16º Simpósio Nacional da Associação Portuguesa de Farmacêuticos Hospitalares

Programa Nacional de prevenção e controlo das infecções associadas aos cuidados de Saúde

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Is Infection in the hospital a real problem?

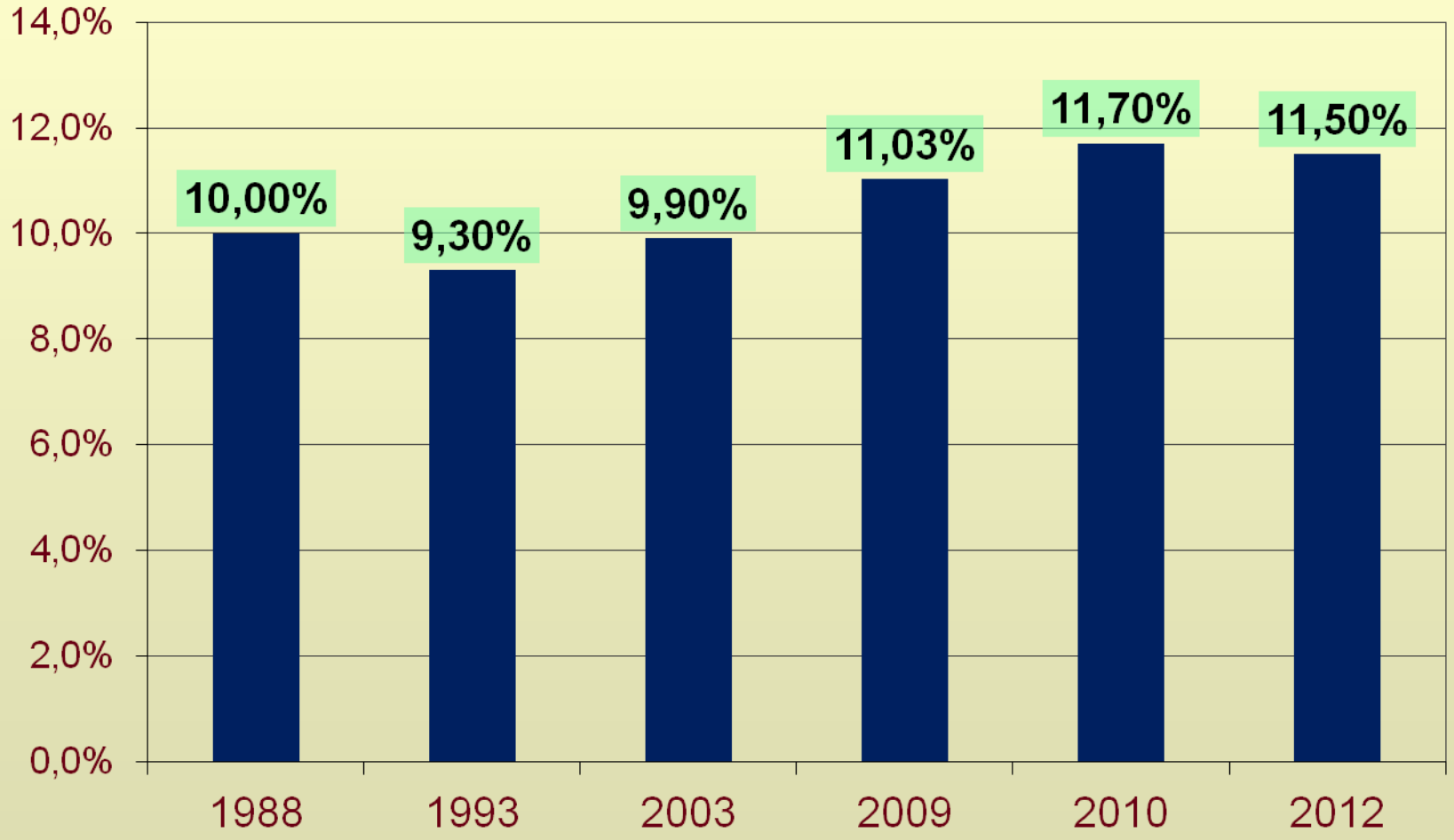
INFAUCI portuguese study

Hospital Mortality (32.2%)			
	P	OR	95% CI
Septic shock (33.3%)	*<0.001*	**4.17**	**3.42-5.09**
Infection on admission (43.9%)	*<0.001*	**1.63**	**1.42-1.87**
ICU acquired infection (22.8%)	*<0.001*	**1.55**	**1.32-1.82**
Both infections (10.1%)	*<0.001*	**2.16**	**1.74-2.67**
Either infection (56.6%)	*<0.001*	**1.67**	**1.45-1.93**

Infection was prevalent and significantly impacted mortality

Gonçalves-Pereira et al. Submitted

Prevalência de infeção hospitalar 1988-2012



Cortesia Drª Elaine Pina

Infeção hospitalar (2012)

	Doentes com IH	
	Portugal	UE
Homens	12,4%	7,2%
Mulheres	8,8%	5,4%
População global	10,5% (IC 95% 10,1 – 11,0)	5,7% (IC95% 4,5 – 7,4)

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RESISTÊNCIA A ANTIMICROBIANOS

Microrganismos isolados	% de resistência	
Gram positivo		
Staphylococcus aureus	MRSA – 73,7	
Enterococcus	VRE – 22,1	
Enterobacteriaceae	C3G-R	CARB-R
Escherichia coli	29,8	2,0
Klebsiella spp.	46,3	6,7
Enterobacter spp.	46,0	8,0
Proteus spp.	15,2	8,5
Citrobacter spp.	16,7	1,2
Serratia spp.	8,3	1,2
Gram negativo não fermentadores		
Pseudomonas aeruginosa	CARB-R :	27,5
Acinetobacter spp.	CARB-R :	84,5

INQUÉRITO DE PREVALÊNCIA DE INFEÇÃO ADQUIRIDA NO HOSPITAL E DO USO DE ANTIMICROBIANOS NOS HOSPITAIS PORTUGUESES 2012

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EARS-net *MRSA* no Sangue e LCR Evolução de 2003-2012

Cortesia Drª Elaine Pina

EARS-net *E.faecium* e *E. faecalis* Evolução das resistências 2003-2012

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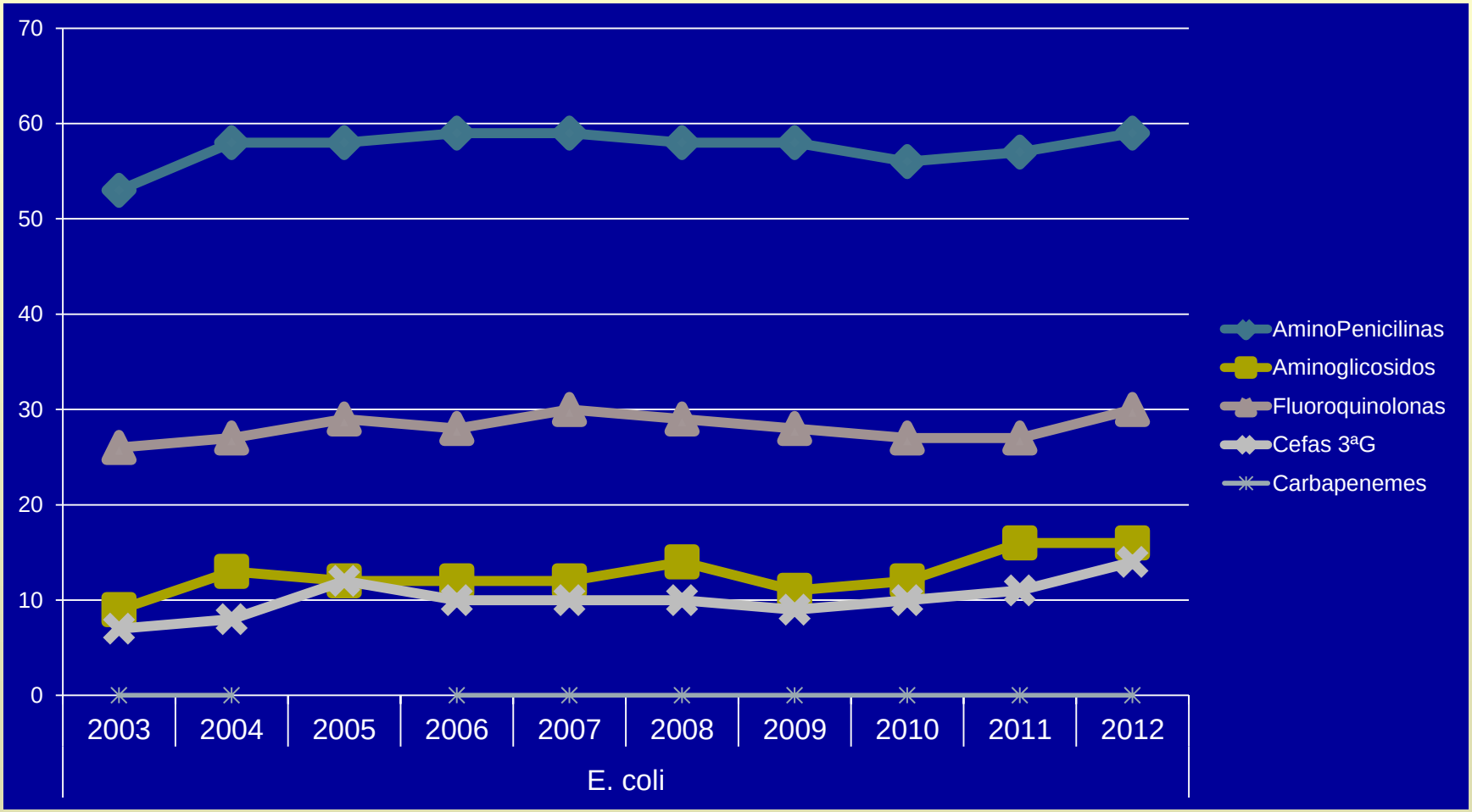
EARS-net – *E. coli*
Evolução das resistências 2003-2012



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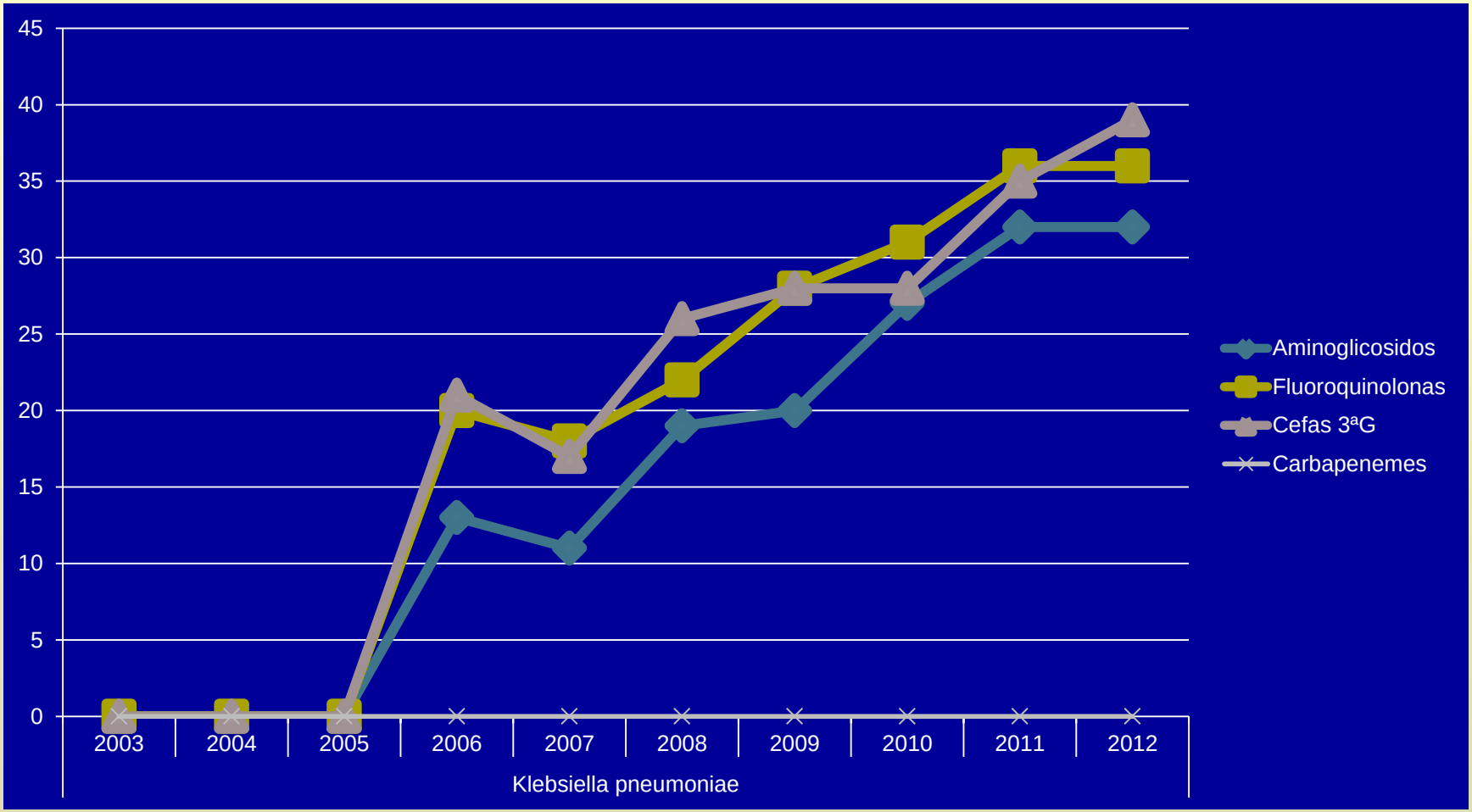
EARS-net *Klebsiella pneumoniae* Evolução das resistências 2003-2012



