



Skeletal Muscle Relaxants

جامعة ساوة
كلية التقنيات الصحية والطبية
قسم تقنيات التخدير
المرحلة الثانية

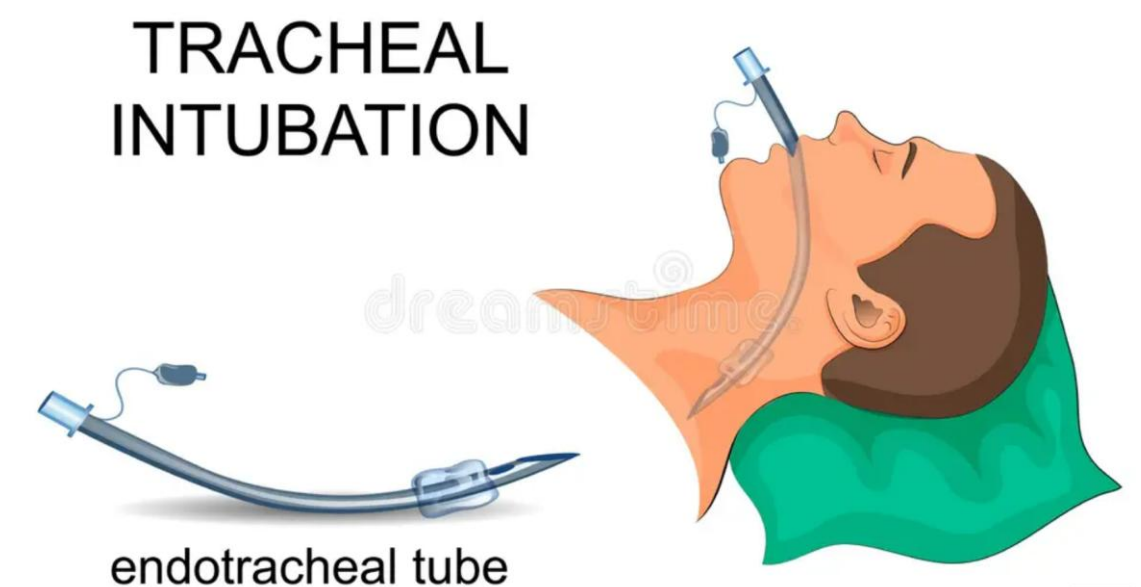
Introduction

Skeletal muscle relaxants are a group of drugs used to **reduce muscle tone, relieve muscle spasm, or produce complete muscle paralysis.**

In anesthesia practice, these drugs are extremely important because they help the anesthetist perform:

1. **Endotracheal intubation**
2. **Surgical procedures requiring complete muscle relaxation**
3. **Mechanical ventilation**

These drugs do **not cause anesthesia or analgesia**, but they **facilitate surgery** by relaxing muscles.

