Ergonomics in the Lab Fact Sheet

There are many job tasks performed in the research laboratories posing ergonomic risks, such as musculoskeletal disorders. Usually repetitive motions, excessive reaching, heavy lifting, static and awkward postures are the major ergonomic issues in laboratory settings. Use of some research equipment may contribute to such risks as well, including, but not limited to: pipettes, microscopes, microtomes, centrifuges, flow cytometers, cryostats, fume hoods, biosafety cabinets and computer workstations. The following tips may help to mitigate laboratory ergonomic risk factors and may also help to improve comfort, productivity, and job satisfaction.

General Tips for Common Ergonomic Risks in Labs:
Three normal curves of the spine (see picture on the right) should be maintained as much as possible, especially when maintaining static postures, bending and lifting. There are also some general tips listed below:

1. Prolonged Standing:
   - Comfortable shoes such as sneakers with good support and cushioning and anti-fatigue mats (picture below on the left) are recommended. Resting one foot on a small platform or box while standing, then shifting to the other foot, can help to relieve lower back strain.

2. Prolonged Sitting:
   - A highly adjustable chair or stool is recommended. Sit against the back of your chair. You may lower the chair, adjust the foot ring, or get a footrest if your feet dangle, so that your feet are supported as well.
   - If your stool lacks back support, you can tilt the seat forward or use a seat wedge to position the back and the pelvis in a more natural posture.

3. Housekeeping and Organization for Work:
   - Keep frequently used items within close reach. It is recommended to keep frequently used items within arm’s reach away. Items you are currently working
with should be directly in front of you. Please find the ergonomic comfort zone below.

- Adjust the position of your work, your work surface, or your chair or stool so that you can work effectively while maintaining an upright, supported position. Avoid hunching over your work. For precision work, the work surface can be adjusted higher to provide support and reduce bending and hunching. Regular light work generally places the work surface around elbow height or just below. Heavy work places the work surface approximately six inches below elbow height. (Light work and heavy work are defined as following table and picture.)
Table 1. Bureau of Labor Statistics: Determining strength level based on lifting or carrying duration or percentage of the workday spent standing

<table>
<thead>
<tr>
<th>Strength level</th>
<th>Duration of lifting or carrying</th>
<th>Percent of workday standing [1]</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Seldom</td>
<td>Occasionally</td>
</tr>
<tr>
<td>Sedentary work</td>
<td>Up to 10 pounds</td>
<td>Up to 10 pounds</td>
</tr>
<tr>
<td>Light work</td>
<td>11–25 pounds</td>
<td>11–25 pounds</td>
</tr>
<tr>
<td>Medium work</td>
<td>26–50 pounds</td>
<td>26–50 pounds</td>
</tr>
<tr>
<td>Heavy work</td>
<td>51–100 pounds</td>
<td>51–100 pounds</td>
</tr>
<tr>
<td>Very heavy work</td>
<td>&gt;100 pounds</td>
<td>&gt;100 pounds</td>
</tr>
</tbody>
</table>

\[1\] Standing estimates includes time spent standing, walking, and in low postures.

\[2\] Negligible weight includes anything lifted or carried weighing less than 1 pound.

\[3\] When the sedentary lifting or carrying requirements are met, and more than 1/3 of the workday is spent standing, light work is required.


- Ensure proper lighting for your task.
- Store heavy items on lower shelves.
- Try to avoid spending long periods looking down while reading. Use a copy holder to elevate materials.
- Keep shoulders, arms and hands relaxed and elbows close to the sides while working.
- Try to keep the wrists neutral and aligned while working. Sitting close to your work will help with this.

4. Equipment Use:
- Make sure all equipment is clean and in good working condition to help minimize repetitive or forceful twisting, turning, and pinching. Equipment should be the right size for your hand. Use padding and/or tubing on equipment and work area edges to reduce pressure and force while working.
- Use the lightest pressure possible to use your equipment (e.g., pipettes). Use electronic, automated, or light touch model equipment when possible.
- Remember to take frequent rest breaks. Alternate your grip on items like forceps. Vary your tasks if possible.
Tips for Common Laboratory Tasks and Equipment:

**Computer Workstation**
- Position the mouse beside the keyboard.
- Fully adjustable seating will accommodate variations in body types.
- Monitors should be placed at approximately arms’ length away from the body. The best distance from the monitor is when characters can be seen clearly without leaning forward. Place the monitor so the top of the screen is at about eye level or slightly below. This allows the eyes to naturally gravitate toward the center of the screen and will keep the cervical spine in its natural curve.
- Use footrests where possible in order to allow for changing leg positions for prolonged sitting.
- Take short, frequent opportunities to alternate your posture to stretch and move around to reduce muscle tension and fatigue or fit in alternative tasks if possible.

**Flow Cytometers**
- Raise the flow cytometer by placing a block between the flow cytometer and the workbench to have a neutral posture.
- If possible, use an electric or hydraulic adjustable table to adjust the height.
- An adjustable chair is recommended, if available.

**Glove Boxes**
- Side reaching may be reduced from moving all needed materials for the experiment from the side chamber to the main chamber at one time.
- Avoiding long continuous use of glove boxes if possible. Alternate work tasks, take mini breaks, and perform stretching exercises to relieve muscle stress from the shoulders.
- It is recommended to wear padded shoes and/or use anti-fatigue mats if standing for long periods of time. A sit-stand seat may help to alleviate stress on the low back.

