ΠΜΣ Λοιμωξιολογία
ΕΛΛΗΝΙΚΗ ΔΗΜΟΚΡΑΤΙΑ
Εθνικόν και Καποδιστριακόν Πανεπιστήμιον Αθηνών
ΙΔΡΥΘΕΝ ΤΟ 1837

Η επιδημιολογία της αντιμικροβιακής αντοχής στην Ελλάδα

Ειρήνη Γαλάνη, Ερευνήτρια Βιολόγος PhD, Ε.ΔΙ.Π, ΕΚΠΑ

4 Οκτωβρίου 2019

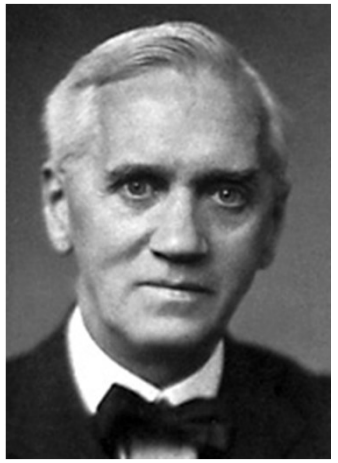
“It is not difficult to make microbes resistant to penicillin in the laboratory, and the same has occasionally happened in the body.”

Nobel Prize Acceptance Speech, 1945

“… the microbes are educated to resist penicillin and a host of penicillin-fast organisms is bred out… In such cases the thoughtless person playing with penicillin is morally responsible for the death of the man who finally succumbs to infection with the penicillin-resistant organisms. I hope this evil can be averted.”

