Scientific Letters

Poster Communication 41

Microbial Contamination in Saturated Saline Solution Used for Cadaver Preservation in Veterinary Anatomy Teaching

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Abstract

Background: The use of animal cadavers is essential for veterinary anatomy education, requiring preservation methods that maintain tissue characteristics similar to those of living organisms. At CESPU, cadavers are preserved using a saturated saline (SS) solution, considered effective in maintaining tissue texture, color, and joint mobility [1,2]. However, its ability to control microbial growth, particularly for halotolerant strains, remains poorly studied [3]. Common bacterial species associated with animal cadavers include *Staphylococcus aureus*, *Bacillus* spp., *Enterococcus* spp., and *Escherichia coli* [4]. **Objectives:** This study aimed to detect fecal contamination indicators, namely *Enterococcus* spp. and *E. coli*, in the SS solution used for preserving animal cadavers in veterinary anatomy classes at CESPU. **Methods:** A total of 42 SS samples were collected from 7 cadavers (3 cats and 4 dogs), including samples obtained before immersion and after 7, 14, and 21 days of preservation. The SS solution was renewed weekly, with each cadaver immersed for 7 days before replacement. Samples were inoculated onto selective media: Slanetz-Bartley agar and Kanamycin Esculin Azide agar for *Enterococcus* spp., and MacConkey agar and Chromogenic Coliform agar for *E. coli*. Up to two typical colonies per sample were subcultured on brain heart infusion agar and identified using MALDI-TOF mass spectrometry. **Results:** Among the 21 SS samples collected before cadaver immersion, 1 showed bacterial growth, yielding two isolates: *Enterococcus hirae* and *E. coli*. Of the 21 samples collected after immersion, 15 showed microbial growth. Identified isolates included *Enterococcus faecalis* (n=2), *Enterococcus faecium* (n=3), *Enterococcus hirae* (n=1), *Enterococcus raffinosus* (n=1), and *Enterococcus* spp. (n=7). Enterococci were detected in samples collected at 7 (n=5), 14 (n=4), and 21 days (n=5). Additionally, two *E. coli* isolates were recovered from a single sample collected at 14 days. **Conclusion:** These findings indicate that the SS solution does not fully inhibit microbial growth during cadaver preservation. The detection of *Enterococcus* spp. and *E. coli*, particularly after immersion, suggests possible fecal contamination and highlights the need for regular

microbiological monitoring and enhanced biosafety measures to reduce occupational exposure and ensure a safer learning environment.

Keywords: veterinary microbiology; biosafety; cadaver preservation

Acknowledgments/Funding

This work received financial support from the projects BioSafeVet-GI2-CESPU-2025 - BioSafeVet - Microbial Risk Assessment of Saline-Preserved Cadavers to Promote Safer Veterinary Anatomy Teaching by the CESPU-Cooperativa de Ensino Superior Politécnico e Universitário, the 1H-TOXRUN of the University Institute of Health Sciences (IUCS-CESPU), 16024 - COMPETE2030-FEDER-00716600 - NEUROBIOTECH - Combining New Cell-based Therapies and Biodegradable Polymers to Promote Peripheral Nerve Regeneration, and from the national funds (FCT/MECI, Fundação para a Ciência e Tecnologia and Ministério da Educação, Ciência e Inovação) through the project UID/50006/2025 DOI 10.54499/UID/50006/2025, UIDB/50006/2020 DOI 10.54499/UIDB/50006/2020, UIDP/50006/2020, UID/50027, UIDB/04378/2020 and LA/P/0140/2020.

References

1. Molina, C. et al. Identification of bacterial and fungal species in human cadavers used in anatomy teaching. *Int J Morphology* **2019,** *37(2)*, 473–476, doi:10.4067/s0717-95022019000200473.
2. Nam, S.M. et al. Comparative evaluation of canine cadaver embalming methods for veterinary anatomy education. *Anat Sci Int* **2020**, *95(4)*, 498–507, doi:10.1007/s12565-020-00547.
3. Kaliappan, A. et al. Innovative Cadaver Preservation Techniques: A Systematic Review. *Maedica* **2023**, *18(1)*, 127–135, doi:10.26574/maedica.2023.18.1.127.
4. De Oliveira, F.S. Assessing the effectiveness of 30% sodium chloride aqueous solution for the preservation of fixed anatomical specimens: a 5-year follow-up study. *J Anat* **2014**, *225(1)*, 118–121, doi:10.1111/joa.12185.