

GENETIC MODIFICATION

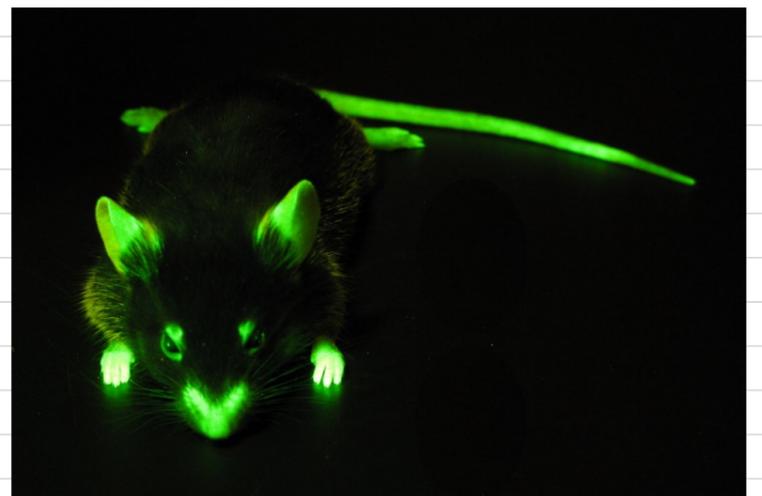
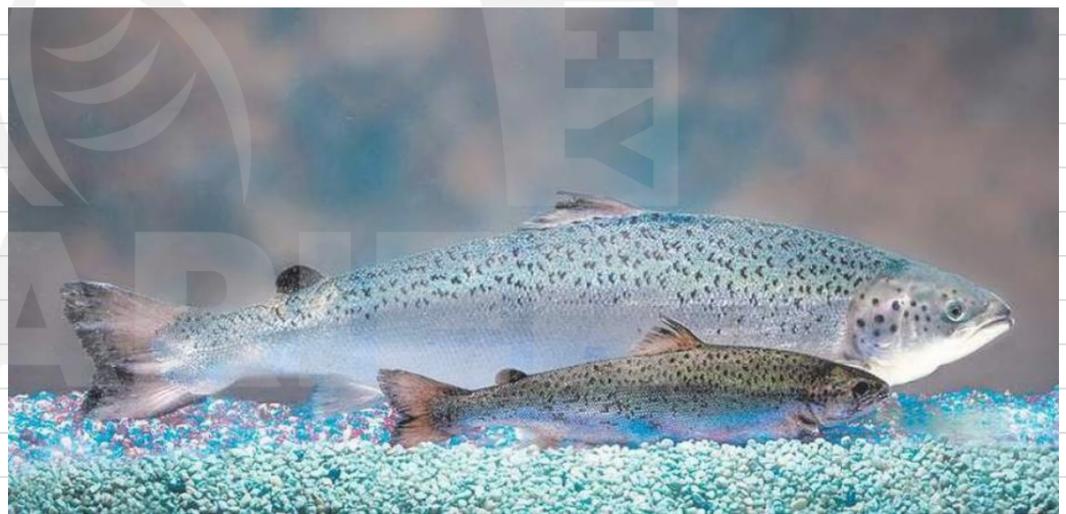
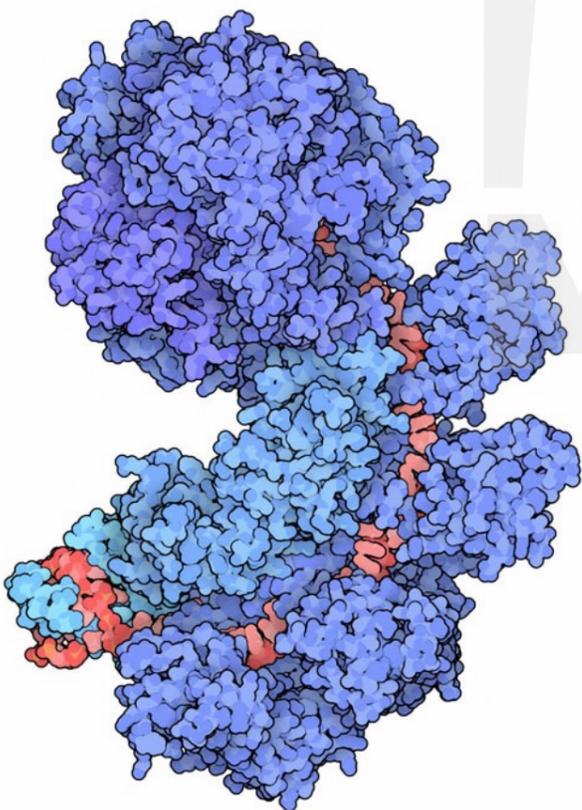
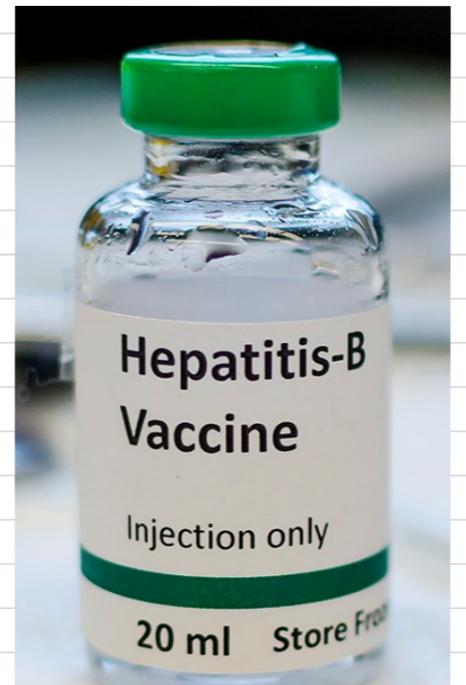
modifying protein synthesis

