

# Case of the Broken Beaker

## A DNA Restriction Analysis Classroom Activity

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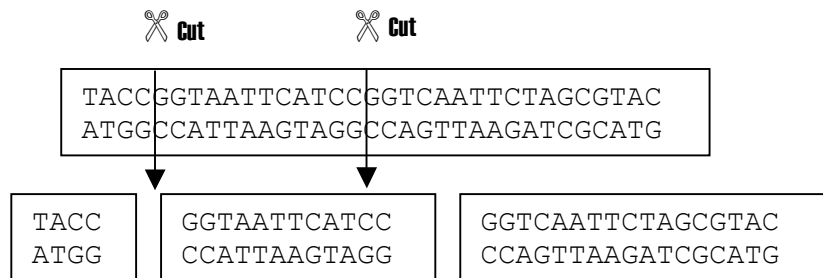
Adapted from *Case of the Crown Jewels* written by Donald A. DeRosa and B. Leslie Wolfe

**Objective:** While investigating the recent theft of tires from the school garage, investigators noticed that a window had been broken. Upon further inspection, they observed there was blood by the broken window. They took a sample of the blood and sent it to your lab for testing. While investigating the crime, two suspects were found. The first suspect was a mechanic in the garage until the day of the theft – he quit that afternoon. The second suspect is a known black market dealer of automotive parts who was spotted in the area around the time of the theft. Your job is to determine if either of the two suspects' DNA matches the DNA found at the crime scene.

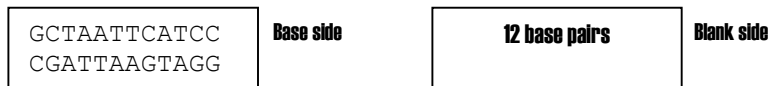
**Pre-Laboratory Work:** Bacteria do not have arms and legs to fight off invaders – instead, they use something inside their cell called a restriction enzyme. These enzymes attack DNA and cut it at a specific group of nucleotides, or bases. Forensic scientists use restriction enzymes to analyze human DNA found at crime scenes. To better understand how these restriction enzymes work, you will act like a restriction enzyme.

### Restriction Enzyme Analysis

1. Turn your paper strip with the DNA base sequences over so the side with the bases is facing you. Use your scissors (restriction enzymes) to cut your DNA samples only where you see this base pattern: CCGG. Cut between the C and G as shown in this example:



2. Count the number of base pairs (bp) in each piece of DNA that you have created. A base pair consists of two complementary bases. Record the number of base pairs in each piece on the blank side of the DNA fragment.



3. Tape your DNA sequences on the chart according to the number of base pairs. Be sure to put your sample in the proper column. The pieces of DNA may overlap into the next column – you may fold your fragments or let them run into each other.

Crime DNA	Suspect 1	Suspect 2	Suspect 3	Suspect 4	Fragment Length (bp)
					32
					31
					30
					29
					28
					27
					26
					25
					24
					23
					22
					21
					20
					19
					18
					17
					16
					15
					14
					13
					12
					11
					10
					9
					8
					7
					6
					5
					4

4. Based on the results of the restriction enzyme analysis, which suspect left their DNA at the crime scene? How do you know?

## DNA STRIPS

**Crime DNA Crime DNA Crime DNA Crime DNA Crime DNA Crime DNA Crime DNA**  
GTCGACCGGTGACCGTGCGTACACAGTGCTCCGGATAGCTGATAGCTCCGGTG  
CAGCTGGCCACTGGCACGCATGTGTCACGAGGCCTATCGACTATCGAGGCCAC

**Suspect 1 DNA Suspect 1 DNA Suspect 1 DNA Suspect 1 DNA Suspect 1 DNA**  
GTCCCAGCCGGACCGTACCGGTAGATCAGCCGGTAGATTGATAGCGTGATGTG  
CAGGGTCGGCCTGGCATGGCCATCTAGTCGGCCATCTAACTATCGCACTACAC

**Suspect 2 DNA Suspect 2 DNA Suspect 2 DNA Suspect 2 DNA Suspect 2 DNA**  
GTCTACGTAATCGTAGCCATCCGGACAGTGTGCACGATCGTACATGCTACGTG  
CAGATGCATTAGCATCGGTAGGCCTGTCACACGTGCTAGCATGTACGATGCAC

**Suspect 3 DNA Suspect 3 DNA Suspect 3 DNA Suspect 3 DNA Suspect 3 DNA**  
GTCGACCGGTGACCGTGCGTACACAGTGCTCCGGATAGCTGATAGCTCCGGTG  
CAGCTGGCCACTGGCACGCATGTGTCACGAGGCCTATCGACTATCGAGGCCAC

**Suspect 4 DNA Suspect 4 DNA Suspect 4 DNA Suspect 4 DNA Suspect 4 DNA**  
GTCTCCATCCGGACTACCATACATCTGGTGTACCCGGTGATATCGTCCGGGTG  
CAGAGGTAGGCCTGATGGTATGTAGACCACATGGGCCACTATAGCAGGCCAC