

Environmental Health and Safety Office

Occupational Ergonomics

Fitting the Task to the Worker

Ergonomics is the science of fitting the work-place conditions and job demands to the capabilities of the working population. The goal of ergonomics is to make the work place more comfortable and to improve both health and productivity. To meet these goals, the capabilities and limitations of workers and their tools, equipment and furniture are considered in conjunction with how they relate to particular tasks.

Prepared by:
UMD Environmental Health and Safety Office
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Dedicated to your Health and Safety

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1.

Program Components

I. Purpose

The purpose of this ergonomics program is to proactively eliminate work-related Ergonomics Risk Factors and prevent or reduce workplace-acquired Musculo-Skeletal Disorders (MSD) by providing management leadership and employee involvement in the identification, correction and elimination of such risk factors, through information dissemination, education and training on an on-going basis.

II. Ergonomic Assessment

An ergonomic assessment usually consists of a discussion period with someone from The UMD-Environmental Health and Safety Office (UMD-EHSO), during which some basic questions about how much time is spent performing the problematic job function and any pain or discomfort you are experiencing are discussed. The discussion is followed by a hands-on evaluation of the activity at the worksite.

An ergonomic evaluation report will be generated at the end of the evaluation. The report will provide recommendations to reduce any risk factors that may be contributing to your discomfort. The report will be kept on file in the UMD-EHSO, and a copy of which will be sent to the employee who requested the assessment. The Assessment is free of charge for all University Employees

III. Requirements

In order for the assessment to take place, employees need to copy and fill out the following forms and surveys, and send them to UMD-EHSO at 31 DADB.

- **Ergonomics Assessment Request Form**
- **Ergonomics Symptoms Survey Form**
- **Computer Workstation Survey Form**

Please Note: If you have been injured on the job, and your injury is work-related, you must fill out a First Report of Injury Form Immediately

IV. Scheduling an Assessment

If you are experiencing any pain or discomfort while working at your computer workstation or while performing any other job function that requires lifting and/or carrying heavy objects, pushing or pulling a heavy load, pipetting chemicals, or working in fume hood or a biological safety cabinet, etc, stop and inform your supervisor immediately.

Either the employee or his/her immediate supervisor should contact the UMD-EHSO at: 726-7139 for Office and General Trade Ergonomics, or 726-7273 for Laboratory Ergonomics or by e-mail at: ehso@d.umn.edu and request an Ergonomic Assessment. Employees can also

V. Terms:

Ergonomic training

- Employees who request Ergonomic Assessment will be asked to attend a 20 minutes ergonomic training offered here at UMD.

Ergonomic survey

- Pre-assessment: given to the employee before assessment to determine any risk factors and history of the problem.
- Post-assessment: given to the employee after 5 months, to identify change in status and implementation of recommendations.

Ergonomics final report includes the following:

- Ergonomic Analysis Report: Who, What, Where, Why, Methods, Results, Recommendations, Current Status, and Challenges

2.

Program Topics:

I. Office Ergonomics

A. Introduction

With the increased use of personal computers at home and at the office, UMD has experienced a new trend of computer/office workstation-related complaints, most of which are induced by poor work habits, poor workstation design, highly repetitive keyboarding and extensive use of the mouse.



Office Worker in Neutral Posture

B. Purpose

The purpose of this topic "Office Ergonomics" is to disseminate, information to office workers about the hazards involved with repetitive motions, extensive keying and mousing, over-reaching, sitting for longer periods of time, and the symptoms associated the onset of MSD's.



Office Worker in Awkward Posture

C. Symptoms and Complaints

The following are types of symptoms and complaints received That associated with repetitive work and the onset of a problem.

- Headaches, general malaise
- Eyestrain and dry or sore eyes
- Back pain and/or fatigue
- Stiffness and soreness in the neck
- Wrist and hand pain
- Stiffness and soreness of shoulders
- Pain, soreness of the elbow
- Discomfort or pain in the knees
- Hips and low back pain

Some of the symptoms may be aggravated by few off-the-job activities. However, investigations of the complaints confirmed that most are workstation-related. Additionally, the discomfort, soreness, and fatigue occur whenever there is a combination of excessive force, or pressure on the joints and muscles of the upper extremities, highly repetitive tasks, and poor work habits such as improper sitting, slouching, or awkward position of the back, arms, wrists, neck, and legs etc.



