Overview of Occupational Health & Safety in Laboratory Animal Medicine

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Regulatory References for Laboratory Animal Medicine

FOR 2012 ACLAM Boards

Disclaimers

- **This is not an ACLAM sanctioned presentation**
- **All information is deemed reliable and correct**
- **No warranty for accuracy (but best efforts were made in this regard!)**
- **No information presented is known to be specifically included in ACLAM Board examinations**

Government agencies - OHS

National Institute for Occupational Safety and Health	**NIOSH**
Occupational Safety and Health Administration	**OSHA**
Centers for Disease Control and Prevention	**CDC**
National Institutes of Health	**NIH**
National Animal Disease Center	**NADC**
Agricultural Research Service	**ARS**
Animal and Plant Health Inspection Service	**APHIS**

OHS **p 25-26**

The Goal

While experts remain at odds over the issue of when life begins, most agree it's sometime after **you pass ACLAM boards!**

Core Mission

- **The core mission of any occupational health and safety program is to:**
  - **Minimize risks of occupational injury and illness by controlling or eliminating hazards in the workplace**
  - **Maximize employee health through targeted delivery of preventive and wellness services, and active management of injury, disease and disability**

OHS program concepts

- An effective occupational health and safety program is based on seven concepts:
  - **Knowing the hazards**
  - **Avoiding and controlling exposures**
  - **Training and education**
  - **Rules and guidelines**
  - **Consistency**
  - **Recordkeeping and monitoring**
  - **Commitment and coordination**

***OHS* p13**

Elements of a successful Occupational Health and Safety Program for Laboratory Animal facilities includes all of the following EXCEPT?

a) Hazard identification and risk assessment
b) Training on zoonoses and allergies
c) Inclusion of nonaffiliated IACUC members in the program
d) Review of completed medical pre-employment questionnaires of potential employees by attending veterinarian
e) Use of personal protective equipment

Reference: Page 10, Occupational Health and Safety in the Care and use of Nonhuman Primates, National Research Council of the National Academies, 2003.

OHS program principal elements

- Key elements of traditional OHS programs that contribute to the control of hazards and reduction of risks:
  - **Administrative procedures**
  - **Facility design and operation**
  - **Exposure control methods**
  - **Education and training**
  - **Equipment performance**
  - **Education and training**
  - **Information management**
  - **Emergency procedures**
  - **Program evaluation**

***OHS* Ch. 6**

Three levels of control to limit occupational exposure to hazards

- **Engineering controls**
- **Administrative / Work Practice controls**
- **Personal protective equipment**

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Common engineering controls

- **Ventilated mouse cage rack with filtered supply and exhaust air vented to outside room**
- **Adequate lighting**

Common engineering controls

- Down-draft cage-changing hood
- Floor mat for those standing at hood
  - Arm rests
  - Foot rests
- Chair for personnel to remain seated

Administrative Controls

- Training and retraining
- Facility entry order
- Proper use of equipment
- Job rotation
- Pre-placement & periodic medical evaluations
- Limitation of overtime
- Provision of stretch breaks

Common engineering controls

- Cage dumping stations permit HEPA filters to capture airborne particles generated by dirty bedding disposal

Administrative Controls

- Work practices: stacking height limitations for bags of rodent chow

Additional Engineering Controls

- Air locks to separate facility zones
- Heating ventilation and air conditioning
- Cubicle spaces with individual venting
- HEPA filtered vacuum units
- Room pressure controls
  'negative <-> positive'
- Automation

Administrative Controls

- Standard operating procedures on how to lift loads properly

- Standard operating procedures for how to use cage washing equipment and appropriate PPE

Personal Protective Equipment (PPE)

Offers a barrier between the laboratory animal worker and the environment & animals

Hazard Identification & Risk Assessment

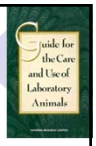
- **Biological**
- **Chemical**
- **Physical**
- **Animal bites/scratches**
- **Allergens**
- **Zoonoses**

Inherent in or intrinsic to animal use

- **Health and safety specialists should be involved in risk assessment**

Guide p14

Guide for the Care and Use of Laboratory Animals 7th Edition (1996)



- **An OHS program must be part of the overall animal care and use program**
- **An effective OHS program ensures that risks associated with experimental use of animals are reduced to acceptable levels**
- **Requires the use of "professional judgment" in application of its recommendations**

Guide p14

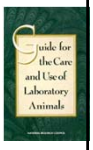
Physical Hazards

Chapter 3.

