

# ”LAF” bra eller dåligt?

Birgitta Lytsy, Uppsala

191106

Svenska hygienläkarföreningens Höstmöte

# Minska risken för postoperativa infektioner.

*Hur och vad göra enligt WHO?*



**World Health  
Organization**

## WHO Guidelines for Safe Surgery 2009

Safe Surgery Saves Lives



WHO guideline  
2009 års version


GLOBAL GUIDELINES  
FOR THE PREVENTION OF  
SURGICAL SITE INFECTION



WHO guideline

2016 års version

# Lancet Infectious Diseases 2016

Series 

Series 

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## Surgical site infections 1



**New WHO recommendations on preoperative measures for surgical site infection prevention: an evidence-based global perspective**

*Benedetta Allegranzi, Peter Bischoff, Stijn de Jonge, NZeynep Kubilay, Bassim Zayed, Stacey M Gomes, Mohamed Abbas, Jasper J Atema, Sarah Gans, Miranda van Rijen, Marja A Boermeester, Matthias Egger, Jan Kluytmans, Didier Pittet, Joseph S Solomkin, and the WHO Guidelines Development Group\**

13 frågeställningar  
preoperativt

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## Surgical site infections 2



**New WHO recommendations on intraoperative and postoperative measures for surgical site infection prevention: an evidence-based global perspective**

*Benedetta Allegranzi, Bassim Zayed, Peter Bischoff, NZeynep Kubilay, Stijn de Jonge, Fleur de Vries, Stacey M Gomes, Sarah Gans, Elon D Wallert, Xiuwen Wu, Mohamed Abbas, Marja A Boermeester, E Patchen Dellinger, Matthias Egger, Petra Gastmeier, Xavier Guirao, Jianan Ren, Didier Pittet, Joseph S Solomkin, and the WHO Guidelines Development Group*

16 frågeställningar peri- och postoperativt

# Rekommendationerna graderas

GLOBAL GUIDELINES  
FOR THE PREVENTION OF  
SURGICAL SITE INFECTION

- "Strong" fördelarna överväger riskerna
- "Conditional" fördelarna överväger troligen riskerna



# LAF-laminar air flow ventilationssystem

LAF ska inte användas vid proteskirurgi



# LAF ska inte användas är bara dyrt

Vid ortopedisk kirurgi



(12) Laminar airflow ventilation systems in the context of operating room ventilation

Is the use of laminar airflow in the operating room associated with the reduction of overall or deep SSI; does the use of fans or cooling devices increase incidence of SSI; is natural ventilation an acceptable alternative?

Laminar airflow ventilation systems should not be used for patients undergoing total arthroplasty surgery

Conditional recommendation (low to very low)

In particular for the construction of future health-care facilities, this recommendation will reduce costs

Metaanalys:

Jämföra konventionella ventilationssystem med "LAF-tak" → postoperativ infektion

Articles

Konklusion: "LAF-tak" minskar inte risken för postoperativ infektion efter kirurgiska ingrepp

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## Effect of laminar airflow ventilation on surgical site infections: a systematic review and meta-analysis



*Peter Bischoff, N Zeynep Kubilay, Benedetta Allegranzi, Matthias Egger, Petra Gastmeier*

### Summary

**Background** The role of the operating room's ventilation system in the prevention of surgical site infections (SSIs) is *Lancet Infect Dis 2017*

contamination of the air and risk of SSIs.<sup>61</sup> The threshold limit of ultra-clean air was arbitrarily defined by Lidwell and colleagues as less than ten colony-forming units per m<sup>3</sup> and has been used as the standard ever since.<sup>15,62</sup>

