

# Detection of Genetically Modified Food

Diana Brandner

[dbrandner@matcmadison.edu](mailto:dbrandner@matcmadison.edu)

Madison Area Technical College

Biotechnology Laboratory Technician Program

<http://matcmadison.edu/biotech/>

## Gel Electrophoresis Results and Analysis Assessment Activity

### Instructional Procedure

Have the students read the story provided in the Student Protocol section, then give the students copies of all the gel results attached. Ask the students what conclusions they could draw from the results pictured on the gels and the information given to them.

### Student Protocol

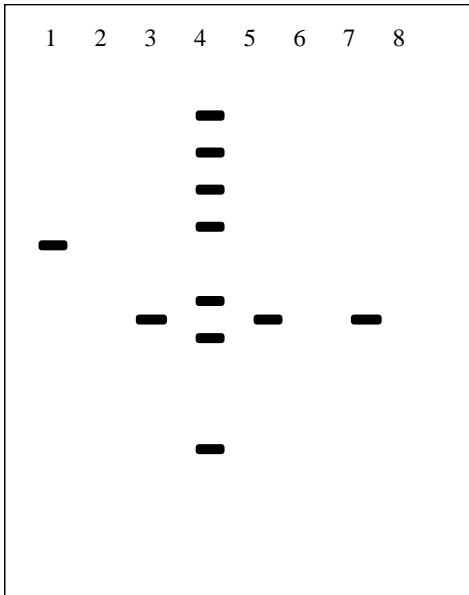
#### Introduction to the Activity

You are the lab manager at a company called Food ID, based in Illinois. Food ID is a company that specializes in testing food for the presence of genetic modification, including the presence of the CaMV35S promoter and specific transgenes. Big K Foods will be introducing a new line of 100% organic corn flour tortillas, taco shells and snack tortilla chips.

Currently, the United States is in great political and social turmoil over the use of genetic modification in crops. The turmoil began when a small group of people became ill from eating products made from corn. It is believed that an experimental field study containing corn genetically modified to produce a swine flu viral coat protein, pharmaceutical feed supplement for pigs, cross-pollinated with corn for human consumption. When people ate the contaminated corn they became ill. Because of these recent developments the Big K Food Company wants documented proof that their new line of 100% organic corn products is absolutely safe to eat and they will be posting the chain of custody documentation trail on their web site.

Because of the increased social pressure, the need for genetic testing of food samples has increased and your lab is expanding and hiring new lab technicians. You've hired all the experienced technicians you can and have had to resort to hiring a few recent graduates from Dunken Technical University. You need to assess the abilities of each new technician and sign off on all their laboratory notebooks and batch records. You have just been given photo-documentation results from two Dunken Technical University graduates who have just completed results on 40 Big K Food organic corn meal samples resulting in a total of ten gels. They used the company standard operation procedure (SOP) for the detection of the CaMV35S promoter that yields a PCR product of 195 bp on a 4% agarose gel. What conclusions can you draw about the lab technicians' performance, from the results you have been presented with?

Gel Results and Analysis  
Gel 1



Lane 1. Negative control

Lane 2. 0% Control

Lane 3. 2% Control

Lane 4. PCR Marker from bottom: 50, 150, 300, 500, 750, 1000, 2000 bp

Lane 5. Sample 1

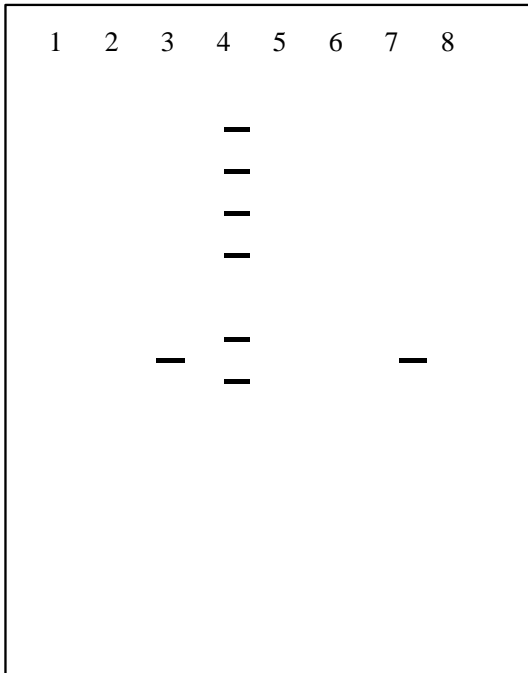
Lane 6. Sample 2

Lane 7. Sample 3

Lane 8. Sample 4

What conclusions can you draw from the results pictured on this gel?

