Rum.

The Head, Neck, and Vertebral Column

Skull

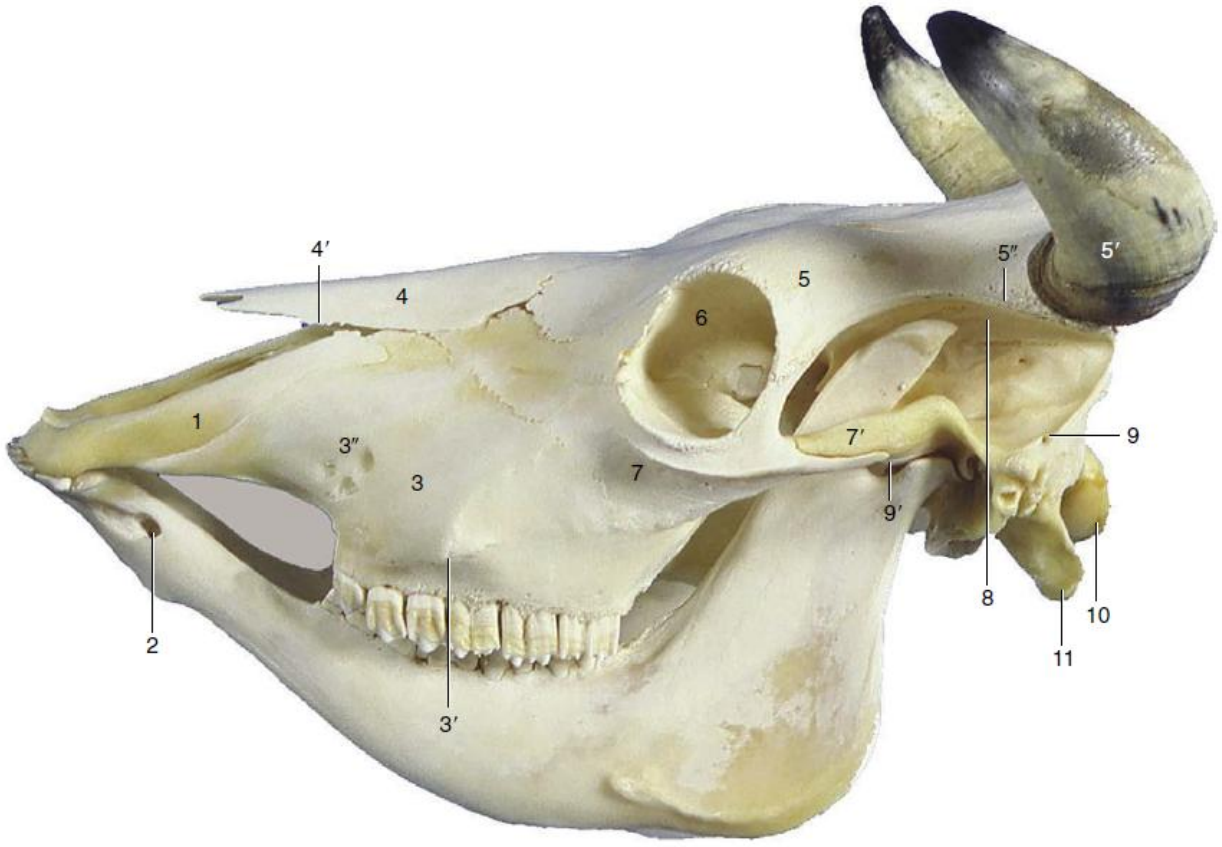
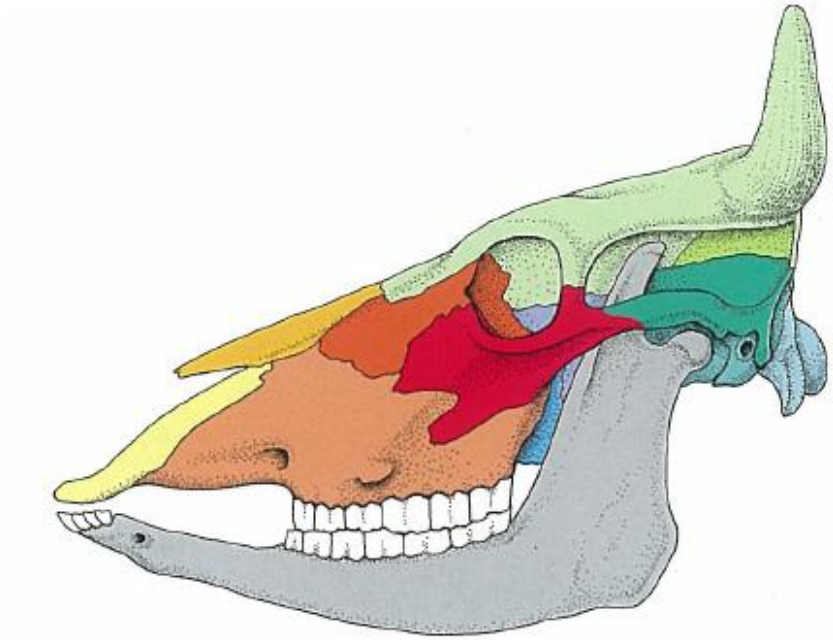
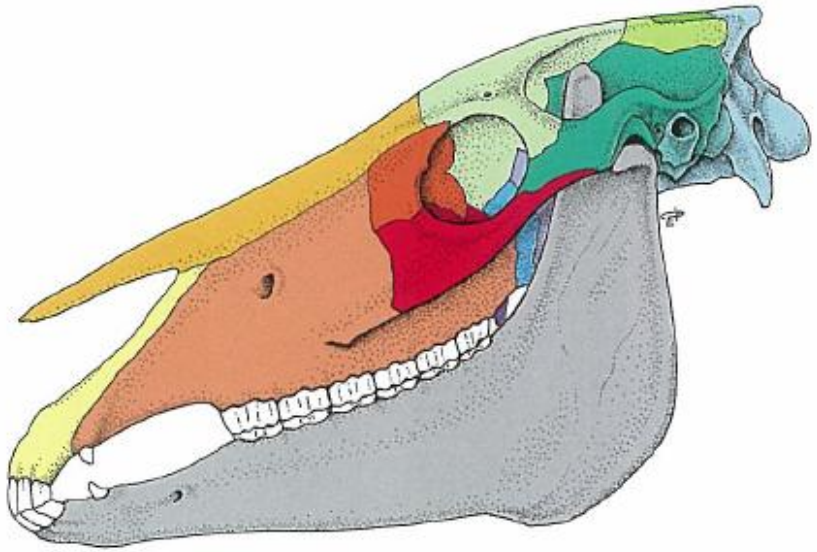


Figure 25–1 Lateral view of bovine skull. *1,* Incisive bone; *2,* mental foramen; *3,* maxilla; *3′,* facial tuberosity; *3″,* infraorbital foramen; *4,* nasal bone; *4′,* nasoincisive notch; *5,* frontal bone; *5′,* horn surrounding cornual process of frontal bone; *5″,* temporal line; *6,* orbit; *7,* zygomatic bone; *7′,* zygomatic arch; *8,* temporal fossa; *9,* temporal bone; *9′,* temporomandibular joint; *10,* occipital condyle; *11,* paracondylar process.

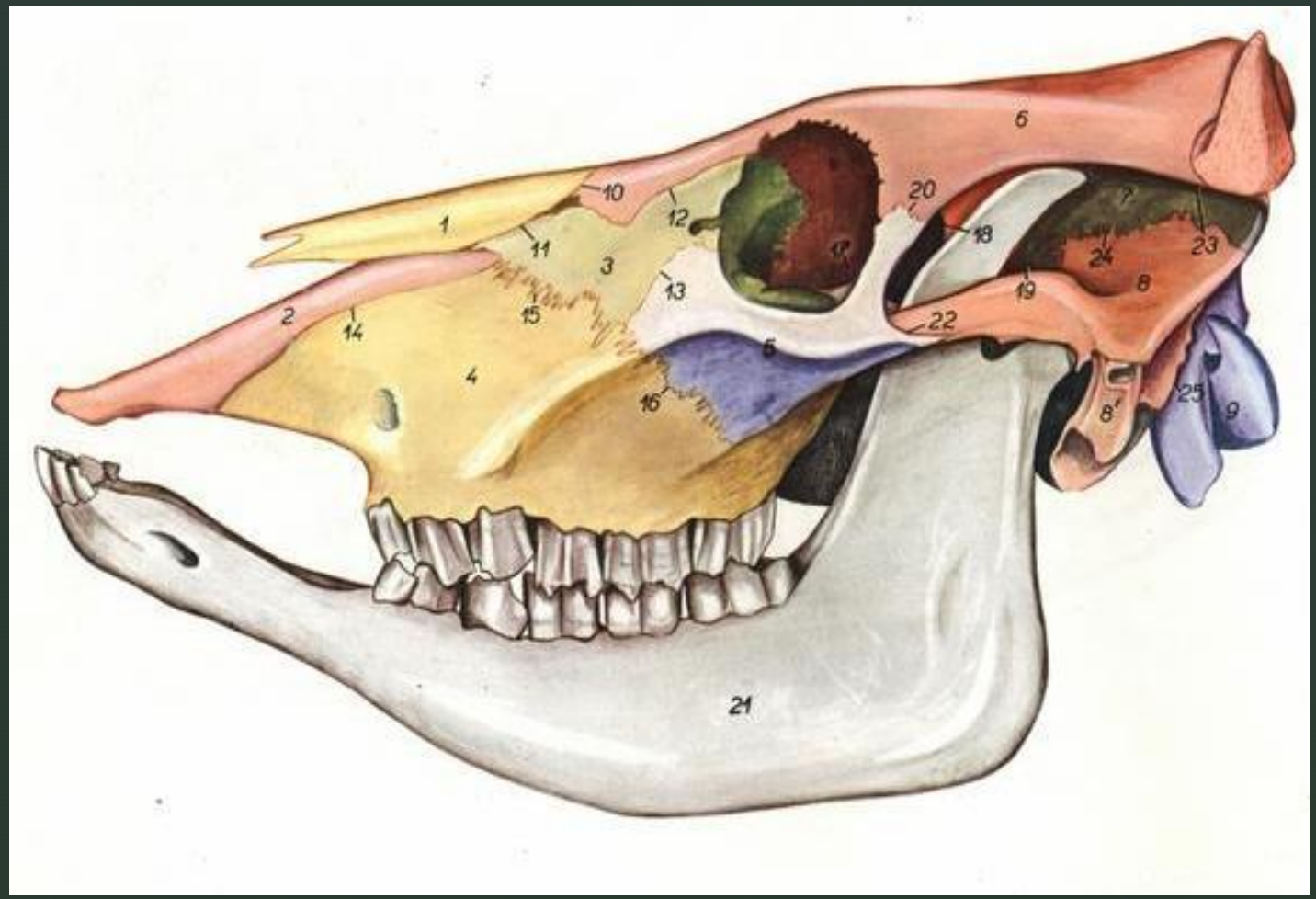


A



B

- Incisive
- Nasal
- Maxilla
- Lacrimal
- Zygomatic
- Frontal
- Parietal
- Interparietal
- Temporal, squamous part
- Temporal, petrous part
- Occipital
- Mandible
- Palatine
- Sphenoid
- Pterygoid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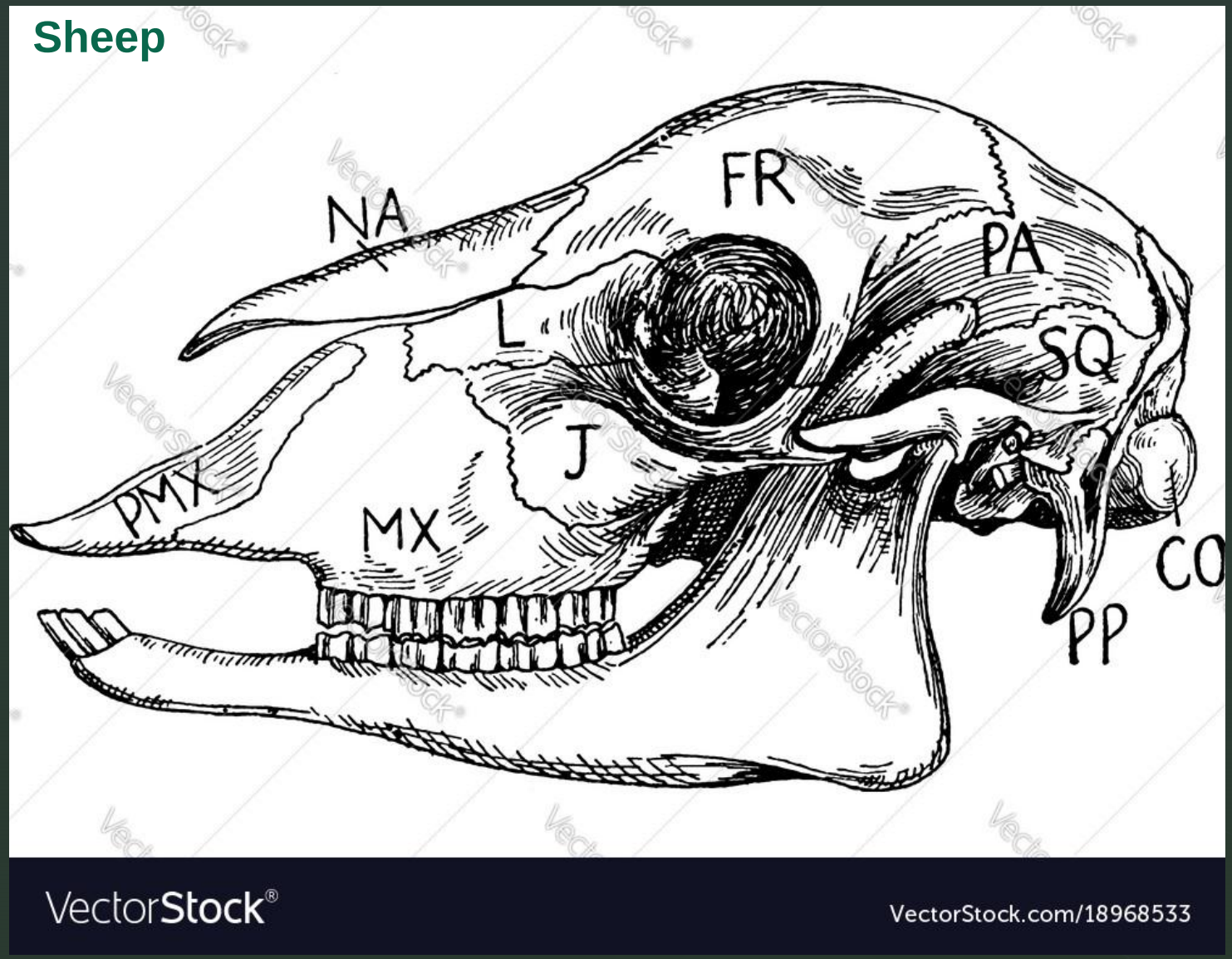
Sheep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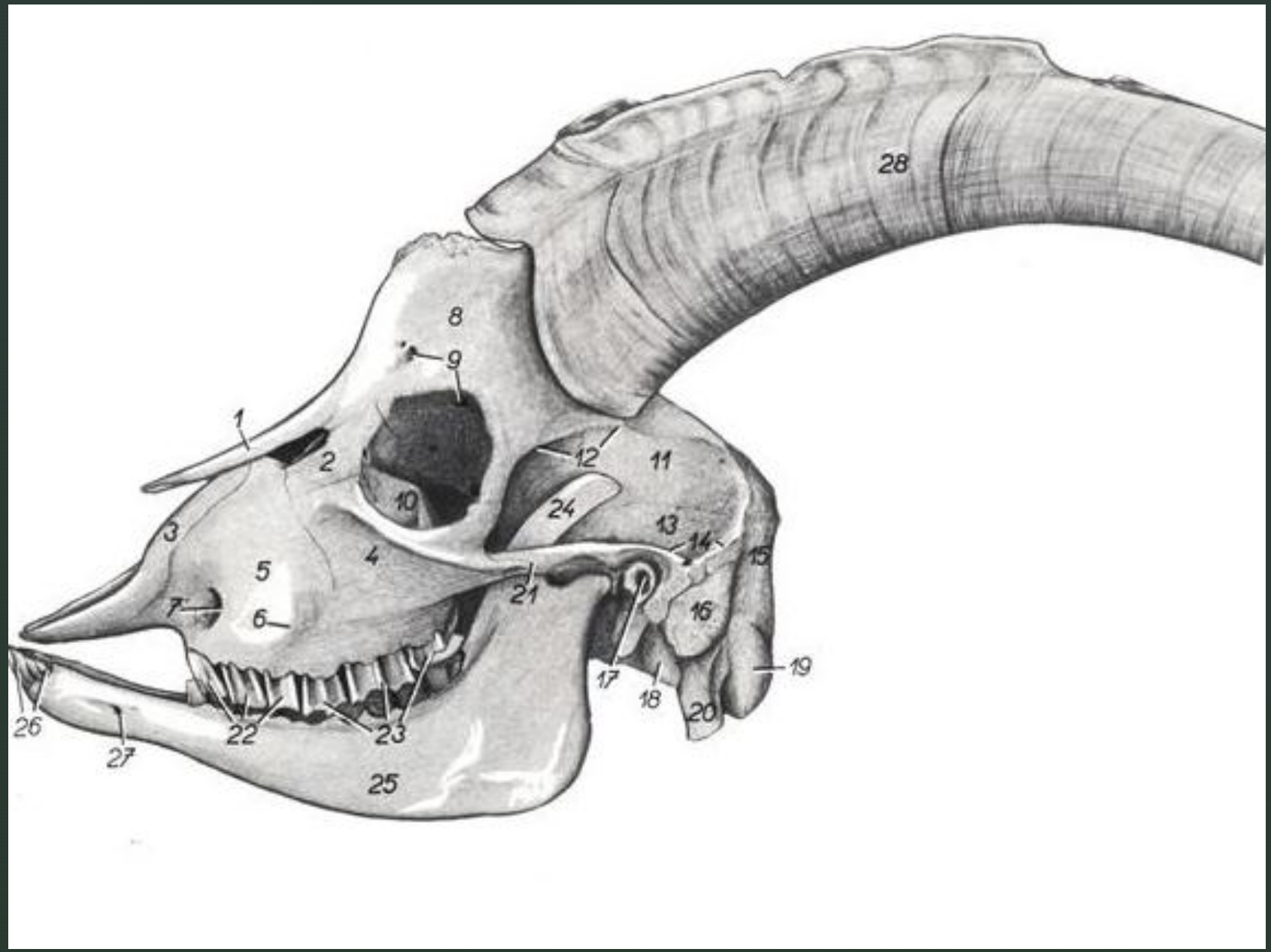
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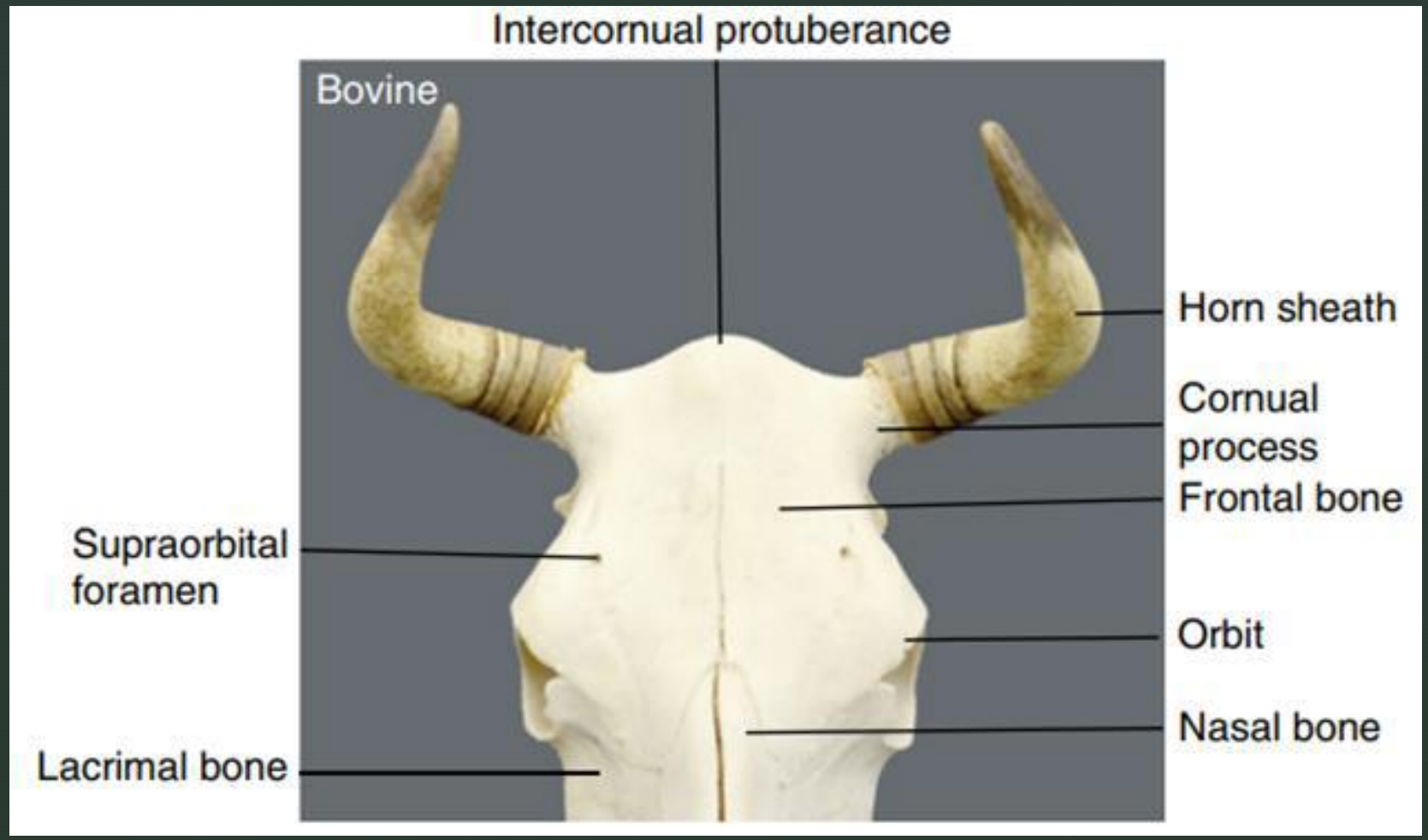

Intercornual protuberance
Bovine
Horn sheath
Cornual process
Frontal bone
Supraorbital foramen
Orbit
Nasal bone
Lacrimal bone

