Investigating the History of Biotechnology

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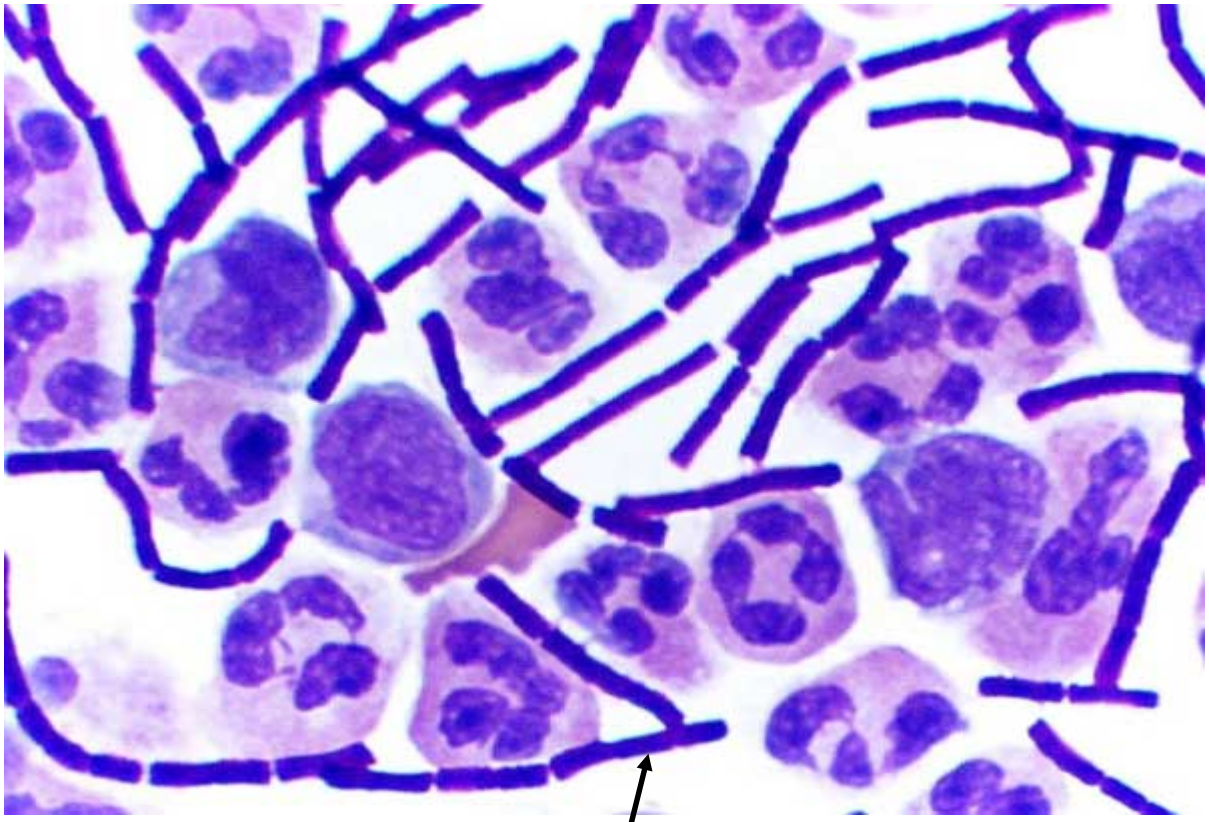
Instructions

- You will learn about the history of biotechnology from the 1920 through present day through a series of slides. As a class, answer the questions and have discussion of the stations.