Bent Wrist / Contact with Sharp or Hard Surfaces



**Winged Elbows:
Elbows Held far From Body**

D. Common CTD Risk Factors

Common Cumulative Trauma Disorders (CTD) risk factors found in offices include:

- Awkward position and posture.
- Chronic/continuous repetition.
- Excessive pressure/force

E. Contributing Factor

As discussed above, the following are some of the contributing factors or root causes of musculo-skeletal discomfort symptoms:

- Inadequate lighting and direct glare.
- Repetitive hand and arm motion.
- Sitting or standing for long periods.
- No breaks for long periods of time.
- Non-adjustable workstation and chair
- Bending or flexing wrists while typing
- Bending neck forward or backward while looking at monitor.
- Bent neck sidewise while on the phone.
- Work surfaces with sharp edges.

- Inadequate leg space.
- No or inadequate armrest.
- Working with winged elbows (elbows held away from the body).

II. Laboratory Ergonomics

A. Introduction

Aside from the risk of working daily with hazardous substances, laboratory personnel are also exposed to many ergonomics risk factors due to the nature of their work and the research they conduct.

Laboratory-associated ergonomic risk factors are not any different from those found in the office and general industry and consist of: awkward and static postures, high repetition, excessive force, contact stresses, vibration and pinch grip, etc.

B. Purpose

The purpose of this Topic is to disseminate information to laboratory employees, about how they can control laboratory ergonomics risk factors, improve their level of comfort while performing their jobs, and reduce the risk of acquiring occupational injuries.

If you also use a computer extensively along with your research procedures, make sure you read the previous topic on Office Ergonomics.

C. Symptom Recognition

As in the case of chemical exposures, it is equally important to recognize the signs and symptoms associated with the laboratory procedure one is using. Early detection of MSD symptoms helps prevent the onset of MSD.

Symptoms associated with repetitive exposure to laboratory ergonomics risk factors include **low back pain, pain in the thumb, finger, wrist, forearm, elbow, neck and shoulder**. Other early warning signs include **burning, cramping, numbness, swelling, tingling, weakness, or fatigue**.

If you feel pain, or notice such signs or symptoms, do not ignore them or let them go unnoticed, no matter how minor they are. You may be at risk of developing a work-related MSD. Take immediate action, assess your work habits, look for the causes

of your symptoms, and take necessary preventive measures. Contact our Office at 726-7273 or by email at ehso@d.umn.edu for free Ergonomic Assessment. **It's your health!**

D. Laboratory Ergonomic Stressors

Laboratory ergonomic stressor the following which will be discussed in further details:

- Pipetting
- Biological Safety Cabinets
- Fume hoods
- Microscopy
- Laboratory Workbenches
- Microtomy

1. Pipetting

This laboratory procedure is highly repetitive and involves a variety of risk factors. Cumulative Trauma Disorders (CTD) or Musculo-skeletal Disorders (MSD) may occur when a laboratory worker pipets for 2 hours a day or longer on a continuous basis.

Associated Risk Factors

Risk factors associated with pipetting include:

