

PHARMACOLOGY OF CENTRAL NERVOUS SYSTEM



CENTRAL NERVOUS SYSTEM

❑ Drugs can produce diverse pharmacological & psychological effects such as:

- Induction of **Anesthesia**
- Relief of **Pain**
- Prevention of **Epileptic seizures**
- Reduction of **Anxiety**
- Treatment of **Depression**
- TTT. of **Alzheimer's disease** & **Parkinsonism**

❑ **CNS Drugs** : Sedatives, Tranquilizers, Hypnotics, Anesthetics, Anticonvulsants , Analgesics, Psychotropic agents, Behavioral

Structure of CNS

1- Brain

- The Brain formed of 3 main parts:

I. The Forebrain

- Cerebrum
- Thalamus
- Hypothalamus

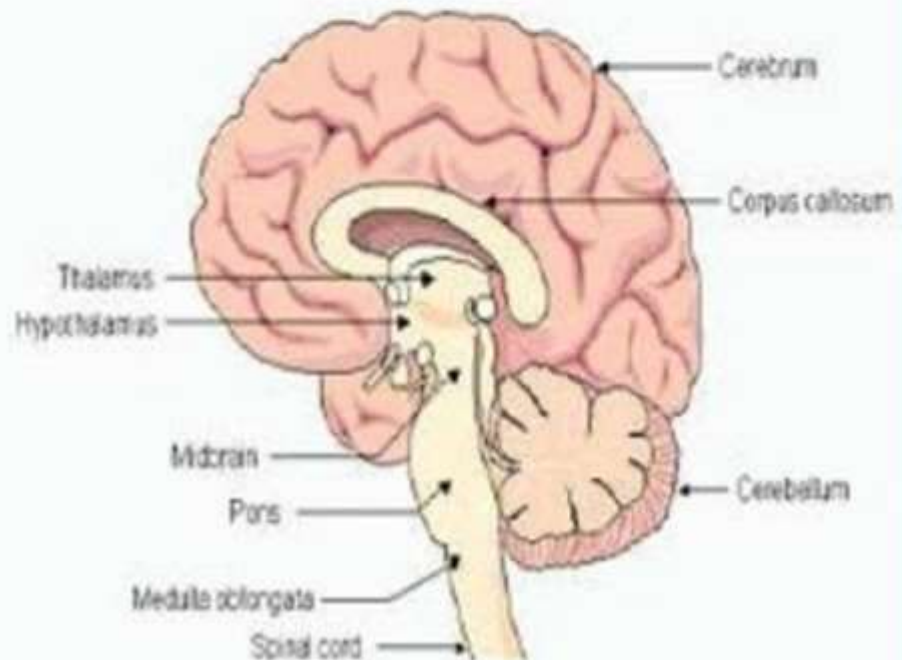
II. The Midbrain

III. The Hindbrain

- Cerebellum
- Pons
- Medulla oblongata

2- Spinal cord

Diagram of Human Brain



Transmission in CNS

- ❑ A nerve impulse (electric current) passé along axon to presynaptic membrane.
- ❑ Release neurotransmitter into synaptic cleft.
- ❑ NT interacts with receptors on effector cells to induce response.
- ❑ NT released in response to action potentials is voltage dependent & require calcium influx (Neuroregulators).
- **Transmission in C.N.S. occurs in 2 ways:**
- **A- Release of Excitatory transmitter by Neuron**
- (1) Cause depolarization of postsynaptic membrane of neuron
- (2) Cause Conduction of N impulse [postsynaptic excitation].
- **B- Release of Inhibitory Transmitter by Neuron**
- (!) Cause Hyper polarization of postsynaptic membrane .
- (2) Block conduction of nerve impulse [postsynaptic inhibition].

Neurohumoral Transmission in central nervous system

All drugs are act on CNS through –

Voltage gated receptor-

- Ion channel-example – Na^+ , K^+ , Cl^- ,
 Ca^{++}

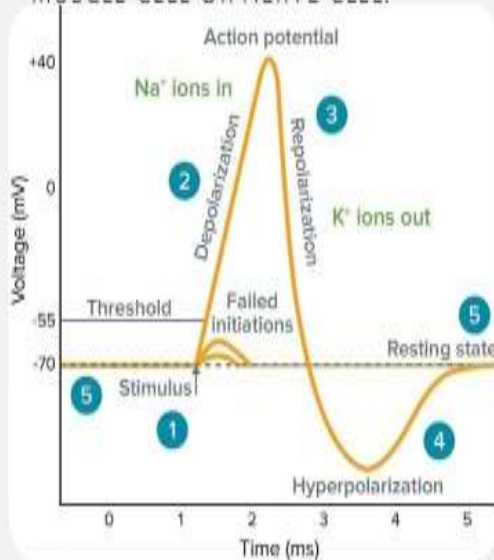
Ligand gated receptor –

- They are also known as Inotropic receptor.
- Those which also bind to G-protein receptor
- They are called **Metabotropic receptor**.