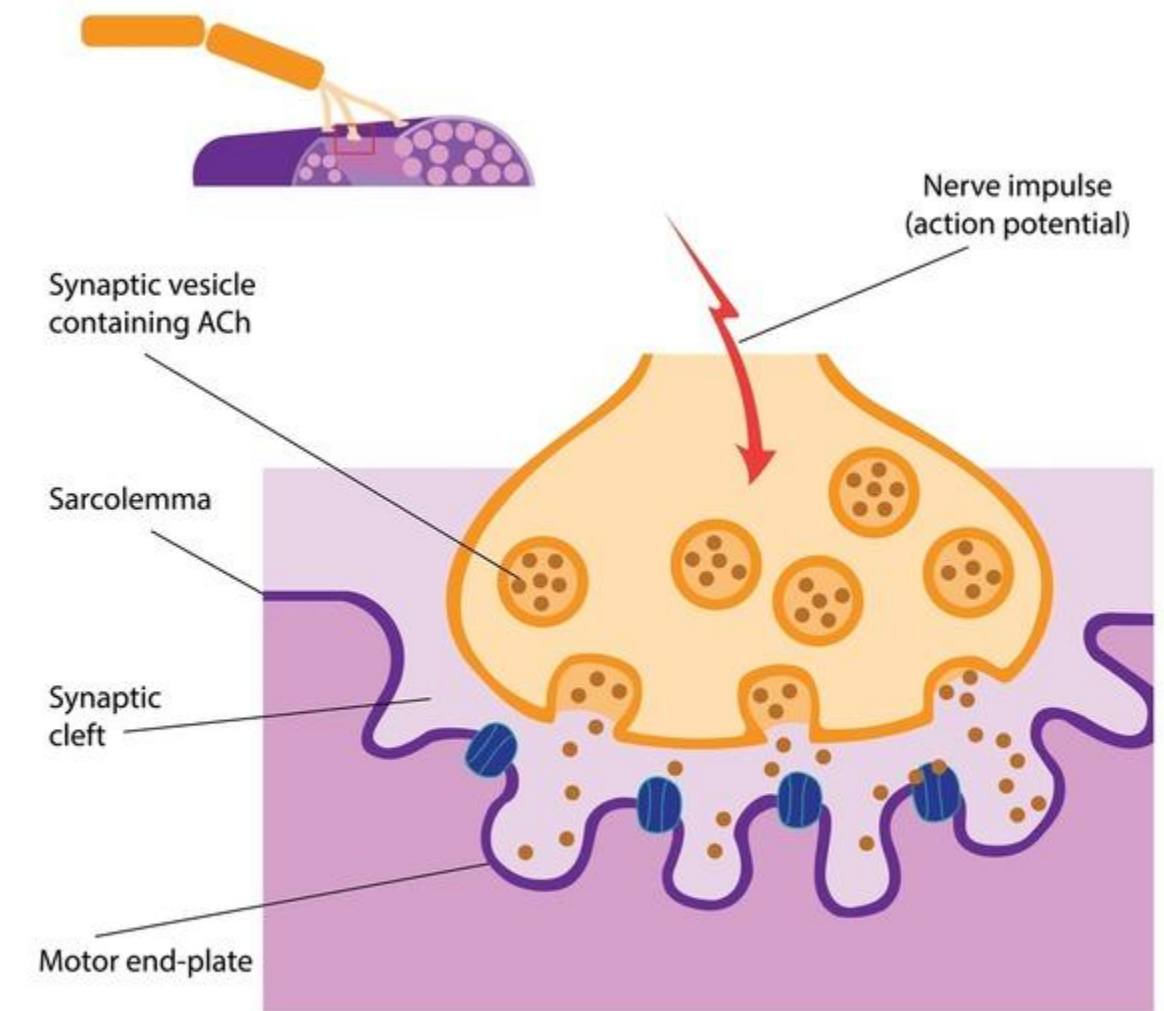


Physiology Review: Neuromuscular Junction (NMJ)

To understand how these drugs work, recall the basic steps:

1. **Nerve impulse arrives** at motor nerve terminal.
2. **Acetylcholine (ACh)** is released.
3. ACh binds to **nicotinic receptors** on the muscle endplate.
4. Muscle membrane **depolarizes** → contraction.
5. ACh is broken down by **acetylcholinesterase**.

Neuromuscular blockers interfere with this pathway.



Classification of Skeletal Muscle Relaxants

Skeletal muscle relaxants are divided into **two main categories**:

1. Peripherally Acting Muscle Relaxants (Neuromuscular Blocking Agents)

These drugs act **at the neuromuscular junction** (the connection between motor nerve and skeletal muscle).

They are divided into:

1. Depolarizing Neuromuscular Blocker

Succinylcholine (Suxamethonium)

2. Non-depolarizing Neuromuscular Blockers

Atracurium ,Cisatracurium ,Vecuronium ,Rocuronium

2. Centrally Acting Muscle Relaxants

These act on the **central nervous system (CNS)** to reduce muscle spasm.

Examples:

Diazepam ,Baclofen



CLASSIFICATION OF SKELETAL MUSCLE RELAXANTS

CENTRALLY ACTING MUSCLE RELAXANTS

These act on the central nervous system (CNS) to reduce muscle spasm.

Examples:

Diazepam ,Baclofen

PERIPHERALLY ACTING MUSCLE RELAXANTS

These drugs act at the neuromuscular junction (the connection between motor nerve and skeletal muscle).

NON-DEPOLARIZING NEUROMUSCULAR BLOCKERS

Atracurium ,Cisatracurium
,Vecuronium ,Rocuronium

DEPOLARIZING NEUROMUSCULAR BLOCKER

Succinylcholine
(Suxamethonium)

Depolarizing Muscle Relaxants

Succinylcholine (Suxamethonium)

Mechanism of Action

Mimics acetylcholine (ACh).

