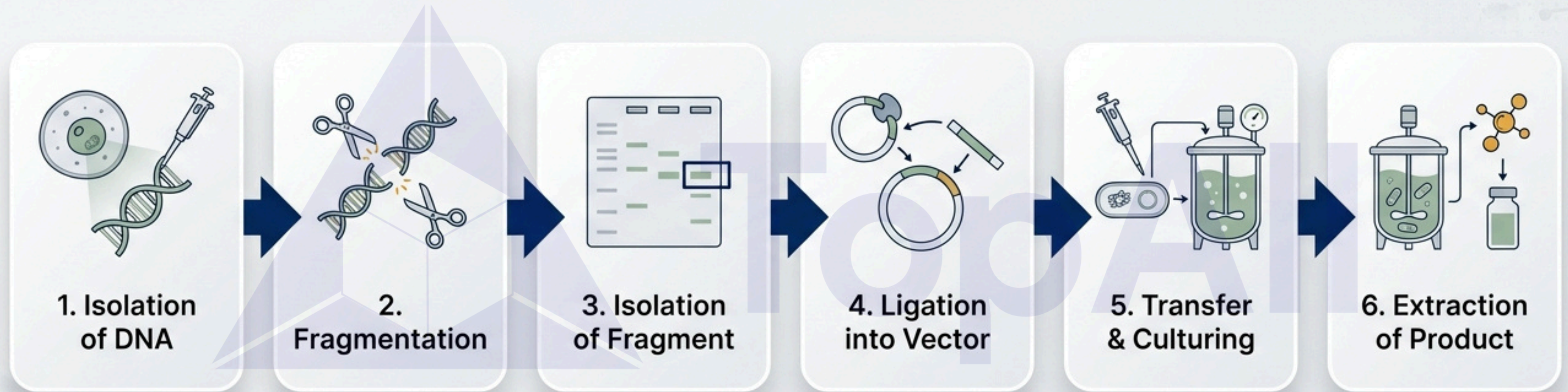
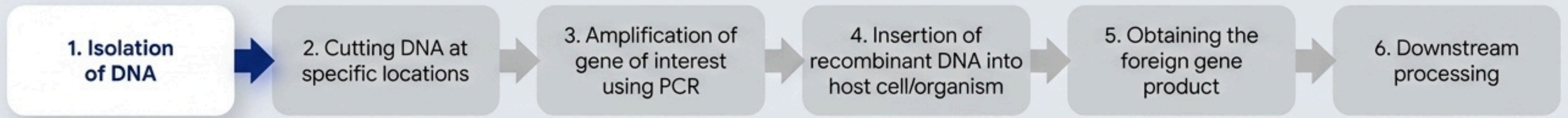


