Catheter-associated UTI many guidelines, no solutions?

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Introduction

- 15-25% of patients in general hospitals ⇒have urethral catheter inserted
- NAUTI ⇒ 65-75% associated with catheterization[1,2]
- Mortality ⇒ 3x higher when catheters are inserted[3] ⇒ LoE IIb.

1. Bonza E, San Juan R, Mu˜noz P, Voss A, Kluytmans J. Co-operative Group of the European Study Group on Nosocomial Infections. A European perspective on nosocomial urinary tract infections II. Report on incidence, clinical characteristics and outcome (ESGNI-004 study). European Study Group on Nosocomial Infection. Clin Microbiol Infect 2001;7:532–42.

2. Bjerklund Johansen TE, Cek M, Naber K, Stratchounski L, Svendsen MV, Tenke P. PEP and PEAP study investigators; European Society of Infections in Urology. Prevalence of hospital-acquired urinary tract infections in urology departments. Eur Urol 2007;51:1100–11

3. Platt R, Polk BF, Murdock B, Rosner B. Mortality associated with nosocomial urinary-tract infection. N Engl J Med 1982;307:637–42.

Global Prevalence Study of Infections in Urology (GPIU)

- 2003 – 2017
- 56 countries

EAU Section of Infections in Urology (ESIU)

GPIU Patients (2003-2017)

- 27.542 patients screened
- 2.768 patients with UTI (13%)
- 2.056 patients with microbiological proven UTI (10%)
- Mean age 59.9±18.2

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journal homepage: www.europeanurology.com

European Association of Urology

Infections

Prevalence of Hospital-Acquired Urinary Tract Infections in Urology Departments

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on behalf of the PEP and PEAP study investigators[2]
the board of the European Society of Infections in Urology[3]

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Tandogdu Z et al. WJU 2015

Characteristics of patients with NAUTI
(Results of the GPIU studies 2005-2010)

- Urinary indwelling catheter 74%
- Average catheter duration 6-11 days
- Urinary tract obstruction 49%
- Previous UTI 44%
- Hospitalisation in prev. 6 months 45%
- Urinary stones 20%

Prevalence of hospital-acquired urinary tract infections in urology departments.Bjerklund Johansen TE, Cek M, Naber K, Stratchounski L, Svendsen MV, Tenke P; PEP and PEAP study investigators; European Society of Infections in Urology.

Hospital acquired urinary tract infections in urology departments: pathogens, susceptibility and use of antibiotics. Data from the PEP and PEAP-studies. Johansen TE, Cek M, Naber KG, Stratchounski L, Svendsen MV, Tenke P; PEP and PEAP-study investigators; Board of the European Society of Infections in Urology.

Guidelines

ELSEVIER

International Journal of Antimicrobial Agents 31S (2008) S68–S78

INTERNATIONAL JOURNAL OF Antimicrobial Agents

www.ischemo.org

European and Asian guidelines on management and prevention of catheter-associated urinary tract infections☆

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IDSA GUIDELINES

Diagnosis, Prevention, and Treatment of Catheter-Associated Urinary Tract Infection in Adults: 2009 International Clinical Practice Guidelines from the Infectious Diseases Society of America

Thomas M. Hooton,[1] Suzanne F. Bradley,[3] Diana D. Cardenas,[2] Richard Colgan,[4] Suzanne E. Geerlings,[7] James C. Rice,[5,a] Sanjay Saint,[3] Anthony J. Schaeffer,[6] Paul A. Tambayh,[8] Peter Tenke,[9] and Lindsay E. Nicolle[10,11]

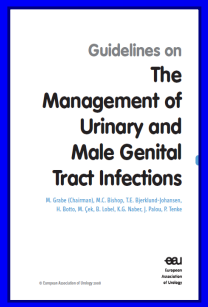
HICPAC
HEALTHCARE INFECTION CONTROL PRACTICES ADVISORY COMMITTEE

CDC

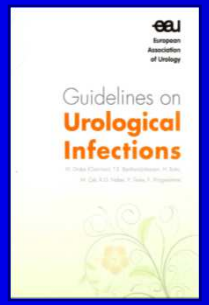
GUIDELINE FOR PREVENTION OF CATHETER-ASSOCIATED URINARY TRACT INFECTIONS 2009

Carolyn V. Gould, MD, MSCR [1]; Craig A. Umscheid, MD, MSCE [2]; Rajender K. Agarwal, MD, MPH [2]; Gretchen Kuntz, MSW, MSLIS [2]; David A. Pegues, MD [3] and the Healthcare Infection Control Practices Advisory Committee (HICPAC) [4]

Guidelines



2008



2010

2011

2012

2013

Recommendations of EAU, IDSA, CDC CAUTI guideline (2010)

- Meta-analyses of randomized controlled trials in medline ⇒ Cochrane reviews
- PubMed search using subject headings „urinary” with the keyword „catheter”, „nosocomial”,”neurogenic bladder”, „intermittent”, „suprapubic” and „methenamine”
- Experts ⇒ to identify any additional trials not accessed through review
- The majority of CAUTI prevention studies ⇒ CA-ASB, CA-B ⇒ rather than CAUTI ⇒ outcome

Levels of recommendations of IDSA and CDC guidelines

IDSA guideline

Category/grade	Definition
Strength of recommendation	
A	Good evidence to support a recommendation for or against use.
B	Moderate evidence to support a recommendation for or against use.
C	Poor evidence to support a recommendation for or against use.
Quality of evidence	
I	Evidence from >1 properly randomized, controlled trial.
II	Evidence from >1 well-designed clinical trial, without randomization; from cohort or case-controlled analytic studies (preferably from >1 center); from multiple time-series; or from dramatic results from uncontrolled experiments.
III	Evidence from opinions of respected authorities, based on clinical experience, descriptive studies, or reports of expert committees.

NOTE. Adapted from the Canadian Task Force on the Periodic Health Examination [10]. Adapted and reproduced with the permission of the Minister of Public Works and Government Services Canada, 2009. Any combination of strength of recommendation and quality of evidence is possible. See Practice Guidelines and Methodology for further discussion.

CDC guideline

Table 1. Modified HICPAC Categorization Scheme* for Recommendations	
Category IA	A strong recommendation supported by high to moderate quality† evidence suggesting net clinical benefits or harms
Category IB	A strong recommendation supported by low quality evidence suggesting net clinical benefits or harms or an accepted practice (e.g., aseptic technique) supported by low to very low quality evidence
Category IC	A strong recommendation required by state or federal regulation.
Category II	A weak recommendation supported by any quality evidence suggesting a trade off between clinical benefits and harms
No recommendation/ unresolved issue	Unresolved issue for which there is low to very low quality evidence with uncertain trade offs between benefits and harms

Catheterization – incidence of CA-B

- The incidence of bacteriuria:
  - 3-8% ⇑/day[1,2]
  - 100% of patients develop bacteriuria by the end of the month
- The most important risk factor ⇒ *the duration of catheterization* (diabetes, se.creatinin ⇑, female, absence of antibiotic use, indications other than surgery, errors in catheter care, microbial colonization of the drainage bag) [3,4,5] ⇒ **LoE IIa-III**

1. Garibaldi RAet al Factors predisposing to bacteriuria during indwelling urethral catheterization. N Engl J Med 1974 Aug 1;291(5):215-9.
2. Classen DC,et al Prevention of catheter-associated bacteriuria: clinical trial of methods to block three known pathways of infection. Am J Infect Control 1991 Jun; 19(3):136-42..
3. Jain Pet al Overuse of the indwelling urinary tract catheter in hospitalized medical patients. Arch Intern Med 1995;155:1425–9.
4. Hooton TH et al The joint association of multiple risk factors with the occurrence of nosocomial infection. Am J Med 1981;70:960–70.
5. Platt R, et al Risk factors for nosocomial urinary tract infection. Am J Epidemiol 1986;124:977–85.
6. Warren J et al. Catheter-associated bacteriuria and the role of biomaterial in prevention. In: Naber KG, Pechere JC, Kumazawa J et al editors. Nosocomial and health care associated infections in urology. Plymouth, UK: Health Publications Ltd.; 2001. p. 153–76.

Catheterization – incidence of CA-B

- Short-term CAB ⇒ asymptomatic, single organism[1,2] ⇒ **LoE III**
- Long-Term CAB ⇒ symptomatic, polymicrobial[1,3] ⇒ **LoE II.b-III**

1. Sedor J, Mulholland SG. Hospital-acquired urinary tract infections associated with the indwelling catheter. Urol Clin North Am 1999;26:821–8.

2. Asher EF, Oliver BG, Fry DE. Urinary tract infections in the surgical patient. Am Surg 1988;54:466–9.

3. Warren JW, Damron D, Tenney JH et al Fever, bacteremia, and death as complications of bacteriuria in women with long-term urethral catheters. J Infect Dis 1987;155:1151–8.

Pathogenesis of CA-B and CAUTI

- Bacteria ⇒ at the time of catheter insertion 20% of patients will be colonized immediately[1,2] - LoE IIa
- Bacteria ⇒ through the lumen of the catheters ⇒ by reflux of urine from contaminated bags (intraluminal)
- Bacteria ⇒ ascend from the urethra along the extraluminal catheter-urethral surface
- Biofilm ⇒ favourable environment for bacterial invasion or proliferation via the extraluminal route

1. Garibaldi RA, Burke JP, Britt MR, Miller MA, Smith CB. Meatal colonization and catheter-associated bacteriuria. N Engl J Med 1980;303:316–8.

2. Platt R, Polk BF, Murdock B, Rosner B. Risk factors for nosocomial urinary tract infection. Am J Epidemiol 1986;124:977–85.

Prevention of catheter-associated UTI

- Prevention of catheterization
- Prevention of bacteriuria
- Prevention of bacteriuria complications

Prevention of catheterization - alternatives

- **Condom catheters** :

✓ Data are insufficient ⇒ risk of CAUTI ⇓

✓ Cognitively not impaired men with low residual urine[1,2] ⇒ bacteriuria ⇓ ⇒LoE Ib

- **Intermittent catheterization**

✓ Should be used ⇒ short-term[3] (Ia) and long-term[1] (IV) catheterization

✓ RT ⇒ clean rather than sterile technique is advisable ⇒ no difference in the risk of CAB or CAUTI[4] ⇒ LoE Ib

➢ CDC: In the **acute** care hospital setting, use aseptic technique and sterile equipment

1. Saint S, Kaufman SR, Rogers MA, et al Condom versus indwelling urinary catheters: a randomized trial. J Am Geriatr Soc 2006 Jul;54(7):1055-61.

