

Anatomy and Physiology

Protective Structures of the Brain and Spinal Cord

Neurotransmitters

The **meninges** are **three** layers of connective tissue that surround the brain and spinal cord.

They are known as:

- Dura mater
- Arachnoid mater
- Pia mater

| Layer | Location | Description |
|-----------------|--|--|
| Dura mater | *Outermost layer | *thickest and toughest of the three meninges *has two layers – outermost fused to the skull |
| Arachnoid mater | *Middle layer | *loosely attached to pia mater by network of strong fibers *subarachnoid space contains cerebrospinal fluid (CSF) |
| Pia mater | *attached to nervous tissue of brain and spinal cord | *lays directly on brain tissue *holds blood vessels that supply nutrients and O ₂ to brain & spinal cord |

Neurotransmitters: chemicals with a specified purpose that provide communication between pre-synaptic neuron & post-synaptic neuron

| Neurotransmitter | Function |
|----------------------------------|--|
| Epinephrine | *FIGHT/FLIGHT hormone *Increase in BP, heart rate |
| Dopamine | *body's natural pain killer * "happy center" |
| Substance P | *associated with transmission of pain impulses & nausea *vomiting center in brainstem contains high volume of Substance P |
| GABA (Gama-aminobutyric acid) | *inhibitory neurotransmitter *often found in anti-anxiety/anti-convulsive medications |
| Cholecystokinin | *stimulates release of enzymes from the pancreas & causes gallbladder to release bile (stimulates digestion) |

| | |
|----------------|--|
| Serotonin | <ul style="list-style-type: none">*sets body clock*helps induce sleep |
| Endorphins | <ul style="list-style-type: none">*related to dopamine release*elicits “Runner’s High” |
| Norepinephrine | <ul style="list-style-type: none">*similar in function to epinephrine*stimulates increases in BP, heart rate |
| Glutamate | <ul style="list-style-type: none">*plays important role in learning & memory*helps neurons grow connections between other neurons |
| Acetylcholine | <ul style="list-style-type: none">*Released at neuromuscular junction*provides communication between nerve & muscle |