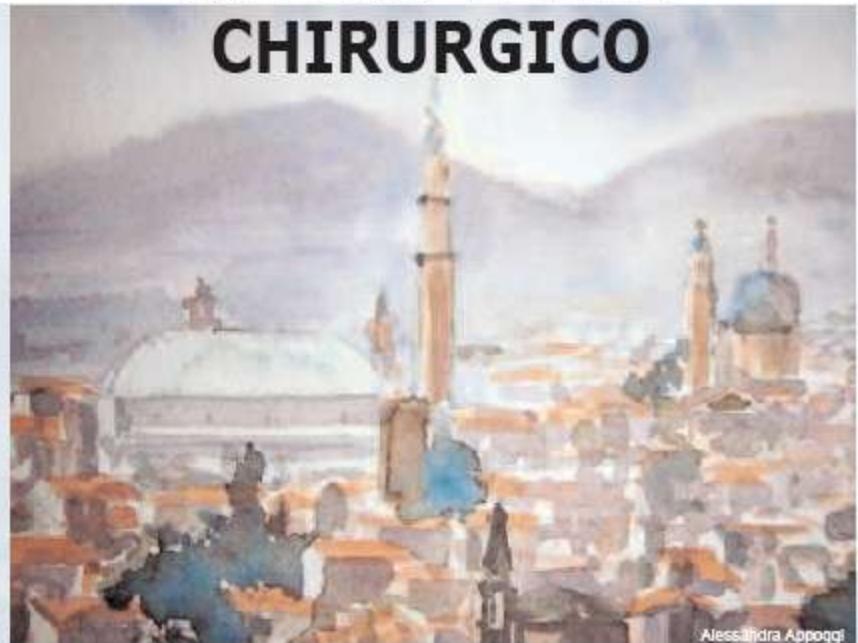


LE INFEZIONI POST OPERATORIE NEL PAZIENTE CHIRURGICO



Mario Rassu
U.O di Microbiologia e
Virologia

VICENZA, 27 Febbraio 2009

Teatro Comunale



ULSS 6
VICENZA

**La diagnosi Microbiologica ed
Epidemiologia**

RISK of SSI

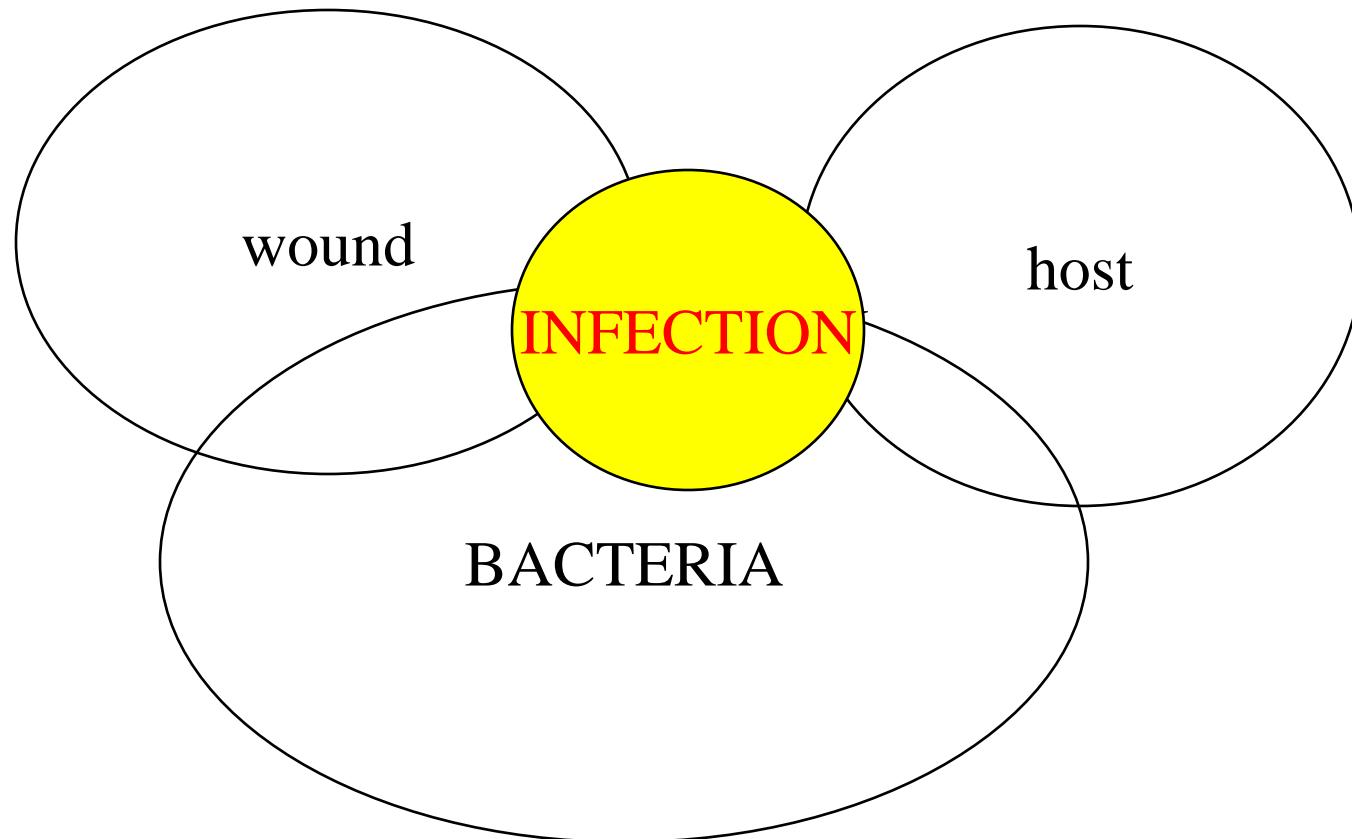
Dose of bacterial contamination X Virulence

Resistance of patients



Se la carica è $> 10^5$ microorganismi per grammo di tessuto
il rischio di SSI è molto aumentato

Può essere molto più bassa la carica se il microorganismo è
presente nel sito dell'intervento es Stafilococchi,
oppure se I batteri
producono tossine (es. Clostridium)



ANTIBIOTIC SELECTION

- ESOPHAGUS AND STOMACH
- NORMALLY < 1000 ORGANISM/ML



- DUODENUM AND JEJUNUM
- 100-10,000 ORGANISMS/ML



- ILEUM
- 1-10 MILLION ORGANISMS/ML



- 2/3 DRY FECAL MATTER IS BACTERIA(400-500 DIFFERENT SPECIES)

Antibiotic selection

- **COLON**

E.coli,klebsiella,enterobacter, bacteroides spp.,peptostreptococci,clostridia

- **BILIARY TRACT**

E.coli, klebsiella, proteus,clostridia

- **VAGINA**

Streptococci,Staphylococci,E coli

- **UPPER RESPIRATORY TRACT**

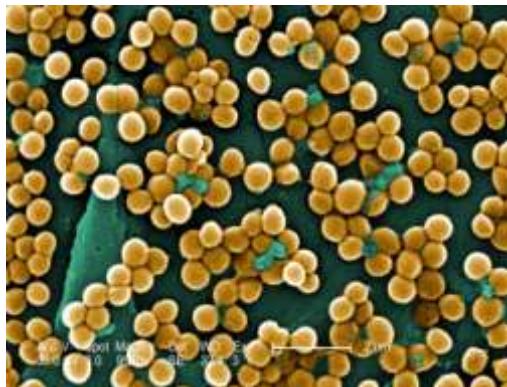
Pneumococcus, H.influenzae

Identified Risk Factors

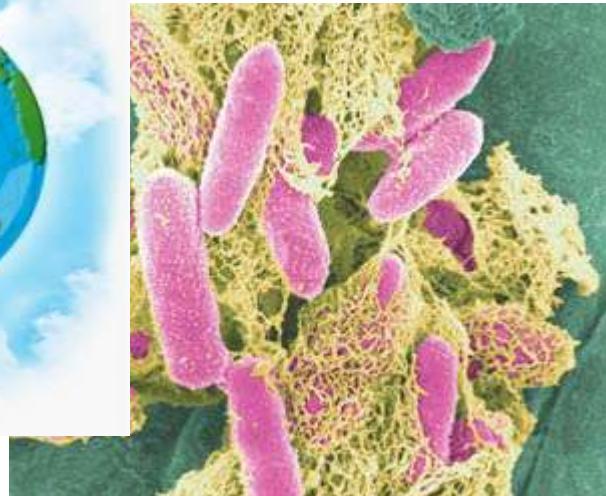
- Type of surgical procedure **and bacterial load**
- **Surgical** procedure
- Technique
- Duration
- Patient preparation
- Equipment preparation

Patogeni più comuni

- S Aureus/Cons



- E.coli/Gram neg



Patogeni più comuni

- S Aureus/Coag.neg



- E.coli/Gram neg

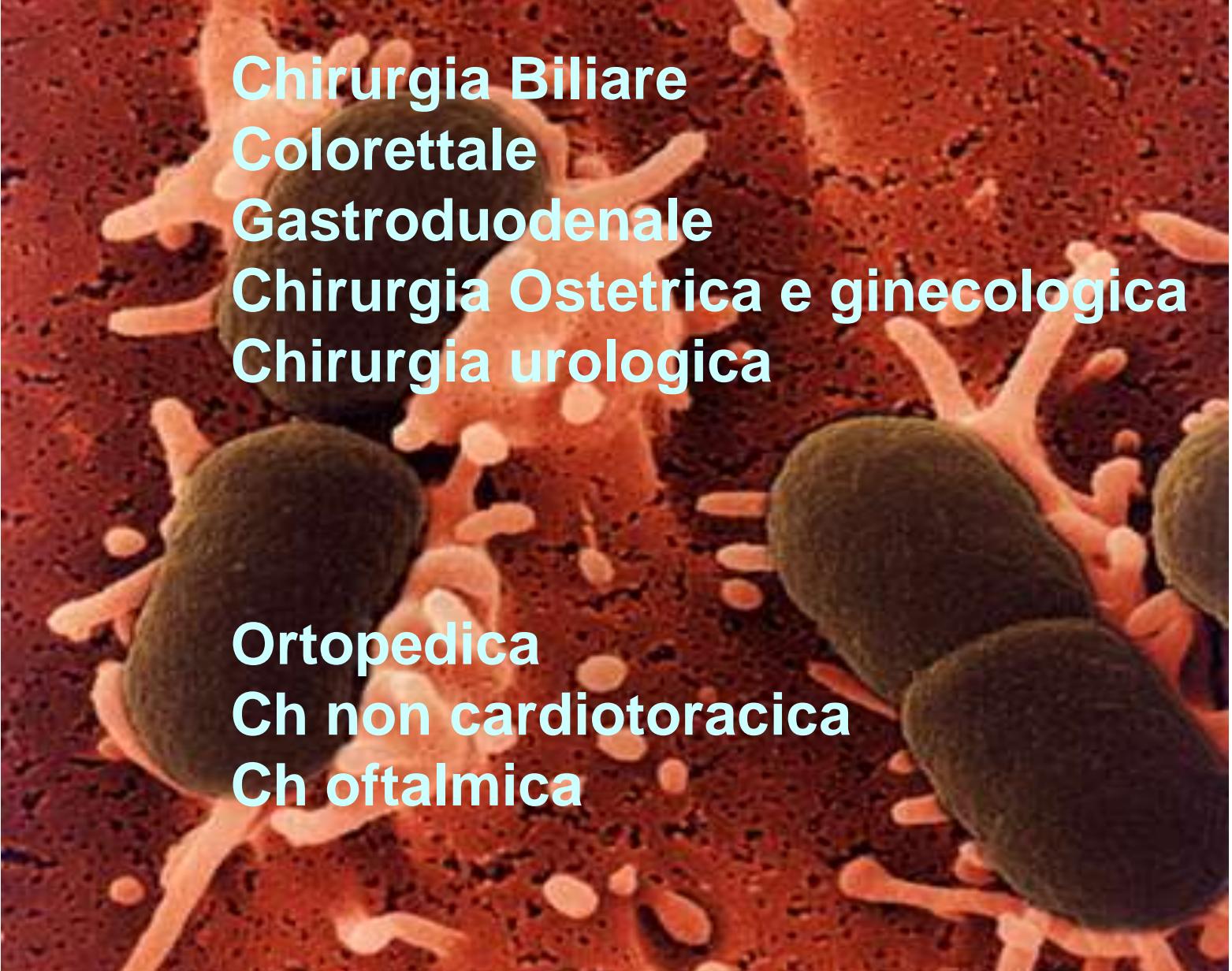


S Aureus/CoNS

- Cardiaca
- Neurochirurgia
- Ch mammella
- Ch vascolare
- Ch capocollo
- Chirurgia ortopedica
- Ch oftalmica

Mangram et al Guidelines for prevention of SSI 1999
Infect control and hospital epidemiology
Vol 20 N°4:250-266.

Bacilli Gram Negativi/Anaerobi



**Chirurgia Biliare
Colorettale
Gastroduodenale
Chirurgia Ostetrica e ginecologica
Chirurgia urologica**

**Ortopedica
Ch non cardiotoracica
Ch oftalmica**

Diagnosi Microbiologica

Metodi culturali tradizionali

Metodi rapidi



Convenzionali(coagulasi , Lysis etc)



Molecolari

PCR artigianale

Prelievo sangue: 10 mL



Centrifugazione per 30 min

SISTEMA ISOLATOR Isolator 10

Tappo di perforazione
Pressa per perforare diaframma Pipetta per soprannatante
Vortex della provetta
Pipetta per sedimento



JOURNAL OF CLINICAL MICROBIOLOGY, Jan. 1990, p. 124-125
0095-1137/90/010124-02\$02.00/0
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Vol. 28, No. 1

Evaluation of Isolator System and Large-Volume Centrifugation Method for Culturing Body Fluids

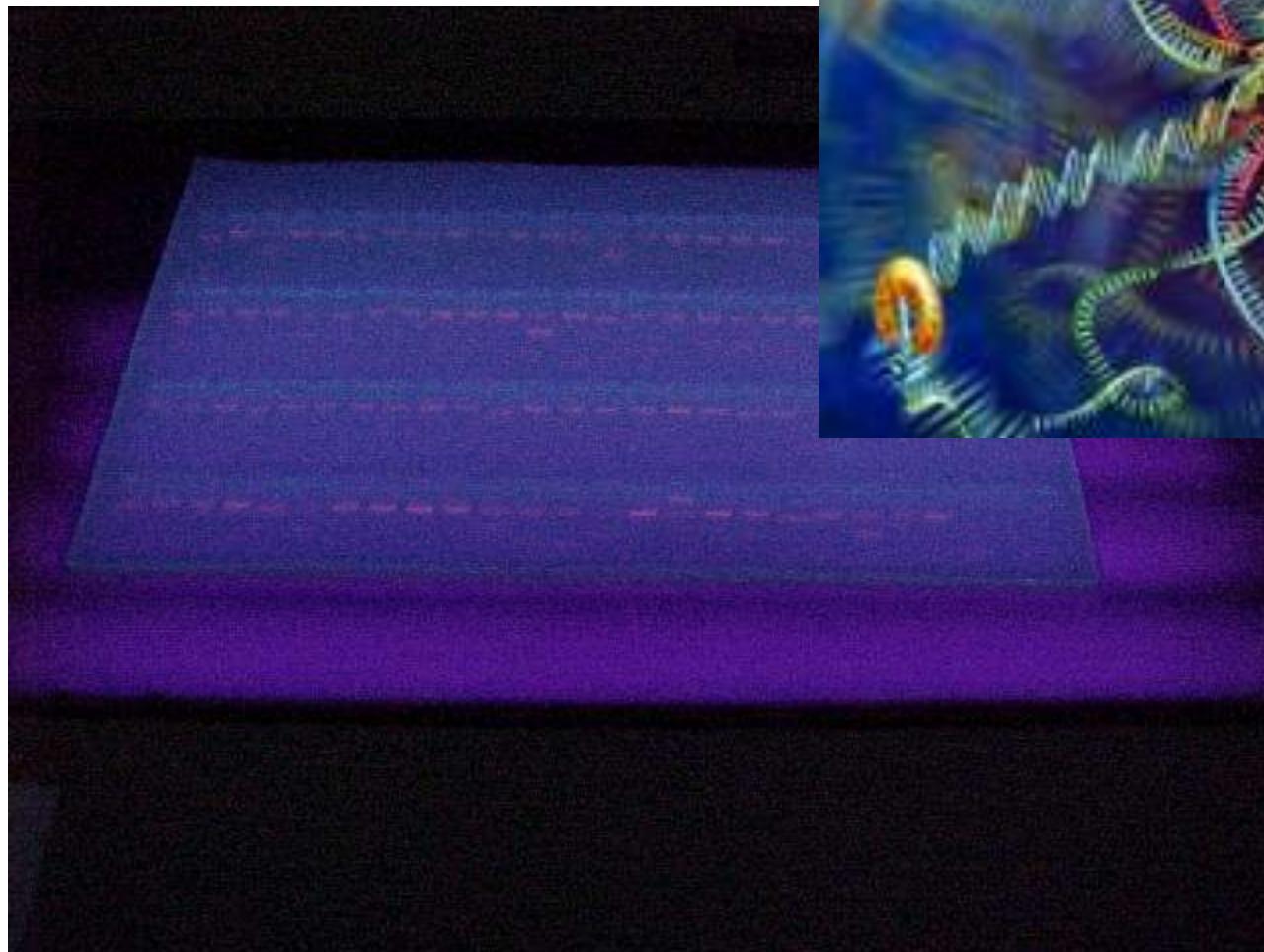
HARRY R. ELSTON,^{1*} MARGHERITA WANG,¹ AND ABRAHAM PHILIP²

Clinical Microbiology Laboratory, Veterans Administration Hospital, Loma Linda, California 92357,¹ and Diagnostic Division, E. I. du Pont de Nemours & Co., Wilmington, Delaware 19810²

Received 5 June 1989/Accepted 22 September 1989

The Isolator system was compared with the large-volume centrifugation method for processing and recovering organisms from body fluids other than blood, cerebrospinal fluid, and urine. A total of 155 body fluid samples were processed for the recovery of clinically significant organisms. Of the 55 positive cultures, Isolator detected 94% and the large-volume centrifugation method detected 64%. The time necessary to indicate positivity was not significantly different in the two methods; however, in five cases, the Isolator system yielded clinically significant organisms 24 h sooner than the conventional method. The Isolator system was found to be a more sensitive alternative than the conventional large-volume centrifugation method.

PCR



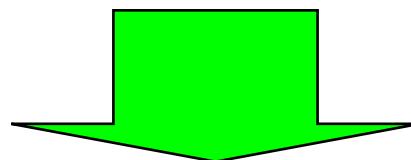
Biologia molecolare

DNA batterico

- **regioni conservate**, praticamente identiche in tutte le specie batteriche
- **regioni variabili**, caratterizzate da sequenze di basi specifiche utili perciò ad una identificazione
- La sequenza determinata viene confrontata con le corrispondenti sequenze di diverse migliaia di specie batteriche catalogate nei vari database

-

-



- Blast

GENE 16S rRNA

- 1550bp
- Codifica per la piccola subunità dei ribosomi

DETERMINAZIONE GENE CODIFICANTE PER rRNA BATTERICO: SEQUENZE PRIMERS UTILIZZATI

BATTERI

355 F 5' – CCTACGGGAGGCAGCAG – 3'

910 R 5' – CCCGTCAATTCCCTTGAGTT – 3'

LIEVITI E MUFFE

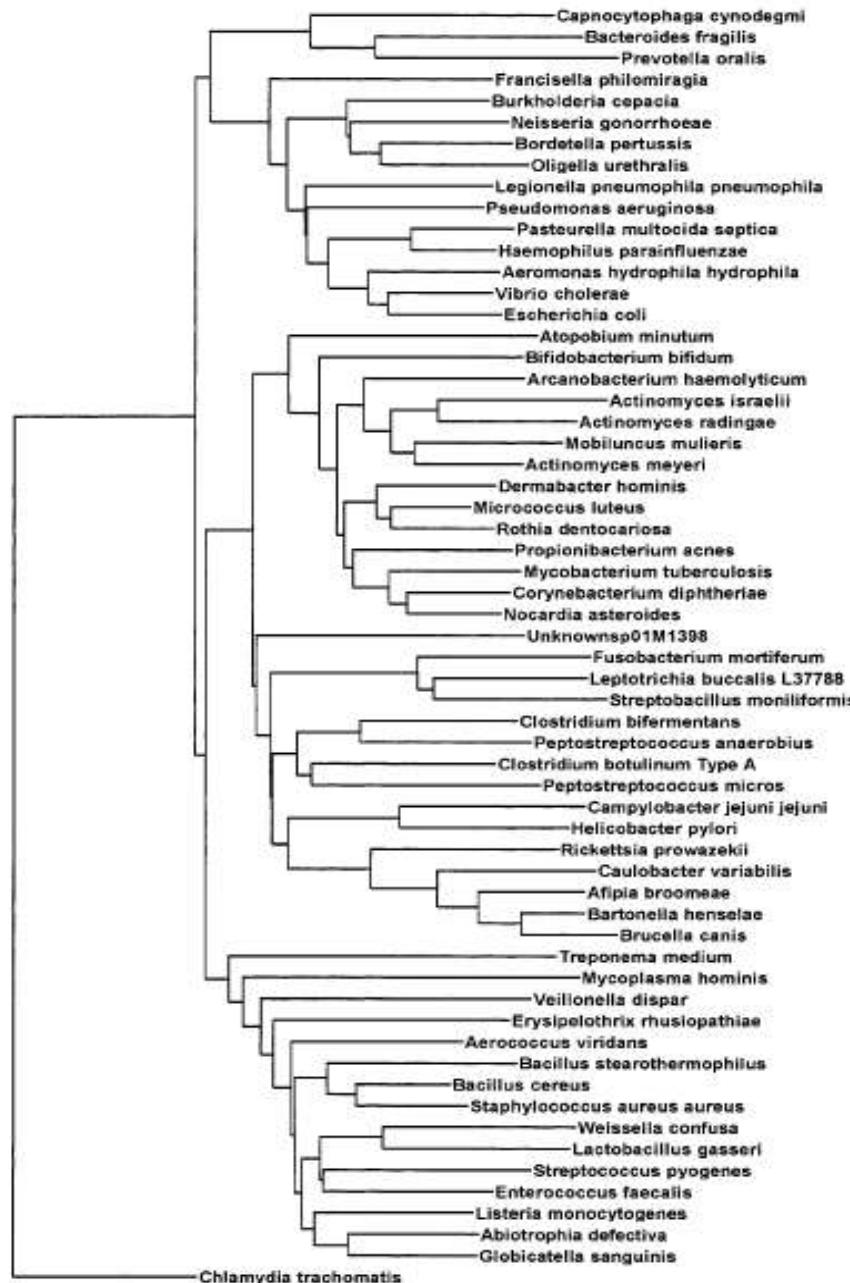
NL1 5' – GCATATCAATAAGCGGAGGAAAAG – 3'

NL4 5' – GGTCCGTGTTCAAGACGG – 3'

355F



1550 bp



DENDROGRAM

showing the genetic relationships of many of the major groups of clinically important organisms based on the **500-bp 16S rRNA gene sequence.**

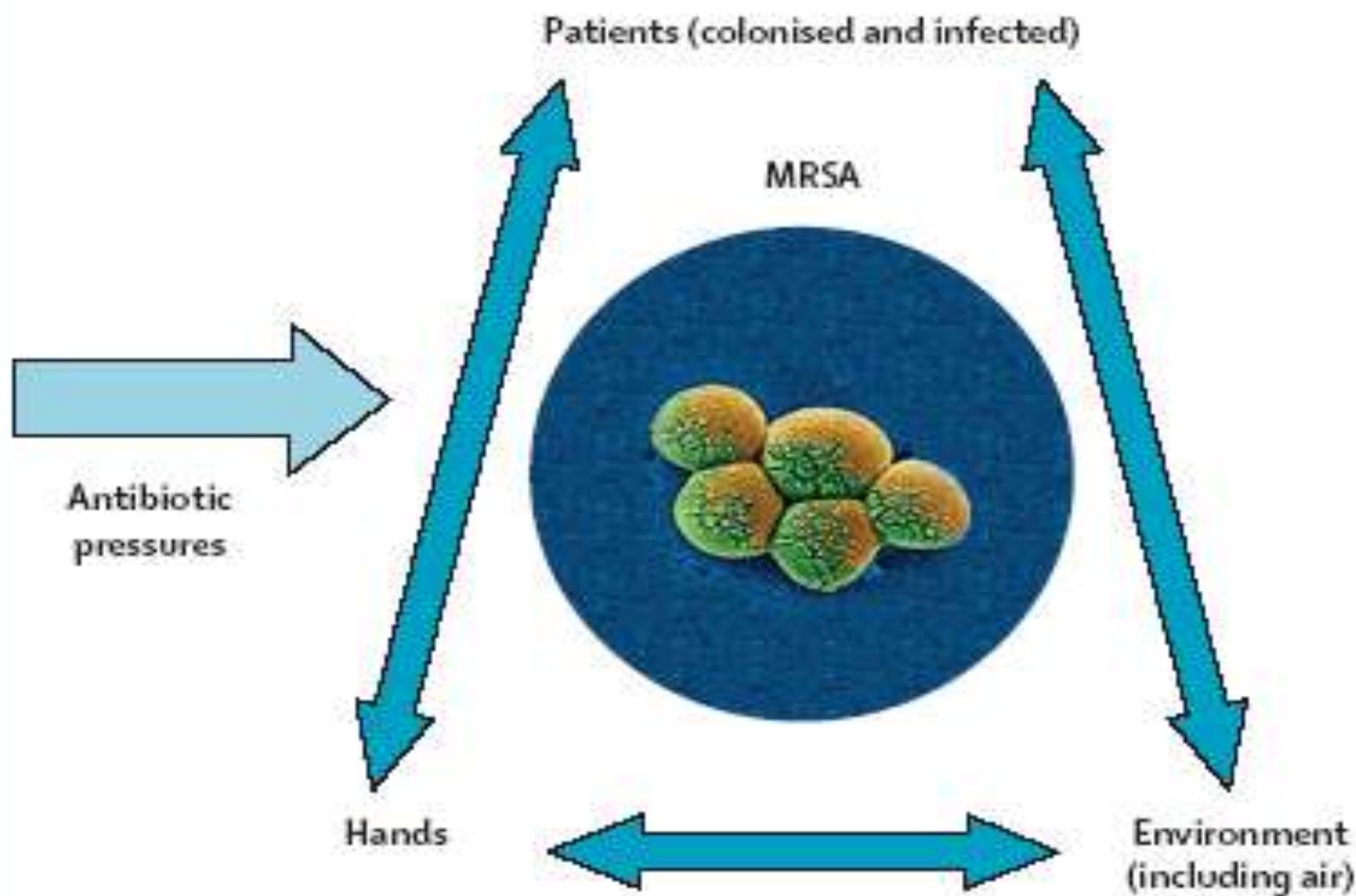
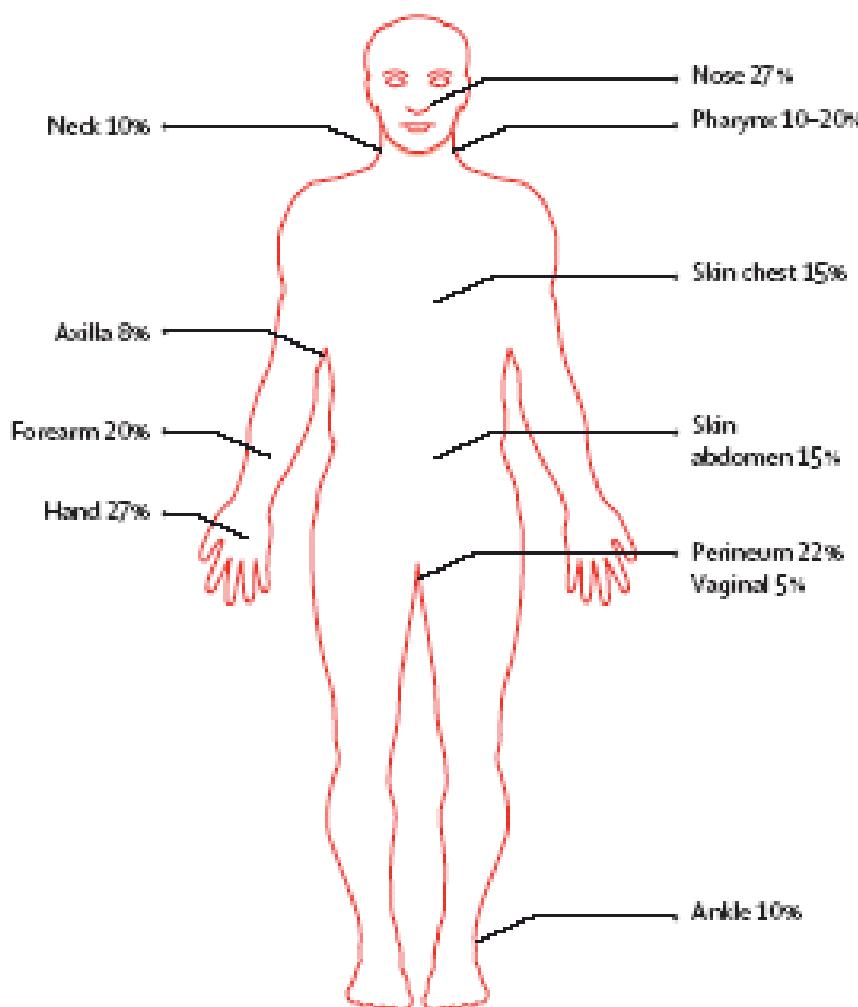


Figure 1: Dynamic transmission cycle of MRSA

Come si cerca?

