



LABORATORY ERGONOMIC RISK FACTORS

Pipetting:

This laboratory procedure is highly repetitive and involves a variety of risk factors. Cumulative Trauma Disorders (CTD) or MSDs may occur when a laboratory worker pipettes for two hours a day or longer on a continuous basis.

Associated Risk Factors:

- Repetitive motion of the hands, forearm and thumb, or fingers
- Pinch grip when handling pipette tips, or opening vials
- Bending and twisting of the wrist
- Working with "winged" elbows (elbow held at an elevated position away from the body)
- Neck bent forward or to the side and/or jutted chin
- Awkward and static postures
- Excessive force of the thumb
- Overreaching
- Standing for long periods of time

Preventive Measures:

- Work smart; eliminate/reduce the impact of laboratory ergonomic stressors.
- Perform your work only at appropriate heights.
- Reduce shoulder strain; avoid working with winged elbows/arms.
- Use short pipettes, shorter waste receptacles for used tips, to reduce reaching.
- Avoid standing for long periods. If standing is unavoidable, use anti-fatigue mats.
- Work at appropriate heights to minimize twisting of the neck and torso.
- Make sure head and shoulders are kept in neutral position.
- Avoid elevating arms and elbows above shoulder for lengthy periods to prevent static work of arm, and shoulder strain
- Purchase an electronic operated or a latch-mode pipette to replace manual plunger-operated pipettes. Both of these units reduce the need for excessive thumb force and repetition. Electronic pipettes are strongly recommended for highly repetitive tasks.
- Use thin-walled pipette tips that are easy to eject.
- Limit periods of continuous pipetting to 20 minutes or less. Vary activities, or take frequent short breaks (e.g., 2 minutes for every 20 minutes of pipetting).
- Rotate pipetting tasks among several people.
- Work with arms close to the body to reduce strain on shoulders.
- Keep head and shoulders in a neutral position (bent forward no more than 30 degrees)
- Use adjustable chairs or ergo-task stools with built-in solid footrest.
- Don't elevate your arm without support for lengthy periods.
- Use low profile waste receptacles for used tips. These should be no higher than the top of the tubes being filled.



Microtome Work

Manual rotary microtome use in histology laboratories requires performing many repetitive functions. In the course of one day, a laboratory technologist may use between 40 and 50 cassettes or blocks a day, hence turning the microtome wheel for at least a 1000 time. This is not only repetitive work, but turning microtome's wheel also requires force or forceful exertion. Other repetitive microtome-related functions such as replacement of specimens and use of trimming wheel increase the probability of acquiring MSD.

- Purchase an automatic microtome to replace manual unit.
- Reduce force when operating handwheel.
- Adjust the feed wheel position to reduce stress.
- Use motorized cutting.
- Use an external control unit like a front pedal instead of the hand-operated wheel.
- Apply padding to the work surface and the edge of the work surface to eliminate sharp edges and increase the amount of blood flow to the hands.
- Rotate tasks and take frequent short breaks.
- Use a fully adjustable ergo-task chair or stool with built-in solid footrest

Microscopy

Operating a microscope for long hours puts much strain on the neck, shoulders, eyes, lower back, and arms/wrists.

Associated Risk Factors:

- Awkward and static posture of the lower back
- Lack of adequate leg and knee clearance under work table
- Working with elbows winged
- Pinch grip when adjusting binocular eyepiece
- Wrist and palm contact pressure in the carpal tunnel area
- High repetition
- Eye strain and fatigue
- Awkward and static posture of the neck and head

Preventive Measures:

- Do not work with elbows winged. Keep elbows close to sides, below 45-degree angle.
- Make sure to work with wrists in neutral (straight) position. Avoid forearm and wrist contact pressure. Pad sharp edges with foam, or pad wrists and forearms to reduce pressure.
- Ensure that feet are flat on floor or supported by footrest.
- Avoid raising shoulders and bending neck while looking through microscope's eyepiece.
- Position microscope as close as possible towards you to ensure upright head position.



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- Use or purchase extended eye tube and/or variable height adapter to achieve proper neck and head position.
 - Prevent repetition, and alter prolonged awkward posture. Take adequate small breaks, or perform other job tasks that require less repetition, rest your eyes, neck, and shoulders.
 - Make sure scopes remain clean all the time and lighting is of proper intensity.
 - Use a fully adjustable ergo-task chair or stool with built-in solid footrest.
 - Adjust the eyepieces and angle of observation to prevent neck strain. Use adjustable microscope stands.
 - Use proper sitting posture and positioning.
 - Take stretch breaks and rotate tasks.
 - Use lifters and angled microscope arm supports to relieve fatigue and strain.
 - Ensure that sufficient knee and leg space is available.
 - Use television systems to eliminate the use of binocular eyepieces when appropriate.

Laboratory Hoods:

Working in Biological Safety Cabinet (BSC's) or fume hoods requires laboratory personnel to assume a variety of awkward postures due to limited work access, which restrict arm movement, and therefore significantly increase the amount of stress on joints of the upper limbs, neck, and back.

Associated Risk Factors:

- Repetitive motions of the hands, wrist, and forearms, especially when pipetting is involved
- Constrained knee and leg space, especially in fume hoods and older BSCs
- Contact pressure on the forearms, wrists and knees, or legs
- Awkward and static posture of the neck, torso, legs, arms and wrists
- Constrained body position, overloading muscles, tendons, and joints in asymmetrical manner
- Working with elbows winged
- Overreaching
- Prolonged standing in unnatural positions or in restricted postures

Preventive Measures:

- Avoid contact pressure (forearm and wrists contact with sharp edges).
- Reduce eyestrain and awkward posture by keeping viewing window of hood/BSC clean, and line of sight unobstructed.
- Raise cabinet couple inches upward to create a more conformable leg and thigh clearance.



- Purchase only ergonomically designed equipment and furniture.
- Position materials in laboratory hoods/BSCs as close as possible to avoid extended reaching. Perform work at least 6" back into the laboratory hood for safety reasons.
- Use a fully adjustable ergo-task chair or stool with built-in solid footrest. Apply foam padding to the front edge of the hood/BSC (away from the downdraft) to reduce contact forces with the forearm and wrists.
- Use an anti-fatigue mat if you will be standing for long periods of time while working in hoods/BSCs.
- Make sure that lights in hoods/BSCs are working properly.
- Use proper sitting posture and positioning.
- Take short breaks to relieve forearm and wrist pressure caused by leaning on front edge of hoods/BSCs.
- Use an ergonomically designed footrest if you will be working for long periods in a BSC.

Glove Boxes:

Working in glove boxes or anaerobic chambers requires extended static loading on the 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 over compensate on grip strength. Where possible, the following controls are recommended for ergonomic hazards associated with using a glove box:

- 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.
- Use highly absorbent hand powder for glove comfort.
- Utilize job enlargement to avoid long continuous use of glove boxes.
- Provide anti-fatigue mats for extended use of glove box.
- Take short breaks to perform stretching exercises to relieve static loading from the shoulders. This improves blood circulation to the arms and hands.

Cryostat Work:

The following are recommended for control of ergonomic hazards associated with the use of a cryostat:

- Purchase an automatic foot operated cryostat.
- Avoid placing utensils such as 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 and fingers.
- Use a fully adjustable ergo-task chair or stool with built-in footrest.
- Apply padding to the edge of the cryostat to reduce contact stresses.
- Take short stretch breaks