

Investigation of Bacterial Load in Multi-Species Laboratory Workspaces

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Summary and Implications

Multi-purpose/multi-species laboratories in veterinary clinics may have an increased risk for bacterial contamination due to the possibility for high traffic and diverse exposures from different farms and species. The goal of this trial was to investigate the level of possible contamination in the shared areas and to evaluate the efficacy of the current SOPs (standard operating procedures) in minimizing microbial contamination of laboratory areas. Specific objectives were to: (1) identify which areas of the laboratory and shared resources have the highest level of contamination and (2) determine whether the current cleaning and decontamination methods are effective and in use.

Two trials, totaling 115 samples, were conducted over a two week period using Replicate Organism Detection and Counting (RODAC) surface contact agar plates. The first trial consisted of randomized sampling within the field laboratory, field equipment shared between species and veterinary service vehicles. The second trial further sampled identified problem areas before and/or after cleaning/disinfection procedures. The experimenter was blinded to the status of the surfaces tested. Commercially available disinfectants typically found in homes, farms, and/or clinic laboratories were used at recommended rates and contact times during testing.

Samples collected were incubated for 24 hours at 37° C with 5% CO₂. Following identification processes, the most common species of bacteria isolated were *Staphylococcus* sp. These were most frequently isolated in the service vehicles.

Hard surfaces in the vehicle were able to be cleaned and disinfected sufficiently, but the carpeted areas retained contamination even after cleaning.

The findings of this project suggest that fomite transfer of bacterial organisms through the use of a multi-purpose service vehicle could potentially spread undesirable pathogens from farm to farm unknowingly. Increased adherence to strict biosecurity standards at the farm level can help to prevent this transfer.

Materials & Methods

Two trials totaling 115 samples were conducted, consisting of two testing regimens. During both trials, the investigator, but not the laboratory supervisor was blinded to the current use and cleaning status of the surfaces being tested.

Part (1) Testing the Status Quo

A. Sample collection

High use areas within the laboratory and service vehicles were identified for testing. Surface contact culture plates (BBL® RODAC with trypticase, lecithin and polysorbate 80 agar) were consecutively numbered and cross-referenced to the surface area being sampled. The agar was allowed to contact the surface to be tested for 2 seconds. Plates were incubated at 37°C with 5% CO₂ for 24 hours. Following incubation, individual colonies were counted, recorded and morphologically categorized. Areas with high plate counts were identified for further testing.

B. Species Identification

Morphologically unique colonies were streaked for isolation to pure culture on 5% Sheep blood agar and MacConkey agar using standard Iowa State University clinical microbiology procedures. All plates were incubated for 24 hours at 37°C. The blood agar plates were given an atmosphere of 5% CO₂ while the MacConkey agar plates were incubated in the standard aerobic environment. Gram Staining and Catalase testing were performed on the pure cultures to further assist in the identification of the organisms.

Part (2) Testing Cleaning SOPs:

Using the colony count information from Part 1, high risk areas were identified for further testing. Control samples were taken prior to cleaning/disinfection of the areas to identify the current state of contamination using same procedure as described in Part 1. Surfaces were subjected to cleaning and/or disinfection with products containing 0.13% phenol, 70% ethyl alcohol, 1% chlorhexidine (Novalsan®), or 10% sodium hypochlorite (Chlorox®) as their active ingredient. Surfaces were saturated and allowed to dry before sampling. Samples were collected and incubated as outlined in Part 1.

Using the information in Part 1, the service vehicles showed high levels of contamination. To compare with vehicles not expected to have farm exposure,, samples were collected from the Iowa State University general motor pool

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for comparison to the service vehicles. Two vehicles of similar make and model that had not used by any animal related department (Animal Science, Agronomy, or Veterinary Medicine) within the last 2 weeks were identified for sampling. Procedures, incubation times, and methods to count and identify colonies were consistent with previously identified procedures.

Results and Discussion

The majority of colonies grown were morphologically similar throughout all trials. Isolation and identification testing was performed on 5 unique colonies. Two species of *Bacillus* and one undetermined environmental *Staphylococcus spp* were identified. The remaining two isolates were also *Bacillus spp* with less common morphological characteristics.

The service vehicles exhibited the highest level of contamination from both species. The carpeted areas within the vehicles were the most problematic areas. These areas not only had the highest bacterial counts, but were also the most resistant to the disinfectants. Cleaning alone was marginally effective on the carpeted areas due to the removal of organic matter. The disinfectants used on the

carpeted areas reduced contamination by an insignificant amount. This is consistent with the results of studies that have shown disinfectants have limited efficacy in the presence of organic matter. Formal statistics were not performed on this data.

The service vehicles do pose the greatest risk of cross-contamination due to the high bacterial loads, the routine visitation to multiple animal production units and the transportation of soiled clothing and animal tissue samples. Current cleaning procedures have been updated and redistributed to all users of the tested vehicles and laboratory spaces. The use of hard vinyl floor mats, vehicle specific cleaning equipment, and vinyl cargo area covering have been implemented in all service vehicles in this organization.

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