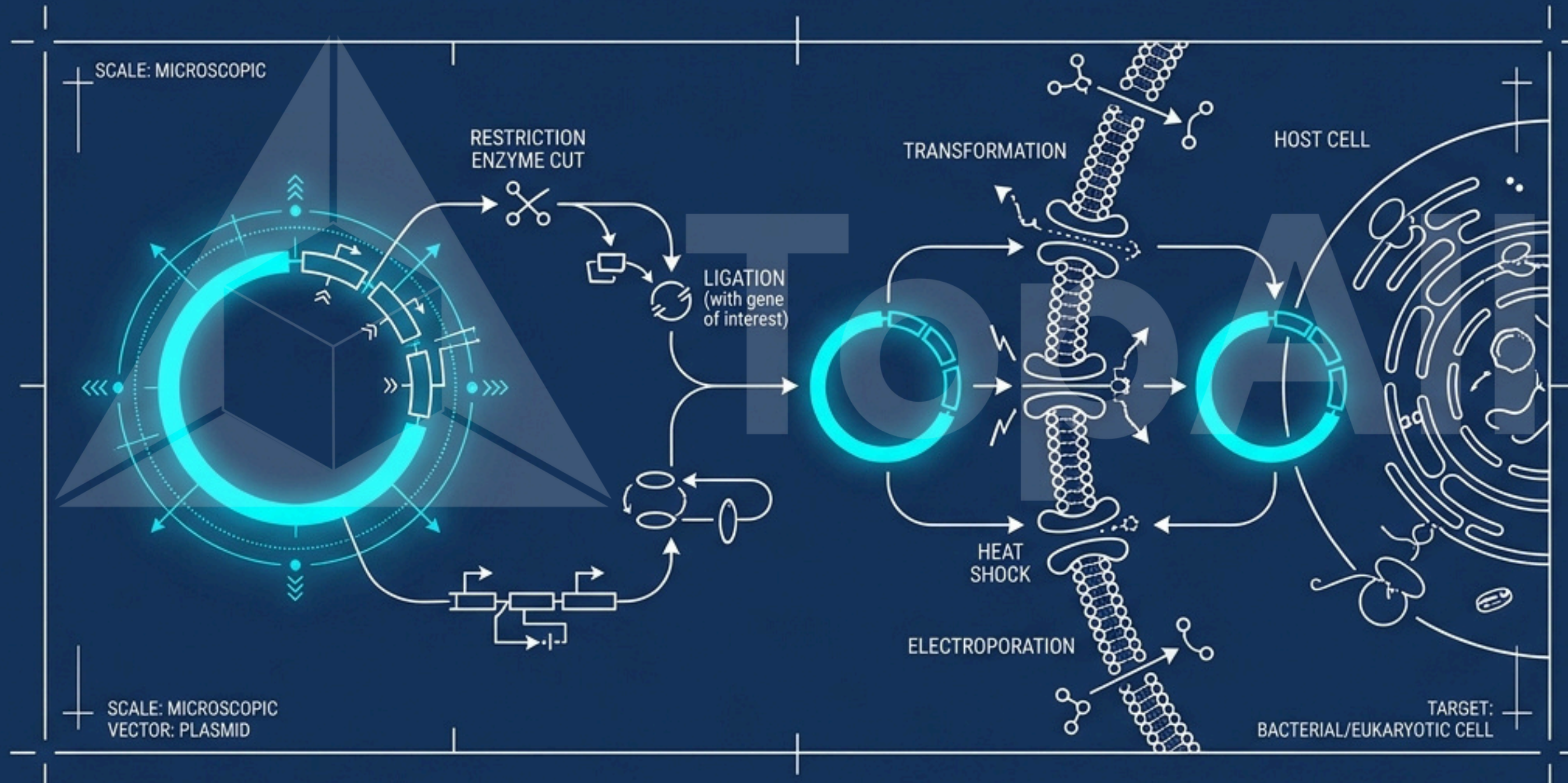


The Entry Strategy

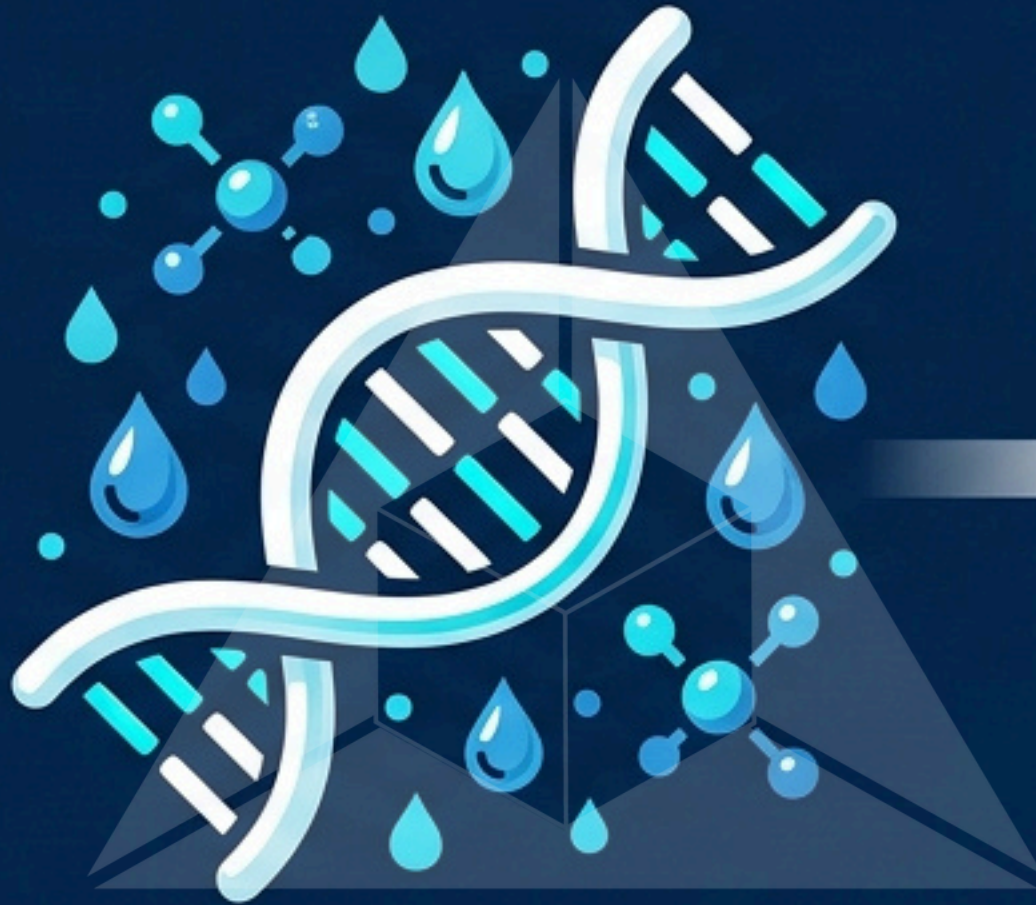
How Recombinant DNA Breaches Host Cells

Biotechnology Principles & Processes



