Generate an Argument:

DNA Family Relationship Analysis (Genetics)

Introduction:

Most of the DNA in the human genome does not encode proteins or RNA. Some of this DNA consists of regulatory sequences, which help control the processes of transcription and translation, but most of it actually consists of sequences whose functions are not yet fully understood by scientists. This DNA includes introns, and stretches of noncoding, repetitive DNA sequences (e.g. ATTGGCC) that repeats several times (e.g ATTGGCCATTGGCCATTGGCC). These repetitive sequences are called short tandem repeats (STR's).

The exact number of times a specific sequence repeats at a specific site in the genome differs from individual to individual. The size of an STR (e.g. the number of times a sequence repeats) at a specific site can therefore be used as a genetic marker. These genetic markers can then be used to determine if two people are related or not. There are several different genetic markers that scientsts use to help determine family relationships (e.g. D21S11 and D7S820).

Everyone inherits two copies of these various genetic markers; one copy from their father and one from their mother. The two copies of each marker are *usually* different. Therefore, scientists can often determine which version of a particular marker was inherited from a particular parent. This information can be used to determine if two people are related or not.

Mr. and Mrs. H. had five children: three sons and two daughters. Tragically, the H.'s youngest son was abducted from them 20 years ago, when he was only six years old. The police were never able to locate him, or the person(s) who took him. Recently, a young man named Jeff M., who is in his mid-20's, has contacted the H. family. He claims that he is their abducted son. However, the H. family is skeptical and has requested a genetic test to determine if Jeff M. is related to them or not. Unfortunately, Mr. H. died in a car accident several years ago. A DNA sample, as a result, can only be collected from Jeff M., Mrs. H., and the family's four children.

Your task is to use the results of an STR analysis that was conducted using DNA samples from these six individuals to determine if Jeff M. is the biological child of Mr. and Mrs. H, and answer the question **Is the H. family related to Jeff M.?**

Day 1: Slideshow construction, and posting.

With your group, use the data provided to develop a claim that best answers this question. Once your group has developed your claim, prepare a brief slideshow that you can use to share and justify your ideas. Your slideshow should include all of the following information:

- The Research Question
- Your Claim: State the claim you are trying to support
- Your Evidence: Include genuine evidence (data, analysis, & interpretation). Make sure to include a hypothetical cladogram showing the evolutionary relationships among the

mammals.
- Your Reasoning: Provide a justification of your evidence that explains why the evidence is relevant and why it provides adequate support for the claim.
- Organize your argument in a way that enhances readability
- Use a broad range of words, including vocabulary that you have learned in class.
- Utilize proper grammar, punctuation, and error-free spelling.

Post your slideshow to the class blog in a post with the labels ("argument", "genetics", and any others that you feel are appropriate). Make it so that anyone in our school google apps can comment on your slides.

Day 2: Commenting and Response

Period 1: Commenting

View and comment on at least five other group's slideshows (use the insert menu to add a comment).

Remember, as you critique the work of others, you need to decide if their conclusions are valid or acceptable based on the quality of their claim and how well they are able to support their ideas. In other words, you need to determine if their argument is *convincing* or not. One way to determine if their argument is convincing is to ask them some of the following questions:

- How did you analyze or interpret your data? Why did you decide to do it that way?
- How do you know that your analysis of the data is free from errors?
- Why does your evidence support your claim?
- Why did you decide to use that evidence? Why is your evidence important?
- How does your justification of the evidence fit with accepted scientific ideas?
- What are some of the other claims your group discussed before agreeing on your claim and why did you reject them?

Period 2: Response

Working in your group, respond to all comments that were left. Incorporate any feedback into your slideshow that you feel is appropriate, and make sure to reply to all comments left on your slideshow.

Reference Information:

Results from STR Family Relationship Analysis Test

Figures 1-4 represent the results from an STR analysis. The profile at each DNA marker or STR region (e.g. D13S317, THO1) appears as one or two bars. The height of each bar represents the number of times that the STR is repeated in that person. For example, in Mrs. H., the STR at the D13S317 locus is repeated 10 times on one chromosome and 14 times on the other. The STR profile for Mrs. H. at the D132317 site is therefore listed as 10, 14.