Station 1: 1920s



Station 1: 1920s

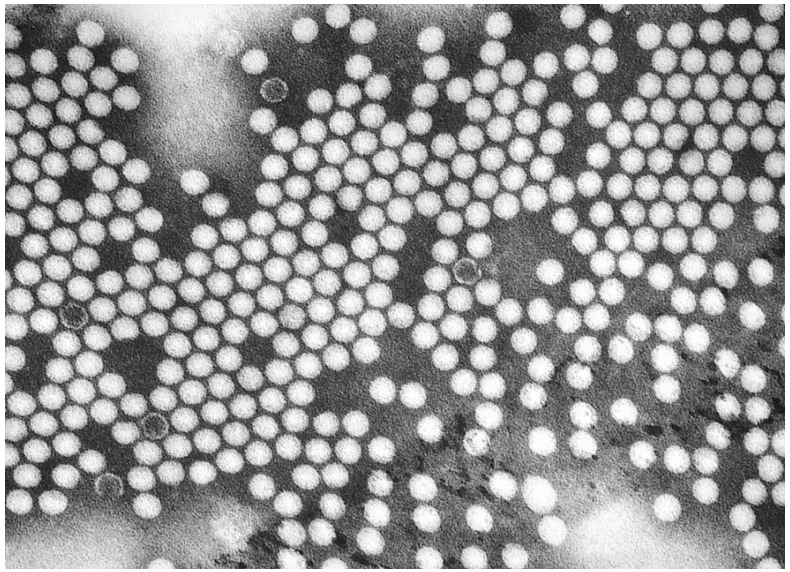
Penicillin

In the 1920s Alexander Fleming accidently discovered penicillin, a powerful antibiotic that is used to treat bacterial infections. Penicillin is derived from fungi. Prior to the 1920s, even minor bacterial infections were deadly. While penicillin was instrumental in treating diseases, such as strep throat, by end of the 1940s bacteria resistance to the drug began to occur.

Station 1: 1920s

1. What is an antibiotic?
2. Which organism can antibiotics be used to kill?
3. How does an antibiotic differ from a vaccine?
4. What happens if a person fails to take antibiotics correctly?

