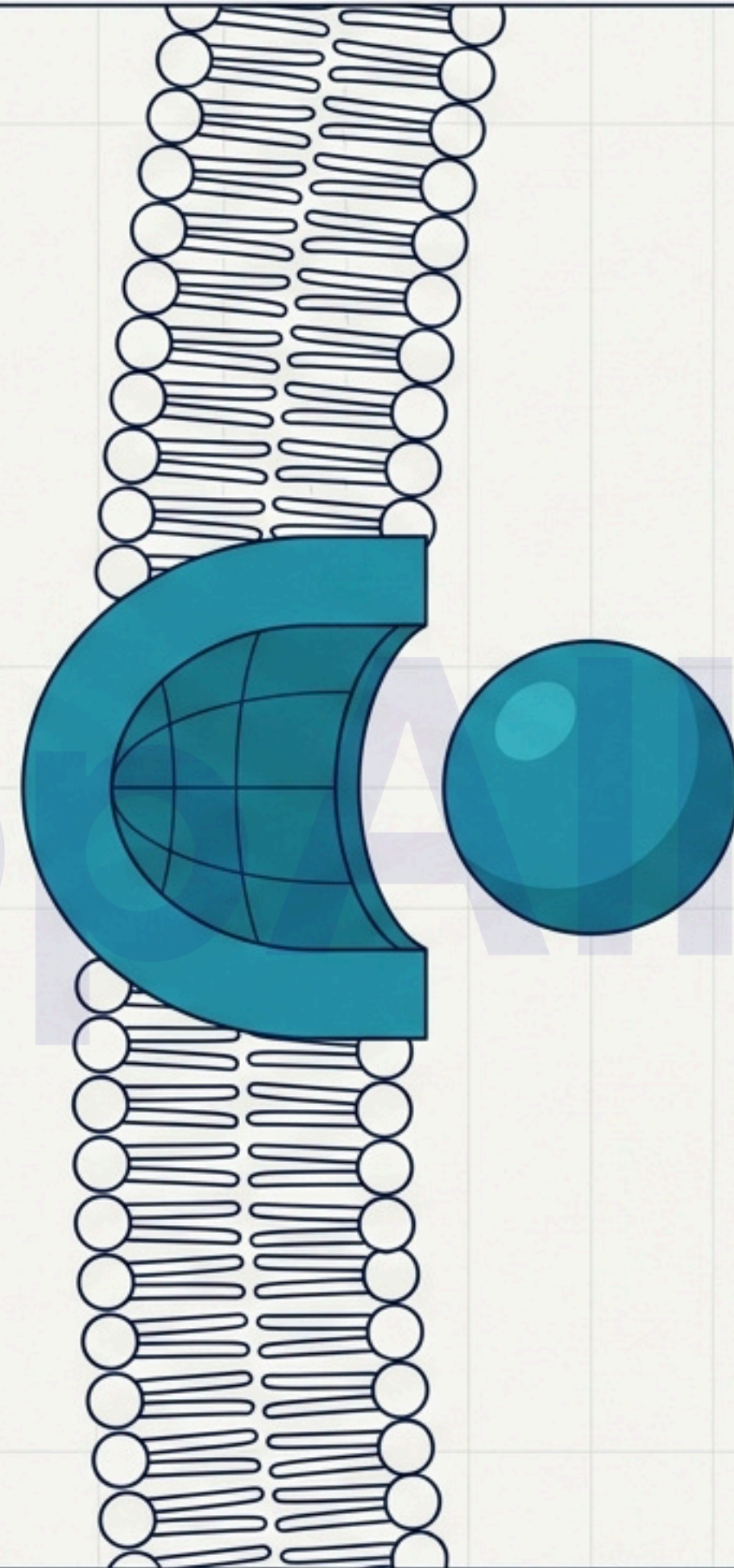


How Hormones Change Target Cells

The Mechanism of Hormone Action

A visual guide to chemical coordination, cellular receptors, and physiological response.



Target Tissues & Hormone Receptors

The Circulatory Broadcast:

Hormones travel systemically via the bloodstream, but do not affect every cell.

