

Application of Ergonomics to animal facility operations

Ergonomic solutions can have a positive impact on morale, productivity, and retention. **Why wait?**

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Those involved in direct animal care are modern day athletes. They perform all sorts of athletic moves, compete in games lasting eight hours per day, and often go into overtime. The season runs 52 weeks per year with no three month reprieve. They participate both as teams and individually, some with careers exceeding 30 years. How do we keep these athletes motivated, healthy, and capable of performing the work? One way is to provide them with an ergonomically sound playing field.

Ergonomics has been a hot topic for at least the past twenty years, yet its scope can still confuse and confound. The definition seems straightforward enough: "The study of how a worker performs work." The concept has been effectively distilled into a "blinding flash of common sense backed by science," usually precipitated by someone saying "this job is hard," "this doesn't feel good," or "I really don't like using this tool." Even with these easy to understand descriptions, incorporating ergonomics remains an elusive target. Our goal here is to dispel a few myths associated with implementing ergonomic solutions and provide guidance and insight into developing solutions based on needs and resources. This article is written from the perspective of rodent-oriented facilities and, while the care of larger animals in many cases may be dissimilar, in a general sense many of the concepts and principles presented can be applied universally.

On **Offense**, ergonomic improvements aim to enhance optimal performance in the first place. This can include anything from changing an employee's task assignments to adding automation to replace manual

work. On **Defense**, strategies aim to correct or modify procedures to lessen the impact of repetitive motion activities. Buying new tools with ergonomic handles or adding cushioned floor mats represent other moves for the **Defense**.

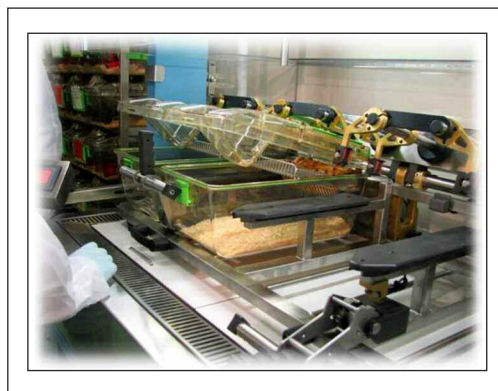


Figure 1: Cage change within a laminar flow environment is made ergonomically "more friendly" with automated cage lid removal and replacement.

Basic Considerations

The "pay now or pay later" axiom applies to implementation of ergonomics. Macroergonomics involve big picture issues such as facility traffic patterns to reduce walking distances or automation to replace highly repetitive manual tasks. Because they are more global, macroergonomic improvements cost more up front but afford a greater savings over the life of the facility. Microergonomics involve issues at the granular level such as ergonomically correct tool handles. In the facility design stages, improvements at the macroergonomic level are often deemed too expensive and are often at risk of being "value engineered" out of a project. However, if the costs of musculoskeletal disorders (MSD) were used in calculating a real cost/benefit, such improvements might not be seen as expensive—

Ergonomics

allowing for more technology and innovation to be incorporated into animal facilities. Ultimately, though, solutions to improve worker comfort in the resulting facility must be considered at the microergonomic level. At this point, these improvements may have been triggered by decreased productivity or even injuries.

Ideally, all of our facilities would be fully automated and repetitive motion tasks would not be required of anyone. Unfortunately, we live in the real world with financial constraints. Fortunately, though, ergonomics is not an “all or nothing” venture. In evaluating opportunities for ergonomic improvements, several measures of economic impact should be considered.

Baby Steps: Small steps can make a big impact on worker comfort. In evaluating a task, consider whether a simple, inexpensive option might be effective enough to adequately reduce an ergonomic risk. Before investing in an automated feed dispensing system, consider a \$5 feed scoop with an ergonomically correct handle. Even if new scoops are purchased for the entire staff, it results in an inexpensive elimination of some repetitive wrist flexions which can lead to carpal tunnel injury.

Productivity: An uncomfortable worker costs time and supplies. The worker using the old feed scoop will work slower to accommodate wrist pain; their processing quota may not be met. Because of pain or immobility, the scooping action may be affected so that the feed pellets don't always make the cage. Processing delays from slowed production and waste from spillage can add up, particularly in a high throughput area. Working with an ergonomically correct tool enhancing the employee's comfort will allow a return to acceptable productivity.

