

Has Cleanroom Technology Left Hospitals Behind?

You may or may not know that cleanroom technology has its roots in hospitals, with most of the early research being carried out during the second world war on the airborne dispersion of micro-organisms and the aerodynamics of particles; the principles of the turbulently ventilated room were established by the 1960s and when industry in general took an interest in the new 'clean' technology, further developments were to come with the introduction of unidirectional (laminar flow) ventilation.

Since those early days, cleanroom technology has moved on at a rapid pace and we are now at the point where many existing cleanroom installations have dropped off the scale of what is deemed to be a clean environment; and, believe it or not, many of these are to be found in hospitals up and down the country; but why should this be? Hospitals are often refurbished so one would assume that the clean areas would have been brought up to the standard relevant at that time, so why do hospitals have a problem with contamination control when cleanroom technology was primarily developed to provide that control?

You only have to glance through the pages of this magazine to get a glimpse of the problem, article after article on MRSA, E-coli, cleaning and decontamination. It is interesting to read about some of the measures being introduced to combat these problems as if they are new technology when most of them have been around for years. They are only new technology in the hospital sector and that is why I ask, has cleanroom technology left hospitals behind?

The basic requirement in hospitals is that of microbial contamination control and there are four areas in a hospital that have differing control requirements; the aseptic pharmacy unit, the operating theatre, the isolation ward and the general ward. Other areas such as the neo-natal and special care baby units are simply a variation of one of the above four main categories.

I have visited many hospitals during the course of my work at HiTech Controlled Environments Ltd some of which are better than others but all of which seem to make the same mistakes over and over again, a few of which I will try to highlight here.

The aseptic pharmacy units are without a doubt very good at microbial control, as one would expect. The staff are usually very well trained in cleanroom procedures and usually have a very good understanding of how their cleanrooms work. They are let down however by the facilities themselves. Most of these cleanrooms are built using old technology by people that do not fully understand the requirements of the facility itself and which are then maintained by a maintenance company that has probably never seen a cleanroom until the day they walked through the door. This increases the workload of the pharmacy staff to maintain the aseptic condition of the facility and of course that in turn increases the running costs.

The operating theatre is a place where people are 'cut open' for one reason or another and is the place where cleanroom technology has its roots as I said above. Yet very few, if any, operating theatres can be classified as a cleanroom. They are mostly a room with a unidirectional (laminar) air flow over the work area; outside this area the cleanliness level drops off, rather dramatically in some cases. OK, you might argue that the most important item, the patient, is in a clean area and yes I have to agree with that; but what about all those items outside the clean area that are brought in later? They do not get clean simply because they are now inside the clean area. More to the point however, is that contamination control procedures in the operating theatres is often very lax and at some points they are non-existent. Typically, I have seen theatre staff leave the theatre altogether to check up on some detail without changing and that includes the theatre shoes. Now, you will say that this is OK and how things are done, but from a contamination control point of view, this is a cardinal sin and after all isn't contamination control the whole point of the exercise?

Isolation wards are my favourite; I have not seen one yet that can not be described as anything other than a joke. You will say that is a bit strong and that you have an excellent facility at your hospital, but do you? The idea of the isolation ward is to isolate a highly infectious patient or to protect immuno-suppressed

patients and they will either be under a positive or negative air pressure according to the type of patient being isolated. So far so good. The problem again is with the facility, they are generally built by people who have little understanding of the requirements of an isolation ward and maintained by people who have no idea about contamination control. The biggest problems I have come across are associated with HEPA filters, or rather the lack of HEPA filters; the lack of HEPA filter testing where they are installed and the lack of any method of 'safe change' facility for the filters.

I will try to keep this simple. If a patient with a contagious disease is placed in isolation the object is to prevent the spread of the disease. The extract system will take the microbe laden air and discharge it into the surrounding environment but to prevent the microbes from getting out it is necessary to filter the air. HEPA filters are used for this purpose but those filters must be tested to prove that they are not leaking past their seals or that they are damaged, otherwise what is the point of the isolation ward. Furthermore, these filters are now contaminated and a 'safe change' facility is required to protect maintenance staff from the microbes.

Common sense yes? No! I could name one large teaching hospital where the above precautions are not met due to the costs involved and that is not an isolated case.

That brings me to the general wards. The other three areas can be classified as 'cleanrooms' even if loosely but the general ward is not a cleanroom; or is it? When we discuss cleanrooms per se it is often in the context of particle counts and BS EN ISO 14644 and the EUGGMP. Well that is alright for industry but a hospital is a very different place with the emphasis not so much on particle counts but on contamination control. Cleanroom procedures however are very good aids to contamination control, even when applied to an ordinary building such as an office, the home or the general hospital ward. Look at MRSA for instance; it is extremely difficult to cure once infection has occurred so the problem is one of prevention, of contamination control. There are a number of cleaning agents that are effective against these microbes yet they are not widely used in hospitals, why not? There are no effective contamination control procedures implemented in hospitals, why not?

Cleanroom technology has come a long way since those early days and the science of contamination control has travelled with it. I suppose that my question shouldn't be has cleanroom technology left hospitals behind but rather, has the science of contamination control left hospitals behind?

The root of the problem is that hospitals do not discuss their requirements with the right people. You talk to building contractors and air conditioning sub-contractors who do not fully understand the requirements of the controlled environment and a hospital is, or should be, a controlled environment. HiTech Controlled Environments Ltd is one of many Companies that specialise in contamination control and the controlled environment. The expertise is out there, it's up to you to use it.

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