Efficacy of three disinfectant formulations and a hydrogen peroxide/silver fogging system on surfaces experimentally inoculated with methicillin-resistant *Staphylococcus pseudintermedius*

Soohoo J, Daniels JB, Brault SA, Rosychuk RAW, Schissler JR.

ABSTRACT

Three disinfectants were tested against methicillin-resistant *Staphylococcus pseudintermedius* (MRSP), a leading cause of nosocomial infections in companion animals. AHP® achieved the greatest reduction in bacteria of the products tested. The HaloFogger fogging unit, using HaloMist disinfectant, was evaluated against the same bacteria, but produced significantly lower reductions.

BAKGROUND

Antimicrobial resistance continues to present an ever-growing concern to the veterinary medical community. In particular, MRSP is known to persist on environmental surfaces for weeks to months, and infections in dogs have been associated with hospital or clinic visits. Due to this ability to survive on surfaces, environmental disinfection is necessary to reduce the risk of transmission; however, there is a lack of peer-reviewed evidence on the efficacy of commonly used veterinary disinfectants against MRSP. The objectives of this study were to:

i) Evaluate the efficacy of three disinfectants against MRSP on an experimentally contaminated surface.
ii) Evaluate the efficacy of a disinfectant fogging system on multiple experimentally contaminated surfaces.

STUDY

The strain of bacteria tested was MRSP Sequence Type ST71. Bacterial suspensions were prepared using standardized methods[1]. The three disinfectants evaluated were:

1) Virex II 256, a quaternary ammonium (quat) formulation (diluted at 1:256);
2) Oxivir Five 16, an AHP®-based formulation (diluted at 1:16);
3) HaloMist, a ready-to-use hydrogen peroxide and silver-based formulation (HAL).

Trial 1: Disinfectant Efficacy

A total of 55 sterile polypropylene conical tubes were inoculated with 10 µL of the test suspension in a biological safety cabinet and allowed to dry. Once dry, each disinfectant was applied to an equal number of samples and allowed to sit for the contact time indicated on the product label. Once the contact times were reached, the disinfectants were neutralized. Samples were vortexed, serial-diluted, and cultured.

Trial 2: Fogging Application

A total of 20 sterile flat-top caps, which accompanied the conical tubes, were inoculated with 10 µL of the test suspension in a biological safety cabinet and allowed to dry. Then, the caps were placed in eight locations throughout a veterinary exam and treatment room. The HaloFogger unit, containing HaloMist, was run for 15 minutes, and test strips were used to verify disinfectant

dispersal. The room was left for two hours prior to re-entry, and bacteria was quantified in the same manner outlined above.

RESULTS

Trial 1: Disinfectant Efficacy

Mean reductions in colony-forming units were calculated as follows:

Product	Log_{10} Reduction	Percentage Reduction
Quat	3.55	99.97%
AHP®	3.60	99.98%
HAL	1.66	97.81%

The study defined 'good efficacy' as a log reduction greater than 3.0, which included the AHP® and quat products, but not HAL. Control values fell within acceptable ranges.

Trial 2: Fogging Application

The mean percentage reduction in colony forming units was 52.14%. Control values fell within acceptable ranges.

IMPLICATIONS

Although used as directed on the product label, the HaloFogger produced reductions far below those achieved in the disinfectant efficacy test., and well below the 99.99% reduction indicated on the label for *S. aureus* (the product does not have a claim against MRSP). The authors present a couple theories as to why this may be the case, but nonetheless conclude that this method should be reserved as an adjunctive to regular cleaning and disinfection.

These findings highlight the fact that a disinfectant will not necessarily be as effective when applied using a fogging apparatus. Due to the many variables involved in fogging applications, it may be important to validate a fogging system in real-world settings. For instance, an AHP® formulation has been demonstrated to achieve a >99% reduction in *Pseudomonas spp.* colonies when used in a large animal hospital environment.[2]

REFERENCES

1. Soohoo J, Daniels JB, Brault SA, Rosychuk RAW, Schissler JR. (2020). Efficacy of three disinfectant formulations and a hydrogen peroxide/silver fogging system on surfaces experimentally inoculated with methicillin-resistant *Staphylococcus pseudintermedius.* Journal of Veterinary Dermatology (In Press).
2. Saklou NT, Burgess BA, Van Metre DC, Hornig KJ, Morley PS, Byers, SR. (2016). Comparison of disinfectant efficacy when using high-volume directed mist application of accelerated hydrogen peroxide and peroxymonosulfate disinfectants in a large animal hospital. Equine Veterinary Journal 48(4).