Injury prevention: According to 2007 data from the U.S. Bureau of Labor Statistics, musculoskeletal disorders (MSD) accounted for 29% of all workplace injuries requiring time away from work.¹ These 335,390 MSD injuries required a median of nine days recovery out of the workplace. This is two days more than the median for all workplace injury cases.¹ According to a comprehensive NIOSH study, there is “strong evidence of an association between MSDs and certain work-related physical factors...”² It is a well know fact that worker injuries are expensive. Not only can they involve worker compensation costs, missed work and decreased productivity, but they add workload burdens to other employees.

Regulatory compliance: We often overlook the issue of regulatory compliance in ergonomic evaluations. Daily animal observations, a re-

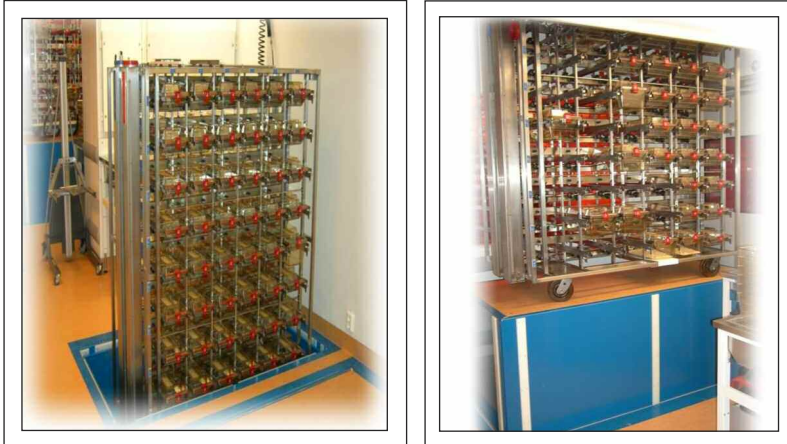


Figure 2: Racks with cages are presented to change staff via an automated conveyer system that includes adjustable elevation, limiting much bending and other ergonomically costly movement.

quirement of the Guide,³ may be inadequately accomplished if reaching for high cages and/or stooping and bending for low cages cause pain. Cage sanitation may be subpar if the tools involved present physical challenges to the users.

Employee satisfaction: An employee who is able to work comfortably will have a higher level of job satisfaction than one who must deal with physical difficulties

related to their work environment. A disgruntled employee can be very expensive in terms of reduced productivity, poor morale, adverse influence on team mates, and missed work.

The bottom line: A balance must be struck between doing nothing which can be expensive and doing too much which may be wasteful. Teamwork thrives in an environment where employees are satisfied with their work environment. That's not to say that ergonomics is a panacea for all workplace ills; however, physical discomfort is a well known cause of job dissatisfaction. Reducing costs associated with injuries and discomfort frees up funds that can be used for other things. Most importantly, animal care is at its best when performed by employees who are able to observe and manipulate them comfortably and free of physical pain. An employee working comfortably is able to focus on the animals' well being rather than spending mental and physical energy figuring out an easier way to do things.

Front-End Options

Room layouts, corridor widths, floor textures and slopes, traffic patterns, robotics, and other forms of automation can be incorporated at the design phase, eliminating particular repetitive tasks from the start. The end user should be involved in the process of determining which solutions will give the biggest return on investment.

Each year ergonomic solutions are presented on tradeshow floors. To date, most have centered on washroom tasks, particularly water bottle processing. However, solutions for animal room tasks are starting to appear. A cage change device has been developed which lifts the cage top to allow movement of animals, then lowers the lid (Figure 1). This device doesn't eliminate all manual processing, but it does eliminate wrist twists associated with manipulation of the cage top. If an animal caretaker processes even as few as 100 cages per day, that's 200 wrist twists or more in a single day—more than 1,000 per week!

A large European facility has taken ergonomic facility design to new heights—literally. Rodent housing rooms are laid out with specific cage change areas near a conveyor system (Figure 2). The person doing the cage change sits in a chair on an elevated platform. All cage equipment is presented at the correct working height using floating floors. Clean and soiled caging is delivered from and to the washroom via the conveyors. In this setup, virtually all reaching, bending, and stooping is eliminated.

While the conveyor and floating floor designs are highly ergonomically correct, could it be too much? Most design phase conversations center on how to get the biggest bang for the buck. With limited construction budgets, highly technical and space intensive designs like these may not be given consideration.

Radiofrequency identification (RFID) is gaining in popularity to track animal populations and inventory equipment. This technology dramatically reduces repetitive tasks associated with cage card inventory checks. This technology, however, can be cost prohibitive to implement and needs to be effectively presented to those funding the construction on the basis of lifetime operational savings (sometimes a daunting task).