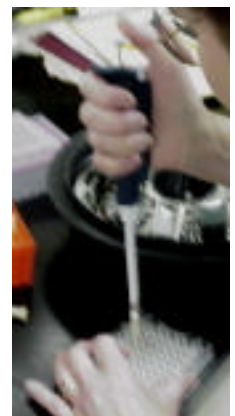
- Repetitive motion of the hands, forearm and thumb, or fingers.
- Pinch grip when handling pipette tips, or opening vials.
- Bending and twisting of the wrist.
- Working with "winged" elbows (elbow held at an elevated position away from the body).
- Neck bent forward or to the side and/or jutted chin.
- 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.
- Alter continuous repetitive pipetting by performing other tasks, and/or taking frequent small rest breaks every 20 minutes.
- Make sure to work with wrists in neutral positions (straight).
- Adjust height and position of sample holders, solution container, waste receptacle to prevent twisting and bending of wrist, neck and rolled shoulders.
- Reduce shoulder strain and avoid working with winged elbows/arms.
- Use short pipettes, shorter waste receptacles for used tips, to reduce reaching.
- Use electronic pipettes for highly repetitive pipetting tasks to reduce/eliminate contact pressure on thumb.
- Ensure proper lower back and thigh support; use adjustable stools or chairs with built-in foot and armrest.
- 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.
- Replace manually operated pipettes with electronic ones for larger workloads.
- 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.
- Task sharing is another way to reduce the impact of risk factor associated with pipetting.



2. Biological Safety Cabinets/Fume Hoods

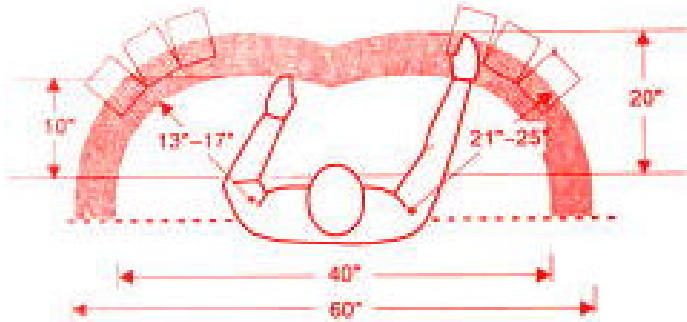
Working in a Biological Safety Cabinet (BSC's) or a fume hood requires laboratory personnel to assume a variety of awkward postures due to limited work access, which restrict arm movement, and therefore significantly increase the amount of stress on joints of the upper limbs, neck and back. Hence increased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

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 BSC's.
- 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:



- Prevent extended reaching, place materials as close as possible (see graphic above).
- Perform your work at least 6" back into the hood or BSC to maintain optimal airflow containment for material and personal protection.

- Always assume a proper posture. Use only adjustable chair or stool with built-in foot and armrest.
- Avoid contact pressure (forearm and wrists contact with sharp edges). Apply foam padding to the front sharp edge of the fume hood/BSC to reduce pressure concentration.
- If you perform work in a fume hood or BSC while standing for prolonged periods of time, use an anti-fatigue mat and footrest to reduce muscle, joint, and spinal fatigue.
- Take short breaks to alter repetitive forearm and wrist motion, relieve joint pressure and contact pressure caused by sharp edges.
- Reduce eyestrain and awkward posture by keeping viewing window of hood/BSC clean, and line of sight unobstructed.
- Make sure hood/BSC lighting is working properly, good and proper lighting help reduces eyestrain.
- Raise cabinet couple inches upwards to create a more comfortable leg and thigh clearance.
- Purchase only ergonomically designed equipment and furniture.

3. Microscopy

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



Associated Risk Factors:

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

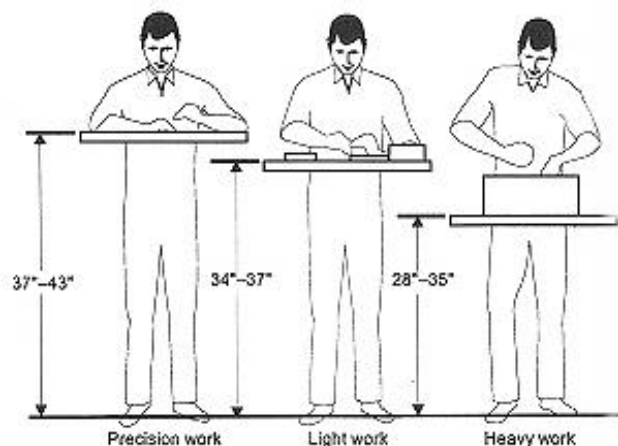
Preventive Measures:

- Do not work with elbows winged. Keep elbows close to sides, below 45-degree angle.
- Make sure to work with wrists in (straight) neutral position.
- Avoid forearm and wrist contact pressure. Pad sharp edges with foam, or pad wrists and forearms to reduce pressure.
- Make sure leg and knee clearance under workbench is adequate.
- Always assume proper sitting position,
- Ensure proper lower back and thigh support.

