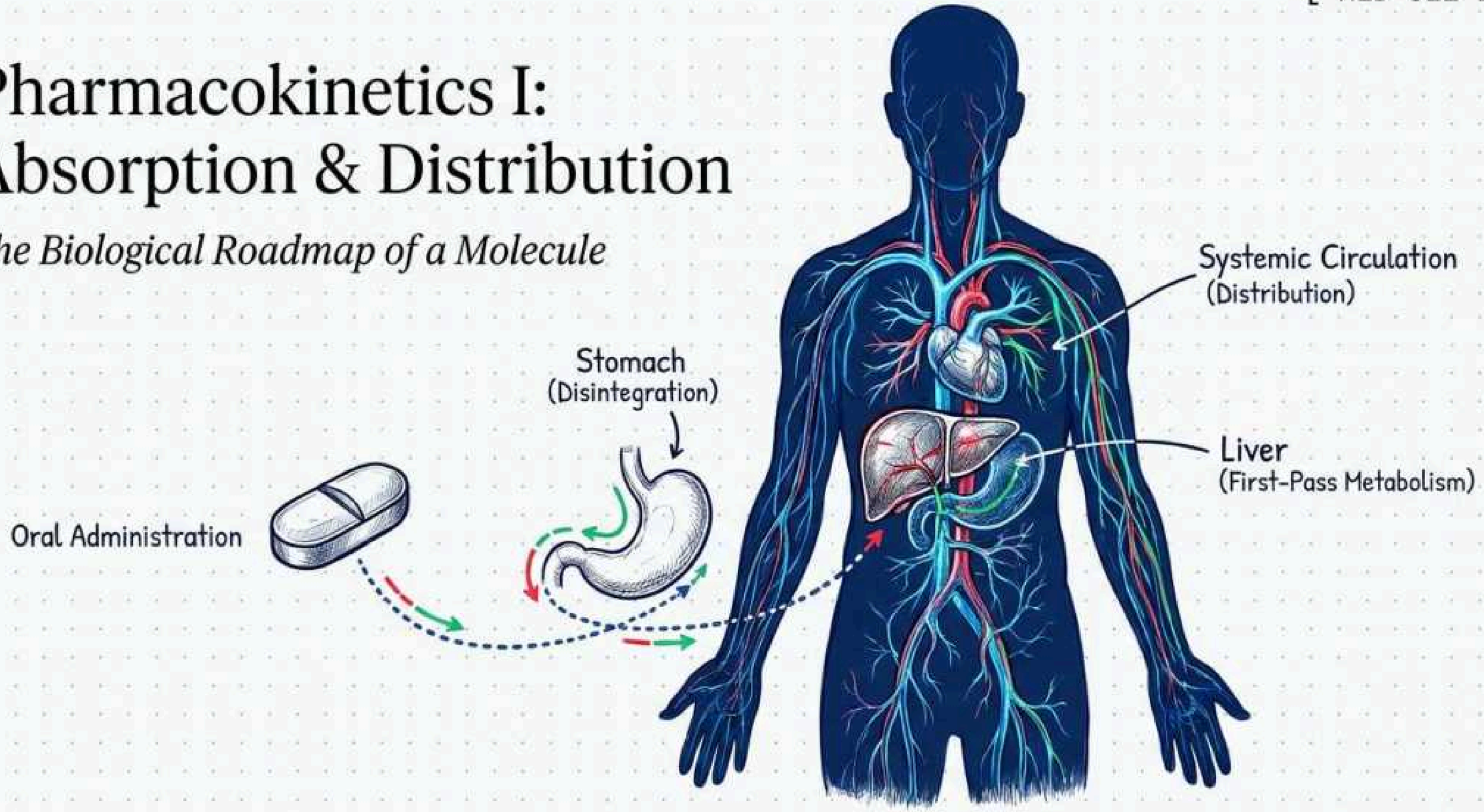
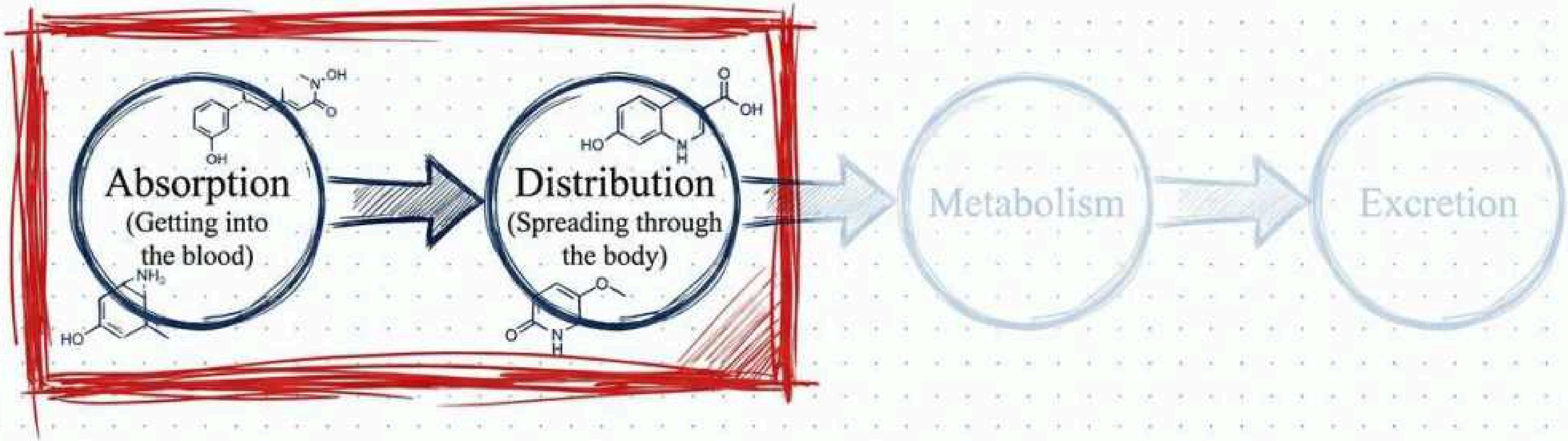
Pharmacokinetics I: Absorption & Distribution

