



## B86 Signatures of Suicide in the Human Postmortem Microbiome

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**Learning Overview:** After attending this presentation, attendees will better understand the potential utility of the postmortem microbiome as a tool to aid in classifying forensic death investigation related to suicide.

**Impact on the Forensic Science Community:** This presentation will impact the forensic science community by providing insight into if and which postmortem microbial signatures exist for suicides.

While postmortem microbial communities have the potential to be used as biological biomarkers of forensic relevance (e.g., postmortem interval range indicator), limited data exists on the variability of postmortem microbial communities related to manner of death, especially suicides.<sup>1</sup> This presentation will describe the human postmortem microbiome associations of suicides from samples collected during routine death investigation.

According to the Center for Disease Control, in 2017, suicides are the tenth leading cause of death (second for individuals between the ages of 10 and 34 years) and were twice as common as homicides. As suicides are a significant contributor to deaths in the United States, it is important to identify if potential signatures from the human postmortem microbiome can identify suicides versus other manners of death (e.g., natural or accidental), which may eventually serve as another tool for forensic investigators in determining manner of death.

Postmortem microbial communities from the mouth and rectum were collected using sterile swabs from 44 cases (22 suicides and 22 natural or accidental deaths, matched for similar demographics). All samples were gathered by the Wayne County Examiner's Office in Detroit, MI, during routine death investigations in 2014–2015. Postmortem microbial DNA was isolated and quantified following a modified manufacturer protocol using commercially available kits, a fluorometer, and a microchannel-based automated electrophoresis system. Targeted amplicon (16S rRNA V4 gene region) high-throughput sequencing was conducted on individual sample libraries using a 2 x 250-base pair, paired end approach. Resulting postmortem microbial community data was analyzed using an open-source bioinformatic pipeline, and statistical analyses were implemented using open-source software. Machine learning algorithms were used to identify significant associations among the targeted gene amplicon sequences (postmortem microbiome) and manner of death (suicides versus non-suicides).

Cases in this dataset represented an equal number of samples between males and females aged 19 to 79 years, but cases were not balanced between race. Approximately 90.9% ( $N=20$ ) were White, while the remaining 9.1% ( $N=2$ ) were Black. In addition, the majority of the cases (90.9%) had an estimated postmortem interval range of less than 48 hours. Other variables investigated included antemortem health conditions, location of the event, season of death, and weight status. Overall, initial findings indicate that suicides may, in fact, have distinct microbial signatures present in their postmortem microbiome. In comparison to control data, suicides presented similar patterns of microbial diversity. However, machine learning identified several microbial taxa that may be useful as indicators for assisting determination of the manner of death.

The results from this dataset are important to future research as they provide data about postmortem microbial variability during routine death investigations. It is critical that datasets with larger sample sizes and increased geographic locations (state, national, and international levels) be developed to corroborate distinct microbial signatures for suicides. Further, recent findings surveying the postmortem microbiome have demonstrated postmortem microbiomes can be reflections of antemortem health status, such as with heart disease and tuberculosis.<sup>1,2</sup> This leads to the consideration of whether swabbing for microbial DNA should be required in all death investigations, due to the vast amount of information the postmortem microbial communities could provide about the decedent.<sup>3</sup> With further collaborative research, the suicide microbial signatures may assist in solidifying relationships between the postmortem microbiome and antemortem health conditions. This topic of study is still in its infancy but shows promise for future applications of using microbial communities in future clinical and forensic settings.

### Reference(s):

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2. Lieberman, T.D. et al. Genomic diversity in autopsy samples reveals within-host dissemination of HIV-associated Mycobacterium tuberculosis. *Nat Med* 22, 1470–1474, <https://doi.org/10.1038/nm.4205> (2016).
3. Carter, D.O. et al. *Forensic Microbiology*. (John Wiley & Sons, 2017).

### Forensic Science, Postmortem Microbiome, Death Investigation