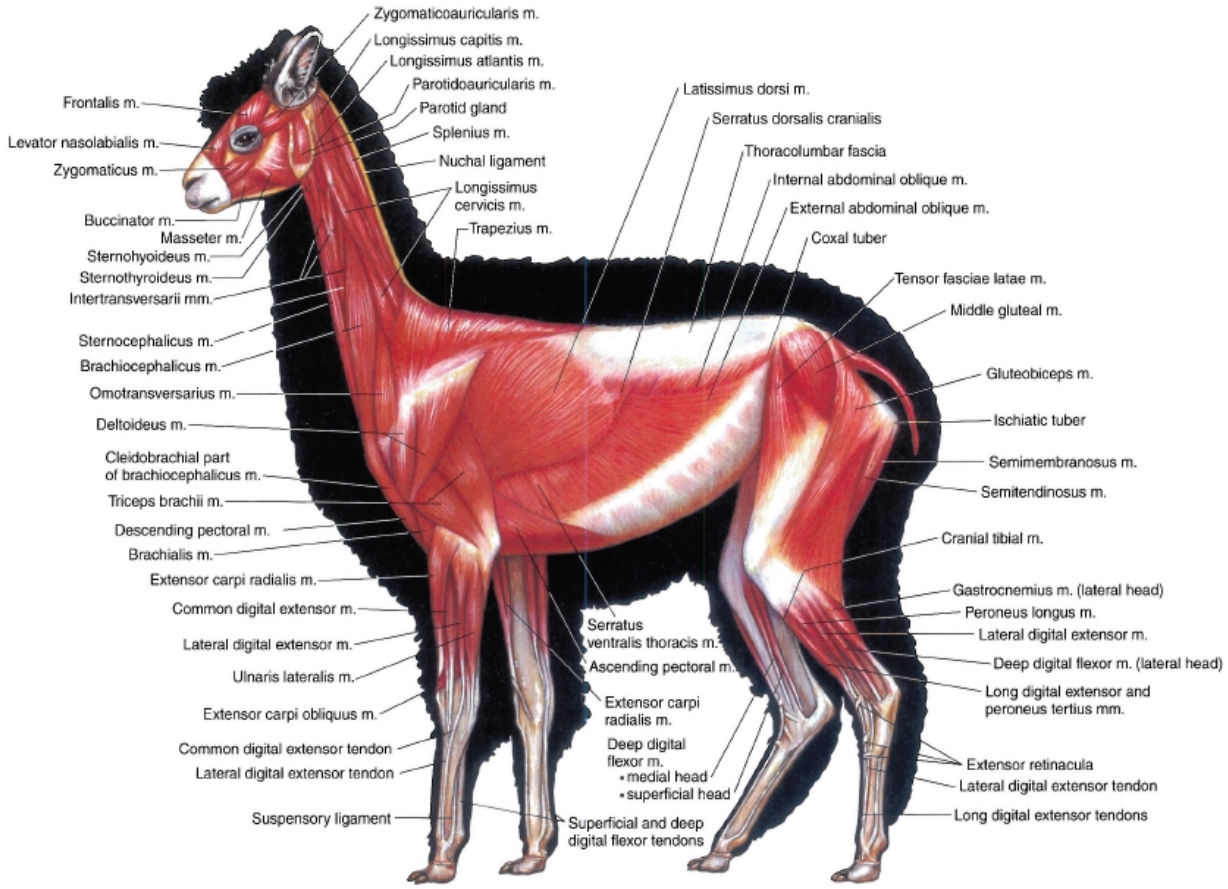


PLATE 5.7 Deep muscles and in situ viscera of the male llama. Omentum is removed. Right lateral view, m = muscle, v = vein, lig = ligament

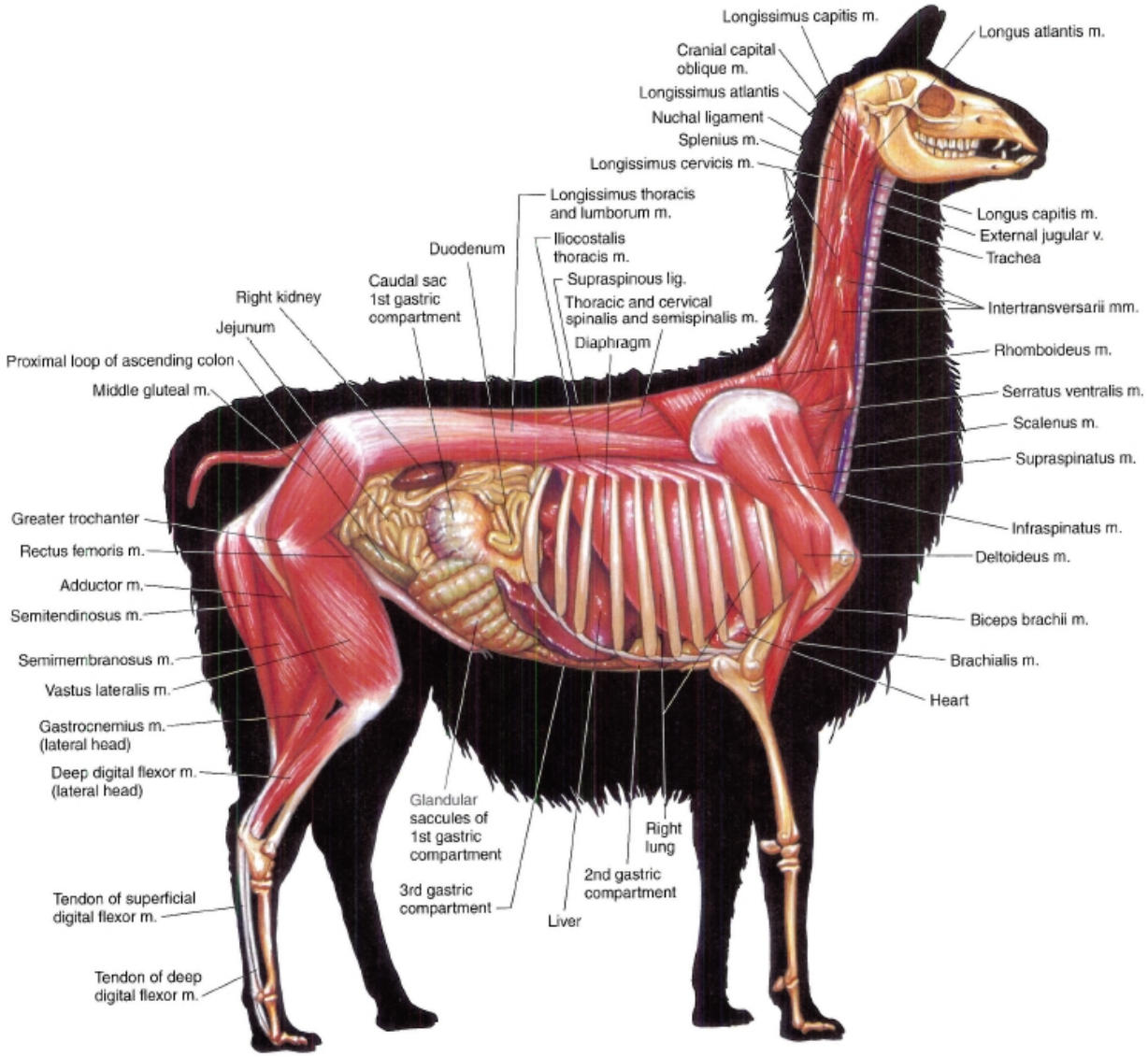


PLATE 5.8 Deep cervical muscles, in situ viscera, and major joints of the female alpaca. The omentum is removed. Left lateral view, m = muscle

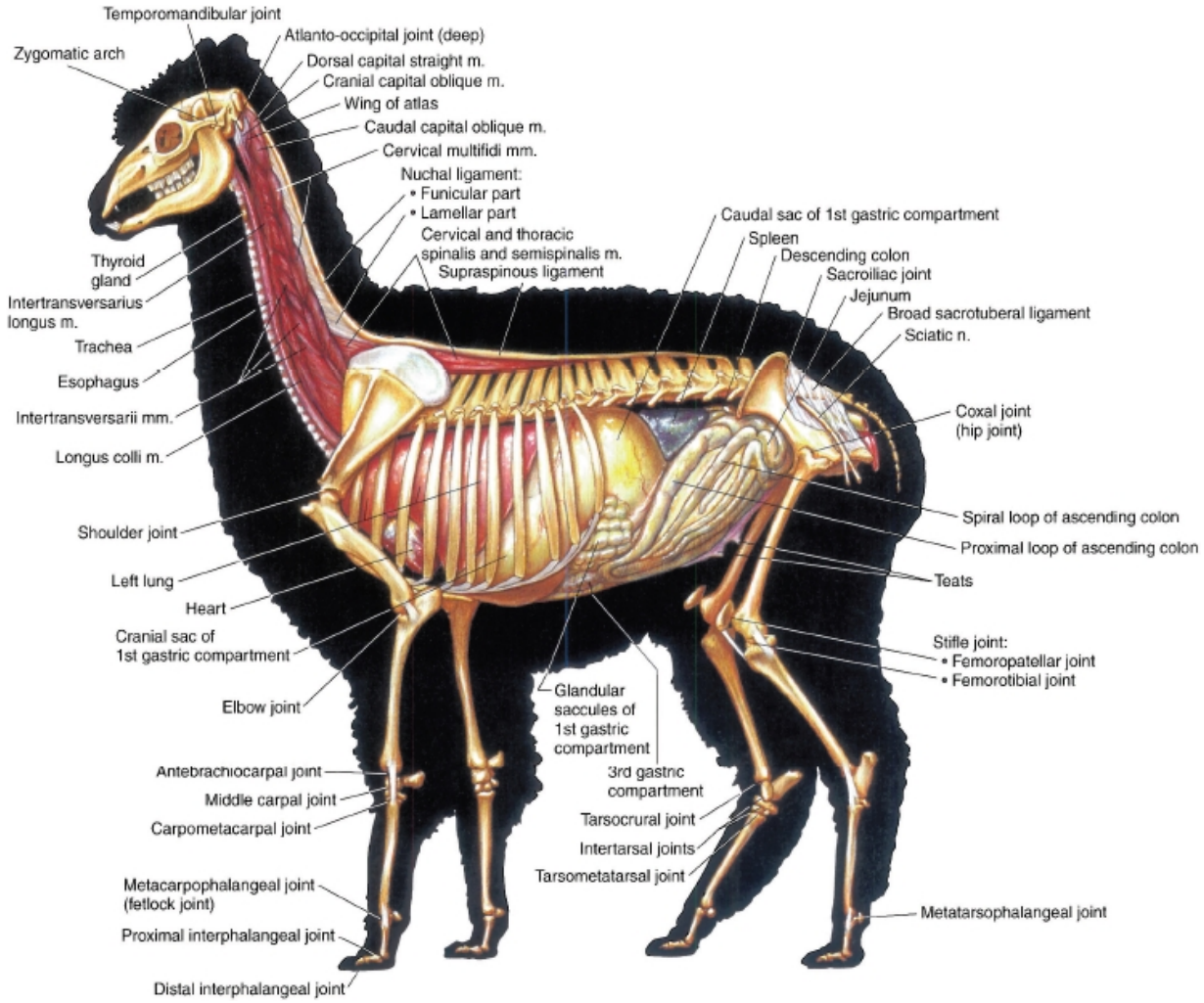


PLATE 5.9 Major structures of the distal metacarpus and digits. A. B. Palmar view, n = nerve, v = vein, m artery

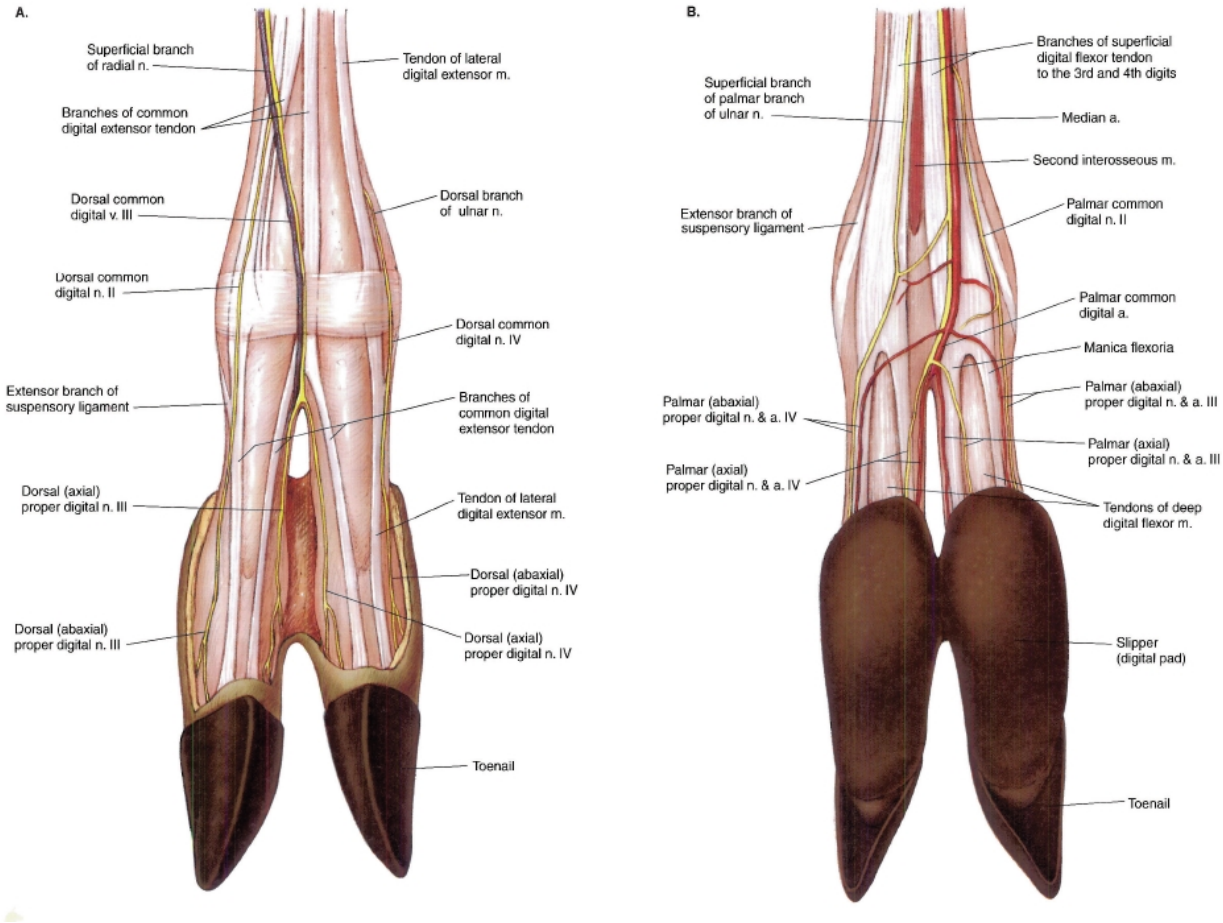


PLATE 5.10 Median section of the llama's head. Most of the nasal septum is removed, b = bone, m = muscle

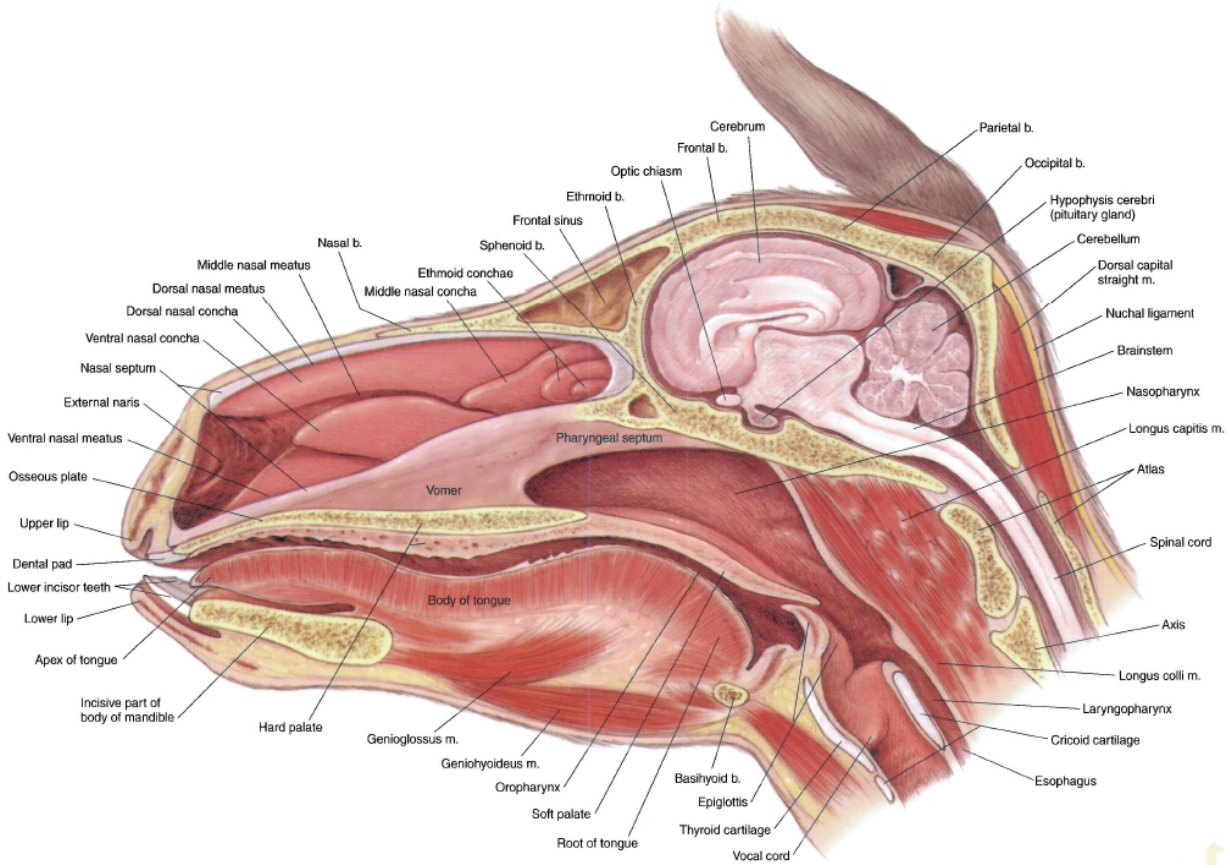


PLATE 5.11 A. Proper placement of a halter on a llama's head. B. Improper placement of a halter. Pressure on the nostrils interferes with breathing.

