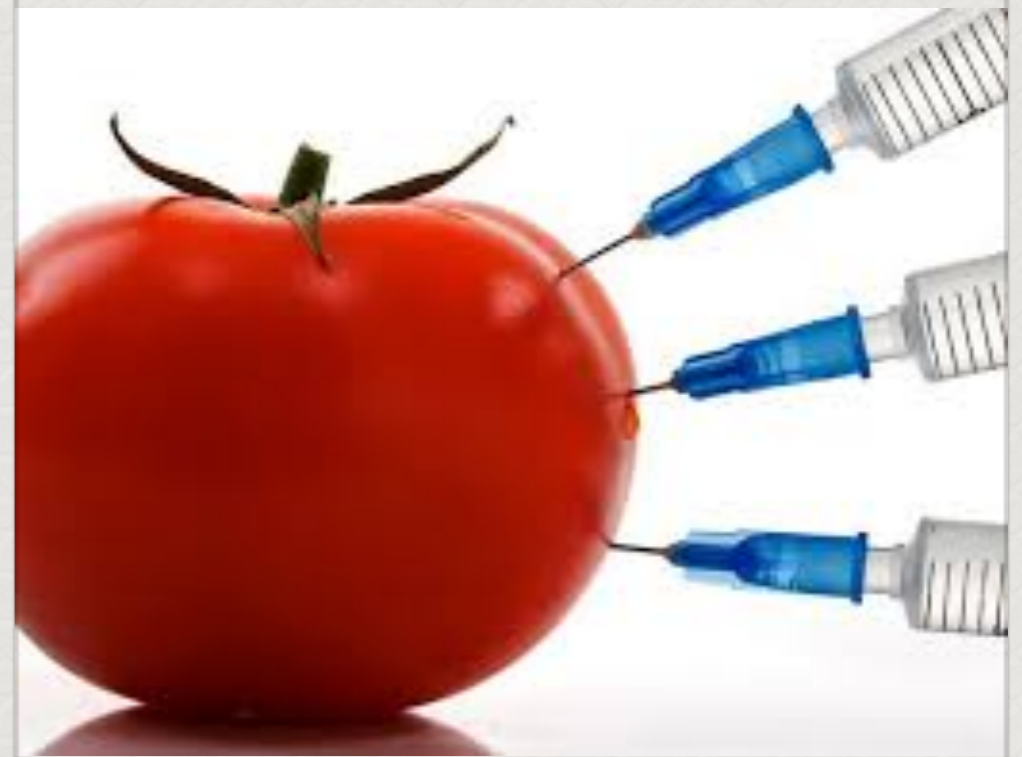


Genetically Modified Organisms

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We are the Genetically Modified Organizers!

Our slogan is... "GMO's gotta go!"