- Ensure that feet are flat on floor or supported by footrest
- Use only adjustable chair or stool with built-in foot and forearm rest
- Avoid raising shoulders and bending neck while looking through microscope's eyepiece.
- Adjust microscope eyepiece's height to allow head and neck proper (upright) neutral posture.
- Position microscope as close as possible towards you to ensure upright head position.
- 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.
- Use video display terminal when appropriate to view sample, and reduce eye and neck strain.
- Make sure scopes remain clean all the time, and lighting is of proper intensity.

4. Laboratory Workbenches

When used inappropriately, laboratory workbenches can expose researchers to a variety of hazardous conditions or ergonomics risk factors depending on the laboratory procedure being used. Most workbenches at UMD are of fixed heights and cannot be modified (raised or lowered); they are in general of the same height and were designed for light to slightly heavy work. Using laboratory workbench as a computer workstation is an example of inappropriate use, since it forces the worker to assume a variety of awkward postures, and may increase the likelihood of acquiring MSD. (See picture above)



- If Workbench height is above elbow height, between 37 and 43 inches, use for precision work.
- If Workbench height is just below elbow height, between 34 and 37 inches, use for light work.
- If Workbench height is below elbow, between 28 and 35 inches, use for heavy work.

Preventive Measures:

- Always assume proper sitting or standing in neutral posture.
- When sitting, use only adjustable stool or a chair with built-in foot- and armrest to insure lower back, thigh and feet support.
- If leg clearance is not available, workbench must not be used for work requiring using a stool. Otherwise, create under the bench legroom by removing drawers.
- When standing for extended periods of time, Use anti-fatigue mats and footrest to reduce joint strain and muscle fatigue.
- Remove drawers, supplies and other materials underneath workbenches to provide legroom.
- Take frequent small breaks to alter repetition, body awkward posture and muscle static work.



5. Microtomy

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 the microtome wheel also requires force or forceful exertion. Other repetitive microtome related function such as replacement of specimens, use of trimming wheel increase the probability of acquiring MSD.

Preventive Measures:

- Place microtome on appropriate workbench (appropriate height). Take into consideration the way work will be performed (standing or sitting).
- If sitting is required, make sure the workbench allows enough clearance for leg and thighs.
- Use only adjustable chair or stool with built-in foot and armrest.
- Make sure sharp edges are not an issue.
- Protect wrists and forearms from contact pressure. Pad sharp edges.
- Use less force when turning hand wheel.
- Take frequent small breaks from microtome work every 20-minute.
- If economically feasible, replace manual rotary microtome with an automatic one.

REQUEST FOR AN ERGONOMICS ASSESSMENT

Date of Request: _____

Employee's Name, Location, Phone Number

Supervisor's Name, Location, Phone Number

Description of Request: _____

This Area For UMD Environmental Health and Safety Office Use Only

Date Received _____

Evaluator's Name _____

Date and Type of Assessment _____

Date Findings Report sent _____

Follow-up Dates _____

SYMPTOMS SURVEY

Name: _____ Date: _____

Dept: _____ Job/Position: _____

Other Jobs you have done in the last year (for more than 2 weeks)

Dept: _____ Position held: _____ Time on this Job _____

Dept: _____ Position held: _____ Time on this Job _____

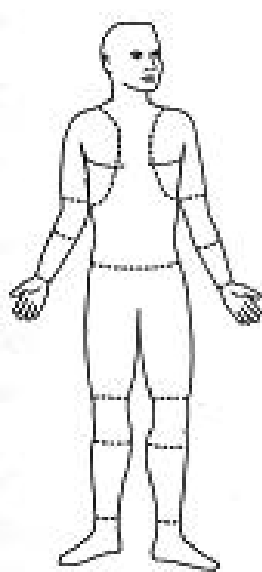
(Include Jobs you worked on the most)

Have you had any pain or discomfort in the upper extremities during the last year?

