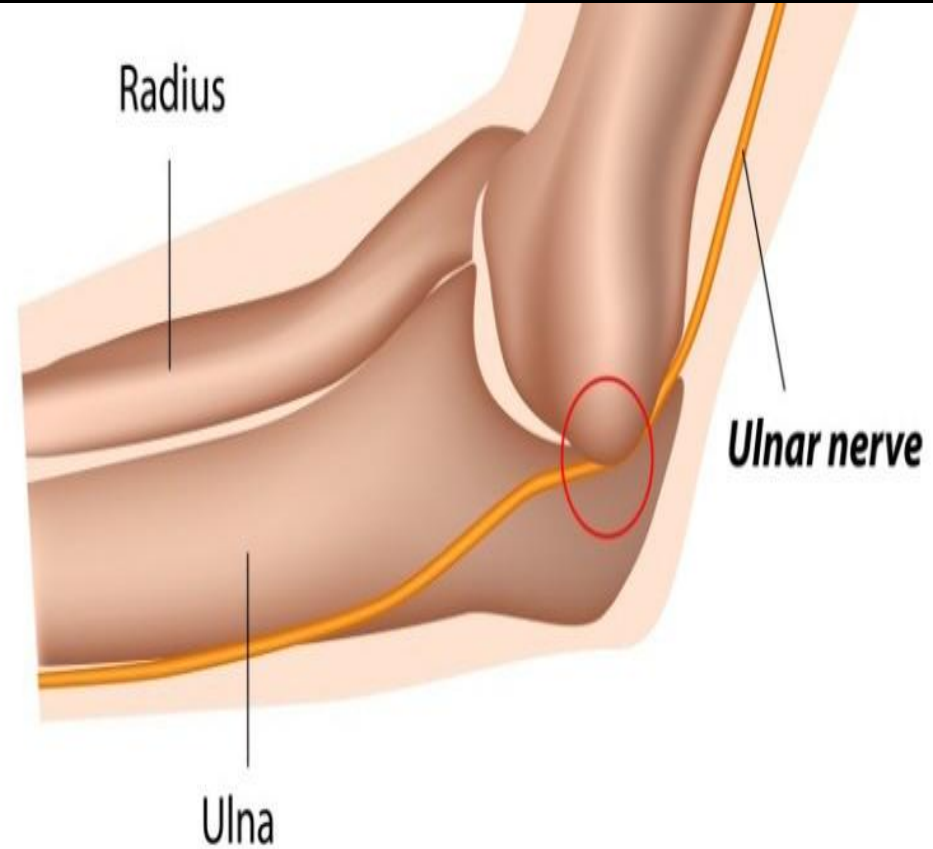


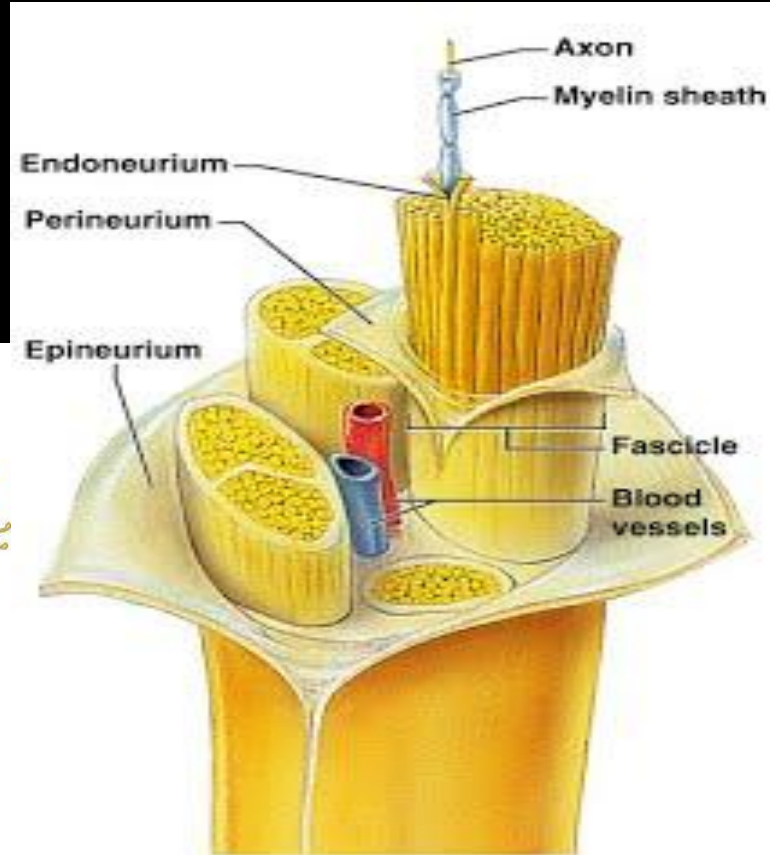
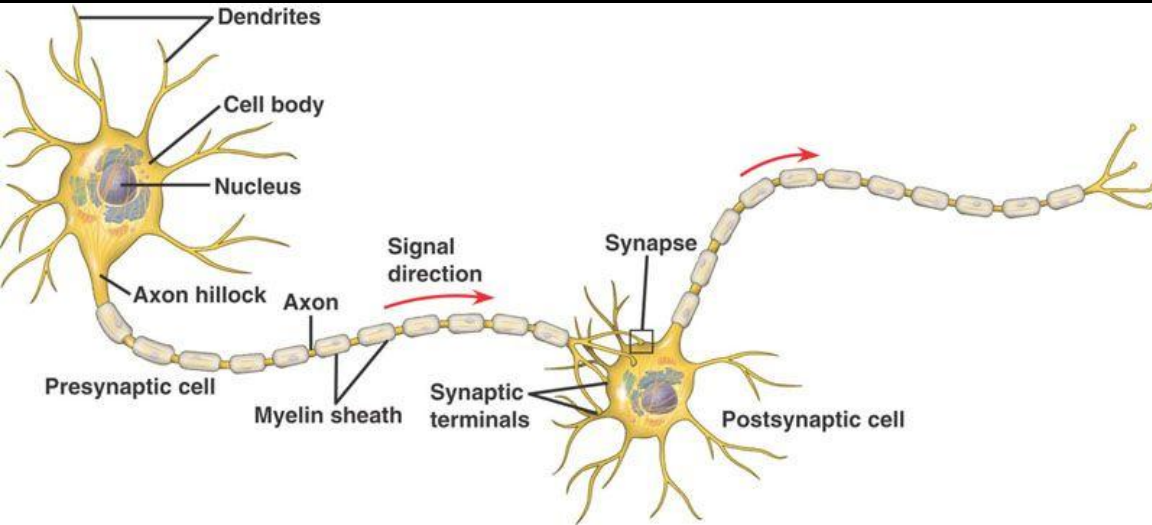


