# **USDA APHIS LABORATORY ERGONOMICS TIPS**

# 

# **Ergonomics**

## Definition

### Fit the Job to the Person

### Work Smarter, Not Harder

## Ergonomics Principles

### Neutral Position and Support

### Reach Zone

### Power Position and

### Fatigue Control

## What can you do to control fatigue?

### Mix up job tasks to provide variety of physical activities

### Break a larger task into smaller tasks.

#### Alternate lab tasks, like pipetting between right and left hands

### Appropriate recovery breaks

#### Replenish energy supplies and fluid intake

#### Try to not skip breaks and lunch

### Drink plenty of fluid on a periodic basis

### Stretching

#### Promote blood circulation and joint lubrication

### Consciously work to identify and control fatigue at work!

# Warm-up and Stretching

## Guidelines

### Follow any specific medical restrictions

### Warm-up by performing a few repetitive movements

### Always stretch from neutral position

### Use slow controlled movement

### Push stretch only as far as is comfortable for you

### You should feel a stretch not pain

### Listen to your body - Stop stretch if experience any numbness or tingling

### Don't hold breath during stretch – breathe in with stretch and out with relaxation

### Selected Stretches (pipetting/lab ergonomics)

# Laboratory Workbenches, Stools and Footrests

## Workbench/Elbow Height Relationship

### Precision work, need to precisely view hands

#### Fixed height workbench

##### Elbow height about 2 to 4 inches above workbench height

#### Adjustable height workbench

##### Workbench height so elbows about 4 to 6” above resting elbow height (this is with arms at sides)

### General light work (handling test tubes, pipetting, etc.)

Workbench at or slightly below (1 to 2 inches) below elbow height

### Heavy work, downward force exerted (pushing down on tool or other materials)

Workbench 4 to 6 inches below elbow height

## Workbench/Stool/Footrest Adjustment Strategies

## Workbench Fixed Height

### Adjust Stool Height

#### Use height adjustment feature of stool

#### Establish desired physical relationship between elbow height and workbench height

### Other Stool Adjustments

#### Seat tilt forward and backward

#### Back support height and angle adjustable

#### Armrests, height adjustable to provide for forearm support

### Most important guideline for stool use

#### Get out of it on a regular basis!

#### Limit sustained seated positions to 30 minutes or less

### Leg/Foot Clearance

#### Remove or relocate obstacles to provide for clearance needed

### Foot Support

#### Foot ring primarily there to help you get on and off seat of stool

#### Use height adjustable footrest to provide for foot and leg support

##### Adjust footrest height

##### Footrest and foot ring should be about same height

## Workbench Adjustable Height

### Adjust Stool Height

#### Adjust stool height to get feet directly on floor

#### Stool may not go lower enough to get feet on floor

##### Need footrest for adequate foot support

### Adjust Workbench Height

#### Adjust workbench height based on task at hand

#### Establish desired physical relationship between elbow height and workbench height

### Other Stool Adjustments

#### Seat tilt forward and backward

#### Back support height and angle adjustable

#### Armrests, height adjustable to provide for forearm support

### Leg/Foot Clearance

Remove or relocate obstacles to provide for clearance needed

### Foot Support

#### Foot ring primarily to help get on and off seat

#### Use height adjustable footrest to provide foot and leg support

##### Adjust footrest height

##### Footrest and foot ring about same height

## Standing at a Workbench

### Spending only a short time (a few minutes)

### Move frequently between different locations at workbench

### Handle heavier items (more than 5 pounds)

### Need to exert significant downward force (more than 10 pounds of force)

### Workbench Height - Standing

#### Apply same elbow and workbench height relationships for standing as for seated

#### Too low fixed height workbench - build up workbench height

##### Platform on workbench top to position tools, equipment or materials

##### Entire workbench itself raised on a permanent basis.

## Footrests - Standing

### Promote neutral position and increased comfort when standing

#### Footrest to put one foot up on footrest and then alternate with the other foot

#### Utilize footwear that has significant cushioning and support

##### Good walking shoes are good standing shoes

#### Shift weight forward to balls of feet and backwards to the heels

#### Perform “heel lifts” frequently

## Anti-fatigue Mats - Standing

### Anti-fatigue standing mats to cushion feet and weight bearing joints of ankles, knees, hips and back

#### Large enough to allow for at least shoulder width foot placement

#### Beveled mat edges to eliminate any trip hazard.

#### Adequate cleaning of mat and underlying floor

# Pipetting

## Pipettes – Workstation Set-up

### Approximately same equipment, tray and supply heights

### Within easy reach in logical work order

### Prevent twisting and bending of wrist, neck and arms, elevation of shoulders and overreaching

### Adjusting height and position of various tools and equipment:

#### Sample holders (place on a tilt)

#### Solution container positioned within reach

#### Waste receptacles – keep at low height (no higher than top of tube being filled)

#### Work with arms close to the body

#### Avoid arm elevation without support for lengthy periods

#### Keep samples and instruments within easy reach

## Pipette Design - Choices

### Hand size

#### Correlating hand size to pipette size is most important

#### Different sizes available

#### Correct size pipette will allow hand to comfortably grasp and manipulate pipette.

### Weight

#### As possible use lightweight pipette; requires less force to hold

### Force

#### Use pipette that requires as little force as possible to control

### Location of Controls

#### Multi-finger pipette controls help distribute force among several fingers rather than continuously using same finger

