The Brain

by Sophia

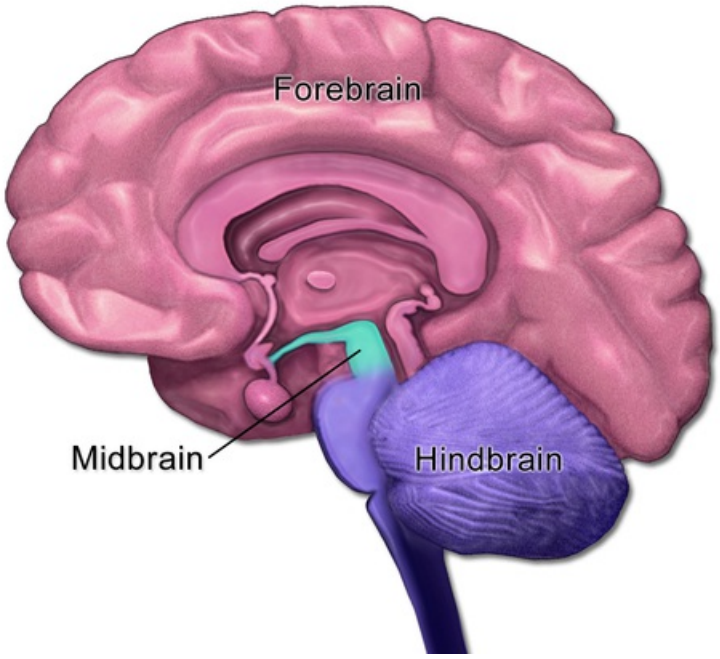
WHAT'S COVERED

In this lesson, you will learn about the three main areas of the brain, their functions, and some of the brain's protective barriers. Specifically, this lesson will cover:

1. The Brain Overview

The brain is the control center of our nervous system and is divided into three main regions: the**forebrain**, the **midbrain**, and the **hindbrain**.

Take a look at the image below as you learn about the three main regions of the brain. The hindbrain is in purple, the midbrain is in green, and the forebrain is in pink.



The forebrain is the most highly developed part of your brain. It includes the two hemispheres of the cerebrum, the thalamus, and the hypothalamus.

The midbrain, which is the little part labeled in green, is the smallest region of our brain. And the function of

the midbrain is to relate information from the body's sensory organs to the forebrain, where that information can then be processed.

The hindbrain, in pink, is located just above the spinal cord and includes the parts of the brain such as the medulla oblongata, the cerebellum, and the pons.

TERMS TO KNOW

Forebrain

The largest part of the brain that consists of the cerebral hemispheres and all of the structures contained within them.

Midbrain

The area of the brain that connects the hindbrain to the forebrain; also the top structure of the brain stem.

Hindbrain

The area of the brain that consists of the cerebellum, pons and medulla oblongata.

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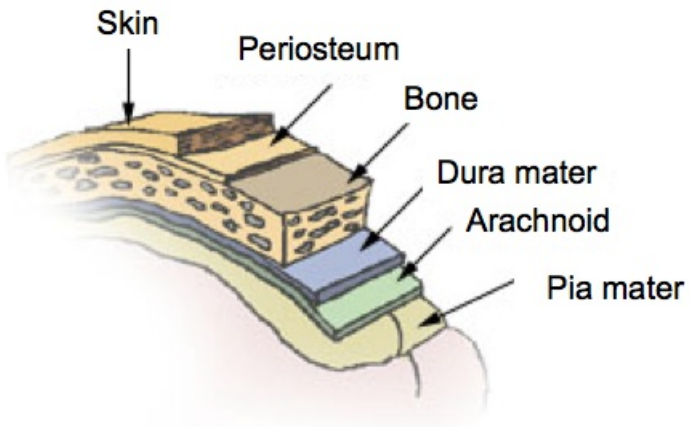
2. Protective Areas & Features

The brain is composed of three layers of **meninges**, and meninges are just membranes of connective tissue located between the skull and the brain.

The purpose of these three layers is to cover the central nervous system's neurons and blood vessels. It's protecting the brain and protecting those neurons and blood vessels associated with the brain.

Take a look at the diagram below to see these layers.



The first layer on the top is not one of the meninges, just skin (and possibly hair). Below the skin, you have periosteum and bone. Then below that, you have the three layers of meninges.

The first layer is called the dura mater. This is a thick, leathery layer that composes the first layer of meninges found right underneath your skull. The next layer is the arachnoid mater, followed by the pia mater.

The layers of the meninges get thinner and more delicate as we move down. The first layer is very thick and

leathery, the next layer is a little bit thinner and a little bit more delicate, and then the pia mater is very thin and very delicate.

BIG IDEA

Those are the protective layers and features of the brain. Another feature of the brain that serve as a protective barrier is the **cerebral spinal fluid**, which acts to cushion the brain. Cerebral spinal fluid is actually formed from blood plasma.

TERMS TO KNOW

Meninges

The protective connective tissue found on the outside of the brain and spinal cord; consists of three layers: dura mater, arachnoid mater, pia mater.

Cerebral Spinal Fluid

A fluid similar to plasma that is created by the brain; it washes the brain of metabolic waste and plays a minor role in cushioning the brain.

3. The Blood-Brain Barrier

The **blood-brain barrier** controls what blood-borne substances are allowed to enter the cerebral spinal fluid.

The reason the blood-brain barrier is protective and can control what substances can enter the cerebral spinal fluid is that the capillary walls of the barrier are much less permeable to substances than other capillaries found in your body. It helps to control the spread of viruses, toxins, and bacteria from having contact with the brain. You don't want those materials entering your cerebral spinal fluid because your brain is such an important part of your nervous system and your entire body that you need to make sure that whatever is entering it is controlled. This means that if you do have an infection in your central nervous system, it's much harder to get medicine (such as antibiotics) past the blood-brain barrier to the site of infection.

However, the blood-brain barrier doesn't protect your hypothalamus, and the reason for that is because your hypothalamus needs to be exposed to your bloodstream so it can monitor the chemical makeup and the temperature of your blood to help maintain homeostasis.

TERM TO KNOW

Blood-Brain Barrier

A barrier created by glial cells called astrocytes; the blood-brain barrier only allows a small amount of materials from the blood to enter the inside of the brain. It plays a role in protecting neurons and creating a stable environment inside of the brain.

MAKE THE CONNECTION

If you're taking the Human Biology Lab course simultaneously with this lecture, it's a good time to try the Gross Function of the Nervous System: Let your brain learn about itself Activity in Unit 4 of the Lab course. Good luck!

SUMMARY

This lesson has been an **overview of the brain**'s three regions: the forebrain, the midbrain, and the hindbrain. It has also been an overview of the **brain's protective areas** and the **blood-brain barrier**.

Keep up the learning and have a great day!

Source: THIS WORK IS ADAPTED FROM SOPHIA AUTHOR AMANDA SODERLIND

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