2, Stelling JD, Hale AM. Protocol for changing condom catheters in males with spinal cord injury. SCI Nurs 1996;13:28–34.

3. Niel-Weise BS, vd Broek PJ. Urinary catheter policies for short-term bladder drainage in adults. Cochrane Database Syst Rev 2005(3): CD004203.

4. Duffy LM, Cleary J, Ahern S, et al. Clean intermittent catheterization: safe, cost-effective bladder management for male residents of VA nursing homes. J Am Geriatr Soc 1995;43:865–70.

Alternatives

Intermittent catheterization

- IDSA: Hydrophilic catheters are **not recommended** for routine use to reduce the risk of CA-bacteriuria or CA-UTI

- CDC: Hydrophilic catheters **might be preferable** to standard catheters for patients requiring intermittent catheterization

Prevention of catheterization - alternatives

- **Suprapubic catheterization** ⇒ IDSA, EAU LoE III
- ✓ Should be considered ⇒ short-term[1] (CI) and long-term (AIII) catheterization
- ✓ Data are insufficient ⇒ risk of CAUTI ⇓
- ✓ Cochrane review[2] ⇒ CA-B ⇓,discomfort ⇓, recatheterization ⇓

OOΘibaldi RAet al Factors predisposing to bacteriuria during indwelling urethral catheterization. N Engl J Med 1974 Aug 1;291(5):215-9.

2. Classen DC,et al Prevention of catheter-associated bacteriuria: clinical trial of methods to block three known pathways of infection. Am J Infect Control 1991 Jun; 19(3):136-42..

3. Jain Pet al Overuse of the indwelling uri

Prevention of catheterization - alternatives

Suprepubic catheterization

CDC:

- **Further research is needed** on the risks and benefits of suprapubic catheters as an alternative to indwelling urethral catheters in selected patients requiring short- or long-term catheterization, particularly with respect to complications related to catheter insertion or the catheter site

Prevention of bacteriuria

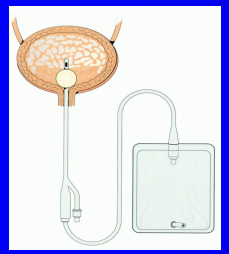
- Indwelling catheters should be placed only when they are indicated[1,2]
  - 30% of initial urinary catheterizations are unjustified ⇒ LoE IIaB
- Institutions ⇒ list of appropriate indications of catheterization, reminder system
  - 1/3-1/2 days of continued catheterization are unjustified[3]

1. Jain P, Parada JP, David A, Smith LG. Overuse of the indwelling urinary tract catheter in hospitalized medical patients.Arch Intern Med 1995 Jul 10;155(13):1425-9
2. Saint S, Wiese J, Amory JK, et al. Are physicians aware of which of their patients have indwelling urinary catheters? Am J Med 2000 Oct 15;109(6):476-80.
3. Munasinghe RL, Yazdani H, Siddique M, Hafeez W. Appropriateness of use of indwelling urinary catheters in patients admitted to the medical service. Infect Control Hosp Epidemiol 2001 Oct;22(10):647-9.

Prevention of bacteriuria

- Remove the catheter as soon as possible
- Catheter insertion ⇒ antiseptic and sterile equipment
- CDC: Ensure that only properly trained persons (e.g., hospital personnel, family members, or patients themselves) who know the correct technique of aseptic catheter insertion and maintenance are given this responsibility

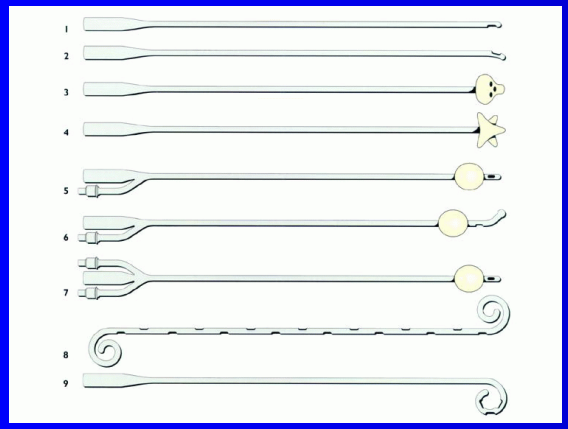
- Catheter system closed[1,2] ⇒LoE IIa (CAB 50% at 14 days closed v. 95% at 96 h open system)

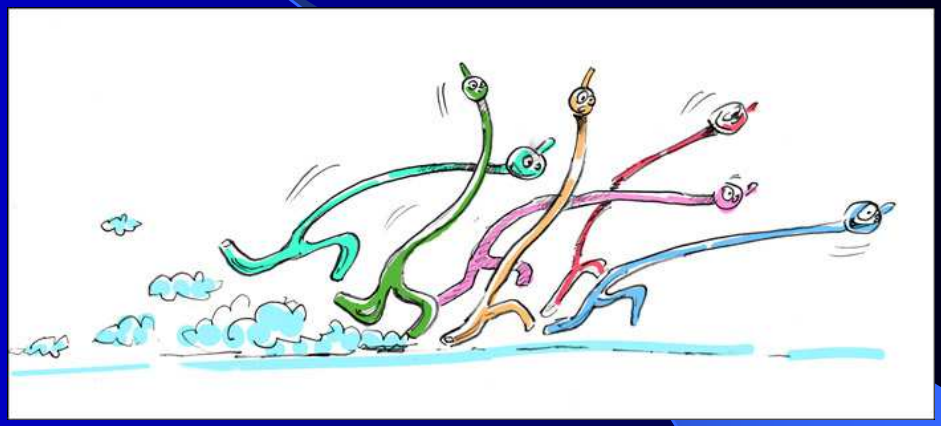


1. Kunin CM, McCormack RC. Prevention of catheter-induced urinary-tract infections by sterile closed drainage. N Engl J Med 1966 May 26;274(21):1155-61.

2. Kass EH. Asymptomatic infections of the urinary tract. Trans Assoc Am Physicians 1956;69:56-64.

Types of urethral catheters





- There is still no consensus as to which catheter is the best in which circumstances ⇒
  - clinical indication, cost, availability and personal preference

The method of catheter insertion

- *Optimum type and size*: the smallest diameter ⇒ adequate drainage
  - 12-16Ch ⇒ to drain clear dilute urine
  - 16-18Ch ⇒ to drain urine containing debris
  - >18Ch ⇒ for drainage of haematuria and clots
- *Balloon size*: should only be inflated with sterile water

Pearmann JW. Catheter care. In: Brumfitt W, Hamilton-Miller JMT, Bailey RR, editors. Urinary tract infections. London, UK: Chapman& Hall; 1998. p. 303–14.

Modification of catheter material

(Prevention of bacteriuria)

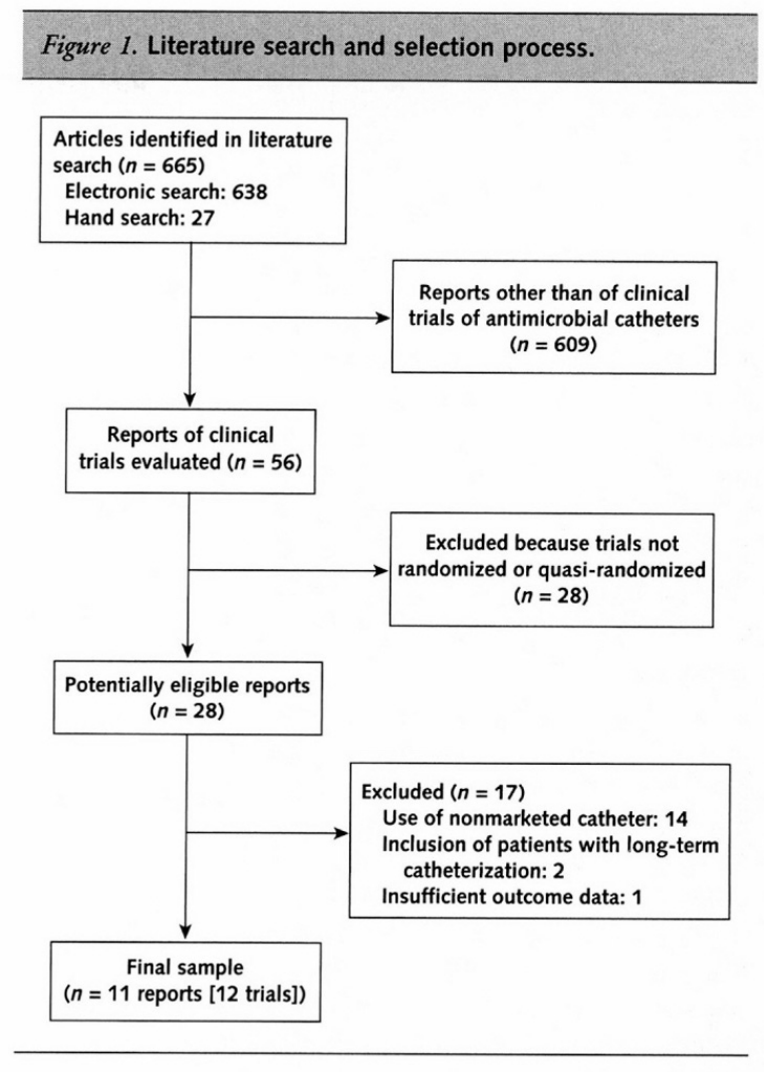
- Goals:
- Prevent bacterial adherence
- Inhibit bacterial growth
- Delay the onset bacteriuria
- Delay or prevent encrustation or blockage

Modification of catheter material

(Prevention of bacteriuria)

- Strategies
- Incorporation of biocides or antibiotics into the catheter material
- Development of materials with surface properties, which prevent the adherence of bacterial cells

Evidence level of antimicrobial coated urinary catheters



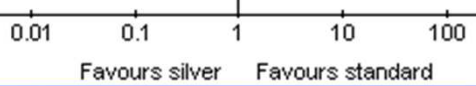
No effect in long-term patients

Some advantages for short-term patients ⇒ intensive care (LoE IIa-III)

