Çevresel Temizlikte Püf Noktaları

Dr Gökhan AYGÜN
Cerrahpaşa Tıp Fakültesi
Tıbbi Mikrobiyoloji AD/HEKK

Hastane İnfeksiyonları

- Sıklık: % 1-% 17
  - YBU:%20-40
- Sayı: Dünyada 5 - 10 milyon olgu / yıl (200 milyon yatan hasta)
- Türkiye: 50-150 bin olgu /yıl (2 milyon yatan hasta) (Artıyor/Artacak)

Birinci Basamak Toplamı	214.564.156
Özel Tıp Merkezleri	26.953.360
Hastaneler	418.581.931
2. ve 3. Basamak Toplamı	445.535.291

YBÜ Güncel Durum

Güncel Durum

	Kateter Kullanım Oranı	KİB	Ventilatör Kullanım Oranı	VİP	Üriner Kateter Kullanım Oranı	ÜSE
INICC 2007-2012	53	4.78	38	14.7	62	5.30
INICC Türkiye 2003-2012	52	8.4	44	21.4	83	7.5
NHSN 2012	59	1.3	38	1.6	70	2.9

Hastane İnfeksiyonlarında etkenler

ANTİMİKROBİYAL DİRENÇ ORANLARI

Tablo 25 . Antimikrobiyal Direnç Oranları* ve Dağılımları.2015.

Antimikrobiyal Direnç Hızları					PERSENTİL				
ANTİMİKROBİYAL DİRENÇLİ PATOJEN	Birim sayısı	Etken sayısı (toplam)	Dirençli etken sayısı	Ağırlıklı genel ortalama	10%	25%	50% (Ortanca)	75%	90%
TÜRKİYE GENELİ									
VRE	399(93)	2909	408	14.03	0.00	0.00	8.00	20.5	30.00
MRSA	397(85)	2879	1127	39.15	7.00	20.50	35.00	59.5	80.80
MRKNS	311(103)	3641	2470	67.84	20.80	60.00	81.00	89.00	97.60
E.Coli suşlarında ESBL	467(169)	7224	3236	44.80	0.00	21.50	50.00	65.00	77.00
Klebsiella Pneumoniae suşlarında ESBL	374(170)	7105	3153	44.38	0.00	20.25	45.50	70.25	80.90
Karbapenem dirençli *Acinetobacter baumannii*	351(203)	9979	6825	68.39	0.00	30.00	76.00	90.00	94.00
Karbapenem dirençli *Pseudomonas aeruginosa*	418(143)	5750	1740	30.26	0.40	16.00	32.00	44.00	58.60
Kolistin dirençli *Acinetobacter baumannii*	351(203)	9979	442	4.43	0.00	0.00	1.00	5.00	12.60

Hastanede İnfeksiyon Kontrolü

- SÜRVEYANS
- EL Hijyeni
- İZOLASYON UYGULAMALARI
- Hastaneye Özel Kontrol politikaları !
- Akılcı Antibiyotik Kullanımı
- EĞİTİM, DENETİM ve GERİ BİLDİRİM
- ÇEVRE !

Hastanede İnfeksiyon Kontrolü

- BİRİNCİ GRUP ÖNLEMLER
  * El yıkama
  * Aletlerin dezenfeksiyonu ve sterilizasyon
  * Tek kullanımlık malzemelerin kullanımı
  * Antibiyotik kullanım politikası
- İKİNCİ GRUP ÖNLEMLER
  * İzolasyon
  * Personel eğitimi
- ÜÇÜNCÜ GRUP ÖNLEMLER
  * Çevre

Çevre kategorileri

- **Düşük riskli alanlar:** Hemşire-doktor odaları, ofis, kafeterya, koridor ve malzeme depoları.
- **Orta riskli alanlar:** Hasta odaları, laboratuar, acil servis, mutfak.
- **Yüksek riskli alanlar:** Ameliyathane, yoğun bakım, izolasyon odası, hemodiyaliz odası, doğumhane, transplantasyon ünitesi, yanık ünitesi.

Florence Nightingale,1854

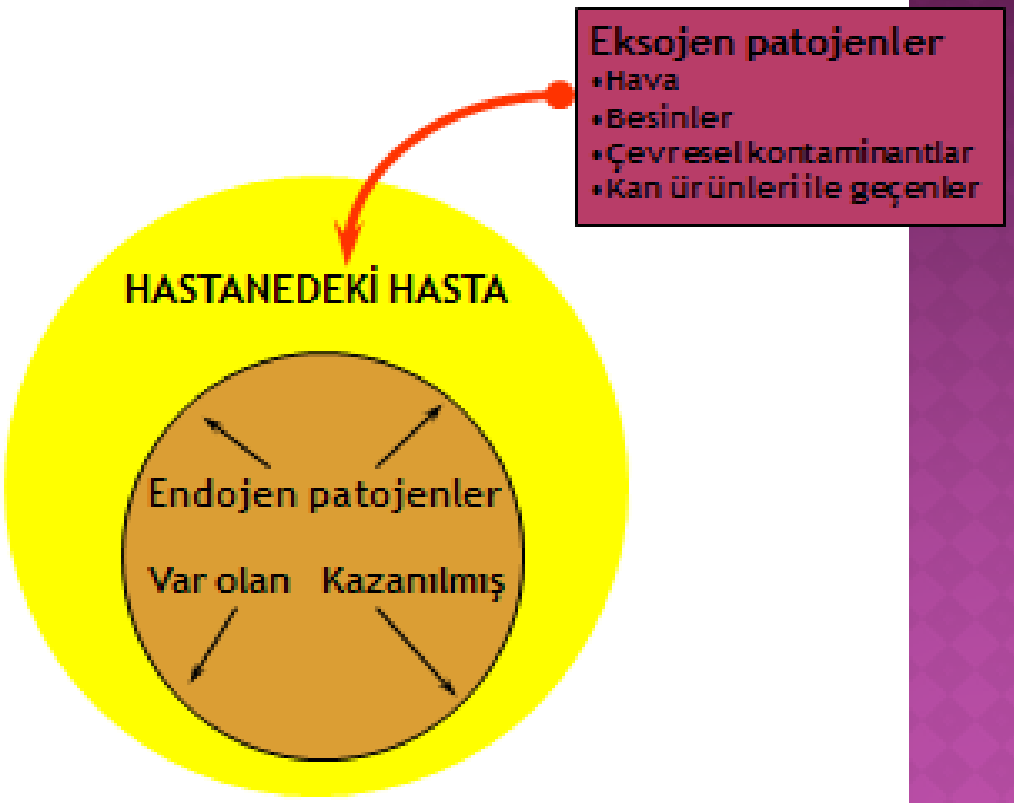
- Kırım Savaşı
- Askerlerde

hastanede
ölüm oranını
% 42’den %2’ye
düşürdü !!!