Birchoff 2017 LID

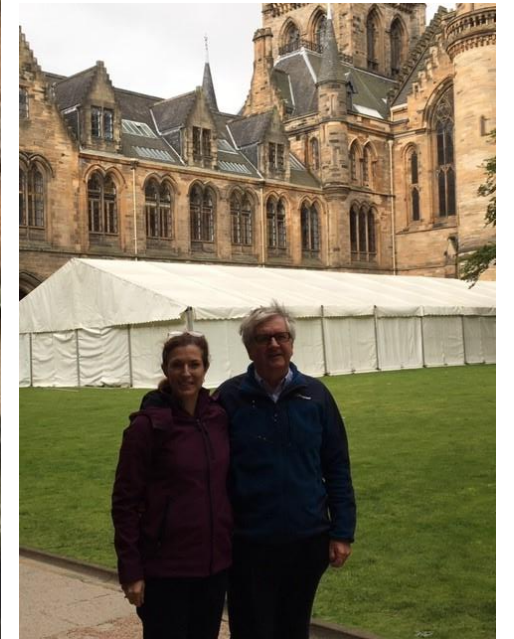
operating rooms today. Furthermore, there was no uniform method for random allocation and the study did not control for the administration of surgical antibiotic prophylaxis, which was given in about 60% of patients.

Bischoff LID 2017



Glasgow 2018

# Bengt Ljunqvist och Berit Reinmüller





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Journal of Hospital Infection

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Review

# Ultraclean air systems and the claim that laminar airflow systems fail to prevent deep infections after total joint arthroplasty

W. Whyte<sup>a</sup>, B. Lytsy<sup>b,\*</sup>

<sup>a</sup> *University of Glasgow, Glasgow, UK*

<sup>b</sup> *Uppsala University Hospital (Akademiska Sjukhuset), Uppsala, Sweden*

## Två syften med Whyte's artikel

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1. Bemöta WHO's rekommendation om "LAF"
2. Bemöta kritiken mot resultaten av MRC studien som re-citeras och blir en befäst "sanning"



# 1. WHO's rekommendation om "LAF" bygger på en metaanalys av Bischoff

## **Bischoffs meta-analys konventionell ventilation jämförs med "LAF" med postoperativ infektion som end-point inkluderar dessa:**

1. Brandt C, Hott U, Sohr D, Daschner F, Gastmeier P, Ruden H. Operating room ventilation with laminar airflow shows no protective effect on the surgical site infection rate in orthopaedic and abdominal surgery. *Ann Surg* 2008;248:695e700.
2. Dale H, Hallan G, Espehaug B, Havelin LI, Engesaeter LB. Increasing risk of revision due to deep infection after hip arthroplasty. *Acta Orthop* 2009;80:639e45.
3. Namba R, Inacio MC, Paxton EW. Risk factors associated with deep surgical site infection in 30,491 primary total hip replacements. *J Bone Joint Surgery Am* 2013;95:775e82.
4. Namba R, Inacio MC, Paxton EW. Risk factors associated with deep surgical site infections after primary total knee arthroplasty e an analysis of 56,216 knees. *J Bone Joint Surg Am* 2013;95:775e82.
5. Breier AC, Brandt C, Sohr D, Geffers C, Gastmeier P. Laminar flow ceiling size: no impact on infection rates following hip and knee prosthesis. *Infect Control Hosp Epidemiol* 2011;32:1097e102.
6. Hooper GJ, Rothwell AG, Frampton C, Wyatt MC. Does the use of laminar flow and space suits reduce early deep infection after total hip and knee replacement? The ten-year results of the New Zealand Joint Registry. *J Bone Joint Surg Br* 2011;93:85e90.
7. Pederson A, Svendsson JE, Johnsen SP, Riis A, Overgaard S. Risk factors for revision due to infection after primary total hip arthroplasty. A population based study of 80,756 primary procedures in the Danish Hip Arthroplasty Registry. *Acta Orthop* 2010;81:542e7.
8. Song KM, Kim ES, Kim YK, Jin HY, Jeong SY, Kwak YG, et al. Differences in the risk factors for surgical site infection between total hip arthroplasty and total knee arthroplasty in the Korean Nosocomial Infections Surveillance System (KONIS). *Infect Control Hosp Epidemiol* 2012;33:1086e93.
9. Miner AL, Losina E, Katz JN, Fossel AH, Platt R. Deep infection after total knee replacement: impact of laminar airflow systems and body exhaust systems in the modern operating room. *Infect Control Hosp Epidemiol* 2007;28:222e6.
10. Kakwani RG, Yohannan D, Wahab KHA. The effect of laminar air flow on the results of AustineMoore hemiarthroplasty. *Injury* 2007;38:820e3.
11. Jeong SJ, Ann HW, Kim JK, Choi H, Kim CO, Han SH, et al. Incidence and risk factors for surgical site infection after gastric surgery: a multicentre prospective cohort study. *Infect Chemother* 2013;45:422e30.
12. Bosanquet DC, Jones Gill N, Jarvis P, Lewis MH. Laminar flow reduces cases of surgical site infections in vascular patients. *Ann R Coll Surg Engl* 2013;95:15e9.

