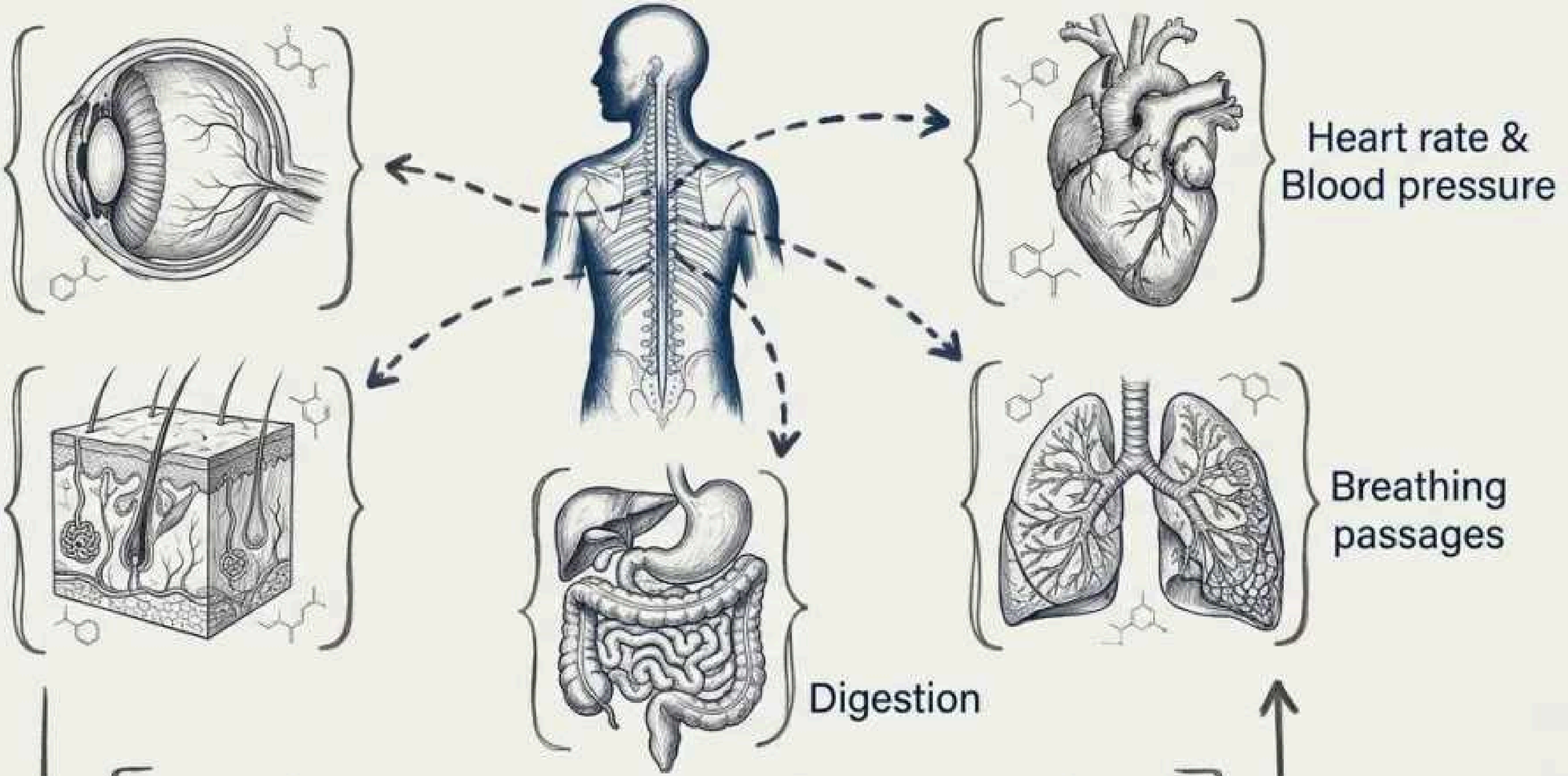
The Autonomic Nervous System operates the body's automatic functions.

¶ 4.1



The traditional first family of drugs studied in Med School.
Understanding receptors = understanding drug action.

Gemini Notebook

¶ 4.2

Organ activity is a balancing act between two autonomic divisions.

