NEUROANATOMY

GROSS ANATOMY OF THE BRAIN

Canine Brain Divisions

Lateral View (Dog)

Sheep Median View

Equine Brainstem

Brain Divisions - three different ways to subdivide the brain

1. Embryonic divisions:
• Telencephalon . . .
• Diencephalon . . .
• Mesencephalon . . .
• Metencephalon . . .
• Myelencephalon . . .

2. Clinically useful divisions:
• Forebrain (telencephalon & diencephalon)
-- mental status; voluntary movement; vision
• Hindbrain (metencephalon & myelencephalon)
-- cerebellum & vestibular syndromes; nerve deficits

TELENCEPHALON

Dissected Sheep Cerebrum

Dissected Sheep Brain

Equine Hippocampus

Sheep Hippocampus

Sheep Cerebrum

Cerebrum - Ventral View

Telencephalon (cerebrum)
Components: [NOTE: * = not paired]
• **lamina terminalis*** - includes rostral commissure
• **cerebral hemisphere** (cerebral cortex, white matter, & basal nuclei)
• **lateral ventricle**
• **rhinencephalon** - concerned with olfaction
• **olfactory bulb** - receives olfactory nerves
• **olfactory tracts (striae)**
- **lateral olfactory stria** - to piriform lobe
- **medial olfactory stria** - to septum
- **intermediate olfactory stria** - to rostral commissure
• **piriform lobe** - receives olfactory nerves
• **septum** - olfactory induced emotion
• **hippocampus** - critical for recent memory

Surface Features . . .
Ventral surface:
• **olfactory bulb** (attached to olfactory peduncle
• **lateral & medial olfactory striae (tracts)**
• **piriform lobe**
• **cerebral cortex (neocortex)** - surface gray matter
dorsal to the rhinencephalon (lateral rhinal sulcus)

Dorsal surface:
• **cerebral cortex (neocortex)**
gyrus (gyri) - ridge (ridges)
sulcus (sulci) - groove (grooves)
• **cruciate sulcus** (motor cortex)
• **coronal sulcus** (sensory cortex)

Median surface:
• **lamina terminalis* & rostral commissure***
• **septum (septal region)** - rostral to lamina terminalis
• **corpus callosum** (white matter commissure)
• **cerebral cortex (neocortex)**

Typical-Section Features:
• **gray matter**
cerebral cortex - surface gray matter
paleocortx - covers rhinencephalon
neocortex - covers most of cerebrum

basal nuclei - internal (deep) gray matter
caudate nucleus - motor function
putamen - motor function
pallidum (globus pallidus) - motor function
amygdala (amygdaloid nucleus) - affective behavior (emotion)
• **white matter**
corpus callosum - commissure for neocortex
internal capsule - fibers to/from brainstem
• **lateral ventricle**
interventricular foramen - to third ventricle

DIENCEPHALON


Sheep Brain


Equine Brainstem


Dissected Sheep Brain


Ventral View

Diencephalon [NOTE: * = not paired]
Regions/Components:
• **thalamus** - includes geniculate bodies (metathalamus)
• **interthalamic adhesion*** - midline structure
• **epithalamus** - habenular, pineal*, caudal commissure*
• **hypothalamus** - includes optic chiasm*, neurohypophysis*, & mamillary bodies
• **subthalamus** - lateral to hypothalamus
• **third ventricle* & interventricular foramina**

Surface Features . . .
Ventral surface:
• optic chiasm*, optic nerve, optic tract
• infundibulum* & neurohypophysis*
• mamillary bodies

Dorsal surface:
• thalamus
• lateral geniculate body (nucleus)
• medial geniculate body (nucleus)

Median surface:
• interthalamic adhesion*
• third ventricle* & interventricular foramen
• ventral surface features:
• optic chiasm*
• infundibulum* & neurohypophysis*
• mamillary body

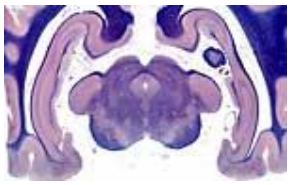
Typical-Section Features:
• thalamus
• subthalamus
• hypothalmus
• third ventricle*

MESENCEPHALON


Equine Brainstem


Brainstem Dorsal View


Sheep Brain



Brain Transection

Mesencephalon (midbrain)
Regions: [NOTE: * = not paired]
• **tectum*** - includes bilateral rostral & caudal colliculi
• **tegmentum** - nuceli, tracts, & reticular formation
• **substantia nigra** (neurons contain melanin in humans)
• **crus cerebri** (white matter tract on ventral surface)
• **mesencephalic aqueduct*** - surrounded by periaqueductal gray matter

