Applications Of Molecular Biology

Applications

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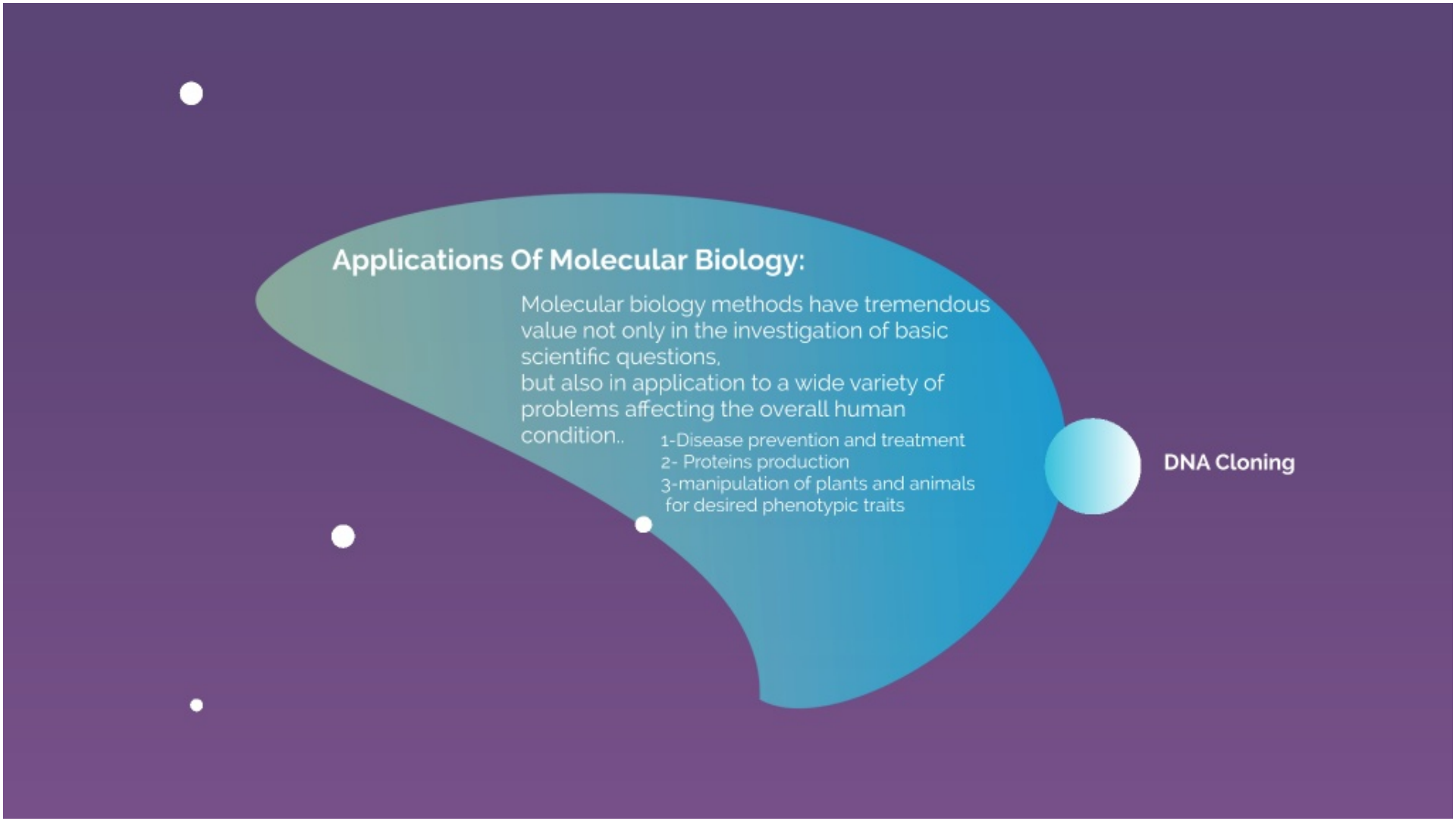

Applications Of Molecular Biology:
Molecular biology methods have tremendous value not only in the investigation of basic scientific questions,
but also in application to a wide variety of problems affecting the overall human condition..
1-Disease prevention and treatment
2- Proteins production
3-manipulation of plants and animals for desired phenotypic traits
DNA Cloning


Key points
Steps
USes
DNA Cloning
is a molecular biology technique that makes many identical copies of a piece of DNA.

Key Points

1-In a typical cloning experiment, a target gene is inserted into a circular piece of DNA called a plasmid.
2-The plasmid is introduced into bacteria via process called transformation, and bacteria carrying the plasmid are selected using antibiotics.
3-Bacteria with the correct plasmid are used to make more plasmid DNA or, in some cases, induced to express the gene and make protein

Steps of DNA cloning

DNA cloning is used for many purposes. As an example, let's see how DNA cloning can be used to synthesize a protein (such as human insulin) in bacteria. The basic steps are:

1-Cut to open the plasmid and "paste" in it the gene. This process relies on restriction enzymes (which cut DNA) and DNA ligase (which joins DNA).

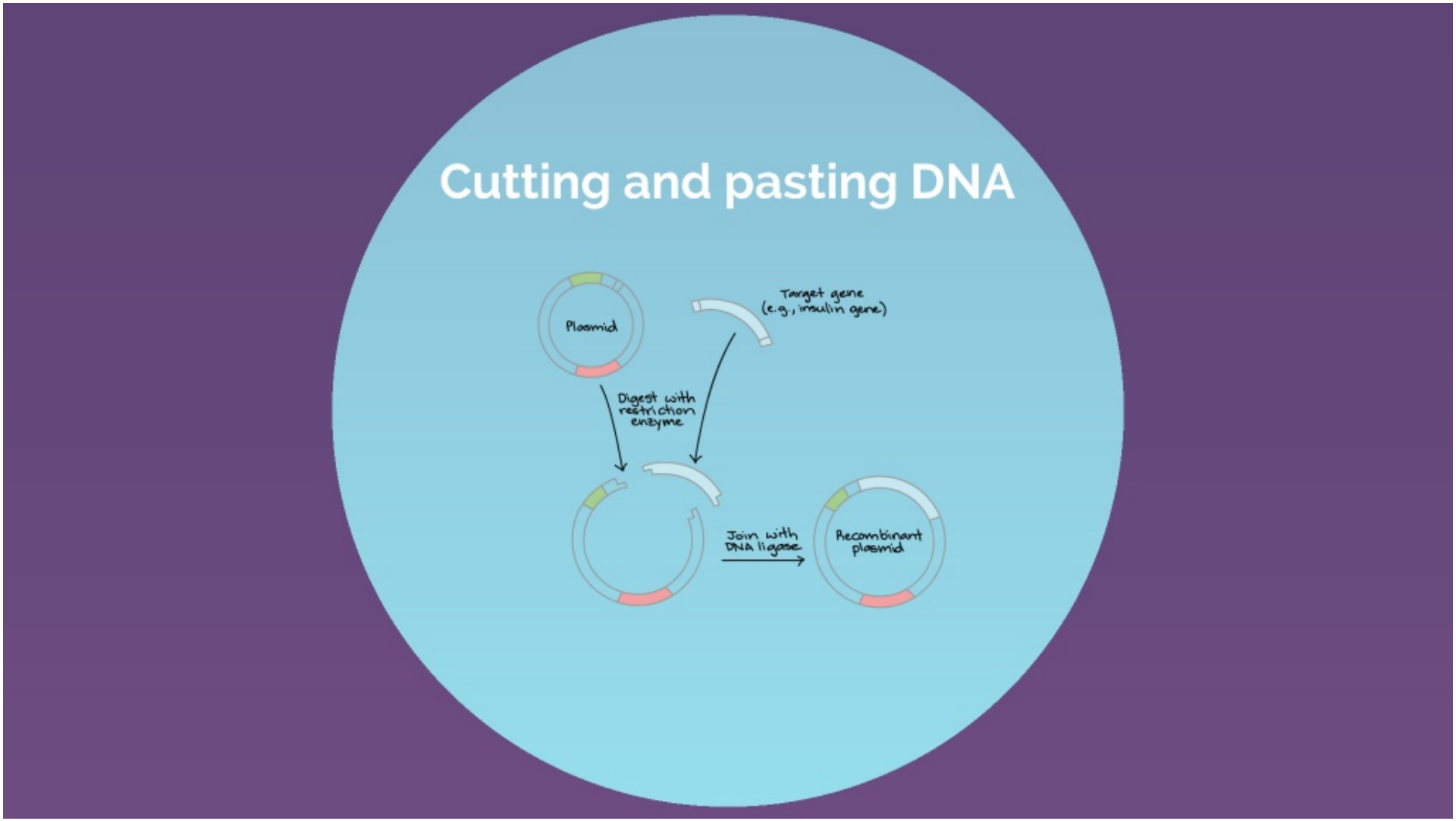
2-Insert the plasmid into bacteria. Use antibiotic selection to identify the bacteria that took up the plasmid.

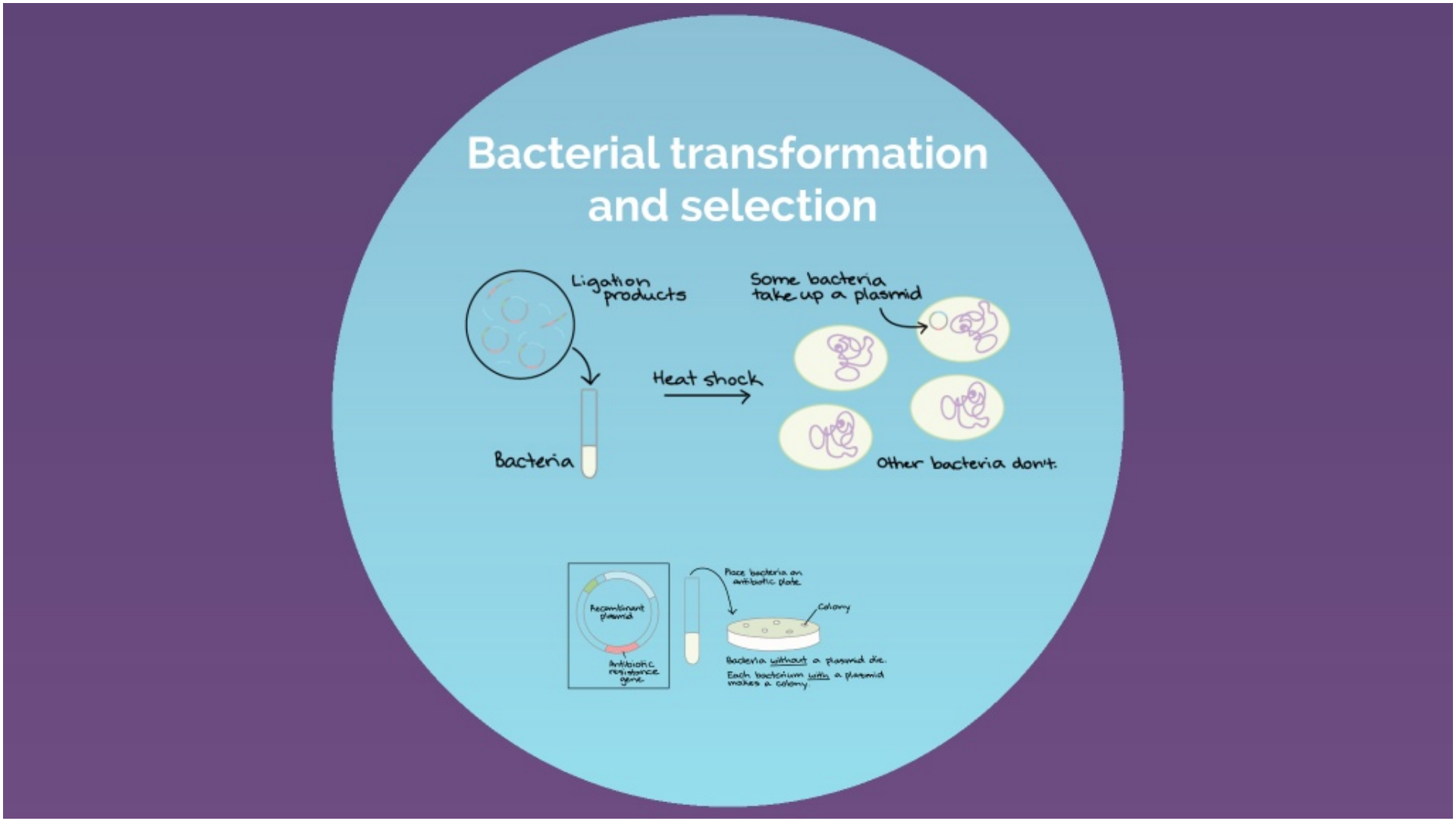
3-Grow up lots of plasmid-carrying bacteria and use them as "factories" to make the protein. Harvest the protein from the bacteria and purify it.

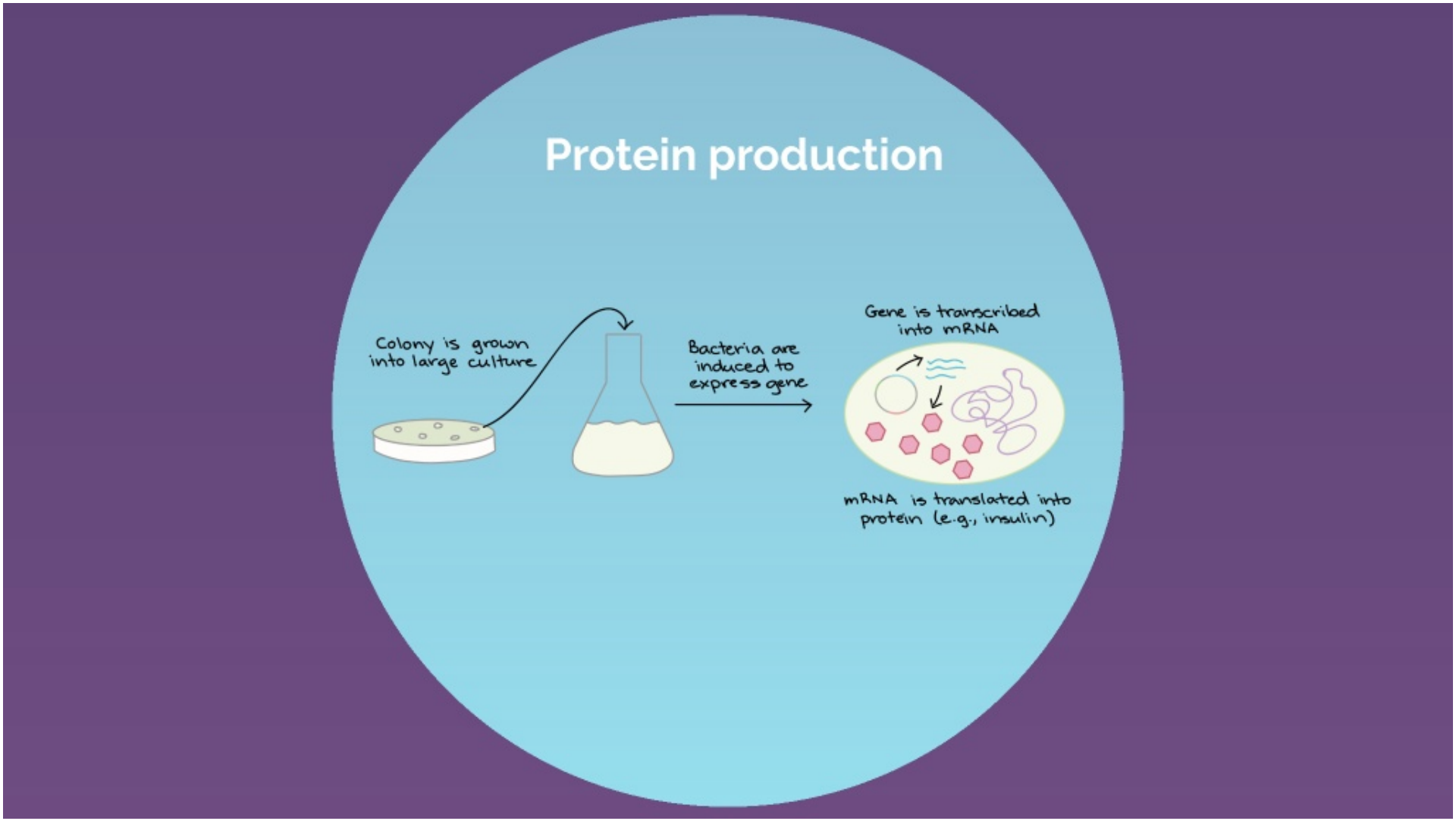
Cutting and pasting DNA

Bacterial transformation and selection

Protein production

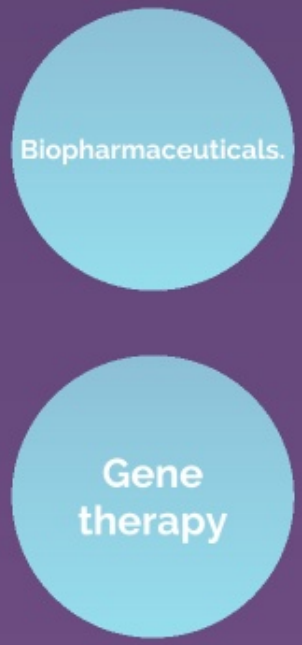

Cutting and pasting DNA
Plasmid
Target gene
(e.g., insulin gene)
Digest with
restriction
enzyme
Join with
DNA ligase
Recombinant
plasmid


Bacterial transformation and selection
Ligation products
Some bacteria take up a plasmid
Heat shock
Bacteria
Other bacteria don't.
Recombinant plasmid
Antibiotic resistance gene
Place bacteria on antibiotic plate
Colony
Bacteria without a plasmid die.
Each bacterium with a plasmid makes a colony.


Protein production
Colony is grown into large culture
Bacteria are induced to express gene
Gene is transcribed into mRNA
mRNA is translated into protein (e.g., insulin)

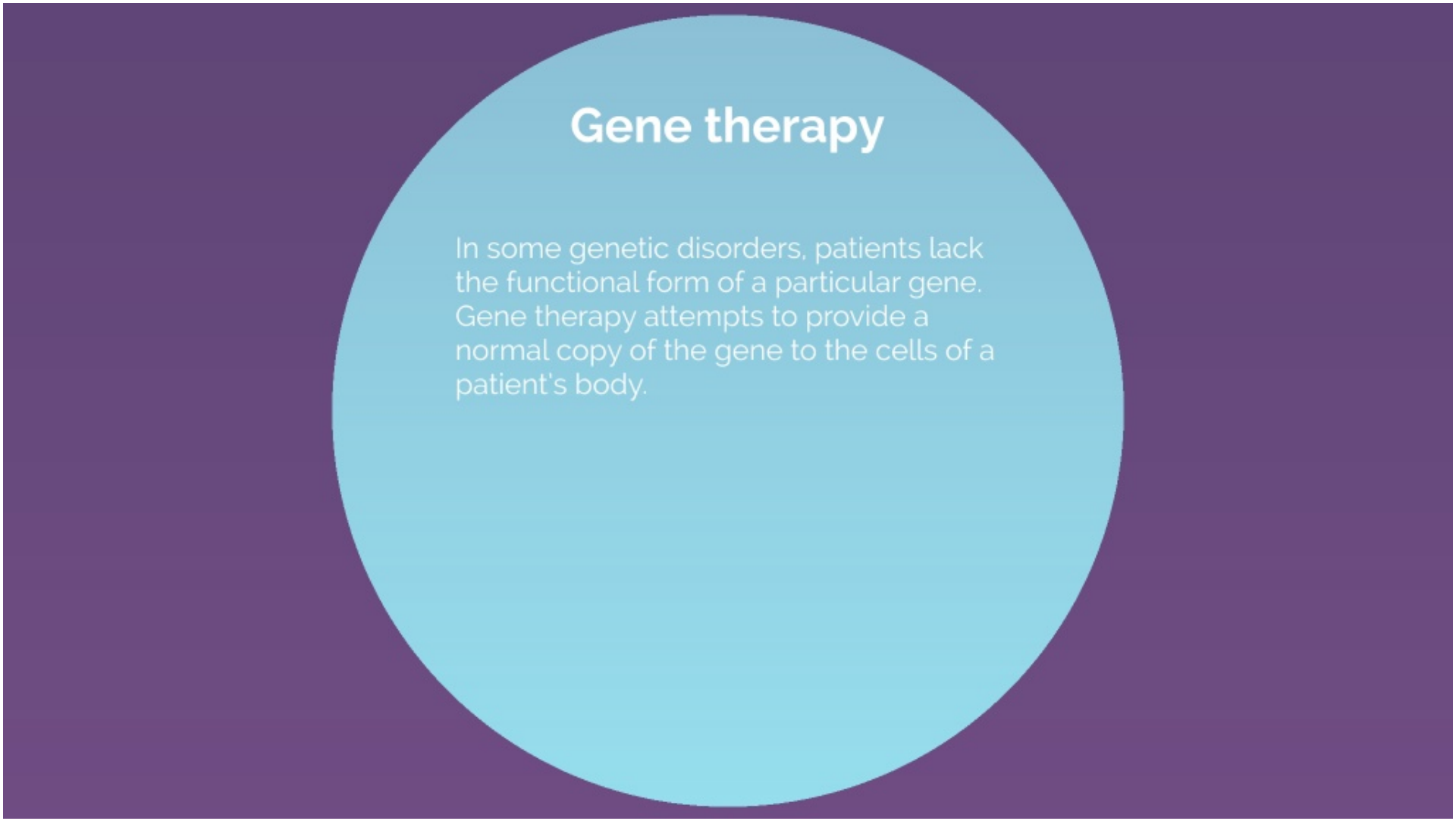
USes of DNA cloning:

DNA molecules built through cloning techniques are used for many purposes in molecular biology. A short list of examples includes:



Bio-pharmaceuticals

DNA cloning can be used to make human proteins with biomedical applications, such as the insulin. Other examples of recombinant proteins include human growth hormone, which is given to patients who are unable to synthesize the hormone.


