

# Laboratory Ergonomics

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If you've been plagued by a variety of aches and pains or by tingling, numbness or burning sensations in your hands and forearms — maybe even waking up at night with these symptoms — you could be a victim of one of the fastest growing occupational illnesses: cumulative trauma disorders, commonly called CTDs.

CTD is an umbrella term used to cover a variety of musculoskeletal disorders involving tendons, muscles, nerves and bones of the upper extremities resulting from the stresses and strains of repetitive motions and static or awkward postures. Left untreated, these disorders can become crippling. However, experts tell us that chances of developing CTD can be reduced or eliminated by using proper work techniques and heeding the principles of ergonomics, the science devoted to making work compatible with human capabilities and limitations.

## FROM MONKS TO MICROSCOPISTS

Workers on auto assembly lines, chicken pluckers, meat cutters, postal employees and bakers have long been plagued by injuries to the neck, elbow, shoulder, back and hands. Piano players and other musicians, as well as athletes, have suffered from cumulative trauma disorders. And one form of CTD — writer's cramp — was observed in monastic scribes as far back as the early eighteenth century.

Today, however, the frequency of CTDs is increasing dramatically. According to U.S. Department of Labor statistics, repetitive motion injuries now account for 60% of reported occupational illnesses; i.e., ailments resulting from exposure to particular occupational hazards over time, up from 15% in the early 1980s.

Much of this increase has been attributed by OSHA to changes in technology and resultant changes in how we do things. Neal Taslitz, executive director of the Chicago-based Repetitive Strain Injury Foundation, observes that today we are more apt to be glued in one place — a desk, a computer or lab bench — performing long, intensive tasks that require awkward and repetitive movements. But the body was not designed for the things we do today. Observes RSI Foundation's Neal Taslitz, "We humans are built to be on the move — hunting, fishing and gathering. Now we're colliding with millions of years of evolution."

Using a computer is perhaps the best known example of CTD. Typists used to stop to move the return carriage or apply white-out. With computers, people let their fingers fly hour after hour without breaks. Consequently, carpal tunnel syndrome and tendinitis, common forms of CTD that afflict the hands and wrists of computer keyboard users, have become familiar words around water coolers and coffee machines.

Like most work places, laboratories are not immune to ergonomic stressors, with pipetting and microscopy cited as the main culprits.

## RECOGNIZE THE RISK FOR CTD

OSHA has identified five specific situations which it says create significant risks for CTD, if incurred over a period of "more than two, three or four hours:"

- Performing the same motion or motion pattern every few seconds for more than two hours continuously or four hours daily.
- Maintaining an unsupported fixed or awkward posture for more than one hour continuously or four hours daily.
- Using vibrating or impact tools or equipment for more than one hour continuously or two hours daily.
- Using forceful hand exertions for more than two hours daily.
- Unassisted frequent or heavy lifting.

So, what can you do to protect yourself from CTDs like carpal tunnel syndrome, low back and neck pain?

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## HEED RECOVERY CYCLES

Ergonomists agree that the most important measures to prevent stress injuries are pretty straight forward. They are:

- Take frequent breaks.
- Don't repeat the same motion for hours on end.
- Avoid awkward motions and postures.
- Perform relief exercises.
- Expand the task each person performs to minimize the constant repetition of any one particular task.

The theory behind this advice: providing recovery time; time for your body to recover from exertions. "It's important to listen to your body and obey its recovery cycle," says Vern Putz-Anderson, Ph.D. and senior ergonomist at NIOSH, the National Institute for Occupational Safety and Health, the research and training arm of the U.S. Department of Health and Human Services. He points out that awkward postures, repetitions and use of force are not bad in themselves. They are bad, however, when sustained over time so that your body doesn't have time to recover. The result: over-exertion, injury and perhaps permanent damage. That's why, he says, formal strength building programs allow 48 hours between episodes for recovery and preventing permanent damage.

It's also critical to recognize the "cumulateness" of stresses and the need to balance tasks and activities, he explains. Without recovery periods, ergonomic stresses incurred during one activity become cumulative with those from another, similar activity. For instance, stresses you incur in leisure time activities, such as in gardening or aerobics, can be cumulative with those you may incur at work. Hence balancing these activities allows an adequate recovery period. As an example he cites a friend, a scientist, who takes care to balance his hobby of piano playing with intensive pipetting procedures in his lab.