Binds to nicotinic receptors and causes **persistent depolarization**.

Muscle becomes unable to repolarize → **paralysis**.

This is called a **Phase I block**.

Onset & Duration

Very rapid onset: 30–60 seconds

Very short duration: 5–10 minutes

Ideal for rapid sequence intubation.



Depolarizing Muscle Relaxants

Clinical Uses

Endotracheal intubation

Short procedures (ECT, laryngoscopy)

Rapid airway control

Side Effects

Hyperkalemia (dangerous in burns, trauma, kidney failure)

Muscle pain (myalgia)

Bradycardia

Malignant hyperthermia (rare but life-threatening)

Increased intraocular pressure

Contraindications

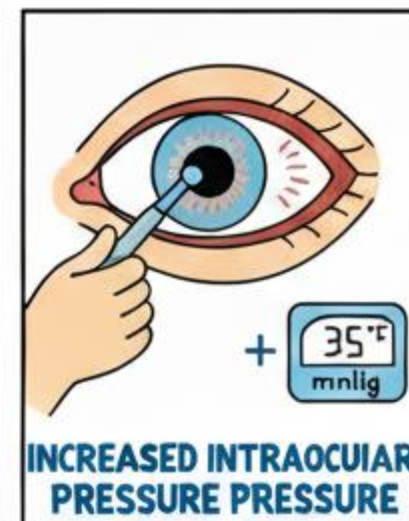
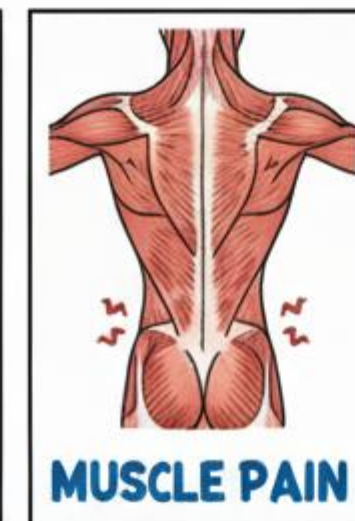
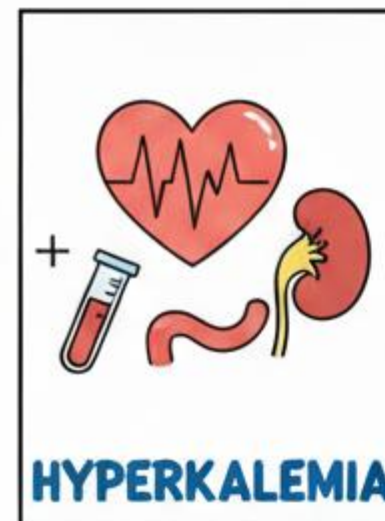
Burns patients