CA-ASB – Effectiveness Ag coating < 1 week

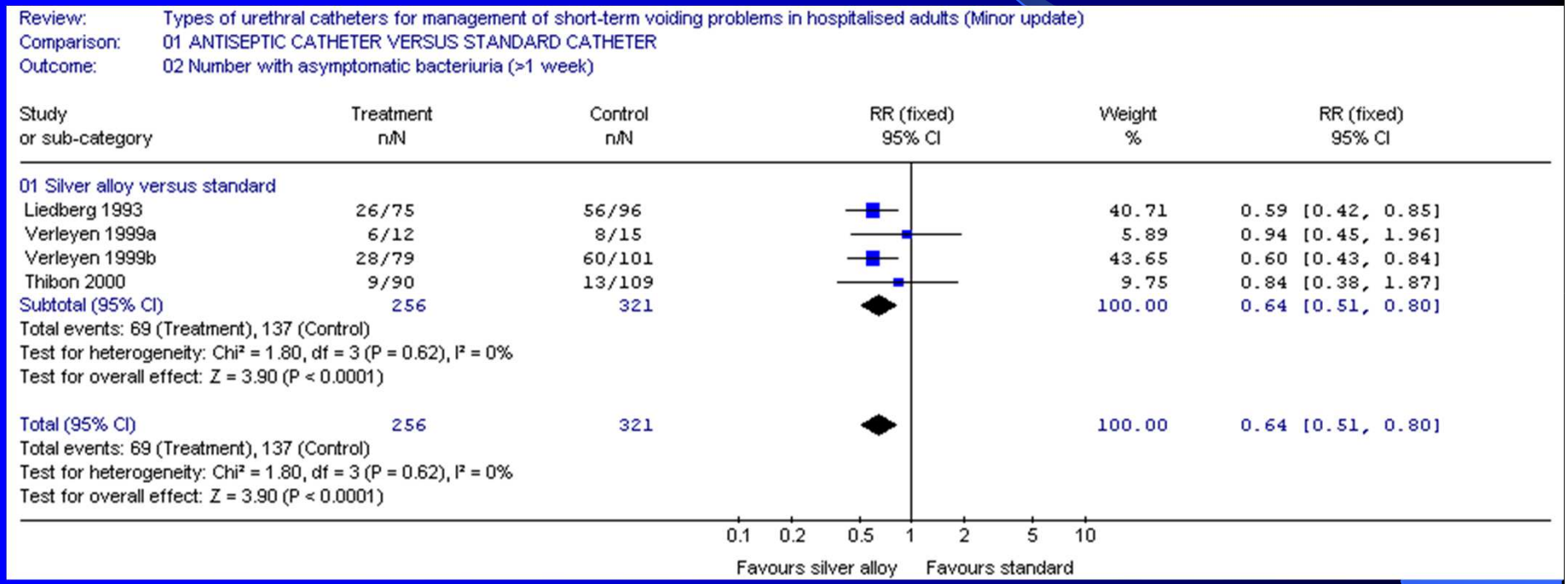
Review: Types of urethral catheters for management of short-term voiding problems in hospitalised adults (Minor update)
Comparison: 01 ANTISEPTIC CATHETER VERSUS STANDARD CATHETER
Outcome: 01 Number with asymptomatic bacteruria (< 1 week)

Study or sub-category	Antiseptic n/N	Standard n/N	RR (fixed) 95% CI	Weight %	RR (fixed) 95% CI
01 Silver oxide versus standard					
Johnson 1990	19/207	28/275		7.78	0.90 [0.52, 1.57]
Takeuchi 1993	26/26	11/11			Not estimable
Riley 1995	85/745	73/564		26.87	0.88 [0.66, 1.18]
Subtotal (95% CI)	978	850		34.65	0.89 [0.68, 1.15]
Total events: 130 (Antiseptic), 112 (Standard)					
Test for heterogeneity: Chi² = 0.00, df = 1 (P = 0.94), I² = 0%					
Test for overall effect: Z = 0.92 (P = 0.36)					
02 Silver alloy versus standard					
Lundeberg 1986	6/51	17/51		5.50	0.35 [0.15, 0.82]
Liedberg 1990a	3/30	25/60		5.39	0.24 [0.08, 0.73]
Liedberg 1990b	6/60	22/60		7.11	0.27 [0.12, 0.62]
Liedberg 1993	8/75	23/96		6.52	0.45 [0.21, 0.94]
Maki 1998a	64/407	94/443		29.11	0.74 [0.56, 0.99]
Verleyen 1999b	8/79	31/101		8.80	0.33 [0.16, 0.68]
Thibon 2000	7/90	10/109		2.92	0.85 [0.34, 2.14]
Subtotal (95% CI)	792	920		65.35	0.54 [0.43, 0.67]
Total events: 102 (Antiseptic), 222 (Standard)					
Test for heterogeneity: Chi² = 13.29, df = 6 (P = 0.04), I² = 54.8%					
Test for overall effect: Z = 5.64 (P < 0.00001)					
Total (95% CI)	1770	1770		100.00	0.66 [0.56, 0.78]
Total events: 232 (Antiseptic), 334 (Standard)					
Test for heterogeneity: Chi² = 20.18, df = 8 (P = 0.010), I² = 60.4%					
Test for overall effect: Z = 4.98 (P < 0.00001)					

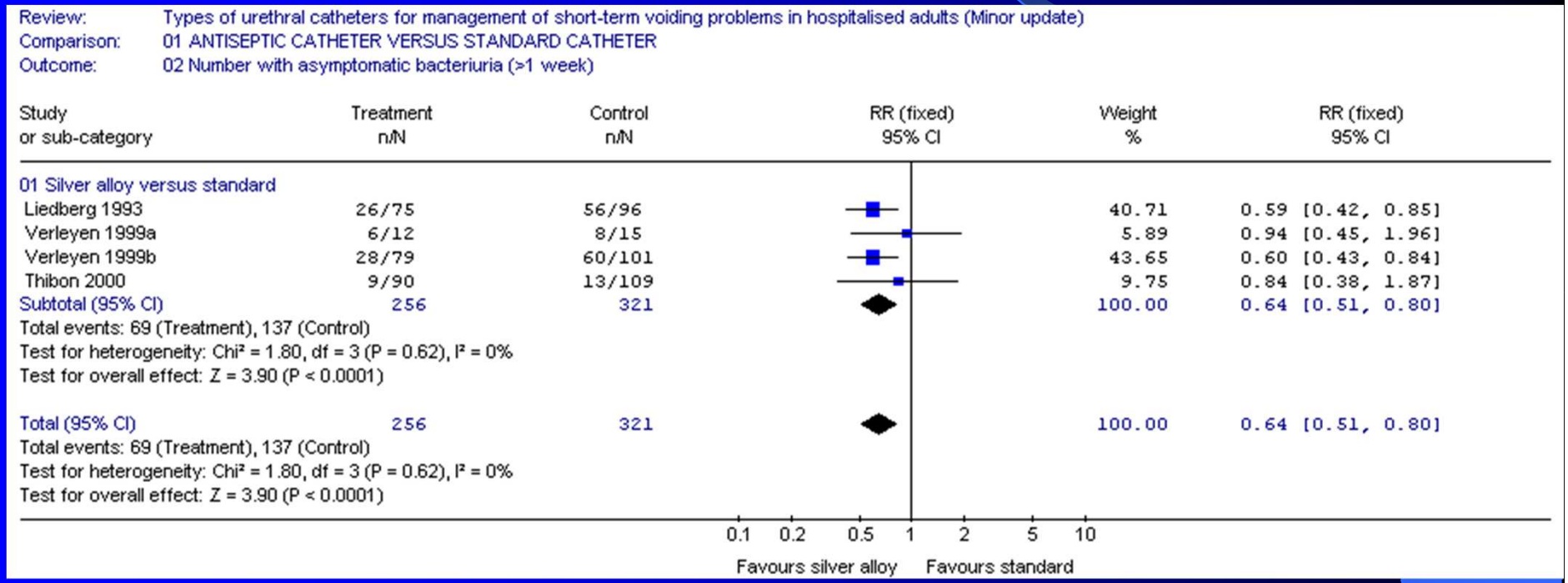


CA-ASB – Effectiveness Ag coating > 1 week

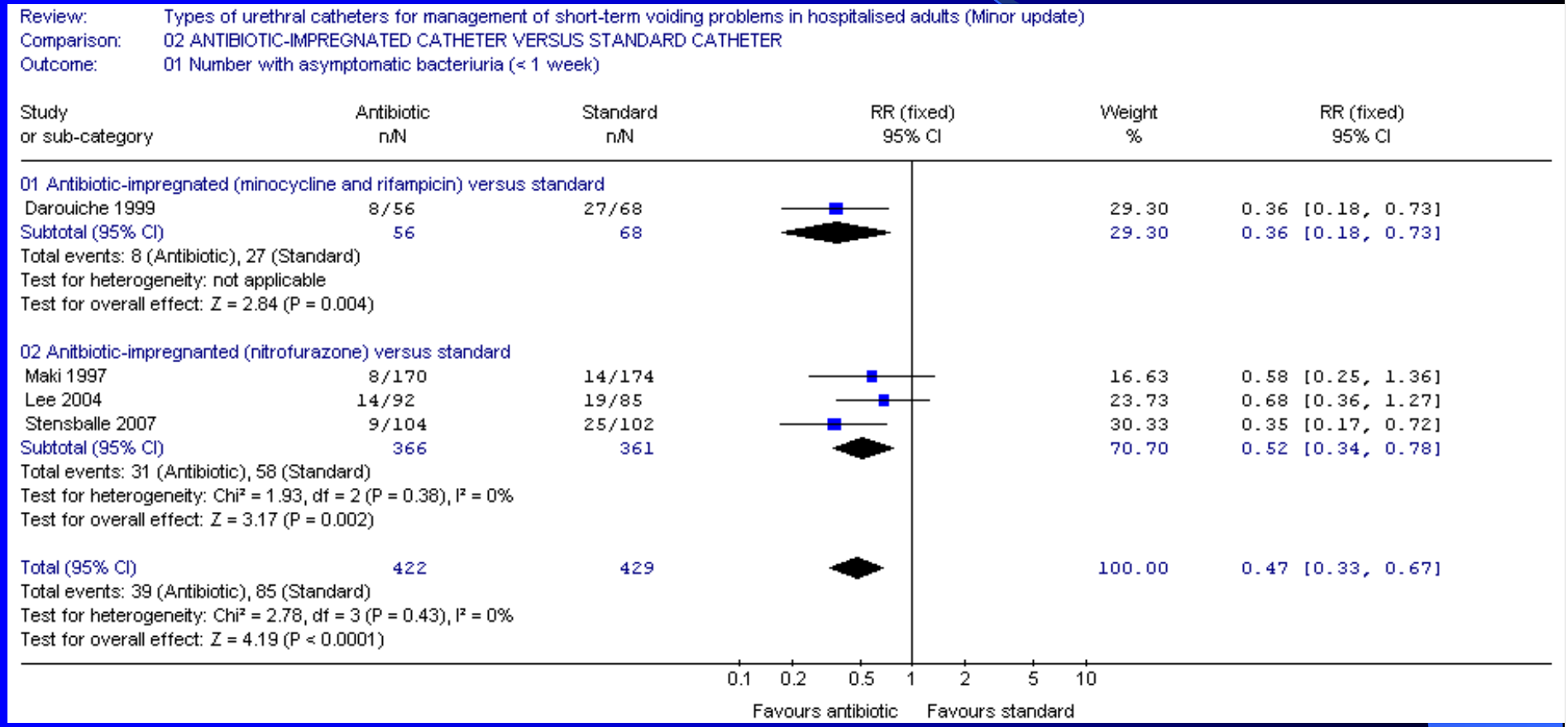
Review: Types of urethral catheters for management of short-term voiding problems in hospitalised adults (Minor update)
Comparison: 01 ANTISEPTIC CATHETER VERSUS STANDARD CATHETER
Outcome: 02 Number with asymptomatic bacteriuria (>1 week)