The Biological Roadmap of a Molecule

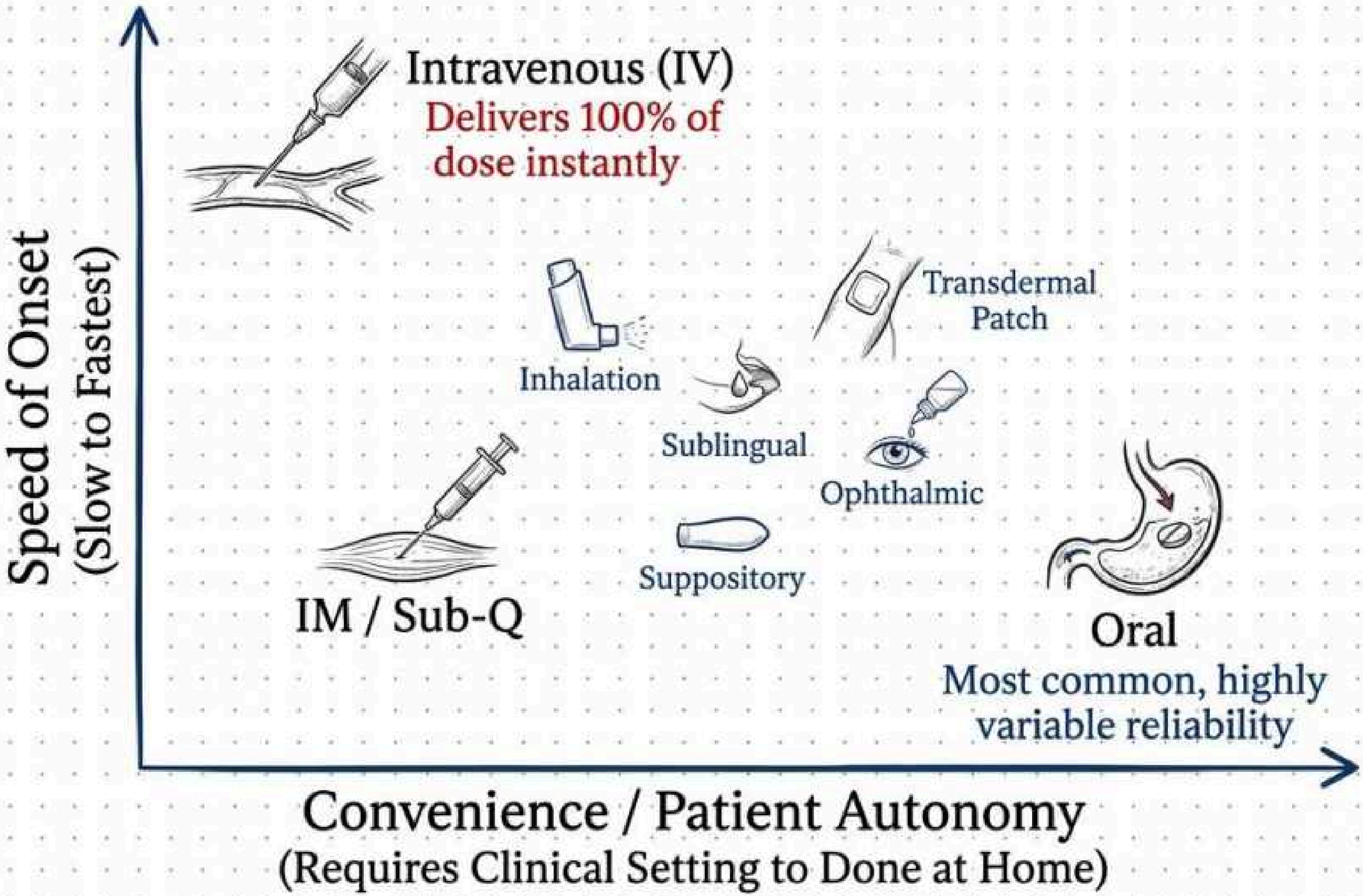


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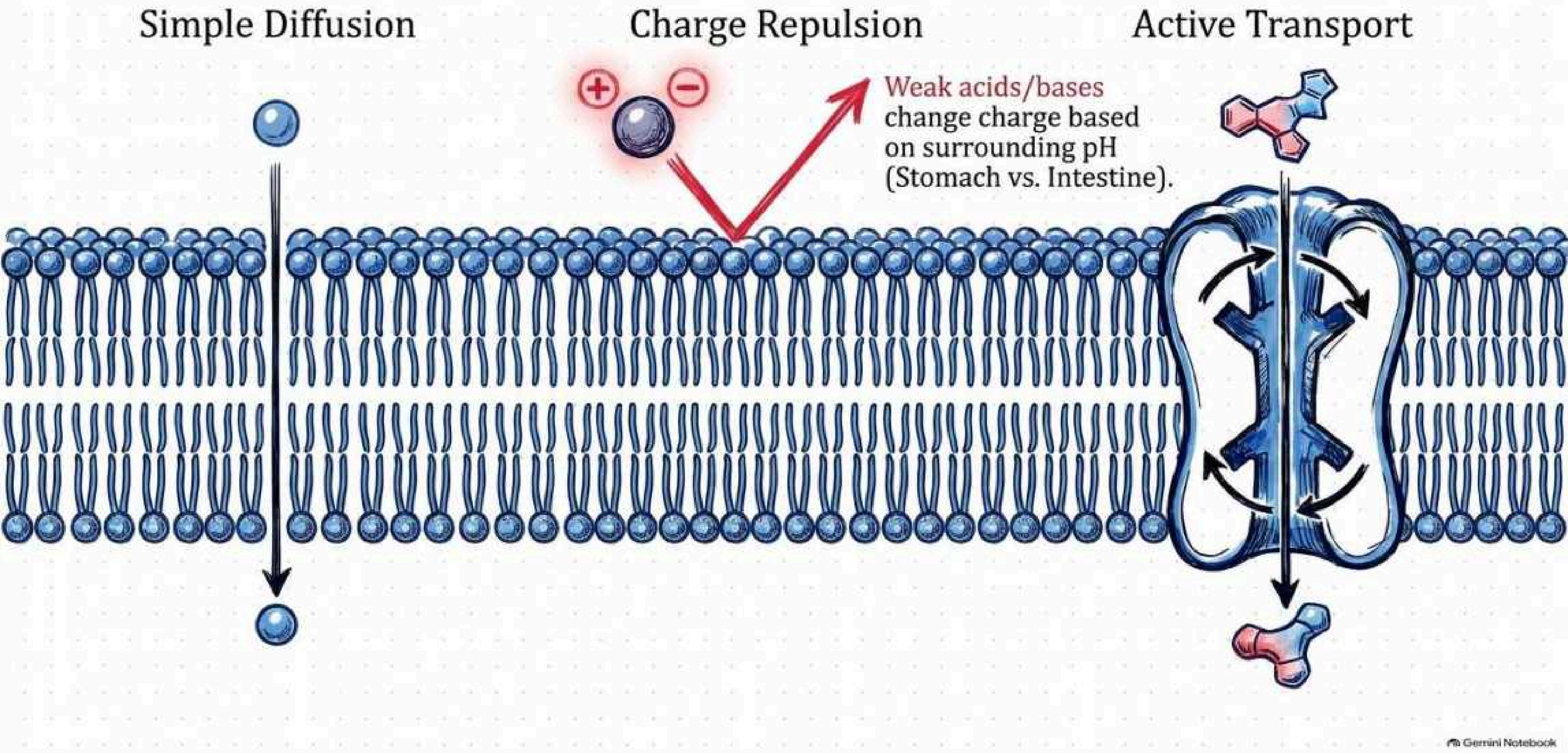
The Journey of the Target Drug: Stages 1 & 2



