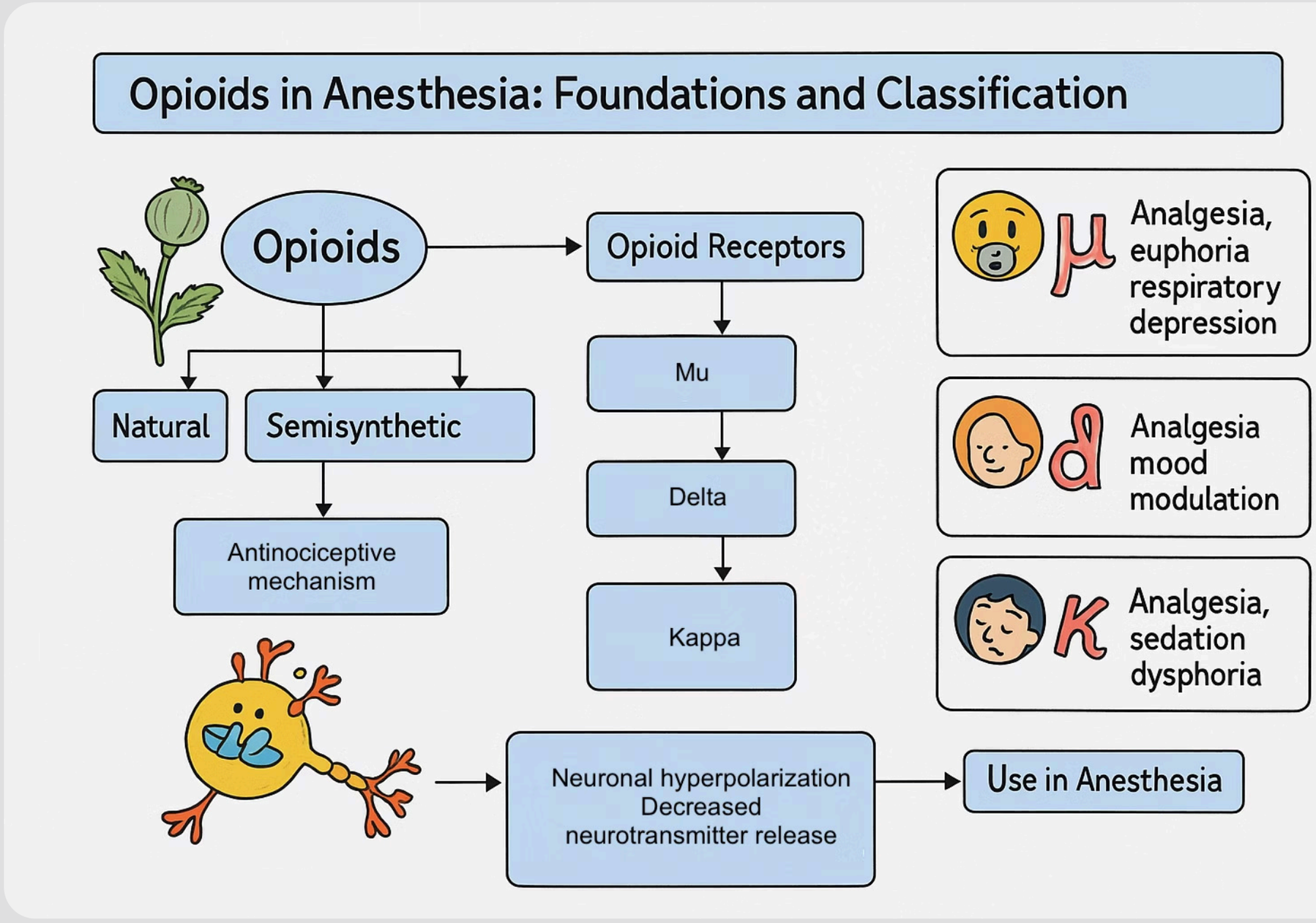
🧠 Concept Map: Opioids in Anesthesia



Classification

Mnemonic: "Now Some Synthetic Friends" → Natural, Semisynthetic, Synthetic, Fentanyl-family

Natural

Morphine, Codeine

Semisynthetic

Hydromorphone, Oxycodone, Oxymorphone

Synthetic

Fentanyl, Sufentanil, Remifentanil, Meperidine, Methadone

Opioid Receptors

Mnemonic: "Mu makes you Merry, Delta gives Dual analgesia, Kappa gets Krazy"

Receptor	Mnemonic	Primary Effects	Example Drugs
μ (Mu)	"Mood and Morphine"	Supraspinal & spinal analgesia, euphoria, respiratory depression, physical dependence	Morphine, Fentanyl
δ (Delta)	"Dual Analgesia"	Analgesia, antidepressant effects	Enkephalins
κ (Kappa)	"Krazy Dreams"	Spinal analgesia, sedation, dysphoria, hallucinations	Butorphanol, Nalbuphine

Mechanism of Action

Mnemonic: "G-protein = Go Slow"

All opioid receptors are G-protein coupled (Gi/o subtype).