- **Bites, kicks, and scratches**
  - **Dogs>cats>rodents**
- Sharps
- Flammable materials
- Pressure vessels
- Lighting
- Electricity
- Ultraviolet radiation
- Lasers
- Ionizing radiation
- Ergonomic hazards
- Noise

Guide for the Care and Use of Laboratory Animals (1996)

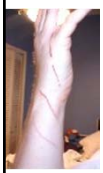
- **Key elements of an appropriate OHS Program:**



  - **Hazard ID and risk assessment**
  - **Personnel training**
  - **Personal hygiene**
  - **Facilities, procedures, and monitoring**
  - **Animal experimentation involving hazards**
  - **Personal protection (PPE)**
  - **Medical evaluations and preventive medicine**

Guide p14-18

Dog and Cat Bites



- **Bacteria**
  - Cat Scratch Fever (*Bartonella henselae*)
    - Animals: Cats and dogs, spread by cat flea
    - Humans: Blister at wound site, swollen lymph nodes, mild fever
    - Control: Minimize flea population in facility
- **Virus**
  - Rabies
    - Animals: Behavioral changes, confusion, weakness
    - Humans: Headaches, fever, invariably fatal
    - Control: Vaccination and 10-day observation post-exposure

Rodent Bites

- Rat Bite Fever (*Streptobacillus moniliformis)*
  - Animals: Inapparent disease, normal oral flora
  - Humans: Intermittent fever, muscle pain
  - Control: Antibiotics

Flammable materials

- NFPA panels (or hazard diamonds)
  - National Fire Protection Association (www.nfpa.org)
  - Posted on any area that contains hazardous chemicals
  - Pertinent to MSDS
  - Provides visual notice about risks within areas and buildings

Injury documentation

A number of actions will take place on January 1, 2002, including:

The revised 29 CFR Part 1904, entitled Recording and Reporting Occupational Injuries and Illnesses, will be in effect.

Three new recordkeeping forms will come into use:

- **OSHA Form 300, Log of Work-Related Injuries and Illnesses**

- **OSHA Form 300A, Summary of Work-Related Injuries and Illnesses**
(The 300 and 300A forms **will replace the former OSHA Form 200, Log and Summary of Occupational Injuries and Illnesses**)

- **OSHA Form 301, Injury and Illness Incident Report**
(The 301 form will replace the former OSHA Form 101, Supplementary Record of Occupational Injuries and Illnesses)

http://www.osha.gov/recordkeeping/entryfaq.html

Safety Information

- **MSDS**
  - **Common abbreviation for Material Safety Data Sheet**
  - **Short technical reports**
  - **Explains how to use, handle and store the product safely**
  - **Required by OSHA to be accessible to all employees/employers working with a hazardous material**

MATERIAL SAFETY DATA SHEET

SECTION 1 - PRODUCT IDENTIFICATION AND USE

PRODUCT IDENTIFIER ⇨ Sodium hydroxide, Caustic soda	PRODUCT IDENTIFICATION NUMBER (PIN) S-318
PRODUCT USE ⇨	
MANUFACTURER'S NAME La Bell Industries	SUPPLIER'S NAME Omega Chemicals
STREET ADDRESS 18 Rue LeJour	STREET ADDRESS P.O. Box 1989
CITY Montreal / PROVINCE Quebec	CITY Sumware / PROVINCE Ont.
POSTAL CODE H0N 0C0 / EMERGENCY TELEPHONE NO. (522) 555-4433	POSTAL CODE C1H 201 / EMERGENCY TELEPHONE NO. (416) 555-4321

SECTION 2 - HAZARDOUS INGREDIENTS

HAZARDOUS INGREDIENTS	%	CAS NUMBER	LD_{50} OF INGREDIENT (Specify species & route)	LC_{50} OF INGREDIENT (Specify species)
Sodium Hydroxide	96	1310-73-2		
Sodium Carbonate (Na_2CO_3)	0.5-2.5			
Sodium Chloride (NaCl)	0.0-2.1			
Sodium Sulphate (Na_2CO_3)	0.02-0.1			

Physical Hazards

Chapter 3.

- Bites, kicks, and scratches
  - Dogs>cats>rodents
- Sharps
- **Flammable materials**
- Pressure vessels
- Lighting
- Electricity
- **Ultraviolet radiation**
- **Lasers**
- Ionizing radiation
- Ergonomic hazards
- **Noise**

Flammable materials: Fire Classification

- **General combustible materials typically found in all animal facilities**
  - **Class A: animal bedding, paper gowns, plastic animal cages, paper towels and laboratory wipes**
  - **Class B: gases and liquid solvents for cleaning, painting, sterilizing**
    - **Classified according to their flash point**
  - **Class C: lighting wet vacuums, steam-cleaning units, equipment**
- **Items not typically found in facilities**
  - **Class D: combustible materials like magnesium, sodium, & potassium**

***OHS* p 35**

Ultraviolet Radiation (UV)

- **UV germicide lamps for sterilization**
- **UV radiation for sterilizing water**
- **UV radiation reacts with certain vaporized chlorinated solvents – produces phosgene, a potent lung irritant**

UV classification	Wavelengths	Effects	Sources
UV-A	320-400	Pigmentation of skin	Sunlight, black light
UV-B	280-320	Photokeratitis, cataracts, erythema	Sunlight, artificial sources
UV-C	100-280	Germicidal effects	Germicidal lamps

***OHS* p 37**

A low power laser that does not have enough power to injure someone accidentally, but does have enough power to cause injury if the beam is viewed for extended periods of time is classified as:

A) Class I
B) Class II
C) Class III
D) Class IV
E) Class V

Reference: National Research Council. *Occupational Health and Safety in the Care and Use of Research Animals.* 1997. National Academy Press, Washington, DC. Pages 97-98.

