

## **There is something in the Air.**

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TUBERCULOSIS, ASPERGILLUS, CHICKEN POX, MEASLES, MRSA-containing particles etc. are known to be floating around in the indoor air of most hospitals as confirmed by numerous publications on Hospital Hygiene. H5N1 might join them in the near future.

Airborne infection transmission causes severe human, social and financial problems and the numbers of these infections are increasing as reported by the WHO on Tuberculosis and the H5N1 pandemic.

But this is not the point. The point is: "Can we do something about it?" and the answer is: "YES, we can clean the indoor air". Is it that simple? Yes it is, but it requires an open mind and commitment from various departments in health care organisations.

For starters;

The hygiene department should look further than the debate and the discussion on the topic of which form of transmission is most important and rather focus on all of the parameters e.g. 'contact - droplet - airborne' that result in the transmission of infections. Linking 'contact - droplet - airborne' preventive measures shall result in the one supporting the other. Consider for one minute; 'what is not in the air, cannot drop and contaminate the furniture or medical devices' and more importantly "cannot be inhaled".

The technical department should look further than the (theoretical) technical details of the HVAC system and have an open mind with respect to new, innovative solutions and options that can support their existing ventilation system, options that contribute to a safer hospital environment.

The management should make a cost-benefit analysis based on all the criteria, facts and figures and consequences no different than commercial companies do on a daily basis. Consideration should be borne in mind for, 'the cost of an infection vis-à-vis the cost of a preventive measure' in light of all the potential savings in financial, patient outcome and reputation.

Herewith some known examples to consider.

1. It was established that airborne MRSA-concentrations are always present in the patients' room ( $\approx 6$  cfu/M<sup>3</sup>) and that higher concentrations occur during bed-making ( $\approx 116$  cfu/M<sup>3</sup>).

This means that high concentrations of MRSA ( $\approx 100$  cfu/M<sup>3</sup>) must have fallen on surfaces like on medical instruments, furniture and on the floor. Consequently, the result of other preventive measures like sterilisation or hand-hygiene will be diminished. Additionally, part of the MRSA particles remain airborne ( $\approx 6$  cfu/M<sup>3</sup>) and will be spread by the indoor air to other hospital areas. Source: *MRSA - Journal of Hospital Infection (2002) 50; 30-35*. "Evaluation of bed-making related airborne and surface MRSA contamination"

2. The risk that HCW's are infected with Tuberculosis is higher in the general departments like First Aid, I.C.U. and Autopsy (non-isolation) than in equipped departments (isolation rooms). Source: *"Hospital Ventilation and Risk for Tuberculosis Infection in Canadian Health Care Workers"*.

3. Mobile HEPA Pro Units completely eliminated Invasive Aspergillosis infections in patients undergoing (allogeneic) Bone Marrow Transplant. Source: *Aspergillus - European Bone Marrow Transplant 29 (2) 2002 P850 - 853*.

Airborne infection transmission has no limits or boundaries and the majority develops inside the hospital facility.

What are the technical options available to decrease the risk of airborne infection transmission?

The options are; a) to renew all inadequate HVAC-installation and/or b) to install HVAC-systems with HEPA filters in all the potential risk areas.

These options are fine when either building a new facility or when costs are not an issue, both are rather demanding as they require building activities with all the associated consequences including disturbances both to the department and patients.

A workable and feasible option is to install specifically designed and developed highly efficient HEPA filter units (preferably mobile units) that filter/clean the indoor air by eliminating airborne infection transmission at the source. (Inclusive of MRSA and/or TB and virtually all other infectious airborne particles).

What are the considerations when trying to establish which HEPA filter unit?

Which questions have to be asked? Which device to choose?

The most important criteria are; is the unit really effective, does it achieve the level of filtration required and is the information from the manufacturer correct?

The only reliable answers come from international health care providers faced with the dangers of airborne infection transmission, as airborne infection transmission in hospitals is an international issue. Secondly from proven scientific confirmations that are published by esteemed scientific organisations typically Hygiene Institutes from University Hospitals that have worked with and tested a specific mobile HEPA unit for a long period of time, preferably months or even years.

Only a unit that has offered significant results (a high decrease or even better the total elimination of airborne infection transmission - CFU's) should be deemed to be reliable.

The technical demands for an efficient (mobile) HEPA unit are:

- double airflow (1 airflow to take in contaminated air and 1 airflow to return cleaned air)
- the air-intake should be at effective horizontal (breathing) level as from 1 meter and over  
360° (air-intake at floor level is useless, this is not where people breath)
- the air-outlet should be over 360° diagonally upwards to create an airflow in the room (air-outlet at floor level is dangerous, CFU's on the floor are made airborne again)
- HEPA 14 filtration with leak test (no risk can be taken with infectious diseases)

- the casing should be shiny stainless steel (to prevent contamination to stick)
- no or limited maintenance (the unit has to function 24/24 hrs, all year through)
- the electronics have to meet maximum safety standards
- little or no occupation of floor space (floor space is limited in the hospital rooms)
- key remote control (only hospital staff can control the unit).

Let us avoid the discussion on 'what infection rate is a socially acceptable level'. Even one (1) infection that could have been prevented is too much so let's look at some financial figures on the costs in Europe of an infection.

- The cost of an MRSA infection is between 10.000 and 36.000 Euro.
- Tuberculosis (non resistant) costs a minimum of 10.000 Euro.
- Treatment of Invasive Aspergillosis costs around 35.000 Euro.
- Preventive medication against I.A. for all patients at risk, costs around 30 Euro/day per patient amounting to around 600 Euro/day for a ward.

With these figures in mind, the question must be "How do we guard against the potential of infection as a result of airborne infectious particles and the crippling associated costs?" and the answer is simple as the costs to implement an effective (mobile) HEPA concept pales into significance when compared to the cost of an airborne infection outbreak?

- An efficient mobile HEPA unit that protects health care workers, patients and visitors all year through, costs substantially less than 10.000 euro and is a one time investment.
- The initial budget estimate, too create an isolation or patient safe room with air-cleaning and pressure difference (positive or negative) is approximately 10.000 Euro.

Apart from that, a professional isolation room with negative pressure (for Tuberculosis /H5N1) or positive pressure (for immune-compromised) is installed in less than a day.

Finally, when you decide to implement an effective and efficient (mobile) HEPA filter device/unit in your organisation, make sure that the unit has been checked, better double checked, and confirmed by medical, clinical and laboratory studies that were published by esteemed medical organisations.

Then and only then, you can be sure that there is nothing "bad" in the air and breath easy.

Is the war on airborne infections and the danger imposed by these invisible demons, that simple?

YES IT IS!