- Il tampone nasale è il tampone ideale
- Dalle altre sedi i tamponi hanno quasi sempre una contaminazione polimicrobica

General population



S. aureus nasal carriers

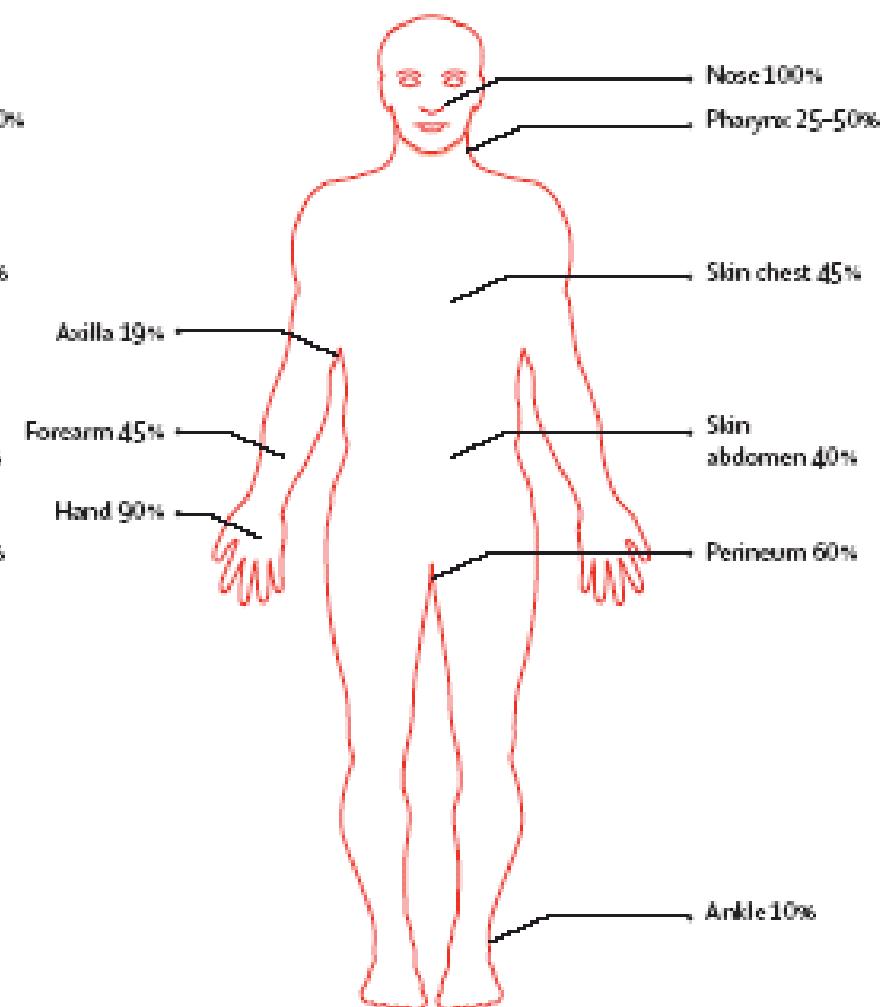
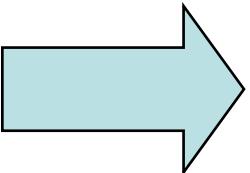
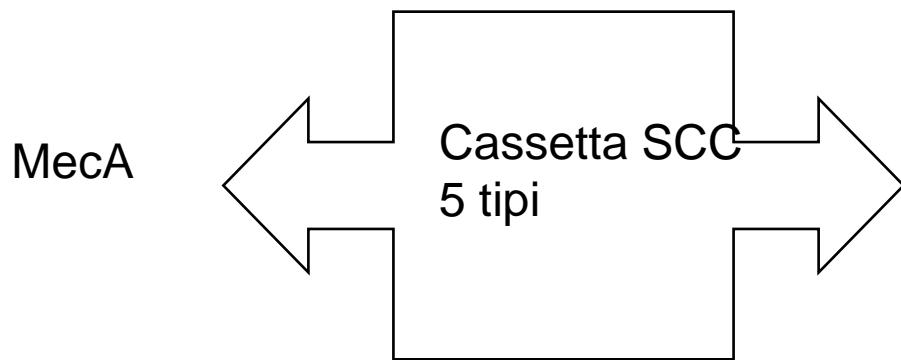


Figure 2: Distribution of *S. aureus* on body sites of the general population and of nasal carriers²⁰

Meticillino resistenza

- Mec A  PBP2a con ridotta affinità per i betalattamici



Mec A gene MRSA

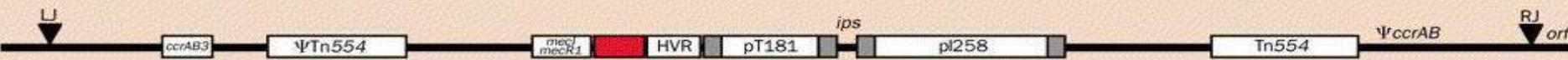
SCCmec type I Archaic clones



SCCmec type IA Iberian clone



SCCmec type III Hungarian clones



SCCmec type IIIA Brazilian clone



SCmec type I NY/Japan clone



SCCmec type IV Paediatric clone

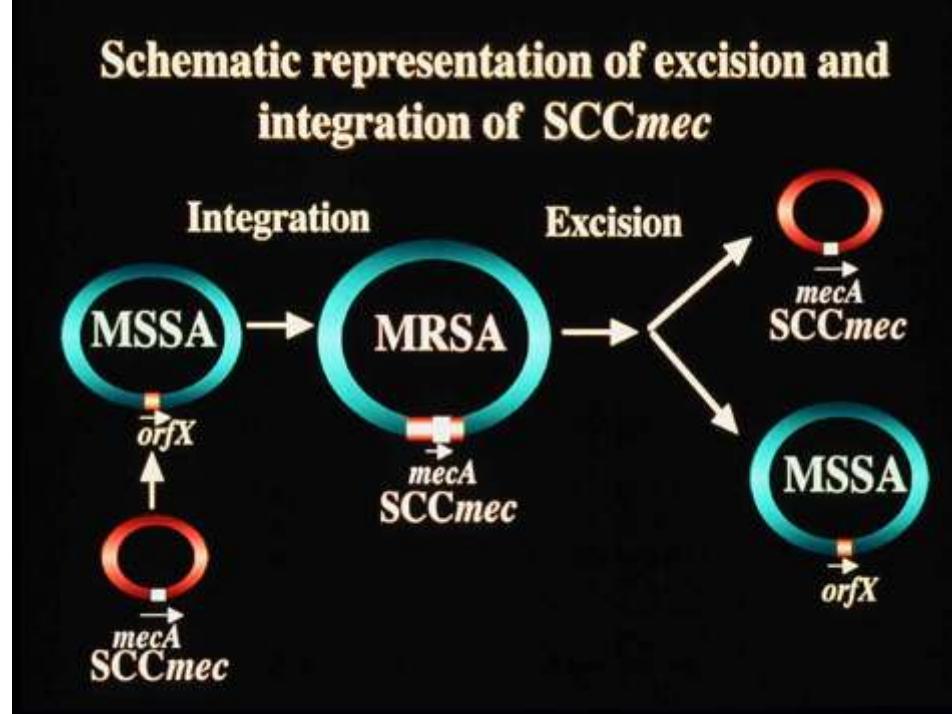


mecA
 IS431

Mec A Low-Affinity PBP-2

SCCmec-The basics

The staphylococcal cassette chromosome (SCC) is a gene cassette widely disseminated in staphylococci. SCCmec is specified by the carriage of methicillin resistant- determinant (*mecA*) MSSA changes to MRSA upon the acquisition of SCCmec. When the SCCmec excises from the MRSA chromosome, MRSA changes to MSSA.



Mec A

5 tipi di cassetta scc



Ospedale I/II/III

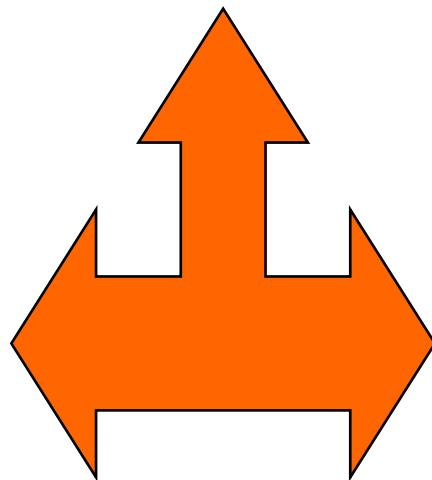


Comunitari IV/V
(Panton Valentine)

Mec A

Costitutivo

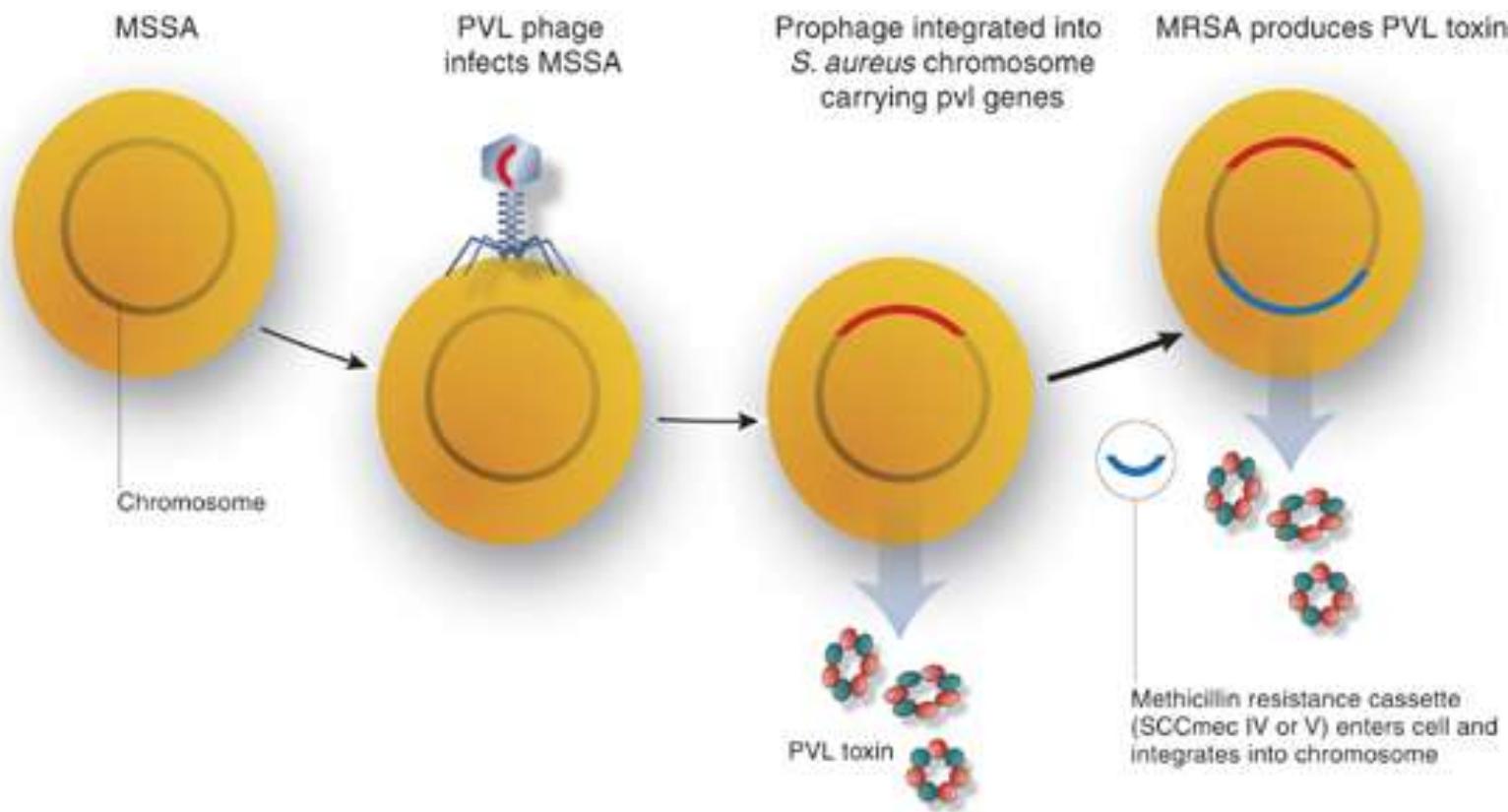
Inducibile



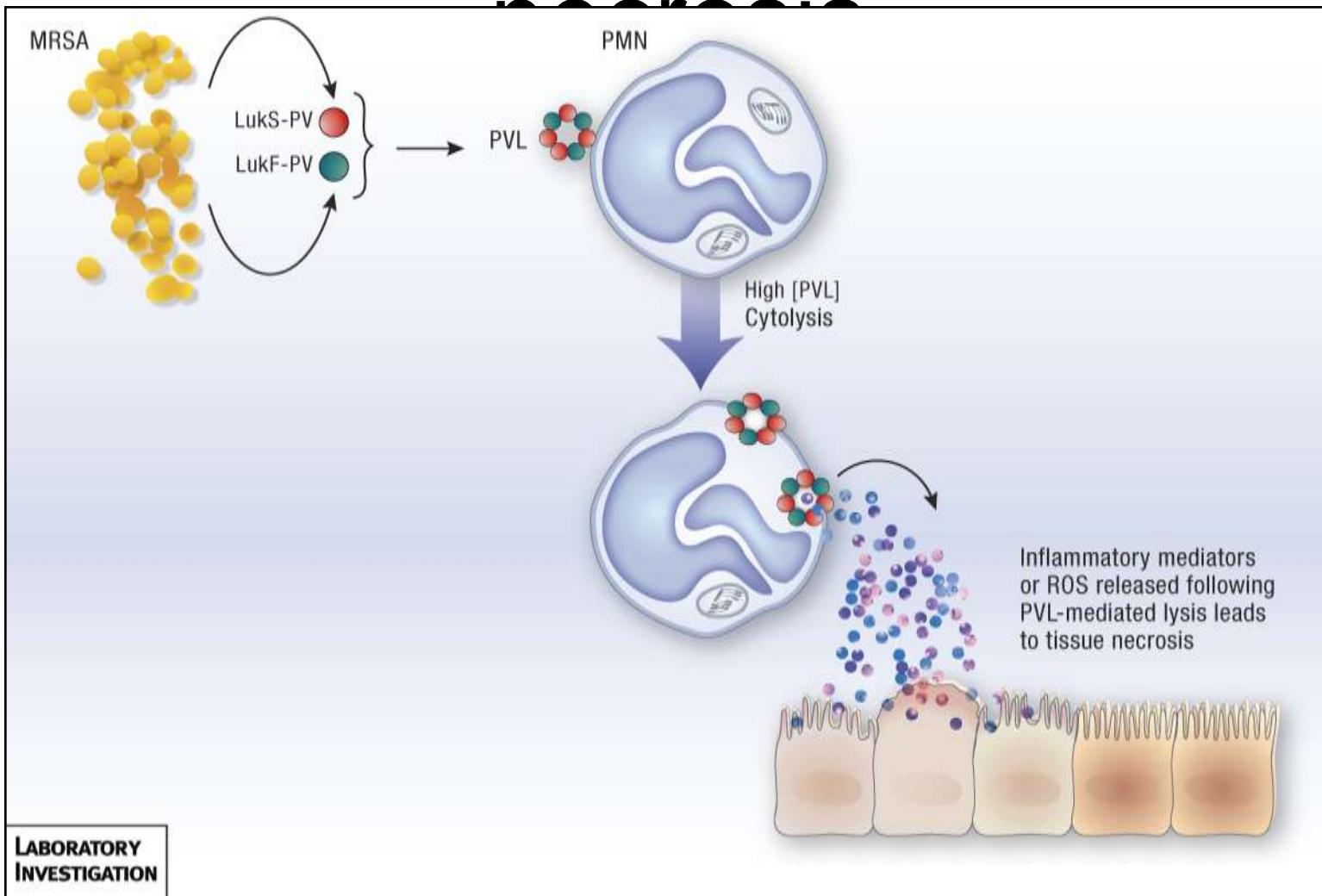
HA-MRSA è più resistente rispetto a CA-MRSA

Panton Valentine

- Esotossina associata a necrosi della cute, polmonite necrotizzante , formazione di ascessi



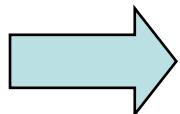
PVL-mediated lysis and tissue necrosis



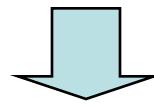
Come si cerca MRSA ?

- Metodo tradizionale
- Coltura in terreno cromogenico
- Metodi rapidi (Baclite Rapid MRSA)
- Metodi molecolari

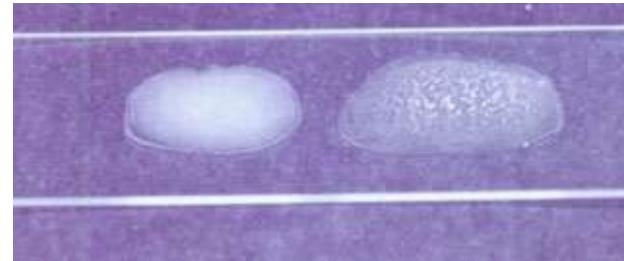
Metodo tradizionale(2-3 giorni)



antibiogramma



Coagulasi



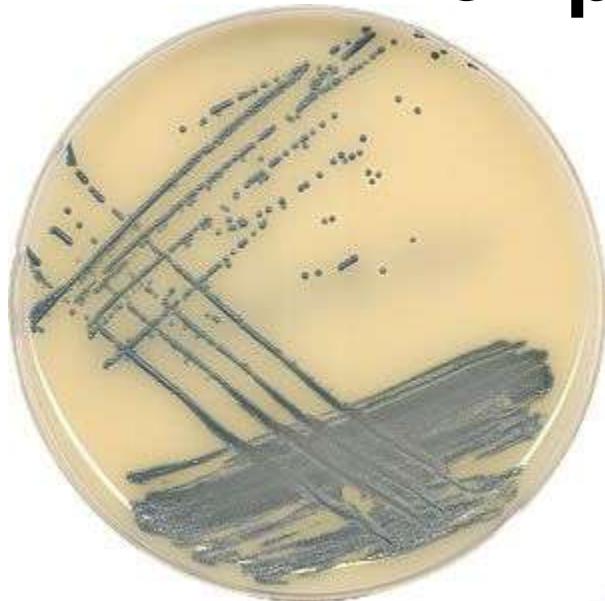
Metodo rapido con Terreno cromogeno

- 24 ore
- Più costoso rispetto ai sistemi tradizionali

Metodo rapido con terreno cromogeno

Tempo 24 ore

Oxoid chromagar



BD chromagar



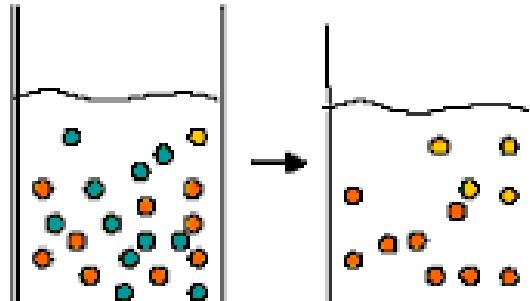
biomerieux



Baclite 3M Tempo di risposta 5-6 ore

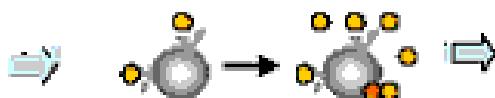


Selective culture



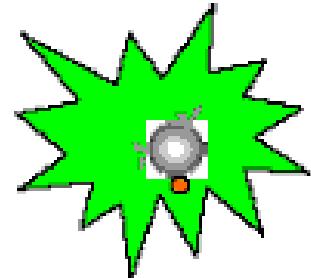
Selective broth containing *oxacillin*, *ciprofloxacin* and *colistin*.

Extraction and Growth



Automated extraction of organisms by immuno-magnetic separation.
Anti-staph aureus monoclonal coupled to para-magnetic particles

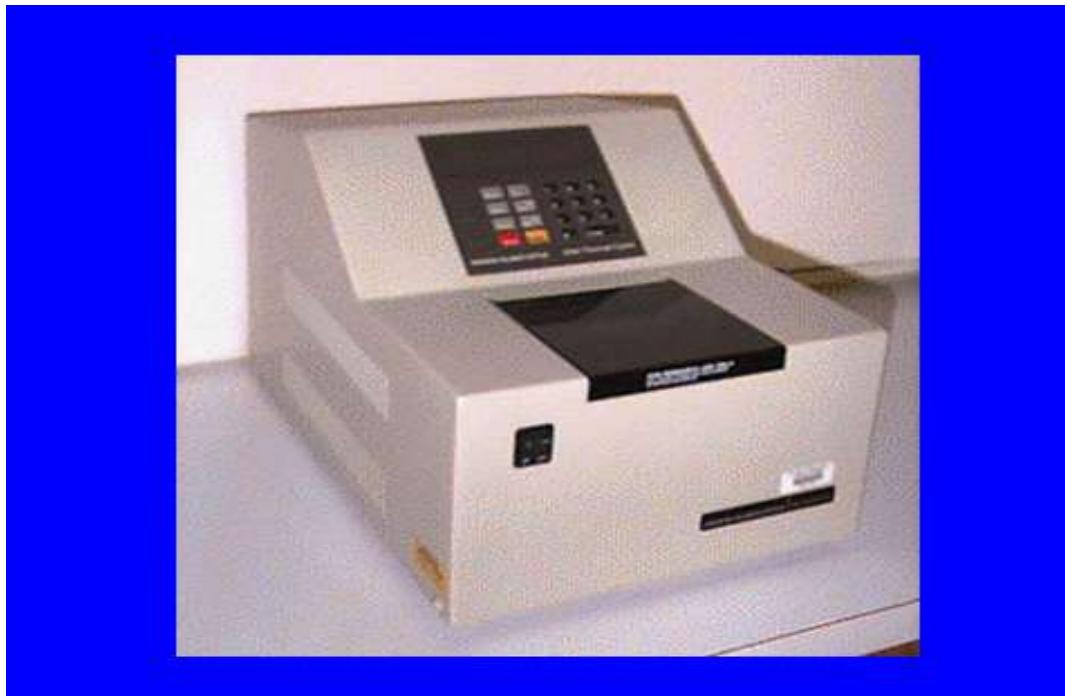
Selective Lysis

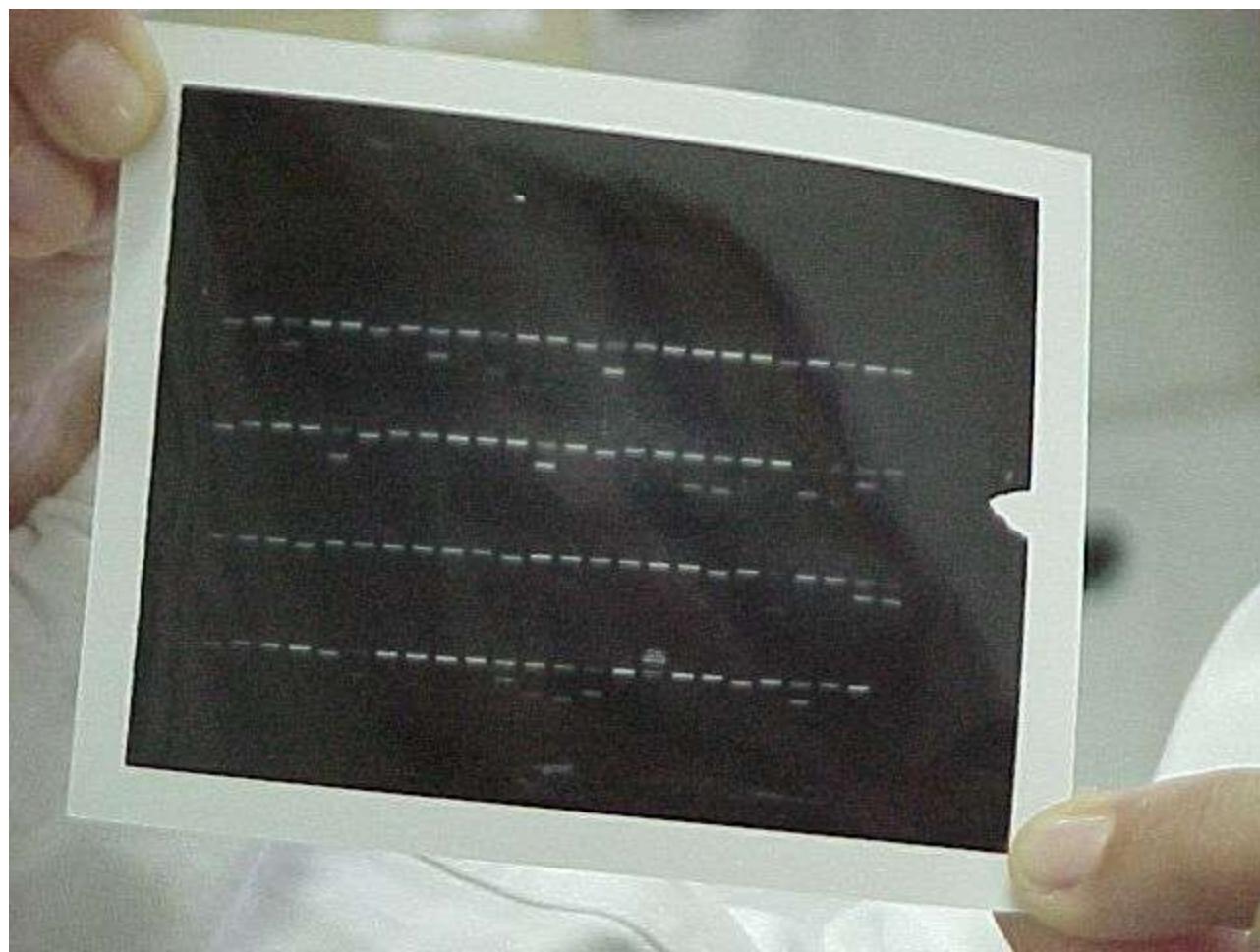


Read

Automated selective lysis and read.
Lysostaphin and ADP added to sample to release AK and convert ADP to ATP. Luciferin and Luciferase added, light emitted and read.

