**Dissection of the Sheep Brain**

**Neurobiology, Spring ‘07**

            We will dissect the sheep brain this semester to better learn the organization of a mammalian brain and the relationships of specific structures involved in many of the functional circuits that are of importance to us in this course.  We will follow the general pattern of study used by our lab guide (*The Sheep Brain: A Photographic Series*, by Vanderwolf and Cooley) - identifying superficial structures first, then studying structures found along the sagittal midline, and finishing with a detailed analysis of internal structures found in coronal sections.  This pattern is also used by a sheep brain dissection manual put on the internet by the University of Scranton (*http://www.uofs.edu/sheepindex.html*), and I recommend using this web site as a supplementary study guide.  However, the internet guide uses some terminology that is a little different from the terms that we will be using, so I have tried to indicate those differences in the list that follows.  This list is a comprehensive summary of all of the structures that you will be responsible for knowing, either in terms of straight identification in the laboratory or in the context of some of the circuits that we will be discussing in the lecture.  I will monitor your pace in this series of dissections, but you will have a lot of freedom to study regions of the brain in whatever sequence works best for you and at your own pace.

            I would like you to do most of your work in groups of two (even though you could all benefit from working communally at times), and each group will have 2-3 sheep brains to use throughout the semester.  One should be cut sagittally to study the structures on the external surface and along the midline, another will be cut in a series of coronal sections (see p. 28 in your lab guide) and stained for contrast (see below), and a third or fourth can be used for special dissections to expose complex 3-dimensional circuits such as the hippocampus or fornix or visual pathways.  These will be stored in a jar (for each group) filled with 70% ethanol, and will be available for your study in J-153 at any time the room is unused.  The coronal sections (and any other sections that you would like) will be stained with the following Mulligan method:

1)  Wash sections overnight in running water to remove preservativa;

2)  Rinse in 3 changes of distilled water for 20 minutes each;

3)  Place in preheated Mulligan’s solution for 3-5 minutes (60oC);

4)  Rinse in tap water for 1 minute;

5)  Place in 1% ferric chloride solution for 2 minutes;

6)  Wash in running tap water for 5 minutes;

7)  Place in 1% potassium ferrocyanide until gray matter turns bright blue (~3 minutes);

8)  Wash in running tap water for 24 hours;

9)  Store in 70% ethanol.

Mulligan’s solution:

                carbolic acid (phenol), crystalline                                     40.00 g

                copper sulfate, crystalline                                                  5.00 g

                HCl, concentrated                                                                1.25 mL

                H2O, distilled                                                                         1 L

                                (be careful not to breathe fumes)

1% Ferric Chloride:

                ferric chloride, crystalline                                                   10 g

                H2O, distilled                                                                         1 L

                                (make up just before use, then discard)

1% Potassium Ferrocyanide:

                potassium ferrocyanide, crystalline                                  10 g

                H2O, distilled                                                                         1 L

                                (can be stored before use)

**Terms (& Structures) to know in the sheep brain:**

(Terms in *italics* are not shown in your dissection manual)

**Directional Terms:**

anterior/posterior

rostral /caudal

dorsal/ventral

superior/inferior

lateral/medial

proximal/distal

**Brain Regions:**

telencephalon - cerebral cortex, corpora striata (caudate, internal capsule, putamen), rhinencephalon (olfactory bulb, hippocampus, amygdala, septal region,cingulate gyrus)

diencephalon - thalamus, hypothalamus, pituitary gland, pineal gland

mesencephalon - tectum (corpora quadrigemina = superior & inferior colliculi), tegmentum

metencephalon - cerebellum, pons

myelencephalon - medulla oblongata

**External Surface:**

4th ventricle

abducens nerve (VI)

ansate sulcus (= cruciate sulcus)

*anterior medullary velum*

brachium conjunctivum (= rostral or superior cerebellar peduncle)

brachium pontis (= middle cerebellar peduncle)