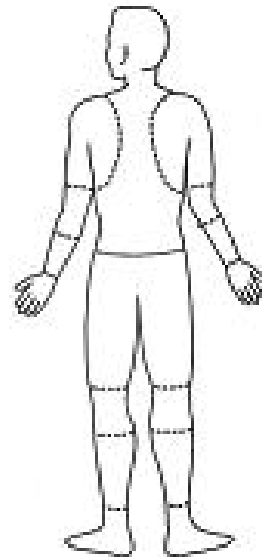
Yes

No

If YES, carefully shade in area of the drawing, which bothers you, the MOST



Front



Back

Symptom Survey (continued)

Check Area (Complete a separate page for each area that bothers you)

- Neck
- Shoulder
- Elbow/forearm
- Hand/Wrist
- Fingers
- Upper Back
- Low Back
- Thigh/Knee
- Low Leg
- Ankle/foot

1. Put a check by the words that best describe the problem.

- Aching
- Burning
- Cramping
- Stiffness
- Numbness (asleep)
- Pain
- Swelling
- Tingling
- Weakness
- Other

2. When did you first notice the problem? _____(Month) _____(year)

3. How long does each episode last? (Mark an X along the line)

_____ / _____ / _____ / _____
1hour 1day 1 week 6 month

4. How many separate episodes have you had in the past year? _____

5. What do you think caused the problem? _____

6. Have you had this problem within the past week or two?

7. How would you rate this problem? (Mark an X on the line)

NOW

_____ *None* *Unbearable*

When it is the WORST

_____ *None* *Unbearable*

Symptom Survey (continued)

8. Have you had any medical treatment for this problem? ____YES ____NO

9. If NO why not? _____

10. If Yes Where did you receive treatment?

Work Right Number of times in past year? _____

Personal Doctor Number of times in past year? _____

Other Number of times in past year? _____

Did treatment help? ____ Yes, ____ No

11. How many workdays have you lost in the last year because of this problem? _____

12. How many days in the last year were you on restricted or light duty? _____

13. Please Comment on what you think would help improve your symptoms _____

COMPUTER WORKSTATION SURVEY

Please complete the following:

1. Does your workstation ensure proper posture, such as:

- | | | |
|--------------------------------|------------------------------|-----------------------------|
| Horizontal thighs? | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| Vertical lower legs? | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| Feet flat on floor or footrest | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| Neutral wrists? | <input type="checkbox"/> Yes | <input type="checkbox"/> No |

2. Does your Chair

- | | | |
|--|------------------------------|-----------------------------|
| Adjust easily | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| Have a padded seat with rounded front? | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| Have an adjustable backrest? | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| Provide lumbar support? | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| Have casters? | <input type="checkbox"/> Yes | <input type="checkbox"/> No |

3. Are the height and tilt of the work surface on Yes No

4. Is the keyboard detachable? Yes No

5. Do keying actions require minimal force? Yes No

6. Is there an adjustable Document holder? Yes No

7. Are armrests provided where needed? Yes No

8. Are glare and reflections avoided? Yes No

9. Does the monitor have brightness and contrast control? Yes No

10. Do you judge the distance between eyes and monitor to be satisfactory for your viewing needs? Yes No

Occupational Ergonomics Program

U N I V E R S I T Y O F M I N N E S O T A D U L U T H

11. Is there sufficient Space for Knees and feet? Yes No
12. Can workstation be used for either right- or left- handed activity? Yes No
13. Are adequate rest breaks provided for task demands? Yes No
14. Are high stroke rates avoided by Self-pacing? Yes No
15. Are you trained in:
- | | | |
|---|------------------------------|-----------------------------|
| Proper posture? | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| Proper work methods? | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| When and how to adjust workstation? | <input type="checkbox"/> Yes | <input type="checkbox"/> No |
| How to seek assistance for your concerns? | <input type="checkbox"/> Yes | <input type="checkbox"/> No |

*Adapted from
NIOSH Elements of Ergonomics programs*