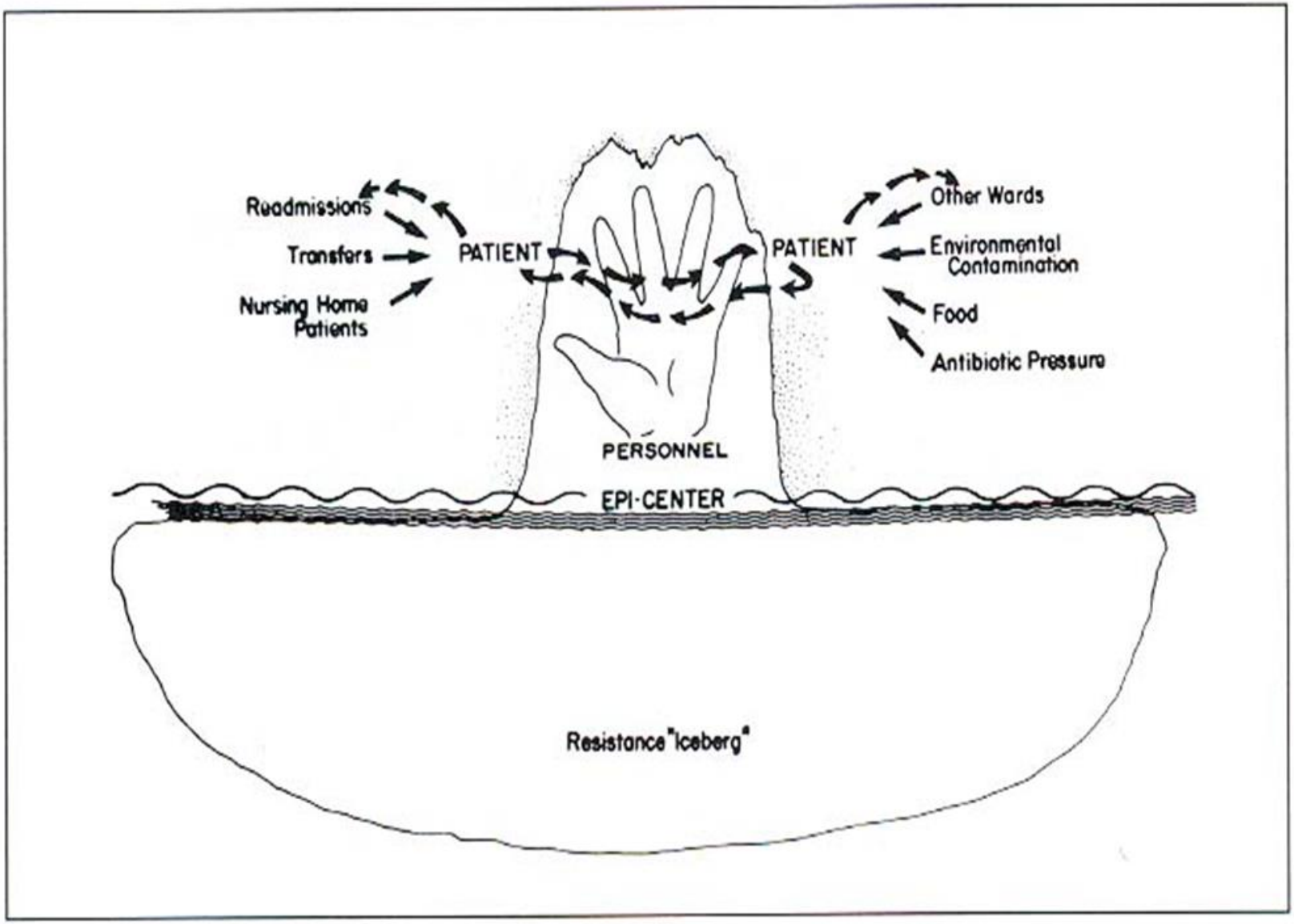
Hastane İnfeksiyonu Dinamiği

- Ekzojen/Çapraz (cross) enfeksiyonlar +

Endojen (self, oto) enfeksiyonlar (% 30-50)



Hastane İnfeksiyonu Dinamiği

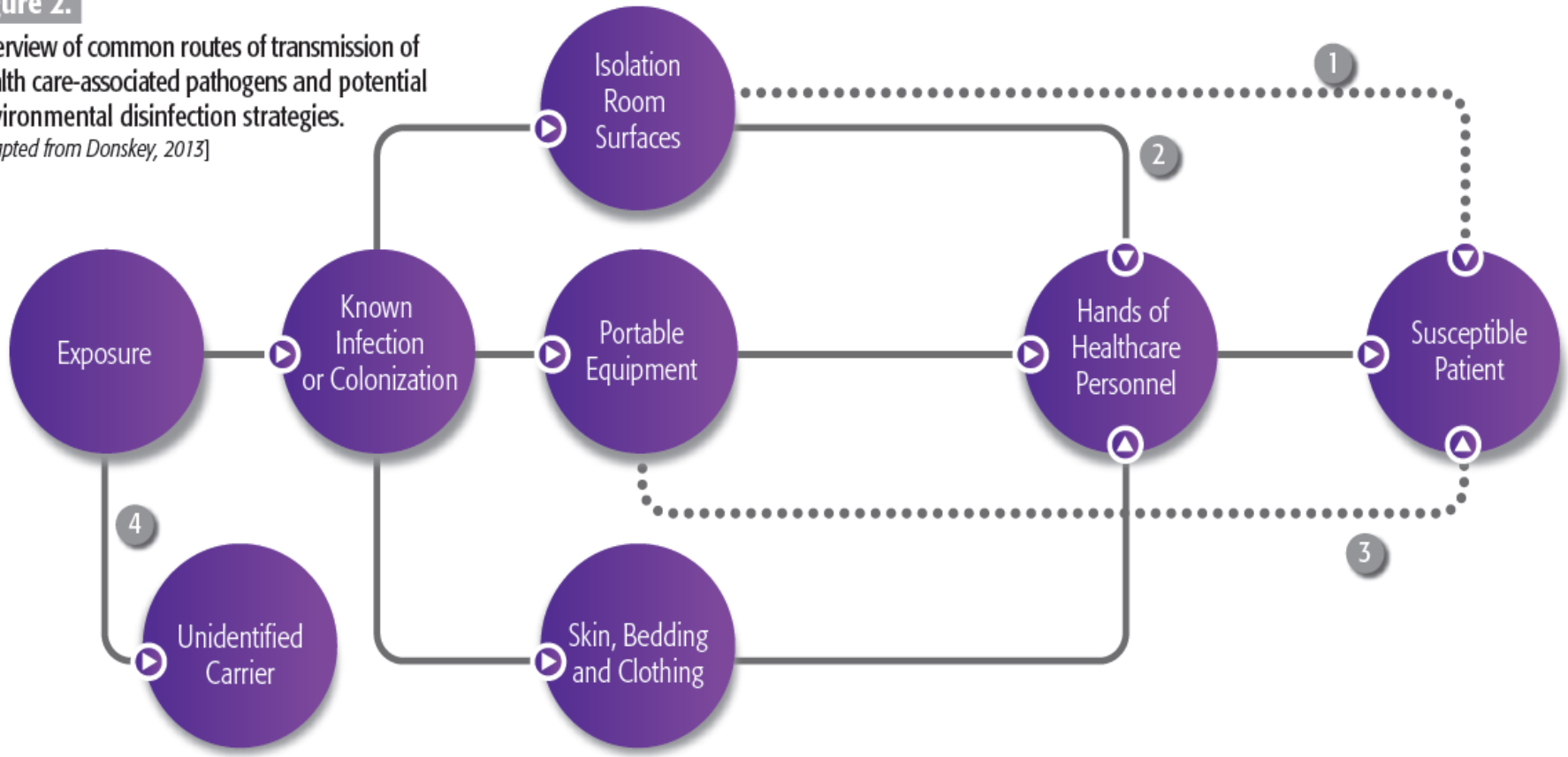


Hastane İnfeksiyonu Dinamiği

C.J. Donskey / American Journal of Infection Control 41 (2013) S12-S19

Figure 2.

Overview of common routes of transmission of health care-associated pathogens and potential environmental disinfection strategies.
[*Adapted from Donskey, 2013*]



Patients colonized or infected with health care-associated pathogens shed organisms

2 contamination of surfaces in isolation rooms resulting in risk for contamin

Çevresel kontaminasyon riskli mi?

Infect Control Hosp Epidemiol. 2011 Feb;32(2):185-7. doi: 10.1086/657944.

Contamination of hands with methicillin-resistant Staphylococcus aureus after contact with environmental surfaces and after contact with the skin of colonized patients.