The Specificity Rule:

Hormones only produce effects on target tissues equipped with highly specific protein molecules called Hormone Receptors.

Key Insight: 1 Hormone = 1 Specific Receptor type.

Membrane-Bound Receptors

The Doorbell Mechanism



Location: Anchored to the target cell's outer membrane.

Interaction: Hormones bind strictly to the exterior surface.

Permeability: The hormone never enters the target cell.

Associated Hormones: Peptides, polypeptides, protein hormones (e.g., Insulin, Glucagon), and amino-acid derivatives (e.g., Epinephrine).



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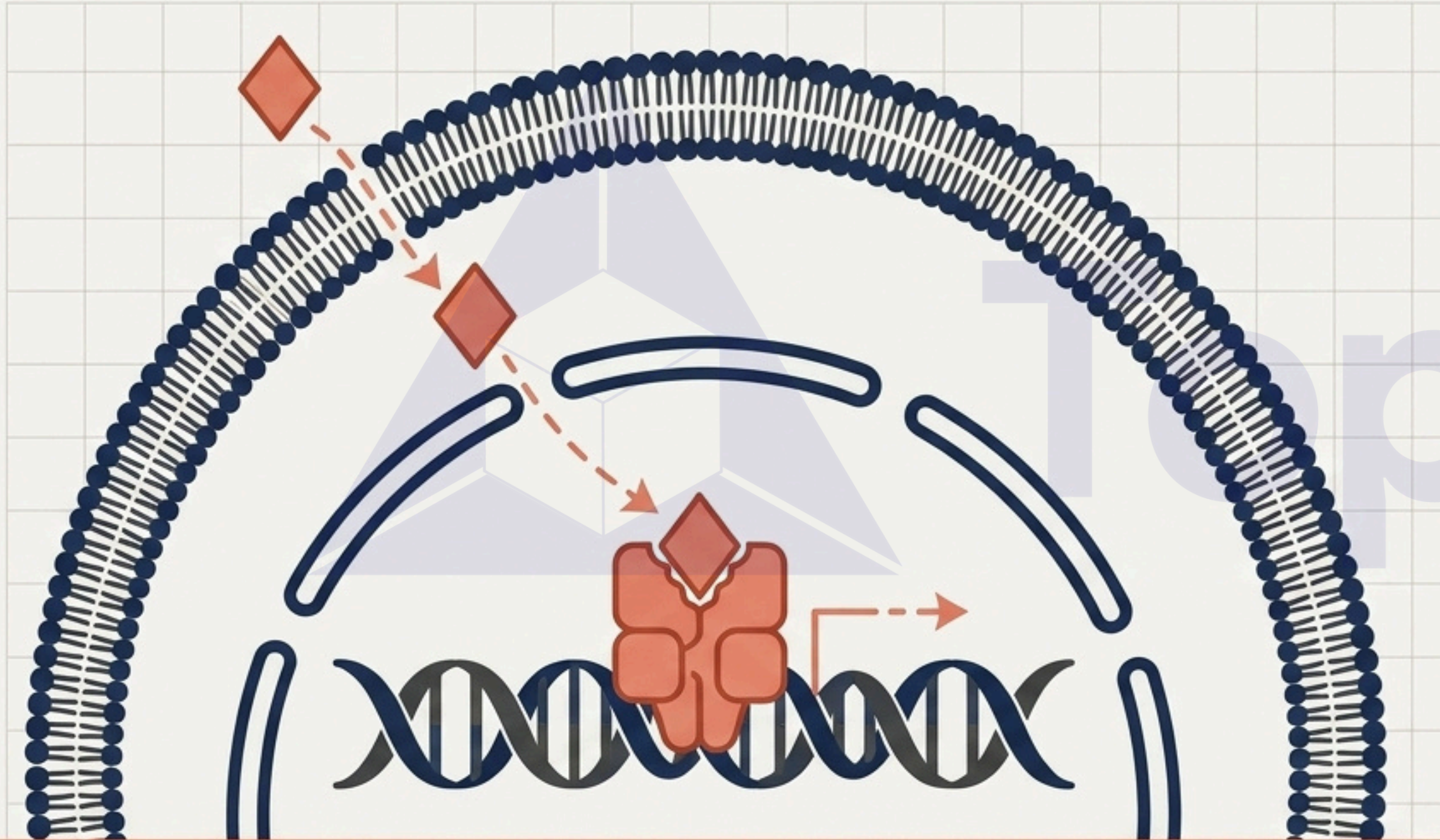
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Intracellular & Nuclear Receptors