Gemini Notebook



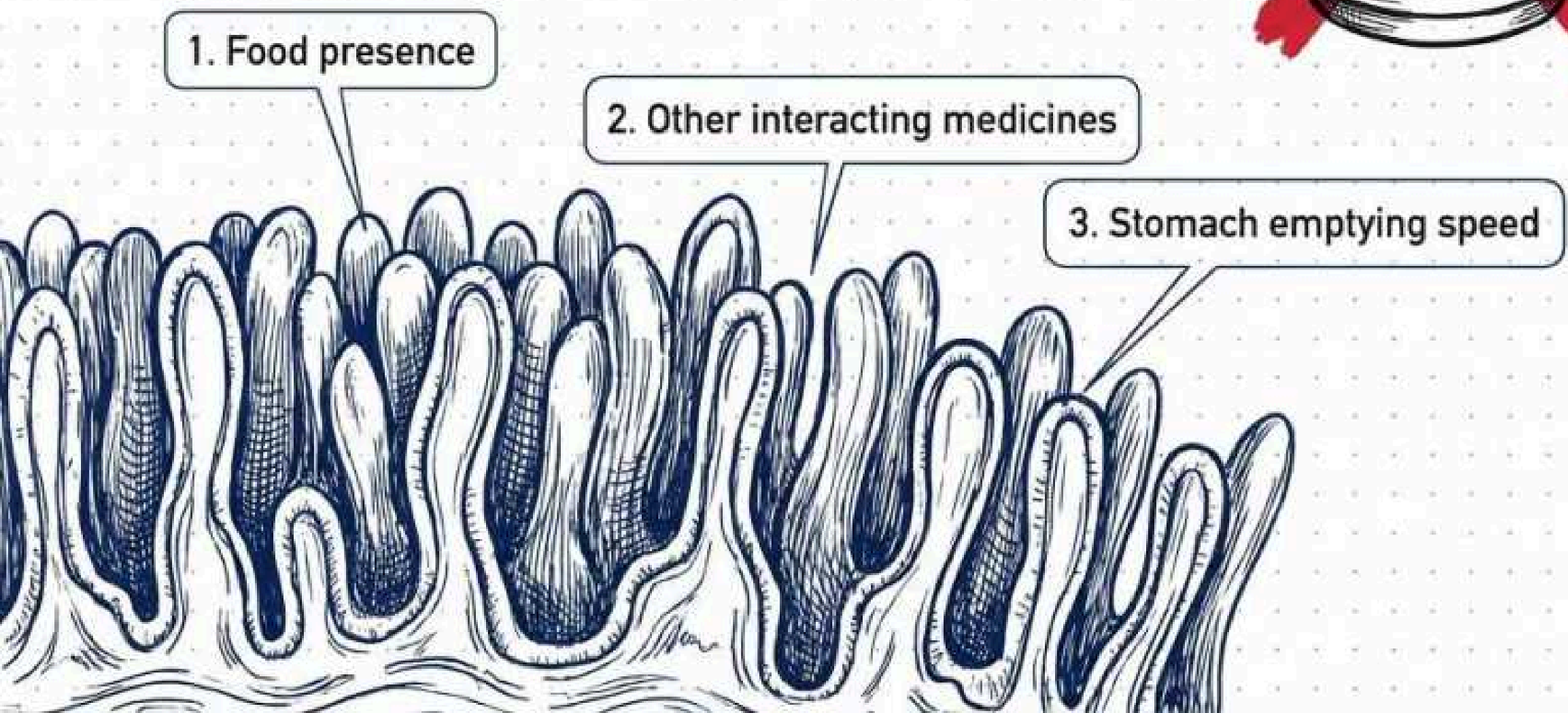
Gemini Notebook



Gemini Notebook





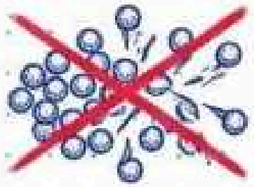


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[¶ 2.5]