Stiefel U[1], Cadnum JL, Eckstein BC, Guerrero DM, Tima MA, Donskey CJ.

Author information

Abstract

In a study of 40 methicillin-resistant Staphylococcus aureus (MRSA) carriers, hand contamination was equally likely after contact with commonly examined skin sites and commonly touched environmental surfaces in patient rooms (40% vs 45%). These findings suggest that contaminated surfaces may be an important source of MRSA transmission.

Am J Infect Control. 2012 Aug;40(6):556-8. doi: 10.1016/j.ajic.2011.08.002. Epub 2011 Oct 7.

Acquisition of spores on gloved hands after contact with the skin of patients with Clostridium difficile infection and with environmental surfaces in their rooms.

Guerrero DM[1], Nerandzic MM, Jury LA, Jinno S, Chang S, Donskey CJ.

Author information

Abstract

In a prospective study of 30 patients with Clostridium difficile infection, we found that acquisition of spores on gloved hands was as likely after contact with commonly touched environmental surfaces (ie, bed rail, bedside table, telephone, call button) as after contact with commonly examined skin sites (ie, chest, abdomen, arm, hand).

El hijyeni

J Hosp Infect. 2010 Nov;76(3):252-5. doi: 10.1016/j.jhin.2010.06.027. Epub 2010 Sep 20.

Twenty-four-hour observational study of hospital hand hygiene compliance.

Randle J[1], Arthur A, Vaughan N.

Author information

Abstract

This observational study measured healthcare workers' (HCWs'), patients' and visitors' hand hygiene compliance over a 24h period in two hospital wards using the 'five moments of hand hygiene' observation tool. Hand hygiene is considered to be the most effective measure in reducing healthcare-associated infections but studies have reported suboptimal levels of compliance. Most studies have used random observational time-periods for data collection and this has been criticised. We monitored a total of 823 hand hygiene opportunities (HCWs, N=659; patients and visitors, N=164). Among HCWs, compliance was 47% for doctors, 75% for nurses, 78% for allied health professionals, and 59% for ancillary and other staff (P<0.001). There was no difference in compliance between patients and visitors (56% vs 57%, P=0.87). Hand hygiene compliance varied depending on which of the five moments of hygiene HCWs had undertaken (P<0.001), with compliance before an aseptic task being 100% (3/3); after body fluid exposure 93% (86/93); after patient contact 80% (114/142); before patient contact 68% (196/290); and after contact with surroundings 50% (65/129). Lower levels of compliance were found for HCWs working during the early shift (P<0.001). For patients and visitors there was no evidence of an association between moments of hygiene and compliance. Levels of compliance were higher compared with previous reported estimates. Medical staff had the lowest level of compliance and this continues to be a concern which warrants specific future interventions.

Çevrede mikroorganizmalar

Survival of hospital pathogens on dry hospital surfaces.
[*Adapted from Otter et al, 2013*]

Organism	Survival time
Clostridium difficile (spores)	> 5 months
Acinetobacter spp	3 days to 11 months
Enterococcus spp including VRE	5 days to > 46 months
Pseudomonas aeruginosa	6 hours to 16 months
Klebsiella spp	2 hours to > 30 months
Staphylococcus aureus, including MRSA	7 days to > 12 months
Norovirus (and feline calicivirus)	8 hours to > 2 weeks

TABLE 1 Survival times and infectious doses retrieved or extrapolated from published studies[a]

Organism	Survival time	Infectious dose
Methicillin-resistant *Staphylococcus aureus*	7 days–>7 mo	4 CFU
Acinetobacter	3 days–>5 mo	250 CFU
Clostridium difficile	>5 mo	5 spores
Vancomycin-resistant *Enterococcus*	5 days–>4 mo	$<10^3$ CFU
Escherichia coli	2 h–16 mo	10^2-10^5 CFU
Klebsiella	2 h–>30 mo	10^2 CFU
Norovirus	8 h–7 days	<20 virions

CMR
Journals.ASM.org

Controlling Hospital-Acquired Infection: Focus on the Role of the Environment and New Technologies for Decontamination

Stephanie J. Dancer
Department of Microbiology, Hairmyres Hospital, East Kilbride, Lanarkshire, Scotland, United Kingdom

Çevrede mikroorganizmalar

- Nem, ıslak çevre, lavabo...P.aeruginosa, Stenotrophomonas, Burkholderia spp,...

JOURNAL OF CLINICAL MICROBIOLOGY, Oct. 2009, p. 3226–3230 Vol. 47, No. 10
0095-1137/09/$08.00+0 doi:10.1128/JCM.00034-09

Association between Contaminated Faucets and Colonization or Infection by Nonfermenting Gram-Negative Bacteria in Intensive Care Units in Taiwan▽

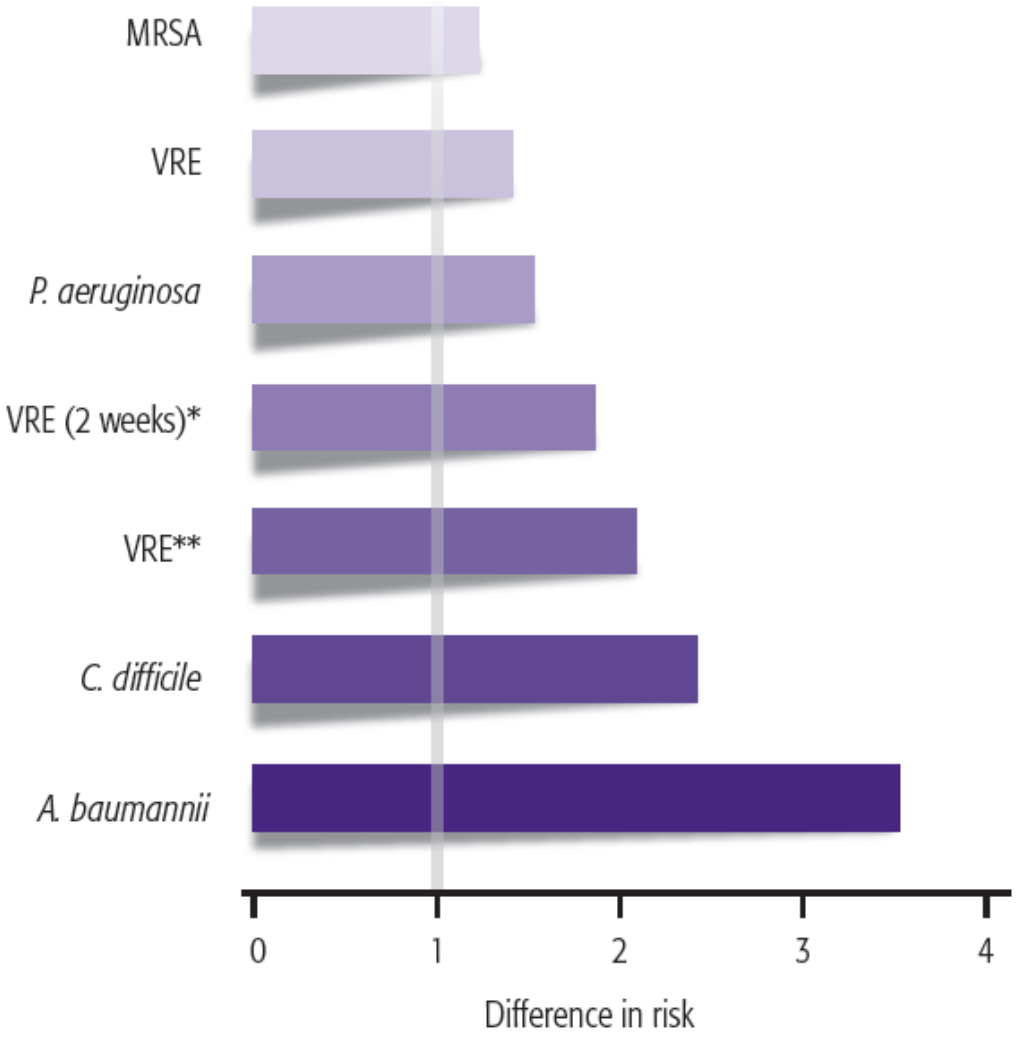
Jiun-Ling Wang,[1,2,3] Mei-Ling Chen,[2] Yusen Eason Lin,[4] Shan-Chwen Chang,[1,2,5] and Yee-Chun Chen[1,2,5]*