# Studierna i metaanalysen- invändning 1:

Beskriver inte hur ventilationssystemen *fungerar* eller vilken *effekt* de har, anger inte bakteriekoncentrationer (cfu/m<sup>3</sup>)

Studierna korrelerar inte *bakteriekoncentrationen* med infektionsfrekvensen.

Andra studier har visat att taken inte uppnår bakteriekoncentrationer < 10 cfu/m<sup>3</sup> fast de betecknas som "LAF-tak"

Tex: Agodi A, Auxilia F, Barchitta M, Cristina ML, D'Alessandro D, Mura I, et al. Operating theatre ventilation systems and microbial air contamination in total joint replacement surgery: results of the GISIO-ISChIA study. J Hosp Infect 2015;90:213e9.

# Studierna i metanalysen- invändning 2:

Åtta av 12 studier var retrospektiva registerstudier.

Tyskland: man frågar om det är "LAF"

Ytliga postoperativa infektioner inkluderade

Heterogenitet vad gäller övriga risk faktorer för postoperativ infektion

Korta uppföljningstider – "inkubationstiden" kan vara > 1 år

# Studierna i metaanalysen- invändning 3

## Inklusionskriterier

Inga studier före 1990 togs med i meta-analysen

Därmed föll MRC-studien och Charnleys studier bort

## Exklusionskriterier:

Fyra studier uteslöts pga av att de "inte uppfyllde inklusionskriterierna"

Tre av dessa studier visade att ultraclean systems (UDAF och täta kläder) reducerar risken för postoperativa infektioner

## 2. Bemöta felaktig information om MRC studien ofta kallad "Lidwells studie"

- Antibiotikaproylax var randomiserat
- Den typ av ventilationssystem som fanns då finns kvar än idag

# MRC-studien på 80-talet

Lidwell, Lowbury, Blowers, Whyte, Stanley, Lowe

1974-1979

19 sjukhus i UK och Sverige (Akademiska sjukhuset)

