After identifying hamburger as the most likely vehicle for transmission, you question the people who prepared the hamburger for the church supper. You determine that Mr. Petri, Ms. Monella, and Ms. Brown prepared the patties the afternoon of the day before the picnic. They each used hamburger from a different local grocery store, and formed it into patties using their hands. Ms. Monella added onion soup mix to the burgers she prepared. Mr. Petri froze his burgers immediately after preparing, Ms. Monella and Ms. Brown put their patties in the refrigerator.

At the picnic the Mr. Coe was in charge of the grill. He was running late, and did not get set up until the students were already arriving. There was a rush for the burgers, but he was able to keep up with the demand by putting the burgers on the hot part of the grill to quickly brown the outside. The group in charge of clean up finished up the left over hamburgers for dinner.

Since the original hamburger is gone, you try to culture samples obtained at the same grocery stores where the original ground beef was purchased. The lab is able to culture *E. coli* O157:H7 from the fecal specimens, but not from any of the hamburger.

Mr. Petri’s 10 year old son has been had diarrhea a few weeks before the picnic, and the son is cultured as well. He too is infected with *E. coli*. It turns out he helped to form the hamburger patties. You want to know if this is the same strain of *E. coli* as the outbreak, so you send it in for DNA fingerprinting.

14. What are the possible explanations for what happened if Mr. Petri’s son has the same strain of *E. coli* as the outbreak strain? What if the strains are different?

**Answer:**

If Mr. Petri’s son has the same strain as the outbreak strain:

Mr. Petri’s son inadvertently contaminated the hamburgers. Perhaps by not washing his hands good enough after going to the bathroom.

Mr. Petri’s son may have also contracted the illness from eating hamburgers made from the same lot of ground beef that had been stored in the Petri’s freezer.

If the strains are different:

Mr. Petri’s son’s diarrhea was contracted from another source and is unrelated to the outbreak.
**Information:**
DNA fingerprints are made by cutting-up the entire bacterial chromosome into 20-40 pieces, and then sorting them out by size. After the DNA is cut, it is loaded onto a gel. The gel is like a big flat jell square, with holes, called wells, at the top into which the DNA is loaded. Next electricity is run through the gel to sort out the DNA by size. Just like a small child can move through a crowded room faster than a big adult, so too do the small DNA pieces move faster through the gel than the big pieces.

The gel pictured here is a PFGE gel. That stands for Pulsed Field Gel Electrophoresis. Like the name suggests, the electricity is pulsed through the gel in different directions. This allows the microbiologist to sort out relatively large pieces of DNA. Since this method uses the whole bacterial chromosome, the DNA pieces are relatively large. Other DNA fingerprinting methods, like those used in human forensic medicine or paternity suits, uses only a very small, specific piece of DNA, which is cut into pieces.

The first lane in each gel is reserved for a control. For the analysis here it can be ignored. The table indicates which samples are in which lane. All of the bands in one lane make up the fingerprint.

To Score the gel:

For each lane examine the pattern formed by the bands.

Assign the letter A to the first band. This will be known as its subtype.

Examine the next lane. If it has the same, identical pattern as the first lane, it receives the same letter. If not, it is given the next letter in the alphabet.

Each successive lane is compared to all previous lanes. If it has the same, identical pattern it receives the same letter. If not it gets a new letter.

Lanes that are identical are considered to have come from the same source. Lanes with 1-3 bands difference are usually considered to have come from the same source if there is other epi data to support the connection.
15. The microbiology lab has just completed the DNA fingerprints. Examine the data and determine whether Mr. Petri’s son was involved in the outbreak.

<table>
<thead>
<tr>
<th>Control</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
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<td>Source</td>
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<td>Part of outbreak?</td>
<td></td>
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<td>6</td>
<td>Mr. Petri’s Son</td>
<td>C</td>
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<td></td>
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<td></td>
</tr>
</tbody>
</table>
As news of the school outbreak spread, other community members started contacting the health department to report similar illnesses. In the end 4 other people were involved in the outbreak, and you were able to collect one positive ground beef sample that had come from store A.

You entered your outbreak into a nation-wide database called PulseNet, and found that there had recently been similar outbreaks in 7 other states. By using PFGE data, you are able to determine that your local outbreak is part of a larger, multi-state outbreak. The traceback indicates that processor A was the source of the contaminated beef, but further research cannot locate the farm of origin.

As a control measure, you coordinate a recall of all affected ground beef that was shipped to Yourtown, and start a food safety education campaign.

**16. Why is it necessary to show that the strain of *E. coli* O157:H7 isolated from the school picnic is identical to the ones involved in the multi-state outbreak?**

**Answer:**
Demonstrating that the strains isolated from Yourtown outbreak are identical to the multi-state outbreak helps to pinpoint the source of the outbreak, and knowing that would help you direct prevention efforts.

Epidemiologists are mobilized under a variety of circumstances, prime ones being when a problem is acute and unexpected and when quick action is required. These criteria are also met when a commercial product presents an imminent threat to public health and safety. High levels of community concern often mandate a quick response. Involvement of the press is occasionally the driving force behind an investigation, and political pressure is also often part of the equation. Uppermost in investigators’ minds is the need to institute the controls necessary to safeguard health as soon as possible, and often this step is taken before the entire investigation is complete. Limited control over the situation, little time for planning a study, and limited data sources and laboratory samples challenge investigators. However, the obligation remains to do the best science possible under the circumstances.
ASSESSMENT
Choose one of the following:

A. You are the outbreak investigator. Submit a written report of the investigation, including descriptions of who was involved, what the source of the outbreak was, how the outbreak occurred, what procedures were followed as part of the investigation, and what control measures were taken.

B. You are a reporter for the Yourtown Times. Write a feature article covering all aspects of the outbreak for the Sunday Edition.

C. You are a lawyer for Winken, Bilkin and Nod, attorneys at law. You have been hired by the families of those who were sick to represent them in a suit against the processor. Prepare a court brief describing your client’s case.

NOTE: All assessment writings will be judged by the following criteria:

- Uses appropriate concepts correctly
- Uses appropriate vocabulary
- Writing is organized and focused
- Writing is thoughtful
- Appropriate information is used to support concept
- Language mechanics are correct, and in the proper style
- References, if needed, are properly made
- Writing is neat and presentable