Metodi molecolari Tempo 2 ore?



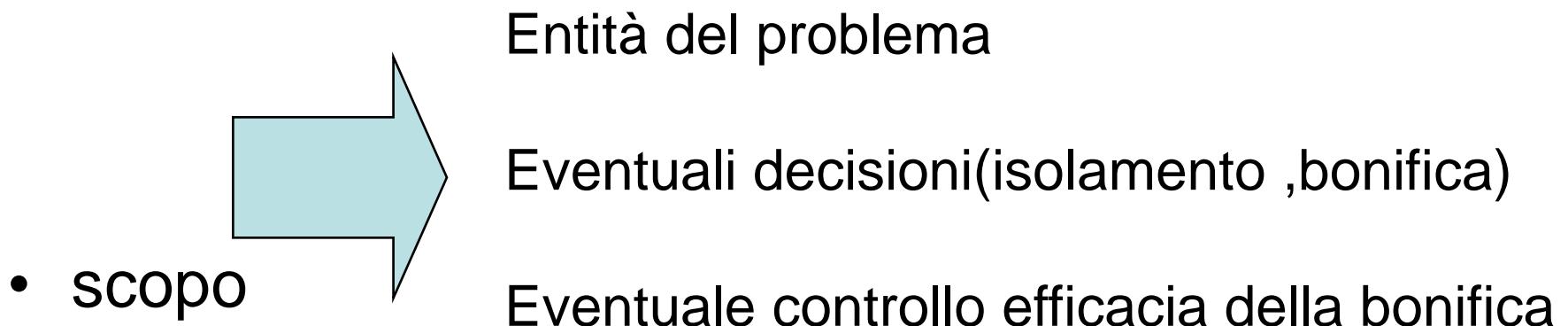


BD gene ohm



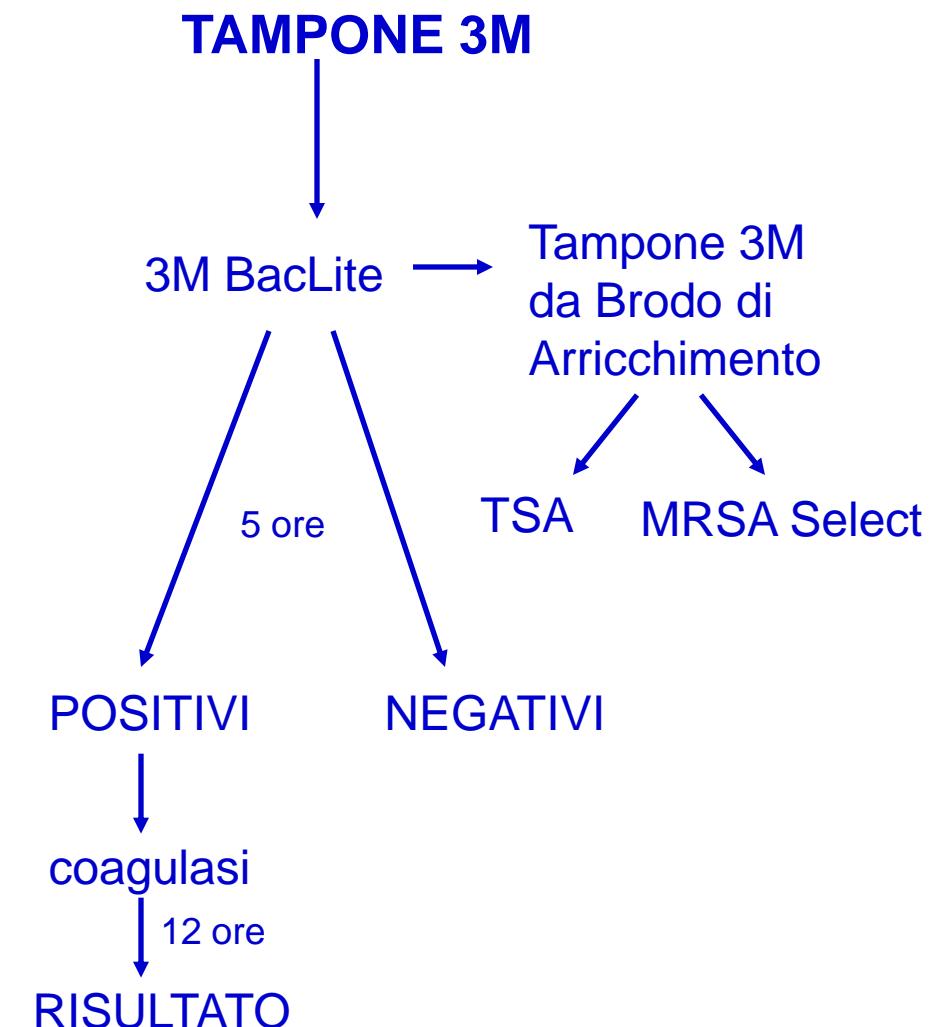
STUDIO conoscitivo SULLA PREVALENZA DELL'MRSA NELL'OSPEDALE S.BORTOLO DI VICENZA mediante la ricerca attiva su tampone nasale

- Ricerca colonizzati/infetti



- Ricerca colonizzati/infetti
- Periodo: da 14/04/2008 a 12/09/2008
- Tampone nasale eseguito:
 - all'ingresso in reparto
 - in 5^a giornata (se il paziente resta ricoverato)
- N° pazienti esaminati: 1005

PROCEDURA OPERATIVA



Se CONCORDANZA metodo colturale/ BacLite 3M

→ RISULTATO DEFINITIVO

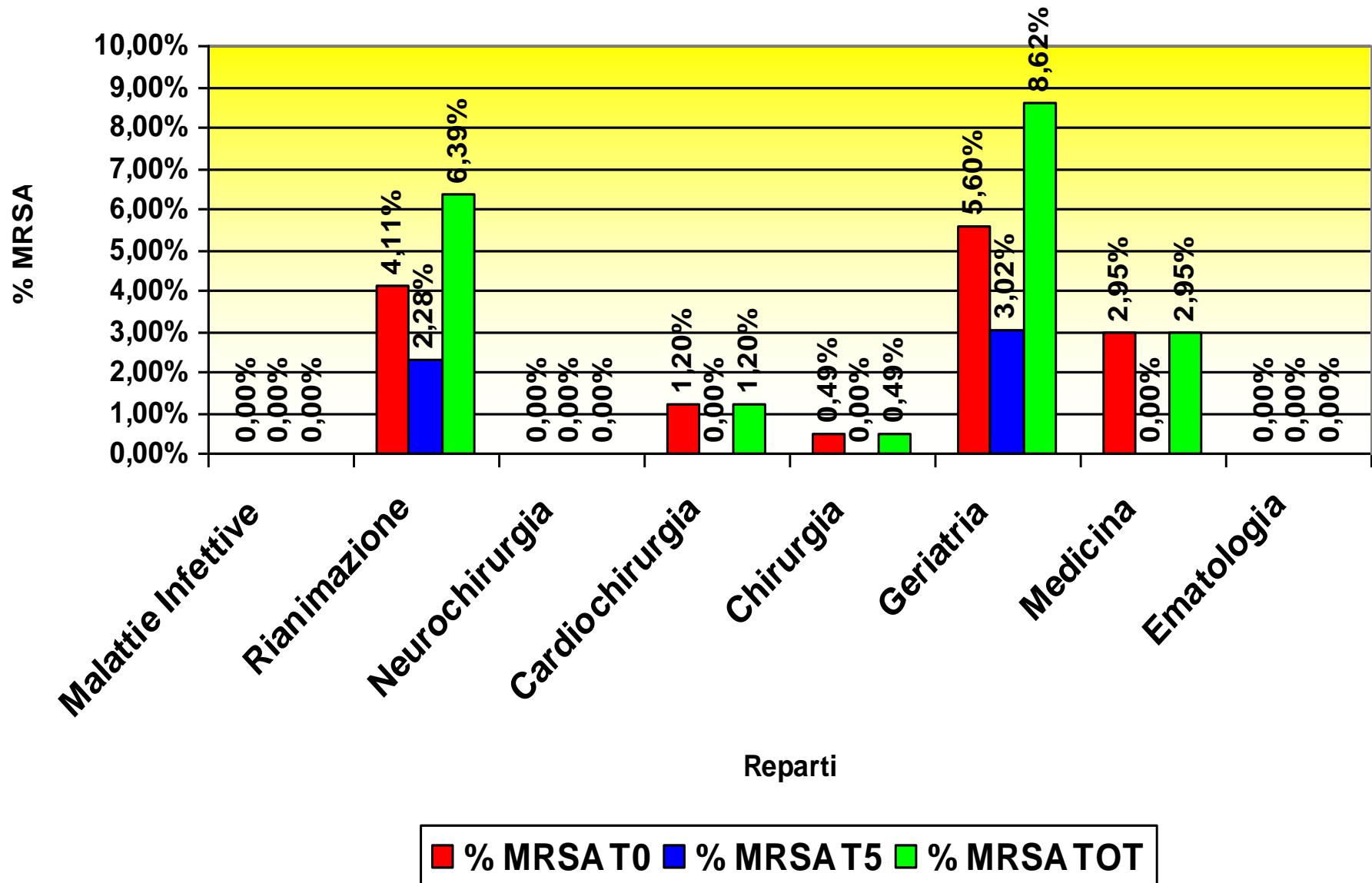
Se DISCORDANZA metodo colturale/ BacLite 3M

→ ANTIBIOGRAMMA

DISTRIBUZIONE MRSA NEI VARI REPARTI

<u>Reparto</u>	<u>N. pazienti</u>	<u>MRSA T0</u>	<u>% MRSA T0</u>	<u>MRSA TOT</u>	<u>% MRSA TOT</u>
Rianimazione	219	9	4,11%	14	6,39%
Neurochirurgia	27	0	0,00%	0	0,00%
Cardiochirurgia	83	1	1,20%	1	1,20%
Chirurgia	204	1	0,49%	1	0,49%
Geriatria	232	13	5,60%	20	8,62%
Medicina	203	6	2,95%	6	2,95%
Ematologia	31	0	0,00%	0	0,00%
TOT	1005	30	2,98%	42	4,17%

Prevalenza ed Incidenza dell'MRSA in alcuni reparti dell'ospedale "S. Bortolo" di Vicenza



INCREMENTO MRSA NEI VARI REPARTI

<u>Reparto</u>	<u>% MRSA T0</u>	<u>INCREMENTO</u>	<u>% MRSA TOT</u>
Rianimazione	4,11%	2,28%	6,39%
Neurochirurgia	0,00%	0,00%	0,00%
Cardiochirurgia	1,20%	0,00%	1,20%
Chirurgia	0,49%	0,00%	0,49%
Geriatria	5,60%	3,02%	8,62%
Medicina	2,95%	0,00%	2,95%
Ematologia	0,00%	0,00%	0,00%
TOT	2,98%	1,19%	4,17%

Geriatria (portatori all'ingresso)

- 2001 7,3%
- 2003 8,7%

Age and Ageing 2005; **34**: 456–462
doi:10.1093/ageing/afi135
Published electronically 11 July 2005

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Prevalence and prediction of previously unknown MRSA carriage on admission to a geriatric hospital

HUGO SAX¹, STEPHAN HARBARTH¹, GAETAN GAVAZZI², NICOLE HENRY¹, JACQUES SCHRENZEL³,
PETER ROHNER³, JEAN PIERRE MICHEL², DIDIER PITTEL¹

¹Infection Control Program, ²Department of Geriatrics, and ³Microbiology Laboratory, Geneva University Hospitals,
Geneva, Switzerland

Harbarth S, Fankhauser C, Schrenzel J, Christenson J, Gervaz P, Bandiera-Clerc C, Renzi G, Vernaz N, Sax H, Pittet D.

Universal screening for methicillin-resistant *Staphylococcus aureus* at hospital admission and nosocomial infection in surgical patients.

JAMA. 2008 Mar

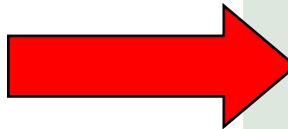
12;299(10):1149-57.

- La ricerca sorveglianza attiva e le misure relative non riducono la infezione da MRSA , ma solo la prevalenza
- Sorveglianza solo di reparti a rischio(Wernitz)

Non è provata l'efficacia delle colture di sorveglianza attiva e non è chiara la definizione

- Clin Infect Dis. 2008 Jun 1;46(11):1717-25. Links
 - Comment in:
 - [Clin Infect Dis. 2008 Jun 1;46\(11\):1726-8.](#)
 - The use of active surveillance cultures in adult intensive care units to reduce methicillin-resistant *Staphylococcus aureus*-related morbidity, mortality, and costs: a systematic review.
 - [McGinigle KL](#), [Gourlay ML](#), [Buchanan IB](#).
 - School of Medicine, University of North Carolina, Chapel Hill, North Carolina, USA. kmcgini@unch.unc.edu

Panel 1: The debate on hospital-acquired infection and hospital cleaning

- 
- There is no evidence; cleaning has never been regarded as an evidence-based science
 - Aesthetic considerations make cleaning difficult to assess
 - No way to measure the cleaning process or its impact on the environment
 - Confounded by fabric and maintenance deficits
 - We cannot see the microorganisms
 - It costs money
 - Cleaning has always been taken for granted

Come cercare dove e quando?

- Solo in alcuni reparti
- Prima dell'intervento chirurgico(es visita anestesiologica)

Biofilm

J. Med. Microbiol. — Vol. 50 (2001), 582–587
© 2001 The Pathological Society of Great Britain and Ireland
ISSN 0022-2615

REVIEW ARTICLE

***Staphylococcus epidermidis* biofilms: importance and implications**

JAMES P. O'GARA and HILARY HUMPHREYS

*Department of Clinical Microbiology, Royal College of Surgeons in Ireland, Education and Research Centre,
Smurfit Building, Beaumont Hospital, Dublin 9, Ireland.*

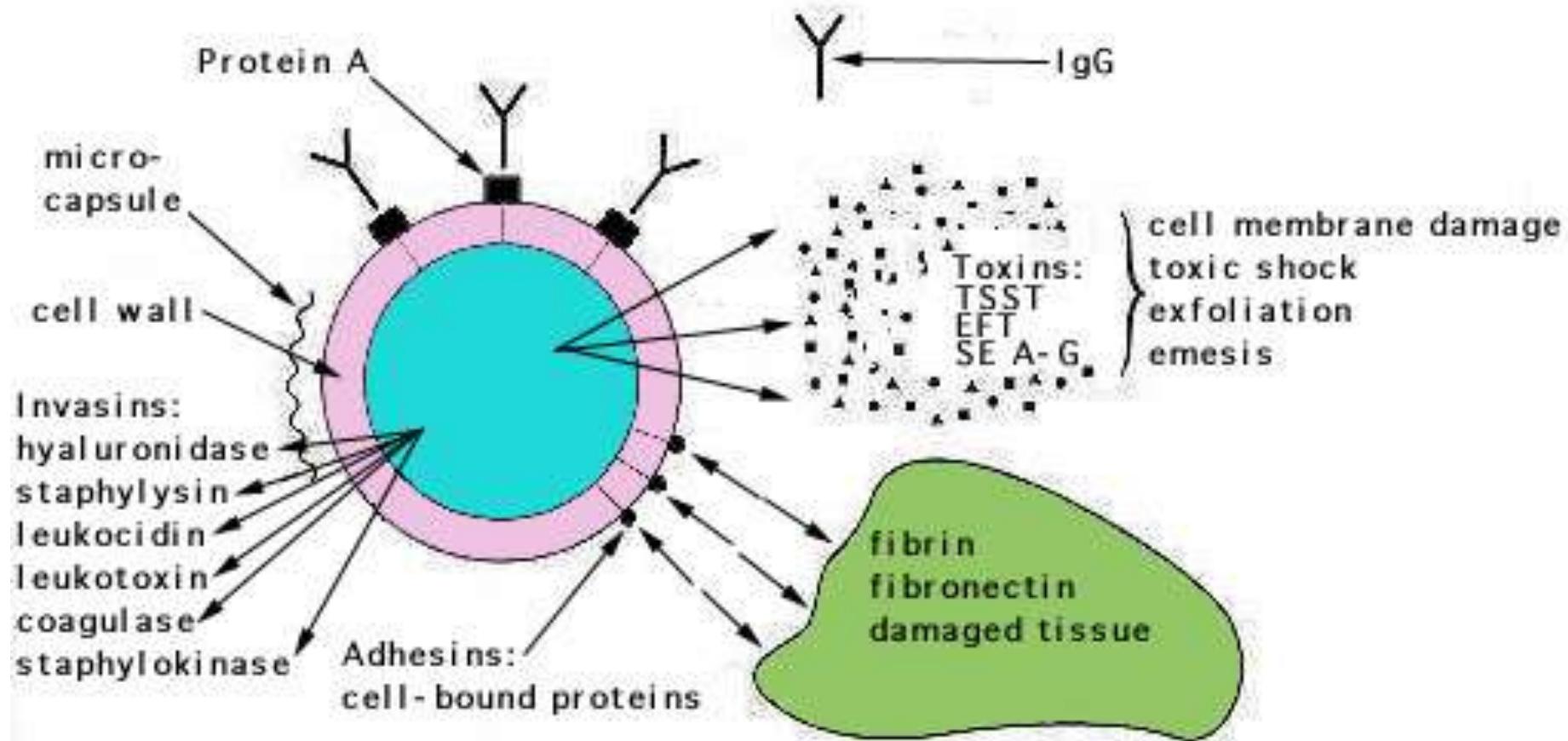
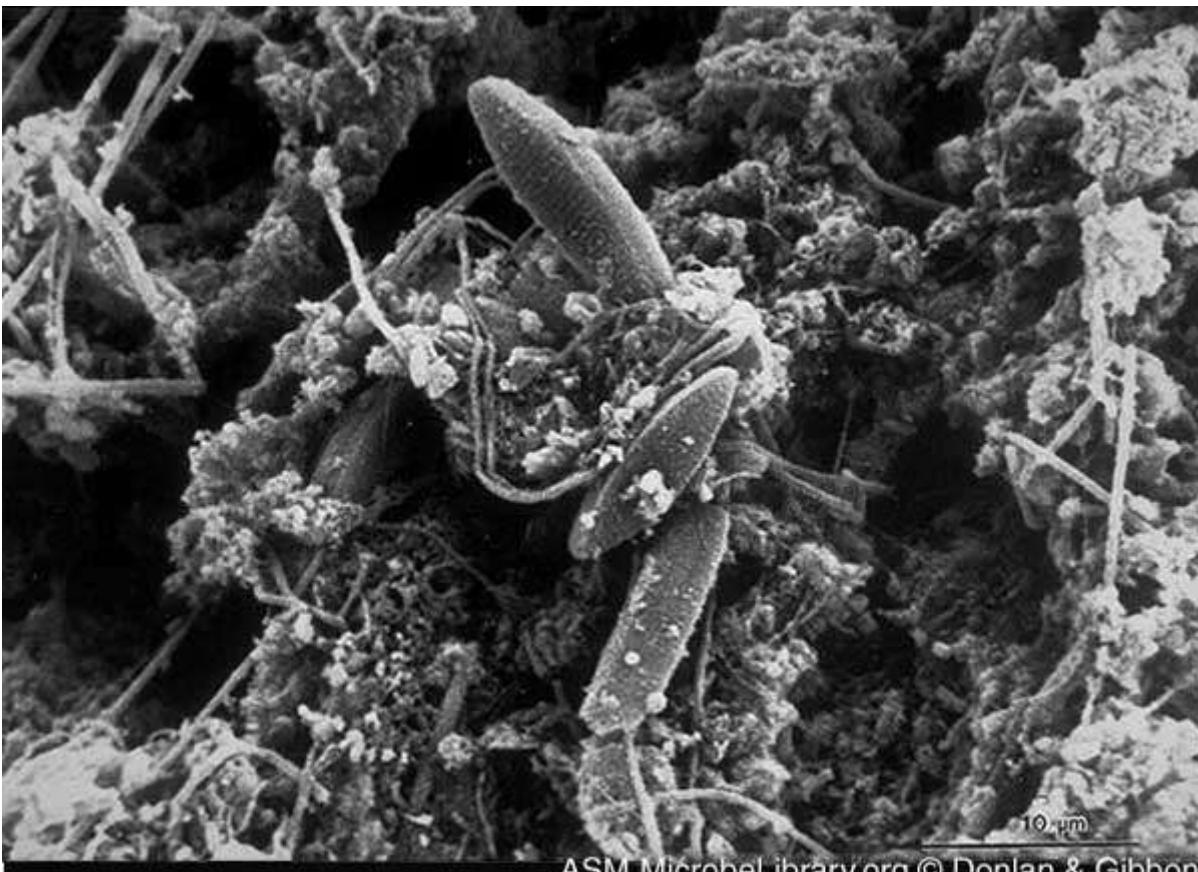


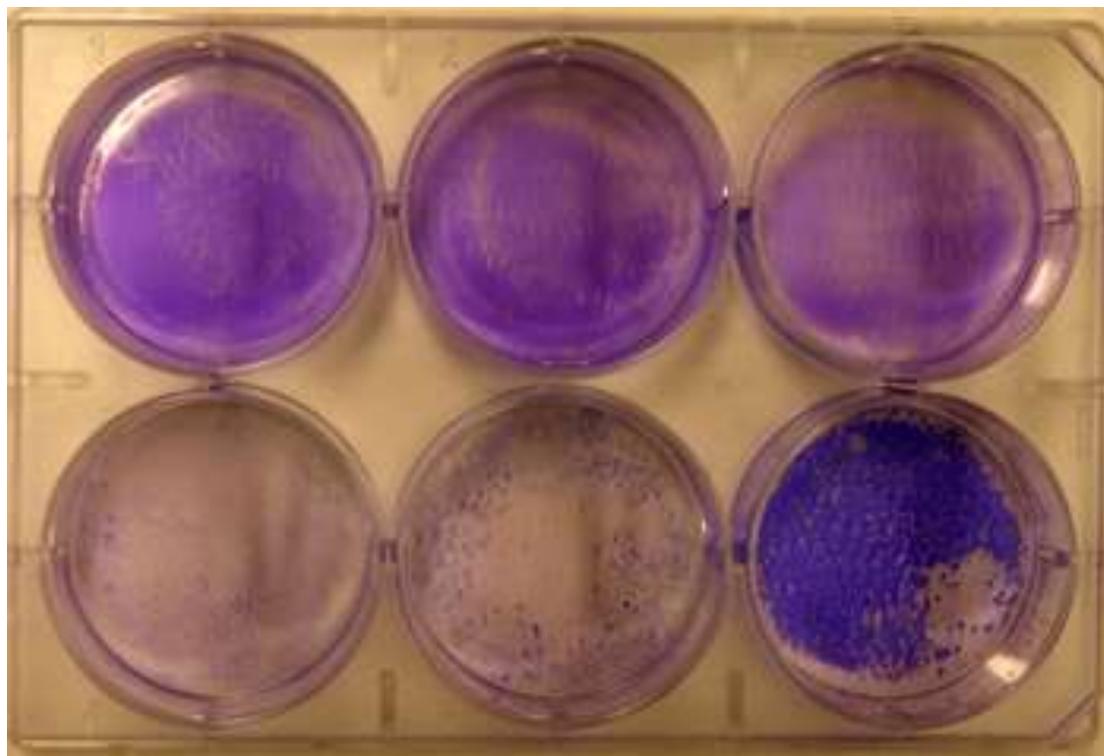
TABLE 2. *Virulence factors of S. epidermidis*

Toxins
β -hemolysin
δ -hemolysin
MSCRAMMs or adhesins
Fibrinogen-binding protein
Fibronectin-binding protein A/B
Collagen-binding protein
Vitronectin-binding protein
Elastin-binding protein
Biofilm
Polysaccharides (e.g. polysaccharide intercellular adhesin, PIA)
Proteins (e.g. accumulation-associated protein, AAP)



ASM MicrobeLibrary.org © Donlan & Gibbon

Cristal violetto



Although the formation of biofilms on indwelling medical devices is generally associated with CNS, particularly *S. epidermidis*, *S. aureus* strains are also capable of biofilm formation [33, 34]. Thus, in addition to their ability to interact with the host-derived proteinaceous conditioning film which quickly coats inserted medical devices, some *S. aureus* strains are also capable of direct adhesion to plastic surfaces.