Nerve



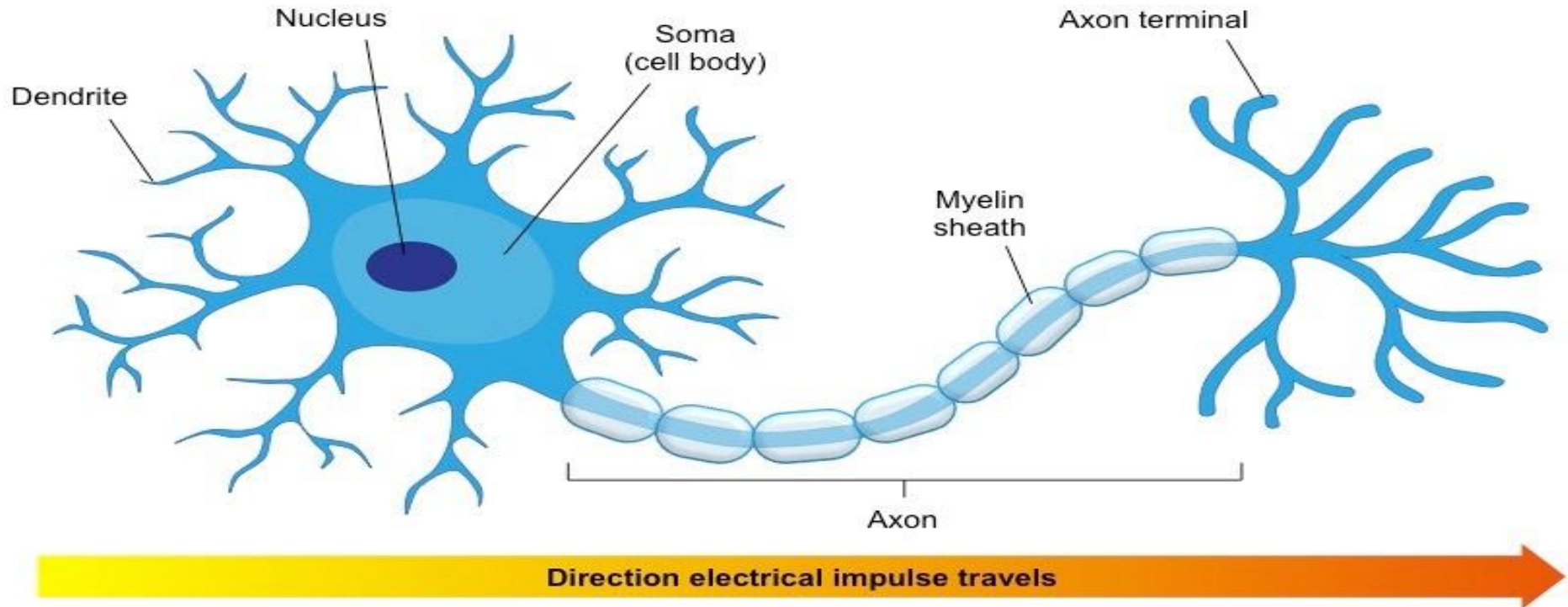
NERVES

A bundle of neuron fibers



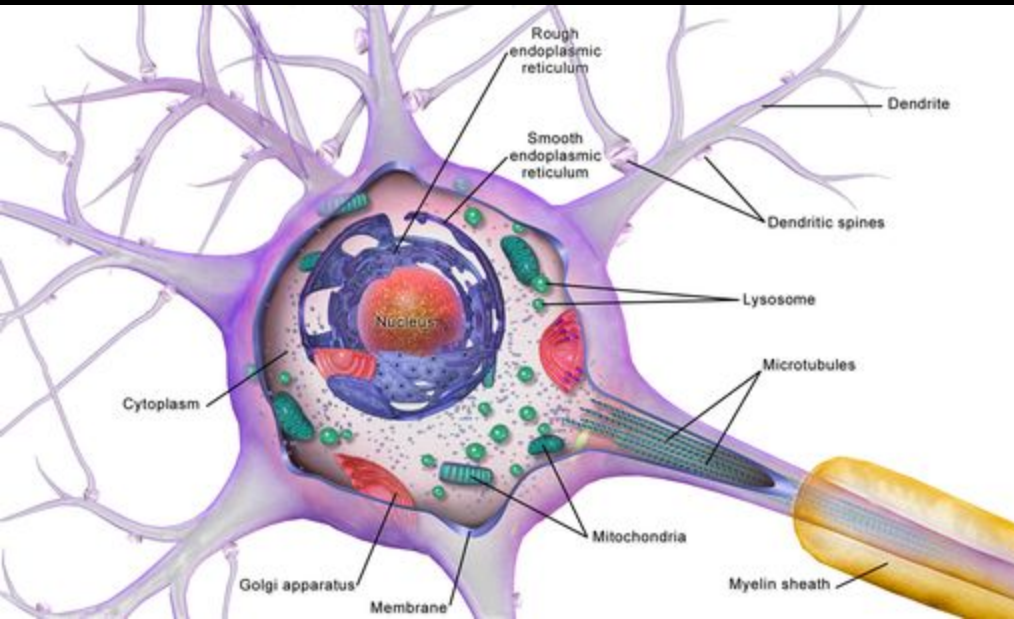
Structure of a Nerve Cell

100 billion nerve cells at birth



SOMA

The cell body of the nerve cell
Serves as small information processor



A. Nucleus
G. Soma

DENDRITES

Branching extensions from the soma of a nerve cell
Input sites receiving signals from other neurons



