H114 Dynamics of Necrophagous Insect Species and Bacteria From Swine Carcasses During the Warm Season in Romania

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After attending this presentation, attendees will better understand corroborated entomological and microbiological approaches by gaining insights on the dynamics of necrophagous insect species and potential microbial decomposition biomarkers identified from swine carcasses during the summer months.

This presentation will impact the forensic science community by demonstrating the importance of using both entomological and microbiological methods, with the goal of narrowing the biases in postmortem interval estimation in death investigations.

The concept of forensic entomology dates back to the 13th century, being mentioned for the first time in China by Sung Tzu. Since then, this method has developed worldwide, demonstrating the importance of using necrophagous insect species as physical evidence for postmortem interval estimation. In Europe, forensic entomology has been recognized by forensic experts since the 19th century, expanding into countries such as the United Kingdom, France, Germany, Italy, Poland, the Netherlands, Austria, Spain, and Switzerland. At present, the entomology method is not included among the forensic expertise in Romania. Moreover, the identification of bacterial communities from decomposed carcasses represents an early stage in worldwide scientific investigations, with few studies attempting to identify the microorganisms in order for them to be used for the postmortem interval estimation.

Therefore, this study represents the first experimental research monitoring the carcass decomposition process during the warm season in the urban area of Bucharest, Romania, by using corroborated entomological and microbiological approaches to identify the diversity and dynamics of insect and bacterial taxa sampled from swine carcasses during the warm season.

The experiment lasted 14 weeks (July 10, 2013-October 10, 2013), covering the summer and beginning of the autumn months. Three swine carcasses were mounted outdoors, directly on the ground at a distance of 20m from each other and protected by metallic cages. The environmental parameters were constantly recorded throughout the entire survey.

Necrophagous insect species, both adult and immature stages, were sampled daily from the swine carcasses and identified by taxonomic and genetic methods. In order to identify the bacterial taxa associated with the swine carcasses, tissues were sampled from the colon (rectum) and mouth cavities using a sterile metal loop. The tissue sampling protocol comprised ten occasions throughout the decomposition. The identification of bacterial communities was carried out by Denaturing Gradient Gel Electrophoresis (DGGE) analysis of the 16S ribosomal RNA (rRNA) gene fragments.

The necrophagous insect species succession comprised in the first colonization wave was the Calliphoridae and Muscidae species, followed by Sepsidae, Staphylinidae, and Dermestidae. The dynamics of both dipterans and coleopterans was in part biased given the dominant presence of *Crysomya albiceps* (Diptera: Calliphoridae) which massively colonized all three carcasses, with up to 2,000 larvae being sampled. The presence of this species had a negative impact on the time presence of other sympatric insects and starting with weeks three and four, no other dipteran species apart from *C. albiceps* was observed on the carcasses. At the same time, Coleoptera was poorly represented by only two species, *Dermestes undulatus* (Dermestidae) during the skeletal-remains stage and predacious *Creophilus maxillosus* (Staphylinidae). The relative abundance of the insect species adults and immature stages was assessed and their presence was recorded during the entire decomposition process, with the environmental condition variations also being considered.

The diversity of bacterial taxa from the swine tissues revealed by the DGGE profile indicated the presence of 26 taxa from the colon (rectum) and 22 taxa from the mouth cavity, respectively. The dynamics of bacterial communities from these cavities indicated two time tendencies, distinguished in the first and last weeks of experimentation. Firmicutes representatives were dominant in both cavities, closely followed by Gammaproteobacteria. The bacterial succession during the decomposition process could be in correlation with the environmental conditions, swine decomposition stages, and insect presence. Moreover, bacterial taxa were identified from ten *C. albiceps* larvae. Two insect-specific bacterial species were also identified from both the mouth and colon (rectum) cavities of all three swine, leading to a possible identification of potential microbial biomarkers that can be used for postmortem interval estimation.

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This pioneering study on Romanian territory represents the first experimental investigation of entomological and microbiological diversity and dynamics from decomposed swine carcasses and attempts to demonstrate the importance of introducing forensic entomology as a valid method in this country, adding data to current knowledge regarding the bacterial taxa involved in decomposition.

Forensic Entomology, Microbiology, Swine Carcasses