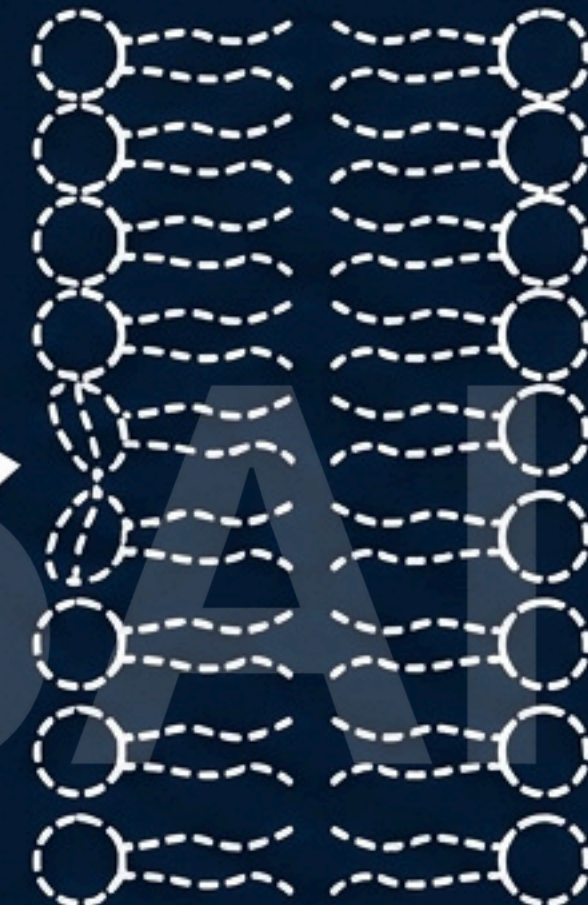
The Biological Barrier

The Hydrophilic Payload



DNA is a hydrophilic molecule.

The Hydrophobic Barrier



Cannot naturally pass through the hydrophobic lipid membranes of host cells.

