Decoding Monkey DNA

Science Fair

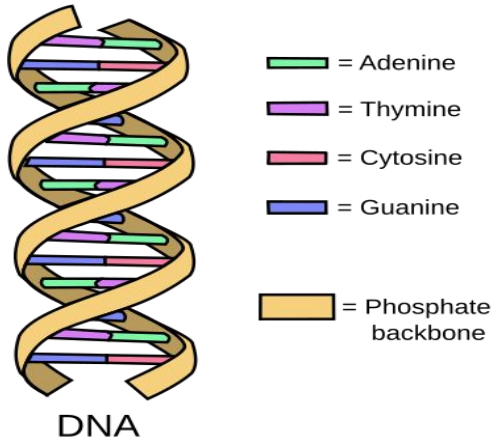
Group: Ibrahim and Noel

Table of Contents

How to Decode DNA?

Step 1: DNA extraction

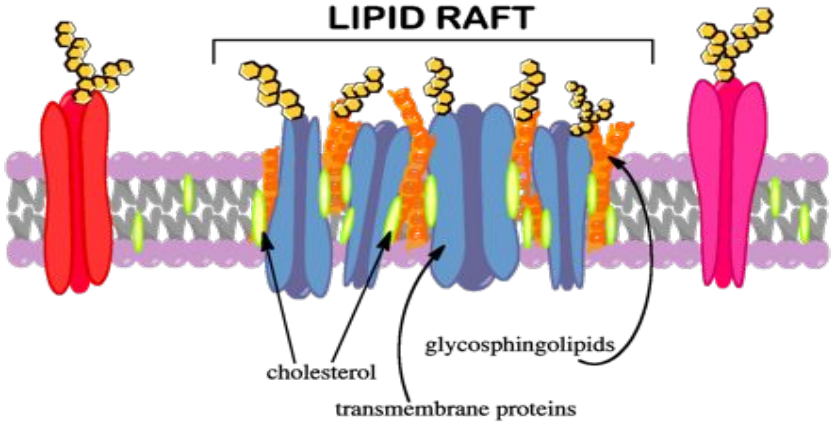
The process begins with DNA extraction, where samples are obtained from monkey cells using standard methods such as blood draws, skin swabs, or tissue biopsies. This step is crucial for isolating the DNA from the cells. The cell membranes are broken down through chemical treatments, which enables the DNA to be released and prepared for further analysis.



How to Decode DNA?

Step 2: Purification of DNA

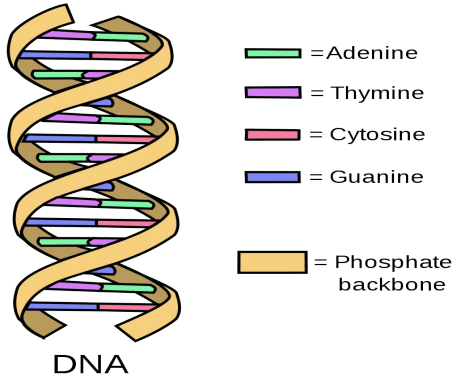
Once the DNA is extracted, it undergoes purification to remove contaminants like proteins and lipids that could interfere with sequencing or alter the results. This is typically done using organic solvents or specialized commercial purification kits. Ensuring the DNA sample is as pure as possible is essential for obtaining accurate sequencing outcomes.



How to Decode DNA?

