Spontaneous Generation

About 2300 years ago, the Greek philosopher Aristotle believed a special "vital heat" brought some living things into existence out of nonliving material. It was generally accepted that some life forms arose spontaneously from non-living matter. This idea of "spontaneous generation" would not be fully disproved until the work of Pasteur in 1859. Such spontaneous generation appeared to occur primarily in decaying matter. For example, a seventeenth century recipe for the spontaneous production of mice required placing sweaty underwear and wheat in an open-mouthed jar, then waiting for about 21 days, during which time it was alleged that the sweat from the underwear would penetrate the husks of wheat, creating mice.

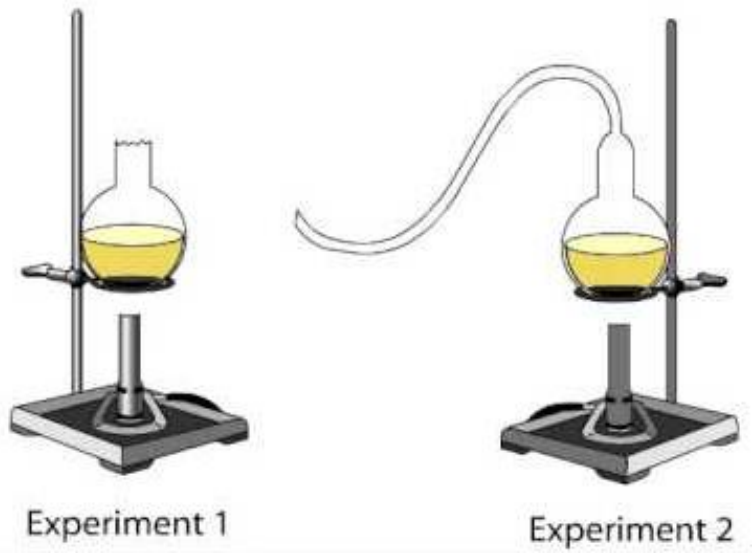
1. [SP 6] Provide reasoning for the belief in spontaneous generation.

The first serious attack on the idea of spontaneous generation was made in 1668 by Francesco Redi, an Italian physician. At that time, it was widely held that maggots arose spontaneously in rotting meat. Redi believed that maggots developed from eggs laid by flies because he noticed that maggots appeared a few days after flies had been present. Redi had his work cut out for him as the idea of spontaneous generation had persisted for nearly 2000 years.

2. [SP 3] State a hypothesis Redi might have had.

3. [SP 4] Design an experiment that could be used to test the hypothesis. Be sure to identify the independent and dependent variables and an appropriate control group.

The belief in spontaneous generation continued after Redi's work because of the discovery of microbes in the 1670s by Antonie van Leeuwenhoek. Critics of Redi claimed that these tiny organisms were not excluded in Redi's experiment and could be the source of the maggots.



Louis Pasteur designed an experiment to test whether sterile nutrient broth could spontaneously generate microbial life. Pasteur added nutrient broth to two flasks, bent the necks of the flasks into S shapes, and then boiled the broth to kill any existing microbes. After the broth had been sterilized, Pasteur broke off the swan necks from one flask, exposing the nutrient broth within them to air from above. The other flask was left alone.

4. [SP 3] State the hypothesis Pasteur might have been testing.

5. [SP 6] Predict in which flask microbes should appear.

6. [SP 4, SP 6] Propose a source of the microbes that appeared in the flask.

7. [SP 4, SP 6] Propose a reason for the lack of microbes in the flask that was not exposed to air.

8. [SP 4, SP 6] Explain how the work of Pasteur refuted the idea of spontaneous generation.

9. [SP 7] What major development in food packaging resulted from Pasteur's work?