#### Button on top requires thumb to be repeatedly extended out of a relaxed, neutral position.

##### Try to avoid and if not possible to avoid entirely, remember to limit sustained use as possible

## Pipetting - Guidelines

### Short pipettes are preferable to decrease hand and arm elevation

### Pipettes where thumb dispenses and index finger aspirates are best

### Pipette usage should be alternated between right and left hand

### Clean pipettes regularly to; reduce "sticking" and improve quality of work

### Use thin-walled pipette tips easy to eject

## Manual vs Power Pipettes

### Power pipettes rather than manual pipettes help to reduce hand stress and exertion

#### Electronic operated or a latch-mode pipette to replace manual plunger-operated pipettes

#### Electronic pipette with mixing functions for tasks such as mixing or aliquotting

#### Multichannel pipette for large aliquotting tasks

## Microbreaks and Task Rotation

### Focus on Fatigue Control throughout day

#### Take micro-breaks of 2 minutes for every 20 minutes of pipetting

#### Perform hand stretches frequently

#### Rotate pipetting activities:

##### Between right and left hands

##### Among different laboratory tasks

##### Different people

# Microscopy

## Microscope Step-by-Step Set-up Protocol

### Understand Adjustment Options

#### Analyze current set-up to make sure you fully understand what adjustment options exist:

##### Height and angle of microscope itself

##### Microscope eyepiece height and angle

##### Stool or chair seat height, back support and armrests

##### Worksurface

### Neutral Position/Support, Reach Zone

#### Adequate room for legs so you can sit directly under microscope

#### Adjust stool or chair

#### Provide a footrest

#### Position microscope towards edge of work surface

#### Position your head upright and your line of sight approximately 20 to 30º below straight-ahead vision

#### Adjust microscope to match neutral head and neck position

#### Adjust eyepieces and angle of view

#### Use chair armrests to support forearms with elbows at sides

#### Apply padding (foam rolls or padded edge protectors) to the edge of work surface

#### Padded angled microscope forearm supports to relieve fatigue and strain

### Fatigue Control

#### Employ fatigue control measures

#### Take 2-minute micro-breaks every 20 minutes of microscope use

#### Stretch to promote circulation and reduce joint stiffness

#### Rotate between variety of laboratory tasks

#### Mix it up throughout day

## Microscopy – Other Tips

### Tilt storage bins toward you

### Enlarge handle diameter of small hand tools by placing cylindrical foam around them

### Make simple tool modifications

## Microscopy - Control Eye Strain

### Scope is clean and lighting is adequate

### Microscope lamp and optical pathway correctly aligned

### Looking at distance point (more than 10 to 15 feet away) allows eyes to relax

### Control excessive glare and reflections from overhead lighting

### Adjust internal microscope light

### Temperature and humidity conditions affect eyes

#### Ambient temperature range of 66 to 73º Fahrenheit is suggested

#### Eye drops can be beneficial for some.

# Lab Hoods or BSCs

## Work practices and tips:

### If standing at the lab hood or BSC, use anti-fatigue matting and wear supportive shoes.

### Position materials as close as possible to avoid extended reaching.

### Use a turntable to store equipment close at hand. This prevents reaching and twisting.

## Reduce contact stress to forearms & wrists:

### Apply closed-cell foam padding to the front edge of the lab hood or BSC.

