Ergonomics Guidelines for Laboratories

Employees that work in a laboratory setting may be exposed to ergonomics-related hazards such as awkward and/or static postures while sitting or standing for extended periods of time, repetitive movements, forceful exertion, bending and crouching, vibration, contact stress, and other factors. Such hazards from computer workstations are discussed in Ergonomics Guidelines for Computer Workstations. Per OSHA, exposure to ergonomics hazards may lead to muscle fatigue, discomfort, and work-related musculoskeletal disorders (MSDs) including carpel tunnel syndrome, tendonitis, tenosynovitis, muscle strain, and back pain. These guidelines may assist employees in reducing such injuries, while maintaining comfort and efficacy at the required laboratory work.

Definitions

Awkward Posture – Non-neutral positions for the body or body parts including torso/back bending (backward, forward, to the side), arm or leg extending (straight away from the body, any direction), neck turned (upward, downward, or to the side), and wrist bending (to the side)
Contact Stress – Points of contact, such as work surfaces or objects, that are hard, sharp, or confining in such a way as to cause pain from increased pressure to sensitive areas such as your finger, wrist, elbow, or other part of the body
Forceful Exertion – Strong muscle activity such gripping, pinching, pressing (finger and/or thumb), and manipulating heavy objects (through lifting, pushing, moving, etc.)
Repetitive Movements – Similar motions or actions done on a continual basis without adequate rest breaks or variety in activity during the work shift
Static Posture – position or alignment for the body maintained for extended period of time, such as standing, sitting, or kneeling.

General Guidelines

Body Position/Seating

General

- Keep shoulders relaxed and elbows at side

Sitting

- Be aware of posture
- Keep space clear for knees below bench
- Situate body so that lab bench is just below the elbows
- Sit upright in seat, with back against the back support
- Tilt chair forward or use seat wedge to avoid jutting chin forward to work closely while seated
- Use footrest or support to position knees at 90-degree angle; also use footrest, if feet do not reach the floor while seated or adjust the sit lower

- Arms should be parallel to the floor and legs should fit comfortably under the table
- Keep shoulders, arms, and hands relaxed and elbows close to the sides while working

Standing

- Keep floor clear of debris or objects
- Shift weight often enough to avoid back and foot strain
- Stand directly in front of surface or equipment, and as close to the work surface or equipment as safely possible

Clothing/Jewelry

- Avoid clothing/jewelry that is bulky, loose, or ill-fitting that can easily get caught on furniture/equipment, or otherwise causes an injury
- Wear comfortable, supportive shoes (shoes should be closed-toe within the laboratory).

Scheduling

Rest

- Avoid long hours
- Minimize the amount of time spent on specific task
- Stretch, improve blood circulation
- Take regular rest breaks to avoid strain on eyes, hands, and muscles

Substitution

- Rotate work duties
- Vary activity/tasks

Workspace

Setup

- Adjust height of work surface to just below the elbows, if possible
- Adjust placement and position of your work area
    - This includes surfaces such as laboratory bench, desktop, or ventilation hood/cabinet; seat adjustment (chair, stool); and the placement of your seat in front of the work surface
- Design space with maximum body clearance to avoid accidental strikes and minimum reach for equipment and other items to reduce strain
- Place items on bench within reach, in a semicircular arrangement
- Place seat in an upright, supported position to avoid leaning, awkward bending or turning; where possible, adjust work surfaces to avoid bending
- Provide ergonomic, adjustable computer workstations for sitting and standing
- Provide support for arms, wrists, neck, back, legs, and feet; add padding to work surfaces
- Provide supportive comfortable chairs that include footrests and ensure that there is knee clearance under the lab table

- Select the right tools for the work/experiment to reduce repetitive movements and reduce other unnecessary hazards such as heat or vibration
- Use anti-fatigue, cushioned floor mat for standing
- Use trays to keep items organized, contained, and close by
- Work at a bench cut out; cut outs can help workers get close to their work while sitting against the back of their chair