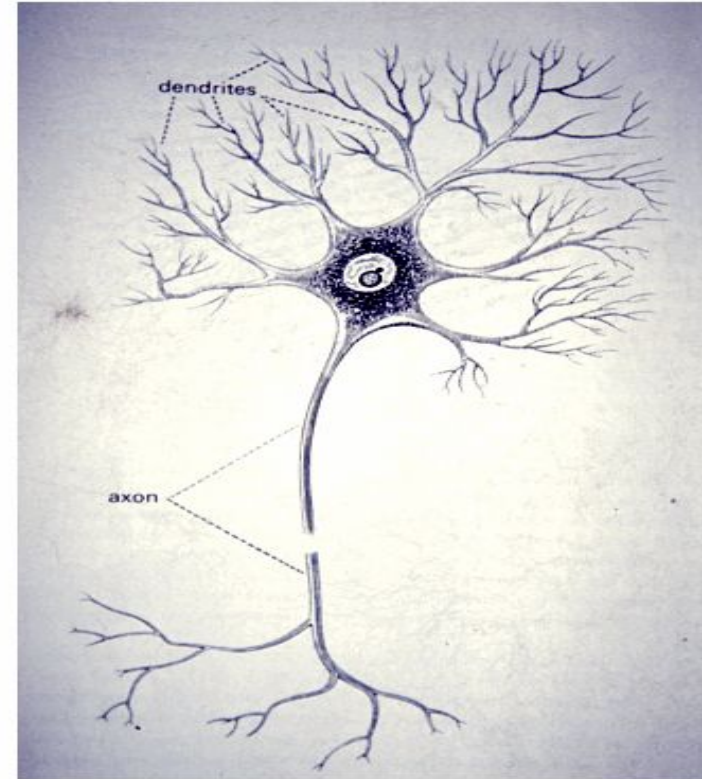
F. Dendrites

AXON

Major extension of the soma

Transmits the electrical signal from soma to pass along to the next neuron

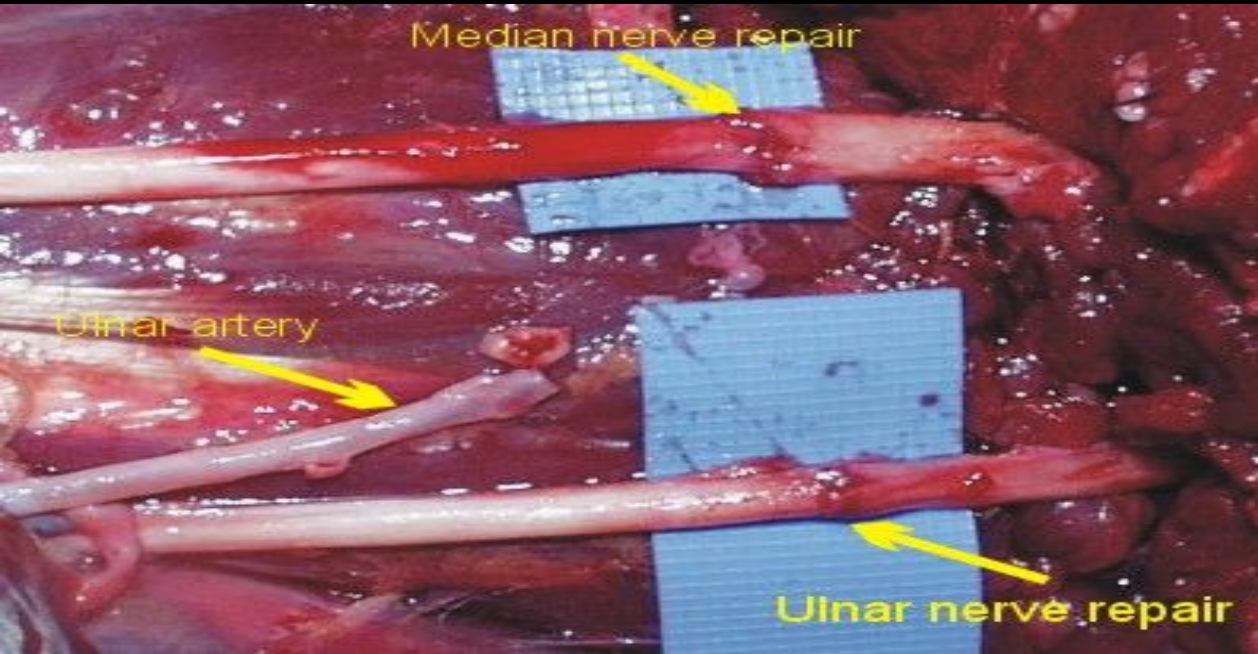
E. Axon



MYELIN SHEATH

A fatty layer coating many axons

Insulates the axon, allows for speed of signal



D. Myelin Sheath



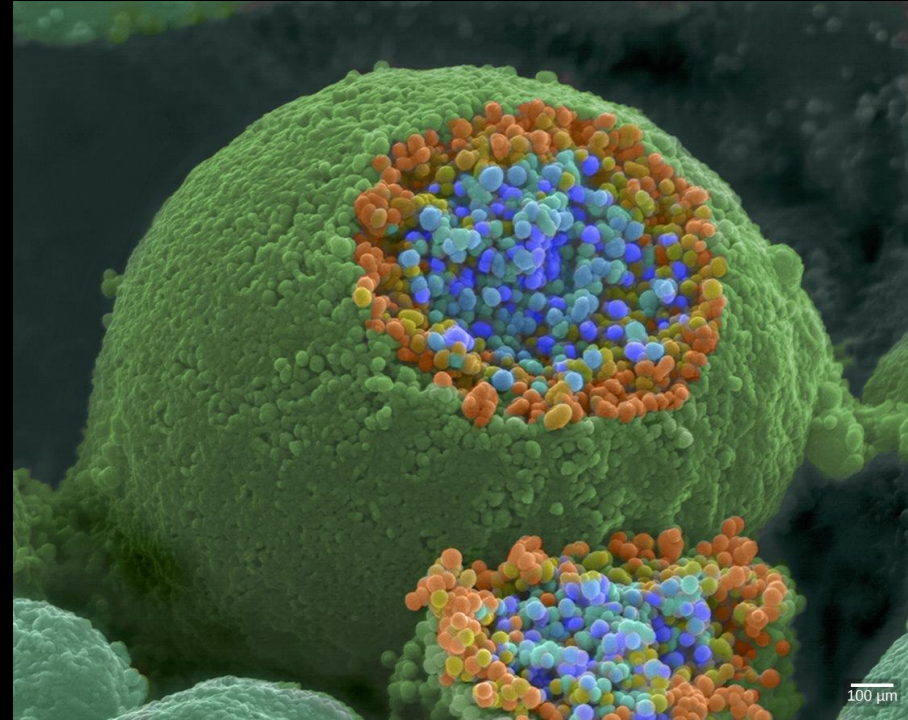
90 SECONDS

TERMINAL BUTTON

End of the axon

Sends the message on to
the next neuron

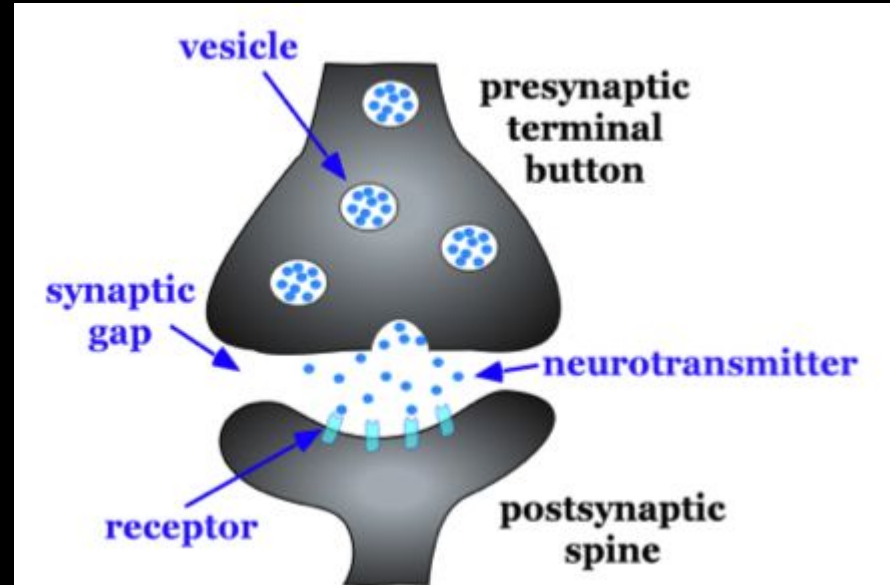
B. Terminal Button



SYNAPSE