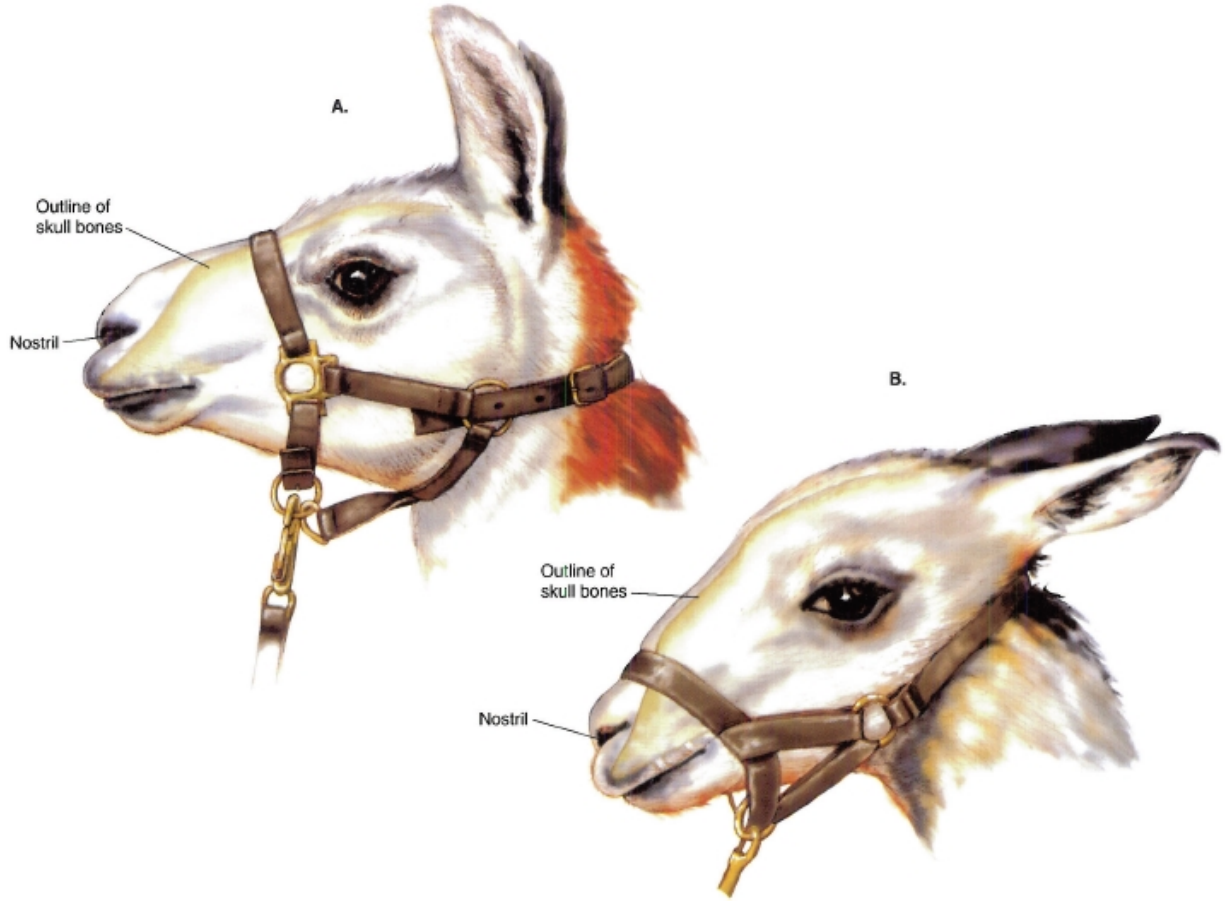


PLATE 5.12 Relations of the llama's common carotid artery and jugular vein. **A**. Right lateral view of the head and neck. **B**. Cross-section through the neck at the level of the 5th cervical vertebra, m = muscle

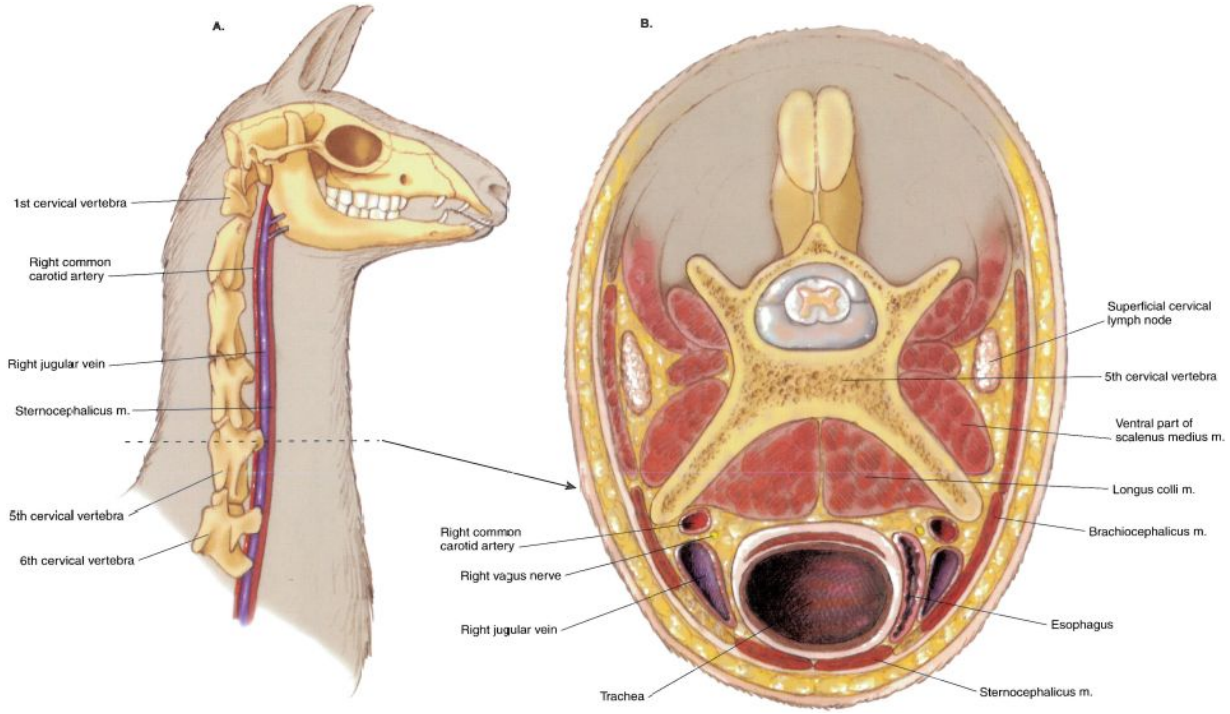


PLATE 5.13 Dentition of the male llama. **A**. Right lateral view of the skull and crowns of permanent teeth *in situ*. **B**. Ventral view of the crowns of the upper incisor and canine teeth. **C**. Dorsal view of the crowns of the lower incisor and canine teeth. *Dashed lines* indicate the plane of sectioning (2-3 mm above the gum [gingival] line) for cutting off the crowns of deciduous or erupting permanent canine and upper incisor teeth, b = bone

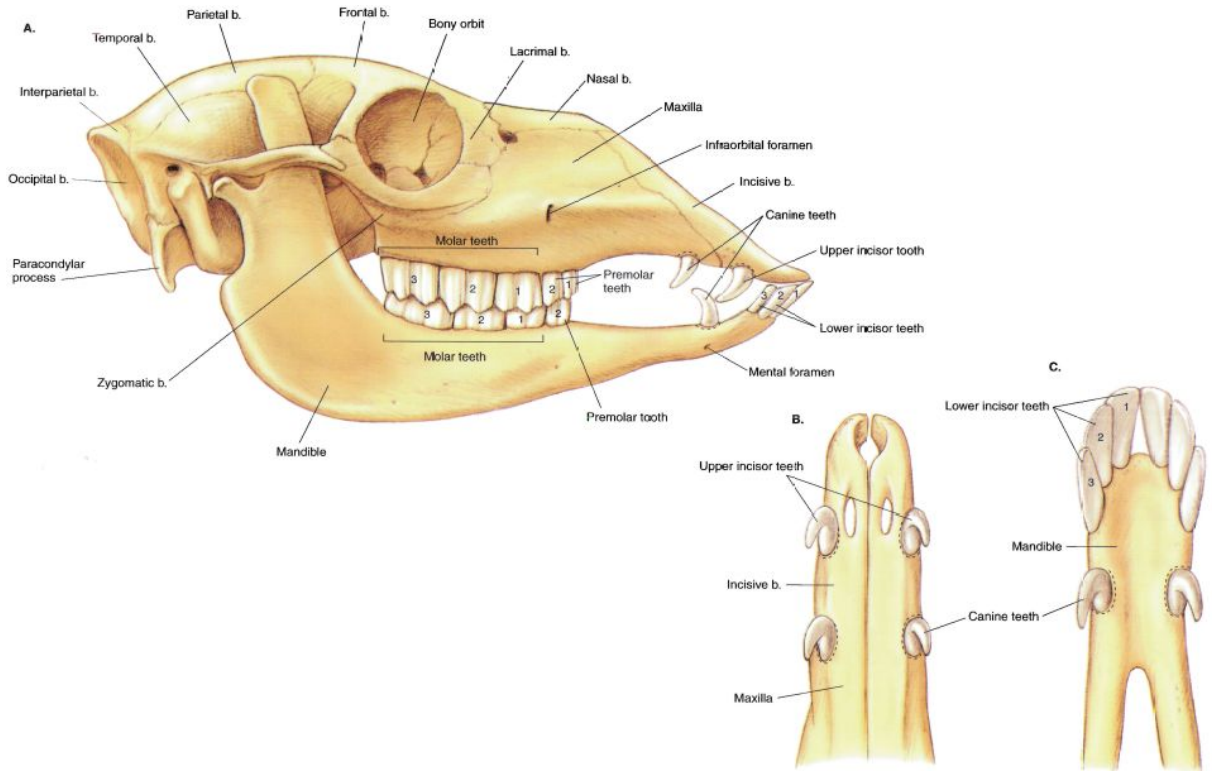


PLATE 5.14 Isolated stomach and intestines of the male llama. Jejunum is shortened.

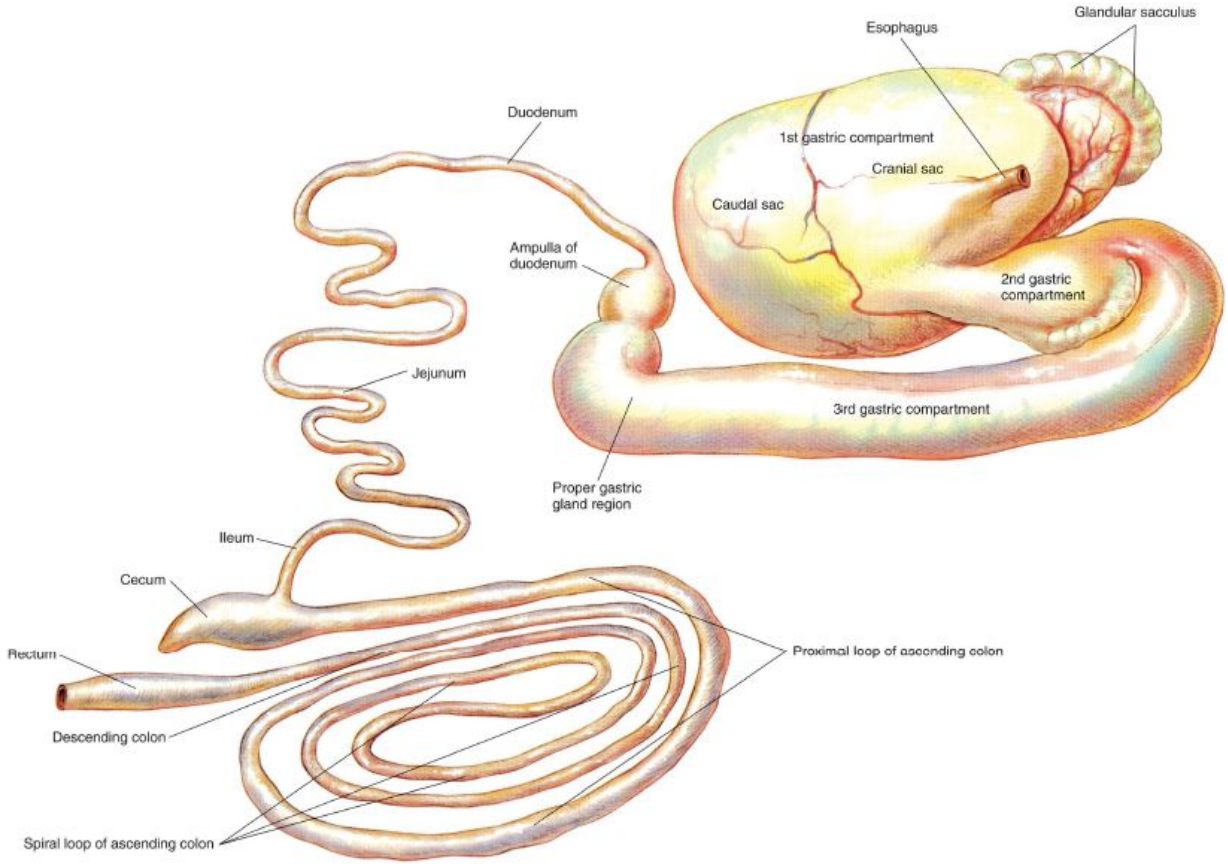


PLATE 5.15 Reproductive and urinary organs, stomach, liver, heart, and adjacent major vessels related to the skeleton of the male llama. Lungs and intestines are removed. Right lateral view. v = vein, a = artery, m = muscle

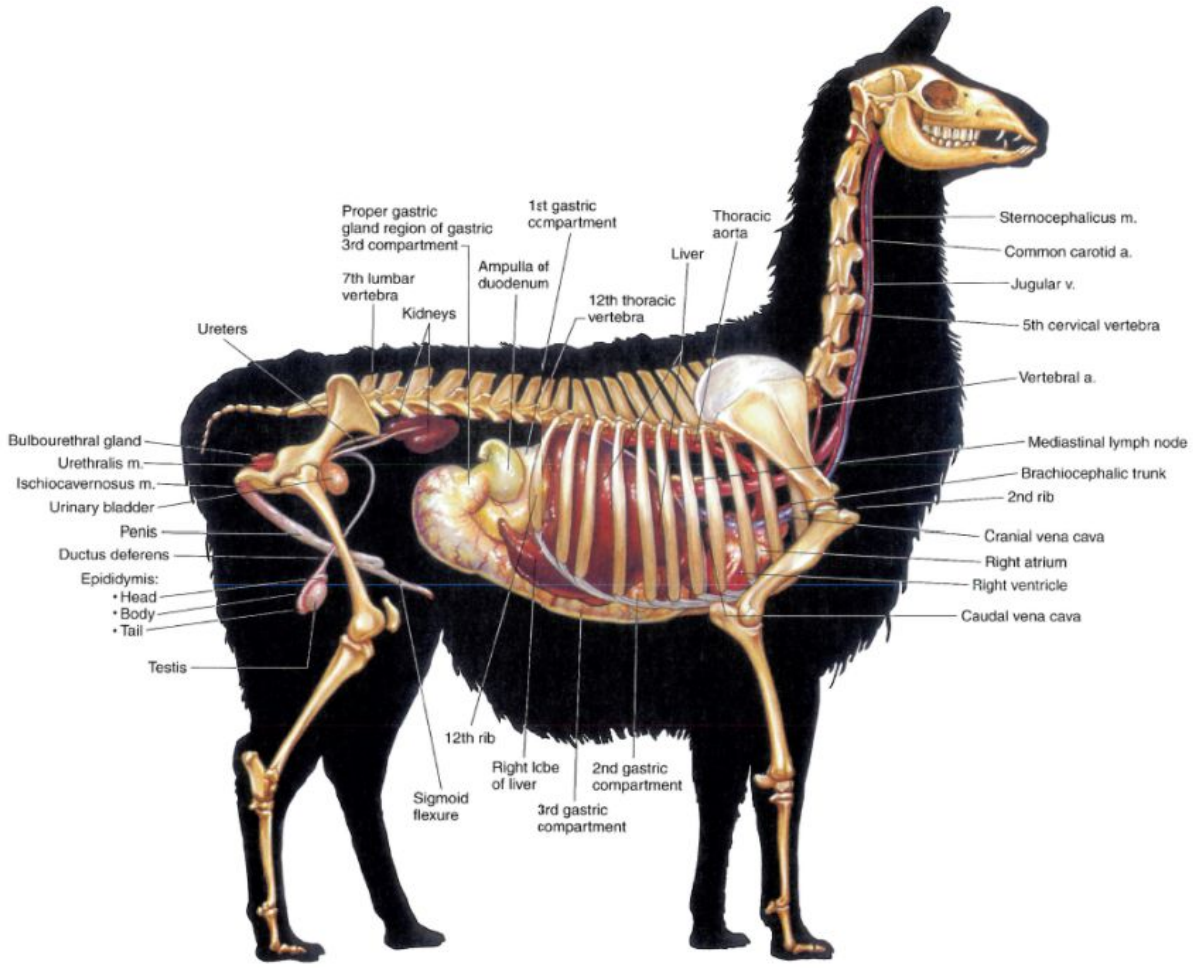


PLATE 5.16 Reproductive and urinary organs, stomach, heart, and adjacent major vessels of the female alpaca. Lungs and intestines are removed. Left lateral view, a = arterv, v = vein

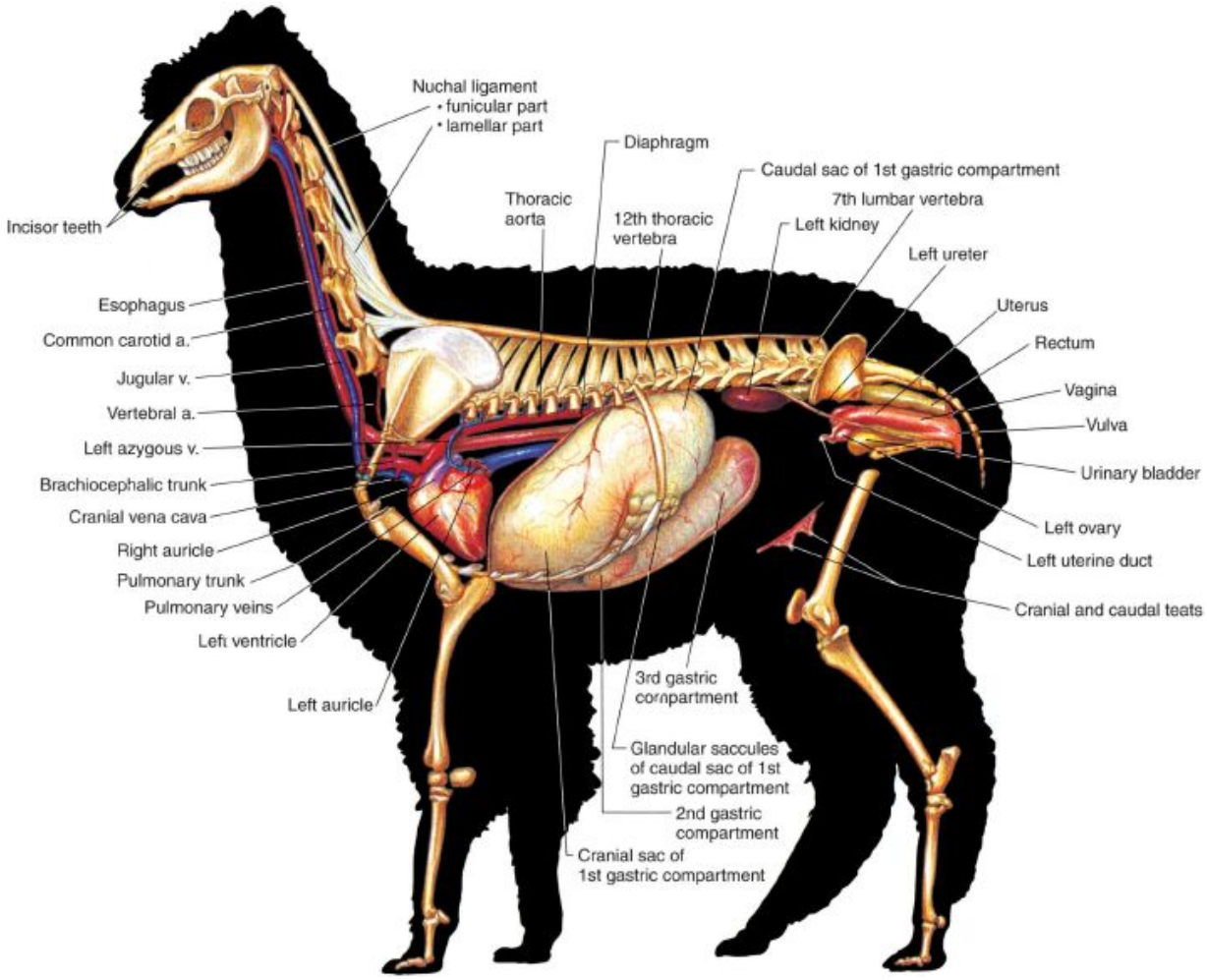


PLATE 5.17 Relations of the reproductive organs of the male llama. Right lateral view, m = muscle. Inn = lymph nodes, v = vein, a = artery