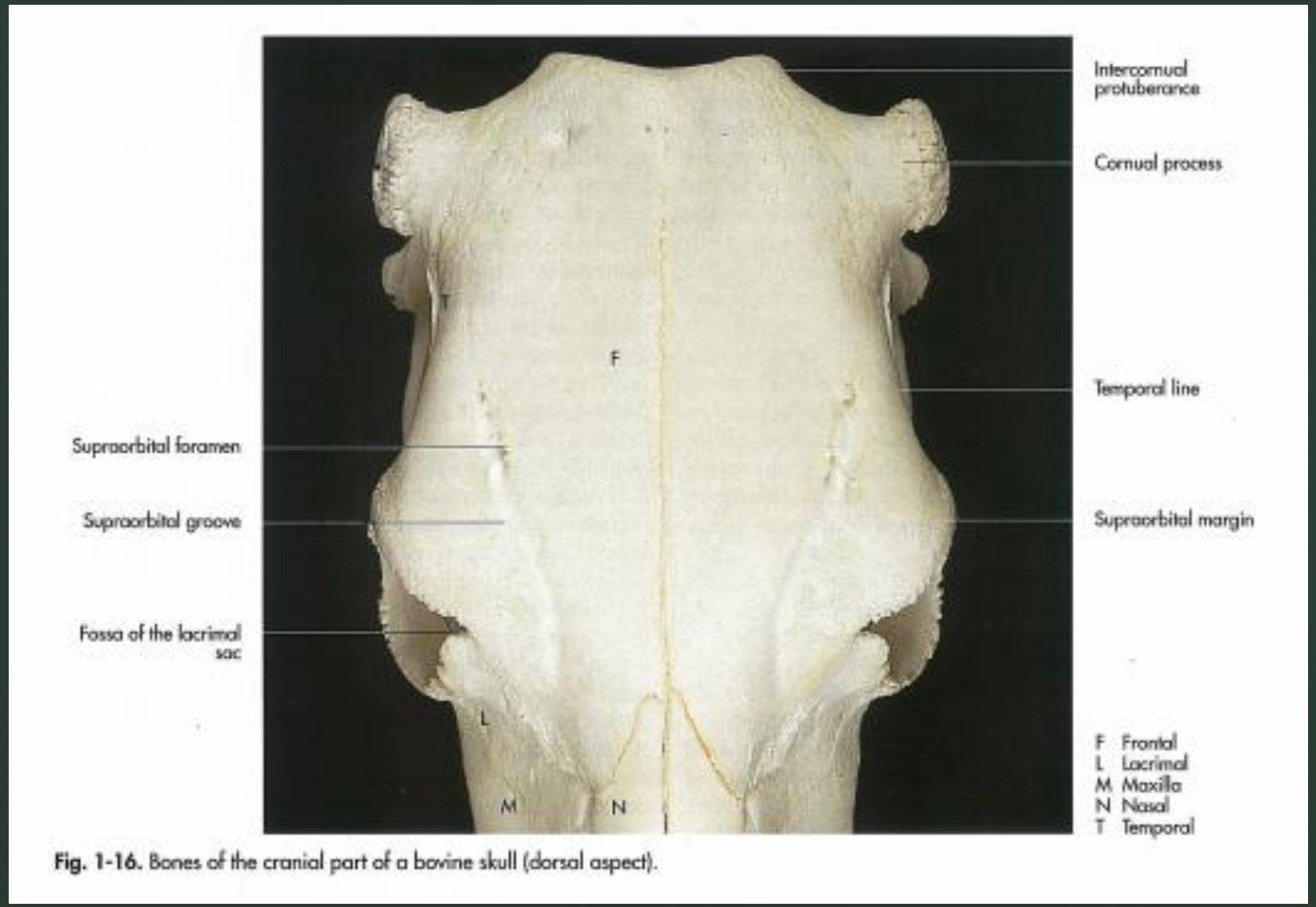
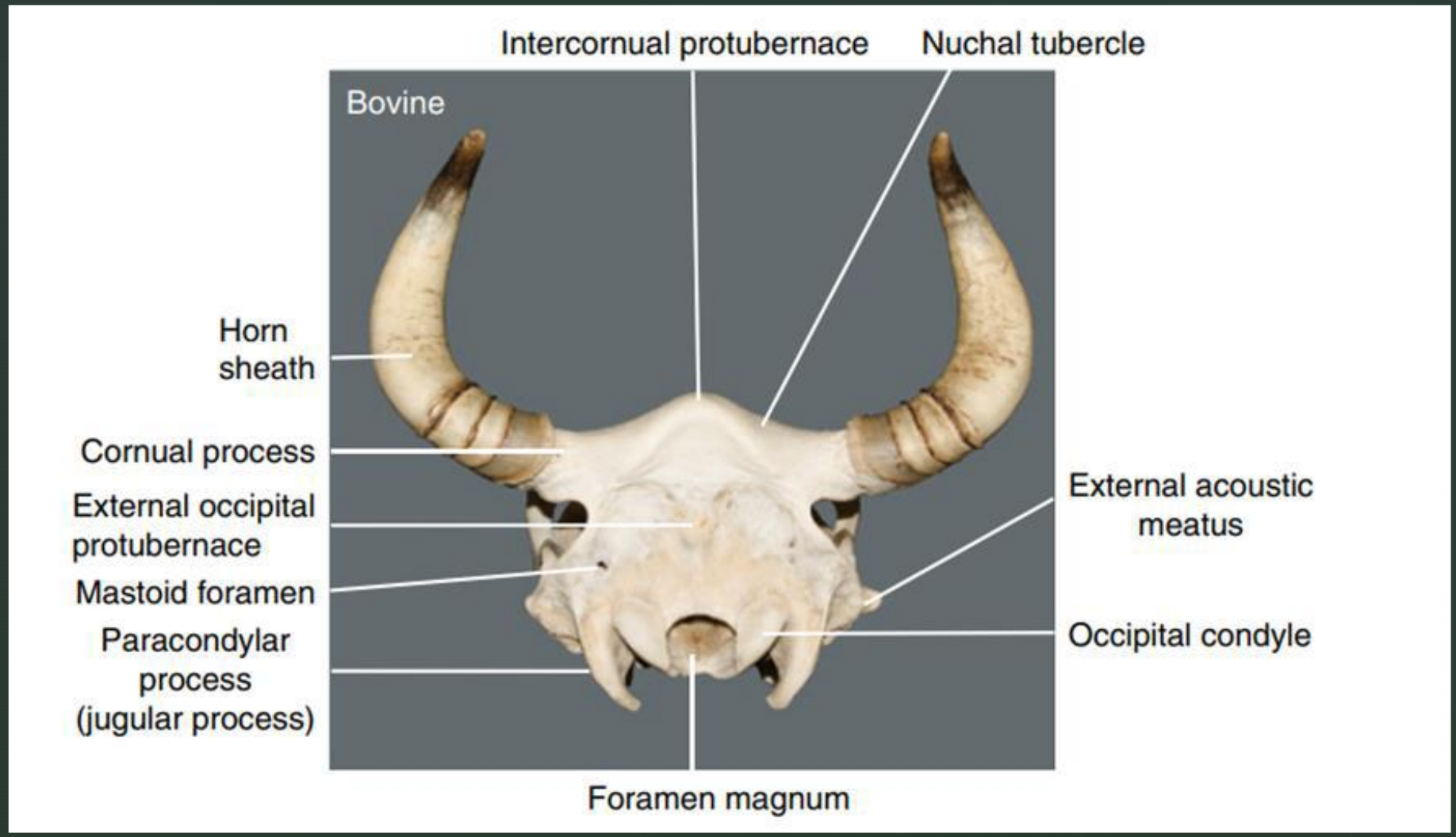
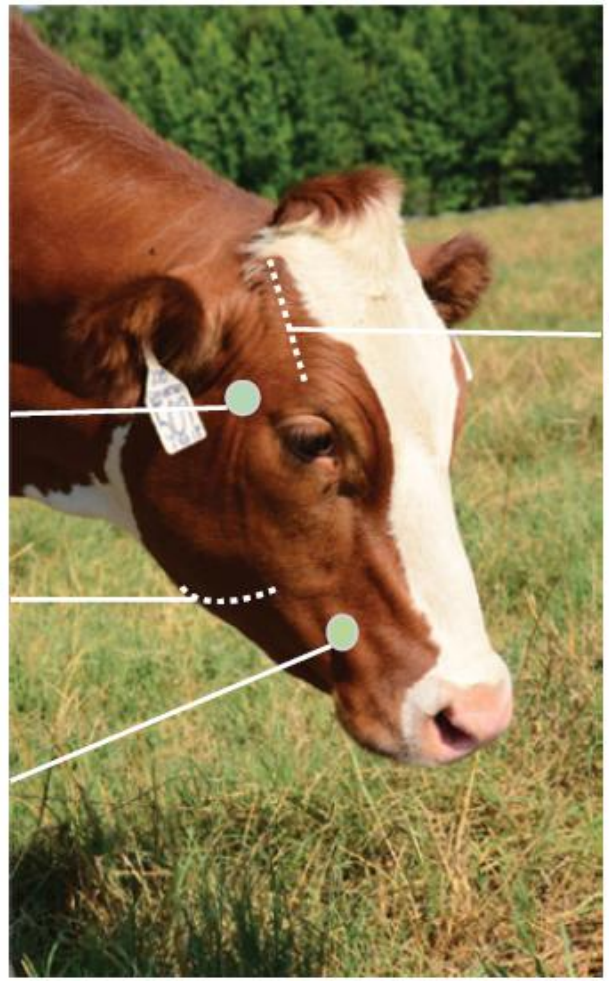


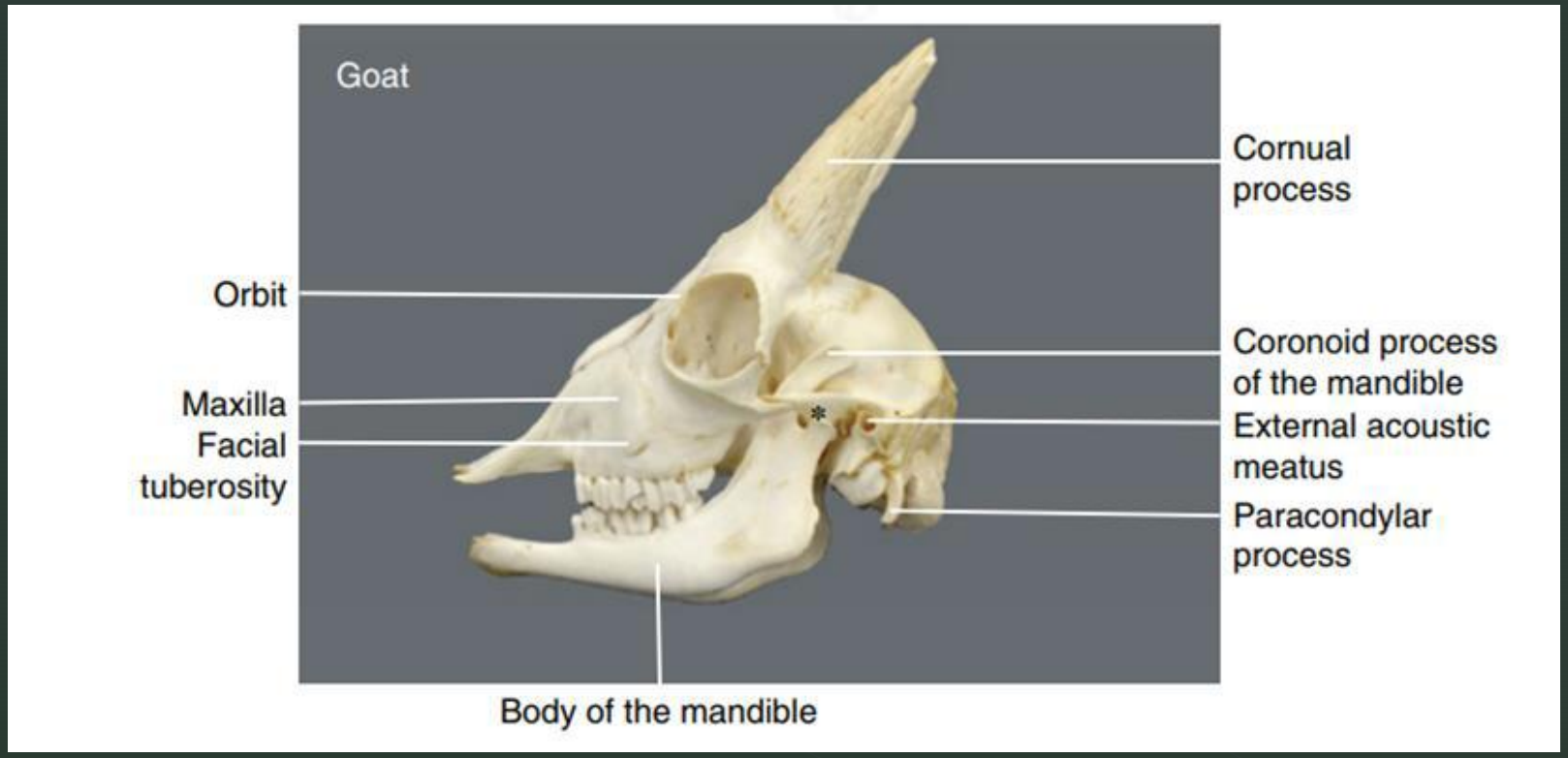
Fig. 1-16. Bones of the cranial part of a bovine skull (dorsal aspect).


Intercornual protubernace
Nuchal tubercle
Bovine
Horn sheath
Cornual process
External occipital protubernace
Mastoid foramen
Paracondylar process (jugular process)
External acoustic meatus
Occipital condyle
Foramen magnum



The facial artery is used for pulse evaluation in cattle. The artery crosses the ventral border of the mandible in front of the masseter muscle accompanied by the facial vein, ventral buccal branch of the facial nerve, and parotid duct. The facial artery is absent in goats and instead the transverse facial artery serves the role of the facial artery for pulse evaluation in goats.

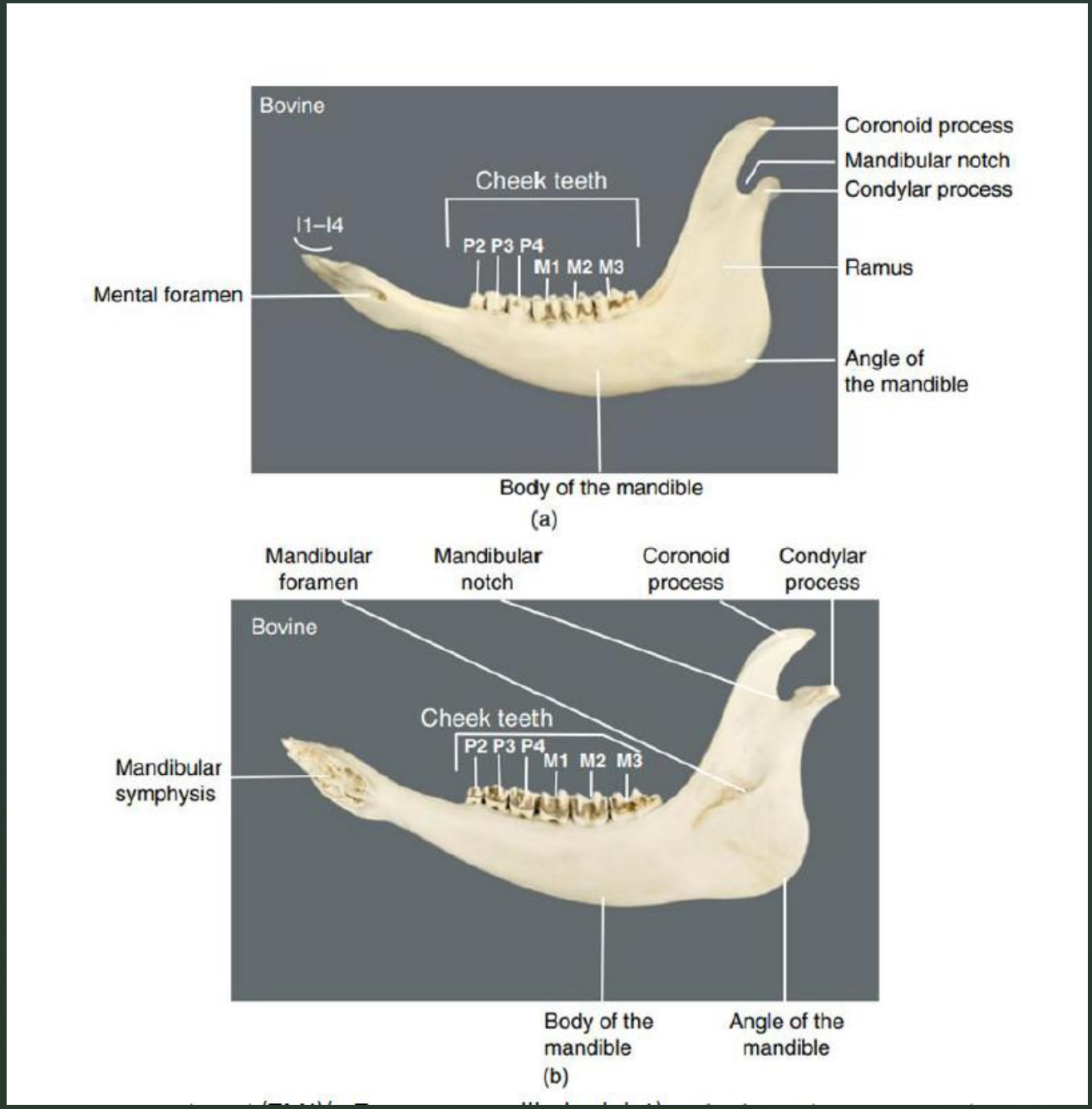
Figure 1.45 Palpable structures on the lateral surface of live cattle. The straight white solid line caudal to the eye depicts the temporal line, a landmark for localization of the cornual nerve and cornual artery. The curved white dotted line depicts the course of the facial artery, facial vein, and parotid duct. The filled circles depict approximate locations of temporomandibular joint and the facial tuberosity.

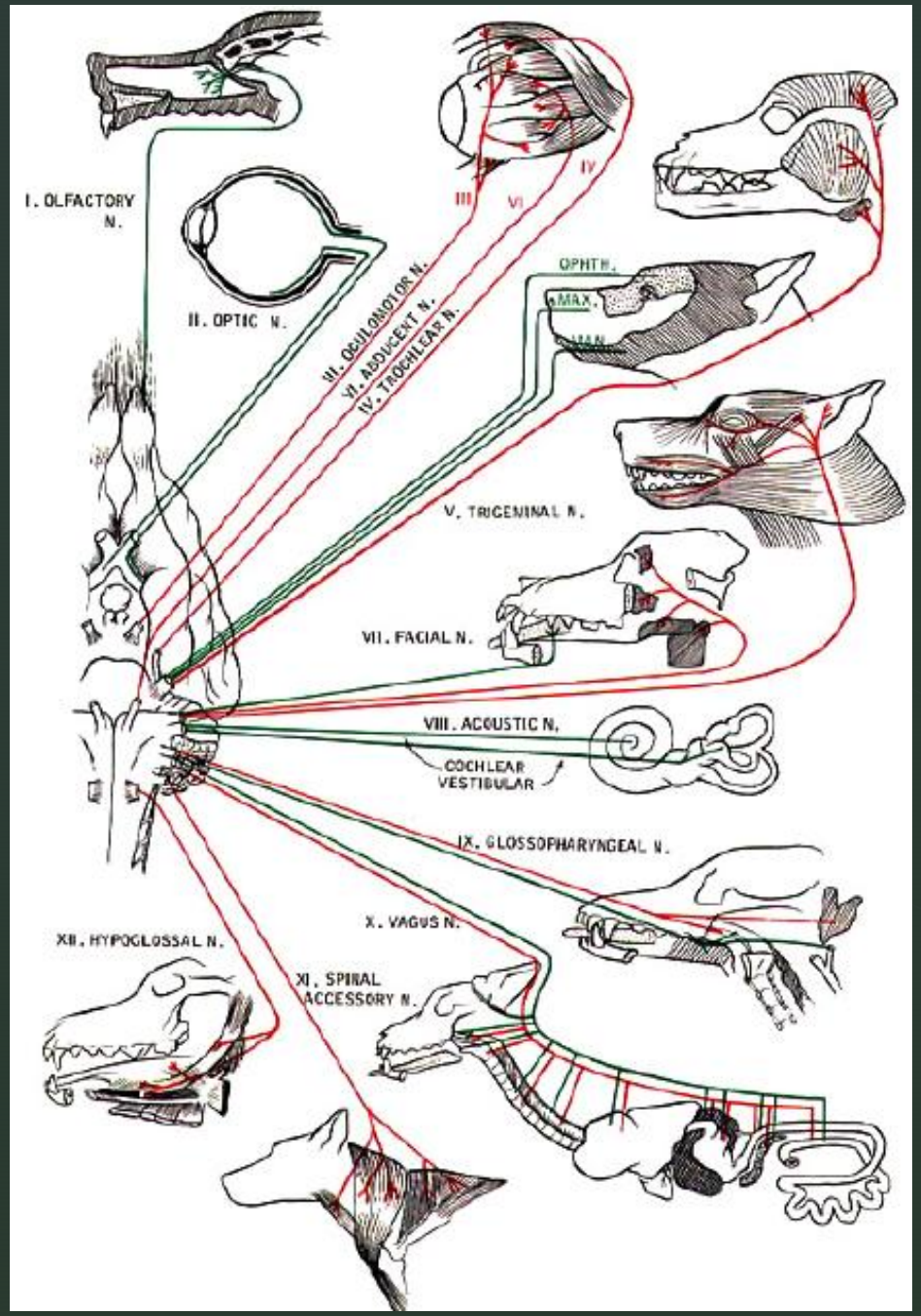


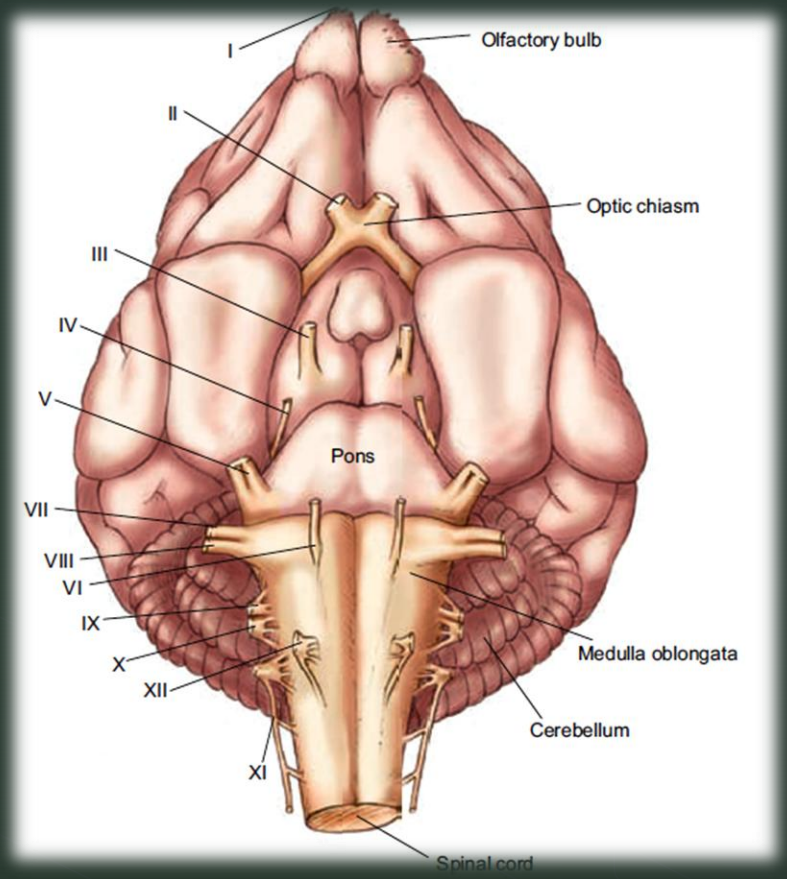
Goat skull: lateral view. The horn sheath (epidermal part) is removed. * Temporomandibular joint (TMJ). Note the proximity of the cornual process to the parietal bone. In dehorning of mature goats, the cut must not be made too far caudally to avoid exposure of the brain.

Mandible

Fracture of the mandible is rare in cattle but can occur in young calves following manipulation of the head with a snare.




I. OLFACTORY N.
II. OPTIC N.
III. OCULOMOTOR N.
VI. ABDUCENT N.
IV. TROCHLEAR N.
III
VI
IV
OPHTH.
MAX.
V. TRIGEMINAL N.
VII. FACIAL N.
VIII. ACOUSTIC N.
COCHLEAR
VESTIBULAR
IX. GLOSSOPHARYNGEAL N.
X. VAGUS N.
XII. HYPOGLOSSAL N.
XI. SPINAL ACCESSORY N.


I
Olfactory bulb
II
Optic chiasm
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Pons
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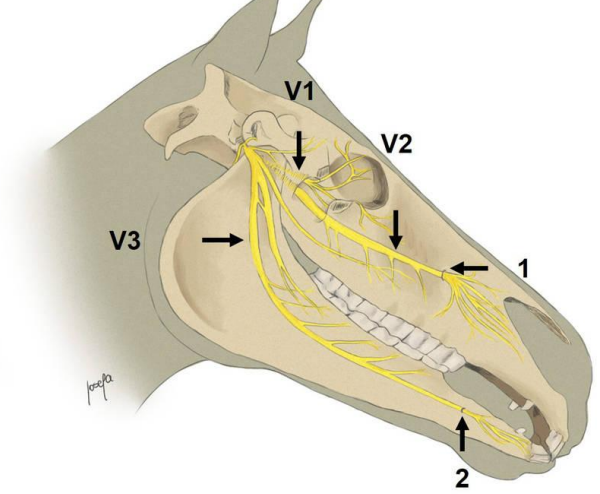
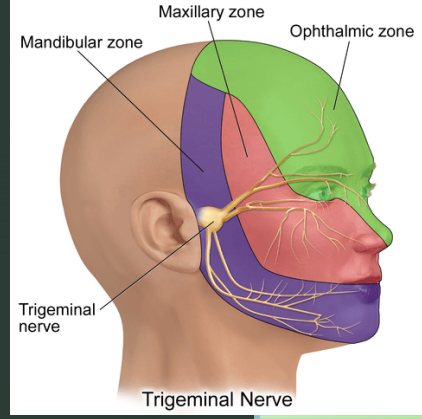
X
XII
Medulla oblongata
Cerebellum
XI
Spinal cord





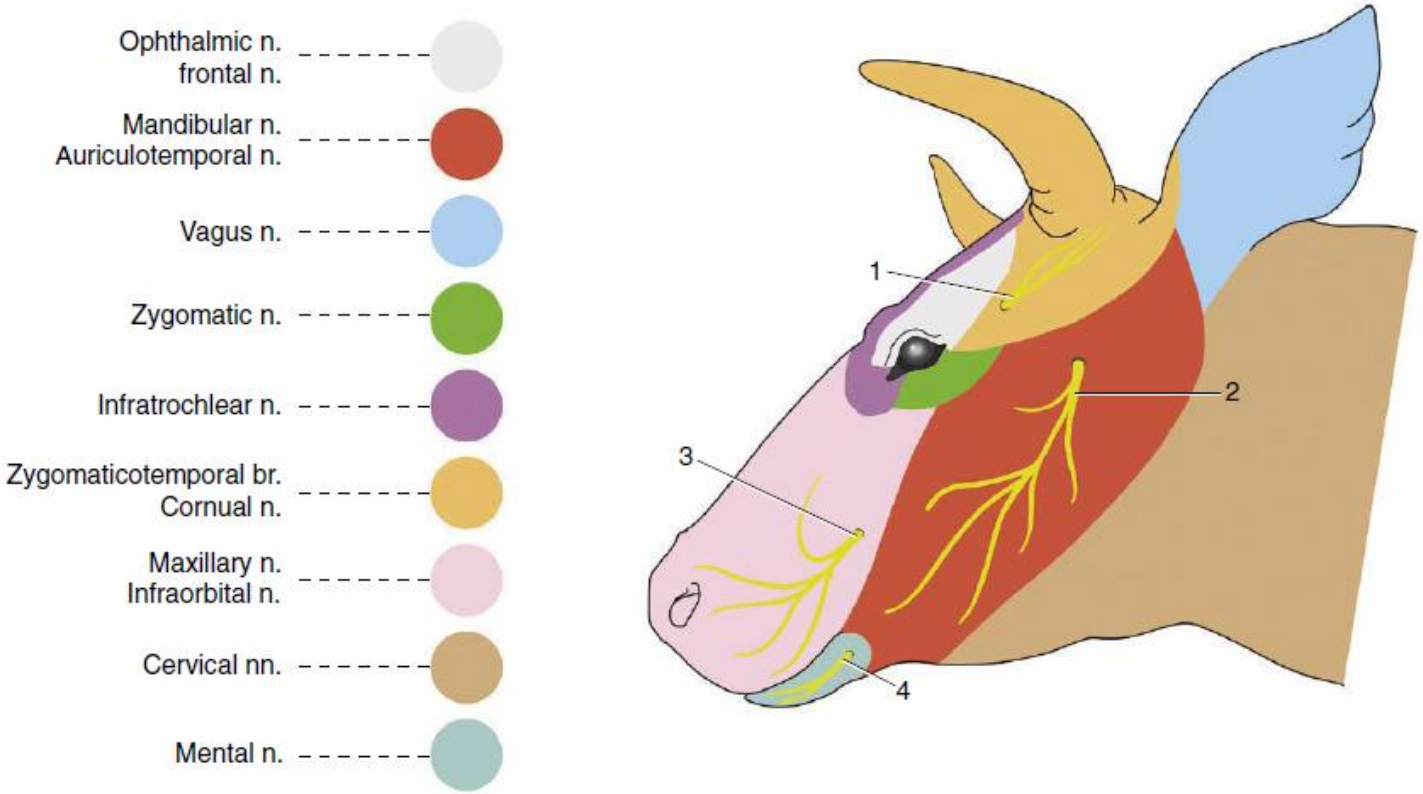
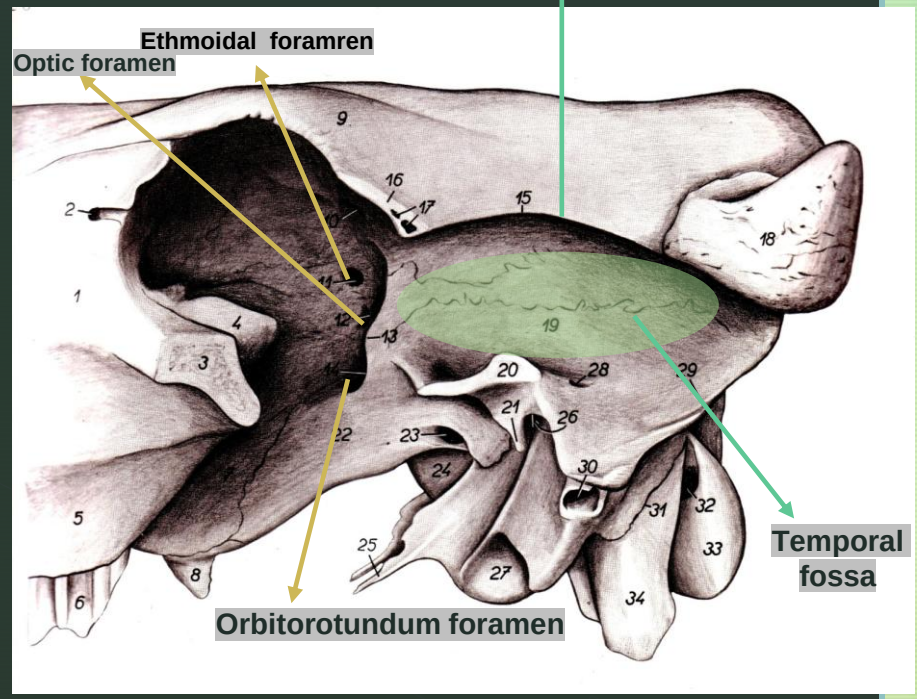


Figure 25–8 Skin innervation of the head. *1,* Cornual n.; *2,* auriculotemporal n.; *3,* infraorbital n.; *4,* mental n.