CAUTI – Effectiveness Ag coating > 1 week



CAUTI – Effectiveness antibiotic coating < 1 week



Antimicrobial coated urinary catheters

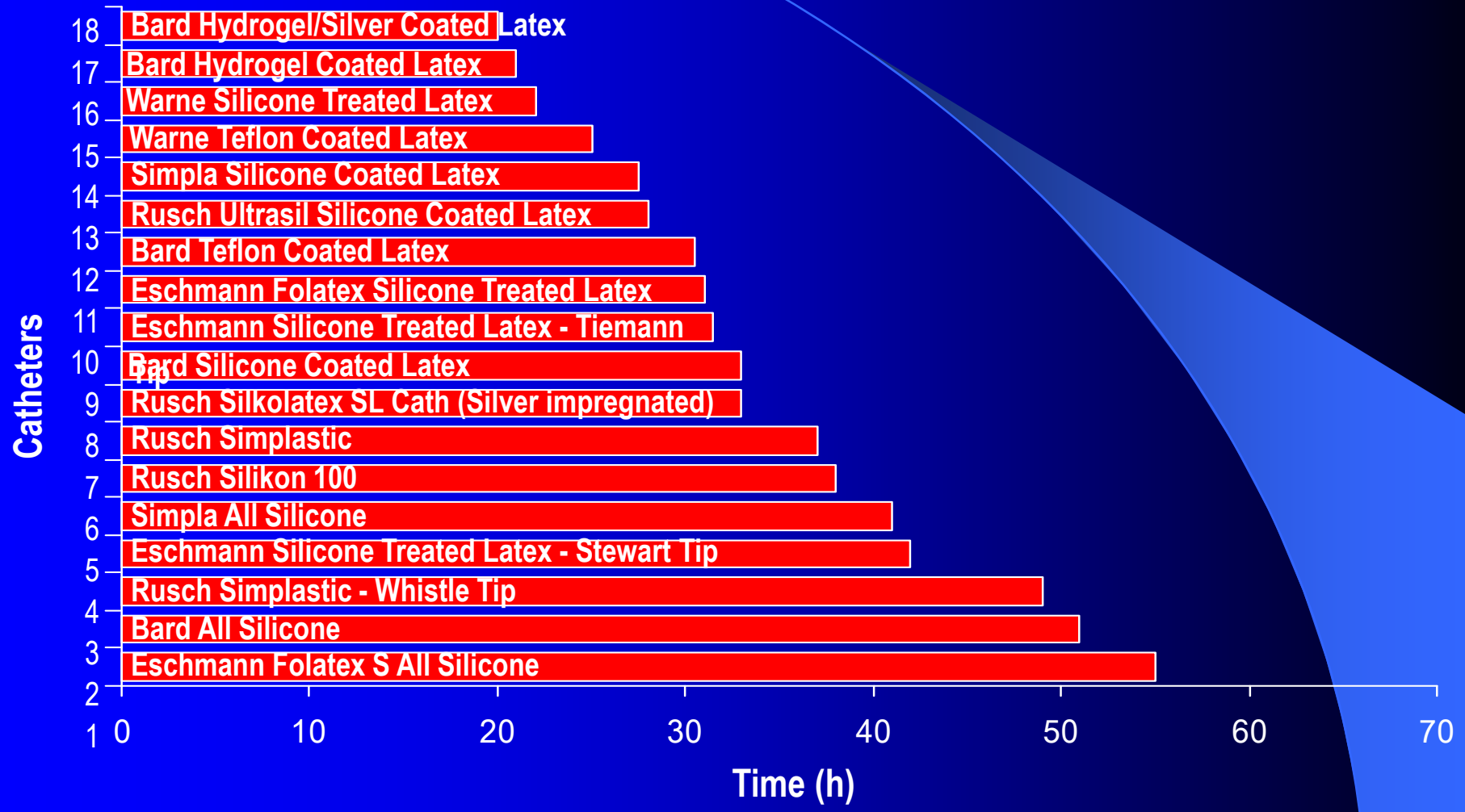
CDC

- If the CAUTI rate is not decreasing after implementing a comprehensive strategy to reduce rates of CAUTI, consider using antimicrobial/antiseptic-impregnated catheters

- Further research is needed on the effect of such catheters in reducing the risk of symptomatic UTI, their inclusion among the primary interventions, and the patient populations. **No recommendation can be made**.

Prevention of complications of bacteriuria

encrustation - silicone coating



The time taken for 18 different types of catheters to block in the bladder model infected with *Proteus mirabilis* .

N.S.Morris B.J.of Urology 1997.80,58-63

HEPARIN-COATING IN VITRO

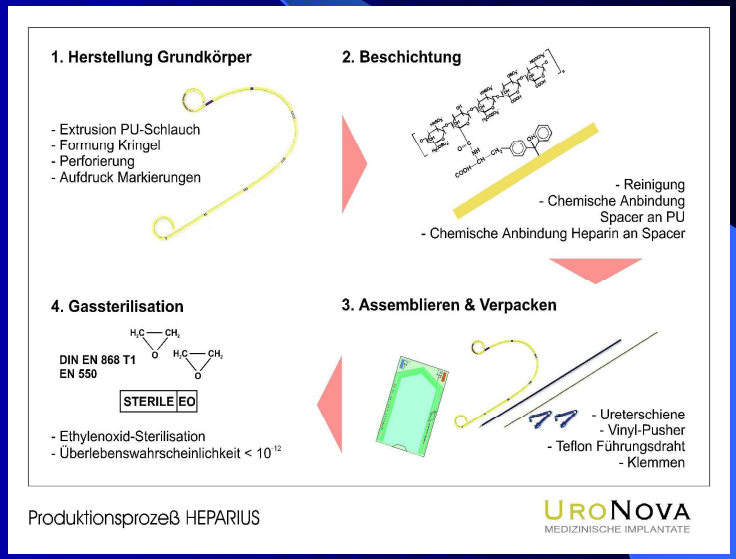
- Heparin coating inhibits bacterial adherence

  > 90% by its strong electronegativity

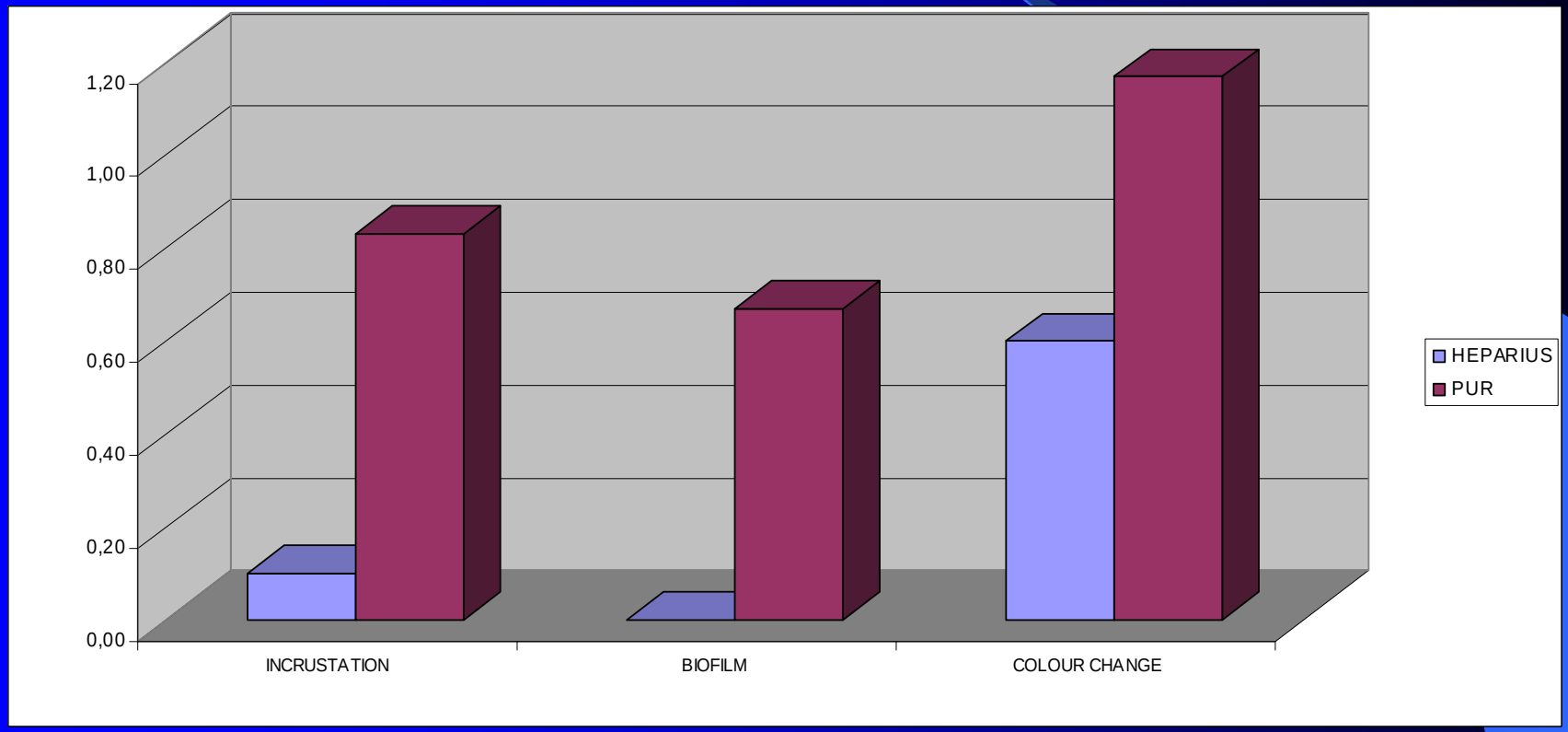
  (Ruggieri, J.Urol.138,1987)