Gene therapy
In some genetic disorders, patients lack the functional form of a particular gene. Gene therapy attempts to provide a normal copy of the gene to the cells of a patient's body.

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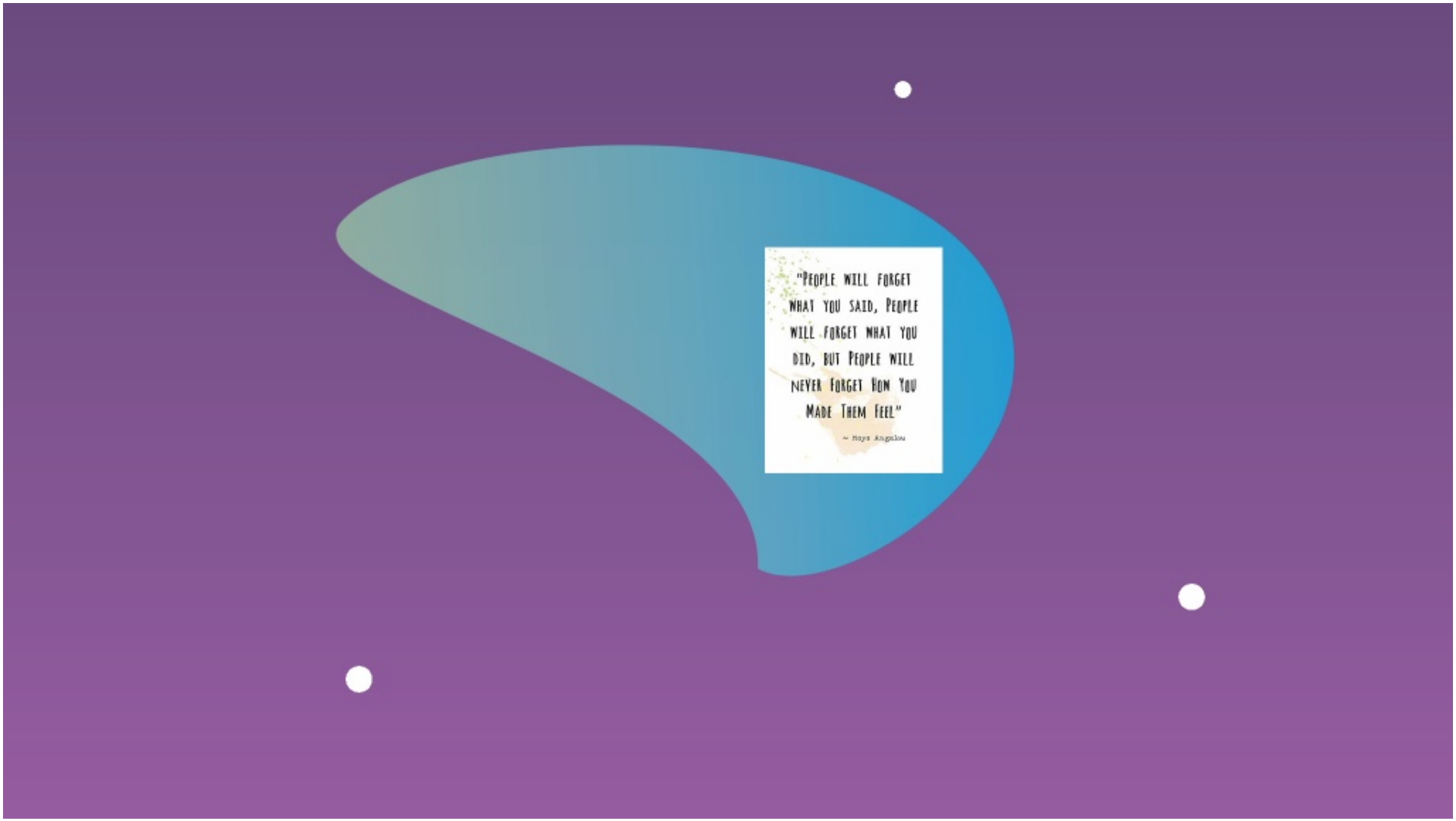
"People will forget
what you said, People
will forget what you
did, but People will
never forget How You
Made Them Feel"
~ Maya Angelou

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