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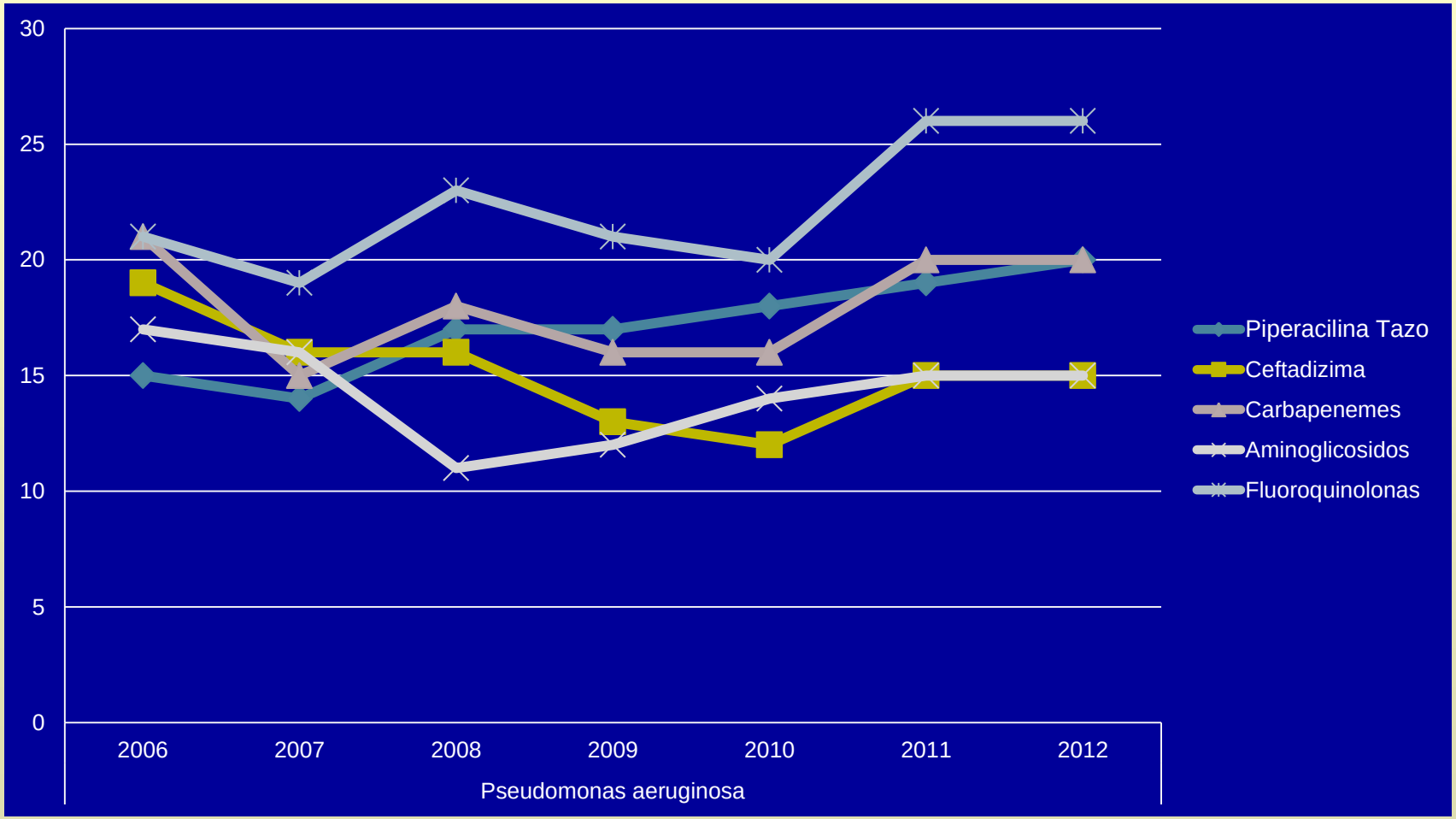
EARS-net – *Pseudomonas aeruginosa* Evolução das resistências 2003-2012



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Agentes epidémicos

- **A resistência implica alterações que traduzem perda de eficiência**
- **Estes determinantes e as bactérias co-evoluem: Se favorável há recuperação de fitness (mutação compensatória)**
- **Pode perpetuar a resistência na comunidade (mesmo sem uso de antibiótico)**

Ganho de *fitness* *(mutação compensatória)*

- Resistência aos desinfectantes
- Aderência à pele e mucosas
- Aumento de virulência

Prevenção da Infecção

IDENTIFICAÇÃO DO AGENTE

Desinfecção das mãos

Da pressão dos antibióticos

Cefalosporinas 3ª geração

Carbapenemes; Fluoroquinolonas

Uso de barreiras

isolamento

mais enfermeiras

Evitar esperas desnecessárias
(Listas de esperas)

- **Diminuição do aporte de inóculo;**

- **Diminuição do tempo de exposição ao risco infeccioso em locais susceptíveis do hospedeiro (p. ex., controlando a duração ou a realização de cirurgias, cateterizações, intubações traqueais, drenagens, etc.).**

Infection and Risk

URINARY TRACT 34%

Urinary catheter
Urinary invasive procedures
Advanced age
Severe underlying disease
Urolitiasis
Pregnancy
Diabetes

13% LOWER RESPIRATORY TRACT

Mechanical ventilation
Aspiration
Nasogastric tube
Central nervous system depressants
Antibiotics and anti-acids
Prolonged health-care facilities stay
alnutrition
vanced age
rgery
munodeficiency

LACK OF HAND HYGIENE

Most common sites of health care-associated infection and the risk factors [illegible] occurrence of

SURGICAL SITE

Inadequate antibiotic prophylaxis
Incorrect surgical skin preparation
Inappropriate wound care
Surgical intervention duration
Type of wound
Poor surgical asepsis
Diabetes
Nutritional state
Immunodeficiency
Lack of training and supervision

BLOOD

cular catheter
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invasive technologies
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Infection and Risk

Most common sites of health care-associated infection and the risk factors underlying the occurrence of infections

URINARY TRACT
34%

Urinary catheter
Urinary invasive procedures
Advanced age
Severe underlying disease
Urolitiasis
Pregnancy
Diabetes

LOWER RESPIRATORY TRACT
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SURGICAL SITE

Inadequate antibiotic prophylaxis
Incorrect surgical skin preparation
Inappropriate wound care
Surgical intervention duration
Type of wound
Poor surgical asepsis
Diabetes
Nutritional state
Immunodeficiency
Lack of training and supervision

BLOOD

Vascular catheter
Neonatal age
Critical care
Severe underlying disease
Neutropenia
Immunodeficiency
New invasive technologies
Lack of training and supervision

Distribuição da prevalência das infeções hospitalares por localização (2012)

- N=18.258

INQUÉRITO DE PREVALÊNCIA DE INFEÇÃO ADQUIRIDA NO HOSPITAL E DO USO DE ANTIMICROBIANOS NOS HOSPITAIS PORTUGUESES 2012

Localização das IH	% Doentes com Infeção (IC 95%)	% do total de IH	Confirmação Microbiológica
Vias respiratórias inf.	**3,4%** (3,1 – 3,8)	**29,3%**	**38,5%**
Vias urinárias	**2,4%** (2,2 – 2,7)	**21,1%**	**73,9%**
Local cirúrgico	**2,1%** (1,9 – 2,3)	**18%**	52,8%
Corrente sanguínea	0,9% (0,8 – 1,1)	8,1%	98,8%
Gastrintestinal	0,7% (0,6 – 0,8)	5,9%	58,5%
Pele e Tec. Moles	0,6% (0,5 – 0,7)	5%	-
Outras infeções	1,5%	12,5%	-
Total	**10,6% (10,1 – 11,0)**	**100%**	**-**

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Ventilator Associated Pneumonia

- Evaluation of the head of the bed to between 30º-45º
- Daily sedative interruption and daily assessment of readiness to extubate
- Peptic ulcer disease prophylaxis
- Deep venous thrombosis prophylaxis if not contraindicated

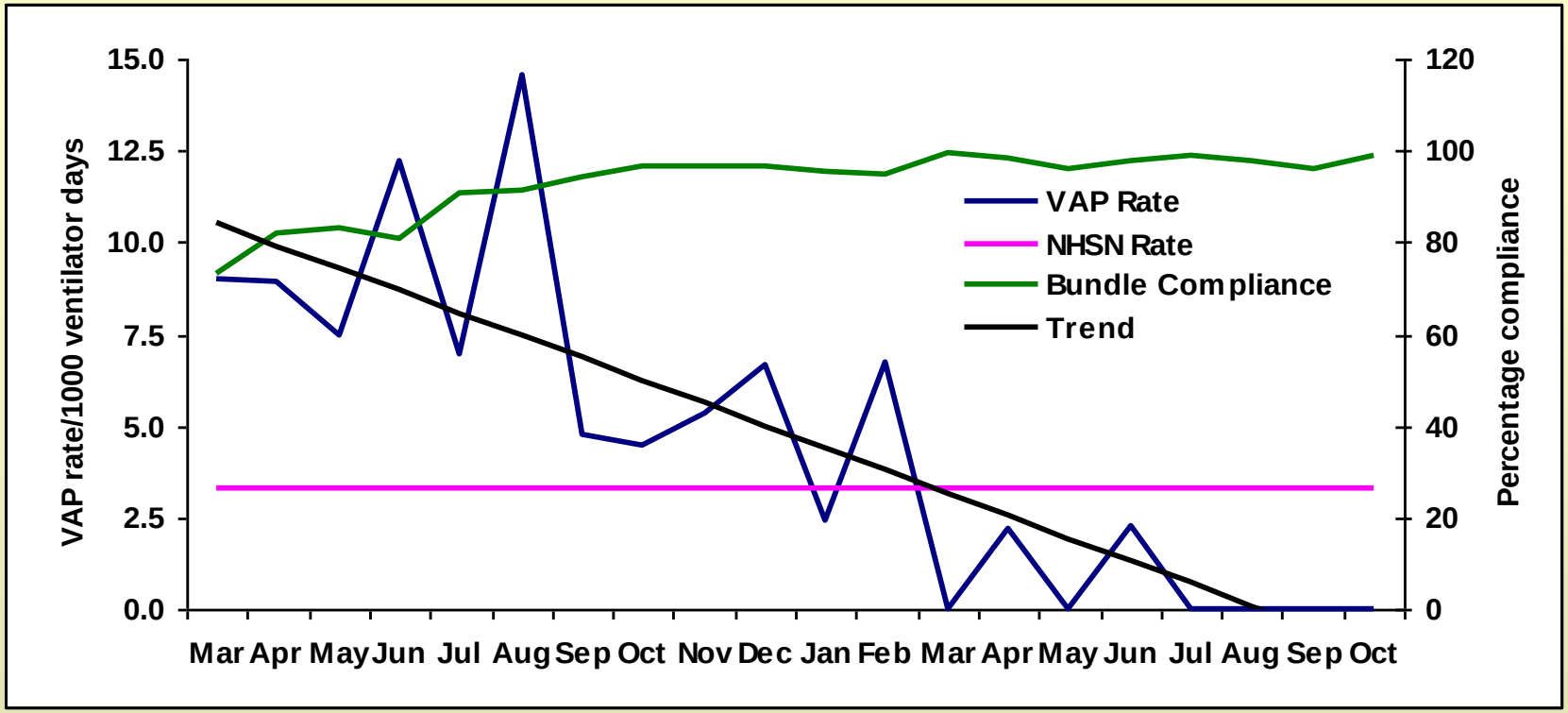
Crookshanks H. et al 2008

Bundle approach

44.5% reduction in VAP

Reser R *Jt Comm J Qual Patient Saf.*2005;31:243.

Ventilator Associated Pneumonia



March 2007 – VAP rate 8.99 per 1000 ventilator days & the VAP care bundle compliance was 72%

October 2008 – VAP rate was 0 per 1000 ventilator days and VAP care bundle compliance was 95%

Crookshanks H et al 2008

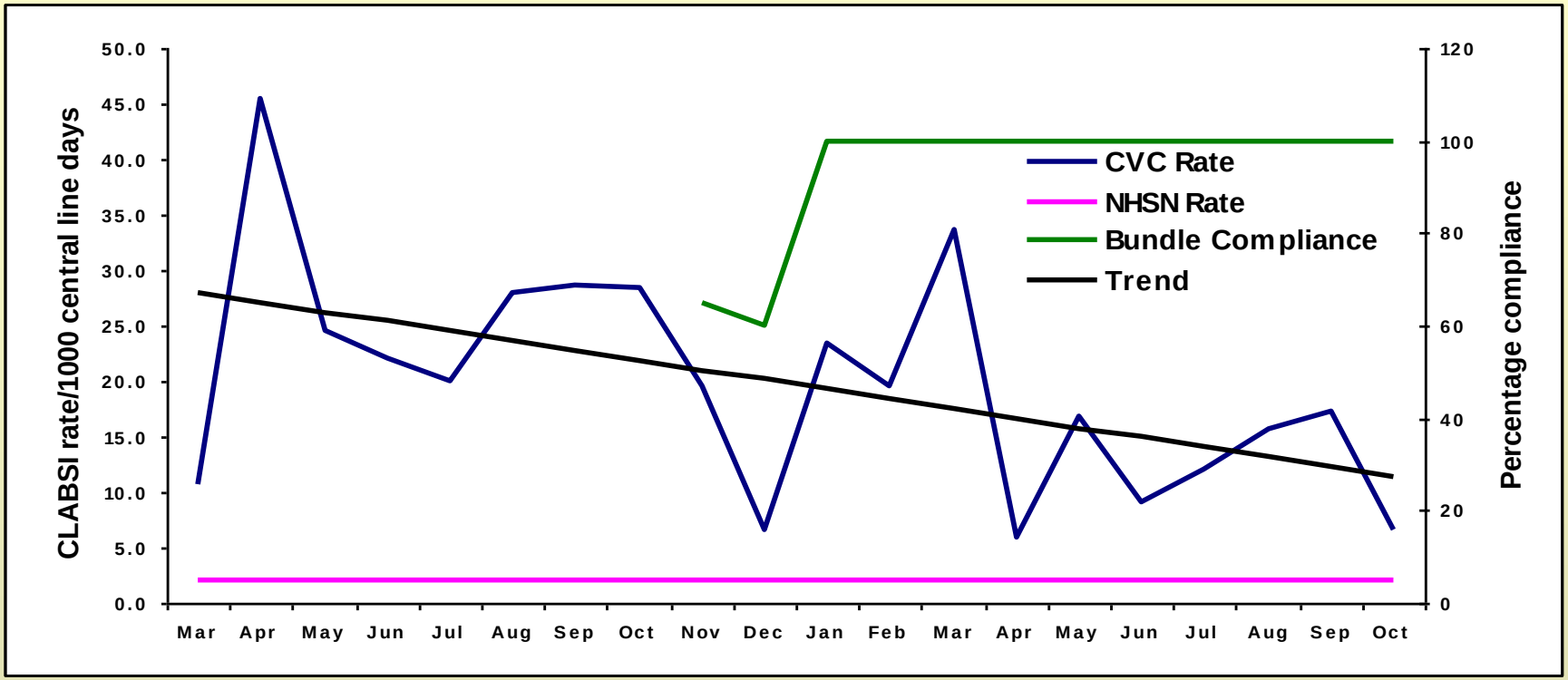
Infection Care Bundles

- Pronovost developed the 1st Care Bundle – insertion and management of CVC's in Michigan

