

Solving Crimes with the Necrobiome

hhmi

BioInteractive

Film Activity
Student Handout

INTRODUCTION

This handout supplements the *I Contain Multitudes* video [Solving Crimes with the Necrobiome](#).

PROCEDURE

Using what you've learned from the video, answer the following questions in the spaces provided.

1. Death is a major event not only for the person who dies but also for the microbes that inhabit their body. Which of the following statements best describes why?
 - a. All the microbes that were living inside the person's body die when the person dies.
 - b. Microbial populations grow and spread to different areas of the body after the person dies.
 - c. Microbes in the body have fewer resources after the person dies, which increases competition.
2. Which of the following statements about cadavers (dead bodies) is most likely to be true?
 - a. Microbial communities in and around a cadaver change over time.
 - b. Samples taken from different cadavers always contain the same microbes.
 - c. The microbial community found in a cadaver is very similar to the one found in a living body.
3. After death, gases build up inside the body and cause the skin to rupture (break open). Rupture is a significant event because microbes from outside the body can now access the inside. Which of the following can be a source of the microbes that enter the body after it ruptures? Select all that apply.
 - a. skin
 - b. air
 - c. soil
 - d. insects
4. Describe how the scientists in the video are using microbes to create a tool to estimate the time since death.
5. The law of conservation of energy states that the amount of energy in an isolated system stays constant. In other words, energy cannot be created or destroyed; it just changes form. Explain how the decomposition of a cadaver demonstrates this law.
6. Examine Figure 1, which shows the five stages of decomposition.



Figure 1. The five stages of decomposition (descriptions not included).

Read the following descriptions of the five stages of decomposition (shown in random order):

- a. Eventually, most of the cadaver's mass is transferred into the ground or consumed by scavengers. Fungi flourish. Decomposition gradually slows as maggots and scavengers leave. Plants close to the cadaver may die from the overload of nutrients and other components coming from the cadaver.
- b. The heart stops beating, so there is less oxygen inside the body. Cells begin to die, and the body no longer maintains a stable temperature. With no immune system regulating microbes that live inside the body, their populations start to shift and grow. Flies lay eggs, which will develop into maggots, in the cadaver's orifices (such as the mouth and nostrils).
- c. Only dried bones, cartilage, and skin remain. Surrounding plant life begins to surge due to the cadaver's nutrients, which may influence the ecosystem for years to come.
- d. With less oxygen inside the cadaver, anaerobic bacteria flourish. These bacteria break down the body's carbohydrates, fats, and proteins, producing byproducts such as the gases hydrogen sulfide, methane, and ammonia. The accumulation of these gases gives the cadaver a strong odor and causes it to bloat. Maggots start to feed on the cadaver's tissues.
- e. The cadaver breaks open. Fluid spills out of the body's openings, releasing an abundance of nutrients, such as nitrogen and phosphorus, into the soil. Breaks in the skin allow more microbes, insects, and scavengers to enter the body.

In the table below, assign the letters of these descriptions to the stages in Figure 1.

Stage	1 (First)	2	3	4	5 (Last)
Name	Fresh	Bloat	Active Decay	Advanced Decay	Dry Remains
Description					

7. Blowflies are often the first scavengers to arrive at a cadaver. They lay their eggs in orifices and open wounds, and the stage of their development can help determine time since death.
 - a. How might the presence of blowflies affect the course of decomposition?
 - b. Other scavengers include beetles, wasps, dogs, crows, and crustaceans. Explain how these other scavengers could also affect decomposition.
 - c. What abiotic factors might affect the kind of scavengers that contribute to a cadaver's decomposition?

8. The graphs in Figure 2 show some of the data that the scientists in the video collected from decomposing mice cadavers.

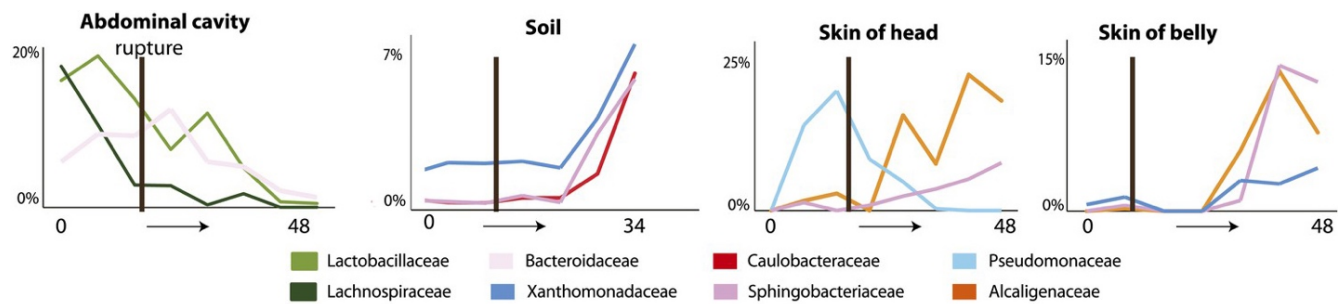


Figure 2. Abundances of different bacterial groups in and around the cadavers over time. In each graph, the x-axis represents the time since death in days, the y-axis represents the relative abundances of the bacterial groups, and the thick vertical line represents when the body ruptured. Figure from [Metcalf et al. \(2013\)](#).

For each of the claims below, use evidence from the graphs to either support or refute it. If you are supporting the claim, summarize a second experiment that would help to confirm it. If you are refuting the claim, summarize a second experiment that would help to rule it out.

Claim A: The rupture of the body during decomposition is associated with changes in the bacterial communities in the abdominal cavity, on the skin of the head, on the skin of the belly, and in the surrounding soil.

Claim B: The changes in bacteria in the abdominal cavity caused the observed changes in bacterial abundance on the head.