

Neurons

Neurons have three big distinguishing properties:

- x
- x
- x

Neuron Description

A cell body with:

- x
- x
- x

Short Processes

One Long Process

Neurons

Neurons have three big distinguishing properties:

- x **Specialization** – they carry a nerve impulse.
- x **Sensitivity** – they die quicker than any other tissue in the body when deprived on oxygen.
- x **Permanent** - one of the two permanent types of cells in the body. If you loose a nerve cell, it's gone.

Neuron Description

A cell body with:

- x **A large Nucleus**
- x **A large nucleolus**
- x **Nissl granuals** – Lots of rough endoplasmic reticulum – making tons of proteins

Short Processes – **Dentrites** that carry impulses toward the cell body.

One Long Process – **Axon**, carries a nerve impulse away from the cell body (mostly)

Nerve Impulses

Synapse –

Neurotransmitter –

The thicker the nerve the _____ the impulse.

Nerve impulses travel at _____ per second

To speed things up:

Afferent nerves:

Efferent nerves:

Myelin

Neurons without myelin

Myelin Sheaths are found:

Nerve Impulses

Synapse – the area where one neuron stimulates another cell

Neurotransmitter – the substance that is released causing transmission between the neurons and its target organ/muscle/nerve.

The thicker the nerve the faster the impulse.

Nerve impulses travel at 1 meter per second

To speed things up mother nature invented myelin and the nodes of ranvier (the bare spots).

Afferent or sensory nerves carry an impulse from the body to the brain.

Efferent or motor nerves carry impulses from the brain to the body.

Myelin is a fatty substance and is generally white in color.

Neurons without myelin have a different color – gray

Only axon's have a myelin sheath so they make up the white matter of the brain. Cell bodies and the short unmyelinated dendrite make the brains gray matter.

Central Nervous System – Brain

Glial -

Astrocyte –

There are two types:

x

x

Oligodendrocytes –

Microglia –

Ependymal cells –

PNS and Glial cells -

Schwann cells –

Neurolemma sheath of Schwann –

Central Nervous System – Brain

Glial (means glue) - glueing the brain together.

Astrocyte – name comes from star-like appearance. There are the honorary connective tissue in the brain, they are the major glial cell that makes up the blood-brain barrier. (can be a macrophage under normal conditions)

There are two types:

Fibrous found in white matter

Protoplasmic found in gray matter.

Oligodendrocytes – Form the myelin in the central nervous system. (Can act as a macrophage under normal conditions.)

Microglia – The smallest of the glial cells they are inactive in a normal healthy brain. They become active phagocytes in times of disease.

Ependymal cells – Makes cerebro-spinal fluid. (Actually they move cerebro-spinal fluid into the space – it actually is created outside and the ependymal cells move it into the space.)

In the PNS we don't need glial cells because we don't have a blood-brain barrier.

Schwann cells – makes myelin in the PNS.

Neurolemma sheath of Schwann – a satellite cell that acts as connective tissue in the PNS.

CNS – the part of the nervous system encased in bone

Brain Development

PNS ___ pairs of cranial nerves, ___ pairs of spinal nerves.

The large expanded portion we think of the brain is the _____.

Diencephalon –

Brain stem –

Brain Stem Structures

Mesencephalon

Pons and Cerebellum

Myelencephalon

Telencephalon

Inside each hemisphere are:

Ganglia -

Tracts -

Brain Development

PNS 12 pairs of cranial nerves, 31 pairs of spinal nerves.

The large expanded portion we think of the brain is the telencephalon.

Diencephalon – covered by the telencephalon

Brain stem – part of the brain that narrows.

Brain Stem Structures

Mesencephalon Top Portion

Pons and Cerebellum – metencephalon – mid portion

Myelencephalon – medulla

Telencephalon is divided into two halves called the cerebral hemispheres.

Inside each hemisphere are:

groups of nerve cell bodies – ganglia

bundles of axons – tracts

Brain Structures

Basal ganglia -

Gyri (gyrus)-

Sulci

Fissures -

Lobes –

Frontal –

Parietal –

Temporal –

Occipital –

The major divisions between the brain are:

median longitudinal fissures –

central sulcus –

Lateral fissure –

The parietal-occipital division –

Brain Structures

Basal ganglia - Groups of ganglia deep in the telencephalon (In human's it's deep, in a shark it's the gray matter)

Gyri (gyrus)- The surface of the telencephalon is made of convolutions.