Spinal cord injury

Neuromuscular diseases

Severe trauma

High potassium levels

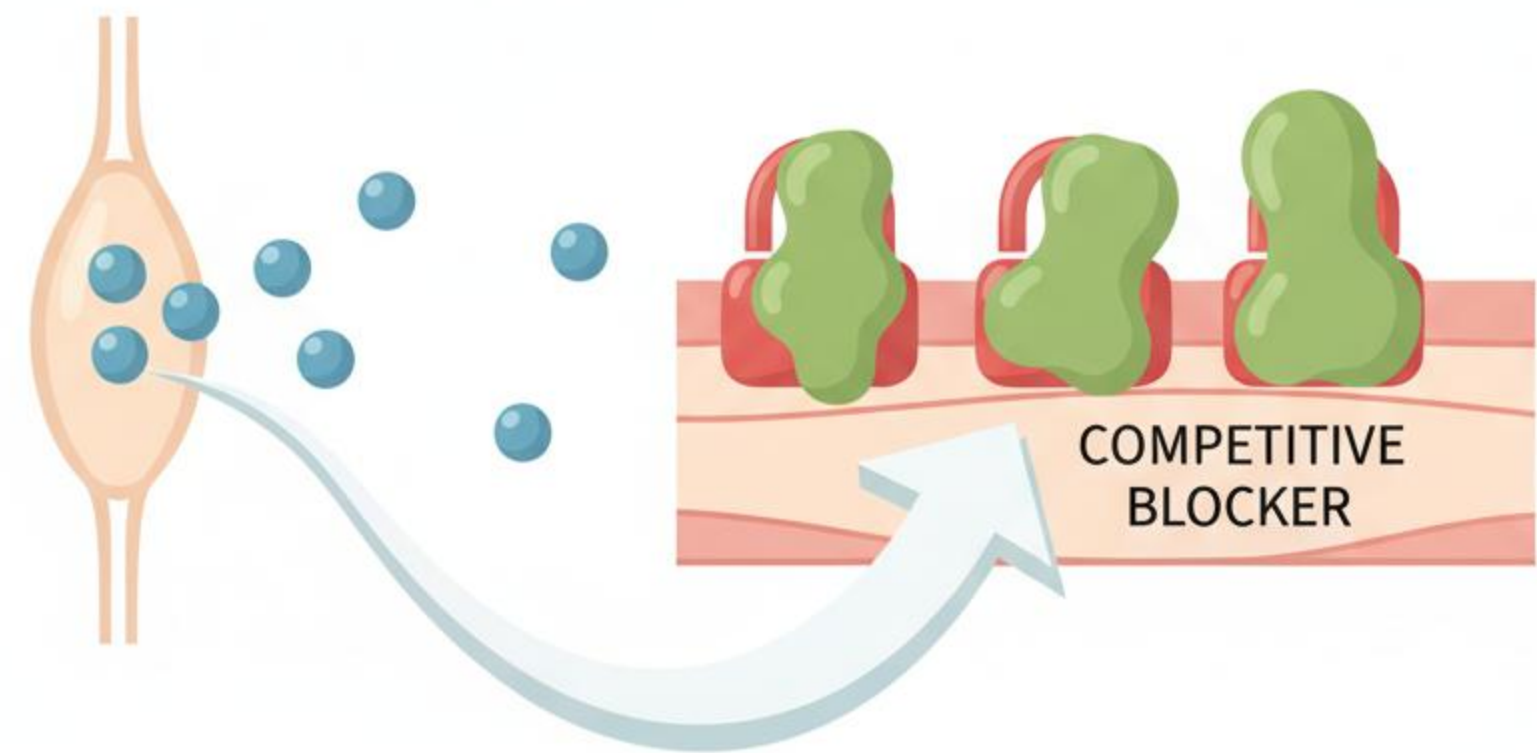


Non-Depolarizing Muscle Relaxants

These drugs **competitively block acetylcholine** at nicotinic receptors → preventing depolarization → paralysis.

General Properties

- Slower onset than succinylcholine.
- Longer duration.
- Can be reversed with **anticholinesterases** (Neostigmine) or **Sugammadex**.



NO DEPOLORIZATION → MUSCLE PARALYSIS

Non-Depolarizing Muscle Relaxants

1. Atracurium

Onset & Duration

Onset: 2–3 minutes

Duration: 20–35 minutes

Metabolism

Broken down by **Hofmann elimination** → independent of liver or kidney.

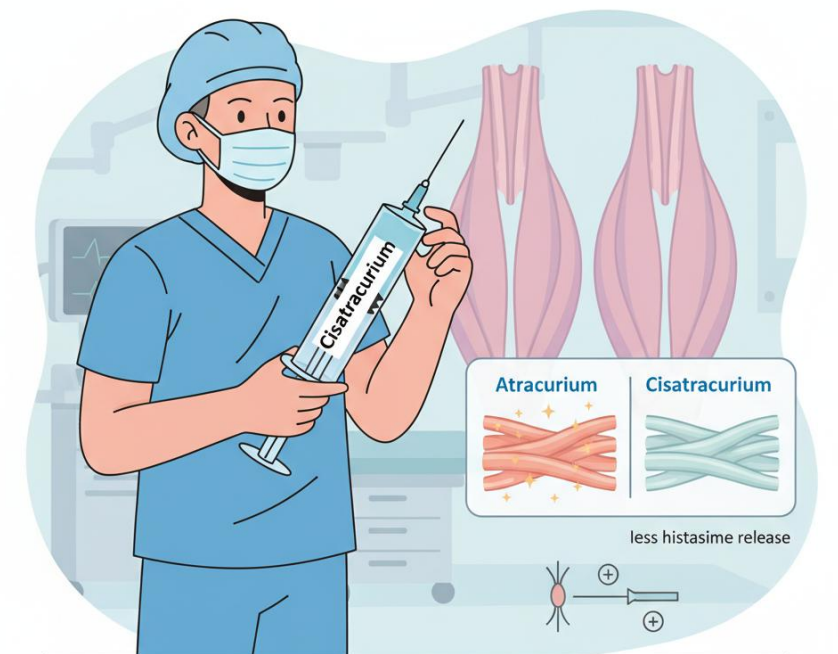
Very useful in **renal or liver failure** patients.

