

**Maggots Are Not Generated From Goat Meat**

Francesco Redi

July 21, 1668

Dr. Deken

## **Introduction**

Spontaneous generation (or abiogenesis) is currently a wide spread belief that living organisms arise from some vital force that is contained or given to inanimate objects. Aphids are often found in or near the dew that falls on plants, fleas appear on putrid matter, and mice are plentiful in dirty hay. Many have argued that these observations lead credence to the hypothesis of spontaneous generation (Aristotle, 340 B.C. and Ross, 1651).

It is also commonly believed that one can grow living organisms from recipe books. One such recipe involves the production of mice from dirty rags (van Helmont, 1630). Within about twenty days mice will appear from dirty shirts or rags that are placed in an open pot or barrel containing a few grains of wheat or some wheat bran ([www.recipefororganisms.com/mice](http://www.recipefororganisms.com/mice)). Van Helmont (1630) argues that both adult male and female mice are formed from the combination of dirty rags and wheat, but are also capable of forming from adult mice mating and reproducing more mice. This argues that mice (and other organisms) are formed not only by abiogenesis but also from biogenesis (life from life).

Recently, spontaneous generation has come under attack (Harvey, 1640 and Browne, 1646). Harvey (1640) believes all animals and plants are generated from living egg-like things. Harvey is careful to note, however, that animals can come from plants, and vice versa. Browne (1646) argues that the idea of abiogenesis is a “vulgar error” accepted only because Aristotle (340 B.C.) and other Greek philosophers said that it was a readily observable truth. Browne (1646) states direct evidence of spontaneous

generation must be given before it should be accepted. Critics argue that to question spontaneous generation is to question reason, sense, and experience (Ross, 1651).

It is readily observable that flies can invariably be seen around meat carcasses at the butcher shop. Where do the flies come from? Does rotting meat turn into or produce the flies? The experiments shown here will test the hypothesis that rotten meat does not turn into flies, and that only flies can make more flies.

## **Experimental Procedure**

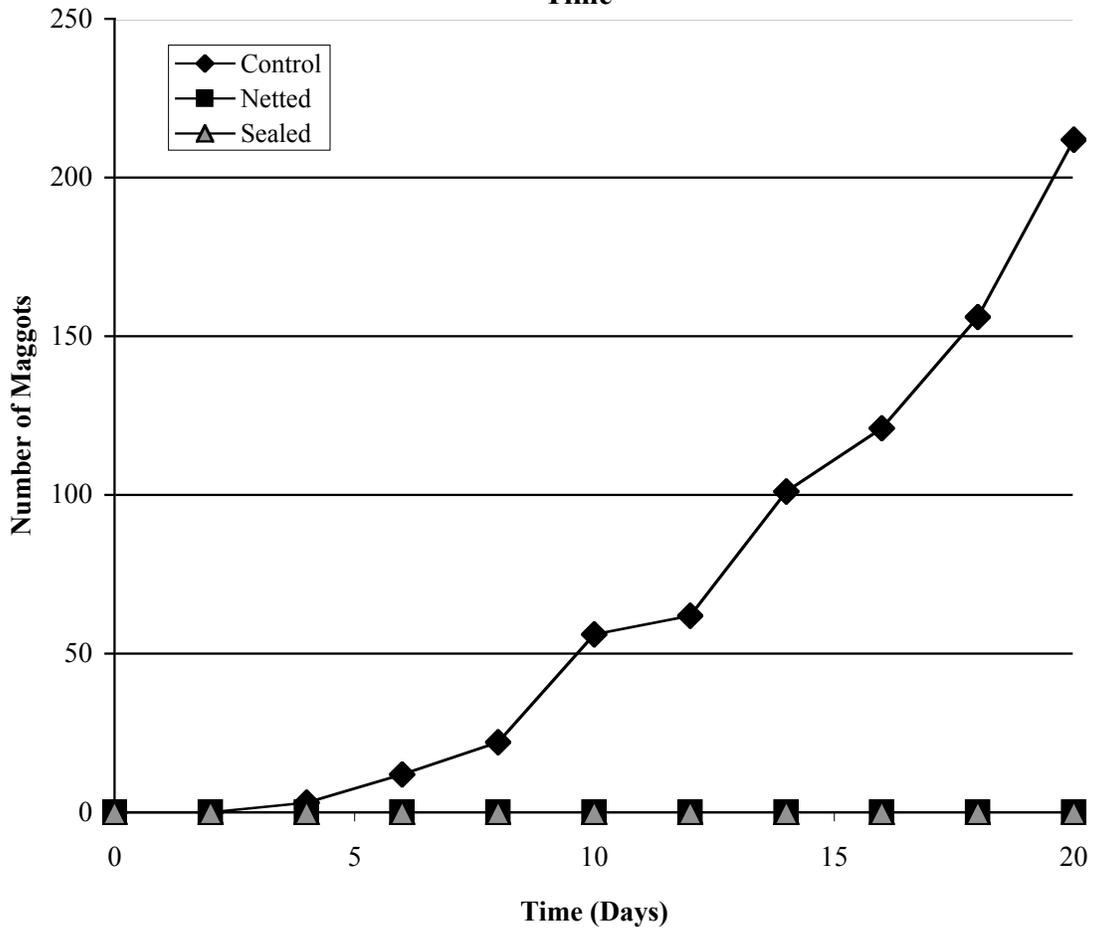
Rotten goat meat that contained no maggots was obtained from local butcher shops. Fifty grams of rotten meat was placed in fifteen separate 500 mL Erlenmeyer flasks. Five of the flasks were labeled “control”, five were labeled “netted”, and five were labeled “sealed”. The control flasks received no additional treatment. Cheesecloth was placed over the opening of the netted flasks to prevent flies from entering. A rubber stopper was placed in the opening of the sealed flasks to prevent both air and flies from entering the flasks. The rotten goat meat in each of the flasks was observed every two days to determine the number of maggots that had appeared. Every two days the flasks were also observed for two minutes to determine the number of flies within one meter of the flasks. The data for each experimental condition were averaged for every day observations were recorded.

