Decentralised Airborne Infection Control in Health-Care Facilities

Airborne pathogens in health-care environments pose a particular risk to immuno-compromised patients who may inhale fungal spores, bacteria and viruses. Airborne microorganisms can not only complicate recovery from surgery, but can also lead to life-threatening infections, costing health-care services hundreds of millions every year.[1] The recent occurrence of the SARS virus has also shown that health-care personnel can be at risk.

Aspergillus Flavus (fungal spore)

Hospital-acquired *aspergillosis* for example has been recognised increasingly as a cause of severe illness and high mortality in immuno-compromised individuals, e.g. patients undergoing chemotherapy and/or organ or bone marrow transplants.

In the light of the marked increase in nosocomial infections over recent years, and the recent occurrence of the SARS virus, the importance of using high-efficiency air filtration systems beyond the confines of so-called "critical areas" (such as operation theatres) has once again been emphasised. Both the World Health Organisation (WHO) and the Centers for Disease Control and Prevention (CDC), advise that, wherever possible, preventive infection control measures should be implemented to reduce the risk of infections.[2,4]

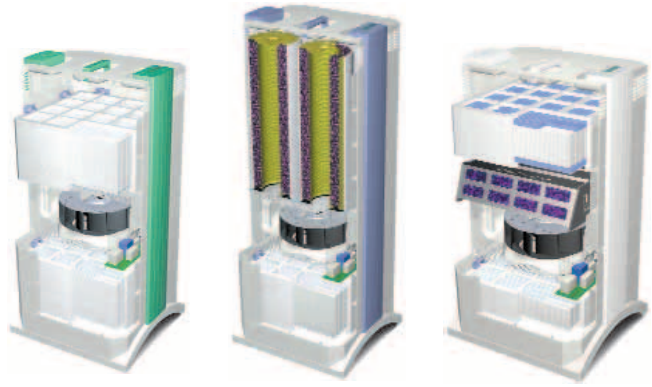
Portable HEPA-Systems can Effectively Reduce the Risk of Infection Transmission

One such preventive control measure is the filtration of the air within a patient´s room.[3] Such devices have shown to effectively reduce the concentration of sub-micron microorganisms to below measurable levels.[5] Even tiny airborne particles such as viruses and bacteria can be removed from the air with over 99% efficiency by advanced HEPA air cleaning systems. However, care must be taken over the selection of the appropriate HEPA systems. The CDC recommends that only HEPA-filters that have "a demonstrated and documented minimum removal efficiency of 99.97% of particles ≥ 0.3 µm in diameter should be used for infection control purposes.[4] Very few HEPA-systems are actually certified and guarantee to provide this high-efficiency.

IQAir® – Intelligent mobile HEPA-Filter Systems

A Swiss group of companies with an experience of 40 years in the field of air filtration has specialised in the production of high-efficiency filtration systems for the medical sector. The name of the series of systems is IQAir®. It offers a wide range of mobile and stationary air cleaning systems for a multitude of hospital applications.

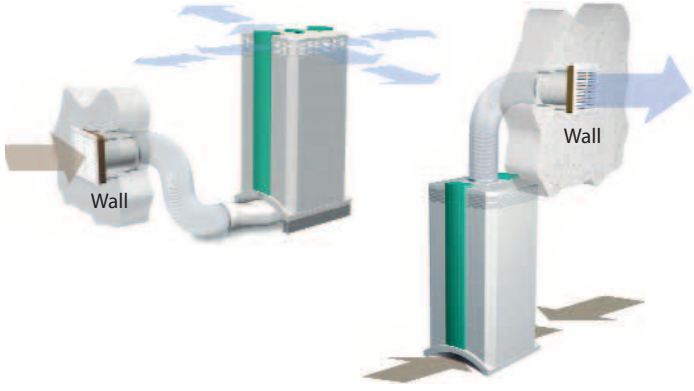
The IQAir® Series consists of several modular filter systems, each optimised to deal with a different range of airborne contaminants or aiming to fulfil a specific air hygiene requirement. The IQAir® Chemisorber for instance has the primary function to filter aldehydes, while the IQAir® Cleanroom H13 is designed for the removal of airborne microoganisms (e.g. bacteria, viruses & spores).



IQAir® systems are optimised by various filter technologies to meet the special requirements of air hygiene in different medical sectors.

