The Challenges of Occupational Health:
The Bugs, The Gloves and The Noise!

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OHS programs

OHS PROGRAM GOAL:
- Prevent occupational injury and illness

PRINCIPAL AREAS OF FOCUS:
- Controlling hazards
- Avoiding and controlling exposures
- Reducing risks
- Training and education
- Rules and guidelines
- Consistency
- Recordkeeping and monitoring
- Commitment and coordination
Personnel Training

All employees should be educated regarding:

- Zoonoses
- Chemical safety
- Microbiologic and physical hazards
- Unusual conditions part of experimental procedures
- Handling of waste material
- Personal hygiene
- Appropriate use of PPE (personal protective equipment)
- Precautions related to personal health issues
The Challenges:

1) The Bugs!

2) THIS STUFF IS BANANAS!!!!!
Methicillin-Resistant *Staphylococcus aureus*

- Bacterium highly resistant to ALL β-lactamase antibiotics (penicillins, etc)
  - First recognized in mid-1970’s

**CA-MRSA: Community-associated**
- Risk factors include health clubs, sports teams
- Not as highly drug resistant but much more virulent due to other virulence genes
- Clinical signs necrotizing soft tissue infections and necrotizing pneumonia, sepsis

**HA-MRSA: Healthcare-associated**
- Risk factors include recent hospitalization or antibiotic treatment
- Multi-drug resistant to most antibiotic classes
- Clinical signs skin infections, device infections
BY THE NUMBERS

Six Gym Health Hazards
They offer great health benefits, but gyms are also breeding grounds for germs. Here’s how to avoid getting a virus along with those toned abs.

By Temma Ehrenfeld | Newsweek
Jan 31, 2008

Infectious diseases

MRSA a problem among teen football players
Risk factors converge in high school training camps, CDC officials say

guardian.co.uk
Shower after swimming to avoid MRSA, scientist advise
Large-scale study shows bathers have a high chance of contact with the drug-resistant superbug

High School Wrestler Has MRSA
Updated: Tuesday, 08 Feb 2011, 11:51 PM EST
Published : Tuesday, 08 Feb 2011, 8:23 AM EST
MYFOXNY/AP - A 16-year-old star wrestler at Hauppauge High School is in critical condition after contracting the drug-resistant staph infection MRSA. Nick Mauriello is also suffering from pneumonia as a result of the staph infection.
Parallels between hospital and research environments

- HA-MRSA is prevalent in human hospitals
  - Immunosuppressed individuals
  - Prolonged exposure to resistant organisms that persist in a hospital setting
  - Medical staff can transmit bacteria between patients

- Animal research environment is similar to a human health-care setting
  - Potentially immunocompromised animals
  - Prolonged experimental use keeps animals in proximity with conspecifics
  - Prolonged laboratory care requires human contact with vet staff, husbandry staff, and research staff
Reports of veterinary-related infections are increasing in animal populations

- Dogs, cats – veterinary hospital studies
- Cattle, pigs, horses, sheep
- Rabbits, chickens, psittacine birds
- Single reports in a turtle, bat, guinea pig and chinchilla

Companion animal strains differ from those in livestock and meat production animals

Limited reports of MRSA have been described in research animal colonies

Dog colony (AALAS 2009) & NHP colony (AALAS 2010)
Outbreak Description

- **Animals:**
  - 6 y.o. female and 8 y.o. male macaques

- **IACUC Approved Use:**
  - Behavioral neuroscience studies

- **History:**
  - Cranial implants placed 3-4 years prior to outbreak
  - Implants associated with clinical abnormalities

- **Colony:**
  - 5 additional carriers identified over the next 4 mths within same NHP colony

MRSA was isolated from implant sites
MRSA finding was unexpected

- Review of past animal health reports revealed no other positive MRSA cultures prior to these diagnoses
  - All animals were treated according to C&S profiles and were bathed with chlorhexidine-based shampoo

- *Staphylococcus aureus* and coagulase-negative *Staphylococcus* are commonly reported to be normal (skin) flora of NHP
  - MRSA is *not* normal flora of NHP
  - Report of MR *non*-SA infection had been reported in a research NHP colony (2008)

- Given reports of MRSA as a zoonosis
  - We needed to prevent spread in the facility
  - We wished to screen personnel
Facility Decontamination

- Multi-species vivarium
  - Rabbits, cats, swine, baboons, rodents
    - Three independent NHP colonies
    - Differing health status among animal models

- Multi-purpose vivarium
  - Surgery suites, imaging areas, research laboratories

- Multi-story vivarium
  - Common freight elevator
  - Common cage wash
  - Complex trafficking patterns
Personnel Screening Program