## **Results**

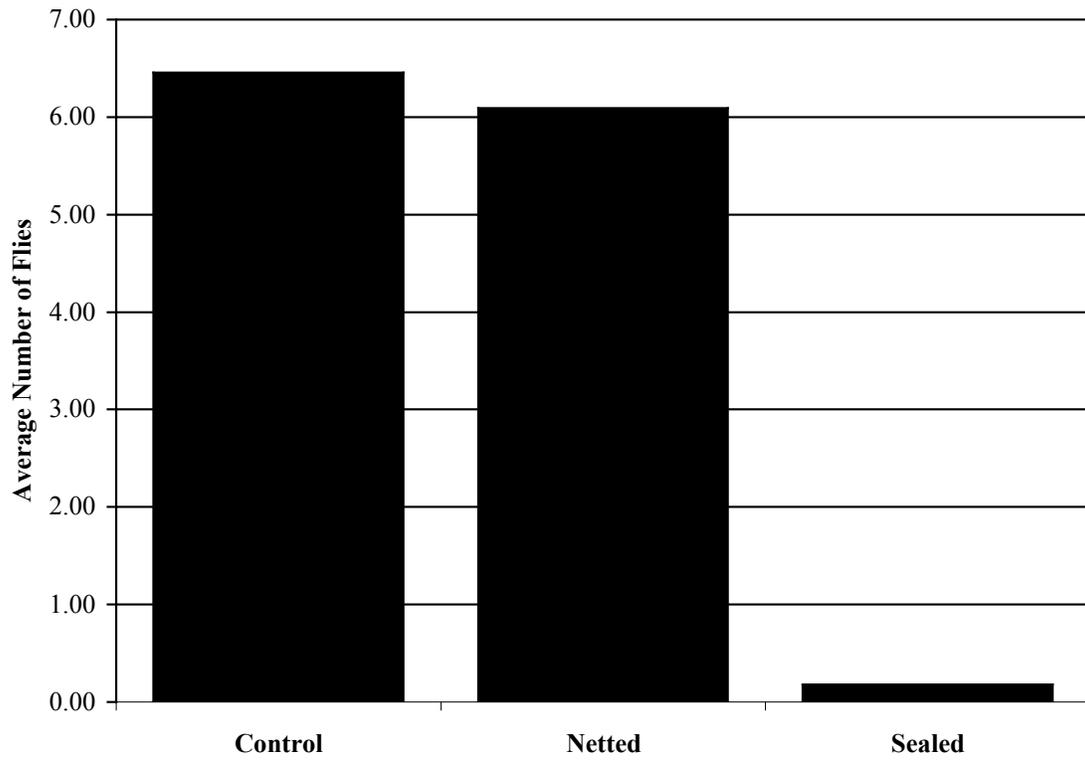
The data indicate that maggots are not found on rotten goat meat that flies cannot access (see Graph 1). Graph 1 shows the number of maggots found over time on the rotten goat meat in flasks without any covering, in flasks with a mesh covering allowing air in and out, and in flasks that were completely sealed. Note that no maggots were found in either of the containers that prevented flies from landing on the meat.