Sympathetic: Fight or Flight

Heart:
↑ Speeds & Strengthens

Lungs/Airways:
<> Widens

Blood Vessels:
>< Narrows

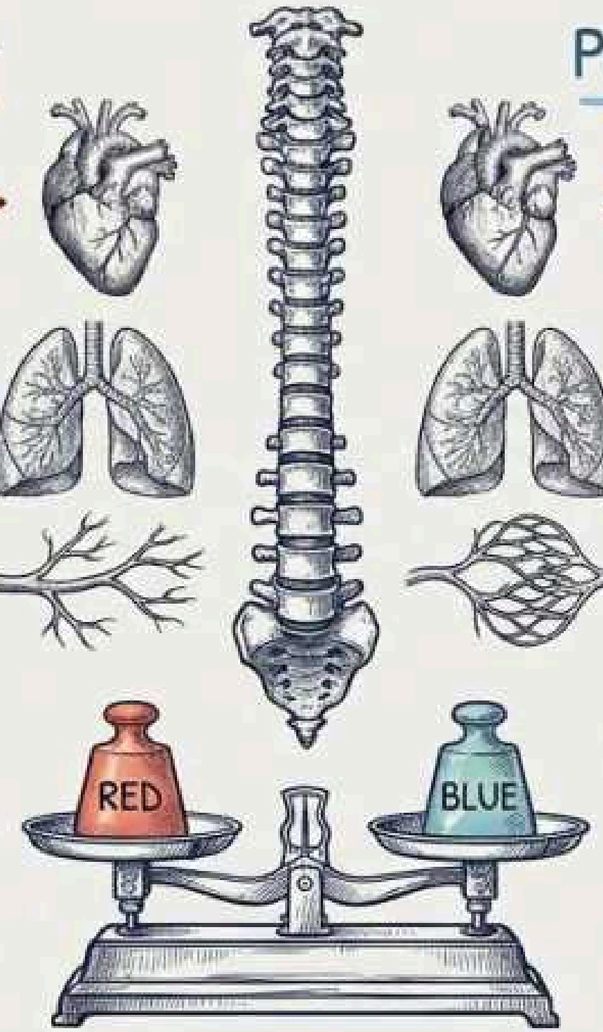
Digestion:
↓ Slows

Parasympathetic: Rest & Digest

Heart:
↓ Slows

Lungs/Airways:
>< Narrows

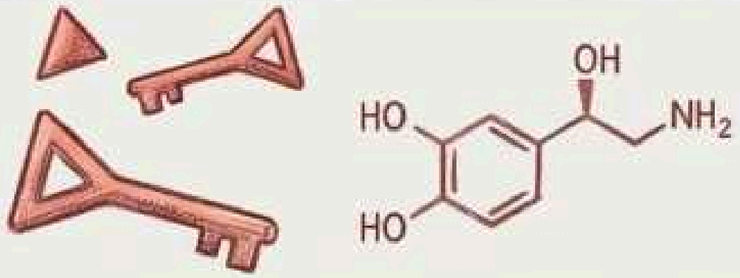
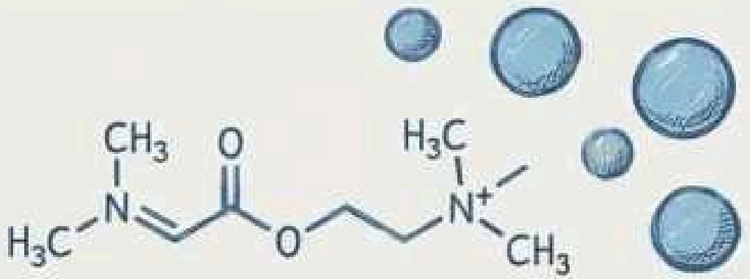
Digestion & Bladder:
↑ Stimulates



Most organs receive both signals; their balance sets the baseline activity.

¶ 4.3

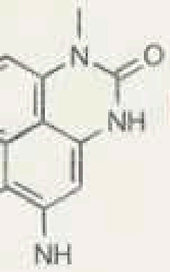
Distinct chemical messengers unlock specific receptor families.

