Giving pathogens the cold shoulder

Protecting staff in the lab is of vital importance as they are exposed to dangerous chemicals and pathogens on a daily basis, however with staff spending so much time disinfecting their workspace – is there a better solution? One company say they have the answer

PERSONNEL safety is an everyday concern for those managing and working in pathology laboratories. Today's high-tech clinical laboratories contain hazardous chemicals, complex electronic instruments and a wide variety of pathogens. Some of the greatest risks faced in these laboratories are associated with biological hazards and the use of pathogenic microorganisms or the handling of contaminated material.

The risk of occupational infection for laboratory workers remains a significant concern with their probability of contracting an infection such as HBV or HCV being significantly higher than in the average population. Working with infectious material is inherent to work in pathology laboratories and it is important that more advanced methods of ensuring the safety of workers are developed and integrated into everyday practice.

Safety in pathology is part and parcel of laboratory quality control. ISO (International Organisation for Standardisation) has issued standards on safety in medical testing laboratories – ISO 15190. These requirements for safety are designed to prevent laboratory acquired infection by personnel and prevent accidental release of agents which can be potentially dangerous to humans. The guidelines cover all aspects of laboratory safety and assist clinical laboratories in establishing processes that make the laboratory a safer place to work while allowing essential diagnostic work to continue. Although the ISO 15190 standards are not compulsory for the purpose of laboratory accreditation, all laboratories are recommended to follow these guidelines1.

The process of disinfection is of vital importance in pathology laboratories to maintain good levels of occupational health. Disinfection is the process of destroying specific pathogenic organisms on the surface of laboratory equipment and should be regarded as the first line of defence in occupational safety. It is a process that reduces the number of contaminating microorganisms to a level which is no longer harmful to the health of laboratory technicians. Technicians in pathology laboratories constantly work with live cells and their equipment is exposed to many infectious tissues, resulting in significant risk to users. Disinfectants should be used on hard surfaces such as countertops and laboratory instrumentation before and after each procedure to ensure the integrity of procedures and investigations.

Microorganisms vary in their resistance to destruction by physical or chemical means. A disinfectant that destroys bacteria may be ineffective against viruses or fungi. There are differences in susceptibility between gram-negative and gram-positive bacteria and sometimes even between strains of the same species. Bacterial spores are more resistant than vegetative forms and non-enveloped, non-lipid-containing viruses respond differently than do viruses which have a lipid coating2. Traditionally a number of methods can be utilised in laboratories for disinfection procedures.

Existing disinfection methods for laboratory equipment currently in place in pathology laboratories include ultraviolet light and chemical disinfection. The light (approximately 260nm wavelength) emitted by UV lamps is germicidal and can be used to reduce the number of pathogenic microorganisms on exposed surfaces. Instruments that are very large or fixed can be disinfected with a broad spectrum liquid chemical germicide, the choice of which will depend upon a number of key factors including the number and nature of microbes to be destroyed and the configuration of the item to be disinfected. The most commonly used chemical disinfectants in laboratory work are clear phenolics and hypochlorites. Disinfectants vary in their properties and microorganisms present a range of resistances to different chemicals. Therefore no single disinfectant is effective in all situations and it is important that laboratories select the

correct disinfectant for a specific task.

Despite the widespread use of these traditional methods of disinfection in pathology laboratories they suffer from a number of limitations that can impact upon both the health of the employee and the integrity of the work undertaken. UV light is limited by poor penetration power due to its ability to only disinfect areas reached by the light source. Consequently accumulations of dirt or clumps of microorganisms may shield microorganisms from the direct exposure necessary for disinfection meaning that contaminated material can still present a hazard to the health of the laboratory technician even after the disinfection procedure is completed. This method also requires a significant warm-up period in addition to a 30 minute disinfection process.

When using the method of chemical disinfection direct contact between germicide and microorganism is required for thorough disinfection. Microorganisms can be protected within air bubbles and agar or proteinacious nutrients and other cellular material can either directly (through inactivation of the germicide) or indirectly (via physical shielding of microorganisms) reduce the efficacy of liquid germicides2. These types of disinfectant can also take several hours to work. In addition they can produce chemicals that are toxic to humans when inhaled in high concentrations. Overt exposure can also result in tissue damage and acute adverse effects causing irritation to the skin, eyes and respiratory tract posing a considerable risk to the health of those working with the instrumentation.

While both of these methods are ultimately effective, laboratories do not want to expose their workforce to the unnecessary dangers associated with them. Furthermore, many busy laboratories cannot feasibly take the time required by these methods to disinfect their instrumentation between samples without causing significant interruption to their workflow.

Perhaps, what is clear from this overview is that laboratories suffer from a number of challenges and issues with regards to traditional disinfection procedures. In the main, this is to do with time and efficiency as well as the health and safety implications to laboratory technicians.

To address the issues and overcome the health risks that clinical laboratories are confronted with, a new feature for laboratory equipment called cold disinfection has been introduced by Thermo Fisher Scientific. The patented technology is able to disinfect the entire cold-cryo chamber of a cryostat, working against aerobic bacteria and fungi in three minutes, significantly reducing the risk to the occupational health of laboratory staff. The new disinfection process is 100 times faster than existing methods and requires no warm-up period. The method also enables the instrumentation to be used immediately after the disinfection cycle is complete, resulting in significantly higher throughput for the laboratory.

Cold disinfection utilises Sanosil, a powerful disinfectant and virucide that harnesses the antimicrobial powers of hydrogen peroxide and silver (Ag+). The combination of these two ingredients is proven to be 99.99% effective against more than 144 pathogens. This gives users complete confidence in the cleanliness and safety of their instrumentation and minimises any health hazards. This form of disinfectant is also non-toxic and non-carcinogenic when used as directed, making it safe for laboratory technicians to work with on a daily basis.

In their day-to-day handling of contaminated materials clinical laboratory workers are at increased risk of infection through work-associated exposure to microbial agents. One such way that a laboratory can lessen the risks to its workforce is by ensuring that exhaustive disinfection procedures of laboratory instrumentation are adhered to. The traditional methods of disinfection widely used in laboratories are not always completely effective and are time-consuming, meaning that workflows are interrupted for as much as several hours at a time. In addition, the very chemicals that are used to protect laboratory workers could themselves pose significant danger to the individual carrying out the disinfection process with the potential to cause tissue damage and acute adverse effects. The introduction of new disinfection technology recognises the importance of a comprehensive approach to laboratory safety and will assist laboratory technicians to develop procedures that not only command significantly less time but also cause no implications to their health. The development of the new innovative disinfection technology will significantly reduce the likelihood of injury and will greatly assist in safeguarding those who work in this high-risk environment.

Labnews Online Quick links
Latest Laboratory News
News Archive
Latest Science & Research Features
Feature Archive
Laboratory Vacancies & Jobs
Laboratory Products & Equipment
Products & Equipment Archive