- ⇒ reduction of incrustations

  (struvite -NH_4MgPO_4, brushit - $CaHPO_4$, hydroxylapatite - Ca_5PO_4OH, calcium-phosphate)

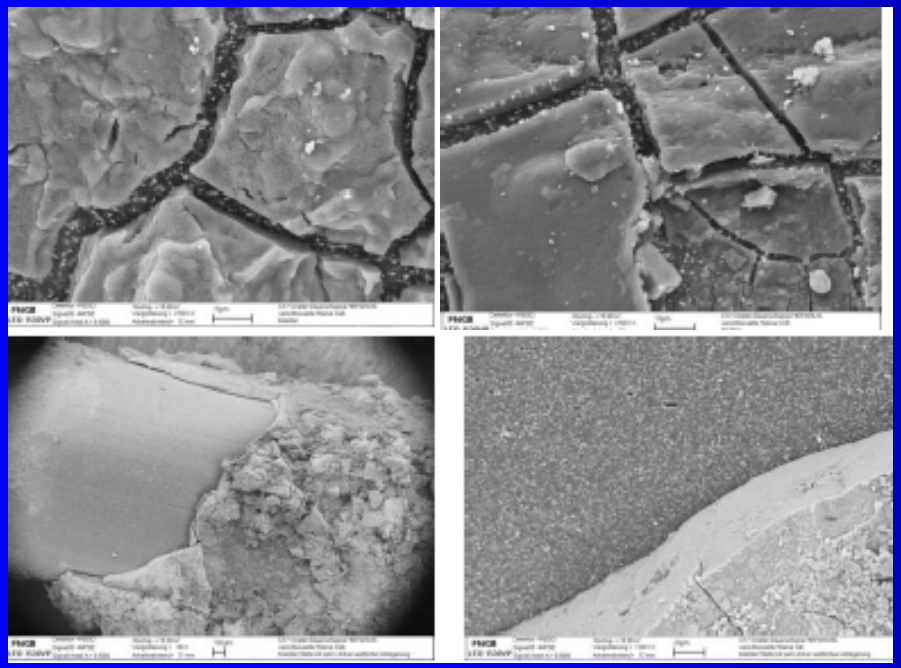


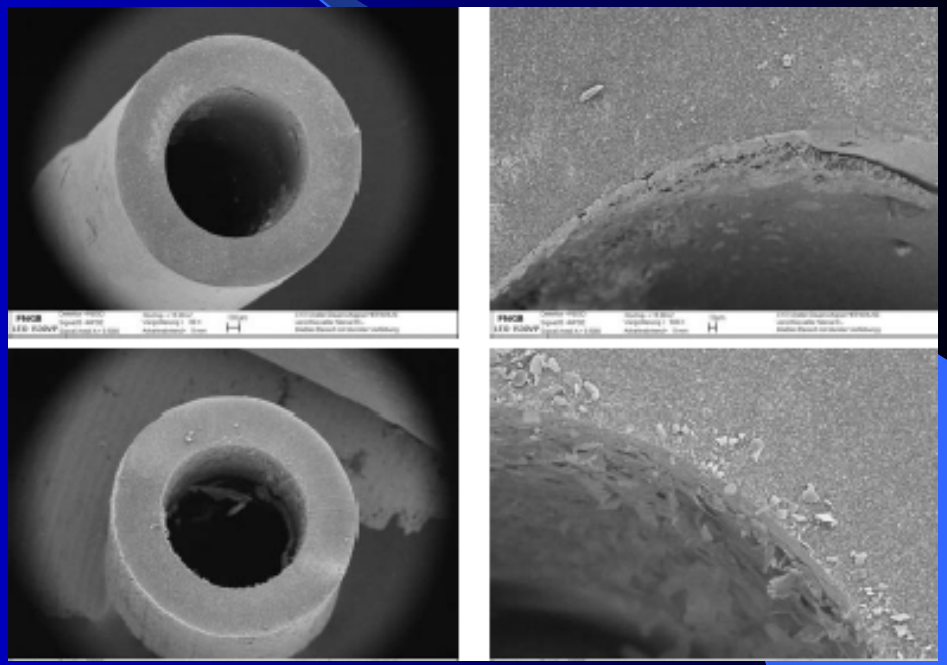
Heparin- coated urinary stents in vivo



P.Tenke, C.Riedl: Int.J.of Antim. Agents 2004

Polyurethane and heparin-coated urinary stents in vivo





C.Riedl:Int.J.of Antim. Agents 2002
P.Tenke Int.J.of Antim. Agents 2004

Phosphoryl-choline coating ureteral stents in vivo

Summary of encrustation scores on stents recovered from patients

Stent type	Mean encrustation scores on stent sections			Mean total encrustation scores
	Bladder	*Ureteral*	*Kidney*	
Uncoated	2,17	1,96	1,62	1,92
Biocompatibles PC-coated	1,79	1,66	1,48	1,64

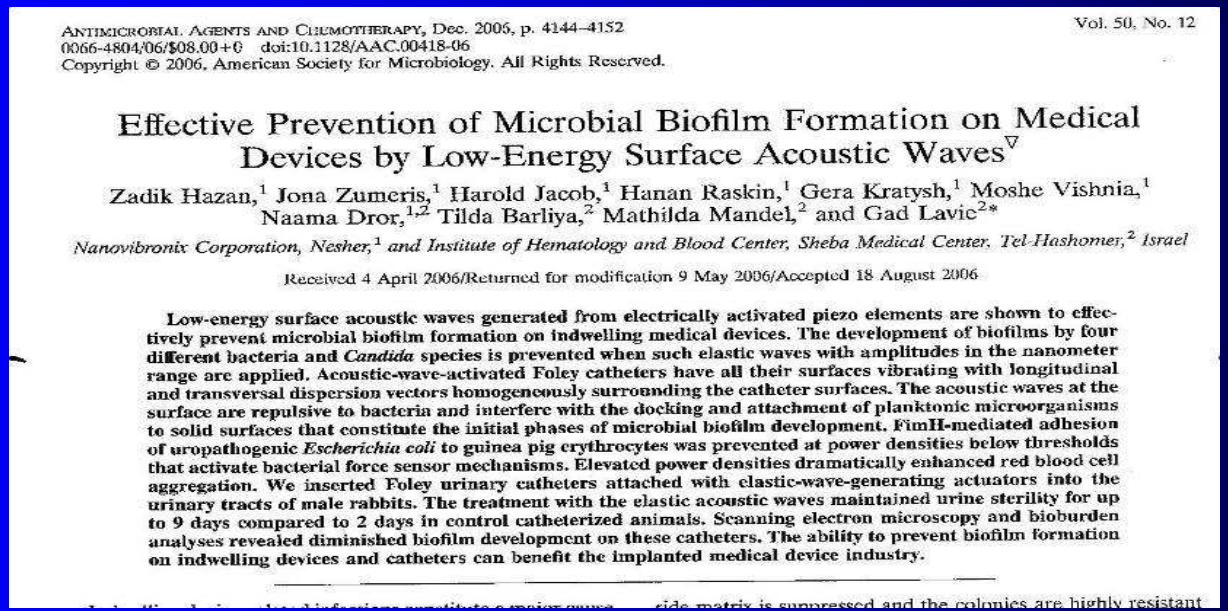
Microbal colonisation of coated and uncoated stents

Type of stents	Total number examined	Number (%) with visible biofilm	Number (%) from which microbes were isolated
Uncoated stents	28	17 (61)	15 (54)
Biocompatibles PC-coated stents	44	16 (36)	16 (36)

D.J.Stickler Int.J.of Antim. 2002.19.499-506

New Approach in the prevention CAUTI
Surface Acoustic Waves (SAW)

- Experimental work with ultrasound -„bursts“ (Mott,1998) seemed to have some effect on biofilms
- Animal studies with rabbits showed that low energy acoustic nanowaves could block biofilmformation on medical devices (Hazan,2006)



ANTIMICROBIAL AGENTS AND CHEMOTHERAPY, Dec. 2006, p. 4144–4152 Vol. 50, No. 12
0066-4804/06/$08.00+0 doi:10.1128/AAC.00418-06

Effective Prevention of Microbial Biofilm Formation on Medical Devices by Low-Energy Surface Acoustic Waves▽