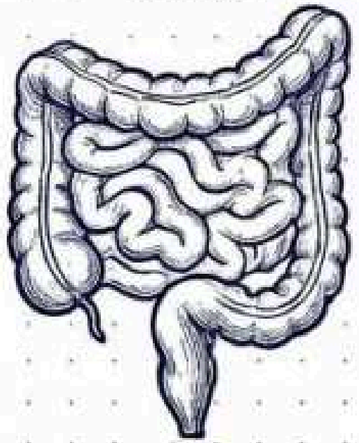
100 molecules



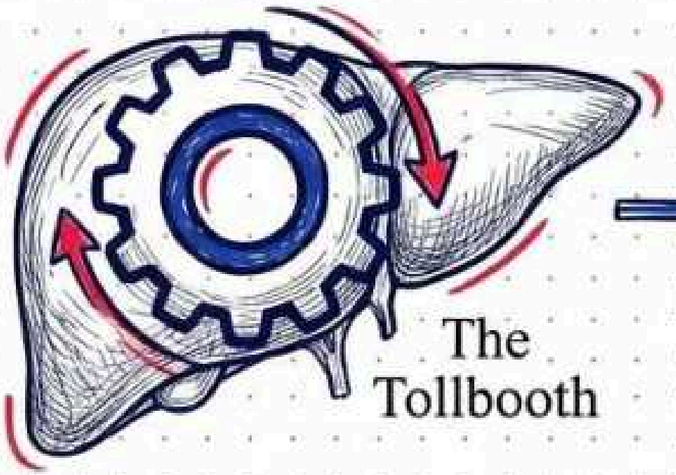
80 molecules destroyed

Low Bioavailability.

Oral



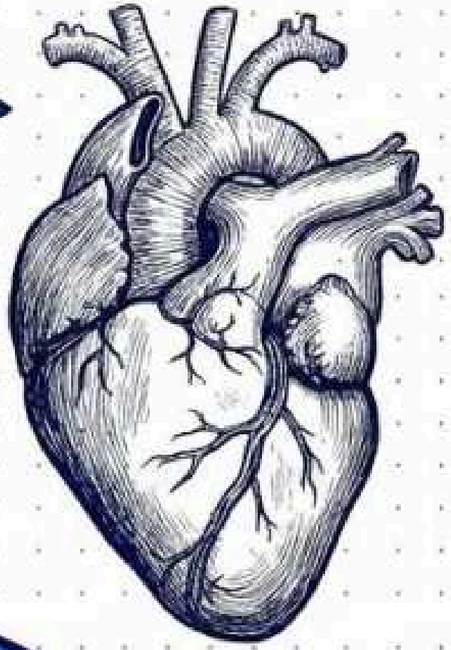
Portal Vein



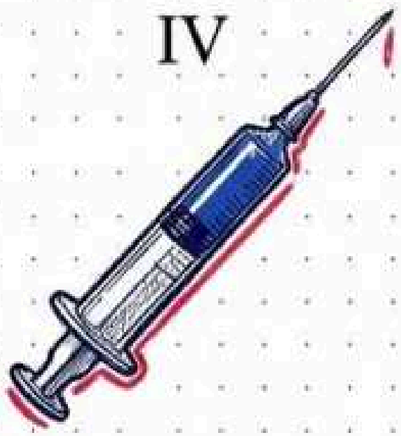
The Tollbooth



20 molecules reaching the heart



IV





100 molecules



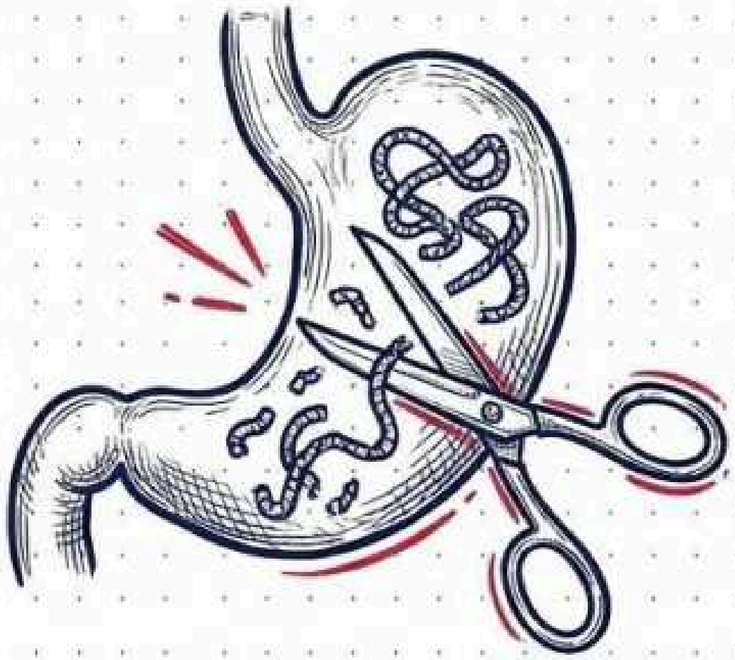
100 molecules arriving at the heart

Heart
General Circulation

100% Bioavailability
(By Definition).