The VIP Access Mechanism



Location: Present entirely inside the target cell (mostly in the nucleus).

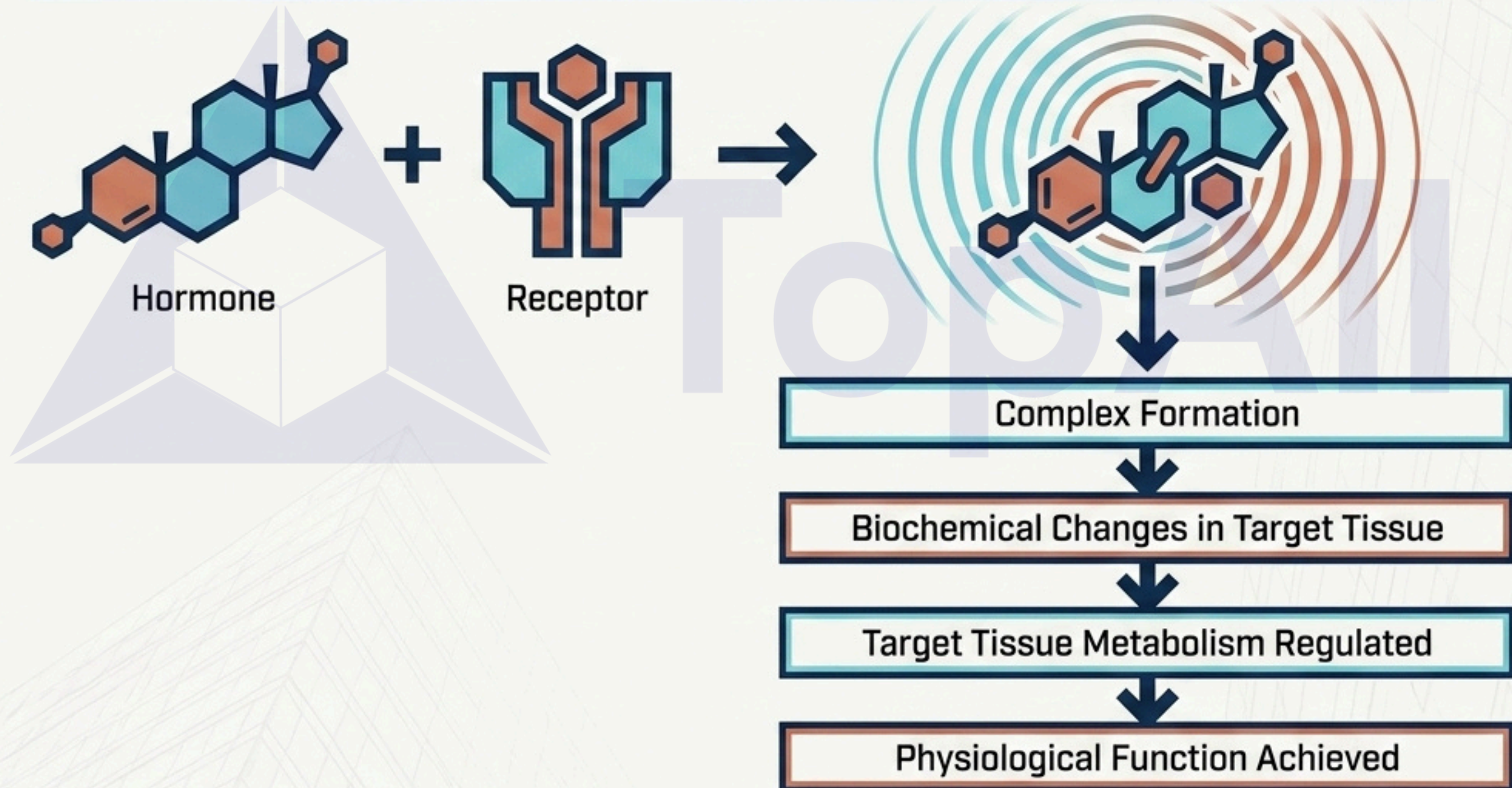
Interaction: Hormone phases seamlessly through the membrane.