Department of Internal Medicine, National Taiwan University Hospital, Taipei,[1] Center for Infection Control, National Taiwan University Hospital, Taipei,[2] Department of Internal Medicine, E-Da Hospital/I-Shou University, Kaohsiung,[3] Graduate Institute of Environmental Education, National Kaohsiung Normal University, Kaohsiung,[4] and Department of Medicine, College of Medicine, National Taiwan University, Taipei,[5] Taiwan

Received 7 January 2009/Returned for modification 23 June 2009/Accepted 2 July 2009

This study was designed to determine the strength of the association between the isolation of nonfermentative gram-negative bacilli (NFGNB) from tap water faucet aerators and the prevalence of colonization or infection of patients in intensive care units (ICUs). Surveillance cultures were obtained during a 4-month period from 162 faucet aerators located in seven different ICUs. The prevalence of colonization or infection of ICU patients with NFGNB was determined by prospective surveillance during the same period. Fifty four (33%) of the faucet aerators contained NFGNB. Among the 66 NFGNB isolated from faucet aerators, the most frequently encountered ones were *Sphingomonas paucimobili* (26 isolates), *Pseudomonas aeruginosa* (14 isolates), *Chryseobacterium meningosepticum* (13 isolates), *Achromobacter xylosoxidans* (6 isolates), *Burkholderia cepacia* (4 isolates), and *Stenotrophomonas maltophilia* (3 isolates). *Acinetobacter baumannii* was not recovered. The most common NFGNB isolated from ICU patients were *P. aeruginosa* and *A. baumannii*. There was a significant correlation between the overall prevalence of NFGNB in faucet aerators and their prevalence in exposed ICU patients (Spearman $r = 0.821$, $P = 0.02$). There was also a significant correlation between the prevalence of *C. meningosepticum* in faucet aerators and its prevalence among ICU patients (Spearman $r = 0.847$, $P = 0.016$). The electrokaryotypes of four clinical isolates of *C. meningosepticum* were similar to those of faucet isolates. Measures directed at making the water supply safe may prevent infection by *C. meningosepticum* and other waterborne pathogens.

Sorunlu Mikroorganizmalar



Çevre ve hastane infeksiyonları

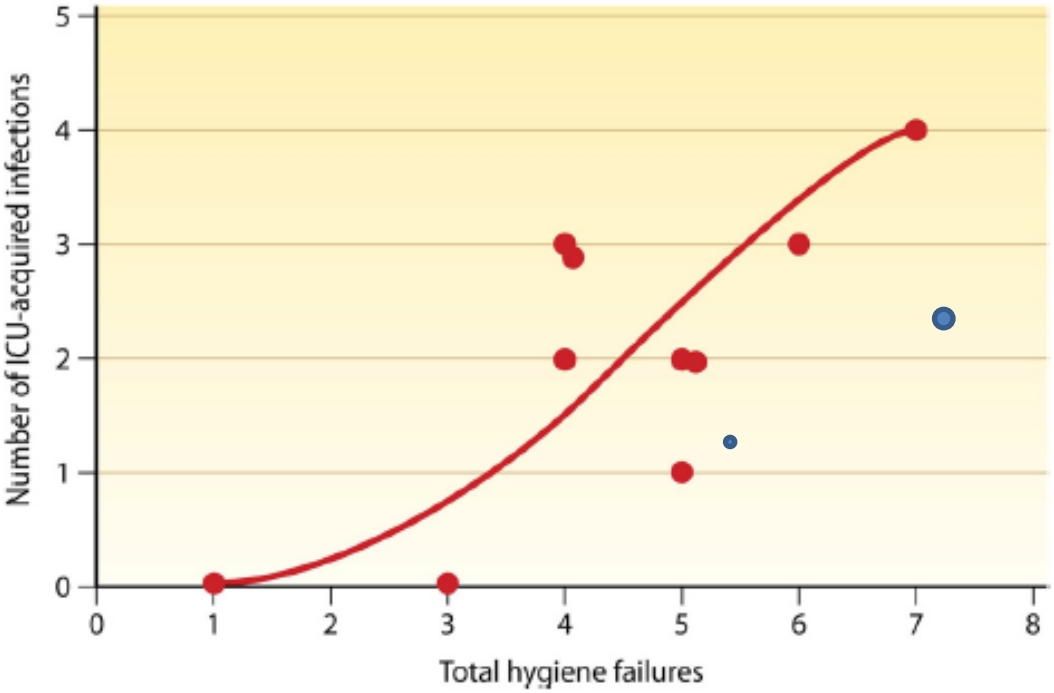


FIG 1 Relationship between environmental bioburden and hospital-acquired infection. This figure shows a relationship between the number of surgical intensive care unit (SICU)-acquired infections and total hygiene fails during a 2-month patient and environmental surveillance study in a Glasgow teaching hospital. Hygiene failures were defined as aerobic colony counts (ACCs) of >2.5 CFU/cm^2 and/or the presence of *Staphylococcus aureus* on hand touch sites (42).

Çevre ve sorun mikroorganizmalar

Environmental contamination during a carbapenem-resistant *Acinetobacter baumannii* outbreak in an intensive care unit

G. Aygün*, O. Demirkiran†, T. Utku†, B. Mete‡, S. Ürkmez†, M. Yılmaz‡, H. Yaşar*, Y. Dikmen† and R. Öztürk‡

*Department of Microbiology and Clinical Microbiology; †Department of Anesthesiology and Reanimation and ‡Department of Clinical Microbiology and Infectious Diseases, Cerrahpaşa Medical Faculty, University of Istanbul 34303, Aksaray, Istanbul, Turkey

Çevre ve sorun mikroorganizmalar?

COMPUTER KEYBOARD AND MOUSE AS A RESERVOIR OF PATHOGENS IN AN INTENSIVE CARE UNIT

Bernd Hartmann, Dr med.,[1] Matthias Benson, Dr med.,[1] Axel Junger, Dr med. habil,[1] Lorenzo Quinzio,[1] Rainer Röhrig, Dr med.,[1] Bernhard Fengler,[1] Udo W. Färber, Dr rer. nat.,[2] Burkhard Wille, Prof Dr med.,[2] and Gunter Hempelmann, Prof Dr med. Dr h.c.

J Clin Monit 2004; 18: 7–12

Çevre dezenfeksiyonu

- Uygulama sıklığı konusunda net öneri yok!
- Görünür kirlenme olduğunda hemen
- Sorun mikroorganizmalarda daha sık !!
- «Çok dokunulan yüzeylerde» ??? daha sık ?
- Hergün/Haftada üç gün...
- Hergün> görünür kirlenme varlığında

Dezenfektanların etkinliği

Uygulanması gereken prosedür		Patojen
Prion inaktivasyon işlemi		Prion
Sterilizasyon		Bakteri sporları
Dezenfeksiyon	Yüksek düzey	Coccidia
		M. tuberculosis , M.terrae
	Orta düzey	Lipid zarfsız veya küçük virüsler (polio, coxackie)
		Mantarlar (Candida spp, Aspergillus)
	Düşük düzey	Vejetatif bakteriler (S. aureus, P. aeruginosa)
		Lipit zarflı veya orta büyüklükte virüsler (HIV, hepatit B, Herpes virüsler..)