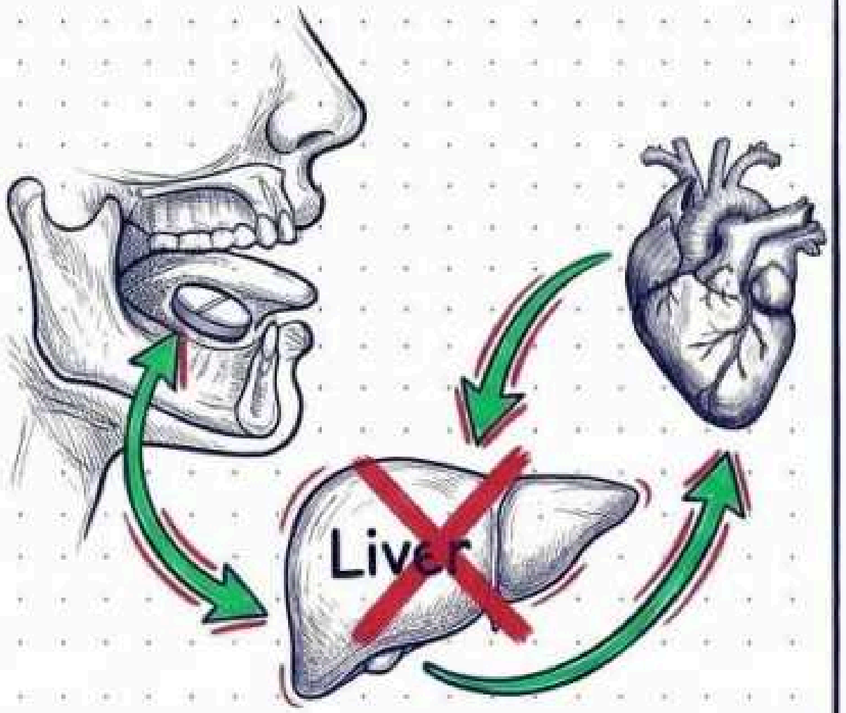
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Insulin



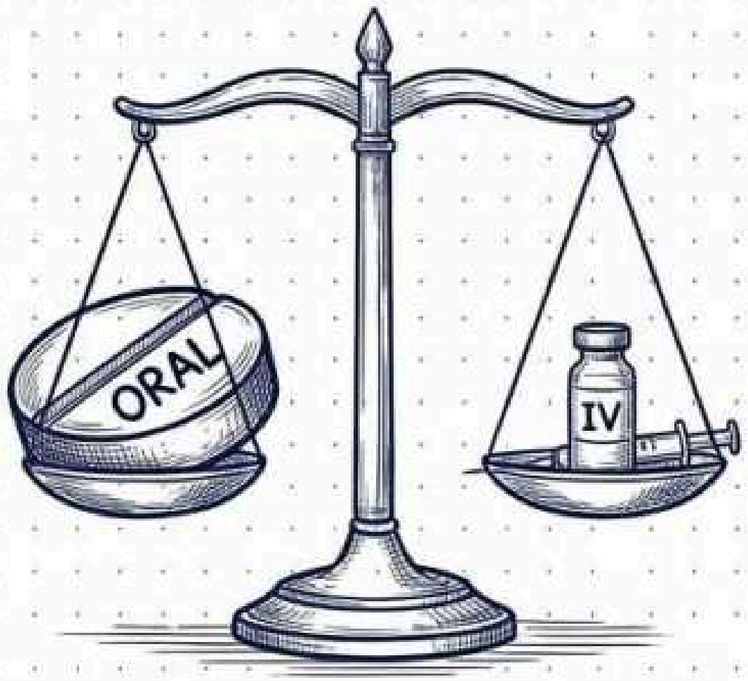
Digested in gut; must be injected.

Nitroglycerin



Sublingual route avoids first-pass destruction.

Dosing

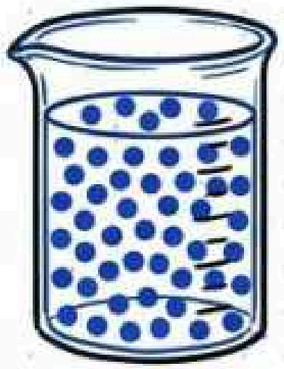


Oral dose ≫ IV dose for the same systemic effect.

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$$V_d = \frac{\text{Total Amount of Drug}}{\text{Plasma Concentration}}$$

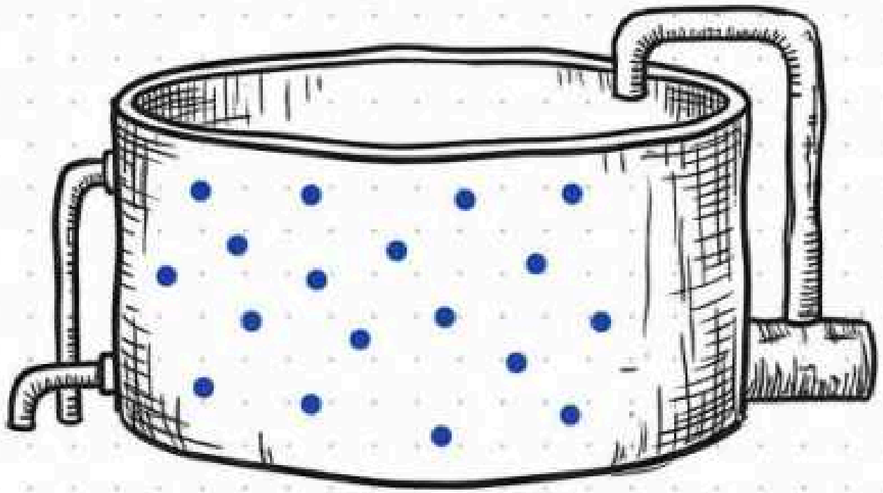
Low V_d



Blood Plasma

Drug stays in blood (small volume).