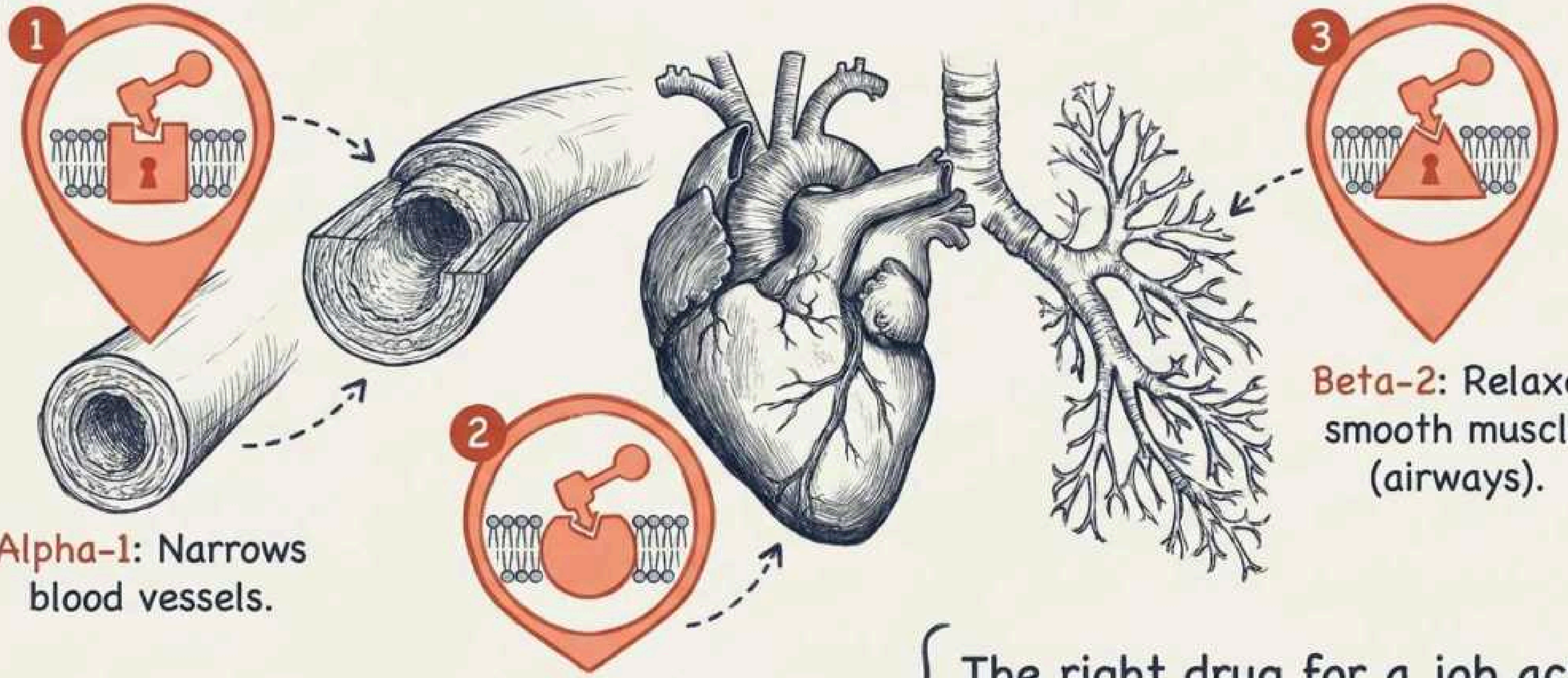
The Sympathetic Division	Neurotransmitters	Receptors
Noradrenaline (Nerves) Adrenaline (Adrenal Glands)		Adrenergic Receptors
The Parasympathetic Division Acetylcholine		Muscarinic Receptors

Also signals between autonomic nerves & to skeletal muscle via NICOTINIC receptors.

¶ 4.4

Adrenergic receptor subtypes dictate specific organ responses.

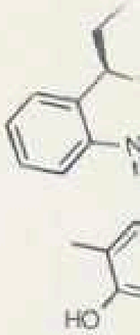


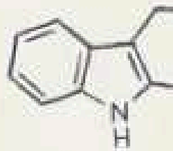


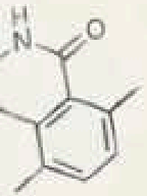
Alpha-1: Narrows blood vessels.

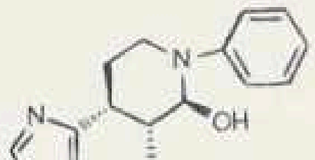
Beta-1: Increases rate & force.

Beta-2: Relaxes smooth muscle (airways).