Target: Directly interacts with the genome/chromosomes.

Associated Hormones: Steroids (e.g., Cortisol, Testosterone, Estradiol, Progesterone) and Iodothyronines (Thyroid hormones)

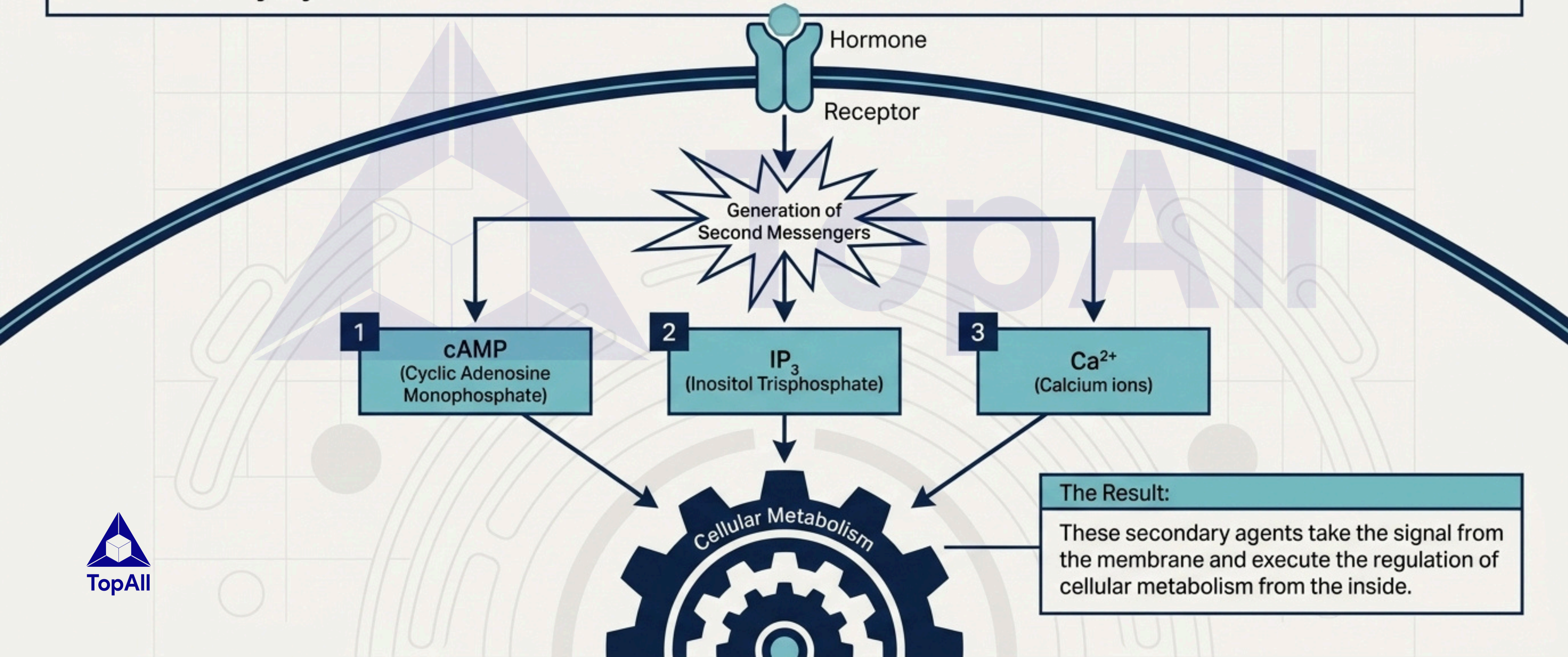
The Hormone-Receptor Complex

The Catalyst for Change: Binding is just the first step. The true driver of cellular change is the formation of the **Hormone-Receptor Complex**.