High V_d



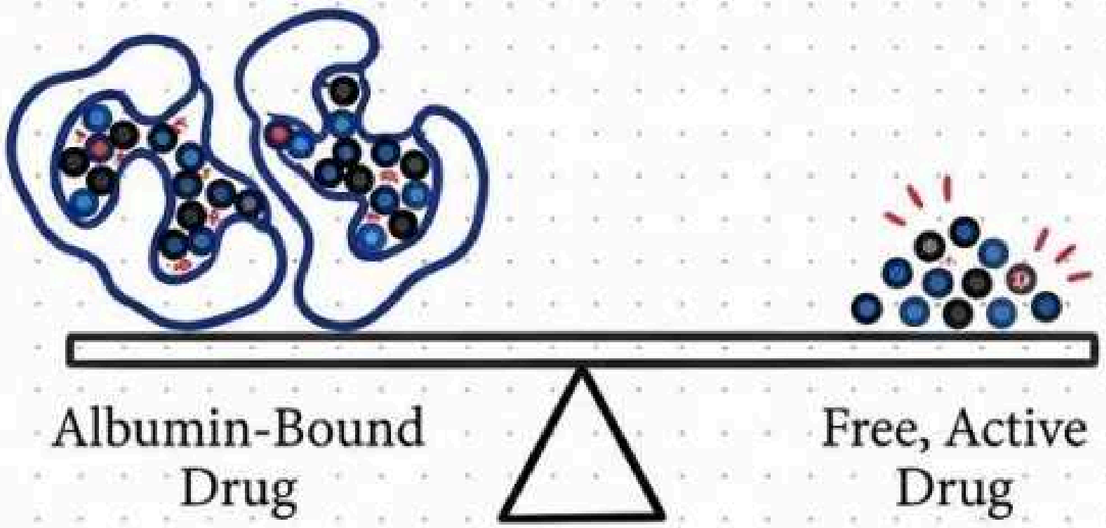
Fat & Tissue

Drug soaks into tissues (large volume).

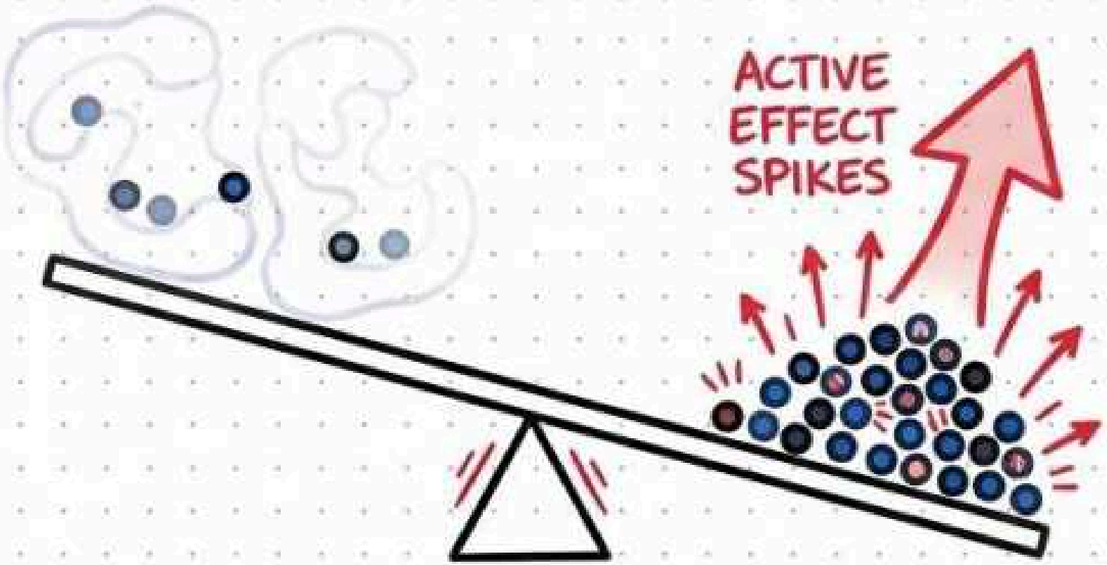
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$$[\text{Free Drug}] + [\text{Albumin}] \rightleftharpoons [\text{Bound Complex}]$$

State 1: Normal



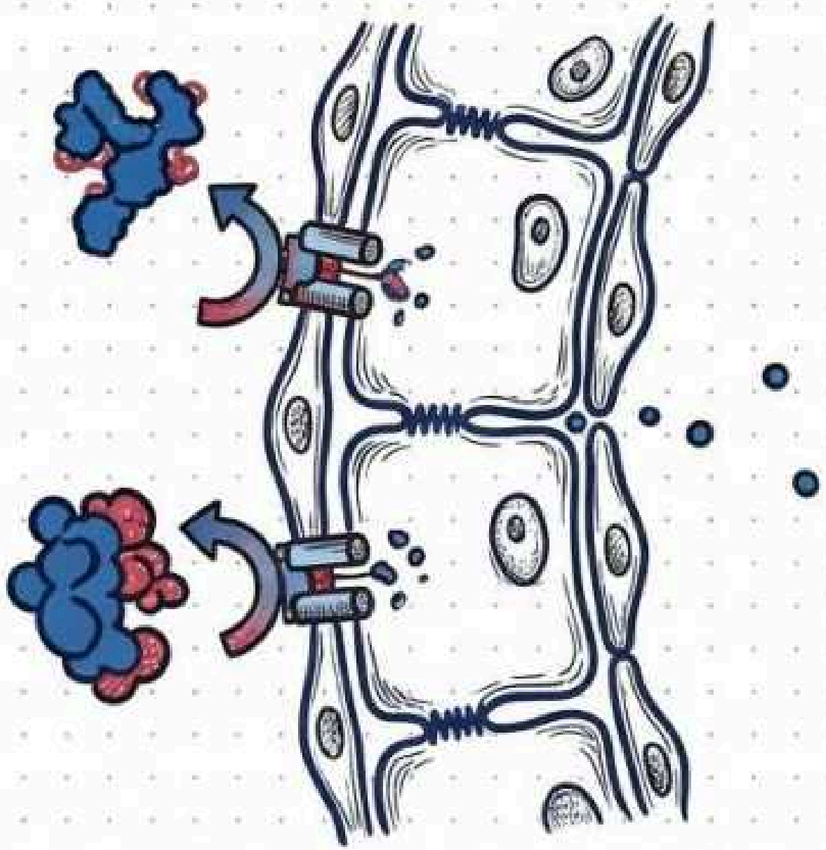
State 2: Liver Disease / Malnutrition



Only free drug can reach targets or be excreted.
Total blood levels stay the same, but active effect spikes.