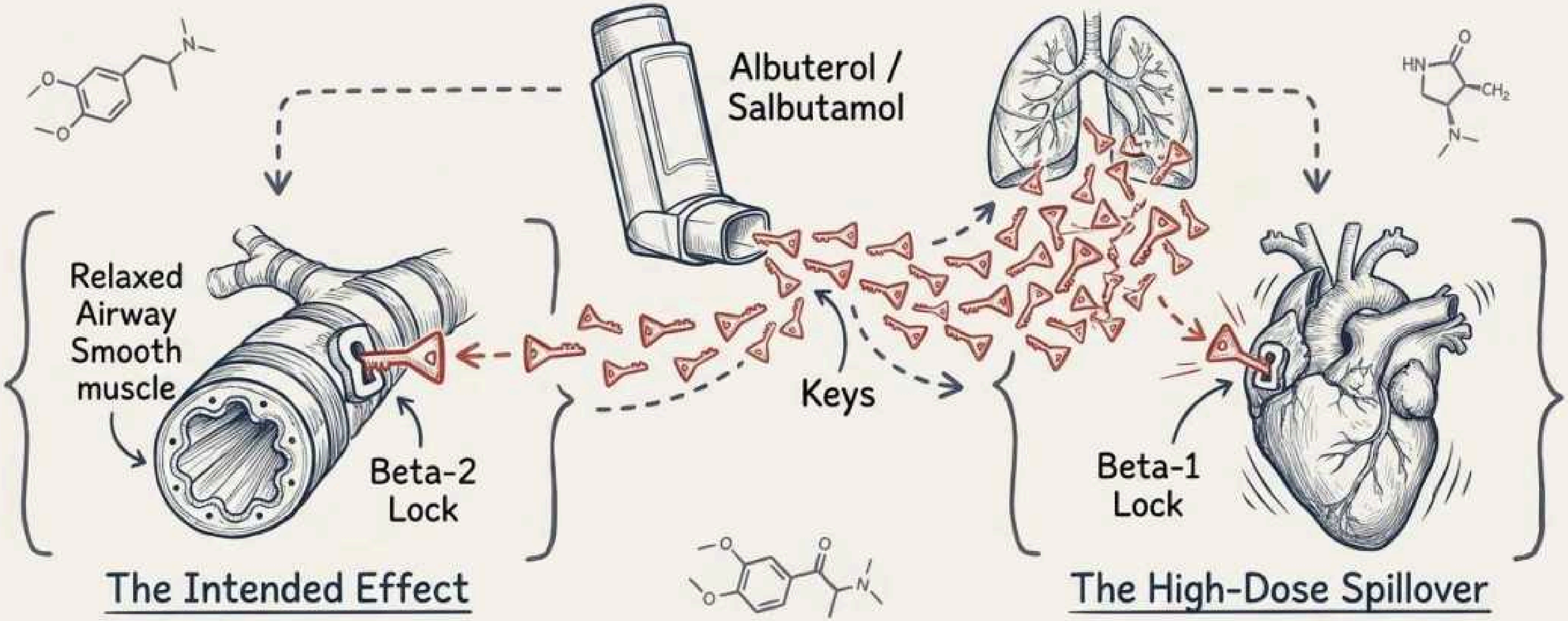


{ The right drug for a job acts on just the right subtype. }

Gemini Notebook

Selective agonists target specific locks, but precision degrades at high doses.

¶ 4.5



The Intended Effect

Relieves wheezing in minutes with little effect on the heart.

The High-Dose Spillover

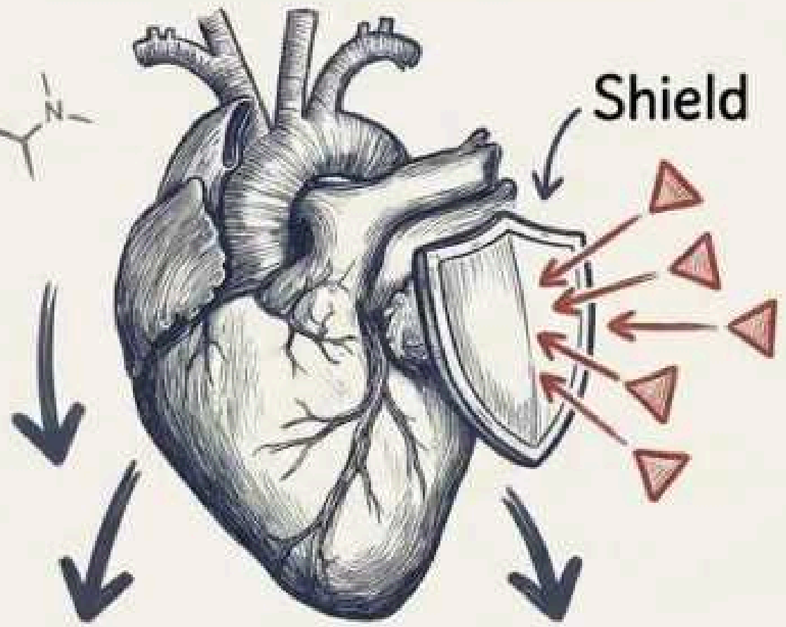
At high doses, spillover causes fast heartbeat and tremor.

Gemini Notebook

Beta-blockers reduce cardiac demand but risk airway constriction.

¶ 4.6

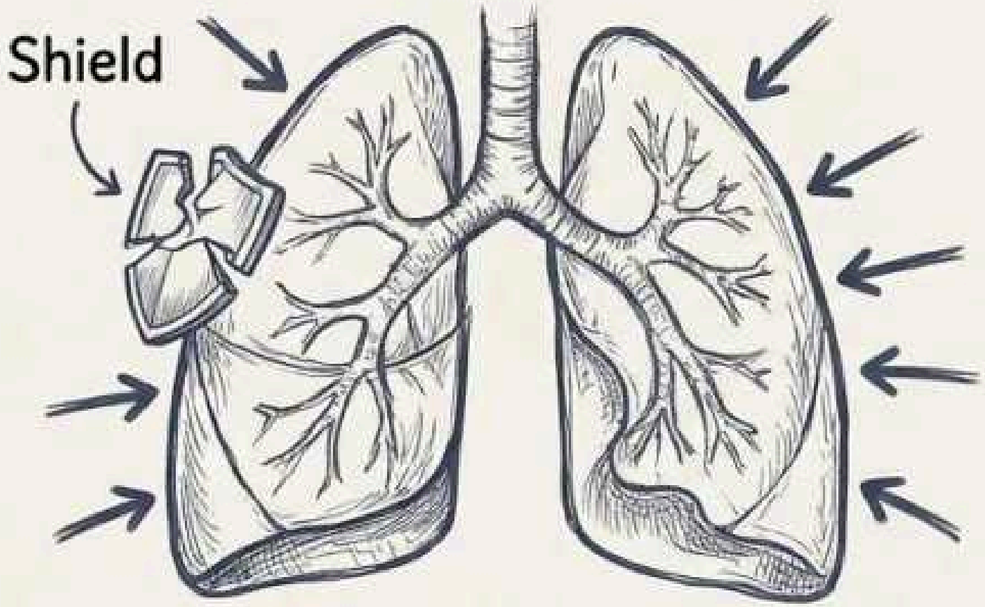
The Intended Target



Slows heart, Reduces force,
Lowers Oxygen demand.

