OPEN ACCESS Freely available online

Mycobacterial Diseases

ISSN: 2161-1068

Opinion Article

Affordable Solutions to Mycobacterial Challenges with Acetic Acid

Sikethawe Amayhuai*

Department of bacteriology, University of Messina, Messina, Italy

DESCRIPTION

Vinegar, a household staple known for its versatility in cooking and cleaning, has recently been in the spotlight for its antimicrobial properties. Specifically, the active ingredient in vinegar, acetic acid, has demonstrated a remarkable ability to kill mycobacteria, a group of bacteria that includes the pathogens responsible for tuberculosis (TB) and leprosy. This discovery holds promising implications for public health, especially in resource-limited settings where access to traditional disinfectants may be limited. Mycobacteria are a genus of bacteria characterized by their tough, waxy cell walls, which make them inherently resistant to many disinfectants and antibiotics. Some mycobacteria, such as *Mycobacterium tuberculosis*, are pathogenic and others are opportunistic pathogens that can cause infections in individuals with compromised immune systems. The resilience of mycobacteria makes them particularly challenging to eliminate, contributing to the persistence of diseases like TB, which remains a global health concern.

Acetic acid ingredient in vinegar

The antimicrobial power of vinegar lies in its acetic acid content. Acetic acid is a weak organic acid that is effective at disrupting the cell walls of various microorganisms, including bacteria, fungi, and viruses. Most household vinegar contains around 5%-8% acetic acid, which is sufficient for common cleaning and culinary purposes. However, higher concentrations of acetic acid have shown enhanced efficacy against more resistant microbes, including mycobacteria. Recent studies have shed light on the potential of acetic acid as an effective agent against mycobacteria. Acetic acid disrupts the lipid rich cell walls of these pathogens, compromising their structural integrity and leading to cell death. Studies have demonstrated that acetic acid concentrations of 6%-10% can effectively kill mycobacteria, making it a promising low-cost alternative to traditional disinfectants. Furthermore, its biodegradability and minimal environmental impact add to its appeal in both healthcare and household settings. Ongoing research is exploring its applications in sterilization protocols and infection control.

Advantages and limitations of acetic acid

Acetic acid is inexpensive and widely available, making it a practical alternative to commercial disinfectants, particularly in low-income regions. Unlike many chemical disinfectants, acetic acid is biodegradable and poses minimal risk to the environment. This makes it a sustainable choice for large-scale disinfection. When used appropriately, vinegar and acetic acid solutions are safe for household and clinical use. However, it is essential to handle higher concentrations with care, as they can cause skin irritation and damage to surfaces. In addition to mycobacteria, acetic acid is effective against a wide range of pathogens, including bacteria, fungi, and certain viruses. This makes it a versatile disinfectant for various applications. While the antimicrobial properties of acetic acid are impressive, there are some limitations to consider, such as, household vinegar may not be strong enough to kill mycobacteria effectively. Higher concentrations of acetic acid are required, which may necessitate special handling and dilution. Acetic acid can corrode certain metals and damage sensitive materials, so it is essential to test surfaces before widespread application. While acetic acid is a valuable addition to the toolkit of disinfectants, it should not replace conventional methods entirely, especially in high-risk environments like hospitals.

Applications in public health

Acetic acid can be used as a disinfectant for medical equipment, surfaces, and laboratory tools, particularly in settings with limited access to commercial disinfectants. In regions where TB is prevalent, acetic acid could play a role in controlling the spread of the disease by disinfecting areas exposed to infected individuals. Vinegar solutions can be employed for cleaning and disinfecting surfaces, helping to minimize the risk of infections caused by mycobacteria and other pathogens. Acetic acid could be used as a supplementary treatment to kill mycobacteria in water supplies, especially in areas with poor water sanitation infrastructure. Acetic acid has shown potential for integration into decontamination protocols for reusable medical equipment, such as endoscopes and surgical instruments, due to its broad-

Correspondence to: Sikethawe Amayhuai, Department of Mycobacteriology, University of Messina, Messina, Italy, E-mail: sikethwemahua@yahoo.com

Received: 03-Jan-2025, Manuscript No. MDTL-25-36892; **Editor assigned:** 06-Jan-2025, PreQC No. MDTL-25-36892 (PQ); **Reviewed:** 20-Jan-2025, QC No. MDTL-25-36892; **Revised:** 27-Jan-2025, Manuscript No. MDTL-25-36892 (R); **Published:** 03-Feb-2025. DOI: 10.35248/2161-1068.25.15.537

Citation: Amayhuai S (2025). Affordable Solutions to Mycobacterial Challenges with Acetic Acid. Mycobact Dis. 15:537.

spectrum antimicrobial properties. It can also be applied in agricultural settings to reduce microbial contamination in food production and processing. Furthermore, combining acetic acid with other natural antimicrobial agents, such as essential oils, could enhance its effectiveness while maintaining its eco-friendly profile. Continued research and standardized guidelines are needed to optimize its application and ensure safe, effective use across diverse settings.

CONCLUSION

The active ingredient in vinegar, acetic acid, offers an effective and affordable solution for combating mycobacteria. Its potential applications in healthcare, public health, and household cleaning make it an invaluable tool in the fight against infections caused by these resilient pathogens. As research continues to explore the full scope of its capabilities, acetic acid could play a significant role in improving global health outcomes, particularly in underserved communities. However, users must exercise caution and adhere to guidelines for safe and effective use.