Infektionsfrekvens 2 – 1 % kräver > 2500 op i varje arm

Tre armar

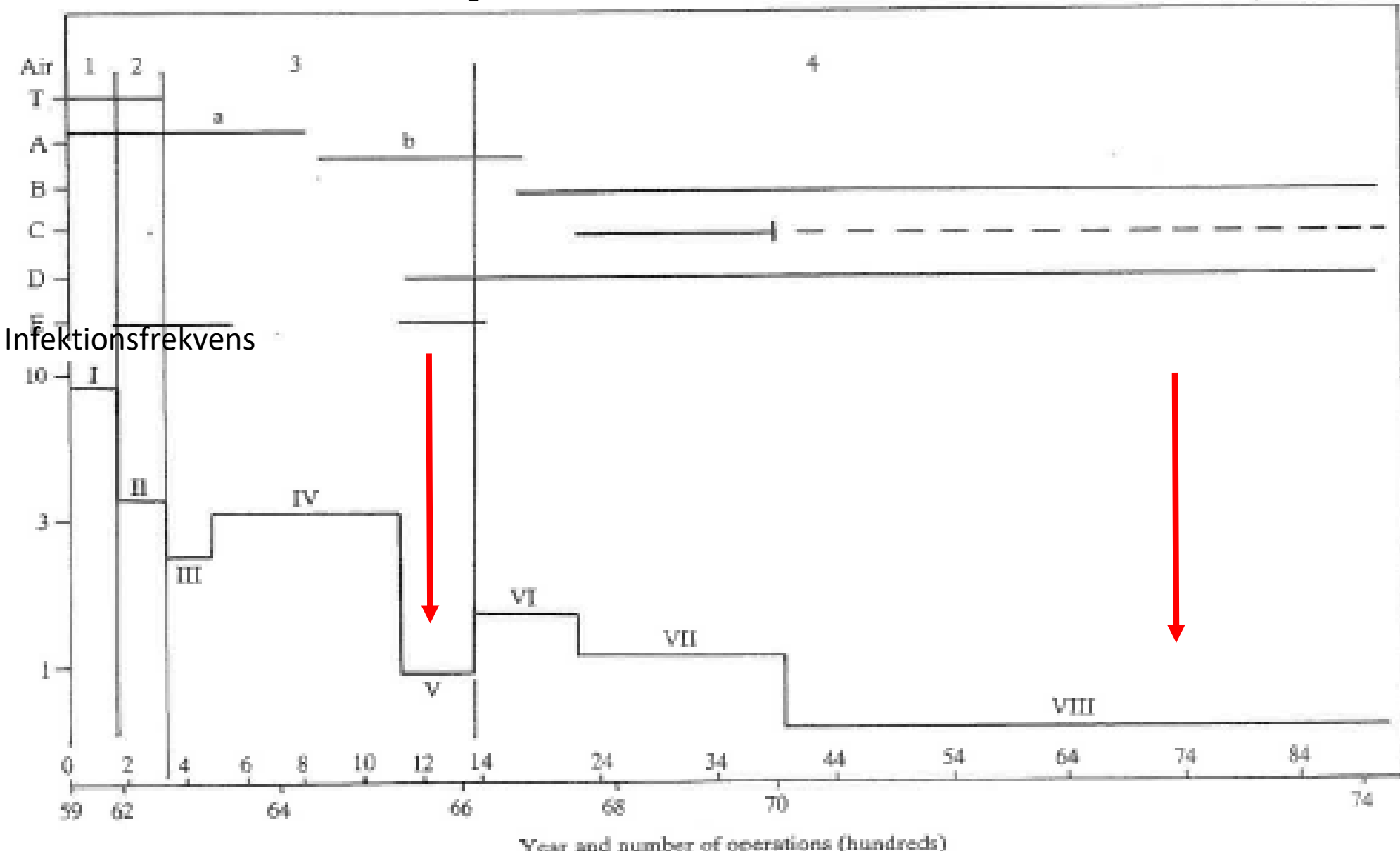
8136 höftledsoperationer

Betydelsen av **ventilation och täta kläder** för postop infektion

Kontrollgrupp konventionell omblandande ventilation och vanliga tygkläder

# Ventilationsförbättringar

# Klädsystem



Årtal och antal op

Lidwell OM., *The control of infection after total joint replacement.* J Hosp Infect 1993; 23: 51-55.

# Publikationer MRC studien

Lidwell OM, Lowbury EJJ, Whyte W, Blowers R, Stanley SJ and Lowe D. Effect of ultraclean air in operating rooms on deep sepsis in the joint after total hip or knee replacement: a randomised study. *Br Med J* 1982; 285: 1014

Lidwell OM, Lowbury EJJ, Whyte W, Blowers R, Stanley SJ and Lowe D. Bacteria isolated from deep joint sepsis after operation for total hip or knee replacement and the sources of the infections with *Staphylococcus aureus*. *J Hosp Infect* 1983; 4: 1929.

Lidwell OM, Lowbury EJJ, Whyte W, Blowers R, Stanley SJ and Lowe D. Airborne contamination of wounds in joint replacement operations: the relationship to sepsis rates. *J Hosp Infect* 1983; 4: 111131.

Whyte W, Lidwell OM, Lowbury EJJ and Blowers R. Suggested bacteriological standards for air in ultraclean operating rooms. *J Hosp Infect* 1983; 4: 133139.

Lidwell OM, Lowbury EJJ, Whyte W, Blowers R, Stanley SJ, and Lowe D. Infection and sepsis after operations for total hip or knee-joint replacement: Influence of ultraclean air, prophylactic antibiotics and other factors. *J Hosp Infect* 1984; 93: 505529

Lidwell OM, Lowbury EJJ, Whyte W, Blowers R, Stanley SJ, and Lowe D. Extended follow-up of patients suspected of having sepsis in the joint after total joint replacement. *J Hosp Infect* 1985; 95: 65564.

Lidwell OM, Elson R.A, Lowbury EJJ, Whyte W, Blowers R, Stanley SJ and Lowe D. Ultraclean air and antibiotics for prevention of postoperative infection. *Acta Orthop Scand* 1987; 58: 413.