Foramen/canal	Nerve
Supraorbital foramen	Supraorbital nerve (continuation of frontal nerve, a branch of the ophthalmic division of the trigeminal nerve)
Maxillary foramen–infraorbital canal–infraorbital foramen	Maxillary nerve (subdivision of the trigeminal nerve continued by the infraorbital nerve through the infraorbital foramen)
Mandibular foramen–mandibular canal–mental foramen	Inferior alveolar nerve, mental nerve (continuation of the inferior alveolar), branches of the mandibular subdivision of the trigeminal nerve(V3)
Foramen orbitorotundum	Oculomotor nerve (CN III), trochlear nerve (CN IV), ophthalmic (CN V-1) subdivision of the trigeminal nerve, maxillary (CN V-2) nerve subdivision of the trigeminal nerve, and abducent nerve (CN VI)
Optic canal	Optic nerve (CN II)
Caudal palatine foramen–major palatine foramen	Major palatine nerve, a branch of the maxillary nerve subdivision of the trigeminal nerve
Sphenopalatine foramen–nasal cavity	Caudal nasal nerve, branch of the maxillary nerve, a subdivision of the trigeminal nerve

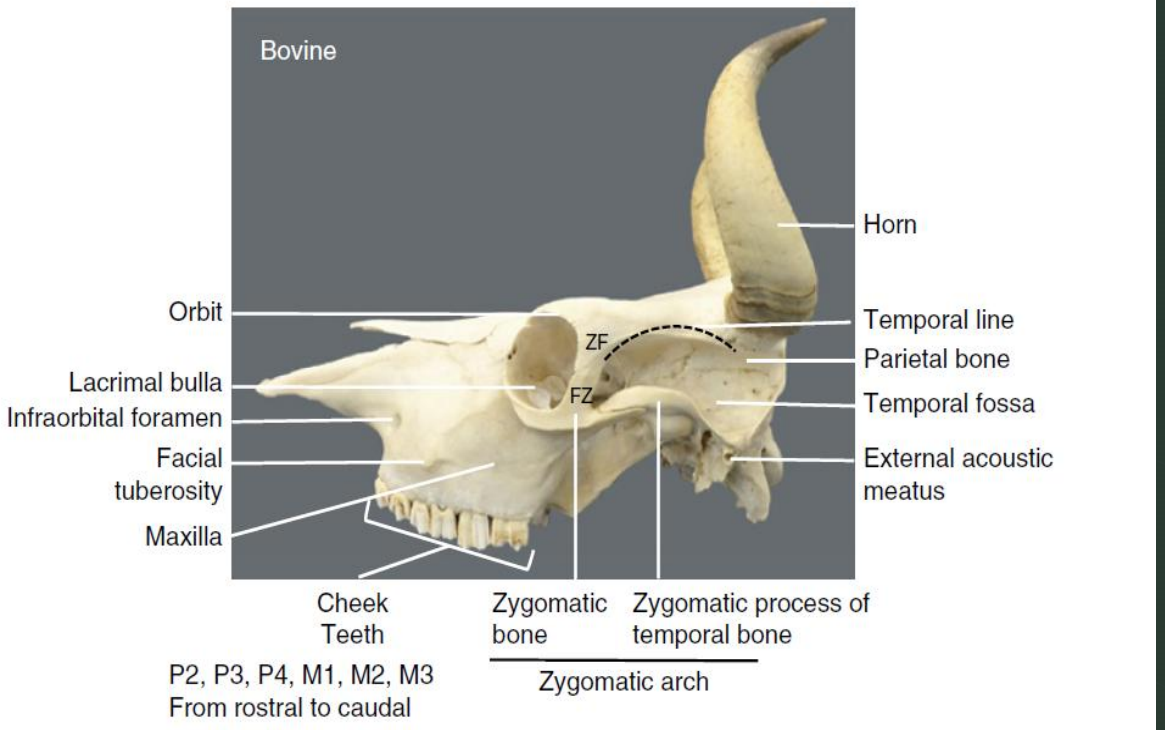


Tab. 1-1. Openings of the skull and transmitted structures.

Openings	Bones	Transmitted structures	Particulars
Hypoglossal canal	Occipital	Hypoglossus nerve (XII) Condylar vein and artery	Often double in the ox; Foramen in the horse
Optic canal	Presphenoid	Optic nerve (II)	Lies above the sphenoidal sinus
Orbital fissure	Presphenoid	Ophthalmic nerve (V_1) III., IV. and VI. cranial nerve	In carnivores and in the horse
Foramen rotundum	Presphenoid	Maxillary nerve (V_2)	Foramen orbitorotundum in ruminants and in the pig
Caudal alar foramen	Basisphenoid	Maxillary artery	
Rostral alar foramen	Basisphenoid	Maxillary artery	In the dog also the maxillary nerve (V_2)
Small alar foramen	Basisphenoid	Rostral deep temporal artery	Only in the horse
Foramen lacerum	Basioccipital, Temporal, Basisphenoid	Internal carotid artery, Mandibular nerve (V_3) Middle meningeal artery	In the horse and pig
Jugular foramen	Basioccipital Temporal	IX., X. and XI. Cranial nerve, Dog: Internal carotid artery	Foramen lacerum as the caudal part
Oval foramen	Basisphenoid	Mandibular nerve (V_3)	In the horse the oval notch lies in the foramen lacerum
Carotid canal	Basisphenoid	Internal carotid artery (excl dog) Internal carotid nerve	In the horse carotid notch and foramen lacerum
Spinous foramen	Basisphenoid	Trochlear nerve (IV) Middle meningeal artery	In the horse spinous notch and foramen lacerum
Supraorbital foramen	Frontal	Frontal nerve (V_1), Frontal vein and artery	Lacking in carnivores

Tab. 1-1. Openings of the skull and transmitted structures (continued).

Openings	Bones	Transmitted structures	Particulars
Ethmoidal foramen	Frontal	Ethmoidal nerve (V_1) Ethmoidal vein and artery	
Petrooccipital fissure	Temporal/ Occipital	Greater petrosal nerve (VII) Chorda tympani (VII)	
Retroarticular foramen	Squamous temporal	Emissary veins for the temporal sinus	
Facial area	Petrous part	Facial nerve (VII)	Internal acoustic meatus
Cochlear area	Temporal	Cochlear nerve ((VIII)	Internal acoustic meatus
Dorsal vestibular area	Temporal	Vestibular nerve (VIII)	Internal acoustic meatus
Ventral vestibular area	Temporal	Vestibular nerve (VIII)	Internal acoustic meatus
Stylomastoid foramen	Petrous part/ Tympanic part	Facial neve (VII)	
Maxillary foramen	Maxilla	Maxillary nerve (V_2) , vein and artery	Pterygopalatine fossa
Caudal palatine foramen	Maxilla	Greater palatine nerve (V_2), vein and artery	Pterygopalatine fossa
Sphenopalatine foramen	Maxilla	Caudal nasal nerve (V_2), Sphenopalatine vein and artery	Pterygopalatine fossa
Infraorbital foramen	Maxilla	Infraorbital nerve (V_2), vein and artery	
Interincisive canal	Incisive	Greater palatine artery	
Mandibular foramen	Mandible	Mandibular nerve (V_3), vein and artery	
Mental foramen	Mandible	Mental nerve (V_3), vein and artery	
Major palatine foramen	Palatine	Greater palatine nerve (V_2) and artery	Greater palatine vein only in small ruminants



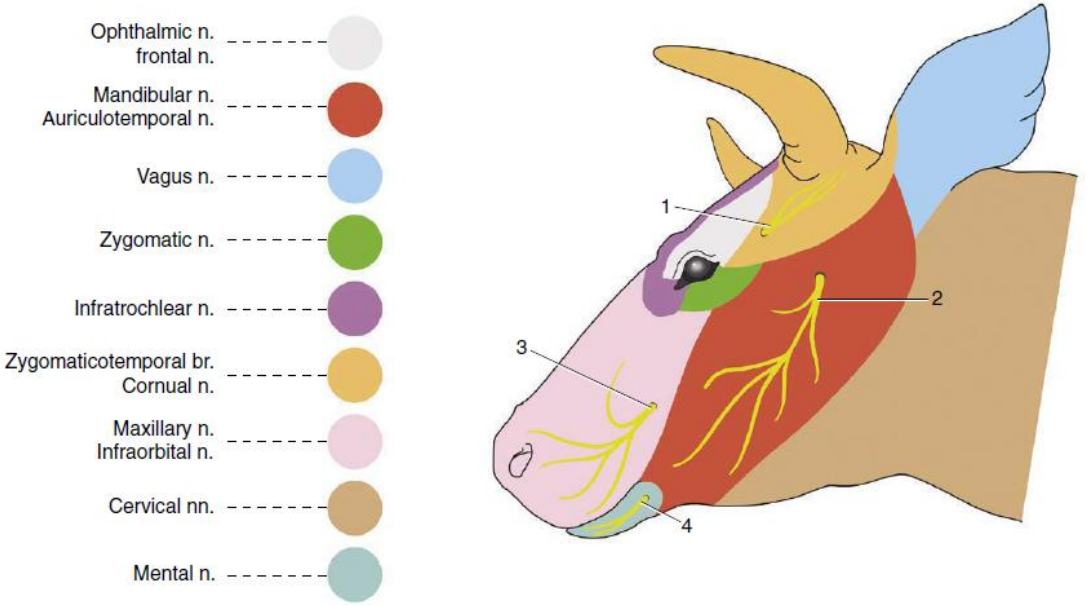


Figure 25–8 Skin innervation of the head. *1,* Cornual n.; *2,* auriculotemporal n.; *3,* infraorbital n.; *4,* mental n.

- **The infraorbital nerve passes out of the skull through the infraorbital foramen. The infraorbital nerve block is sometimes used in cattle to repair nasal laceration and/or to place nasal rings in bulls. Alternatively, a local anesthetic drug, such as lidocaine, can be injected directly at the site of the surgical procedure (local nerve block).**

Dehorning in cattle

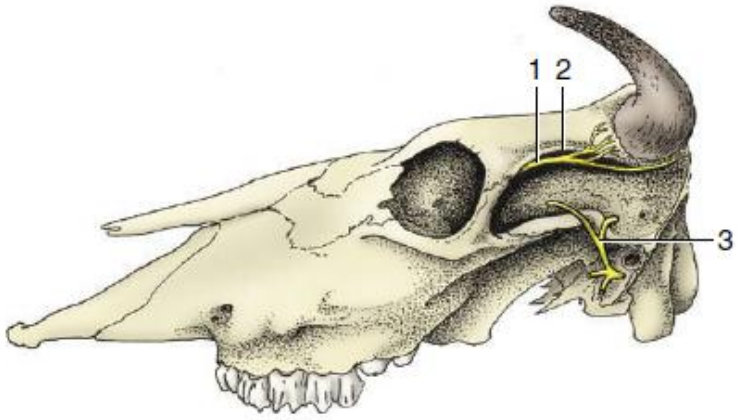
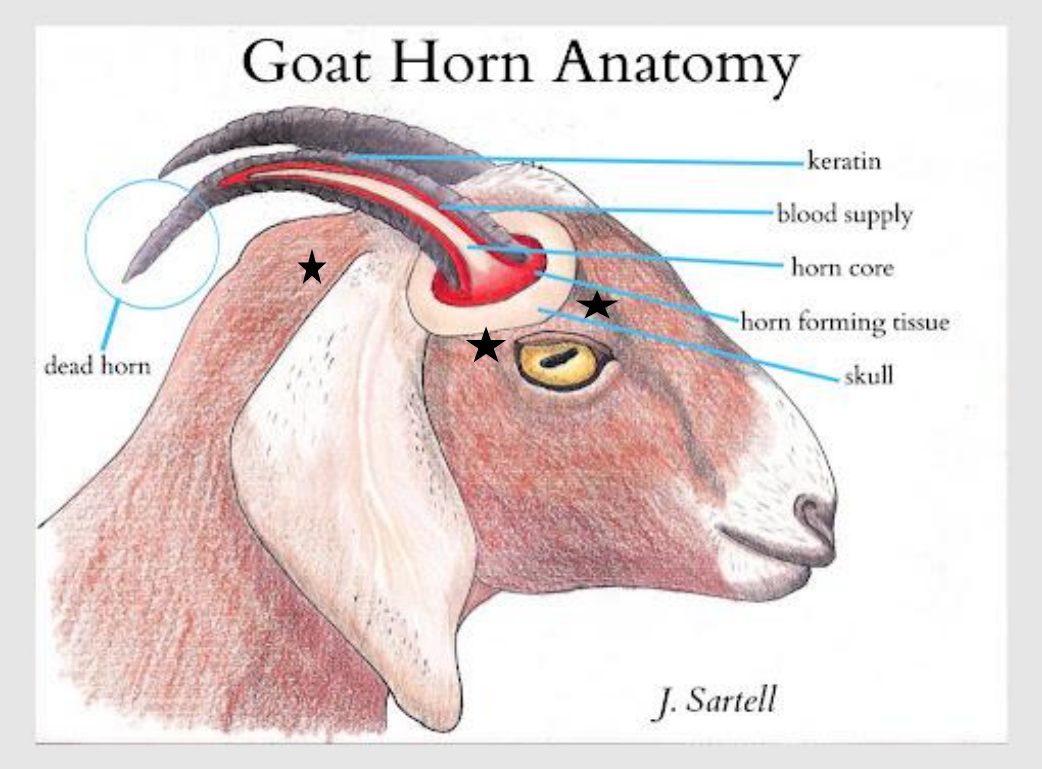
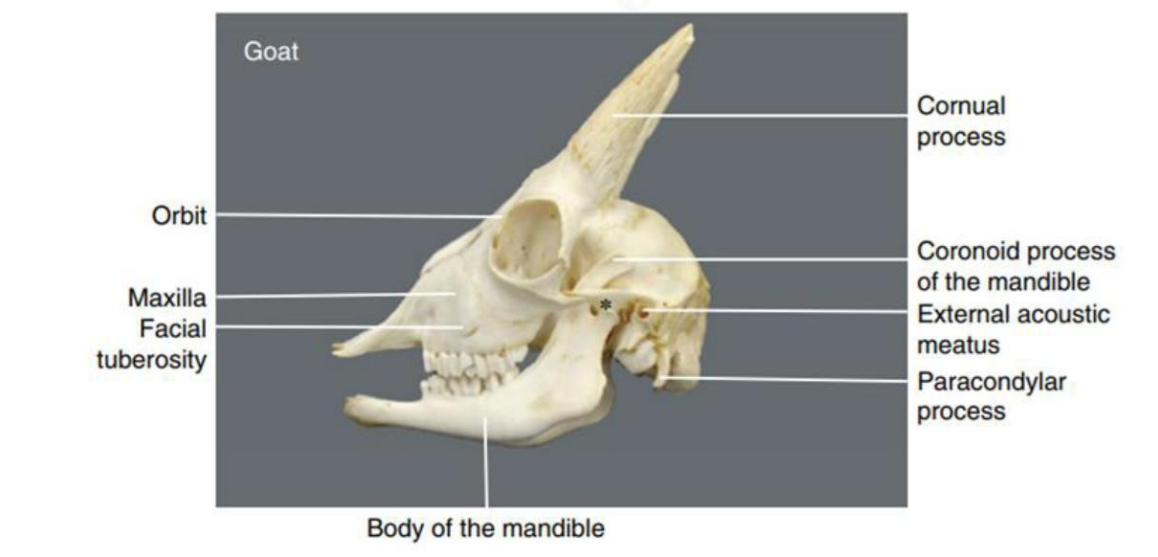


Figure 25–6 Bovine skull with cornual nerve *(1)* and auriculopalpebral nerve *(3)*. The cornual nerve follows the temporal line *(2)* to the base of the horn. The auriculopalpebral nerve is palpable where it crosses the zygomatic arch.

In dehorning operations in cattle, the temporal line is used as a palpable landmark to block the cornual nerve that innervates the horn in cattle. The cornual nerve emerges from the orbit and courses toward the base of the horn along the temporal line. The cornual artery, which supplies the horn, must also be ligated or its branches cauterized.

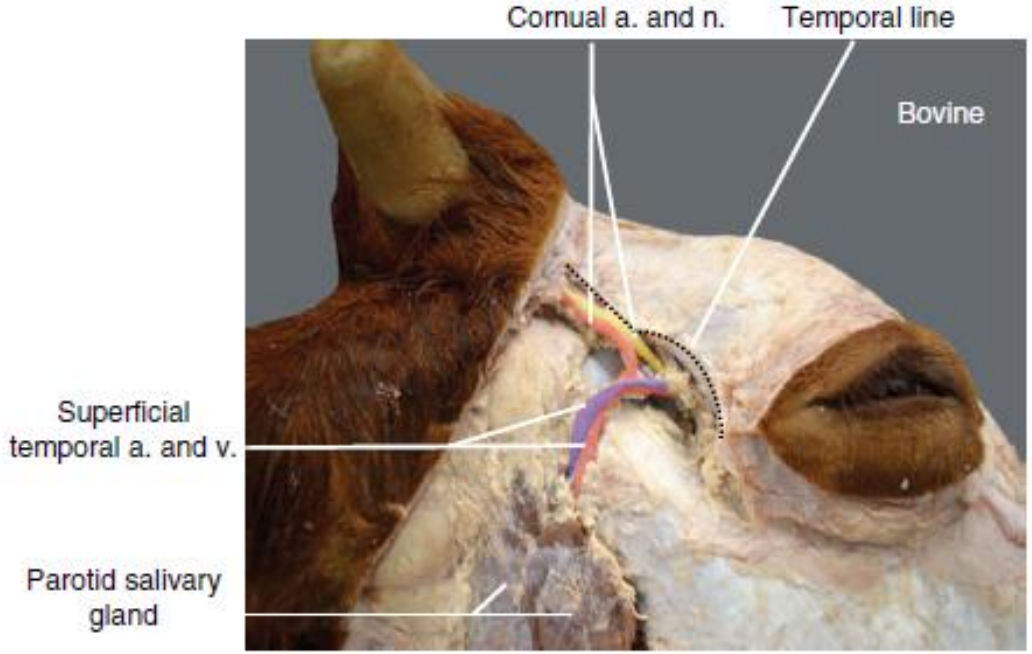
Dehorning





In adult goats, three nerves must be blocked if regional anesthesia is selected. These nerves are:

1) The cornual nerve: block is between the lateral canthus of the eye and the lateral part of the base of the horn.
2) The cornual branches of the infratrochlear nerve block is more medial than that of the cornual nerve between the medial canthus of the eye and medial edge of the base of the horn.
3) Cornual branches of the great auricular nerve: at the back of the ear.



(b)

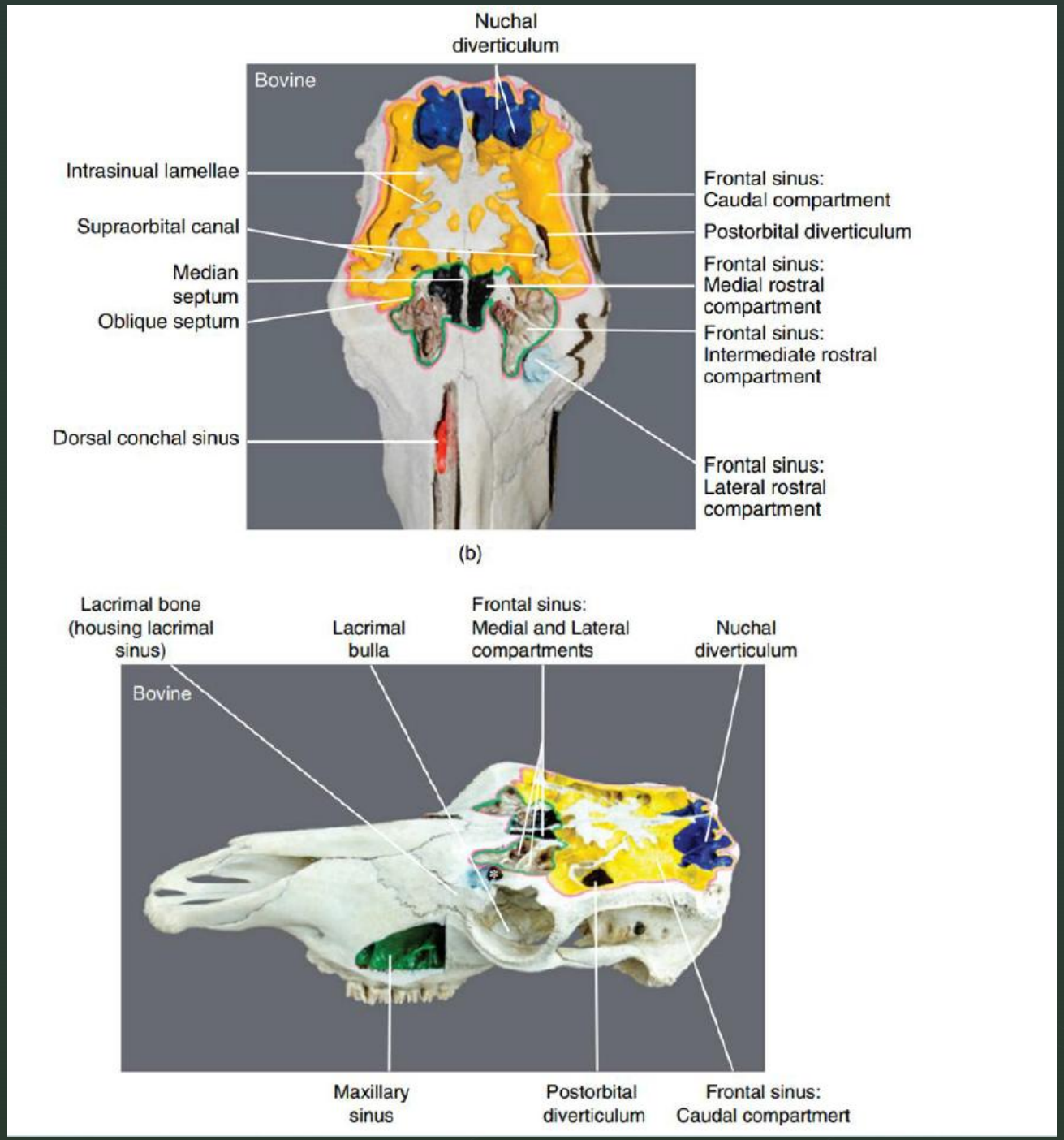
Figure 1.19 (a) Bovine head: lateral view. The cutaneous faciei muscle is reflected cranially to uncover the superficial vessels and nerves of the bovine head. The parotidoauricularis muscle that covers the parotid salivary gland is removed. (b) Bovine head: lateral view. Close-up view of the superficial temporal artery and vein, and cornual artery and nerve. In dehorning operations, the cornual nerve is blocked along the bony temporal line. The cornual artery is a branch of the superficial temporal artery.

