Contribution ID: **41** Type: **not specified**

Miniaturized aerosol collector integrating sensors for real-time bio-aerosol detection

Thursday 9 February 2023 15:30 (15 minutes)

Contamination of people, animals, foodstuffs, objects and several types of materials by biological agents are of major concern, especially by man or animal pathogens. However, some non-pathogenic agents are also relevant, mainly those associate with food spoilage, or those responsible with the breakdown of sterility, in certain types of equipments and health devices. The primary ways involved in the contamination process are: by contact (direct or indirect), or by air. Air spreading of biologic agents is probably the most important contamination pathway, and requires the aerosolization of biologic agents to effective. Most of the diseases that affect animals and humans are spread by air, in indoors and outdoors. Nevertheless, indoor spreading of biologic agents is most effective than outdoor spreading, due to confinement and agent proliferation. This is of particular importance in public places, such as hospitals, airports, covert stadiums, shopping centres, among others, where natural or intentional disease outbreaks can affect more effectively, a higher number of targets. Intentional releases of biologic agents, in bioterrorism actions, pose great concern to public health and to law enforcement authorities. These entities need even more, of technologies capable to sensing the atmosphere in a continuous way, for the presence of pathogens. Real time detection technologies are a crucial tool, to improve the response efficiency of authorities, in outbreaks situations.
The current technologies available in the market to detect aerosolized agents are cumbersome, expensive, have a high logistic foot print and most of them don't give a specific result in real-time. Most of these technologies are poor used and when an air analysis is needed, generally it is split in two main steps: 1) aerosol collection, with dedicated air samplers; 2) aerosol analysis, by culture and molecular methods.
Project outline/goals:
The limitations in the commercially available technologies, for real-time detection of biologic agents in aerosols, need to be improved in several aspects: 1) miniaturized, capable to be transported by hand or installed in robotic interfaces such as UAV (unmaned air vehicle), or UGV (unman ground vehicle); 2) fully integrated with the air sampling module and with the detection module; 3) real-time or near real-time detection of aerosolized agents.
The main project outline will be focused on the development of a compact aerosol detection biosensor based on magnetoresistive sensors and microfluidics, capable to sensing in real-time the presence of biologic agents in air. The model organism to be used in this project will be pure spores of the non-pathogen Bacillus thuringiensis a surrogate of B. anthracis. The project will require the testing of the aerosol detection biosensor, against standard concentrations of aerosolized B. thuringiensis spores in controlled environment.

Author: BATISTA, Eduardo

Presenter: BATISTA, Eduardo