Animal Observation Considerations

Daily animal observation itself presents ergonomic challenges: reaching to see cages in high rows and stooping to observe those in low rows. A large facility in Europe has developed a system of rack-mounted cameras aligned with each cage row (Figure 3). A computer associated with the camera displays the view from each camera. The caretaker no longer must reach, bend, and stoop, etc., to see all cages. An added bonus is that images captured by the camera can be sent to veterinary staff, researchers, or even



Figure 3: Rack-mounted closed circuit video cameras permit remote monitoring of animal activities within cages.

to an animal health record. The equipment is not sophisticated and is readily available at most electronics stores. For a small facility with few racks, this could be a cost effective solution. For a large facility, with hundreds of racks, however, it could be cost prohibitive.

With the advent of automated animal drinking water and ventilated cages, the cage change intervals are much longer than they used to be. With the longer intervals, our staff, rather

than alleviated of some cage changing duties, may be responsible for as many as twice the number of cages as before. We now expect an individual to be responsible for up to 1,500 cages changed once in two weeks, but observed daily. According to the *Guide for the Care and Use of Laboratory Animals* (the Guide),³ “[a]ll animals should be observed for signs of illness, injury, or abnormal behavior...” and that “[a]s a rule, this should occur daily...” To remain in compliance, a technician may need to observe up to 1500 cages daily. This is in addition to routine cage changes, other spot changes, room custodial activities, researcher support duties, and any other tasks.

As far as direct animal impact, the method of observation has the largest potential for negative effects. Animals can be observed actively by pulling each cage out to see the animals, but this involves repeated reaching, bending, twisting, wrist twists, and other repetitive, often awkward, motions. The act of moving cages can be noisy and intrusive, potentially altering behavior and physiology. Labor intensive tasks can translate to higher per diem rates. Stress related to disruption of the animals’ tranquility and sleep cycles can result in a cost to science when daily observations are vigorous and intrusive. Conversely, observation can be accomplished passively by simply looking into each cage from the front as it sits on the rack. This method may be better for the animals, but are they really being seen—especially those on top and bottom rows?

The Guide goes on to say that “[p]rofessional judgment should be used to ensure that the frequency and character of observation minimize risks to individual animals.” By definition, “observe” means to “inspect” or “take note” which is essentially passive. It does not include anything about interventional involvement. The Guide also states that animal housing should “allow for the observation of animals with minimum disturbance of them.” Does active observation violate the spirit of the Guide?

Regardless of how observation is accomplished, ergonomic risks exist for the animal care worker. With active methods, there are reaching, bending, stooping, wrist twists, and other repetitive motions. The passive method eliminates the wrist twist and some repetitive shoulder motions; however, the reaching, bending, and stooping remain. To lessen the impact of repetitive motions, staff should be encouraged to stop at regular intervals for stretch breaks. Staff rotation through different task types might be a solution to minimize the effects of repetitive motion tasks. However because of the potential for animal stress and differences in how different people perform the same tasks, research staff often frown upon a lack of consistent animal care personnel.

Research Staff Considerations

The facility design at times may not accommodate the needs of research staff. Materials management needs can overshadow the needs of pedestrian traffic. At a typical vivarium cost of around \$700/sq.ft., adequate storage and staging space is a luxury most facilities cannot afford. But can we afford not to accommodate researcher needs?

Cage accessibility: As cage capacities of racks increase, animal holding room space generally does not increase, presenting challenges. More cages often result in more people accessing the room.⁴ Rooms crowded with racks, cage change stations, and carts with additional supplies present a multitude of ergonomic issues for both animal care and research staff. Aisle space between racks is often the first casualty of increasing populations as additional racks are squeezed into any “extra” space. Reaching and stooping, which are problematic even in wide aisle spaces, can become physically impossible in tight aisles. To work in tight spaces, racks must be moved. A fully loaded ventilated cage rack can weigh in excess of a half ton! Modifications such as handles, larger wheels, and a lowered center of gravity can make these large pieces of equipment more ergonomically friendly. Stepstools for reaching high rows are a good way to prevent injuries associated with repetitive overhead reaching, but they present a slip/fall hazard. A better solution may be to provide a step ladder with rails.

Communication: Ideally, researchers should be aware of cage change schedules to reduce the number of just-changed cages being returned to the washroom. For example, if a researcher schedules a study to be terminated on an afternoon and those cages are scheduled to be changed out that morning, the cage change-out may be prevented, thus reducing the associated effort and costs.