- **Ligation of the cornual artery is suggested in the dehorning operation of adult cattle. While that sure would be helpful, understand that the cornual artery cannot be clamped at the origin during dehorning procedures. Rather, hemostasis is provided ligation or cauterization following horn removal.**

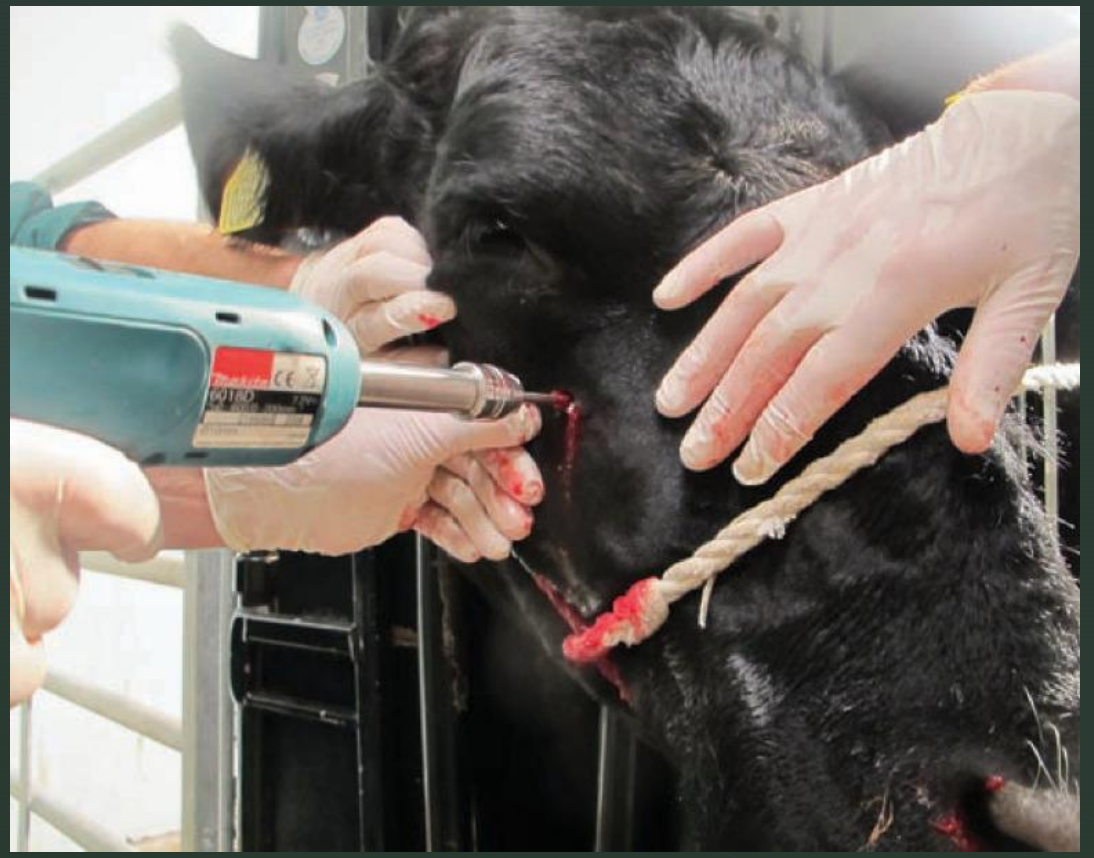
Horn buds (called horn buttons) are typically eliminated in young animals to prevent horn growth. Several procedures, including chemical or heat cautery, are used to prevent the growth of the horn buds.

Sinuses in rum.

Bovine skull with sculptured frontal sinus: dorsal view. An oblique transverse septum (dotted line) divides the frontal sinus into rostral and caudal compartments. The line extends obliquely from the mid-dorsal border of the orbit to the median septum. The median septum separates the left and right frontal sinuses. The caudal compartment of the frontal sinus has three diverticuli: the cornual (within the cornual process), nuchal (rostral to the nuchal tubercle), and postorbital (caudal to the orbit) diverticuli. The bony supraorbital canal, which houses the supraorbital vein, passes through the caudal compartment of the frontal sinus. (b) Compartments of the bovine left and right frontal sinuses. Bovine skull showing caudal (yellow and blue) and rostral(multiple colors) compartments and diverticuli of the frontal sinus: dorsal view. The cornual diverticulum is absent in this skull (no horns present; Figure 1.9a). The rostral compartment of the frontal sinus is divided into three smaller spaces (lateral, intermediate, and medial parts). The rostral and caudal compartments of the frontal sinus communicate with ethmoidal meatuses(not visible). Another major paranasal sinus in cattle is the maxillary sinus (Figure 1.9c). Minor sinuses of less clinical significance include the lacrimal, palatine, sphenoid, and conchal sinuses.



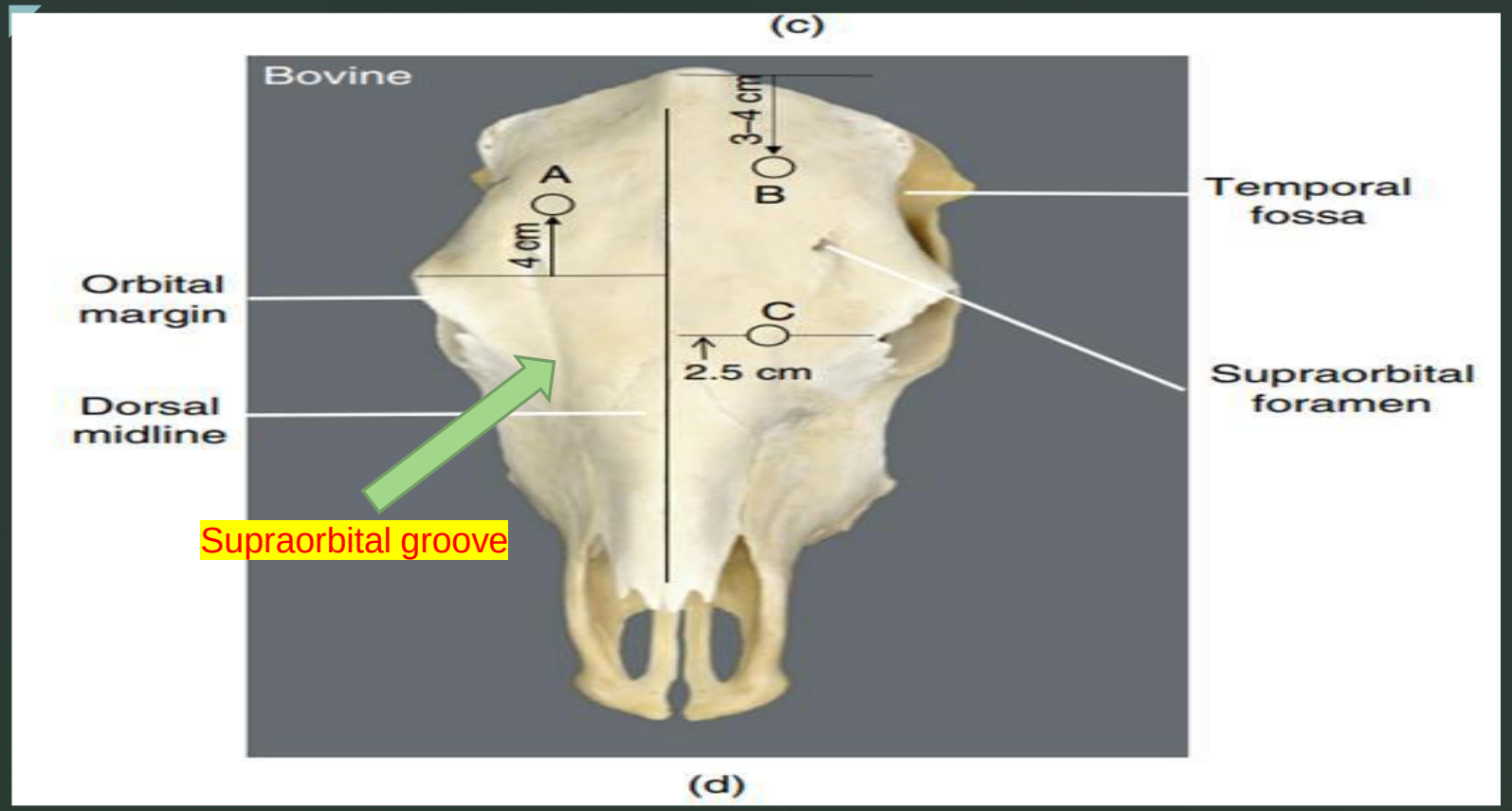
Trephination



Frontal Sinusitis

Frontal sinusitis is frequently associated with dehorning procedures, where the sinus may become infected due to open wounds. Other causes include upper respiratory tract infections and dental diseases that can lead to bacterial infections within the sinus cavity

- Drilling a circular hole in the skull or other bones is known as trephination. This hole is generally made to drain inflammatory exudate and flush sinuses in the skull with antiseptic solution. Diseases of the frontal sinus result from microbial infections mostly from dehorning operations in cattle. In the bovine, the supraorbital groove is palpable. It houses the supraorbital or frontal vein. In rostral frontal sinus surgery (i.e., trephination), the frontal vein must be avoided.



Selected trephination sites of the frontal sinus (small circles). Site A: postorbital diverticulum, located about 4 cm caudal to the caudal edge of the orbit and above the temporal fossa. Site B: caudal part of frontal sinus (major part of frontal sinus), drilled 4 cm rostral from topmost of the head and midway between the base of the horn and the dorsal midline. Site C: rostral frontal sinus, drilled 2.5 cm laterally from the dorsal midline on a perpendicular midline passing through the center of the orbit.

FIGURE 17.1-3 Topography of the paranasal sinuses, which are the most clinically important in cattle and defined during percussion. Key: 1, maxillary sinus; 2, dorsal conchal sinus; 3, rostral frontal sinus and 4, caudal frontal sinus.

- MAXILLARY SINUSITIS

The location of the maxillary sinus makes it more predisposed to disease compared to other sinuses. Primary sinusitis may result from extension of infection from the nasal cavity. Secondary sinusitis may result from a maxillary cheek tooth periapical abscess. Special attention and care to the facial vein passing over the ventral limit of the sinus is important when surgically entering the sinus). In addition, the lowest point of the sinus (located above the second molar) is identified/trephined to provide for the best drainage of accumulated material.

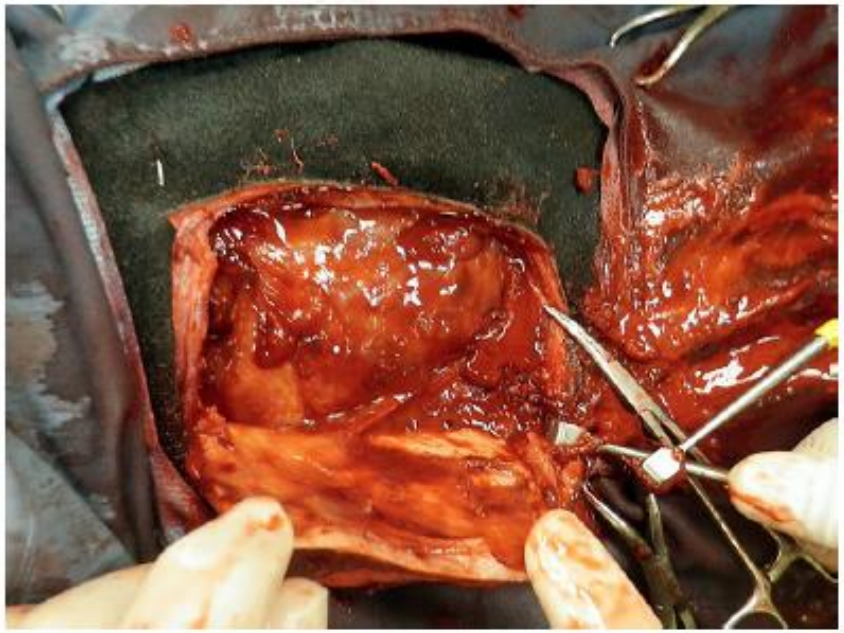
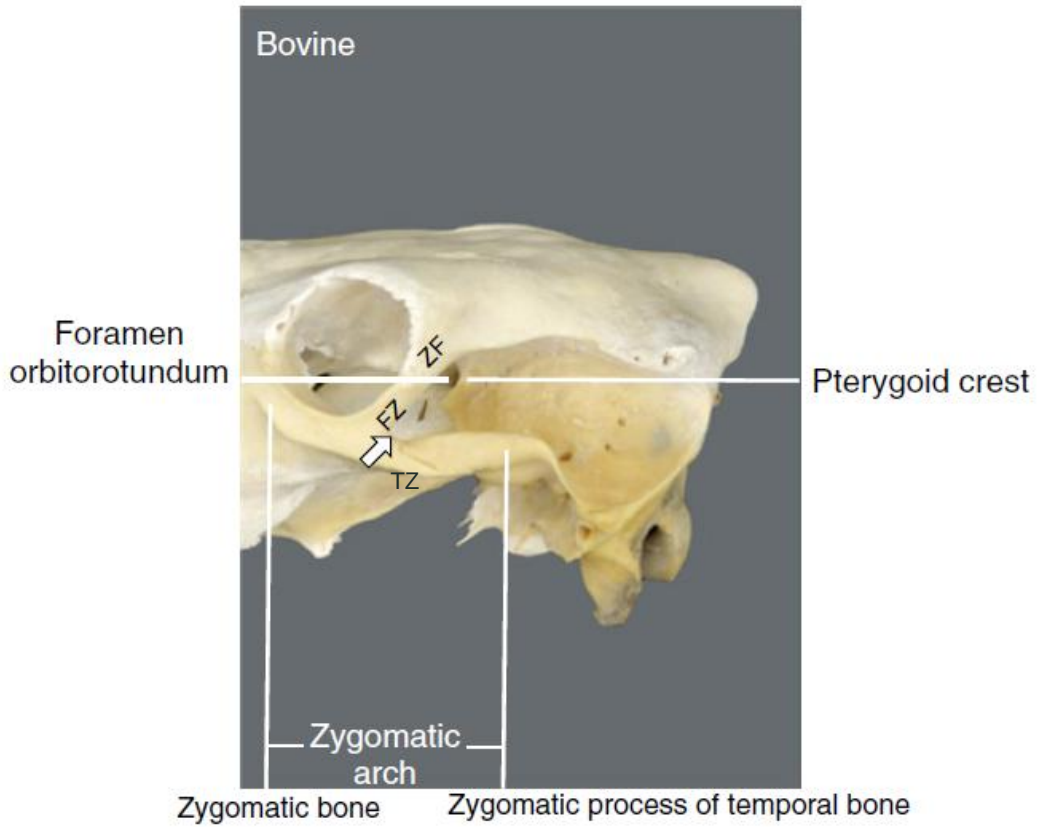


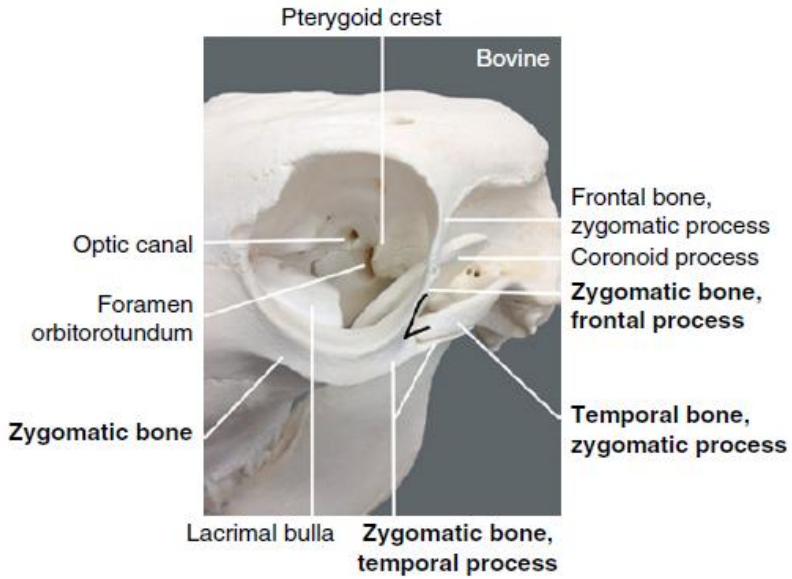
FIGURE 17.1-12 A bone flap exposing the maxillary sinus for a sinonasal cyst in an adult cow. It is a non-neoplastic, fluid-filled mass occupying the nasal conchae along with the maxillary and palatine sinuses. The wall of the cyst is seen filling the cavity.

Squamous Cell Carcinoma

Ocular squamous cell carcinoma (OSCC) in animals is a primary neoplasm of epithelial origin. OSCC or "cancer eye" is the most common malignant tumor affecting cattle in North America and is responsible for significant economic losses. Bovine ocular squamous cell carcinoma is generally treated by enucleation (surgical removal) of the eye.

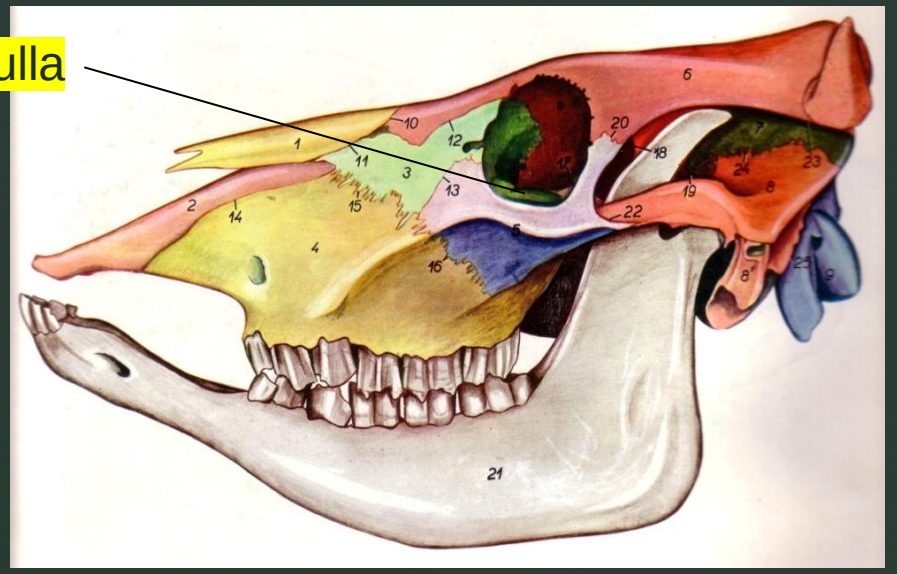
Anesthesia for enucleation of the eye

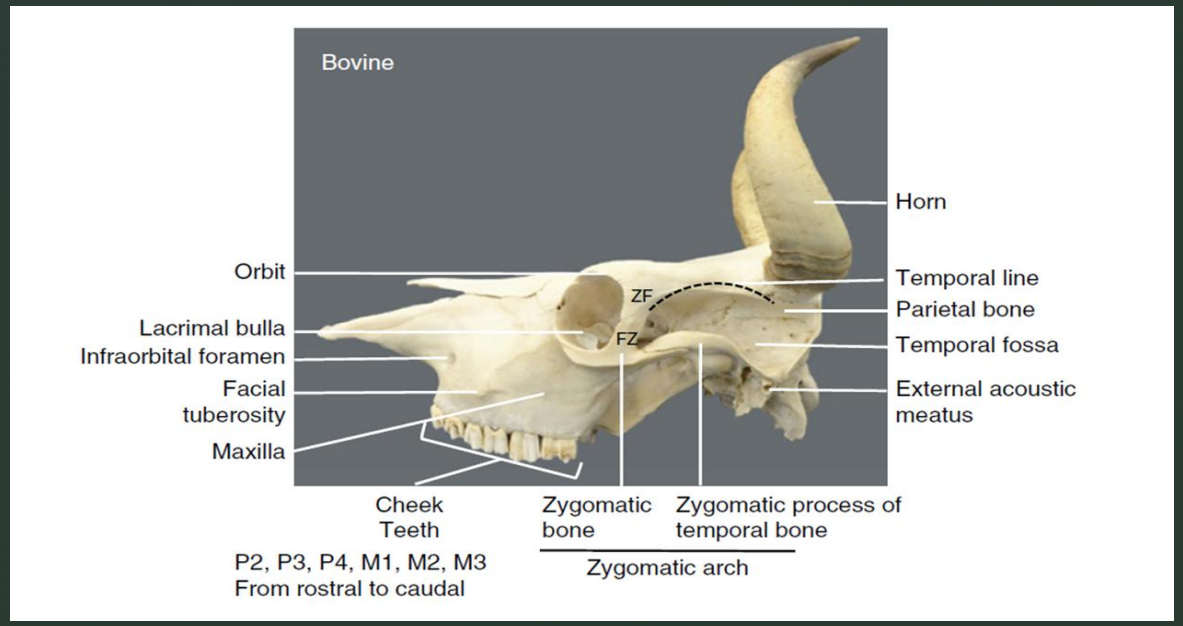




The bovine skull showing the bony landmarks for Peterson's nerve block: caudolateral view. The white arrow points to the angle where the needle is inserted to deposit an anesthetic close to the foramen orbitorotundum. This angle is formed by the bifurcation of the zygomatic bone caudally into the frontal process of the zygomatic bone (FZ) and the temporal process of the zygomatic bone (TZ). The pterygoid crest and coronoid process of the mandible are encountered and avoided as a long-curved needle is advanced toward the foramen.

Lacrimal bulla

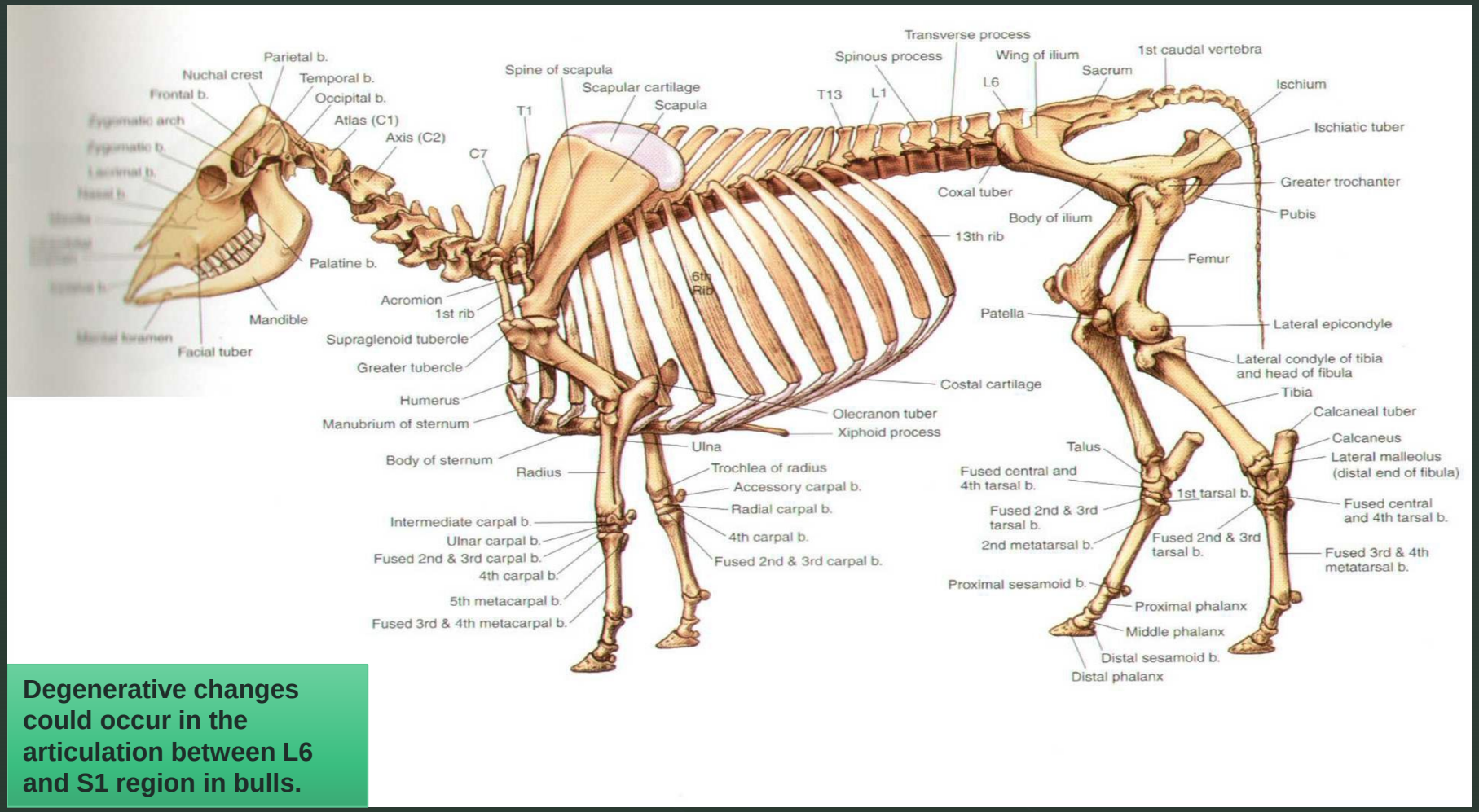




Anesthesia for enucleation of the eye

Because Peterson's nerve block requires advanced technical skill, the retrobulbar technique is considered as an easier alternative. The medial and lateral canthi of the eye and upper (superior) and lower (inferior) eyelids are used as landmarks for anesthetic injection at four points. In this procedure, care should be taken to avoid damaging the thin lacrimal bulla.

Vertebral Column



Degenerative changes could occur in the articulation between L6 and S1 region in bulls.

- The vertebral formula is C7, T13, L6, S5, Cd 18–20 in cattle;
  - C7, T13, L6 (7), S5, Cd 16–18 in goats;
  - C7, T13, L6 (7), S4, Cd 16–18 in sheep

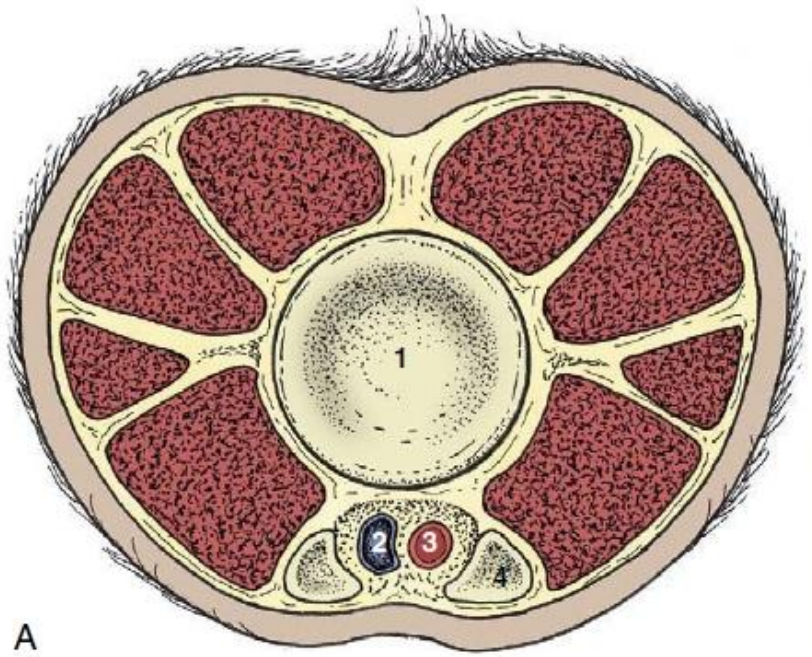


Figure 26–7 A, Transverse section of the bovine tail between Cd3 and Cd4. *1,* Intervertebral disk; *2,* median caudal vein; *3,* median caudal artery; *4,* hemal process. B, Collection of blood from a median caudal vessel.