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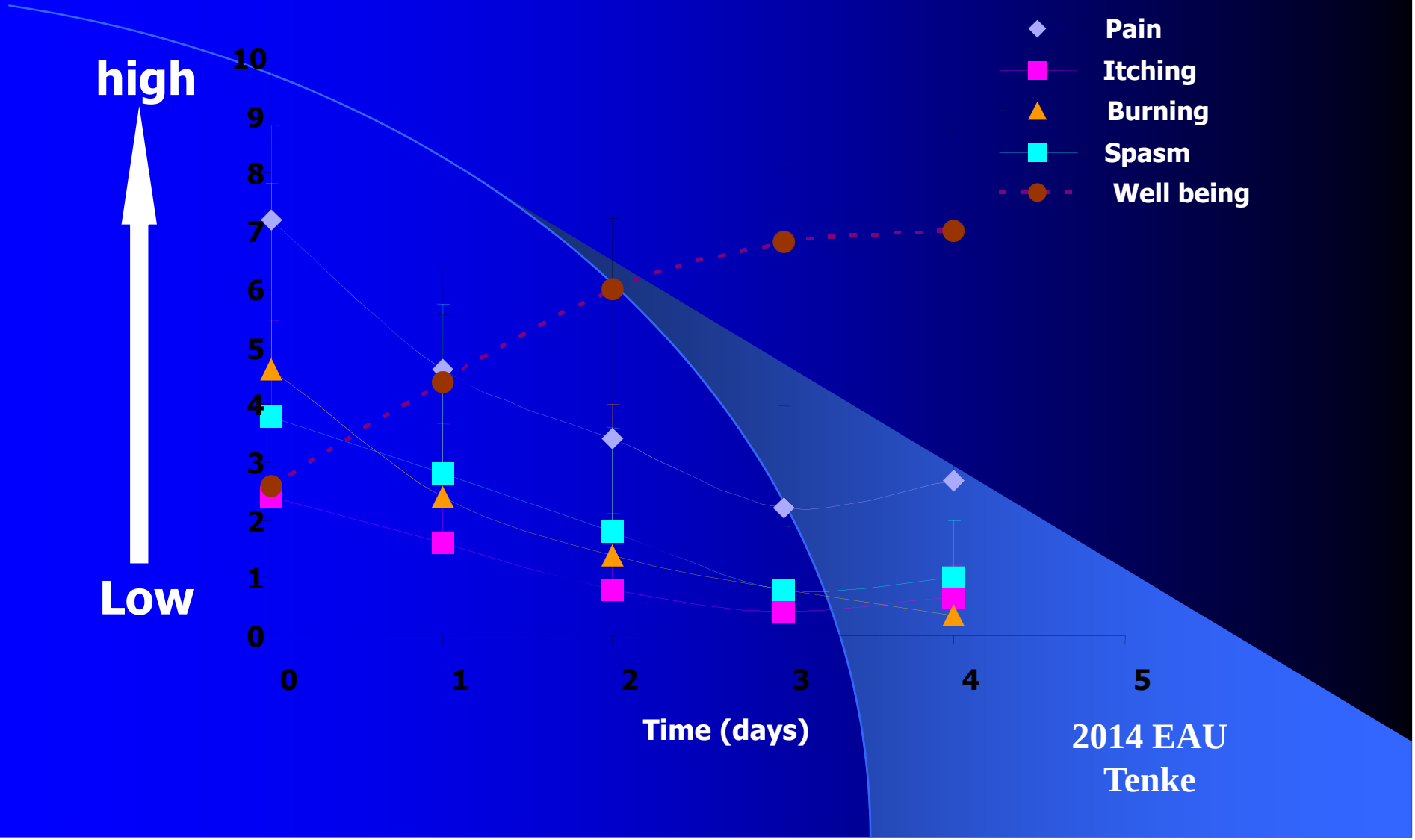
Low-energy surface acoustic waves generated from electrically activated piezo elements are shown to effectively prevent microbial biofilm formation on indwelling medical devices. The development of biofilms by four different bacteria and *Candida* species is prevented when such elastic waves with amplitudes in the nanometer range are applied. Acoustic-wave-activated Foley catheters have all their surfaces vibrating with longitudinal and transversal dispersion vectors homogeneously surrounding the catheter surfaces. The acoustic waves at the surface are repulsive to bacteria and interfere with the docking and attachment of planktonic microorganisms to solid surfaces that constitute the initial phases of microbial biofilm development. FimH-mediated adhesion of uropathogenic *Escherichia coli* to guinea pig erythrocytes was prevented at power densities below thresholds that activate bacterial force sensor mechanisms. Elevated power densities dramatically enhanced red blood cell aggregation. We inserted Foley urinary catheters attached with elastic-wave-generating actuators into the urinary tracts of male rabbits. The treatment with the elastic acoustic waves maintained urine sterility for up to 9 days compared to 2 days in control catheterized animals. Scanning electron microscopy and bioburden analyses revealed diminished biofilm development on these catheters. The ability to prevent biofilm formation on indwelling devices and catheters can benefit the implanted medical device industry.

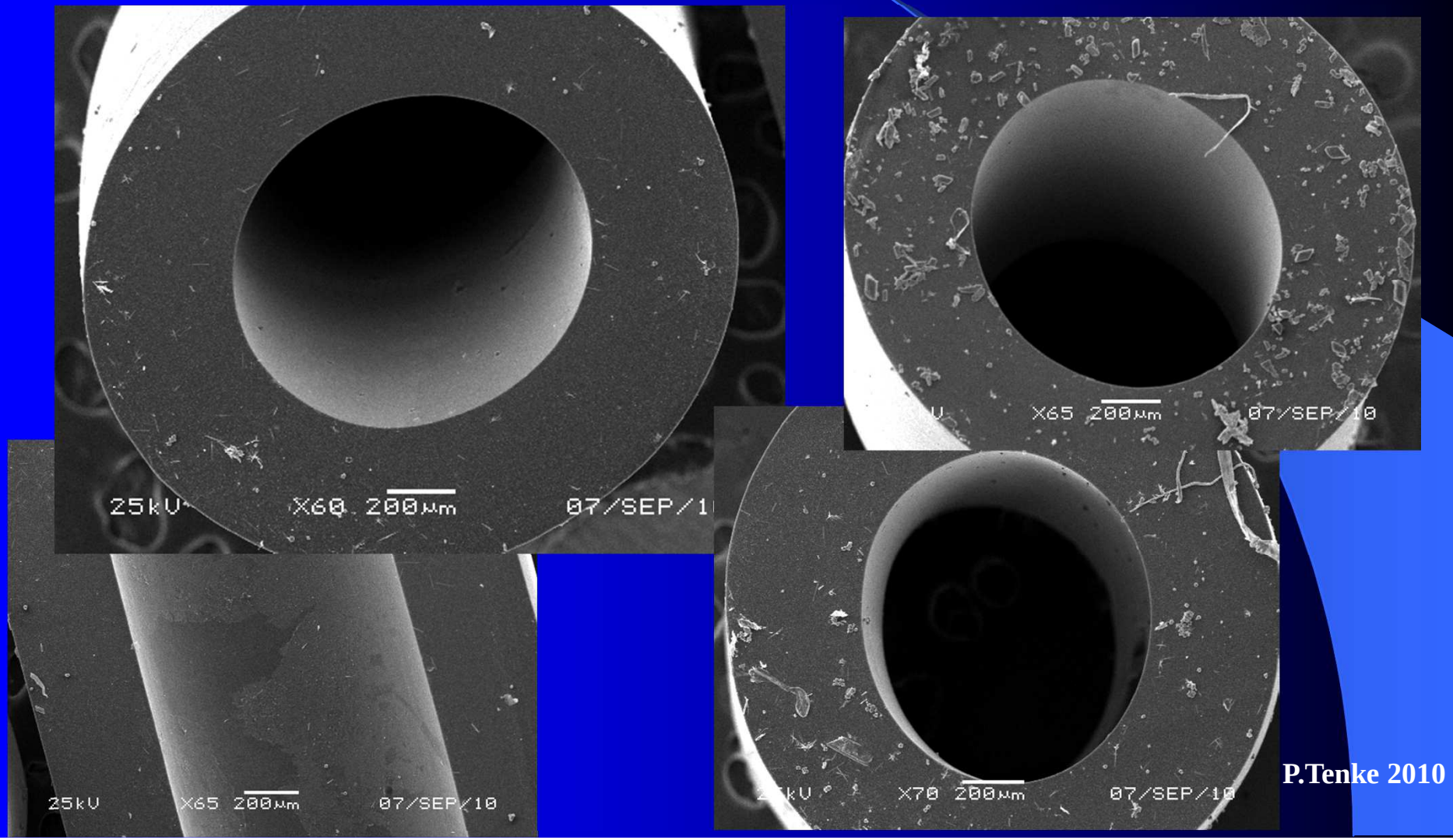
UroShield ™ Surface Acoustic Solution

- Prevention of bacterial attachment
- Always active on surface (silver/coatings are neutralized)
- Micro-ventilation of zone of contact between catheter and body entry
- Acoustic envelope improves contact conditions of catheter and body - Endothelial Restoration
- Converts balloon into resonator
- Increases antibiotic efficacy

Effect of UroShield Treatment on Pain and Discomfort In Patients Requiring Urinary Catheter