- Coordinated effort to obtain samples for MRSA testing from all personnel with NHP contact in the 6 months prior to the NHP cases (n=47)
  - Veterinarians: 10
  - Vet technicians: 11
  - Research staff: 16
  - Animal care staff: 8
  - IACUC staff: 2

- Participants (n=44) - representing a 93.6% compliance rate - were informed by Occupational Medicine about health issues related to MRSA and sampling overseen by Occupational Med personnel

- Established clinic for each person to self-sample by inserting a cotton-tipped swab ~1cm into each nostril
  - Anterior nares sampling is key site to test humans for colonization
  - Samples coded immediately to follow privacy laws
• Human isolate matched the predominant isolate from NHP with greater than 90% similarity

• All isolates had greater than 95% similarity with USA 100

• USA 100 is the **most common HA-MRSA** in the USA
Relevant health history of MRSA+ employee

- MRSA + employee agreed to disclosure of personal health information
  - Signed written release per Office of Human Subjects Research

- Individual had worked in LA field for almost 2 decades at time of testing
  - Routine responsibility for NHP care

- Medical history relevance:
  - No known history of documented *Staph aureus*
  - Non-insulin dependent diabetes of several years duration
  - 6-week hospitalization for operative reduction/internal fixation of complex leg fractures sustained during car accident ~3 years prior to MRSA outbreak
  - Prolonged surgical admission constituted a risk factor for MRSA carriage
• During time of treatment, employee was permitted to continue work within facility

• Re-culturing performed at Occ Med clinic
  • Employee completed 2-week decontamination protocol
  • Confirmed negative for SA approximately 1 month after diagnosis

• Low level of MRSA carriage in described outbreak (2.3%) was within expected range for MRSA carriage in human population
  • National estimates are 31.6% for carriage of *Staph aureus*, of which only a small number are MRSA, for an overall population rate for MRSA+ of ~1%

Graham, Ann Int Med 144; 318. 2006
The Challenges:

1) The Bugs!

2) The Gloves!

3) The Noise!
Personal Protective Equipment (PPE)

Protective gear offers a barrier between the laboratory animal employee and the animal environment.
SAFETY ALERT: Disposable Nitrile Gloves and Clidox Use

Last month a research associate experienced a chemical injury to his hands when working in a ULAR facility. The research associate injured his hands by repeatedly spraying his disposable nitrile gloves with a 1:18:1 dilution of Clidox-S between cage changes. Both hands were severely irritated and required treatment by Occupational Medicine.

Disposable nitrile gloves protect from accidental exposure to small quantities of chemicals. They are NOT appropriate for direct or prolonged contact with chemicals, including Clidox.

Do not spray your gloves with Clidox or any other chemical. If a splash occurs, remove the disposable nitrile gloves, wash your hands and replace the gloves.

Notify your supervisor if you will be performing a task that involves direct or prolonged hand contact with a chemical. EHRS will evaluate the task and select the appropriate glove.
OSHA General Duty Clause

Occupational Safety & Health Administration

We Can Help

OSH Act of 1970 - Table of Contents

SEC. 5. Duties

(a) Each employer --

(1) shall furnish to each of his employees employment and a place of employment which are free from recognized hazards that are causing or are likely to cause death or serious physical harm to his employees;

(2) shall comply with occupational safety and health standards promulgated under this Act.

(b) Each employee shall comply with occupational safety and health standards and all rules, regulations, and orders issued pursuant to this Act which are applicable to his own actions and conduct.

29 USC 654

OSH Act of 1970 - Table of Contents
1910.138(a)

General requirements. Employers shall select and require employees to use appropriate hand protection when employees' hands are exposed to hazards such as those from skin absorption of harmful substances; severe cuts or lacerations; severe abrasions; punctures; chemical burns; thermal burns; and harmful temperature extremes.

1910.138(b)

Selection. Employers shall base the selection of the appropriate hand protection on an evaluation of the performance characteristics of the hand protection relative to the task(s) to be performed, conditions present, duration of use, and the hazards and potential hazards identified.