Step 3: Sequencing the DNA

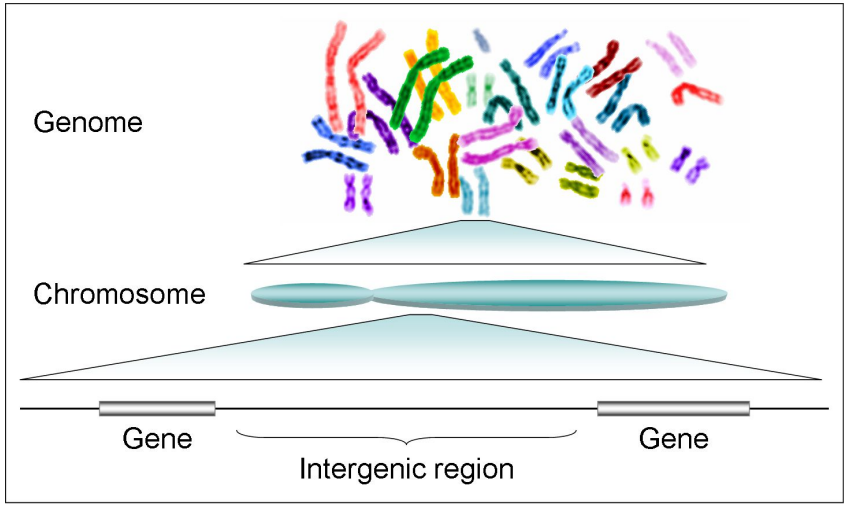
Once purified, the DNA is sequenced to determine the sequence and arrangement of nucleotide bases (adenine, thymine, cytosine, and guanine). Advanced technologies, such as next-generation sequencing (NGS), enable fast, high-throughput sequencing. NGS works by fragmenting the DNA, amplifying the fragments using polymerase chain reaction (PCR), and then sequencing them in parallel, generating large datasets efficiently and accurately.



How to Decode DNA?

Step 4: Functional Annotation

Understanding the functional elements in the DNA is crucial. Researchers annotate the genome to identify the roles of genes and regulatory regions. Techniques such as gene expression analysis help determine which genes are active in particular tissues, while epigenetic studies investigate modifications that affect gene expression without altering the DNA sequence.



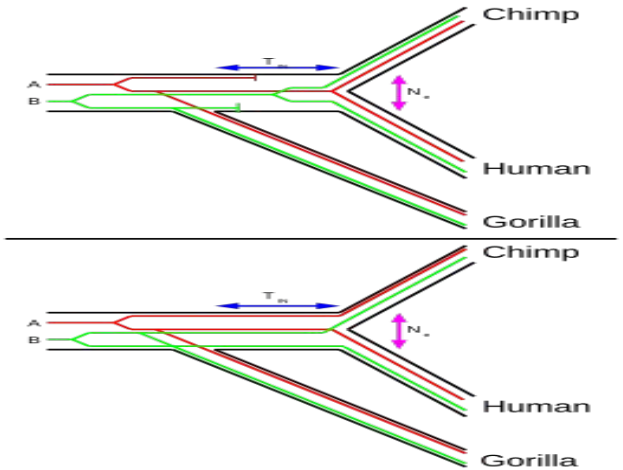
How to Decode DNA?

Conclusion: Applications of Decoded DNA

The data obtained from decoding monkey DNA has a wide range of applications in both research and medicine. It plays a key role in understanding genetic diseases, contributes to the development of new treatments, and enhances our knowledge of primate biology.

Problem: Why can’t you cure cancer with the monkey DNA

Decoding monkey DNA offers valuable insights into genetic diseases, but curing cancer is not as simple as analyzing a genetic blueprint. Cancer is a complex and diverse group of diseases, each with different genetic and environmental factors, making it difficult to find a universal cure. While monkeys share genetic similarities with humans, significant differences exist, meaning treatments effective in monkeys may not work the same in humans. Monkey DNA research provides helpful models for understanding cancer, but it does not directly lead to a cure. Developing a cancer cure requires extensive testing, clinical trials, and approval, which takes years and substantial resources. Monkey DNA is one piece of the puzzle in the ongoing effort to cure cancer.



Discovery of Monkey DNA

The discovery of monkey DNA has been a gradual process involving many scientists. A major milestone was the sequencing of the rhesus macaque genome in 2007 by an international team of over 170 scientists. This project aimed to understand human biology and evolution by comparing human and monkey DNA, with the rhesus macaque chosen for its genetic similarity to humans and its long use in labs. The sequencing revealed that humans and macaques share about 93% of their DNA, offering valuable insights into genetic similarities and differences. This research has contributed to the study of human diseases and the development of medical treatments. In 2023, scientists at the Chinese Academy of Sciences created the world's first chimeric monkey, with two different sets of DNA, to improve research in neurological diseases and biomedical studies. These ongoing discoveries aim to deepen our understanding of human biology, develop disease treatments, and explore genetic traits and behaviors.