- **Checklist for insertion and management of CVC's**
  - to ensure that key interventions recommended by the CDC 2002 guidelines were implemented every time a CVC was inserted

- **Hand decontamination pre insertion**
- **Full sterile barrier precautions (operator & patient)**
- **2% chlorhexidine for skin disinfectant**
- **Avoiding use of femoral site**
- **Removing unnecessary catheters**

Blood stream infection (CRBSI)



March 2007 – CRBSI rate 10.75 per 1000 catheter days

October 2008 – CRBSI rate was 6.5 per 1000 catheters days and CVC care bundle compliance was 95%

Crookshanks H et al 2008

Urinary Catheter

Insertion

- **Insert only for specific reasons**
  - Urinary output in critical ill
  - Bladder outlet obstruction or neurogenic bladder dysfunction
  - Prevent contamination of sacral wounds
  - Terminal care
- **Competent HCW to insert**
- **Aseptic technique**
- **Closed system with bag below bladder**

Management

Review need for catheter daily

Empty when ¾ full and use clean container for each patient

Secure catheter to leg/abdomen

Urine samples from sampling port only

Hand hygiene & PPE before and after any catheter care

Peripheral venous catheter

- ***Don't put them in***

- 32%- 66% of patients are estimated to have PVC's inserted
- Some inserted just in case
- Daily check to confirm that PVC is still necessary

- ***Look after them properly***

- Sterile dressing
- Hand Hygiene before all contact with PVCs
- At a minimum check daily for inflammation

- ***Get them out***

- Remove after 72 hours or clinical decision to leave in if no signs of inflammation

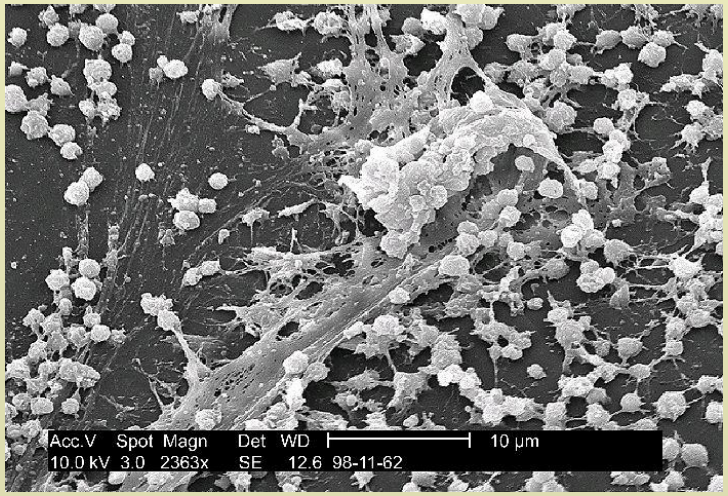
Biofilmes

>99% microbes live in a biofilm

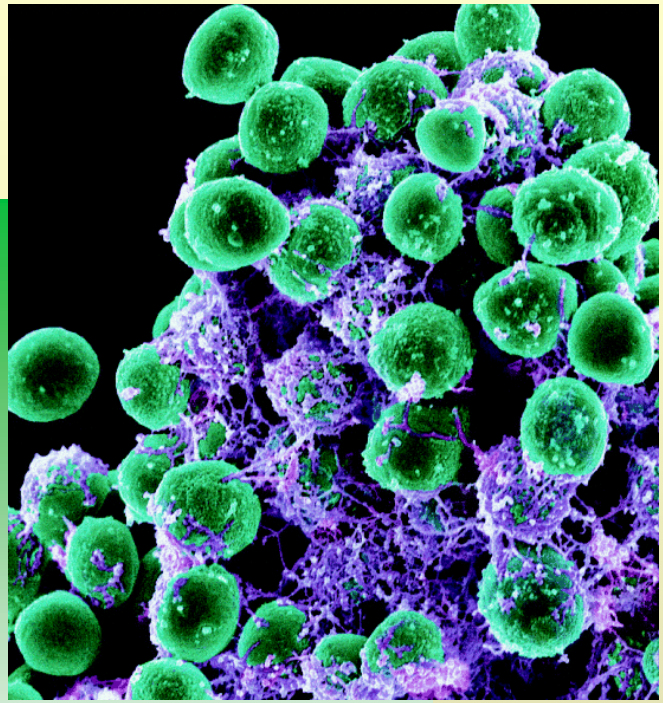
- Whereas conventional microbiology has concentrated on planktonic organisms

- Planktonic
  - From Greek ‘wandering’
  - Free floating form

- Sessile
  - From Latin ‘sitting’
  - Fixed to a site (usually an organic/ inorganic surface)



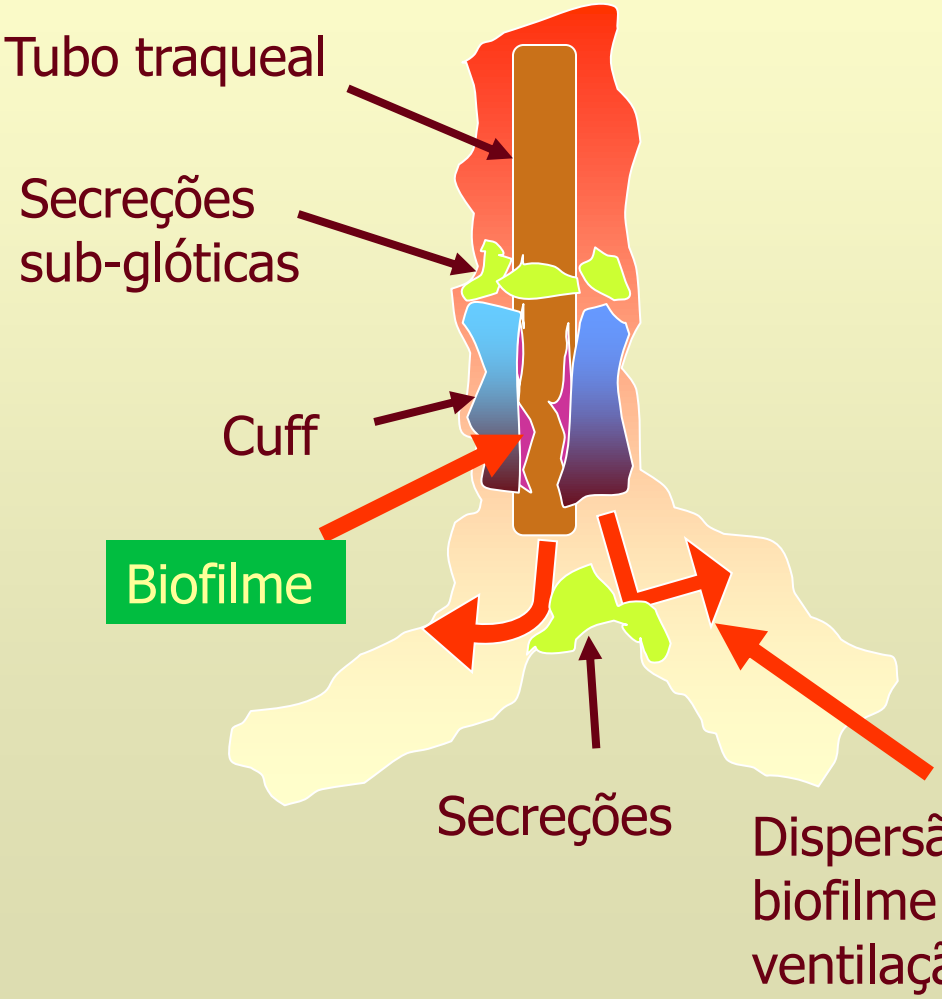
Implicações clínicas dos Biofilmes

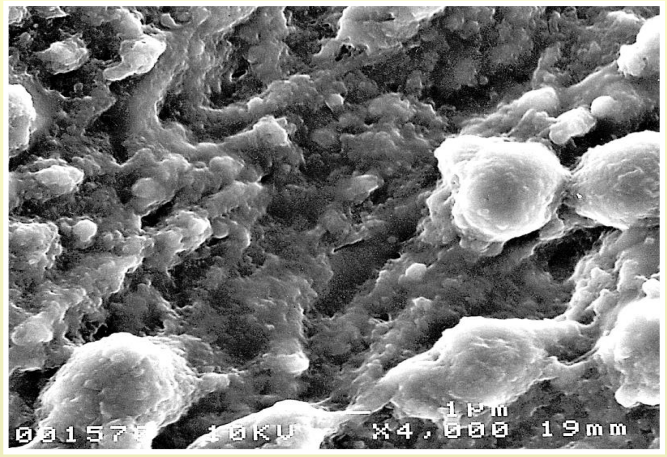


- A maioria das infecções nosocomiais estão associadas a dispositivos médicos invasivos

- 97% ITU - algália
- 87% bacteriémia – Catéter venoso central
- 83% pneumonia – Tubo traqueal

Mecanismos de colonização

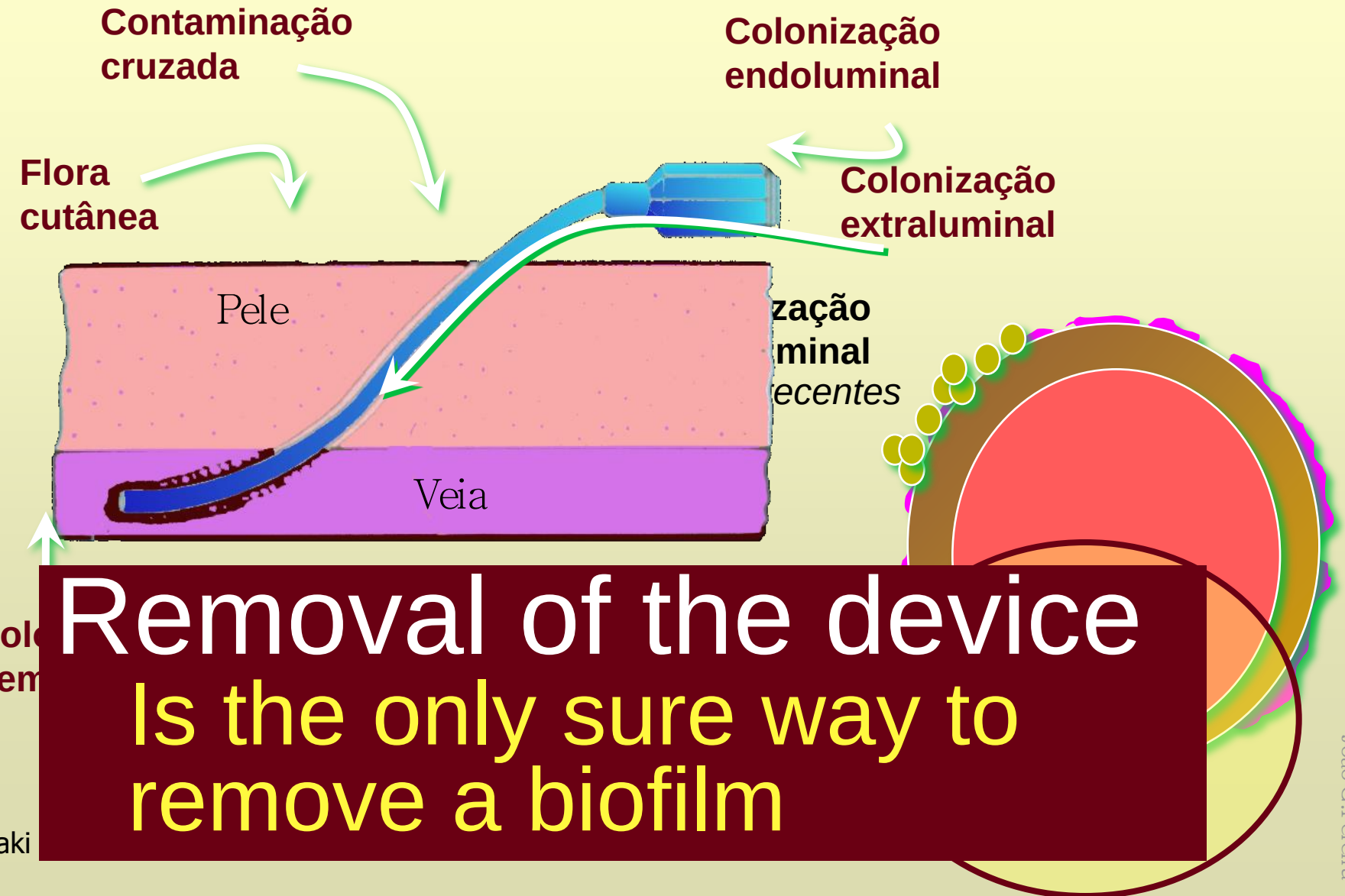




Superfície dum tubo endotraqueal removido dum doente de UCI

"In vivo" incluem muco, restos celulares do hospedeiro e bacterianos

Mecanismos de colonização



Removal of the device

Is the only sure way to remove a biofilm

Maki

João G.Pereira

What is a Biofilm?