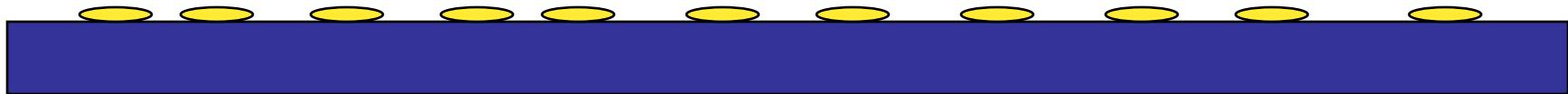
THE VALUE OF BACTERIAL CULTURE DURING CLEAN ORTHOPEDIC SURGERY: A PROSPECTIVE STUDY OF 1,036 PATIENTS

Louis Bernard, MD; Christophe Sadowski, MD; Daniel Monin, MD; Richard Stern, MD; Blaise Wyssa, MD; Peter Rohner, PhD;
Daniel Lew, MD; Pierre Hoffmeyer, MD; Groupe d'Etude sur l'Ostéite

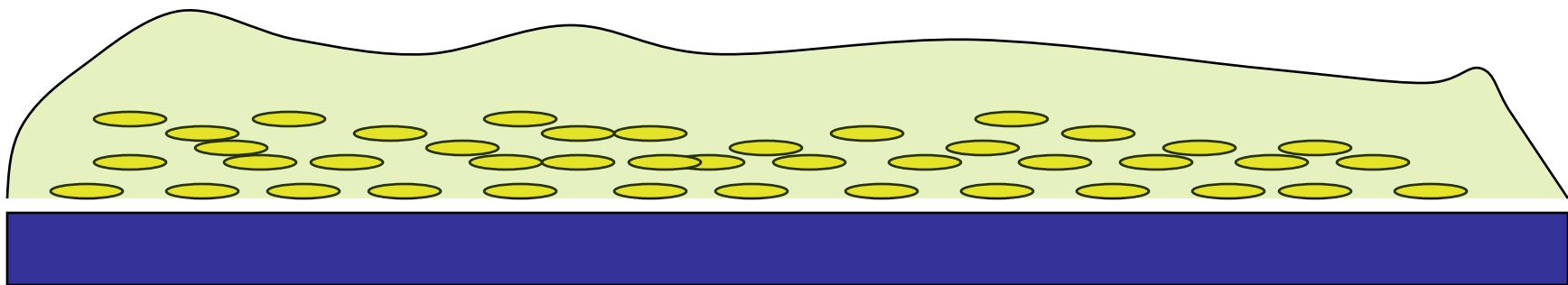
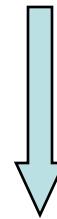
TABLE 1
MICROORGANISMS OBTAINED FROM THE POSITIVE
INTRAOPERATIVE CULTURES

Bacteria	No. (%)
Coagulase-negative staphylococci	51 (53)
<i>Propionibacterium</i> species	22 (23)
<i>Corynebacterium</i> species	11 (11)
<i>Streptococcus</i> species	4 (4)
<i>Bacillus</i> species	4 (4)
<i>Micrococcus</i> species	1 (1)
<i>Proteus mirabilis</i>	1 (1)
<i>Escherichia coli</i>	1 (1)
<i>Stomatococcus mucilaginous</i>	1 (1)
<i>Streptococcus</i> species and <i>Propionibacterium</i> species	1 (1)
Total	97 (100)

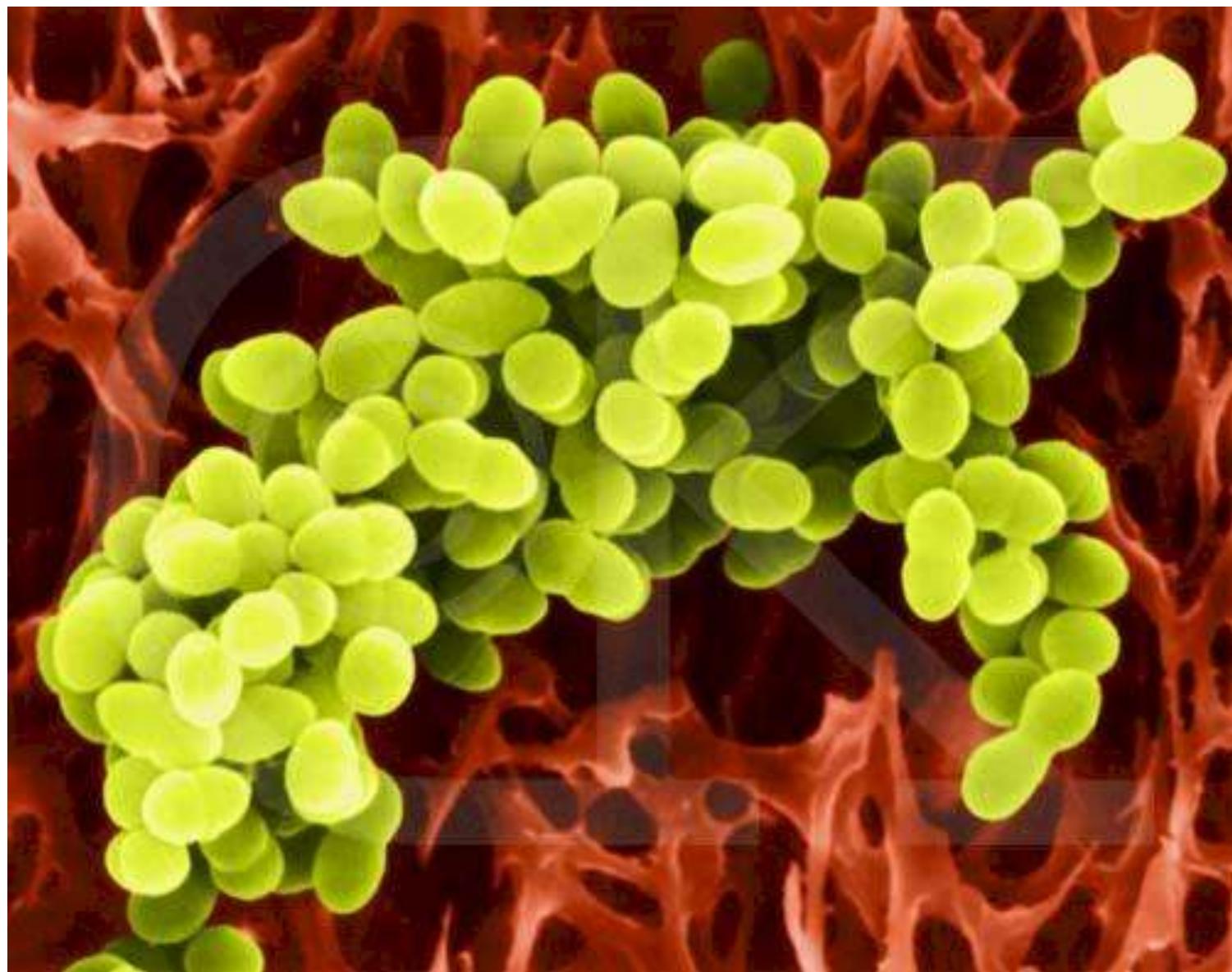
Two-step model of staphylococcal biofilm formation



1. Receptor-mediated and aspecific adhesion of bacteria



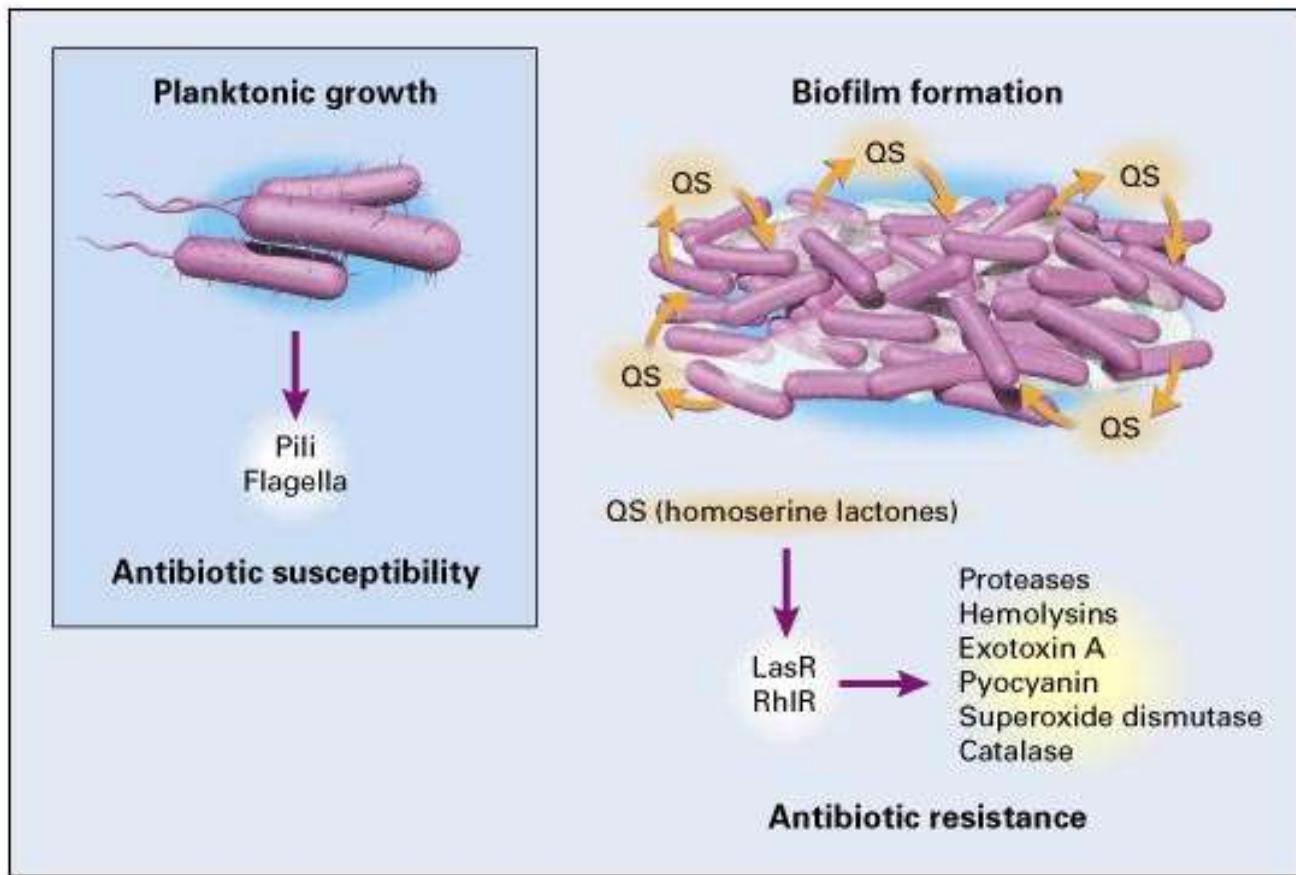
2. Bacterial multiplication and production of a slime matrix



Persistenza batterica intorno al catetere e resistenza agli antimicobici

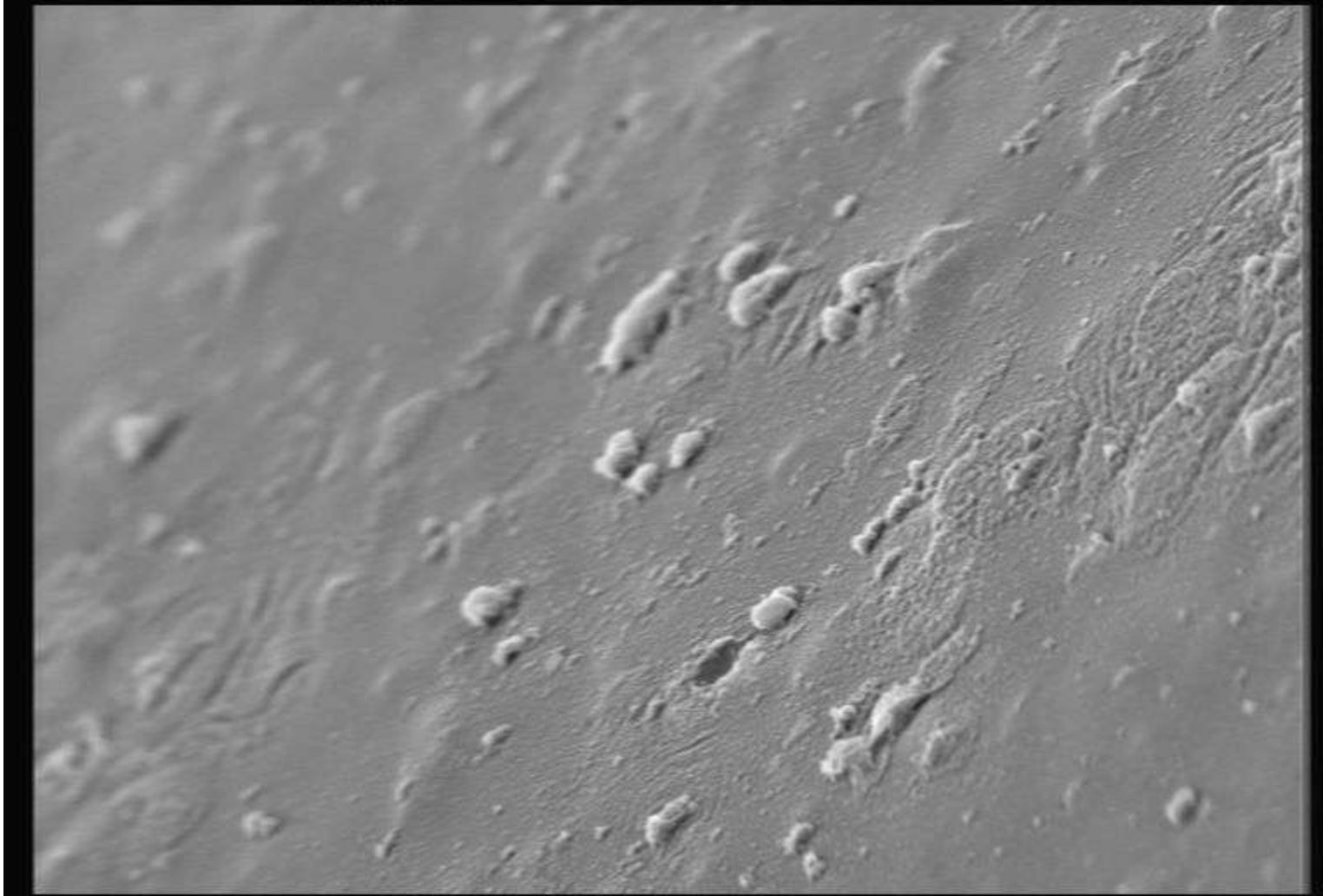
L'eradicazione batterica è molto difficile per:

1. Protezione effettuata nei confronti dei batteri dallo slime e dal glicocalice
2. Incapacità dei neutrofili di fagocitare i batteri aderenti
3. Diminuita attività degli antibiotici nei confronti dei batteri aderenti
 - Barriera verso gli antibiotici
 - Batteri adesi diversi dai batteri che crescono in sospensione (planktonically)

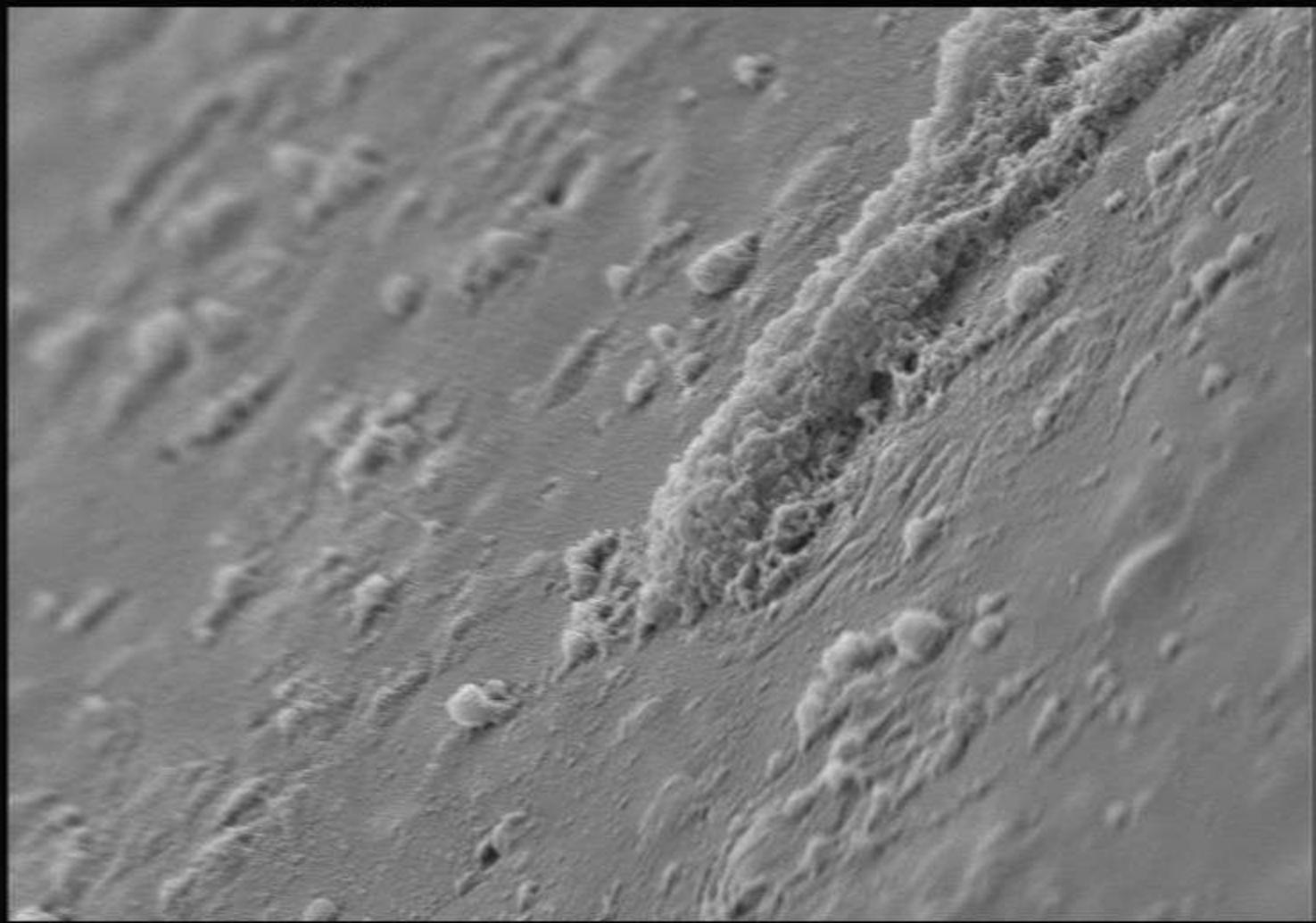


Reference	Organism	Antibiotic	MIC or MBC of planktonic phenotype ($\mu\text{g}/\text{ml}$)	Concn effective against biofilm phenotype ($\mu\text{g}/\text{ml}$)
21 5	<i>S. aureus</i> NCTC 8325-4	Vancomycin	2 (MBC)	20 ^a
26	<i>Pseudomonas aeruginosa</i> ATCC 27853	Imipenem	1 (MIC)	>1,024 ^b
26	<i>E. coli</i> ATCC 25922	Ampicillin	2 (MIC)	512 ^b
20 8	<i>P. pseudomallei</i>	Ceftazidime	8 (MBC)	800 ^c
114	<i>Streptococcus sanguis</i> 804	Doxycycline	0.063 (MIC)	3.15 ^d

4.14kX 16kV WD:10mm S:00000 P:00000
10μm



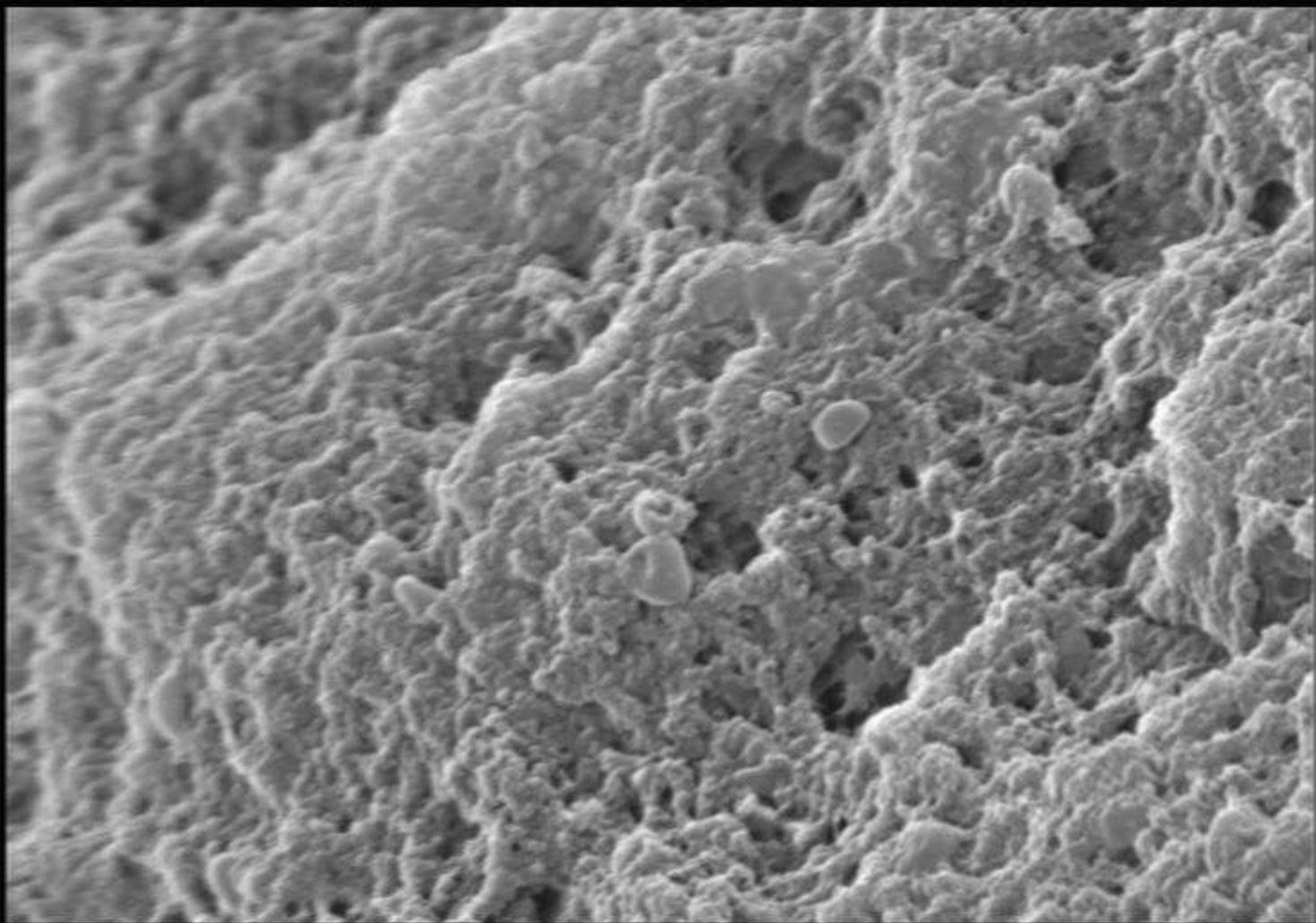
3.80kX 16kV WD:10mm S:00000 P:00000
10μm