Figure 1: DNA Marker: D13S317 (Found on Chromosome 13)

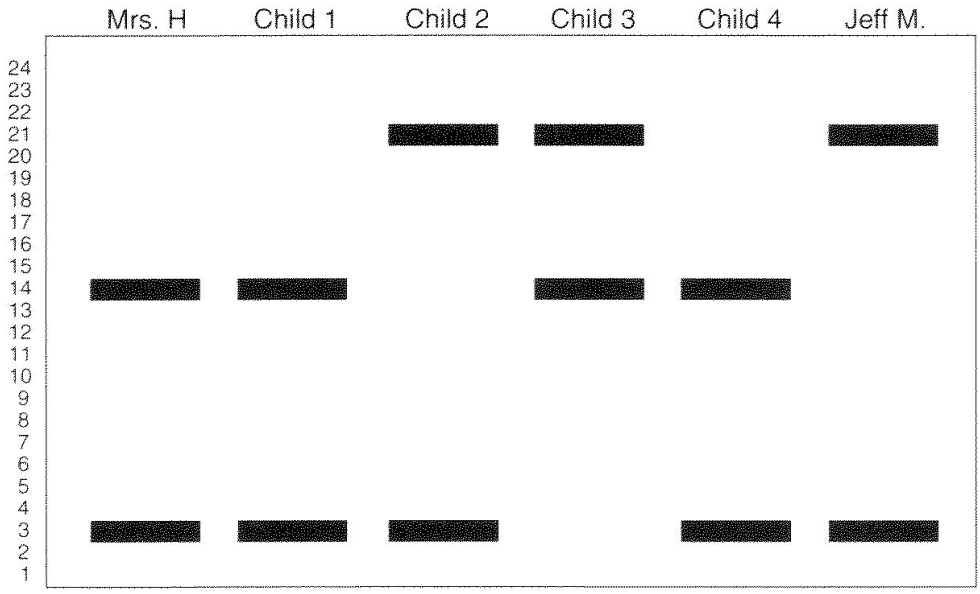


Figure 2: DNA Marker: THO1 (Found on Chromosome 11)

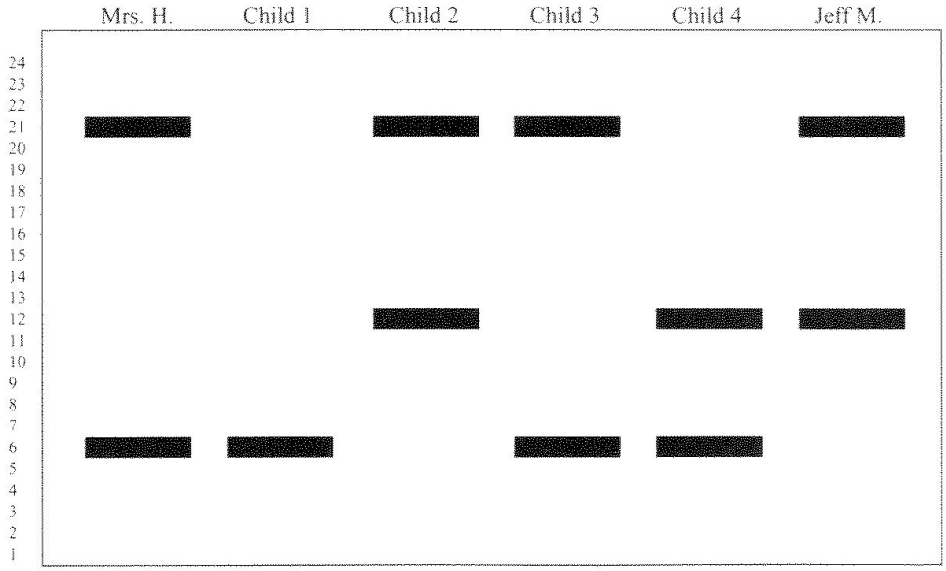


Figure 3: DNA Marker: D21S11 (Found on Chromosome 21)

