

THE SAFETY NET

Well documented and closely followed safety procedures are a very important aspect of laboratory work. As a pipette manufacturer we are always interested in any problems associated with safety. Recently we began to undertake further research on this subject.

Unlike the immense amount of material published on chemical, biological, radiation and general safety in the laboratory, there appears to be little consolidated information published on the safety aspects of pipetting in these environments, at least any supported by referenced research. There is a substantial amount of data on aspects of pipetting but commercially biased. Many companies expound the safety virtues of their pipettors but only founded on here-say, or what appears to be direct copy from other web sites or competitors promotional literature.

Over the years we have undertaken extensive internal research on the ergonomics of pipetting with recognized authorities on the subject. We have also held seminars and questioned our customers. From this research we are certain there are aspects of pipetting which we believe can lead to increased chances of developing WRULD (Work Related Upper Limb Disorders). This has been evidenced on a number of occasions by personal contact with laboratory workers and correspondence with solicitors representing unnamed clients looking for supporting data. In developing both our manual and electronic products we have studied this information and developed products that will benefit and protect the user. There is a lot more that goes into researching this problem than is initially anticipated, such as wrist angle, wrist flexion, seating position, pipette length, plunger pressures, grip diameter, bench height and much more. We do of course use some of this material in our promotional literature as a selling aid, but only the most observable elements such as thumb pressures. For example a technician dispensing with a mechanical pipette may have to apply up to 5Kg thumb pressure to “blow out” each time. This is 50 times the force needed with an electronic pipette! Naturally enough our competitors, big and small alike also promote similar features, although these may not actually have been tried and tested in the “laboratory”.

It seems that there are little or no definitive rules and regulations for protecting the worker, or possibly even more important, protecting their samples. It would appear companies seeking a competitive advantage from new features are leading the development of safety. It is more usual however in a laboratory environment for directives to appear from one legislative body or another proposing controls, not so for pipetting, yet! Perhaps this is due to a lack of understanding or a misconception of the risks. The risks are not just ergonomic but can be more profound if studied carefully.

So what are these risks:-

Risks to the laboratory workers from using a pipette

Ergonomics of pipetting is important and relates to development of WRULD (Work Related Upper Limb Disorders, CTD (Cumulative Trauma Disorder) or RSI (Repetitive Strain Injury). These include a whole spectrum of diseases, from tendonitis of the hand or wrist to carpal tunnel syndrome. If hands or wrists hurt or go numb or tingle, if your joints ache after repetitive tasks, such as pipetting, it is almost certainly a WRULD. Other symptoms include losing strength or coordination in your hands, perhaps even dropping objects. Not everyone experiences all symptoms, and sometimes your symptoms may not occur until several hours or even days after the activity which causes them. This problem can be caused by a number of elements: Design of the pipette, number of repetitions, seating position, lack of rest intervals or poor bench layout. It can be also accompanied by other ailments such as backaches or headaches.

Although this problem is not clearly covered in legislation, cases frequently come to light, employers naturally become very concerned and directives will no doubt follow in due course.

Secondly the action of pipetting can form aerosols. Obvious precautions need taking to avoid inhalation or even skin contact. All laboratories should have sound safety practices and these are governed by established bodies world-wide. Protective coats, gloves, laminar airflow cabinets etc. all assist in this prevention.

Risks to the sample, test and patient

This is an area of laboratory work that has come under close scrutiny in the last few years. If the sample is not handled correctly a result could ensue that puts at risk the test and even a patients life. The areas of concern are as follows:

- Are the pipettors regularly calibrated and serviced? Without this how can any worker be sure that the volume of sample is correct and therefore the result correct.
- Is the correct tool used being used for the job? For example, using an air displacement pipette to aspirate and dispense viscous fluids is unlikely to produce accurate results.
- Are the pipettors used under the correct conditions and in the correct manner? Is the pipette held upright, is the volume adjustment used correctly, is the blow out facility used properly, is the right technique being used? What is the ambient laboratory temperature, the pipette temperature and sample temperature? All these factors need to be addressed.
- Is your pipettor cross contaminating your samples? Do you know if your pipettor aspirates aerosols up into the tip cone, if you suspect it might, how often and how much? Does your tip cone touch the side of a reaction vessel? Do these risks mean that you cross contaminate samples regularly? So do you use filter tips as a precaution? Do these filter tips actually work?

This area of research is now under question, we hope to answer all these questions based on substantial research very shortly. We think you will be very surprised, even shocked!
<http://www.biohit.com/>

Risks to the final data

Once you have calibrated and serviced a pipette, the information should be stored accurately and securely for later retrieval. The same should also be said about sample tracking and processing. Although the pipette may have been calibrated, was it used for a specific test? Was the entire test protocol stored and easy to retrieve including information on the pipette used and who used it? If information is stored through use of software is it backed up regularly and accredited?

Most aspects of this safety chain are addressed in one way or another and some, such as calibration, are being considered by the relevant authorities more carefully month on month. The most obvious gaps in our knowledge that companies need to work on are:

- Further research and study on the mechanics of manual pipetting with respect to WRULD.
- Further research on the cross contamination of pipettors.

At Biohit we have internal documentary evidence of pipettor performance and risk factors associated with pipette design, handling and forces involved to operate these pipettors. We have surveys of several hundred people and the extent of their problems. Indications are there is a substantial undercurrent of discontent with certain products used in specific situations, particularly with

females. Even more curious is that the most popular products often need the most operational force and cause the most problems! Eliciting an honest response or a response at all, from some surveys often proved difficult. Laboratory workers with problems were frequently concerned about their jobs, prospects and completing their projects.

We are also working on a study examining the cross contamination problems associated with pipetting. This study is revealing positive evidence of cross contamination occurring. These results will be published shortly.

What the industry really needs is a more extensive survey of problems associated with pipetting in the laboratory environment. These surveys can take years to produce, dispatch, return and assimilate by which time many lab workers could have developed WRULDs. It could also be possible that a number of tests have proved inaccurate due to cross contamination by bacteriological, viral or radiochemical agents!

The Internet is proving itself to be a provider of global information and instant communication in an inexpensive and efficient manner. This may be an opportunity to test the efficacy of collating information on these two problems on a global scale, through use of the Internet. Please join this working group of scientists to help us design products that protect you and your work. If you contact us we will keep you up to date with our work in return.

If you have any evidence of, are a sufferer with WRULD, connected (you believe) with pipetting email us for more information on rsi@Biohit.com

If you are concerned about pipette cross contamination and the effect it may have on your work email us on contam@Biohit.com we will send you a copy of our soon to be published paper and further information.

If you would like a comprehensive guide to pipetting please email us on glh@biohit.com

All correspondence will be handled in complete confidence.

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