ABSTRACT

Does contaminates from the floor enter the rodent cage?
A room within the vivarium was equipped with a bio-safety hood and a ventilated rack containing microisolator cages. Inanimate objects such as ear plugs to represent weanlings) were placed in cages to coordinate with room tasks (Fig. 1). A thin layer (1 oz) of XR-7 powder was applied to an area inside the animal room door (Fig. 2). Study participants randomly selected a task to perform (Table 1); do not required PPE including shoe covers, entered the room and performed the task. PPE was discarded outside of the animal room. After the last participant finished, the room was examined for distribution of powder using a black light. The room was cleaned, checked with a black light and the experiment repeated without shoe covers. Participants were not informed about the nature of the study until the end.

RESULTS

Most participants put on their gown first (Fig. 2); while all participants put on gloves as the final step before entering the animal room.

RESULTS

Material

Krypton Powder and XR-7 Contamination Simulation Powder are useful in situations where invisible detection is needed. Krypton powder has a light green appearance, while XR-7 powder has a white appearance. A light application of either powder is virtually undetectable. Krypton powder can be viewed using an ultra violet or black light and will glow bright green in the dark. XR-7 powder is visible with the aid of a UV or black light and glows brilliant blue. Both powders are useful in teaching proper cleaning techniques, personnel training, and contamination control. The powders are easily removed with soap and water.

METHODS

The effectiveness of shoe covers as part of required personal protective equipment for bio-containment within the animal facility
ML Nicolaus, JM Petty, DM Harrison, VK Bergdall, and JM Hickman-Davis
University Laboratory Animal Resources

Conclusions

The application of shoe covers provides a source of contamination for gloves which may outweigh the benefit of their use. Shoe covers may still be warranted in certain situations and SOPs (standard operating procedures) concerning the order in which PPE is applied should be considered.

Acknowledgements

Special thanks to Joanna Petty, Pete McKinley, Lainy Kathary, Mandy Leber, the husbandry staff, and the medicine technicians, for their assistance with making this project a success. Thanks to Total NRQ for use of PPE photographs.

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**ABSTRACT**

Staphylococcus aureus is a leading cause of skin, soft tissue, and surgical site infections in humans and animals, with a recent increase attributed to methicillin-resistant *Staphylococcus aureus* (MRSA). Investigations into the zoonotic nature of MRSA and the enhanced prevalence within veterinary hospitals have stressed its importance to the veterinary community. A routine culture and sensitivity of a surgical incision from a cynomolgus macaque (*Macaca fascicularis*) at The Ohio State University tested positive for MRSA. As a result of this finding, the intent of this project was to determine the prevalence of *S. aureus*, specifically MRSA, colonization within a primate colony. Samples were collected from 31 animals 1, 2, or 3 times over a 9-month period from the nasal cavity using CultureSwabs (Becton Dickinson & Company). Swabs were plated onto Triple Sotc Yog Agar and Gram stained. All colonies with Gram positive cocci were catalase positive, mannitol positive, and coagulase tested positive. Mannitol and coagulase positive colonies were transferred to Oxacillin Screen Agar (OXA) and MRSA Chromagar. Samples with growth on OSA and mauve-colored colonies on MRSA chromogenic agar were considered positive. An average of 41% were positive for MRSA at any given sampling time point. This MRSA prevalence is significantly higher than the reported human colonization rate of 2-5%. To our knowledge there are no publications documenting the prevalence of MRSA in a nonhuman primate colony. MRSA surveillance and prevalence data of a primate colony provides valuable information which from informed decisions could be made regarding housing, protocols with surgical candidates, and equipment. Additionally, the culturing method used is a simple, inexpensive way to perform MRSA surveillance in all types of animal colonies.

**MATERIALS AND METHODS**

Sampling of all nonhuman primates occurred concurrent with the semianual tuberculosis screening. The animal health assurance protocol encompassed TB testing and nasal swabbing for staphylococcal surveillance and was approved by The Ohio State University IACUC. All primates had been obtained from commercial vendors.