Small gap between the _____
of one neuron and the _____
of the next neuron.

H. Synapse

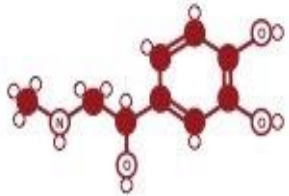


NEUROTRANSMITTERS

Chemical messengers of the nervous system

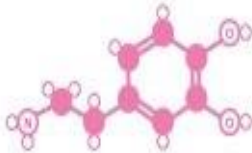
Over 100 different ones; 7 do majority of work

ADRENALINE



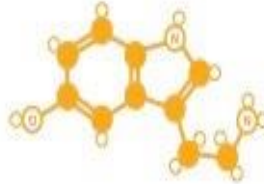
Fight or flight
neurotransmitter

DOPAMINE



Pleasure
neurotransmitter

SEROTONIN



Mood
neurotransmitter

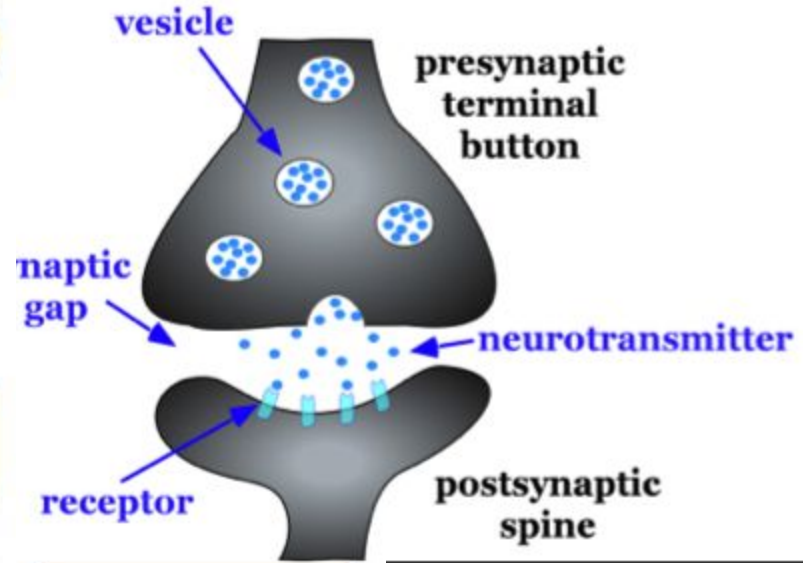
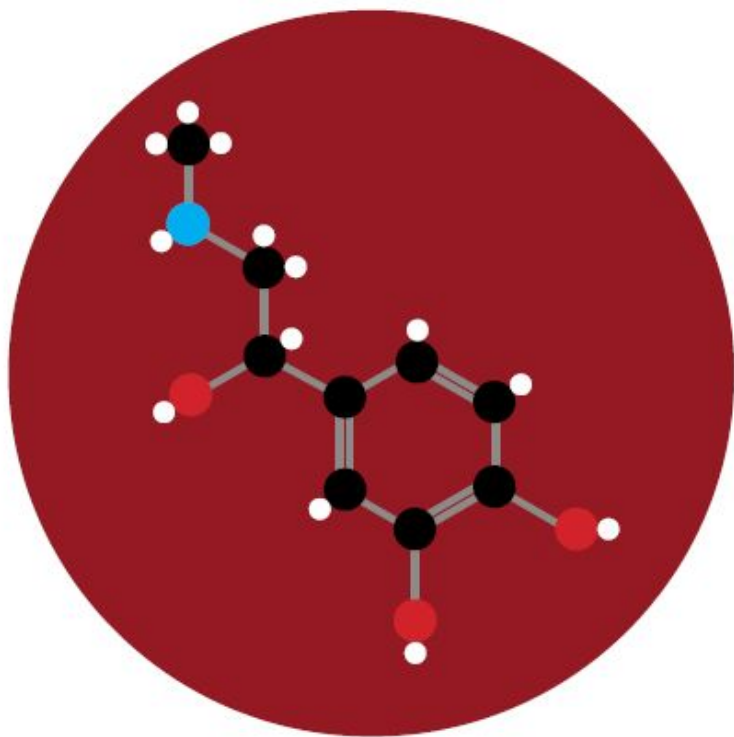