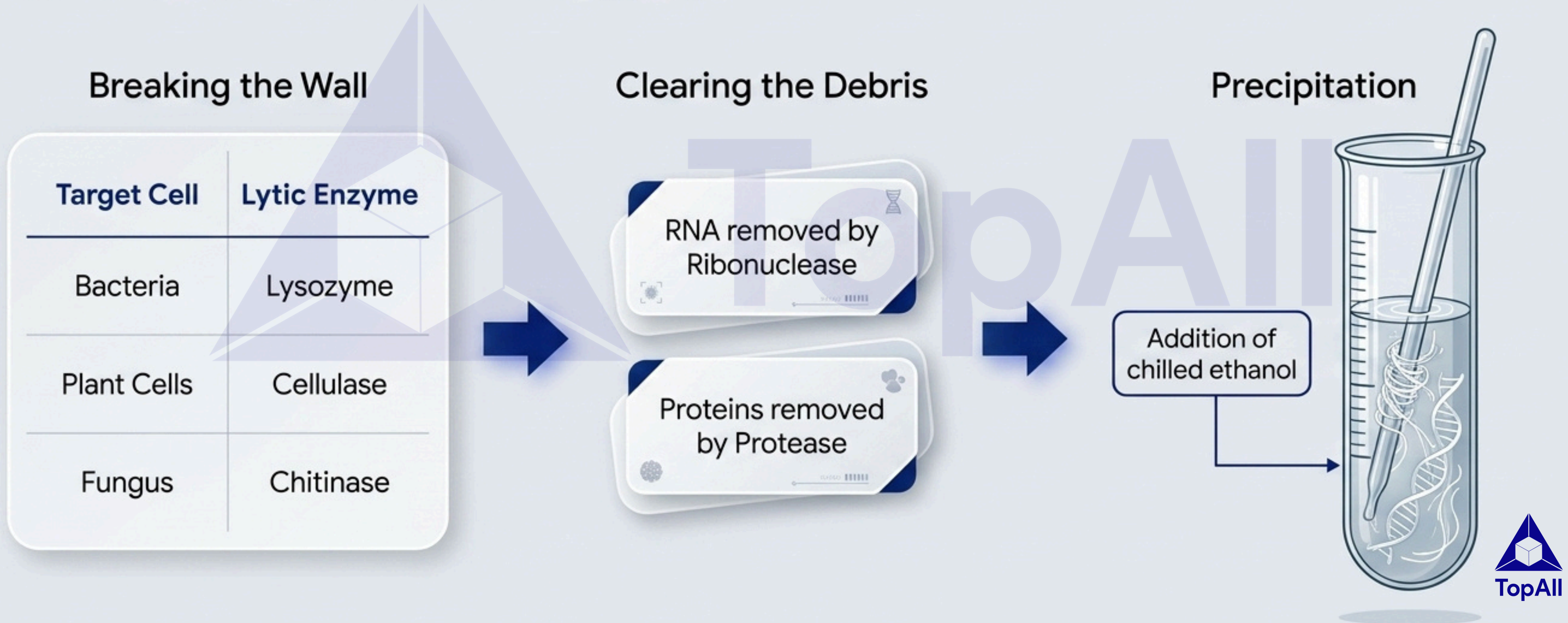
R-DNA Technology: The Complete Process



The Bio-Engineering Pipeline: From single gene to mass-produced therapeutic.



Isolation of the Genetic Material



