

## Genano Application Note

# Infection Control in Operating Theatres



**Surgical-site infections caused by intra-operative contamination mainly originate from microbes carried by airborne particles, which settle on the surgeon’s hands and instruments.** Furthermore, operating theatres are characterized by constant exchange between airborne and surface contamination - airborne pathogens settling on surfaces and surface-bound microbes being released into the air.

The risk of airborne pathogens cannot always be eliminated by central ventilation. Operating room hygiene can be significantly improved with supplementary systems such as electrical air purifier units even if meticulous aseptic procedures and standards-compliant air filtration are used.

Operating theatres must comply with the ISO 14644 cleanroom standard classes 7–5, depending on local cleanliness requirements. In addition to particle count, other important design factors are the rate

of **air volume change per hour (ACH)** and **positive pressure difference** between the operating room and outside environment. Research suggests that when ACH decreases, particle count at the wound site increases. If the ACH provided by central ventilation is inadequate, ventilation rate can be compensated with a recirculating air purifier unit.

Lastly, the operating theatre air hygiene must be adequately monitored by particle measurements and microbiological tests within the room (not just by filter performance), to achieve minimal risk to patients.

Airborne Particulate Cleanliness Classes  
(by cubic meter) (ISO 14644-1)

CLASS	Number of Particles per Cubic Meter by Micrometer Size					
	0.1 um	0.2 um	0.3 um	0.5 um	1 um	5 um
ISO 1	10	2				
ISO 2	100	24	10	4		
ISO 3	1,000	237	102	35	8	
ISO 4	10,000	2,370	1,020	352	83	
ISO 5	100,000	23,700	10,200	3,520	832	29
ISO 6		237,000	102,000	35,200	8,320	293
ISO 7				352,000	83,200	2,930
ISO 8					832,000	29,300
ISO 9						293,000

ISO 14644 standard establishes classes of air cleanliness for airborne particulate levels in cleanrooms and associated cleanroom areas, (clean zones) including critical environments in hospitals and other healthcare facilities.

## GENANO'S ADVANTAGES

- 1** Eliminates all microbes and collects particles down to 0.003  $\mu\text{m}$  size.
- 2** Decreases incidence of surgical-site infections with constant purification efficiency.
- 3** Increases air change rate and boosts ventilation in the room.

Hospital acquired infections are a serious risk in healthcare facilities around the world. Operating rooms especially have high hygiene standards for the apparent risk of the patient getting an infection during an invasive procedure.

## DECREASE SURGICAL-SITE INFECTIONS with Genano air purifiers



### NANOSCALE INFECTION CONTROL

Regardless of the type of the main ventilation system, Genano air purifiers perfectly fit into an operating room as an additional nanoscale purification system.

The supply air flow in an operating theatre is commonly filtered by HEPA, which only collects particles of 0.3  $\mu\text{m}$  and bigger in diameter. Many airborne pathogens are much smaller. **Genano's core advantage is the ability to remove and eliminate airborne microbes of all sizes - down to nanometer scale.**

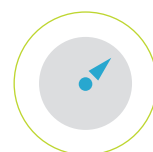


### BOOST VENTILATION & ACH

Genano brings additional boost to the current operating theatre ventilation system if the total ACH does not meet requirements. In this case, the total ACH of the room is determined by the room ventilation rate and the re-circulating Genano air purifier together.



**Boosting the system ventilation and/or creating a pressurized operating room with Genano is a powerful and cost-effective solution especially in an outpatient surgery rooms and elder hospital facilities.**



### CREATE POSITIVE PRESSURE

Operating room pressurization should always be positive to prevent non-hygienic air from other premises from entering the room. In case adequate pressurization cannot be created with central ventilation, a Genano unit is installed to induce positive pressure.

The supply air of the central ventilation is led into the room through the Genano air purifier. The device is capable of controlling the positive pressure difference, which should be 5–10 Pa relative to adjacent spaces. To obtain maximal results, the supply air should be at least 20 % more than the exhaust air and all the air leakages are being controlled well.