Pressure Differences Enable the Isolation of Airborne Pathogens

The strategy to filter the air by recirculating indoor air through a high-performance filter can be optimised by creating and maintaining pressure differentials between adjacent rooms.[5] IQAir® systems are capable of creating pressure differentials with the help of special ducting adaptors. As a result, a room can be equipped with positive or negative pressure within minutes.



IQAir® systems with InFlow™ & Outflow™ adaptors for the creation of pressure differentials to isolate airborne microorganisms.

The Application of Positive and Negative Pressure

In the case of immuno-compromised individuals, the patient should be placed in a room with positive pressure to prevent contaminated air from entering.[6] If a patient carries a contagious disease (e.g. tuberculosis, SARS) that may be transmitted through the air, a negative pressure environment should be created to prevent spreading airborne microorganisms beyond the patient´s room.[6]

Individually Tested and Certified

To guarantee filtration efficiency and air delivery, the Swiss manufacturers have taken an uncompromising approach: Each IQAir® HEPA system is individually tested and certified. For the IQAir® Cleanroom H13, for example, that means a guaranteed filtration efficiency greater than 99.97% for particles of ≥ 0.3 µm and a certified maximum air delivery rate of 400 m^3 per hour.

EN1822 Independently Type-Tested

To guarantee absolute filter integrity, IQAir® HEPA filters are also independently type-tested in accordance with the world's most stringent hospital and cleanroom filter test norm (European Norm EN1822).

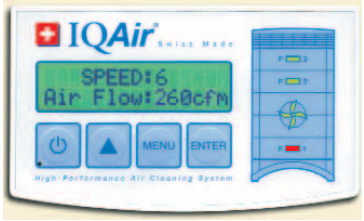
Quality Control: Each IQAir® HEPA filter system is individually tested for filtration efficiency and air delivery. The actual test results are documented on a numbered test certificate supplied with each system.

Flexible Point-of-Use Application

Since IQAir® systems work independently and decentralised, each unit´s air delivery and timer programme can be adjusted to suit the requirements of the room where it is located. The portable nature of the device also permits quick relocation or supplementary filtration, if needed. The variety of IQAir® models available, allows matching the most suitable filtration technology to the specific indoor air quality problem at hand.

Microchip Calculates When it´s Time to Change Filters

With regard to maintenance and filter change, IQAir® offers several advanced features. Every model is equipped with its own microchip-controlled filter life monitor, which calculates the remaining filter life, taking air pollution load, actual usage and fan speed into account. When a filter element reaches the end of its useful life, an LED indicator will light up on the IQAir®´s control panel, informing staff that it is time to change a particular filter.



LED on the control panel turns red when it's time to change a filter

Quick and Safe Filter Replacement

One of the most attractive features of IQAir® systems is the ease with which filters can be replaced. Whether the system is wall-mounted or floor-based, a patented system allows quick and safe access to all filter elements without the need for tools. In practice this means that the "down-time" of the filtration system, and consequently the build-up of pathogens in the room, are kept to an absolute minimum.

High Performance Need not Mean Expensive

In spite of the array of advanced features, the cost of IQAir® systems is only a fraction of that of centralised air cleaning systems. As a result, IQAir® systems enable health-care facilities to add to, or extend airborne hygiene measures to areas and patients which so far were not within the scope of an advanced airborne infection control strategy.

Safe and easy filter change within seconds.

Advantages of IQAir® Systems:

Reliable and Certified Performance

- Individually tested and certified
- Guaranteed HEPA filtration efficiency of up to 99.99% (Cleanroom H14) for airborne particles at ≥ 0.3 µm
- Independently type-tested in accordance with EN1822
- Guaranteed and certified air flow rate
- Reliable non-stop operation

Decentralised Operation

- Fast and economic installation and maintenance
- Rapid expansion of air hygiene area and short response time to epidemics
- Individually adjustable for various areas of application

Installation within Minutes

- Minimal installation cost and time expenditure
- Minimum interruption of daily routine
- No increase of infection risk as would otherwise be likely with elaborate construction measures

Use of Proved Filtration Techniques

- HEPA-filtration of solid and liquid particles, aerosols and microorganisms
- Chemisorption for filtration of chemical substances
- Adsorption for filtration of gases and odours

IQAir® Accessories

- Various accessories enable the creation of positive and negative pressure areas, wall mounting and the source-capture of odours and pollutants.