Learning outcomes

- ✓ Understand different methods of genetically modifying organisms
- ✓ Understand the process of producing insulin using gene transfer (transgenesis)
- ✓ Understand different uses of genetically modifying organisms with corresponding examples
- ✓ Evaluate the use of a genetically modified organism of your choice, being aware of:
 - how the GMO works
 - advantages of its use
 - disadvantages/risks of its use

Key terms

- genetic modification
- induced polyploidy
- mutagenesis
- genome editing
- transgenesis
- restriction enzyme
- sticky ends
- vector
- recombinant plasmid
- evaluate



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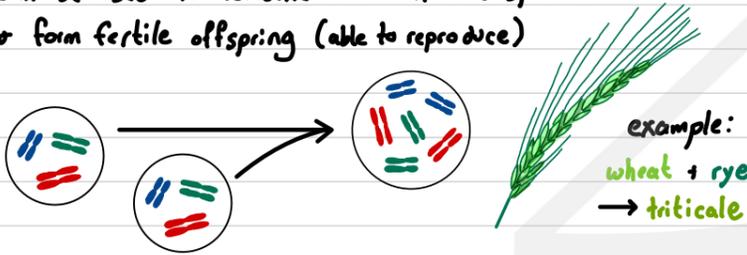
genetic modification: also known as 'genetic engineering' is where the genome of an organism is altered in order to include or exclude a particular characteristic → result is a Genetically Modified Organism or GMO
 → the genetic material is altered by either adding, removing, or editing genes

How does this alter characteristics?

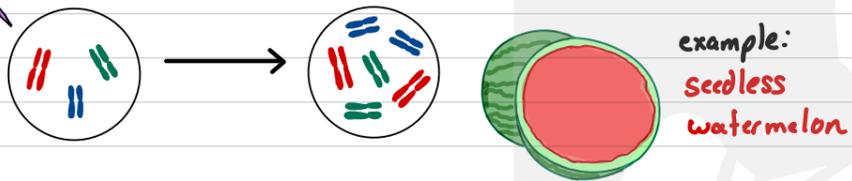
genetic modification alters the genetic code of an organism → different genetic code produces new proteins / stops producing certain proteins → different protein expression leads to new characteristics

Induced polyploidy: increases the amount of chromosomes in a species

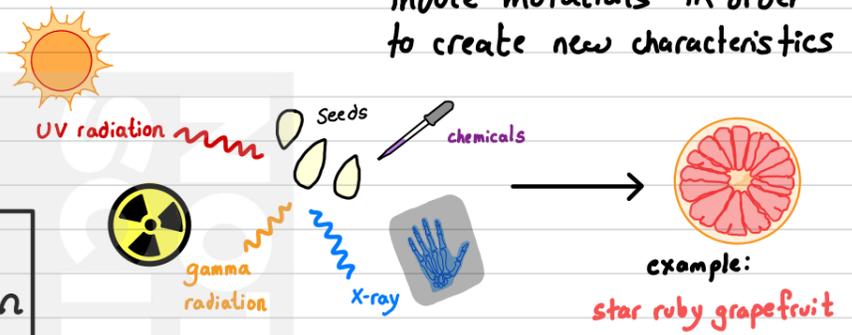
→ can be used to combine two infertile species or form fertile offspring (able to reproduce)



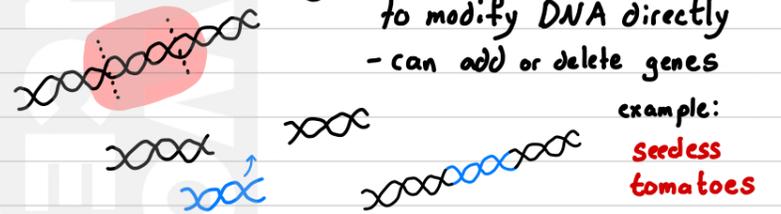
→ chemicals can be applied in order to cause species to become infertile (unable to reproduce)



Mutagenesis: use of mutagens to induce mutations in order to create new characteristics



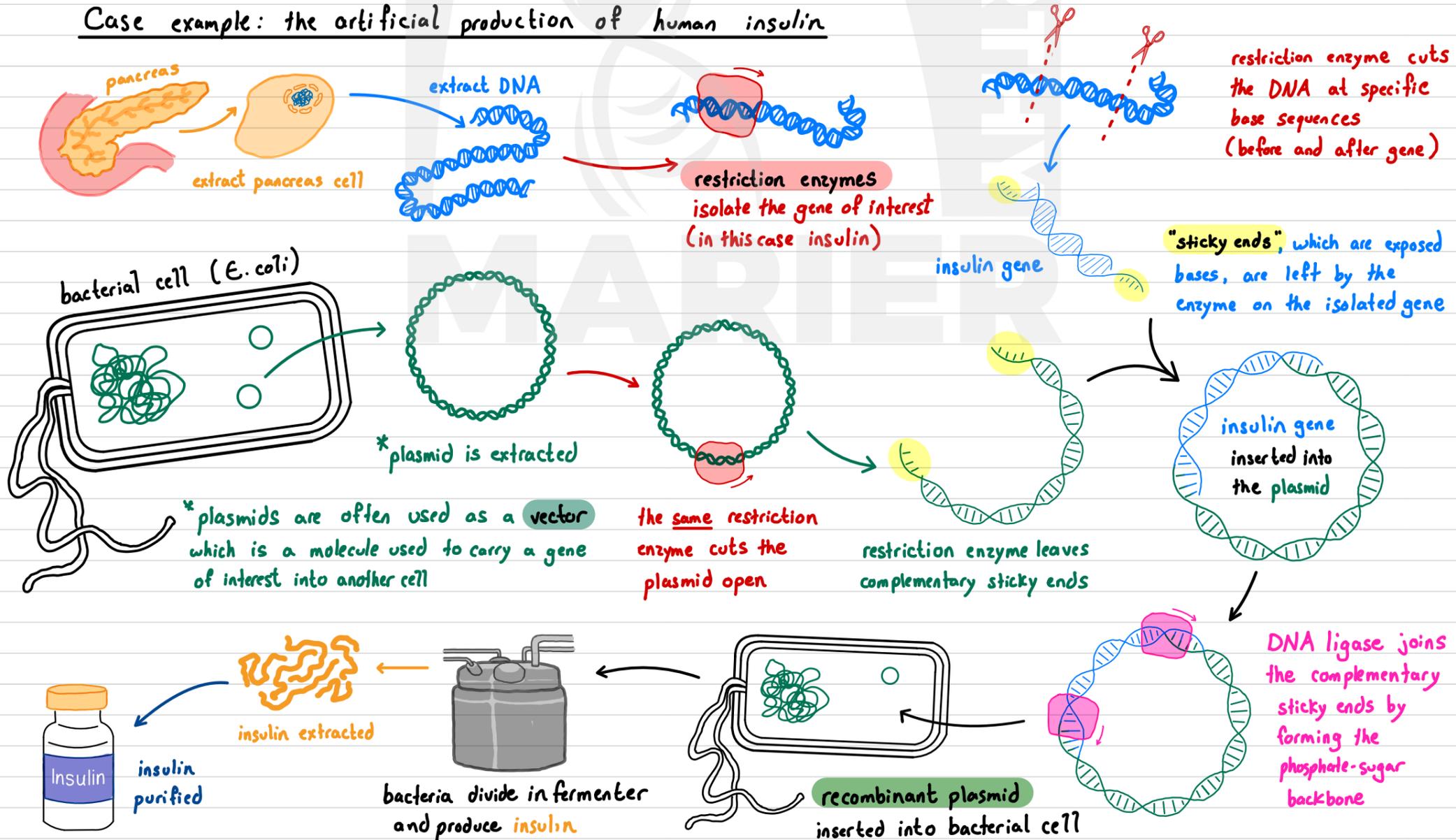
Genome editing: use enzymes (like CRISPR) to modify DNA directly - can add or delete genes



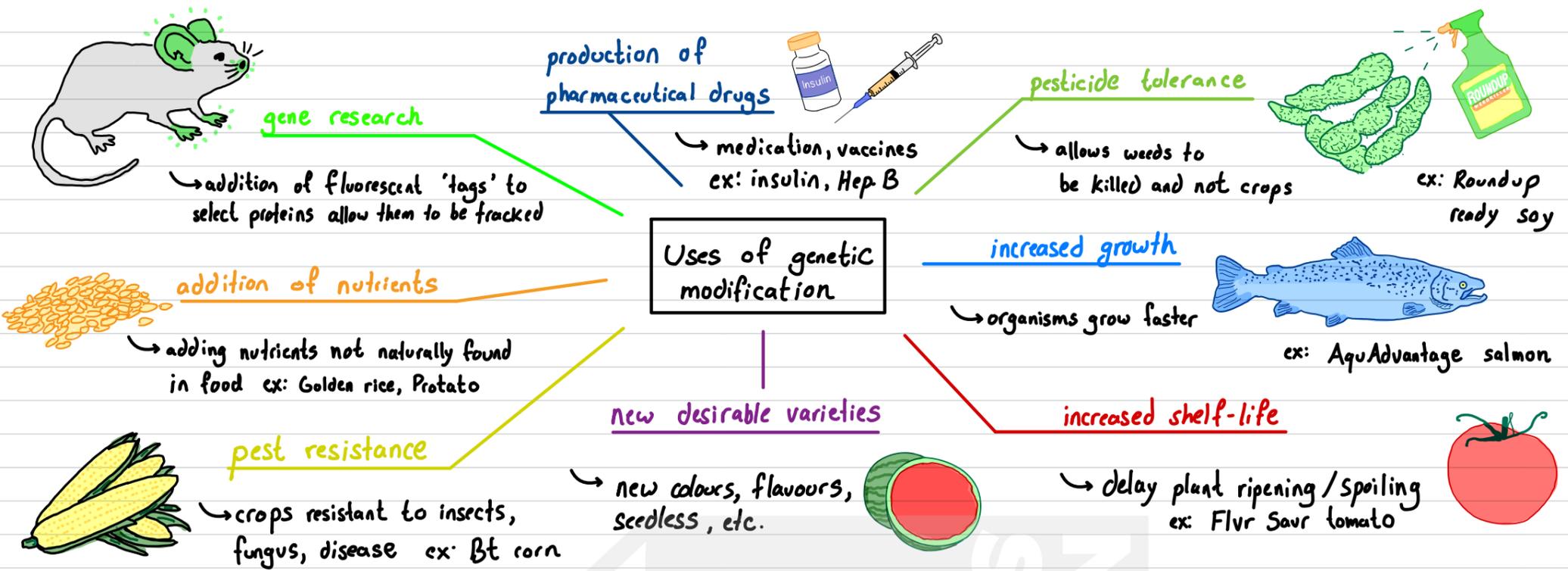
Methods of Genetic Modification

Transgenesis: also known as 'gene transfer' introducing a gene from one organism into the genome of another organism

