# Examination of Bacterial Communities in Soil Beneath Decaying Organic Matter and the Effect of Insect Succession.

Microbial Communities in Organic Decomposition

**Olivia Fotiadis and Dr. Chad Welsh**

Department of Natural Sciences, Lindenwood University, St. Charles, MO

## Organic Decomposition

In the process of organic decomposition, factors such as temperature, humidity, soil pH, oxygen availability, and the composition of soil microbiota play key roles in this collective process, and influence rates of decomposition. When a vertebrate dies, essential nutrients and biomolecules like nucleic acids and proteins are released from its body into the soil beneath; becoming an ephemeral pulse which facilitates a rapid, focused response from a diverse array of macro and microorganisms in the surrounding area (Lauber et al., 2014). Soil bacteria and microbial communities have been found to be positively associated with decomposition rates of organic matter.

## Soil-Associated Microbes

Soil bacteria separated into two groups:

**Autochthonous -** Organisms which have adapted to carry out metabolic processes in low-nutrient environments (Ireneusz Całkosiński et al., 2015).
(*Arthrobacter spp., Azotobacter spp., Acidithiobacillus spp., Bradyrhizobium spp., Clostridium spp., Desulfovibrio spp., Nitrobacter spp., Nitrosomonas spp., Pseudomonas spp.,Rhizobium spp., Serraita sps., Sinorhizobium spp.*, and *Thiobacillus spp.)*

**Zymogenic**- Microorganisms which flourish in environments subject to surges of high concentrations of nutrients.
*(Bacillus spp., Corynebacterium spp., Escherichia coli*, and *Proteus spp.)*

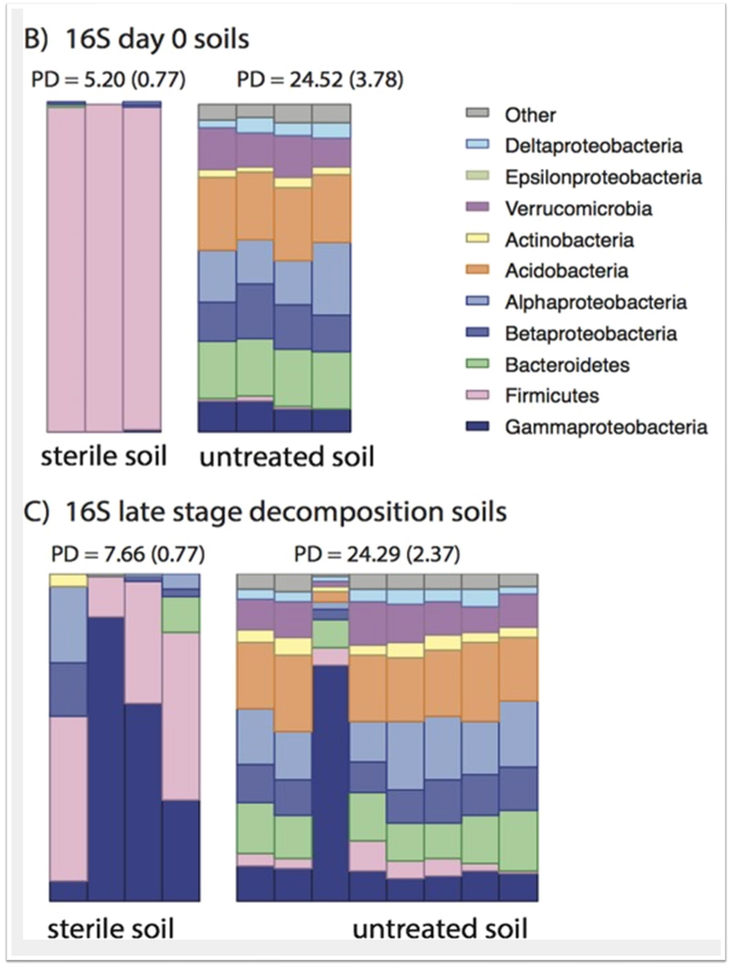


**Figure 1.** 16S (B) represents bacterial taxa present initially at day 0 of the decomposition process, and 16S (C) represents bacterial taxa present in the late stages of decomposition (Lauber et al., 2014).

## Carrion-Associated Microbes

Bacteria which are secreted by decomposing matter significantly alter the composition of soil, as well as the response of other microbes. Microbes found in soil beneath decaying organic matter include:

*Limosilactobacillus reuteri* (Miguel et al., 2021) , *Gammaproteobacteria* (Lauber et al., 2014), *Bacillus spp., B. cereus., Enterococcus spp, Escherichia spp.*, including *E. coli*, and *Staphylococcus spp.* including *Staphylococcus epidermidis* (Ireneusz Całkosiński et al., 2015).

## Research Proposal:

Examination of Bacterial Communities in Soil Beneath Decaying Organic Matter and the Effect of Insect Succession.

### Abstract

Bacterial species of the *Proteobacteria, Acidobacteria,* and *Bacteroidetes* phyla are key components in decomposing organic matter by secreting specialized enzymes into decaying material, facilitating its breakdown and nutrient release. Diverse microbial communities in areas of decomposition are known for their efficiency in decomposition and nutrient cycling. Less is understood about the effect of insects introducing unique microbes alongside initial soil bacteria, like *Bacillus subtilis*, in the decomposition process. Studying the decomposition of pork samples as a human analog will explore variations in bacterial populations in soil before and after the introduction of insect-mediated microbes and provide information on the efficiency and origins of microbial communities involved in decomposition. Microbial communities in soil beneath decaying matter not subject to insect succession and those subject to insect succession, will be compared.

### Importance

Extensive research has been conducted to identify and analyze soil bacteria and other microbes involved in organic decomposition. With that, researchers have studied the physical impact of insect succession on decaying matter. A clear identification of microbes which are introduced to sites of decomposition strictly by insect contact, have not been presented. To analyze the impact of insect-mediated microbes on the decomposition process, decomposition rates, and soil composition, I will compare soil samples beneath pork samples which are separated by insect exposure. My research will highlight the individual origins and functions of microbes introduced by insects in decomposition, as well as their overall impact on decomposition rates.

**Literature cited:**

Lauber, C. L., Metcalf, J. L., Keepers, K., Ackermann, G., Carter, D. O., & Knight, R. (2014). Vertebrate Decomposition Is Accelerated by Soil Microbes. *Applied and Environmental Microbiology*, *80*(16), 4920–4929. https://doi.org/10.1128/aem.00957-14

Ireneusz Całkosiński, Katarzyna Płoneczka-Janeczko, Ostapska, M., Dudek, K., Andrzej Gamian, & Krzysztof Rypuła. (2015). *Microbiological Analysis of Necrosols Collected from Urban Cemeteries in Poland*. *2015*, 1–7. https://doi.org/10.1155/2015/169573

*Miguel, M. A., Kim, S.-H., Lee, S.-S., & Cho, Y.-I. (2021). Impact of Soil Microbes and Oxygen Availability on Bacterial Community Structure of Decomposing Poultry Carcasses. Animals, 11(10), 2937. https://doi.org/10.3390/ani11102937*