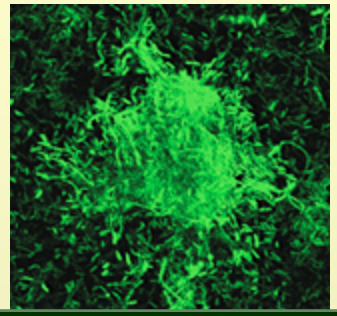
- Structured, co-operative microbial community embedded in an extracellular matrix, usually attached to a surface

- Different species may be competing or co-operating

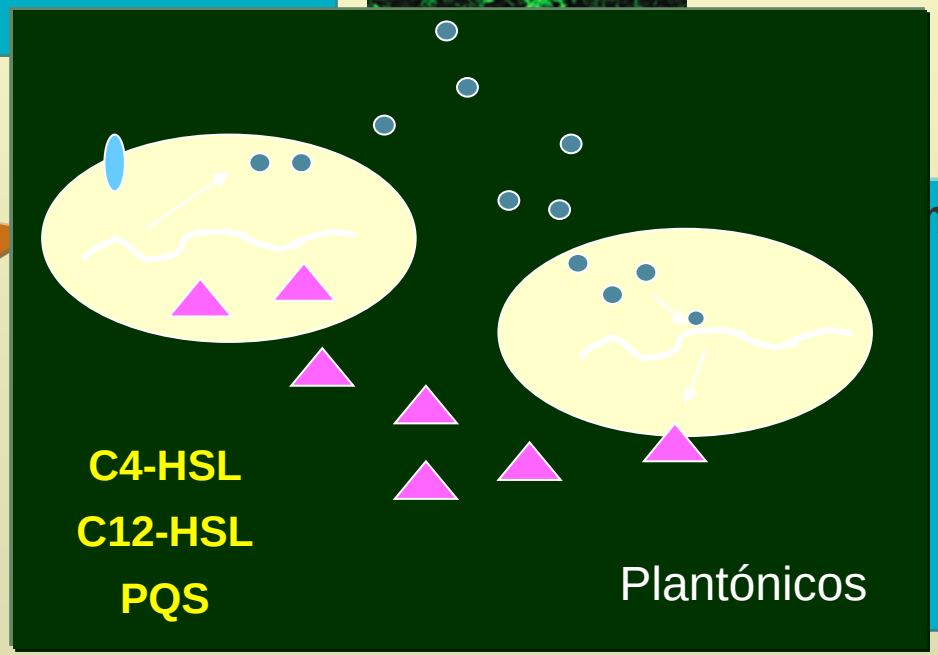
•Free-floating (planktonic) cells attach to become sessile
•Biofilm organisms usually express a different phenotype

Colonização: *Quorum sensing*

As bactérias podem parecer relativamente inócuas enquanto se multiplicam



Moléculas de sinalização



- Self / não Self
- Número

☞ **Factores de virulência**

☞ **especialização celular**

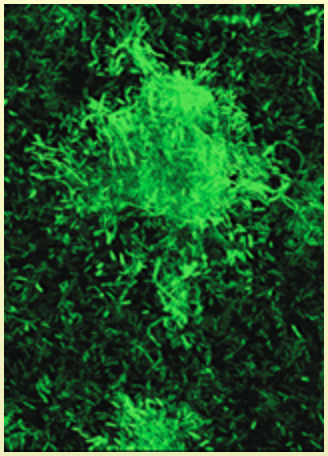
☞ **Biofilmes**

Necessita meios em que esses mediadores de auto-indução não sejam eliminados - Superfície com materiais orgânicos e inorgânicos

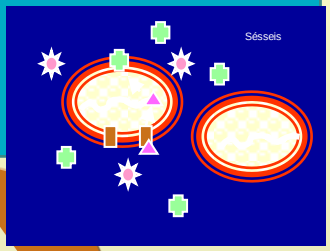
João G.Pereira

Colonização: *Quorum sensing*

As bactérias podem parecer relativamente inócuas enquanto se multiplicam



Estas alterações culminam no aparecimento das infecções



Moléculas de sinalização

- Self / não Self
- Número

Quando o seu número ultrapassa um determinado limiar (“*quorum*”) ocorrem mudanças no seu

- Comportamento
- Aparência
- Metabolismo

☞ **Factores de virulência**

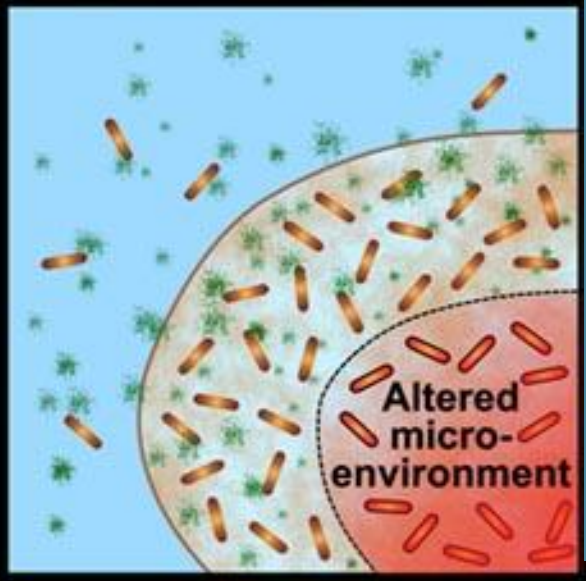
☞**especialização celular**

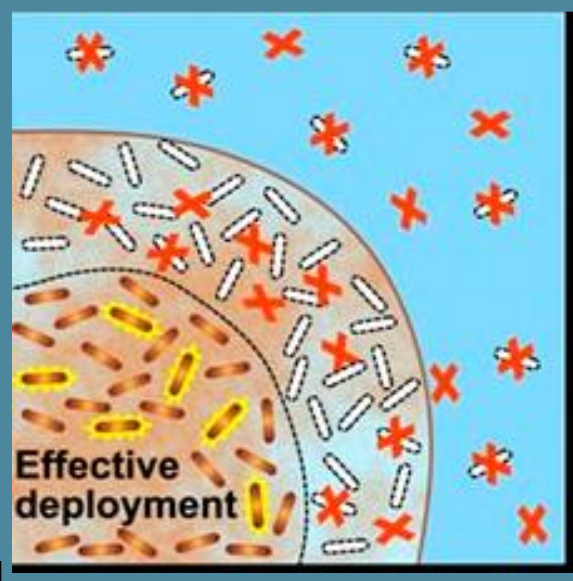
☞ **Biofilmes**

Necessita meios em que esses mediadores de auto-indução não sejam eliminados - Superfície com materiais orgânicos e inorgânicos

Biofilm multicellularity results in better bacterial defenses

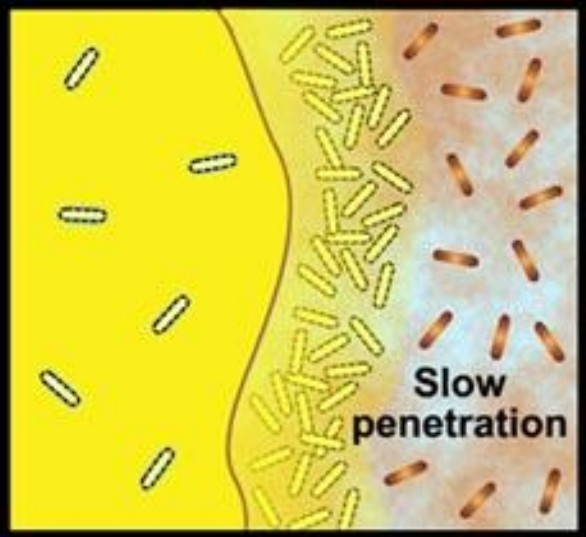
Nutrient depletion creates zones of altered activity.

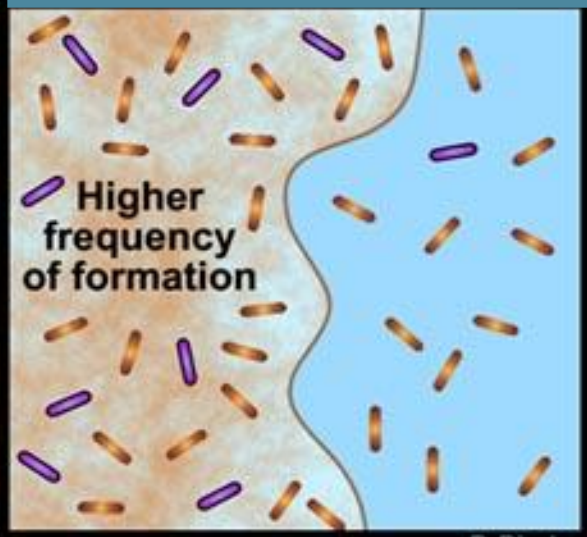




Inner layers of biofilm cells have more time to initiate stress response.

Outer layers of biofilm cells absorb damage.





"Persister" cells may be present in higher numbers.

P. Dirckx

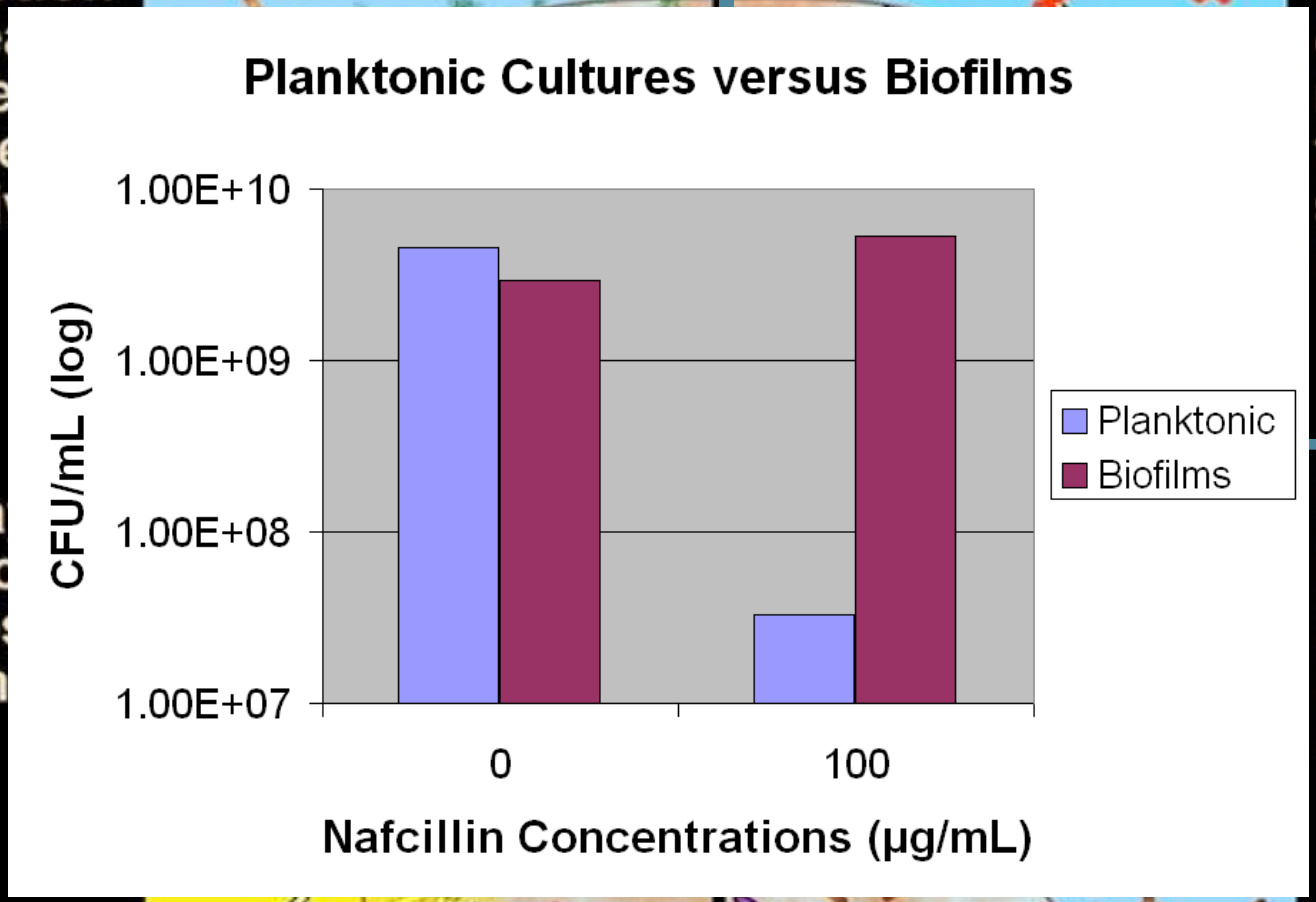
Biofilm multicellularity results in better bacterial defenses

Nutrient depletion cre zone alte acti

Inner layers of biofilm cells have more time to initiate stress response.

Outer la of bio cells abs dam

"Persister" cells may be present in higher numbers.



P. Dirckx

One size fits all?

