

# Roberson Museum and Science Center

## Post-Visit Gel Electrophoresis

**Grade Level:** 9 through Adult

**New York State Learning Standards:** M, S & T 2, 4, 5 & 7

**Pennsylvania Learning Standards:** S & T 3.1, 3.2, 3.3, & 3.7

**Objectives:** Students will read a series of recent articles related to DNA and Biotechnology in the news. They will then answer questions about the articles that will test the knowledge they acquired both at school during the pre-visit and during the lab at Roberson Museum and Science Center. These articles will also present new information that will cause students to dig deeper into their knowledge base and to make inferences. Students will also form opinions about these topics.

### Materials:

#### ■ The following Articles:

Bakalar, N. "In the Lab: Gene Study Helps Explain Link to Breast Cancer." *The New York Times*. (December 11, 2007).

Grady, D. and Kolata, G. "Gene Therapy Used To Treat Patient With Parkinson's." *The New York Times*. (August 19, 2003).

Harmon, A. "My Genome, Myself: Seeking Clues in DNA." *The New York Times*. (November 17, 2007).

Pollack, A. "Biotech's Sparse Harvest; A Gap Between the Lab And the Dining Table." *The New York Times*. (February 14, 2006).

Stolberg, SG. "Senate Sends to House a Bill on Safeguarding Genetic Privacy." *The New York Times*. (October 15, 2003).

- Worksheet (one per student) to go along with articles
- Pen or Pencil

**Procedure:**

1. Have students read articles in class and complete worksheet in pairs. Another option is to have students read article for homework and complete worksheet either at home or in class.
2. Review worksheet in class so that you may go over the more difficult concepts concerning DNA as a molecule.
3. Lead the class in a discussion on some of the more open-ended questions that lend themselves to debate and are opinion-based. This can be fun, but be prepared.....students love to debate questions of an ethical nature!

**Conclusion:**

A. Pages that follow are a student worksheet with questions related to the articles and an answer sheet for the teacher.

**Developed By:** Barbara Betza

**Date:** December 2007

## Teacher's Answer Sheet: Post-Visit Gel Electrophoresis

### Part I: Article: In the Lab Gene Study Helps Explain Link to Breast Cancer

1. What is BRCA1?

*BRCA1 is a mutation in a gene that produces a particularly deadly type of breast cancer*

2. What is PTEN?

*PTEN is a tumor suppressor gene that most women have that prevents breast cancer. BRCA1 inactivates PTEN, therefore it allows tumors to grow.*

3. What does Dr. Ramon E. Parsons think will happen over the next five years?

*Dr. Parsons believes we will be using drugs that work on the PTEN pathway within the next five years.*

4. What problem will women with BRCA1 mutations have?

*These women are at very high risk for breast cancer at a very early age.*

5. Some women who have BRCA1 choose preventative mastectomies. Do you agree with this? Why or Why not? *Answers May Vary (AMV)*

### Part II: Article: Gene Therapy Used To Treat Patients With Parkinson's

1. Explain what Dr. Kaplitt's experiment was?

*Dr. Kaplitt bore a hole in Mr. Klien's head and infused 3.5 billion viral particles each carrying a copy of a human gene that would help relieve symptoms of Parkinson's.*

2. What are some of the symptoms of Parkinson's Disease?

*Some of the symptoms are tremors, shuffling gait, abnormal movements etc.*

3. What is meant by a Phase 1 Trial?

*The FDA approved this experiment as a Phase 1 trial, meaning that its main goal is to determine safety, not efficacy.*

4. Why are some experts in gene therapy expressing concern about this procedure?

*These experts are concerned because this experiment had not been done on monkeys first to see if it could work or if it could cause potential harm by possibly spreading viruses in the brain or producing huge amounts of protein that could inhibit brain cells from firing.*

5. How Many Americans have Parkinson's?

*About 1.5 million.*

6. Do you know any famous people that have this disease?

*Actor Michael J Fox, Attorney General Janet Reno, (AMV)*

7. What happens to nerve cells in the brain of people with this disease?

*Nerve cells die in part of the brain. There is a shortage of a chemical messenger (dopamine) that helps to carry signals between various parts of the brain involved in movement.*