1. Isolation of DNA

2. Fragmentation

3. Amplification of gene of interest using PCR

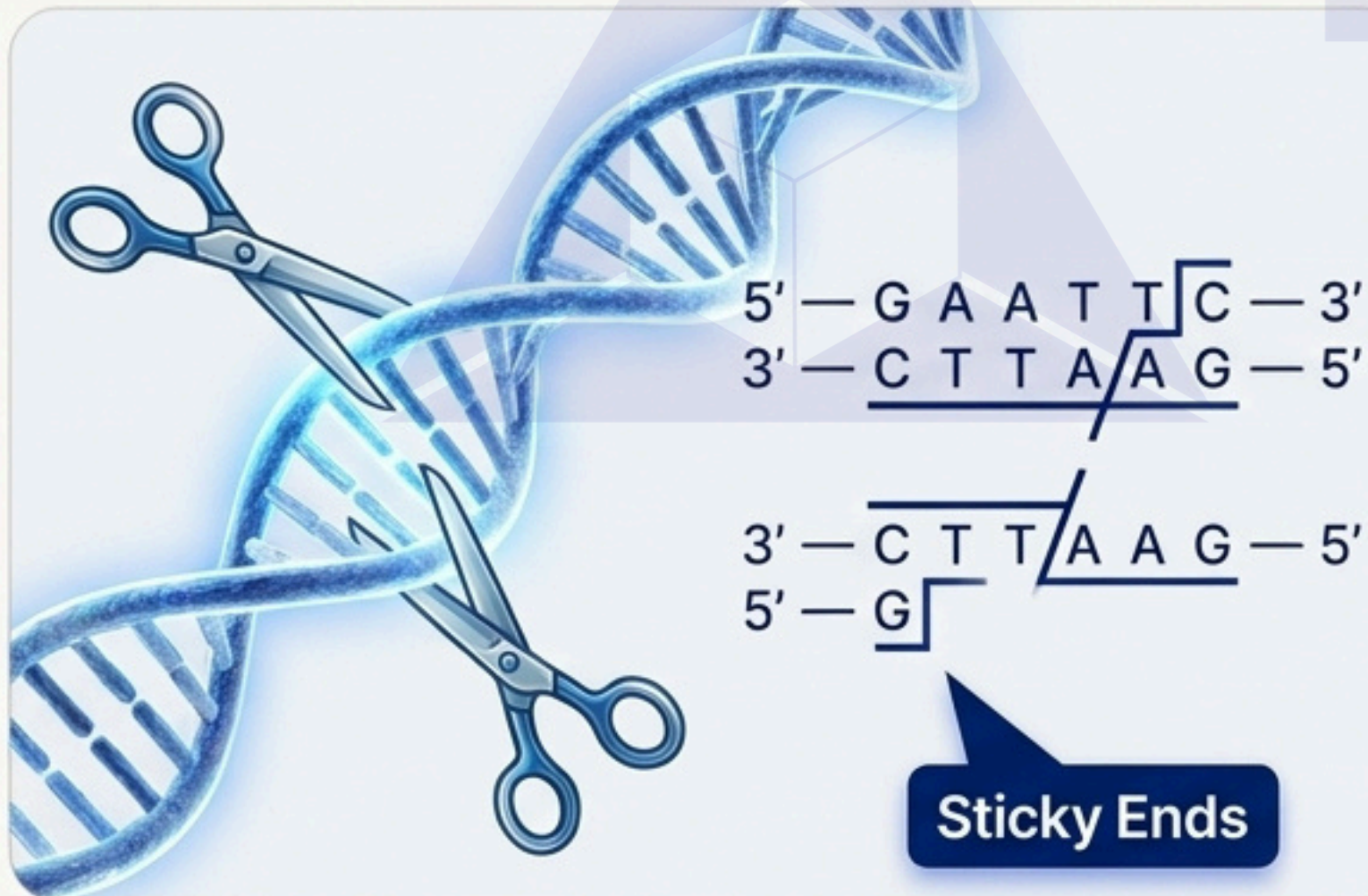
4. Insertion of recombinant DNA...