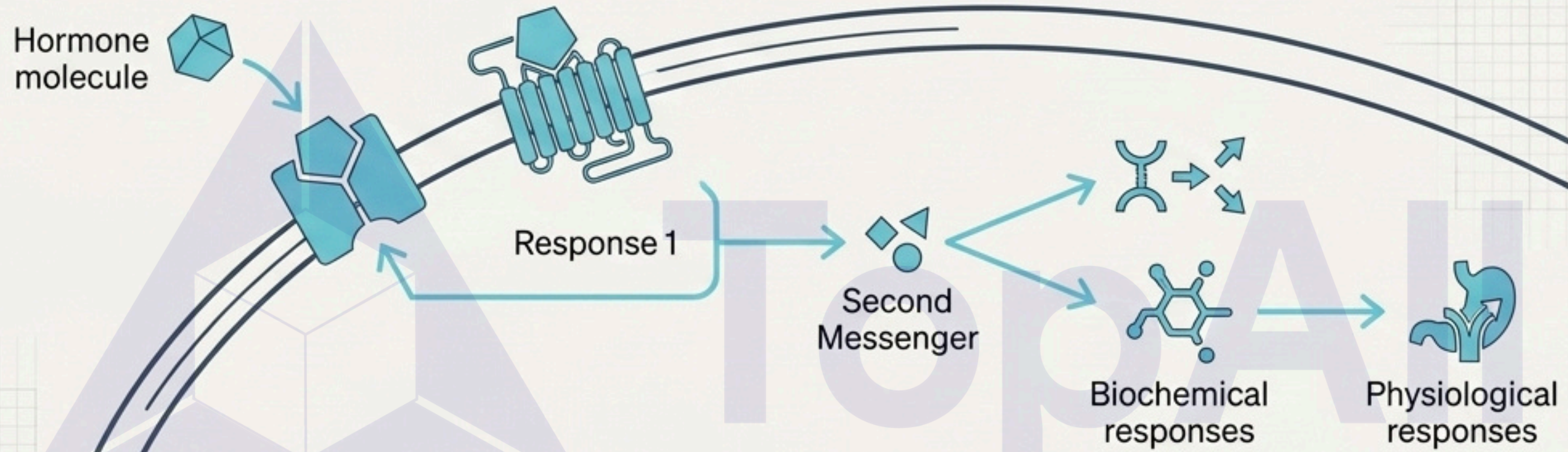


Second Messengers: The Cellular Relay

Context: Because membrane-bound hormones cannot enter the cell, they utilize an internal relay system.