Station 2:1950s



Polio Virus

Iron Lung

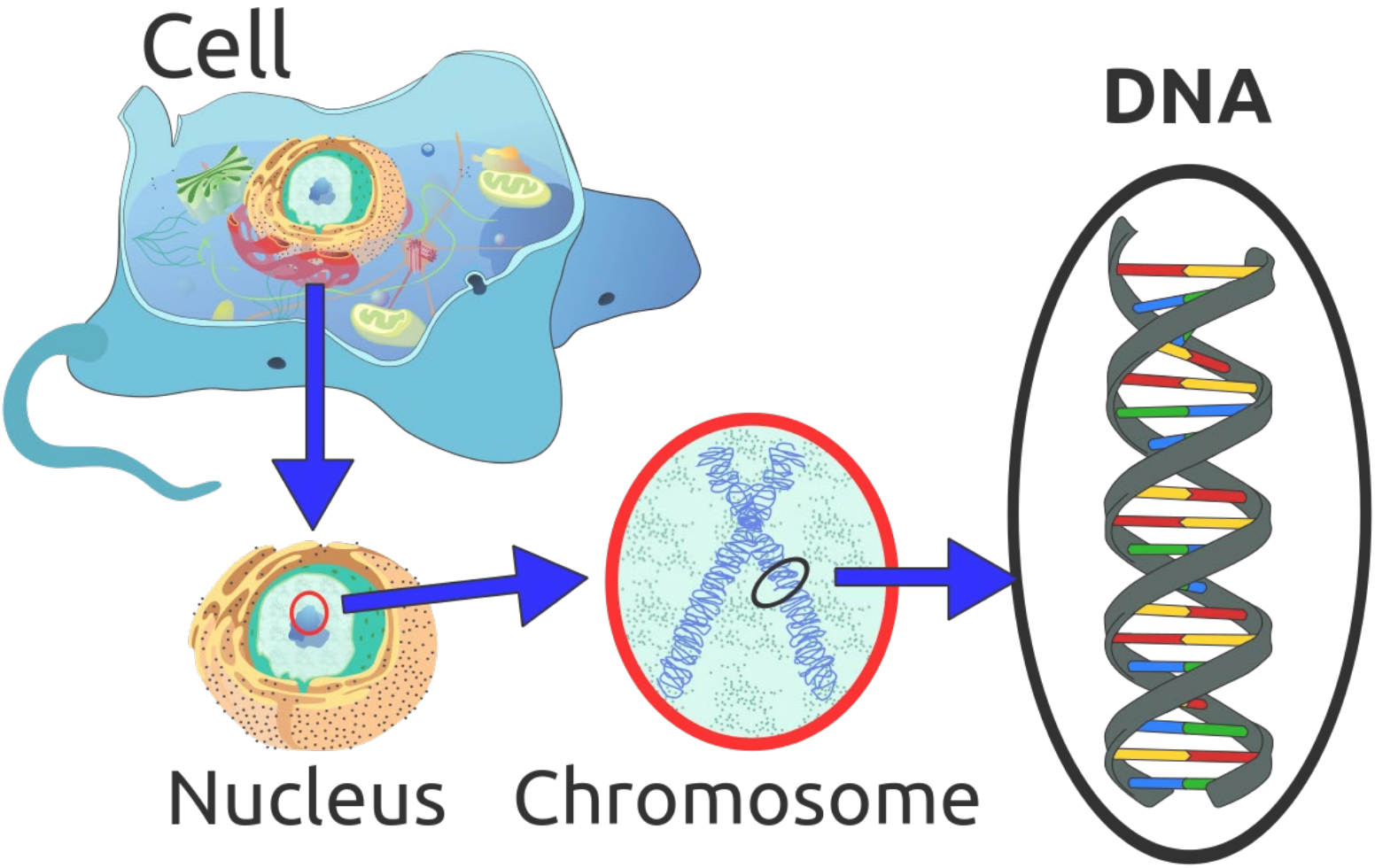
Station 2:1950s
Eradicating Polio

Poliomyelitis is an infectious crippling disease that is caused by a virus. In the early 1900s, many people, especially children, were left paralyzed as a result of being infected. Some even ended up spending their life in an iron lung. In the 1950s Dr. Jonas Salk developed the polio vaccine, which has nearly eradicated polio in the US.

Station 2:1950s

1. What is a vaccine?
2. What role do vaccines play in preventing and treating diseases?
3. Name three diseases that have vaccines.
4. How have vaccines improved human health?