To achieve transformation, we must force entry.

Creating the 'Competent' Host

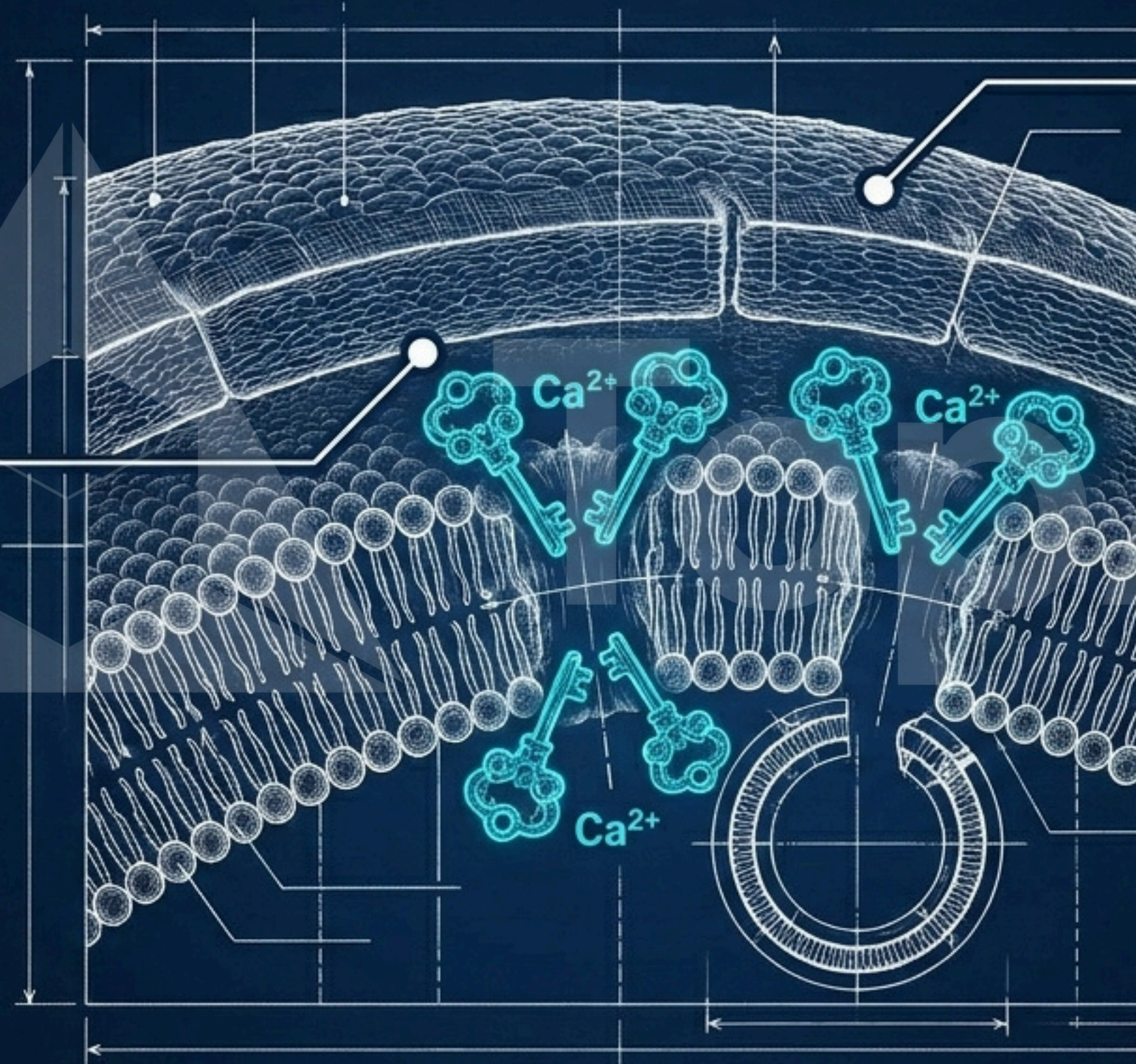
Bacteria must be chemically primed to accept foreign DNA.