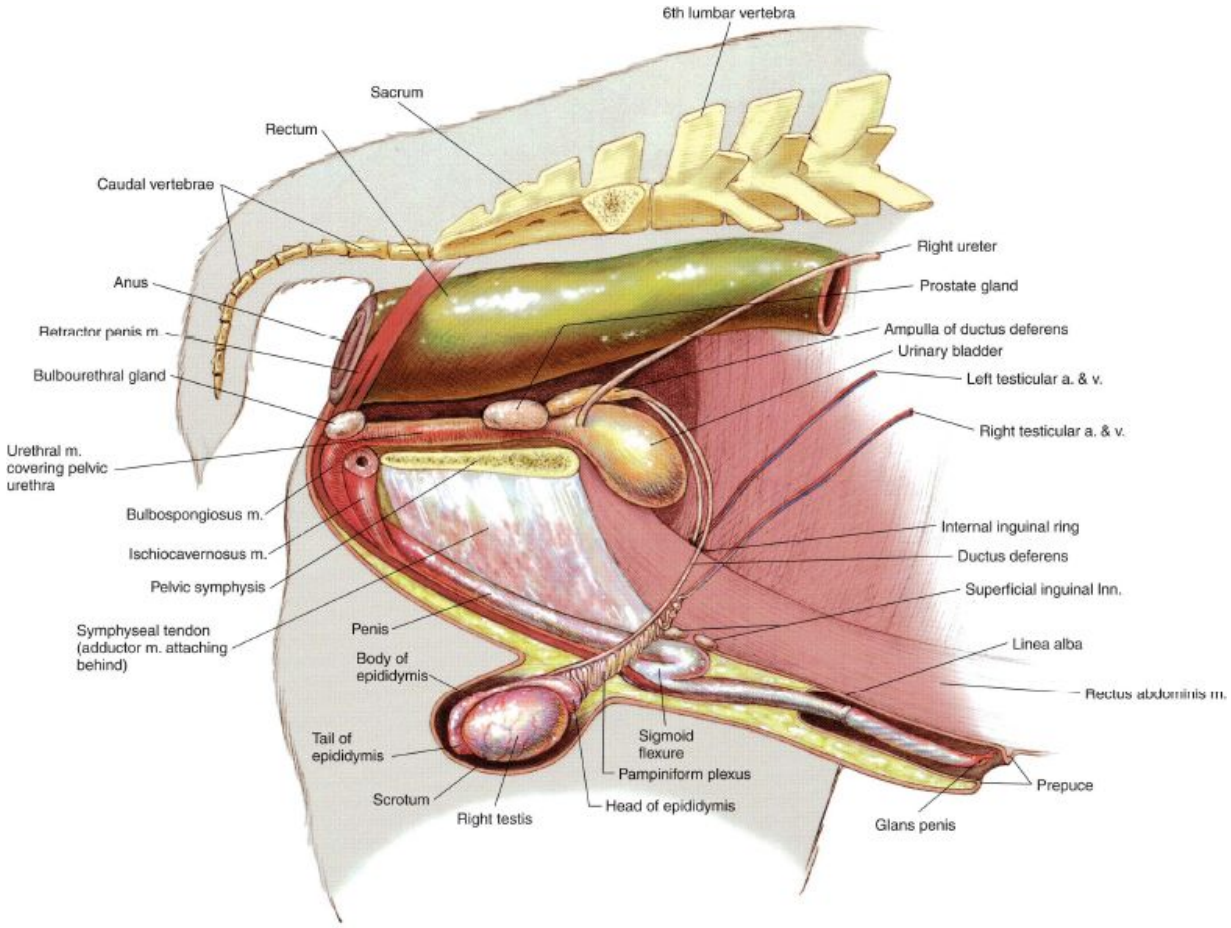
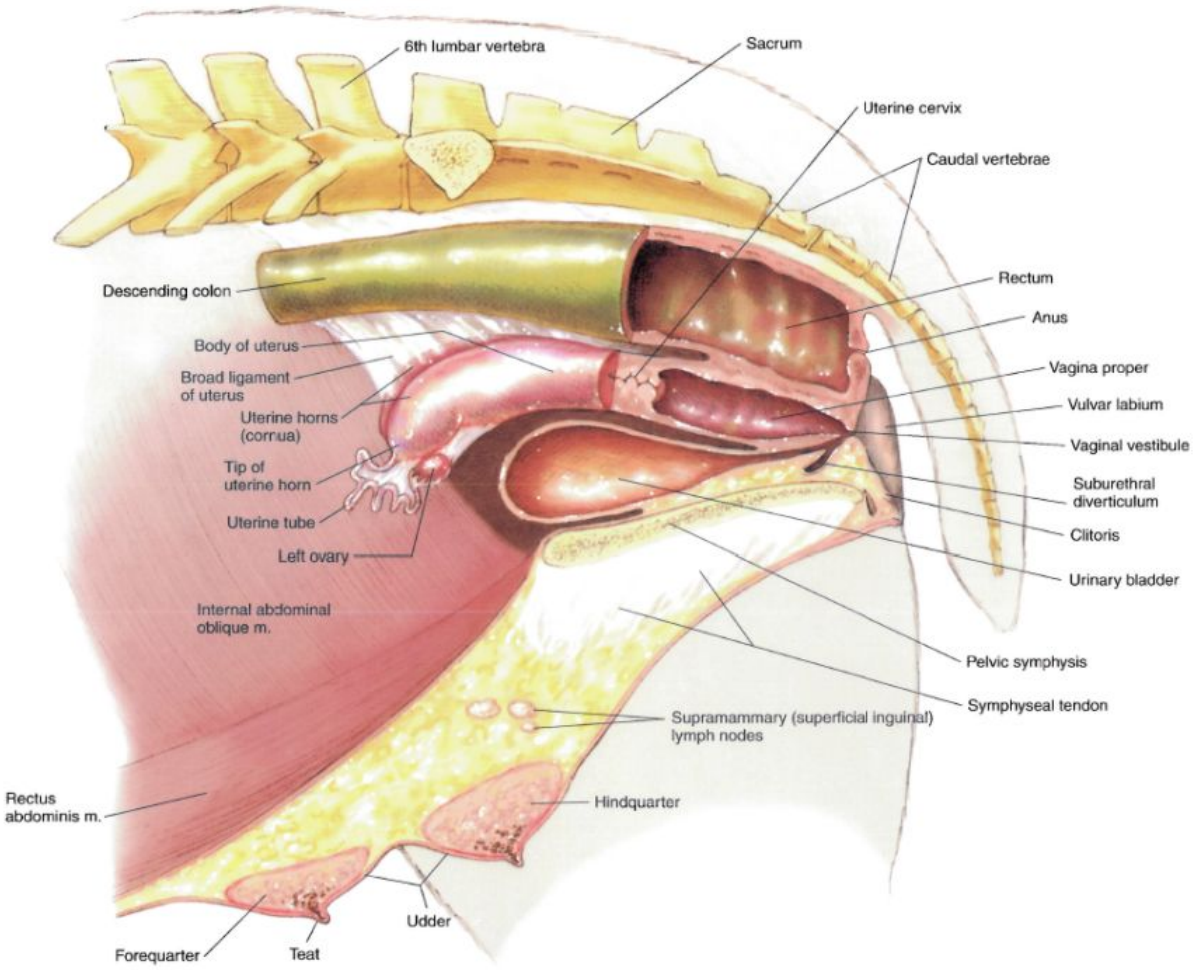


PLATE 5.18 Relations of the reproductive organs of the female alpaca. Partial median section. Left lateral view. m = muscle


6th lumbar vertebra
Sacrum
Uterine cervix
Caudal vertebrae
Descending colon
Rectum
Anus
Body of uterus
Broad ligament of uterus
Uterine horns (cornua)
Vagina proper
Vulvar labium
Vaginal vestibule
Tip of uterine horn
Uterine tube
Left ovary
Suburethral diverticulum
Clitoris
Urinary bladder
Internal abdominal oblique m.
Pelvic symphysis
Symphyseal tendon
Supramammary (superficial inguinal) lymph nodes
Rectus abdominis m.
Hindquarter
Udder
Forequarter
Teat

SECTION 6 THE SWINE (*Sus scrofa domesticus*)

PLATES

PLATE 6.1 Right lateral view of a boar.

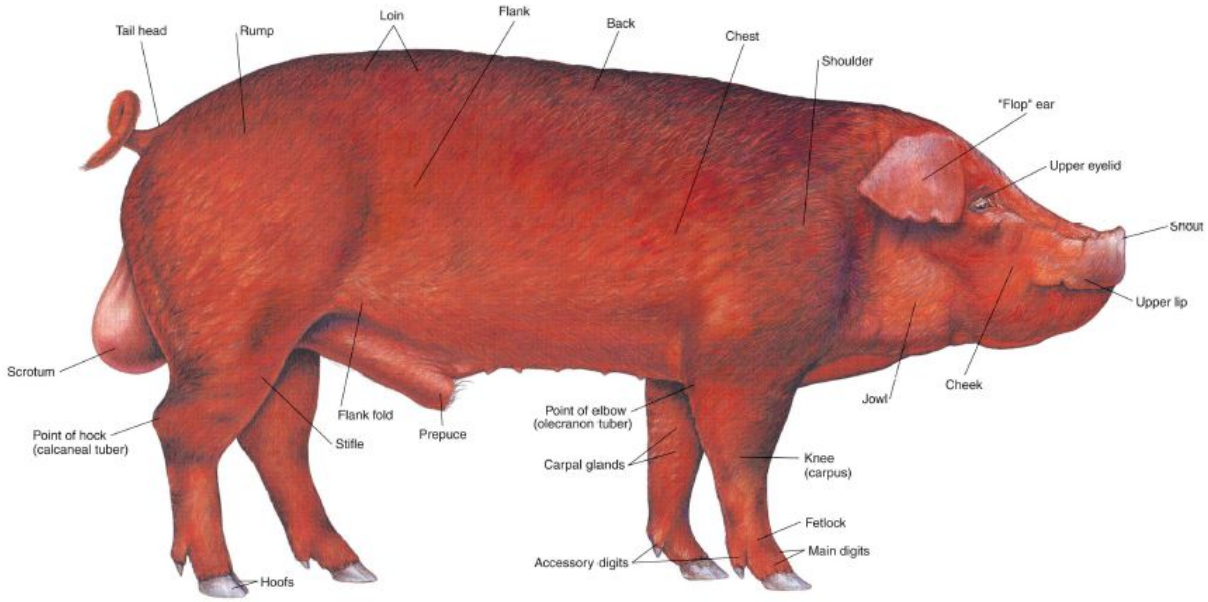


PLATE 6.2 left lateral view of a sow.

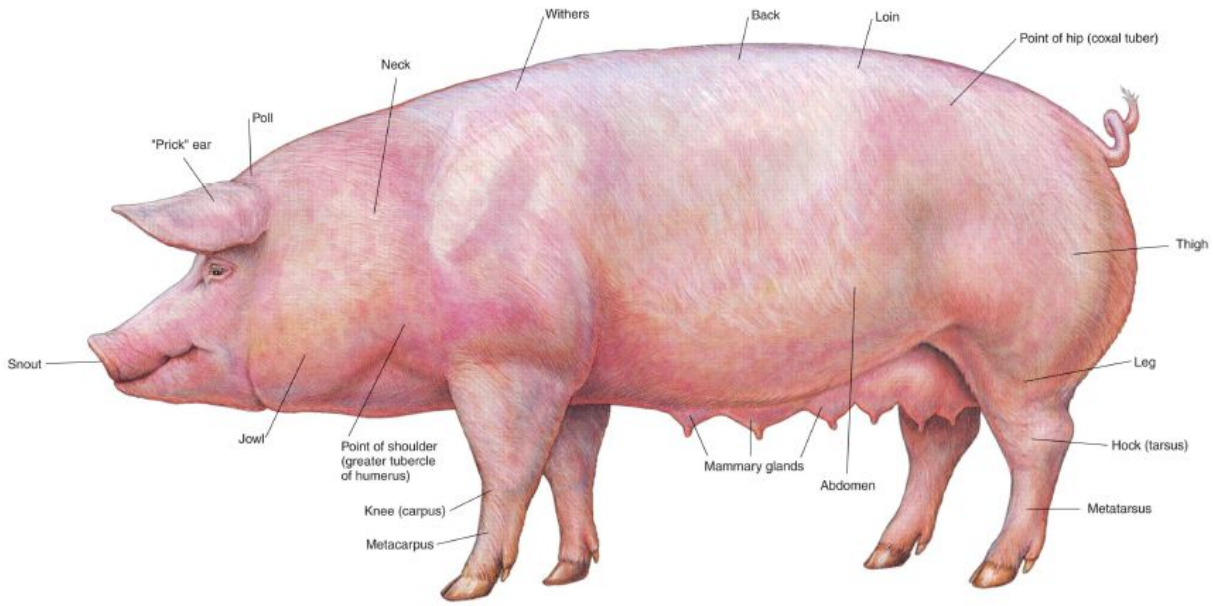


PLATE 6.3 Carcass cuts of the hog.

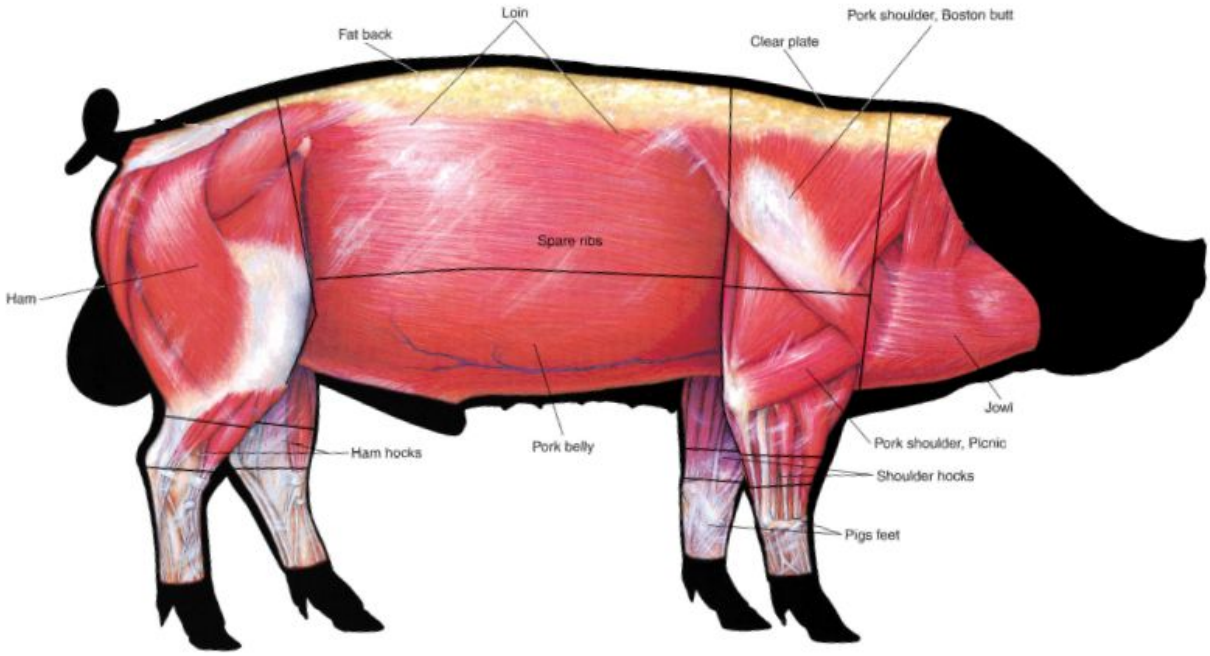


PLATE 6.4 Skeleton of the swine. b = bone

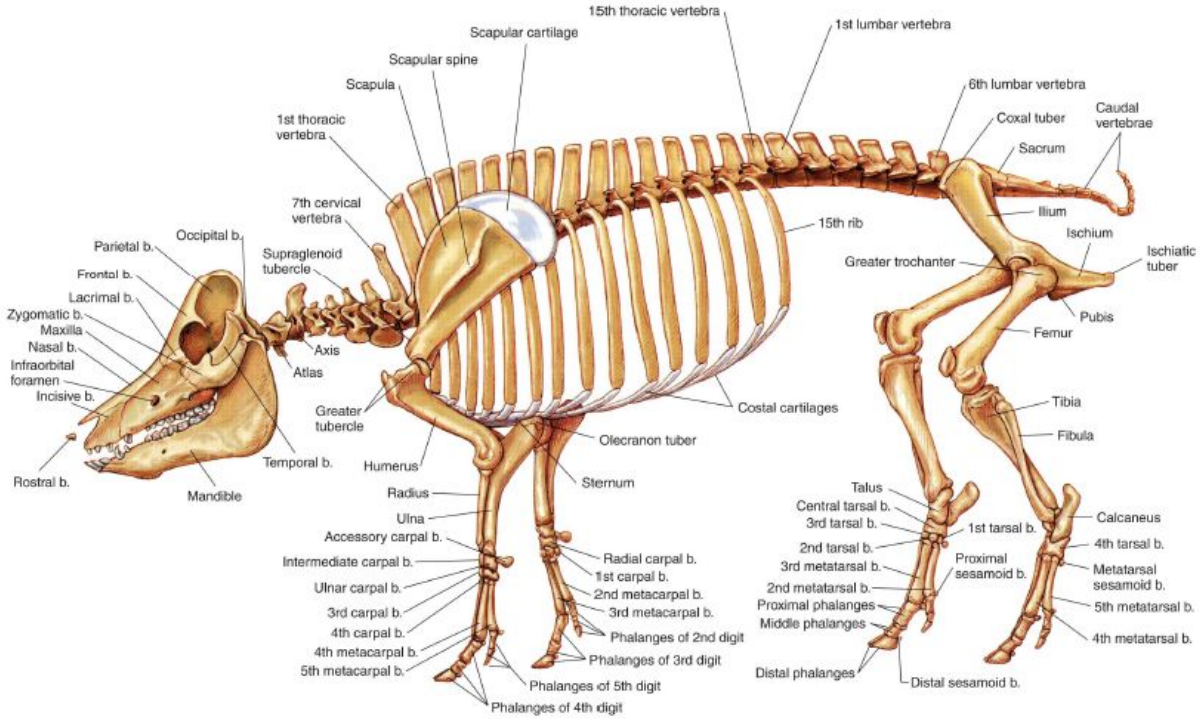


PLATE 6.5 Cutaneous and superficial muscles of the boar. Panniculus adiposus (fat layer) removed. Right lateral view, v = vein, m = muscle