Provisions for research: Normally, facilities include procedure space. Minimally, though, ice machines, paper/pens, and other supplies can be readily available in the facility to reduce the need for travel to/from laboratories. Supplies of clean cages and components should be near animal housing and procedure rooms to minimize travel to retrieve them. This convenience benefits both animal care staff and research staff who need the equipment for weaning new litters, separating groups, spot changes, etc.

Personal needs: Restrooms, drinking fountains, and break areas are often dedicated to animal care staff. Research staff sometimes must spend extended periods of time in the facility and therefore could benefit from access to these areas, reducing travel—a time and effort sink.

MBA: “Management By Attention”

The best way to know how things are going is by having an MBA attitude—not the schoolwork kind, but “Management By Attention,” keeping a finger on the pulse of the facility. The farther up the organizational ladder one ascends, the more distance between management and product. Ultimately, our product is animal care. Managers often conceive of procedures that, when put into practice, aren’t always effective. If a procedure is uncomfortable, workers will find ways to modify it (not uncommonly with unintended consequences)—or worse—won’t do the task at all. It is important to periodically evaluate policies and procedures to determine how things are really getting done. Most facility leadership is well known to the staff, which is a good thing, but it makes an “Undercover Boss” style impossible. An evaluation of procedures and equip-

ment by a qualified individual is an excellent way to identify improvements to worker comfort and accessibility. An MBA style manager stays aware of employee activities and is able to coach and counsel on the spot. This may best be accomplished by occasionally having managers actually perform the tasks for a whole day.

Worker involvement is the key to a successful improvement plan. Those who routinely perform the tasks often have great ideas of how to do things better—managers just need to listen to them. In some cases, workers may be timid and assume that management has worked everything out—these workers need to be actively engaged. Empowerment of the workforce is beneficial on many levels. Staff who feel at ease bringing concerns to leadership are obviously more inclined to do so. Learning about problematic procedures early can avoid the health and economic consequences of repetitive motion and other ergonomically incorrect work practices. Employee involvement in the evaluation, creation, and implementation of ergonomic solutions increases the probability that the new procedures will be followed over time.

Even though the benefits of staff buy-in are great, it is not always easy to achieve. Many times, the most vocal staff members are the most resistant to the implementation of new procedures. The challenge to management is to lead the staff in such a way that they recognize their own vested interest in the solutions.

Ergonomics and Human Resources

Even in the best circumstances, animal care is a difficult job, not unlike athletes playing a physically demanding game. During an initial interview of a prospective employee, questions that would likely elicit information about a person’s disability are clearly a violation of the Americans with Disabilities Act of 1990 (ADA). According to the U.S. Equal Employment Opportunity Commission’s (EEOC) position on preemployment screening of candidates, however, an employer may describe the physical requirements of the position and ask if the applicant is able to satisfy these requirements. The applicant may also be asked to demonstrate how s/he would perform the tasks.⁵

It is important to realize that workers are very adept at accomplishing physically demanding tasks in spite of outward appearances to the contrary. Reasonable accommodations must be made to enable an otherwise qualified candidate to perform the essential functions of a job, unless they would create undue hardship.⁶ A complete redesign and retrofit of a washroom to accommodate a wheelchair bound employee would represent an undue hardship for the employer. However, installation of a small raised platform allowing the employee to be at the appropriate height for accessing existing equipment would be a reasonable expense assuming the employee could perform the function at the raised height. If you think reasonable accommodations are expensive, they are cheap compared to lost productivity and medical costs associated with a worker’s compensation claim. More importantly, implementation of reasonable accommodations shows a real commitment to providing a healthy work environment.

In typical staffing needs calculations, the obvious variables are usually included like legitimate leave time, e.g., vacation, sick time, holidays, etc. A thorough evaluation of missed time due to on-the-job injuries should also be included. Costs for overtime and lost productivity when staff are out for extended periods can run high. Ergonomic improvements that reduce time-lost injuries can save a considerable amount of money, not to mention protecting employees from unnecessary harm.

Final Thoughts

Ergonomic improvements on the animal care “playing field” are not an “all or nothing” venture. Small changes can have large and lasting positive impact on worker comfort, morale, retention, and productivity. Each of us has a responsibility to ensure a safe workplace. The trick is to find that perfect balance between Offense and Defense. Let the games begin!

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