**MRSA Detection Sampling Method**

**Cost of Materials**

<table>
<thead>
<tr>
<th>Item</th>
<th>Quantity</th>
<th>Cost per Unit</th>
<th>Total</th>
</tr>
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<tr>
<td>CultureSwab</td>
<td>1.00</td>
<td>$1.00</td>
<td>$1.00</td>
</tr>
<tr>
<td>A with 5% sheep’s blood</td>
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<tr>
<td>Gram Stain</td>
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</tr>
<tr>
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</tr>
<tr>
<td>Oxacillin Screen Agar</td>
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</tr>
<tr>
<td>MRSA Chromagar</td>
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<td>$3.00</td>
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<tr>
<td><strong>Total Per Sample</strong></td>
<td></td>
<td></td>
<td><strong>$9.45</strong></td>
</tr>
</tbody>
</table>

**PROBLEM**

The Ohio State University Laboratory Animal Resources (ULAR) houses a small primate colony with approximately 15-25 cynomolgus macaques (*Macaca fascicularis*). Six days following a designated research surgical procedure, a 5-year-old female presented with a partially dehiscing incision. The skin and underlying tissue was healthy, with no signs of infection at the dehiscence was self-induced. The subject was currently on an 8-day course of flornicol, which was administered immediately post-operatively. Under anesthesia and following the standard operating procedure (SOP) for open wounds, the incision was swabbed for culture and sensitivity before debriding/repairing. The sample was tested by an independent lab and was positive for MRSA. Despite being resistant to a number of antibiotics, the sample was susceptible to flornicol. The macaque’s incision healed without complication after closure, treatment with a non-steroidal anti-inflammatory, and completion of the course of antibiotics. Based on the discovery of the index case, this project was designed to create a simple, inexpensive way to perform MRSA surveillance and to determine the MRSA prevalence within our nonhuman primate colony.

**REFERENCES**


**OBSERVATIONS**

**MRSA Detection Sampling Time Line**

Day 1: Initial Nasal Swab
- Plating on TSA (1 minute/swab)

Day 2: Plate Oxacillin
- Gram Stain (1 hour)
- Coagulase (5 hours)
- Catalase (5 minutes)

Day 3: Plate Mannitol
- Oxacillin Screen Agar (1 minute/plate)

Day 4: MRSA Chromagar
- Read and Interpret Results (2 minutes)

**RESULTS**

- MRSA has been shown to cause significant clinical disease in humans and animals, and also has been identified as a potential zoonotic pathogen.
- Following the discovery of a positive case of MRSA in a small nonhuman primate research colony, the goal of this study was to establish an estimated prevalence of MRSA in this species when housed in the research setting.
- Surveillance data regarding the prevalence of MRSA is of importance as it could be used to make informed decisions regarding housing, equipment sanitation, and designation of animals to surgical or non-surgical protocols.
- This information could be utilized by veterinary staff at laboratory animal institutions to minimize the chance of MRSA spread between animals, the risk of MRSA surgical site infections, and any potential exposure to personnel.
- The culturing method described in this poster is a simple, inexpensive way to accurately perform the MRSA surveillance testing. The nasal swab culturing method is convenient to perform during the non-human primate semi-annual tuberculosis testing or when animals are anesthetized for research or medical procedures.
- The average MRSA prevalence within the sampled primate colony was determined to be 41%. This is in contrast to humans, in which nasal cultures identify MRSA in 0.8-1.5% of individuals at any given time.
- This snapshot does not necessarily represent the expected prevalence for a larger number of animals spread over multiple facilities. Further studies would need to be performed to obtain a more accurate representation of the prevalence of MRSA in nonhuman primates, specifically cynomolgus macaques, in contemporary laboratory animal facilities.