Lidwell OM. Air, antibiotics and sepsis in replacement joints. *J Hosp Infect* 1988; 11 (Supplement C): 1840.

Lidwell OM, Lowbury EJJ, Whyte W, Blowers R, Stanley SJ, and Lowe D. Ventilation in operating rooms. *Br Med J*; 286: 12145.



# Resultat MRC-studien- luftburen smittväg viktigast när alla andra smittvägar är kontrollerade

- "Wound wash out"

20 ml natrium klorid sprutades ner i såret

Fångades upp i en skål

Odlades ut

Typades

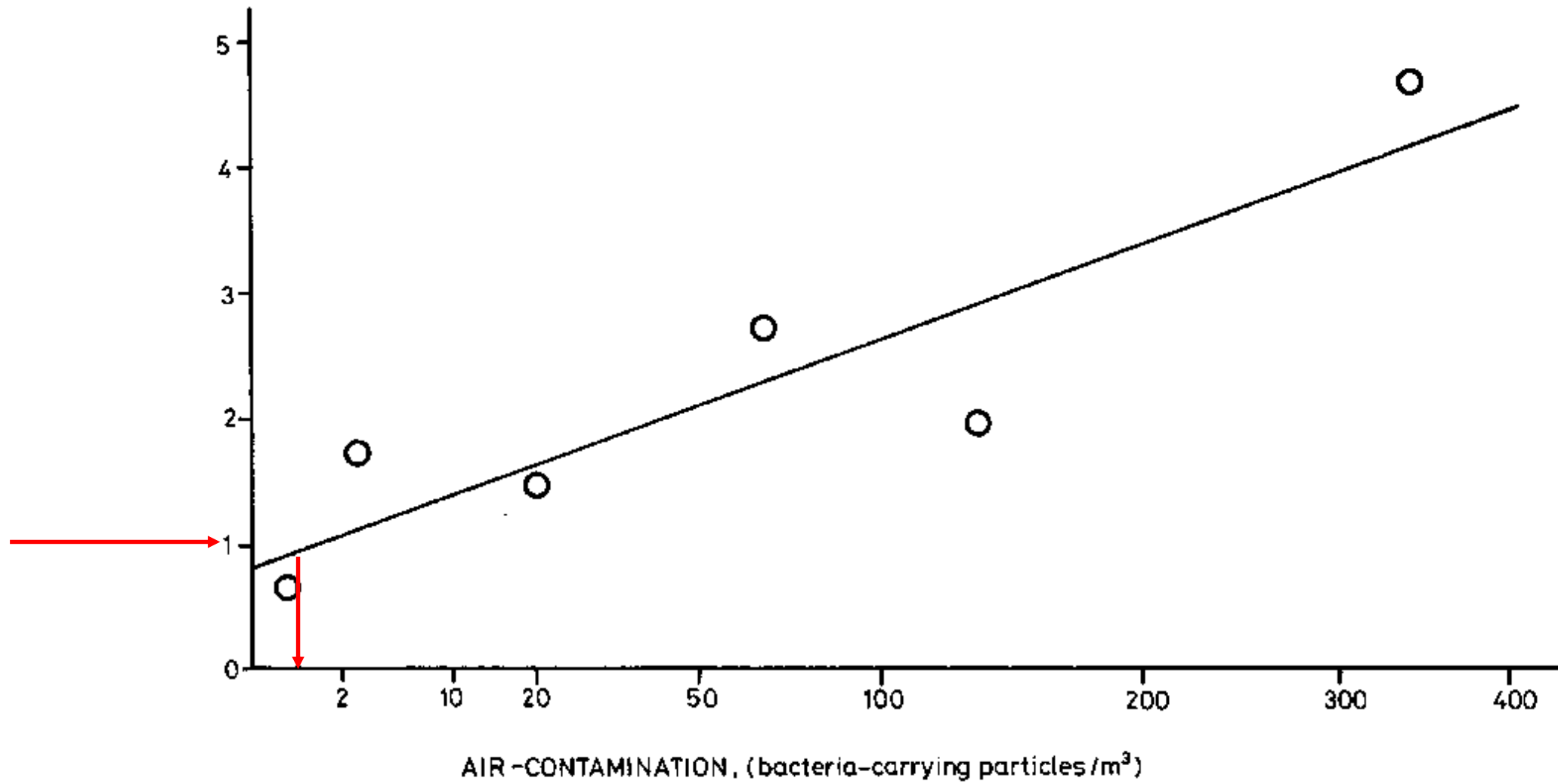
98 % av bakterierna i såret kom från luften (ej från hud, ej från ytor)

Whyte W, Hodgson R and Tinkler J.

