

“Clean Room Technology” as an alternative for the housing of Laboratory Animals in a Specific Pathogen Free (SPF) and High Containment Facility

Andrew G. Brown

Vernon Jansen Unit, Faculty of Medical and Health Science, The University of Auckland, Auckland, New Zealand

Introduction

The majority of animal facilities are designed and built using hard walled rooms, which are effective as a barrier for containment of hazardous organisms, and the exclusion of pathogens, but they are expensive to construct and inflexible as the requirements of the facility change with time.

A new facility at The University of Auckland was designed and built using Biobubbles throughout, to house all small animals.

How does a BioBubble Work?

A Biobubble is constructed by hanging a vinyl skin over a tubular aluminium frame, which is mounted on castors. The skin is made of sections that are fastened together with Velcro. Ventilation is provided by AHU's (Figure.1); the size of the bubble determines the number required.

Figure 1: Air Handling Unit (AHU).

The Hepa filtered air is either pumped into or out off the skin, depending whether you require running the bubble at +ve or -ve pressures.

(Figures. 2, 3 & 5).



Figure 2: AHU (+ve Pressure)

The vinyl skin stops just short of the floor, allowing the flow of air either into or out of the bubble. Each bubble is set up to achieve 100-air changes/hour.



Figure 3: AHU (-ve Pressure)

Maintenance

Weekly- wash prefilters and frames. Monthly- wipe the outside of the skin.

Yearly- check efficiency of the Hepa Filter, replacing as required.

Cost comparisons

The cost of constructing a facility that is all hard walled rooms is approx 8,400NZ\$/m². The cost of the same facility, same standard, using Biobubbles is 5,300NZ\$/m².

SPF Facility

The aim of the Facility is to produce and supply SPF animals to researchers. To achieve this, Biobubbles are run at positive pressure. The breeding performance of the rat and mouse colonies being bred appears not to be affected by their new environment e.g. we have one transgenic rat line that is breeding better in its new environment.

Due to the increase in proximity to numerous electrical appliances in the unit, a concern was the level of Ultrasonic noise omitted from the AHU's. Tests have shown that the noise produced by the AHU's are around the <10kHz (the range that is repulsive to Rats is 32-62kHz)

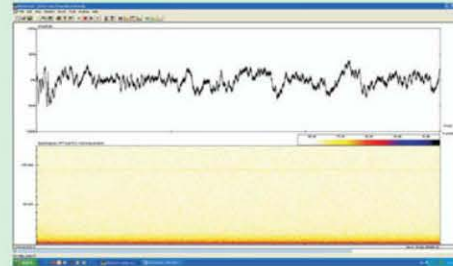


Figure 4: Spectrogram sound trace from inside empty Bubble

The effectiveness of this technology is dependent on the protocols and procedures put in place, and the adherence by staff to the procedures.

High Containment Environment

The requirements of a High Containment facility are to contain Hazardous organisms, and in some instances exclude harmful pathogens, e.g. in viral research using immunocompromised animal models.

The Biobubble should be run at negative pressure, with immunocompromised animals housed in positive pressure IVC caging within the negative pressure Bubble.

Advantages of using Biobubbles

- Cheaper to install when compared to hard-walled rooms
- Flexibility, easy to change the positioning of the Bubbles within the facility as the needs and requirements of Facility changes.
- Easy to maintain.
- Safer for staff to work in as they do not feel isolated and can see through the walls of the bubble into the whole unit.
- Increased air quality within facility.

Disadvantages of using Biobubbles

- Not easy to contain escaped animals.
- Additional training required in their use and maintenance.



Figure 5: Positive Pressure Bubble

Summary and Conclusion

As with every situation in Facility Management, the performance of any technology employed is only as good as the protocols and procedures that are in place for the facilities safe and effective operation. Biobubble have allowed the use of “clean room technology” in animal technology as a realistic, inexpensive, improved air quality, and practical alternative to conventional hard walled rooms.

Acknowledgements

- Faculty of Medical and Health Sciences, The University of Auckland.
- bioBubble®, Colorado, USA

Contact Andrew Brown andrew.brown@auckland.ac.nz