SEM of indwelling catheters with UroShield of 3 months indwelling time



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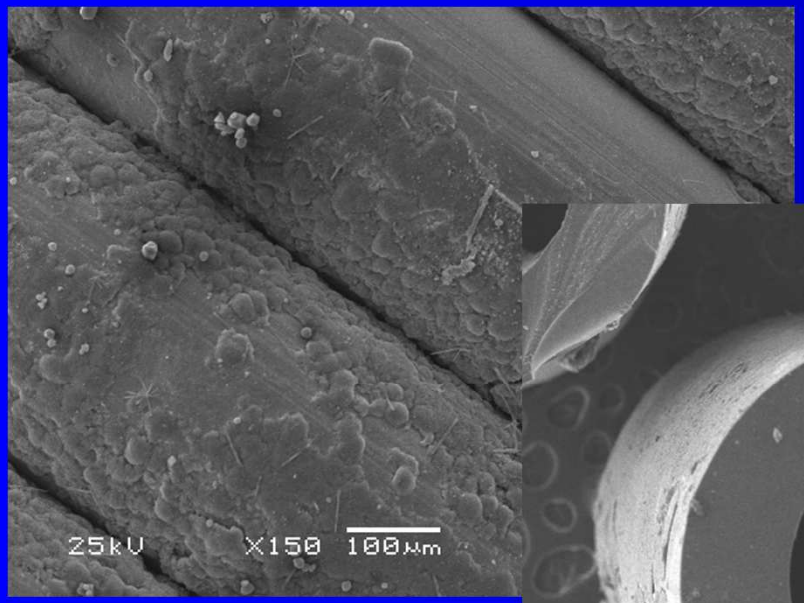
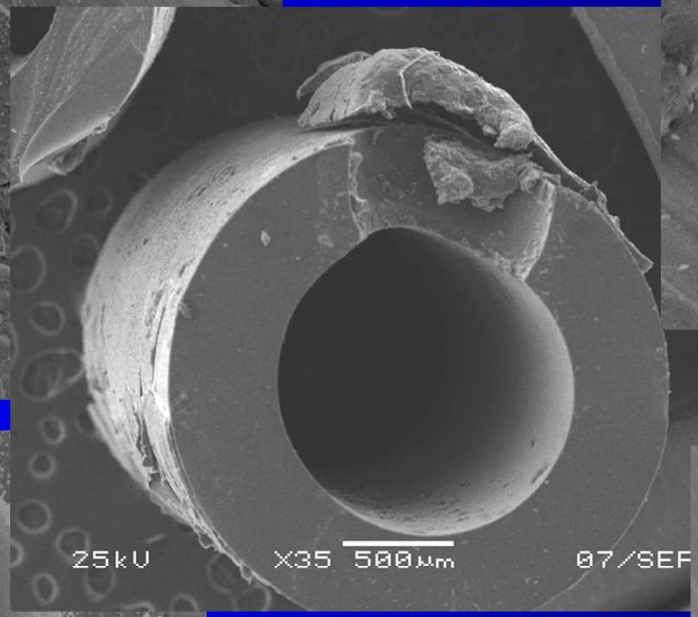
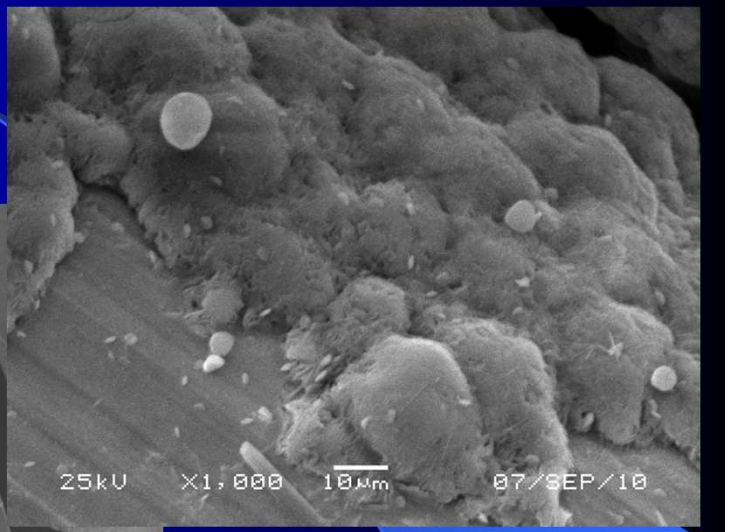
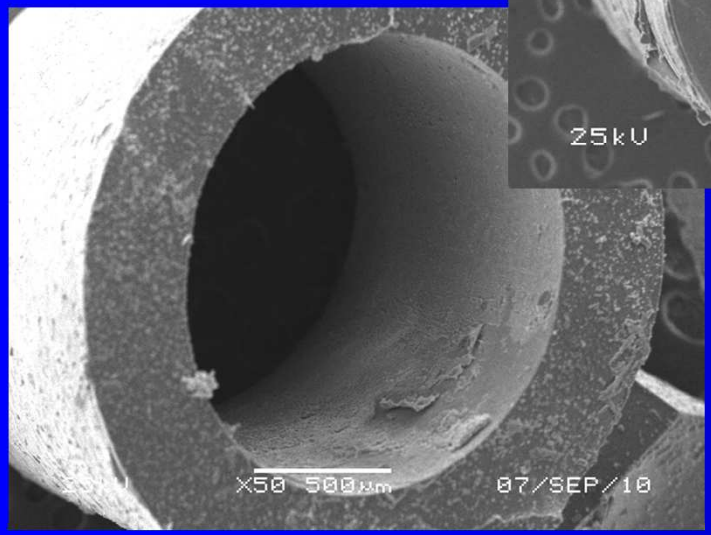
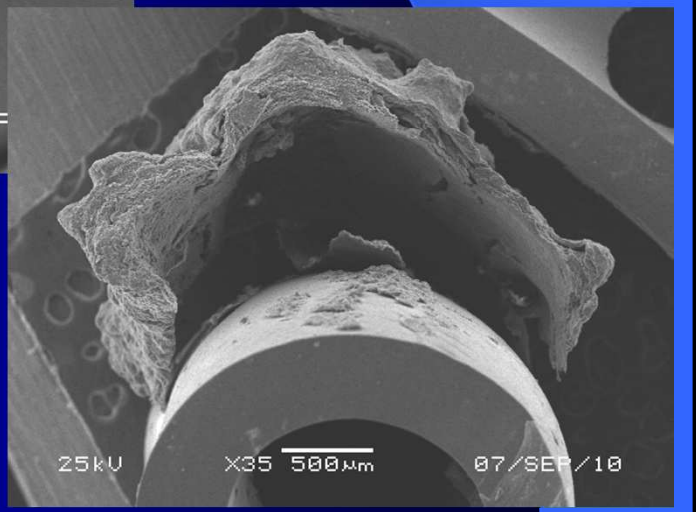
SEM of indwelling catheter controll











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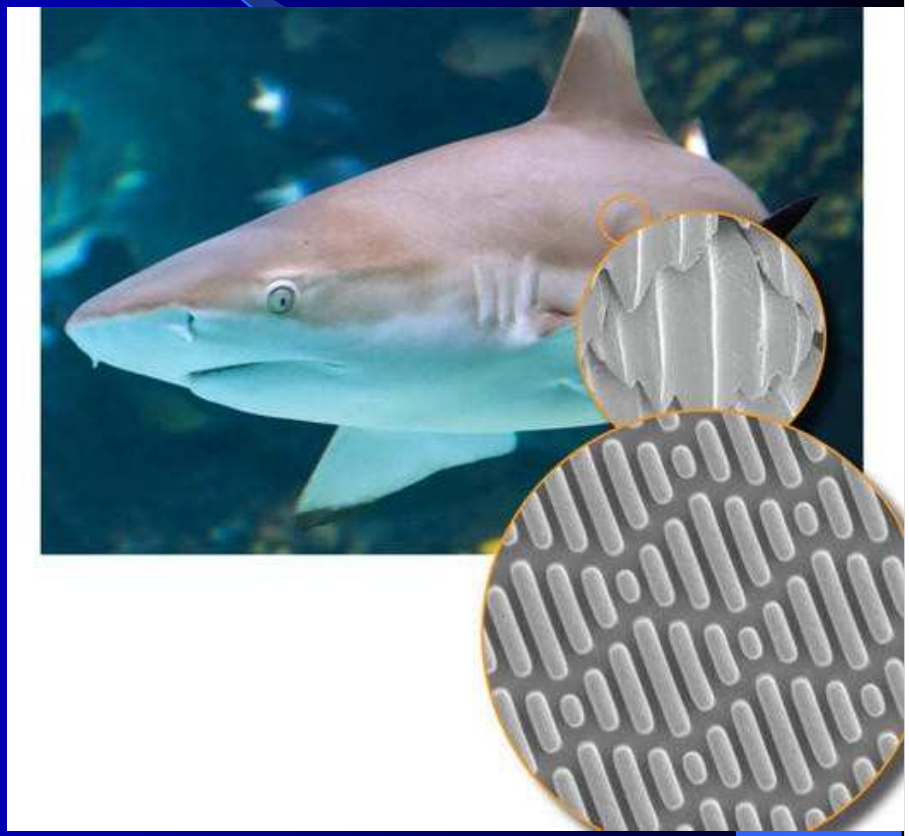
Surface Micropattern (Sharklet)

- Mechanical modification, not chemical
- Galapagos shark skin pattern: protects it from attachment of living organisms such as algae and barnacles
- Used in Ship and submarine technology
- In Catheters: may prevent biofilm formation, migration of the bacteria



OBJECTIVES

- **Sharklet vs standard silicone catheter**
  - Biofilm
  - Bacteriuria
  - CAUTI

Asymptomatic bacteriuria and CAUTI, symptoms

Significant asymptomatic bacteriuria:

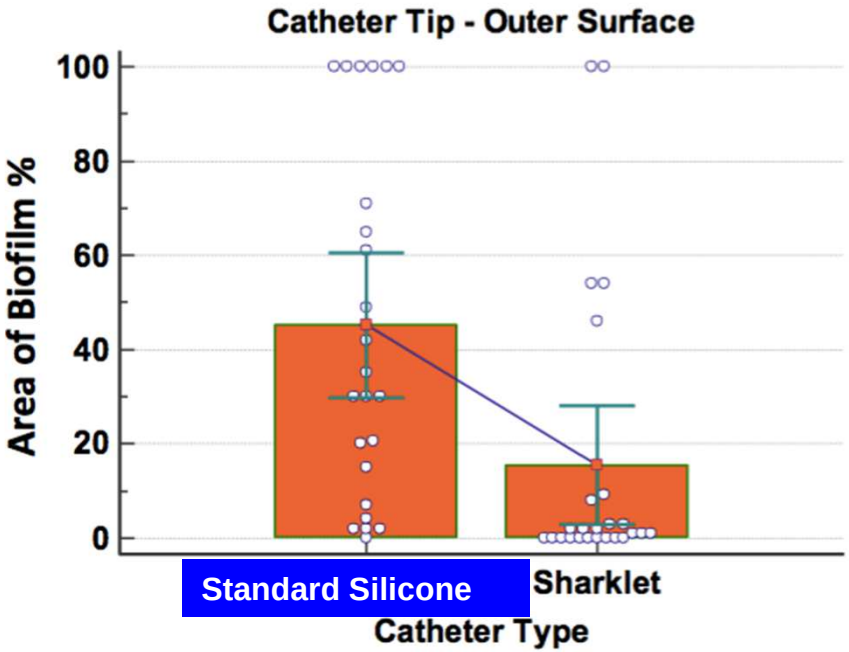
- **Four patients in each group**

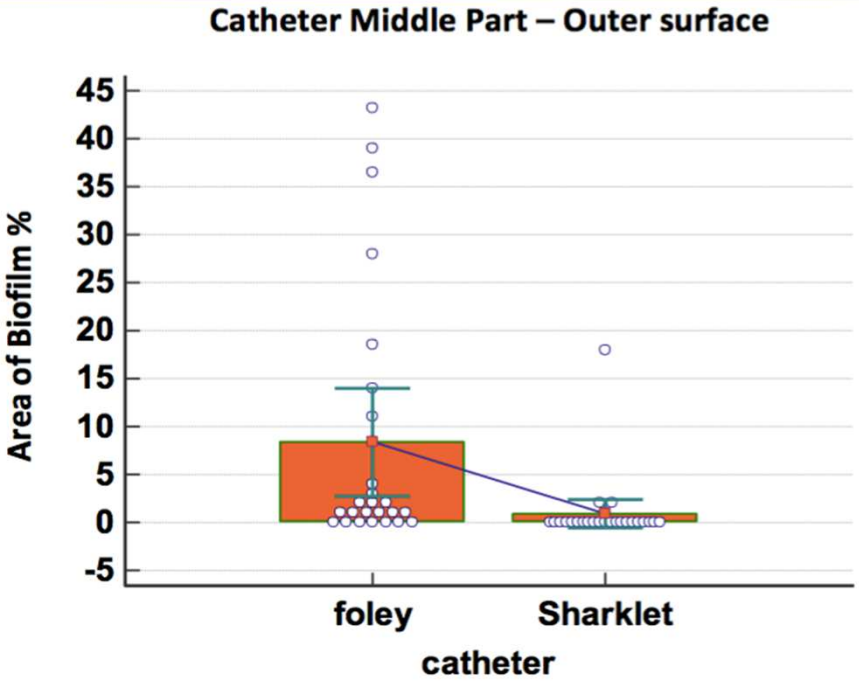
CAUTI: No symptomatic CAUTI

Quality of Life:

