Bioaerosol Sampler for Real-time Airborne Virus Detection

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Technology description

Samples and Analyzes Bioaerosols to Detect Viral Nanoparticles in Potentially Contaminated Locations

This integrated bioaerosol sampling and detection system enlarges airborne biological nanoparticles to enable accurate, on-site detection of airborne viruses in real time. Many of the diseases that affect human or animal populations and agricultural production have epidemic potential and spread via air dispersed with biological particles, called bioaerosols. Performing bioaerosol sampling and analysis of possibly contaminated air is critically important in limiting the spread of these diseases. However, available bioaerosol sampling devices are very ineffective at sampling virus aerosols. Since virus particles are much smaller than those of bacteria and fungi, available bioaerosol samplers capture very few virus particles, which leads to non-representative air samples. Additionally, available bioaerosol sampling devices require time-consuming analyses and do not support on-site virus detection, increasing the chances of disease outbreak.

Researchers at the University of Florida have developed a bioaerosol sampling system, integrated with nanoparticle analysis capabilities, that efficiently detects viruses in the air. The system is easy to use and supports real-time, on-site diagnosis of airborne pathogens to improve medical response time and disease control.

Technology

This bioaerosol sampling unit detects the presence of virus bioaerosols within a sample, while improving the overall sampling efficiency. The unit consists of two interconnected components: a Virus Aerosol Amplification Unit (VAU) and a Nucleic Acid Sequence Based Amplification Assay (NASBA) or paper-based immunoassay. Ambient air, containing bioaerosols, enters into a chamber within the amplification unit by either a pump or a suction motor. The unit cultivates and amplifies the bioaerosol particles by performing various cooling, swirling, and mixing motions, increasing the overall concentration of the sample. Next, in the NASBA or immunoassay, microfluidic devices quickly detect

virus DNA and RNA found within the captured bioaerosols of the amplified sample. Manufacturers may also include type-specific nucleic acid assays that detect a particular viral particle.

Application area

Rapid aerosol sampling unit that detects airborne viruses for both ambient air-quality monitoring and on-site contamination analysis of public indoor and outdoor facilities, such as schools, hospitals, clinics, airports, parks, animal farms and military conflict zones

Advantages

Amplifies the size of bioaerosol particles via water condensation, enabling reliable sample collection to detect viruses and other airborne nanoscale pathogens particles
Provides real-time air sampling and virus analysis, improving disease detection rate for better medical response and outbreak prevention
Detects virus DNA and RNA using type-specific assays, minimizing the time required for assessment
Functions simply and effectively outside controlled laboratory conditions, supporting both ambient air monitoring and easy, on-site viral analysis of contaminated locations
Catches any respiratory virus, such as current influenza strains, aiding biomedical and disease control personnel in identifying and preventing the spread of airborne viruses

Institution

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