8.43kX
5μm

16kV WD:9mm

S:00000 P:00000

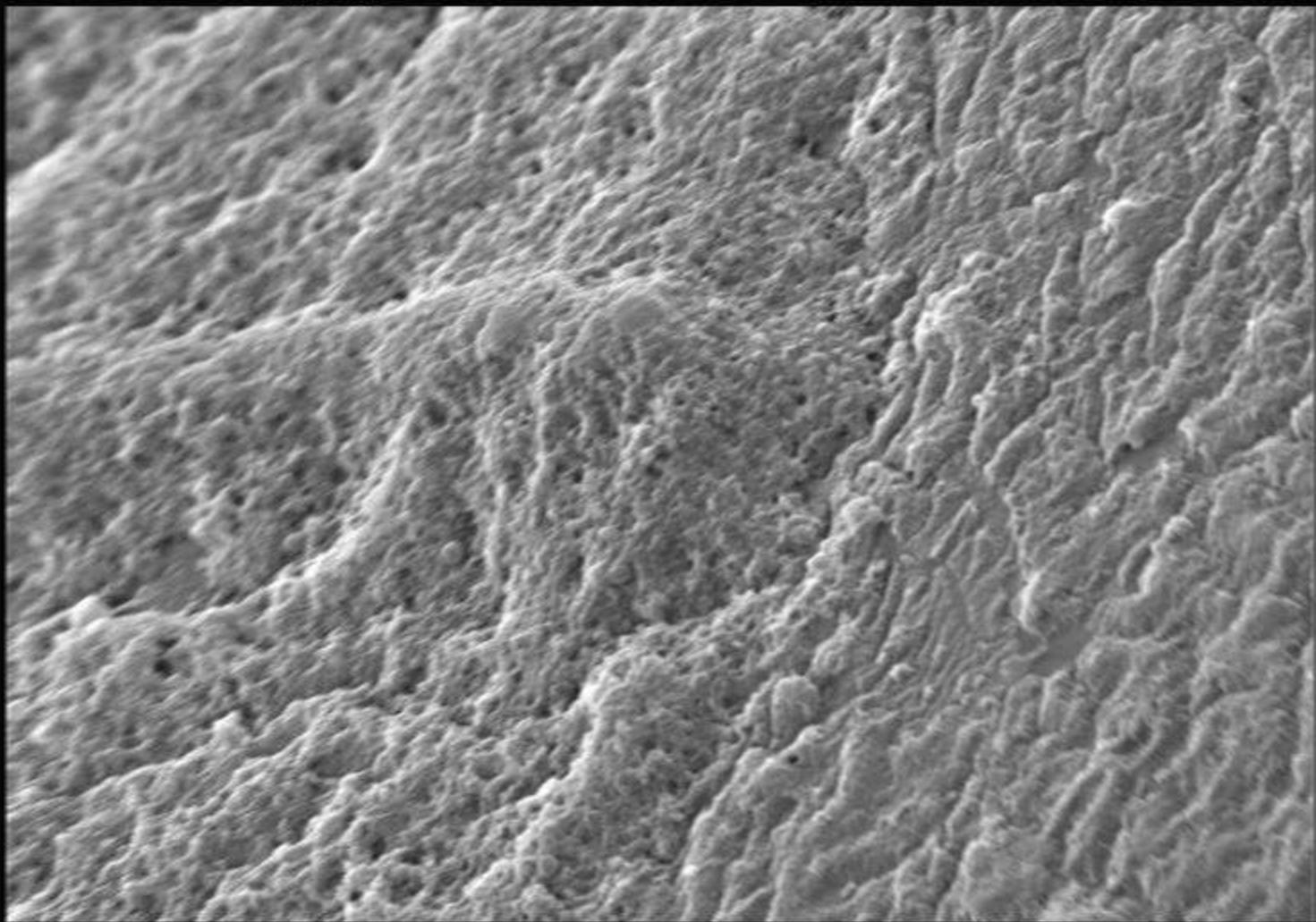


2.32kX

16kV WD:9mm

S:00000 P:00000

26μm

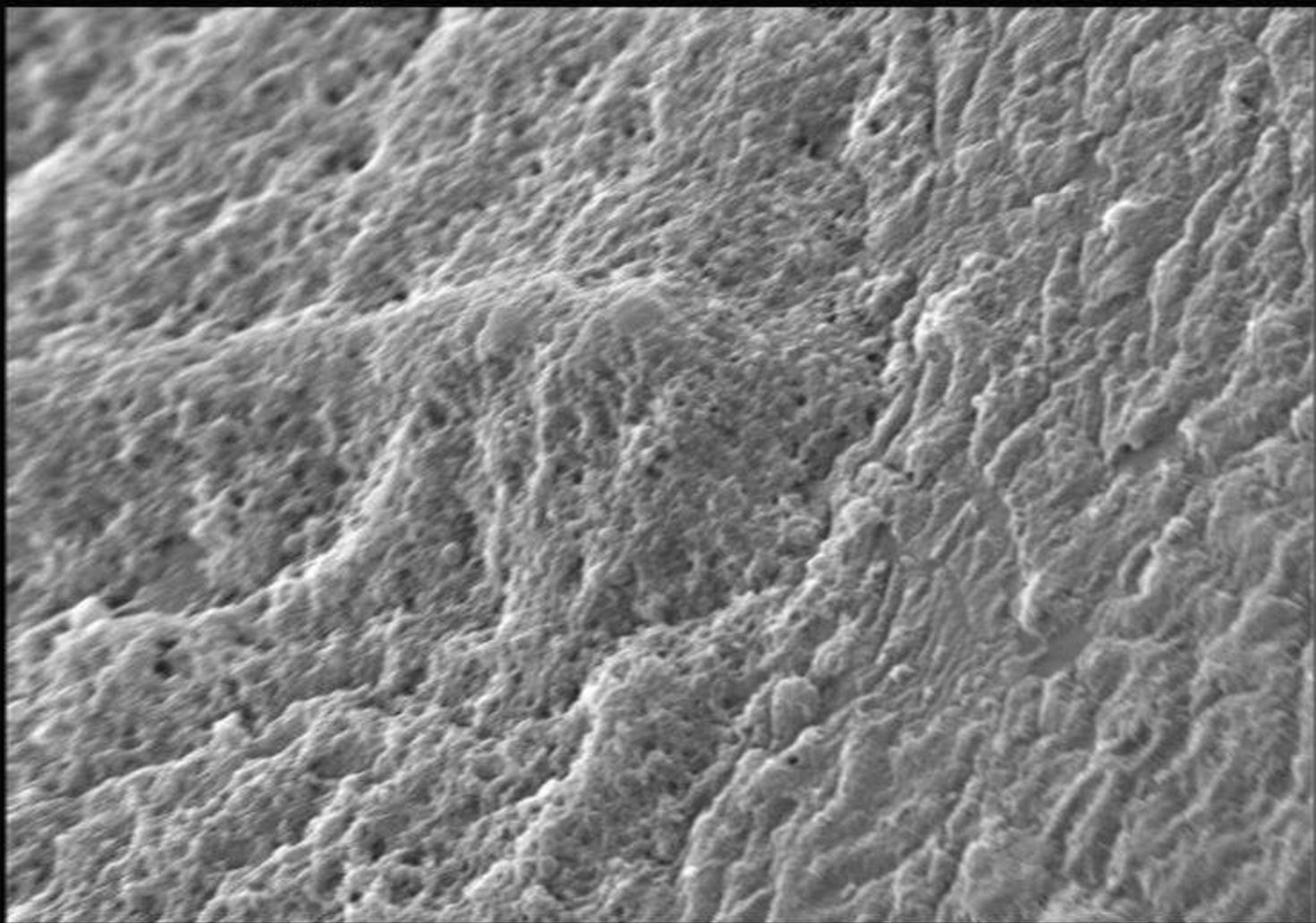


2.32kX

16kV WD:9mm

S:00000 P:00000

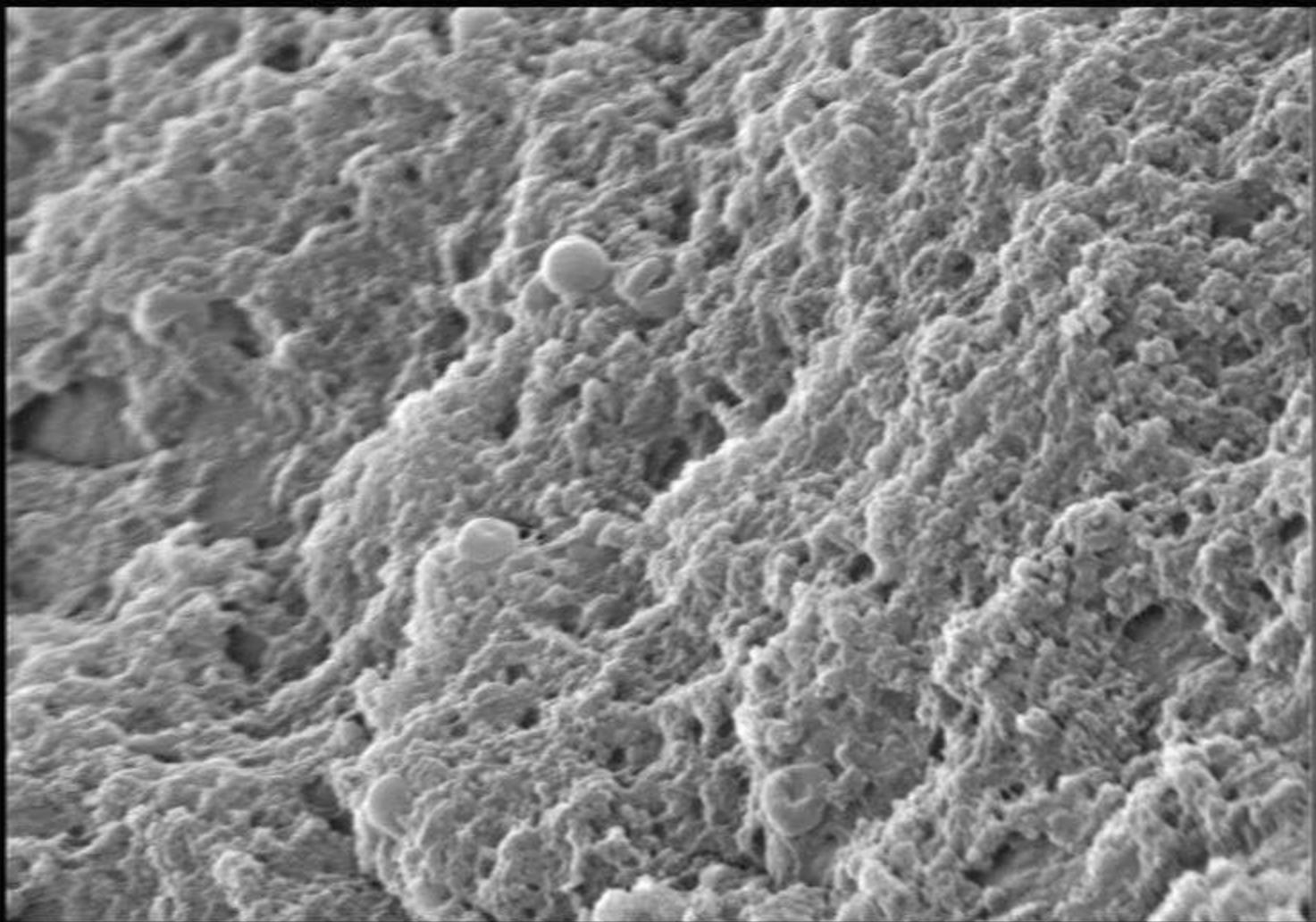
26μm



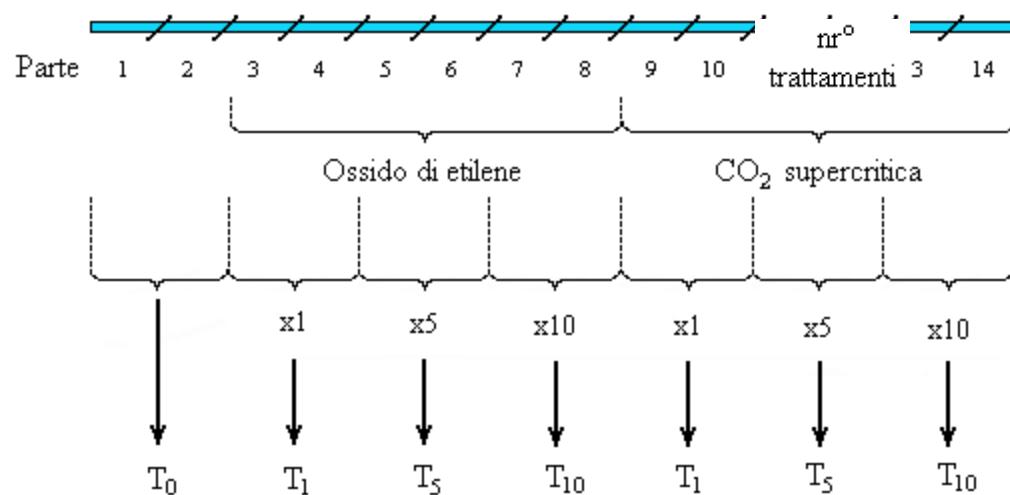
7.03kX
5μm

16kV WD:9mm

S:00000 P:00000



Sterilizzazione con Co₂ supercritica



Infezione con *S.aureus* / *E.coli* / *P.aeruginosa* / *C.albicans*



controllo diluizione
(Clen)

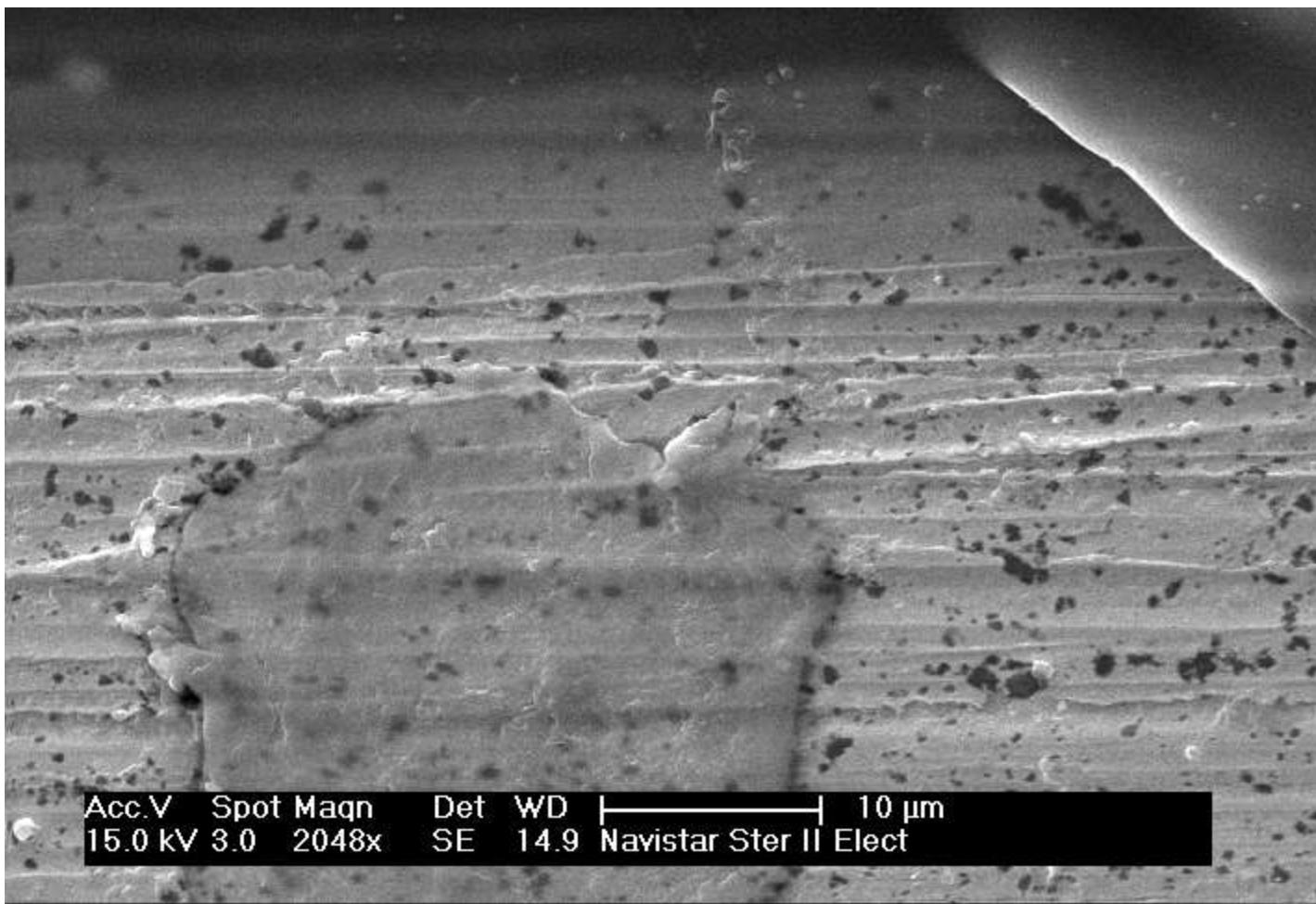


superficie interna
(Clen)

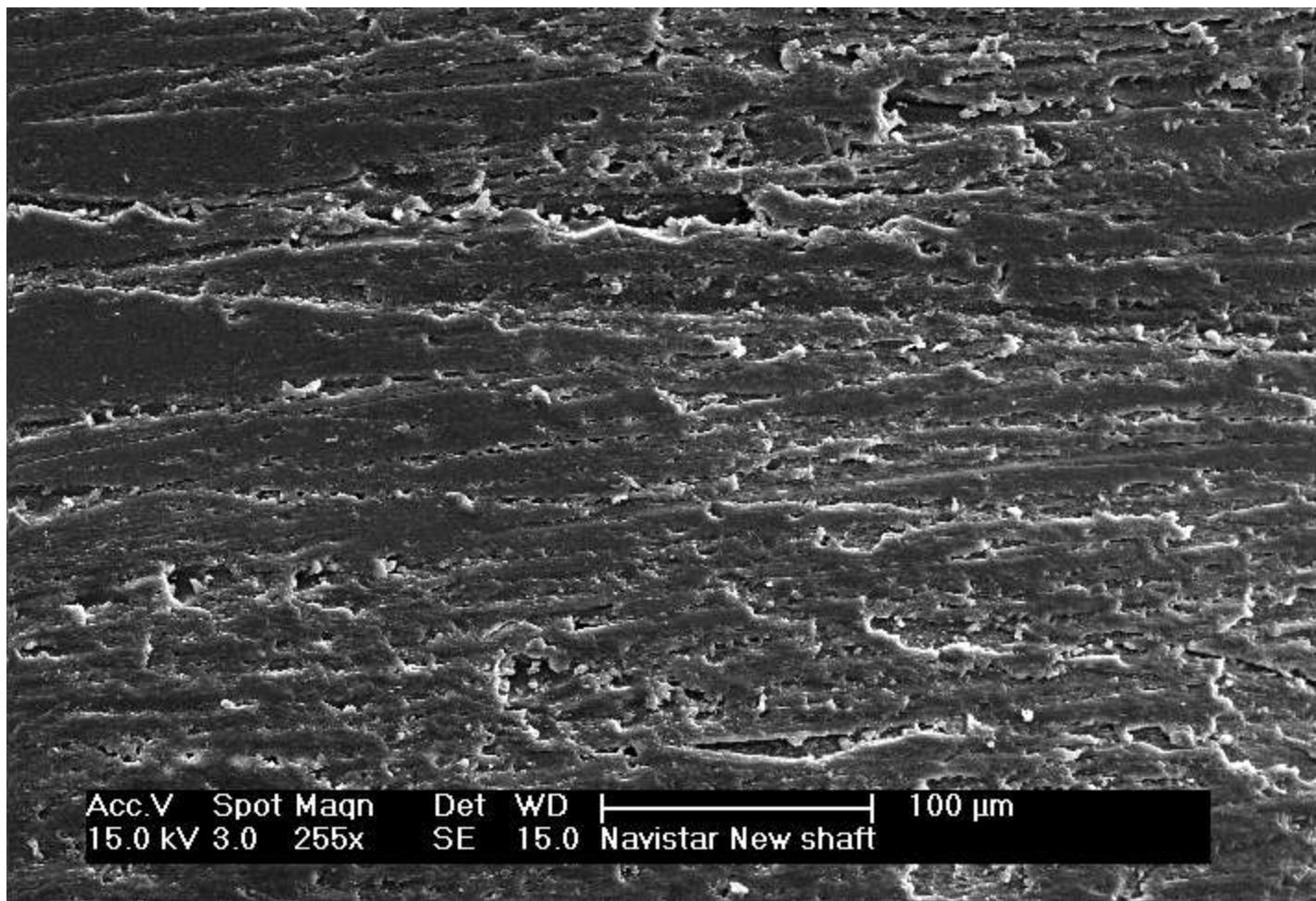


superficie esterna
(Maki)

T0

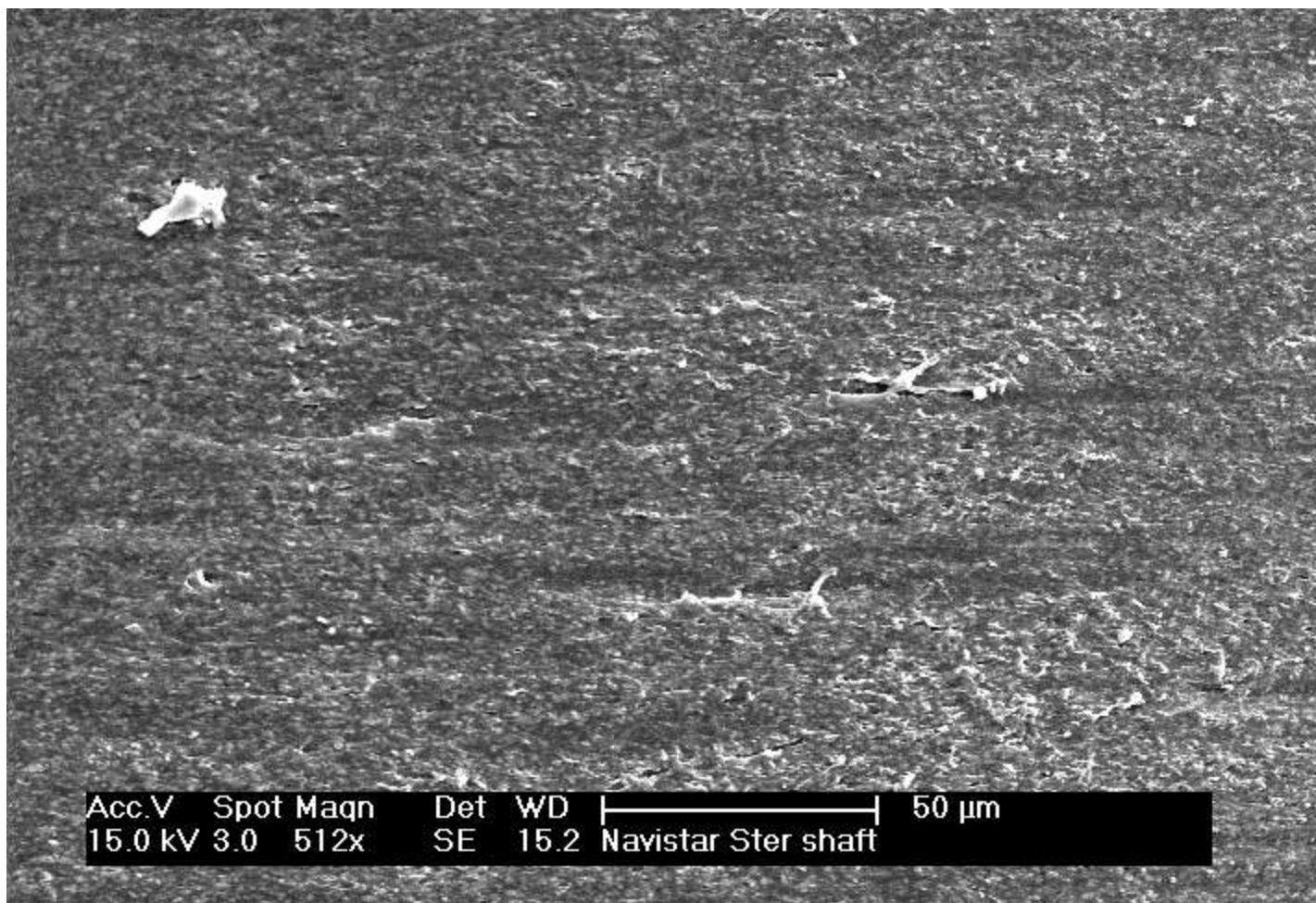


Catetere t0



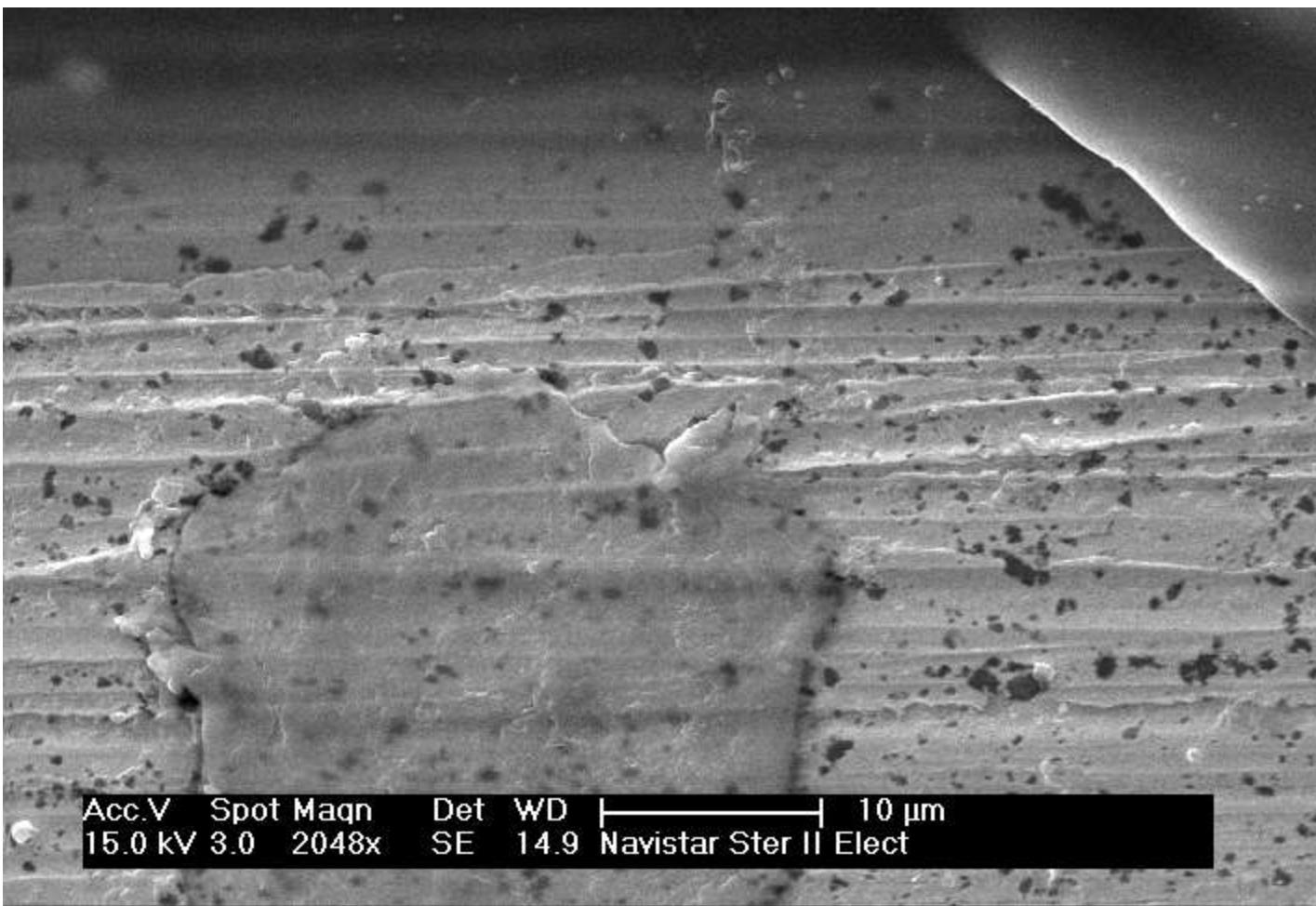
Acc.V Spot Magn Det WD 100 µm
15.0 KV 3.0 255x SE 15.0 Navistar New shaft

T 10



Acc.V Spot Magn Det WD | 50 µm
15.0 kV 3.0 512x SE 15.2 Navistar Ster shaft

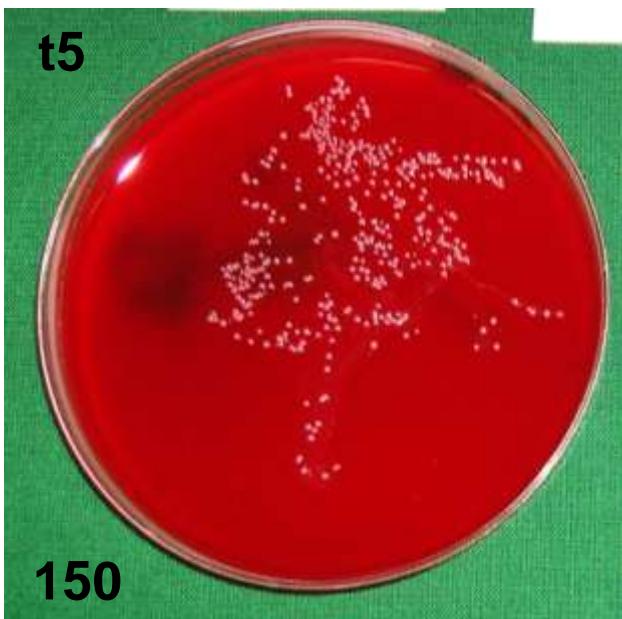
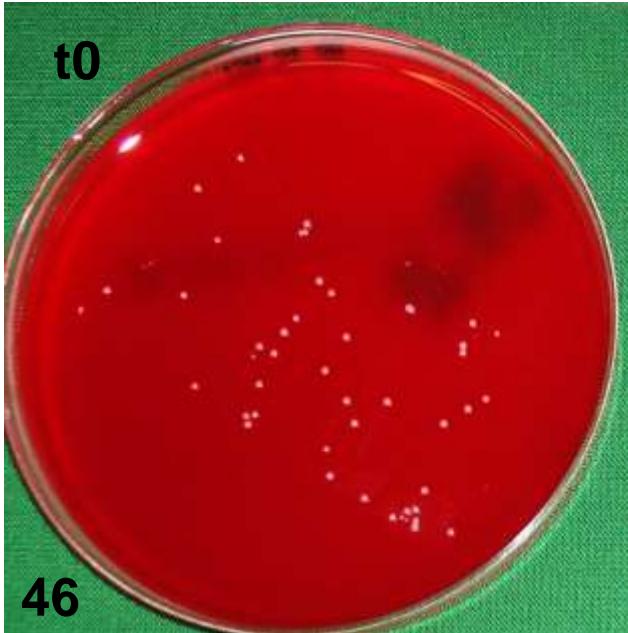
T10



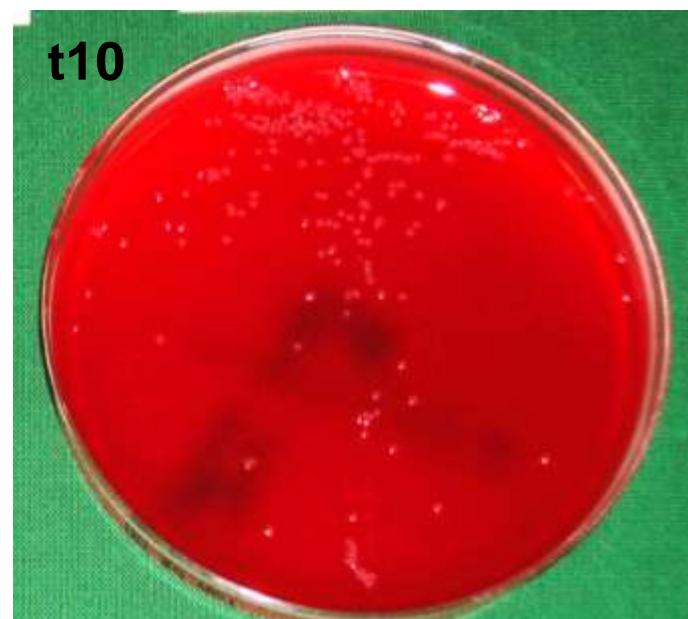
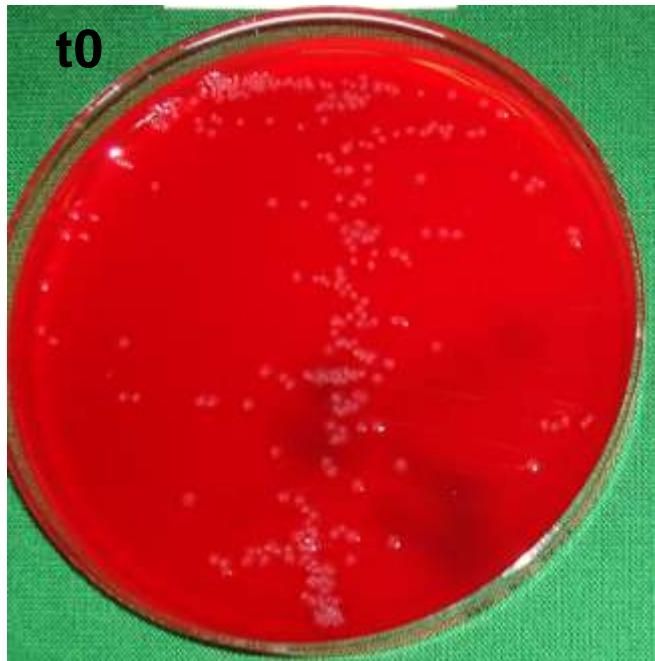
Staphylococcus aureus