Çevre/yüzey dezenfeksiyonu

Etil veya izopropil alkol	% 70-90
Klor 100 ppm	(1:500 dilüsyon)
Fenolik	UD
İyodofor	UD
Kuaterner amonyum	UD

UD= Üretici firma önerilerine uyulmalıdır

Temas süresi > 1 dak

Terminal dezenfeksiyon

- Hasta çıktıktan sonra yapılan dezenfeksiyon!

Infect Control Hosp Epidemiol. 2008 Nov;29(11):1035-41. doi: 10.1086/591940.

Improving cleaning of the environment surrounding patients in 36 acute care hospitals.

Carling PC[1], Parry MM, Rupp ME, Po JL, Dick B, Von Beheren S; Healthcare Environmental Hygiene Study Group.

DESIGN: Prospective quasi-experimental, before-after, study.

SETTING: Thirty-six acute care hospitals in the United States ranging in size from 25 to 721 beds.

METHODS: We used a fluorescent targeting method to objectively evaluate the thoroughness of terminal room disinfection cleaning before and after structured educational and procedural interventions.

RESULTS: Of 20,646 standardized environmental surfaces (14 types of objects), only 9,910 (48%) were cleaned at baseline (95% confidence interval, 43.4-51.8). Thoroughness of cleaning at baseline correlated only with hospital expenditures for environmental services personnel (P = .02). After implementation of interventions and provision of objective performance feedback to the environmental services staff, it was determined that 7,287 (77%) of 9,464 standardized environmental surfaces were cleaned (P < .001). Improvement was unrelated to any

Crit Care Med. 2010 Apr;38(4):1054-9. doi: 10.1097/CCM.0b013e3181cdf705.

Improving environmental hygiene in 27 intensive care units to decrease multidrug-resistant bacterial transmission.

Carling PC[1], Parry MF, Bruno-Murtha LA, Dick B.

MEASUREMENTS AND MAIN RESULTS: In total, 3532 environmental surfaces (14 standardized objects) were assessed after terminal cleaning in 260 intensive care unit rooms. Only 49.5% (1748) of surfaces were cleaned at baseline (95% confidence interval, 42% to 57%). Thoroughness of cleaning at baseline did not correlate with hospital size, patient volume, case mix index, geographic location, or teaching status. After intervention and multiple cycles of objective performance feedback to environmental services staff, thoroughness of cleaning improved to 82% (95% confidence interval, 78% to 86%).

Contents lists available at ScienceDirect

American Journal of Infection Control

journal homepage: www.ajicjournal.org

Original research article

Methods for assessing the adequacy of practice and improving room disinfection

Philip Carling MD [a,b,*]

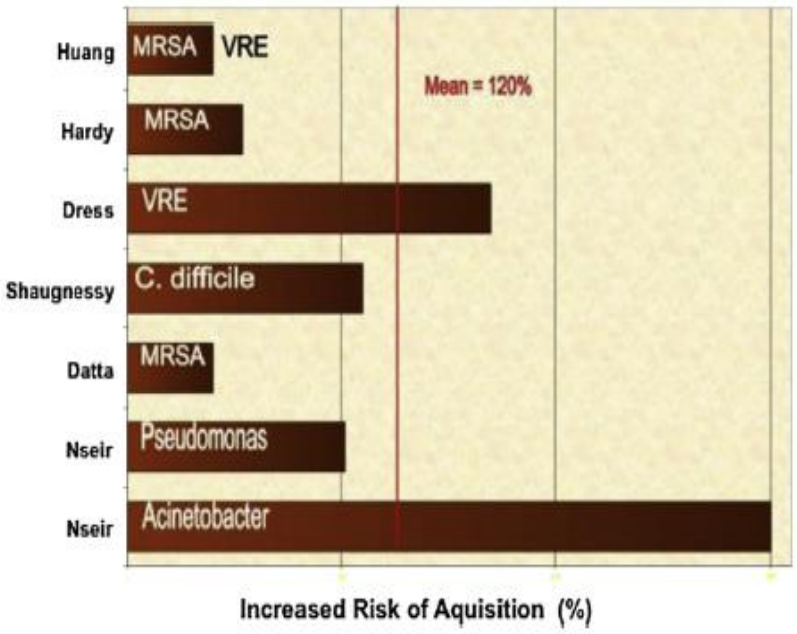


Fig 1. Increased HAP acquisition risk from prior room occupant.

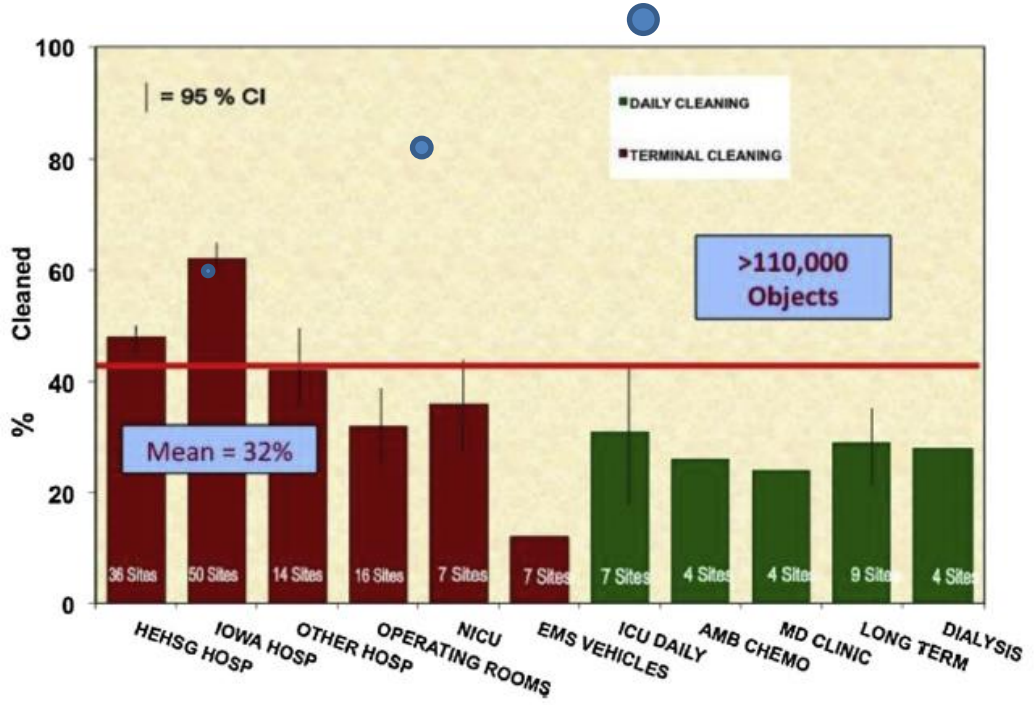


Fig 2. Thoroughness of environmental cleaning in multiple health care settings.

Çevre dezenfeksiyonu sorunlu!

- Sorunun temeline inildiğinde yetersiz dezenfeksiyonda yoğun kontaminasyon ya da dezenfektan direncinin çok önemli olmadığı, sorunun dezenfeksiyon uygulamalarına uyumsuzluk, dezenfektan etkisinin kalıcı olmaması, her kontamine alanın işleme alınamaması, dezenfektan hazırlama ile ilgili olduğu saptanmıştır. (İNSAN FAKTÖRÜ)
- Özellikle bu konuda uzman olmayan, sıklıkla değişen personellerle bu sistemi oturtabilmek oldukça zor olmaktadır.