The data also indicate that more flies are found around rotten goat meat that is exposed to the air (see Graph 2 and Table 1). Graph 2 and Table 1 shows the average number of flies that were found in a two-minute time period within one meter of each of the experimental flasks. Note that while no maggots were found in the meat contained within the netted flasks (Graph 1), there were flies around these flasks (Graph 2 and Table 1).

**Graph 1. The Number of Maggots on Rotten Goat Meat Over Time**



**Graph 2. Average Number of Flies Around Flasks Containing Rotten Meat**



**Table 1. Number of Flies Within One Meter of the Flasks**

<b>Day</b>	<b>Control</b>	<b>Netted</b>	<b>Scaled</b>
0	0	0	0
2	3	2	0
4	6	4	0
6	4	3	0
8	8	7	1
10	12	4	0
12	5	9	1
14	6	11	0
16	9	14	0
18	13	5	0
20	5	8	0
<b>Average</b>	<b>6.45</b>	<b>6.09</b>	<b>0.18</b>

## **Discussion**

The data found here strongly support the hypothesis that rotten goat meat does not generate maggots that develop into flies. The goat meat in both experimental groups, netted container and sealed container, contained no maggots while the control group contained over 200 maggots after twenty days (see Graph 1). While more replicates should have been used, this data suggests goat meat does not generate maggots even if it is exposed to the air.

Based on the observation that maggots turn into flies and flies are often found around rotting meat, the experiment was expanded to look at the number of flies found around each of the containers of rotting meat. While the goat meat in the netted container contained no maggots, these containers had as many flies around them as the open containers (see Graph 2). In addition, the sealed containers had only two flies that were found in their vicinity over the twenty-day period of sampling (see Table 1). These data suggest that the reason no maggots were found in the rotten goat meat of the netted container is because adult flies did not have access to the meat. In fact, it was observed that the flies around the netted container would often land on the netted fitting. I hypothesize that these flies hovering around the netted container are somehow attracted to the rotting meat and landing on the meat encourages the flies to lay their eggs directly on the meat. However, experimental evidence for this hypothesis is still lacking.

While this data provide strong evidence against abiogenesis, it remains unclear whether abiogenesis for organisms other than maggots exists in nature. Using the approach described herein one could test for abiogenesis of other organisms. My current hypothesis is that abiogenesis does not exist for complex organisms but does exist for

simpler organisms such as plankton and bacteria. Over time experimental evidence will reveal the true nature of nature.

## References

- Aristotle, (340 B.C.) *Abiogenesis of Life*. Athens, Greece: Plato Publishing Company.
- Browne, T, (1646) *Enquiries into Very many Received Tenets, and Commonly Presumed Truths*. *Journal of Reasoning* **54**:15-19.
- Harvey, W, (1640) *Life Arises from Eggs*. *Journal of Embryology* **23**:12-24.
- Ross, A, (1651) *A Refutation of Thomas Browne's Vulgar Errors*. *Journal of Abiogenesis* **34**:91-123.
- Van Helmont, J, (1630) *Recipe for mice*. In: *The Chemistry of Genesis* (Boyle R, ed), 16-45. New York, New York: Holland Publishing.
- Unknown Author (retrieved June 25, 1668) <http://www.recipefororganisms.com/mice>