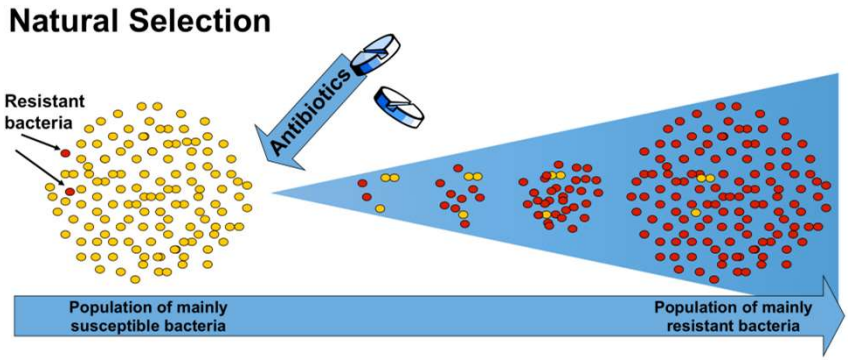
NY Times, June 1945

Alexander Fleming

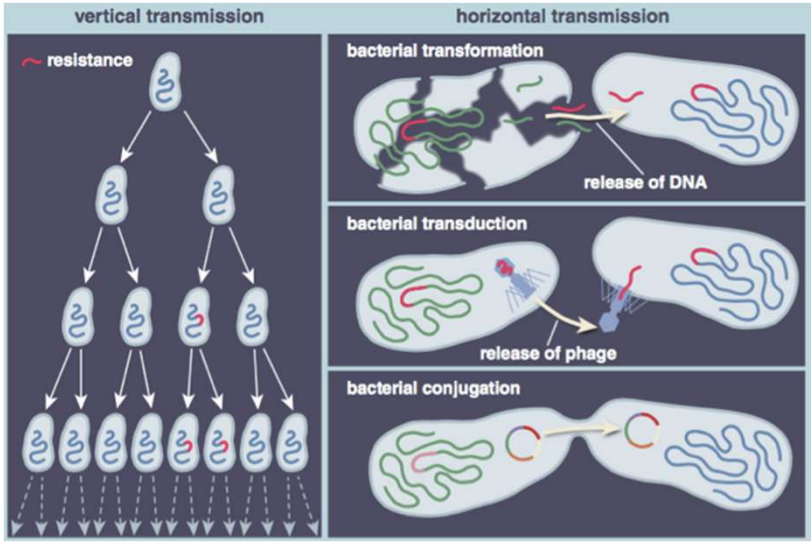


ΑΝΤΙΜΙΚΡΟΒΙΑΚΗ ΑΝΤΟΧΗ

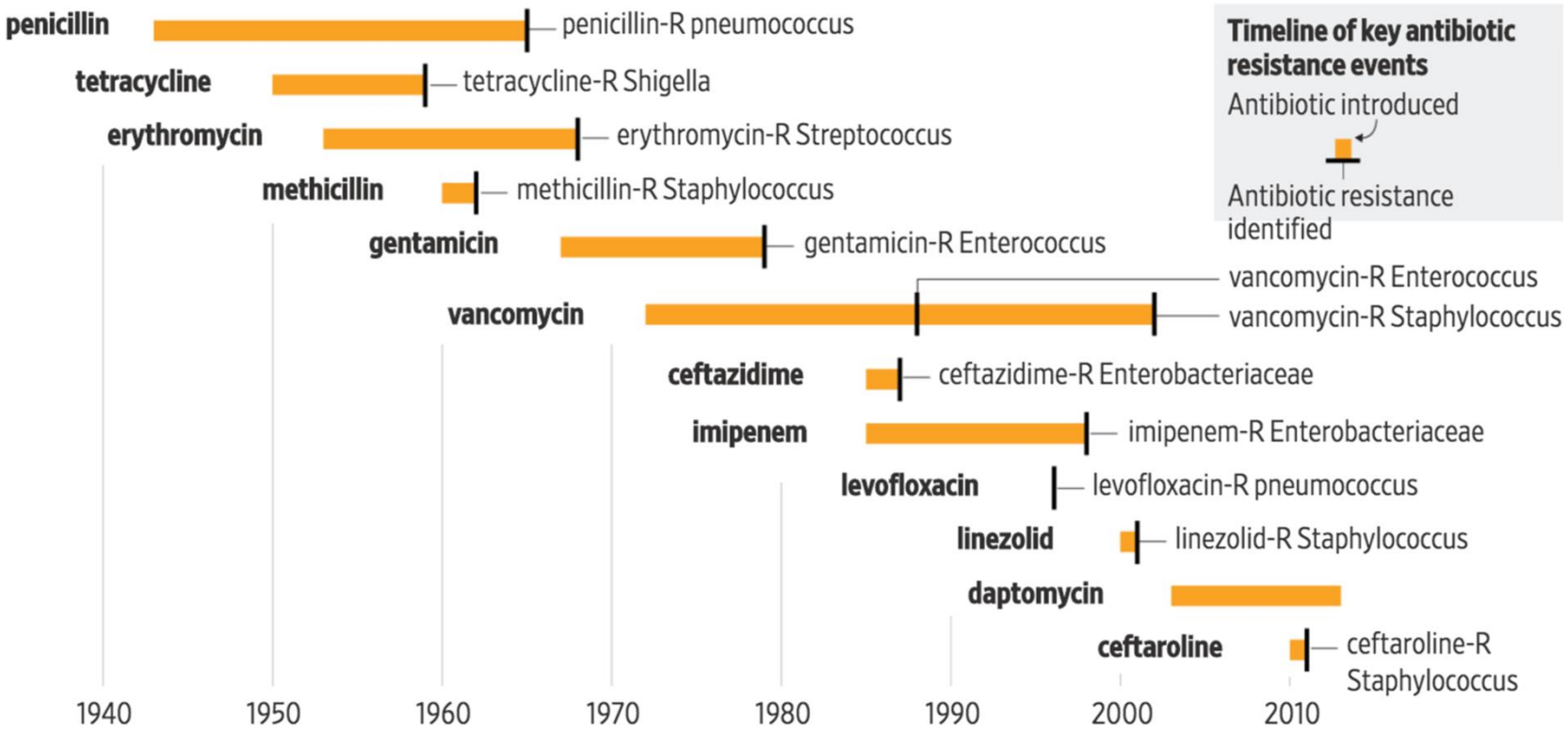
Φυσική επιλογή



Μετάδοση

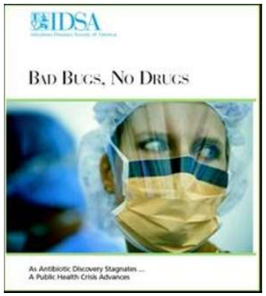


Εμφάνιση της Μικροβιακής Αντοχής



Centers for Disease Control and Prevention, Data is as of 2013

Αντοχή: πού βρισκόμαστε σήμερα