Dezenfeksiyon sorununa klasik çözümler

- Eğitim
- Etkin organizasyon (Environmental Sevices Staff)
- Ayrıntılı hastane temizlik ve dezenfeksiyon planı
- Kontrol listeleri
- Temizlik/Dezenfeksiyon kontrolü
- Geri bildirim

Temizlik/Dezenfeksiyon planı

TYPE OF CLEANING	RESPONSIBLE SERVICE	ITEMS TO BE CLEANED	PRODUCTS USED TO CLEAN	COMMENTS
COMPUTERS (excluding terminals in patients rooms)	All users NEW	1. wipe down computer keyboard and mouse	1. EPA/ICC hosp quat* or bleach wipe**	Clean after use
ROUTINE DAILY CLEANING OF PATIENT ROOM	Environmental Services	1. dust window ledge 1.spot clean furniture (chairs) 2.wipe down over-bed table 3.wipe down side rails 4.wipe down TV control 5.wipe down bathroom fixtures (faucets, grab bar, shelf, etc.) 6.clean sink and toilet 7.wipe down door handles (room and bathroom) 8.mop bathroom and patient floor 9.remove trash	1. – 9. EPA/ICC hosp quat* or 1. - 8. EPA/ICC hosp bleach wipe** for Contact CD and Enteric Precautions 9. EPA/ICC hosp quat*	10 Step daily cleaning process
TRANSFER/ DISCHARGE CLEANING OF PATIENT ROOM, AND ANY PATIENT ROOM AT NURSE'S REQUEST (WHEN ROOM IS EMPTY)	Environmental Services NEW	1. strip bed of all linen, clean bed frame, side rails, mattress NOTE: after nursing has removed all patient belongings (i.e. clothing in closets, hearing aids in bedside table or over-bed table) and nursing equipment (i.e. halter monitors, blood glucose meters, pulse oximeters) 1. clean bedside table, over bed table, phone, call bell, TV control 2. wipe down flow meters 3. wipe down regulators 4. dust/clean lighting fixtures 5. clean outside canister (clean) of suction container 6. clean and wipe down IV poles and pumps that need to remain on the unit, apply sani-strip ⌘¶ 7. wipe down furniture 8. dust all ledges 9. clean around sharps containers and glove boxes 10. wipe down step stools 11. wipe down walkers 12. wipe down canes 13. clean bedside commode, (once emptied by nursing) apply sani-strip⌘ 14. clean bathroom fixtures, sink, shower, and toilet apply sani-strip ⌘ 15. mop bathroom and patient floor 16. pull trash 17. change out privacy curtains if soiled or on request	1. - 16. EPA/ICC hosp quat* or 1-15. EPA/ICC hosp bleach wipe** for Contact CD and Enteric Precautions 16. EPA/ICC hosp quat* ¶ see cleaning instructions provided by Clinical Engineering, below ⌘ apply sani-strip, see notes below	10 Step Discharge cleaning process

Fig 1. Example of an environmental cleaning grid.

Temizlik/Dezenfeksiyon kontrolü

- Gözlem
- Görünür kir kontrolü
- Mikrobiyolojik örnek
- ATP
- Floresans boyalar

UYGUN ÇEVRE TEMİZLİĞİ ?

- **DANCER :"çok dokunulan yüzeylerde" ,**

  < 5 koloni oluşturan ünit/cm2 bakteri varlığının

  ya da indikatör bakterilerden (S.aureus, MRSA, C.difficile, VRE, Salmonella spp., Lokal verilerle belirlenecek değişik Gram negatif çomaklar) herhangi birinin saptanmamasının uygun temizlik göstergesi olabileceği ??

J Hosp Infect 2004; 56: 10-15.

Çevreden örnek alma

- Dezenfektan yokken

  * SF, TSB, BHI sıvı besiyerleri

- Dezenfektan varsa nötralizasyonlu sıvı

Table 13.10–3 Neutralizers of common disinfectant chemicals[a,b]

Disinfectant(s)	Neutralizer
Glutaraldehyde	Glycine
Formaldehyde	Glycine
Phenolics	Polysorbate (Tween) 80
Quaternary ammonium compounds	Lecithin + polysorbate (Tween) 80[c]
Chlorine	Sodium thiosulfate
Iodine	Sodium thiosulfate
Hydrogen peroxide	Catalase

Table 25. Methods of environmental-surface sampling

Method	Suitable for appropriate surface(s)	Assay technique	Procedural notes	Points of interpretation	Available standards	References
Sample/rinse Moistened swab/rinse	Non-absorbent surfaces, corners, crevices, devices, and instruments	Dilutions; qualitative or quantitative assays	Assay multiple measures areas or devices with separate swabs	Report results per measured areas or if assaying an object, per the entire sample site	**YES** – food industry; **NO** – heath care	1214, 1239–1242
Moistened sponge/rinse	Large areas and housekeeping surfaces (e.g., floors or walls)	Dilutions; qualitative or quantitative assays	Vigorously rub a sterile sponge over the surface	Report results per measured area	**YES** – food industry; **NO** – health care	1214, 1239–1242
Moistened wipe/rinse	Large areas and housekeeping surfaces (e.g., countertops)	Dilutions; qualitative or quantitative assays	Use a sterile wipe	Report results per measured area	**YES** – food industry; **NO** – health care	1214, 1239–1242
Direct immersion	Small items capable of being immersed	Dilutions; qualitative or quantitative assays	Use membrane filtration if rinse volume is large and anticipated microbiological concentration is low	Report results per item	**NO**	1214
Containment	Interior surfaces of containers, tubes, or bottles	Dilutions; qualitative or quantitative assays	Use membrane filtration if rinse volume is large	Evaluate both the types and numbers of microorganisms	**YES** – food and industrial applications for containers prior to fill	1214
RODAC*	Previously cleaned and sanitized flat, non-absorbent surfaces; not suitable for irregular surfaces	Direct assay	Overgrowth occurs if used on heavily contaminated surfaces; use neutralizers in the agar if surface disinfectant residuals are present	Provides direct, quantitative results; use a minimum of 15 plates per an average hospital room	**NO**	1214, 1237, 1239, 1243, 1244

Int J Hyg Environ Health. 2001 Mar;203(3):245-8.

Comparison of two sampling methods for the detection of gram-positive and gram-negative bacteria in the environment: moistened swabs versus Rodac plates.

Lemmen SW, Hafner H, Zolldann D, Amedick G, Lutticken R.

Zentralbereich fur Krankenhaushygiene, Universitatsklinikum, RWTH Aachen, 52057 Aachen, Germany.
slemmen@post.klinikum.rwth-aachen.de

The objective of this study was to evaluate the moistened swab technique vs. Rodac plates for detecting Gram-positive and Gram-negative bacteria in the inanimate environment. Over a period of 22 months, the environment of 190 patients infected or colonized with MRSA, VRE or multiresistant Gram-negative bacteria was sampled in turn. MRSA and VRE could be detected with either method in 33 out of 54 (61.1%) patient rooms in 174 out of 706 (24.6%) environmental samples. However, multiresistant Gram-negative bacteria were found in 42 out of 136 (30.9%) rooms with a very low frequency of 89 out of 1827 (4.9%) environmental samples ($p < 0.0001$). The sensitivity of the swab technique for Gram-positive cocci was 54% (94/174) vs. 69.5% (121/174) for the Rodac plates, ([CI95%], 47-61% vs. 62-76%, $p < 0.05$). In contrast, the sensitivity of the swab technique for Gram-negative bacteria was 74.2% (66/89) vs. 42.7% (38/89) for the Rodac plates, ([CI95%], 64-83% vs. 32-54%, $p < 0.05$). In conclusion, environmental contamination with Gram positive cocci is detected more often than with Gram-negative bacteria. For the detection of Gram-positive cocci, Rodac plates are superior to the swab technique; whereas Gram-negative rods can be detected more often by the swab technique. All these results proved to be statistically significant.