Station 3: 1950s

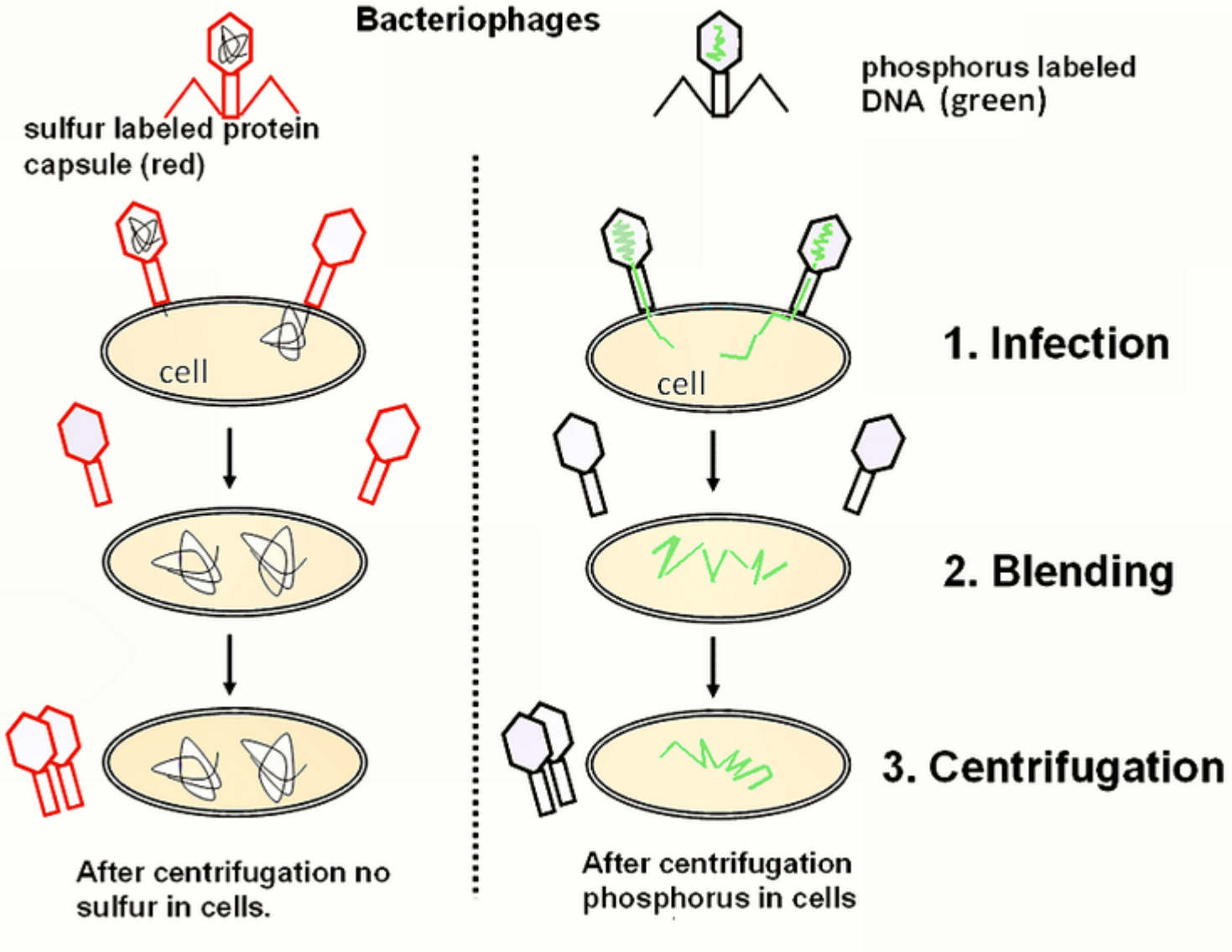


Station 3: 1950s

Discovering DNA's Function

Prior to the 1950s, little was known about structure and function DNA. Many experts hypothesized that proteins were the genetic material for organisms. In 1952, Alfred Hershey and Martha Chase conducted their famous experiment to confirm that DNA was the genetic material.

Hershey-Chase Experiment



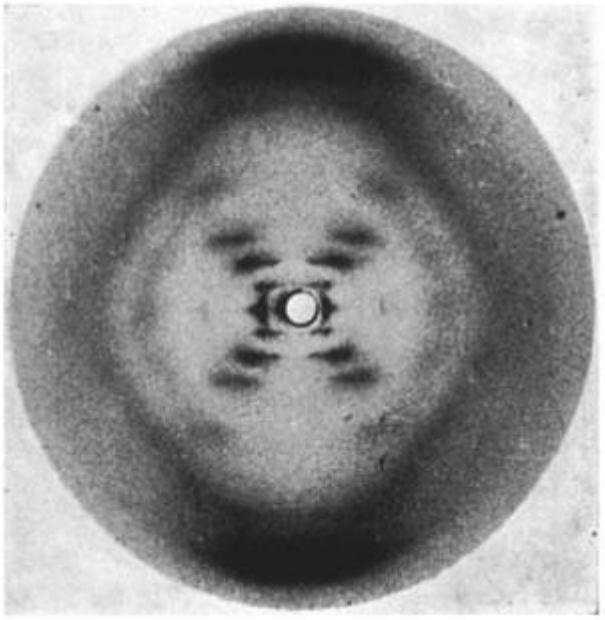
Station 3: 1950s

1. What is the central dogma in biology?

2. Why were proteins first considered to the first genetic material?

3. How did scientist determine DNA was the first genetic material?

Station 4: 1960s



Station 4: 1960s

Discovering DNA's Structure

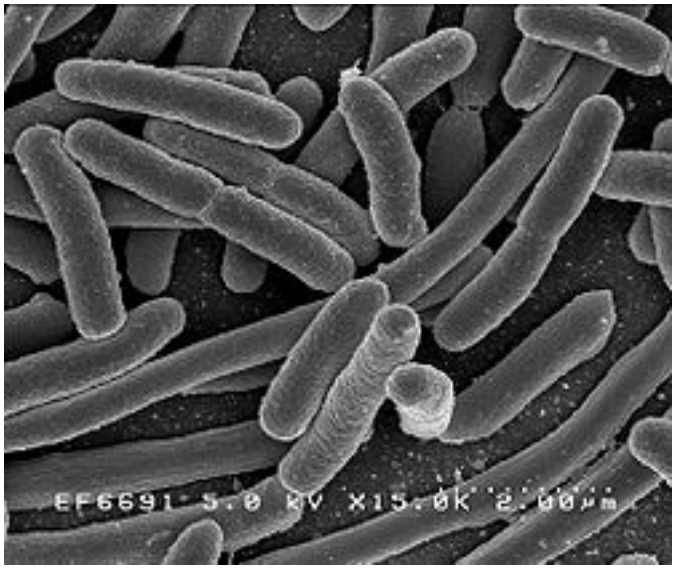
While Hershey-Chase determined the function of DNA, Crick, Watson, and Rosalind Franklin determined the structure of DNA. DNA is double helix composed of nucleotide bases, a phosphate group, and a sugar. Crick and Watson won the Nobel Prize in 1963.