Genetically Modified Organizers

GMO's Gotta Go

Our First Mystery... GMOs

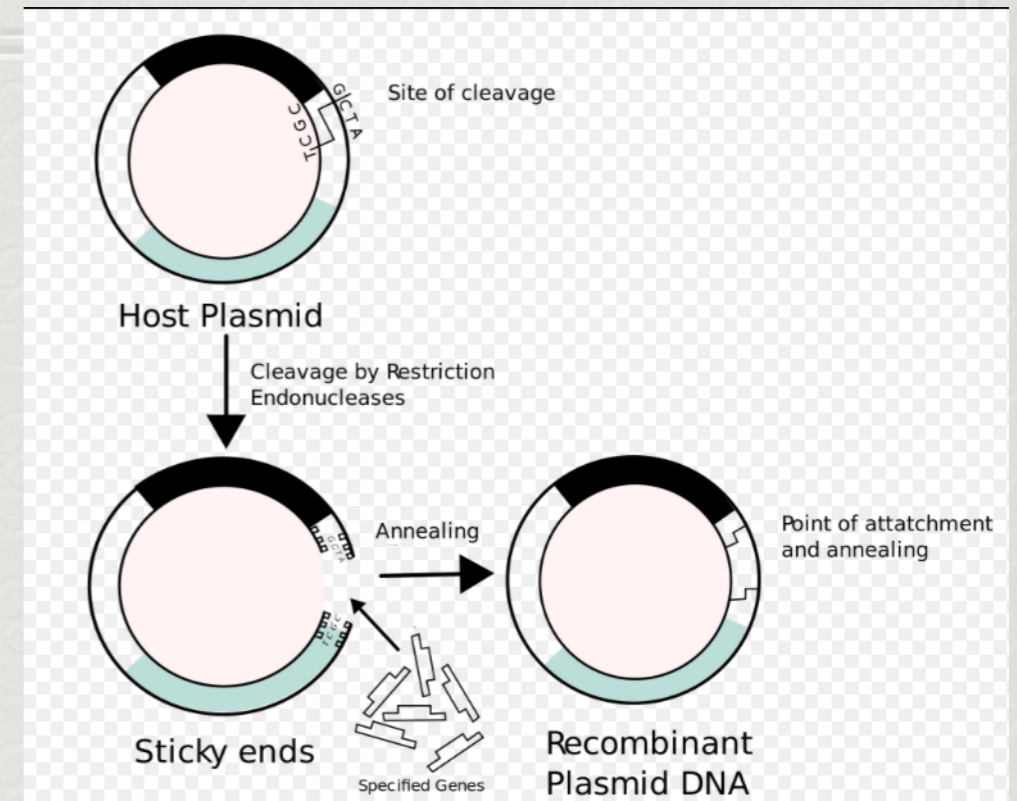
- ✿ *Genetically modified organism- an organism that has its genes modified by the lab in order to express a specific trait*
- ✿ *GMOs are made by two processes: reproductive cloning and recombinant DNA*
- ✿ *Recombinant DNA is made by taking one strand of DNA and mixing it with another strand of DNA*
- ✿ *During reproductive cloning, a nucleus is taken from the cell of an organism for the purpose of cloning, The cloned cell will be place into a surrogate, and the new organisms will be genetically identical to the original donor*

Second Mystery.... How Recombinant DNA is made?

- ◆ *Recombinant DNA is created by three different methods: Transformation, Non-Bacterial Transformation, and Phage Introduction*

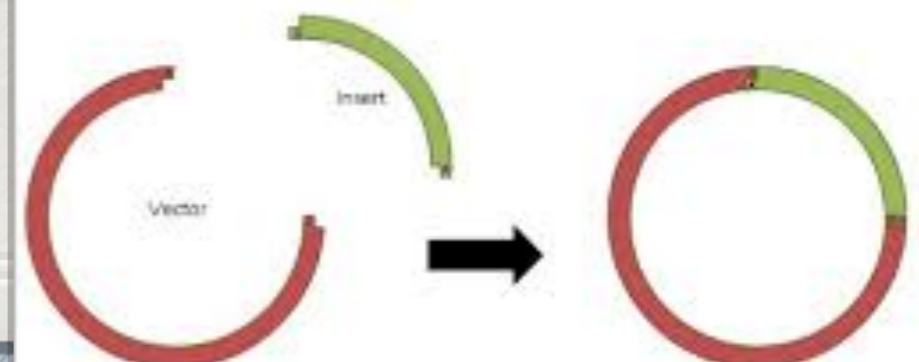
Transformation

1. *Isolate the gene from the DNA of an organism*
2. *Insert the gene into vector DNA*
3. *Using a restriction enzyme, cut the DNA. Afterwards bind the DNA insert into the vector using the DNA ligase.*
4. *The vector is inserted into a bacterial host cell through transformation*
5. *Amplification occurs when bacterial cells begin to multiply until the cells become DNA clones*