Scientific Method

Question: How can we accurately decode and manipulate the DNA of monkeys to gain a deeper u
of their genetic composition and structure?

Hypothesis: We hypothesize that it is possible to successfully decode monkey DNA by obtaining a sample, examining it under a microscope, and identifying its key components.

Th

Supplies: Monkey, DNA extraction kits, thermal cycler, sequencing equipment, bioinformatics tools, laboratory supplies.

Procedure:

1. Collect DNA samples from the monkey using methods such as blood draws, skin swabs, or tissue biopsies.
2. Purify the extracted DNA to remove proteins and lipids.
3. Sequence the DNA to determine the order and arrangement of nucleotide bases, and amplify it using PCR.
4. Annotate the genome to predict the function of genes through gene expression analysis.

Scientific Method

Experiment: DNA Extraction: First Collect samples from the monkey cells available with methods like (blood, skin swabs, and tissue biopsies). Then treat them with chemicals to break down the cell membranes that release DNA.

Purification: Secondly purify the extracted DNA available to remove contaminants, making sure there is a clean sample for sequencing.

Sequencing: Thirdly Use next-generation sequencing (NGS) technology to find out the order and arrangement of nucleotide bases in the DNA and fragment the DNA.

Bioinformatics Analysis: Then assemble DNA sequences into complete genomes, identifying genes, regulatory elements, and other features.

Functional Annotation: Finally annotate the genome to predict and find out gene functions, conduct gene expression analysis, and perform epigenetic studies to understand gene regulation.

Observation: Scientists observe that understanding monkey DNA can provide valuable knowledge into genetics, disease research, and etc. They notice holes in the current knowledge about primate genetics and identify the need to decode monkey DNA for further study and analysis.

Scientific Method

Data Collection: During the experiment, gather data at each stage: DNA quality and quantity during extraction and purification, sequencing data during the sequencing process, and gene annotations and expression patterns during bioinformatics analysis and functional annotation.

Analysis: Analyze the collected data to identify alignments, patterns, similarities, and differences in the DNA sequences. Compare the monkey DNA to known sequences from other species to uncover evolutionary changes.

Conclusion: Our hypothesis was found to be incorrect, as it involved many complex steps. However, based on the available data, the experiment contributes more to understanding and potentially curing illnesses.

Positive Hypothesis

We hypothesize that it is possible to successfully decode monkey DNA by collecting a sample (such as skin, hair, or saliva) from the monkey. The sample would then be examined under a high-powered microscope to identify its components, which could lead to a deeper understanding of monkey DNA and its potential applications in curing illnesses.

Null and Negative Hypothesis

Null Hypothesis:
Decoding monkey DNA does not result in a cure for cancer.

Negative Hypothesis:
There have been instances where experiments have led to the death of monkeys, such as in the mid-20th century when Dr. Robert J. White transplanted the head of one monkey onto the body of another. Unfortunately, immune rejection caused the monkey to die nine days later. Immune rejection occurs when the monkey's immune system recognizes the transplanted head as a foreign object and attacks it.

Fun Facts

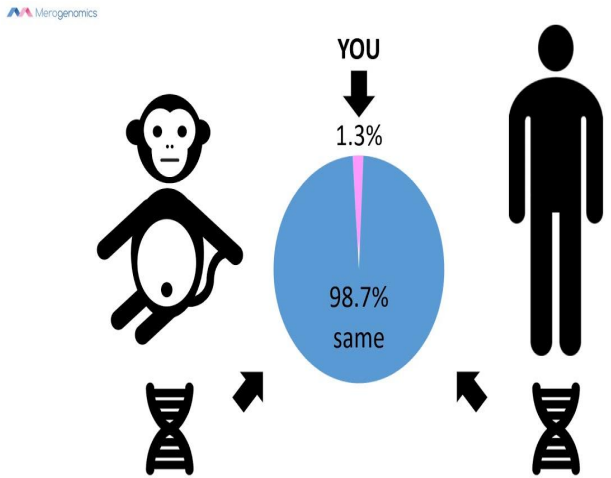
Monkey in Space

Some of the first monkeys to travel to space were also involved in genetic studies. By examining their genetic makeup and patterns, researchers were able to study the effects of space travel on living organisms.