Station 4: 1960s

1. What does DNA stand for?
2. What are the nucleotide bases and how are they paired?
3. If DNA has 20% As, how many Cs does it have?
4. If there so few bases, why are people so different?

Station 5: 1970s

http://www.medhelp.org/drug_images/LLY75100.JPG



http://upload.wikimedia.org/wikipedia/commons/thumb/3/32/EscherichiaColi_NIAID.jpg/250px-EscherichiaColi_NIAID.jpg

Station 5: 1970s

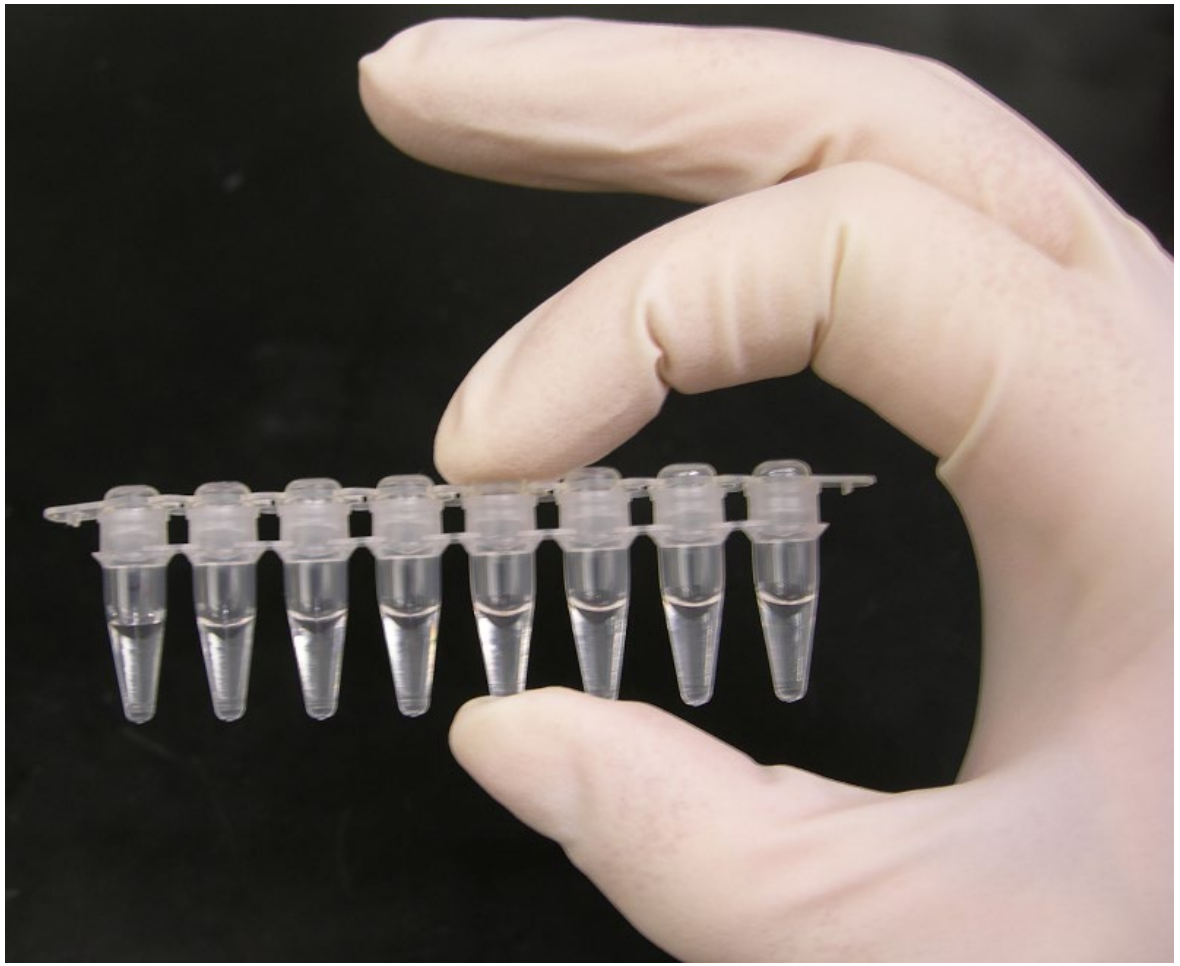
Recombinant Technology

Prior to the 1900s, diabetes was a certain death sentence. Doctors often used crude methods for treatment since little was known about the role of insulin in regulating blood glucose. Insulin was first discovered in the 1920s as an effective treatment for diabetes. Early formulations were extracted from animal sources and were impure, which often caused adverse reactions. In the 1970s, E coli were used to make synthetic insulin, which resulted in larger quantities that could be purified and safely injected.