5. Obtaining the foreign gene...

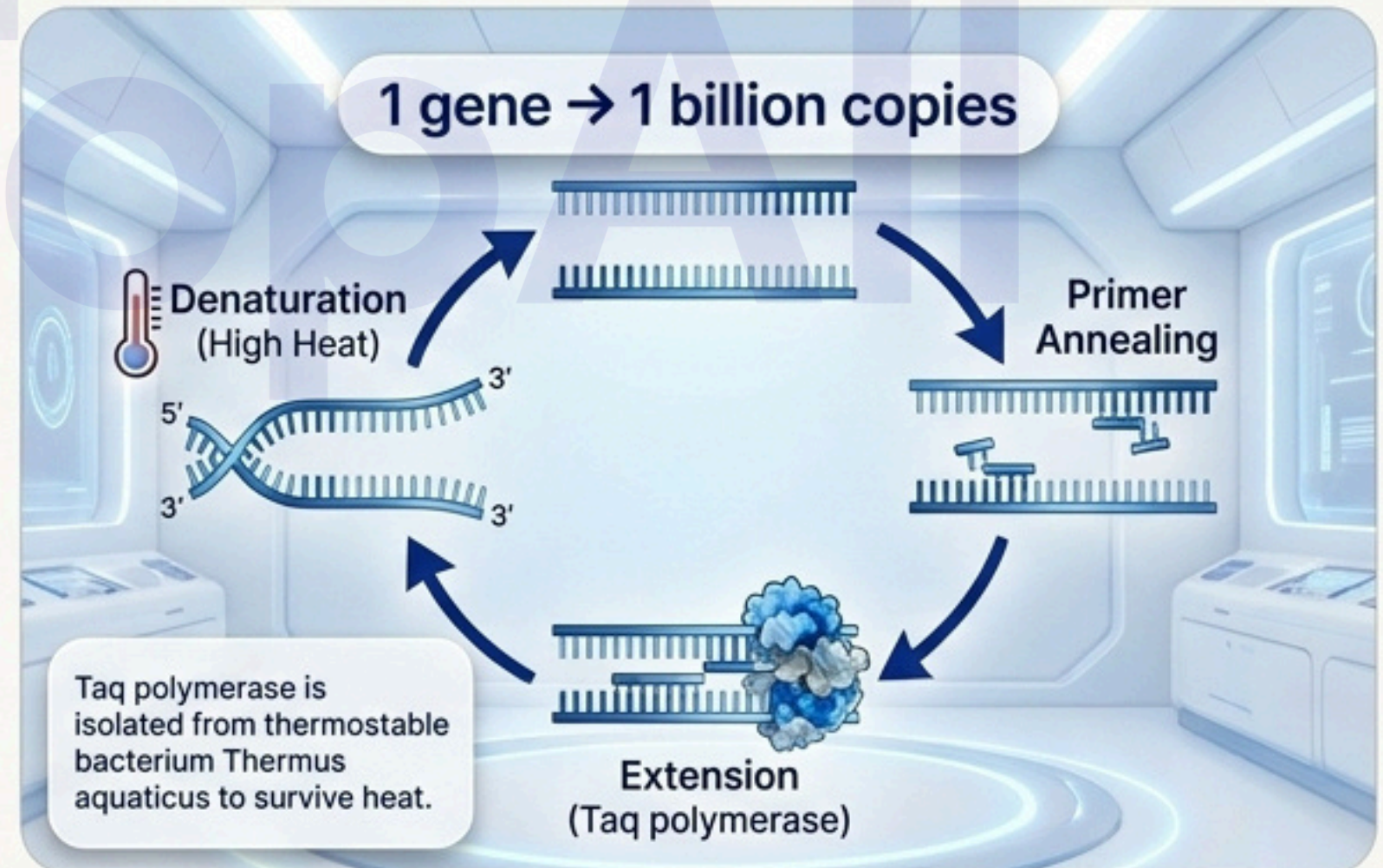
6. Downstream processing

Fragmentation & Amplification

Molecular Scissors



Amplification via PCR





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1. Isolation of DNA



2. Cutting DNA



3. Isolation of Fragment



4. Insertion of Recombinant DNA



5. Obtaining Product



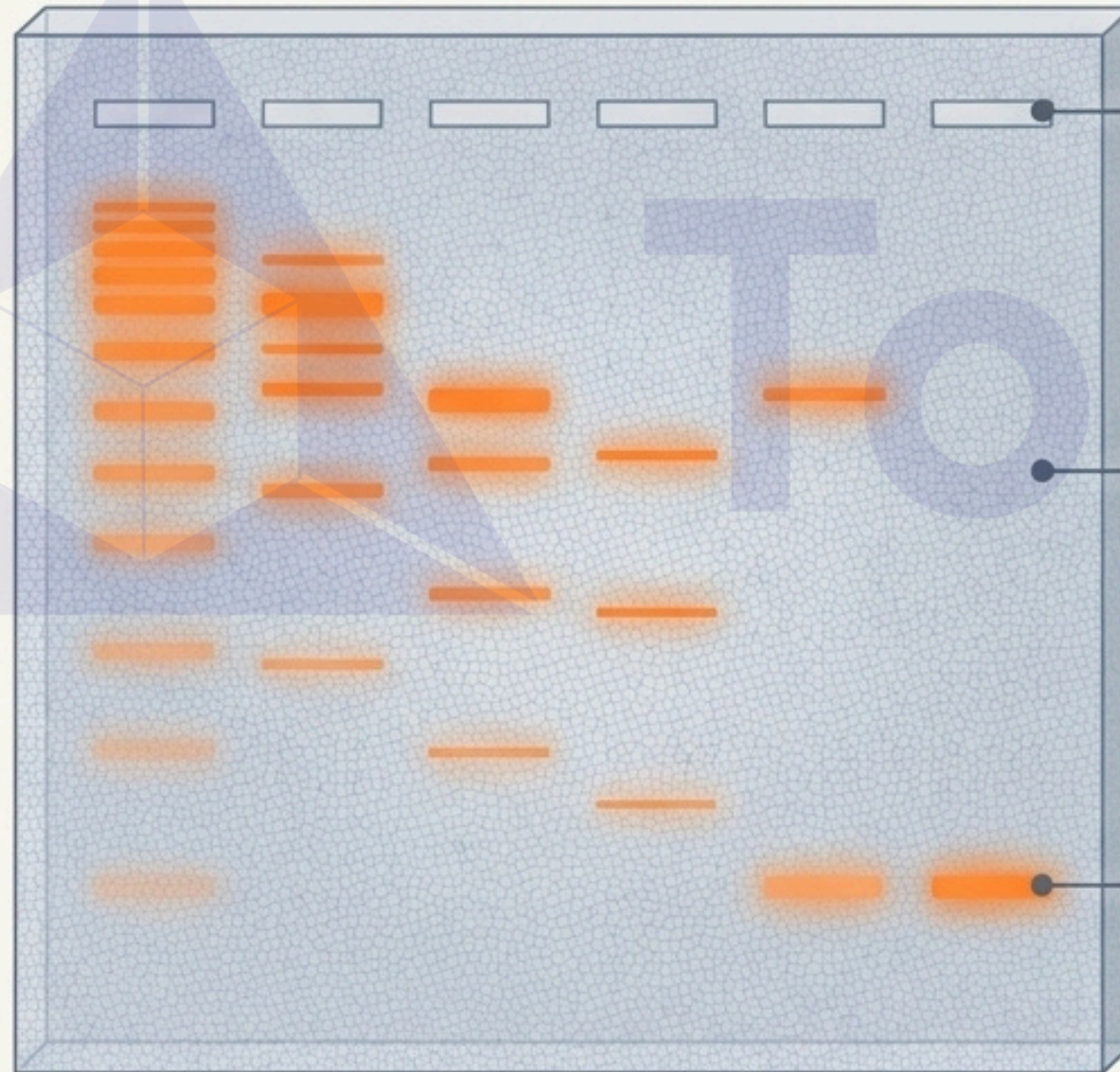
6. Downstream Processing

Gel Electrophoresis: Sorting by Size

Cathode
(Negative)



Anode
(Positive)



DNA is negatively charged, forcing downward migration.

Sieving Effect: Smaller fragments move faster and farther through the agarose matrix.

Visualization & Elution: DNA is invisible in standard light. Stained with ethidium bromide + UV radiation. Bands are cut out (Eluted).



1. Isolation of DNA

2. Fragmentation

3. Amplification...

4. Ligation into Vector

5. Obtaining the foreign...

6. Downstream processing

Ligation: The Molecular Puzzle

Source DNA (Desired Gene)



Vector DNA (Plasmid)