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

- Adjustable workstations for microscopes are recommended for appropriate height and bringing the microscope as close as possible. A cut-out work table may help. Arms should be supported and relaxed while using the microscope with the elbows close to the sides. Wrists should be in a neutral position while making adjustments.
- Ensure that you can view the eyepiece while sitting or standing in an upright position, including the shoulders, back and neck. Accomplish this by adjusting your chair (if applicable), the work surface, and/or the microscope eyepiece. An angle stand or extendable eye tube may be available to aid in adjustment. Use armrests to support your forearms while using adjustment knobs on the microscope.
- Keep scopes repaired and clean for easier use.
- Provide height appropriate footrests or foot rings on stools to avoid pressure to the backs of thighs while seated. Make sure you have adequate legroom.
- Use monitors/television systems where possible to eliminate the use of binocular eyepieces.
- Take short, frequent breaks and fit in alternative tasks.

**Pipetting**

- Where possible, use electronic, light-touch, or latch mode pipettes for intensive pipetting and use pipettes that fit your hands. Use the lightest touch or force possible.
- Multiple finger (not only thumb) pipette techniques are preferred. Try alternating hands or using both hands to pipet if possible.
- Electronic pipettes with mixing functions may be used for mixing or aliquoting as they are programmable and reduce excessive force and repetitive motion, or multichannel pipettes may be used for large aliquoting tasks. Clean pipettes regularly.
- Work supplies such as samples, trays and beakers should be placed within easy reach (within forearm or arm length away) and with no obstructions to their access. Keep work in front of the body to minimize twisting and awkward reaching.
- Keep head and shoulders in an upright, neutral position. Keep arms relaxed and elbows close to the body.
- Use low profile tubes, containers, and receptacles to avoid bending and twisting of the wrists, neck, and rolled shoulders.
- Ensure that your work surface is at the appropriate height. Work as close to the bench as possible and to sit back in the chair if you are seated. If it is necessary to stand for
long periods of time during pipetting, use an anti-fatigue mat or cushioned shoes. Use adjustable workstation or chair when working.

- Take short, frequent opportunities to stretch and perform mild hand exercises while pipetting to reduce muscle strain and fatigue or fit in alternative tasks.

**Fume Hoods and Biological Safety Cabinets**

- Perform all work 6 inches inside the hood.
- Keep arms relaxed and by the sides. Back, shoulders and neck should be upright and neutral in position. If available, use an ergonomically designed chair that provides adequate back support, along with seat height and seat angle adjustability. Ensure legroom and support legs with foot-ring/rest while seated.
- Keep the sash clean and free of glare. Use diffused lighting if possible 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 or at arm’s length. Remove unnecessary items.
- Avoid contact pressure (forearm and wrists in contact with sharp edges) with foam padding.
- Wear cushioned shoes and use anti-fatigue mats for prolonged standing.
- Take short opportunities to alternate your posture to stretch and move around to reduce muscle tension and fatigue or fit in alternative tasks if possible.

**Microtomes and Cryostat**

- Place the microtome at the appropriate height for work or use adjustable chairs, keep arms closer to body and operate in an upright position.
- Avoid contact pressure (forearm and wrists in contact with sharp edges). Foam padding or padded arm supports or other ways to soft edging are recommended.
- Use as little force as possible when turning the handwheel. Please consider using an automatic foot operated cryostat when frequent cryosection is performed.
- Retrofit the existing handle with an adapter that will allow you to use the handwheel in a pistol grip position (wrist aligned with forearm in handshake position). This will alleviate repetitive wrist flexion and extension.
- Try to fit in alternative work tasks, take breaks, and perform mild hand stretches and exercises to reduce muscle strain and fatigue.
Micro-Manipulation and Fine Motor Skills

- Plastic vials with fewer threads (if applicable to your work) may help reduce twisting motions during capping and uncapping.
- Small pieces of foam or other ways to soft edging may be used to prevent soreness on the fingertips, where fingers and forceps touch.
- Reduce wrist flexion while reaching for supplies by organizing storage closer.
- Try to fit in various work tasks, take breaks, and perform mild hand stretches and exercises to reduce muscle strain and fatigue.

Overhead Lifting and Heavy Lifting

- Avoid overhead reaching. Store heavy objects on lower shelves whenever possible.
- Use a stable footstool or stepladder or other tools to help reach higher shelves.
- Avoid asymmetrical lifting (twisting while lifting). Lift the object directly in front of you.
- Rotating carousels or turntables may help to reduce excessive reaching for objects.
- Use a cart or dolly to move heavy objects whenever possible.
- When performing heavy lifting, keep the following techniques in mind: bending knees, keeping back straight, getting a good grip and keeping wrists straight.

References and More Information:

The following resources are available for more information about ergonomics:

- National Institute of Occupational Safety and Health. Ergonomics and musculoskeletal disorders. [https://www.cdc.gov/niosh/topics/ergonomics/](https://www.cdc.gov/niosh/topics/ergonomics/)
- Occupational Safety & Health Administration. Ergonomics. [https://www.osha.gov/ergonomics](https://www.osha.gov/ergonomics)
- UCLA. Ergonomics. [https://ergonomics.ucla.edu/](https://ergonomics.ucla.edu/)
- University of Michigan. Laboratory Ergonomics. [https://hr.umich.edu/benefits-wellness/health-well-being/mhealthy/faculty-staff-well-being/ergonomics-awareness/ergonomics-self-help/laboratory-ergonomics](https://hr.umich.edu/benefits-wellness/health-well-being/mhealthy/faculty-staff-well-being/ergonomics-awareness/ergonomics-self-help/laboratory-ergonomics)
- University of North Carolina at Chapel Hill. Laboratory Ergonomics. [https://ehs.unc.edu/workplace-safety/ergonomics/lab/](https://ehs.unc.edu/workplace-safety/ergonomics/lab/)
- UMass Amherst EH&S. Ergonomics. [https://ehs.umass.edu/workstation-ergonomics](https://ehs.umass.edu/workstation-ergonomics) [https://ehs.umass.edu/ergonomics](https://ehs.umass.edu/ergonomics)