- **5 patients complained of a change in pain severity from none or mild pain to severe pain in the standard silicone Foleys group**
- **This difference was statistically significant with P = 0.018 when compared to Sharklet group**

BIOFILM FORMATION: Catheter TIP





- **Biofilm formation was significantly reduced on the outer surface of the tip (P=0.003)**

- **Biofilm formation was significantly reduced on the outer surface of the tip (P=0.0135)**

Prevention of complications of bacteriuria - Antibiotic prophylaxis

- Short-term
  - Antibiotic prophylaxis should NOT be routinely used[1] (Ia)
  - BUT Cochrane authors concluded: ⇒ limited evidence
  - In women with abdominal surgery and urethral catheter for 24 h[2] ⇒ CAUTI ⇓
  - The first 3 postoperative days or until catheter removal ⇒ CA-B⇓ in surgical patients with urethral catheter at least 24h postop.
- Long-term
  - According to the Cochrane database the data are sparse[3] (Ia)
  - ⇒ No recommendation can be made
  - Creates more resistant flora

1. Niel-Weise, BS, van den Broek PJ. Antibiotic policies for short-term catheter bladder drainage in adults. The Cochrane Library, 2006. The Cochrane Collaboration, vol. 4, 2006.

3. Niël-Weise BS, van den Broek PJ. Urinary catheter policies for long-term bladder drainage. Cochrane Database Syst Rev. 2005 Jan 25;(1):CD004201

Prevention of complications of bacteriuria- Antibiotic prophylaxis

- The possible role of prophylaxis in short-term catheterized patients ⇒ high risk for serious copmplications if UTI occurs
  - granulocytopenia
  - urologic or gynecologic surgery
  - foreign bodies
- But no studies have been performed ⇒ high risk group

Prevention of complications of bacteriuria - Additional methods of prevention

- Methenamine salts
  - Shouldn't be used routinely to prevent CA-B and CAUTI **(C)**
  - In patients following gynecologic surgery ⇒ catheterized <1 week **(Ib)**
- Cranberry: data are insufficient

  ⇒ No recommendation can be made (D)
- Irrigation with antiseptics (povidone-iodine or chlorhexidine) or antibiotics
  - Not effective ⇒ not recommended **(A)**
  - Considering: in selected surgery patients undergoing short-term catheterization to prevent CA-B **(C)**

Prevention of complications of bacteriuria - Catheter change

- Routine catheter change ⇒ not recommended to prevent CAB or CAUTI in patients with functional urethral or suprapubic catheter[1]
- Early catheter blockage ⇒ catheter change every 7-10 days[2]
- *CDC: Changing at routine, fixed intervals is not recommended. Rather, it is suggested to change catheters and drainage bags based on clinical indications such as infection, obstruction, or when the closed system is compromised*
- No studies ⇒ value of prophylactic antibiotic to prevent CAUTI at catheter removal or change

1. Ho CH, Kirshblum S, Linsenmeyer TA, Millis SR. Effects of the routine change of chronic indwelling Foley catheters in persons with spinal cord injury. J Spinal Cord Med 2001 Summer;24(2):101-4.

2. Kunin CM, Chin QF, Chambers S. Indwelling urinary catheters in the elderly. Relation of "catheter life" to formation of encrustations in patients with and without blocked catheters. Am J Med 1987 Mar;82(3):405-11.

CA-ASB

- Screening and treatment ⇒ not recommended
- Short- and long-term catheterized patients: - low rate in complications

  - Treatment does not appear beneficial ⇒ CAUTI⇓

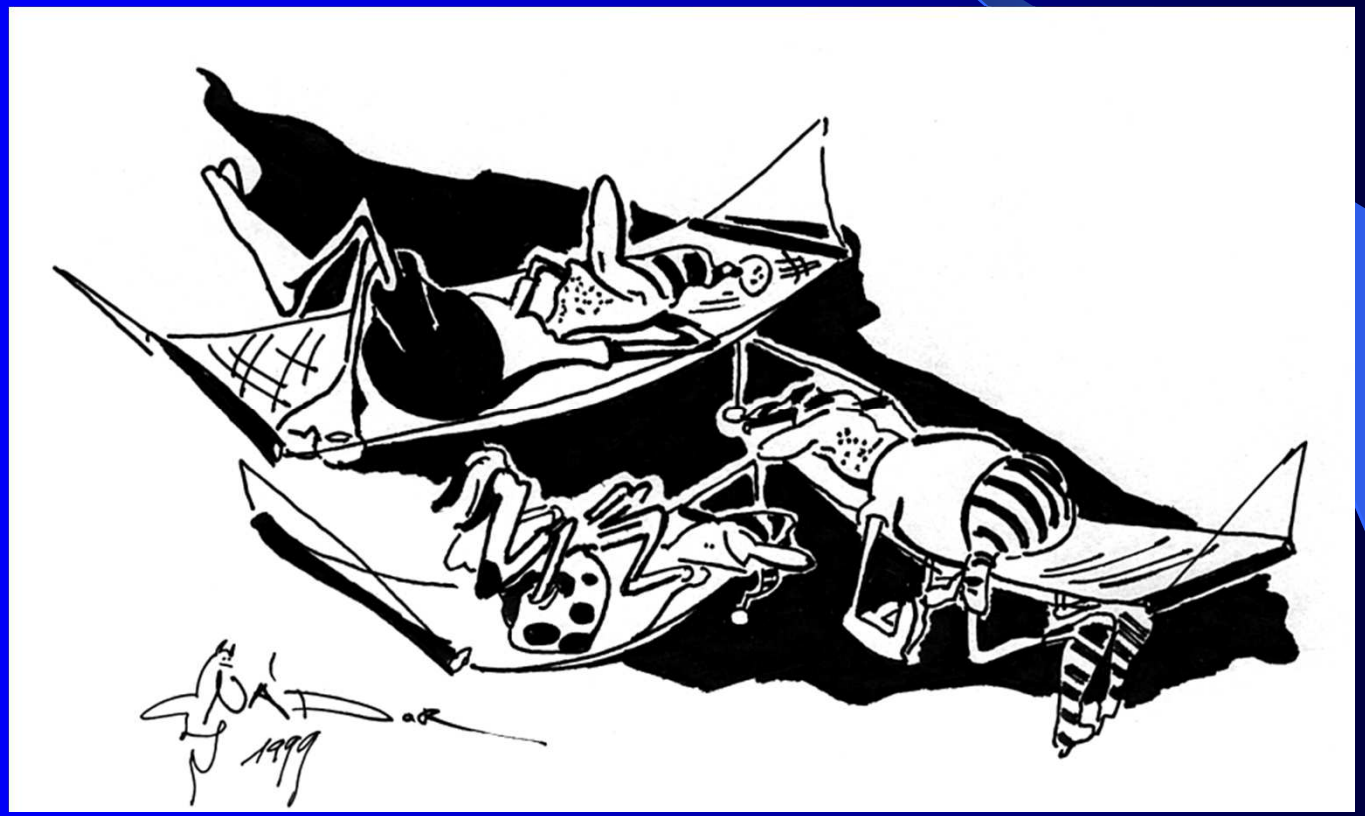
CA-ASB

- Systemic antimicrobial treatment is only recommended:
  1. Patients undergoing urological surgery or implantation of prostheses (A)
  2. Treatment is part of a plan to control nosocomial infection due to a virulent organism (B)
  3. Patients who have a high risk of serious infectious complications, e.g. patients who are immunosuppressed (C)
  4. In case of pregnancy (B)
  5. Infections caused by strains causing a high incidence of bacteraemia, e.g. *Serratia marcescens* (B)

Conclusion

- Effective ways $\Rightarrow$ CAB or CAUTI $\Downarrow$
  - Reduce urinary catheters $\Rightarrow$ clear indication
  - Remove the catheter
- Strategies
  - Use of condom catheters or intermittent catheterization
  - Use of a closed drainage system with proper catheter maintanence
  - Use of antimicrobial coated catheters $\Rightarrow$ short-term
  - Use of catheter with antiadhesive surfaces $\Rightarrow$ heparine, sharklet....

Thank you for your attention.



Treatment of symptomatic UTI

- Urine and blood culture
- Parenteral antibiotics
- Changes or removal of the catheter ⇒ > 1 week
- 7 days treatment is recommended[1] ⇒ prompt resolution of symptoms (IIIC)
- 10-14 days treatment is usually required[2] ⇒ delayed response - LoE Ib
- 5 days of levofloxacin ⇒ who are not severily ill[3] (IbB)
- Minor symptoms, negative blood culture ⇒ short courses of oral antibiotics (3-5 days)

1. Nicolle LE. A practical guide to antimicrobial management of complicated urinary tract infection. Drugs Aging 2001;18(4):243-54.

2. Stamm WE, Hooton TM. Management of urinary tract infections in adults. N Engl J Med 1993 Oct 28;329(18):1328-34.

3. Peterson J et al. A double-blind, randomized comparison of levofloxacin 750 mg once-daily for five days with ciprofloxacin 400/500 mg twice-daily for 10 days for the treatment of complicated urinary tract infections and acute pyelonephritis. Urology 2008 Jan;71(1):17-22.