Station 5: 1970s

1. What are some examples of biological pharmaceuticals?
2. Which organisms are used to make medications?
3. What is the name of the process used to make biological pharmaceuticals?
4. How can you tell if a biological was made using E coli or another organism?

Station 6: 1980s

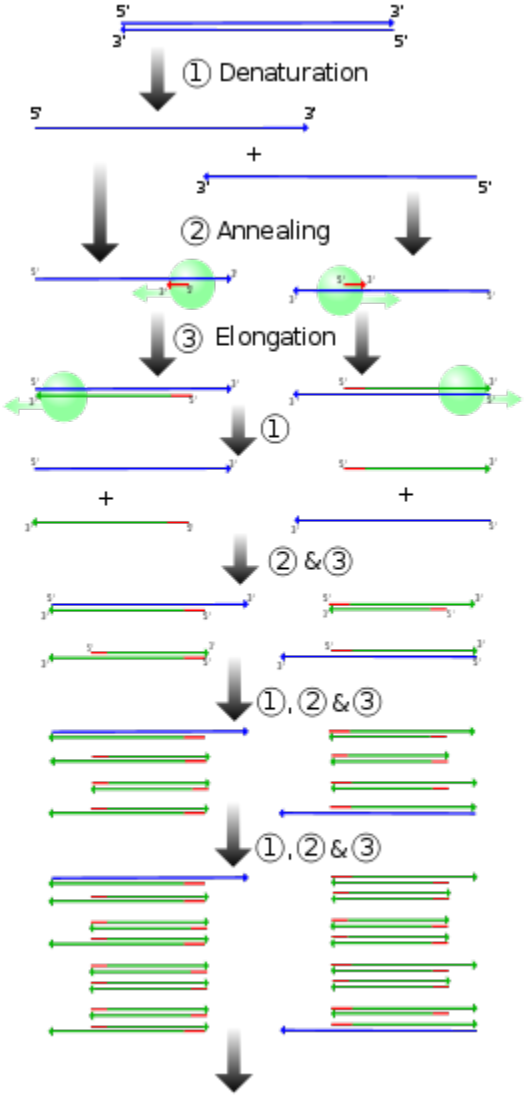


Station 6: 1980s

PCR

Polymerase Chain Reaction (PCR) is a process in which DNA is rapidly replicated using primers, enzymes, and temperature cycles. It was invented by Kary Mullis in 1983. PCR is used to amplify gene sequences and rapidly replicate small samples. Before PCR, small DNA samples were difficult, if not impossible to analyze. It is used for forensic and genetic analysis.

PCR



Exponential growth of short product

Station 6: 1980s

1. How does PCR compare to DNA replication?
2. What mathematical function describes the amount of DNA produced during PCR?
3. After 30 rounds of PCR, how much DNA would be produced?

Station 7: 1996-2005

Soybeans

Station 7: 1996-2005

Genetically Modified Organisms (GMOs)

GMOs, which were first introduced in 1996, are organisms that have foreign DNA inserted into their genome. Expression of the foreign DNA allows the organism to be more nutritious and disease resistant. GMOs have also increased the size and yield of organisms. Many commonly consumed GMOs are corn, papaya, and soybeans.

Station 7: 1996-2005

1. Why would some farmers not want to plant genetically modified crops?
2. How would a neighboring farmer who is planting genetically modified plants impact a farmer who is not?
3. What are the ethical concerns of creating and eating GMOs?

Station 8: Present Day

Station 8: Present Day

GMO (Animals)

Currently, the only types of GMOs that are approved for human consumption are plants. However, animals are being genetically modified for desired properties such as fewer feathers, increased nutrition, faster growth, and disease resistance.