Gel Results and Analysis  
Gel 2



Lane 1. Negative Control

Lane 2. 0% Control

Lane 3. 2% Control

Lane 4. PCR Marker from bottom: 50, 150, 300, 500, 750, 1000, 2000 bp

Lane 5. Sample 5

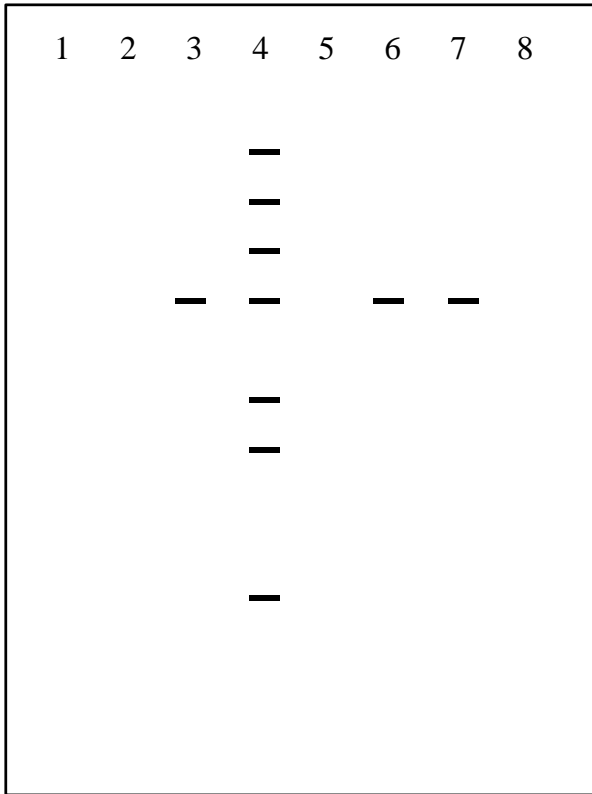
Lane 6. Sample 6

Lane 7. Sample 8

Lane 8. Sample 9

What conclusions can you draw from the results pictured on this gel?

Gel Results and Analysis  
Gel 3



Lane 1. Negative Control

Lane 2. 0% Control

Lane 3. 2% Control

Lane 4. PCR Marker from bottom: 50, 150, 300, 500, 750, 1000, 2000 bp

Lane 5. Sample 9

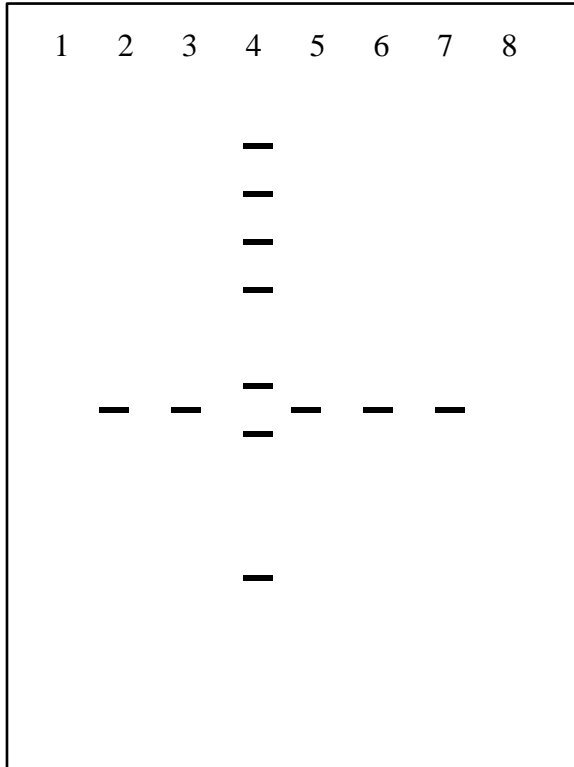
Lane 6. Sample 10

Lane 7. Sample 11

Lane 8. Sample 12

What conclusions can you draw from the results pictured on this gel?