### THE PRESSURE OF PIPETTING

According to Dr. Putz-Anderson (Ph.D. and senior ergonomist at NIOSH, the National Institute for Occupational Safety and Health), pipetting involves several ergonomic stressors: thumb force, repetitive motions and awkward postures, especially of the wrists, arms and shoulders. And these can be exacerbated by the mental pressure resulting from the accuracy, precision and timing demanded in many pipetting procedures. In fact, he asserts, there is evidence indicating that when pipetting is done for more than 300 hours in a year, the prevalence of hand and should pain increases. Dr. Putz-Anderson recommends these protective measures:

- Rotate pipetting tasks among several people.
- Take short micro pauses of a few seconds, when you can't take a longer break.
- Use only the force necessary to operate the pipetter.
- Choose pipettors requiring the least pressure.
- 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 stools with built-in solid foot stools. Don't use a foot ring, which could compress blood vessels in feet, and don't use high stools which can force you to work with a bent neck.
- Don't elevate your arm without support for lengthy periods.
- Use shorter pipettes. This decreases arm and hand elevation and consequent awkward postures.
- Use low profile waste receptacles for used tips. They should be no higher than the top of the tubes being filled.

## POSTURING AT MICROSCOPES



Awkward postures while looking through microscope eyepieces over prolonged periods of time are ergonomic stressors for people using microscopes, Dr. Putz-Anderson asserts. He explains that people typically lean forward, away from the back of the chair so that head, upper back and lower back are all inclined beyond acceptable limits, leading to back and neck pain. As antidotes, he again stresses the importance of recovery time as well as ergonomic seating and arrangement of work.

- Don't use a microscope for more than five hours per day. Spread use out over the entire work day so you don't spend long uninterrupted periods at it.
- Keep scopes clean and use illuminators and shadow boxes properly to avoid visual and musculoskeletal strain.
- Adjust chair height so thighs are horizontal and feet flat on the floor. Chairs should be adjustable from 15 to 21 inches (38 to 53 centimeters).
- Make sure the back rest provides proper lumbar support and be sure to readjust when you change positions.
- Select chairs with padded arm rests to rest your arms and increase stability without compressing the ulnar nerve in your arm.
- Position work surfaces high enough to allow close inspection without inclining your head beyond 17 to 29 degrees.
- Use a cutout work table. This puts you close to the scope yet gives an area for supporting forearms.
- Or, mount the microscope on a slant stand — like a drafting table — with its surface at an upward 30 degree angle so you can look directly into the eyepiece.

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## BECOME AN ERGONOMIC SLEUTH

You can probably find many other ways to reduce ergonomic stressors in your work environment. Stay alert for situations involving high rates of repetition, awkward postures and lifting. Then find ways to reduce or eliminate them. The tips below, picked up in discussion with ergonomic experts, may help you. And finally, remember your body is designed to be constantly in motion, not glued to a desk or lab chair.

## DON'T IGNORE SYMPTOMS OF CDT

If you have symptoms, see your doctor. The problem, according to Talitz, is that symptoms can gradually creep up on people without their noticing them. And because they often occur at night, people may not make the connection.

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## TIPS FOR RELIEVING THOSE ERGNOMIC STRESSES

### Evaluate your actions.

You could be creating stresses without even knowing it. Something as seemingly insignificant as constantly changing position to look through your bifocals can create a repetitive motion.

### Eliminate constant reaching and bending.

Organize your work space so you're not always reaching for things.

### Soften hard edges.

Leaning arms and elbows against the top edges of hard work benches can injure tendons, nerves and blood vessels.

Place anti-fatigue matting on work surfaces and soft pads on sharp edges of work benches.

### Be foot friendly.

If you stand for long periods, put anti-fatigue matting on the floor and use insoles made of the same type of material in your shoes.

**Support your back while sitting.**

Use chairs that can be easily adjusted and readjusted to suit different postures for different tasks.

**Support forward leaning postures.**

Pipetting and other lab activities require leaning forward over your work bench for long periods of time. Look into ways to support your body in this position, thus relieving lower back muscles.

**Use keyboard and terminals correctly.**

Keep wrists in neutral (not cocked) position, use minimum force to operate the keyboard, type with elbows at elbow height, and view the screen without tilting your neck. A variety of devices are available to help keyboard users maintain the correct wrist posture.

**Stay rested and relaxed.**

Fatigued, stressed workers are more susceptible to CTD injury than rested, relaxed ones. Keep your lab environment calm and comfortable by reducing noise and commotion and ensuring good air flow and adequate glare-free lighting.

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