{ High BP, angina, post-heart attack, irregular rhythms, heart failure. }

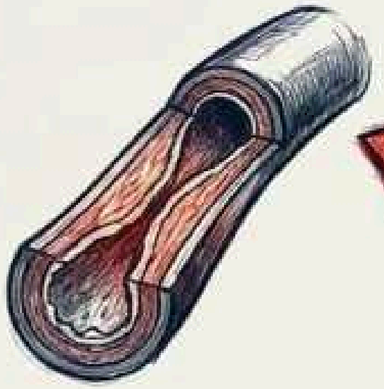
The Unintended Block

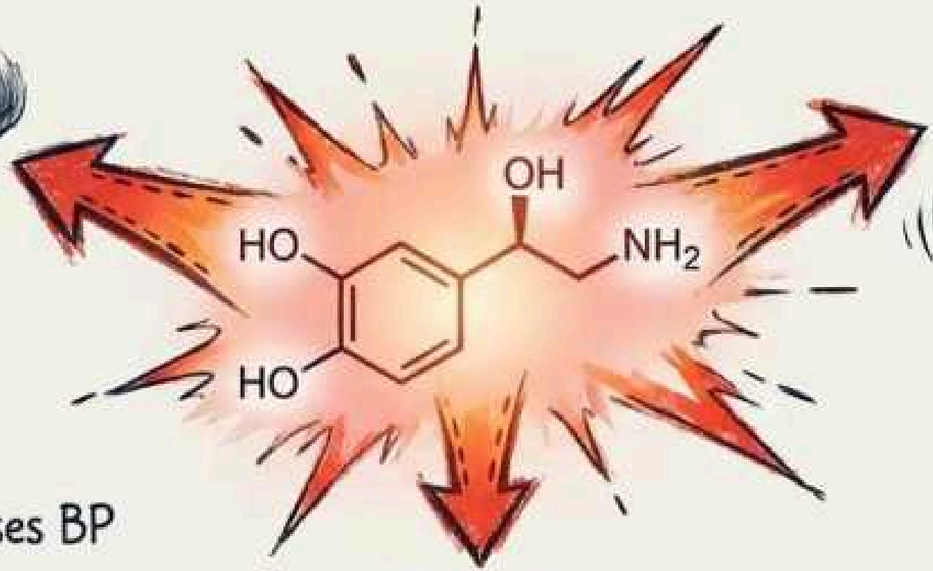


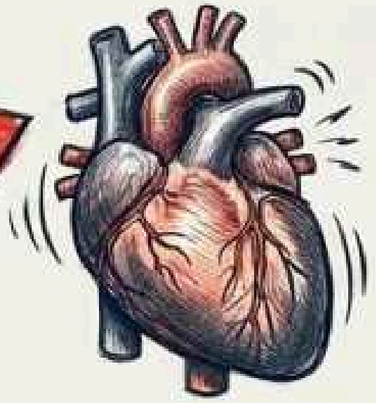
⚠ **Danger for Asthma:**
A direct consequence of receptor pharmacology.

Gemini Notebook

Adrenaline is a universal key that triggers a massive systemic rescue.

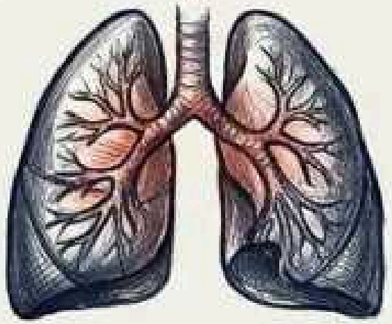






Alpha Receptors
→ Narrows vessels / Raises BP

Beta-1 Receptors
→ Strengthens Heart



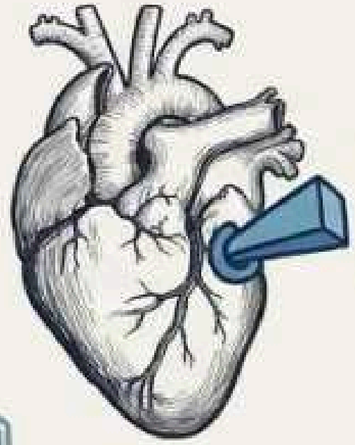
Beta-2 Receptors
→ Widens Airways

The first treatment for Anaphylaxis (MED 504 B) and Cardiac Arrest.
The body's own signals are life-saving drugs.

Gemini Notebook

¶ 4.8

Blocking muscarinic receptors reverses rest-and-digest functions.



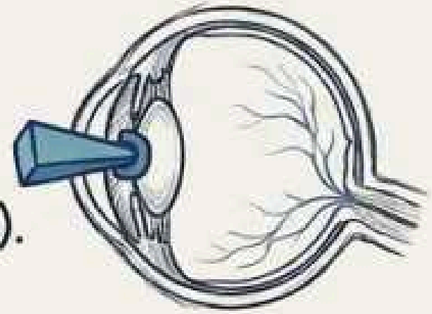
Therapeutic:
Speeds dangerously slow heart rate.

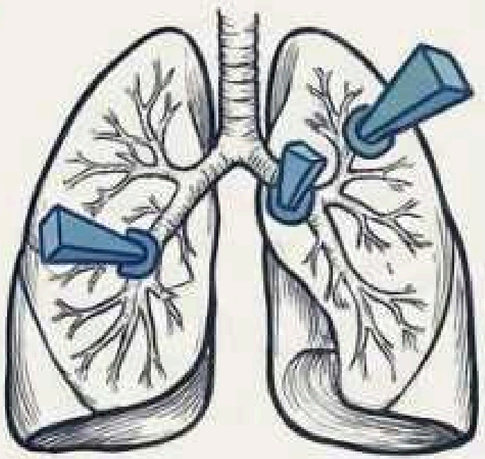
Atropine



Muscarinic Receptors

Therapeutic:
Widens pupils (used for exams).





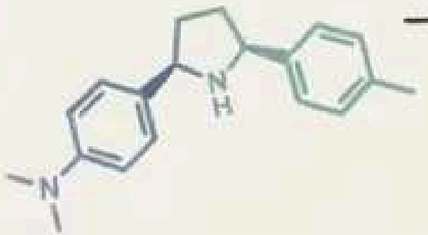
Therapeutic:
Inhaled versions widen airways in chronic lung disease.

Side Effects:
Dries secretions (dry mouth), causes constipation, relieves overactive bladder.



Side effects follow directly from blocking the exact same receptors elsewhere.

Gemini Notebook

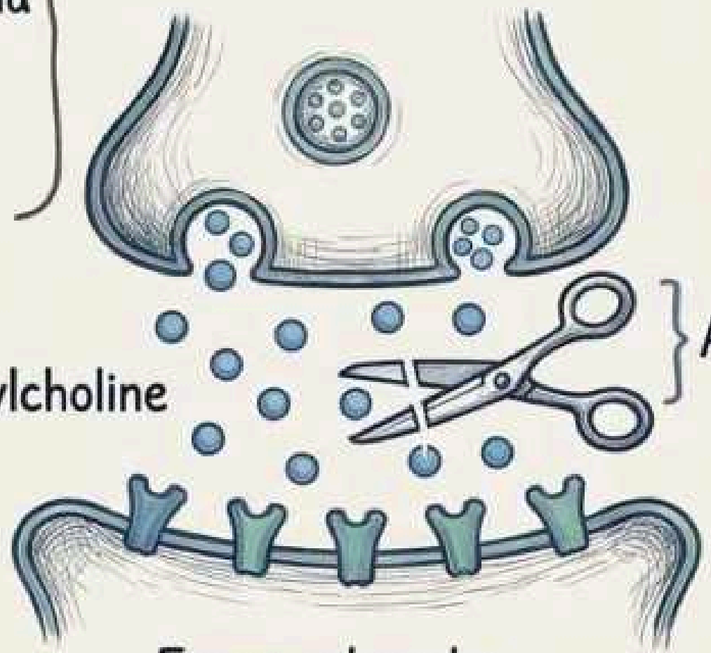


Blocking acetylcholinesterase floods the synapse with signals.

¶ 4.9

Milder blocks treat Myasthenia gravis & Alzheimer's symptoms.

Normal Function

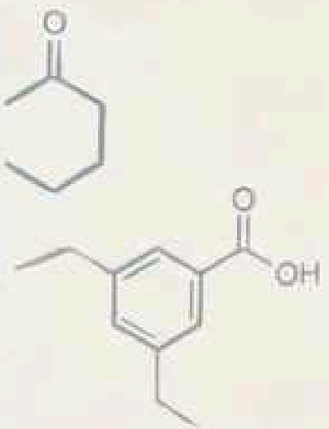


Enzyme breaks down messenger.

The Flood



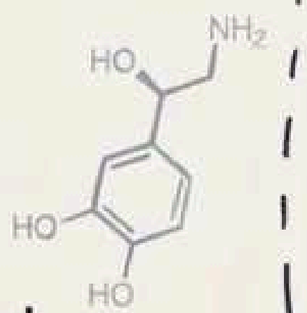
Extreme block causes toxic acetylcholine flood.



Atropine



An elegant use of an antagonist against an excess of natural signal.

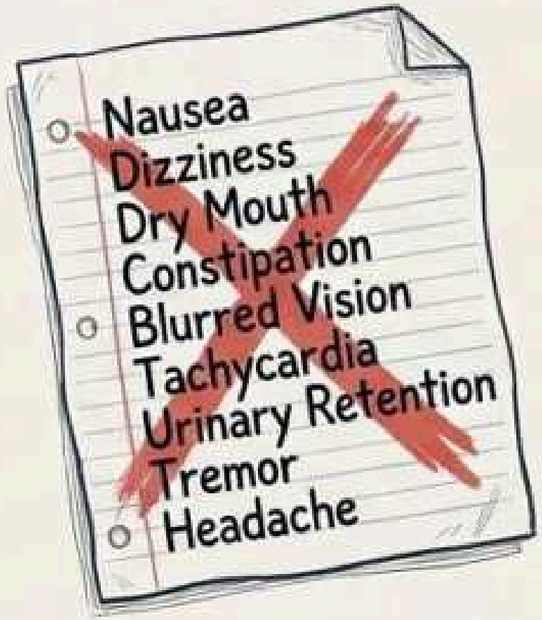


Gemini Notebook

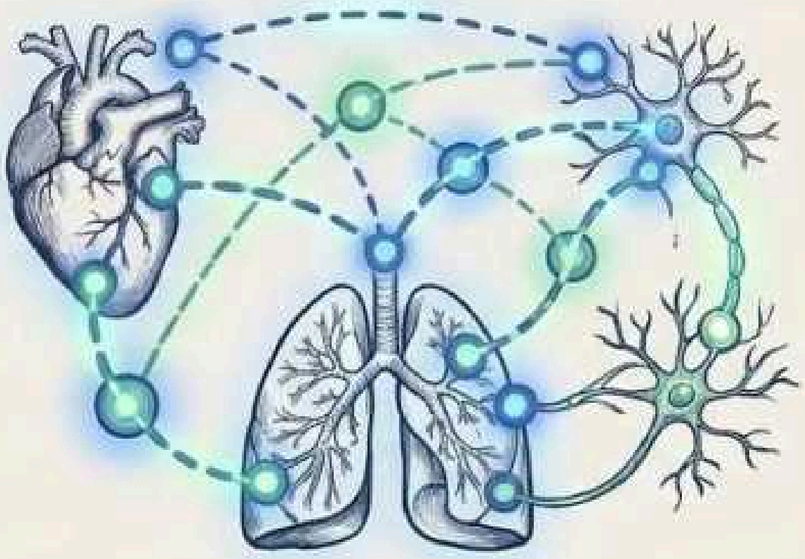
The Golden Rule of Receptor Pharmacology

¶ 4.10

[Location of Receptor] + [Action of Receptor] = [Predict Efficacy] & [Predict Side Effects]



Rote Memorization



Clinical Anticipation

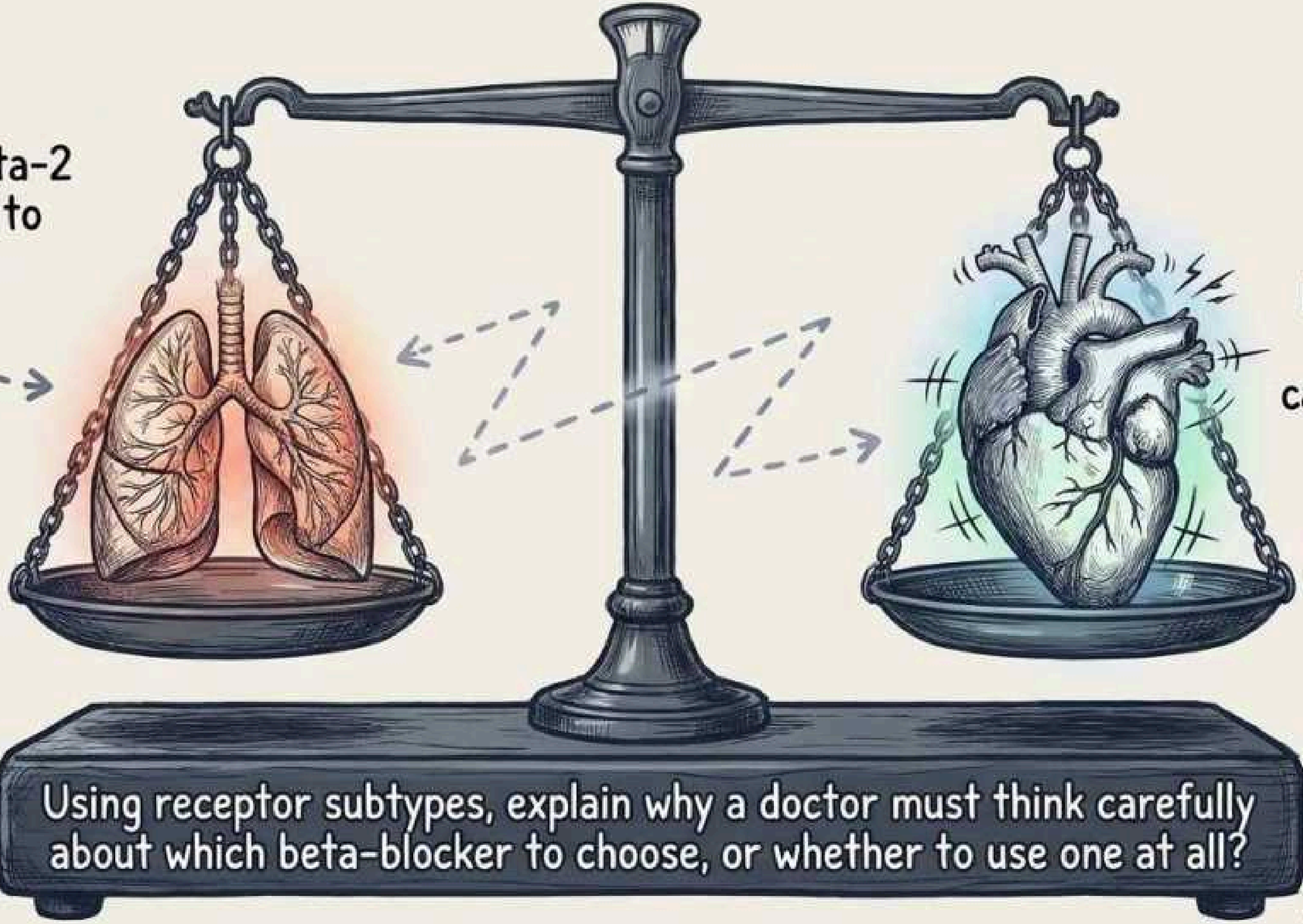
If you know where a receptor is and what it does, you can anticipate problems before they happen.

Gemini Notebook

Clinical Case: The Asthmatic Heart.

¶ 4.11

Requires Beta-2 Activation to breathe.



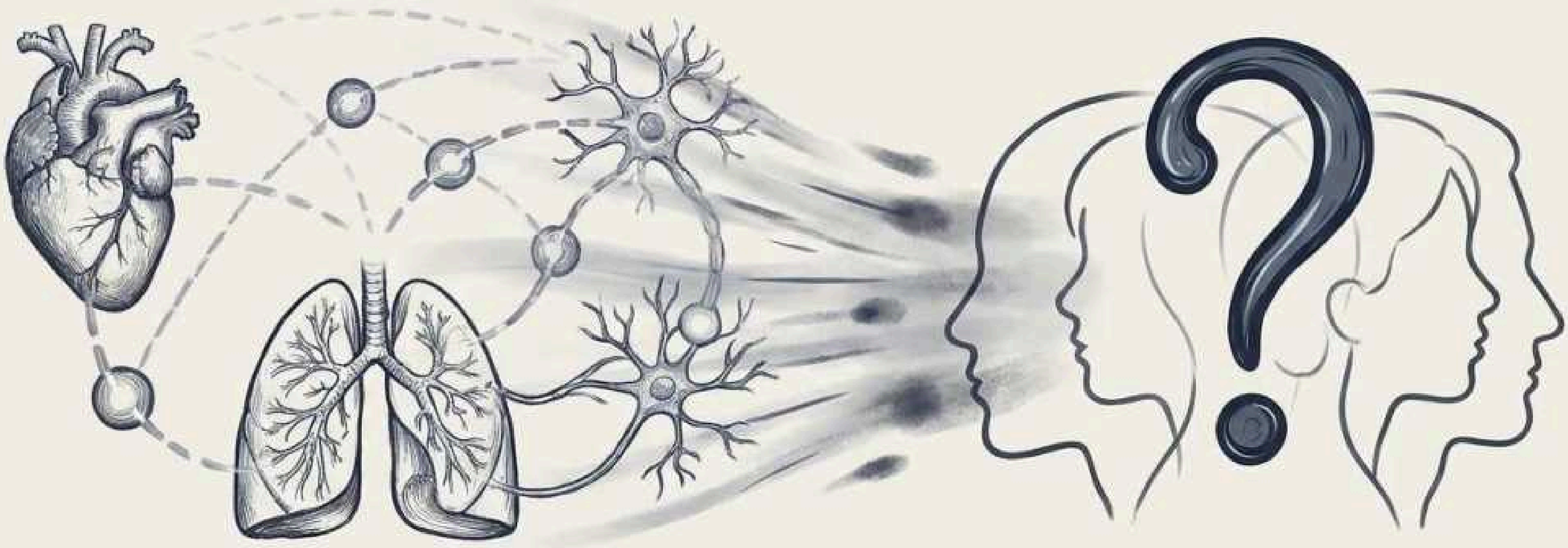
Prescribed Beta-Blocker to reduce cardiac demand (Beta-1).

Using receptor subtypes, explain why a doctor must think carefully about which beta-blocker to choose, or whether to use one at all?

Gemini Notebook

Looking ahead: Variability in drug response.

¶ 4.12



Lecture 5: What can go wrong with drugs, and why individual bodies respond to them so differently.

Gemini Notebook