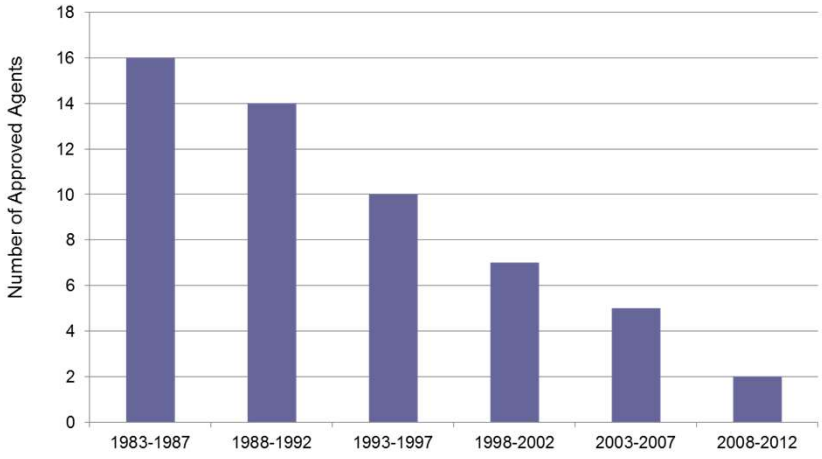
IDSA REPORT

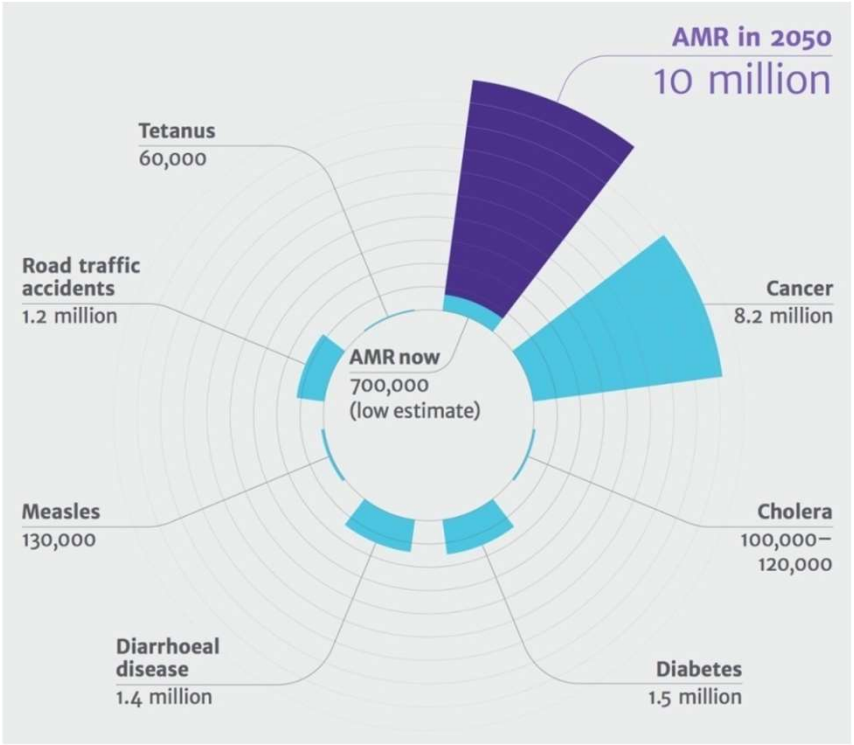
Bad Bugs, No Drugs: No ESKAPE! An Update from the Infectious Diseases Society of America

Helen W. Boucher,[1] George H. Talbot,[2] John S. Bradley,[3,4] John E. Edwards, Jr,[5,6,7] David Gilbert,[8] Louis B. Rice,[9,10] Michael Scheld,[11] Brad Spellberg,[5,6,7] and John Bartlett[12]

