

 NATIONAL CANCER INSTITUTE  Biorepositories and Biospecimen Research Branch		Brain Autopsy Normal Tissue Collection	
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1.0 Brain and Brain Stem

1.1 Preparation: Immediately after the hair is removed, pack the head with five (5) zip-locked bags of ice, filled to capacity. This is approximately 4 lbs of wet ice. Inform the transcriber that the time the brain is placed on ice should be documented on the **GTE_x Tissue Recovery Case Report Form, PM-0003-F5**. Place one bag under the head, the second and third bags on each side of the head, the fourth bag over the face, and the fifth bag on the dome of the head. Place a plastic-backed pad around the iced head and tape and/or clamp it to secure the ice bags and keep the head cold since the brain is removed last and the collection of other organs may take hours to complete.

1.2 Time of removal: The brain should be removed last during the autopsy. Once the brain is removed, sampling and packaging the brain takes priority over any other organs waiting for processing. Keep the sampling, handling, and packing time to a minimum.

2.0 Procedure: Removal of Brain

2.1 Exposure of calvaria for sawing:

- 2.1.1 The cadaver should be in the supine position. Reflect the scalp inferiorly. Reflect the temporalis muscle inferiorly (**Figure 1**). Mark the surface of the skull with a guideline using a pencil.
- 2.1.2 Use a saw to cut along the line. Turn the head from side to side alternately while cutting. Be particularly careful when cutting through the temporal bone, which is very thin. If you saw through the inner lamina, you may damage the underlying dura mater and the brain. Using a skull breaker or chisel blade, break the inner lamina of the calvaria. Remove the calvaria by prying it from the dura mater with a forceps or chisel blade. Work from anterior to posterior using no more force than necessary.

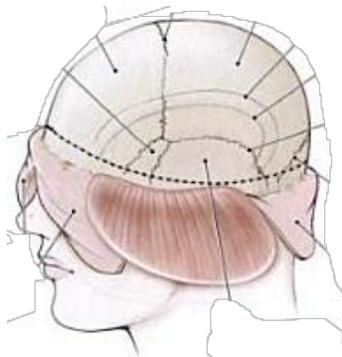
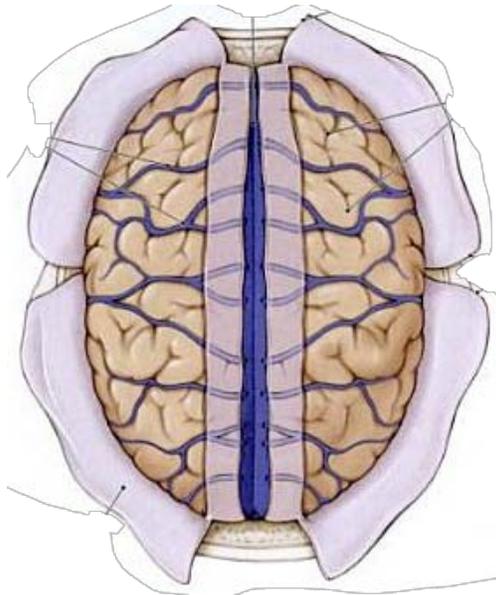


Figure 1: Reflect the temporalis muscle and mark the calvaria for sawing

2.2 Removal of dura mater to expose brain surface



2.2.1 Use scissors to make a parasagittal cut through the dura mater about 2 cm lateral to the midline on each side. Make a coronal cut through the dura mater on each side from the midpoint of the parasagittal cut to just above the ear (**Figure 2**).

2.2.2 Fold the resulting flaps over the cut edges of the skull. Cut through the medial strip of the dura at the anterior (frontal) end of the brain and carefully dissect away from the midline.

Figure 2: Dura mater

2.3 Removal of the intact brain and cervical spinal cord segment C1

- 2.3.1 Use your fingers to elevate the frontal lobes. **Use a probe to lift the olfactory bulbs from the base of the skull.**
- 2.3.2 Use a scalpel to cut the visible nerves and arteries bilaterally in order to raise the brain higher.
- 2.3.3 Retract the cerebellum superoanteriorly, sever the two vertebral arteries and, using a long-handled curved scissor or a long-handled thin bladed scalpel, cut the spinal cord as low in the foramen magnum or cervical vertebral canal as you can reach (**Figure 3**).

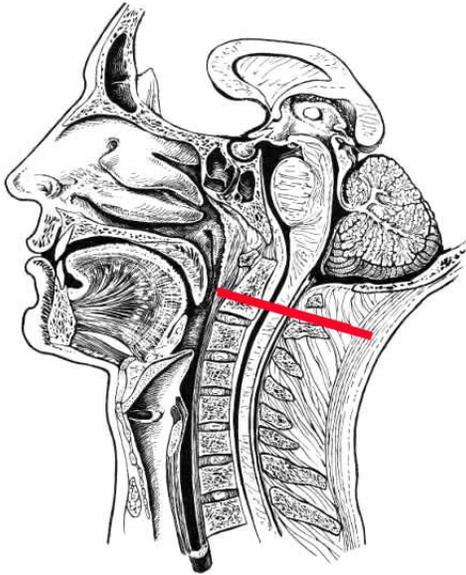


Figure 3: Transect cervical cord at level below cerebellum and foramen magnum

- 2.3.4 Support the brain with the palm of one hand under the frontal lobes and extend your fingers down the ventral surface of the brainstem. Insert your finger into the cut that was made across the cervical spinal cord to support the brainstem and cerebellum. Roll the brain, brainstem, and cerebellum posteriorly out of the cranial cavity in one piece.
- 2.3.5 After the brain has been removed, inspect the brain and the cranial cavity and verify that the olfactory bulbs (**Figure 4**) and a portion of the cervical spinal cord have been retrieved. These structures may be separately collected after the removal of the brain, if necessary. To retrieve olfactory bulbs after brain removal, bluntly dissect them from the cribriform plate (preferably in one piece). Cut the cervical portion of the spinal cord transversely as low as possible.

