Validation study of ZeBox™ in a multibed ICU: A device to reduce the environmental (airborne) load of pathogenic organisms in Healthcare Environments

Biomoneta

ZeBox™

Air decontamination by Biomoneta

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Problem and existing solutions

The problem:

- Microbial particles are a source of contamination via airborne dispersion
- Further dispersed via contact with healthcare workers and cross contamination
- A need for microbial decontamination systems near the patient to prevent dissemination via air or by contact.

Stated comparison of the available technologies

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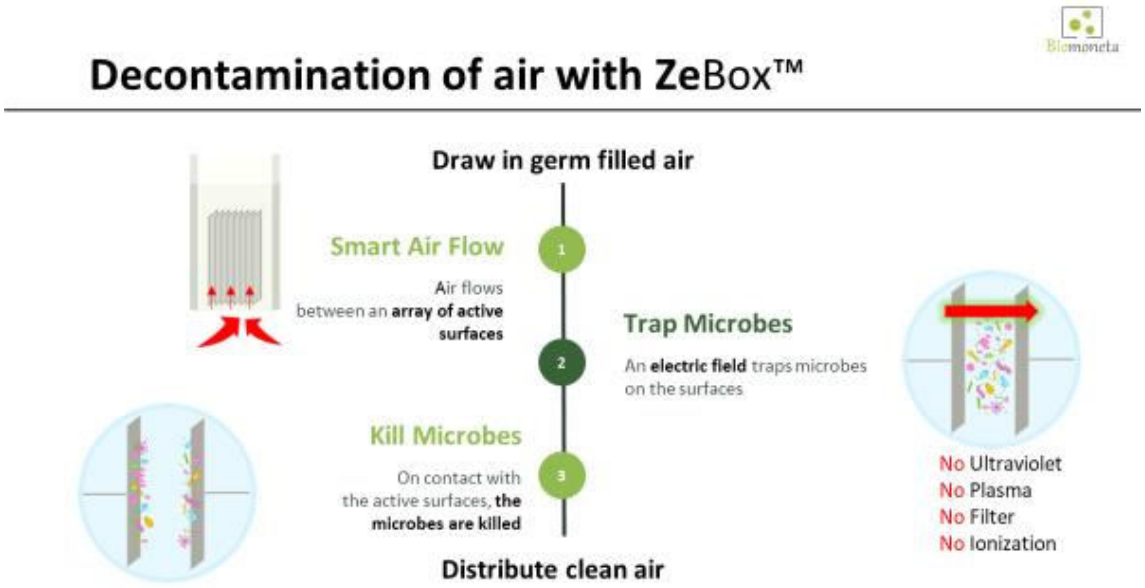
	HEPA filter	UV radiation	Plasma-based	ZeBox
Can be used in presence of humans	✓	X	✓	✓
Kill microbes	X	✓	✓	✓
No toxic by-products	✓	X	Some require particle capture	✓
No equipment damage	✓	X	UNKNOWN	✓
Top companies in the field	Commodity	Xenex	Airinspace Novaerus	



ZeBox™

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The Technology

Click here to see a video on how it works

- Designed and built by Biomoneta Research Pvt Ltd, a Department of Biotechnology (BIRAC) supported healthcare startup
- The innovative technology is a synergistic whole of 3 components:
  - ❑ A composite antimicrobial surface with the ability to kill a range of microorganisms (bacteria, fungi, spores, viruses) when retained in contact.
  - ❑ An airflow path designed to increase the probability that airborne microbial particles contact the antimicrobial surface
  - ❑ Electronics that drive the performance of the antimicrobial surface and the movement of microbes inside the device

Study Site – Multibed ICU, Period : Dec 2019 to March 2020 (unpublished data)

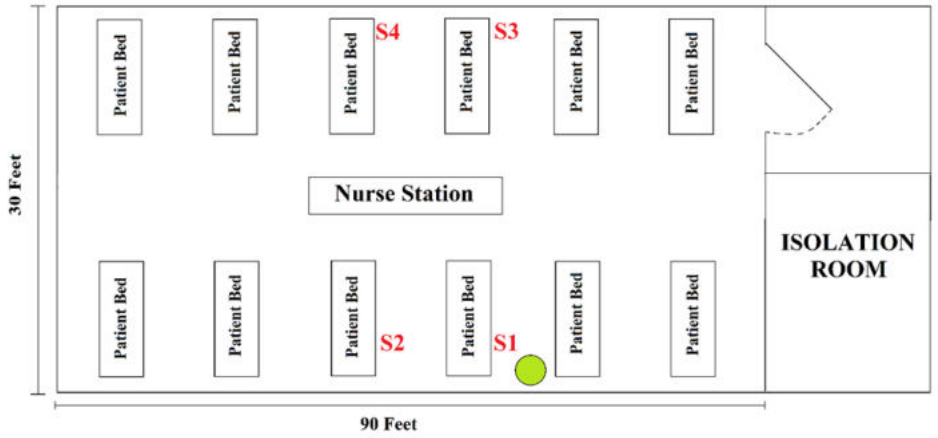
Room dimension: 30 feet x 90 feet.