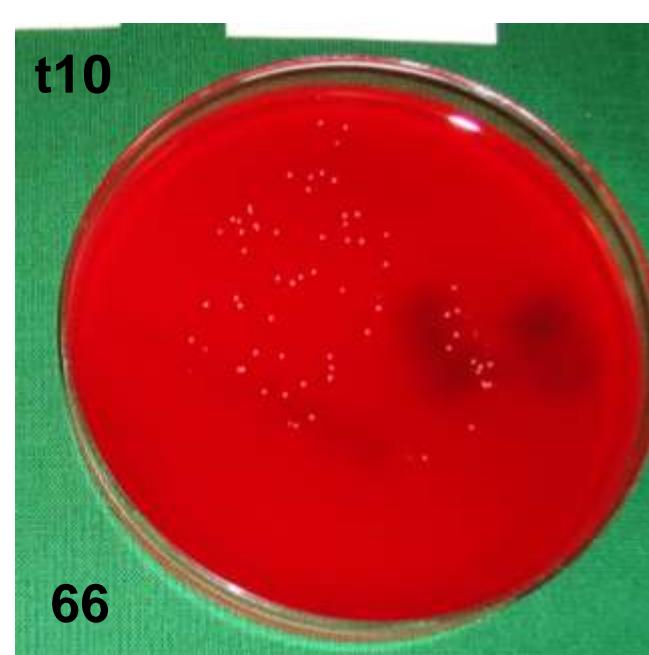
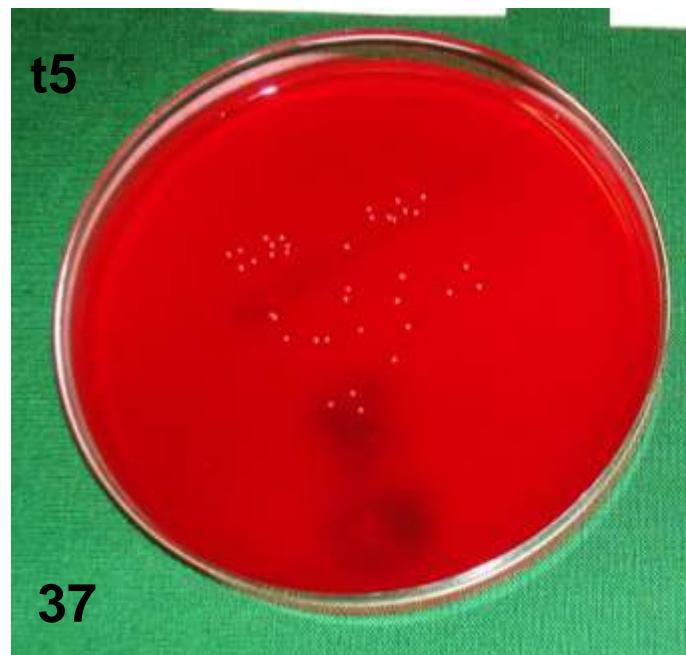
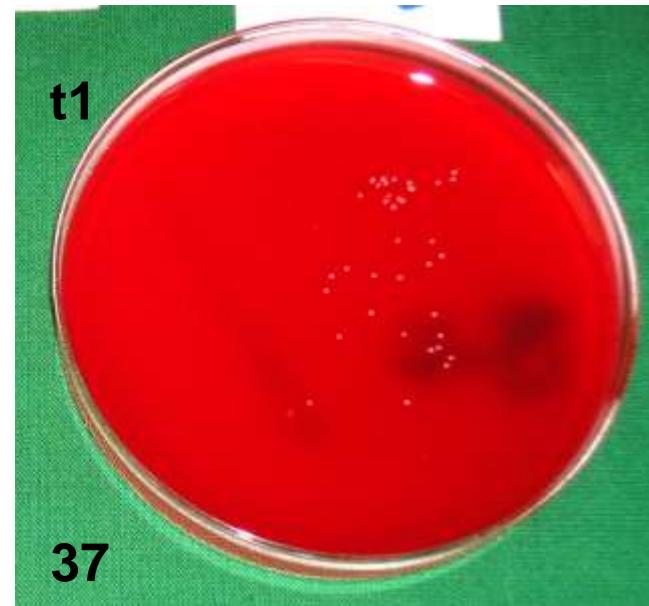
Staphylococcus aureus



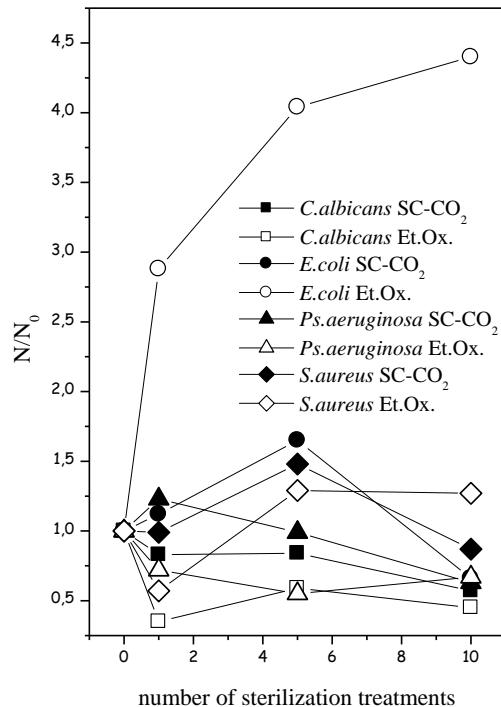
Pseudomonas aeruginosa



Candida albicans



Nuova modalità di sterilizzazione Co₂ Supercritica



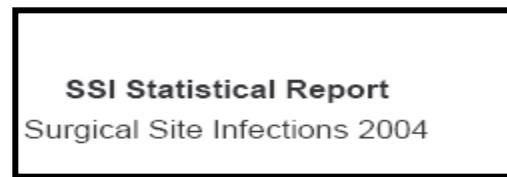
	N° treatments	Blood		Sterilization methods	
		cfu ml ⁻¹ /SD	SC-CO ₂	Et. Ox.	cfu cm ⁻¹ /SD
<i>C.albicans</i>	0	16500/860	24.5/3.5		
	1	17120/3280	20.3/0.7 (p=0.029)	8.5/0.7 (p=0.000)	
	5	17920/2830	20.5/2.5 (p=0.07)	14.5/1.5 (p=0.000)	
	10	18750/3610	13.9/1.02 (p=0.0001)	11/0.9 (p=0.000)	
<i>E.coli</i>	0	95000/2100	127.3/21.3		
	1	95000/2040	143.1/16.5 (p=0.58)	367.5/17.5 (p=0.000)	
	5	98750/1250	209.7/18.2 (p=0.029)	515/61.2 (p=0.0034)	
	10	98750/2500	84/1 (p=0.032)	560/40 (p=0.000)	
<i>Ps.aeruginosa</i>	0	100000/1850	297/4.3		
	1	96250/1250	366/28 (p=0.39)	215/17 (p=0.0005)	
	5	96250/2500	296.2/24.5 (p=0.96)	165/14.4 (p=0.00058)	
	10	100000/2600	187.7/23.9 (p=0.013)	200/11.5 (p=0.00088)	
<i>S.aureus</i>	0	105000/2880	352.7/47		
	1	97500/2500	349/10 (p=0.94)	202/5 (p=0.03)	
	5	97500/2880	523.3/15.8 (p=0.027)	455/12.6 (p=0.44)	
	10	100000/5000	308.7/37.4 (p=0.5)	450/28 (p=0.15)	

La nuova sterilizzazione riduce l'adesività batterica alle superfici



Hospital in Europe
Link for Infection Control through
Surveillance

Surveillance of Surgical Site Infections



March 2006



Project commissioned by the EC / DG SANCO/ F/ 4
Agreement Reference number: VS/1999/5235 (99CVF4-025)

Manca L'Italia

Table 3.1. Number of surgical procedures included in Helics pilot database on surveillance of surgical site infections, by country and type of Helics selected surgical procedure categories, 2004

	CABG	CHOL	COLO	CSEC	HPRO	LAM	Total
AT	48	0	0	173	93	0	314
BE	109	57	130	0	191	101	588
DE	5,268	7,647	3,854	9,543	13,429	696	40,437
ES	10	90	162	354	379	48	1,043
FI ¹	0	0	0	0	2,854	0	2,854
FR	342	4,235	3,232	4,345	2,759	1,647	16,560
HU	0	342	92	0	235	0	669
LT	883	1,357	222	672	206	0	3,340
NL	0	491	630	826	4,079	199	6,225
PL	787	2,161	776	1,495	1,325	222	6,766
UK-EN	4,787	0	1,680	0	18,443	0	24,910
UK-NI	0	0	0	0	2,001	0	2,001
UK-SC	0	0	0	2,172	3,010	0	5,182
UK-WA	0	0	0	0	472	0	472
Total	12,234	16,380	10,778	19,580	49,476	2,913	111,361

¹Data from 2003 for Finland

Surgical procedure categories: CABG: Coronary artery bypass grafting; CHOL: Cholecystectomy; COLO: colon surgery; CSEC: Caesarean Section; HPRO: Arthroplasty of the hip; LAM: Laminectomy. Country codes: AT: Austria, BE: Belgium, DE: Germany, ES: Spain, FI: Finland, FR: France, HU: Hungary, LT: Lithuania, NL: the Netherlands, PL: Poland, UK-EN: United Kingdom-England, UK-NI: United Kingdom-Northern Ireland, UK-SC: United Kingdom-Scotland, UK-WA: United Kingdom-Wales.

2912 SSI

Distribution of isolated micro-organisms

Not all countries have information on micro-organisms responsible for SSI, and if reported the information on micro-organisms is often incomplete. For the **2912 SSI reported in 2004**, information about one or more detected micro-organisms was available in **1167 cases** (40%). For the 7 networks that did report microbiology data the **average availability was 70%** (1167 cases and 1667 SSI). Table 3.11A gives the availability of microbiology data for each intervention category and country. The availability of microbiology in this table is lower than it was in tabel 3.3 since the values for 'micro-organism not found' or 'examination not done' were not considered as missing data.

Table 3.11A. Proportion of Surgical Site Infections for which at least one micro-organism was reported

	CABG	CHOL	COLO	CSEC	HPRO	LAM	Total	# SSI
AT	0%			0%	50%		25%	8
BE	63%	0%	75%		58%		61%	51
DE	87%	46%	47%	50%	84%	0%	63%	914
ES		100%	93%	0%	86%		64%	45
FI					0%		0%	132
FR	0%	0%	0%	0%	0%	0%	0%	575
HU		0%	0%		0%		0%	15
LT	55%	19%	62%	31%	100%		51%	142
NL		0%	0%	0%	0%	0%	0%	212
PL	75%	67%	72%	59%	53%	33%	65%	293
UK-EN	72%		85%		85%		82%	667
UK-NI					0%		0%	32
UK-SC				0%	0%		0%	269
UK-WA					0%		0%	10
Total	71%	36%	37%	19%	50%	8%	43%	3365

Per 7 paesi non ci sono i Dati microbiologici

Negli altri varia dal 25% All'82%

For 7 networks no microbiology data are available. Some of those networks do ask for microbiology data but do not send them to the Helics collaboration because there are too many missing values. For the other 7 networks the availability of microbiology ranges from 25% tot 82%, and the overall proportion for those countries that do report microbiology data is 68%. Therefore no country comparisons are included in this analysis. An overview of micro-organisms detected is given in table 3.11B and based on data from Austria, Belgium, Germany, Spain, Lithuania, Poland and England. The highest proportion for which at least one micro-organism was reported was after CABG, the lowest after LAM.

Table 3.11B. Distribution of micro-organisms isolated in infections for which at least one micro-organism was reported

	CABG	CHOL	COLO	CSEC	HPRO	LAM	Total
Number of micro-organisms	414	112	561	121	695	3	1906
Gram-positive cocci	68.4%	42.9%	42.2%	71.9%	73.8%	33.3%	61.3%
STAPHYLOCOCCUS AUREUS	31.6%	11.6%	11.9%	28.9%	44.3%	33.3%	29.1%
COAGULASE-NEGATIVE STAPHYLOCOCCI (CNS)	28.7%	8.0%	5.2%	17.4%	15.1%	0.0%	14.8%
ENTEROCOCCUS SPECIES	6.8%	17.0%	19.6%	15.7%	11.8%	0.0%	13.5%
STREPTOCOCCUS SPECIES	1.0%	5.4%	5.2%	9.1%	2.0%	0.0%	3.4%
OTHER GRAM POSITIVE COCCI	0.2%	0.9%	0.4%	0.6%	0.6%	0.0%	0.5%
Gram-negative cocci	0.0%	0.0%	0.2%	0.0%	0.0%	0.0%	0.1%
Gram-positive bacilli	1.4%	0.0%	0.0%	1.7%	1.4%	0.0%	0.9%
Gram-negative bacilli, enterobacteriaceae	18.6%	44.6%	37.4%	24.0%	9.8%	66.7%	22.9%
CITROBACTER SPECIES	1.2%	2.7%	1.2%	1.7%	0.0%	0.0%	0.9%
ENTEROBACTER SPECIES	5.1%	6.3%	5.0%	0.8%	2.6%	33.3%	4.0%
ESCHERICHIA COLI	5.6%	24.1%	22.8%	14.0%	3.2%	33.3%	11.4%
KLEBSIELLA SPECIES	2.4%	8.0%	3.9%	1.7%	0.9%	0.0%	2.6%
PROTEUS SPECIES	1.0%	2.7%	3.7%	5.0%	2.0%	0.0%	2.5%
SERRATIA SPECIES	2.7%	0.0%	0.2%	0.0%	0.9%	0.0%	0.9%
OTHER ENTEROBACTERIAC	0.7%	0.9%	0.5%	0.8%	0.3%	0.0%	0.5%
Gram-negative bacilli, non-enterobacteriaceae	5.8%	6.3%	8.4%	1.7%	7.5%	0.0%	6.9%
ACINETOBACTER SPECIES	0.5%	3.6%	0.7%	0.0%	1.4%	0.0%	1.0%
PSEUDOMONAS AERUGINOS	2.7%	2.7%	6.4%	1.7%	4.6%	0.0%	4.4%
STENOTROPHOMONAS MALT	0.2%	0.0%	0.0%	0.0%	0.1%	0.0%	0.1%
PSEUDOMONADACEAE FAMI	1.9%	0.0%	1.2%	0.0%	1.3%	0.0%	1.3%
HAEMOPHILUS SPECIES	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%
OTH. GRAM- BAC., NON-ENTEROBACT.	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%
Anaerobic bacilli	0.2%	3.6%	2.1%	0.8%	0.7%	0.0%	1.2%
BACTEROIDES SPECIES	0.0%	2.7%	1.2%	0.0%	0.0%	0.0%	0.5%
OTHER ANAEROBES	0.2%	0.9%	0.9%	0.8%	0.7%	0.0%	0.7%
Other bacteria	4.8%	0.0%	6.4%	0.0%	6.5%	0.0%	5.3%
Fungi, parasites	0.7%	2.7%	3.2%	0.0%	0.3%	0.0%	1.4%
CANDIDA SPECIES	0.7%	2.7%	3.0%	0.0%	0.3%	0.0%	1.3%
OTHER FUNGI / PARASITES	0.0%	0.0%	0.2%	0.0%	0.0%	0.0%	0.1%

45%

Table 3.11B. Distribution of micro-organisms isolated in infections for which at least one micro-organism was reported

By-pass Add Cesareo Protesi d'anca

	CABG	CHOL	COLO	CSEC	HPRO	LAM	Total
Number of micro-organisms	414	112	561	121	695	3	1906
Gram-positive cocci	68.4%	42.9%	42.2%	71.9%	73.8%	33.3%	61.3%
STAPHYLOCOCCUS AUREUS	31.6%	11.6%	11.9%	28.9%	44.3%	33.3%	29.1%
COAGULASE-NEGATIVE STAPHYLOCOCCI (CNS)	28.7%	8.0%	5.2%	17.4%	15.1%	0.0%	14.8%
ENTEROCOCCUS SPECIES	6.8%	17.0%	19.6%	15.7%	11.8%	0.0%	13.5%
STREPTOCOCCUS SPECIES	1.0%	5.4%	5.2%	9.1%	2.0%	0.0%	3.4%
OTHER GRAM POSITIVE COCCI	0.2%	0.9%	0.4%	0.6%	0.6%	0.0%	0.5%
Gram-negative cocci	0.0%	0.0%	0.2%	0.0%	0.0%	0.0%	0.1%
Gram-positive bacilli	1.4%	0.0%	0.0%	1.7%	1.4%	0.0%	0.9%
Gram-negative bacilli, enterobacteriaceae	18.6%	44.6%	37.4%	24.0%	9.8%	66.7%	22.9%
CITROBACTER SPECIES	1.2%	2.7%	1.2%	1.7%	0.0%	0.0%	0.9%
ENTEROBACTER SPECIES	5.1%	6.3%	5.0%	0.8%	2.6%	33.3%	4.0%
ESCHERICHIA COLI	5.6%	24.1%	22.8%	14.0%	3.2%	33.3%	11.4%
KLEBSIELLA SPECIES	2.4%	8.0%	3.9%	1.7%	0.9%	0.0%	2.6%
PROTEUS SPECIES	1.0%	2.7%	3.7%	5.0%	2.0%	0.0%	2.5%
SERRATIA SPECIES	2.7%	0.0%	0.2%	0.0%	0.9%	0.0%	0.9%
OTHER ENTEROBACTERIAC	0.7%	0.9%	0.5%	0.8%	0.3%	0.0%	0.5%
Gram-negative bacilli, non-enterobacteriaceae	5.8%	6.3%	8.4%	1.7%	7.5%	0.0%	6.9%
ACINETOBACTER SPECIES	0.5%	3.6%	0.7%	0.0%	1.4%	0.0%	1.0%
PSEUDOMONAS AERUGINOS	2.7%	2.7%	6.4%	1.7%	4.6%	0.0%	4.4%
STENOTROPHOMONAS MALT	0.2%	0.0%	0.0%	0.0%	0.1%	0.0%	0.1%
PSEUDOMONADACEAE FAMI	1.9%	0.0%	1.2%	0.0%	1.3%	0.0%	1.3%
HAEMOPHILUS SPECIES	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%
OTH. GRAM- BAC., NON-ENTEROBACT.	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%
Anaerobic bacilli	0.2%	3.6%	2.1%	0.8%	0.7%	0.0%	1.2%
BACTEROIDES SPECIES	0.0%	2.7%	1.2%	0.0%	0.0%	0.0%	0.5%
OTHER ANAEROBES	0.2%	0.9%	0.9%	0.8%	0.7%	0.0%	0.7%
Other bacteria	4.8%	0.0%	6.4%	0.0%	6.5%	0.0%	5.3%
Fungi, parasites	0.7%	2.7%	3.2%	0.0%	0.3%	0.0%	1.4%
CANDIDA SPECIES	0.7%	2.7%	3.0%	0.0%	0.3%	0.0%	1.3%
OTHER FUNGI / PARASITES	0.0%	0.0%	0.2%	0.0%	0.0%	0.0%	0.1%

The Caveats of SSI Incidence

A major problem in comparing incidence indicators from different countries is that observation methods and observation periods differ between countries: some countries observe SSI during hospital stay only , while others do full or partial post-discharge surveillance (PDS). Moreover, length of stay (LOS) and therefore the in-hospital observation period, differs between operation types, between countries, between hospitals and between individuals within those hospitals. The result is that any metric expressing incidence is biased one way or another.

There is no ideal solution for this problem and this was discussed at various Helics meetings. The chosen solution was to present several metrics, but remain aware of the fact that all of them give a partially biased and therefore incomplete picture of reality, i.e. **observation methods and periods in different countries are not the same.**

We agreed on two basic metrics to be included : a) 30 day cumulative incidence, reflecting the common protocol definition of **SSI** but influenced by the fact that no countries have complete 30 day (or 365 day) follow-up, and that this follow-up period differs by country, thereby introducing differential bias, and b) **incidence density**, partially removing the observation bias caused by the different lengths of observation period and different PDS by giving only in-hospital SSI divided by the period of in-hospital observation.



Six Years of Surgical Wound Infection Surveillance at a Tertiary Care Center

Review of the Microbiologic and Epidemiological Aspects of 20 007 Wounds

Carl A. Weiss III, MD; Catherine L. Statz, RN, MPH; Rachel A. Dahms;
Michael J. Remucal; David L. Dunn, MD, PhD; Gregory J. Beilman, MD

1999

Hypotheses: (1) Antibiotic restriction policies result in alteration of microbiologic features of surgical site infections (SSIs) and (2) reported SSI rates are underestimated when postdischarge surveillance is not included in SSI surveillance efforts.

Design: Retrospective analysis of prospectively collected SSI surveillance data.

Patients and Methods: We compared initial microbial isolates from SSIs between (1) January 1, 1993, and December 31, 1995, and (2) January 1, 1996, and December 31, 1998. Antibiotic restriction policies were implemented at Fairview-University Medical Center, Minneapolis, Minn, on March 1, 1995. For the combined periods (January 1, 1993, to December 31, 1998), we determined SSI rates for 20 007 operations according to the extent of bacterial contamination at surgery (wound class). Then, we analyzed SSI rates for 10 559 of these operations (selected based on availability of Anesthesia Society of America score and type of procedure) using the surgical wound risk index (wound class, Anesthesia Society of America score, and length of operation). We categorized SSI rates by 17 procedures for comparison with SSI rates reported by 286 hospitals that contributed data confidentially and volun-

tarily to the National Nosocomial Infections Surveillance System in 1998. We compared SSI rates with and without postdischarge surveillance.

Results: Coagulase-negative staphylococcus and group D enterococcus were the 2 most frequent isolates before and after antibiotic restriction policies were implemented. *Candida albicans* isolates decreased from 7.9% (1993-1995) to 6.5% (1996-1998; $P = .46$). Methicillin-resistant *Staphylococcus aureus* (1.8% of isolates) and vancomycin-resistant enterococcus (2.4% of isolates) organisms were first identified between 1996 and 1998. Our SSI rates were 2.6% for class I wounds, 3.6% for class II wounds, and 10.5% for class III/IV wounds; 53.9% of SSIs were identified after hospital discharge.

Conclusions: Antibiotic restriction policies did not alter the microbial spectrum of SSIs during the observation period. Reporting SSI rates in the absence of postdischarge surveillance dramatically underestimates actual SSI rates, especially in tertiary care hospitals that provide care for large populations of elderly and immunosuppressed patients.

Arch Surg. 1999;134:1041-1048

1. 58082 interventi/ analizzati 20.000

Table 1. Surgical Cases and Wound Infections, 1993-1998

Year	Surgical Cases, No.	Wound Infections, No.	Wound Infection Rate, %
1993	3378	132	3.9
1994	3260	175	5.4
1995	3605	132	3.7
1996	3139	105	3.4
1997	3240	114	3.5
1998	3385	125	3.7

General surgery 8.6%

all Wound Infections

Cardiovascular 2.8%

50% General surgery
34% Transplant surgery
15.8% cardiovascular surgery

Stafilococchi cons 25.6%
Enterococcus 11.5%
S.aureus 8.7%

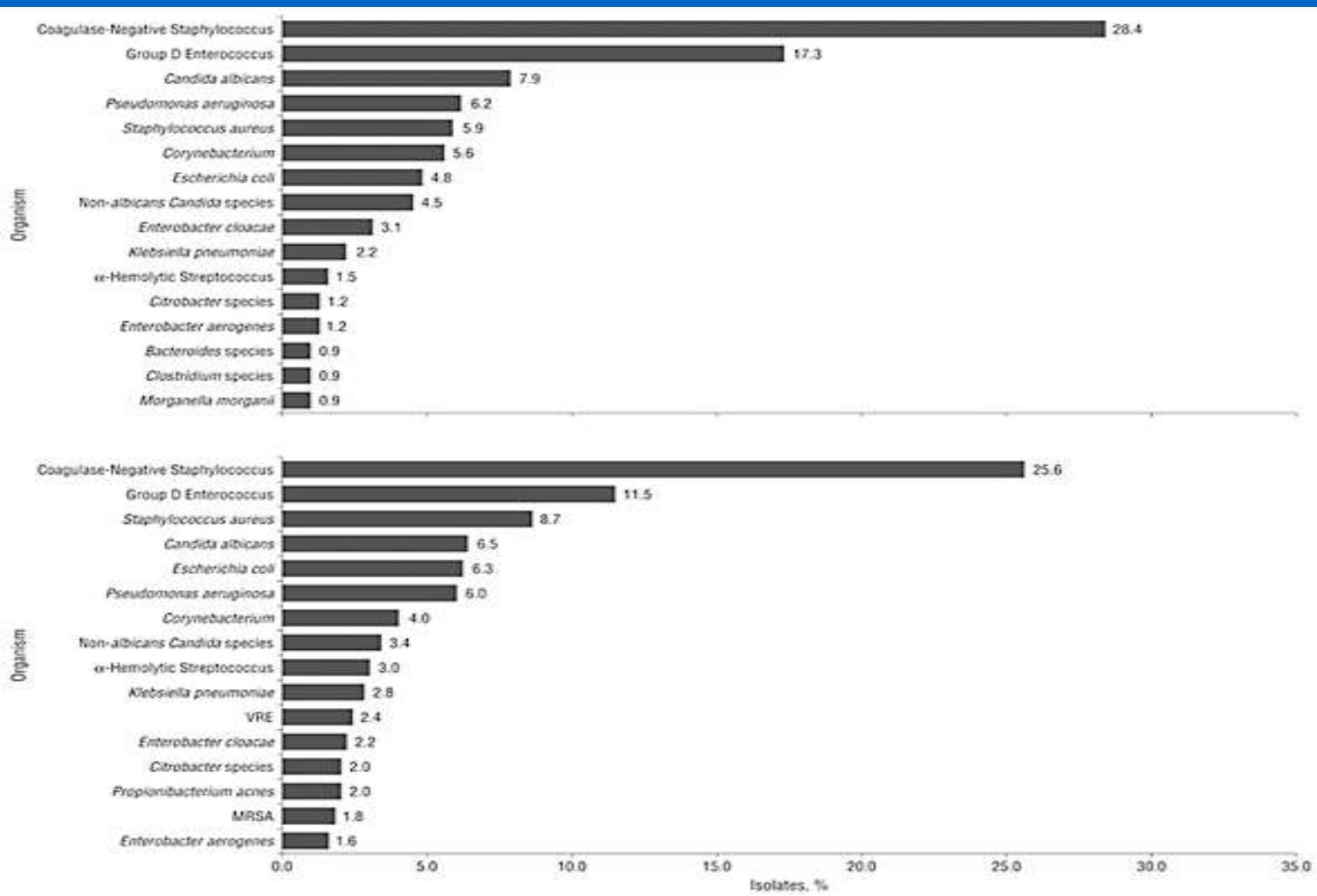


Figure 2. Top, Microbial isolates from 374 superficial, deep, and combined wound infections, 1993 through 1995. Bottom, Microbial isolates from 284 superficial, deep, and combined wound infections, 1996 through 1998. VRE indicates vancomycin-resistant enterococcus; MRSA, methicillin-resistant *Staphylococcus aureus*.

Arch Surg vol 134, OCT 1999
Six years of Surgical Wound Infection Surveillance at Tertiary Care
Center
C.A. Weiss III and others.

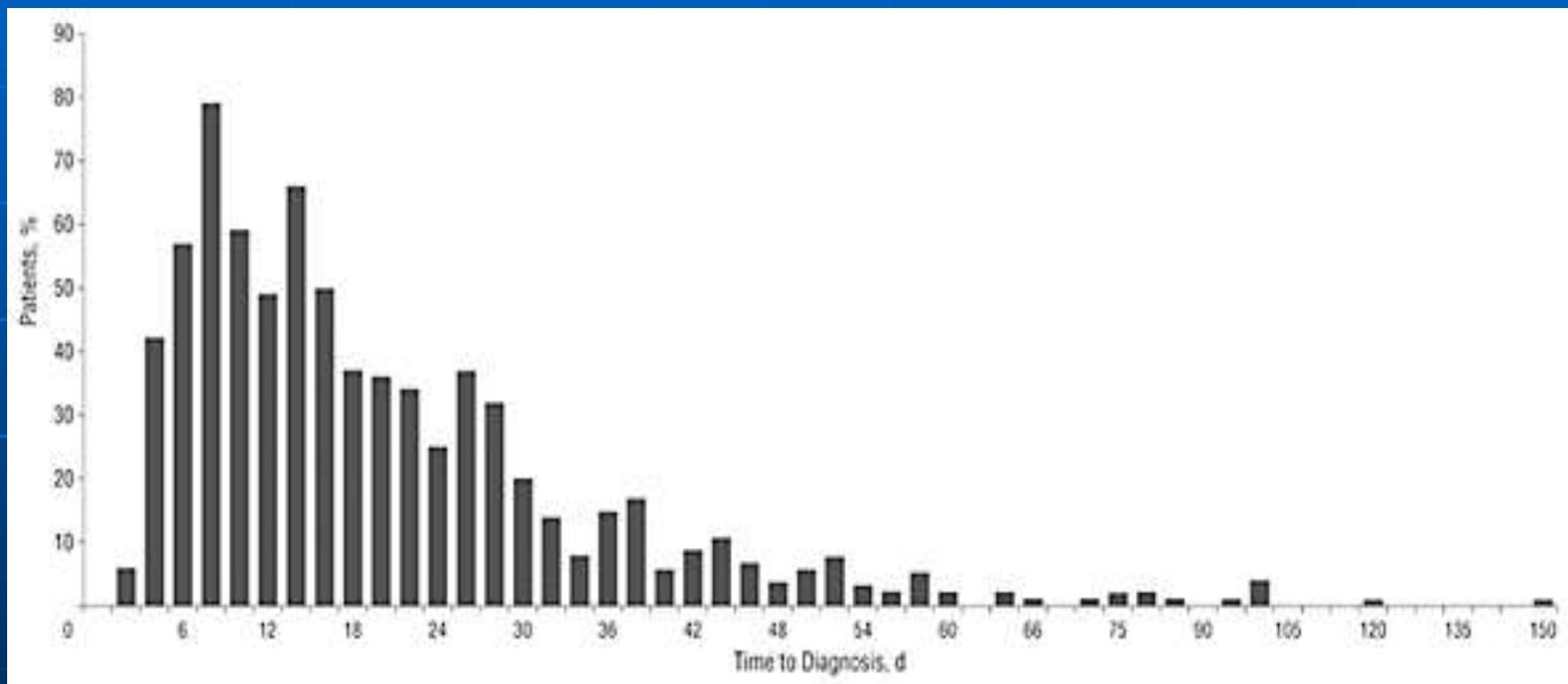


Figure 1. Number of postoperative days until diagnosis of wound infection, 1994 through 1998.



Surveillance of Surgical Site Infection in English Hospitals 1997 - 2002

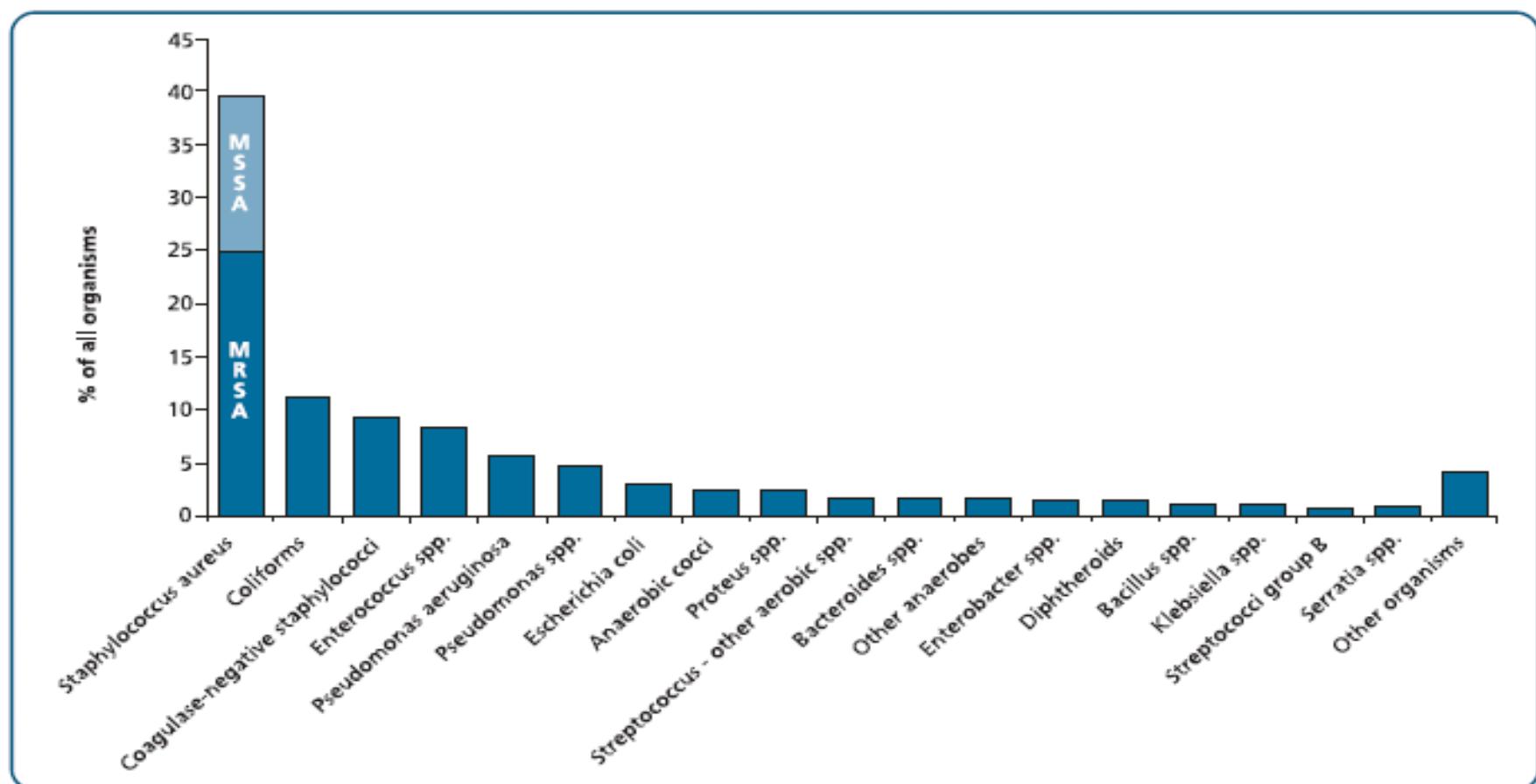
A national surveillance and quality improvement programme



Micro-organisms causing surgical site infection

Figure 3.1 gives information about micro-organisms causing surgical site infections. The distribution of staphylococci causing SSIs by category of surgical procedures where 25 or more infections were reported are shown in figure 3.2.

Figure 3.1 Distribution of micro-organisms identified as causing surgical site infections for all categories of surgical procedures.



Key summary points

49% of the micro-organisms identified as causing infections were staphylococci, of which 81% were *Staphylococcus aureus*. 63% of *Staphylococcus aureus* were resistant to methicillin (MRSA).



Epidemiology and Microbiology of Surgical Wound Infections

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This study included 676 surgery patients with signs and symptoms indicative of wound infections, who presented over the course of 6 years. Bacterial pathogens were isolated from 614 individuals. A single etiologic agent was identified in 271 patients, multiple agents were found in 343, and no agent was identified in 62. A high preponderance of aerobic bacteria was observed. Among the common pathogens were *Staphylococcus aureus* (191 patients, 28.2%), *Pseudomonas aeruginosa* (170 patients, 25.2%), *Escherichia coli* (53 patients, 7.8%), *Staphylococcus epidermidis* (48 patients, 7.1%), and *Enterococcus faecalis* (38 patients, 5.6%).

<i>Staphylococcus aureus</i>	28%
<i>Pseudomonas aeruginosa</i>	25.2%
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<i>Enterococcus faecalis</i>	5.6%

TABLE 2. Organisms Most Commonly Isolated From Serious Surgical Site Infections (SSIs) in 26 Community Hospitals During 2005

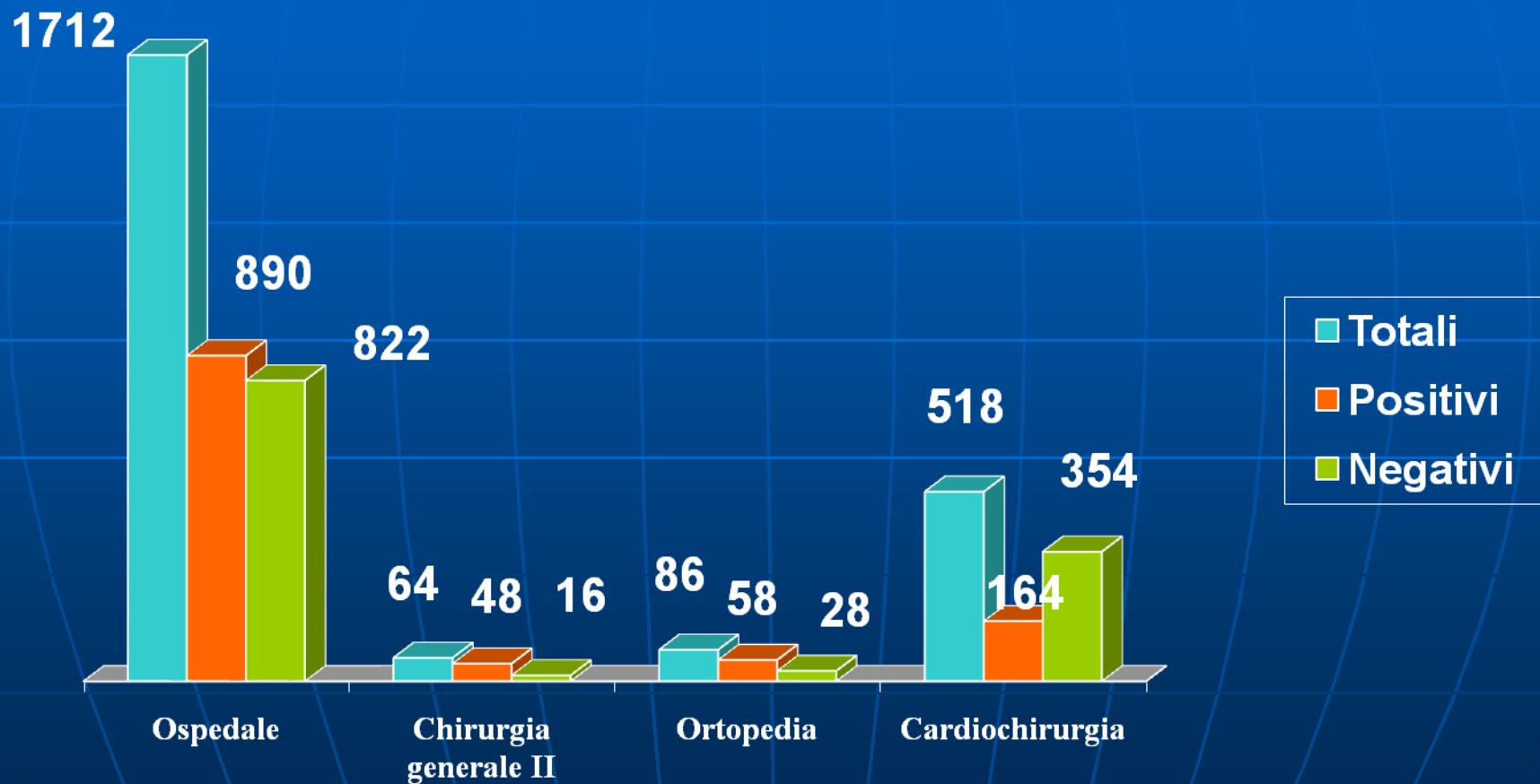
Organism	No. (%) of SSIs (n = 1,010)	Prevalence rate, SSIs per 100 procedures
<i>Staphylococcus aureus</i>	331 (33)	0.37
MRSA	175 (17)	0.20
MSSA	156 (15)	0.17
Coagulase-negative staphylococci	116 (11)	0.13
<i>Enterococcus</i> spp	84 (8)	0.09
<i>Escherichia coli</i>	57 (6)	0.06
<i>Pseudomonas aeruginosa</i>	44 (4)	0.05
<i>Klebsiella</i> spp	39 (4)	0.04
<i>Streptococcus</i> spp	35 (3)	0.04
Fungi	29 (3)	0.03
Anaerobes	26 (3)	0.03

NOTE. Only deep and organ space SSIs were included; superficial SSIs were excluded. MRSA, methicillin-resistant *S. aureus*. MSSA, methicillin-susceptible *S. aureus*.

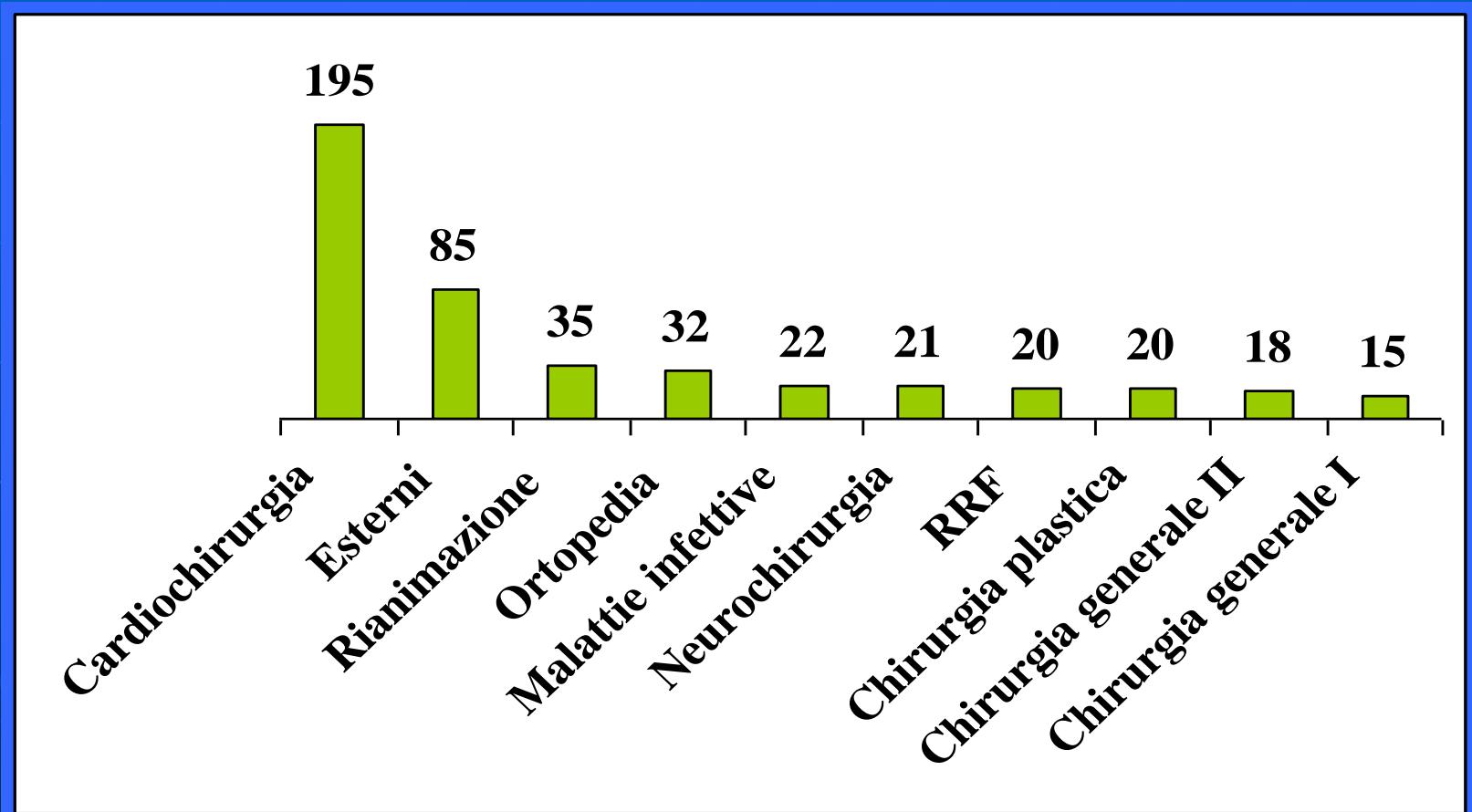
18:1047-1053

spitals. The

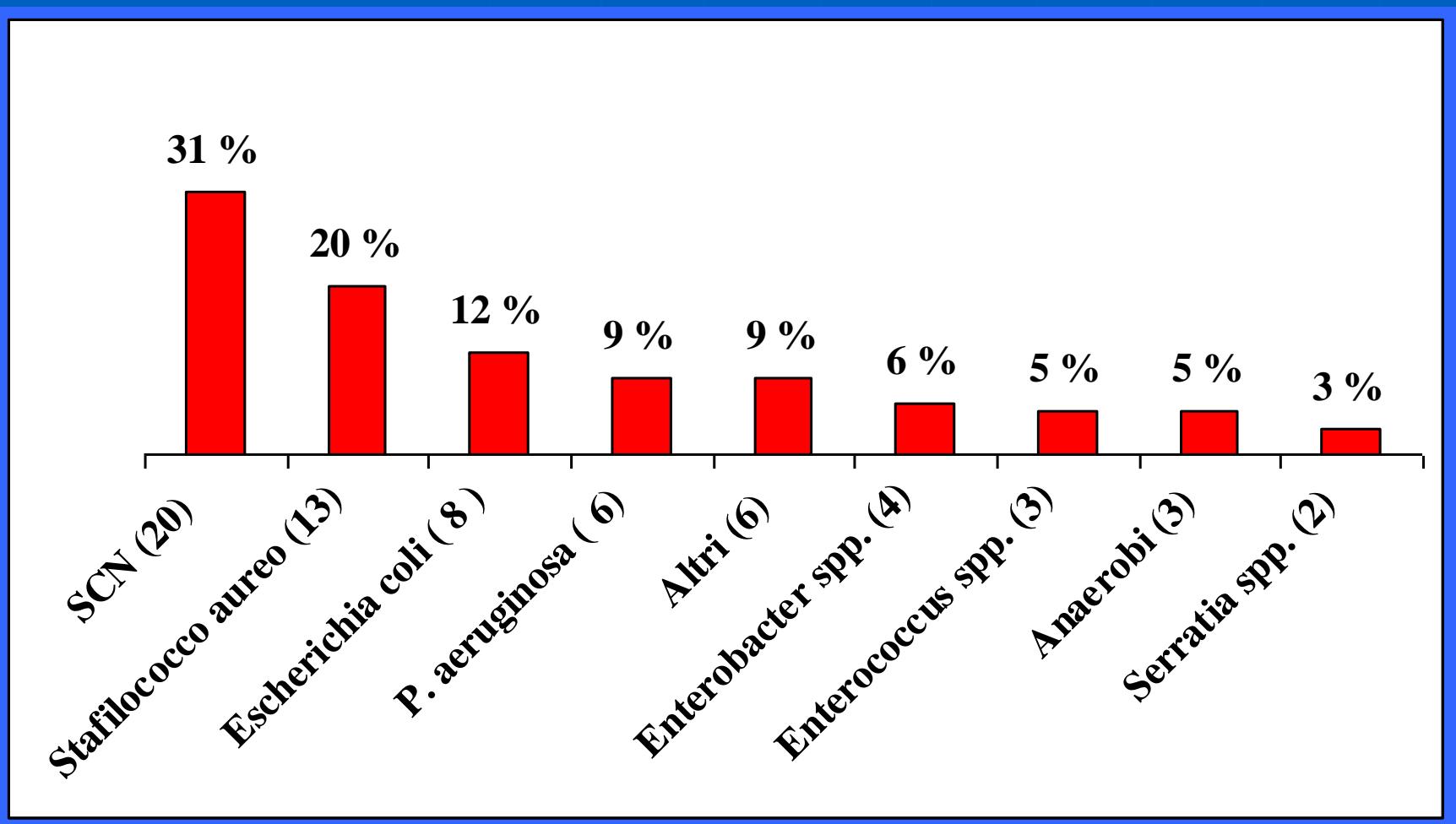
Campioni inviati da ferita chirurgica in 3 anni totali/positivi/negativi



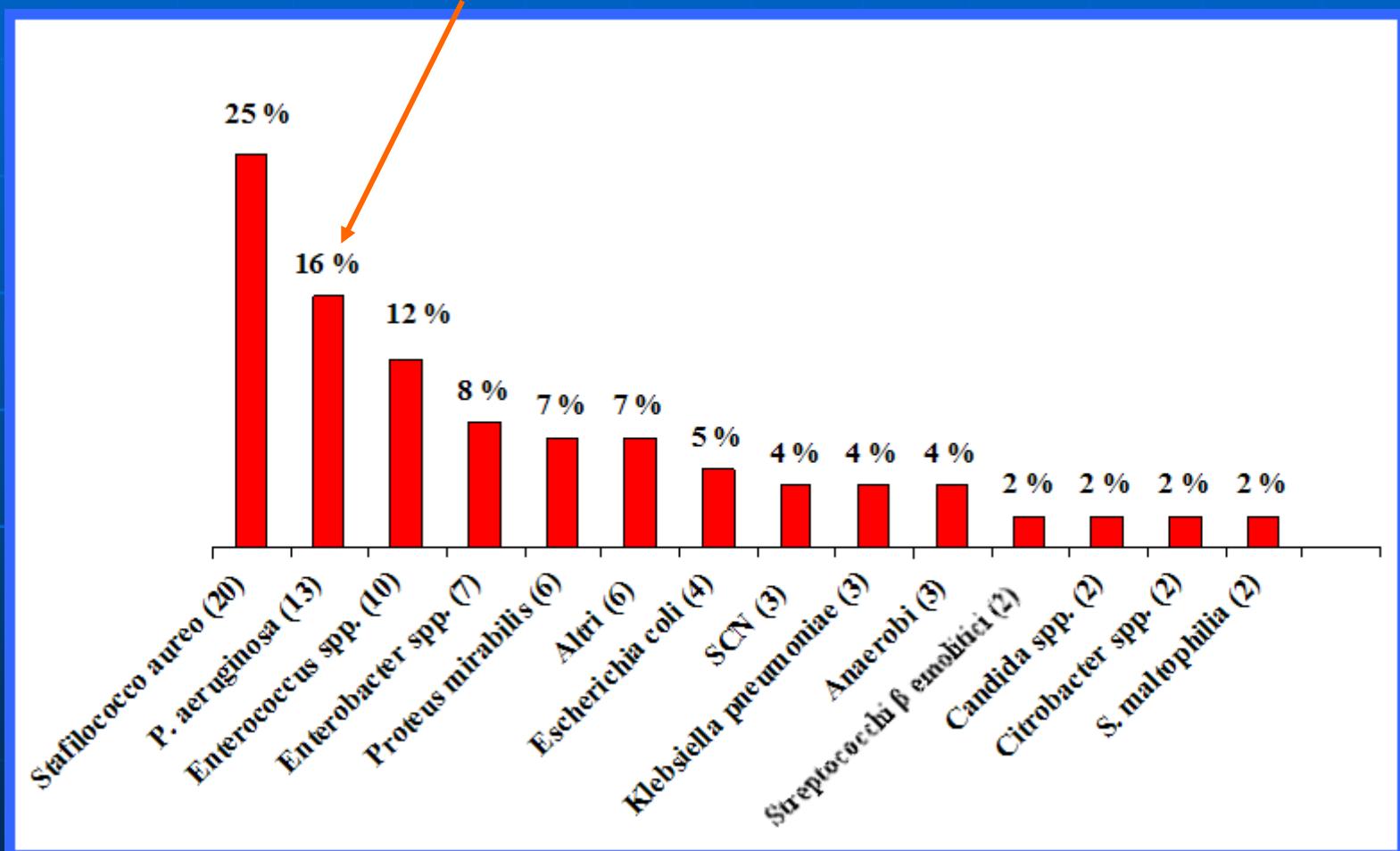
Provenienza per reparto dei tamponi ferita chirurgica 2008



