A. Summary

Many ergonomic risk factors are present in the laboratory, including awkward posture, high repetition, excessive force, contact stresses, and vibration. By learning how to control laboratory ergonomic risk factors, you can improve comfort, productivity, and job satisfaction while lowering the likelihood for occupational injuries.

Awkward postures take the body out of neutral positions and can result in increased stress on muscles, tendons, and nerves. Working with the wrist in a forward bent position results in compression or crimping of tendons.

High Repetition can result in injury if the repetition exceeds the body’s capacity. Problems arise when there are dramatic increases in repetition, so great that the body cannot accommodate.

Forces vary with equipment type, design, and state of repair. For example when activating a pipetter, forces are transferred to your finger or thumb. Choosing equipment in good working order, and that requires less force to activate and requires a shorter activation distance can reduce forces transferred to your body.

Contact Stresses occur when a force is concentrated to a small area, also known as pressure. For example, contact stress occurs when resting your forearm against the sharp edge of a hood or a desk. When grasping hand-held equipment, contact stress occurs in the hand and this stress can affect structures of the hand. Ensure that hand-held equipment does not result in pressure at the base of the palm of the hand since the pressure can affect the median nerve.

Vibrations can be transferred to the body when holding an object on some types of oscillating equipment. For example, vibration to the hand occurs when holding tubes by hand onto a vortex mixer. In this case, using a vortex mixer rack instead of holding the tubes by hand can eliminate vibration.
The following information lists ways to reduce ergonomic risk factors for several common laboratory activities.

**B. Pipetting**

To Control Awkward Postures:
- Work with wrists in straight, neutral positions - may need to incline sample holder or solution flask.
- Reduce reaching by:
  - Using short pipettes
  - Using low profile waste receptacles for used tips
  - Using low profile solution containers
- Keeping items as close as possible.
- Working with elbows as close to sides as possible.
- Ensure that your chair provides proper lower back and thigh support, and that feet are supported.
- Ensure items are positioned to minimize twisting the neck and torso.

To Control High Repetition:
- Automate pipetting tasks.
- Use multi-pipetters whenever practical.
- Share workload between right and left sides.
- Vary pipetter types having different activation motions, e.g. thumb-controlled vs. finger-controlled.
- Take adequate breaks from pipetting activity - even short several second “micro-breaks” help.
- Rotate pipetting among several employees.
- Evaluate work processes to spread pipetting throughout the day.
- Add personnel for peak periods.

To Control Excessive Force:
- Choose pipetters that require less finger or thumb motion to activate.
- Choose pipetters that require less force to activate.
- Use only the force necessary to activate.

To Control Contact Stresses:
- Choose pipetters that best fit your hand.
- Avoid resting forearms on sharp work surface edges; pad edge or forearm if necessary.
C. Handling Test Tubes

To Control Awkward Postures:

• If seated, ensure that your chair has proper lower back and thigh support and that feet are supported.
• If standing, ensure the work surface is at the proper height to reduce the need to reach upward or bend forward.
• Arrange test tube racks to minimize reaching and twisting.
• Work with elbows close to sides.
• Maintain straight wrist positions. This may require inclining test tube racks.

To Control High Repetition:

• Automate processes when possible.
• Share workload between right and left sides.
• Take adequate breaks away from handling activity - even short several second "micro-breaks" help.
• Rotate handling among several employees.
• Evaluate work processes to reduce steps requiring manual handling.
• Add personnel for peak periods.

To Control Excessive Forces:

• Automate test tube opening when possible.
• Use pinch (thumb working with index finger) for precision activities that require minimal force.
• Use full hand grip for activities that require greater force.
• Use cap removers that change handling from pinch to full hand grip.
• Request that samples be received in test tubes that allow improved ergonomics.
• Explore other sample mediums.

To Control Contact Stresses:

• Use two hands to open test tube samples.
• Do not rest forearms on a sharp edge of the work surface; pad edge or forearm or create a forearm rest pad.

To Control Vibration:

• Use vortex mixer rack instead of holding tubes by hand on vortex mixer.

D. Microscope Use

To Control Awkward Postures:
• Ensure that your chair has proper lower back and thigh support and that feet are supported.
• Ensure adequate thigh clearance under laboratory bench; often low-hanging false fronts need to be removed.
• Raise, incline, and move microscope as close as possible to ensure upright head position.
• Working with elbows close to sides.
• Work with wrists in straight, neutral positions.
• Choose microscope eyepieces that allow improved head and neck posture.

To Control High Repetition:
• Take adequate breaks - even short several second “micro-breaks” help.
• Rotate microscope work between several employees.
• Evaluate work processes to spread microscope work throughout the day.
• Add personnel for peak periods.

To Control Contact Stresses:
• Do not rest forearms on sharp work surface edges; pad edge or forearm or use a forearm rest pad.

To Control Eye Fatigue:
• Keep scopes clean.
• Ensure illuminators are in alignment and light is even with proper intensity.
• Ensure optical components are in proper repair.
• Take frequent short breaks to rest your eyes; focus far away or shut eyes to change eye focal length.