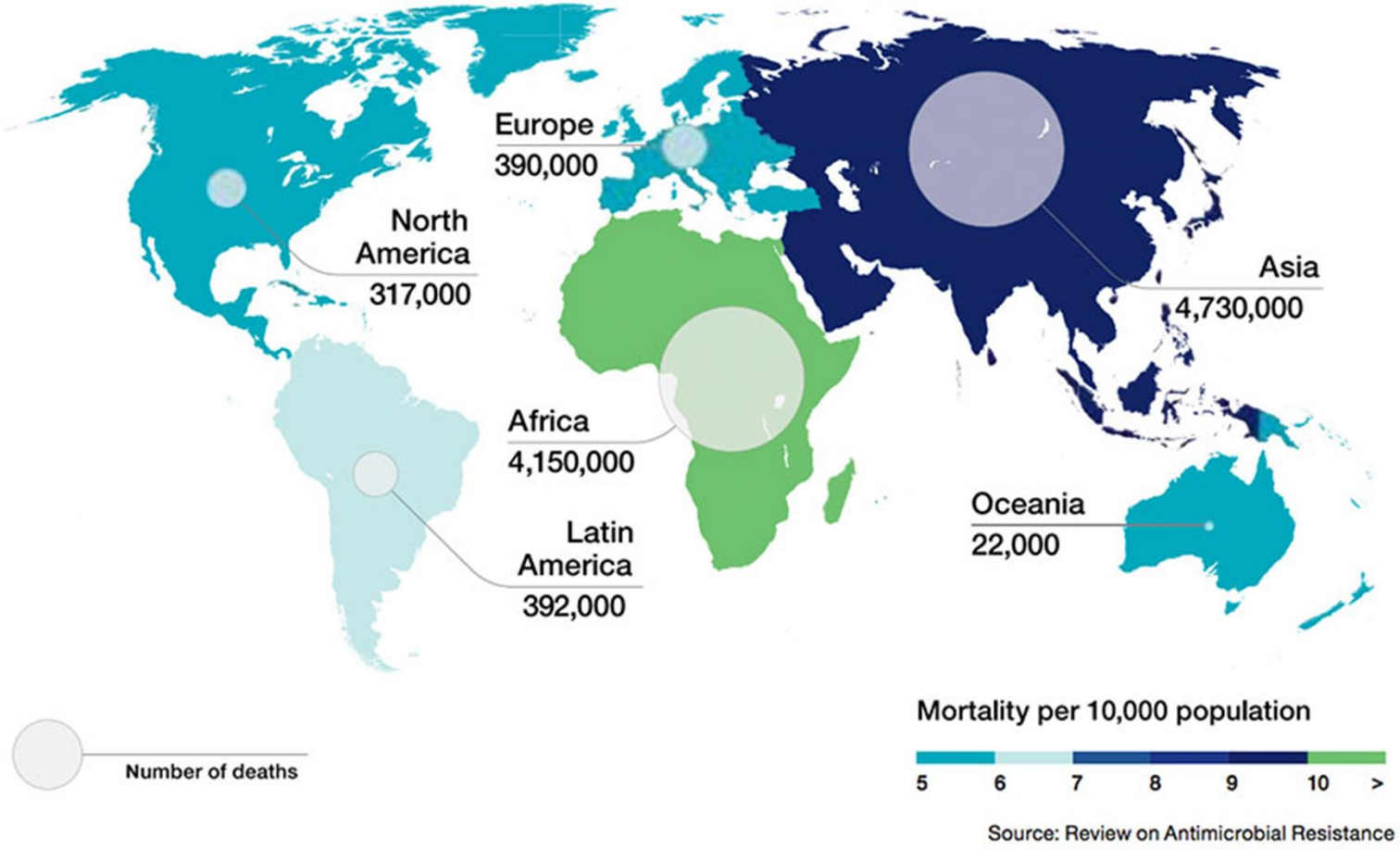
Clinical Infectious Diseases 2009; 48:1–12

