# Managing Recurrent Repetitive Strain Injury (RSI)

## Manual Pipetting Can Cause Pain

**A number of commonly employed laboratory procedures are highly repetitive, thus putting users at risk of incurring injury. As more and more people predominantly spend their time stationary within their lab environment – whether at a desk or a lab bench – small movements such as typing on a keyboard, or pipetting, can become harmful to the user. As such, recent advances in occupational health have stipulated that in order to effectively manage this risk, ergonomic practices should be implemented in all relevant environments.**

**Utilizing index finger trigger action, shown here with the Thermo Scientific Finnpipette Novus, significantly reduces risk of injury.**

### The Laboratory Setting

In any scientific laboratory, the implementation of ergonomic working practices is essential to maintain personnel safety. User's joints and muscles are both put under an undue amount of stress when executing various experimental protocols, from using a microscope or biosafety cabinet to manipulating large centrifuge rotors. Most of these stresses come from maintaining a single pose long-term, for example when sitting in-front of a biosafety cabinet, or from consistently repetitive movements, such as pipetting.

### Repetitive Strain Injury and Pipetting

In many laboratories, manual pipetting is routinely performed, and a highly accurate and precise dispense is required to achieve optimal results. Studies (1 – 3) have however shown that repetitive pipetting can lead to an increased risk of strain related injuries and pipetting has specifically been identified as a source of exacerbated upper limb symptoms, especially when performed in excess of 300 hours per year (1). As a result, laboratory workers suffer from more hand and wrist symptoms compared to the general public (1), experiencing muscle and joint strain within the shoulder, forearm, wrist and fingers (4, 5). For example, wrist movement while adjusting the pipette volume can cause tendinitis (an inflammation of the tendon), whereas resting elbows on a hard benchtop while pipetting can result in cubital tunnel syndrome (the compression of the ulnar nerve in the cubital tunnel of the elbow). These disorders may cause significant reductions in accuracy and repeatability by altering the proper pipetting techniques that are crucial to achieving optimal accuracy. Good laboratory practice, combined with ergonomically designed pipettes and pipette tips can substantially reduce this risk.



### Risk Factors

The most common risk factors for injury while pipetting include repetition, force and posture. Activities that require a repetitive contraction of the same muscles and tendons are known to be causative factors for upper limb injuries (6), and it is therefore recommended that users take regular breaks. It should not be necessary to use excessive force in the operation of a manual pipette. However, force is often increased if the plunger is more difficult to operate.

In order to control the ergonomic hazards associated with repetitive pipetting, the Division of Occupational Health and Safety (7) (which serves the UK National Health Service (NHS)), recommends to use pipettes with newer trigger mechanisms which require less force, to use pipettes that fit comfortably in the hand, and to take micro-breaks of 2 minutes for every 20 minutes of pipetting. Mild hand exercises and stretches are also beneficial. Clean pipettes on a regular basis to reduce 'sticking', adjust the workstation so that the individual does not work with their arms at an elevated position: users should work with their arms close to the body. Use thin walled pipette tips that fit correctly and are easily ejected, use minimal force when applying pipette tips, keep samples and instruments within easy reach and use an adjustable stool or chair.

## Case Study

Dr Farhat Khanim, a research scientist at the University of Birmingham (UK) has experienced severe RSI. In her work with the translational research group at the College of Life and Environmental Sciences (funded by Leukaemia Lymphoma Research), she has carried out various experiments looking into blood cancers. This did however necessitate the implementation of a variety of protocols, which required highly repetitive manual pipetting - tissue culture; cell purification; SDS-polyacrylamide gel electrophoresis (PAGE); western blotting; RNA extraction; cDNA synthesis; and RTqPCR. The work that she was doing when she incurred the injury involved the investigation of treatment options for acute myeloid leukaemia (AML). As an incurable disease in the majority of adults, new, more targeted therapies are required to reduce the toxicity and increase the efficacy of treatments. In performing the protocols to obtain this data, Dr Khanim experienced severe RSI, leaving her unable to carry out any manual pipetting over a longer time period, without significant discomfort.

## Easing the Strain

In order to further this research, it was vital that a new pipetting technique was employed to alleviate the pain associated with the RSI. By switching to the electronic Thermo Scientific Finnpipette Novus, research was able to continue, regardless of the previous infliction. The trigger action of this pipette enabled the index finger to control dispensing, rather than the thumb, at the gentle press of a button. Furthermore, the introduction of the innovative stepper mode reduced the set-up time of a screening assay (typically consisting of approximately 20 96-well plates) from three hours to an hour and a half. Therefore, not only were ergonomics improved, but also throughput and efficiency. Following this move to a new, ergonomic pipette, Dr Khanim was able to continue her research, while no further symptoms of RSI were experienced.


## What is RSI

Also known as repetitive stress injury, repetitive motion injury, repetitive motion disorder (RMD), cumulative trauma disorder (CT), occupational overuse syndrome, overuse syndrome or regional musculoskeletal disorder is caused by monotonous and highly repetitive movements of the limbs or fingers. The symptoms are: short bursts of excruciating pain in the arm, back, shoulders, wrists, hands, or thumbs. The pain is typically diffuse (spread over many areas). The pain is worse with activity and there is weakness and lack of endurance.

The symptoms tend to be diffuse and non-anatomical, crossing the distribution of nerves, tendons, etc. They tend not to be characteristic of any discrete pathological conditions. Continuing the movements results in pain, even when the forces needed for these movements are low.

Besides laboratory staff, people working (or gaming) intensively with computers are frequently affected. Other joints than wrists are often affected in people doing sports extremely intensive.

Most RSIs will resolve spontaneously provided the area is first given enough rest when the RSI first begins. However, without such care, some RSIs have been known to persist for years, or have needed to be cured with surgery.

The most often prescribed treatments for repetitive strain injuries are rest, exercise, braces and massage. A variety of medical products also are available to augment these therapies. Ergonomic adjustments of the workstation are often recommended.

## Conclusion

Injury such as RSI occurs as a result of continuous, repetitive movement such as depressing a pipette plunger. As such, this is commonly experienced in laboratories due to the requirement for accurate and precise pipetting. There are, however, a number of preventative measures that can be taken to reduce the risk of RSI, one of which is to use ergonomically designed equipment. As an electronic model, the Novus has been developed to eliminate the strain of depressing the plunger commonly felt by the thumb through the incorporation of a trigger action dispense, which is activated by a soft touch from the index finger. This ergonomic practice is further supported by the lightweight design and soft-touch tip ejection. Its stepping mode also reduces the number of times that the user is required to move their arm from sample to plate. Furthermore, by increasing throughput, users are not required to sit in the same position for as long.

As discussed here, key research requires constant pipetting of various solutions in a time-efficient manner. When pipetting manually at such a high throughput, injury is inevitably obtained. However, by switching to a more ergonomic procedure, symptoms are alleviated to enable pivotal work to continue.

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