

# Genetically Modified (GM) Foods

- GM foods can be either transgenic or cisgenic.
- The transgene codes for a protein that is somehow advantageous to the plant.
  - Pest resistance
  - Tolerance to herbicides
  - Delayed ripening of fruit
  - Improved yield
  - Increased or improved nutrient content

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# Creating a GM Crop

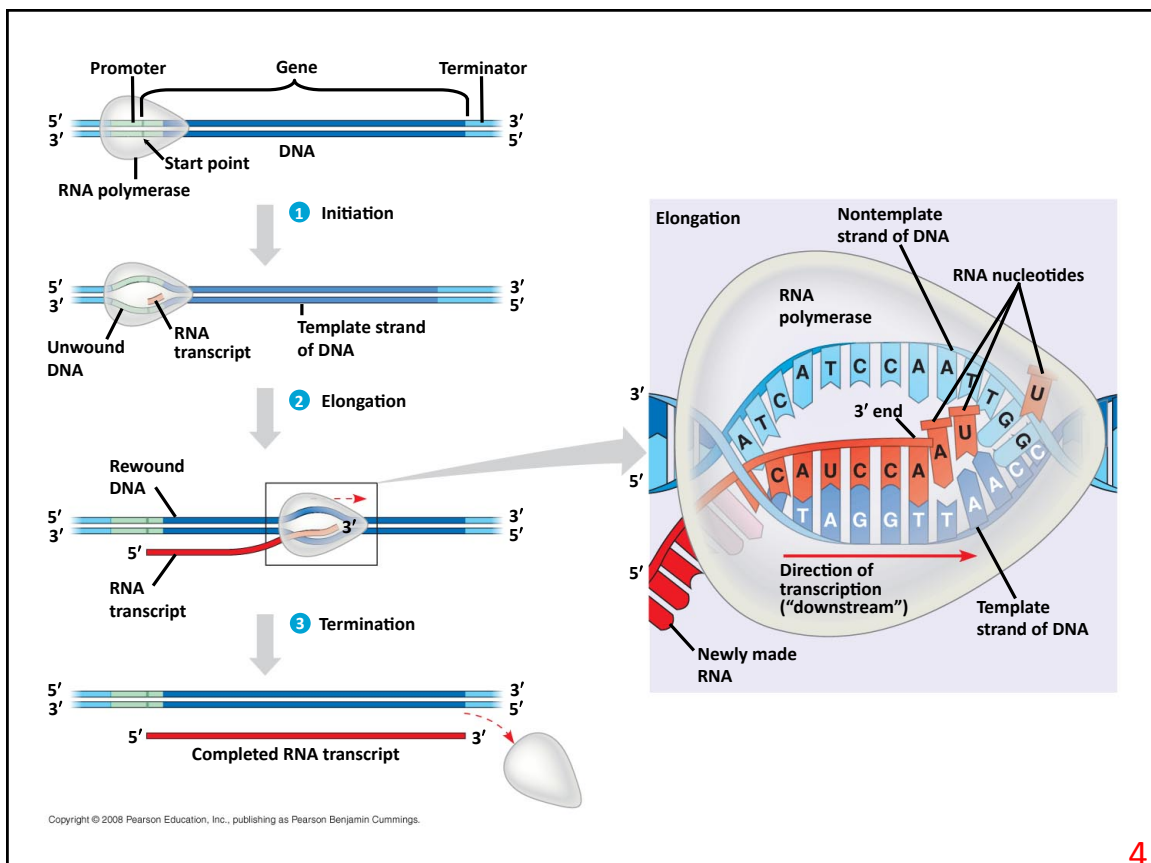
- A potentially useful gene must be identified.
  - A popular source is a gene from the bacterium, *Bacillus thuringiensis* (Bt).
  - The Bt transgene codes for delta-endotoxin.
  - Delta-endotoxin kills various pests that would otherwise destroy plants by boring into them.
- The potential transgene must be located within the host's genome.
- The potential transgene must be isolated.
- The coding portion of the transgene might be just hundreds or thousands of base pairs, but could contain tens of thousands base pairs in introns.

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# Creating a GM Crop (cont.)

- The transgene is modified for the recipient by removing introns.
- A promoter is added, allowing polymerase to initiate transcription.
  - The most commonly used promoter is CaMV 35S from the cauliflower mosaic virus.
  - 35S is used, because it has evolved to “work” (cause transcription) in all types of cells within a plant.
- A terminator is added, serving as a signal to end transcription.
  - The most commonly used terminator is the nopaline synthase (NOS) terminator from *Agrobacterium tumefaciens*.
- The transgene is engineered to be constitutively produced.

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## Creating a GM Crop (cont.)

- A sample of cells is removed from the “parent” plant.
- Sampled cells are grown into a callus.
- The transgene is inserted into cells of the callus by one of several methods.
  - Electroporation
  - Gene gun
  - *Agrobacterium tumefaciens*
- A marker is transferred along with the transgene.
  - Antibiotic resistance
  - Visual marker (e.g., GFP)
- Transgenic cells must be identified and isolated from the callus.

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## Creating a GM Crop (cont.)

- Isolated transgenic cells are hormonally induced to grow into complete plants.
- The transgenic plant is back-crossed with the highest-yielding field crop.
- Bringing a GM crop to market can take a decade or more.

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## Experimental Procedure

- Follow instructions very carefully.
- Take careful steps to prevent contamination.
- InstaGene matrix is a suspension of negatively charged beads that bind to cations, preventing them from helping enzymes degrade the DNA.
- The beads are removed by centrifugation, and the supernatant contains the DNA.
- Master Mix contains nucleotides, buffer, polymerase, primers, and dye.