Table 9.1 Some Neurotransmitters and Their Functions

Neurotransmitter	Function	Examples of Malfunctions
<i>Acetylcholine (ACh)</i>	Enables muscle action, learning, and memory.	With Alzheimer's disease, ACh-producing neurons deteriorate.
<i>Dopamine</i>	Influences movement, learning, attention, and emotion.	Oversupply linked to schizophrenia. Undersupply linked to tremors and decreased mobility in Parkinson's disease.
<i>Serotonin</i>	Affects mood, hunger, sleep, and arousal.	Undersupply linked to depression. Some antidepressant drugs raise serotonin levels.
<i>Norepinephrine</i>	Helps control alertness and arousal.	Undersupply can depress mood.
<i>GABA (gamma-aminobutyric acid)</i>	A major inhibitory neurotransmitter.	Undersupply linked to seizures, tremors, and insomnia.
<i>Glutamate</i>	A major excitatory neurotransmitter; involved in memory.	Oversupply can overstimulate the brain, producing migraines or seizures (which is why some people avoid MSG, monosodium glutamate, in food).

ADRENALINE

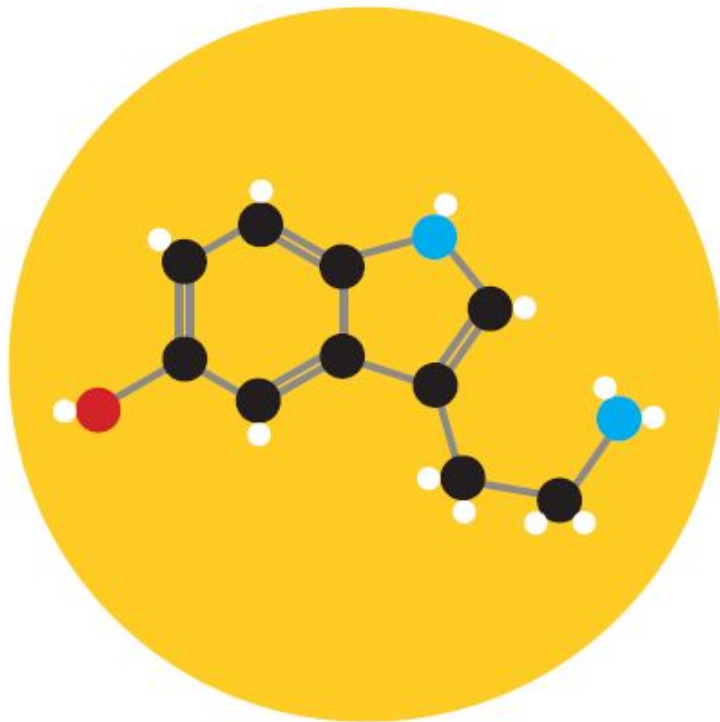
THE 'RIGHT OR FLIGHT' NEUROTRANSMITTER



Adrenaline, also known as epinephrine, is a hormone produced in high stress or exciting situations. It stimulates increased heart rate, contracts blood vessels, and dilates airways, to increase blood flow to the muscles & oxygen to the lungs. This leads to a physical boost, and heightened awareness. EpiPens, which are used to treat allergic reactions, work by injecting adrenaline.

SEROTONIN

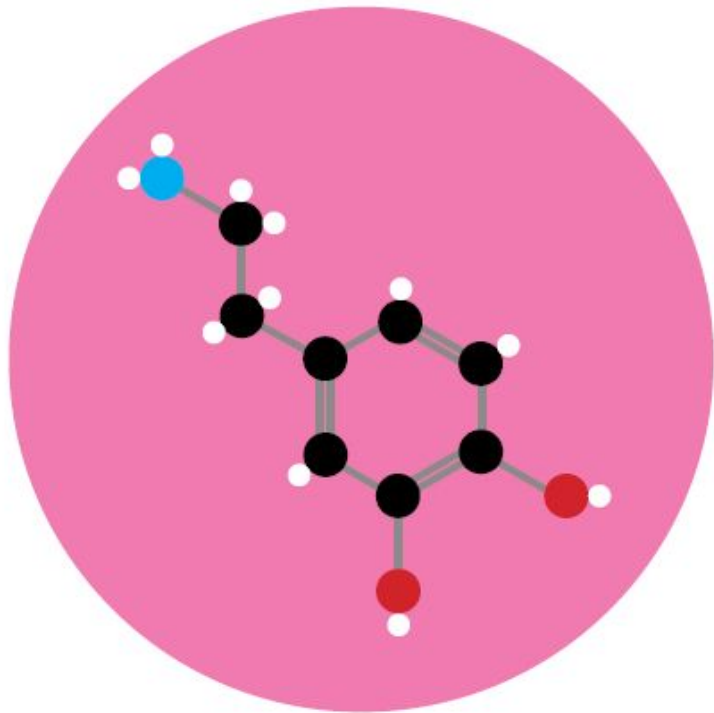
THE MOOD NEUROTRANSMITTER



Serotonin is thought to be a contributor to feelings of well-being and happiness. It regulates the sleep cycle along with melatonin, and also regulates intestinal movements. Low levels of serotonin have been linked to depression, anxiety, and some mental disorders. Antidepressants work by increasing serotonin levels. Exercise and light levels can also both have positive effects on the levels of serotonin.

