

LABORATORY 7 – MOLECULAR GENOTYPING

Name:

Date:

“Our Babe” Project

Purpose: Working through the questions will help you learn how to extract critical information from the genotype data.

Background: The wreck of the *Titanic* was a turning point in maritime history that has continued to capture the public’s attention for over 90 years. At the time, the newly launched *Titanic* was the largest moving object ever designed and the most luxurious ocean liner ever built. With its multiple water-tight compartments, the *Titanic* was designed to be “unsinkable” but an encounter with an iceberg in the North Atlantic provided too much for the great vessel. At 11:40 on 14 April 1912, the ship collided with an iceberg and broke apart three hours later with the loss of over 1,500 lives. While many of the missing were never located, some bodies were recovered by the crew of the *Mackay-Bennet* and returned to Halifax, Nova Scotia for burial. Among the bodies brought to Halifax was that of a small blond boy, estimated to be 2 years of age. This young boy quickly became a symbol of the tragedy of the *Titanic* for both the crew of the *Mackay-Bennet* and for people throughout the world. Flowers, gifts and letters flooded into Halifax. Unlike many of the bodies that were buried with little ceremony, the boy was given a full burial service attended by the entire crew and dozens of others. So strong was worldwide emotion about this child that a bronze plaque, inscribed “Our Babe”, was made and placed in the casket with the body. Unfortunately, the true identity of the boy could not be determined. From passenger records, the child was believed to be Gosta Paulson but nothing could be found on the child or his clothing to allow an absolute determination. Based on this assumption, however, the body was buried close to that of Alma Paulson, his supposed mother. The grave was marked by a headstone labeled with the words “An Unknown Child”.



Information and Data: Recently, new efforts have begun to identify several of the “unknown” bodies buried in Halifax. Driven by the desire to bring closure to the *Titanic* tragedy, several families have

pressured officials to apply DNA testing to determine the identity of the few remaining unknown individuals. One of these requests led to reexamination of “Our Babe”. In a strange twist of fate, “Our Babe” turned out to be one of the few bodies that could actually be tested. Extensive amounts of



ground water had invaded most “Our Babe” of the Halifax graves. This resulted in the complete deterioration of most of the remains. The one exception was “Our Babe”. The bronze plaque had apparently pressed down on the body and in doing so, had helped to preserve a small fragment of femur. This piece of bone and three teeth were all that remained in the grave site. The teeth presented forensics experts with an unexpected surprise. Tooth development was not consistent with a two year old child. The age was estimated to be closer to 1 year. The lone, overworked coroner had clearly miss-aged

the body of the child. A new search of the passenger records revealed another, more probable, name for the Unknown Child, that of 13-month old Eino Panula. Fortunately, researchers were able to extract DNA from the small femur fragment. They were also able to obtain DNA from Alma Paulson, Gosta’s mother. Like Gosta Paulson, the story of Eino Panula was a tragic one. Eino was traveling with his mother and four brothers. The family was on its way to Coal Center, Pennsylvania to join Eino’s father (Juho Panula) and older brother Aneo. Juho and Aneo had immigrated to the United States two years earlier and had finally earned enough money to provide passage for the rest of the family. The bodies of Eino’s mother and four brothers were never accounted for. It was assumed that they were among the many third class passengers trapped deep in the lower sections of the ship when it sank. Researchers were able to locate the graves of Juho and Aneo from family records.

- You are provided with DNA samples from 4 individuals: “Our Babe”, Alma Paulson, Juho Panula and Aneo Panula.
- Your laboratory has the capability to determine genotypes at four microsatellite loci. All of the loci exhibit co-dominant modes of inheritance.
- Your problem is to determine the identity of the Unknown Child. Could either child (Gosta or Eino) be the unknown “Our Babe”?

Assignment:

1. Use the *ELS* program to collect genotype data from each of the 4 individuals. Be sure to carefully record the sample identification information on the **Electrophoresis Loading Sheets** and the genotypes on the **Genotyping Data Sheet**. Your data set is called "*Our Babe*".
2. Before examining the data, propose a hypothesis for one possible outcome of your investigation. Based on your hypothesis, state a prediction and an alternative prediction that will allow you to answer the investigator's question.

Hypothesis:

Prediction 1:

Alternative Prediction:

3. Examine Locus 1 of the genotype data (ignore the other loci for now). Remember, exclusion is always the strongest evidence.

A. Can Alma be excluded as a potential parent of Our Babe? Yes or no. Why did you reach this conclusion?

B. Can Juho be excluded? Why?

4. Now examine locus 2. Briefly explain the pattern that you see for this locus. Is this locus helpful (i.e. informative)?

5. Examine Locus 3.

A. Can Alma now be excluded as a potential parent of Our Babe? Yes or no. Why?

B. Can Juho be excluded? Why?

6. Examine Locus 4.

A. Can Alma be excluded as a potential parent of Our Babe? Yes or no. Why?

B. Can Juho be excluded? Why?

7. Using the data from the 4 loci, what can you now say about the Predictions that you made regarding the outcome of this investigation? Would you Reject or Fail to Reject your initial hypothesis? Briefly explain why.

8. Who was Our Babe? If the information from Locus 4 was not available, would this change your answer? Why?

9. If you determine that Alma or Juho is a potential parent of Our Babe, what would the genotype of the other parent have been?

10. What additional information about the “alleles” might be helpful?