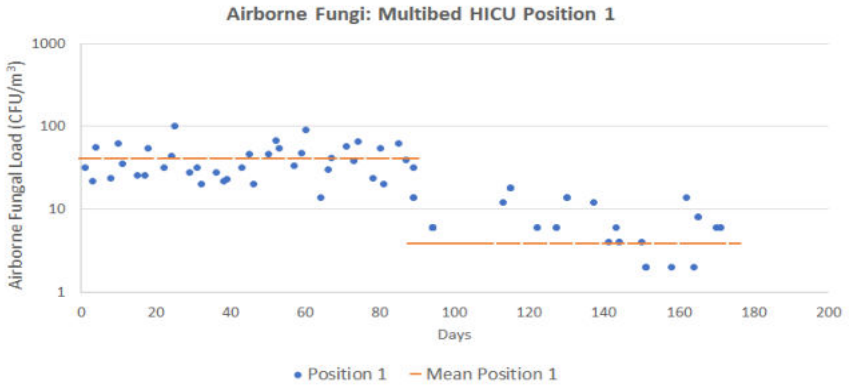
Sampling sites chosen in consultation with the ICU staff

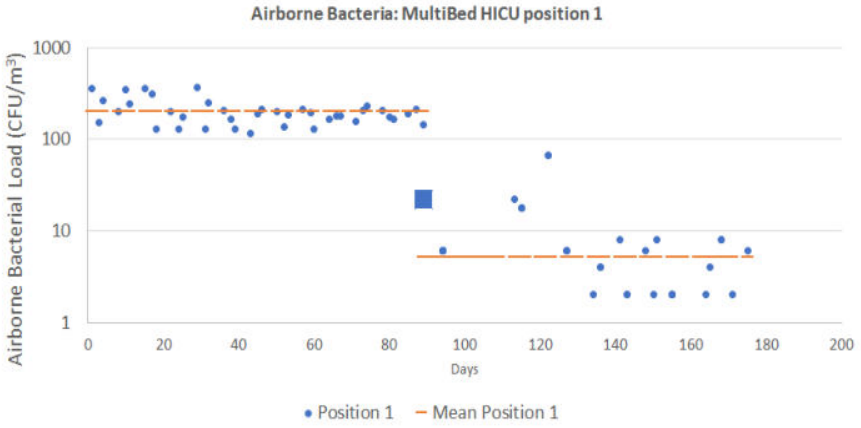
Positions 1 (2ft) and 2 (8ft) were proximal to the ZeBox on which the direct effect of the device could be monitored.

Positions 3 (24ft) and 4 (26 ft) were distal to the ZeBox and served as the control sampling sites

Zebox™ Unit expected to effectively serve an area of 250sq. ft. with a radial throw of ~15ft.







Results

(unpublished data submitted for peer review)

At sites proximal to the ZeBox:

- Reduction of airborne bacterial and fungal load was 93-97%.
- Reduction of surface deposition of bacteria and fungi was 78-92%

At sites distal to the Zebox:

- Reduction in airborne bacterial load ranged from 24-45% and airborne fungal load from 35-70%.
- Reduction in surface bacterial load ranged from 15-80% and fungal load from 61-73%.

Statistical analysis (parametric *t*-test and non-parametric Mann Whitney U-test):

p-values significantly less than 0.05.

Exception: one location farthest from the ZeBox in the multi-bed ICU

There was a significant reduction in bacterial and fungal airborne as well as surface loads within 10-15 feet from the unit

- 90-95% reduction of airborne load
- 80-90% reduction of surface load
- 15-80% at the distal sites (24ft/26 ft away)

The study was done in a fully functional ICU with varying staff and patient movement.

The device operated continuously and safely in human presence and required almost no manual intervention while operating close to the source of infection or contamination.

Impact of the device on HAI rates or on Virus particles was not evaluated in this study.

Scalability and usefulness

Possible reasons for use of the device in an institutional setting

- ***low bioburden zone was created with an approximate radius of 10-15 feet from the unit***

- Critical care units, isolation units to control spread of airborne particles
- Inpatient rooms in hospitals, long term care facilities

Further specific studies needed

- To see the effect on Viral particles
- To see if there is a reduction in transmissible respiratory infections e.g. COVID19, H1N1, TB, HAI, etc.

For more information regarding the device:

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www.zebox.store

Thank you

<u>The Team</u>

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