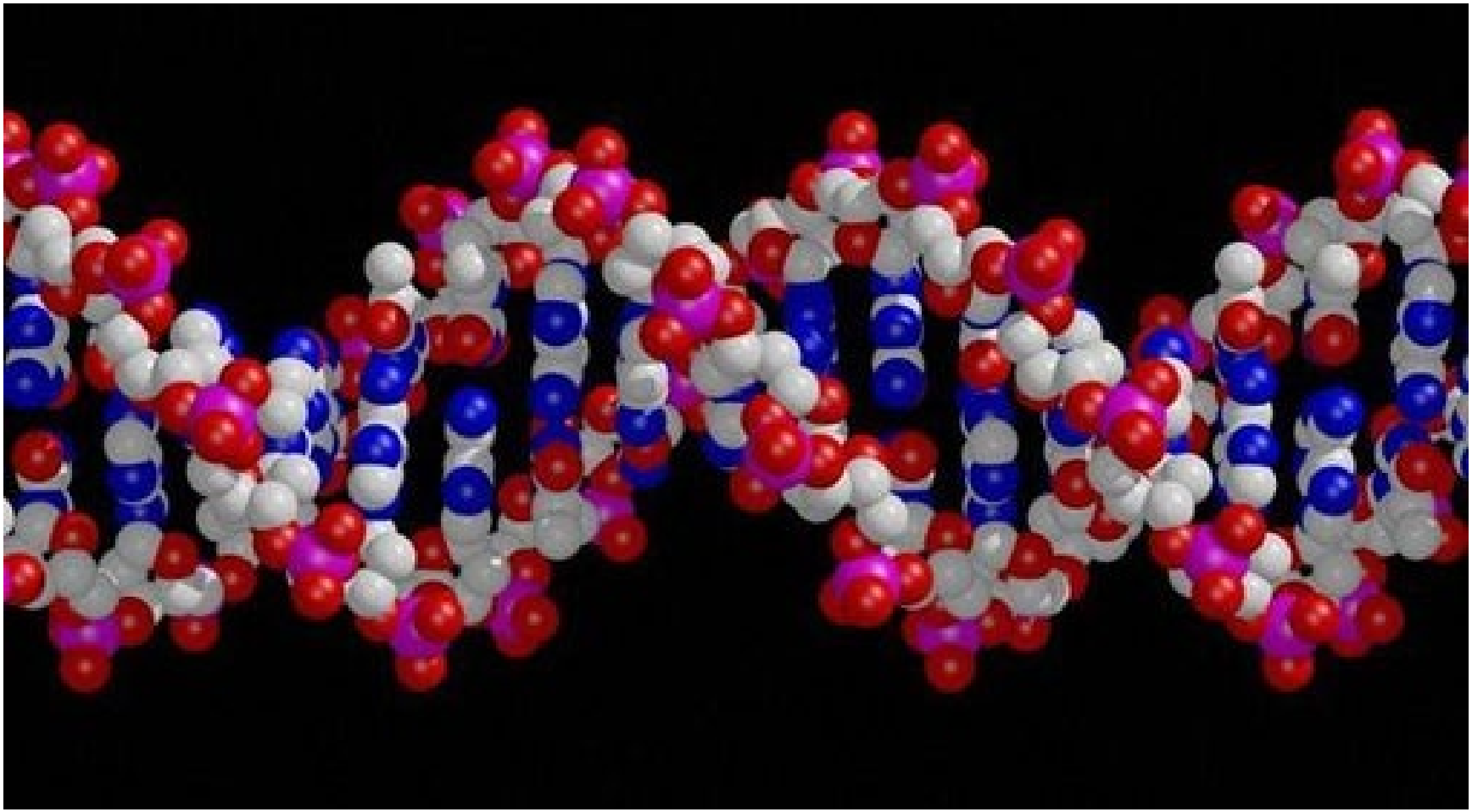
Station 8: Present Day

1. How can a chicken be born without feathers?

2. Why would you want to raise featherless chickens?

3. Are there any issues associated with this organism?

Station 9: Present Day (2013)



DNA

Station 9: Present Day (2013)

Who owns the genome?

In 2013, the US Supreme Court ruled that naturally occurring DNA cannot be patented. Several companies have created and manipulated DNA sequences for agriculture and pharmaceutical purposes. The court ruled that manipulated DNA can be patented.

Station 9: Present Day (2013)

1. What defines natural DNA?

2. Do companies have the right to patent DNA?

3. How do patents impact scientific progress?

4. What are the concerns with creating synthetic DNA?

References

Images are from open sources or from sites below

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