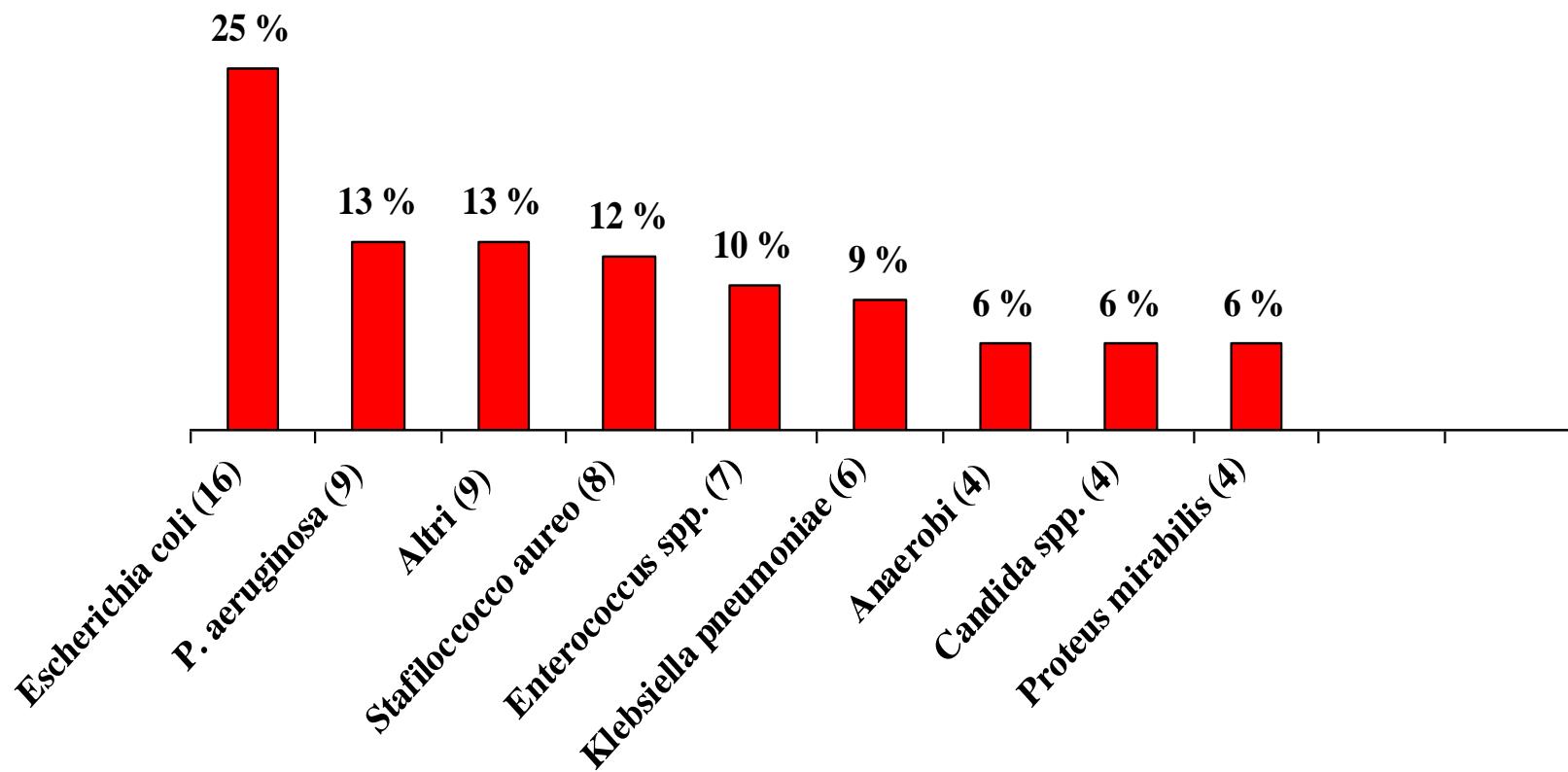
Microrganismi isolati in Cardiochirurgia in 3 anni



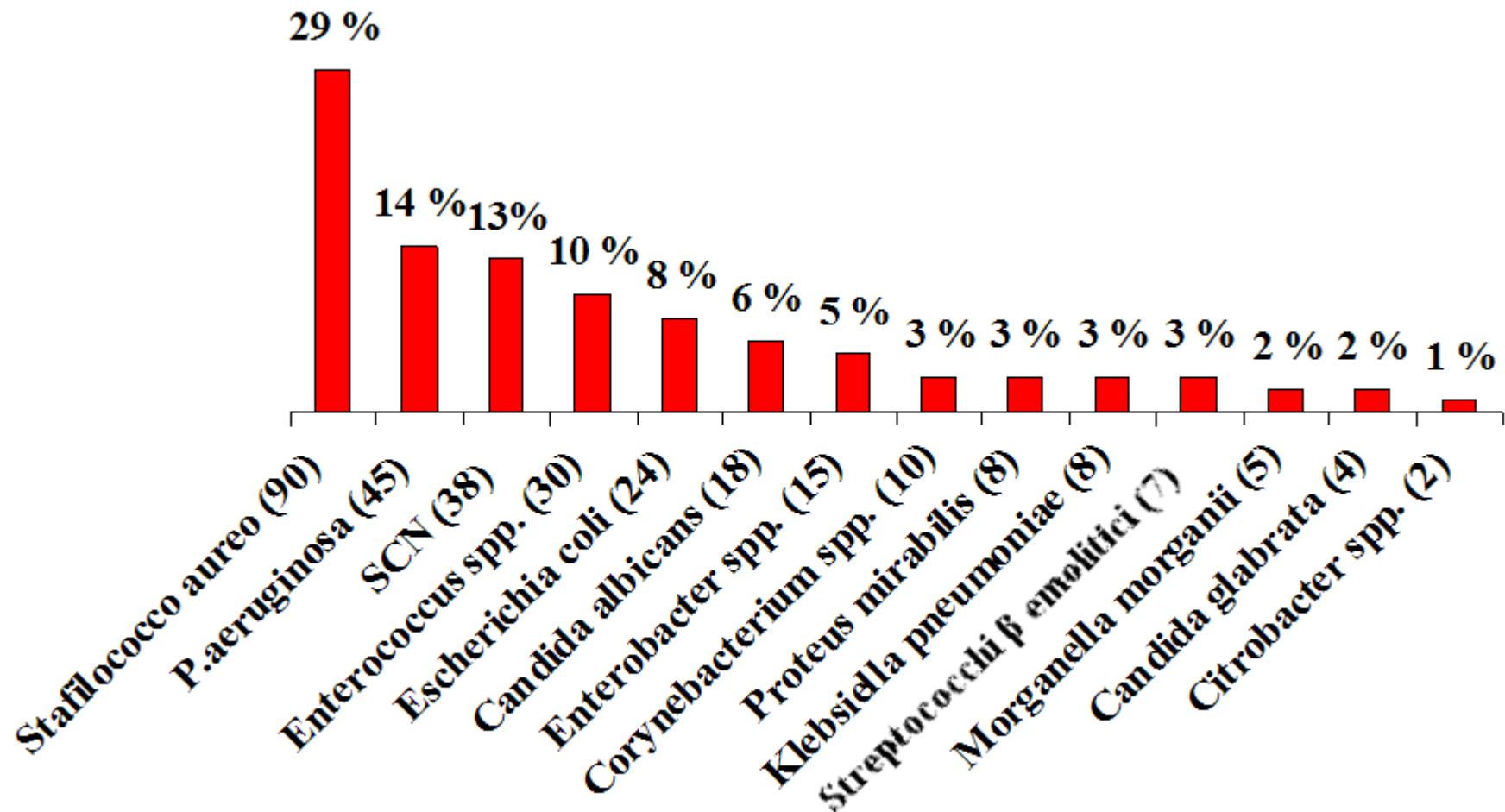
Microrganismi isolati in Ortopedia in 3 anni(2006/08)



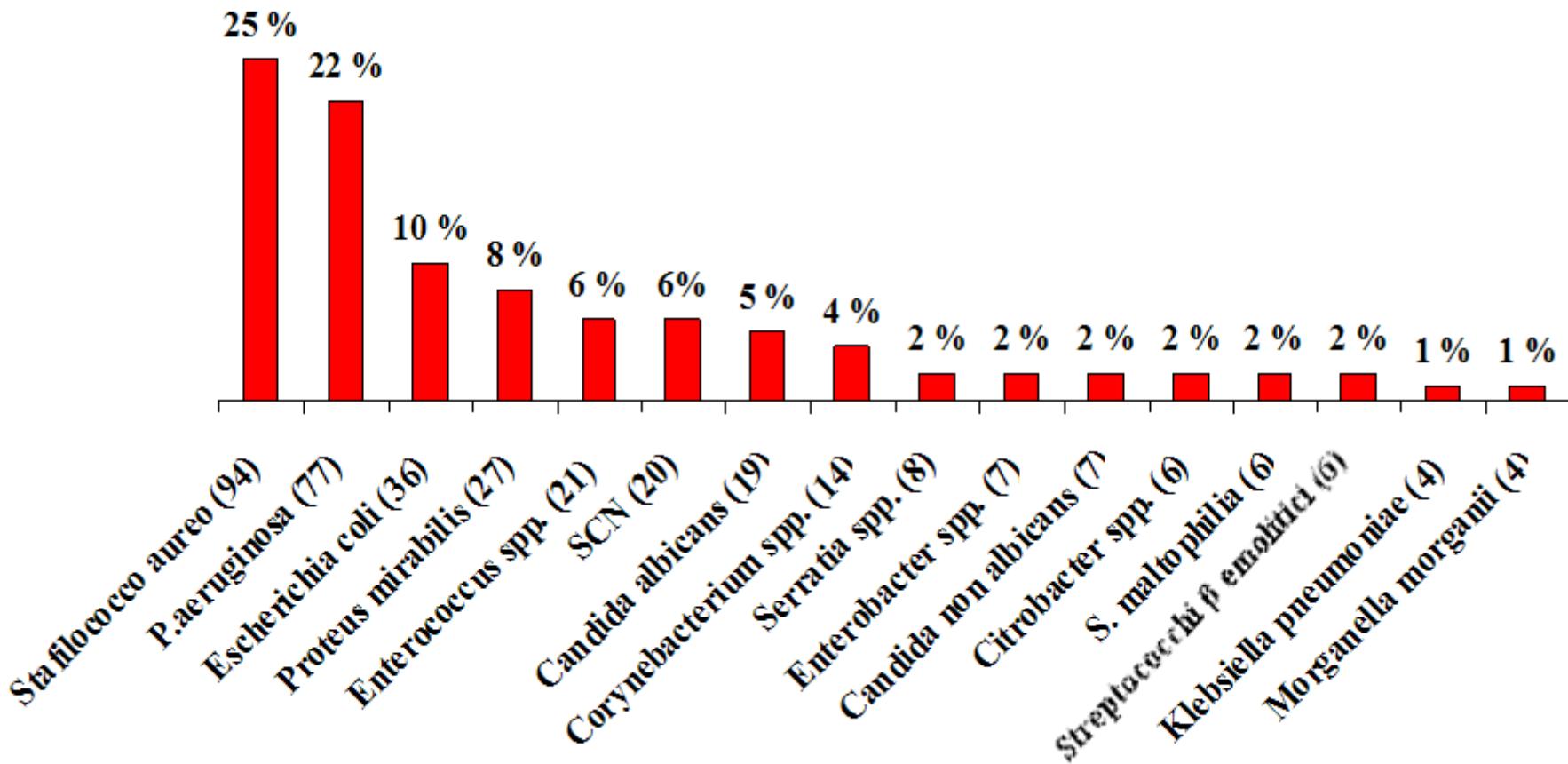
Microrganismi isolati in Chirurgia II in 3 anni



Microrganismi isolati anno 2007 da ferita chirurgica



Microrganismi isolati anno 2008 da ferita chirurgica



Microorganismi più frequenti isolati da ferita chirurgica

	2006	2007	2008
S Aureus	26%	29%	25%
Pseudomonas aeruginosa	11%	14%	22%
S, coagulasi negativo	10%	13%	6%
E.coli	9%	8%	10%
candida	9%	6%	5%



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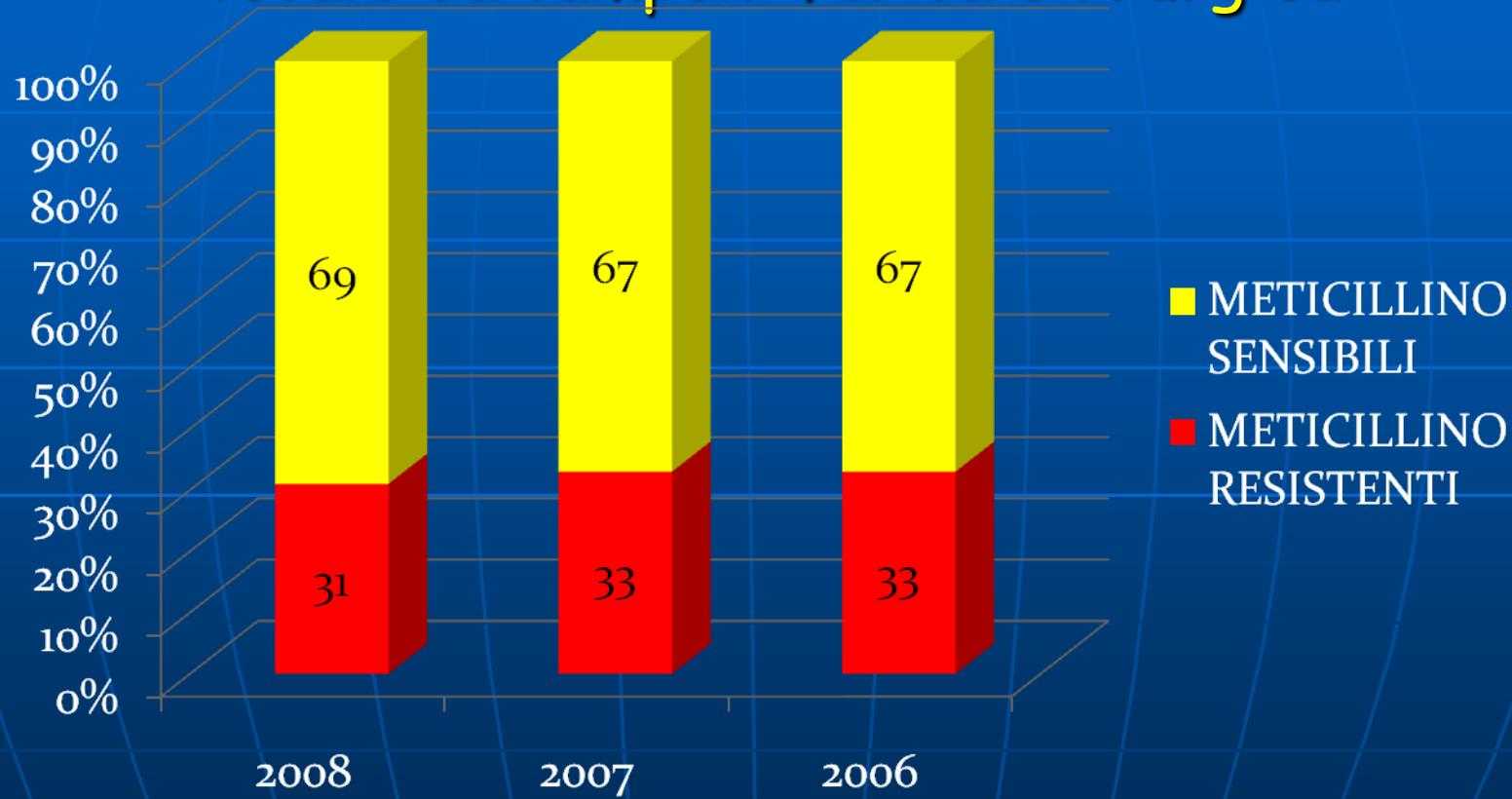
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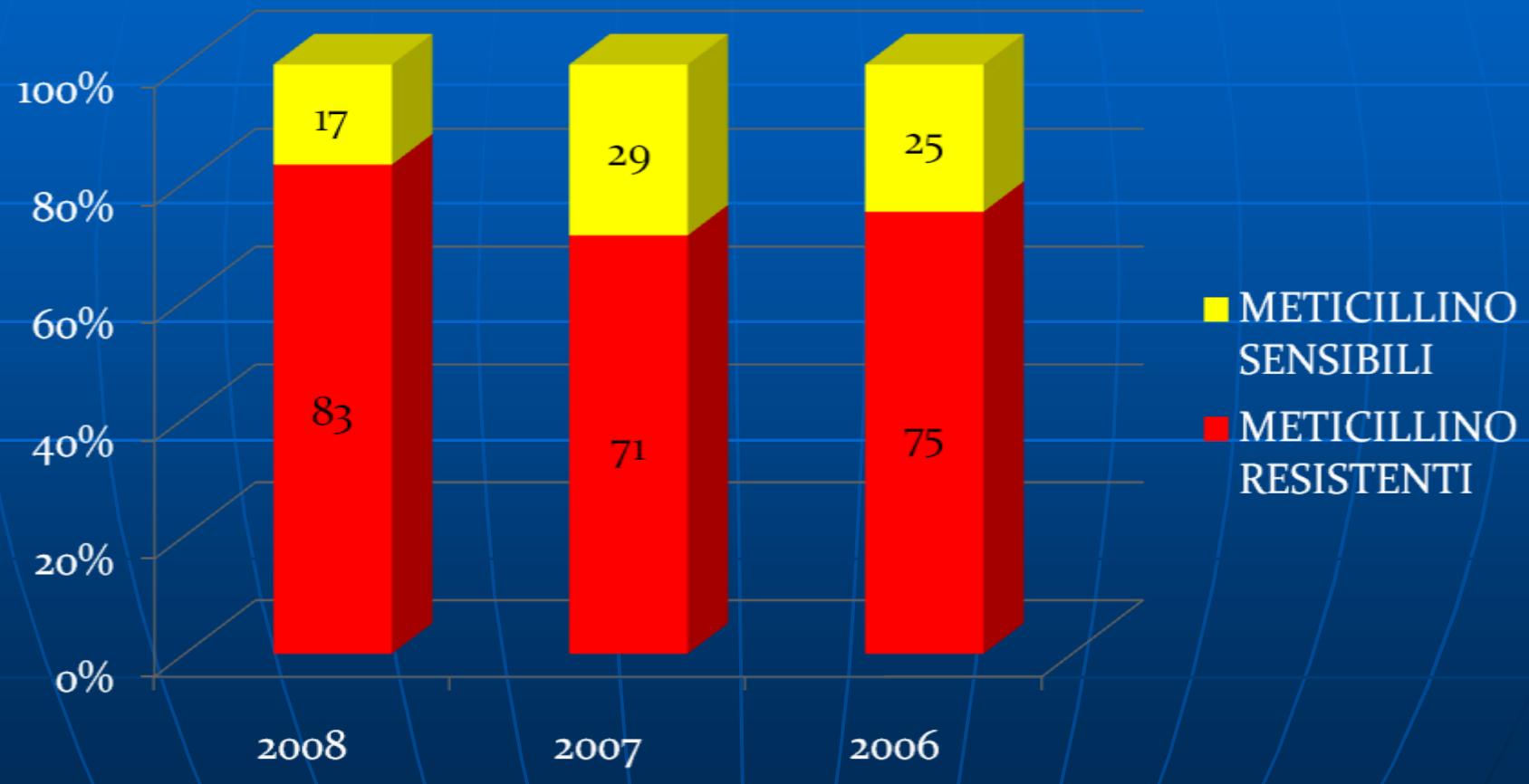
Stafilococco aureo MS / MR

totale da tamponi ferita chirurgica

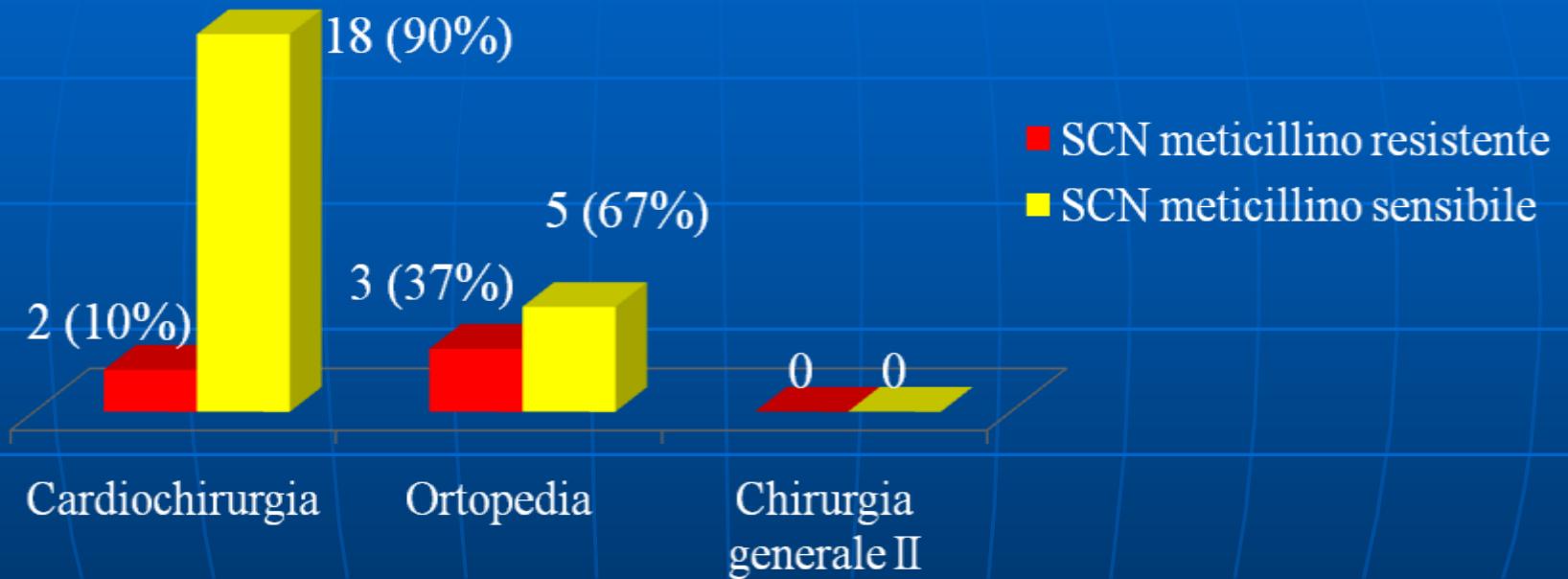


Stafilococchi coagulasi negativi MS/MR

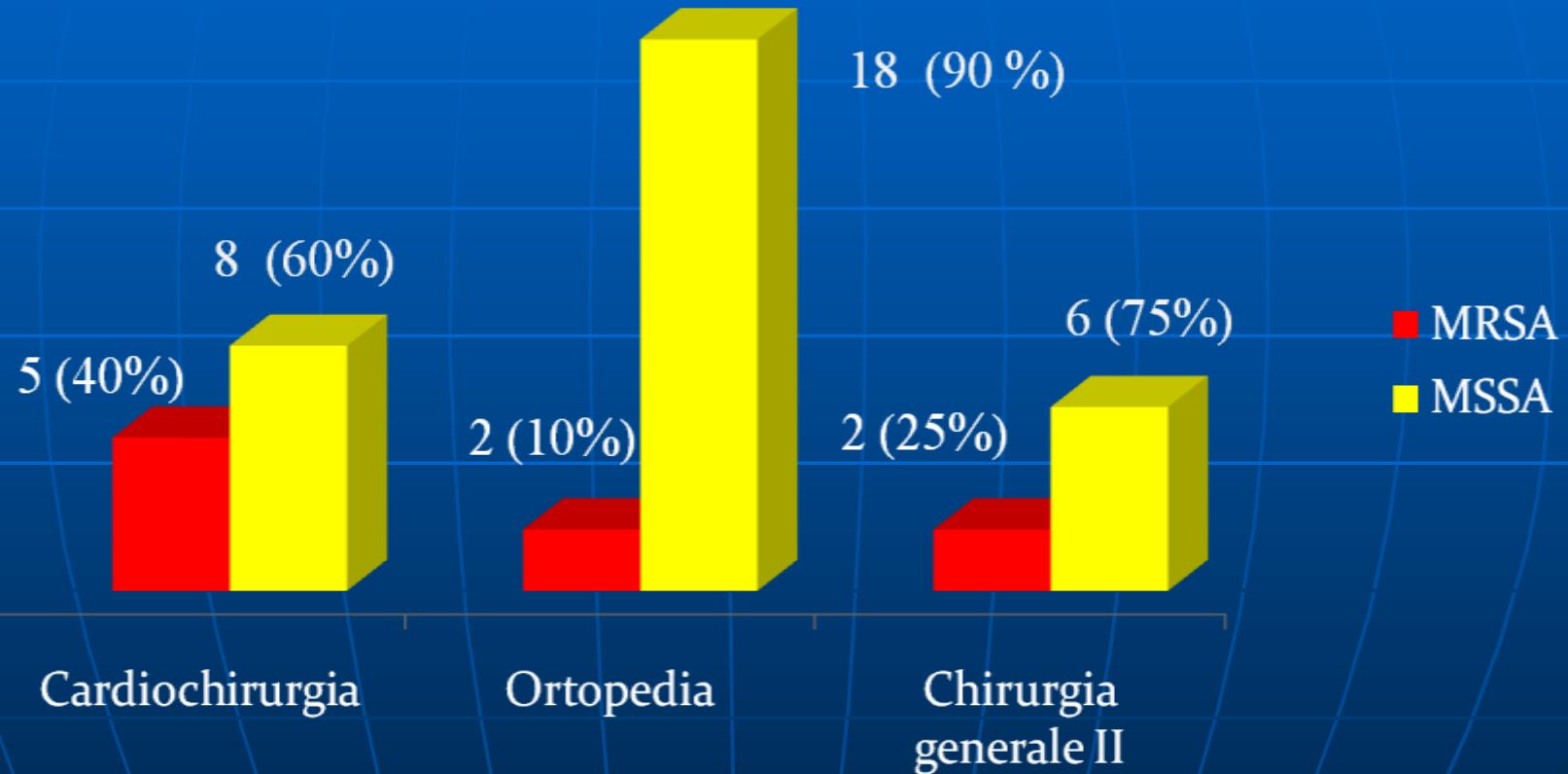
totale da tamponi ferita chirurgica



Stafilococchi coagulasi negativi MS / MR in tre reparti



Stafilococco aureo MS /MR in tre reparti

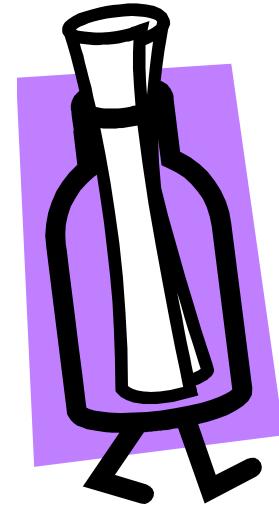
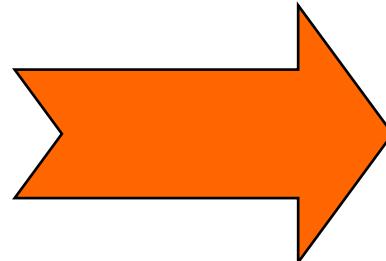
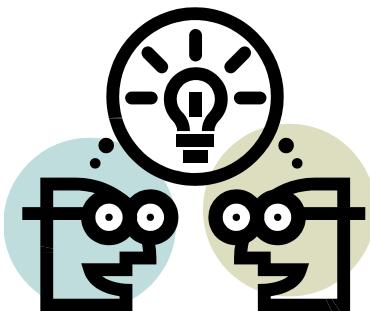


- Linkage of microbiology reports and hospital discharge diagnoses for surveillance of surgical site infections
- P. Spolaore, G. Pellizzer, U. Fedeli, ___, E. Schievano, P. Mantoan, L. Timillero and M. Saia
- Epidemiological Department, Veneto Region, SER, Via Ospedale, 18-31033 Castelfranco Veneto (TV), Italy
- 2001
- Hospital discharge diagnoses (selected codes from the International Classification of Diseases, 9th Revision—Clinical Modification) and electronic microbiology reports (positive cultures from surgical wounds and drainages) were linked to identify suspected SSIs. A random sample of tracked events was submitted to total chart review in order to confirm the presence of SSIs retrospectively according to Centers for Disease Control and Prevention definitions. Of **865 suspected SSIs, 64.5% were identified from the microbiological database, 27.1% from discharge codes, and 8.4% from both.**
- The main drawback is that infections manifesting after discharge are not tracked unless re-admission is required

Note

- Infezione o colonizzazione?
- Biofilm
- Controlli post interventi
- (1° mese / un anno)?
- Sorveglianza(es Acinetobacter, Pseudomonas MDR)

INFORMAZIONE



Microbiologia



Microbiologia