Chromossome mediated resistance

↓

Clonal or oligoclonal epidemiology

↓

Infection control measures

Plasmid mediated resistance

↓

Policlonal epidemiology

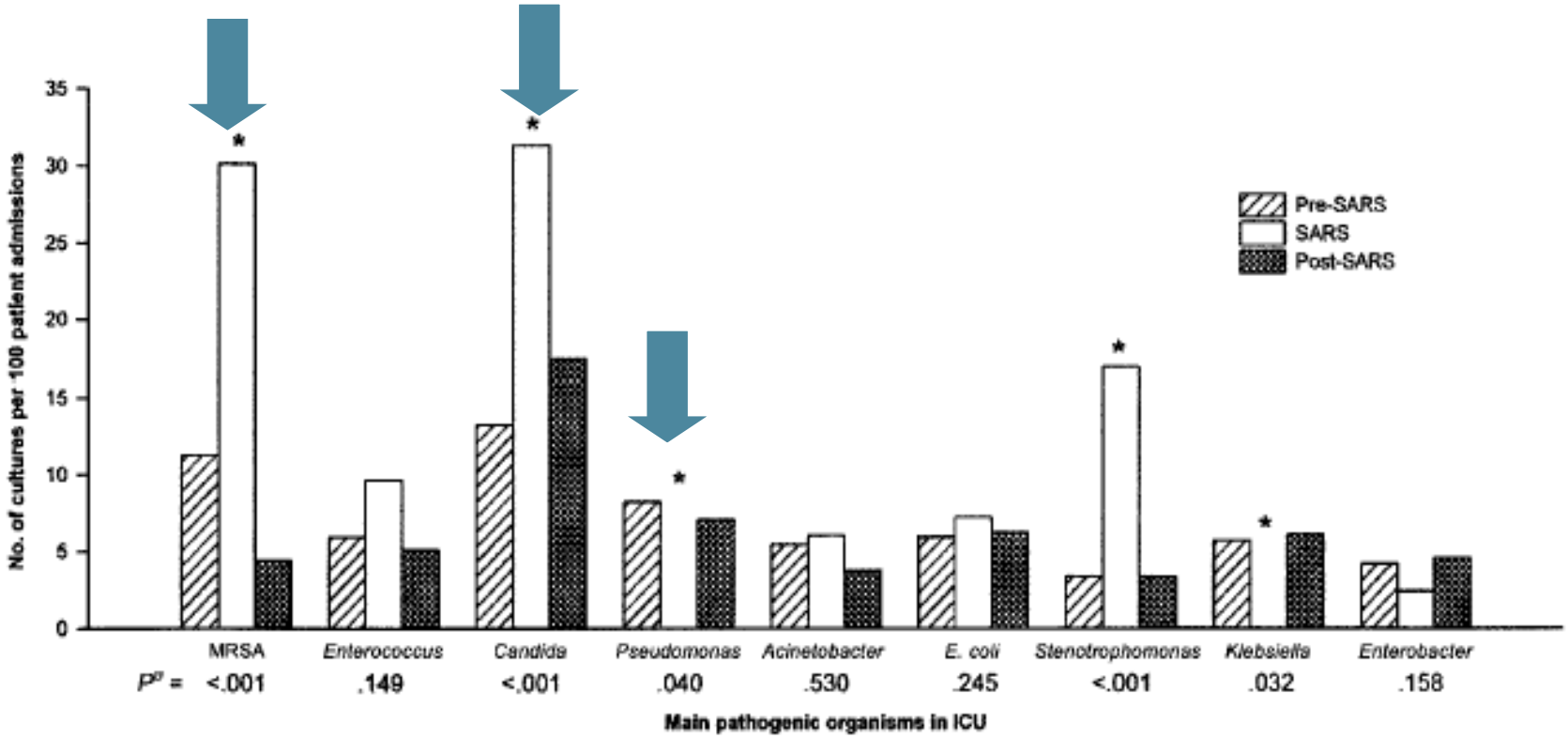
↓

Need for antibiotic policy (restriction) to achieve resistance control

Ahmad M et al. *Clin Infect Dis* 1999;29:352

Rigorous isolation – SARS epidemics

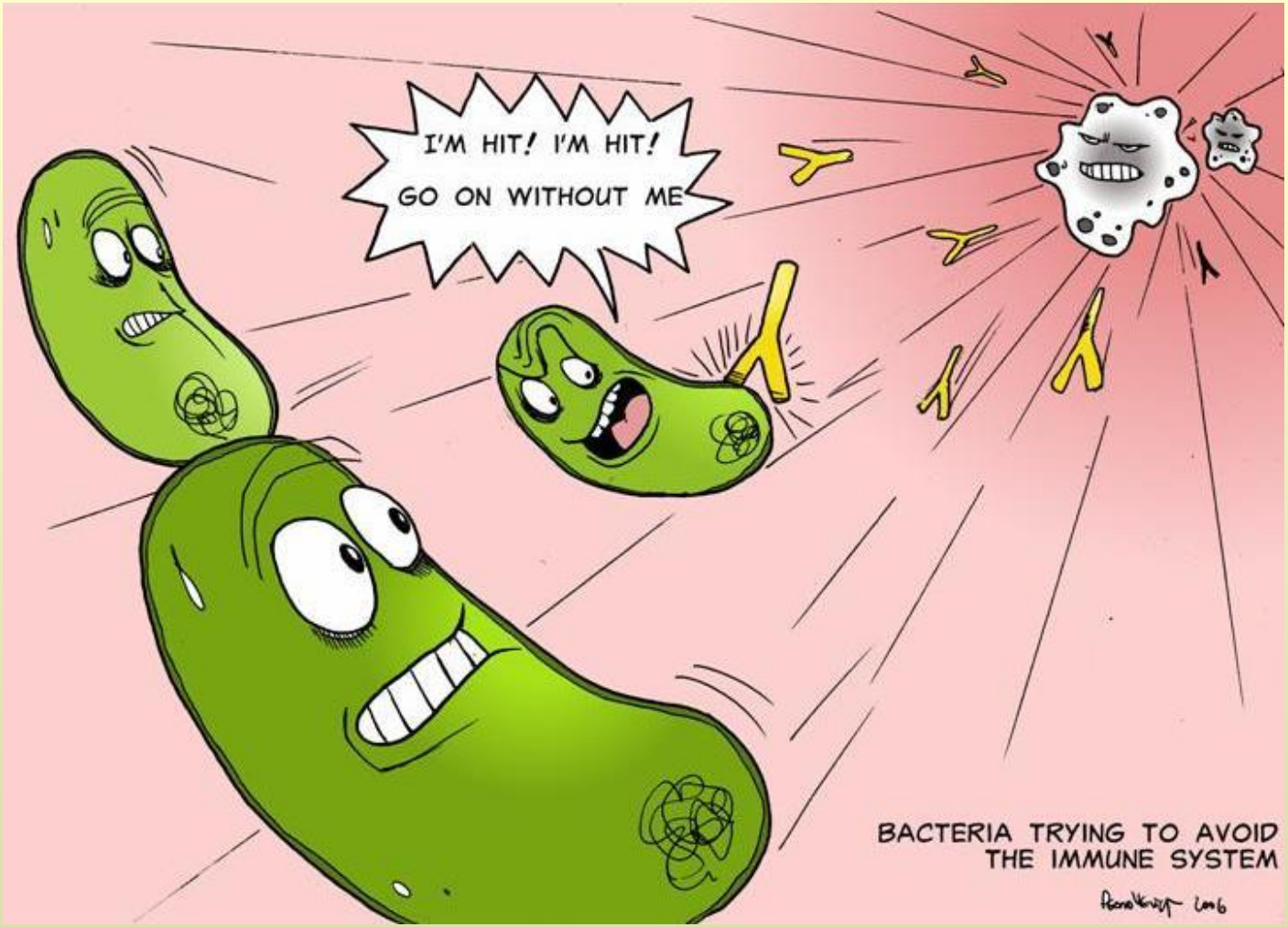
Epidemiological variation



Yap, Clin Infect Dis. 2004; 39:511

Hospital
Vila Franca de Xira

USO DE ANTIMICROBIANOS



Uso de Antimicrobianos (2012)

	Uso de AM	
	Portugal	UE
Homens	48,3%	39,2%
Mulheres	42,3%	32,7%
População global	45,4%	36,2%

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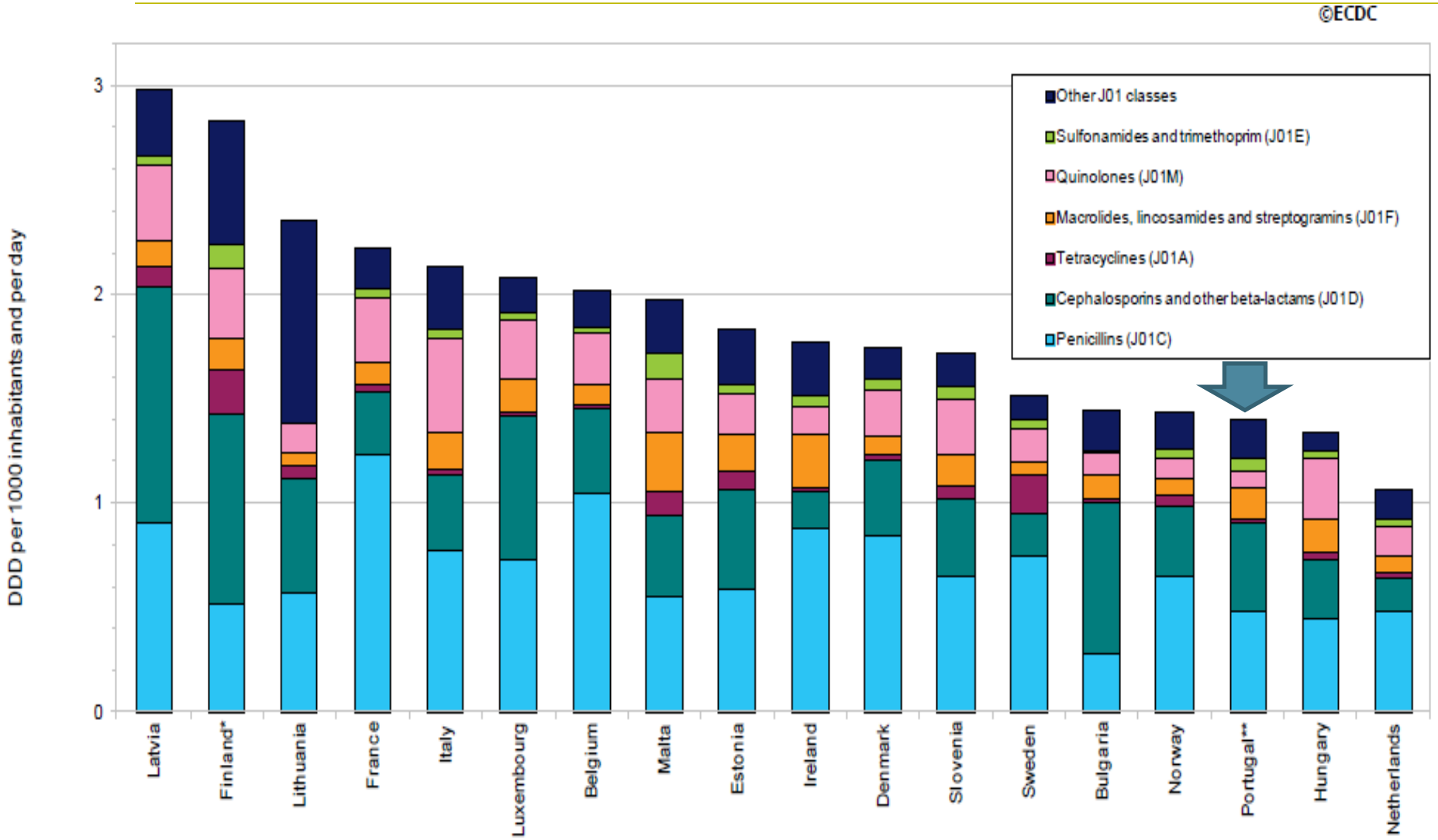
Consumo hospitalar de antimicrobianos 2010