DOPAMINE

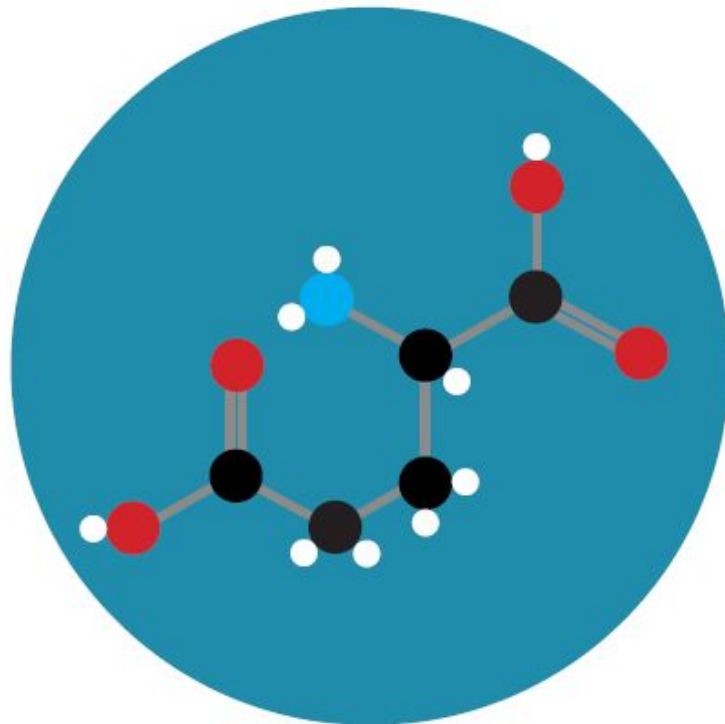
THE PLEASURE NEUROTRANSMITTER



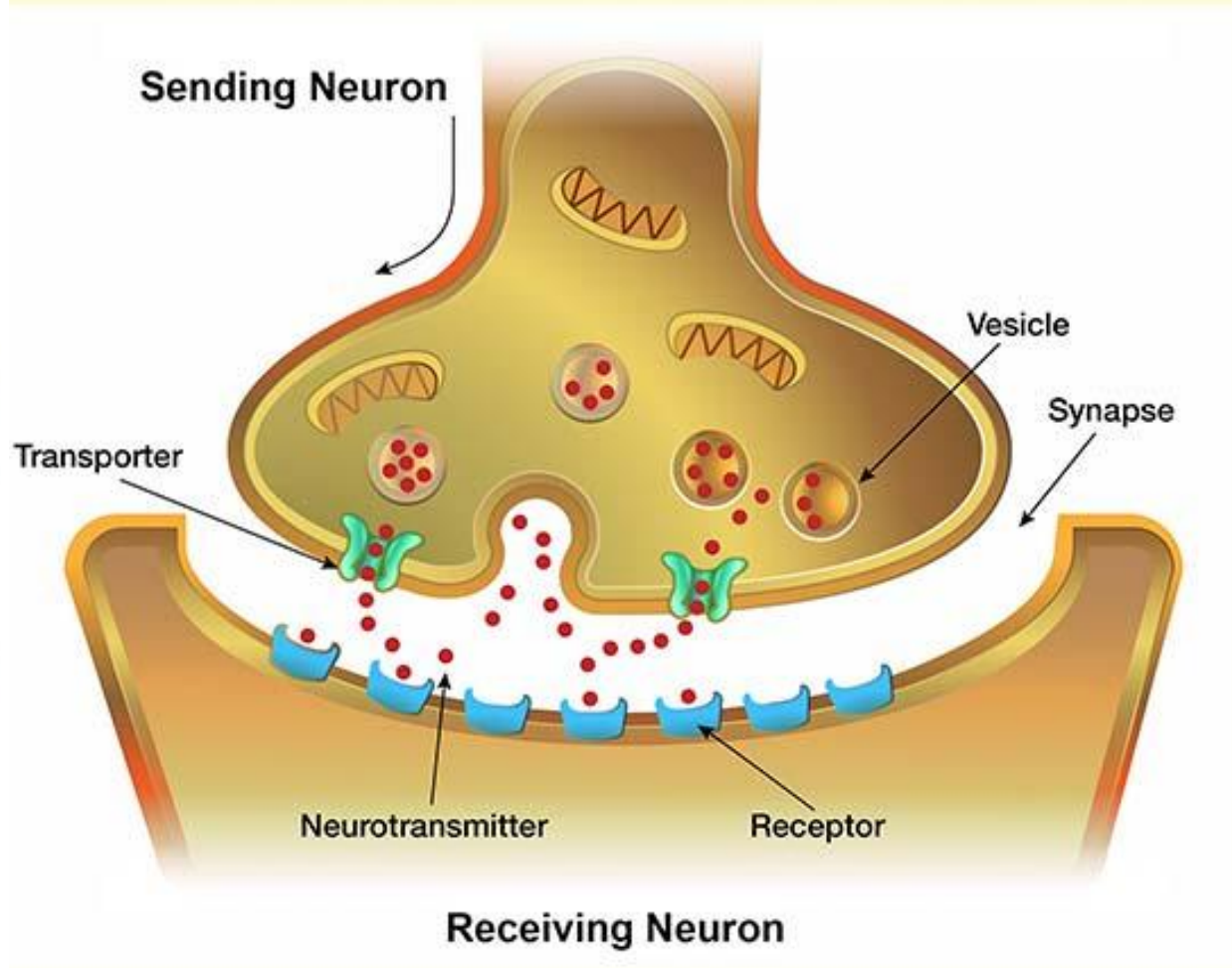
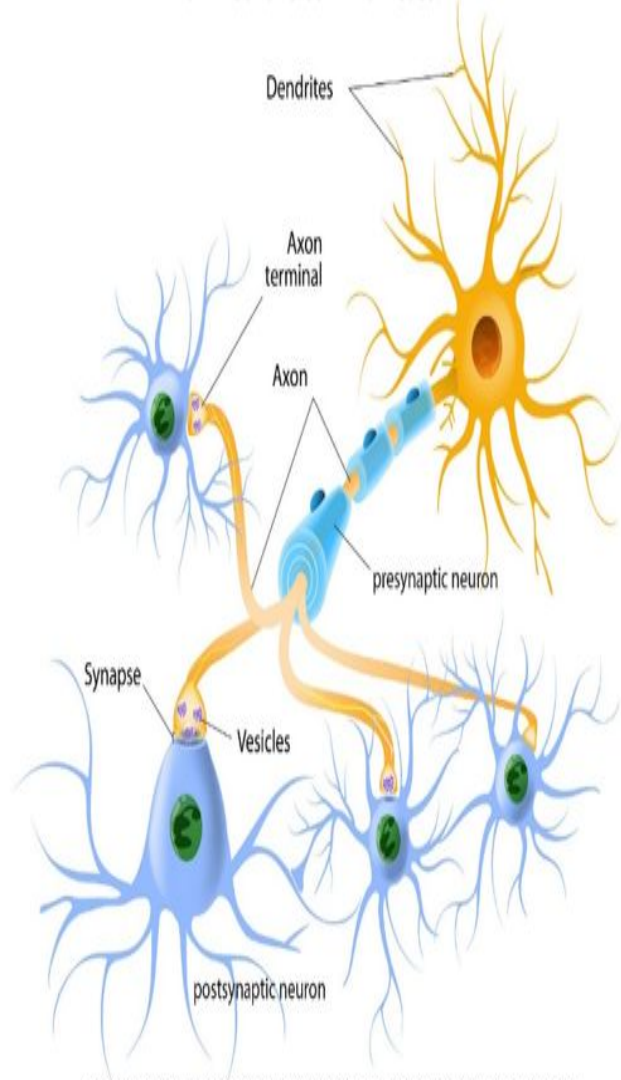
Dopamine is associated with feelings of pleasure & satisfaction. It is also associated with addiction, movement, and motivation. The feelings of satisfaction caused by dopamine can become desired, and to satisfy this the person will repeat behaviours that lead to release of dopamine. These behaviours can be natural, as with eating and sex, or unnatural, as with drug addiction.