Side Effects

Histamine release (hypotension, flushing)

2. Cisatracurium

- More potent and **less histamine release** than atracurium.
- Safer in **cardiac patients**.



Non-Depolarizing Muscle Relaxants

3. Vecuronium

Onset & Duration

Onset: 2–3 minutes

Duration: 30–40 minutes

No histamine release.

Uses

Common in general anesthesia.

4. Rocuronium

Onset

Rapid onset similar to succinylcholine in high doses.

Used for **rapid sequence induction** if succinylcholine contraindicated.

Reversal

Can be reversed rapidly using **Sugammadex**.



Reversal of Non-Depolarizing Block

1. Neostigmine

Inhibits acetylcholinesterase → increases ACh levels

Given with **Atropine** or **Glycopyrrolate** to prevent bradycardia.

2. Sugammadex

Specifically reverses **Rocuronium** and **Vecuronium**

Very rapid and safe.



Comparison: Depolarizing vs Non-Depolarizing

Feature	Depolarizing (Succinylcholine)	Non-Depolarizing
Mechanism	Persistent depolarization	Competitive ACh blockade
Onset	Very fast	Slower
Duration	Very short	Short to long
Reversal	No specific reversal	Neostigmine or Sugammadex

Centrally Acting Muscle Relaxants

These drugs act on the **brain and spinal cord**.

Used for:

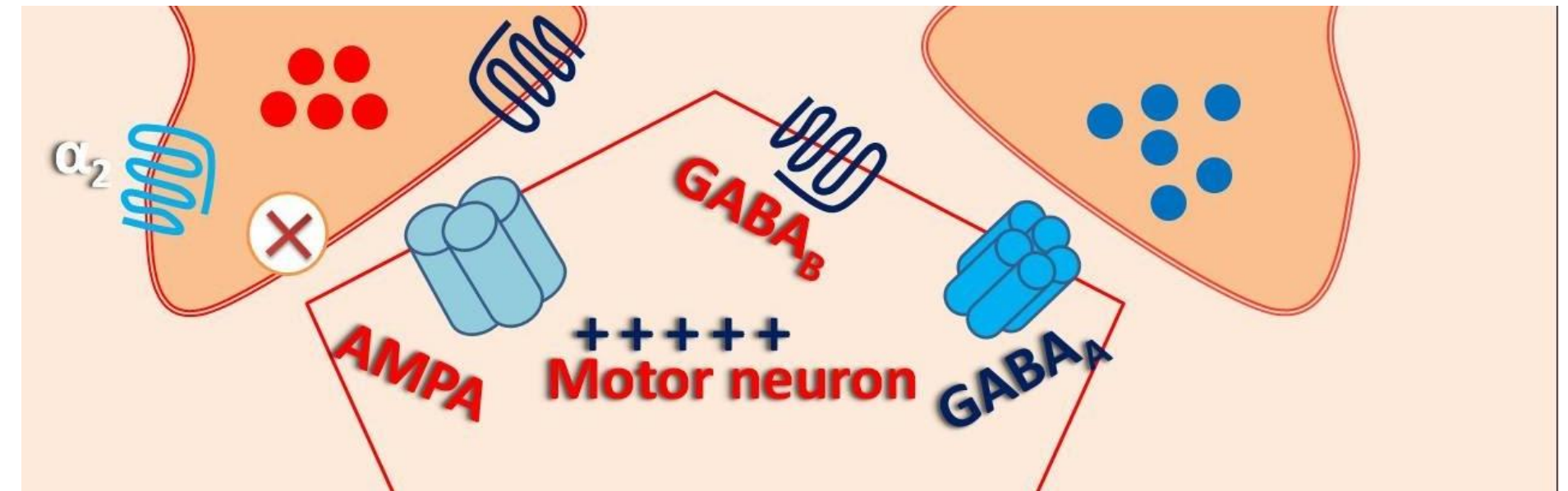
Painful muscle spasms

Back pain

Multiple sclerosis

Spinal cord injury

Not used for surgery.