- **In addition to the external jugular vein in the neck region, the median caudal or "tail" vein is one of the common locations where blood can be collected from cattle. When the tail is raised, the median caudal vein can be accessed in proximal ventral third of the tail between two adjacent tail vertebrae. In this location, the caudal vertebrae have hemal arches that should be avoided.**

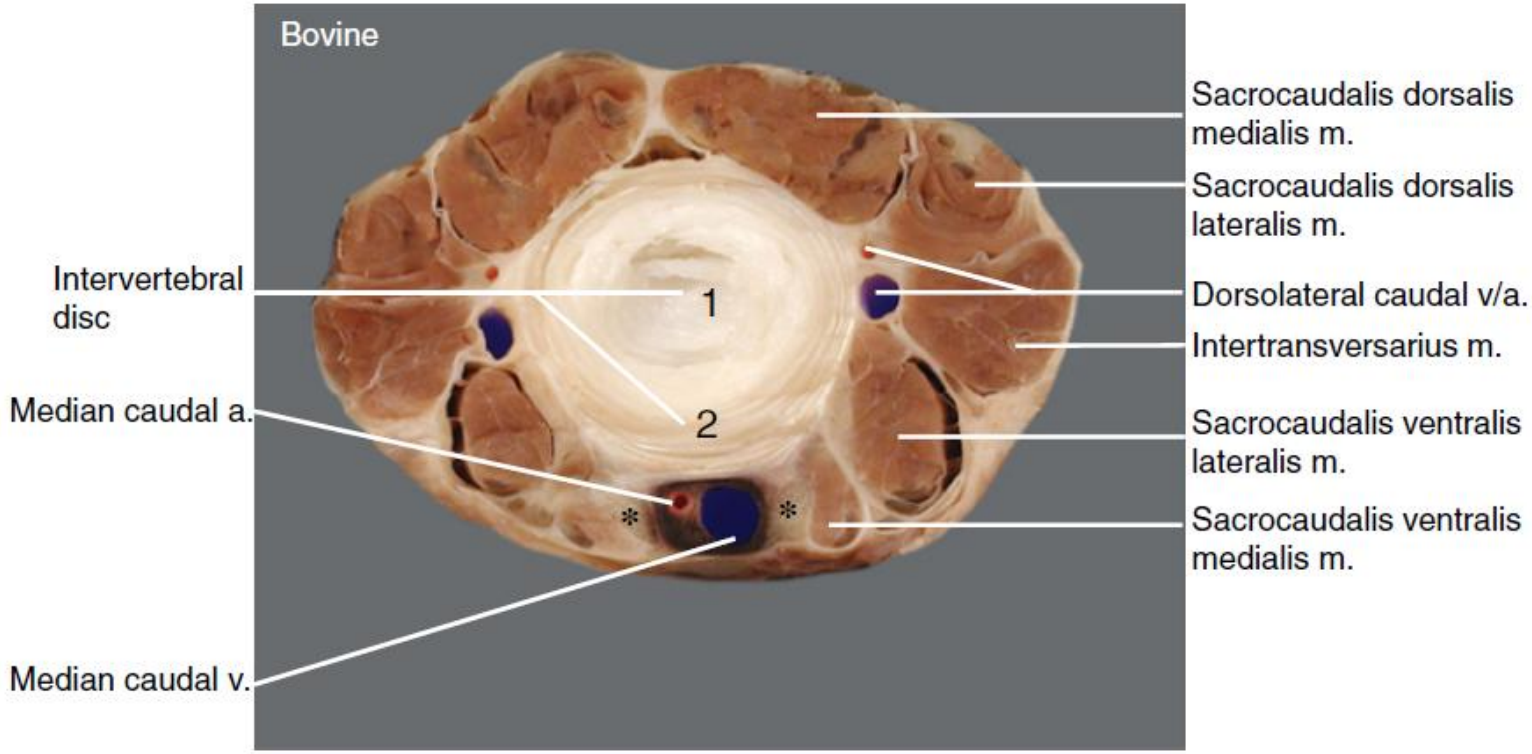
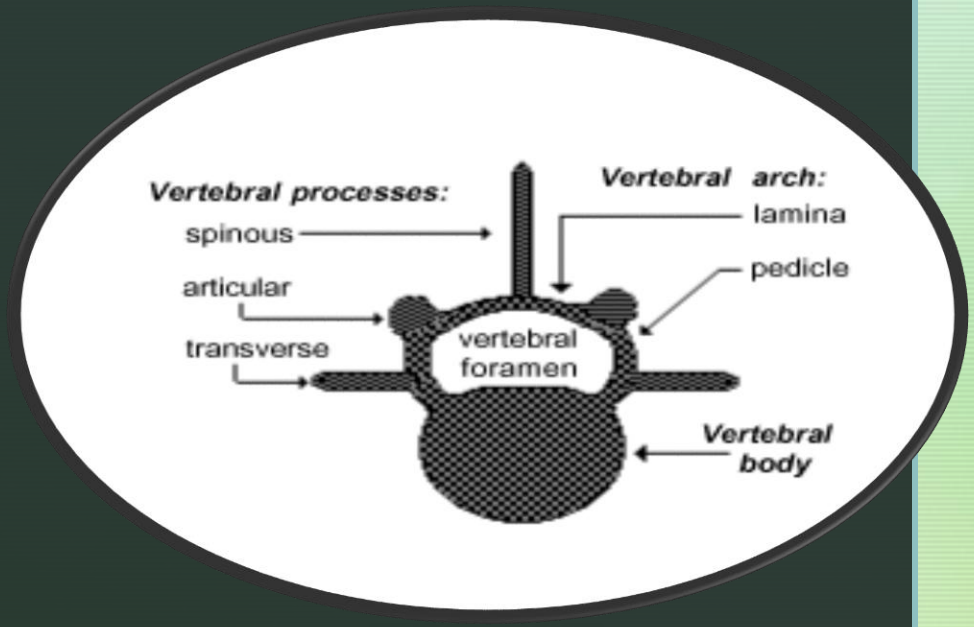
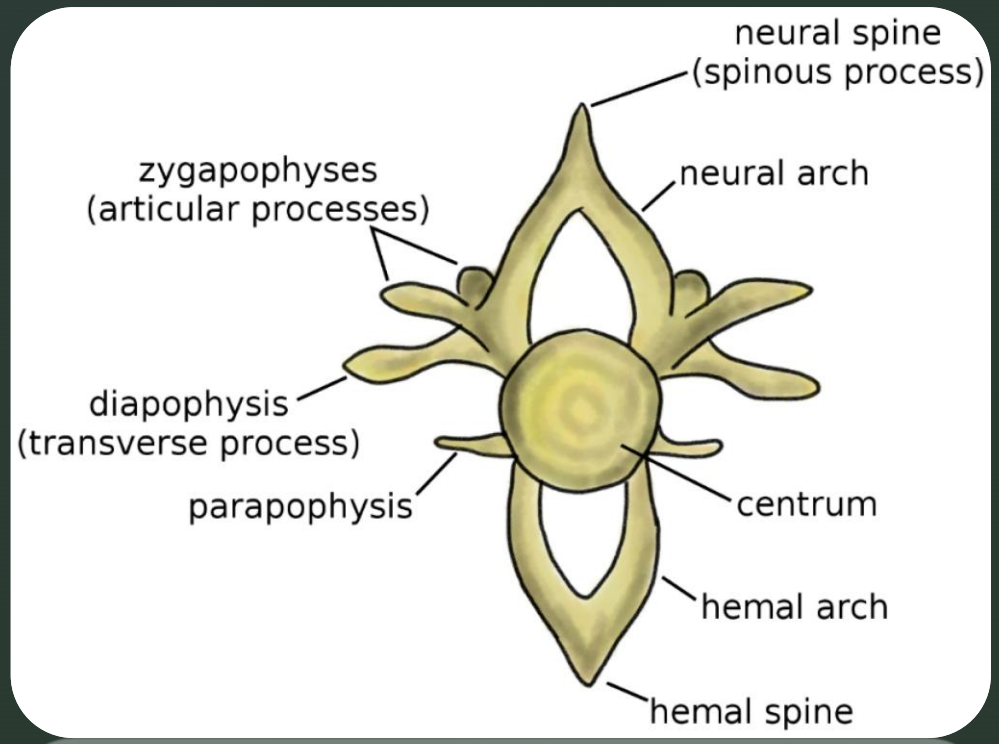


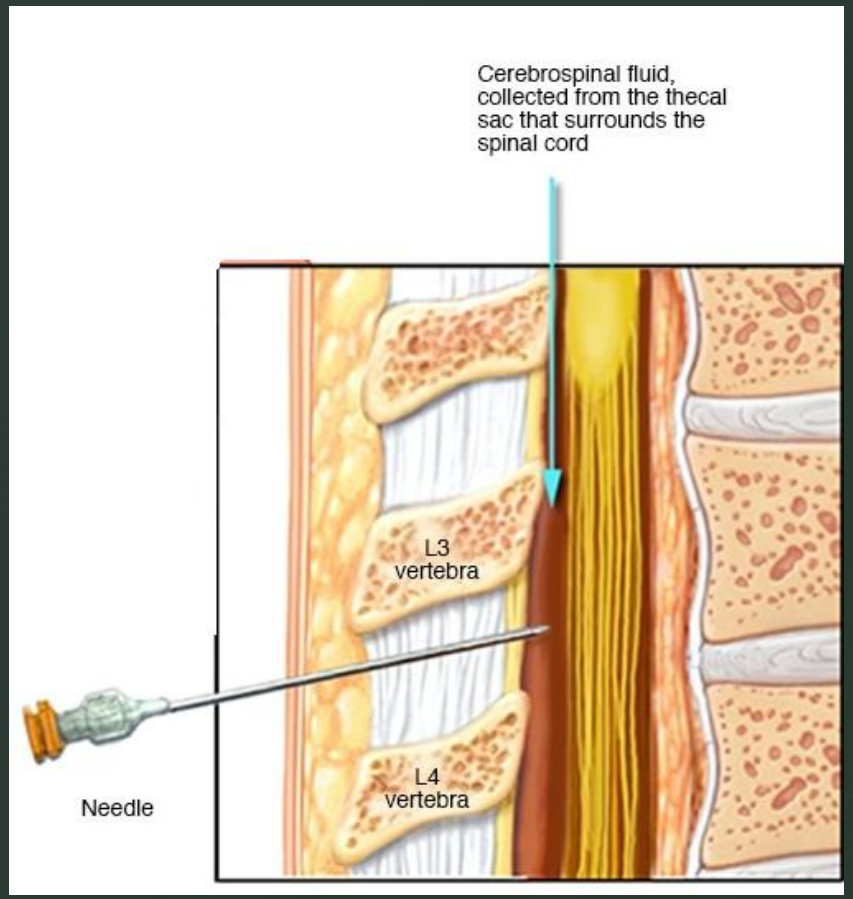
Figure 1.50 Cross-section of a cow tail showing location of the **median caudal vein** (tail vein) and **median caudal artery** on the midline of the ventral surface of the proximal third of the tail. *Hemal arch. 1, nucleus pulposus; 2, anulus fibrosus of the intervertebral disc. See Box 1.26 for clinical application related to the tail vein.

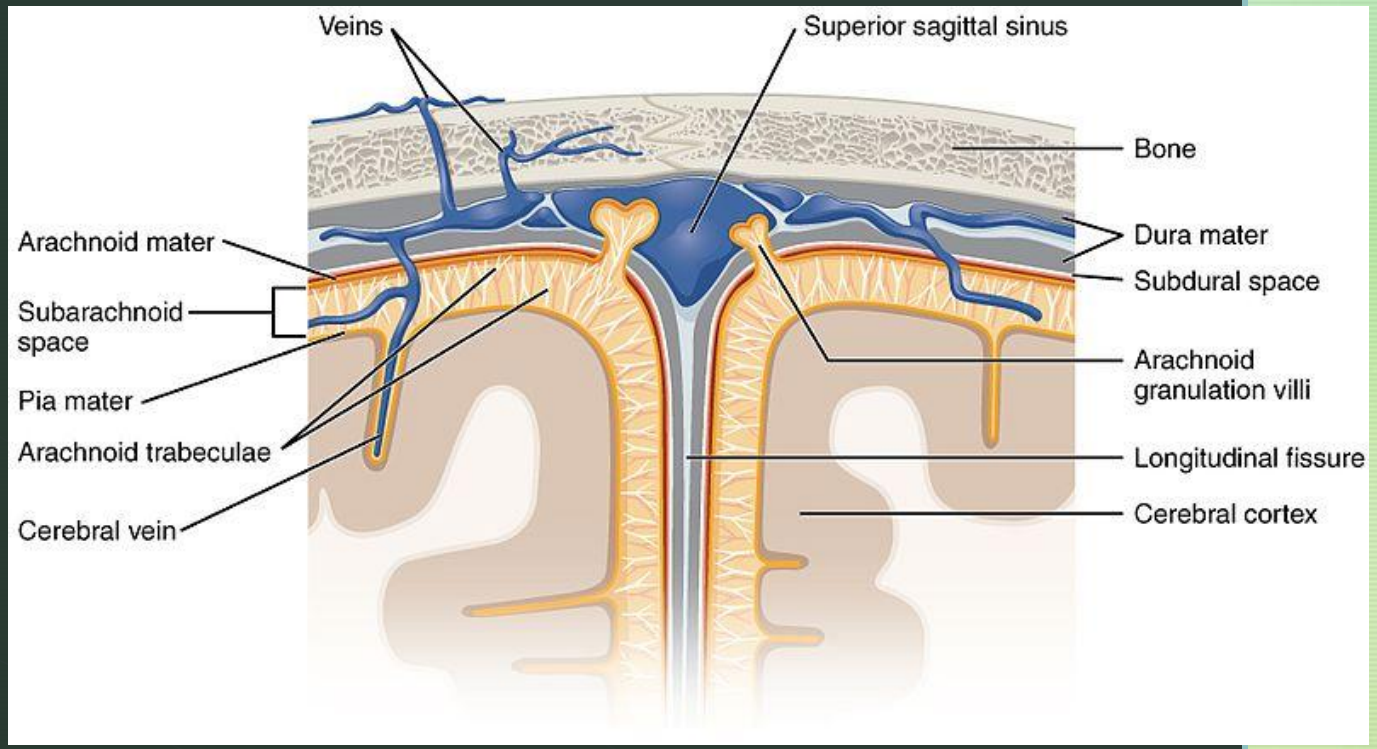
The median caudal vein in cattle is located under the ventral midline of the tail in association with a satellite artery, the median caudal artery. The vein can be used for the withdrawal of a small quantity of blood from the tail. Because of the proximity to the artery, venous blood collected from this site may become mixed with arterial blood.
The artery can also be used for pulse evaluation.



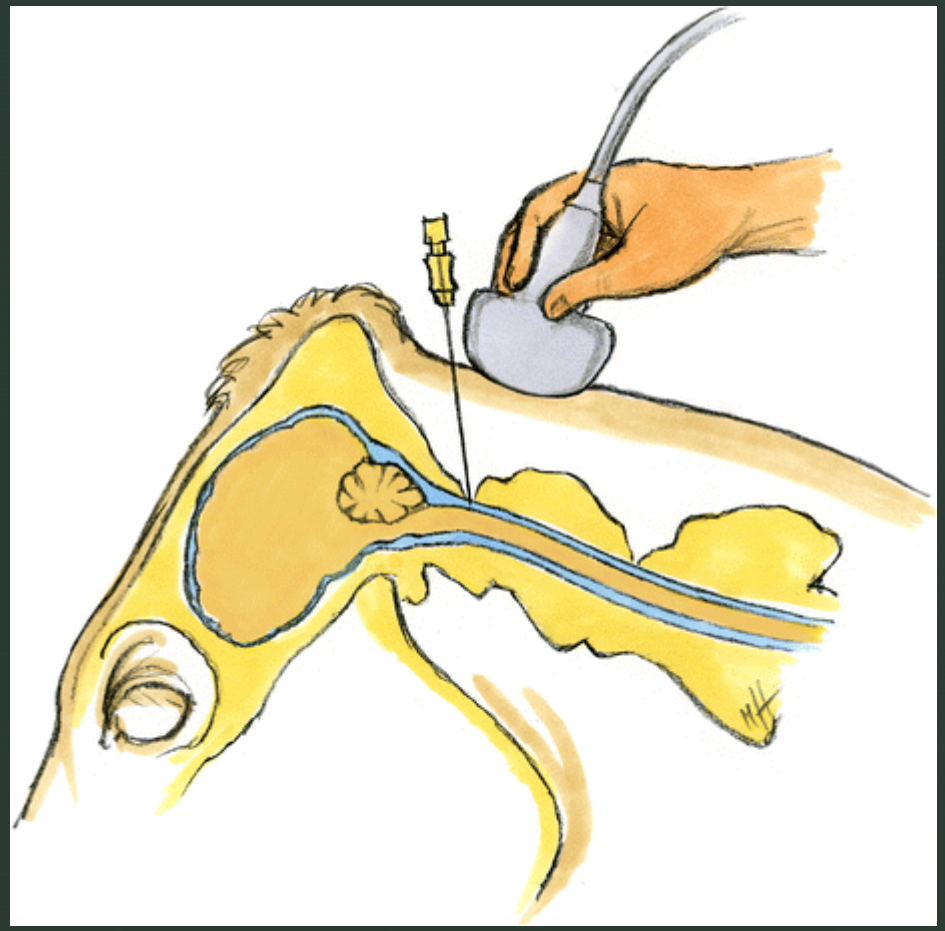


On the ventral surfaces of caudal vertebrae in ruminants (Cd1 to 8) and carnivores (Cd 5 to 15), are paramedian processes, the hemal processes, for the protection of caudal vessels. These hemal processes sometimes fuse to form the hemal arches (ox: Cd 2-3).



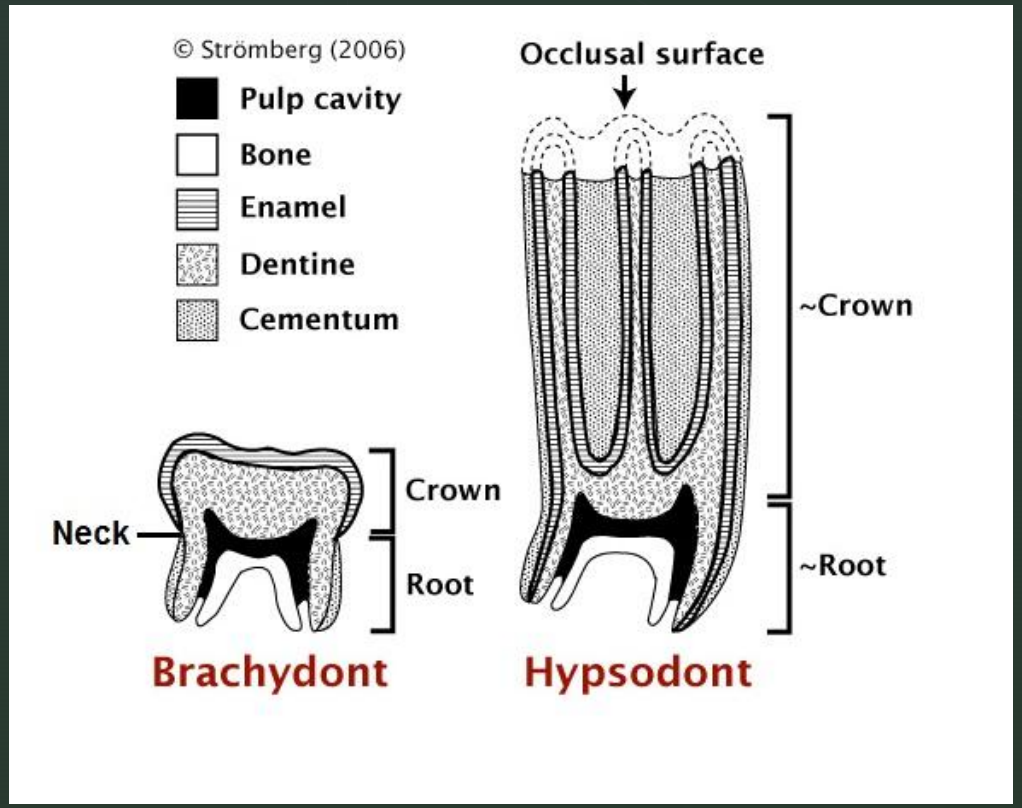


- Site for collection of the CSF is similar to other species and can be performed at the atlantooccipital (AO) joint; however, this procedure requires general anesthesia. A more convenient sampling site is the lumbosacral space, which allows collection of CSF samples in standing or sternally recumbent animals using no or light sedation.



Ultrasonographic examination of the spinal cord and collection of cerebrospinal fluid from the atlantooccipital space in cattle

Teeth



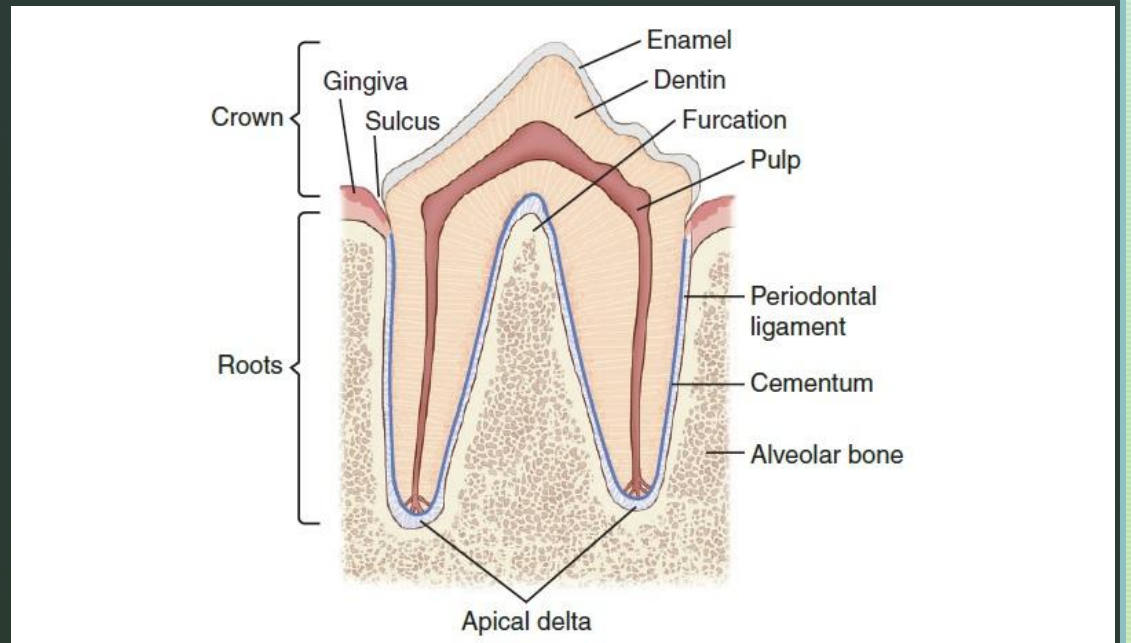
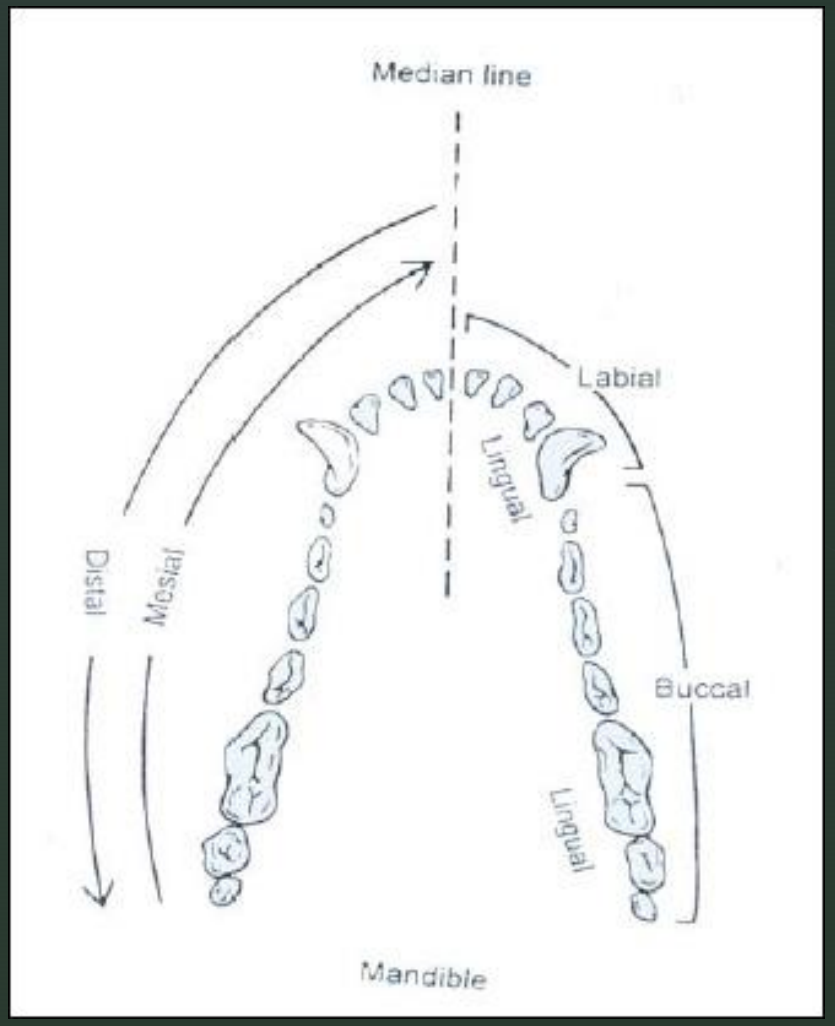
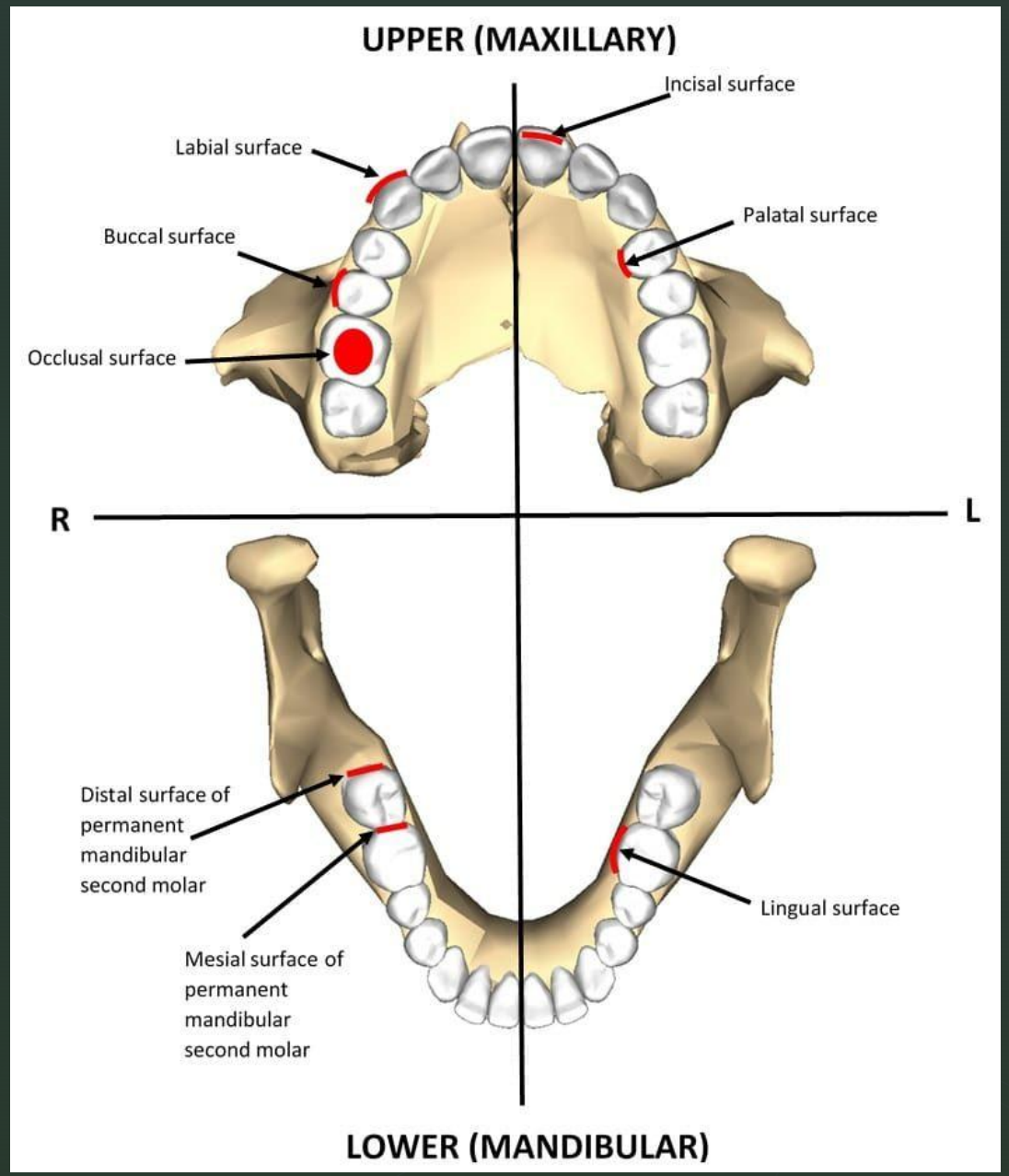