Neurohumoral Transmission in central nervous system-

ACTION POTENTIAL

THE CHANGE IN ELECTRICAL POTENTIAL ASSOCIATED WITH THE PASSAGE OF AN IMPULSE ALONG THE MEMBRANE OF A MUSCLE CELL OR NERVE CELL.



- **Resting Potential**

- Sodium and potassium channels are closed. Na⁺ rush into the cell; K⁺ are concentrated inside the cell. Potential difference: -85 mV.

- **Depolarization**

- Sodium channels open in response to a stimulus. Na⁺ rush into the cell according to the dictates of diffusion. Final potential difference +30 mV.

- **Repolarization**

- Na⁺ channels close and K⁺ channels open. K⁺ rush out of the cell according to the dictates of diffusion. Potential difference: slightly below -85 mV.

- **Hyperpolarization** is a change in a cell's membrane potential that makes it more negative. It is the opposite of a depolarization. It inhibits action potentials by increasing the stimulus required to move the membrane potential to the action potential threshold.

- **Resting Conditions Re-established**

- Na⁺ and K⁺ channels are closed. Sodium-potassium exchange pump moves Na⁺ out and K⁺ in. Resting potential difference: -85 mV.

Neurohumoral Transmission in central nervous system-

Neurotransmission :-

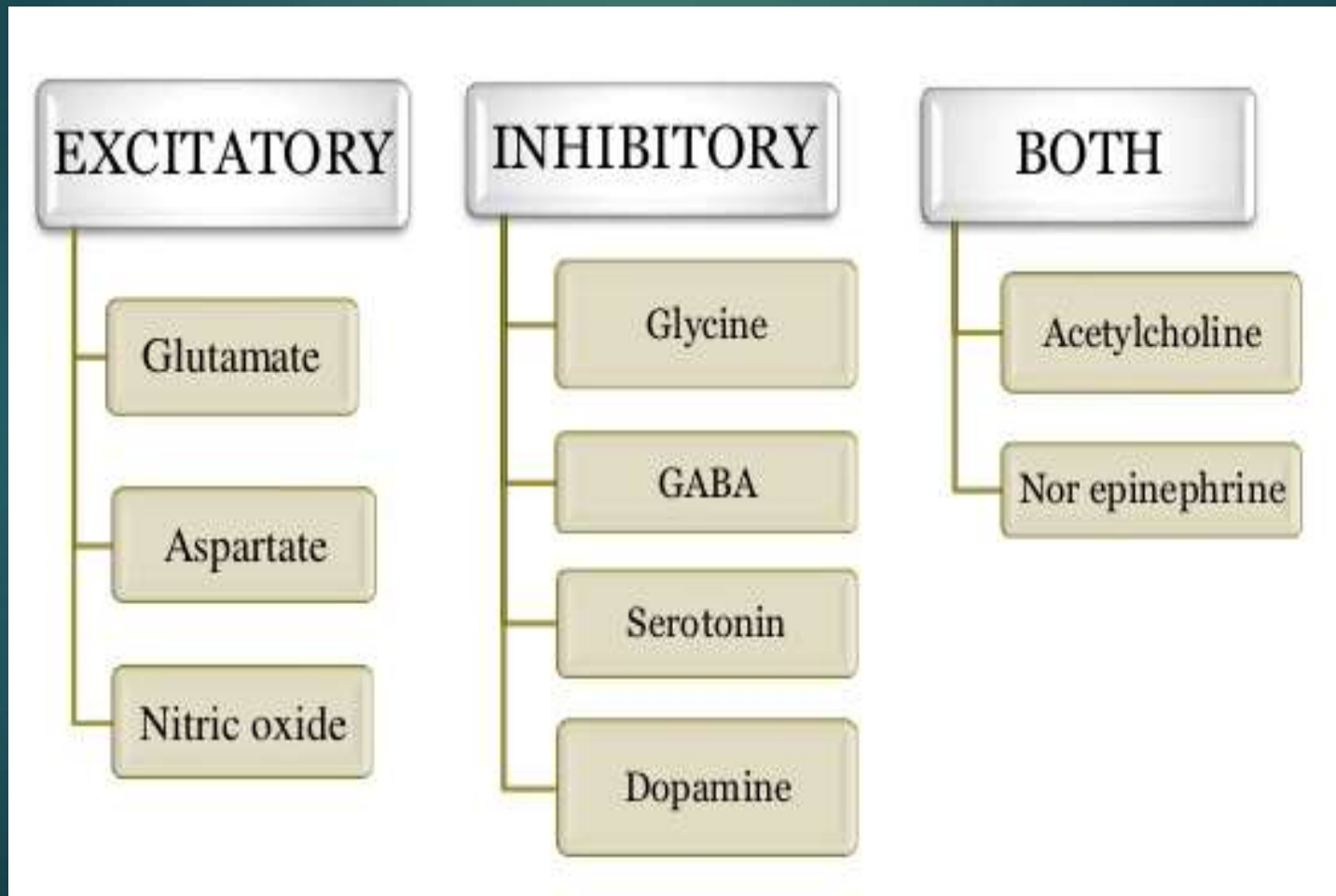
- Impulse is transmitted across a synapse between two neurons .
- Neurotransmitters (NT) are released in to synaptic cleft either by stimulation or inhibit the post synaptic neuron