Medical Application Areas for IQAir® Systems:

Due to their unique adaptability, reliability and certified filtration efficiency, IQAir® systems cover a broad spectrum of applications in health-care facilities:

- **Bone marrow transplant units**
- **Organ transplant units**
- **Burn units**
- **Critical care facilities**
- **Intensive care units**
- **Isolation areas (e.g. TB-isolation)**
- **Dental clinics and dental laboratories**
- **Geriatric units**
- **Neonatal intensive care units**
- **Pulmonary Diseases**
- **Paediatric wards**
- **Oncology wards**
- **Haematology**
- **Microbiology labs**
- **Laser surgery fume and odour controls**
- **Operation theatres and anterooms**
- **Pathology theatres**
- **Pharmacies**
- **Computer and data storage areas**
- **Smoking areas**
- **Fresh air filtration / ventilation**
- **Sanitary facilities**
- **Waiting rooms**
- **Emergency rooms**

IQAir® systems are in use at many world-leading health-care and research institutions, including:

Beijing Friendship Hospital, Beijing, P.R. China
Beijing Union Medical College Hospital, Beijing, P.R-. China
Blackrock Clinic, County Dublin, Ireland
Cardarelli Hospital, Neaple, Italy
Duke University Medical Center, Durham, NC, USA
German Allergy & Asthma Society, Bonn, Germany
Hollister Research Center (Univ. of California) Santa Barbara, USA
Harvard University, Cambridge, USA
Holy Cross Hospital, Silver Spring, MD, USA
Interfaith Medical Centre (Psychiatric Ward), New York, USA
Kamillianer Krankenhaus (für Allergien), M.-Gladbach, Germany
King's College Hospital (Histopathology Dept.), London, UK
Lungenliga (Lung Association), Zürich, Switzerland
Merlin Park Regional Hospital (Operation Room), Galway, Ireland
Massachusetts Institute of Technology (M.I.T.), Boston, USA
National Cancer Institute, Bethesda, Maryland, USA
New York University Downtown Hospital (Burn Ward), NY, USA
Our Lady's Hospital for Sick Children (Univ. Coll. Dublin), Ireland
Long Island College/University Hospital, New York, USA
Oklahoma Medical Research Foundation, Oklahoma City, USA
Ospedale Israelitico, Rome, Italy
Ospedali Vitofazzi di Lecce, Lecce, Italy
Pennsylvania State Univ. (Applied Research Center), PA, USA
Rockford Memorial Hospital, Rockford, Illinois, USA
Royal Free & Univ. Coll. Med. School (Oncology), London, UK
St. Vincent Hosp. (Oncology & Liver Transplant), Dublin, Ireland
Sunshine Dental Practice, Diamond Bar, CA, USA
The University Hospital Cincinatti, Ohio, USA
Universitair Ziekenhuis Antwerpen, Edegem, Belgium
University Clinic Bonn, Germany
Univ. Coll. Hosp. Galway (Haematology, Neonatal, Oncology), Irel.
Univ. Coll. Davis, (Primate Research Center), Davis, CA, USA
University Dental Clinic Halle, Germany
University of North Florida, Jacksonville, FL, USA
University Health Network, Toronto, Canada
Universtiy of Connecticut (Fine Arts Dept.), Storrs, CT, USA
University of Colorado, Denver, Colorado, USA
University of Texas, Austin, TX, USA
Wartburg Kilnik, Eisenach, Germany
Washington Univ. (HHMI, Clinical Sciences), St. Louis, MO, USA
Wayne State University, Detroit, MI, USA
Virga Jesseziekenhuis, Hasselt, Belgium
Zürcher Höhenklink Wald, Zürich, Switzerland

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[4] Centers for Disease Control & Prevention (CDC), *Guidelines for Preventing the Transmission of Mycobacterium tuberculosis in Health-Care Facilities*, October 28th. 1994 / Vol. 43 / No. RR-13

[5] Streifel, A J. 1999. *Pressure Relationships in Hospital Critical-Care Facilities.* Indoor Air. Vol 5-31

[6] Sherertz R J, Belani A, Kramer B S, et al. *Impact of air filtration on nosocomial Aspergillus infections.* Am J Med 1987: 83: 709-18

For further information on IQAir® advanced filtration systems, please contact:

www.iqair.com

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