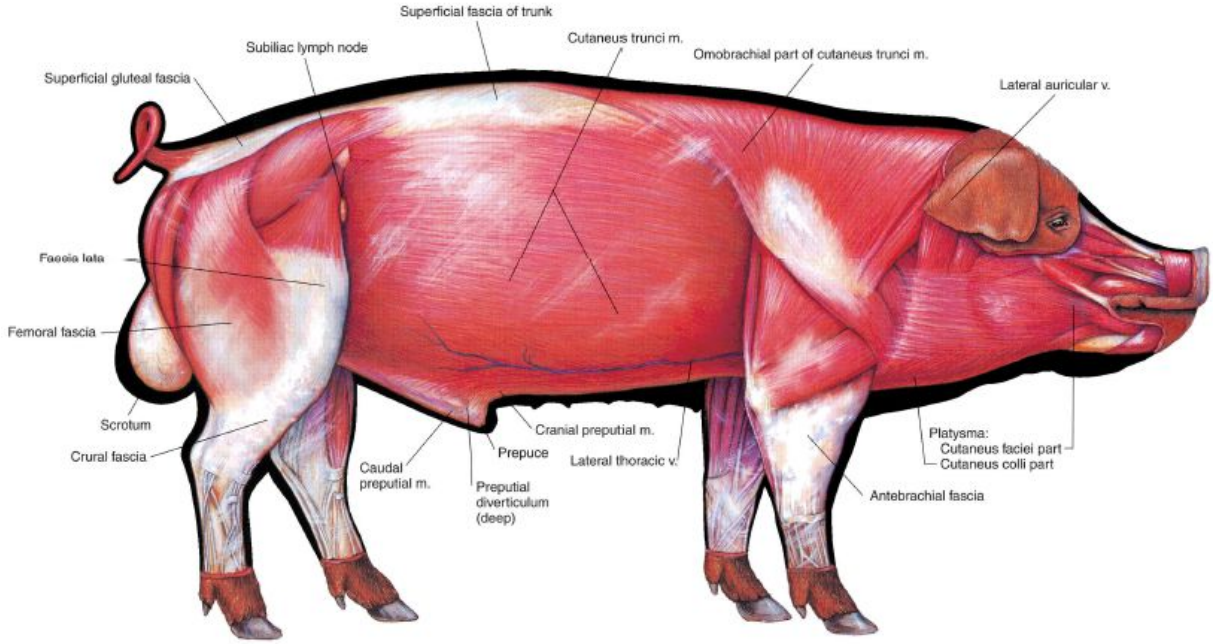


PLATE 6.6 Superficial muscles of the sow. Left lateral view, m = muscle, n = nerve

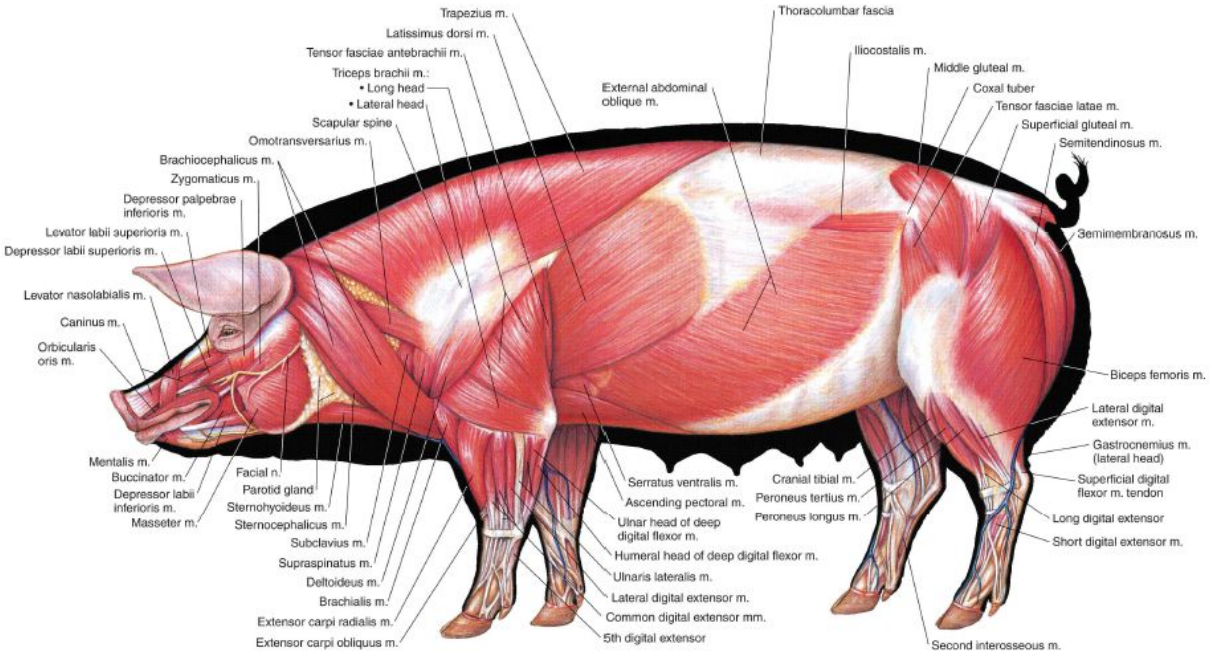


PLATE 6.7 Deep muscles and *in situ* viscera of the boar. Right lateral view, m = muscle, n = nerve

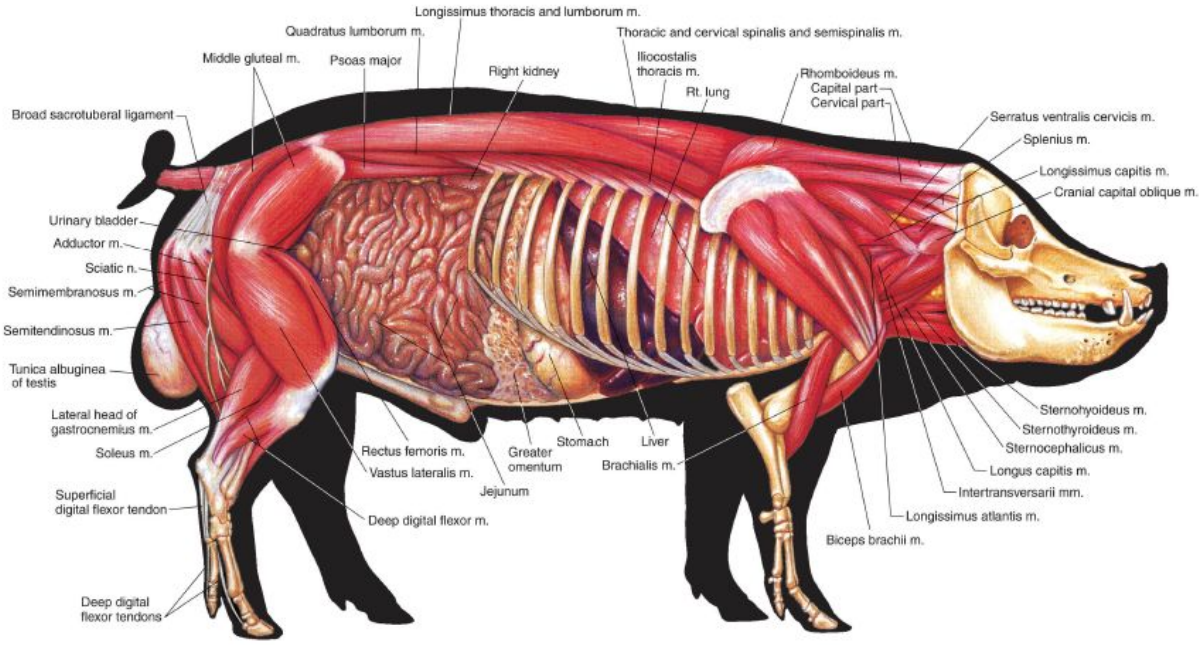


PLATE 6.8 Deep cervical muscles, major joints, and *in situ* viscera of the sow. Lett lateral view, m = muscle, j = joint

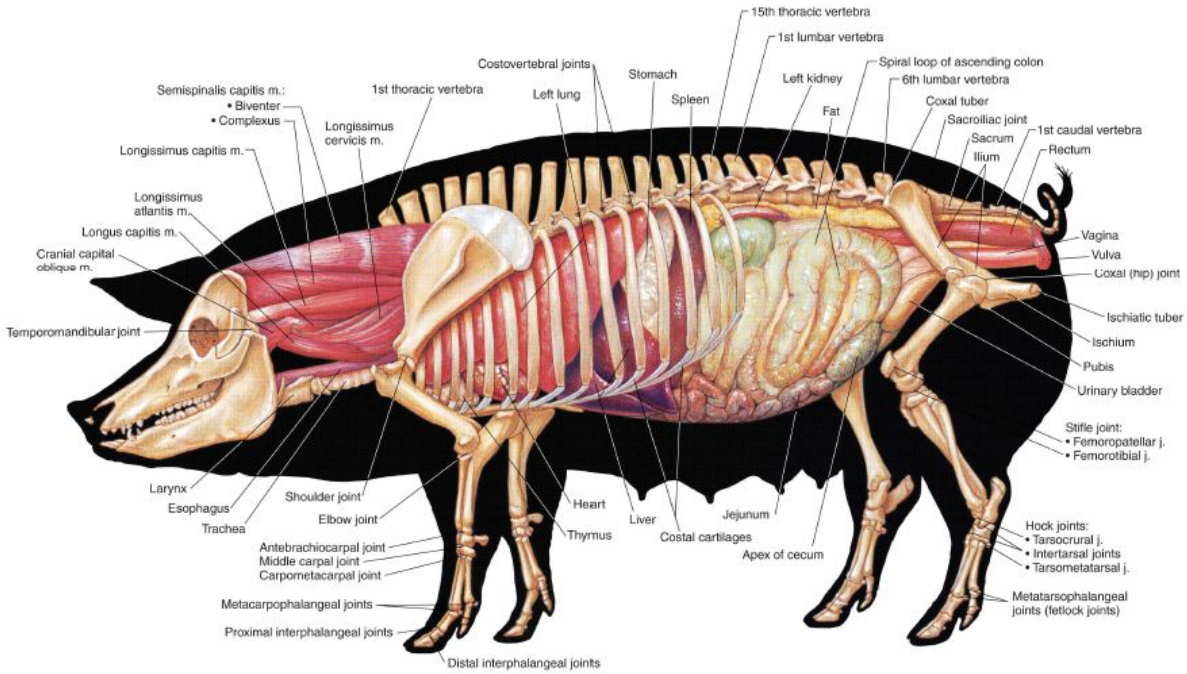


PLATE 6.9 Median section of the porcine head. The nasal septum has been removed. Right lateral view, m = muscle, b = bone

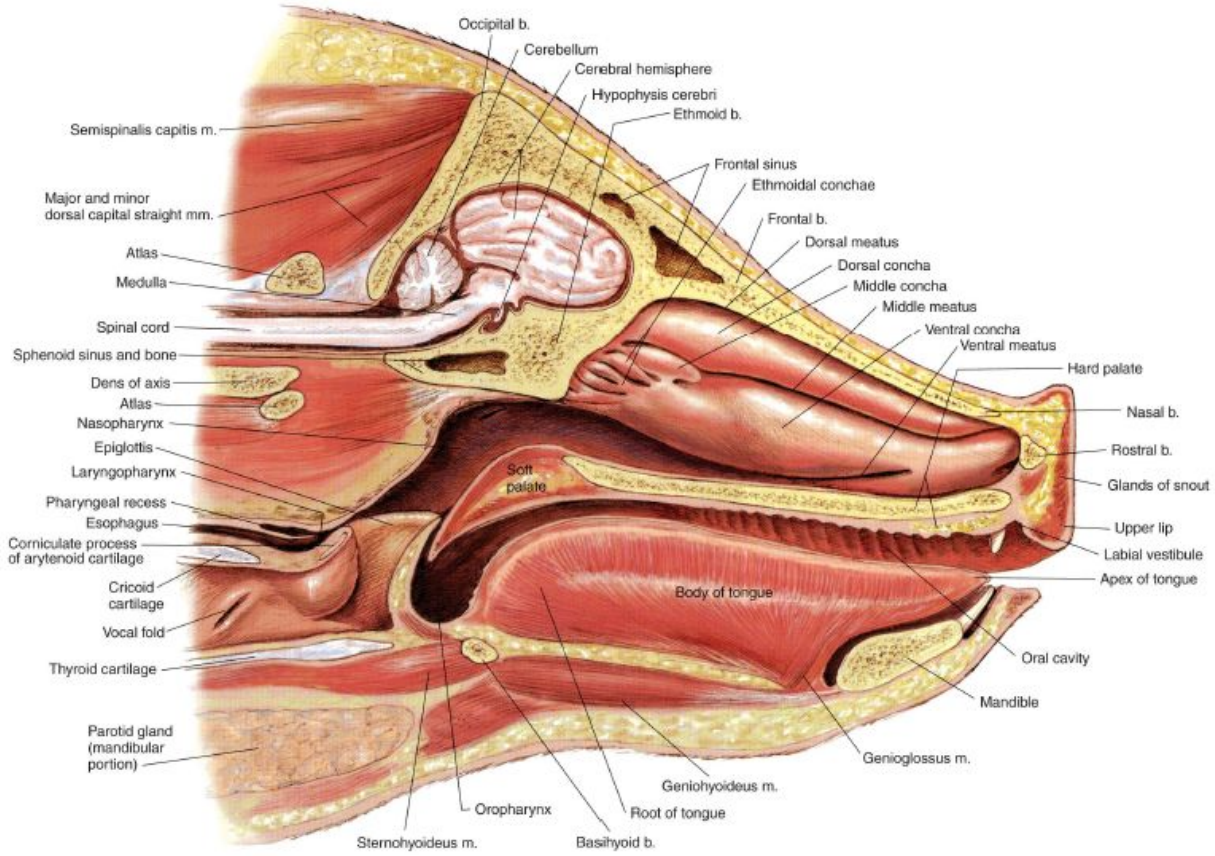


PLATE 6.10 **A**. Permanent dentition of the boar, b = bone, I = incisor tooth, C = canine tooth, P = premolar tooth, M = molar tooth **B**. Cutting the deciduous incisor and canine teeth of a piglet. They are routinely cut off to prevent damage lo sow's teats.

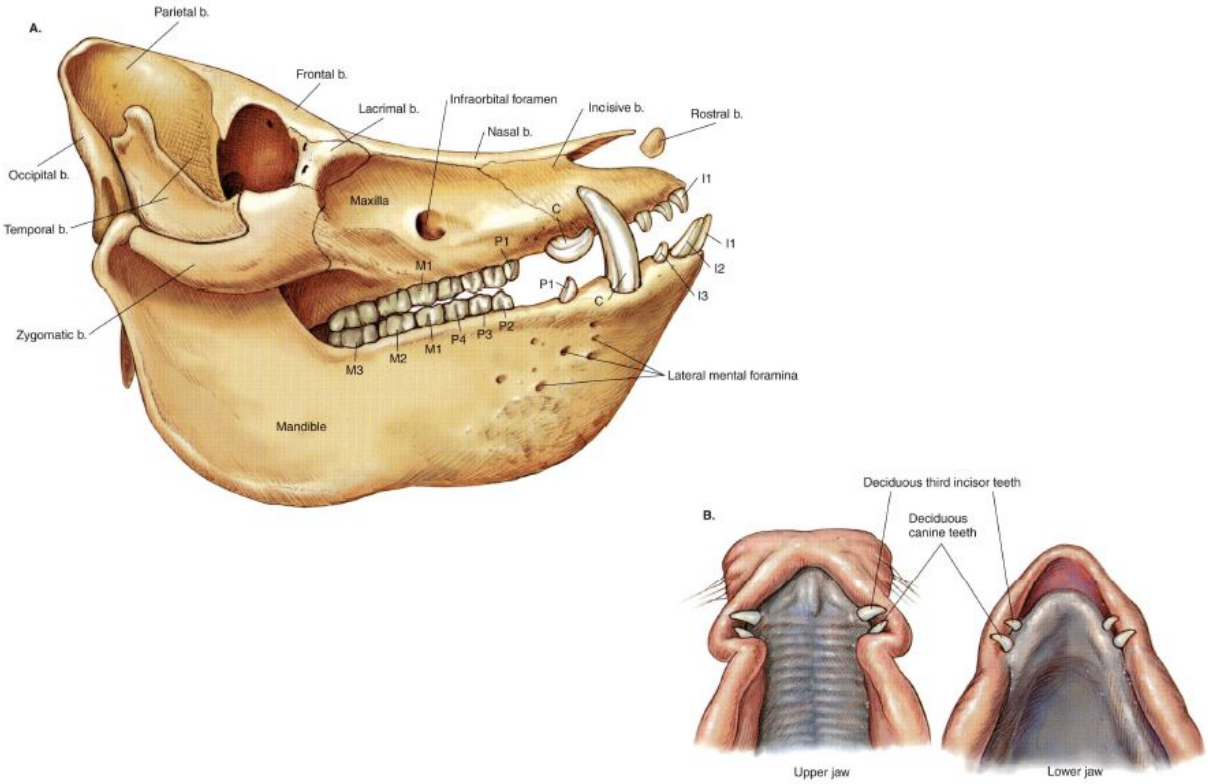


PLATE 6.11 Isolated stomach and intestines of the swine. The jejunum is shortened and uncoiled, and the loops of the ascending colon are pulled apart.

