



Ergonomic Program in a DoD Animal Care Facility Status of Issues and Corrective Approaches

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Ergonomic Concerns in Animal Care Operations

- **Heavy equipment and materials**
- **Increase risk of back strain and traumatic injury**
- **Repetitive operations**
 - **Potential for upper arm cumulative trauma disorders**
 - **(Example; changing of rodent cages)**
- **Persistent stress and time pressures**



Processes and Operations Reviewed

- **Cage wash facility**
 - Repetitive operations and heavy equipment
 - Other stresses - heat, noise, potential for chemical accidents
- **Equipment moving within the facility**
- **Small rodent cage changing (mice and rats)**
- **Water bottle filling and handling**
- **Care of large animals (canines and non-human primates)**



Cage Wash Facility

Repetitive operations and heavy equipment

- **Other stresses**
 - **Heat**
 - **Noise**
 - **Potential for chemical accidents**
 - **Environmental compliance issues (wastewater)**
 - **Infectious materials**
- **Critical marshaling point for all equipment**



Cage Wash Facility

Industrial process operation with high capital costs.

- **Many types of materials handled.**
- **Need for flexibility and limitations of specialized/automated equipment for small items.**
- **Lack of industrial engineering support.**
- **Space limitations.**
- **Stable workforce includes many handicapped staff**



Cage Wash Facility Problems/Concerns

- **Unnecessary and inefficient lifting compounded by lack of storage space**
 - Many items unloaded from carts onto floor level and then raised to level of input.
 - Repeat process at output (clean) side
- **Handling of small items includes awkward “pinch grips” and rotation/turn over of items (stress on wrists and arms)**
- **Dispensing of feed and bedding (manual dispensing with scoop involves rotation of wrist and entire body)**



Approach/ Corrective Measures

- **Training in lifting techniques**
- **Equipment staging and use of carts to minimize repetitive handling**
- **Lock-out/tag-out for repairs of cage wash**
- **Portable conveyors * (Must withstand sterilization)**
- **Repair conveyor outlet to prevent sticking (items trapped inside tunnel wash)**
- **Replace output rollers with longer conveyor***
- **Modify feed dispensing practices and equipment***

* Planned or in progress



Equipment Moving Within the Animal Care Facilities

- **Design limitations of many equipment items**
- **AFRRI had to weld handles on cage racks!**
- **Key role of casters in reducing rolling resistance**
- **Lack of storage space**
- **Vertical movement a problem - lack of lifting devices and conveyors**



Cleaning of Dog Runs

- **Holding heavy hose stresses hands and wrists**
- **Pronation (deviation) of wrist in handling hose and other tools**
- **Static position - awkward posture squat to reach underneath cages**
- **Handling of heavy mesh and sometimes poorly fitting fencing**



Alternatives for Handling Hose

- **Adaptation to try holding hose at better angle**
 - Mark's device
 - Reduces pronation (deviation) but, also hard to hold.
 - Does not reduce squatting.
 - Water snake angled device with long handle
- **Lighter weight hose (Will it last?)**



Cleaning of Dog Runs (continued) Protective equipment

- **Awkward, hard to don and may slip off.**
- **Face and head protected by surgical mask, face shield, surgical cap, earmuffs**
- **Add gloves, sleeves and rubber apron**
- **Trial of special helmet designed for forestry industry with hard-hat, earmuffs and face-shield attachment (Discontinued?)**

USUHS:

picture of 3 M
device

Handling of Shoe Box Rodent Cages

Mice and Rats Total 90% of Animals in Facility

- **Problems resulting from lack of storage space and materials handling equipment.**
- **High stacks of boxes cling together.**
- **Stuck by suction .**
- **Separation requires a pinch grip with excessive force and consumption**
- **Stress on hands and wrists.**

USUHS:

Picture of box stacks being "walked on the floor"



Stacking of Wet Boxes in Cage Wash (No time to dry!)