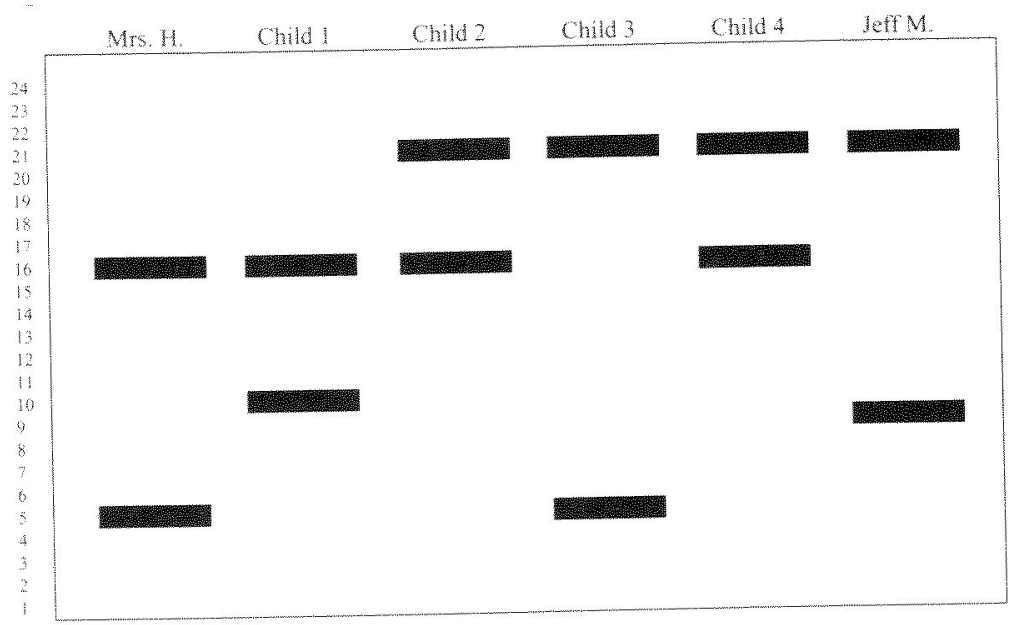


Figure 4: DNA Marker: D7S820 (Found on Chromosome 7)