Έγκριση νέων αντιβιοτικών από τον FDA



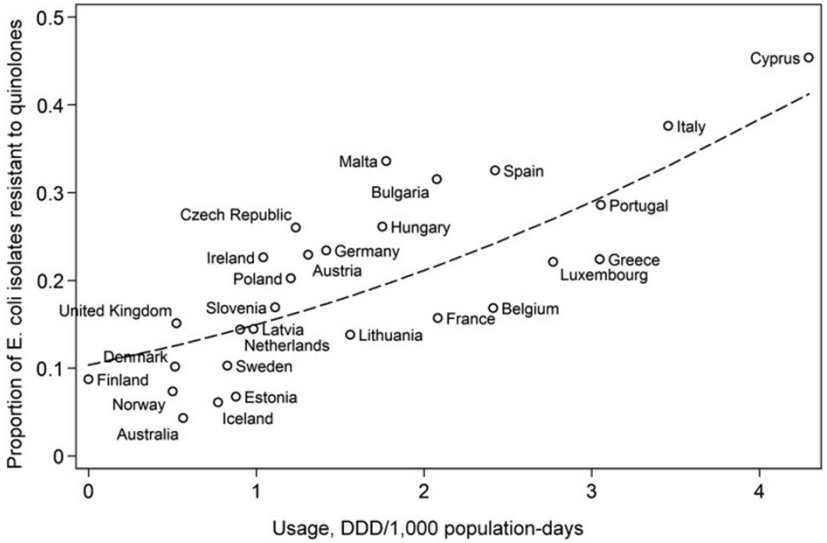


Θάνατοι που θα οφείλονται σε αντιμικροβιακή αντοχή ετησίως, μέχρι το 2050

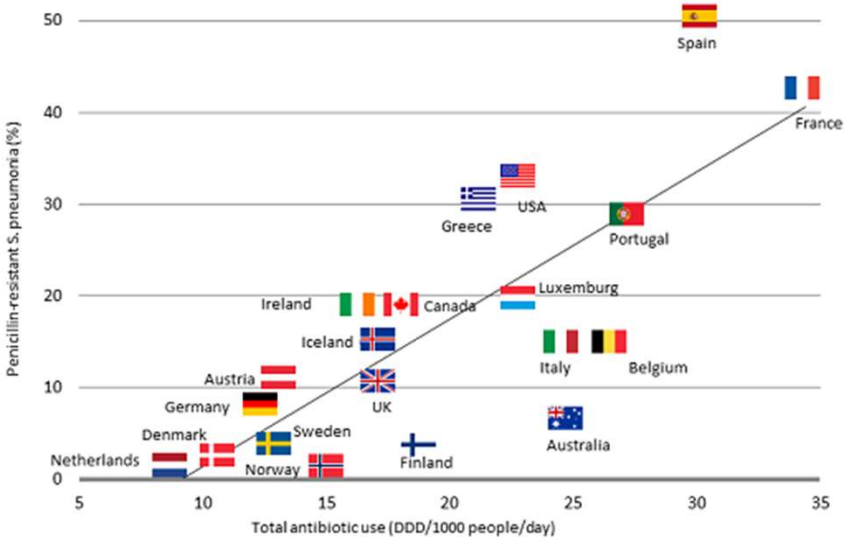


Συσχέτιση της χρήσης αντιβιοτικών και της αντοχής

E. coli - quinolones



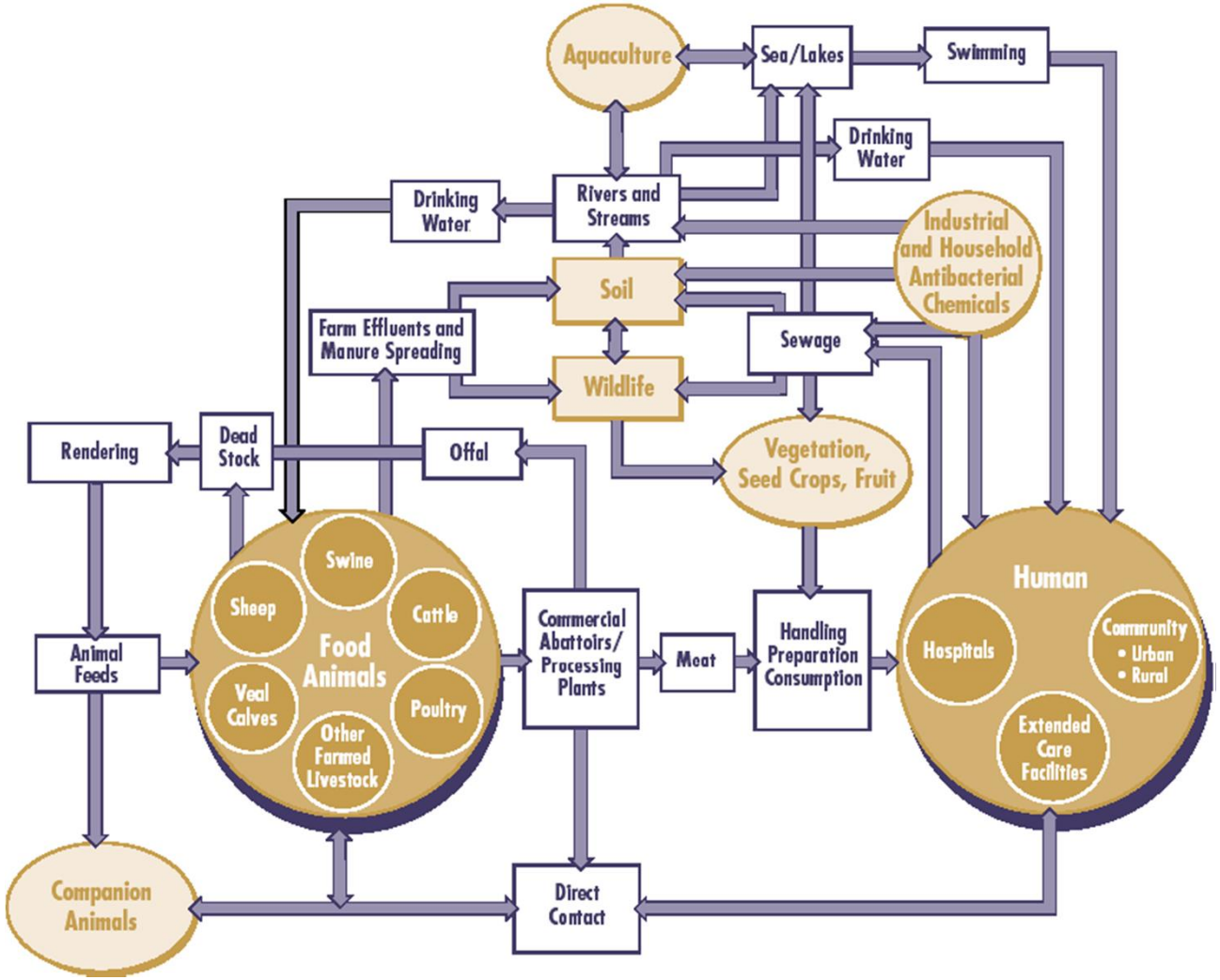
S. pneumoniae - penicillin



Emerg Infect Dis. 2012; 18: 1453–1460

The Lancet. 2005; 365: 579-587

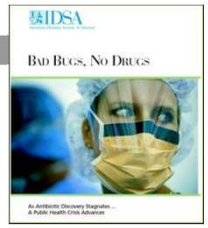
Εξάπλωση της Μικροβιακής Αντοχής



IDSA REPORT

Bad Bugs, No Drugs: No ESKAPE! An Update from the Infectious Diseases Society of America

Helen W. Boucher,[1] George H. Talbot,[2] John S. Bradley,[3,4] John E. Edwards, Jr,[5,6,7] David Gilbert,[8] Louis B. Rice,[9,10] Michael Scheld,[11] Brad Spellberg,[5,6,7] and John Bartlett[12]



Bad Bugs, No Drugs: No ESCAPE Revisited

Lance R. Peterson

ESKAPE pathogens

E: *Enterococcus faecium*

S: *Staphylococcus aureus*

K: ***Klebsiella pneumoniae***

A: *Acinetobacter baumannii*

P: *Pseudomonas aeruginosa*

