Two Peas in a Pod?
A Case of Questionable Twins

by
Paul Welsh
Singapore American School

Part I

When a couple who had tried unsuccessfully for six years to have a baby naturally turned to one of the best known fertility clinics in the United States, they never imagined what would develop nine months later.

The couple studied their options and eventually opted for *in vitro* fertilization to increase their opportunities of having children. Technicians at the prestigious clinic extracted several mature eggs from Hannah's ovaries after several weeks of mild hormone treatments. Two of Hannah's ova (eggs) were selected and later fertilized with sperm from her husband. The fertilized eggs were then transplanted back into Hannah's uterus to continue their development. The *in vitro* fertilization (IVF) occurred in March and the following December the couple excitedly awaited the birth of twins.

Hannah and Nathan Jones were ecstatic when healthy twin baby boys, Thomas and Darrell, were born.

The differences in the Jones' twins weren't that noticable at birth, but as the weeks passed and both infants started to grow, the parents watched in amazement as their children changed right before their eyes. One mellowed to a golden bronze and his dark hair turned curly, while the other displayed a milky complexion with straight, blond hair.

"Right after the birth it wasn't obvious to us," said Hannah, adding, "Thomas was a little lighter than Darrell. But after eight weeks I thought, this isn't possible." Darrell's skin was quite dark, and he had a much flatter nose than his brother.

Questions

1. How are *in vivo* fertilization and *in vitro* fertilization similar? How are they different?

2. Are Darrell and Thomas fraternal or identical twins? How is the formation of fraternal twins different from the formation of identical twins?

3. In the time remaining, write down as many questions as you can that are raised by this story. Think of as many scenarios as you can that would lead to this situation.

Image Credit: Detail from "Slumber" by William-Adolph Bouguereau (1825-1905).

Two Peas in a Pod? A Case of Questionable Twins

Part II

by
Paul Welsh
Singapore American School

The constant stares, innuendoes, and inquiries from nosey neighbors became more than the new parents could stand. As hard as she tried, Hannah could not protect her family from the town gossip.

"We've lived in this town for a year now. When I walk with the kids, people stare at me and think: 'It's true, those kids really exist.' People I have never met look in the buggy and say: 'They're twins? How is that possible?'"

After a lot of debate, Hannah, 33, and Nathan, 40, decided to have their family genetically tested using gel electrophoresis, also called DNA profiling. The results of four different single locus autorads are shown in Figure 1. Four different locations on their genome were analyzed for the number of VNTRs (Variable Number Tandem Repeats) found in relation to a sample of VNTRs of known (standard) lengths and each other. Strands of similar length are pulled similar distances through a gel by an electrical current resulting in "bands" that can be read.

Questions

1. What does each "band" represent? Account for the two bands shown by each individual. Why is it necessary to run more than a single gel?

2. What conclusions regarding paternity can be drawn from the gel results? Which scenarios listed in Part I, Question 3, are no longer likely in light of this evidence? Which scenarios remain possible? Why?