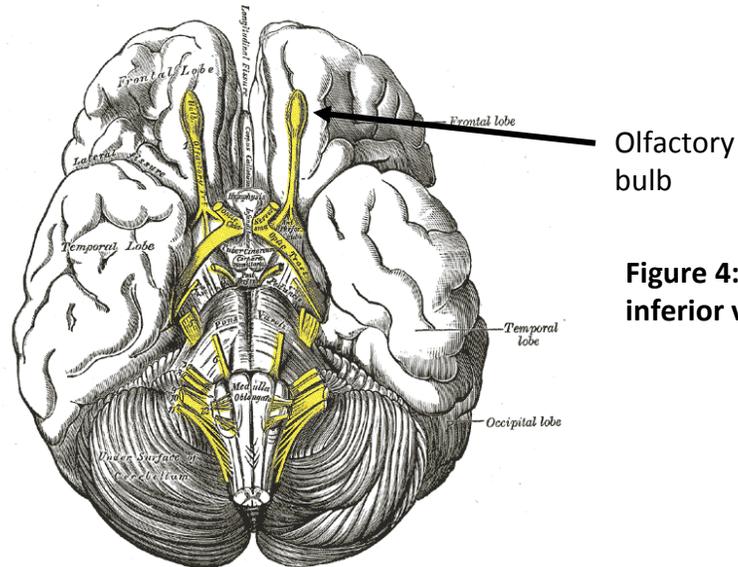
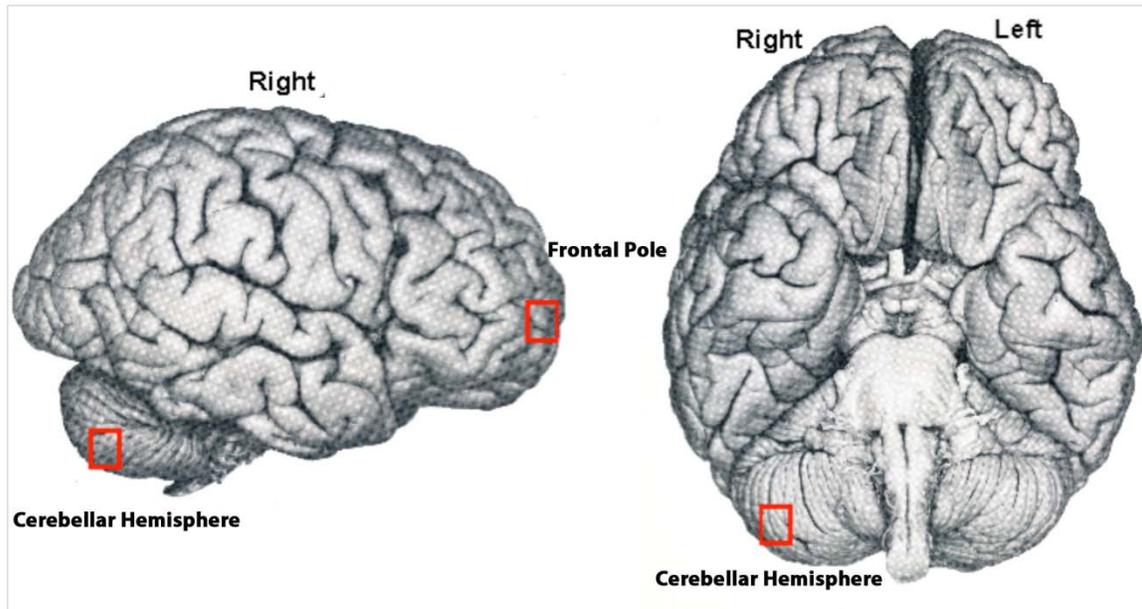


Figure 4: Brain, inferior view

2.4 Target brain regions for samples taken by the Biospecimen Source Site (BSS)



2.4.1 Areas in red illustrate sample regions from frontal pole and cerebellar hemisphere as per instruction.

2.5 Packing: Pack and ship the brain, brain stem, olfactory bulbs, spinal cord and hair according to the instructions in the **GTEx Kit Receipt, Supplies, and Shipping Procedure, OP-0001**.

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3.0 Background Information

3.1 DeArmond SJ, Fusco MF, Dewey MM. Structure of the Human Brain: A Photographic Atlas. Third Edition. Oxford University Press, NY 1989

3.2 Tank PW, Grant JCB. Grant's dissector. Fourteenth Edition. Lippincott, William and Wilkins, Philadelphia PA 2009