

No More Canaries in the Coal Mine: Replacing Soiled Bedding Sentinels with Environmental Health Monitoring

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1. Introduction

Traditional rodent health monitoring programs have long relied on soiled bedding sentinels (SBS), a method that involves housing live animals in cages with soiled bedding from colony animals to detect infectious agents. While historically considered the gold standard, SBS has significant limitations, including ethical concerns, inconsistent pathogen detection, and labor-intensive protocols. In contrast, Environmental Health Monitoring (EHM) offers a non-animal alternative that aligns with the 3Rs—particularly Replacement—by eliminating the need for live sentinels.

2. Body

The 3Rs Collaborative is a non-profit organization based in the United States that seeks to advance better science – for both people and animals – through facilitating collaborative 3Rs initiative. As part of the Rodent Health Monitoring initiative, they led a systematic literature review comparing EHM methods - such as exhaust air dust testing, direct colony sampling, and sentinel-free soiled bedding - with SBS.

We searched 3 databases for peer-reviewed studies published through October 2023 that empirically compared EHM methods to SBS. Eligible studies had to include data on pathogen detection in laboratory rodents using EHM to be included. A total of 42 studies met the inclusion criteria. These studies varied in design and methodology but collectively represented three main EHM approaches: exhaust air dust testing (n = 27), sentinel-free soiled bedding (n = 8), and direct colony sampling (n = 24). We extracted outcome data and analyzed it using both logistic regression and descriptive statistics to assess comparative efficacy.

We found that all three EHM methods were consistently superior or equivalent to SBS in detecting pathogens, regardless of the pathogen's classification or type of EHM. In fact, EHM was 20% more effective at detecting pathogens as compared to SBS. And in head to head comparisons, SBS failed 25% of the time when EHM succeeded. These findings strongly support the replacement of SBS with EHM in routine rodent health monitoring programs.

Furthermore, our benchmarking surveys of EHM use across the years identify both common barriers to implementation as well as a shift in practice and acceptance over time. Common barriers include scepticism in data quality, concern with feasibility, convincing other people,

and cost concerns. The 3Rs Collaborative has created an resource hub and published our systematic literature review to address these concerns.

3. Conclusion

Ultimately, I advocate for replacing SBS with EHM, due to multi-model benefits to science, the 3Rs, and operations. This shift in best practice is occurring throughout the United States and Canada. The 3Rs Collaborative EHM resource hub can provide individuals and organizations with extensive guidance and training to support this transition.

References

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