GENETIC SEQUENCING & GENETIC TESTING UNIT PROJECT

By C. Kohn
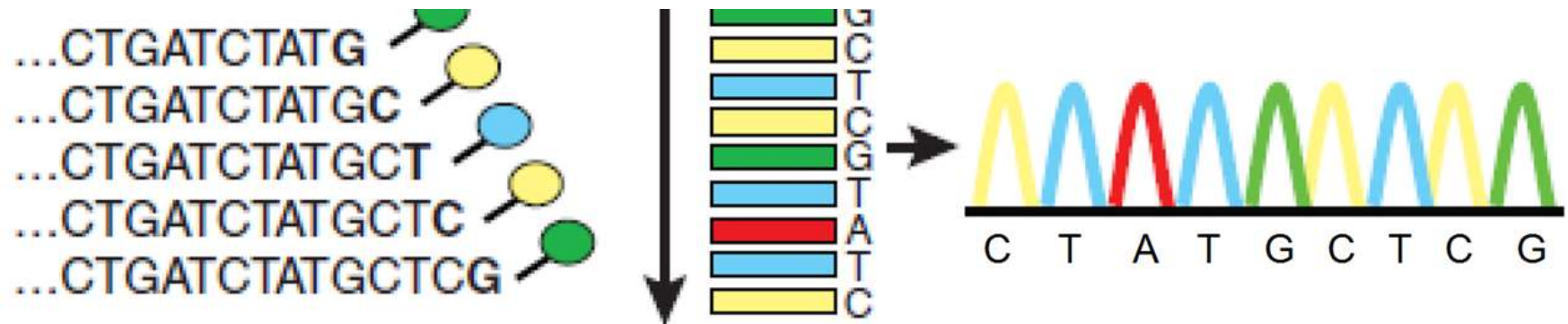Agricultural Sciences
Waterford, WI

Directions

- **For this project, you will be working in student teams of 3-4.**
  - You will be presenting *some* of the following slides in small groups to your instructor.
  - Your slides will be chosen at random, so you will need to be prepared to discuss *any* of the material included on the following slides.
  - Prepare responses for each of the following slides to deliver verbally to your instructor on the day of your presentations.

Sanger Method

Address each of the following in detail:

- **General overview of how the Sanger Method works.**

- **Description of each of the components of the Sanger Method, including: A) Primers, B) Polymerase, C) nucleotides, and D) ddNTPs.**

- **How ddNTPs are different from nucleotides and why these differences are necessary for the Sanger method to work.**

- **Explanation of the image on the following slide.**

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Use the image below to explain the Sanger Method..

Next Generation Sequencing

Address each of the following in detail:

- **General overview of how pyrosequencing works.**

- **Summary of the process of 454-Roche Pyrosequencing.**

- **Summary of the process of Illumina Bridge Pyrosequencing.**

- **Summary of the process of Ion-Torrent Sequencing.**

- **Summary of the process of Nanopore Sequencing.**

Interpreting Sequences

- **Summarize how to tell if a sequence of bases is an intron or an exon and what this means.**

- **Summarize how the function of genes is determined using knockout mice.**
  - Include why a knockout mouse must be a chimera for this process to work and what 'chimera' means.
  - Describe how a knockout mouse is created.