Certain criteria in order to accept NT:

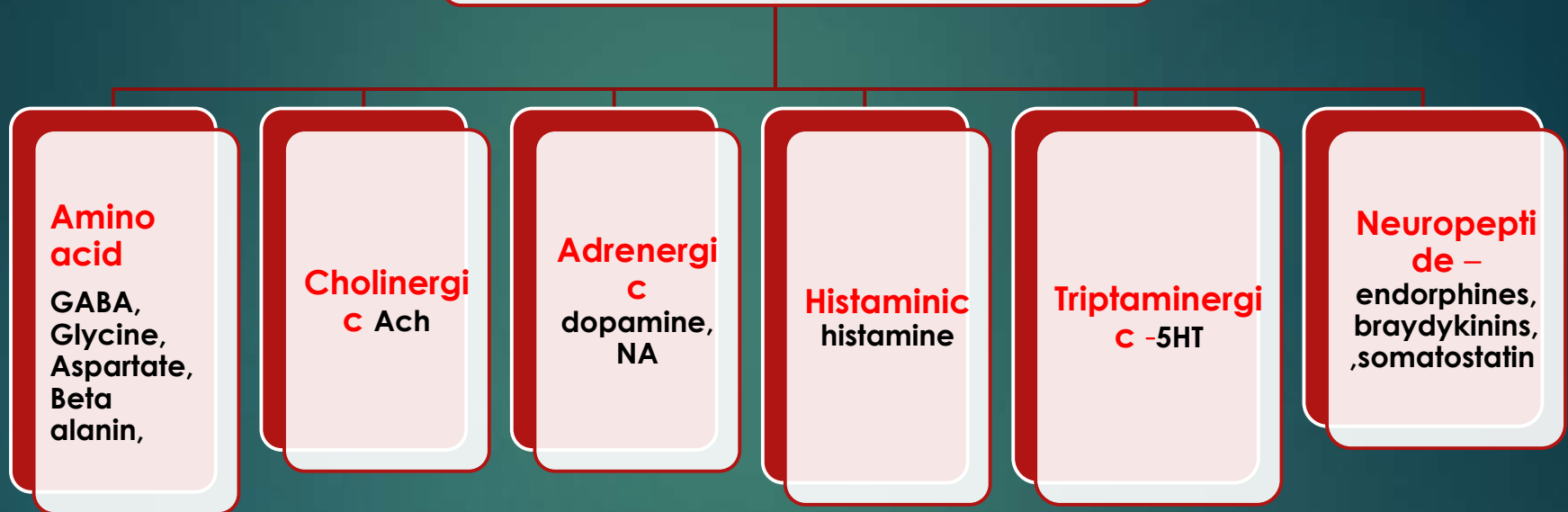
- Must be present in the neurons & presynaptic nerve endings should have a discrete rather than uniform pattern of distribution
- Must be released from presynaptic nerve terminal
- Enzymatic mechanisms capable of synthesizing and degraded the substance should be present with in the neuron
- Local concentration of the substance related to function of neuronal structure & fluctuations in its concentration
- Blocking agents should produce demonstrable effects by preventing the access of transmitter

Neurohumoral Transmission in central nervous system-

Neurotransmitters are chemical messengers that transmit signals from a neuron to a target cell across a synapse.



CLASSIFICATION OF CNS NEUROTRANSMITTERS



<https://www.slideshare.net/DekolluSuku/neurohumoral-transmission-in-cns>

<https://www.slideshare.net/RAviKumarReddy31/neurohumoral-transmission-in-cns>

Thank
you