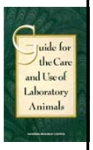
LASERs

- **Light Amplification by the Stimulated Emission of Radiation**
- **American National Standards Institute (ANSI Z-136.1 1986) classified lasers on their relative power**:
  - **Class I.** Do not emit hazardous levels of radiation
  - **Class II.** Low-power; enough to cause injury is beam viewed for extended periods
  - **Class IIIa.** Higher power; cause injury if beam concentrated with viewing device
  - **Class IIIb.** Higher power; cause injury if viewed directly
  - **Class IV.** Class III properties; can be a fire hazard

***OHS* p 37-38**

Guide for the Care and Use of Laboratory Animals (1996)

- **Key elements of an appropriate OHS Program:**



  - **Hazard ID and risk assessment**
  - **Personnel training**
  - **Personal hygiene**
  - **Facilities, procedures, and monitoring**
  - **Animal experimentation involving hazards**
  - **Personal protection (PPE)**
  - **Medical evaluations and preventive medicine**

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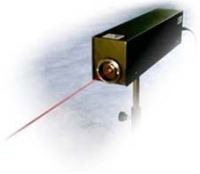


Animal Experimentation Involving Hazards

- **Animal care and housing**
- **Storage and disbursement of agents**
- **Dose preparation and administration**
- **Body-fluid and tissue handling**
- **Waste and carcass disposal**
- **Personal protection**
- **Specialized safety equipment**

- **Institutions should have written policies governing experiments with hazardous agents**

Guide p16-17

Biosafety in Microbiological and Biomedical Laboratories (BMBL) 5th Edition; 2009

- **Represents an organized attempt to develop a standard of practice from the government**
  - **CDC, NIH, other sponsoring agencies**
- **Recommendations will be advisory and will be based on two main principles of biosafety:**
  - **Containment & Risk Assessment**
- **More standardized format for agent summaries with specific guidance**
- **OSHA enforces the *BMBL***

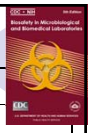
Biosafety Training

- Issue of more critical importance since September 11, 2001
- **Standard precautions should be covered:**
  - **Standard operating procedures (SOPs)**
  - **Signage (and how to interpret!)**
  - **Maintaining work spaces**
  - **Equipment usage**
  - **Sharps disposal**
  - **Biohazard waste management**

Le Duc JW, Anderson K, Bloom ME, Estep JE, Feldmann H, Geisbert JB, Geisbert TW, Hensley L, Holbrook M, Jahrling PB, Ksiazek TG, Korch G, Patterson J, Skvorak JP, Weingartl H. Framework for leadership and training of Biosafety Level 4 laboratory workers. *Emerg Infect Dis*. 2008 Nov;14(11):1685-8.

Pritt S, Hankenson FC, Wagner T, Tate M. The Basics of Animal Biosafety and Biocontainment Training. *Lab Anim (NY)*, 36(6): 31-38, 2007.

BMBL 5th Edition (2009)



Changes to BMBL	Sections
Chapter expansions	II: Biological Risk Assessment III: Principles of Biosafety V: Vertebrate Animal Biosafety Level Criteria for Vivarium Research Facilities VIII: Agent Summary Statements
New chapters	VI: Principles of Laboratory Biosecurity VII: Occupational Health and Immunoprophylaxis
Revised appendices	A, C, G, H, K, I
New appendices	B: Decontamination and Disinfection D: Agriculture Pathogen Biosafety; BSL 3 Ag Lab F: Select Agents and Toxins J: NIH Oversight of Research Involving Recombinant Biosafety Issues L: Acronyms

Adapted from Univ of Pittsburgh 2007

Containment

- **Describes safe methods, facilities & equipment for managing infectious materials in the environments where they are being handled or maintained**
- **Aims to reduce or eliminate exposure of laboratory workers, others and outside environment**
  - **Laboratory practice and technique**
  - **Safety equipment (Primary barriers & PPE)**
  - **Facility design and construction (Secondary barriers)**

BMBL p22-23

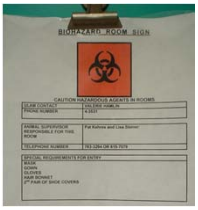
Risk Assessments

- **Represents the foundation – a code of practice for safe handling of infectious agents in microbiological and biomedical laboratories**
- **Information obtained through risk assessment provides a guide for selection of appropriate biosafety levels, safety equipment and facility safeguards to prevent laboratory-acquired infections**
- **Primary factors to consider for risk assessment:**
  - **Agent hazards**
  - **Laboratory procedures hazards**
  - **Training, technical proficiency and establishing good habits**

BMBL p 9

Animal Experimentation Involving Hazards

- Special facilities for animals infected with hazardous agents should be separated from other animal housing and support areas



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Risk Groups

- RG1 "don't drink it"
- RG2 "don't touch it"
- RG3 "don't breathe it"
- RG4 "don't do it in our state!"