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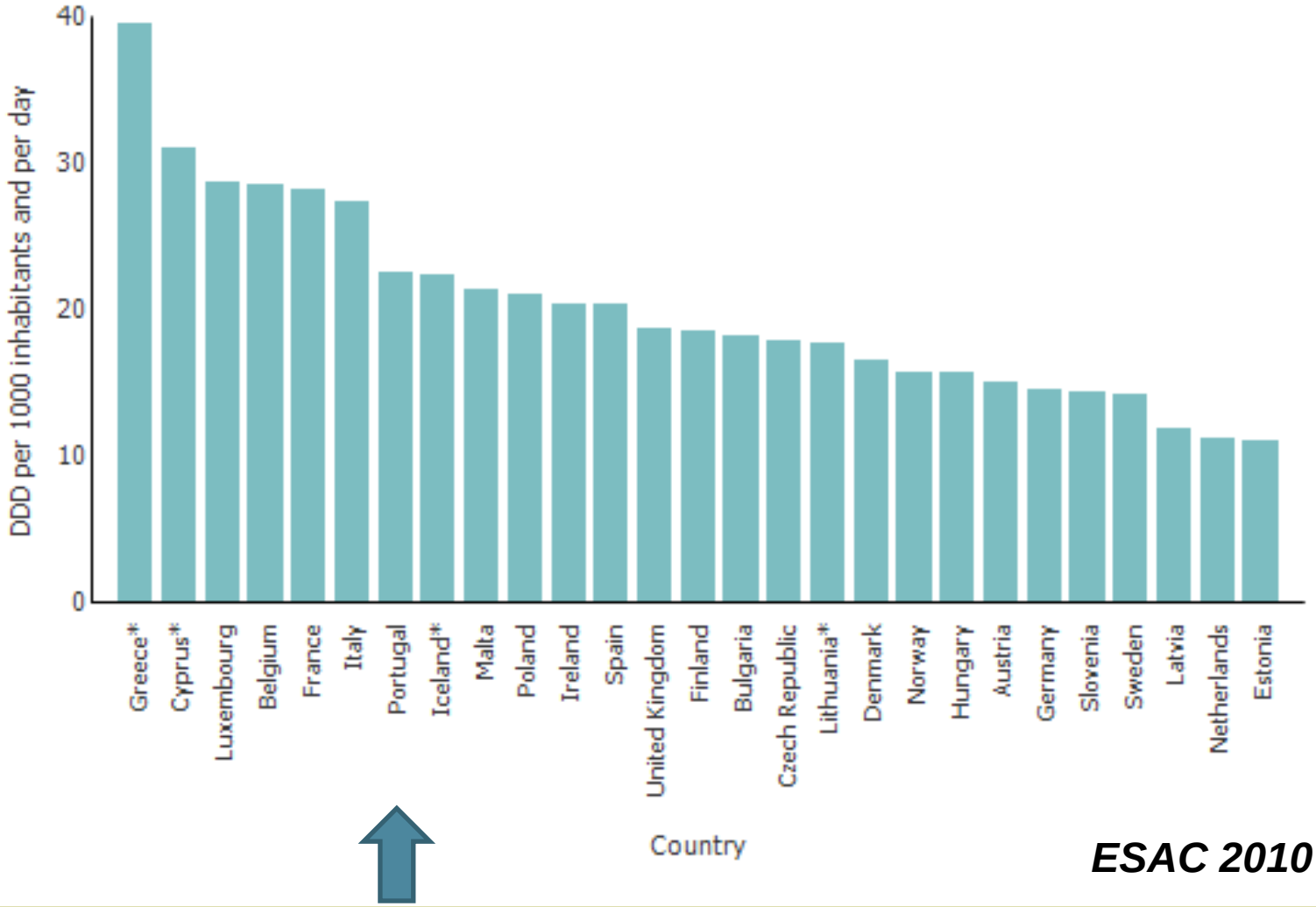
Consumo no ambulatório de antibióticos de uso sistémico



ESAC 2010

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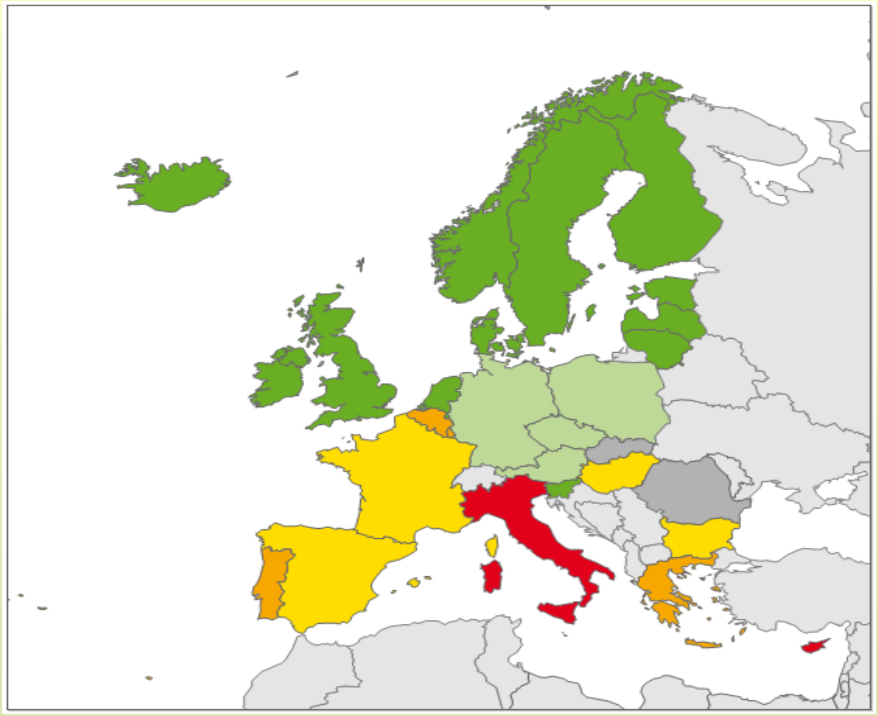
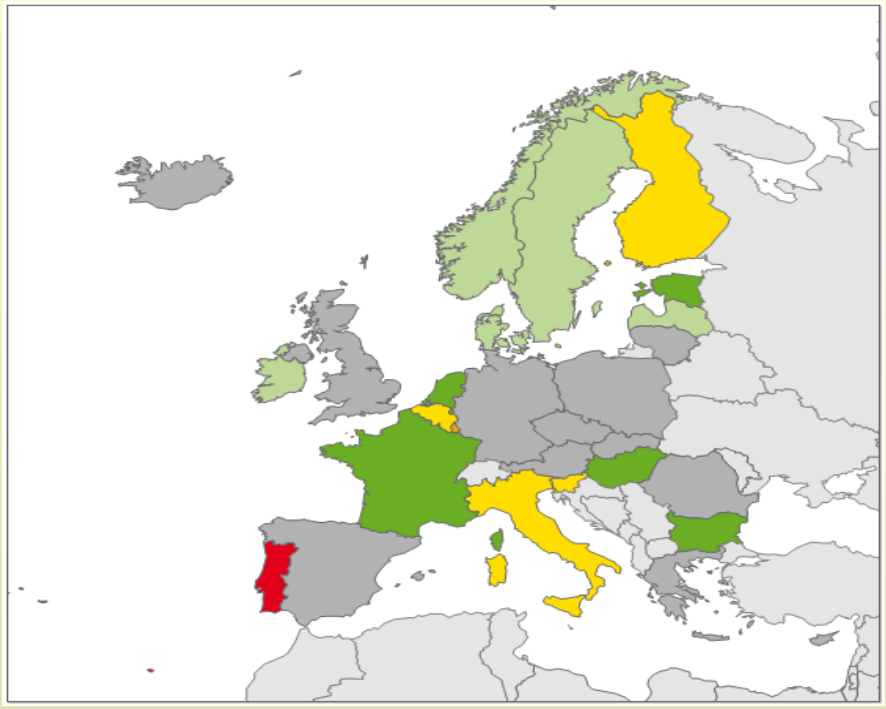
USO DE ANTIMICROBIANOS

Fluroquinolonas



Carbapenemes



ESAC 2010

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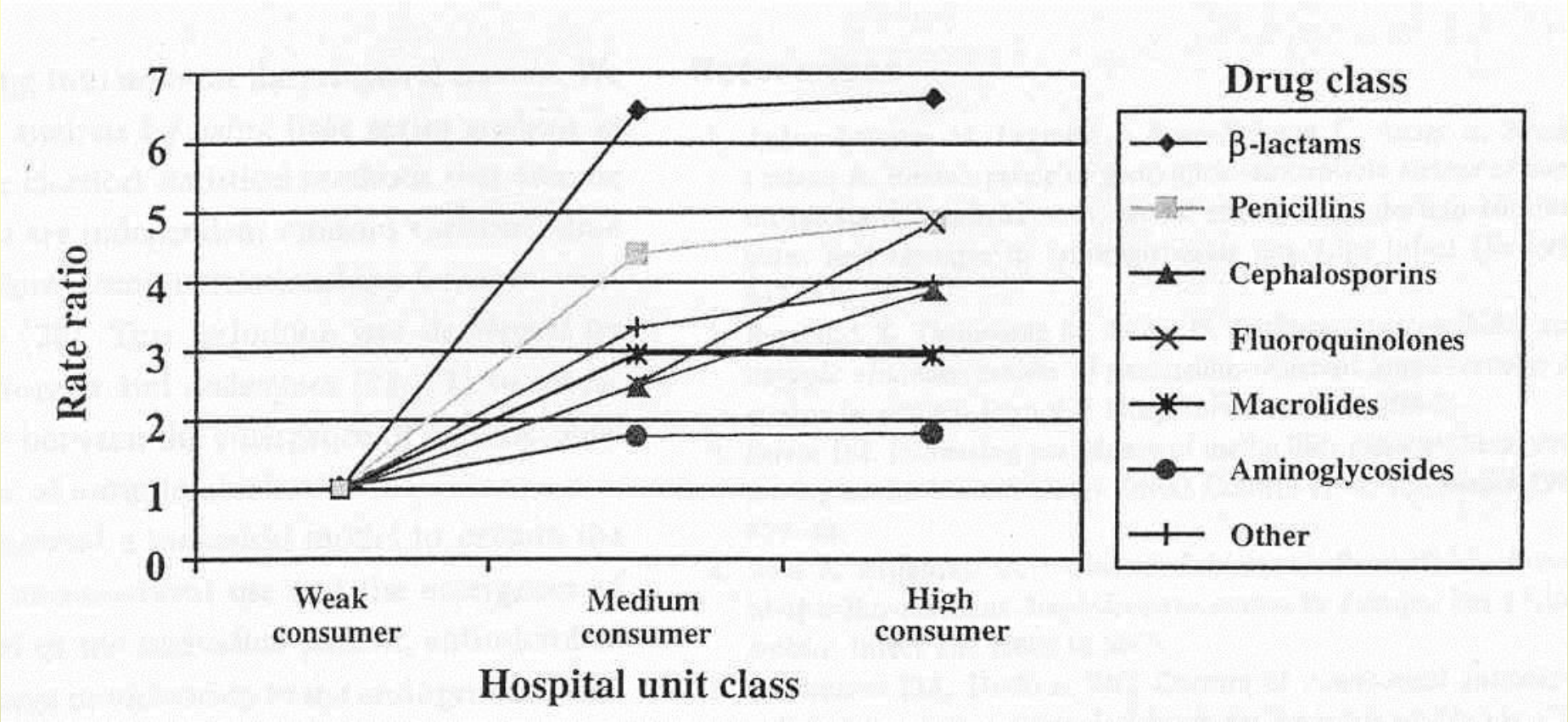
Antimicrobial Use and Antimicrobial Resistance

- Changes in antimicrobial use parallel changes in the prevalence of resistance
- Antimicrobial resistance is more prevalent in Health Care Associated Infections than in Community Acquired Infections
- Patients with HCAI caused by MR pathogens are more likely than controls to have received prior antibiotherapy
- Hospital areas with higher rates of antimicrobial resistance also have higher rates of antimicrobial use
- Increasing duration of patient exposure to antimicrobials increases the likelihood of colonization with MR Mo

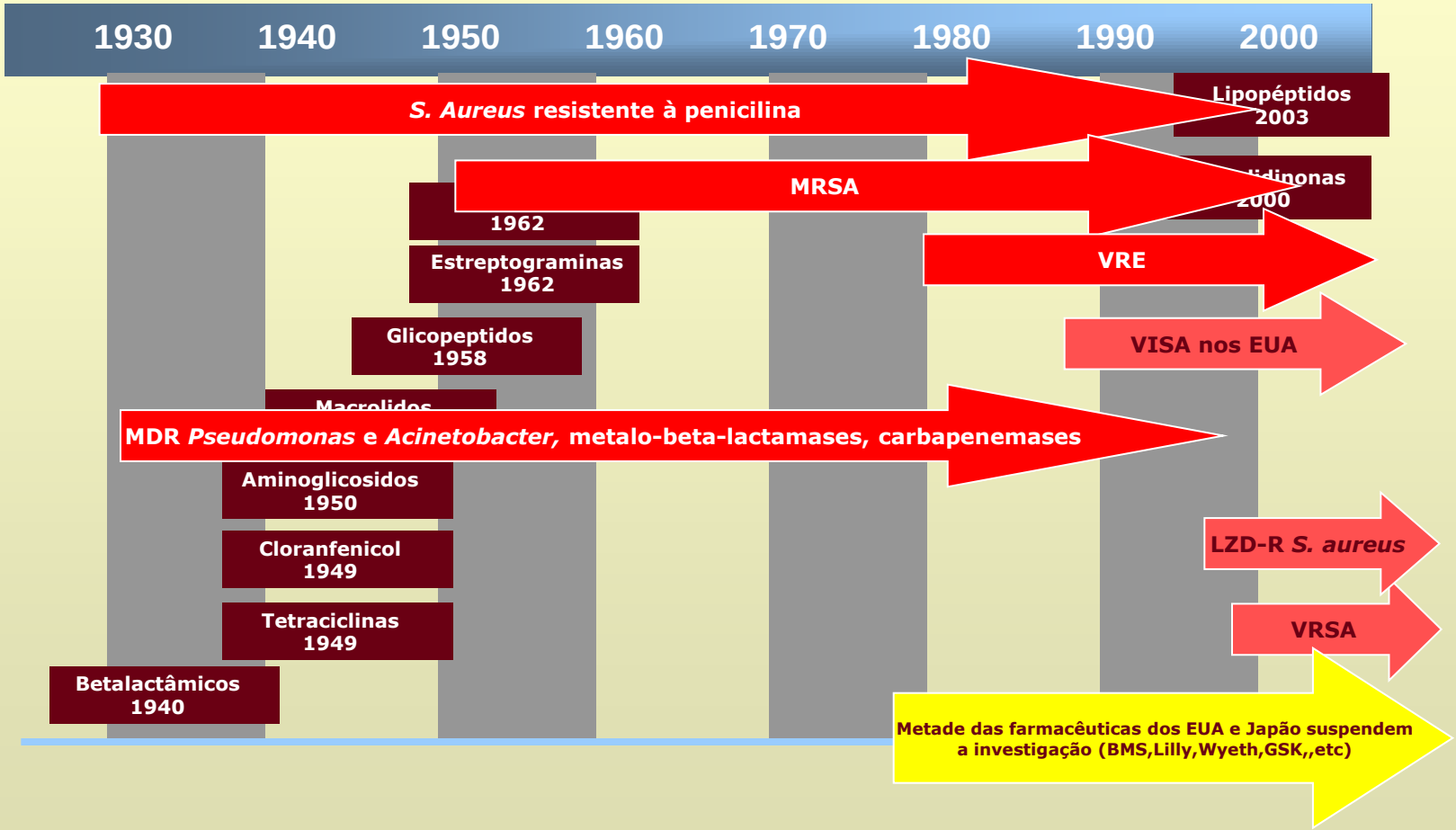
Spread of methicilin-resistant *Staph. aureus* and antimicrobial use