E: *Enterobacter Species*

ESCAPE pathogens

E: *Enterococcus faecium*

S: *Staphylococcus aureus*

C: *Clostridium difficile*

A: *Acinetobacter baumannii*

P: *Pseudomonas aeruginosa*

E: **Enterobacteriaceae**

Boucher et al, Clin Infect Dis 2009; 48: 1-12

Peterson LR. Clin Infect Dis 2009; 49: 992-3

The Biggest Threats

Urgent Threats

- *Clostridioides difficile*
- Carbapenem-resistant Enterobacteriaceae (CRE)
- Drug-resistant *Neisseria gonorrhoeae*

Serious Threats

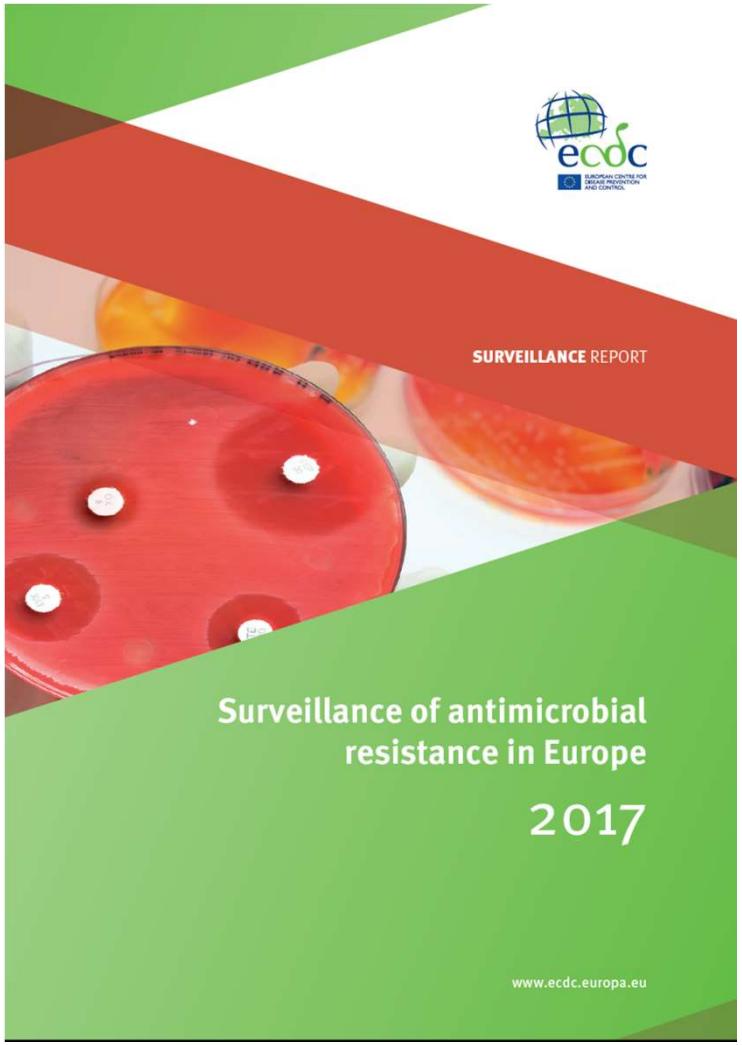
- Multidrug-resistant *Acinetobacter*
- Drug-resistant *Campylobacter*
- Fluconazole-resistant *Candida*
- Extended-spectrum Beta-lactamase producing Enterobacteriaceae
- Vancomycin-resistant *Enterococcus* (VRE)
- Multidrug-resistant *Pseudomonas aeruginosa*
- Drug-resistant non-typhoidal *Salmonella*
- Drug-resistant *Salmonella* Serotype Typhi
- Drug-resistant *Shigella*
- Methicillin-resistant *Staphylococcus aureus* (MRSA)
- Drug-resistant *Streptococcus pneumoniae*
- Drug-resistant Tuberculosis