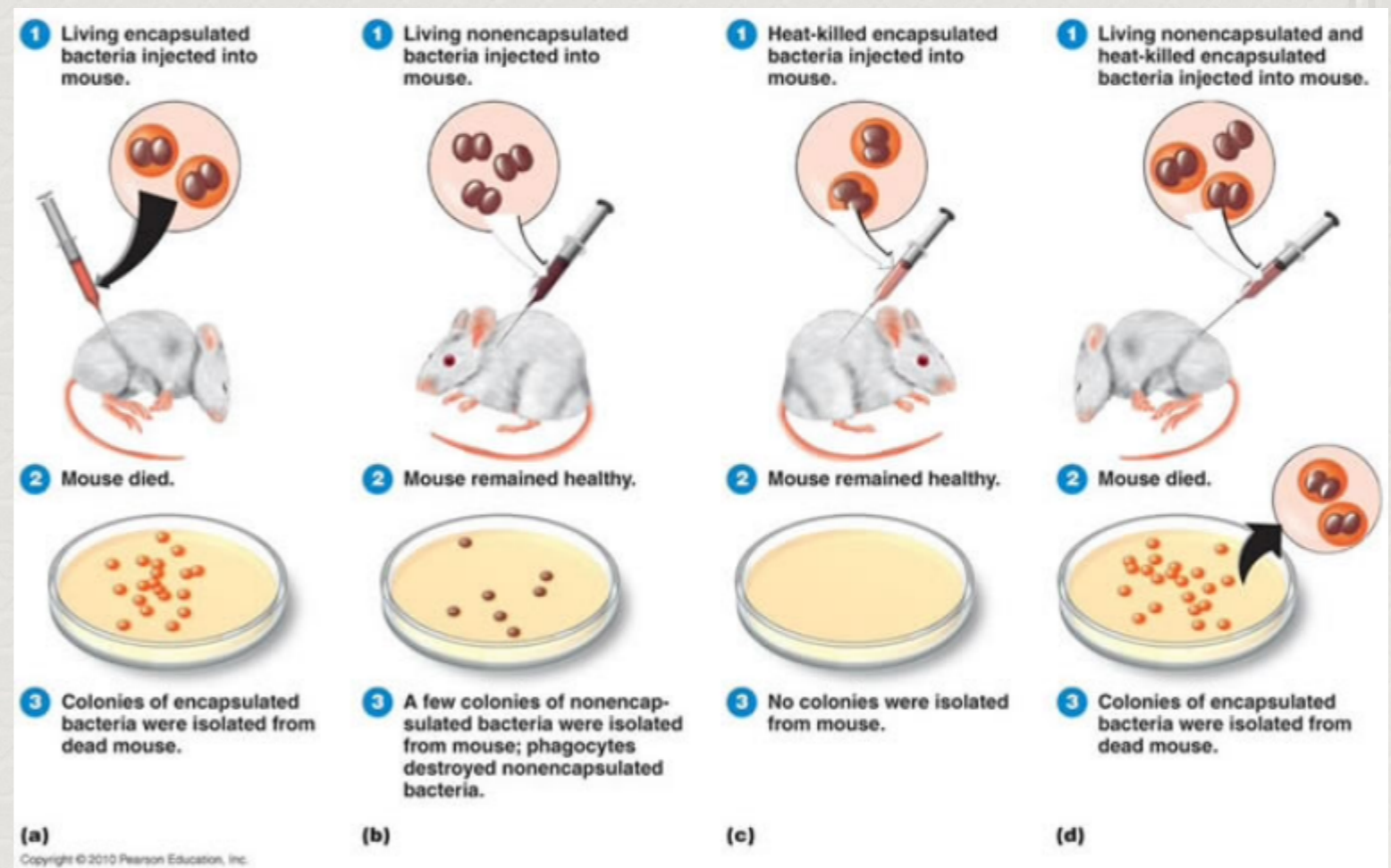
Recombinant DNA

Complementary sticky ends from different pieces of DNA can be joined together – **recombinant DNA**