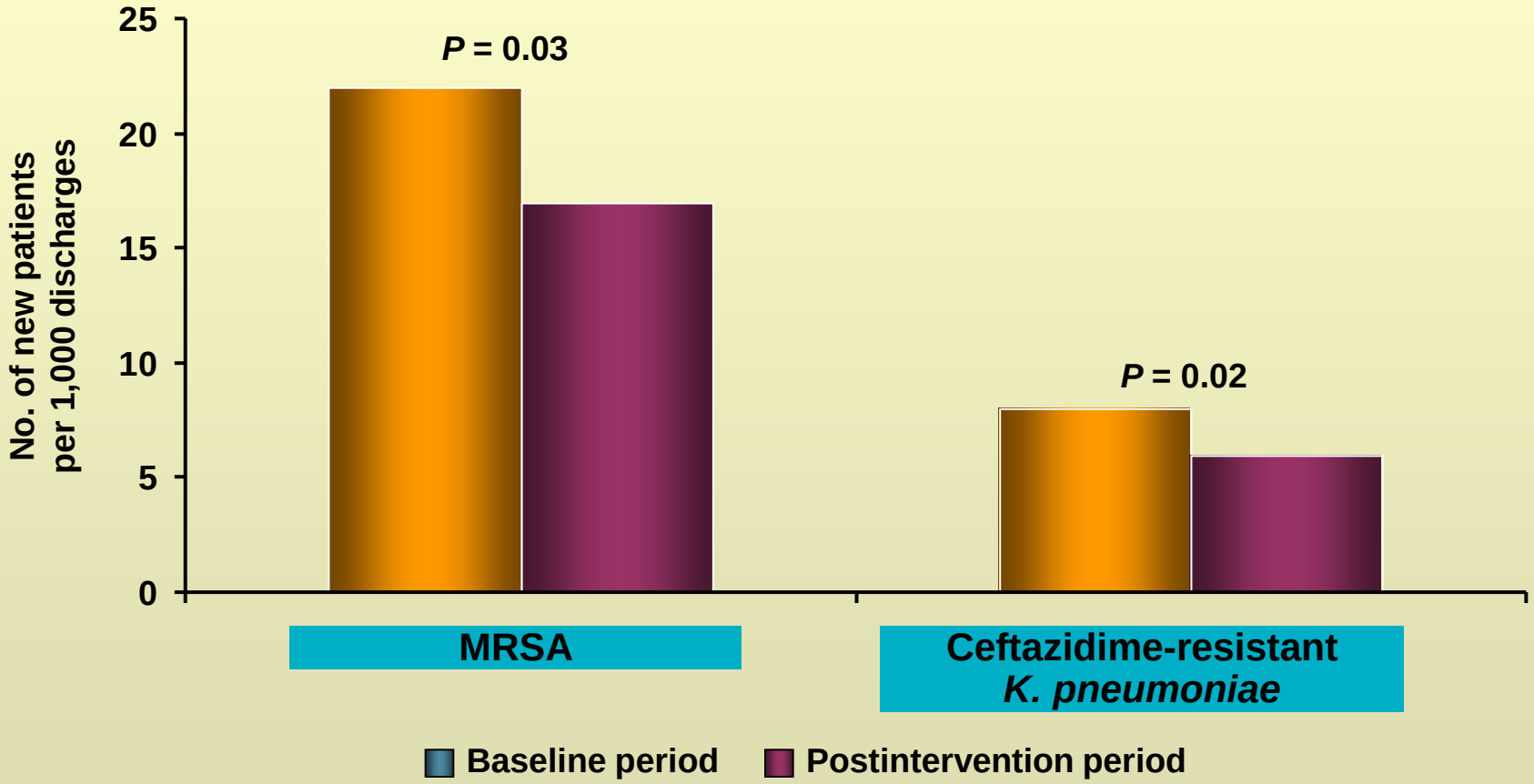
The use of all antimicrobials (fluoroquinolones $p < 0,001$) was associated with the incidence of acquisition of MRSA.

Muller, Clin Infect Dis 2003; 36 : 971

Desenvolvimento de antibióticos

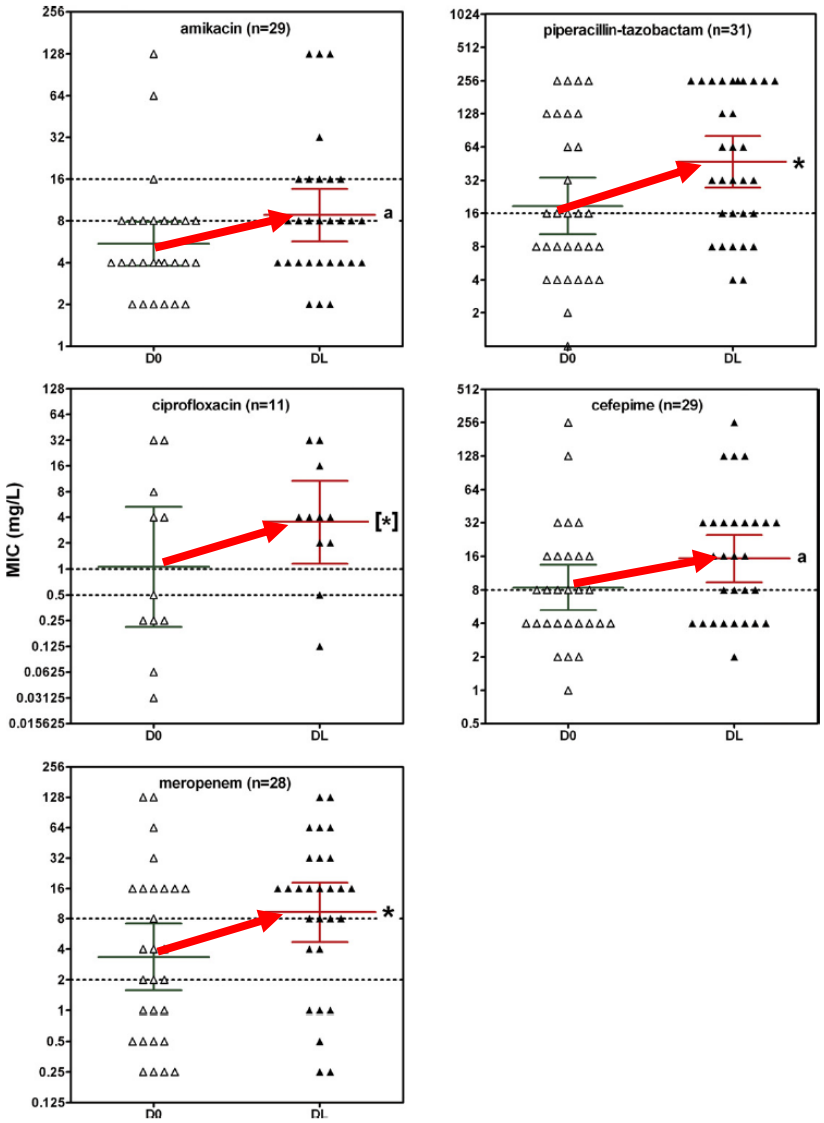


Impact of Formulary Changes on MRSA and Ceftazidime-Resistant *K. pneumoniae*



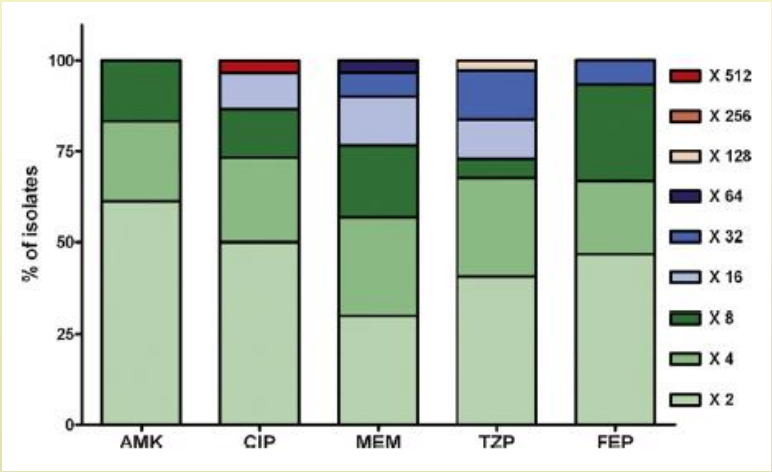
Landman D, et al. *Clin Infect Dis.* 1999;28:1062-1066.

Induction of Resistance



Bacteria previously exposed to an antibiotic

Increase in the MIC



Riou Int J Antimicrob Agents 2010; 36:513

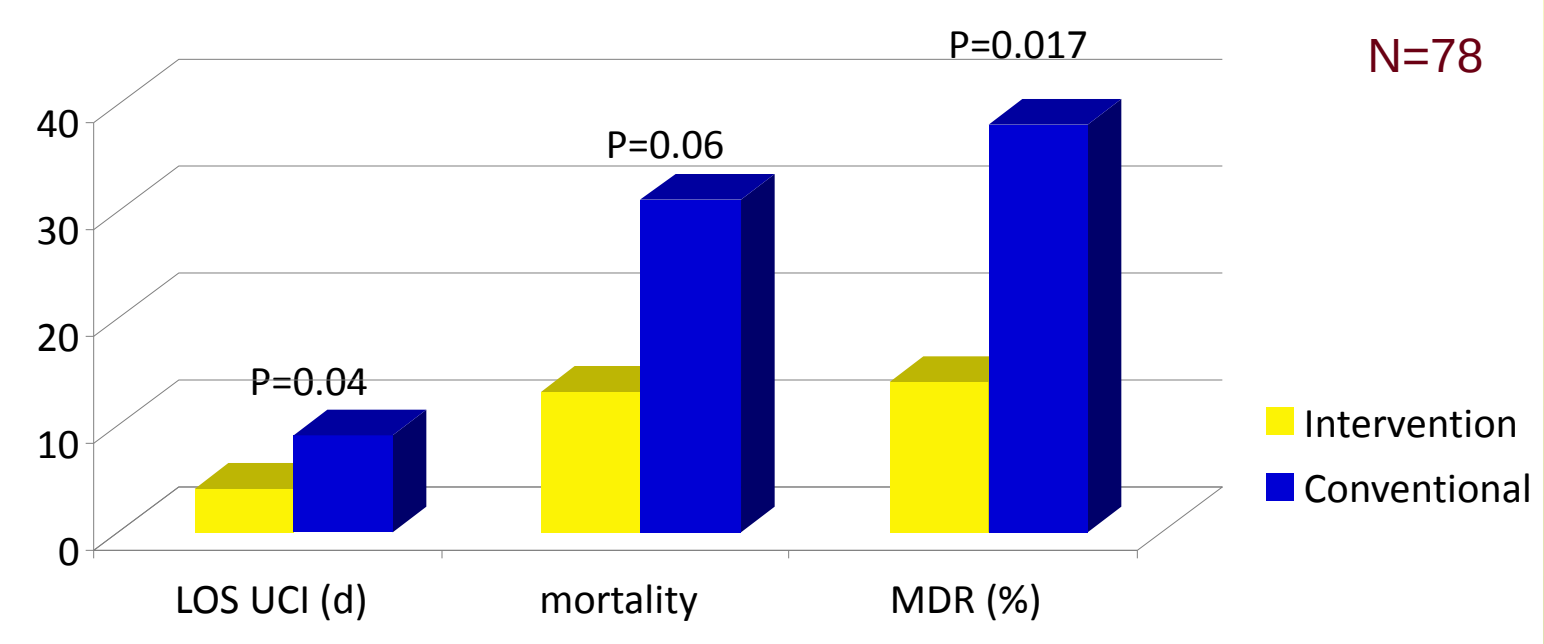
Short-course Empiric Antibiotic Therapy for Patients with Pulmonary Infiltrates in the Intensive Care Unit

A Proposed Solution for Indiscriminate Antibiotic Prescription

NINA SINGH, PAUL ROGERS, CHARLES W. ATWOOD, MARILYN M. WAGENER, and VICTOR L. YU

Low suspition of VAP (CPIS≤6)