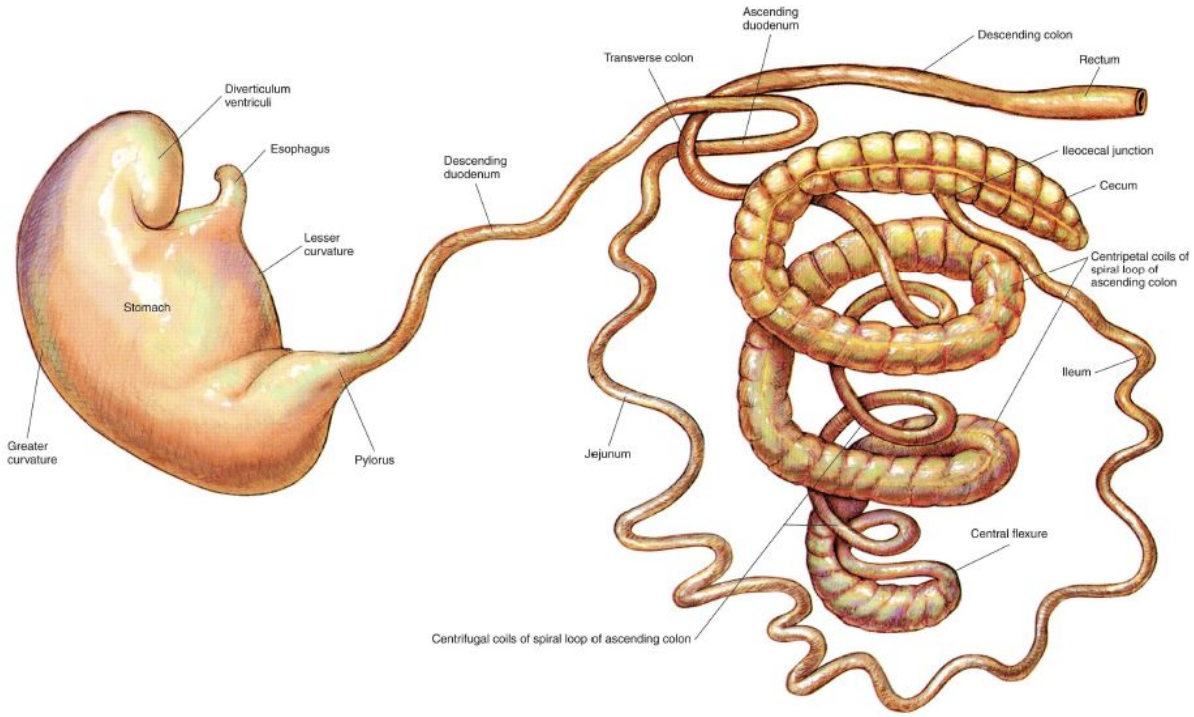


PLATE 6.12 Lymph nodes and vessels of the sow. In = lymph node

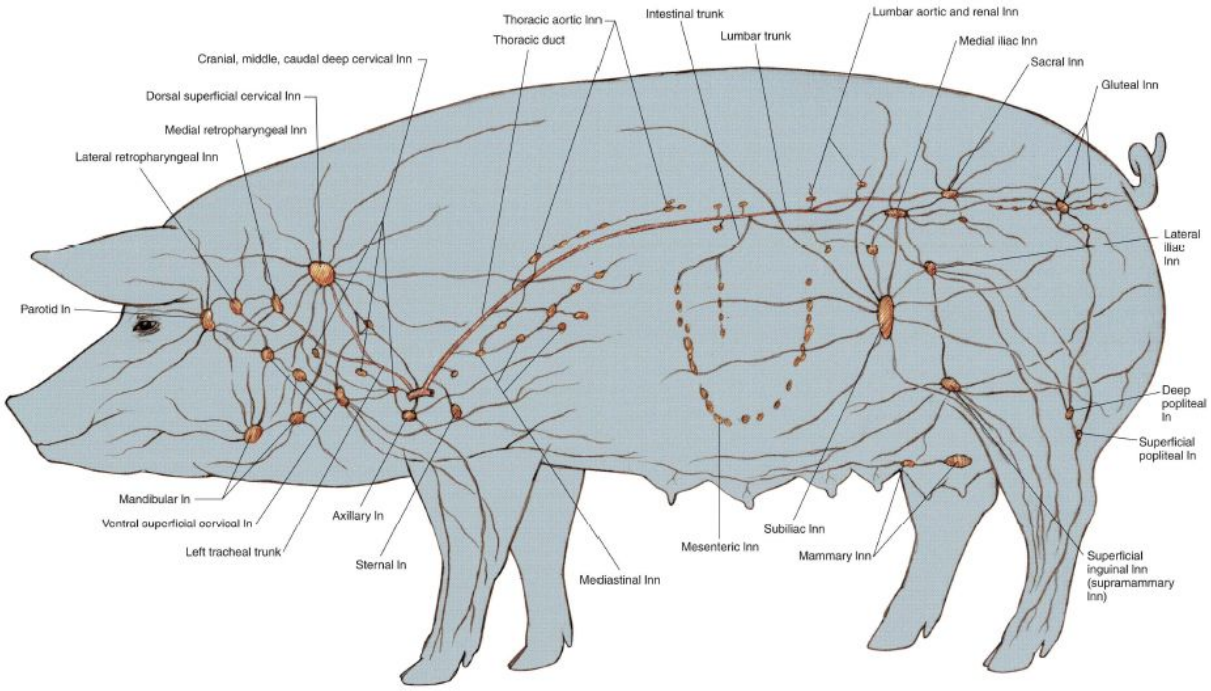


PLATE 6.13 Reproductive and urinary organs, stomach, liver, heart, and adjacent major vessels related to the skeleton of the boar. Lungs and intestines are removed. Right lateral view, a = artery

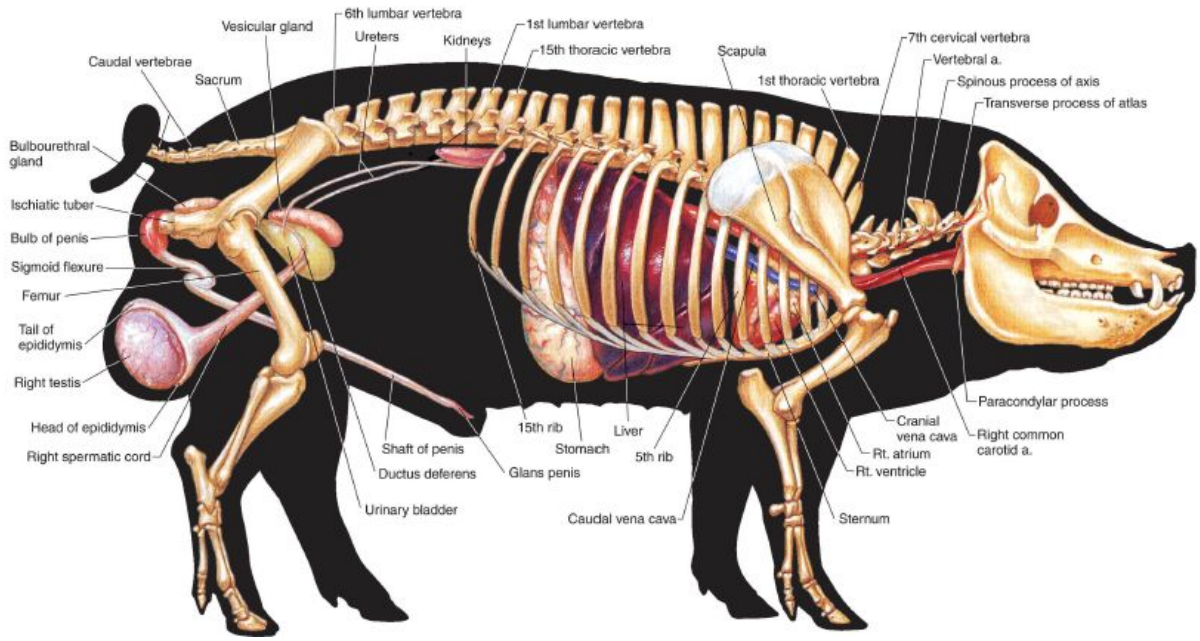


PLATE 6.14 Reproductive and urinary organs, abdominal viscera, spleen, heart, and adjacent major vessels of the sow. Lungs and intestines are removed. Left lateral view, v = vein, a = arterv

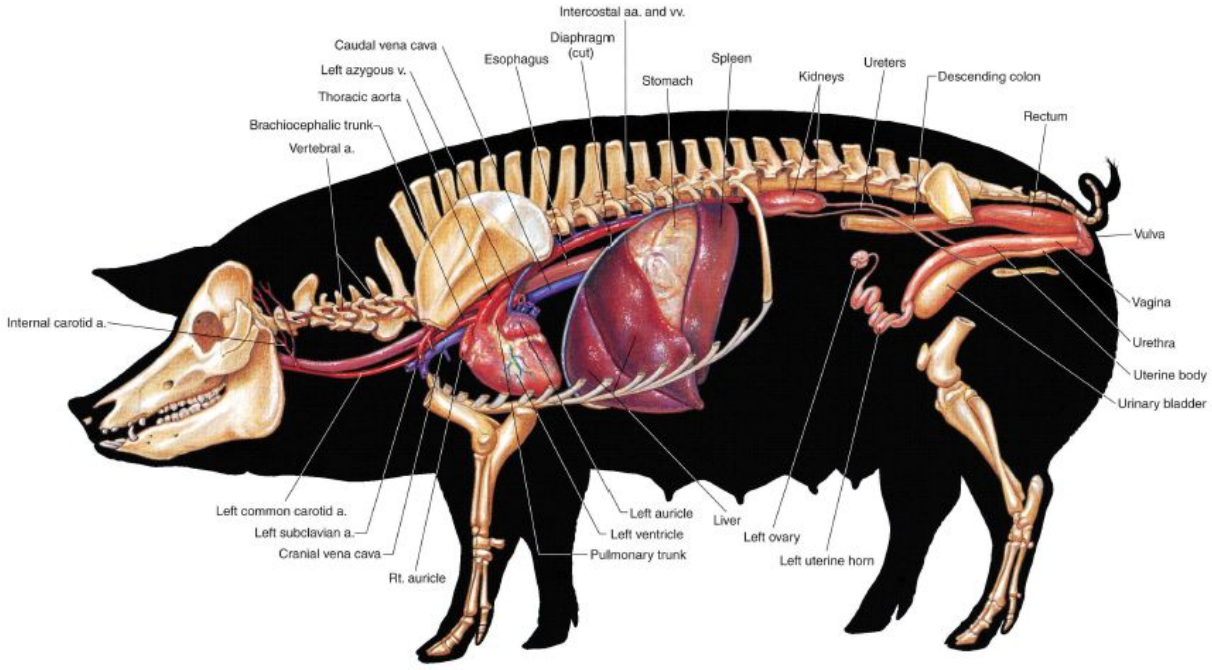


PLATE 6.15 Relations of the reproductive organs of the boar, m = muscle, v = vein, a = artery

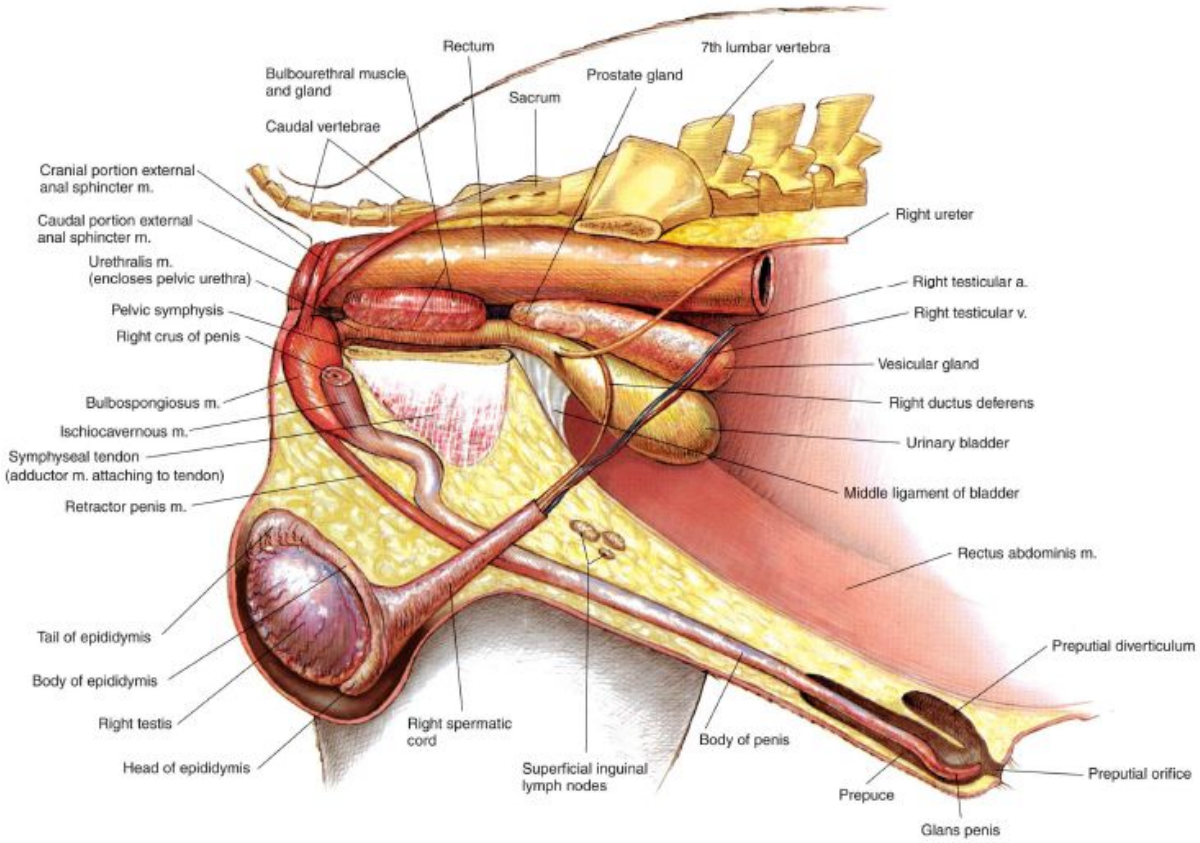
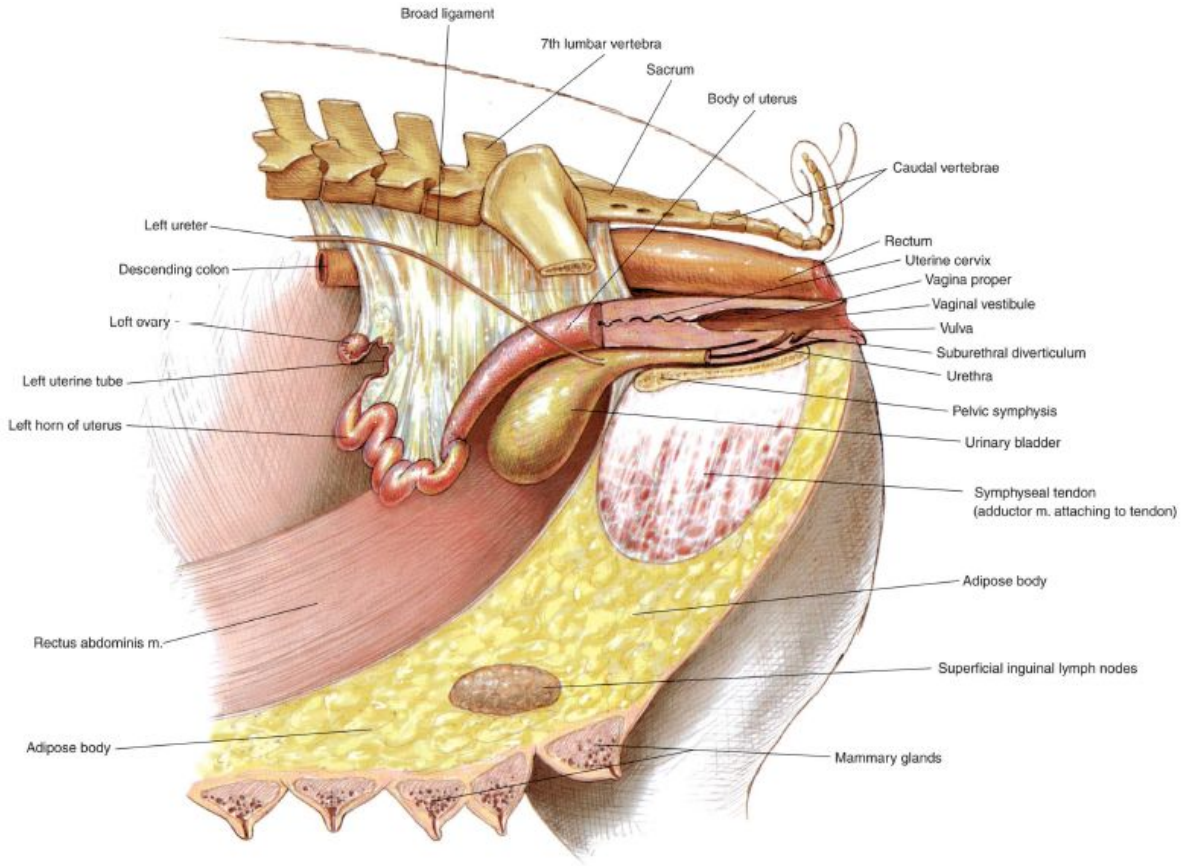


PLATE 6.16 Relations of the reproductive organs of the sow.


Broad ligament
7th lumbar vertebra
Sacrum
Body of uterus
Caudal vertebrae
Left ureter
Descending colon
Loft ovary
Left uterine tube
Left horn of uterus
Rectum
Uterine cervix
Vagina proper
Vaginal vestibule
Vulva
Suburethral diverticulum
Urethra
Pelvic symphysis
Urinary bladder
Symphyseal tendon
(adductor m. attaching to tendon)
Adipose body
Rectus abdominis m.
Superficial inguinal lymph nodes
Adipose body
Mammary glands

SECTION 7 THE CHICKEN (*Gallus gallus domesticus*)

PLATES

PLATE 7.1 Right lateral view of a rooster (cock).

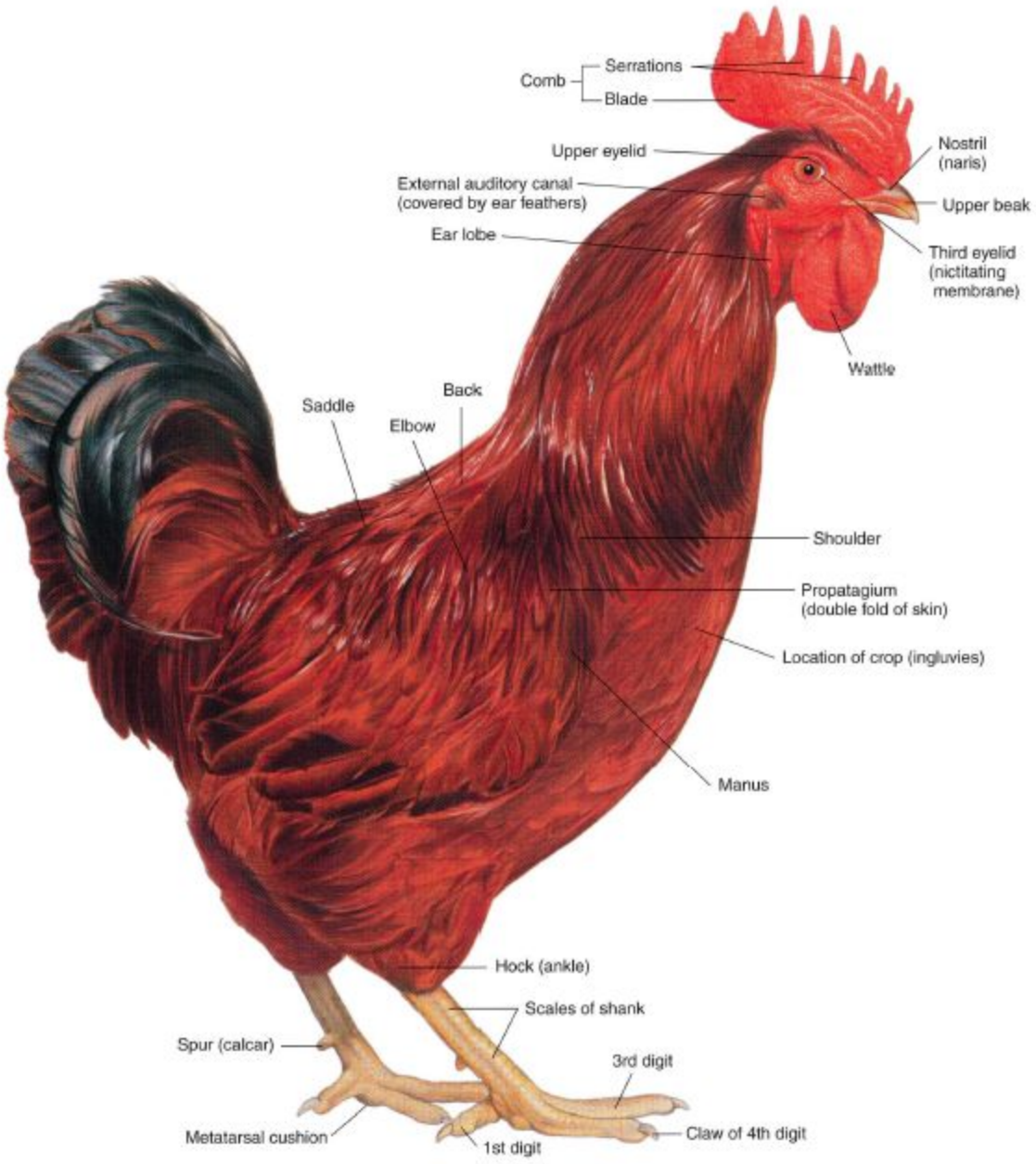


PLATE 7.2 Left lateral view of a hen. Patagiectomy (wing clipping), excision of part of the propatagium (wing membrane), is performed on one wing to prevent flight.