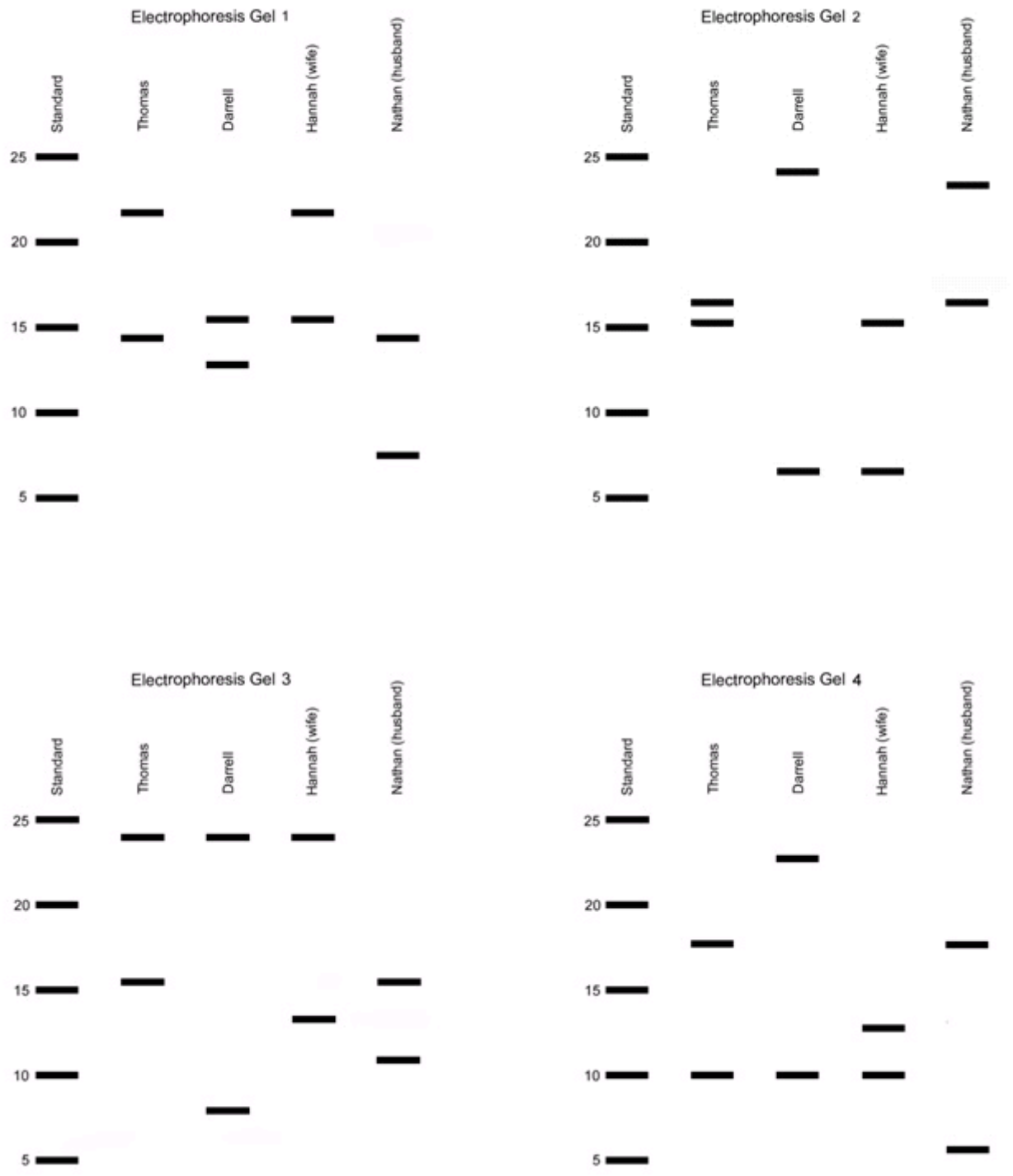

Figure 1: *Results of four different single locus DNA electrophoresis gels from the Jones' family. Four different locations on each person's genome were analyzed for the number of VNTRs (Variable Number Tandem Repeats) found in relation to a standard sample of VNTRs of known lengths. Strands of similar length are pulled "down" similar distances through a gel by an electrical current resulting in "bands" that can be stained and read.*

Two Peas in a Pod? A Case of Questionable Twins

Part III

by
Paul Welsh
Singapore American School

After technicians at the fertility clinic saw the gels, they were quick to defend their procedures and further suggested that the results showed Mrs. Jones had committed adultery. “I was offended by their claims,” Hannah said. “I live in decency.”

Ensuing legal action resulted in the clinic running additional DNA profiles between Darrell, his mother, and selected male patients from the clinic; see Figure 2.

Question

1. What conclusions can be drawn from the results shown in gels 5-8? What are the *only* likely scenarios explained by this evidence?