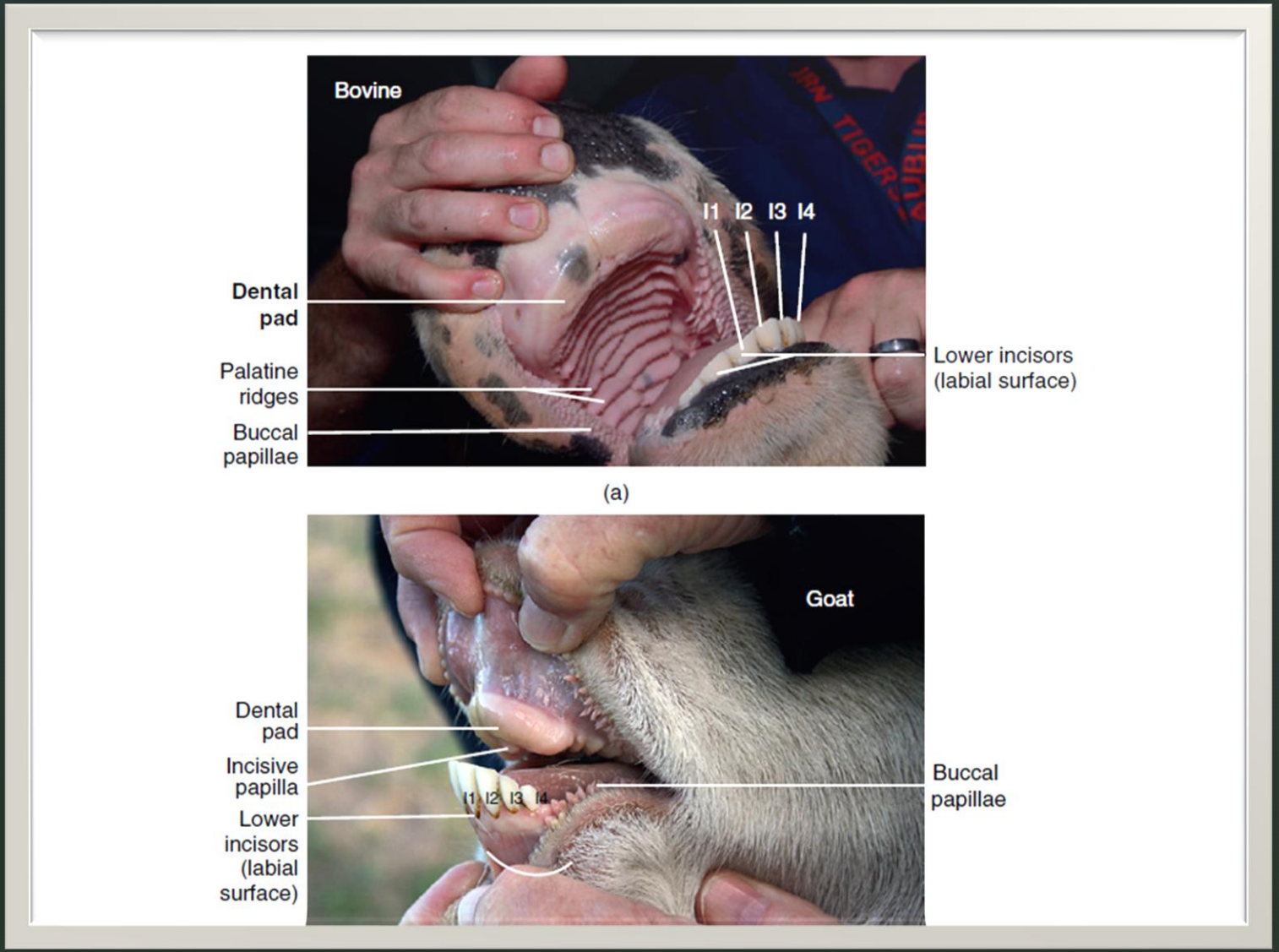
FIGURE 3.3-5 Graphic demonstrating the normal dental and periodontal anatomy of a tooth of a dog.

Dental surfaces





Teeth and Age Estimation



Permanent teeth dental formula: 2(I0/ 4, P3/3,M3/3) = 32

Temporary (deciduous, milk, or baby) : teeth dental formula: 2 (DI 0/4, DP 3/3) = 20.

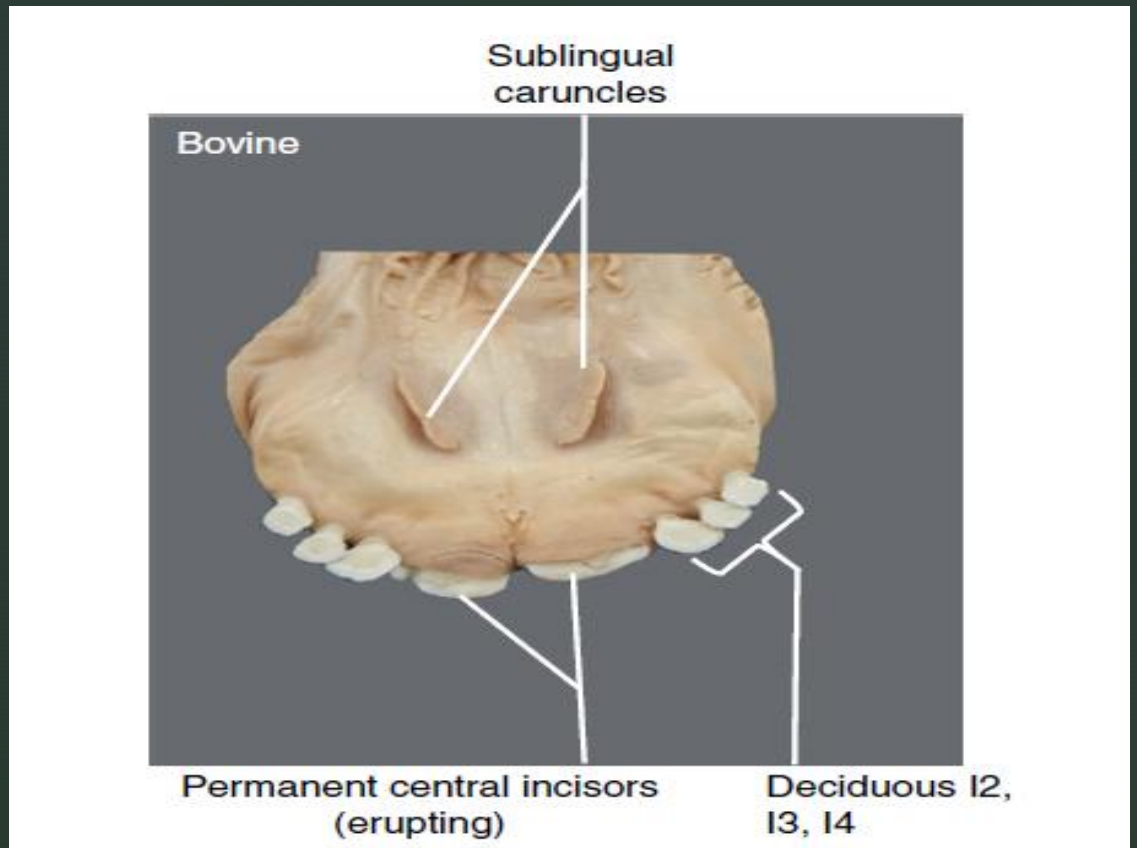


Figure 1.12 Bovine lower jaw showing the permanent central incisors (I1) just erupting while the rest of the incisor teeth (2–4) are still deciduous. This suggests an 18-month-old cow.

- The deciduous teeth will be lost as an animal matures and will be replaced sequentially by permanent teeth starting with the central incisors erupting at approximately 18 months of age in cattle (Figure 1.12). Followed outward by the first intermediate incisors at approximately 27 months, the second intermediate incisors at approximately 36 months, and the corner incisors (canines) at approximately 45 months.

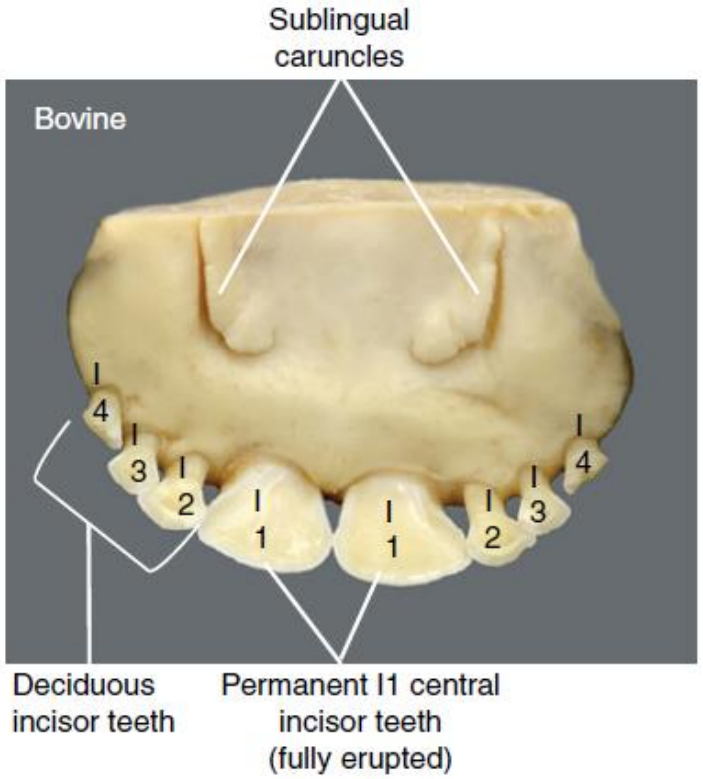


Figure 1.14 Lower bovine jaw showing *permanent* central incisors (I1) that are fully erupted but not in wear. The remaining set of incisors (first intermediate [I2], second intermediate [I3], and corner [I4] incisors) are deciduous. Estimated age of this cow is 24 months (2 years). Note the **small size** and **triangular, peg-shaped** appearance of deciduous I2–I4 compared with the **broad-shaped** appearance of the fully erupted permanent central incisors (I1).

- **Grossly, permanent incisors are relatively larger than deciduous incisors. They are also yellowish in color and lack a distinct neck. In contrast, deciduous teeth are whiter in color with a distinct neck and a triangular shape**

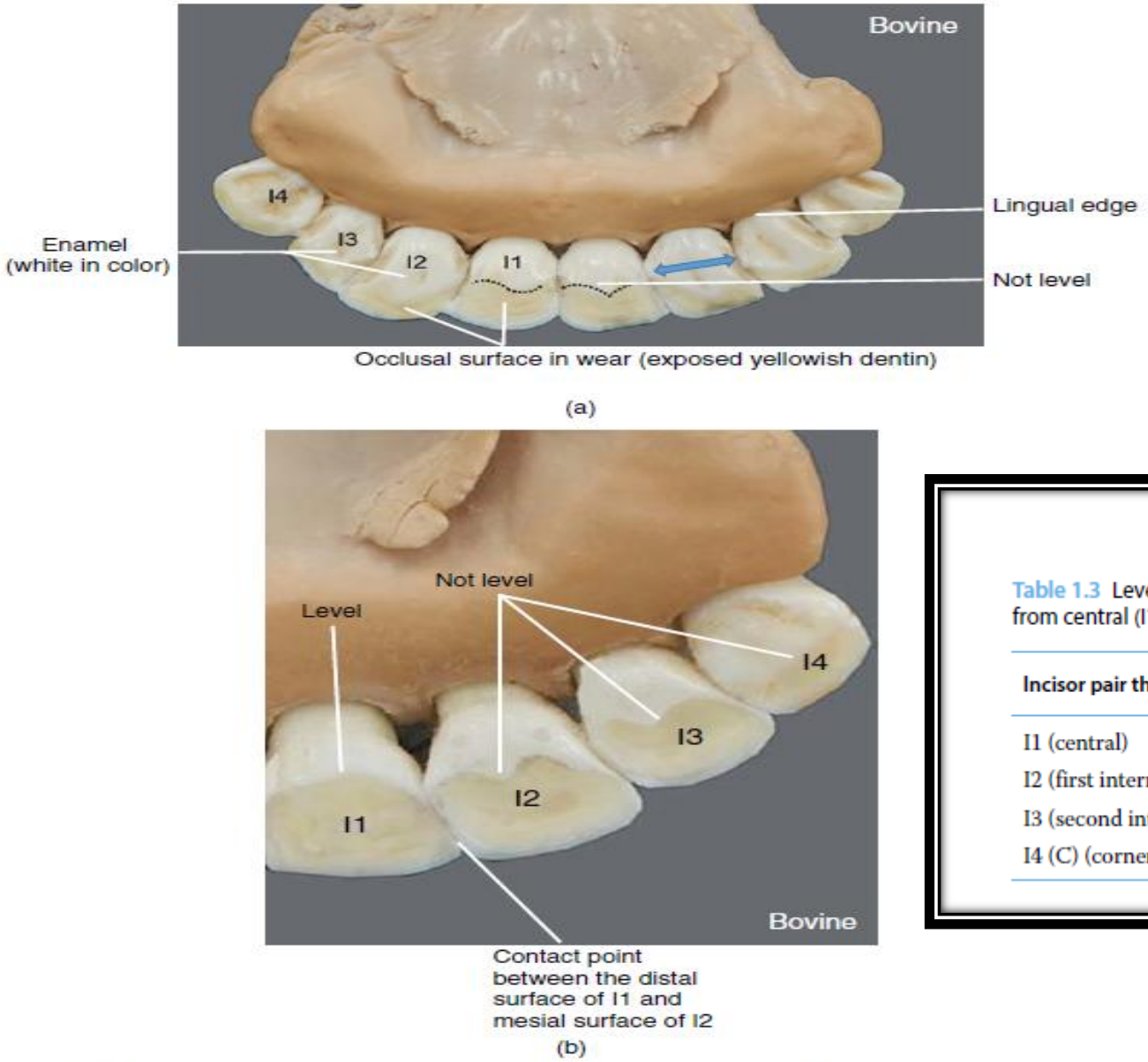


Table 1.3 Leveling times of permanent incisors in cattle starts from central (I1) out to the corner (I4) incisors, respectively.

Incisor pair that are level	Leveling in years
I1 (central)	6
I2 (first intermediate)	7
I3 (second intermediate)	8
I4 (C) (corner incisor or canine	9

Figure 1.15 (a) Bovine lower mandible showing permanent lower incisors that are all fully erupted and in **wear** but **not level** yet. Note the shovel-like appearance of teeth characteristic of ruminant incisors. The enamel–dentin junction line on the lingual surface of incisors is serrated or **wavy** (i.e., not level; see dotted wavy line on I1). Estimated age of this cow is 5 years. The corner incisors (I4) mandibular canines have fully developed, and their shapes is similar to the other true incisors. Blue arrow denotes the lingual surface. (b) Permanent incisors in the left half of a lower bovine jaw. All permanent incisors in this mouth are in wear with I1 level. Note the round lingual surface of the central incisor (I1) that indicates leveling. I2–I4 are not level and have wavy or serrated lingual surfaces. The approximate age of this cow is 6 years.

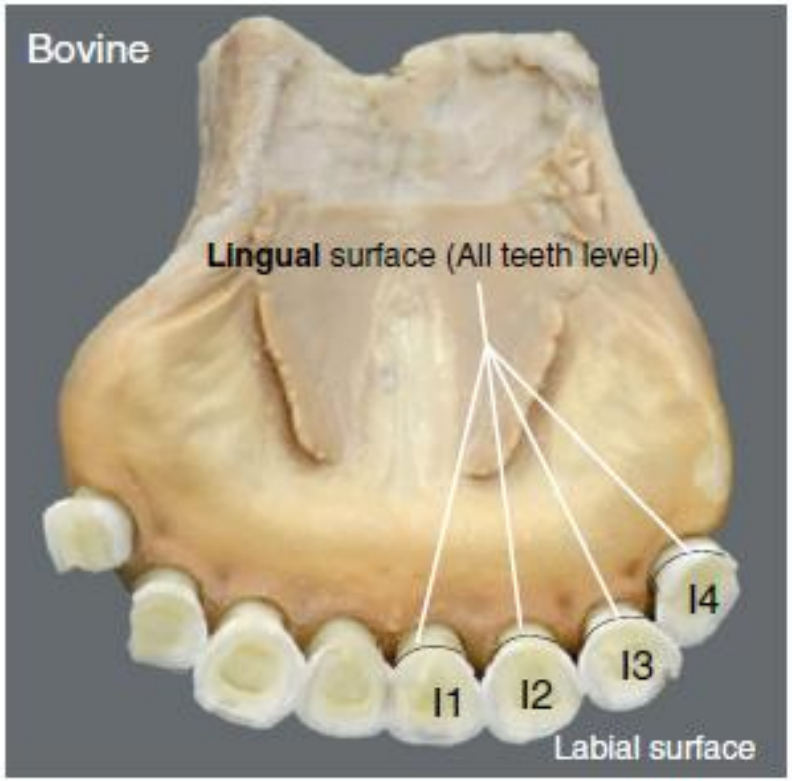
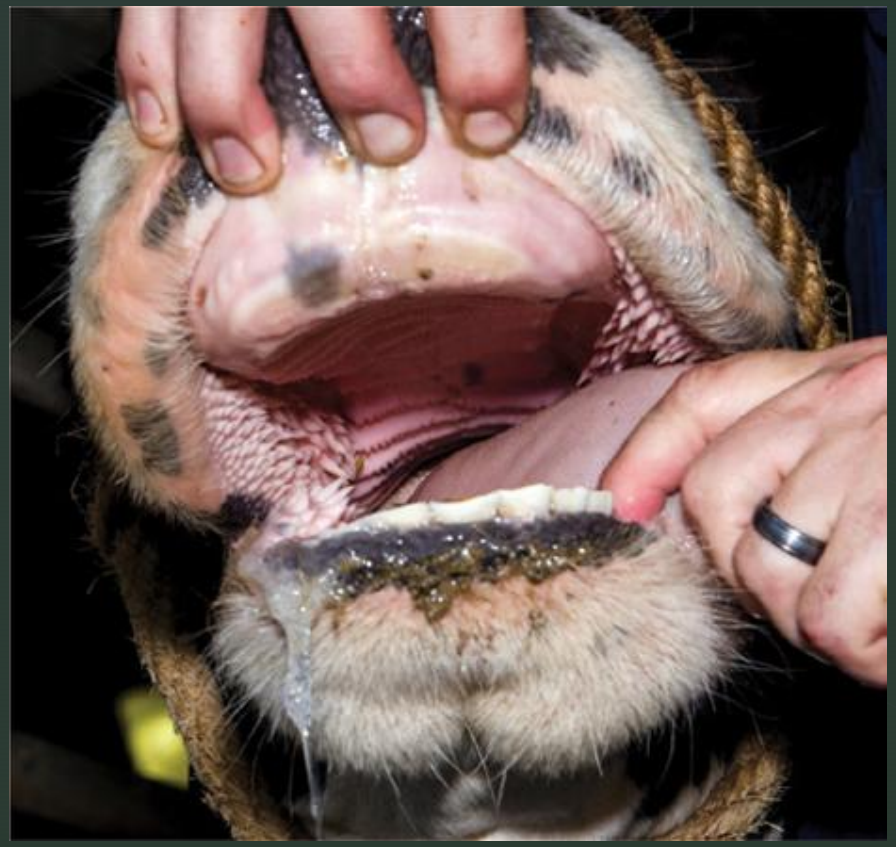


Figure 1.16 Lower bovine jaw showing all eight incisors are **permanent** and **level.** Note the round and smooth arc lines at the enamel–dentin junctions of the lingual surfaces. Estimated age of this cow is above nine years of age.

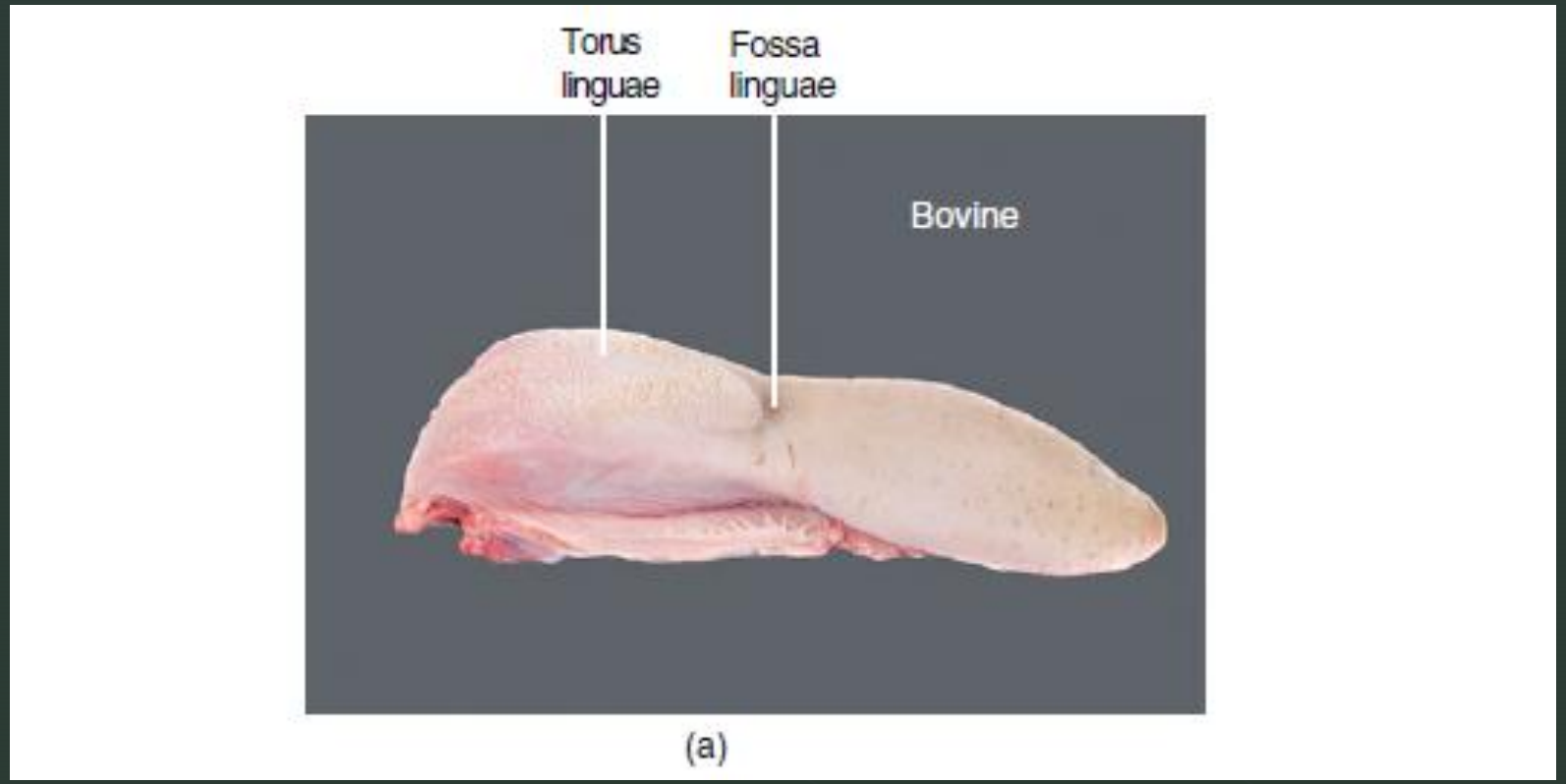
Teeth	Eruption times (age)	Wear (but not level*) times
Permanent incisors-all present	42–48 months (3½–4 years)	
I1 (central)	18–24 months (1½–2 years)	24–30 months (2–2½ years)
I2 (first intermediate)	24–30 months (2–2½ years)	30–36 months (2½–3 years)
I3 (second intermediate)	36–42 months (3–3½ years)	42 months (3½ years)
I4 (corner incisor or canine)	42–48 months (3½–4 years)	60 months (5 years)
Permanent premolars		Not applicable
P2 (premolar 2)	24–30 months (2–2½ years)	
P3 (premolar 3)	18–30 months (1½–2½ years)	
P4 (premolar 4)	30–36 months (2½–3 years)	
Permanent molars		
M1 (molar 1)	6 months	
M2 (molar 2)	12–18 months (1–1½ years)	
M3 (molar 3)	24–30 months (2–2½ years)	

Table 1.4 Eruption of **permanent** and **deciduous teeth** in **goats** and **sheep**. Generally, estimation of eruption times of permanent incisors in small ruminants is derived by subtraction of 6 months from the eruption times of permanent incisors in cattle except for I1 (Tables 1.2 and 1.5). The eruption time for I1 is similar in cattle and small ruminants (i.e., 18 months).