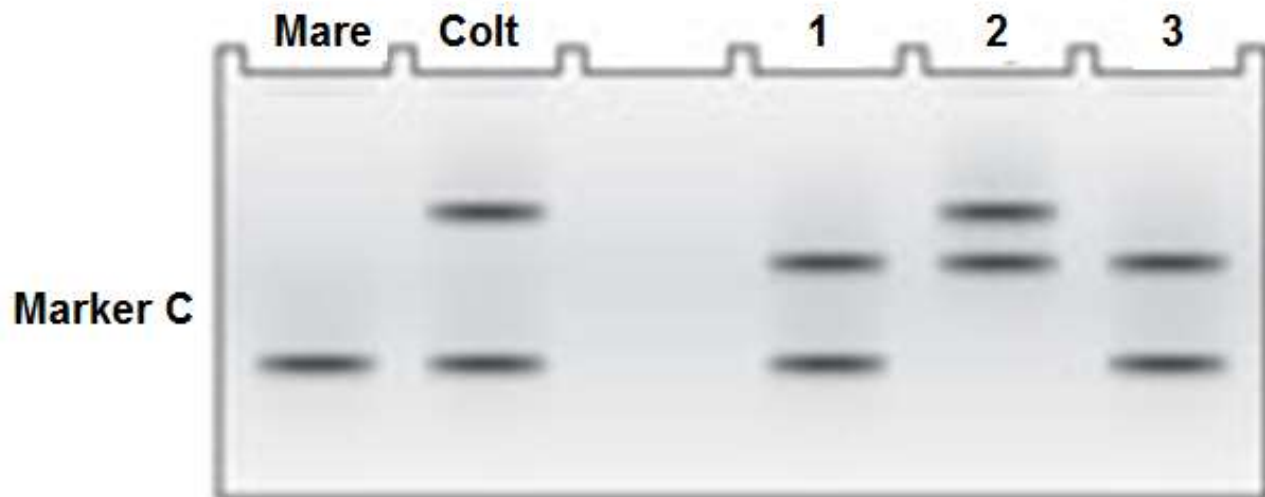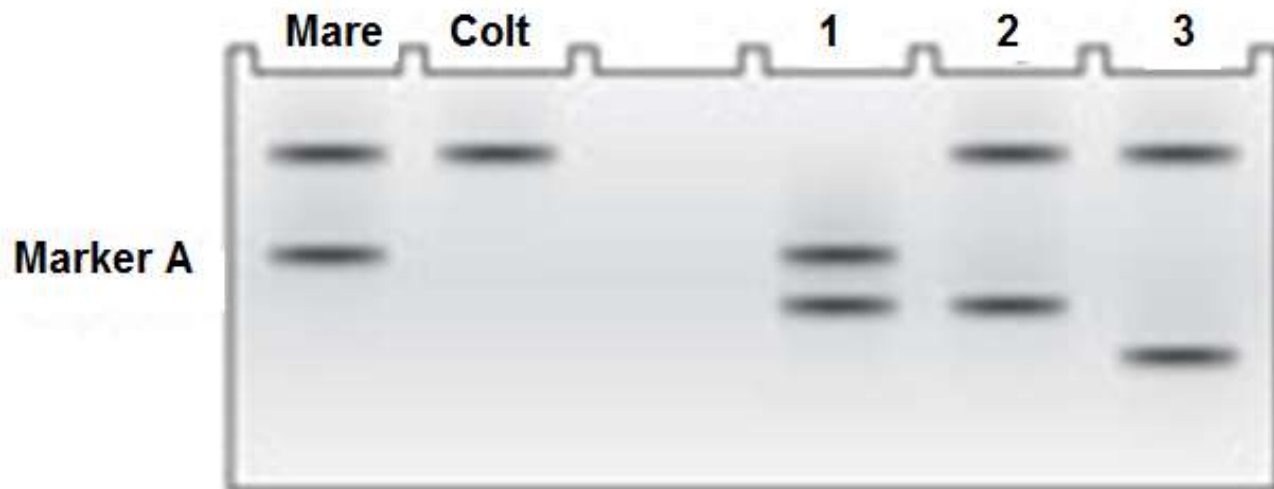- **Summarize how the function of genes is determined using BLAST.**

PCR-Electrophoresis

- **Summarize the purpose and outcome of PCR.**
- **Explain how PCR works and address each of the following in your explanation:** A) Taq polymerase, B) thermal-cycler, C) primers, D) nucleotides, E) restriction enzyme.
- **Explain why Taq polymerase is the polymerase that is used for PCR.**
- **Explain why a restriction enzyme is needed for PCR-electrophoresis to work.**
- **Explain how the electrophoresis gel functions in order to create useful results that allow us to analyze the DNA.**

Interpret the image below. Use it to explain how PCR-Electrophoresis is used in forensics.

