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Assessment of the Variability of Airborne Contamination Levels in an Intensive Care Unit over a 24 Hour Period

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Introduction

- Airborne transmission of infectious microorganisms is a serious public health threat, accounting for ~30-33% of all nosocomial infections.
- Environmental monitoring of airborne contamination levels was conducted in GRI ICU, in both occupied and unoccupied patient isolation rooms.
- Samples were collected on agar plates, and bacterial contamination levels recorded as CFU/m3 of air.
- An activity log was collated to record activities that might contribute to spikes in contamination levels.

Methods

- A sieve impactor sampler was used to collect 500L air samples every 15 minutes over a 24 hour period (8am – 8pm).
- Samples were collected on agar plates, and bacterial contamination levels recorded as CFU/m3 of air.
- A droplet impactor sampler was used to collect 150L air samples at 08:00, 13:00, 18:00 and 23:00.
- The probability of contamination was expressed as probabilistic curves in terms of CFU/m3 of air.

Results

Study

Graphical Data

- Observation (15 min intervals)

Statistical Data

- Observation (15 min intervals)

Analysis

- Average: 104 CFU/m3
- Highest: 510 CFU/m3
- Lowest: 12 CFU/m3
- Patient turn, patient moved from bed to chair, visitation, high room activity

Microbiology:

- Visual representation of variation in air contamination levels throughout the day in an occupied patient isolation room.

Future Work

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Conclusions

- This study demonstrates the degree of airborne contamination that can occur in an ICU over a 24 hour period and how much it can vary.
- Numerous factors were found to contribute to microbial air contamination including patient status, length of stay, time of day and room activity.
- Peaks in airborne contamination showed a direct relation to an increase in room activity.
- Contamination levels were lower overall during the night and in unoccupied isolation rooms, whilst the highest counts were observed in an isolation room occupied by a patient with C. difficile infection.

Acknowledgements

- Consideration should be given to potential improved infection control strategies and decontamination technologies which could be deployed within the clinical environment to reduce the airborne contamination levels, with the ultimate aim of reducing healthcare-associated infections from environmental sources.