Concerning Threats

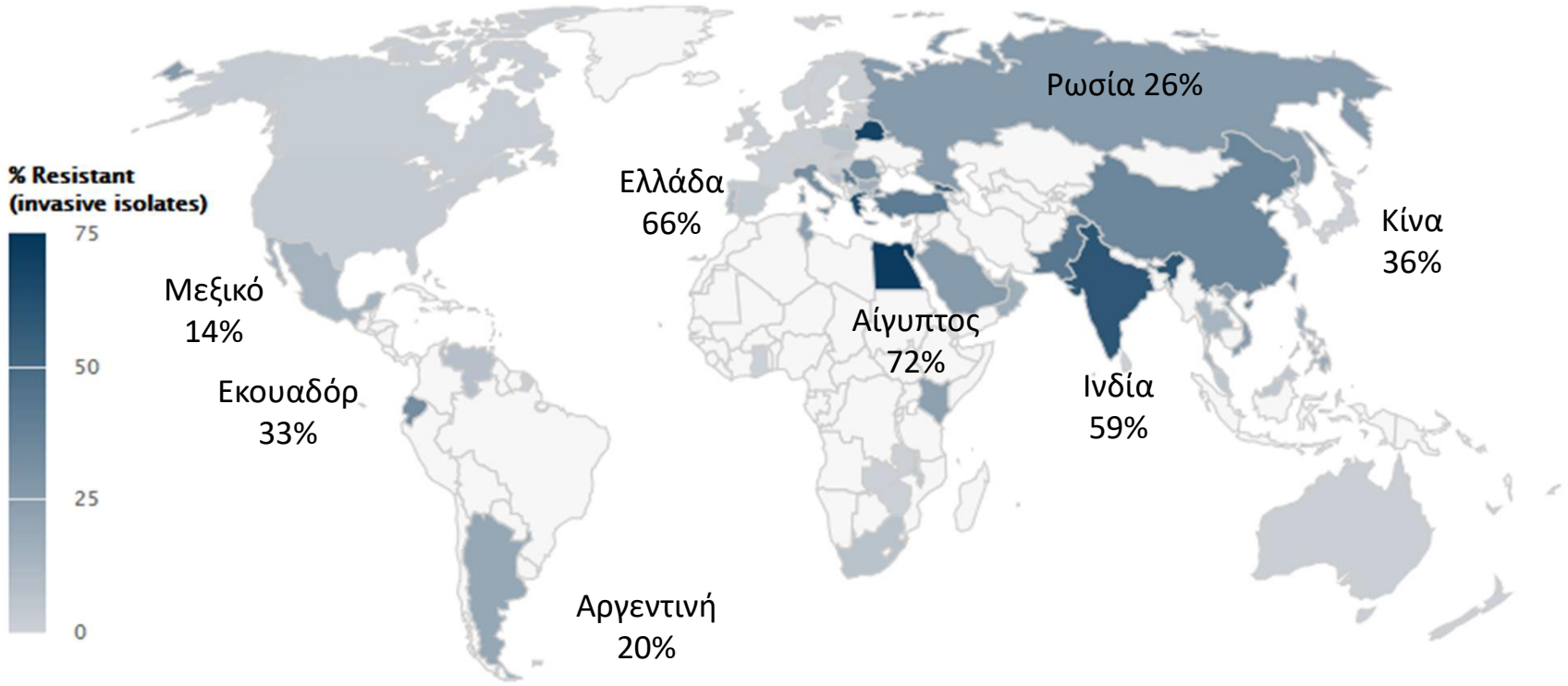
- Vancomycin-resistant *Staphylococcus aureus* (VRSA)
- Erythromycin-Resistant Group A *Streptococcus*
- Clindamycin-resistant Group B *Streptococcus*