Risk Group (RG) classification	NIH Guidelines 2002	World Health Organization 2004
RG 1	Agents not associated with disease in healthy humans	No or low individual or community risk
RG 2	Agents associated with human disease that is rarely serious; treatments often available	Moderate individual; low community risk
RG 3	Agents associated with serious or lethal human disease for which preventive therapies may be available	High individual risk; low community risk
RG 4	Agents likely to cause serious human disease and treatments not usually available	High individual and community risk

BMBL p10

Modified from Ben Fontes, Yale University EHS 2011

Biosafety Levels (BSL-3 Ag)

- **DESIGNATION FOR ENVIRONMENTAL PROTECTION FROM AN ECONOMIC, HIGH-RISK PATHOGEN IN A SITUATION WITH LARGE AGRICULTURAL ANIMALS WHERE THE FACILITY BARRIERS NOW SERVE AS THE PRIMARY CONTAINMENT**
- Conditions for approval to work with specific agricultural agents are provided at the time USDA/APHIS permits a location to work with an agent
- Uses containment features of a standard ABSL-3 facility as a starting point

PLUS (and not limited to):

- Personnel change and shower rooms separate from facility
- Access doors are self-closing and lockable
- All supplies and equipment enter through airlock, chamber or shower
- Double-door autoclave
- Dedicated, single pass, directional and pressure gradient ventilation systems
- Supply and exhaust air is HEPA-filtered to/from the containment space
- Decontamination of all wastes
- Airtight spaces with all containment areas

BMBL – App. D

Biosafety Levels (BSLs)

- **Biosafety Level-1**
  - Not known to consistently cause disease in healthy adults
  - Standard microbiological practices
  - No primary barriers required
  - PPE as needed
  - Within facilities: laboratory bench and sink
- **Biosafety Level-2**
  - Agents associated with human disease
  - Exposures by percutaneous injury, ingestion, mucous membranes
  - BSL -1 practice plus limited access, biohazard signage, sharps precautions
  - Biosafety manual for waste decontamination or medical surveillance policies
  - Use primary barriers: BSCs, PPE, gowns, and gloves
  - Within facilities: BSL-1 plus autoclave available

BMBL p59

Animal Biosafety Levels (ABSLs)

- **Important to follow once infected animals are introduced into the framework of biosafety levels**
- **The activities of the animals themselves can present additional hazards (allergens, aerosols, bites, scratches, pathogens)**
- **ABSL 1 –** suitable for work involving well characterized agents not known to cause disease in healthy adult humans
- **ABSL 2 –** involves practices for work with agents associated with human disease; either by ingestion, percutaneous or mucous membrane exposure
- **ABSL 3 –** involves practices suitable for work with animals infected with indigenous or exotic agents that present the potential of aerosol transmission and of causing serious or potentially lethal disease
- **ABSL 4 –** involves practices suitable for addressing dangerous or exotic agents that pose high risk of life threatening disease, aerosol transmission or related agents with unknown risk of transmission

BMBL p103

Biosafety Levels (BSLs)

- **Biosafety Level 3**
  - Agents associated with indigenous or exotic agents that may cause serious or potentially lethal disease
  - Exposure through the inhalation route
  - BSL-2 practices plus controlled access, decontamination of all waste and clothing before laundering
  - Use primary barriers: BSCs, PPE, gowns, and gloves
  - Within facilities: Physical separation from access corridors, self-cloing, double door access, exhausted non-recirculated air, negative airflow into laboratory, entry through airlock/anteroom, handwashing sink near lab exit
- **Biosafety Level 4**
  - Associated with dangerous and exotic agents that pose a high individual risk of life-threatening disease; no available vaccines or therapies exist
  - Aerosol-transmission
  - BSL-3 practices plus clothing change prior to entry, shower on exit, all material decontaminated upon facility exit
  - All lab manipulations should be performed in a Class III BSC or in a full-body, air-supplied positive-pressure suit
  - Within separate facility with dedicated airflow and decontamination systems

Select Agents

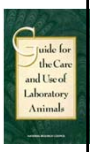
http://www.selectagents.gov/
www.absa.org

- **Pathogens with potential to pose substantial harm to human health and safety**
- **Entities using select agents must register with CDC or APHIS**
- **Attorney General has authority and responsibility to conduct electronic database checks; the FBI conducts security risk assessments**
- **Extensive overviews available through the American Biological Safety Association**

BMBL – App. F

Guide for the Care and Use of Laboratory Animals (1996)