Teeth	Eruption times of permanent teeth	Eruption times of deciduous teeth
Permanent incisors		
I1 (central)	12–18 months (1–1½ years)	At birth
I2 (first intermediate)	18–24 months (1½–2 years)	At birth
I3 (second intermediate)	30–36 months (2½–3 years)	At birth
I4 (corner incisor or canine)	36–48 months (3–4 years)	Birth or (1–3 weeks)
Permanent premolars		
P2 (premolar 2)	18–24 months (1½–2 years)	Birth–4 weeks (3 weeks)
P3 (premolar 3)	18–24 months (1½–2 years)	Birth–4 weeks (3 weeks)
P 4 (premolar 4)	18–24 months (1½–2 years)	Birth–4 weeks (3 weeks)
Permanent molars		
M1 (molar 1)	3 (3–4) months	Not present
M2 (molar 2)	9 (8–10) months	Not present
M3 (molar 3)	18 (18–24) months (1½–2 years)	Not present

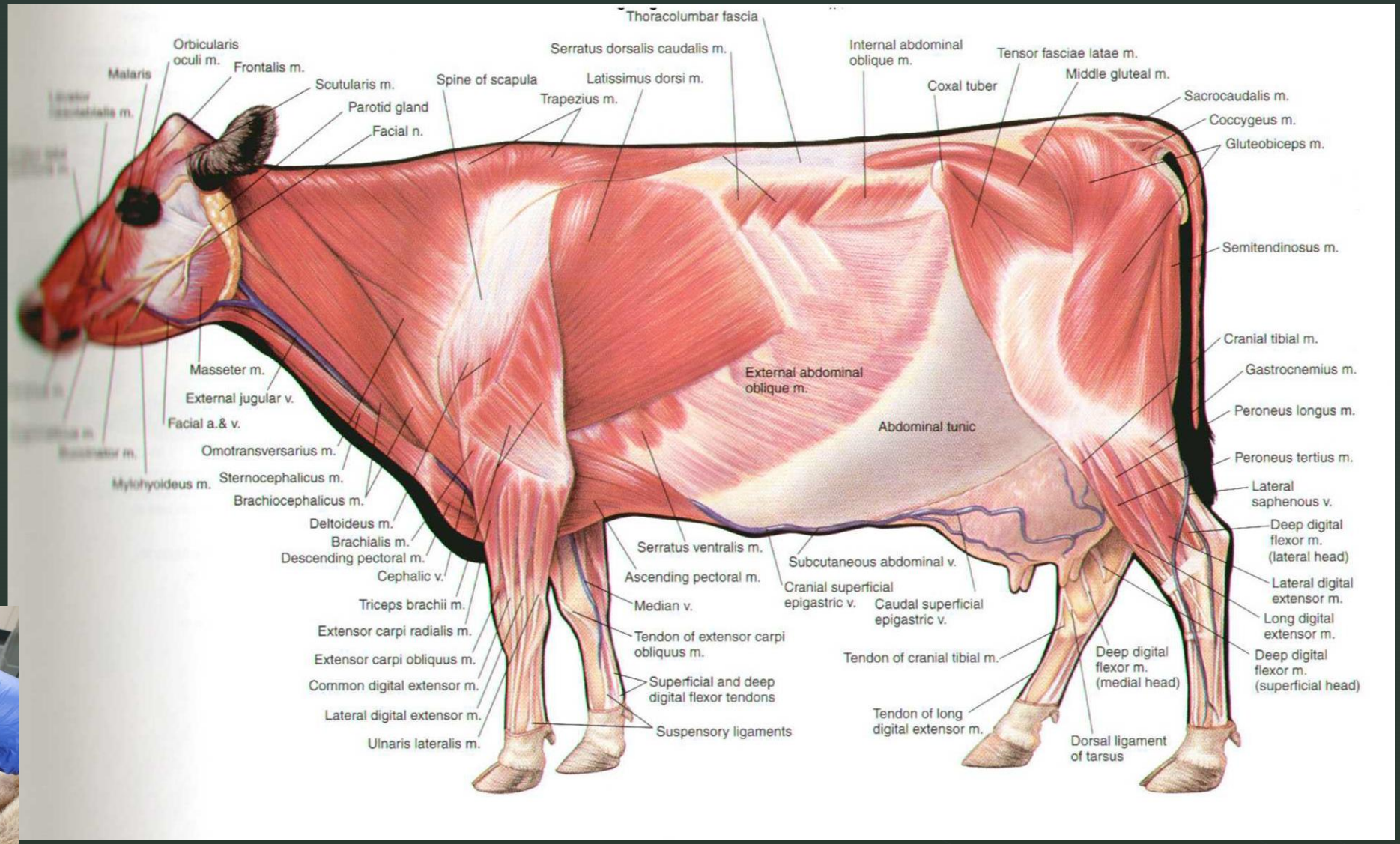


- The diastema between the corner incisor and second premolar offers a space to make it easy to pry open the mouth, grasp the tongue, and pull it sideways for clinical examination of the teeth or for drenching an animal with drugs.
- The eruption of the permanent central incisors (I1) is used as a guide to determine eligibility for brucellosis vaccinations in heifers. According to the USDA APHIS calves should be vaccinated for brucellosis between 4 and 12 months of age. The presence of permanent central incisors will disqualify a heifer for this vaccination.



Food tends to collect in the lingual fossa. The fossa is considered a potential site for harboring microbes. It has a delicate mucosa that can easily be pierced by sharp contaminated objects. A bacterial tongue infection known commonly as wooden tongue or Actinobacillosis is caused by a bacterium from the genus Actinobacillus. It causes a hard swollen tongue, a retropharyngeal abscess and could spread to the respiratory system causing pleuropneumonia. It primarily affects cattle but can be seen in sheep.

The torus linguae, the concave elevation at the root of the tongue, can present an obstacle to the passage of a balling gun or cattle mouth Frick speculum. The gun must be carefully passed over the torus linguae before dispensing the bolus, otherwise the ball will be chewed and spilled out.



The sternomandibularis muscle in cattle (sternozygomaticus in goats) forms the ventral boundaries of the jugular groove for the external jugular vein. This muscle is absent in sheep, making the ovine jugular groove less distinct. The external jugular vein is used as the prime site for venipuncture and for the placement of indwelling catheters in ruminants. Venous catheters can also be placed in the ear veins of small ruminants.

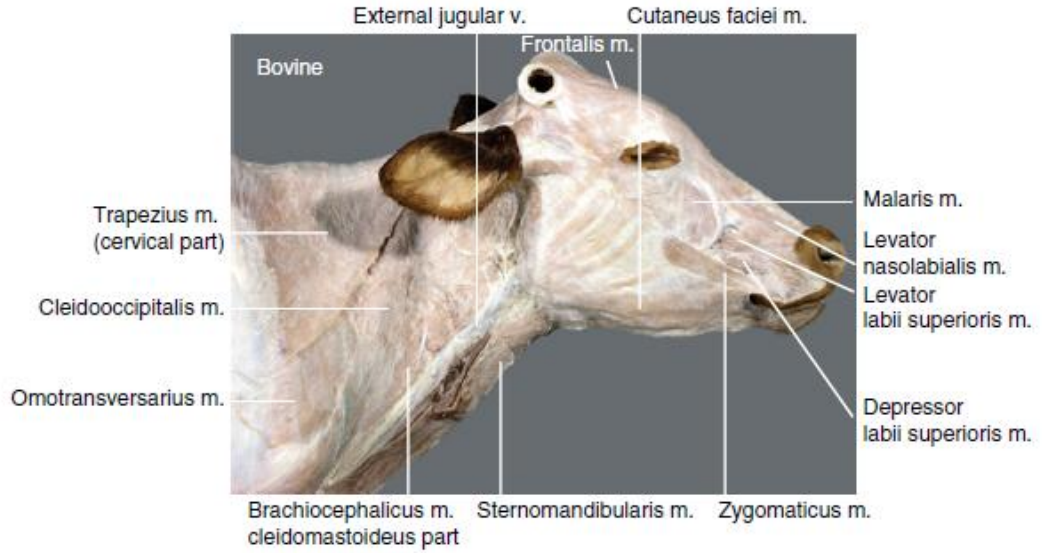


Figure 1.38 Bovine superficial neck and head muscles. Identify the **dorsal** and **ventral** boundaries of the jugular groove formed by the cleidomastoideus muscle (ventral part of the brachiocephalicus muscle) and sternomandibularis muscle (superficial part of the sternocephalicus muscle), respectively. The deep part of the sternocephalicus muscle is formed by the sternomastoideus muscle.

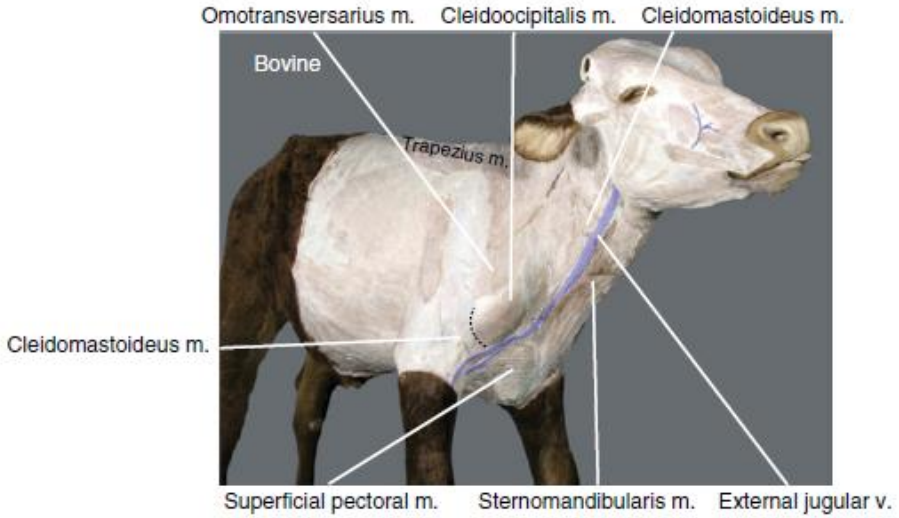
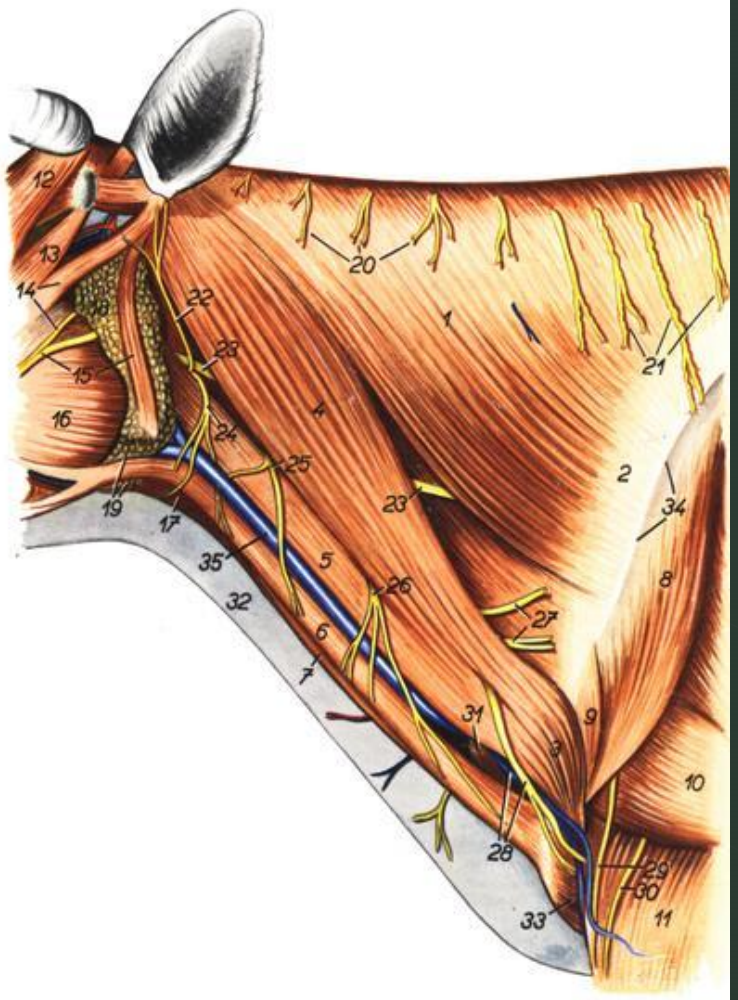


Figure 1.39 Bovine superficial muscles of the neck. Clavicular intersection shown by the dotted line. Trapezius muscle has cervical and thoracic parts.

Jugular groove or furrow containing the external jugular vein, a major site for venipuncture in domestic animals including cattle. The muscular boundaries for the jugular groove include the brachiocephalicus muscle dorsally (specifically the cleidomastoideus part), and sternomandibularis muscle ventrally (superficial part of the sternocephalicus). Pulling the head up and to the opposite side is helpful in visualization of the jugular groove.

Bovine. Dissection of the neck, left view. First layer. Cutaneous muscles removed.

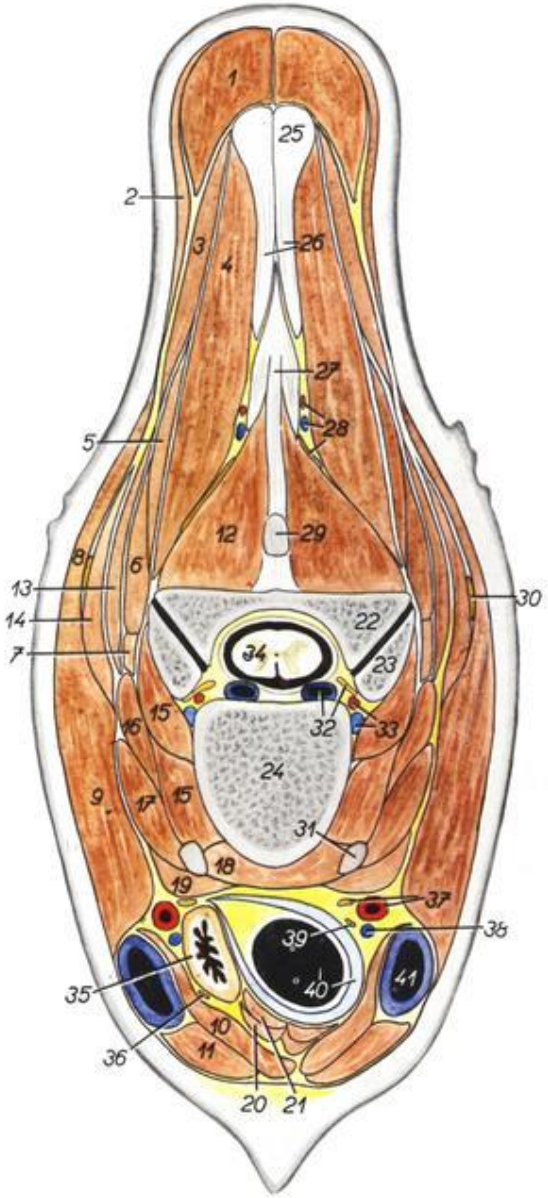
Figure 42



1. *pars cervicalis mi. trapezii* — cervical part of trapezius muscle
2. *aponeurosis mi. trapezii* — aponeurosis of trapezius muscle
3.–5. *m. brachiocephalicus* — brachiocephalic muscle
3. *m. cleidobrachialis* — cleidobrachial muscle
4. *m. cleidooccipitalis* — cleido-occipital muscle
5. *m. cleidomastoideus* — cleidomastoid muscle
6., 7. *m. sternocephalicus* — sternocephalic muscle
6. *m. sternomandibularis* — sternomandibular muscle
7. *m. sternomastoideus* — sternomastoid muscle
8. *m. deltoideus* — deltoid muscle
9. *pars acromialis mi. deltoidei* — acromial part of deltoid muscle
10. *caput laterale mi. tricipitis brachii* — lateral head of triceps brachii muscle
11. *m. extensor carpi radialis* — extensor carpi radialis muscle
12. *m. frontalis* — frontal muscle
13. *pars temporalis mi. frontoscutularis* — temporal part of frontoscutular muscle
14. *m. zygomaticoauricularis, ramus transversus facialis mi. auriculotemporalis* — zygomaticoauricular muscle, transverse facial branch of auriculotemporal nerve
15. *m. parotidoauricularis, ramus buccalis dorsalis mi. facialis* — parotidoauricular muscle, dorsal buccal branch of facial nerve
16. *m. masseter* — masseter muscle
17. *m. sternohyoideus* — sternohyoid muscle
18. *glandula parotis* — parotid gland
19. *glandula mandibularis* — mandibular gland
20. *rami cutanei dorsales nervorum cervicalium* — dorsal cutaneous branches of cervical nerves
21. *rami cutanei dorsales nervorum thoracicorum* — dorsal cutaneous branches of thoracic nerves
22. *n. auricularis magnus (ni. cervicalis II)* — large auricular nerve (of second cervical nerve)
23. *ramus dorsalis ni. accessorii* — dorsal branch of accessory nerve
24. *n. transversus colli* — transversus colli nerve
25. *n. cervicalis III* — third cervical nerve
26. *n. cervicalis IV* — fourth cervical nerve
27. *n. supraclavicularis dorsalis* — dorsal supraclavicular nerve
28. *v. cephalica, n. supraclavicularis ventralis* — cephalic vein, ventral supraclavicular nerve
29. *n. cutaneus antebrachii cranialis (ni. axillaris)* — cutaneus antebrachii cranialis nerve (of axillar nerve)
30. *ramus superficialis ni. radialis* — superficial branch of radial nerve
31. *m. subclavius* — subclavian muscle
32. *palear (plica ventralis colli)* — ventral fold of neck
33. *m. pectoralis superficialis (descendens)* — superficial pectoral muscle
34. *spina scapulae* — spine of scapula
35. *v. jugularis externa* — external jugular vein

Bovine. Heifer (one year old). Cross section through the neck at the level of the caudal end of the fourth cervical vertebra. View of caudal surface of section.

Figure 50



1. *m. rhomboideus cervicis* — cervical rhomboid muscle
2. *pars cervicalis mi. trapezii* — cervical part of trapezius muscle
3. *m. splenius* — splenius muscle
4. *m. semispinalis capitis* — semispinalis capitis muscle
5. *m. longissimus capitis* — longissimus capitis muscle
6. *m. longissimus atlantis* — longissimus atlantis muscle
7. *m. longissimus cervicis* — longissimus cervicis muscle
8., 9. *m. brachiocephalicus* — brachiocephalic muscle
8. *m. cleidooccipitalis* — cleido-occipital muscle
9. *m. cleidomastoideus* — cleidomastoid muscle
10., 11. *m. sternocephalicus* — sternocephalic muscle
10. *m. sternomastoideus* — sternomastoid muscle
11. *m. sternomandibularis* — sternomandibular muscle
12. *m. multifidus cervicis* — multifidus cervicis muscle
13. *m. serratus ventralis cervicis* — cervical serratus ventralis muscle
14. *m. omotransversarius* — omotransverse muscle
15. *mm. intertransversarii* — intertransverse muscles
16. *m. scalenus medius (m. scalenus primae costae)* — scalenus medius muscle (scalenus muscle of first rib)
17. *m. longus atlantis* — longus atlantis muscle
18. *m. longus colli* — longus colli muscle
19. *m. longus capitis* — longus capitis muscle
20. *m. sternohyoideus* — sternohyoid muscle
21. *m. sternothyroideus* — sternothyroid muscle
22. *processus articularis caudalis vertebrae cervicalis IV* — caudal articular process of fourth cervical vertebra
23. *processus articularis cranialis vertebrae cervicalis V* — cranial articular process of fifth cervical vertebra
24. *corpus vertebrae cervicalis IV* — body of fourth cervical vertebra
25. *funiculus nuchae* — nuchal funiculus
26., 27. *lamina nuchae (26. pars cranialis sinistra et dextra, 27. pars caudalis impar)* — nuchal plate (26. left and right cranial part, 27. unpaired caudal part)
28. *a. et v. cervicalis profunda, ramus dorsalis ni. cervicalis IV* — deep cervical artery and vein, dorsal branch of fourth cervical nerve
29. *processus spinosus vertebrae cervicalis V* — spinous process of fifth cervical vertebra
30. *ramus dorsalis ni. accessorii* — dorsal branch of accessory nerve
31. *processus transversus vertebrae cervicalis V* — transverse process of fifth cervical vertebra
32. *plexus vertebralis internus, n. cervicalis V* — internal vertebral plexus, fifth cervical nerve
33. *a. et v. vertebralis* — vertebral artery and vein
34. *medulla spinalis* — spinal medulla
35. *esophagus* — esophagus
36. *n. laryngeus recurrens sinister* — left laryngeal recurrent nerve
37. *a. carotis communis, truncus vagosympathicus* — common carotid artery, vagosympathetic trunk
38. *v. jugularis interna* — internal jugular vein
39. *n. laryngeus recurrens dexter* — right laryngeal recurrent nerve
40. *trachea* — trachea
41. *v. jugularis externa* — external jugular vein

Lymph nodes

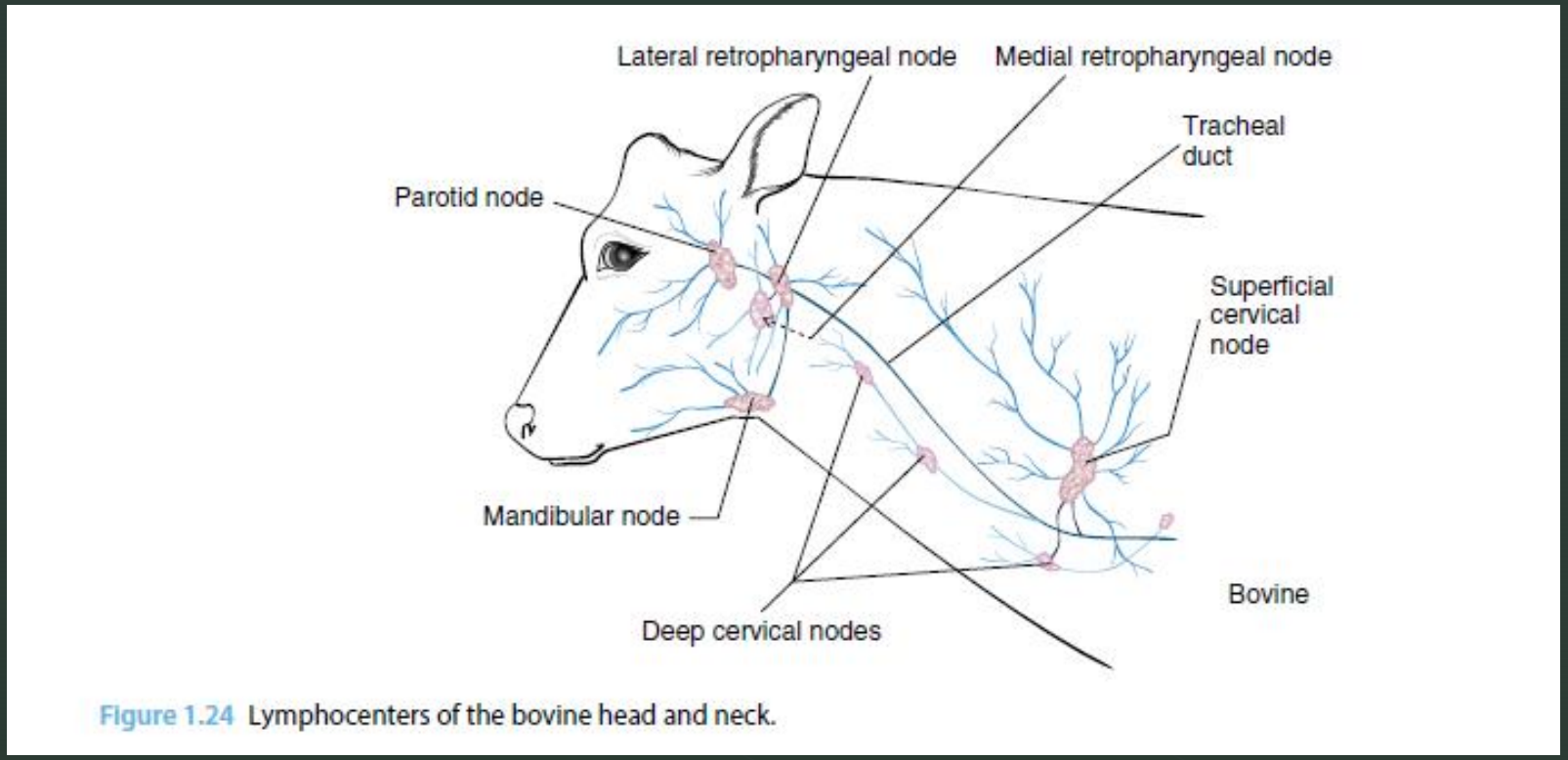
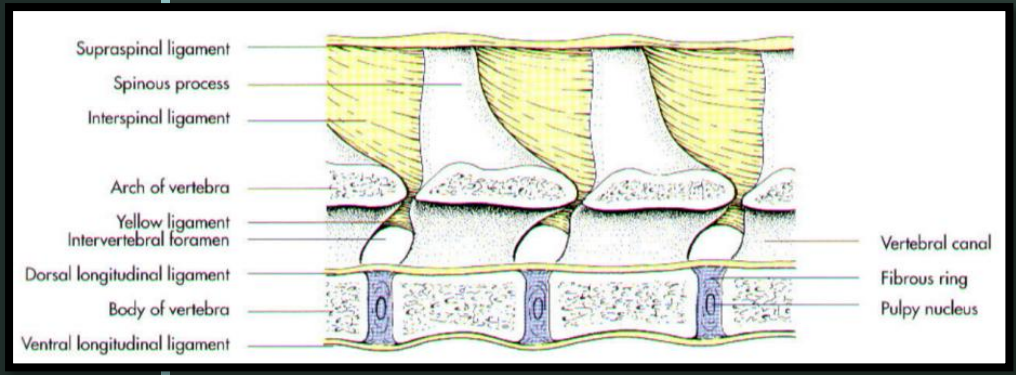
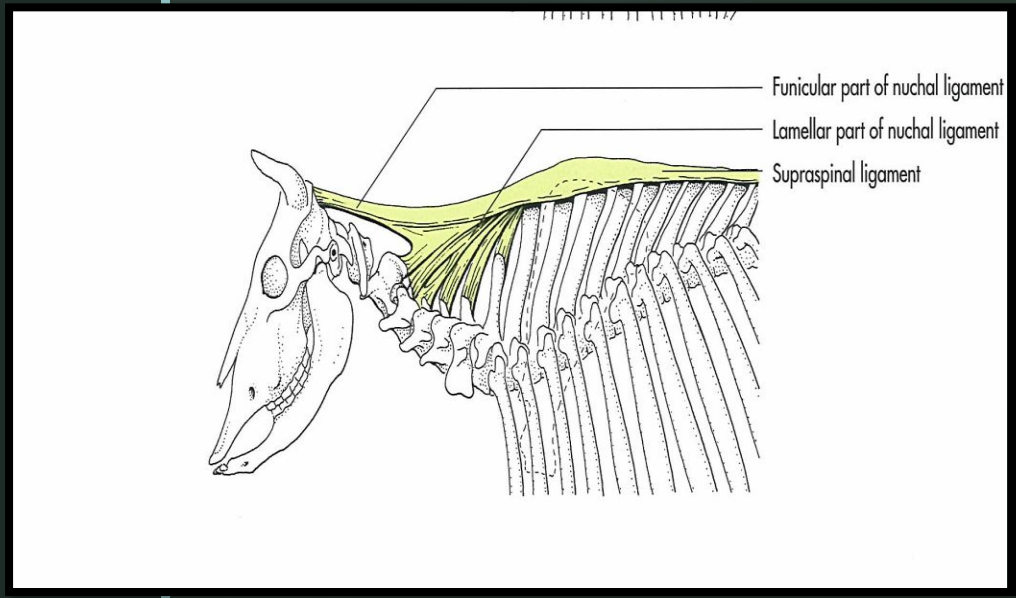


Figure 1.24 Lymphocenters of the bovine head and neck.