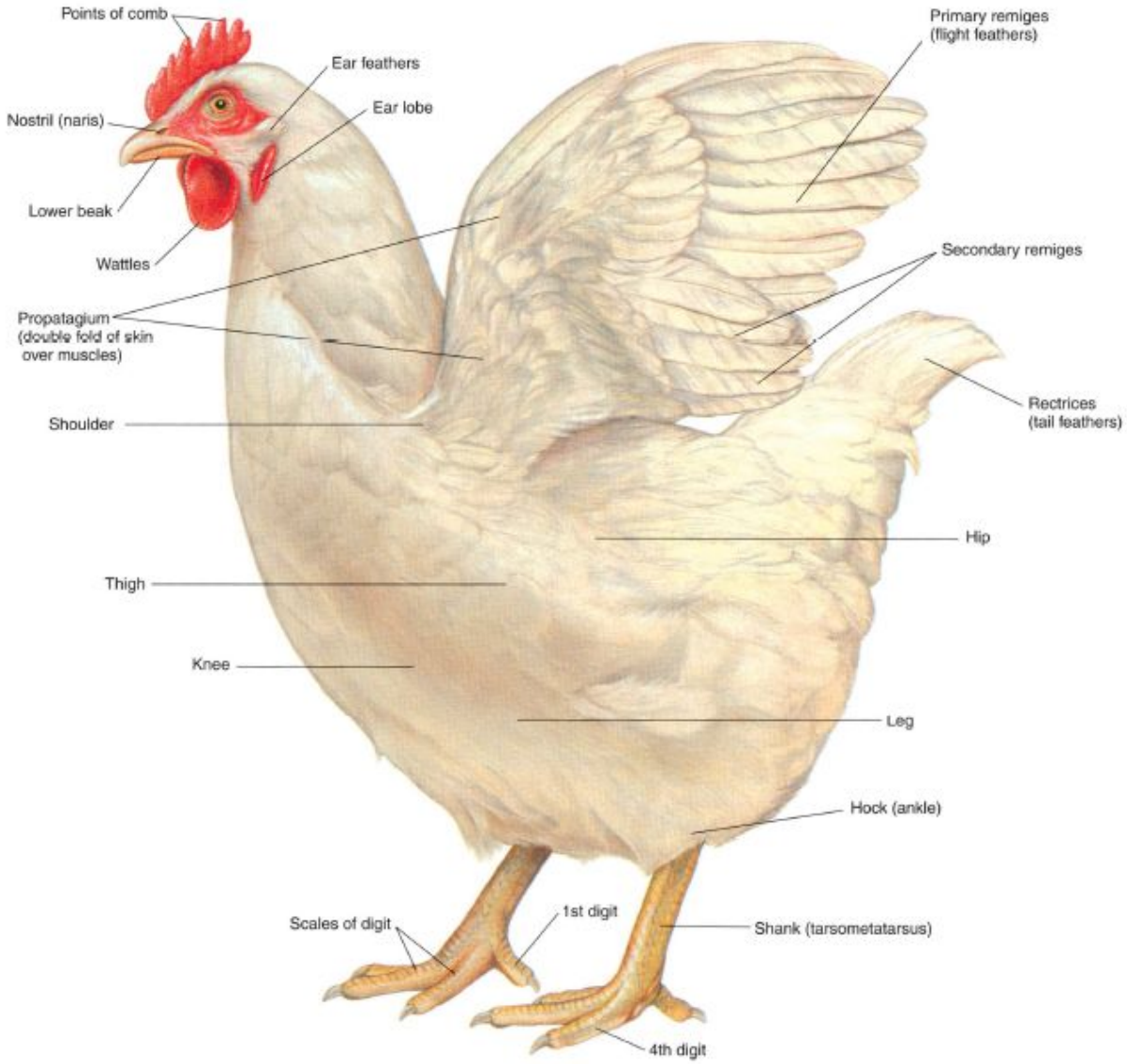


PLATE 7.3 Feather coal of the rooster.

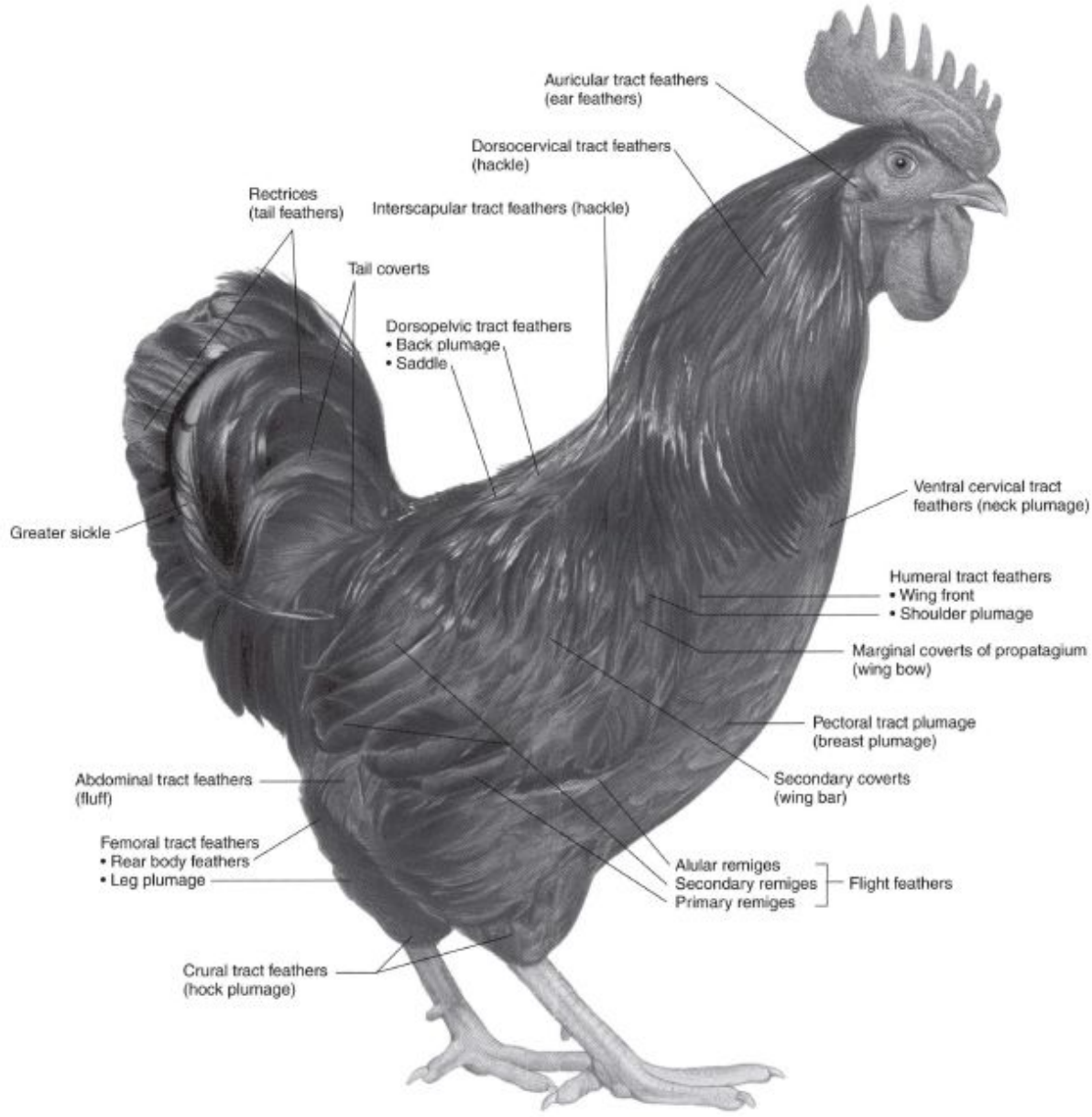


PLATE 7.4 Skeleton of the chicken. Left lateral view.

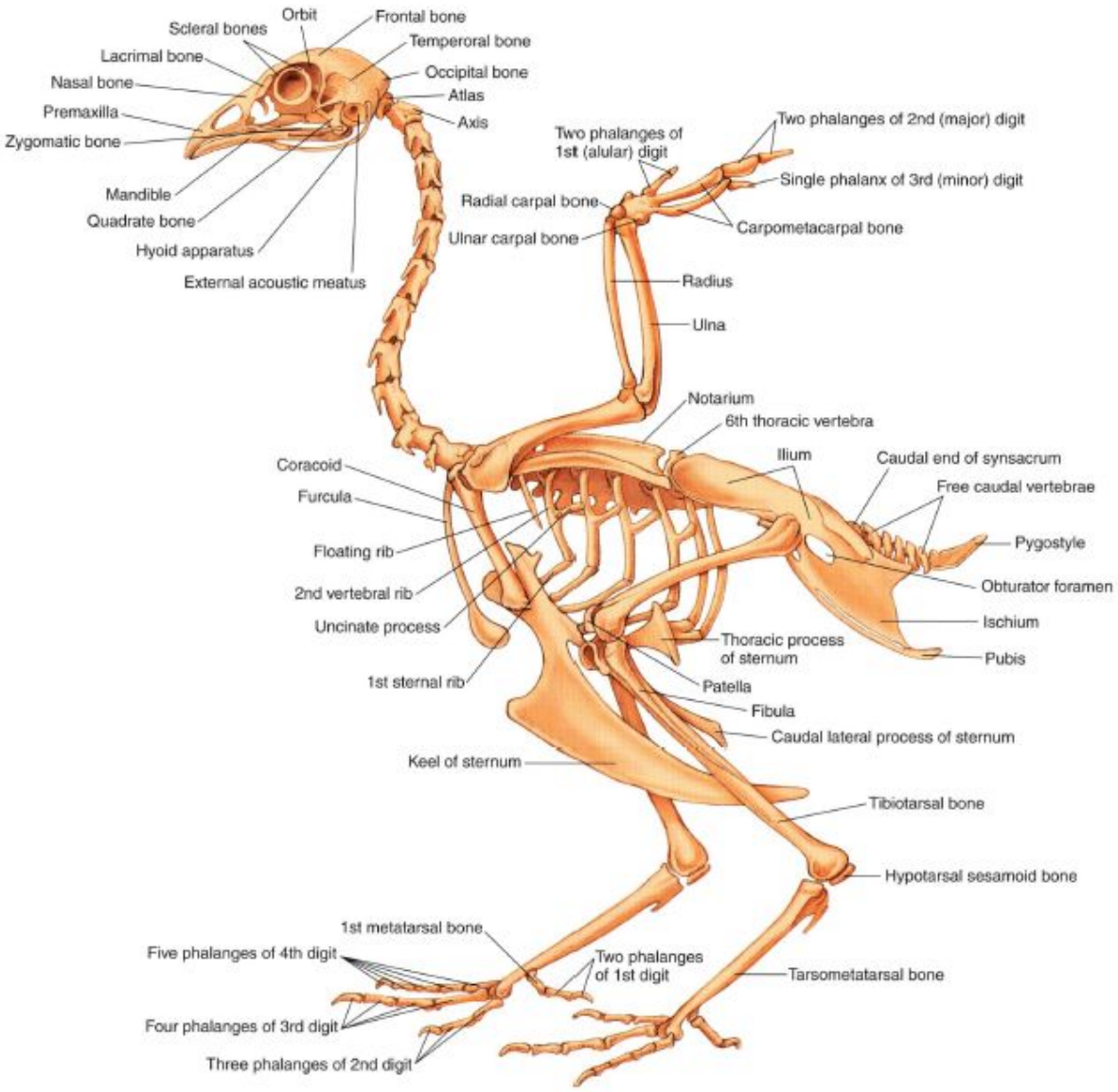


PLATE 7.5 Superficial muscles of the rooster. Right lateral view, m = muscle, v = vein

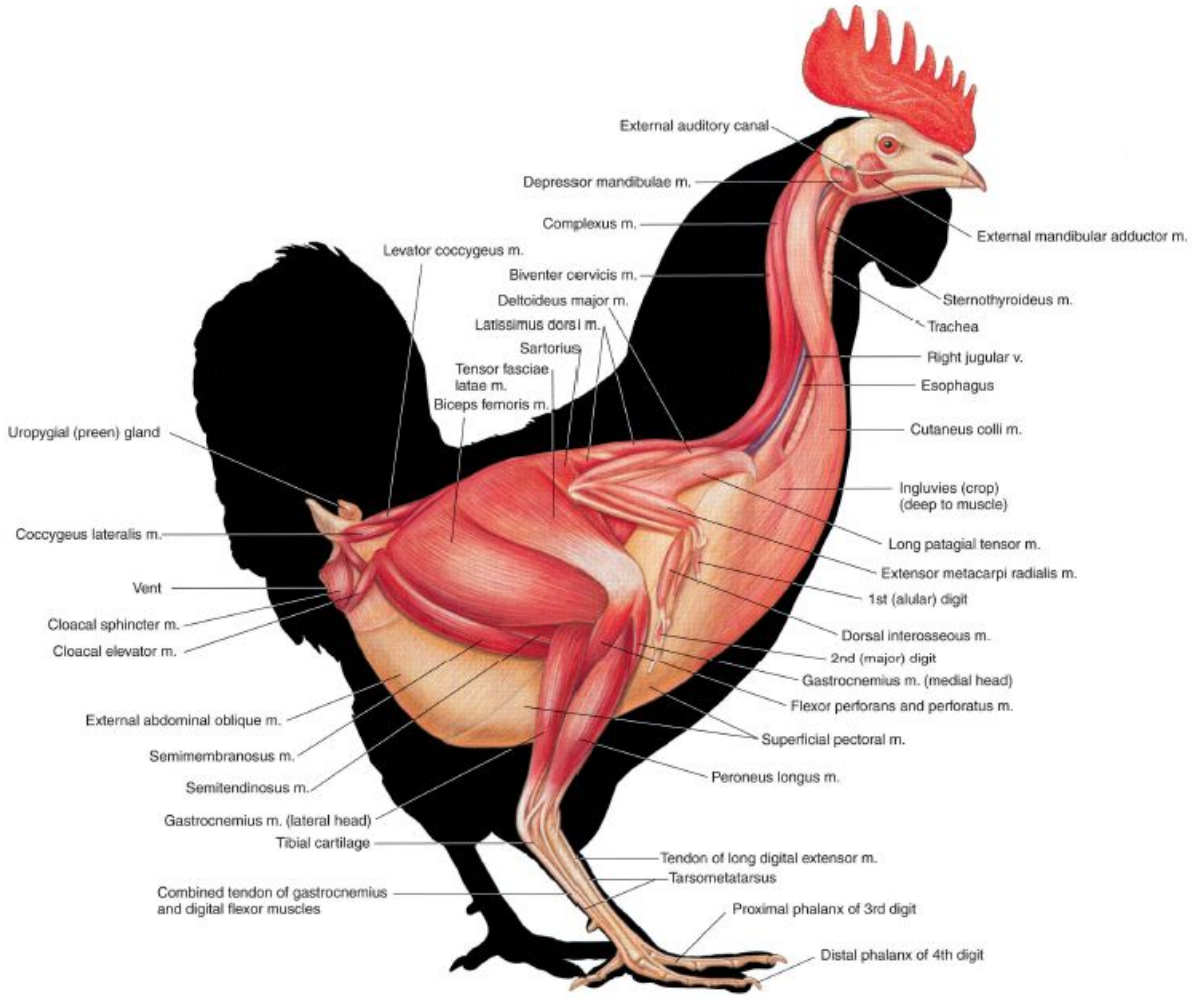


PLATE 7.6 Superficial muscles of the hen. Left lateral view, m = muscle

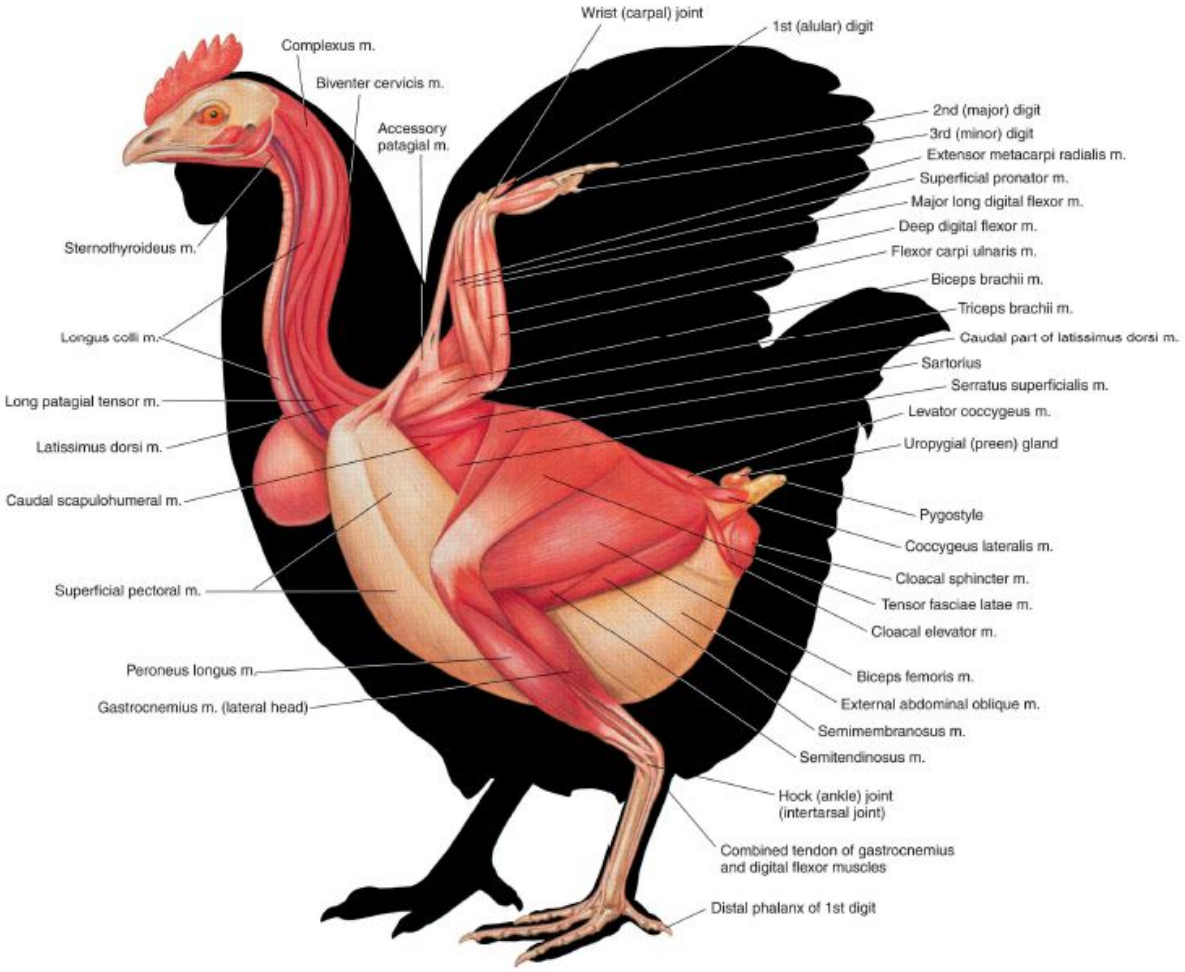


PLATE 7.7 Relations of *in situ* viscera to the skeleton and cervical muscles of the rooster. Right lateral view, m = muscle, b = bone, a = artery, v = vein

