H95 Embalmed Human Cadavers Are Not Sterile: The Impact of Two Embalming Methods on the Microbiome of Human Cadavers

Amelia A. Bussell, MSFS, 2113 17th Street, Lubbock, TX 79401; Cynthia Cornelissen, PhD, Virginia Commonwealth University, Dept of Microbiology and Immunology, 1101 E Marshall Street, Richmond, VA 23298; Richard Sikon, MS, Virginia State Anatomical Program, 400 E Jackson Street, Richmond, VA 23219; and Baneshwar Singh, PhD*, Virginia Commonwealth University, Dept of Forensic Science, 1015 Floyd Avenue, Rm 2015, Richmond, VA 23284*

After attending this presentation, attendees will better understand the impact of embalming on bacteria associated with human cadavers and how this information can be used for medical and forensic purposes.

This presentation will impact the forensic science community by providing detailed information on key bacterial species associated with human cadavers after embalming, and on whether a bacterial succession-based Postmortem Interval (PMI) estimation method can be applied on embalmed human remains or not.

The act of embalming has been performed for at least 5,000 years, dating back to the Egyptians, who preserved their dead to ensure their entry into the afterlife. Today, embalming is a common practice in the United States that is used for the preparation of the deceased for funerals and wakes, but also for use in the medical field to prepare cadavers for medical teaching and research. The purpose of embalming is not to permanently preserve the deceased but to delay decomposition for a period of time. This study investigated which embalming technique, between the traditional formalin and soft cure, is most effective in stopping the growth of the microbiome associated with the anal/rectal region of human cadavers.[1] In addition, the structure of the postmortem microbiome was investigated in embalmed cadavers over a period of one month and whether the potential to infer the PMI by using indicator microbes could be achieved. To achieve this, DNA was extracted from the anal/rectal region of ten pre- and post-embalmed cadavers of each embalming technique using a modified Cetyl Trimethyl Ammonium Bromide (CTAB) DNA extraction method.[2] Extracted DNA was amplified and sequenced for the variable regions of V3 and V4 of the 16S rDNA using the Illumina® MiSeq® sequencing platform.[3] Sequences were analyzed using the Mothur pipeline for hierarchical classification and diversity calculation[4]. Statistical analysis of the data was performed in R.[5]

No significant difference in bacterial taxa was observed between the control (non-embalmed) and embalmed remains by both embalming methods, which suggests that both embalming methods are effective in suppressing bacterial growth, at least for up to one month after embalming; however, embalming didn't suppress all bacterial growth. Relative abundance of Verrucomicrobia increased after embalming in both methods. In soft-embalmed cadavers, Proteobacteria increased 30 days post-embalming and Actinobacteria declined significantly after seven days post-embalming. There are potentially pathogenic phyla and genera present in both embalming methods at 30 days post-embalming, which should be made aware to the medical and teaching communities who use these cadavers. Bacterial succession associated with embalmed remains didn't provide enough information for the development of a model for PMI estimation. Studies on microbes associated with other body parts (e.g., skin, hair, buccal) may help in determining if those communities may offer more information on PMI estimation.

In conclusion, this is the first study that provides evidence that embalming, although mostly effective, doesn't suppresses all bacterial growth of human cadavers, and the bacterial community associated with the anal/rectal region of embalmed human cadavers are not very informative in developing a bacterial succession-based model for the estimation of PMI.

Reference(s):

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Embalming, Postmortem Interval, Human Decomposition