Surface Features . . .
Ventral surface:
• **oculomotor nerve**
• **crus cerebri**

Dorsal surface:
• **rostral colliculus** - also, commissure of rostral colliculus
• **caudal colliculus** - also, commissure of caudal colliculus
• **trochlear nerve (decussating)**

Median surface:
• **tectum***
• **mesencepaholic aqueduct***
• **tegmentum**

Typical-Section Features:
• **tectum***
• **mesencephalic aqueduct*** - surrounded by periaqueductal gray matter
• **tegmentum**
• **substantia nigra**
• **crus cerebri**

METENCEPHALON

PONS

Equine Brainstem

Ventral View of Brain

Dorsal Brainstem

Sheep Brain

Metencephalon — Pons
Components: [NOTE: * = not paired]
Cerebellum . . .* (connected to brainstem by peduncles)
Pons . . .* (part of the brainstem)

Pons Regions:
• **tegmentum** - nuclei, tracts, & reticular formation
• **ventral pons** (pontine nucle & transverse pontine fibers
• **fourth ventricle***

Surface Features . . .
Ventral surface: (when removed from pons)
• **transverse pontine fibers**
• **trigeminal nerve**

Dorsal surface: (cerebellum removed)
• **cerebellar peduncles**
• **rostral, middle, caudal**
• **fourth ventricle**
• **rostral medullary vellum (roof of ventricle)**

Median surface:
• **ventral pons** (transverse fibers & pontine nuclei)
• **tegmentum**
• **fourth ventricle** & rostral medullary vellum

Typical-Section Features:
• **trigeminal nerve**
• **ventral pons** (transverse fibers & pontine nuclei)
• **tegmentum**
• **fourth ventricle** & rostral medullary vellum
• **cerebellar peduncles**

Cerebellar Components/Regions:
• **cerebellar vermis*** - median region ("worm-like")
nodulus* (most caudal lobule of the vermis)
• **cerebellar hemispheres** - bilateral regions
flocculus (most ventrolateral lobule of the hemisphere)
• **cerebellar peduncles** - rostral, middle, & caudal

Cerebellar Surface Features . . .
Ventral surface: (when removed from pons)
• **cerebellar peduncles** (three peduncles merged)
• **flocculonodular lobe** (consists of the nodulus and bilateral tracts connecting to flocculi)

Dorsal surface:
• **cerebellar vermis***
• **cerebellar hemispheres**

Median surface:
• **cerebellar vermis***
• **nodulus***

Typical-Section Features:
• **cerebellar cortex**
-sulci (grooves)
- folia (ridges)
• **cerebellar white matter**
- cerebellar peduncles
• **three cerebellar nuclei**
- fastigeal nucleus
- interpositus nucleus
- dentate nucleus

MYELENCEPHALON- MEDULLA OBLONGATA


Ventral Brainstem


Brain Dissection

Pyramids

Half Brain

Myelencephalon (medulla oblongata)
Components: [NOTE: * = not paired]
• **pyramids** (corticospinal fiber tracts)
• **trapezoid body *** (auditory fibers & nuclei)
• **various nuclei, tracts, & reticular formation**
• **fourth ventricle*** (caudal medullary vellum*= roof of the ventricle)
• **cranial nerves:**
abducent n. (VI)
facial n. (VII)
vestibulocochlear n. (VIII)
glossopharyngeal n. (IX)
vagus n. (X)
accessory n. (XI)
hypoglossal n. (XII)

Surface Features . . .
Ventral surface:
• **pyramids**
• **trapezoid body***
• **cranial nerves (VI through XII)**

Dorsal surface:
• **fourth ventricle*** (including: caudal medullary vellum* & choroid plexus)
• **obex***
• **nucleus gracilis**
• **medial & lateral cuneate nuclei**
• **spinal tract of the trigeminal nerve**

Lateral surface:
• **pyramid** (also, pyramidal decussation)
• **trapezoid body***
• **cranial nerves (VI, VII, & VIII)**

Median surface:
• **pyramid** (also, pyramidal decussation)
• **nuclei, tracts, & reticular formation**s
• **fourth ventricle*** (including: caudal medullary vellum* & choroid plexus)

Typical-sections Features . . .

Rostral level:

- **pyramids**
- **cochlear nuclei** (ventral & dorsal)
- **dorsal nucleus of trapezoid body**
- **cranial nerve nuclei & fibers (VI, VII, & VIII)**

Caudal level:

- **pyramids**
- **pyramidal decussation***
- **olivary nucleus**
- **lateral cuneate nucleu**
- **medial cuneate nucleus**
- **nucleus gracilis**
- **cranial nerve nuclei & fibers (X & XII)**