Yöntemlerin karşılaştırılması

Evaluating Patient Zone Environmental Cleaning

Method	Ease of Use	Identifies Pathogens	Accuracy	Useful for Teaching	Use in Programmatic Monitoring
Direct observation	Low	No	Variable	Yes	Difficult
Culture swab	High	Yes	High	No	No
Agar culture system	Moderate	Possible	Moderate	No	Possible*
Fluorescent system	High	No	High	Yes	Yes
ATP Bioluminescence	High	No	Variable	Yes	Possible*

* Measures cleanliness at that moment but NOT the process of cleaning

ATP ve geri bildirim

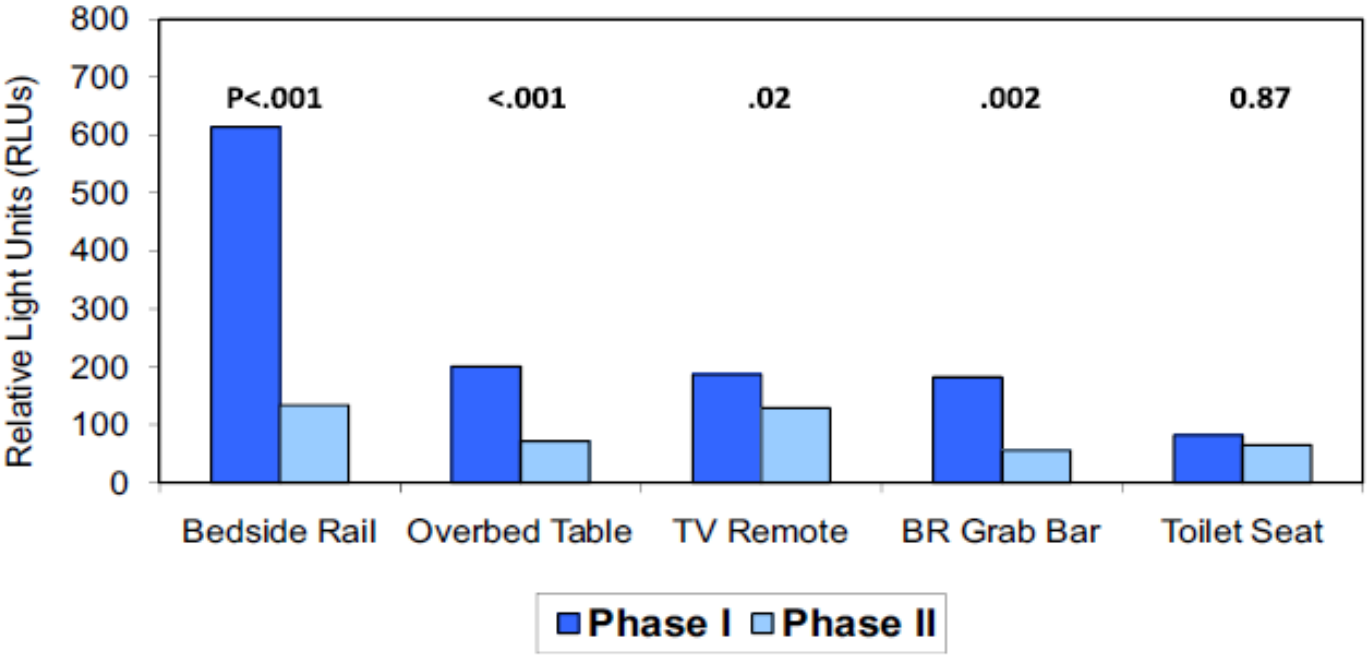


Fig 2. Median relative light units (RLUs) for 5 sites for phase I and phase II.

Boyce JM, ICHE 2009

Dezenfeksiyon sorununa yeni çözümler

- İnsansız teknolojiler (no touch) !

  UV sistemleri

  Hidrojen peroksit buharı

(Önce kir ve debris ortadan kaldırılmalı. Ancak iyi bir temizlik sonrası etkinliği olabiliyor!!!)

- Uzun süreli/kendiliğinden dezenfeksiyon sistemleri

(self-disinfecting surfaces)

H2O2 buharı/UV ile oda dekontaminasyonu

Comparison of room decontamination systems using hydrogen peroxide and ultraviolet irradiation

	Glosair (formerly Sterinis)	Steris	Bioquell	Tru-D
Abbreviation	DMHP (dry mist HP)	VHP (vaporized HP)	HPV (HP vapor)	UV-C
Active agent	5% hydrogen peroxide, <50 ppm silver cations, <50 ppm ortho-phosphoric acid	Vaprox (35% hydrogen peroxide)	35% hydrogen peroxide	UV-C irradiation at 254 nm
Application	Aerosol of active solution	Vapor, noncondensing	Vapor, condensing	UV irradiation; direct and reflected
Aeration (removal of active agent from enclosure)	Passive decomposition	Active catalytic conversion	Active catalytic conversion	Not necessary
Sporicidal efficacy	Single cycle does not inactivate *Bacillus atrophaeus* BIs; ~4-$\log_{10}$ reduction of *C difficile* and incomplete inactivation in situ	Inactivation of *Geobacillus stearothermophilus* BIs	Inactivation of *Geobacillus stearothermophilus* BIs; >6-$\log_{10}$ reduction of *C difficile* in vitro and complete inactivation in situ	1.8- to 4-$\log_{10}$ reduction of *C difficile* in situ
Evidence of clinical impact	None published	None published	Significant reduction in the incidence of *C difficile*	None published

UV sistemleri

UV avantajları

- Geniş spekrumlu etkinlik
- Oda ve ekipman birlikte dezenfekte oluyor
- Hızlı (vejetatif bakterilerde 15 dk, spor 50 dk)
- Havalandırma gerekmiyor
- Artık ürün bırakmıyor
- Zaman kaybı yaratan düzenlemeler yok
- Özel sistemlerle uygun bir dağılım sağlanabiliyor

UV dezavantajları

- Oda tamamen boşaltılmalı (sadece TD için)
- İlk yatırım pahalı
- Teknik parametrelere bağlı etki (doz, dalga boyu,...)
- Mobilya, yatak duvardan uzaklaştırılmalı
- Klinik faydası ile bilgi kısıtlı (Fakat artıyor !)

H2O2 buhar teknolojileri

H2O2 buharı

Table 3
Effectiveness of hydrogen peroxide systems on reducing multidrug-resistant organisms in contaminated patient rooms

Author, Year	HP system	Pathogen	Before HPV (% surfaces positive)	After HPV (% surfaces positive)	Reduction (%)
French, 2004[49]	HPV (Bioquell)	MRSA	72 (61/85)	1 (1/85)	98
Bates, 2005[50]	HPV (Bioquell)	*Serratia marcescens*	10 (4/42)	0 (0/25)	100
Jeanes, 2005[51]	HPV (Bioquell)	MRSA	36 (10/28)	0 (0/50)	100
Hardy, 2007[52]	HPV (Bioquell)	MRSA	24 (7/29)	0 (0/29)	100
Otter, 2007[53]	VHP (Bioquell)	MRSA, GNR	40 (12/30), 10 (3/30)	3 (1/30), 0 (3/30)	93, 100
Shapey, 2008[54]	HP dry mist (Sterinis)	*Clostridium difficile*	23.6 (48/203)	3.4 (7/203)	86
Dryden, 2008[55]	VHP (Bioquell)	MRSA	27.6 (8/29)	3.4 (1/29)	88
Boyce, 2008[56]	VHP (Bioquell)	*C difficile*	25.6 (11/43)	0 (0/37)	100
Bartels, 2008[57]	HP dry mist (Sterinis)	MRSA	28.6 (4/14)	0 (0/14)	100
Otter, 2010[58]	HPV (Bioquell)	GNR	48 (10/21)	0 (0/63)	100