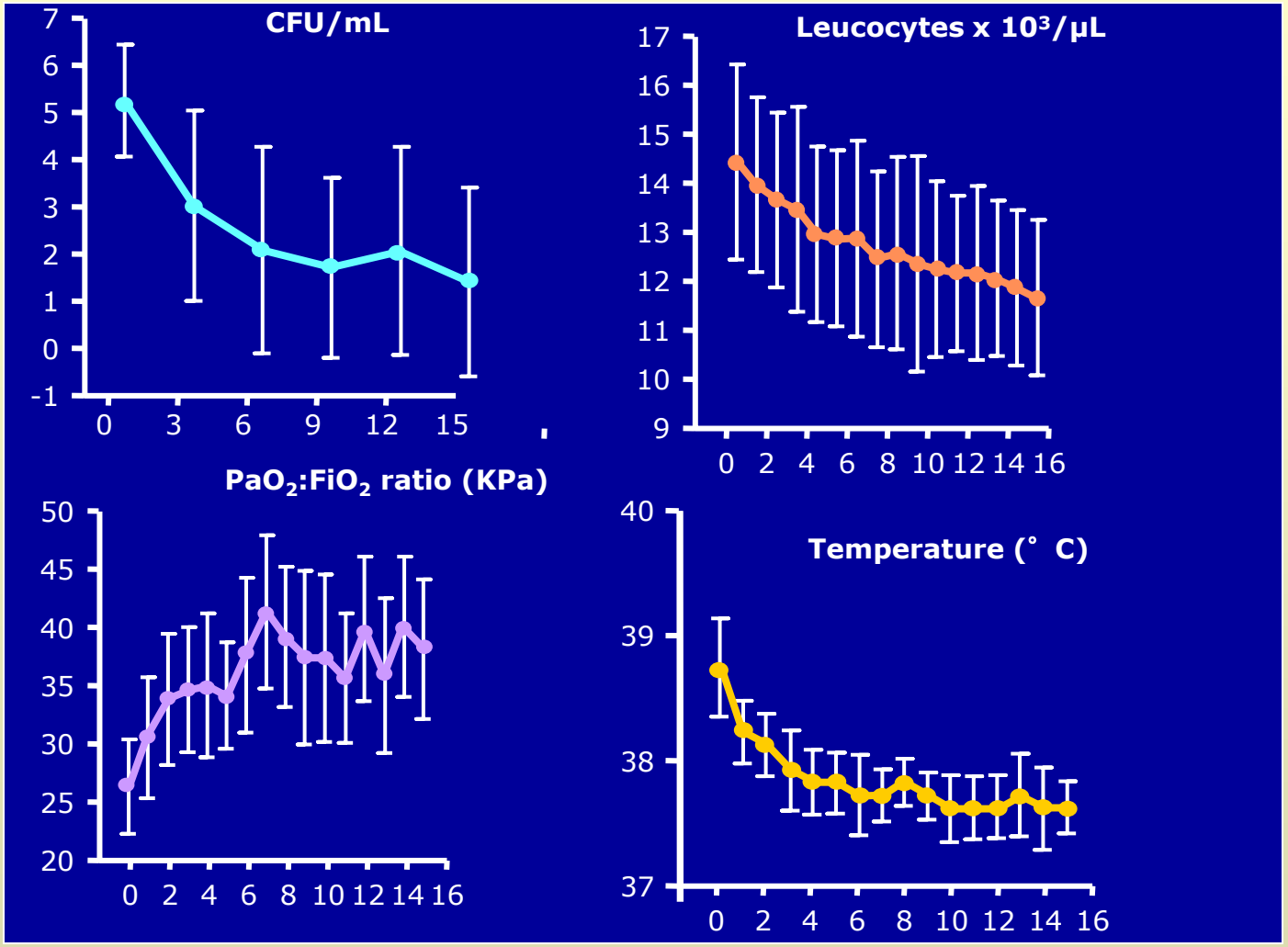
Antibiotics (median) intervention 3d vs. standard 9.8d



Superinfection 14% vs. 38% p=0.017

Singh AJRCCM 2000;162:505

Infection Resolution



Dennesen Am J Crit Care Med 2001;163:1371

Discontinuation of Antibiotics

Discontinuation policy:

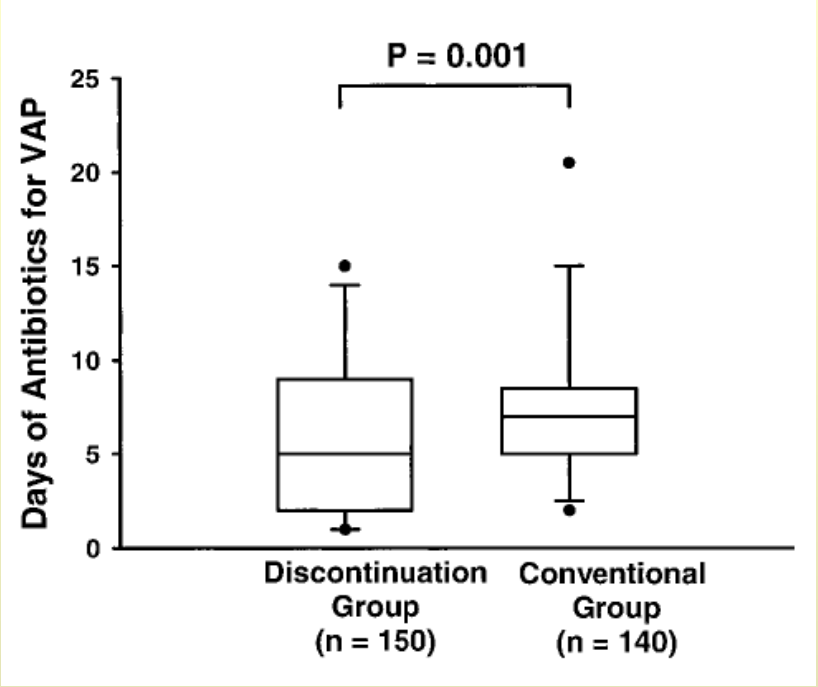
- ✓ Initial administration of adequate antibiotic treatment

  or

- ✓ Noninfectious etiology for the infiltrates

  and

- ✓ Signs and symptoms suggesting active infection had resolves



Hospital Mortality	32%	vs. 37.1%	(p=0.357)
Lenght of stay (H)	15.7	vs. 15.4	(p=0.865)
Subsequent infection	37.3%	vs. 46%	(p=0.425)

Micek Chest 2004;125:1791

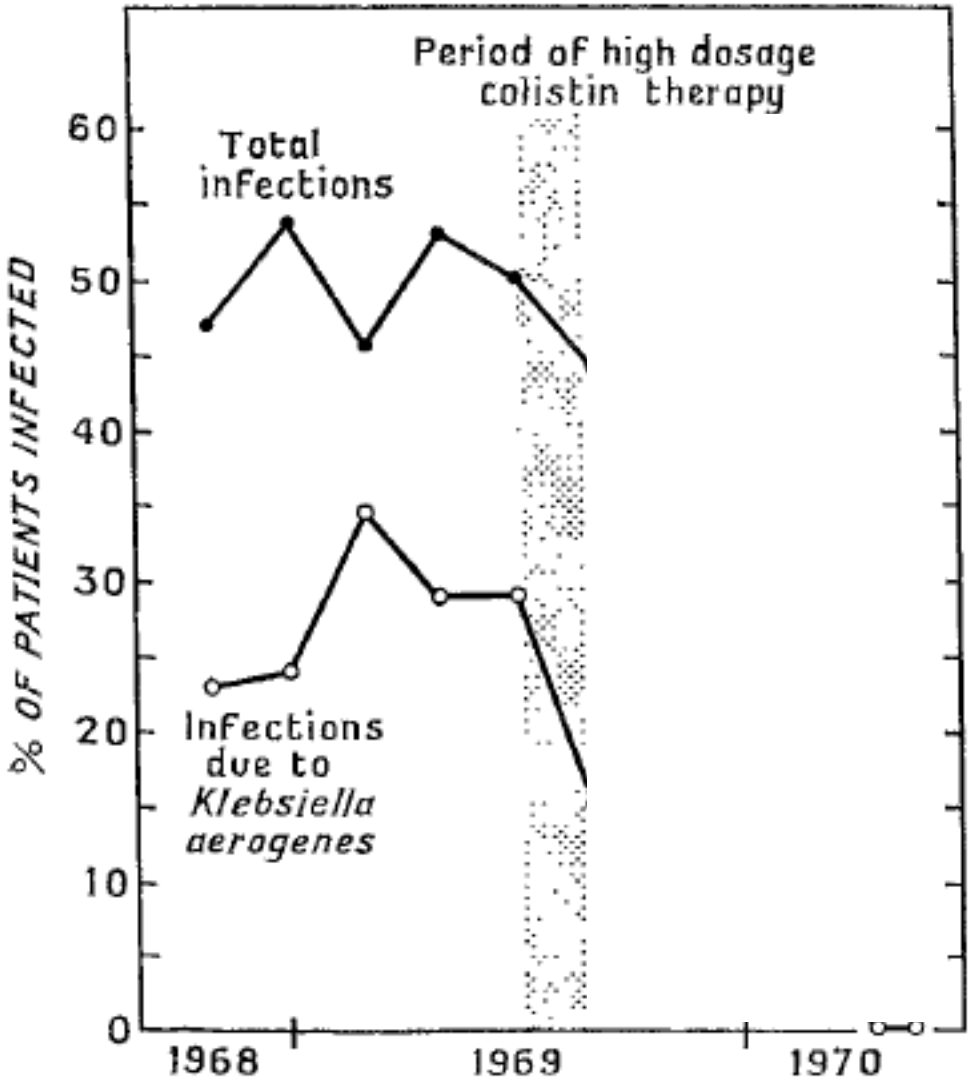
Interventions to Decrease Antibiotic Resistance

Neurosurgical patients

Klebsiella aerogens

High LOS

Increase Mortality



Price, Lancet 1970; 1213

Interventions to Decrease Antibiotic Resistance

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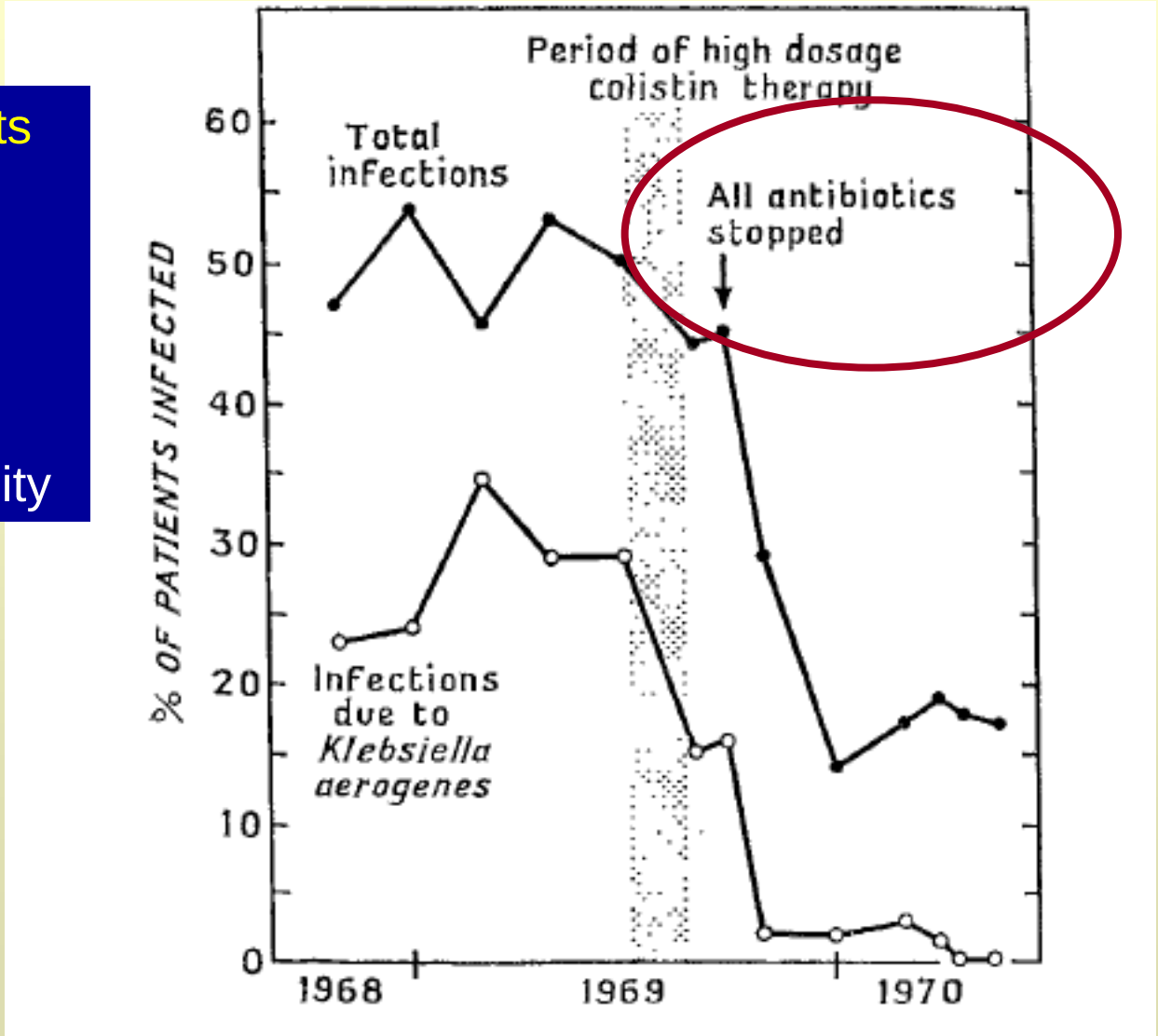

Price, Lancet 1970; 1213

A RESPOSTA

PROGRAMA NACIONAL DE CONTROLO DE INFEÇÃO 1999

+

PROGRAMA NACIONAL DE PREVENÇÃO DE RESISTÊNCIA AOS ANTIMICROBIANOS 2008

PROGRAMA DE PREVENÇÃO E CONTROLO DE INFEÇÃO E DE RESISTÊNCIA AOS ANTIMICROBIANOS 2013

Alice laughed. "There's no use trying," she said. "One can't believe impossible things."
"I daresay you haven't had much practice," said the Queen. "When I was your age, I always did it for half-an-hour a day. Why, sometimes I've believed as many as six impossible things before breakfast."

Lewis Carroll

Cortesia Drª Elaine Pina

Hospital Vila Franca de Xira

Direcção-Geral da Saúde
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Ministério da Saúde

Estratégia

1. Definição e normalização de estrutura
2. Vigilância epidemiológica
3. Normalização de procedimentos e práticas clínicas
4. Informação/Educação
5. Incentivos financeiros por via do financiamento hospitalar

Cortesia Drª Elaine Pina

Hospital Vila Franca de Xira

SECOND OPINION

BY ROB ROGERS

Rogers R Chest 2011;139:980-980