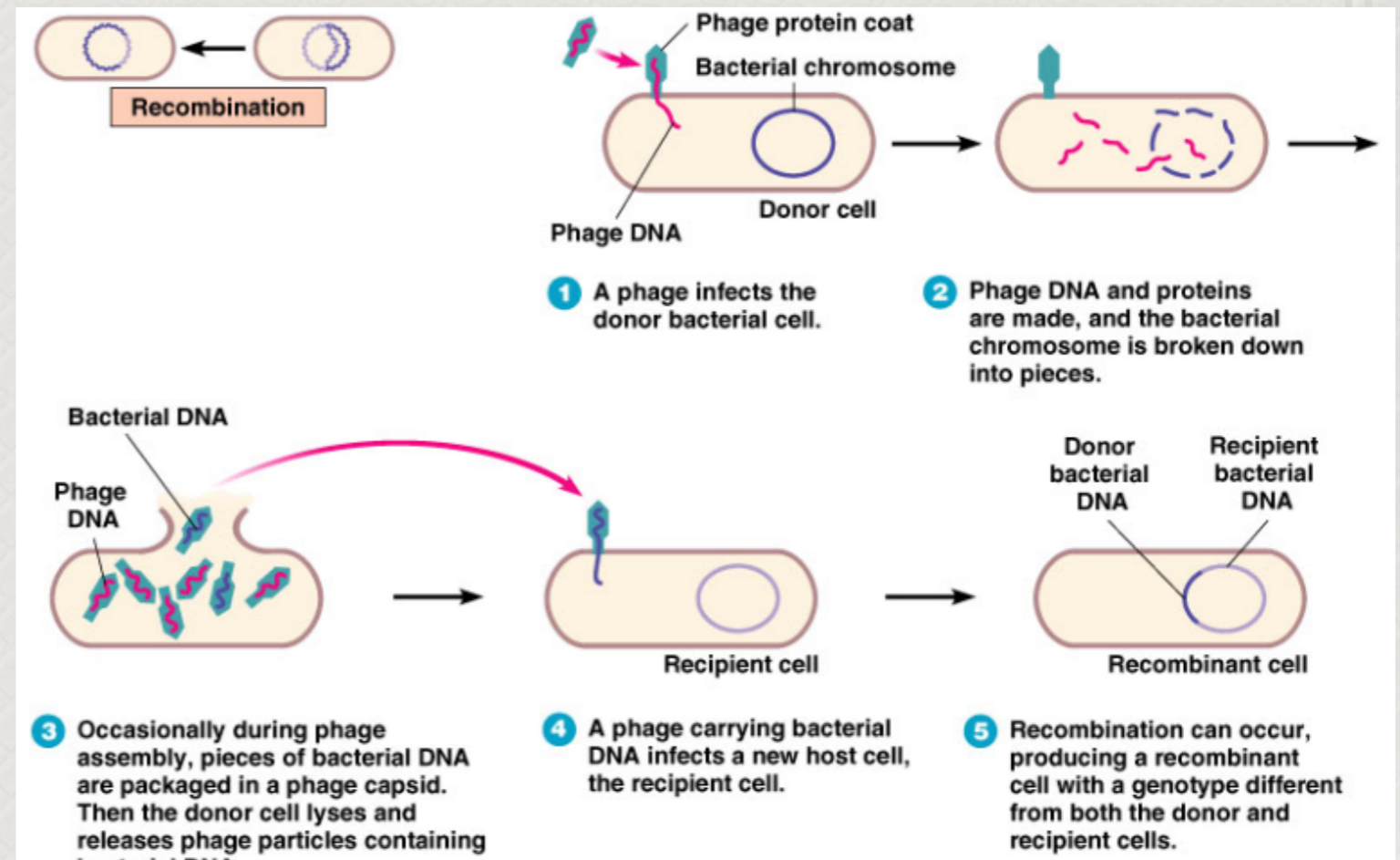
Non-Bacterial Transformation

- ✦ *Uses the same steps as Transformation, but uses a process called micro injection, where DNA is directly into the nucleus of the cell that will be transformed*
- ✦ *Most commonly done through injection of DNA to the eukaryotic cells*
- ✦ *Uses eukaryotic cells such as yeast, plant or animals*