Pathway 1: Protein Hormone Action



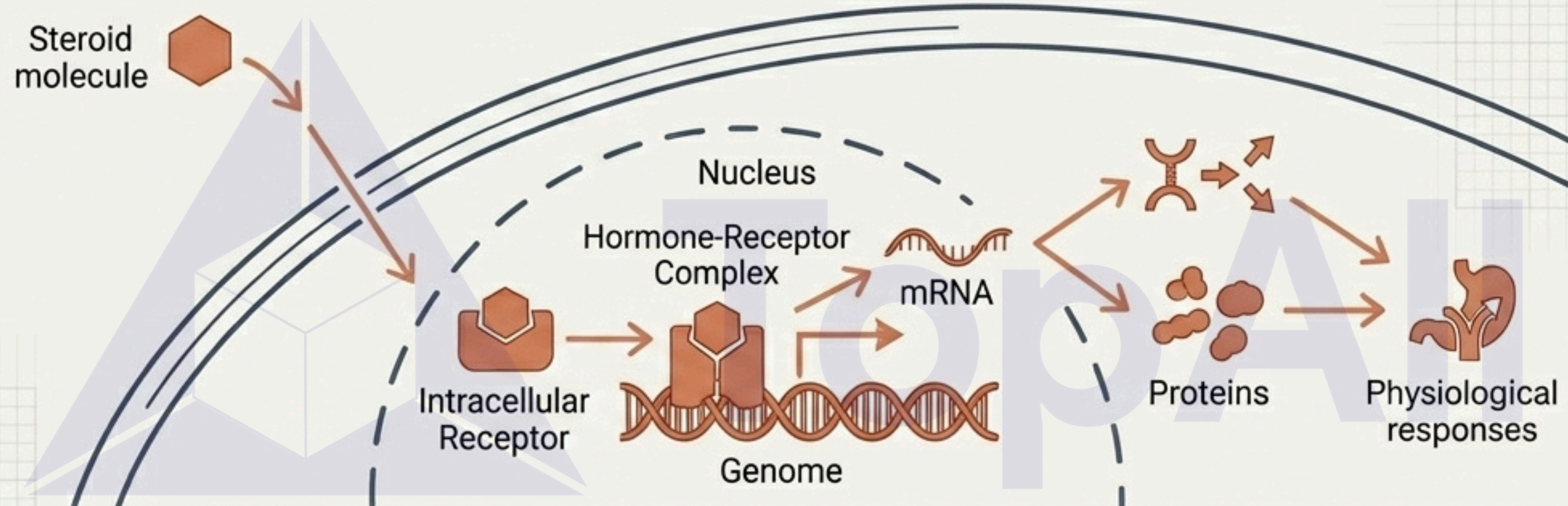
Step 1: Primary Binding.
Hormone (e.g., FSH) binds to the membrane-bound receptor.

Step 2: Initial Response.
Formation of the hormone-receptor complex triggers a membrane-level response.

Step 3: Signal Generation.
Second messengers (cAMP or Ca^{2+}) are synthesized inside the cell.

Step 4: Physiological Effect.
Biochemical responses trigger targeted functions (e.g., ovarian growth).

Pathway 2: Steroid Hormone Action



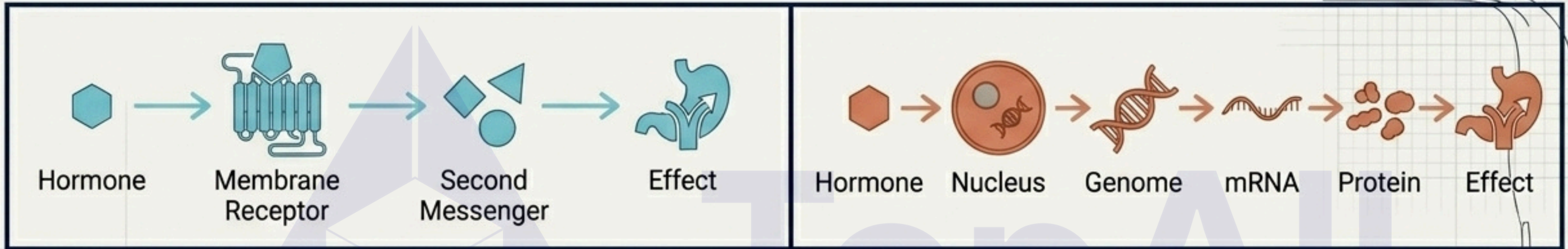
Step 1: Cell Entry.
Steroid hormone (e.g., Estrogen) diffuses directly through the cell membrane.

Step 2: Nuclear Binding.
Binds to a specific intracellular receptor to form the active complex.

Step 3: Genomic Interaction.
The complex binds directly to the genome (DNA), regulating gene expression.

Step 4: Physiological Effect.
Production of specific mRNA and proteins leads to developmental effects (e.g., tissue growth).

Mechanisms of Action: The Key Takeaways



Feature	Protein/Peptide Hormones	Steroid Hormones
Receptor Location	Membrane-bound	Intracellular / Nuclear
Cellular Entry?	No (Relies on Second Messengers)	Yes (Direct interaction)
Core Mechanism	Alters existing cellular metabolism	Regulates gene expression and chromosome function



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