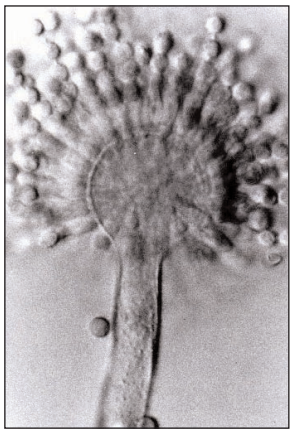
Decentralised Airborne Infection Control in Health-Care Facilities

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].



***Aspergillus Flavus* (fungal spore)**

Hospital-acquired *aspergillosis* for example has been recognised increasingly as a cause of severe illness and high mortality in immunocompromised 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, many of which are caused by drug-resistant pathogens[2], 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 nosocomial infections.

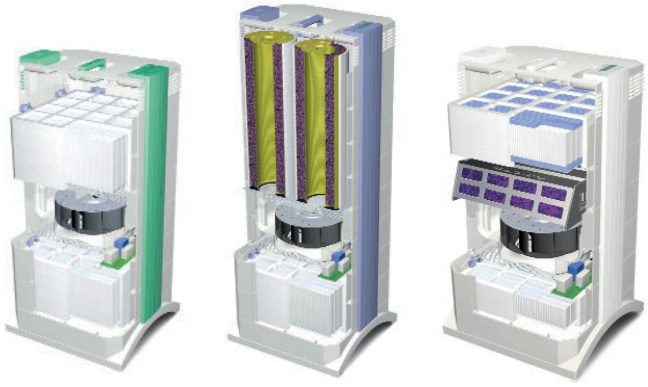
Portable HEPA-Systems can Effectively Reduce Infection Risk

One such preventive control measure is the filtration of the air within a susceptible patient´s room[3]. Such devices have shown to effectively reduce the concentration of aspergillus spores (which range in size from 1.5 µm to 6 µm) to below measurable levels. 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. 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 provide this efficiency guarantee.

IQAir – Intelligent mobile HEPA-Filter Systems

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

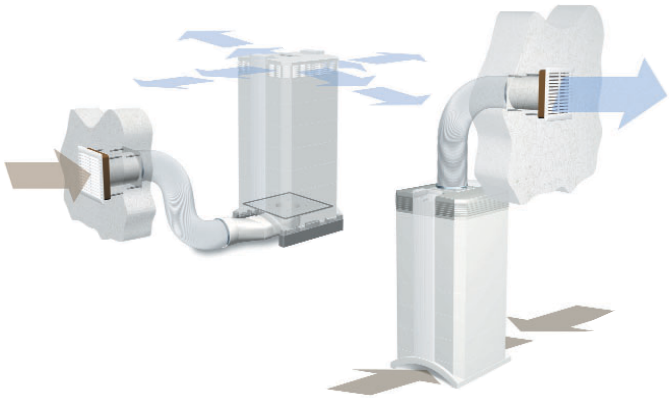
The IQAir Series consists of several modular filter systems, each optimised to deal with a different range of airborne contaminants or aiming to fulfil a specific air hygiene requirement. The IQAir Chemisorber for instance has the primary function to filter aldehydes, while the IQAir Cleanroom H13 is dedicated to 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 of recirculating indoor air through a high-performance filter can be optimised by creating and maintaining pressure differentials between two adjacent rooms. IQAir systems are capable of creating positive or



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

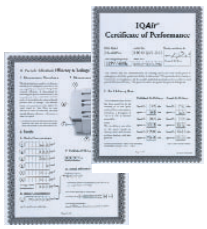
negative pressure environments with the help of special ducting adaptors. As a result, a room can be equipped with positive or negative pressure within minutes.

The Application of Positive and Negative Pressure Environments

In the case of immuno-compromised individuals, the patient should be placed in a room with a positive pressure to prevent the inflow of contaminated air[6]. If a patient carries a contagious disease (e.g. tuberculosis) 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 device is individually tested and certified. For the IQAir Cleanroom H13, for example, that means a guaranteed filtration efficiency of 99.97% for particles of ≥ 0.3 µm and a certified maximum air delivery of at least 400 m^3 per hour at maximum fan speed.



IQAir Quality Control: The actual efficiency test results are documented on the numbered test certificate supplied with each IQAir system.

Flexible Point-of-Use Application

As 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.

Integrated Microchip Calculates When it´s time to Change Filters

With regard to maintenance and filter change, the IQAir Series offers several advanced features. Every model is equipped with its very own microchip-controlled filter life monitor, 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 filters.

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

- Guaranteed and certified HEPA filtration efficiency of 99.97% for airborne particles at 0.3 µm reduces risk of disease transmission through infectuous microorganisms
- Guaranteed and certified air flow rate
- Reliable non-stop operation

Decentralised Operation

- Fast and economic installation and maintenance
- Individual accommodation of special hygiene requirements
- 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 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 capturing of odours and pollutants right at the source.

Medical Application Areas for IQAir Systems:

Due to their unique adaptability and high 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

Examples of worldwide institutions using IQAir® systems:

Blackrock Clinic, Blackrock, County Dublin, Republic of Ireland
Beijing Friendship Hospital, Beijing, P.R.China
Debreceni Református Kollégium Nagykönyvta'r, Debrecen, Hungary
Deutscher Allergie & Asthma Bund (OV Bonn), German Allergy & Asthma Society, Bonn, Germany
Harvard University, Cambridge, Massachusetts, USA
Hollister Research Center (University of California) Santa Barbara, USA
Interfaith Medical Centre Brooklyn (Psychiatric Ward), New York, USA
Kamillianer Krankenhaus (Clinic for Allergy & Asthma Sufferers), Mönchengladbach, Germany
Long Island College/University Hospital, New York, USA
Lungenliga (Lung Association), Zürich, Switzerland
Merlin Park Regional Hospital (Operation Room), Galway, Republic of Ireland
Massachusetts Institute of Technology (MIT), Boston, Massachusetts, USA
National Cancer Institute, Bethesda, Maryland, USA
New York University Downtown Hospital (Burn Ward), New York, USA
Our Lady's Hospital for Sick Children (University College Dublin), Crumlin, Republic of Ireland
Oklahoma Medical Research Foundation, Oklahoma City, USA
Peking Union Medical College Hospital, Beijing, P.R. China
Rockford Memorial Hospital, Rockford, Illinois, USA
Royal Free & University College Medical School (Oncology Ward), London, United Kingdom
St. Vincent Hospital (Oncology & Liver Transplant Ward), Dublin, Republic of Ireland
The University Hospital Cincinatti, Ohio, USA
Universitair Ziekenhuis Antwerpen, Edegem, Belgium
University Clinic Bonn, Germany
University College Hospital Galway (Haematology, Neonatal, Oncology, Peadiatric), Ireland
University Dental Clinic Halle, Germany
University Health Network, Toronto, Canada
University of Colorado, Denver, Colorado, USA
Virga Jesseziekenhuis, Hasselt, Belgium
Zürcher Höhenklink Wald, Zürich, Switzerland

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

[7] http://www.hopkins-heic.org/infectious_diseases/aspergillus/hepafiltration-table.htm

[8] http://www.hopkins-heic.org/infectious_diseases/aspergillus/asp-outbreak-table.htm