- **Key elements of an appropriate OHS Program:**
  - **Hazard ID and risk assessment**
  - **Personnel training**
  - **Personal hygiene**
  - **Facilities, procedures, and monitoring**
  - **Animal experimentation involving hazards**
  - **Personal protection (PPE)**
  - **Medical evaluations and preventive medicine**



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PPE

Medical Evaluation & Preventive Medicine

- Health history or pre-exposure questionnaire
- Periodic medical exams for at-risk personnel
- Appropriate immunization schedule (e.g. tetanus, rabies, Hepatitis B virus)
- Screening for tuberculosis in NHP workers
- Respiratory protection
- Zoonoses surveillance

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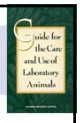
Laboratory Animal Allergy Program

- One of the most important health hazards resulting from animal contact
  - 10-44% of exposed workers develop allergic type chest, skin, or upper respiratory symptoms
  - Severe asthma in 17%; inhalation most impt route
  - Excessive loss of lung function
    - *Portengen, et al. Occup Environ Med 2003;60:870-875*
  - Increased bronchial hyperresponsiveness
    - *Renstrom, et al. Eur Respir J 1995;8:1514-1519*
  - Development of other allergies
    - Sensitization to common allergens following development of LAA
    - *Nguyen, et al. Allergy Clin Immunol 2003;111:807-812*

Personal protection



- **Personal Protective Equipment (PPE) SHOULD BE PROVIDED**
- **NHP workers should have additional PPE as needed**
  - **Goggles**
  - **Arm shields**
  - **Face shields +/- additional surgical mask**
    - **May consider using chin drape for additional splash protection**
      - **Cooper DM, Charles D, et al. Assessment of personal protective equipment used for facial mucocutaneous exposure protection in nonhuman primate areas. (Lab Anim (NY)) 34(5): 49-53, 2005**
- **Hearing protection should be used in high noise areas**

Guide p17

Animal protein allergens

- **Dander**
- **Saliva**
- **Urine**

All present in bedding and caging equipment

May be minimized or eliminated by engineering controls in animal rooms

Many of the proteins are lipocalins – similar to proteins from schistosomes (trematode parasites)

Laboratory Animal Allergy

Chapter 4.

- Important to know the specific animals and their by-products that can provoke allergic reactions
  - **Rat: *Rat n 1A; Rat n 1B* - **urine**
  - **Mouse: *Mus m 1* - **urine**
  - Cat: *Fel d 1*
  - Dog: *Can f 1*
- Use of PPE does not distinguish between those who will or will not develop symptoms; PPE can limit exposures (e.g. respirators)
- Allergies may also exist to latex, medical equipment, fungal spores, chemicals in facility

Respiratory Protection from Allergens

- **Use of particulate respirators or "air-purifying respirators"**
  - **N95 respirator mask**
  - **Rated by NIOSH to meet performance criteria**

- **Powered air-purifying respirators (PAPR) are more expensive**
- **<u>Surgical</u> <u>masks are NOT respirators</u> – do not filter small allergenic particles; mainly for splash protection**

Mice are an important source of allergen exposure for laboratory workers. Which statement regarding mouse allergens is NOT true?

A) The major mouse allergen is a urinary protein, *Mus m 1*
B) Female mice excrete 4 times as much allergen as male mice
C) Urine samples contain 100 times more allergen than serum samples
D) It is produced in the liver and saliva and excreted in the urine

Fit Testing

- **Select respirator based on hazards of workplace**
- **Fit test is required by law if employee must wear respirator mask on the job**
- **Must be fit tested with the same make, model, style, and size of respirator that will be used in the workplace**
- **Fit testing procedures (29 CFR 1910.134 Appendix A)**
  - **www.osha.gov**

Mice are an important source of allergen exposure for laboratory workers. Which statement regarding mouse allergens is NOT true?

A) The major mouse allergen is a urinary protein, *Mus m 1*
<u>B) Female mice excrete 4 times as much allergen as male mice</u>
C) Urine samples contain 100 times more allergen than serum samples
D) It is produced in the liver and saliva and excreted in the urine

Reference: *Occupational Health and Safety in the Care and Use of Research Animals*, page 55-56. ILAR 42 (1) pages 12-16

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

Noise Monitoring- Personnel Survey

(doseBadge ® noise dosimeter)

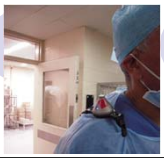


Table 3 – Personal Noise Dosimeter

Name	Average (dBA)	TWA	Location
[redacted]	93.7	88.4	Dirty side of cage wash
[redacted]	83.6	78.1	Clean side of cage wash

Conclusions

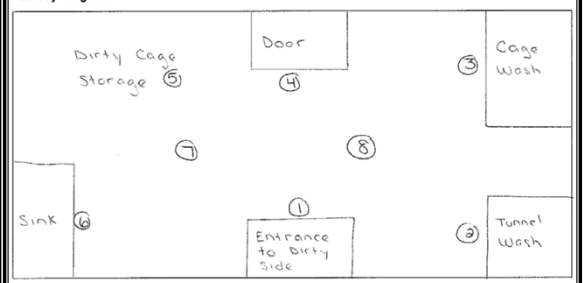
The US Occupational Safety and Health Administration (OSHA) Occupational Noise Exposure Standard, 29CFR1910.95, states that the Permissible Noise Exposure is 90 dBA averaged over an 8-hour workday. The Noise Standard requires that the employers administer a hearing conservation program (HCP) whenever 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.