Gel Results and Analysis  
Gel 4



Lane 1. Negative Control

Lane 2. 0% Control

Lane 3. 2% Control

Lane 4. PCR Marker from bottom: 50, 150, 300, 500, 750, 1000, 2000 bp

Lane 5. Sample 13

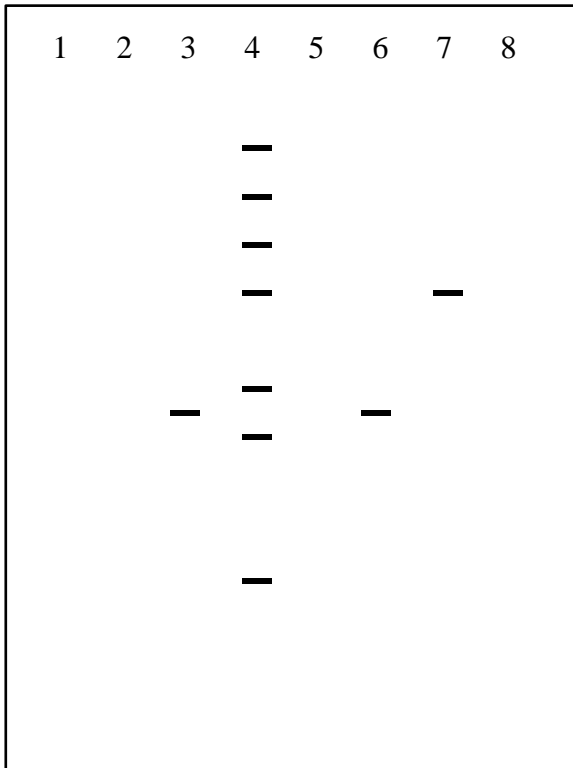
Lane 6. Sample 14

Lane 7. Sample 15

Lane 8. Sample 16

What conclusions can you draw from the results pictured on this gel?

Gel Results and Analysis  
Gel 5



Lane 1. Negative Control

Lane 2. 0% Control

Lane 3. 2% Control

Lane 4. PCR Marker from bottom: 50, 150, 300, 500, 750, 1000, 2000 bp

Lane 5. Sample 17

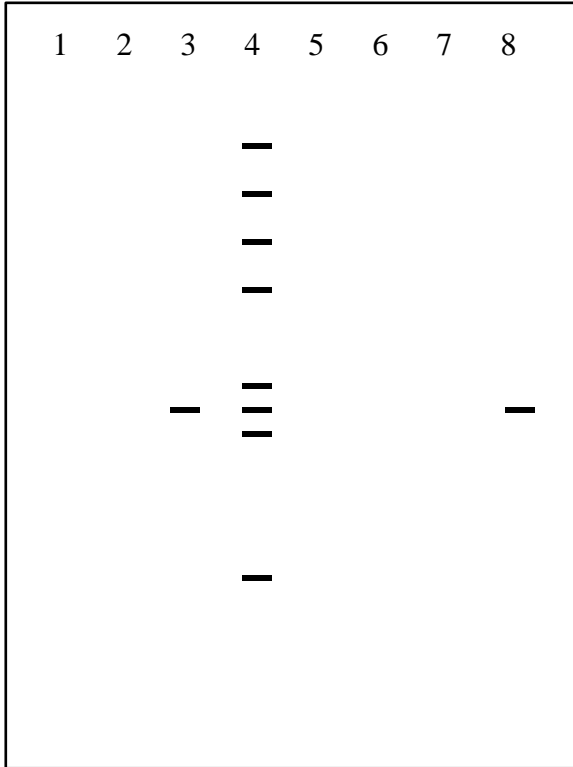
Lane 6. Sample 18

Lane 7. Sample 19

Lane 8. Sample 20

What conclusions can you draw from the results pictured on this gel?