Sulci – the shallow grooves

Fissures - the deep grooves

Lobes – there are 4 (maybe 5-6) lobes in the telencephalon

Frontal – under the frontal bone

Parietal – under the parietal bone

Temporal – under the temporal bone

Occipital – under the occipital bone

The major divisions between the brain are:

median longitudinal fissures – splits the left and right hemispheres

central sulcus – a groove that divides the frontal from the parietal lobe.

Lateral fissure – divides the temporal lobe below from the temporal lobe and parietal lobes above.

The parietal-occipital division is a made-up area. It isn't really a clear division between the parietal and occipital lobes.

More Brain Structures

On the under surface of the frontal lobe are the first two cranial nerves:

Cerebral Cortex (neocortex) –

White matter -

Commisural fibers –

Corpus collosum –

Associative fibers –

Projection Fibers –

internal capsule –

Diencephalon –

Mid brain–

Pons and Cerebellum –

Medulla –

Five divisions of the brain

- 1.
- 2.
- 3.
- 4.
- 5.

More Brain Structures

On the under surface of the frontal lobe are the first two cranial nerves: Olfactory (I) and Optic (II).

Cerebral Cortex (neocortex) – the outer crust when you cut a plane thru the cerebrum. Is made of cell bodies and is therefore gray matter.

White matter - made of myelinated axons.

Commisural fibers – fibers that connect the right side of the brain to the left side of the brain.

Corpus collosum – connects the left side of the brain with the right side of the brain.

Associative fibers – connect the lobes of the brain on the same side (frontal-parietal-temporal-occipital)

Projection Fibers – leave the cerebral hemisphere and connect to some place else in the body.

Most of these are found in the **internal capsule**.

Diencephalon – anything with the word thalamus in it is part of this. This is also where the pituitary and pineal glands are found. It is underneath the telencephalon.

Mid brain– mesencephalon

Pons and Cerebellum – metencephalon

Medulla – myelencephalon.

Five divisions of the brain

1. Cerebral hemisphere
2. diencephalon
3. mid brain
4. pons & cerebellum
5. medulla

Spinal Cord

Spinal chord runs from _____ to _____

Foramen magnum –

The function of the spinal chord –

A cross section of spinal chord contains:

The Gray “H” -

Dorsal Horn –

Ventral Horn –

Deeper fissure –

Shallower fissure –

Columns –

The fibers from the brain come:

The fibers from the body:

The columns are divided into three sections

x

x

x

Spinal Cord

Spinal chord runs from the foramen magnum down to roughly L1 and L2. (the bony spine rows more than the nervous system – they are the same early on)

Foramen magnum – whole in bottom of skull.

The function of the spinal chord – a messenger highway carry messages from the brain to the body or to the body from the brain.

A cross section of spinal chord contains:

The Gray “H” - Central gray section in the shape of a butterfly or “H”

Dorsal Horn – almost always sensory – the back of the spinal chord

Ventral Horn – are comprised of motor nerves.- the front of the spinal chord.

Deeper fissure – on the posterior side

Shallower fissure – on the anterior side

Columns – the Myelinated axons – the white area surrounding the Gray “H”.

The fibers from the brain come down the front of the gray “H”.

The fibers from the body enter the spinal chord on the ventral horn.

Where these two meets, it forms the spinal nerves.

The columns are divided into three sections

x Front – ventral columns

x Sides – lateral columns

x Back – dorsal columns

Pain and Temperature Pathways

Cranial Nerves –

Spinal Nerves –

first order –

second order –

third order –

post central gyrus –

Pain and Temperature Pathways

Cranial Nerves – 12 pairs CN I through CN XII

Spinal Nerves – 31 pairs C1-8, T1-T12, L1-L5, S1-5, Cox1

first order – sensory neuron travels to the cord it synapses with 2 order

second order – goes up spinal cord to the thalamus where it synapses with the

third order – goes from the thalamus into the post central gyrus.

post central gyrus – main sensory portion of brain (In the parietal portion of the brain)