**OSHA limits employee exposure to noise at 90 decibels, measured on the A scale of a standard sound-level meter at slow response (dBA) Averaged over an 8-hour work shift.

***OHS* p 41**

Noise Monitoring- Area Survey

Survey Diagram:



Equipment Operating at Time of Survey:

Tunnel Washer

Hearing Protection

Enrollment in a Hearing Conservation Program should occur 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
  - Workers with beards, sideburns or glasses may not get good protection

Slide courtesy of Karen Kelley, UPenn EHRS

Noise Monitoring- Area Survey

(Quest Q-100 ® dosimeter)

Table 2 – Area Noise Monitoring – Dirty Side

Location	Description	Average (dBA)
1	Entrance to dirty side	81.0
2	In front of tunnel wash	83.0
3	In front of cage wash	78.5
4	Doorway	77.4
5	Cage storage area	79.3
6	In front of sink	78.1
7	Left side of room	77.9
8	Right side of room	80.0

Laboratory Animal Species of Importance

PRIMARY	SECONDARY	TERTIARY
MOUSE	GUINEA PIG	OTHER RODENTS
RAT	SYRIAN HAMSTER	
	GERBIL	
RABBIT	FERRET	OTHER MAMMALS
MACAQUES	SQUIRREL MONKEY	OTHER
	BABOON	NONHUMAN
	MARMOSET/TAMARIN	PRIMATES
DOG	CAT	CHICKEN
		PIGEON
		OTHER BIRDS
PIG	SHEEP	OTHER LIVESTOCK
	GOAT	SPECIES (CATTLE,
		HORSES)
	ZEBRAFISH	OTHER FISH
	AFRICAN-CLAWED	REPTILES
	FROG	OTHER
		AMPHIBIANS
		INVERTEBRATES

Courtesy of the American College of Laboratory Animal Medicine = 'ROLE DELINEATION DOCUMENT'

Zoonoses in Laboratory Animal Sources

- Barrier-reared
- Purpose-bred
  - Class A "Breeders"
- Random-source
  - Class B "Dealers"
- Wild-caught

Increasing likelihood of serving as reservoir of zoonotic pathogens

Macacine herpesvirus 1
B Virus
Cercopithecine herpesvirus 1

- Humans:
  - Early "flu-like" signs may progress to encephalomyelitis
  - Can be fatal!
  - Issues of injury type vs. incubation
    - Incubation prior to clinical signs: 2 days – 1 month
- Control:
  - Wear personal protective equipment to cover mucosal membranes and skin
  - Vigorously clean wound – 15 minute minimum
  - Treat all macaques as if infected

Cohen, J I, et al. 2002. **Recommendations for prevention of and therapy for exposure to B virus (Cercopithecine herpesvirus 1). *Clin Infect Dis* 35:1191-203.

Zoonotic concerns in contemporary animal facilities

- *Macacine herpesvirus* 1
  - Formerly:
    Cercopithecine herpesvirus 1
    B virus
- ORF – contagious ecthyma
- Dermatophytosis
- Q Fever
- Tuberculosis (for NHP areas)

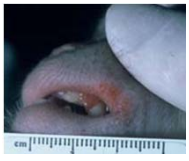
OHS program concepts –
working with NHPs in Neuroscience/Behavior Research

- Not as concerned with introduction of physical, chemical, exogenous biohazards
- Class of hazards associated with neuroscience research that warrants special attention – **ZOONOTIC DISEASE of NHPs**
  - Working with awake rhesus for studies places personnel at special risk for B virus infection.
  - All macaques, even those from sources thought to be free of B virus and that repeatedly test serologically negative to B virus, should be presumed to be naturally infected and handled with appropriate precautions
- Personnel safety may necessitate restraint of animals
  - Manual restraint should be short term with appropriate PPE worn
- Make certain personnel are fully trained in proper handling, husbandry of NHP and how to dispose of materials contaminated with animal tissue/fluids

***Guidelines-NHP* p 29, 46-7, 82**

Macacine herpesvirus 1
B Virus
Cercopithecine herpesvirus 1

- **Animals:**
  - Most significant infectious occupational health hazard in nonhuman primate research
  - Common in macaques
  - Usually asymptomatic, may cause vesiculo-ulcerative lesions
  - Active lesions not diagnostic for infection



- **Transmission:**
  - Direct exposure to monkey saliva, secretions or tissues

OHS program concepts –
working with NHPs in Neuroscience/Behavior Research

- Neuro-imaging (PET) precautions of working with NHP
- Transportation of NHP through facilities for imaging
  - Plan for emergencies (clinical, power outages)
  - Consideration given to potential for animal tissues/fluids to contaminate common areas, public corridors, etc.
- Personnel safety from gene therapy agents, neurotoxin exposure (MPTP), infectious agents, noise
- Adherence to US Drug Enforcement Agency (DEA) expectations for use of controlled drugs in NHPs
- Care when cleaning and disinfecting NHP cages

***Guidelines-NHP* p 42, 85, 95, 116**

Additional resources on *Macacine herpesvirus* 1

Chapter 3.