Phage Transformation

- *Uses the same processes of transformation and non bacterial transformation to make DNA, but uses phages as hosts to inject foreign DNA*
- *Phages are used to carry the DNA to specific location*



Current Uses

- ✿ *Agriculture: create resistance to predators, chemical, or to make more crops*
 1. *Bt cotton- Genetically modified cotton contained the BT toxin used to decrease pesticide. Initially worked in China, 1997 but failed seven years later when the population of insects had increased*
- ✿ *Medicine and Research: using genetically modified organisms to prevent disease and explore risk factors of a certain disease*
 2. *Genetically modified mosquitos possess a protein, SM_I that block the malaria parasite, plasmodium into their system*

History of GMOs

- ✿ *In 1973, Herbert Boyer and Stanley Cohen combine their research to successfully create the first recombinant DNA organism*
- ✿ *In 1980, the U.S Supreme Court in *Diamond v. Chakrabarty* rules that genetically altered life forms can be patented, and the decision allows the Exxon Oil Company to patent an oil-eating microorganism.*
- ✿ *In 1982, the U.S. Food and Drug Administration approves the first genetically engineered drug, Genentech's Humulin, which is a form of human insulin produced by bacteria. This is the first consumer product developed through modern bioengineering.*

Pros and Cons

✦ *Pros*

- *GMO's help food last longer*
- *Modify foods to where they are more vitamins which promotes better nutrition*
- *Higher crops*
- *Produces vaccines*

✦ *Cons*

- *Produce food allergies*
- *Lower antibiotic resistance*
- *Fear of new diseases*

Genetically Modified Pig

- *Enviro-pig, also known as Frankenswine, is a type of pig which was genetically modified. It contains DNA from the mouse and E. Coli. So it can process and digest phosphorus better, and then it is unnecessary to feed them with additional phosphorus. This kind of pig is created for the current issue that normal pig manure contains high levels of phosphorus, so if it is used as fertilizer, this chemical gets into the water, leading to algae blooms and oxygen depletion as well as death of marine life. The enviro-pig won't need to be fed with phosphorus, so their manure has quite low level of it, thus they won't do harm to the marine animals*

Genetically Modified Tomato

- ★ *GMO tomato is made using gene transfer technology. It begins by cutting out the bacterium gene and inserting the gene to the tomato plant. It's purpose is to protect the tomato from insects*





Bioethical Considerations

- ✦ *The use of genetically modified organisms is a practice. The long-term effects of this technology have not been seen, and therefore we must proceed with caution as we develop our practices and guidelines.*
- ✦ *- GMO crops could possibly have negative effects on human health as well. When splicing genes between species, there are examples in which consumers have developed unexpected allergic reactions.*
- ✦ *The greatest danger is not in the effects that we have studied, but in those, which we cannot justify at this point.*

Resources

- ✿ <http://www.geneticallymodifiedfoods.co.uk/fact-sheet-pros-vs-cons.html>
- ✿ http://americanradioworks.publicradio.org/features/gmos_india/history.html
- ✿ <http://www.enkivillage.com/genetically-modified-animals.html>
- ✿ <http://learn.genetics.utah.edu/content/science/gmfoods/>
- ✿ <http://www.rpi.edu/dept/chem-eng/Biotech-Environ/Projects00/rdna/rdna.html>
- ✿ <http://www.wisegeek.com/what-are-the-different-types-of-recombinant-dna-technology.htm>
- ✿ *Images:*
- ✿ <http://www.biotechnologyforums.com/thread-47.html>
- ✿ <http://biolympiads.blogspot.com/2014/09/gene-transfer-in-bacteria.html>
- ✿ <http://classes.midlandstech.edu/carterp/Courses/bio225/chap08/lecture6.htm>