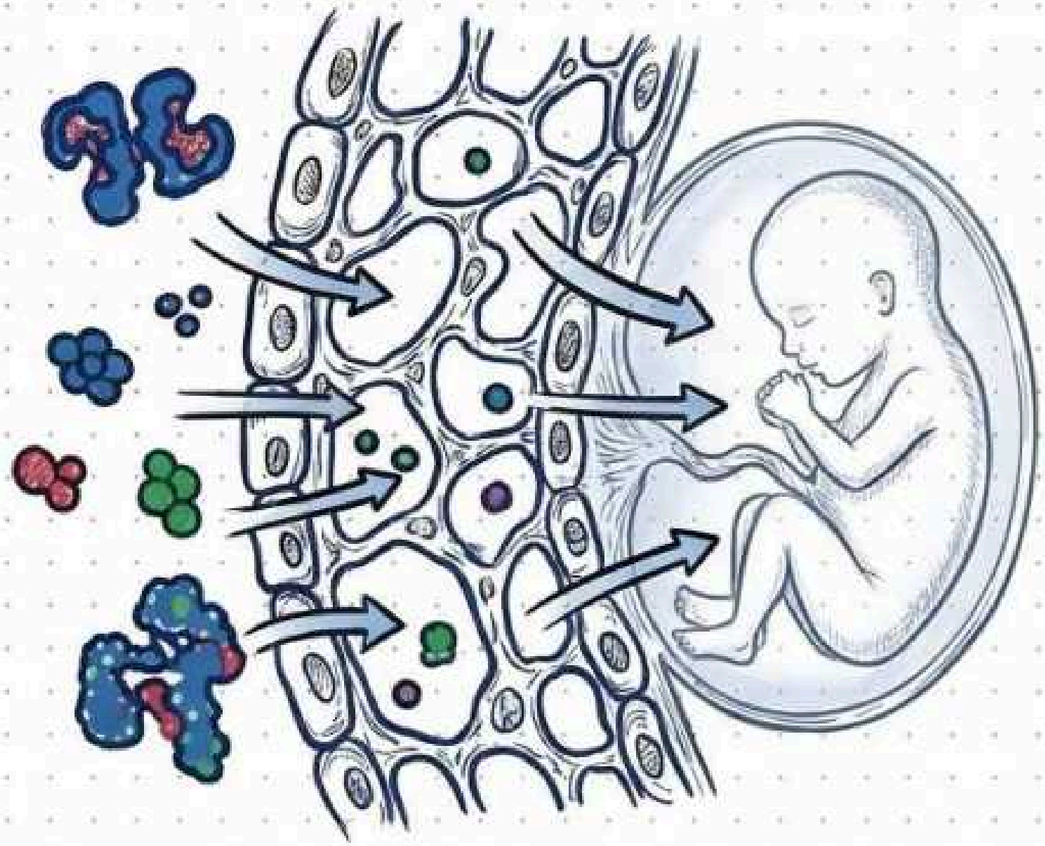
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Blood-Brain Barrier



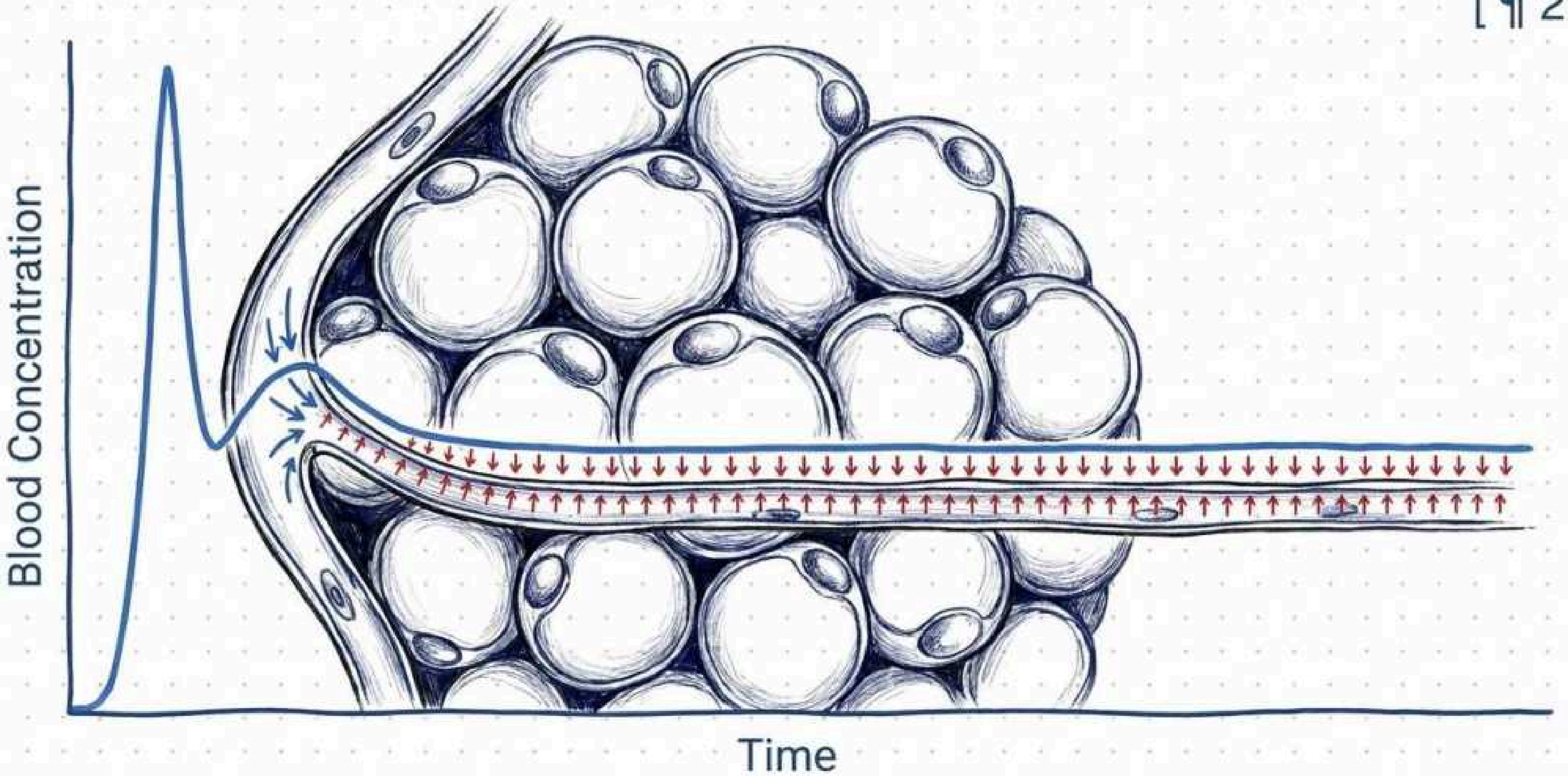
Hard to treat brain diseases; protected from toxins.