Cut with the **EXACT SAME** restriction enzyme

Ligation

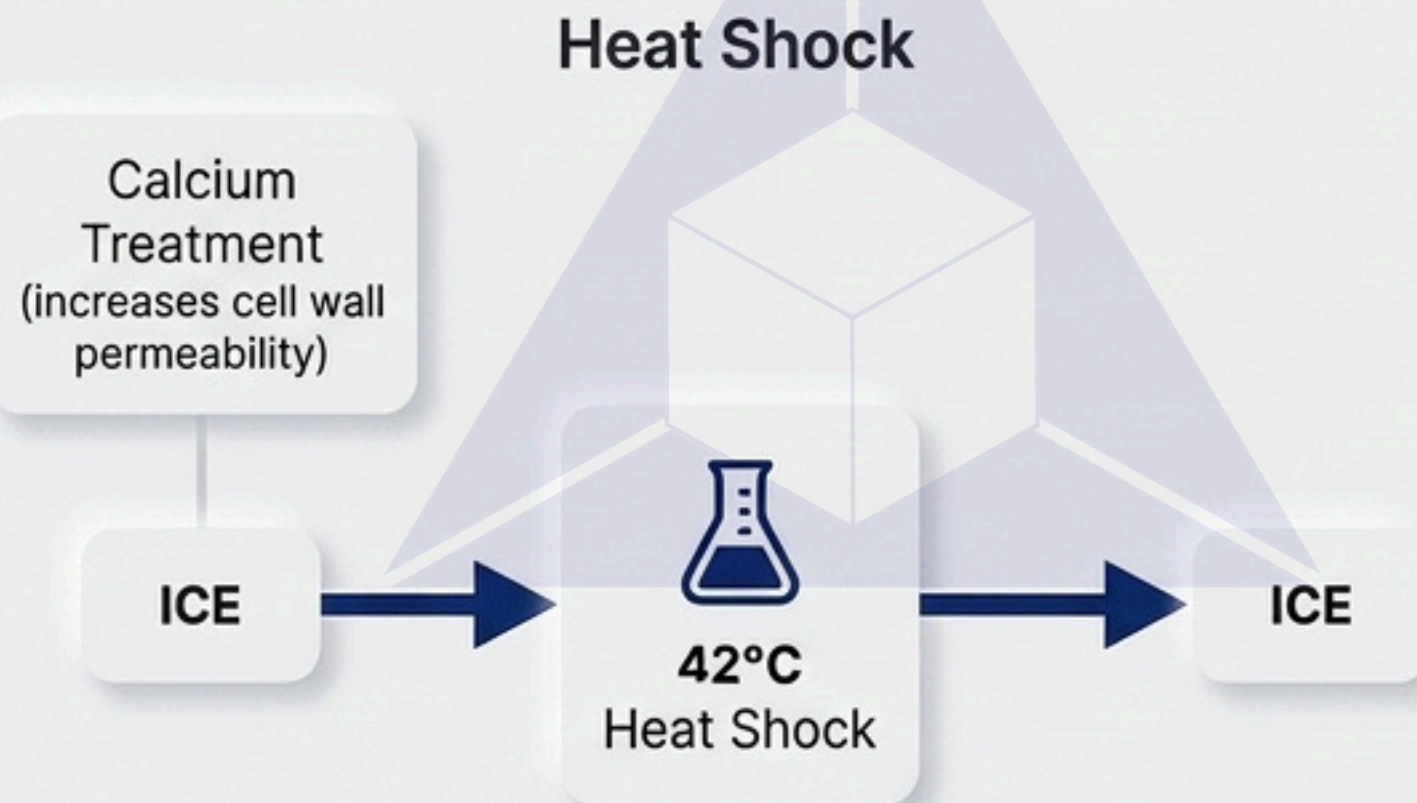
DNA Ligase



Molecular Glue: DNA Ligase seals the sugar-phosphate backbone, creating a fully formed Recombinant DNA ring.