Case example: the artificial production of human insulin



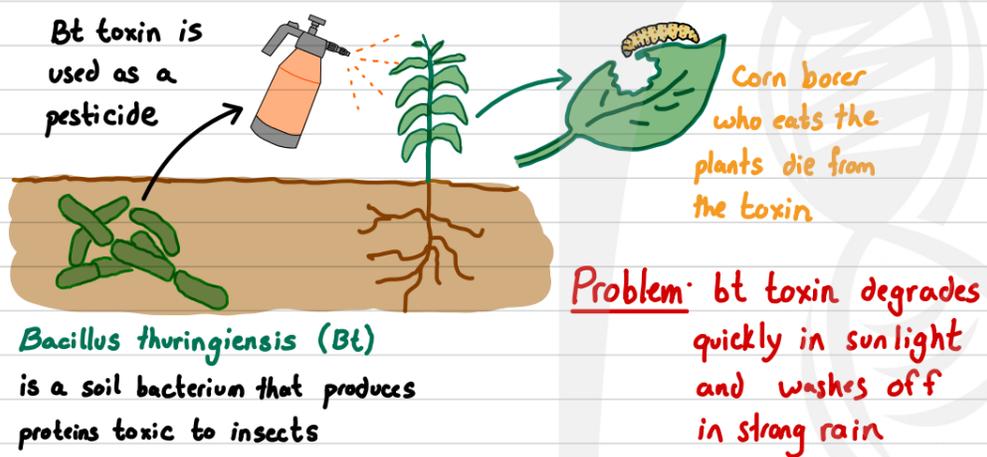
EVALUATING THE USES OF GMOS



* When deciding whether to adopt a new process / technology, it is important to evaluate its use



Case example: Evaluate the use of Bt corn * research your own example!



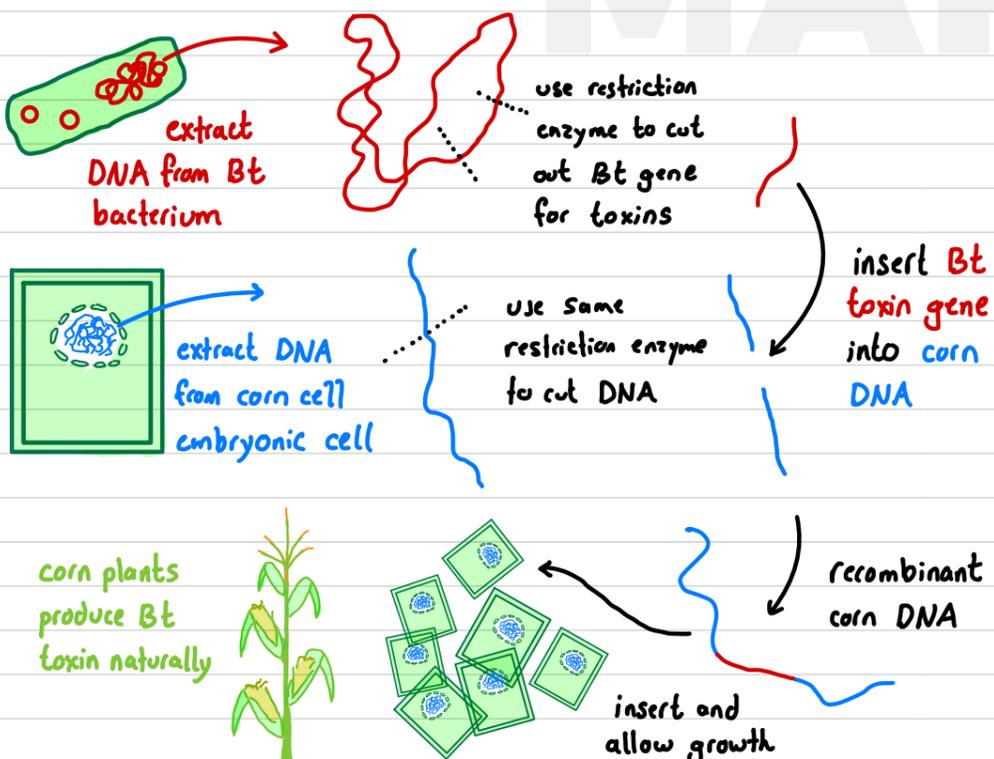
Advantages

- ✓ increase resistance to pests (like European corn borer)
- ✓ less crop damage ∴ increased productivity
- ✓ less chemical pesticides used ∴ reduced cost + damage
- ✓ non-toxic to humans, fish, or birds
- ✓ plant produces toxin yearound, extending protective effects

Disadvantages

- ✓ non-target organisms can be harmed / killed
- ✓ Bt pollen can be accidentally released and out-compete native plants ∴ reduced biodiversity
- ✓ can cause allergic reaction in people
- ✓ Bt corn can cross-breed with other plants → super weeds
- ✓ can lead to a resistance to toxin

Solution: genetically modify plants to produce Bt toxin



Appraisal

the use of Bt corn has both economic and biological benefits as needing to use less chemical pesticides on crops both saves money and is more safe to consume. Furthermore, less crop damage leads to more productivity. While there are several negative aspects, many of these are risks associated with other crops and are theoretical / rare / still as of yet unseen in Bt corn, reducing their relative risk. Overall, the benefits outweigh the risks at this stage and I recommend Bt corn is used although risks should be continually examined