1	2	3
↓ Adenylate cyclase	**↑ K^+ efflux**	**↓ Ca^{2+} influx**
↓ cAMP	hyperpolarization	↓ neurotransmitter release (ACh, NE, Substance P)

Result = Reduced neuronal excitability & pain transmission

Clinical Effects

Mnemonic: "MORPHINES"

M – Miosis

Parasympathetic stimulation (Edinger-Westphal nucleus)

O – Out of it (sedation/euphoria)

CNS depression, limbic μ activation

R – Respiratory depression

↓ brainstem CO_2 sensitivity

P – Pain relief

Spinal & supraspinal μ, δ receptor activation

H – Hypotension

Histamine release, venodilation (esp. morphine)

I – Increased ICP (in CO_2 retainers)

Secondary to ↑ $PaCO_2$

N – Nausea/vomiting

CTZ stimulation

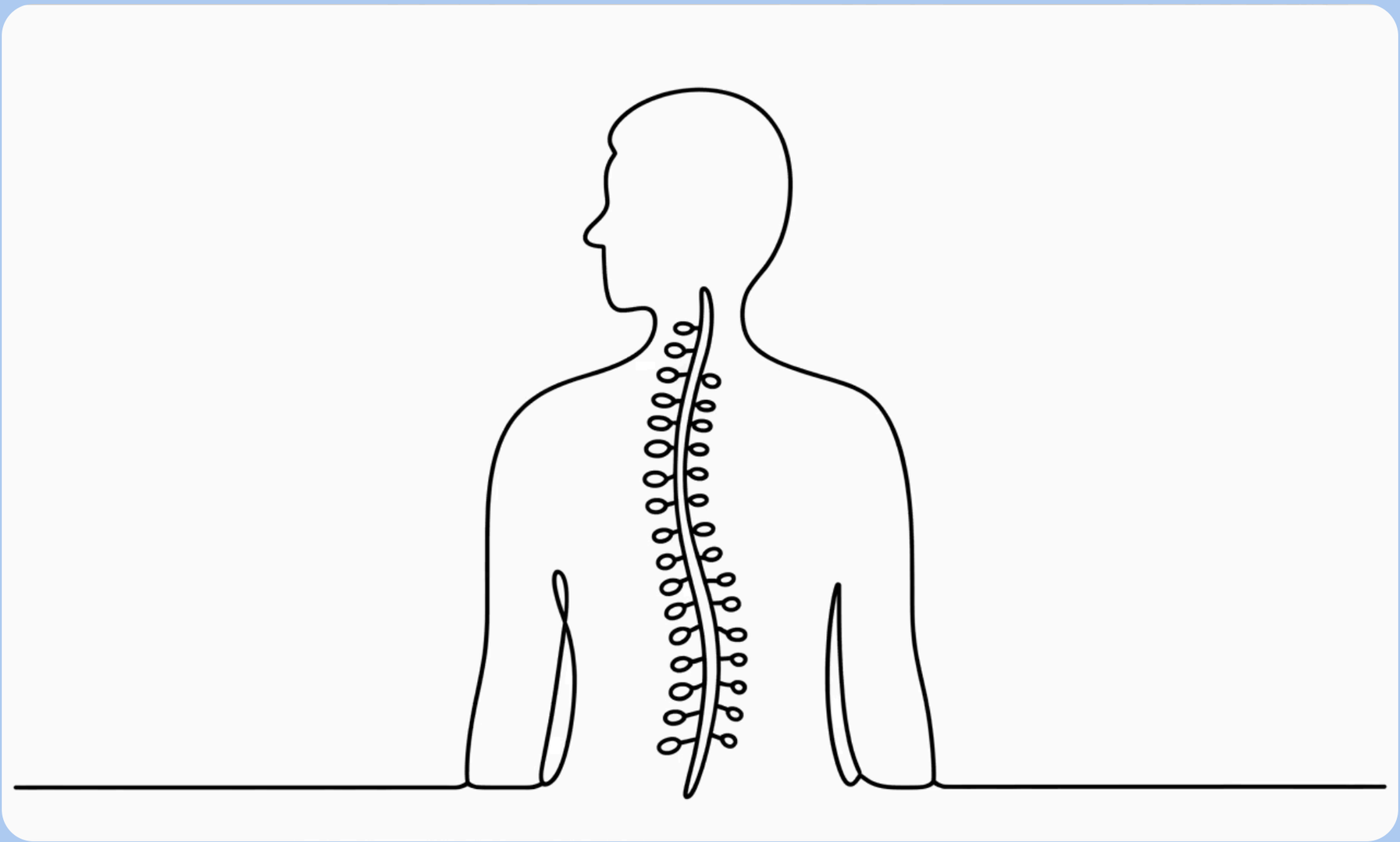
E – Euphoria

Limbic μ receptor activity

S – Suppressed cough

Medullary cough center inhibition

Clinical Uses



- Balanced anesthesia (with volatile agents)
- Analgesia (intra- and postoperative)
- Blunting sympathetic responses to intubation/surgical stimulation
- Epidural/spinal analgesia (hydrophilic opioids = morphine, hydromorphone)

Key Takeaways

Main Mechanism

Gi protein → hyperpolarization → ↓ neurotransmitter release

Main Clinical Benefit

Analgesia without amnesia

Main Risk

Respiratory depression & dependence

Mnemonic Summary:

"Mu makes you Merry, Delta gives Dual analgesia, Kappa gets Krazy — all Go Slow through G-proteins."