AEROSOL IONIZATION FOR CHARGE DETECTION MASS SPECTROMETRY ION MOBILITY ANALYSIS

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PATENT STATUS

Country	Type	Number	Dated	Case
Patent Cooperation Treaty	Published Application	WO 2024/118601	06/06/2024	2023-039

BRIEF DESCRIPTION

Existing screening tools for respiratory pathogens, including PCR-based methods and antibody-based methods, are generally time-consuming to perform and analyze, difficult to manufacture at scale, and reliant on a detailed understanding of the targeted pathogen. Additionally, these traditional methods give little insight into the extent to which an individual is capable of spreading the disease. All of these features hamstring early responses to emerging pathogens and early-stage epidemics, as can be seen from the ongoing SARS-COV-2 pandemic.

To address these problems, researchers at UC Berkeley have developed a device which ionizes large biomolecules from aerosol droplets and routes them to the inlet of a mass spectrometer or ion mobility spectrometer for identification based on size and/or mass. This can serve as the basis for a screening tool which measures the concentration of pathogenic particles, including common respiratory viruses and bacteria, in the breath. Results from this test could be read out in a matter of seconds, and it does not depend on detailed knowledge of the pathogen in question. Researchers have demonstrated the efficacy of such a device in detecting both large human proteins and virus-sized styrofoam particles.

SUGGESTED USES

This device could be incorporated into a charge detection-based instrument for measuring the concentration of virus and bacteria particles in human breath, providing information distinguishing various pathogens by size and/or shape. Such an instrument could screen for infection and contagiousness of even a novel or poorly characterized pathogen nearly in real time, and hence could be instrumental in the early response to future novel pandemics.

ADVANTAGES

As discussed above, traditional methods for pathogen screening suffer from long lag times, large amounts of disposable and pathogen-specific materials which makes manufacturing difficult to scale up, and a need to apply detailed knowledge of the structure of each specific pathogen of interest. Screening by mass spectroscopy provides an almost instantaneous readout, does not rely on disposable materials, and can be performed in a way which is pathogen-agnostic. Additionally, measurement of pathogen concentration in the breath much more naturally incorporates a measurement of contagiousness than other approaches.

Existing devices, however, have been unable to implement detection of aerosolized pathogens because existing ionization methods were either unable to effectively ionize and weigh particles as large as viruses and bacteria, or were unable to efficiently route the ionized particles into a mass spectrometer. The present invention overcomes both of these challenges, allowing pathogens to be robustly identified by their molecular weight and for substantial signal to be achieved with realistic pathogen concentrations.

RELATED MATERIALS

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OTHER INFORMATION

KEYWORDS

Aerosol transmission, respiratory diseases, mass spectroscopy

CATEGORIZED AS

» **Biotechnology**

» Health

» **Medical**

» Diagnostics

» Disease: Infectious Diseases

» Disease: Respiratory and Pulmonary System

» Screening

RELATED CASES

2023-039-0

ADDITIONAL TECHNOLOGIES BY THESE INVENTORS

- Full Signal Utilization In Charge Detection Mass Spectrometry
- Apodization Specific Peak Fitting In Charge Detection Mass Spectrometry
- Multiplex Charge Detection Mass Spectrometry
- Sequential Pass Express Charge Detection Mass Analyzer
- Ambient infrared laser ablation mass spectrometry (AIRLAB-MS) with plume capture by continuous flow solvent probe

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