[59 FR 16362, April 6, 1994]
<table>
<thead>
<tr>
<th>MONTH</th>
<th>PROJECT PROGRESS</th>
</tr>
</thead>
</table>
| Aug '10 | • Identified medical issue with UPenn employee  
| | • Contacted glove testing expert at Georgia State |
| Sept '10 | • Determined where our gloves used at UPenn are manufactured  
| | • Identification of US testing lab for permeation studies (ShowaBestGlove, GA) |
| Oct '10 | • Arrangement for shipping activated Clidox at differing dilutions to GA  
| | • Permeability testing performed on ShowaBestGloves:  
| | No degradation on 4 mil blue 6005PF and green 7705PFT gloves over a period of 2 hours in direct contact with the 1:5:1 solutions (at day 7) |
| Nov '10 | • Arrangement for shipping Clidox to BE activated at independent testing lab  
| | • Permeability testing performed on the gloves used at UPenn at 1:5:1 dilution on day of mixing and day 7 after mixing; degradation was noted at 60 min for one type and at 90 min for another type on day 0 of mixing  
| | • Arrangement to ship Clidox to BE activated to ShowaBestGloves for day 0 testing |
| Dec '10 | • Testing completed at independent testing laboratory  
| | • Testing completed at ShowaBestGlove laboratory |
| Jan '11 | • Meeting with Environmental Health and Radiation Safety to discuss progress  
| | • Meeting with Pharmacal to discuss data and MSDS language |
| Feb '11 | • Determination if overseas manufacturers do appropriate QA testing  
| | • Determination of spraying process on gloves (0.4ml-2.0ml/spray) |
| March '11 | • Finalize process description with husbandry/veterinary staff  
| | • Updates completed to Clidox MSDS language |
| Apr '11 & BEYOND | Training and updating UPenn staff on the agreed process for Clidox and gloves in facilities |
# Summary of Clidox-S Permeation Test Results on Selected Nitrile Gloves

<table>
<thead>
<tr>
<th>Material</th>
<th>Breakthrough Time (minutes)* †</th>
<th>Permeation Rate (μg/cm²-min)**</th>
<th>Cumul. Permeation (μg/cm²)***</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Actual</td>
<td>Normalized</td>
<td>European</td>
</tr>
<tr>
<td><strong>Clidox-S Solution prepared at a 1:5:1 dilution (freshly prepared)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Glove A (purple)</td>
<td>60</td>
<td>60</td>
<td>90</td>
</tr>
<tr>
<td>Gloves B (blue)</td>
<td>90</td>
<td>90</td>
<td>&gt;120</td>
</tr>
<tr>
<td><strong>Clidox-S Solution prepared at a 1:5:1 dilution (1-week old)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Glove A (purple)</td>
<td>&gt;120</td>
<td>&gt;120</td>
<td>&gt;120</td>
</tr>
<tr>
<td>Gloves B (blue)</td>
<td>&gt;120</td>
<td>&gt;120</td>
<td>&gt;120</td>
</tr>
</tbody>
</table>

- Average breakthrough time: actual – first detected chemical per analytical method; normalized – time to a permeation rate of 0.1 μg/cm²-min
- European – time to a permeation rate of 1.0 μg/cm²-min
- ** Average maximum permeation rate
- *** Average cumulative permeation over 2 hour test period
- † All tests performed for a maximum of 2 hours with a total of three replicates
VIII. SPILL, LEAK, AND DISPOSAL PROCEDURES
STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED:
CONTAIN SPILLED MATERIAL IN SUITABLE CONTAINERS OR HOLDING AREA. FLUSH
WITH PLENTY OF WATER. DISPOSE INTO TREATMENT SYSTEM IN ACCORDANCE WITH
FEDERAL, STATE, AND LOCAL LAWS.

“EMPTY” CONTAINER WARNINGS:
TRIPLE RINSE WITH WATER - DISPOSE OF IN CONFORMANCE WITH FEDERAL, STATE,
AND LOCAL REGULATIONS.

IX. PROTECTION AND PRECAUTIONS
VENTILATION:
GOOD VENTILATION TO KEEP HAZARDOUS INGREDIENTS BELOW TLV

RESPIRATORY PROTECTION:
NIOSH APPROVED ACID MIST RESPIRATOR SUITABLE FOR CHLORINE IF THERE IS A
REASONABLE POSSIBILITY OF EXPOSURE

PROTECTIVE GLOVES:
COMPATIBLE CHEMICAL RESISTANT GLOVES.
NITRILE GLOVES (4- TO 5-MIL THICKNESS) FOR USE AT THE 1:5:1 OR LESSER DILUTION
WITH A MAXIMUM SUSTAINED CONTACT TIME OF 30 MINUTES. BEYOND 30 MINUTES OF
EXPOSURE, NITRILE GLOVES SHOULD BE CHANGED TO A NEW PAIR OF SIMILAR
THICKNESS.

EYE PROTECTION:
CHEMICAL SAFETY GOGGLES OR FACESHIELD

OTHER PROTECTIVE EQUIPMENT:
APRON - SOLUTION MAY STAIN CLOTHING

PERSONAL HYGIENE:
DO NOT GET INTO EYES, ON SKIN OR CLOTHING - WASH THOROUGHLY AFTER USE
The Challenges:

1) The Bugs!
2) The Gloves!
3) The Noise!
How Loud Is Our Workplace?
Hearing Protection

- OSHA 1910.95 Occupational Noise Exposure Standard

Employees exposed to the OSHA Action Level of an 8-hour time-weighted average (TWA) of 85 dBA or higher must be enrolled in the Hearing Conservation Program.