Chapter 2.

National Research Council. 2003. **Occupational Health and Safety in the Care and Use of Nonhuman Primates**. The National Academies Press, Washington, D.C.

National Research Council. 2003. **Guidelines for the Care and Use of Mammals in Neuroscience and Behavioral Research**. The National Academies Press, Washington, D.C.

Cohen, J I, et al. **Recommendations for prevention of and therapy for exposure to B virus (cercopithecine herpesvirus 1).** *Clin Infect Dis* 35:1191-203.

Q Fever – Select Agent registration needed

Coxiella burnetii

- **Animals:**
  - **Rickettsial agent primarily transmitted by facility sheep (also by cows, goats, dogs, cats)**
  - **Disease subclinical**
  - **Reproductive complications may be observed**
- **Transmission:**
  - **Direct contact with infected repro tissues (1° placenta/milk)**
  - **Aerosol**
  - **Tick bite**
- **Humans:**
  - **"Flu-like" illness 3 weeks after exposure**
  - **Immunocompromised at risk**
- **Control:**
  - **Prevent exposure to amniotic fluids**
  - **Antibiotics (e.g. doxycycline)**
  - **Vaccines – limited availability**

***BMBL* p 195-196**

ORF

(Contagious ecthyma)

- Animals:
  - Most commonly seen in facility sheep and goats
  - Pustular lesions on lips, gums, nostrils, teats, udders
- Transmission:
  - Direct contact with infected animals
- Humans:
  - Risk of infection is high when exposed
- Control:
  - No treatment for pustular lesions in humans
  - Vaccination can be performed with live attenuated virus

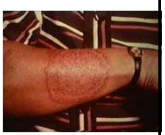
Which of these actions is recommended to reduce the risk of exposure to *Coxiella burnetii* in facilities housing sheep?

A) Extended pre-conditioning periods
B) Avoidance of mucosal exposure via use of appropriate personal protective equipment
C) Selective use of male or non-pregnant animals
D) Antibiotic treatment to reduce organism burden below 10^2 organisms per gram of tissue

Dermatophytosis

Microsporum
Epidermophyton
Trichophyton

- **Animals:**
  - **Wide host range**
  - **May see crusts and lesions in lab animals, bedding, caging**
- **Transmission:**
  - **Direct contact with infected animals**
- **Humans:**
  - **Flat, spreading, ring-shaped skin lesion**
- **Control:**
  - **Thorough cleansing with soap and water**
  - **May be self-limiting**
  - **Topical fungicide for > 1 month**



***BMBL* p 176-177**

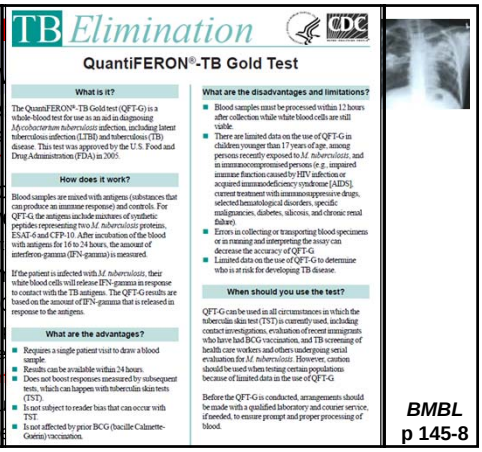
Which of these actions is recommended to reduce the risk of exposure to *Coxiella burnetii* in facilities housing sheep?

A) Extended pre-conditioning periods
B) Avoidance of mucosal exposure via use of appropriate personal protective equipment
C) Selective use of male or non-pregnant animals
D) Antibiotic treatment to reduce organism burden below 10^2 organisms per gram of tissue

References: Laboratory Animal Medicine, 2nd edition (Blue Book), Academic Press 2002, p1076. Occupational Health and Safety in the Care and Use of Research Animals, NRC1997, p.81-81. T1K7 (Sheep-S)

Tu

- **Agent:** *M*
- **Vaccine**
  - BCG
  - NOT
- **Test:** In
  derivativ
  - Man
- **Recomm**
  - No BC
    - Low
    - Unce
    - Inter
  - Mantou
  - Positiv



TB Elimination

QuantiFERON®-TB Gold Test

What is it?