- **Tunnel Wash does not dry boxes.**
- **No space or time to air dry.**
- **Storage and handling problems.**
- **Excessive stacking.**
- **Lack storage space and equipment.**
- **Warps boxes and reduces their life-span.**



(Cost of boxes would pay for better equipment!)

Alternatives to Sticking Boxes

- **Trial of gluing tabs to side of boxes**
 - (spacer to prevent clinging)
 - Impractical for in-house effort, too many boxes
- **Vendors consulted.**
 - Question: Could box mold be changed to create air gap between boxes?
 - Answer: Maybe but change in mold would cost \$100K to \$200K
 - (Idea to be considered when new molds fabricated).



Other Alternatives to Sticking Boxes and Excessive Reaching

- Storage and handling carts with more shelves?
- Self leveling (*lowerator*) cart?
- Improved processing in tunnel wash
(Infeasible to modify drying unit)
- Insufficient time for boxes to dry leaving tunnel wash
- Longer conveyor (space problem   folding conveyor)*
- Low pressure compressed air drying of boxes*

* Under consideration.



Space remains a problem!



Shoe Box Retrieval from Tunnel Wash and Addition of Bedding

- **Position near output increases heat stress**
- **Rotation of hand, wrist and entire body in adding bedding.**
- **Rotation of wrist and arm in turning over boxes**



Shoe Box Retrieval from Tunnel Wash and Addition of Bedding

- **Repair device at output end (bent).**
- **Automatic bedding dispenser? Unit clogged and faced other technical problems (removed).**
- ***Alternative dispensing methods still need evaluation.***

Changing of Mouse and Rat Cages

Repetitive movement, some involving pinch grips (separation of cages) and rotation of hands and wrists* (Pelkonen, 1993)

2760 times/day	Lifting hand movements when moving mice
368 times/day	Lifting cage (dirty and clean)
184 times/day	Add bedding to cage
184 times/day	Empty dirty cage
184 times/day	Filling covers with feed
184 times/day	Filling water bottles
184 times/day	Emptying used water bottles

Reduction of Repetitive Stress in Changing Rodent Cages

- **Comparison of work habits and methods to reduce problems.**
 - *Minor changes, such as position of labels on end of cages and pushing cages on side (rather than pinch grip) reduce but do not eliminate stress. Ongoing work needed*
- **Reduce boxes clinging together (in Cage Wash)**
- **Alternative carts for handling shoe box cages.**
- **Angled device for holding water bottles**
(Improve angle of access and reduce wrist bending)



Input of Dirty Materials into Tunnel Washer

- **Unnecessary and inefficient repetitive lifting**
- **Many items unloaded from carts onto floor and then raised to level of input.**
- **Problems compounded by lack of storage space.**
- **Flexible (folding) conveyor belts being considered.**
- **Rigid, but wheel mounted conveyors being considered.**



Handling of Water Bottles

- **Racks of glass water bottles weigh up to 55 pounds.**
- **Lifting to varied heights creates stresses exceeding recommended guidelines.**
- **Dumping of waste bottles in Cage Wash also creates an ergonomic issue**
- **Interim designation of handling in filling station as a two-person job.**



Reducing Weight of Water Bottles

Material	Full	Empty
Glass	50 lb.	24.7 lb.
Plastic	43.0 lb.	11.7 lb.



Water Bottle Handling

- **Unsuccessful use of lift table (it rusted)**
- **Plastic bottles substituted.**
 - 7 to 13 lb weight change
- **Racks holding twelve (versus twenty four) bottles being investigated**
- **New bottle filling station includes conveyor to reduce lifting.**
- **Allocation for new unit includes ergonomics.**
- **Dumping station in Cage Wash includes table**



Space Limitations in Bottle-Filling Rooms



Processes and Operations Reviewed

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Approach to Ergonomic Program

- **Initial evaluation**
- **Detailed survey describing operations**
- **Report to management and staff**
- **Staff training**
- **Identify alternative equipment**
- **Involve staff and management**
- **Never give up!**



