GLUTAMATE

THE MEMORY NEUROTRANSMITTER

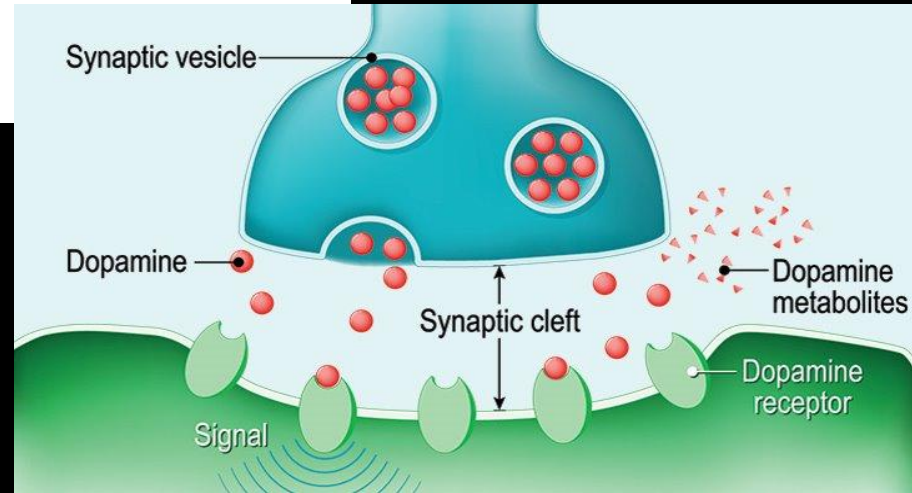


Glutamate is the most common neurotransmitter in the brain, and is involved in cognitive functions, such as learning and memory. It also regulates brain development and creation of nerve contacts. Glutamate is actually toxic to neurons in larger quantities, and if too much glutamate is present it can kill them; brain damage or strokes can lead to the creation of a harmful excess, killing brain cells.



Excitatory vs. Inhibitory

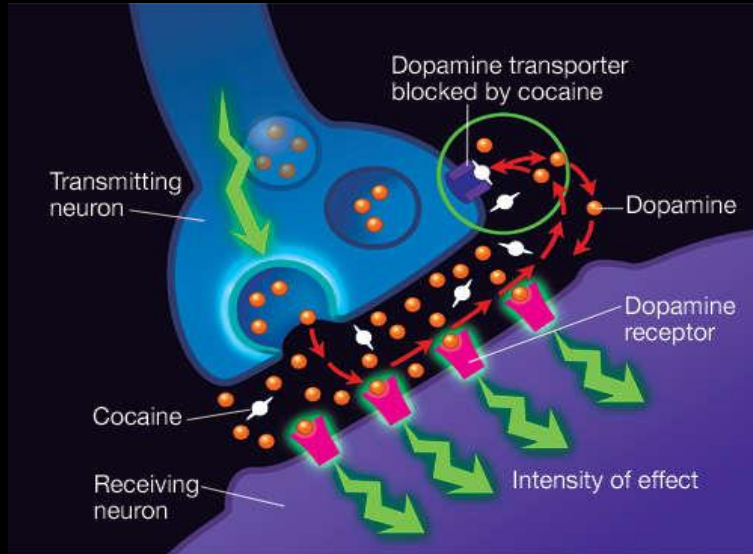
- **Excitatory message**—increases the likelihood that the postsynaptic neuron will activate
- **Inhibitory message**—decreases the likelihood that the postsynaptic neuron will activate.



