

**Testing for Anthrax\***  
**A *Disease Detectives* Exercise from the**  
**Centers for Disease Control and Prevention**



**Part 1**

(Recommended time: 10 minutes)

Disease Detectives use a variety of tools, including statistical methods, data collection techniques, and laboratory tests. To understand the importance of results, investigators need to know the relative strengths and weaknesses of each of these tools.

During the release of anthrax following the terrorist attacks of September 11, 2002, Disease Detectives tested thousands of people for exposure to *Bacillus anthracis*, the bacteria that causes anthrax. Most of this testing was done by swabbing the nasal passages of people thought to have been exposed. This method was used in part because of its usefulness in a study conducted almost 50 years ago to determine whether workers at a textile mill were carriers of *B. anthracis*.

In that study, the Disease Detectives first collected nasal and throat swabs from a group of 101 healthy mill workers. These individuals worked at various stations throughout the mill and came directly to the room used for culture collection from their work areas after they had been at work for at least 90 minutes. A group of 43 government workers was also tested.

- ✎ 1. What do Disease Detectives call a second group (such as the group of government workers) in a study?
  
  
  
  
  
  
  
  
  
  
- ✎ 2. Why would Disease Detectives test such a group?

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\* This exercise was originally developed for the *Disease Detectives* event in the 2002 National Science Olympiad held at the University of Delaware in Newark, Delaware. Winners of the event were from Harriton High School in Rosemont, Pennsylvania.

**Testing for Anthrax**  
**Part I**



- ✎ 3. Why did the investigators collect cultures from mill workers after they had been at work for a while rather than first thing in the morning?

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**Part II**  
(Recommended time: 10 minutes)

Swabs were inoculated directly onto plates of either blood agar or brain-heart-infusion (BHI) agar. Immediately after the swab samples were taken, the Disease Detectives collected throat washings from the same 101 workers. These were processed using digestion (to break down mucous) and filtering onto a sterile membrane. The membrane was then placed onto BHI agar and incubated. Colonies suspected of being *B. anthracis* were tested for virulence by mouse inoculation and confirmed as *B. anthracis* using a phage assay system. Here are the results:

**Table 3.** Distribution of mill workers carrying *B. anthracis* in nose and throat\*

Occupation	Number of Workers Sampled	Number of Positives <sup>†</sup>	
		Throat Washings	Nasal Swabs
Picking	3	0	1
Carding	20	1	2
Combing	16	3	3
Drawing	24	1	0
Spinning	37	2	0
Unspecified	1	0	0
<b>Totals</b>	101	7 <sup>†</sup>	7 <sup>†</sup>

\*Modified from Case EA & Rew RR, J Infect Disease 1957. 100:169-171.

<sup>†</sup>None of the mill workers with positive throat washings had positive nasal swabs, and none of the workers with positive nasal swabs had positive throat washings.



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**Answer Key**

- 📌 1. What do Disease Detectives call a second group (such as the group of government workers) in a study?

*Answer (2 points)*

This group is called “controls” or “the unexposed group.”

- 📌 2. Why would Disease Detectives test such a group?

*Answer (1 point)*

Controls are a comparison group from a different setting who are thought not to be exposed.

- 📌 3. Why did the investigators collect cultures from mill workers after they had been at work for a while rather than first thing in the morning?

*Answer (1 point)*

The hypothesis is related to exposure at work; Disease Detectives were not investigating home exposure.

- 📌 4. Which occupational group had the highest prevalence of carriers of *B. anthracis*?

*Answer (1 point)*

Combing: 6/16, about 37%

- 📌 5. What was the overall prevalence of carriers of *B. anthracis* in the mill workers?

*Answer (1 point)*

14/101 or 14%

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**Answer Key**



6. None of the government workers tested positive with either test. Give a likely explanation for this finding.

*Answer (1 point)*

They were not exposed.