Environmental Science and Pollution Research (2024) 31:48073–48084
https://doi.org/10.1007/s11356-024-34379-3

RESEARCH ARTICLE

Surviving chlorinated waters: bleaching sensitivity and persistence of free-living amoebae

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Received: 21 February 2024 / Accepted: 9 July 2024 / Published online: 17 July 2024

Abstract

Recent advancements in membrane technologies and disinfection methods have enhanced drinking water quality significantly. However, microorganisms, including free-living amoebae (FLA), persist and pose potential threats to humans. FLA are linked to severe neuro-ophthalmic infections and serve as hosts of pathogenic bacteria. This study examined FLA presence in chlorinated and ultrafiltration drinking water and evaluated chlorine's disinfectant. Of 115 water samples, 21 tested positive for *Acanthamoeba* sp., *Allovahlkampfia* sp., and *Vermamoeba vermiformis*, originating from chlorinated sources. FLA trophozoites withstand temperatures up to 37 °C, while the cysts tolerate heat shocks of 60–70 °C. Trophozoites are susceptible to 5 mg L^{-1} chlorine, but cysts remain viable at concentrations up to 10 mg L^{-1}. FLAs' survival in chlorinated waters is attributed to high cyst tolerance and lower residual chlorine concentrations. These findings highlight the need for ultrafiltration or enhanced chlorination protocols to ensure safer drinking water.

Keywords Drinking water · Free-living amoebae · Disinfection · *Acanthamoeba* · *Allovahlkampfia* · *Vermamoeba vermiformis*

Introduction

Free-living amoebae (FLA) play significant roles in water and soil ecosystems, shaping microbial community dynamics through the consumption of organic matter, bacteria, fungi, and small protists (Balczun and Scheid 2017; Samba-Louaka et al. 2019). Their ubiquitous presence is evident across diverse environments, including recreational waters (Chaúque et al. 2022), water distribution systems (Holsinger et al. 2021), hospitals (Nisar et al. 2022), and dental units (Hoogenkamp et al. 2021).

Responsible Editor: Diane Purchase

Highlights1. Three FLA isolated from the chlorinated drinking water.

2. The isolated FLAs thrive at 27 °C and 37 °C; cysts endure 60 °C for 10 min.

3. Cysts maintain viability at 10 mg L^{-1} chlorine concentration.

4. *Acanthamoeba* sp. exhibited a significant tolerance to temperature and chlorine.

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