### Make sure padding can be decontaminated.

## Armrests

### Support arms at correct height and angle

### Do not restrict air flow

### Bubble wrap that is disposable and inexpensive

## Seated at Lab Hood or BSC

### Fully adjustable chair or stool

### Provides adequate back support, adjustable seat angle, and height adjustability

### Adequate leg and thigh clearance under the cabinets

### Raise cabinet a couple of inches if necessary and possible

### Use a footrest to provide stability in leaning forward from the hips

## Chair/stool options

### Sit-stand stools

# Test Tube Handling Tips

## Body posture

### Adjust chair properly to provide adequate back support

### Remove chair arms if interfere with ability to get close to work

## Arrange tubes

### Arrange tubes to minimize reaching and twisting

### Use container to raise test tube racks

### Use a vortexer mixer rack instead of holding tubes by hand

## Open/close test tubes

### Use both hands to open and close

### Rotate cap in one direction with one hand while rotating tube in opposite direction with other hand

## Cap Removers

### Use cap removers to minimize pinch grip and stress on fingers

## Automatic capping/decapping machines

### If screwing many similar microtubes, automatic capping and de-capping machines may be appropriate.

# Micro-Manipulation & Fine Motor Skills

## Considerations

### Use plastic vials with fewer threads to reduce twisting motions

### Tilt storage bins toward you to reduce wrist flexion while reaching for supplies

### For forceps manipulation, use small pieces of foam, like the type used on pencils and pens

### Practice using forceps between index and middle fingers instead of using thumb and index finger

# Material and Equipment Handling

## Up-front planning

### Need to use mechanical equipment or get someone to help you

### You have thought through where material is going to end up.

### You have anticipated any surprises

## Power Lift - Step-By-Step Details

### Approach object with feet slightly wider than shoulder width

### Good footing

### Straddle object

### Bend your hips and knees somewhat, reach your hands to object

### Grip object, might be at a diagonal

### Build “bridge” with elbow on knee to unload back

### Your goal is to keep object as close as possible to you

### Tighten up stomach muscles

### At the moment of the exertion . . . LOOK UP

### Automatically puts you into Power Position

### Use large muscles of legs and thighs - not your back to accomplish the lift

### Back muscles will work with stomach muscles to stabilize spine in neutral position

## Golfer’s Lift

### Lighter weight item that you can handle with one hand

#### Lift one leg back as you bend over at hip to reach to the item

#### Counterbalances trunk

### Practice using Golfer’s Lift

## Two **Stage** Lift

### Break lift into stages

### Item to higher level

#### Use power position to bend hips and knees to start item at higher position

#### As you stand upright item is already at height you need it to be

#### Makes good use of leg strength and not just arm strength

#### Legs are stronger than arms!

### Item at a distance

#### Slide item to edge as first stage of lift

#### Once its closer, use power lift technique to lift

# Available Services

## Individual Ergonomics Evaluations and/or Training Services

For employees wishing to request an ergonomics evaluation or training services follow the instructions listed in the APHIS Ergonomics website: https://www.aphis.usda.gov/aphis/ourfocus/business-services/emergency\_management/ergonomics\_program/

# NOTES: