



## Homer's Forbidden Donut (A Gel Electrophoresis Exercise) By Eva McLanahan

This activity is used to explain the concept behind gel electrophoresis. Students work in groups to determine who committed the crime of taking a bite out of Homer Simpson's *forbidden donut*.

### Primary Learning Outcomes

Students will learn the difference between DNA and RNA.

Students will understand the importance and role of DNA in living organisms.

Students will learn how restriction enzymes operate and the basis behind DNA fingerprinting.

Students will examine and understand the use of DNA technology in forensics.

---

### Assessed Georgia Performance Standards:

#### Habits of Mind

SCSh1. Students will evaluate the importance of curiosity, honesty, openness, and skepticism in science.

SCSh3. Students will identify and investigate problems scientifically.

SCSh6. Students will communicate scientific investigations and information clearly.

#### Nature of Science

SCSh7. Students analyze how scientific knowledge is developed.

#### Co-Requisite – Content

SB2. Students will analyze how biological traits are passed on to successive generations.

a. Distinguish between DNA and RNA.

b. Explain the role of DNA in storing and transmitting cellular information.

f. Examine the use of DNA technology in forensics, medicine, and agriculture.

---

### Procedures/Activities

*Step: 1 Duration: 15-20 minutes*

Use a PowerPoint presentation to present the components of gel electrophoresis and its applications. The end of the PowerPoint presentation contains brief instructions to guide the students on how to solve the crime.

#### Attachments for Step 1

**Title:** Gel Electrophoresis PowerPoint presentation

**FileName:** GelEL.ppt

**Description:** This presentation will prepare your students to solve the crime of Homer's forbidden donut.

*Step: 2 Duration: 45-50 minutes*

Place the students in six groups (Analysis Units) of 4-5 students each and provide them with the "Bulletins." Allow the students to read through the "Bulletins" before the remaining materials are distributed. The students should be able to work through the exercise with little guidance by following instructions provided in the PowerPoint and the "Bulletins." After each group has processed the "gel" with the suspects' DNA, provide them with their evidence DNA found at the crime scene. The exercise is designed such that each Analysis Unit has a different criminal--to prevent groups from sharing answers.

### **Attachments for Step 2**

**Title:** Bulletins

**FileName:** Homer\_Bulletins.pdf

**Description:** This file contains the "Bulletins" to pass out to the group and instructions for creating the poster board (gel). The poster boards can be created and laminated for reuse which will save time in the classroom. Also, the discussion questions are included at the end of the file.

**Title:** Strands of DNA for activity (should be printed on legal size paper)

**FileName:** Homer\_DNA.pdf

**Description:** This file contains the strands of DNA to distribute to each group and a sheet of "Evidence DNA" that should be distributed by the Lead Analyst to each Analysis Unit after they have correctly processed the suspects' DNA.

---

### **Materials and Equipment**

1/2 sheet of poster board for each group, marker, tape, scissors for each student, pencil

### **Total Duration**

60-70 minutes

### **Technology Connection**

This activity will teach the concept behind gel electrophoresis and enable the students to better understand a lab using the actual gel electrophoresis equipment.

---

### **Assessment**

Discussion questions and completion of exercise.

### **Extension**

After completion of this exercise a lab using "real" gel electrophoresis will be better understood by students.