The Treatment

Cells are treated with a specific concentration of a divalent cation, such as Calcium (Ca^{2+}).

The Effect

These ions alter the cell wall, significantly increasing the efficiency with which DNA can enter through the membrane pores.





You've Learned the Theory. Let's Test Them Now.

$$E=mc^2$$



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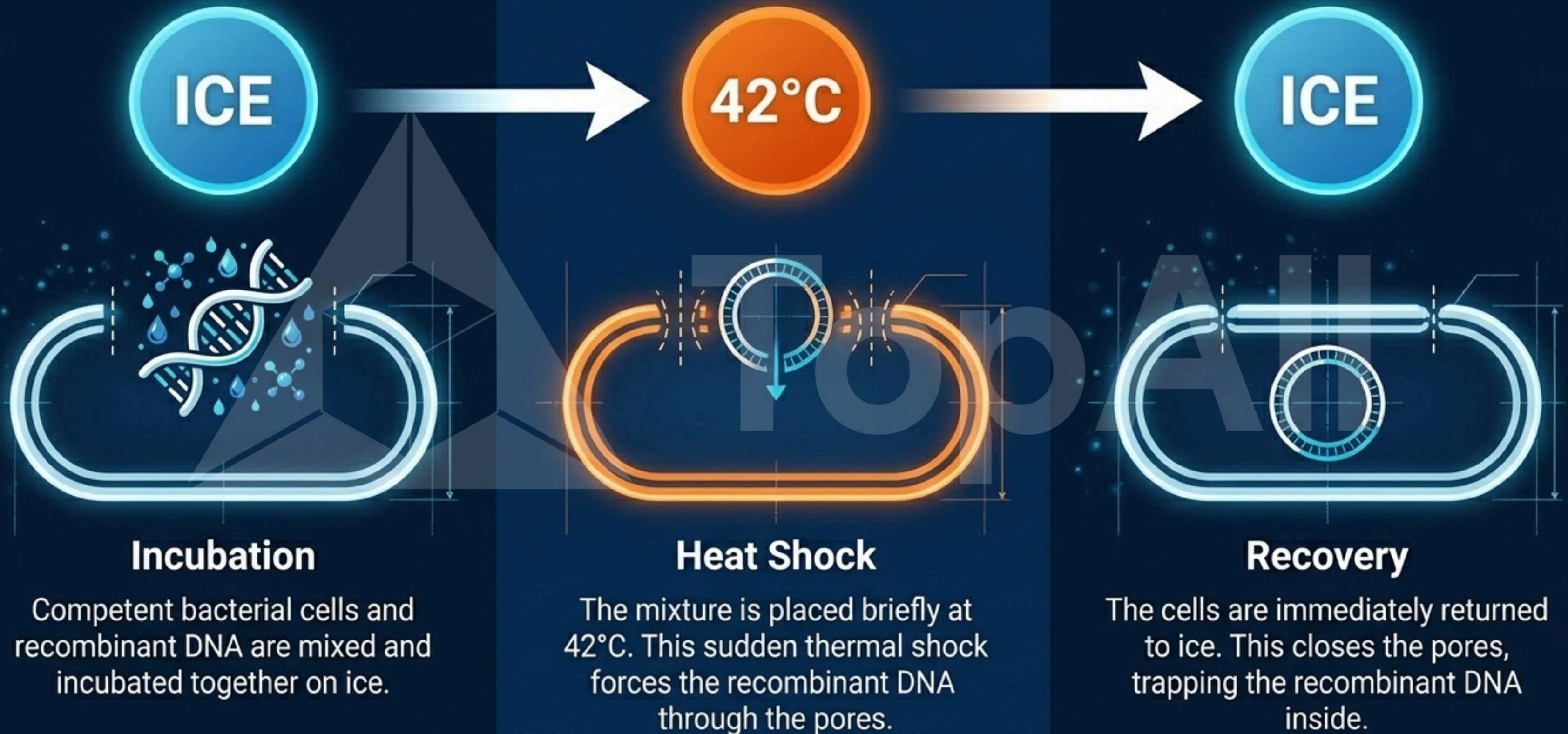
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The Heat Shock Protocol