Environmental Conditions

- Adjust temperature and humidity in work area to increase comfort
- Practice good housekeeping (remove debris, dispose waste, reduce hazards)
- Use adequate light to avoid floor obstructions, to use the work surface and equipment clearly, and to reduce eye strain

Equipment/Techniques

- Alternate your grip on items like forceps
- Equipment should be the right size for your hand
- For precision work, the work surface can be adjusted higher to provide support and reduce bending and hunching
- Keep equipment clean and well-maintained to avoid injuries or strain from use
- Provide ergonomic microscopes and pipettes; separate supports may be needed for the arms when working with microscopes
- Provide handling devices to move and lift full carboys (containers)
- Store heavy items on lower shelves
- Use light pressure when performing tasks involving hands to use your equipment (e.g. pipettes)
- Use appropriate personal protective equipment (PPE) to avoid injury
- Use bottle dispensers and bottom dispensing carboys for dispensing liquids
- Use equipment with ergonomic design (e.g. rubber grips) to protect hands
- Use utility carts to move bulky or large amounts of items at once
- Use electronic, automated, or light touch model equipment when possible

Specific Guidelines for Laboratory Equipment Use

Centrifuge

Practice the following duties to reduce hazards:

- Ensure balanced centrifuge to avoid unnecessary vibration and damage
- Plastic vials with fewer threads may help reduce twisting motions during capping and uncapping

For heavy equipment:

- Have a second person to assist with lifting and removing the rotors whenever possible
- Use a cart to transport rotors

Cryostat

Practice the following duties to reduce hazards:

- Apply padding to the edge of the cryostat to reduce contact stress
- Avoid placing utensils (e.g. forceps) inside of the cryostat
    - Forceps should be placed outside of cryostat when not being used; this will keep the utensils at room temperature and reduce cold exposure to the hands
- Limit prolonged use and take breaks
- Use adjustable chair or stool with footrest at cryostat
- When purchasing new equipment, consider an automatic, foot-operated cryostat

Flow Cytometer

Practice the following duties to reduce hazards:

- Limit prolonged use and take breaks
- Raise the flow cytometer to minimize extended reaching and neck bending during specimen processing
- Use adjustable chair or stool with footrest

Fume Hoods/BSCs

Working in chemical fume hoods and biological safety cabinets (BSCs) requires employees to assume a variety of awkward postures due to limited work access, which restrict arm movement, and therefore significantly increase strain on the body. Practice the following duties to reduce hazards:

- Avoid contact pressure (forearm and wrists in contact with sharp edges); foam padding may be used on the front sharp edge of the unit
- Keep arms relaxed and by the sides; back, shoulders and neck should be upright and neutral in position
- Keep the sash clean and free of glare so that you can see without tilting your neck or assuming an awkward position; use diffused lighting to limit glare
- Keep the work area clean and free of clutter
    - Keep what you are working on directly in front of you, with frequently accessed items within forearm length and lesser-used items at arm's length; remove unnecessary supplies
- Maintain hood sash cleanliness and internal lights functional to avoid eye strain
- Perform all work six inches inside the hood
- Strive to keep wrists straight and neutral while working
- Take breaks
- Use an anti-fatigue floor mat if you will be standing for long periods of time while working in hoods/BSCs
- Use chair with adjustable height and back support, or stool with footrest
- Use low-profile tubes, containers, and receptacles to avoid bending and twisting of the wrists, neck, and rolled shoulders

Glovebox

Working in gloveboxes or anaerobic chambers puts stress on arms and shoulders. Extending the arms for more than a couple of minutes can become very exhausting. In addition to static loading and frequent side reaching, the thick gloves also make the user overcompensate on grip strength. Practice the following duties to reduce hazards:

- Move all materials to be used for the experiment from the side chamber to the main chamber at one time to reduce the amount of side reaching
- Provide anti-fatigue mats for extended use of glovebox
- Take breaks
- Use highly absorbent hand powder for glove comfort

Microscope

Practice the following duties to reduce hazards:

- Arms should be supported and relaxed while using the microscope with the elbows close to the sides, use pads for arm support, if available; wrists should be in a neutral position while making eyepiece adjustments
- Avoid eye strain by using the 20/20/20 rule: every 20 minutes, shift your focus to an object 20 feet away for at least 20 seconds
- Bring the microscope as close to you as necessary to avoid body strain
- Ensure that you can view the microscope eyepiece while sitting or standing in an upright position
    - This will include the shoulders, back, and neck; this may be done by adjusting the chair, if applicable, the work surface where the microscope sits, and/or the eyepiece
- Keep the microscopes properly maintained for easier use and to avoid eye strain
- Use a 30-degree angle stand or extendable eye tube as an aid in adjustment
- Use adjustable chair or stool with footrest
- Use television systems to eliminate the use of binocular eyepieces when appropriate Vary tasks and take breaks

Microtomes

Manual rotary microtome use in histology laboratories requires performing many repetitive functions. Turning the microtome wheel also requires forceful exertion. Other repetitive microtome-related functions such as replacement of specimens and use of trimming wheel. Practice the following duties to reduce hazards:

- Adjust the feed wheel position to reduce stress
- Avoid contact pressure (forearm and wrists in contact with sharp edges); foam padding or padded arm supports may be used to reduce sharp edges
- Ensure that the microtome can be operated in an upright position with back, shoulders, and neck in neutral positions
- Keep arms close to the sides
- Operate equipment with the hand in a handshake grip position (wrist aligned with forearm)
- Place the microtome at the appropriate height for work

- Purchase an automatic microtome to replace manual unit
- Rotate tasks and take frequent short breaks
- Use a foot pedal instead of the hand-operated wheel
- Use as little force as possible when turning the handwheel; when possible, replace manual rotary microtomes with automatic ones, especially for high-intensity work
- Use chair with adjustable height and back support, or stool with footrest
- Use motorized cutting

Pipetting

Practice the following duties to reduce hazards:

- Alternate activities or make schedule adjustments to avoid prolonged work; rotate pipetting duties with other employees
- Avoid overextending the thumb and adjust the grip position, if necessary
- Avoid working with winged elbows/arms; keep arms relaxed and elbows close to the body
- Ensure that your work surface is at the appropriate height
- Keep head and shoulders in an upright, neutral position
- Keep work in front of the body to minimize twisting and awkward reaching, and keep work supplies such as trays and beakers should be placed within easy reach, with no obstructions to their access
- Keep wrist straight and in neutral position; reposition the body, plate, or pipette to do so
- Rotate use of left and right hands to pipet
- Use ergonomic equipment
    - Purchase an electronic, light-touch, or a latch-mode pipette to replace manual plunger-operated pipettes; use of electronic pipettes, multichannel pipettors, or automated processes are helpful for repetitive, prolonged, or forceful use
    - Use multiple finger (as opposed to thumb-only) pipette design
    - Use shorter pipettors and pipette tips or such items that require less finger or thumb effort (good-fitting) and thin-walled pipette tips; use such tips that press lightly to attach and are easy to eject
- Use low profile waste receptacles for waste tips and keep them as close as necessary to do work; these should be no higher than the top of the tubes being filled
- Use the lightest touch possible while pipetting and changing tips
- Try alternating hands or using both hands to pipet
- Use low profile tubes, containers, and receptacles to avoid bending and twisting of the wrists, neck and rolled shoulders
- Use adjustable chair or stool with footrest
- Vary activities and take breaks (recommended break for every 20 minutes of pipetting)

Test Tube Handling

Practice the following duties to reduce hazards:

- Avoid reaching upward or stooping low
- Maintain straight wrists
- Use cap removers to avoid untwisting by hand (pinch gripping)
- Use pads for arm support on surfaces
- Use vortex mixer rack instead of holding tubes by hand
- Work with elbows close to body

Resources

For questions involving the ergonomics of your laboratory workspace, contact EHS at (410) 704-2949 or safety@towson.edu. You may also browse the hyperlink below.

https://www.osha.gov/ergonomics