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Microwave technology- A game changer for sterilization

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Microwave-assisted sterilization is an emerging technology that is an efficient combination of both low heat and microwave energy to sterilize medical waste

Currently, no specific antiviral therapy for 2019-nCoV is available, so preventing the spread of infection is the best possible cure. In healthcare facilities, biomedical waste generated is the primary source of transmission of infection throughout the cycle of transportation, collection, segregation and treatment process before final disposal.

Personal protective equipment or PPEs (that include masks, goggles, gloves, shoe covers and face shields) is a mandatory requirement for all health workers involved in screening, testing or treating people for the virus. Both doctors and manufacturers have vehemently flagged the issue of dwindling PPE supplies.

Microwave-assisted sterilization is an emerging technology that is an efficient combination of both low heat and microwave energy to sterilize medical waste offering microbial inactivation equivalent to thermal sterilization along with reducing the deleterious effects of heat on the material.

In waste treatment by microwaves, the heat is generated inside the waste and then transferred to the outside. In contrast to other methods, the heat is applied from outside. Traditional conductive heating method using steam and hot-air is a slow and relatively inefficient method for transferring energy into the system since it depends on convection currents and on the thermal conductivity of various materials that must be penetrated.

These attributes of microwave energy make it very attractive for industrial applications such as food or beverage processing, health care facilities, biotherapeutics, etc. as an alternative to conventional processing methods

In 2004, Elhafi et al. reported that four avian viruses (infectious bronchitis virus - Coronavirus, avian pneumovirus, Newcastle disease virus and avian influenza virus) were inactivated on dried cotton swab samples using a domestic microwave oven for as little as 20 seconds.

OptiMaser® is a state-of-the-art Microwave Based Disinfection System (MMDS), utilizing an innovative “Microwave-assisted cold sterilization (MACS)” technology for the disinfection of Hazardous Biomedical Waste in hospitals at the point of generation.

MACS is designed to cover all levels of ‘microbial inactivation’, i.e., Level I to Level IV, as recommended by the State and Territorial Association on Alternate Treatment Technologies (STAATT) classification system. Moreover, this has already been tested in various institutions such as CSIR-IITR and SGPGI, Lucknow India (against bacteria, fungi, spore, and viruses).

It has been reported that the exposure of microwaves can effectively reduce the infectivity of HIV-1, HCV and prevent viral transmission. Thus, the proposed technology would be a green (non-burn) technology for sterilization/ disinfection with zero emissions. This states that microwave-assisted sterilization/ disinfection is a fundamental approach to prevent the cross-contamination of viral infections such as HIV, HCV and COVID-19 in healthcare settings.

In February 2020, the Chinese Minister of Health confirmed the acquisition of 16 Sterilwave® (Microwave based Sterilization technology with combined shredder system) treatment stations for leading hospitals in the Wuhan region.

However, there are some limitations with Sterilwave® -

1. Integrated shredder, which is not good if the waste is not segregated before treatment, which is again a tedious job with the risk of cross-infection to worker,
2. Has only one basic cycle of medical waste treatment. The cost of this Sterilwave® machine is approximately 4-5 times more than our proposed OptiMaser technology. This device would be much faster in terms of disinfection efficacy as compared to legacy technologies and be a suitable solution for the disinfection of on-site generated infectious waste along with all PPE kits that are used mostly in such pandemic situation.

Unlike existing technologies, OptiMaser® -

- occupies minimal power and water resource,
- is easy to install, plug and play,
- is customizable and user-friendly,
- has nine dedicated algorithms and
- is eco-friendly.

This disruptive technology is game-changing in the sterilization technologies market, thereby confirming its potential to be the end game for infection control across billions of lives worldwide.

Krishna Gautam, Dr. Ayesha AR and Monish Bhandari, SS Maser Technology, Lucknow