Centrally Acting Muscle Relaxants

1. Diazepam (Benzodiazepine)

Mechanism

Enhances GABA inhibition in CNS.

Uses

Muscle spasm

Anxiety

Seizures

Side Effects

Sedation

Dependence



Centrally Acting Muscle Relaxants

2. Baclofen

Mechanism

GABA-B receptor agonist in the spinal cord.

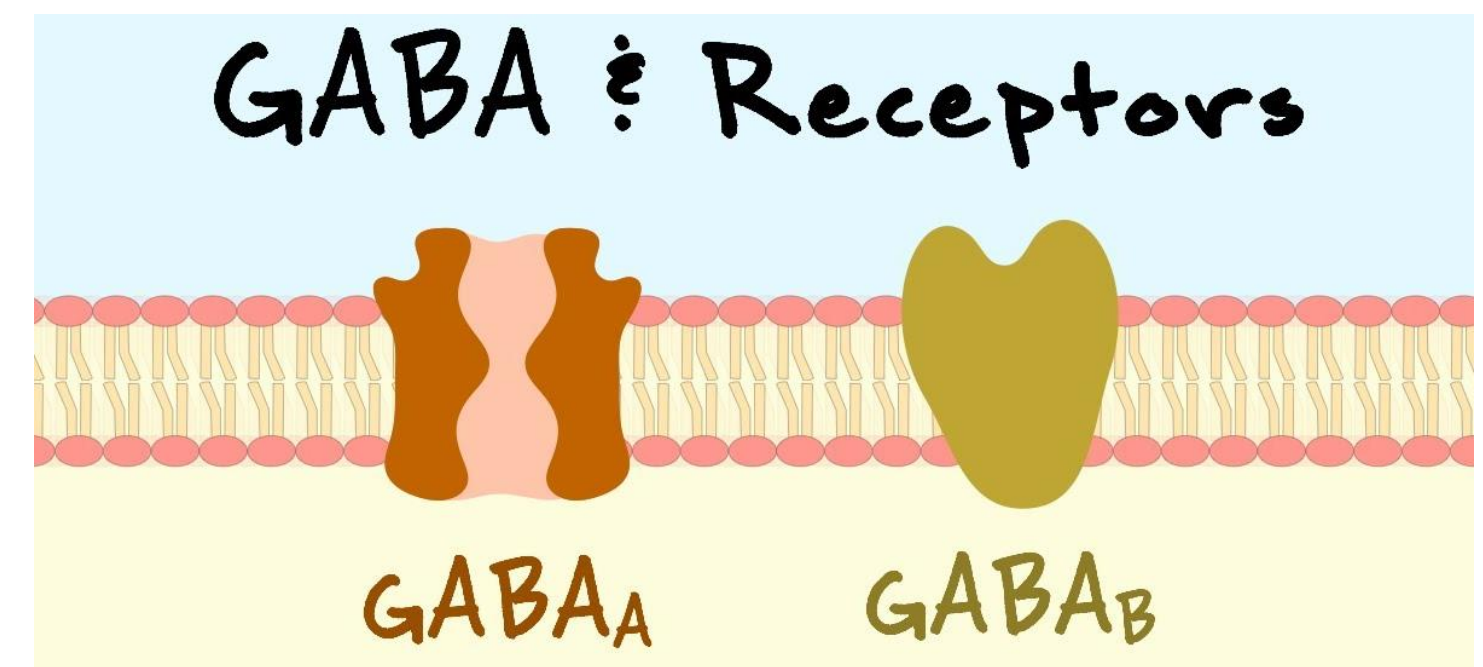
Uses

Spasticity (e.g., multiple sclerosis)

Side Effects

Weakness

Drowsiness



Safety Notes for Anaesthetic Technicians

1. Always know the **dose, onset, and duration**
2. Monitor **oxygenation** and **ventilation**
3. Be aware of **contraindications**, especially for succinylcholine
4. Prepare reversal agents (Neostigmine + Atropine / Sugammadex)
5. Observe for signs of **malignant hyperthermia**:
 - Increased CO₂
 - Muscle rigidity
 - Hyperthermia
6. Ensure availability of **dantrolene**