H2O2 buharı avantajları

- Geniş spektrumlu etkinlik
- Oda ve ekipman birlikte dezenfekte oluyor
- Karmaşık, kalabalık alanlarda da etkili
- Mobilya ve ekipman yer değişikliği gerekmiyor
- Artık sorunu yok
- Otomatize sistemlerle her yere eşit dağılım mümkün
- Klinik deneyim var

H2O2 buharı dezavantajları

- Oda boş olmalı (TD için uygun)
- Havalandırma kontrolü süreci gerekiyor
- İlk yatırım pahalı
- Dekontaminasyon süresi uzun (2.5-5 saat)
- Bazı parametrelere bağımlı (HP konsantrasyonu)

UV/H2O2 buharı ve Hİ önlemek

Table 4
Clinical trials using UV or HP devices for terminal room disinfection to reduce health care–associated infections

Author, year	Design	Setting	Modality tested	Pathogen(s)	Outcome (HAI)	Assessment of HH compliance	Assessment of EVS cleaning	Other HAI prevention initiatives
Boyce, 2008[56]	Before-after (CDI high-incidence wards)	Community hospital	HPV (Bioquell)	CDI	2.28 to 1.28 per 1,000 Pt days ($P = .047$)	No	No	NA
Cooper, 2011[65]	Before-after (2 cycles)	Hospitals	HPV (NS)	CDI	Decreased cases (incidence NS)	No	No	Yes
Levin, 2013[66]	Before-after	Community hospital	UV-PX, Xenex	CDI	9.46 to 4.45 per 10,000 Pt days ($P = .01$)	No	No	Yes
Passaretti, 2013[67]	Prospective cohort (comparison of MDRO acquisition; admitted to rooms with or without HPV decontamination)	Academic center	HPV (Bioquell)	MRSA	2.3 to 1.2 ($P = .30$)	No	No	No
				VRE	7.2 to 2.4 ($P < .01$)			
				CDI	2.4 to 1.0 ($P = .19$)			
				All MDROs; MRSA, VRE, CDI	12.6 to 6.2 per 1,000 Pt days ($P < .01$)			
Manian, 2013[68]	Before-after	Community hospital	HPV (Bioquell)	CDI	0.88 to 0.55 cases per 1,000 Pt days ($P < .0001$)	Yes	No	No
Hass, 2014[69]	Before-after	Academic center	UV-PX, Xenex	CDI	0.79 to 0.65 per 1,000 Pt days ($P = .02$)	No	Yes	Yes
				MRSA	0.45 to 0.33 per 1,000 Pt days ($P = .007$)			
				VRE	0.90 to 0.73 per 1,000 Pt days ($P = .002$)			
				MDRO-GNB	0.52 to 0.42 per 1,000 Pt days (($P = .04$)			
				Total	2.67 to 2.14 per 1,000 Pt days ($P < .001$)			
Mitchell, 2014[70]	Before-after	Acute care hospital	Dry hydrogen vapor (Nocospray)	MRSA (colonization and infection)	9.0 to 5.3 per 10,000 Pt days ($P < .001$)	Yes	No	Yes
Miller, 2015[71]	Before-after	Urban hospital	UV-PX, Xenex	CDI	23.3 to 8.3 per 10,000 Pt days ($P = .02$)	No	No	Yes
Nagaraja, 2015[72]	Before-after	Academic center	UV-PX, Xenex	CDI	1.06 to 0.83 per 1,000 Pt days ($P = .06$)	No	No	No
Pegues, 2015[73]	Before-after	Academic center	CV-C (Optimum)	CDI	30.34 to 22.85 per 10,000 Pt days (IRR = 0.49; 95% CI, 0.26-0.94; $P = .03$)	Yes	Yes	No
Anderson, 2015[74]	RCT	9 hospitals	UV-C (Tru-D)	MRSA, VRE, CDI	51.3 to 33.9 per 10,000 Pt days ($P = .036$)*	Yes	Yes	No

CDI, Clostridium difficile infection; *CI*, confidence interval; *EVS*, environmental service; *GNB*, gram-negative bacteria; *HAI*, health care–associated infections; *HH*, hand hygiene; *HP*, hydrogen peroxide; *HPV*, hydrogen peroxide vapor; *IRR*, incidence rate ratio; *MDRO*, multidrug-resistant organism; *MRSA*, methicillin-resistant *Staphylococcus aureus*; *NA*, not applicable; *NS*, not stated; *Pt*, patient; *RCT*, randomized clinical trial; *UV*, ultraviolet light; *UV-PX*, ultraviolet light, pulsed-xenon device; *VRE*, vancomycin-resistant enterococci.
*Outcome includes new colonization plus HAI.

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Uzun süreli/kendiliğinden dezenfeksiyon (self-disinfecting surfaces)

- Ağır metal kullanılan ürünler:
  GÜMÜŞ, bakır, titanyum
- Yüzeyel yapıda değişim ile bakteri yapışmasını önleyen ürünler:

  *Biofilm oluşmasını önleyen köpek balığı derisi formatında ürünler-Sharklet AF

  *Işık ile aktive olan antimikrobial ürünler içeren selüloz asetat yüzeyler)
- Dezenfektan emdirilmiş uzun etkili yüzey ürünleri (Triclosan, QA, biguanid)
- Dar spekrumlu ışık (405 nm)
- Düşük doz devamlı H2O2 buharı (0.2 ppm)

CTF TEZ Çalışması Dr Belkıs Yolburun, Prof Dr M.Samastı,HEKK

- Uzun Süre Etkili Dezenfektan “Bacoban®” Uygulamasının Hastanelerde Vankomisine Dirençli Enterokok Yayılımını Önlemedeki Rolü.

CTF

Kullanılan madde/malzeme	İlk VRE üremesi
Tahta	2. gün
Kumaş	2. gün
Plastik (Belirgin pürüzlü)	3. gün
Plastik (hafif pürüzlü)	8. gün
Formika	11. gün
Plastik (düz)	18. gün
Metal	18.gün
Fayans	22. gün

	Alınan toplam çevre örneği sayısı	VRE pozitif örnek sayısı (%)
Uygulama öncesi dönem (UÖD)	362	38 (10.5)
Uygulama sonrası dönem (USD)	607	13 (2.1)
Toplam	969	51 (5.2)

CTF

	Uygulama öncesi dönem (UÖD)				Uygulama sonrası dönem (USD)			
	Tarama sayısı	**Örnek sayısı**	**Toplam VRE**	**Yeni VRE**	**Tarama sayısı**	**Örnek sayısı**	**Toplam VRE**	**Yeni VRE**
Enfeksiyon Hastalıkları	8	65	17	8	8	86	6	1
Genel Cerrahi	6	81	17	6	3	34	7	3
SSYBÜ	10	83	20	17	3	33	11	5
KİT	2	20	9	1	5	45	14	4
Toplam	26	249	63 % 25.3	32 % 12.8	19	198	38 % 19.1	13 % 6.5

Yeni teknoloji sorunlar!

- İn vitro veriler olumlu (sporlar hariç)
- Klinik kullanım verisi yok
- Klinik kullanımda sorunlar? (rutin temizlik ile etkileşim)
- Toksisite ??? (uzun süreli toksisite?)
- Direnç !!! (Triklosan !!!)

Kişisel korunma

Standart Önlemler !!!

Prosedürlere uyum

Kişisel korunma

Sonuç

- Çevre özellikle bazı mikroorganizmalar için çok önemli bir kaynak!
- Çevre dezenfeksiyonu hastane infeksiynları mücadelesinde önemli bir alan
- Rutin/insan temelli uygulamalar genelde yetersiz
- HİKK için önemli ve sorunlu bir uğraşı sahası

Teşekkür ederim !