**CONCLUSIONS**

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**ACKNOWLEDGEMENTS**

Special thanks to Mackenzie Nicole, Colleen Harmer, and Dr. Judy Richard Coastal.
ABSTRACT

Constant high levels of stress can lead to distress resulting in poor health. During stress, elevated glucocorticoids can have detrimental effects on the animal and result in altered physiologic responses to experimental conditions. Therefore, lowering the stress levels of animals used in research is a key aspect of refinement both in terms of animal welfare and the validity and reproducibility of the research. Voluntary exercise has been shown to have a positive effect on both physiological and psychological states and also decreases the negative aspects of stress. The aim of this project was to determine if voluntary exercise would alter the levels of corticosterone, the primary glucocorticoid hormone in rodents, in mice housed in a standard lab cage environment. C57BL/6 male mice were placed in one of 2 conditions: standard or standard with exercise cages. The exercise group was given 2 exercise wheels per cage for 4 weeks. Fecal samples were collected from both groups daily over a 4 week period and assayed for corticosterone using an EIA method. Since rodents are the most common animal research model, identifying ways to decrease the stress levels can enhance animal welfare and also the quality of the research.

INTRODUCTION

• Stress has been well documented to cause multiple physiological and psychological changes in rodents including changes in immunity, reproduction, weight gain, and behavior (Touma, et al., 2003). Rodents under stressful conditions are therefore more likely to have health problems leading to decreased welfare of the animals and increased variability in research studies using these species. Therefore, finding a way to minimize stress by improving the housing environment in research animals is a key aspect in the refinement of lab facilities. Physical voluntary exercise has been found to have multiple effects on both physiology and psychology in a positive fashion and is believed to combat the negative aspects of stress (Sasse et al., 2003). Therefore, a relatively easy and cost-effective mechanism for decreasing stress of standard lab conditions of rodents could be the placement of an exercise wheel in cages.

• Corticosterone is the primary glucocorticoid secreted by the mouse adrenal gland and is associated with the regulation of carbohydrates, proteins, and overall metabolism. It also modifies the response to other stress hormones. Therefore corticosterone is the primary hormone used to measure stress levels in rodents. This study investigated the corticosterone levels in feces of lab mice in response to the ability to voluntarily exercise in a standard lab cage environment.

MATERIALS

Animals and General Housing Conditions

• Thirteen, four week old C57BL/6 male mice; Housed 3-4 per cage
• Standard laboratory cages with ad libitum food and water
• 12:12 hour light to dark cycle beginning at 6am
• Mice acclimated for 1 week prior to experimental manipulations

METHODS

Experimental Design

• 2 exercise wheels were added to cages 1 and 2
• Schwinn bicycle odometers calibrated to wheel size were attached to exercise wheels to establish daily average
• Fecal samples were collected twice a day at 9am and 4pm for first week to establish peak and nadir
• Samples were then collected once per day Monday through Friday for 4 weeks
• Samples were collected twice per day on last 3 days for a total of 4 weeks of collection
• Group 1 is comprised of cages 1 and 2, with cages 3 and 4 in group 2

<table>
<thead>
<tr>
<th># of Mice</th>
<th>Cage 1</th>
<th>Cage 2</th>
<th>Cage 3</th>
<th>Cage 4</th>
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<tr>
<td>4</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>

RESULTS

• Optical densities were analyzed following the procedures of the EIA kit in order to generate a standard curve with the corticosterone standards of 20,000, 4,000, 800, 160, and 32 pg/ml.
• Corticosterone levels were determined using interpolation with the standard curve
• Data produced are corticosterone levels in the sample feces in pg/ml
• The standard deviation for Group 1 is 138.0 while Group 2’s standard deviation is 173.6

BIBLIOGRAPHY

Thanks to Merck-Merial and the Department of Veterinary Preventive Medicine, The Ohio State University for funding and support. The authors would also like to thank Dr. Courtney DeVries and Kate Karelina for the use and assistance with the microplate reader.

Fecal Corticosterone Levels Related to Voluntary Physical Exercise in Lab Mice
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The Ohio State University College of Veterinary Medicine