- The parotid lymph node is located along the rostral edge of the parotid salivary gland. It drains the region of the eye. In cattle, this node is usually inspected in slaughterhouses to determine cancer of the eye.
- In goats, the parotid lymph node is the lymph node most frequently affected by caseous lymphadenitis (CL), a common disease caused by Corynebacterium paratuberculosis. The main lymph collection in the center of the head, the lateral retropharyngeal, is also inspected to rule out general head infections.
- The medial retropharyngeal lymph node may become inflamed and could interfere with swallowing and breathing by causing compression in the region of the larynx and/or oropharynx.





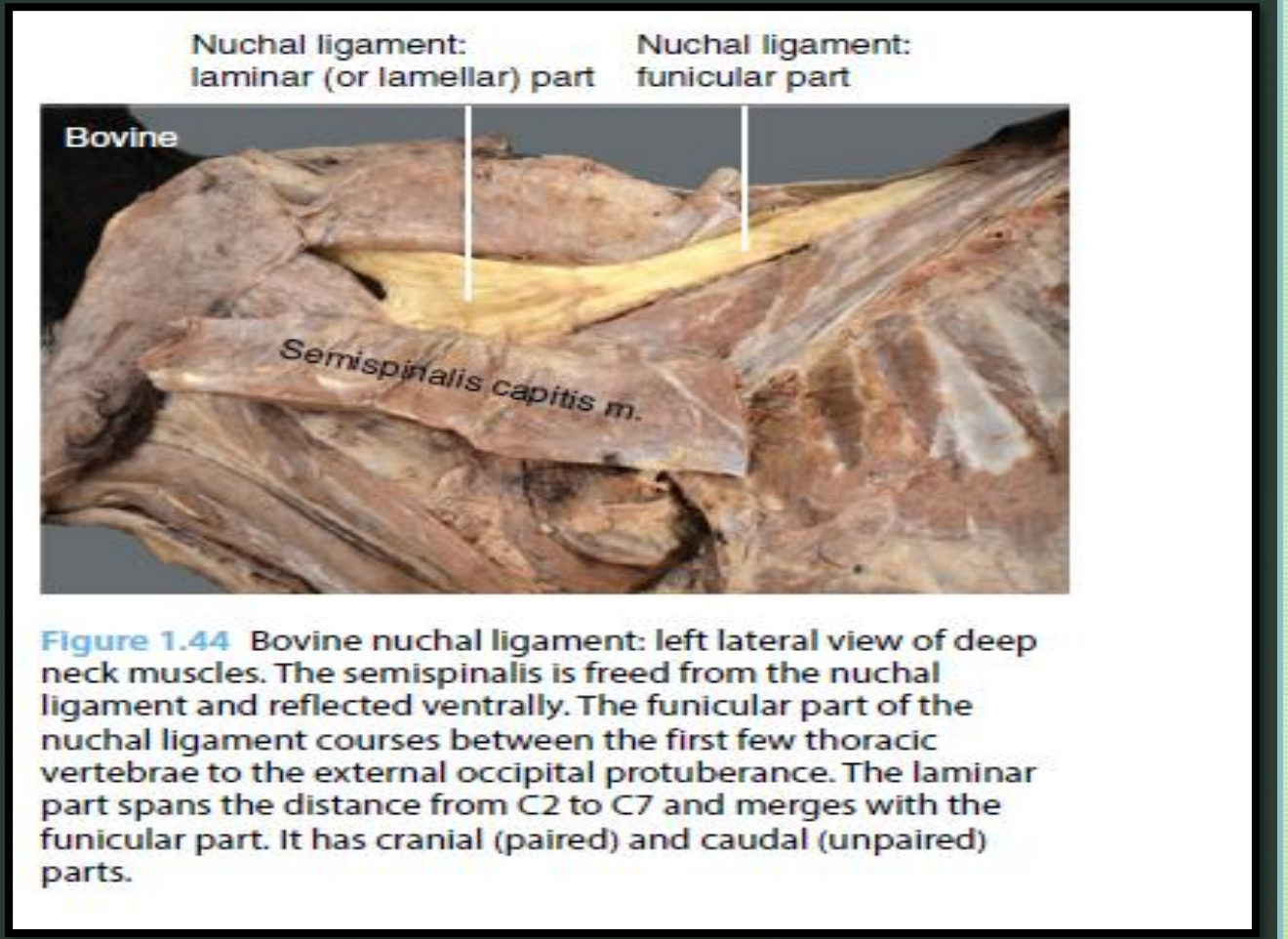


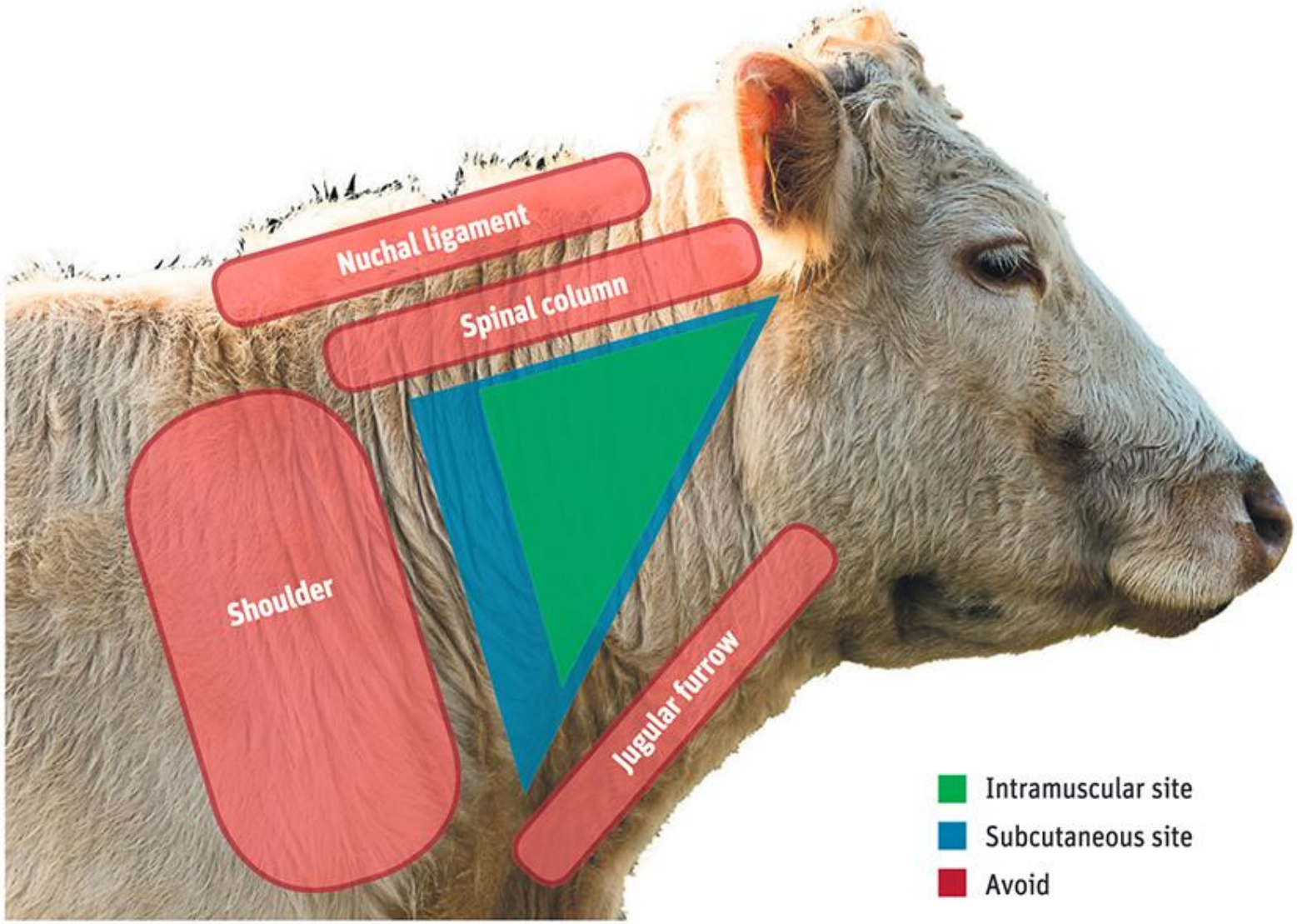
Figure 1.44 Bovine nuchal ligament: left lateral view of deep neck muscles. The semispinalis is freed from the nuchal ligament and reflected ventrally. The funicular part of the nuchal ligament courses between the first few thoracic vertebrae to the external occipital protuberance. The laminar part spans the distance from C2 to C7 and merges with the funicular part. It has cranial (paired) and caudal (unpaired) parts.

The nuchal ligament acts as a barrier to the spread of cervical abscesses between the left and right sides of the neck. It also helps direct inflammatory exudate fluid ventrally in the direction of gravity away from the chest.

When administering medications to cattle via subcutaneous or intramuscular injection, a triangular area of the neck is used. This area is outlined by the nuchal ligament dorsally, jugular furrow ventrally, and shoulder caudally. Injections given at other sites could cause damage to more valuable cuts of meat and should be avoided.

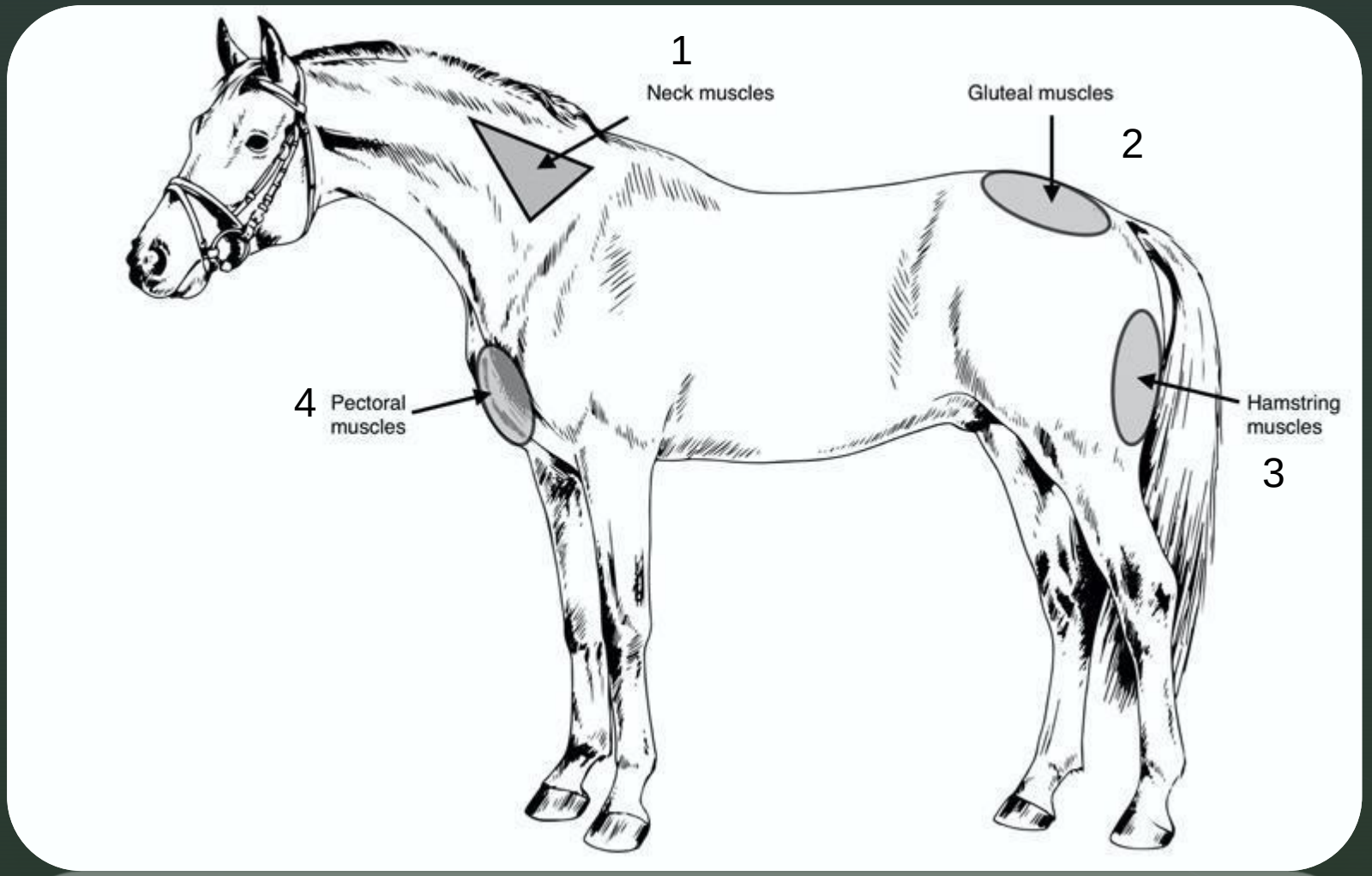
WHERE TO INJECT

Subcutaneous injections in the neck have become the norm but care must be taken to administer vaccines in the right spot.

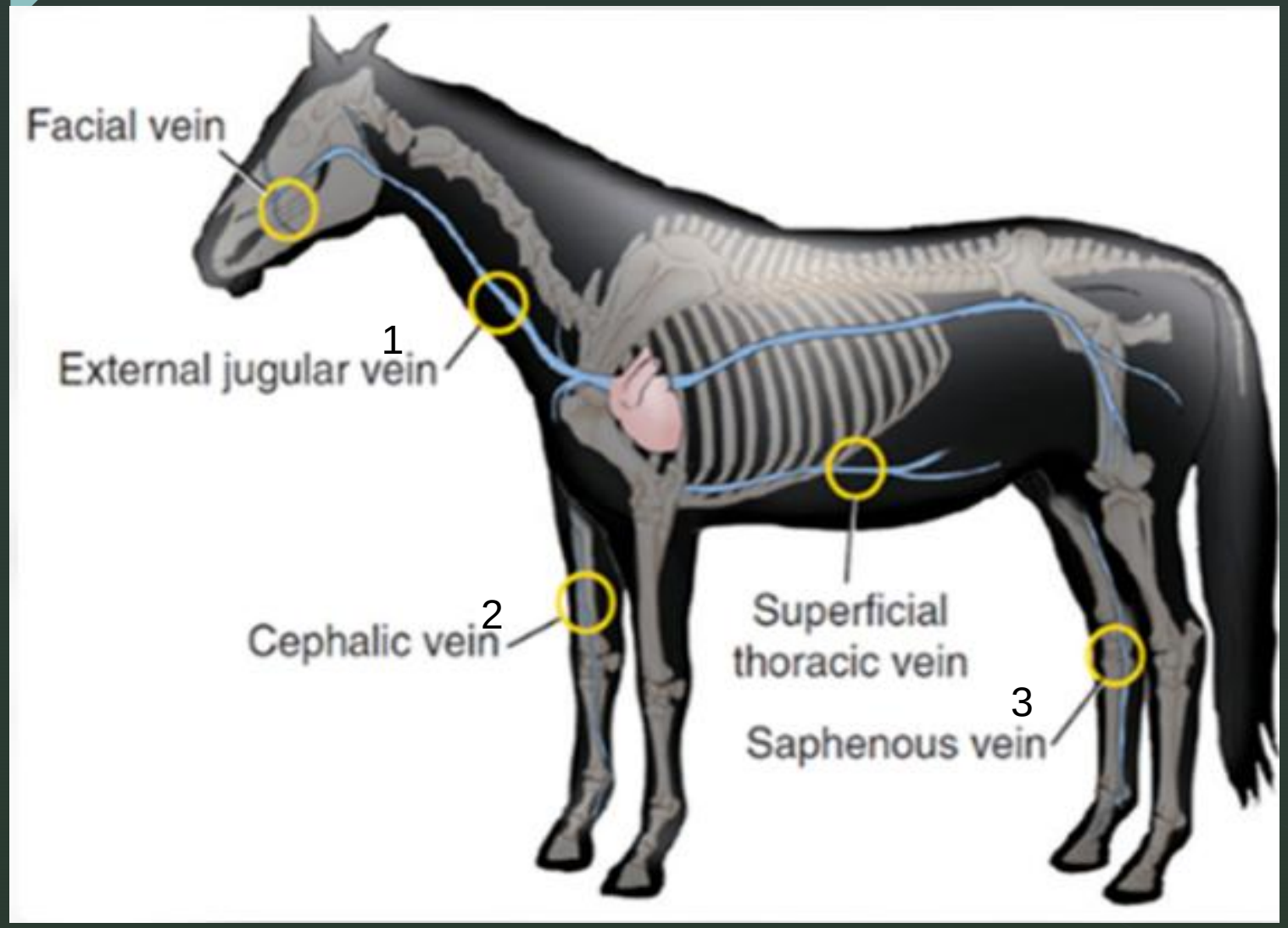


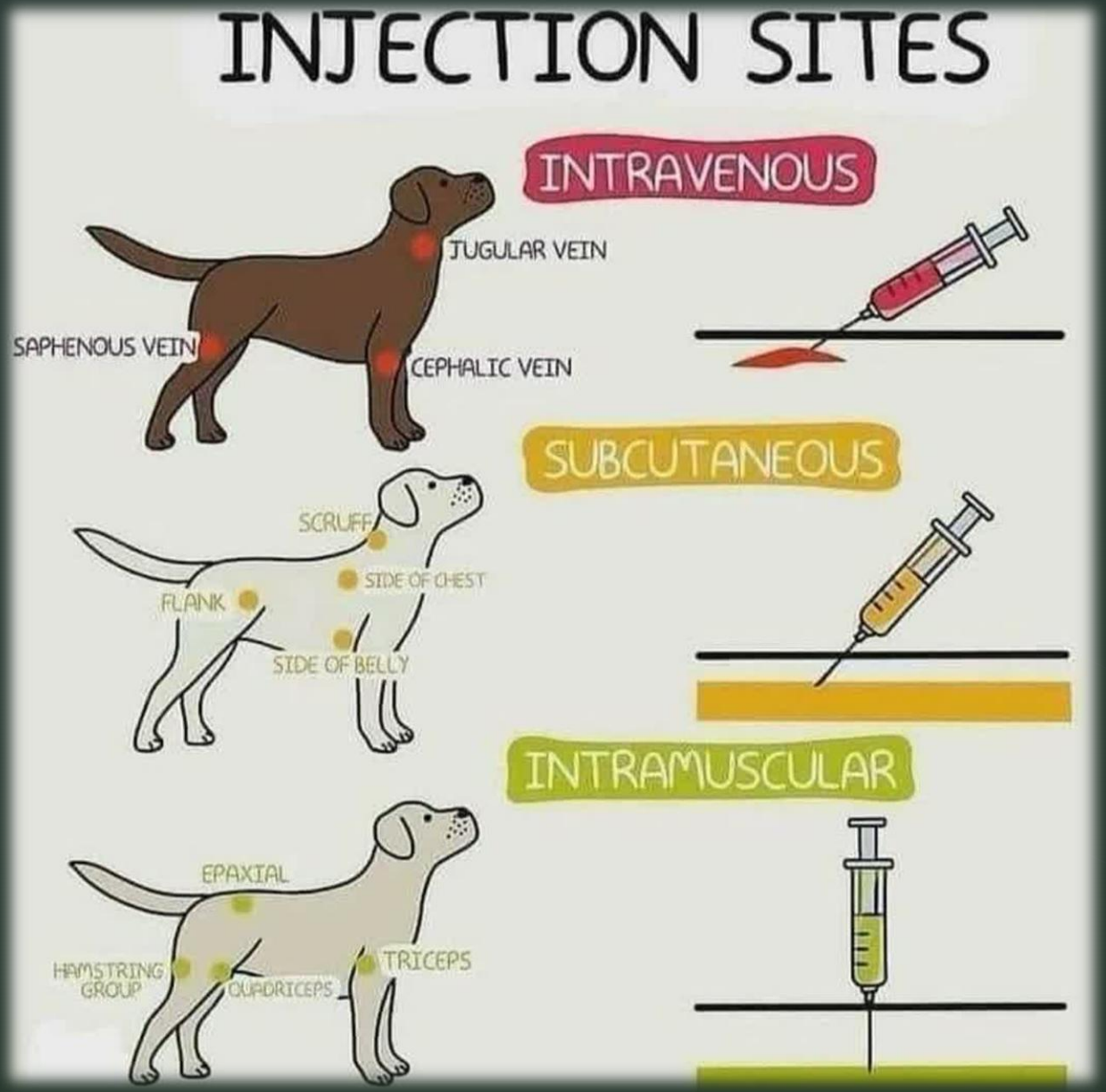
Source: www.bovinevetonline.com | RAELENE HOLTH GRAPHIC

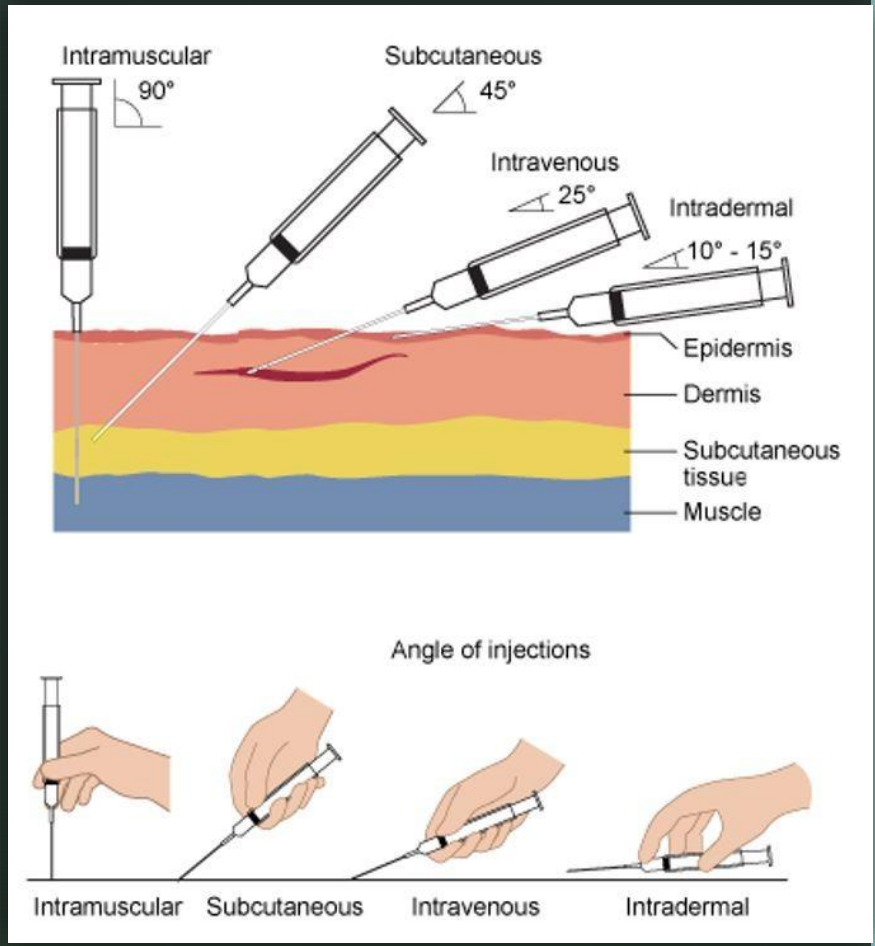
Intramuscular injection in horse (IM)



Intravenous injection in horse (IV)




INJECTION SITES
INTRAVENOUS
JUGULAR VEIN
SAPHENOUS VEIN
CEPHALIC VEIN
SUBCUTANEOUS
SCRUFF
SIDE OF CHEST
FLANK
SIDE OF BELLY
INTRAMUSCULAR
EPAXIAL
HAMSTRING GROUP
QUADRICEPS
TRICEPS


Intramuscular
90°
Subcutaneous
45°
Intravenous
25°
Intradermal
10° - 15°
Epidermis
Dermis
Subcutaneous tissue
Muscle
Angle of injections
Intramuscular
Subcutaneous
Intravenous
Intradermal