# BARRIER® Clean Air Suit

## Proven to maintain ultra clean air in the OR

BARRIER® Clean Air Suit can maintain ultra clean air in the operating room[1-4] (OR). It's a single-use clothing system proven to have a better protective effect than reusable systems made of Mertex, olefin, cotton or polyester[1,4,5].

We've heard how decreasing counts of airborne bacteria in the OR plays an important part in infection control. And we understand that people in the OR are a main source of airborne microorganisms[6] that can cause surgical site infections. Our BARRIER Clean Air Suit is proven to contribute to hospital infection control – the below evidence summaries explain how.

### Kasina P et al, 2016[1]

Prospective study/clinical setting

**Key findings:**

- The BARRIER Clean Air Suit achieved a significantly larger reduction in colony forming units (CFU/$m^3$) compared to the olefin suit, and also compared to the laminar air flow-assisted Mertex suit (p=0.009)

**Objective:**

To investigate if BARRIER Clean Air Suit alone can achieve similar air quality in the OR to reusable clothing systems assisted by mobile laminar air flow.

**Methods:**

- Setting: OR (hip and knee arthroplasties)
- No. of procedures: 37
- Outcome measure: CFU/$m^3$ of air (mean, median, range)

**Products tested:**

- BARRIER Clean Air Suit (n=11)
- Olefin suit (n=13): reusable suit made out of olefin fabric (woven polypropylene). Test was done without laminar air flow devices
- Mertex P-3477 suit (n=13): reusable suit made out of mixed material (cotton/polyester). Test was done with using 2 TOUL mobile laminar air flow devices

### Tammelin A et al, 2013[5]

Prospective studies/clinical and laboratory settings

**Key findings:**

- BARRIER Clean Air Suit maintained significantly lower counts of CFU/$m^3$ compared to a reusable clothing system (Mertex) both in the OR and in an air chamber ($p<0.05$)
- BARRIER Clean Air Suit improved air quality (<10 CFU/$m^3$) even when ordinary ventilation was used in the OR
- The results show that clean air suits of different materials meeting the requirements of the EN 13795 standard may still exhibit significant differences in their protection capacity (bacterial penetration)
- BARRIER Clean Air Suit has a better protective effect than a reusable system made of cotton/polyester

**Objective:**

To investigate if there is a difference in protective efficacy between BARRIER Clean Air Suit and a reusable clothing system.

**Methods:**

- Settings: OR/dispersal chamber
- No. of procedures: OR, n=10; dispersal chamber, n=5
- Outcome measure: CFU/$m^3$ of air (mean, range)

**Products tested:**

- BARRIER Clean Air Suit
- Mertex P-3477 suit – reusable, mixed material (cotton/polyester/carbon fibre)

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## Ljungqvist B and Reinmuller B, 2012[3]
### Laboratory study

**Key findings:**

- The BARRIER Clean Air Suits all resulted in a >75% reduction in CFU concentration and a >90% reduction in particles emitted from the test subjects, compared to the mixed cotton/polyester reusable material (Mertex P-3477)
- When low concentrations of airborne bacteria-carrying particles are necessary to avoid hospital infections to patients, surgical clothing systems of evaluated disposable non-woven material is preferable

**Objective:**

To evaluate and compare the protective efficiency of a single-use and a reusable clothing system in a laboratory setting.

**Methods:**

- Setting: dispersal chamber
- No. of procedures: 5 per product (4 measurements per individual)
- Outcome measures: source strength – total particulates (numbers); bacteria-carrying particles (CFU)

**Products tested:**

- Older version of BARRIER Clean Air Suit (shirt tucked in)
- New BARRIER Clean Air Suit, antistatic-treated (shirt outside pants)
- New BARRIER Clean Air Suit, not antistatic-treated (shirt outside pants)
- Reusable clothing system (cotton/polyester): Mertex P-3477 clean air suit. Reusable, laundered up to 50 times (shirt tucked in)

## Ljungqvist B and Reinmuller B, 2013[4]
### Laborative study/clinical setting

**Key findings:**

- BARRIER Clean Air Suits achieved a CFU concentration (CFU/$m^3$, mean (SD)) of 11.5 ± 6 and a source strength of 1.15 ± 0.6 under the stated conditions
- The BARRIER Clean Air Suit showed higher protection efficiency when compared to that of a suit from reusable material, Mertex P-3477 (data from a previous study in the same environment)

**Objective:**

To evaluate the protective efficiency of a single-use clothing system in a clinical setting.

**Methods:**

- Setting: OR (hip and knee arthroplasties)
- No. of procedures: 10
- Outcome measures: source strength – total particulates (numbers); bacteria-carrying particles (CFU)

**Products tested:**

- BARRIER Clean Air Suit

## Definitions

**Colony forming units (CFUs):** Number of particles that carry bacteria and can give rise to a colony on a culture plate.

**Laminar air flow device:** Instrument that creates a streamlined air flow in the operating room. This makes all particles move in the same direction.

**Dispersal chamber:** Test chamber with HEPA-filtered air supply and with exhaust air in which the concentration of the total number of particles and bacteria-carrying particles from the test subjects are measured in order to calculate the source strength.

**Source strength:** The average number of CFUs released per second from one person wearing a specified clothing system.

## What is needed to limit the levels of air-borne bacteria?

- Staff clothing that reduces the emission of skin scales[2]
- Adequate hygienic standards[7]
- Good ventilation[7]

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References:
**1.** Kasina, P., Tammelin, A., Blomfeldt, A-M., Ljungqvist, B., Reinmuller, B., Ottosson, C. Comparison of three distinct clean air suits to decrease the bacterial load in the operating room: an observationalstudy. Patient Safety in Surgery 2016;10(1): DOI 10.1186/s13087-015-0091-4. **2.** Tammelin, A., Hambraeus, A., Stahle, E. Routes and sources of Staphylococcus aureus transmitted to the surgical wound during cardiothoracic surgery: possibility of preventing wound contamination by use of special scrub suits. Infection Control and Hospital Epidemiology 2001;22(6):338–346. **3.** Ljungqvist, B., Reinmüller, B. PEOPLE AS A CONTAMINATION SOURCE. Surgical clothing systems for operating rooms – a comparison between disposable non-woven and reusable mixed material. Technical Report from Chalmers University of Technology, Gothenburg, Sweden. 2012. **4.** Ljungqvist, B., Reinmüller, B. PEOPLE AS A CONTAMINATION SOURCE. Performance of single-use surgical clothing systems for operating rooms, Technical Report from Chalmers University of Technology, Gothenburg, Sweden. 2013. **5.** Tammelin, A., Ljungqvist, B., Reinmüller, B. Single-use surgical clothing system for reduction of airborne bacteria in the operating room. Journal of Hospital Infection 2013;84(3):245-247. **6.** Hambraeus, A. Aerobiology in the operating room – a review. Journal of Hospital Infection 1988;11(Supplement A):68-76. **7.** Hirsch, T., Hubert, H., Fischer, S., Lahmer, A., Lehnhardt, M., Steinau, H.U., Steinstraesser, L., Seipp, H.M. Bacterial burden in the operating room: impact of airflow systems. American Journal of Infection Control 2012;40(7):E228–E232.



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