*brainstem*

cerebellum (vermis, hemispheres, ansiform lobule, paraflocculus, flocculus, posterior median lobule, anterior lobe)

cerebral peduncle

*choroid plexus*

*cisterna magna*

coronal sulcus (= superior frontal sulcus)

dentate gyrus

entorhinal cortex (= hippocampal gyrus)

facial nerve (VII)

fimbria

*frontal lobe*

glossopharyngeal nerve (IX)

hippocampal fissure

hypoglossal nerve (XII)

infundibulum

interpeduncular fossa (*cistern*)

lateral geniculate body

lateral olfactory tract (= gyrus) (=*stria*)

mammillary body

marginal gyrus

medial geniculate body

medial olfactory tract (= gyrus)

median longitudinal fissure

*meninges (dura mater, arachnoid, pia mater)*

mesencephalic tectum (corpora quadrigemina - superior & inferior colliculi)

*mesencephlic tegmentum*

*obex*

*occipital lobe*

oculomotor nerve (III)

olfactory bulb

olfactory tubercle

optic nerve (II) (optic chiasm, optic tract)

*parietal lobe*

periamygdaloid cortex (=uncus)

*pituitary gland (anterior & posterior)*

pons

prepyriform cortex

pulvinar

pyramidal tract

pyriform cortex (= hippocampal gyrus)

*restiform body (= caudal  or inferior cerebellar peduncle)*

rhinal fissure

*rhinencephalon*

spinal accessory nerve (XI)

*superior cistern*

sylvian sulcus

*tela choroidea*

*temporal lobe*

*transverse fibers*

trapezoid body

trigeminal nerve (V)

trochlear nerve (IV)

tuber cinereum

vagus nerve (X)

vestibolocochlear nerve (VIII)

**Sagittal Surface:**

3rd ventricle

4th ventricle

*anterior commissure*

*callosal sulcus*

*central canal*

cerebellum (*arbor vitae*, *folia*)

cerebral aqueduct

cingulate gyrus

*cingulate sulcus*

corpus callosum (rostrum, genu, body, splenium)

fornix (columns, body, hippocampal commissure)

genual sulcus

hippocampal formation

inferior colliculus

interventricular foramen

*lamina quadrigemina*

lamina terminalis

*lateral ventricle*

*mammillothalamic tract*

massa intermedia

pineal body

posterior commissure

*septal area*

septum pellucidum

splenial sulcus

superior colliculus

thalamus

**Coronal Sections:**(Follow p. 28 in the lab guide in making the coronal sections - you should end up with 11 pieces of brain produced by 10 cuts, but cut just 3-4 sections at a time starting with the most anterior.  The sections are labeled by the cut location and you should see the same structures on either of the surfaces produced by a given cut.)

anterior forebrain (sections C, D, E) -

anterior commissure

caudate nucleus

cingulum

claustrum

corona radiata

corpus callosum (genu & body)

external capsule

extreme capsule

fornix (columns)

globus pallidus

internal capsule

lateral olfactory tract

lateral ventricle

olfactory tubercle

optic chiasma

preoptic area

putamen

rhinal fissure

septal nuclei

septohypothalamic tract

septum pellucidum

caudal forebrain & midbrain (sections F, G, H, I) -

amygdala

anterior thalamus

caudate nucleus (tail)

central gray

cerebral aqueduct

corpus callosum (body, splenium)

crus cerebri

fornix (dorsal fornix, fimbria)

hippocampus (alveus, dentate gyrus)

hypothalamus

inferior colliculus (brachium)

internal medullary lamina

lateral geniculate body

mammillary body

mammillothalamic tract

medial geniculate body

medial thalamic nucleus

midbrain reticular formation

optic tract

pineal body

posterior commissure

pulvinar

stria medullaris

stria terminalis

substantia nigra

superior colliculus

third ventricle

ventral thalamic nucleus

hindbrain (sections I, J, K, L) -

cochlear nerve

corticobulbar tract

corticospinal tract

dorsal tegmental nucleus

facial nerve (genu)

fourth ventricle

hindbrain reticular formation

inferior cerebellar peduncle

lateral lemniscus

lingula

medial lemniscus

medial longitudinal fasciculus

middle cerebellar peduncle

olivary nuclei

pyramidal tract

solitary tract (& nucleus)

superior cerebellar peduncle

transverse pontine fibers

trapezoid body

trigeminal nerve (spinal tract & nucleus)

vestibular nuclei