The QuantiFERON®-TB Gold test (QFT-G) is a whole-blood test for use as an aid in diagnosing *Mycobacterium tuberculosis* infection, including latent tuberculous infection (LTBI) and tuberculous (TB) disease. This test was approved by the U.S. Food and Drug Administration (FDA) in 2005.

How does it work?

Blood samples are mixed with antigens (substances that can produce an immune response) and controls. For QFT-G the antigens include mixtures of synthetic peptides representing two *M. tuberculosis* proteins, ESAT-6 and CFP-10. After incubation of the blood with antigens for 16 to 24 hours, the amount of interferon-gamma (IFN-gamma) is measured.

If the patient is infected with *M. tuberculosis*, their white blood cells will release IFN-gamma in response to contact with the TB antigens. The QFT-G results are based on the amount of IFN-gamma that is released in response to the antigens.

What are the advantages?

- Requires a single patient visit to draw a blood sample.
- Results can be available within 24 hours.
- Does not boost responses measured by subsequent tests, which can happen with tuberculin skin tests (TST).
- Is not subject to reader bias that can occur with TST.
- Is not affected by prior BCG (bacille Calmette-Guerin) vaccination.

What are the disadvantages and limitations?

- Blood samples must be processed within 12 hours after collection while whole blood cells are still viable.
- There are limited data on the use of QFT-G in children younger than 17 years of age, among persons recently exposed to *M. tuberculosis*, and in immunocompromised persons (e.g., impaired immune function caused by HIV infection or acquired immunodeficiency syndrome [AIDS], current treatment with immunosuppressive drugs, selected hematological disorders, specific malignancies, diabetes, silicosis, and chronic renal failure).
- Errors in collecting or transporting blood specimens or in running and interpreting the assay can decrease the accuracy of QFT-G.
- Limited data on the use of QFT-G to determine who is at risk for developing TB disease.

When should you use the test?

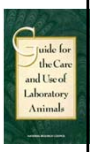
QFT-G can be used in all circumstances in which the tuberculin skin test (TST) is currently used, including contact investigations, evaluation of recent immigrants who have had BCG vaccination, and TB screening of health care workers and others undergoing serial evaluation for *M. tuberculosis*. However, caution should be used when testing certain populations because of limited data in the use of QFT-G.

Before the QFT-G is conducted, arrangements should be made with a qualified laboratory and courier service, if needed, to ensure prompt and proper processing of blood.

***BMBL* p 145-8**

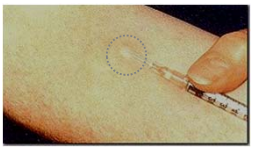
According to the *Guide…*

- "An appropriate immunization schedule should be adopted"
- "It is important to immunize…against tetanus"
- "Pre-exposure immunization should be offered to people at risk of infection or exposure to such agents as rabies or hepatitis B virus"



Overview: Mantoux skin test

- Standard test used to determine if an individual has been exposed to *Mycobacterium*
- Subcutaneous injection of PPD on the forearm
- "Read" site within 48-72 hours to determine if a reaction has occurred
- **THIS IS A SCREENING TEST, NOT A VACCINE**



According to *BMBL…*

- "Commercial vaccines should be made available…to provide protection against infectious agents to which they may be exposed"
- Advisory Committee on Immunization Practices (ACIP) provides expert advice to CDC and other federal groups on vaccine recommendations
- "Each worker's immunization history should be evaluated for completeness…at time of employment and re-evaluated when ….assigned job responsibilities with a new biohazard".

According to *OHS in Care and Use of Research Animals…*

- "Decision to immunize an employee should be made because of a clearly defined, recognized risk at the time of…health evaluations"
- Should make available the following vaccines to "clearly identified at-risk employees":
  - Hepatitis B, Rabies, Yellow fever, Poliomyelitis, Tetanus toxoid
- Recommendation for "skin testing with purified protein derivative (PPD) of previously skin-test-negative at-risk employees"

According to a recent national survey of laboratory animal workers, what percentage of alleged zoonotic disease cases WAS NOT reported to the employee's supervisor?

A) 0%
B) 10%
C) 27%
D) 36%
E) 49%

According to a recent national survey of laboratory animal workers, what percentage of alleged zoonotic disease cases <u>WAS NOT</u> reported to the employee's supervisor?

A) 0%
B) 10%
C) 27%
<u>D) 36%</u>
E) 49%

Reference: Weigler et al. 2005. A national survey of laboratory animal workers concerning occupational risks for zoonotic diseases. Comp Med 55(2):183-191.

Any questions?

"If I know the answer I'll tell you the answer, and if I don't, I'll just respond, cleverly."

"Learn to say 'I don't know.' If used when appropriate, it will be often."

-Former Defense Secretary, Donald Rumsfeld

Additional References

National Institute of Occupational Safety and Health (NIOSH) Alert: Preventing Asthma in Animal Handlers. 1998:publication No 97-116.

www.cdc.gov/niosh/animalrt.html

www.cdc.gov/niosh/homepage.html

www.cdc.gov

www.absa.org

www.osha.gov

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