Fun Facts

Monkey DNA Similarity with Humans

Monkeys share approximately 93% to 98% of their DNA with humans. This genetic similarity makes them valuable subjects for studying human biology, diseases, and illnesses.



Fun Facts

First Cloned Monkey

The techniques used in decoding DNA also paved the way for cloning. The first cloned primate, a rhesus monkey named Tetra, was born in 1999, thanks to advancements in genetic technology.

Rhesus macaque clone

Fun Facts

Enhanced Color Vision

Certain monkeys, such as howler monkeys, have unique traits in their DNA that enable them to perceive a wider range of colors compared to many other mammals.

Howler monkey

Additional information

What is DNA?

•DNA stands for deoxyribo nucleic acid

Which is pronounced: de-oxy-ri-bo-nu-cliec-acid

•It’s like a code that carries genetic information in all living organisms.

•The DNA our cells how to grow, work, and reproduce

Additional information

What is the (monkey) DNA

·Monkey DNA is the genetic code found in monkeys.

·Humans and monkeys share a lot of DNA.

·Monkeys, like chimpanzees and gorillas, are some of our closest relatives in the animal kingdom.

·By studying their DNA scientists can learn about evolution and how species are connected.

Additional information

Why decode the monkey DNA?

•How did humans and monkeys evolve from a common ancestor: Because we humans and monkeys have lots of genetic similarities such as the DNA similarity, the chromosome similarity, etc.

•Studying and decoding the monkey DNA can help scientists understand diseases that affect both monkeys and humans.

•(Conservation efforts): Decoding the monkey DNA can help protect endangered species of monkeys.

Additional information

Interesting facts about the monkey DNA

- Monkeys can have up to 24 chromosomes while humans have 23
- Over millions of years, small changes/mutations in the DNA have led to the differences we see between species
- Some monkeys can even be taught sign language to communicate.

Additional information

Challenges in decoding the monkey DNA

•Monkey DNA is huge and complex, so decoding the monkey DNA takes a lot of time and effort

•Researchers must be careful when using animals such as the monkey (In this case) in studies to ensure they are treated humanely