8. How do you feel about experimentation on people without trials on animals first?

*(AMV)*

### **Part III: Article: Biotech's Sparse Harvest; A Gap Between the Lab and the Dining Table**

1. What were scientists first envisioning at the dawn of genetically engineered crops?

*Scientists envisioned healthier and tastier foods, cancer fighting foods, rot-resistant fruits etc. healthier French fries, beans without flatulence.*

2. Who have been the beneficiaries of genetically modified crops and how?

*They have mostly benefited farmers making it easier to control weeds and insects.*

3. Why is the list of biotech crops to benefit consumers rather short?

*Developing these crops is difficult because of legal issues, allergies and because of trade rules.*

4. What two advantages have the biotech industry been "peddling" over the years?

*They have been peddling herbicide tolerance and insect resistance.*

5. For what did Monsanto just win approval?

*Monsanto won approval for a genetically engineered corn promoting greater nutritional value for pigs and poultry. The corn contains a bacterial gene that increases the level of lysine and amino acid often given to farm animals as a supplement.*

6. What will be happening soon with soybean oils?

*Soybean oils will soon be yielding healthier baked goods and fried foods. These oils would be without trans fats.*

7. How do you feel about genetically altered foods?

*(AMV)*

### **Part IV: Article: Senate Sends to House a Bill on Safeguarding Genetic Privacy**

1. What did the Senate vote unanimously to pass after a six year gridlock?

*They passed the first federal bill aimed exclusively at safeguarding genetic privacy.*

2. What will this bill encourage people to do?

*This will encourage millions of people to have genetic testing without fear of discrimination.*

3. Who opposes this bill?

*The insurance industry opposes this bill.*

4. What kind of new standards would this bill provide?

*This would set new standards for genetic privacy. It would prevent health plans from deciding enrollment based on genetic information and employers could not use the information as a basis for hiring.*

5. What was determined to be the definition of a genetic test

*Genetic tests are those that indicate a predisposition toward illness in the future.*

*This is because they feared that they could jeopardize their health coverage or jobs.*

6. What did Senator Olympia Snowe have to say about the bill?

*After watching this happen first hand to one family she said, "The American people, cannot have access to the quality of care and the advancement of medical and scientific discoveries if they are subjected and held hostage to the fears of discrimination by their employers and by insurers."*

### **Part V: Article: My Genome, Myself: Seeking Clues in DNA**

1. Who are Navegenics, DeCODE and 23 and Me?

*These are companies that market personal DNA and provide genetic consultation.*

2. Why did the author decide not to have her three year old daughter's DNA tested?

*Because she did not want her daughter to regard anything about her as predestined.*

3. What did the author say about looking at her own DNA?

*It was like looking at a fundamental part of myself. It was compelling to know.*

4. What are some of the things the author found out about herself?

*Her risk of breast cancer was no higher than normal, as was her risk of developing Alzheimers. She was 23% less likely to get type 2 diabetes and her chance of getting MS was nil. She was three times more likely to get Crohn's disease and 23% more likely to have a heart attack.*

5. Did the author feel that finding out her genetic future was a good thing?

*She said she found the knowledge of her potential future strangely comforting.*

6. How do you feel about this topic? Would you want to know?

*(AMV)*

## **Student Activity Sheet: Post-Visit Gel Electrophoresis**

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5. Some women who have BRCA1 choose preventative mastectomies. Do you agree with this? Why or Why not? Answers May Vary (AMV)

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2. What are some of the symptoms of Parkinson's Disease?
3. What is meant by a Phase 1 Trial?
4. Why are some experts in gene therapy expressing concern about this procedure?
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6. Do you know any famous people that have this disease?

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3. Who opposes this bill?
4. What kind of new standards would this bill provide?
5. What would employers be able to do?
6. What was determined to be the definition of a genetic test?
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4. What are some of the things the author found out about herself?
5. Did the author feel that finding out her genetic future was a good thing?
6. How do you feel about this topic? Would you want to know?