Agonists vs. Antagonists

Drugs also can excite or inhibit the function of neurons

Agonists- enhance action of neurotransmitter



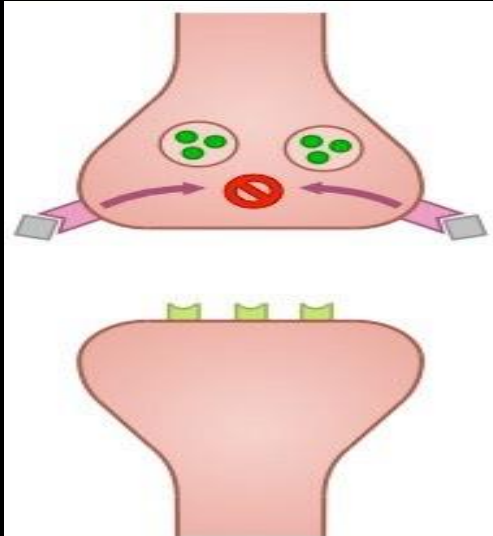
Cocaine blocks dopamine neurotransmitter reuptake



Agonists vs. Antagonists

Drugs also can excite or inhibit the function of neurons

Antagonists- inhibit action of neurotransmitter



THC / cannabis (☐)
Binds cannabinoid
receptors, causing
hyperpolarisation
(pre-synaptic)

Marijuana blocks neurotransmitters
regulating mood and memory leading to
feelings of relaxation



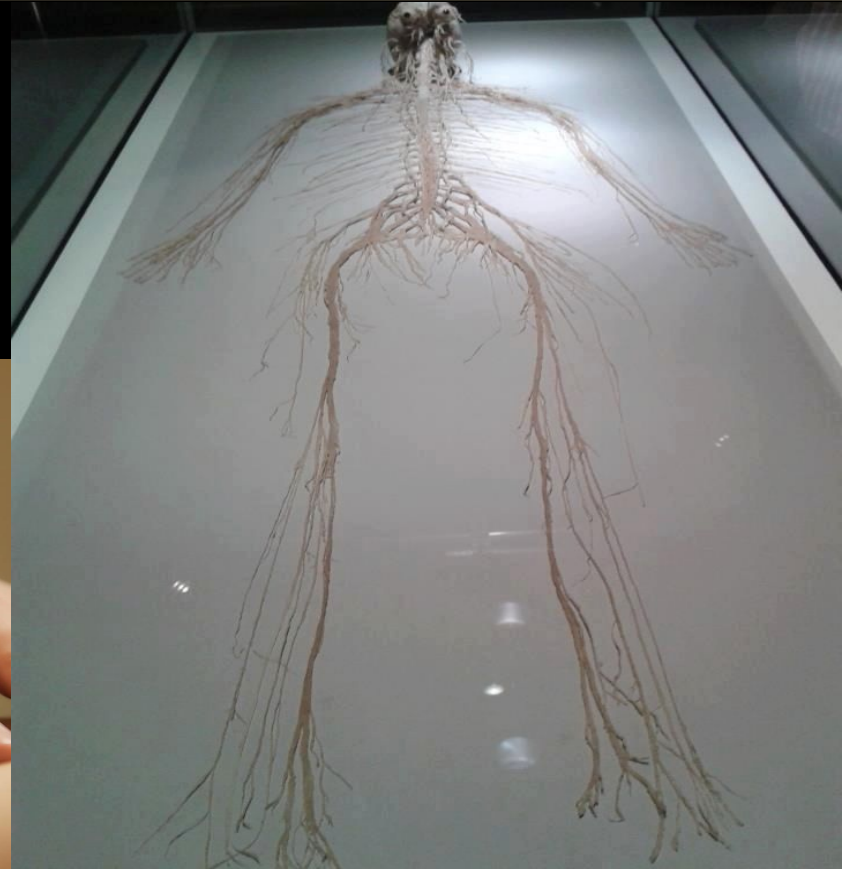
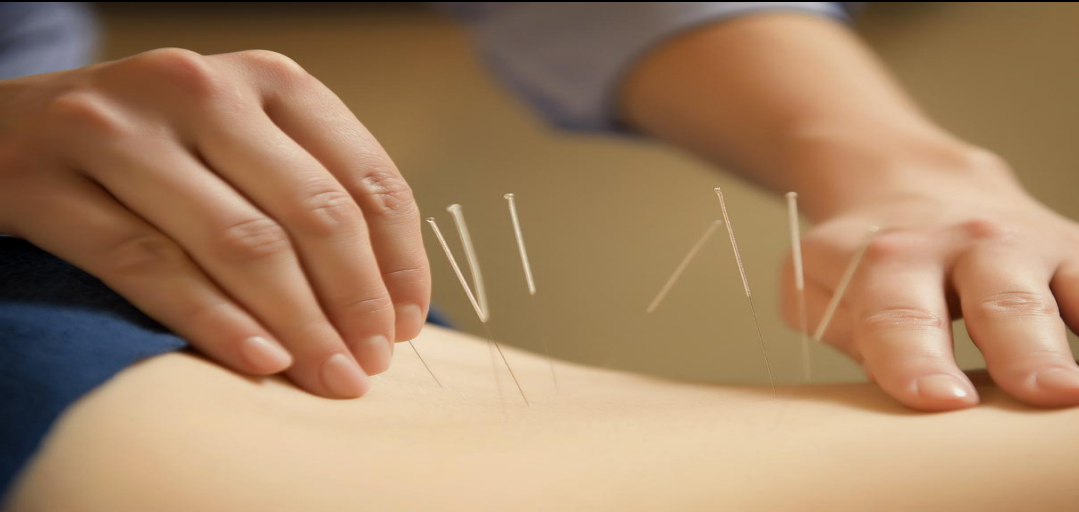
CENTRAL NERVOUS SYSTEM (CNS)

The brain and spinal cord



PERIPHERAL NERVOUS SYSTEM (PNS)

All parts of the nervous system outside the brain and spinal cord



Peripheral Nervous System

- Peripheral nerves (cranial and spinal)
- Communication between CNS and body

Autonomic Nervous System

- Controls involuntary responses

Somatic Nervous System

- Controls voluntary movement

Sympathetic Division

- Mobilises body systems
- 'Flight or fight' responses

Parasympathetic Division

- Conserves energy
- 'Rest and digest' responses



PERIPHERAL NERVOUS SYSTEM

12

PAIN AND YOUR PNS

Welcome Harvard Medical School
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