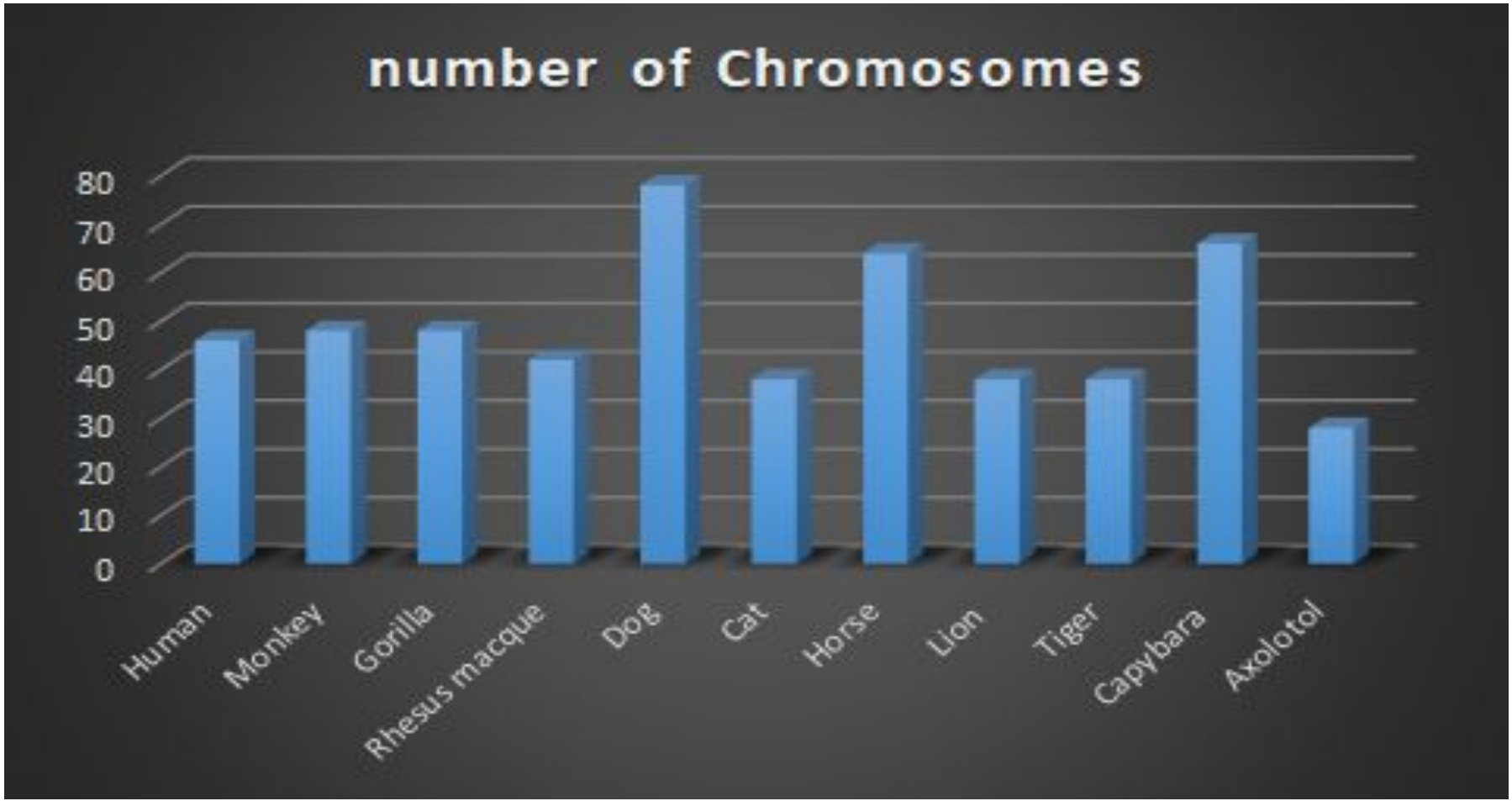
Additional information

What have we learned from the monkey DNA?

- Some monkeys, like chimpanzees use tools and communicate in advanced ways

- Studying diseases like HIV in monkeys has helped us learn how to fight diseases in humans

Chromosome comparison



Conclusion

Our Hypothesis:

We hypothesized that it is possible to successfully decode monkey DNA by collecting a sample (such as skin, hair, or saliva) from the monkey, examining it under a powerful microscope, and identifying its components. However, this hypothesis was incorrect for five reasons:

1. We mentioned DNA extraction but did not address the need for chemical treatments to break down cell membranes and release the DNA.
2. We failed to include the step of purifying the extracted DNA.
3. We did not mention sequencing the DNA or identifying its elements (adenine, thymine, cytosine, and guanine).
4. We overlooked advanced techniques like next-generation sequencing and polymerase chain reaction (PCR).
5. We also neglected to include genome annotation and epigenetic studies in our process.

Summary

Overall, the project was successful for five reasons:

1. We completed it without needing a fourth trifold.
2. Our hypothesis was at least 25% correct.
3. The trifold included a lot of relevant information.
4. We stayed focused on the topic of decoding monkey DNA.
5. Our explanation was detailed enough to be understandable.

However, there were areas for improvement. We could have added more color, reduced the number of trifolds, included additional pages of information, and provided more facts in the conclusion. Despite these areas for improvement, we did well on the CYSF project overall.

Links to websites

1 monkey's genetic code deciphered

2 Rhesus monkey genome reveals DNA similarities with ...

3 Chimpanzee genome decoded

4 DNA: Comparing Humans and Chimps

5 Cancer Genes in Humans vs. Chimps: Why Are We More ...

6 No, 'monkey virus DNA' was not found in COVID vaccines

Link to websites page 2

6 youtube videos:

- Monkey dna/50 fascinating facts about the monkey DNA
- The difference between the monkey and human DNA
- DNA Evidence That Humans & Chimps Share A Common Ancestor: Endogenous Retroviruses
- # facts human share 99% DNA with humans
- Are We Really 99% Chimp?
- who discovered the monkey DNA?

7**Genetics | The Smithsonian Institution's Human Origins Program**

8**Scientists decipher chimp genome | Genetics**

Thank you for reading this adventure of decoding monkey DNA.we hope together we now know how monkey genetics are decoded.

Thank you for your time and have a great day!