Direct & Mechanical Methods

Techniques to physically bypass cell membranes and introduce foreign DNA.

Micro-injection

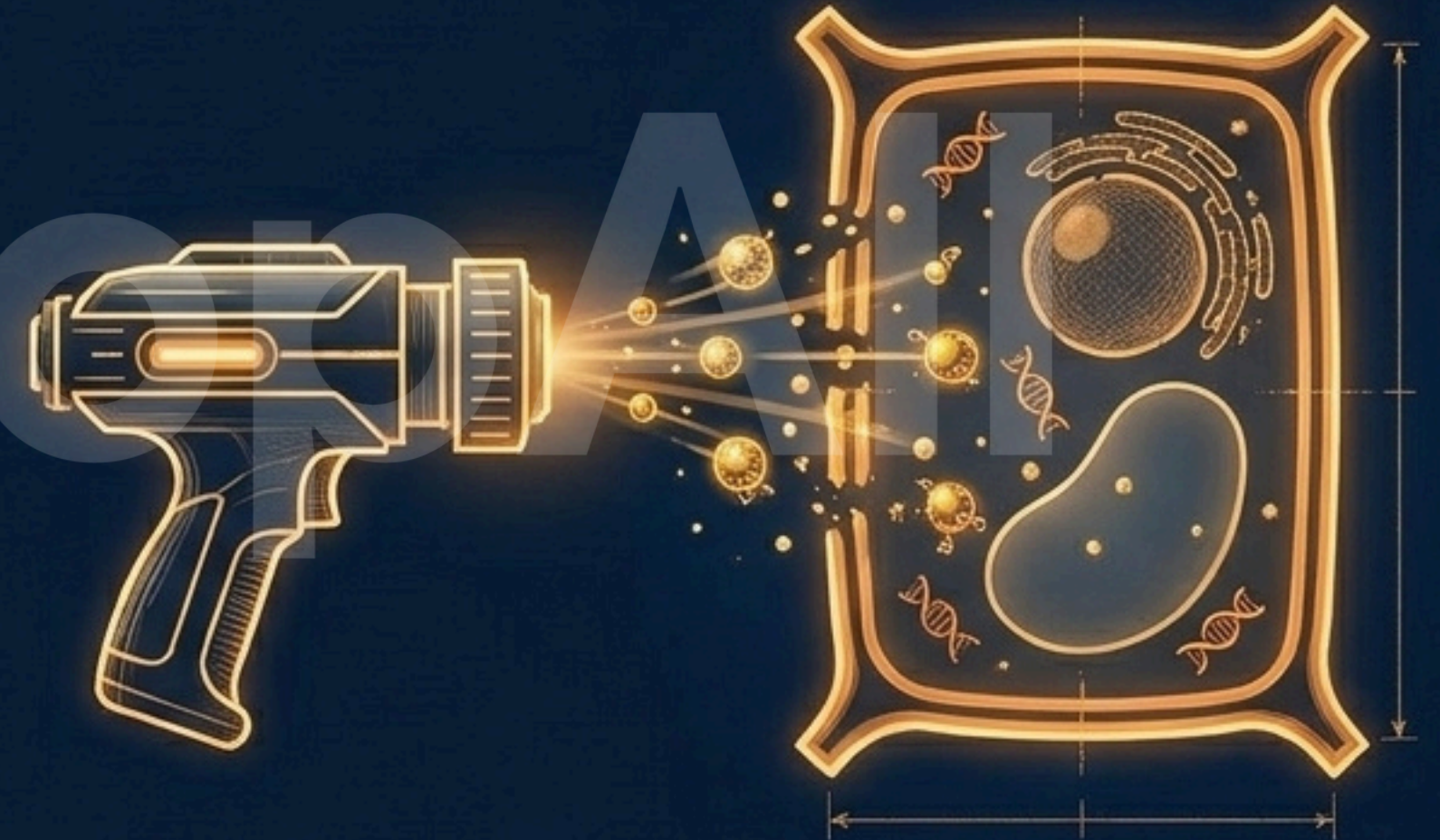
Animal Cells



Recombinant DNA is directly injected into the nucleus of an animal cell.

Biolistics (Gene Gun)

Plant Cells



Plant cells are bombarded with high-velocity micro-particles of gold or tungsten coated with DNA.

Disarmed Pathogen Vectors

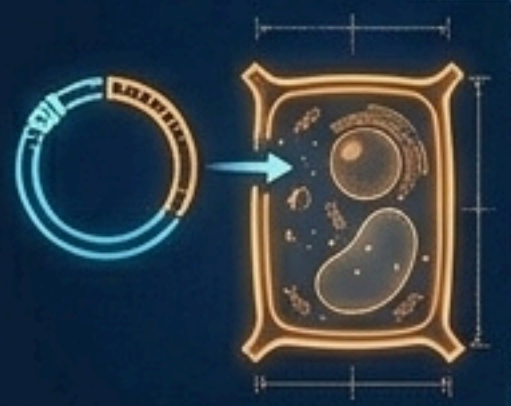
Hijacking natural infection mechanisms by removing the pathogen's ability to cause disease while keeping its ability to deliver DNA.



Agrobacterium tumefaciens

PLANT CELLS

Modified Ti plasmid naturally delivers DNA into a variety of plant cells.



Retroviruses

ANIMAL CELLS

Disarmed viruses naturally infect and deliver desirable genes into animal cells.



NEET Takeaway: Entry Mechanisms at a Glance

Method	Target Host	Key Agent / Mechanism
Transformation (Heat Shock)	Bacteria	Divalent Cations (Ca^{2+}) + Ice 42°C / Ice
Micro-injection	Animal Cells	Direct injection into the nucleus
Biolistics (Gene Gun)	Plant Cells	High-velocity Gold or Tungsten micro-particles
Disarmed Pathogens	Plants & Animals	Agrobacterium (plants) / Retroviruses (animals)

Memorize these target-host pairings for rapid recall.



You've Learned the Theory.

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