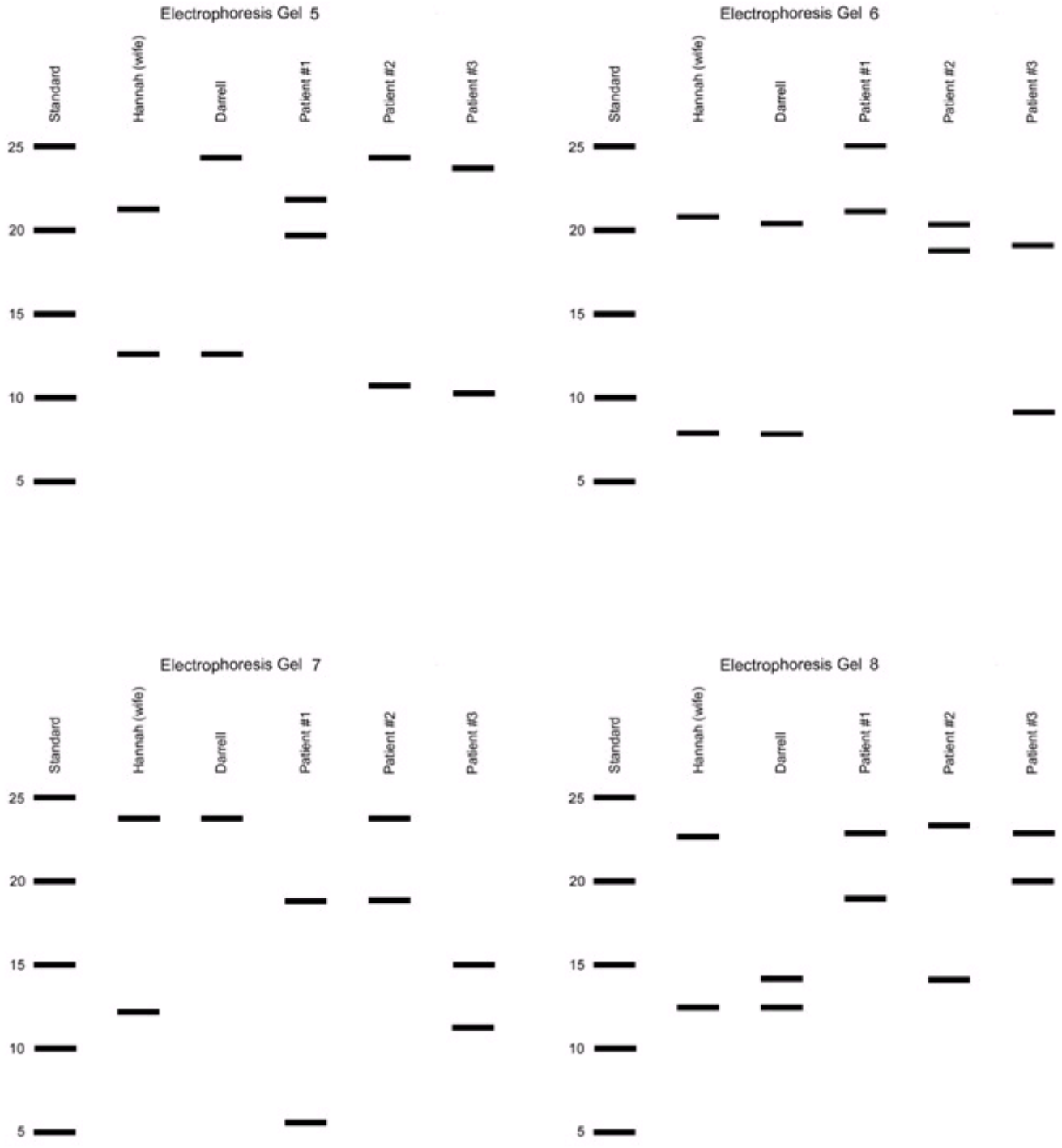

Figure 2: *Results of four single locus DNA electrophoresis gels conducted on Darrell, his mother Hannah, and three male patients from the fertility clinic. Four different locations on each person's genome were analyzed for the number of VNTRs (Variable Number Tandem Repeats) found in relation to a standard sample of VNTRs of known lengths. Strands of similar length are pulled "down" similar distances through a gel by an electrical current resulting in "bands" that can be stained and read.*

Two Peas in a Pod? A Case of Questionable Twins

Conclusion

by
Paul Welsh
Singapore American School

In fact, Darrell's biological father is a Caribbean man (patient #2) from Aruba in the Dutch Antilles, who had been in the hospital with his wife on the same day as the Joneses for a similar IVF procedure.

But how could such a serious error take place? Hospital spokesperson Simone Labrae said, "We suspect that a technician broke the rules and reused a pipette to transfer the two different sperm."

The doctors at the university hospital clinic are now calling the event a "deeply regrettable mistake." Administrators admit the eggs were accidentally inseminated with the sperm from the Caribbean man along with the sperm of Nathan Jones.

Further Considerations

While the situation has long-term, far-reaching implications, the Joneses are most immediately concerned about Darrell's biological father's medical history. "I am sometimes concerned about Darrell's health," Hannah has said, adding, "I don't know his medical history or that of his father's family…."

While the couple had an agreement with the hospital not to go to the media with their story, they decided to talk about the hospital error that left them with sons from different racial backgrounds to point out the problem of racism.

Cases like this one may be more common than reports indicate (Weiss, 1997). However, increased paternity testing may also be playing a role in bringing more cases like this forward.

Assignment

1. Brainstorm as many issues as you can that are raised by this case.

2. Research and be prepared to report on other current fertility, or assisted reproductive technologies (ART), or paternity related cases.

3. Comment on the strengths and limitations of technology regarding reproduction and/or DNA as evidence.

4. Use a table to list the costs/risks that couples face choosing to utilize this and other types of reproductive technologies and contrast them to the risks faced when using "natural" methods of conception. You may want to begin by considering factors in categories related to the health of the mother and child, social reactions from others, and financial costs.

5. Generate a list of ethical rules and procedures for reproductive clinics and technicians. Compare your lists to any rules that exist for such professionals.

References

- Anonymous. 1995. “Black and white twins born after test tube mix-up.” *Jet* July 24, v88 n11 p34 (4).
- Weiss, Rick. 1997. “Biology: A case of twins with different fathers.” *Washington Post*, Science Notebook, June 16, pA2.

Date Posted: 10/20/03 nas

Originally published at http://www.sciencecases.org/twins/twins.asp