Determine which stallion (1, 2, or 3) is the parent of this colt. Explain.
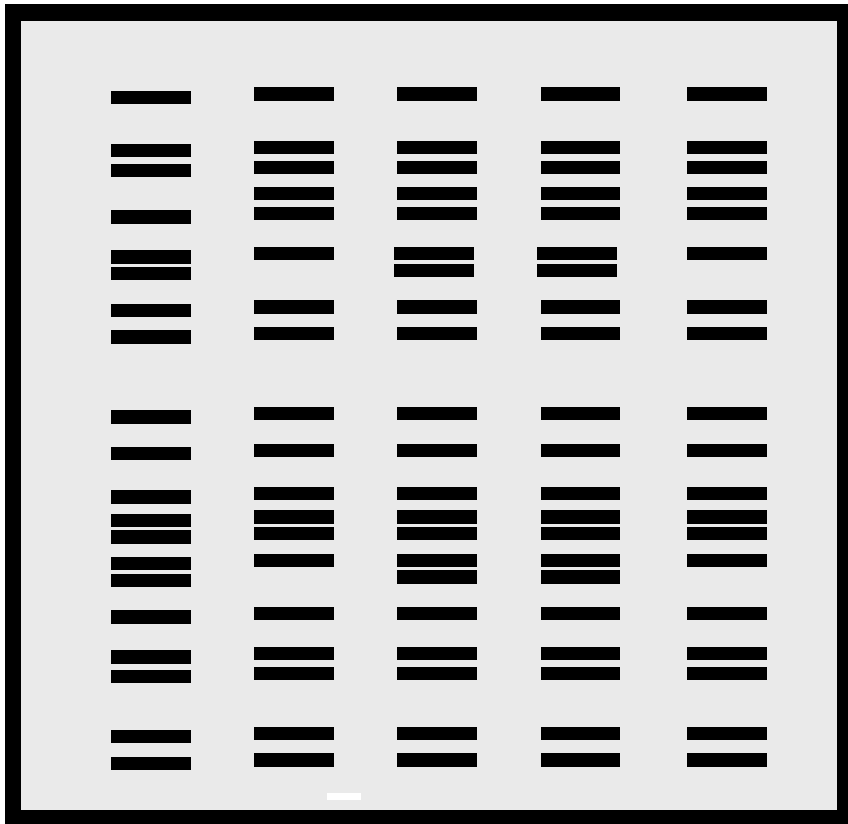
Southern Blotting

- **Compare Southern Blotting to PCR – Electrophoresis. How are they similar and how are they different?**

- **Summarize how Southern Blotting works and what it determines.**
  - Be sure to address the following: A) membrane; B) probe.

- **Provide examples of the types of scenarios in which Southern Blotting could be used to provide needed information.**
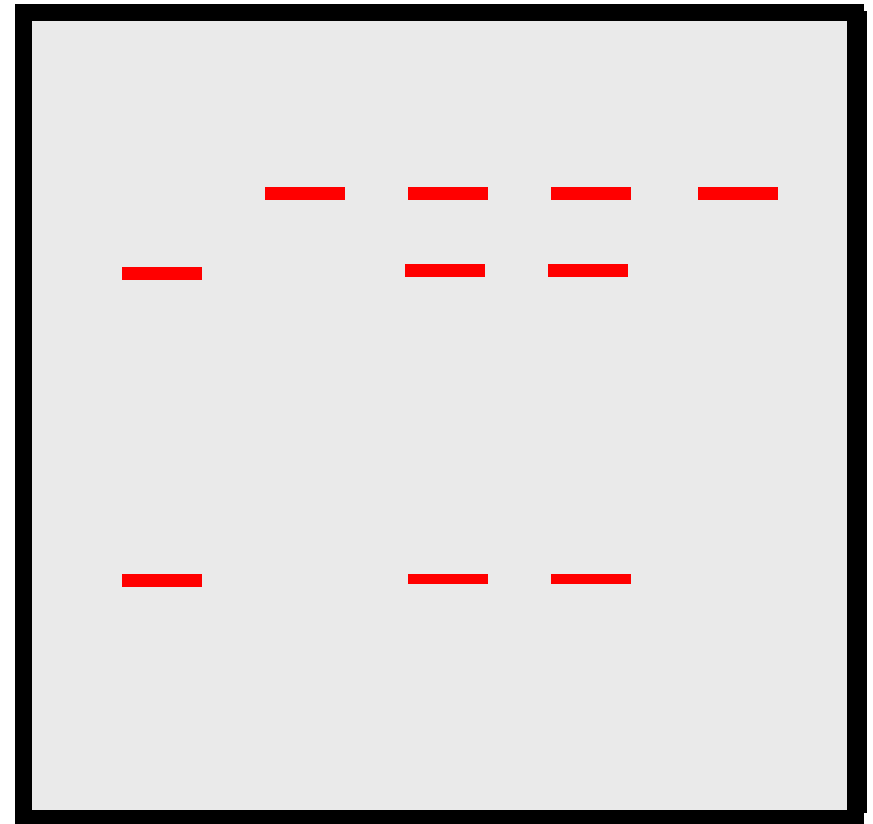
Interpret the image below. Tom & Sally are the parents; Peter is their child.

PCR-Electrophoresis

Southern Blotting

ELISA

- **Summarize how ELISA works.**
- **Summarize what ELISA tests for and what it indicates.**
- **Explain how the antibody-antigen response works and how it enables ELISA to function.**

Use the image below to explain ELISA.