Gel Results and Analysis  
Gel 6



Lane 1. Negative Control

Lane 2. 0% Control

Lane 3. 2% Control

Lane 4. PCR Marker from bottom: 50, 150, 300, 500, 750, 1000, 2000 bp

Lane 5. Sample 21

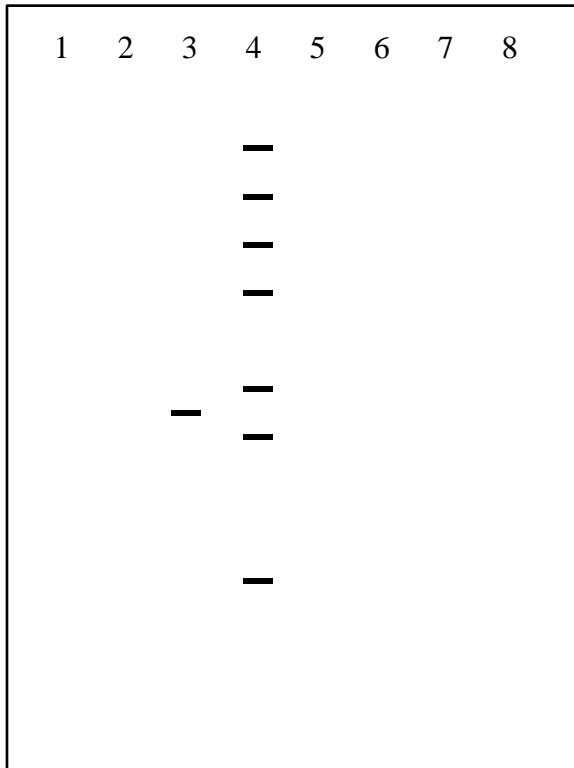
Lane 6. Sample 22

Lane 7. Sample 23

Lane 8. Sample 24

What conclusions can you draw from the results pictured on this gel?

Gel Results and Analysis  
Gel 7



Lane 1. Negative Control

Lane 2. 0% Control

Lane 3. 2% Control

Lane 4. PCR Marker from bottom: 50, 150, 300, 500, 750, 1000, 2000 bp

Lane 5. Sample 25

Lane 6. Sample 26

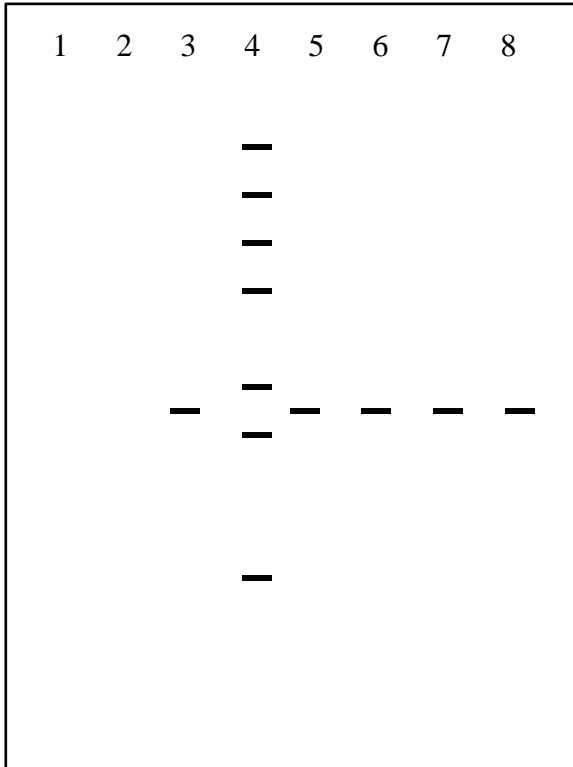
Lane 7. Sample 27

Lane 8. Sample 28

What conclusions can you draw from the results pictured on this gel?