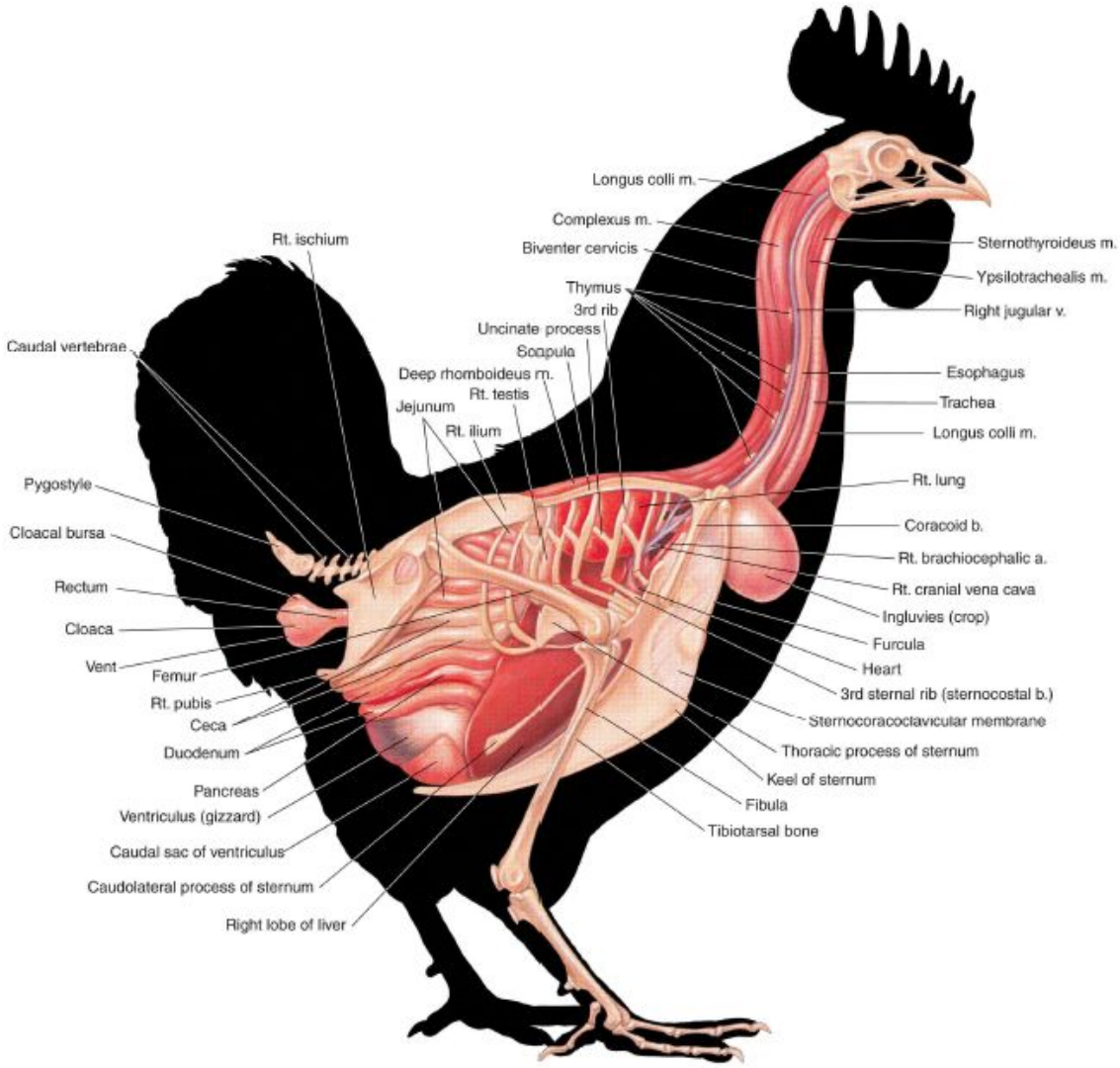


PLATE 7.8 Relations of *in situ* viscera and blood vessels to the skeleton and cervical muscles of the hen. m = muscle, v = vein, b = bone, a = artery

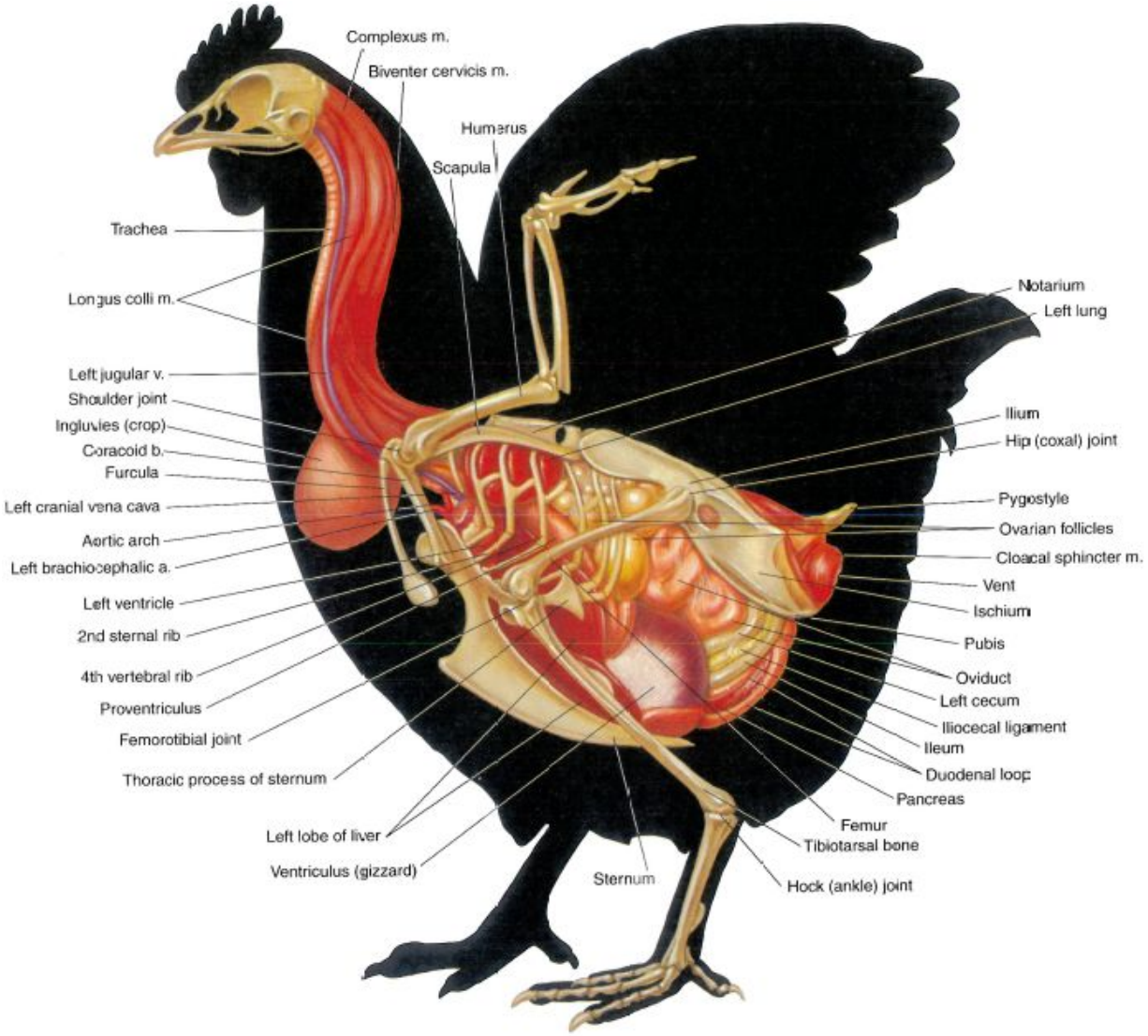


PLATE 7.9 Isolated gastrointestinal tract of the chicken.

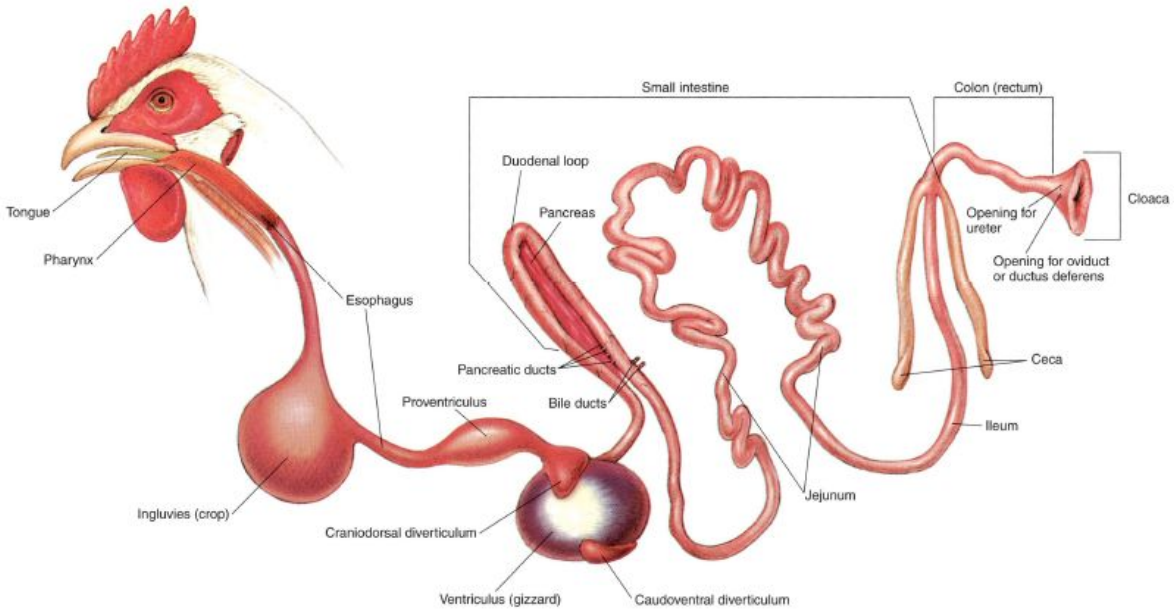


PLATE 7.10 Air sacs and lungs of the chicken. Left lateral view. There is a total of eleven air sacs named according to location: abdominal, caudal thoracic, cranial thoracic, axillary, clavicular, and cervical. All are paired except the single clavicular sac. With the exception of the thoracic sacs, all provide communication between a bronchus and the interior of some of the pneumatic (air-containing) bones.

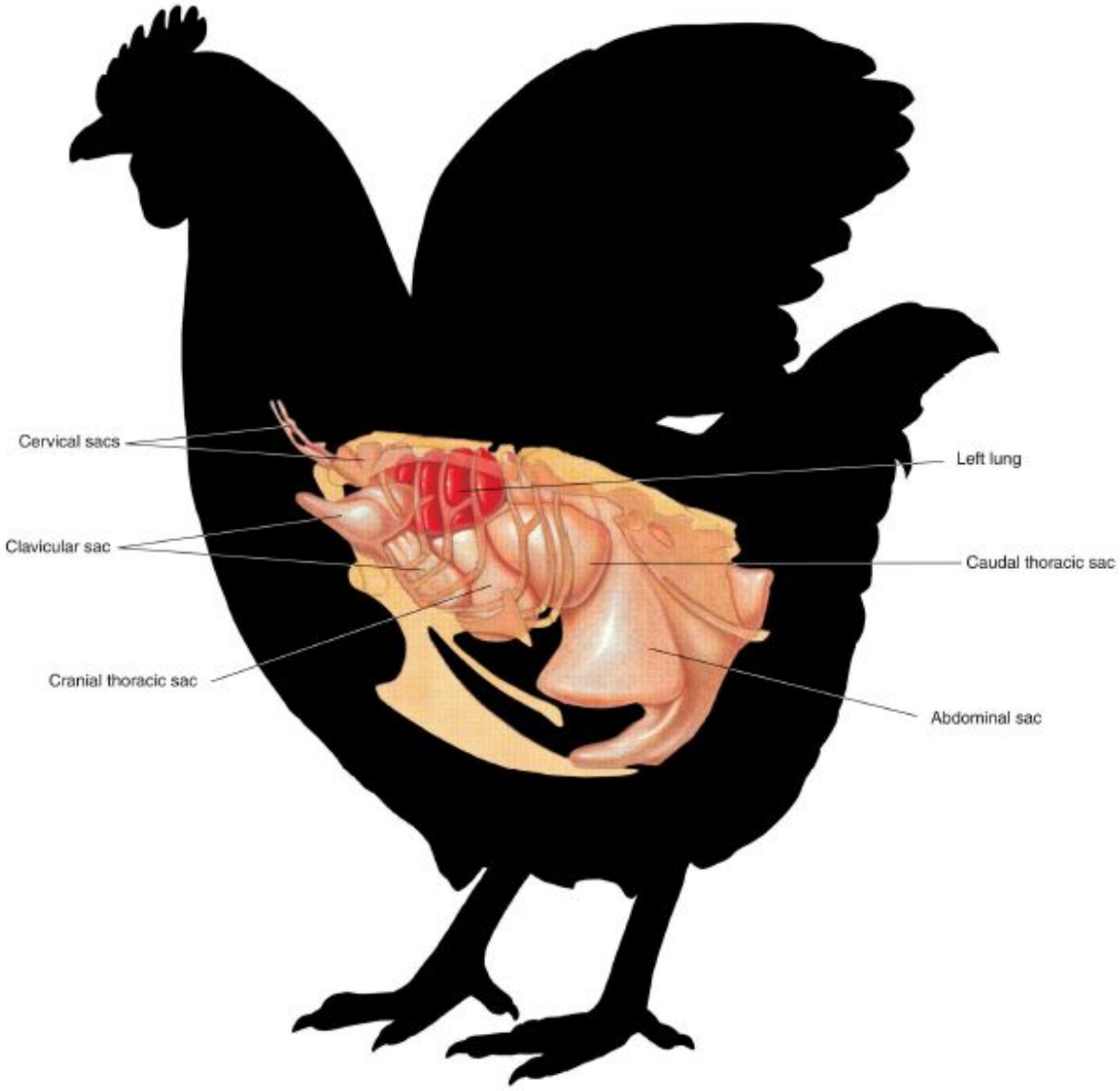


PLATE 7.11 *In situ* viscera, major blood vessels, and axial skeleton of the rooster. Intestines, liver, and lungs are removed. Right lateral view, b = bone, a = artery, v = vein

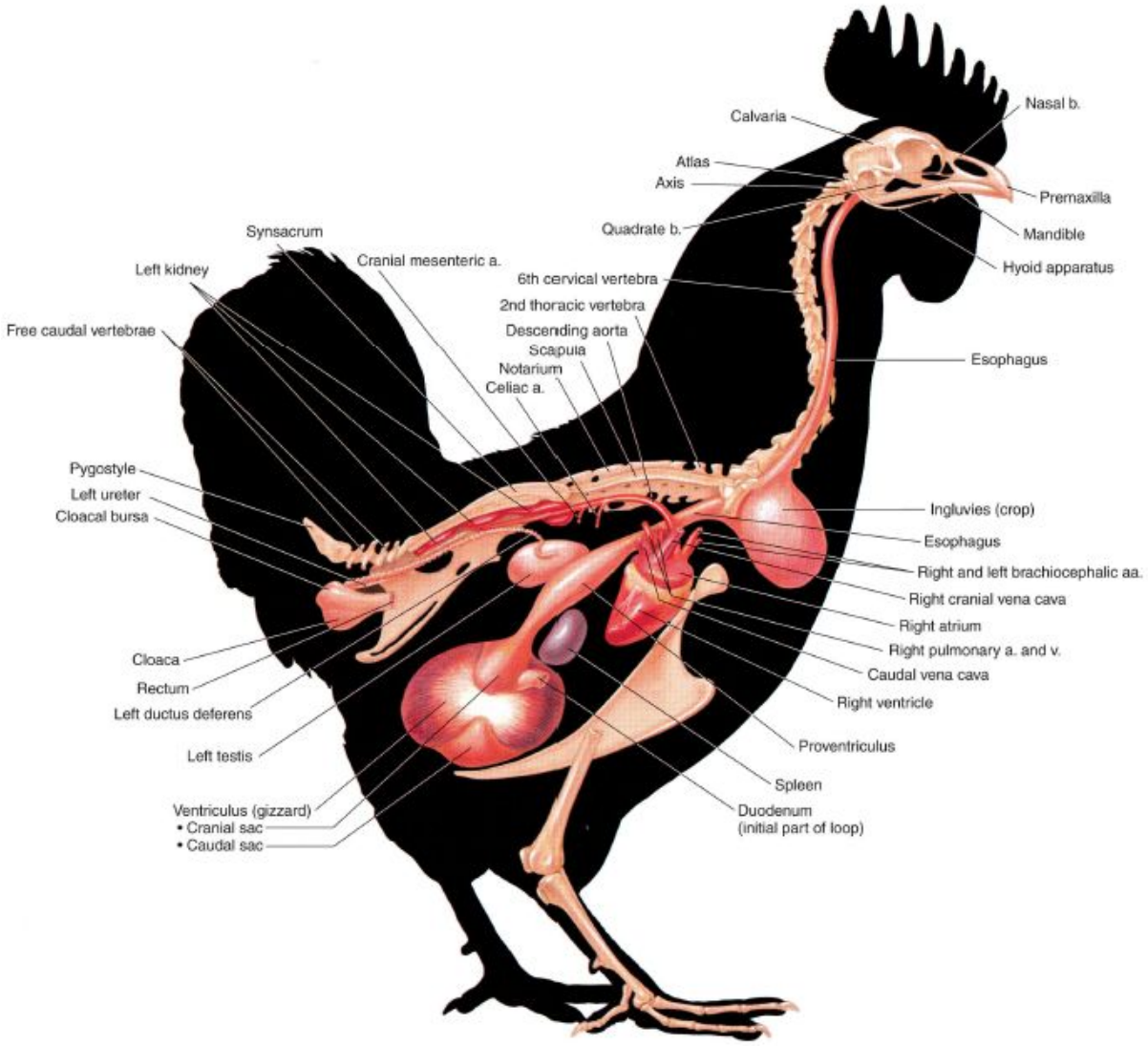


PLATE 7.12 *it situ* viscera, major blood vessels, and axial skeleton of ihe hen. Intestines, liver, and lungs are removed. Left lateral view, v = vein, a = artery