Transfer into Host & Mass Culturing

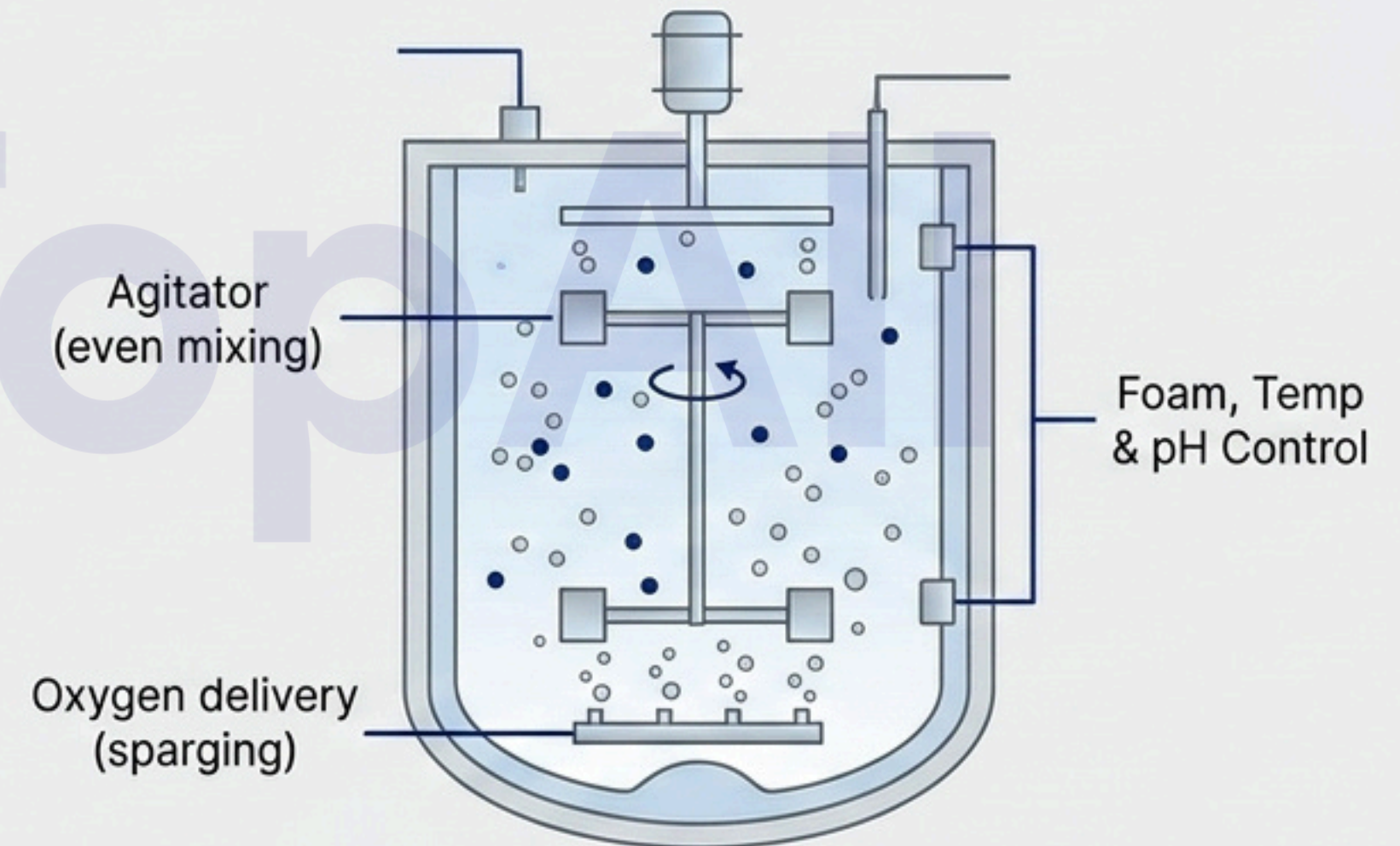
Making a "Competent" Host



Alternatives:

Micro-injection (animal cells) | Gene gun / Biolistics (plant cells)

Mass Culturing

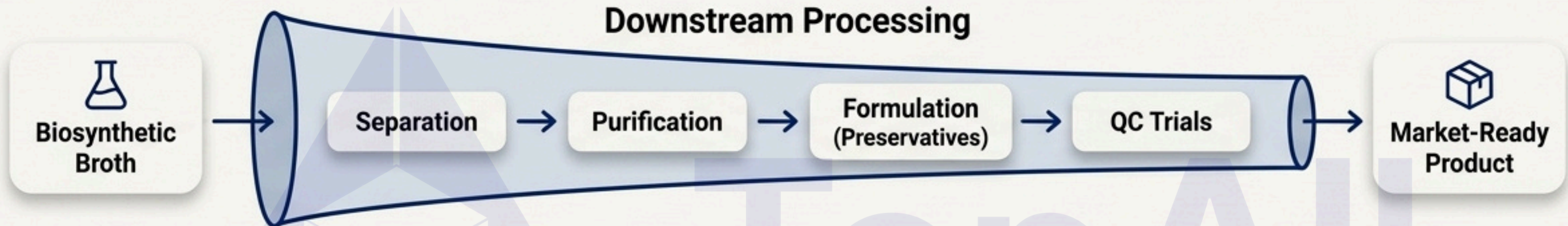


Key Concept: Maintains cells in their most active log/exponential phase for maximum recombinant protein yield.

Bio-Engineering Pipeline Tracker



Extraction & Complete Exam Summary



The Exam Summary Matrix

Process Step	Key Tool/Enzyme	Core Scientific Principle
Isolation	Lysozyme / Cellulase / Ethanol	Break membranes; precipitate pure DNA threads
Fragmentation	Restriction Endonucleases	Cut palindromes to create sticky ends
Separation	Agarose Gel Electrophoresis	Sort by size via negative-to-positive charge
Ligation	DNA Ligase	Seal sugar-phosphate backbone of recombinant vector
Transformation	Heat Shock (42°C) / Calcium	Force competent host cell to take up plasmid
Amplification	PCR (Taq) / Bioreactors	Exponential in-vitro / in-vivo multiplication



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