Hearing Conservation Program requirements:
  i. Noise surveys
  ii. Audiometric testing
  iii. Noise control and/or hearing protection
  iv. Employee training

Assumption:
ALL PERSONNEL IN CAGE WASH MUST BE ENROLLED IN THE HEARING CONSERVATION PROGRAM
Noise Monitoring - Area Survey

Survey Diagram:

1. Entrance to Dirty Side
2. Tunnel Wash
3. Cage Wash
4. Door
5. Dirty Cage Storage
6. Sink

Equipment Operating at Time of Survey:

Tunnel Washer
## Noise Monitoring-Area Survey

(Quest Q-100 ® dosimeter)

<table>
<thead>
<tr>
<th>Location</th>
<th>Description</th>
<th>Average (dBA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Entrance to dirty side</td>
<td>81.0</td>
</tr>
<tr>
<td>2</td>
<td>In front of tunnel wash</td>
<td>83.0</td>
</tr>
<tr>
<td>3</td>
<td>In front of cage wash</td>
<td>78.5</td>
</tr>
<tr>
<td>4</td>
<td>Doorway</td>
<td>77.4</td>
</tr>
<tr>
<td>5</td>
<td>Cage storage area</td>
<td>79.3</td>
</tr>
<tr>
<td>6</td>
<td>In front of sink</td>
<td>78.1</td>
</tr>
<tr>
<td>7</td>
<td>Left side of room</td>
<td>77.9</td>
</tr>
<tr>
<td>8</td>
<td>Right side of room</td>
<td>80.0</td>
</tr>
</tbody>
</table>
Noise Monitoring-Personnel Survey (doseBadge ® noise dosimeter)

Table 3 – Personal Noise Dosimeter

<table>
<thead>
<tr>
<th>Name</th>
<th>Average (dBA)</th>
<th>TWA</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>93.7</td>
<td>88.4</td>
<td>Dirty side of cage wash</td>
</tr>
<tr>
<td></td>
<td>83.6</td>
<td>78.1</td>
<td>Clean side of cage wash</td>
</tr>
</tbody>
</table>

Conclusions

The US Occupational Safety and Health Administration (OSHA) Occupational Noise Exposure Standard, 29CFR1910.95, states that the Permissible Noise Exposure is 90 dBA averaged over an 8-hour workday. The Noise Standard requires that the employers administer a hearing conservation program (HCP) whenever employee exposures equal or exceed the Action Level, which is defined as an 8-hour TWA exposure of 85 dBA. Based on these results, any employee working on the dirty side of the Stemmler cage wash facility must be enrolled in the program.
Hearing protection should be worn if exposed to prolonged sounds that AVERAGE 85 decibels (85 dB) over an 8-hr day

- **Disposable “Push-Ins”**
  - Do not need to be rolled

- **Expandable Foam Ear Plugs**
  - Conforms to the shape of each person’s ear canal
  - Disposable (do not reuse)

- **Reusable Ear Plugs**
  - Different models and sizes to fit most people
  - Must be cleaned after each use

- **Ear Muffs**
  - Completely cover outer ear
  - Different models and sizes to fit most people
How does this HCP impact you?

**Question:** How often would an employee have to be exposed to an environment with noise levels in excess of the 85-decibel (dB) time weighted average (TWA) before he/she is required to be covered by the company HCP (i.e., one day, ten days, thirty days)?

**Response:** One day. The occupational noise exposure standard requires that all employees exposed to noise levels at or above 85-dB on an eight-hour time weighted average (TWA) must be included in a hearing conservation program. This includes employees who may have only occasional exposures at this level. Thus, for example, the HCP provisions would apply with respect to an engineer or other such employees who visit a facility several times a year and are exposed to TWA noise levels at or above 85 dBA, even though they may not experience any other such exposures during the year.

When enforcing the standard, OSHA reviews employer records and may perform monitoring to determine if all employees with exposures equaling or exceeding the TWA of 85 dB have been included in the HCP.
Lessons learned....

- Whether a zoonotic/chemical/physical hazard, examples demonstrate coordination efforts between:
  - Research groups
  - The animal care program
  - Environmental health and safety staff
  - Occupational health services
  - Legal and human resources representatives
  - External consultants and vendors

- Communication is critical to harmonize the occupational health and safety initiatives for the overall animal program at any institution

- **Evidence-Based Practices** should be used to obtain the scientific data necessary to guide decisions about our lab animal environments
Acknowledgements

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