Laboratory Ergonomics Guideline

Section 1 - Purpose and Scope

(1) The purpose of this Guideline is to offer advice regarding the management of musculoskeletal risks associated with work in laboratories. This Guideline applies to all staff and students working in laboratories within the University.

Section 2 - Process and Key Controls

(2) The University is aware that musculoskeletal disorders can occur during intensive use of laboratory equipment and offers guidance to manage the risks associated with common laboratory tasks.

(3) The Hazardous Manual Tasks Code of Practice 2021 advises that employers must take reasonable precautions to eliminate or reduce exposure to risk factors associated with musculoskeletal disorders.

Section 3 - Musculoskeletal Disorder Risks Associated with Use of Laboratory Workstations

Part A - Laboratory Workstations

Laboratory Workbenches

(4) The height of laboratory workbenches facilitates standing work. For seated tasks, drafting height chairs or stools are required when sitting at laboratory benches.

(5) If leg clearance is not available for work requiring seated postures, consider removing boxes or mobile drawer units stored under benches or relocating to a workbench area with available leg space.

Laboratory Chairs

Chair Selection

(6) Those in control of selection of seating for laboratories should consider the type of work carried out in the laboratory and the duration of tasks. Fixed height (non-adjustable) laboratory stools are suitable for teaching laboratories and laboratories with tasks of limited duration (1-2 hours). Height-adjustable drafting-height chairs are more suited to research laboratories where tasks are longer in duration and more frequent.

(7) If leg space is not available but seated work is required (i.e. using a fumehood), consider a saddle or perch style chair that reduces the leg space requirements but maintains larger knee and hip angles than standard chairs.

(8) Review UQeMarket for approved stool options and suppliers. Consult the local WHSC for advice on laboratory stools for specific tasks or to manage a musculoskeletal risk.

(9) Height-adjustable laboratory chairs should have a 5-star base with seat height adjustability to suit the worker and the height of the work surface. Wet laboratories, i.e. those that involve work with chemicals or biologicals (including

PC1 and PC2 labs), require seating to be non-porous, i.e. a vinyl fabric or other non-porous material.

(10) An adjustable foot ring or foot support should be included with all drafting-height chairs and users should adjust the height of the foot ring to provide effective foot support. Foot rings are usually adjusted by turning the ring one direction to loosen the ring, adjusting the height of the ring and turning the ring back to tighten in the new position. Other foot rings have a knob that loosens and tightens the foot ring.

(11) Backrest height or tilt adjustability may provide additional levels of customised adjustability to suit students and workers of different sizes.

(12) Castors should be selected to suit the flooring type and task. Locking castors will prevent users from rolling around while seated but will also restrict the user's ability to pull the seat under the bench during use. Friction castors resist movement when weighted down but can still be moved while seated with moderate effort.

Adjusting the Chair

(13) Optimal seat height will vary with the type of task and size of equipment being used. Adjust the seat height for comfort and to minimise shoulder elevation while performing tasks.

(14) While sitting at the very back of the seat, adjust the backrest so the angle between hip and torso is comfortable (usually between 90-100 degrees). Adjust the height of the backrest (if applicable) so the contour of the chair supports the curve in the lower back. Many chairs in use at the University have a ratchet mechanism where the backrest is lifted from underneath and "clicks" through various height settings. Once at the top, the backrest drops down to the lowest setting.

(15) Adjust the foot ring so the feet are comfortably supported while seated. Avoid using the foot ring for support when getting into and out of the chair.

Footrests

(16) If an adjustable foot ring is not provided or is not adequately supportive, consider use of a footrest of adequate height to support feet while seated on drafting-height chairs.

(17) Contact the local WHSC for footrests suitable for laboratory use.

Section 4 - Musculoskeletal Disorder Risks Associated with Laboratory Equipment

Part B - Pipetting

(18) The use of manual pipettes has been associated with a high prevalence of musculoskeletal disorders of the hand, wrist, forearm, shoulder and neck among laboratory workers.

(19) Risk factors include:

a. Forceful and sustained gripping of pipette.
b. Excessive force of the thumb when aspirating and ejecting tips.
c. Repetitive thumb movements.
d. Awkward postures of the hand, wrist, arms and shoulders.
e. Sustained shoulder elevation and forward reaching.

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Risk Minimisation

(20) Tool selection and design are the most effective methods of preventing or minimising exposure to risk factors related to musculoskeletal disorders. In the case of repetitive pipetting, extended durations of pipette use and pre-existing injuries, it is particularly important to consider pipette design and selection as the first control option.

Pipette Selection

(21) When selecting pipettes, consider the type of work to be performed and the workers' pre-existing musculoskeletal disorders. Alternative pipettes have been trialled by University laboratory workers and benefits to comfort have been identified.

a. Consider use of assistive devices, robotics, etc. for large pipetting tasks or when workers have pre-existing musculoskeletal injuries.
b. Consider use of multi-channel pipettes and/or electronic pipettes when workers have pre-existing wrist or thumb injuries.
c. Consider use of shorter or pistol grip pipettes when workers have pre-existing shoulder injuries.
d. Use multi-channel pipettes for large aliquoting tasks.
e. Use electronic pipette with mixing functions for mixing or aliquoting.

Work Practices

(22) The following work practices should be followed:

a. Ensure appropriate tip selection; tips specifically designed for the pipette(s) in use are usually easier to apply than generic tips.
b. Use minimal force when applying pipette tips.
c. Clean pipettes regularly to reduce sticking.
d. Ensure provision of an adjustable chair or stool that adjusts high enough for comfortable use with bench or biosafety cabinets.
e. Keep height of sample holders, solution containers and waste receptacles as low as possible to minimise awkward postures of the upper limb.
f. Frequently used equipment and materials should be placed as close as possible to the user in order to minimise forward reach distance.
g. Keep elbows close to the body to avoid unnecessary shoulder strain.
h. Try to avoid awkward wrist postures, align the middle finger with the midline of the wrist when possible.
i. Consider alternating height of work surface or user (i.e. using a chair) to avoid prolonged periods of neck flexion and shoulder elevation.
j. Alternate continuous and repetitive pipetting with other tasks on a 20-minute basis when possible.
k. Take micro-breaks every 30 minutes to rest the wrists, arms, shoulders and neck.

Part C - Use of Biosafety Cabinets, Laminar Flow Cabinets, Glove Boxes and Fume Hoods

(23) The use of biosafety cabinets, laminar flow cabinets, glove boxes and fume hoods has been associated with increased risk of musculoskeletal disorders.

(24) The design of cabinets restrict arm movement, increasing the muscular load on the shoulders, neck and upper back. The height of the sash and the nature of the work conducted in cabinets and fume hoods encourage the

adoption of awkward and static neck postures, including neck flexion and neck twisting.

(25) The height of the cabinet work surface may not be comfortable for some users, requiring the use of adjustable chairs. Some biosafety and laminar flow cabinets lack adequate knee and leg space, forcing the user to reach forward or adopt twisted postures.

(26) Due to the nature of work conducted in fume hoods as well as lack of knee and leg space, seated postures while using fume hood is not recommended, unless alternative seating (perches or saddle chairs) are available.

Risk Minimisation

(27) Consider the following to minimise risks of musculoskeletal disorders when using biosafety cabinets, laminar flow cabinets, glove boxes, fume hoods, etc.:

a. Stand during short periods of work in cabinets when comfortable and alternate between sitting and standing when working in cabinets for long periods of time.
b. Use height-adjustable when available.
c. Use an adjustable chair, saddle seat or perch stool and adjust height of seat to avoid shoulder elevation.
d. Sit close to the work surface to avoid overreaching.
e. Organise the workspace by keeping frequently used materials closer to the front of the cabinet to limit overreaching.
f. Use an anti-fatigue mat for prolonged standing work.
g. Remove drawers, equipment, etc. from under the cabinet to provide leg space.
h. Consider use of turntables within the cabinet to provide improved access to samples and tools.
i. Ensure viewing window is clean and line of sight unobstructed.
j. Take short breaks every 30 minutes from work in cabinets to rest the shoulders, arms and back.

(28) Those in control of selection and purchase of biosafety cabinets should consider height-adjustable models to allow users to adjust height of work surface and minimise awkward working postures.

Part D - Microscope Use

(29) The use of microscopes generally involves sustained awkward neck, shoulder and back postures.

(30) Use of control knobs typically involves sustained arm elevation, including static loading of the forearms and upper arms with elbows externally rotated. Sustained pinch grip is required when adjusting binocular eye piece, and eye fatigue.

Risk Minimisation

(31) Consider the following to minimise musculoskeletal disorder risk associated with microscope use:

a. Position the microscope close for neutral, supported posture.
b. Ensure adequate leg and knee clearance under bench.
c. Ensure feet are firmly planted on floor or footrest.
d. Use adjustable chair suitable for the work surface height.
e. Adjust eye pieces and angle of observation to prevent neck strain.
f. Use adjustable stands, adjustable eye tubes and variable height adapters.
g. Try to keep elbows close to the body.
h. Consider use of a microscope camera and video display equipment to display microscope image and limit neck

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strain and eye fatigue.

i. Limit duration of microscope work to 1-2 hours at a time when possible.
j. Utilise task rotation to alternate between microscope work and other tasks.

Part E - Use of Microtomes and Cryostats

(32) Use of manual rotary microtomes may involve thousands of hand wheel rotations, creating great potential for shoulder strain and inflammation of supporting structures. Turning the handle of the wheel requires sustained grip in potentially awkward postures.

Risk Minimisation

(33) Consider the following to minimise musculoskeletal disorder risk associated with use of microtomes and cryostats:

a. Ensure microtome or cryostat is at the appropriate height. Adjust the work surface height or the user height using an adjustable chair.
b. Consider using foot operated pedal in place of the hand-held wheel.
c. Use minimal force when turning wheel by hand.
d. Retrofit existing handle with a u-shaped handle to increase hand and wrist postural variation.
e. Consider replacing manual rotary microtome with automatic model.
f. Take frequent breaks every 20 minutes.

Part F - Vibration in Laboratories

(34) Many pieces of laboratory equipment may expose the worker or student to vibration. Guidelines to reduce exposure to vibration are outlined in Controlling Risks From Exposure to Vibration Guideline.

Section 5 - Roles, Responsibilities and Accountabilities

(35) Supervisors are required to ensure relevant training in safe use of laboratory equipment and techniques is provided to workers and students. Refer to the UQ Staff and Health and Safety Training and Induction website in the 'Laboratory staff and HDR students' section for the 'Laboratory Safety training needs analysis' checklist and more information on recommended training.

(36) Work Health and Safety Coordinators may be able to provide advice to minimise risk of musculoskeletal disorder arising from laboratory tasks and equipment and can request further assistance or advice from the UQ Ergonomics and Rehabilitation Advisor.

(37) Workers have a responsibility to report any symptoms that may be related to laboratory tasks or equipment and to comply with reasonable instructions or advice provided with the purpose of reducing the risk of musculoskeletal disorder or discomfort.

Section 6 - Appendix

Definitions

Term	Definition
Musculoskeletal disorder	Sprain or strain to soft tissues of the body, including nerves, tendons, ligaments, blood vessels and intervertebral discs.
Students	Includes both undergraduate and postgraduate students (Higher Degree by Research and Masters students).

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