Gel Results and Analysis  
Gel 8



Lane 1. Negative Control

Lane 2. 0% Control

Lane 3. 2% Control

Lane 4. PCR Marker from bottom: 50, 150, 300, 500, 750, 1000, 2000 bp

Lane 5. Sample 29

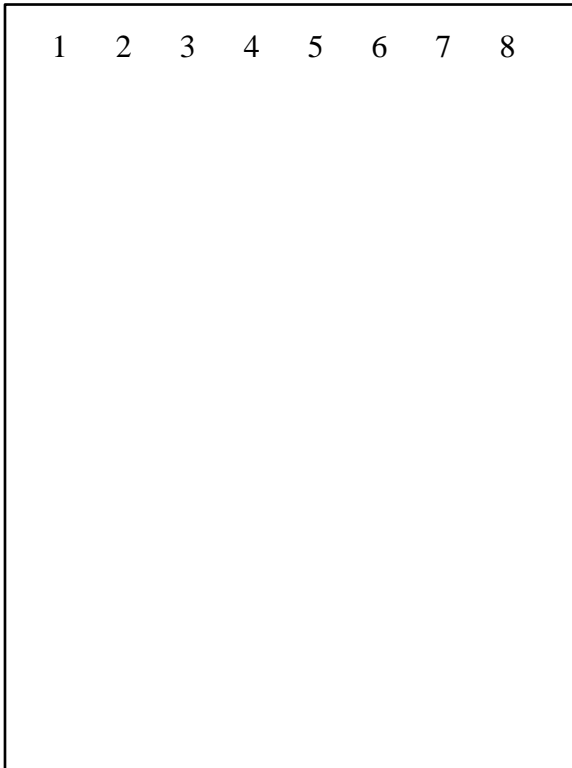
Lane 6. Sample 30

Lane 7. Sample 31

Lane 8. Sample 32

What conclusions can you draw from the results pictured on this gel?

Gel Results and Analysis  
Gel 9



Lane 1. Negative Control

Lane 2. 0% Control

Lane 3. 2% Control

Lane 4. PCR Marker from bottom: 50, 150, 300, 500, 750, 1000, 2000 bp

Lane 5. Sample 33

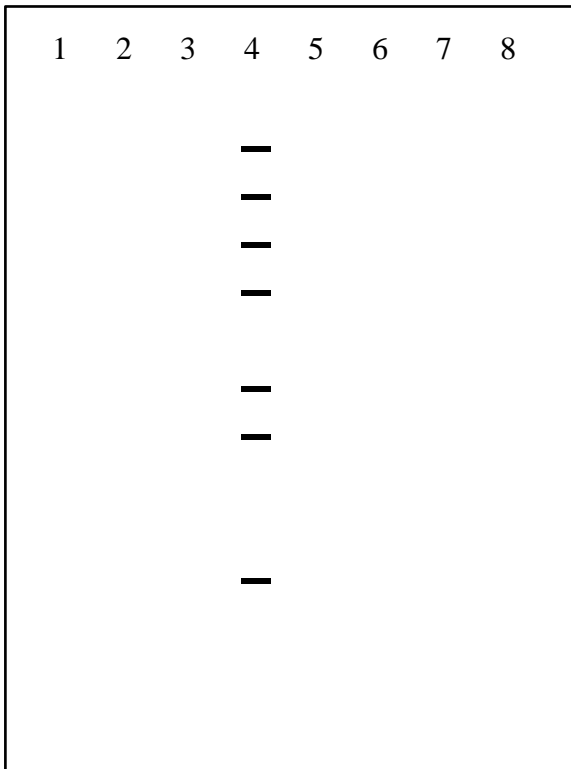
Lane 6. Sample 34

Lane 7. Sample 35

Lane 8. Sample 36

What conclusions can you draw from the results pictured on this gel?

Gel Results and Analysis  
Gel 10



Lane 1. Negative Control

Lane 2. 0% Control

Lane 3. 2% Control

Lane 4. PCR Marker from bottom: 50, 150, 300, 500, 750, 1000, 2000 bp

Lane 5. Sample 37

Lane 6. Sample 38

Lane 7. Sample 39

Lane 8. Sample 40

What conclusions can you draw from the results pictured on this gel?

## **Instructor Gel Results and Analysis Key**

- Gel 1. Negative control is contaminated
- Gel 2. Not enough marker bands, results inconclusive
- Gel 3. 2% positive control wrong size, results inconclusive
- Gel 4. 0% control contaminated or 2% control added to two lanes
- Gel 5. Sample 19 is not positive for CaMV35S promoter, Sample 18 is positive.
- Gel 6. A sample was loaded into marker lane, sample 24 is positive for CaMV35S promoter
- Gel 7. All samples tested negative for CaMV35S promoter
- Gel 8. All samples tested positive for CaMV35S promoter
- Gel 9. The technician may have attached the gel electrophoresis cables backwards, running all samples, standards and marker off wrong end of gel. The technician forgot to stain the gel. No samples were added to the gel.
- Gel 10. No 2% positive control standard PCR product present and no sample DNA PCR products present, maybe the DNA isolation procedure didn't work.