

Poster 16

Ozone: eliminating pathogens and safeguarding evidence in forensic sciences and other sectors

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Abstract

Background: Microbial contamination poses significant risks to biodiversity, food safety, and public health (Fig. 1) [1]. Traditional microbicide methods that rely on harmful chemicals are associated with risks to environmental health (e.g., toxicity to non-target organisms and resistance to pathogens) [2-4]. In forensics, microbial exposure decomposes biological evidence, staining or altering documents and textiles, corroding metals, weakening polymers, and introducing contamination that compromises analytical accuracy and evidence integrity. **Objective:** Given the urgent need for sustainable alternatives, this systematic review examines ozone as an ecological and effective solution for decontamination [5,6]. **Methods:** A systematic search was carried out in databases such as PubMed, ScienceDirect, and Google Scholar using the keywords "ozone decontamination," "ozone concentration," "application methods and environments," and "fungal load reduction." Inclusion criteria were based on thematic relevance, scientific rigor, and date of publication (2020-2025), while articles outside the specified period and articles not peer-reviewed were excluded. **Results:** Ozone, applied in its gaseous or aqueous forms, significantly reduces the pathogen load, with an average efficacy rate of over 85% in the case of fungal contamination. Higher ozone concentrations and longer exposure times are consistently associated with more significant reductions. Therefore, ozone is an effective microbicide agent that mitigates pathogen contamination while presenting minimal environmental impacts. **Conclusions:** After application, ozone rapidly reverts to oxygen, highlighting its advantage as a residue-free decontaminant. This is particularly relevant in forensics, where maintaining evidence's integrity free of chemical contamination is essential. Ozone's ability to effectively disinfect surfaces and atmospheres and prevent microbial growth on stored evidence and forensic laboratories allows for accurate analysis and preservation of biological evidence. Creating standardized ozone application protocols in various sectors, including forensic science, improves decontamination efforts and security measures. Future research will focus on optimizing ozone application mechanisms and investigating long-term impacts on materials and environments to leverage its potential in the military and civilian domains.



Figure 1. Main sectors affected by microbial contamination.

Keywords: pathogen control; forensic evidence preservation; technological innovation

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