The importance of airborne bacterial contamination of wounds.

J Hosp Infect; 1982; 3: 123135.

JOINT SEPSIS  
RATE %



# MRC studien

- Kunde belägga Charnley's resultat

Ventilationens utformning

Klädernas täthet utan glipor

Ventilationen och kläder utgör tillsammans **ett system** som garanterar minsta möjliga halter av bakteriebärande partiklar i ett operationsrum

Minsta möjliga bakteriekoncentrationer i luft ger minsta möjliga risk för infektion vid ortopedisk implantatkirurgi

# Slutsats: Vid infektionskänslig kirurgi

Tillräcklig ventilation

OCH

Tillräckligt täta kläder

# “UCA –system” 1 cfu /m<sup>3</sup>

Whyte and Lytsy

Ultra clean air system

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Review

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# ”Ultra clean system”

Är ett **system** där ventilationen + klädsystemet uppnår en luftkoncentration av bakterier 1 cfu/m<sup>3</sup>

# I Sverige och många andra länder i Europa

Bakterietal i luft (cfu)/m<sup>3</sup>

Infektionskänslig < 10

Allmän kirurgi < 100

Teknisk specifikation  
SIS-TS 39:2015

Publicerad/Published: 2015-03-26  
Utgåva/Edition: 2  
Språk/Language: svenska/Swedish  
ICS: 11.020; 11.080.01; 13.040.35; 91.140.30



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**Mikrobiologisk renhet i operationsrum – Förebyggande av luftburen smitta – Vägledning och grundläggande krav**

**Microbiological cleanliness in the operating room – Preventing airborne contamination – Guidance and fundamental requirements**

SIS TS-39:2015



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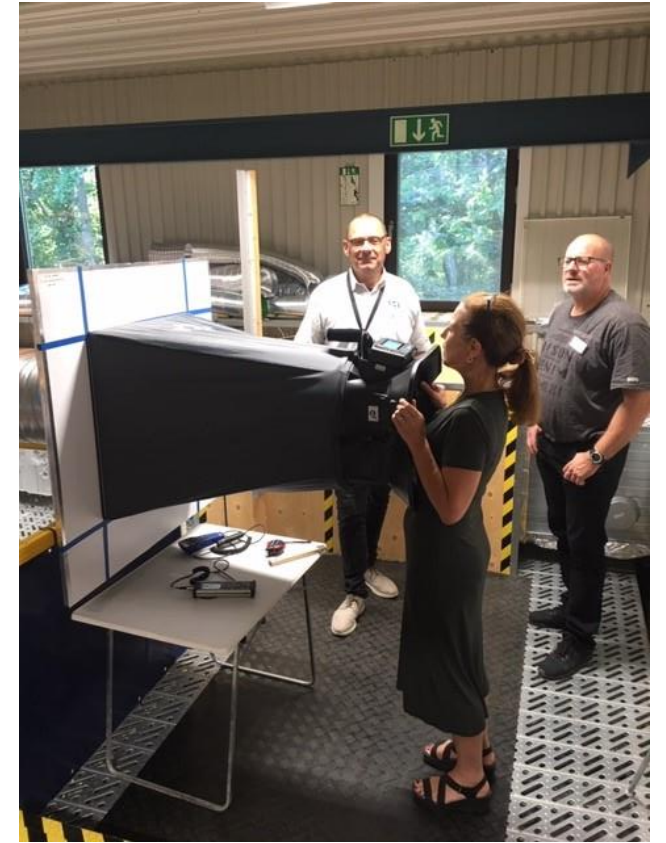
**Chalmers, CTCBI and R3-Nordic invites to  
Cleanroom Testing and Certification Course 2019**



**Date:** 17-19 September 2019

**Location:** Chalmers Teknikpark, Sven Hultins gata 9C, Gothenburg





Kursen kan varmt rekommenderas

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