Integrating Aerosol-Based Air Purification Technology in Community Settings for the Prevention of Respiratory Infections: A Public Health Perspective

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Abstract

The airborne spread of respiratory infections such as SARS-CoV-2, TB, and influenza has highlighted the importance of integrated aerosol mitigation systems in public settings. Aerosol-based air purification techniques, including high-efficiency particulate air (HEPA) filters and ultraviolet germicidal irradiation (UVGI), have showed efficacy in eliminating or inactivating airborne particles, including pathogens, hence reducing transmission risk. This abstract investigates the possible application of such technologies in communal settings such as classrooms, clinics, and public waiting areas. Drawing on international evidence, we show that HEPA and UVGI interventions considerably reduce aerosol particle load, which corresponds to a drop in respiratory infection incidence. From a public health standpoint, integrating these technologies corresponds with health promotion efforts aiming at environmental sanitation, especially in low-resource or highly populated places. Nonetheless, problems remain, such as economic viability, maintenance, and behavioral change. To achieve sustainability, effective deployment will involve intersectoral collaboration, consistent policies, and public awareness campaigns. This integration is an important step in the larger framework of disease prevention and health-system resilience.

Keywords*:* Aerosol, Air Purification Technology, respiratory infection