

Antiepileptic Drugs (AEDs)

1. Epilepsy and Seizures

Epilepsy is a neurological disorder caused by an **imbalance** between **excitatory** (Glutamate, Na⁺, Ca²⁺) and **inhibitory** (GABA, Cl⁻) signals in the brain. This imbalance leads to sudden, uncontrolled electrical impulses, resulting in seizures.

2. Types of Seizures

a. Focal Seizures:

-Affect **one hemisphere** of the brain.

b. Generalized Seizures:

- Affect **both hemispheres** of the brain.

-Loss of consciousness is present.

3. Mechanisms of Antiepileptic Drugs (AEDs)

Antiepileptic drugs work by reducing excessive excitation or enhancing inhibition to restore balance in the brain.

- Too much excitation (caused by excess Glutamate, Na⁺, and Ca²⁺) → AEDs block excitatory pathways.

- Too little inhibition (caused by insufficient GABA and Cl⁻) → AEDs enhance inhibitory pathways.

4. Classification of Antiepileptic Drugs

Older AEDs

1. Valproic Acid

- Broad-spectrum antiseizure drug.

- Inhibits Na⁺ and Ca²⁺ channels and enhances GABA.

2. Phenytoin

- Blocks Na⁺ channels to reduce neuronal excitability.

3. Barbiturates

-Enhances GABA activity by increasing Cl⁻ influx.

- Used mainly for status epilepticus and focal seizures.

B. Newer AEDs

1. Na⁺ Channel Blockers

-Reduce excessive neuronal firing by blocking sodium influx.

2. Ca²⁺ Channel Blockers

-Specifically blocks T-type Ca²⁺ channels, effective for absence seizures.

3. GABA Reuptake Inhibitors

- Inhibits the reuptake of GABA, increasing its levels and enhancing inhibitory action.

4. GABAergic Enhancers

- Increase GABA activity, **enhancing neuronal inhibition**

5. SV2A Modulators

- modulate synaptic vesicle protein 2A

6. AMPA Receptor Inhibitors

- Reduce excitatory glutamate

AMPA & SV2A Inhibitors: Prevent excessive glutamate release.