The Placenta



Partial barrier; special care required in pregnancy.

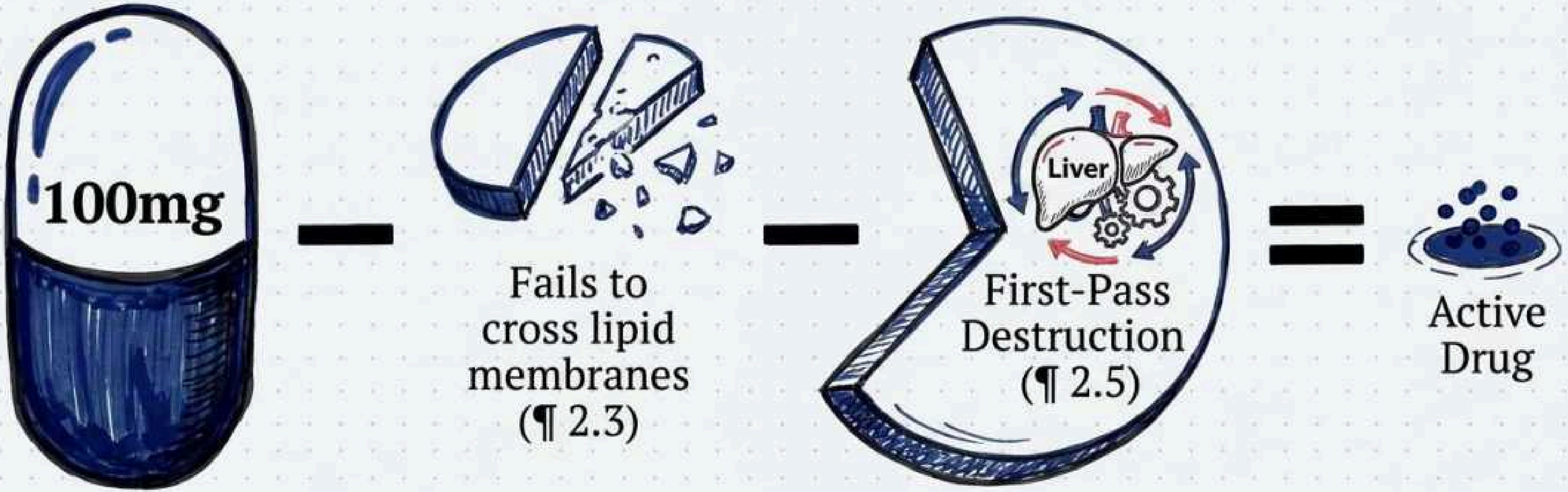
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Body size & age change fat composition, fundamentally altering drug dosing in children and the elderly.

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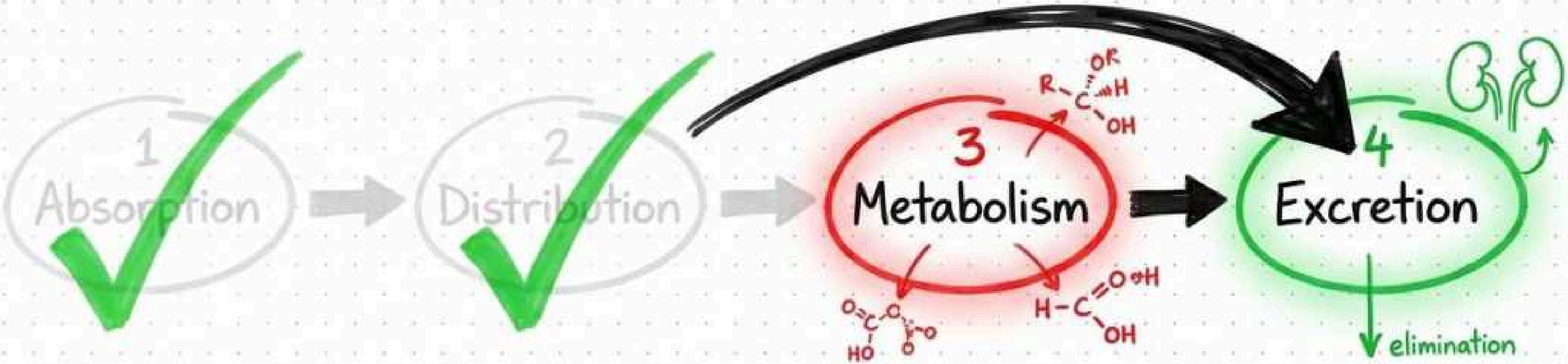
[¶ 2.11]





The Synthesis: The oral dose must be exponentially larger to survive the biological gauntlet of first-pass metabolism.

Gemini Notebook



Next in Lecture 3: How the body breaks drugs down and removes them, and what that means for dosing.

Gemini Notebook