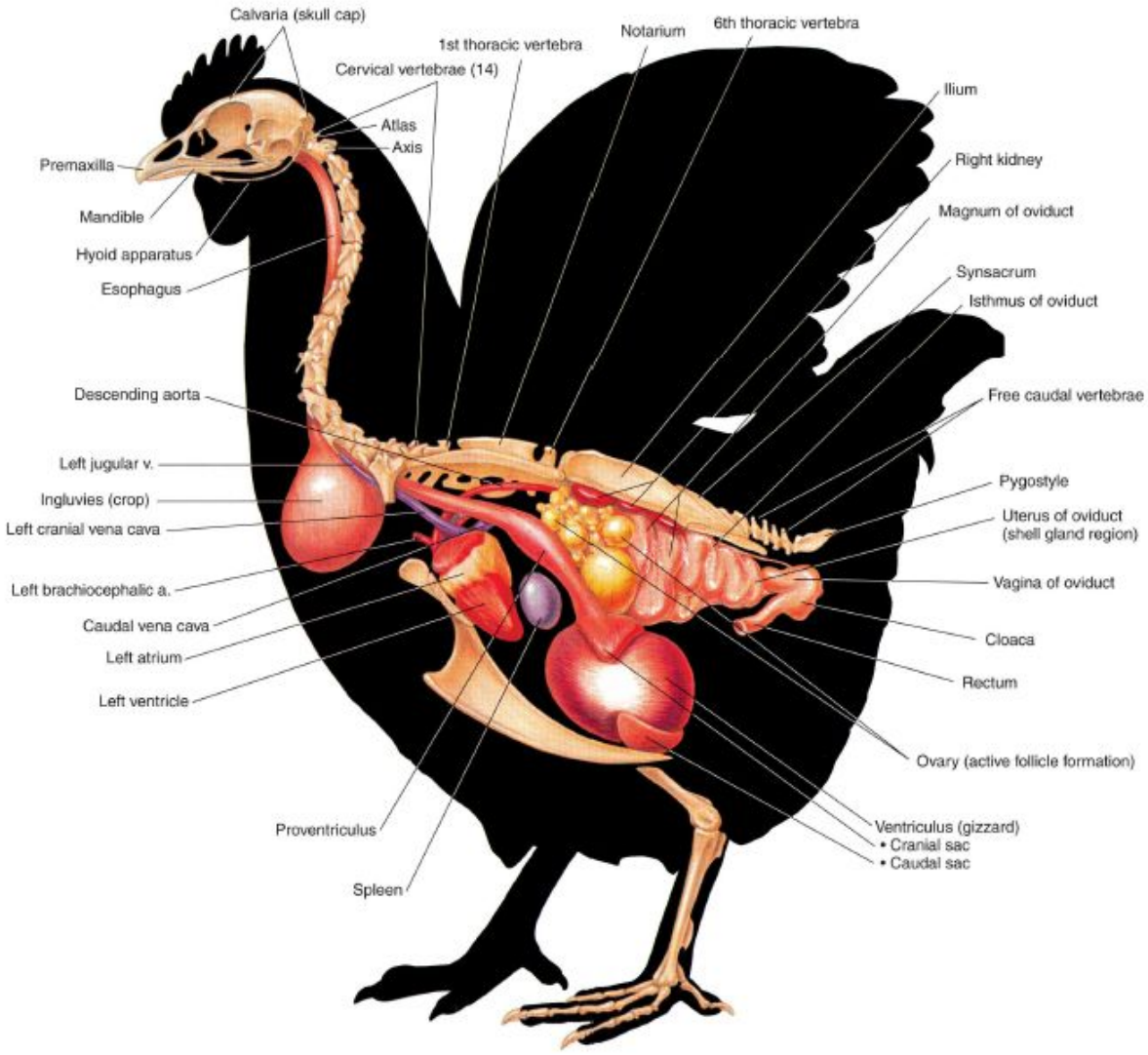


PLATE 7.13 **A**. Reproductive and urinary organs of the rooster. Right lateral view. **B**. Cloaca oi the rooster. Dorsal view. **C**. Erect copulatory apparatus. Caudodorsal view.

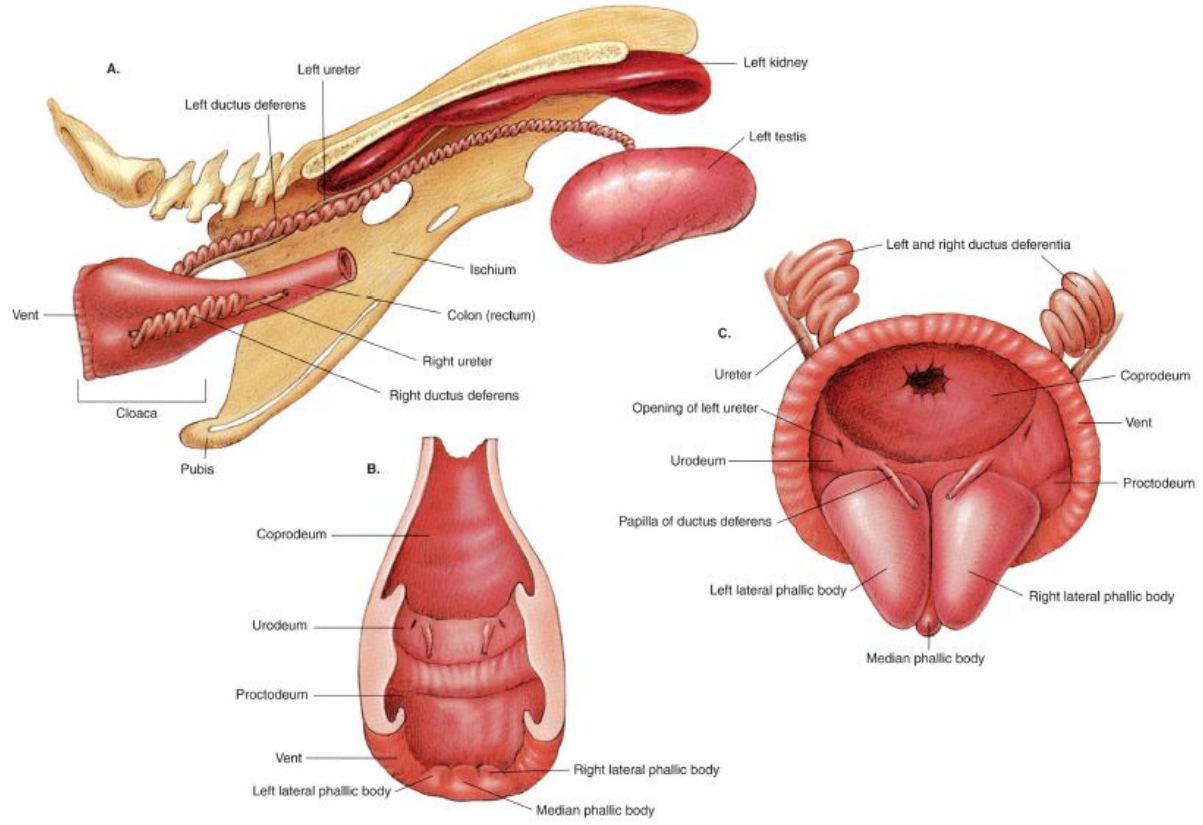
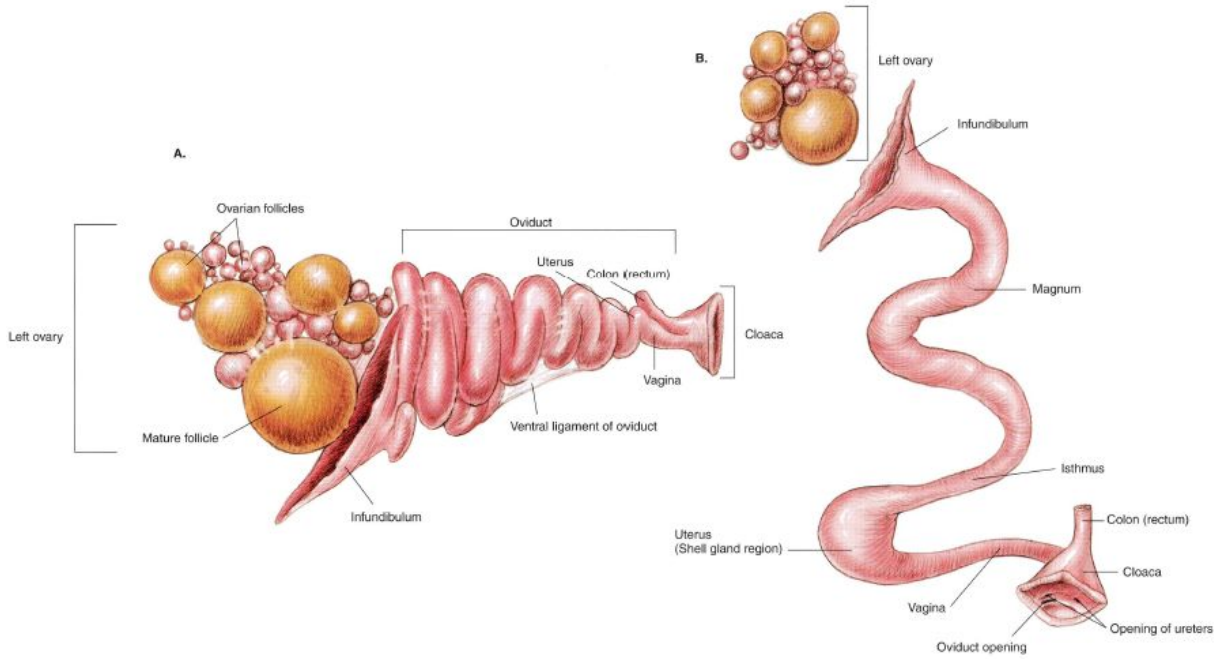


PLATE 7.14 **A**. Isolated reproductive organs of the hen. Left lateral view. **B**. Diagrammatic representation of the reproductive organs of the hen.



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INDEX

common interosseous
condylar
corneal
costocervical trunk
cranial epigastric
cranial gluteal
cranial interosseous
cranial mammary
cranial mesenteric
cranial tibial
deep cervical
deep circumflex iliac
deep femoral
descending genicular
digital
distal perforating branch
dorsal
dorsal common digital
dorsal metacarpal
dorsal metatarsal
dorsal nasal
dorsal pedal
dorsal proper digital
ethmoid
external carotid
external iliac
external maxillary
external pudendal
external thoracic
facial
femoral
iliolumbar
inferior labial
infraorbital
intercostal
internal carotid

internal iliac
internal pudendal
internal thoracic
lacrimal
lateral circumflex femoral
lateral dorsal metacarpal
lateral palmar
lateral palmar metacarpal
lateral plantar
lateral plantar metatarsal
left brachiocephalic
lingual
linguofacial trunk
malar
mammary
masseteric br. of transverse facial
maxillary
medial circumflex femoral
medial dorsal metacarpal
medial palmar
medial palmar metacarpal
medial plantar
medial plantar metatarsal
medial tarsal
median
median sacral
mental
middle mammary
obturator
occipital
ovarian
palmar common digital
palmar proper digital
papillary
plantar common digital
plantar metatarsal

plantar proper digital
popliteal
pudendoepigastric trunk
pulmonary trunk
radial
renal
rete mirabile
right brachiocephalic
saphenous
subclavian
subscapular
superficial cervical
superficial temporal
superior labial
terminal arch
testicular
thoracodorsal
transverse cubital
transverse facial
umbilical
uterine
vaginal
vertebral
Autonomie nervous system
ganglia
parasympathetic cranial outflow
parasympathetic nerves
parasympathetic sacral outflow
sympathetic nerves
sympathetic thoracic outflow
sympathetic trunk

B

Back
Barrel

Beak
Beard
Body regions
dorsal vertebral regions
perineal region
Bone(s)
atlas
axis
basihyoid
calcaneus
    calcaneal tuber
calvaria (skull cap)
cannon
carpal
carpometacarpal
coffin
coracoid
ethmoid
femur
    greater trochanter
fibula
frontal
    cornual process
furcula
humerus
    deltoid tuberosity
    greater tubercle
    lateral epicondyle
hyoid apparatus
ilium
    body
    coxal tuber
    sacral tuber
    wing
incisive

interparietal
ischium
    ischiatic tuber
lacrimal
mandible
    coronoid process
    mental foramen (foramina)
maxilla
    facial crest
    facial tuber
    infraorbital foramen
metacarpal
    fifth
    fourth
    second
    third
metacarpal tuberosity
metatarsal
    fifth
    fourth
    second
    third
nasal
navicular
Bone(s)—*Continued*
notarium
occipital
    nuchal crest
palatine
paracondylar process
parietal
patella
phalanges
premaxilla
presphenoid

C

D

E

F

G

H

I

I

sternocostal
stifle
tarsocrural
tarsometatarsal
temporomandibular
wrist (carpal)
Joint capsule
coffin
fetlock
pastern
Jowl
Jugular groove

K

Kidneys
Knee

L

Labial vestibule
Lacertus fibrosus
Larynx
laryngeal ventricle
Lateral ala
Left flank incision
Leg
“Leg” of lamb
Ligament(s)
accessory 1. of deep digital flexor m.
accessory 1. of superficial digital flexor m
broad 1. of uterus
broad sacrotuberal
carpal check
collateral sesamoidean
digital anular

dorsal thoracic
epigastric
gluteal
intercostal
lateral iliac
lateral retropharyngeal
lumbar aortic and renal
mandibular
medial iliac
medial retropharyngeal
mediastinal
mesenteric
middle deep cervical
parotid
popliteal
    deep
    superficial
sacral
sternal
subiliac
superficial cervical
    dorsal
    ventral
superficial inguinal
supramammary
thoracic aortic
tracheobronchial
ventral thoracic

Lymph vessels

chyle cistern
intestinal trunk
left tracheal trunk
lumbar trunk
right tracheal trunk
thoracic duct

M

coccygeus
coccygeus lateralis
common digital extensor
complexus. *See* Semispinalis capitis
cranial capital oblique
cranial preputial
cranial tibial
cutaneus colli
cutaneus faciei
cutaneus nasi
cutaneus trunci
deep digital flexor
deltoideus
depressor labii inferioris
depressor labii superioris
depressor mandibulae
depressor palpebrae
descending pectoral
digastricus
dilator naris
dorsal capital straight
dorsal interosseous
extensor carpi obliquus
extensor carpi radialis
extensor metacarpi radialis
external abdominal oblique
external anal sphincter
external mandibular adductor
fifth digital extensor
flexor carpi radialis
flexor carpi ulnaris
flexor perforans and perforatus
frontalis
frontoscutularis
gastrocnemius
genioglossus

geniohyoideus
gluteobiceps
gracilis
hyoepiglottic
iliacus
iliocostal thoracis
infraspinatus
internal abdominal oblique
interosseus medius
    See also Suspensory ligament
interosseus secundus
intertransversarii
intertransversarius longus
ischiocavernosus
lateral digital extensor
latissimus dorsi
levator ani
levator coccygeus
levator labii superioris
levator nasolabialis
long digital extensor
long patagial tensor
longissimus atlantis
longissimus capitis
longissimus cervicis
longissimus thoracis and lumborum
longus atlantis
longus capitis
longus coli
major long digital flexor
malaris
masseter
mentalis
middle gluteal
multifidus cervicis
mylohyoideus

obturator internis
occipital hyoideus
omohyoideus
omotransversarius
orbicularis oris
parotidoauricularis
peroneus longus
peroneus tertius
platysma
psoas major
quadratus lumborum
quadriceps femoris
rectus abdominis
rectus femoris
retractor penis
rhomboideus
sacrocaudalis
sartorius
scalenus
scutularis
semimembranosus
semispinalis capitis
    biventer cervicis
    complexus
semitendinosus
serratus dorsalis caudalis
serratus dorsalis cranialis
serratus superficialis
serratus ventralis
short digital extensor
Muscle(s)—*Continued*
soleus
spinalis cervicis
spinalis thoracis
splenitis

N

caudal laryngeal
caudal rectal
cervical
common peroneal
communicating branch
cornual branch of lacrimal
cranial gluteal
deep peroneal
dorsal br. of lateral palmar digital
dorsal br. of lateral plantar digital
dorsal common digital II
dorsal digital
dorsal proper (abaxial & axial) digital III & IV
dorsal spinal
facial
femoral
genitofemoral
glossopharyngeal
ilioinguinal
infraorbital
infratrochlear, cornual br. & frontal br.
intercostal
lateral cutaneous antebrachial
lateral cutaneous femoral
lateral dorsal metatarsal
lateral palmar
lateral palmar digital
lateral plantar
lateral plantar digital
lateral thoracic
long thoracic
lumbosacral plexus
mandibular
mandibular alveolar
maxillary
medial cutaneous antebrachial

O

P

Q

R

S

T

teat sinus
Tendon(s)
biceps brachii m
common calcaneal
common digital extensor m
cranial tibial m
cunean
deep digital flexor m.
extensor carpi obliquus m
gastrocnemius m
gastrocnemius + digital flexor mm
lateral digital extensor m
long digital extensor m
peroneus longus m
peroneus tertius m
superficial digital flexor m
symphyseal
Testis
tunica albuginea
Thigh
Throatlatch
Thymus
Toe Nails
Tongue
lingual fossa
Tonsil
palatine
pharyngeal
Tooth (teeth)
canine
cement
cheek
crown
cup

V

cranial br. of medial saphenous
cranial epigastric
cranial gluteal
cranial superficial epigastric
cranial tibial
cranial vena cava
    left
    right
deep cervical
deep circumflex iliac
deep facial
deep femoral
digital
dorsal
dorsal common digital III
dorsal nasal
dorsal proper digital
dorsal scapular
external iliac
external jugular
external pudendal
external thoracic
facial
hepatic
iliolumbar
intercostal
internal iliac
internal jugular
internal thoracic
interosseous
jugular
lateral auricular
lateral palmar
lateral plantar
lateral sacral
lateral saphenous

lateral thoracic
linguofacial
maxillary
medial plantar
medial saphenous
median
median sacral
milk. *See* Subcutaneous abdominal
occipital
ovarian
palmar common digital
palmar proper digital
pampiniform plexus
plantar common digital
plantar proper digital
popliteal
portal
prostatic
pudendal epigastric
pulmonary
renal
rostral auricular
subclavian
subcutaneous abdominal
subscapular
superficial cervical
superficial thoracic
testicular
thoracodorsal
transverse facial
umbilical
vertebral
Vent
Ventriculus (gizzard)
Vulva

W

X

Z