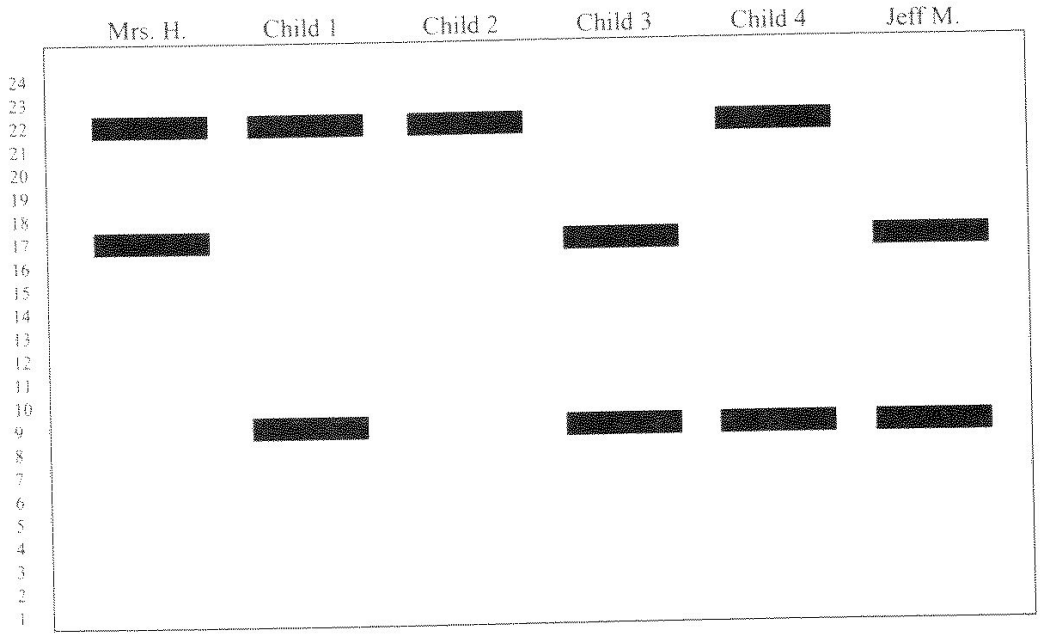
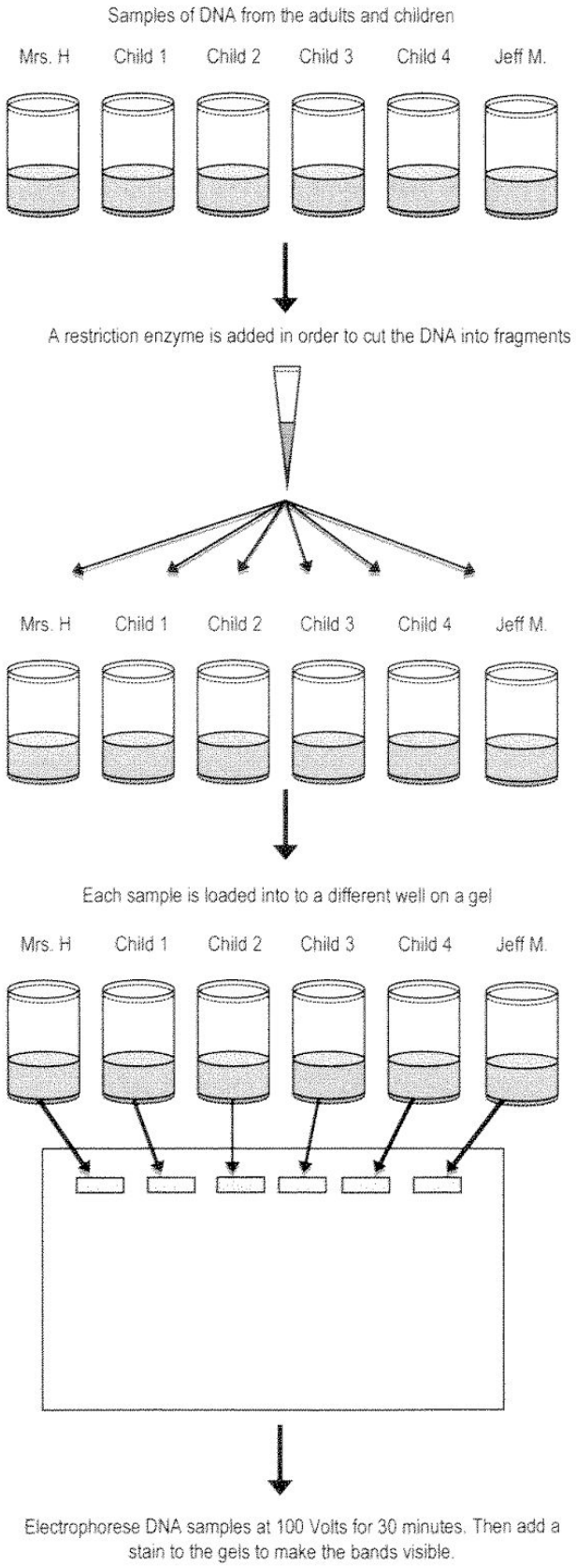


Figure 5: The protocol followed by lab technicians to create each gel.


Samples of DNA from the adults and children
Mrs. H
Child 1
Child 2
Child 3
Child 4
Jeff M.
A restriction enzyme is added in order to cut the DNA into fragments
Mrs. H
Child 1
Child 2
Child 3
Child 4
Jeff M.
Each sample is loaded into to a different well on a gel
Mrs. H
Child 1
Child 2
Child 3
Child 4
Jeff M.
Electrophorese DNA samples at 100 Volts for 30 minutes. Then add a stain to the gels to make the bands visible.