Εντεροβακτηριακά ανθεκτικά στις καρβαπενέμες (CRE)

- Η αντοχή στις καρβαπενέμες παραμένει σπάνια στο *E. coli*
- Αρκετές χώρες αναφέρουν ποσοστά αντοχής στις καρβαπενέμες πάνω από 10% για την *K. pneumoniae*
- Οι χώρες που αναφέρουν τα υψηλότερα ποσοστά αντοχής στις καρβαπενέμες αναφέρουν επίσης υψηλότερα ποσοστά αντοχής και στις άλλες αντιμικροβιακές ομάδες



Αντοχή της *Klebsiella pneumoniae* στις καρβαπενέμες 2017

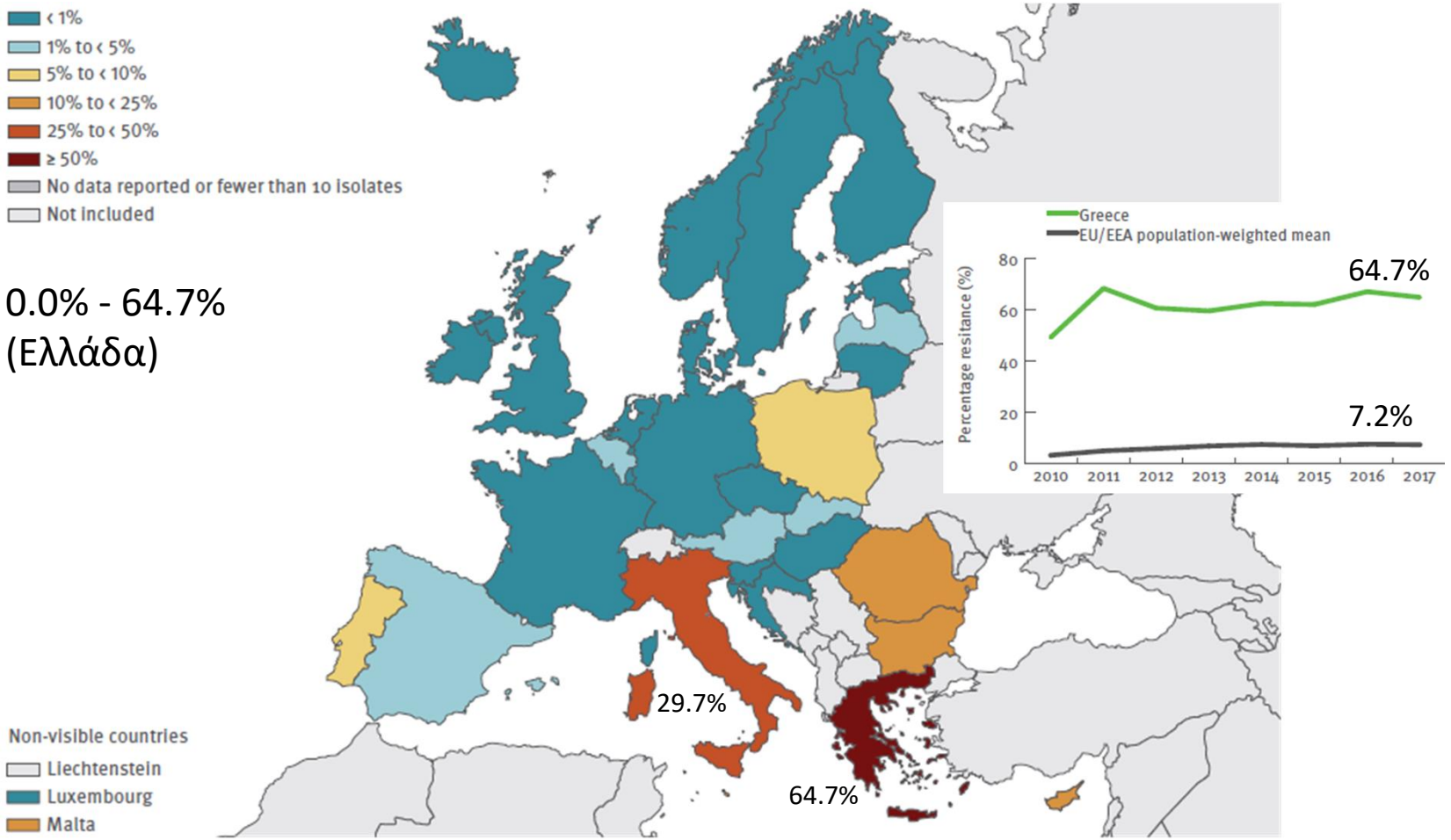


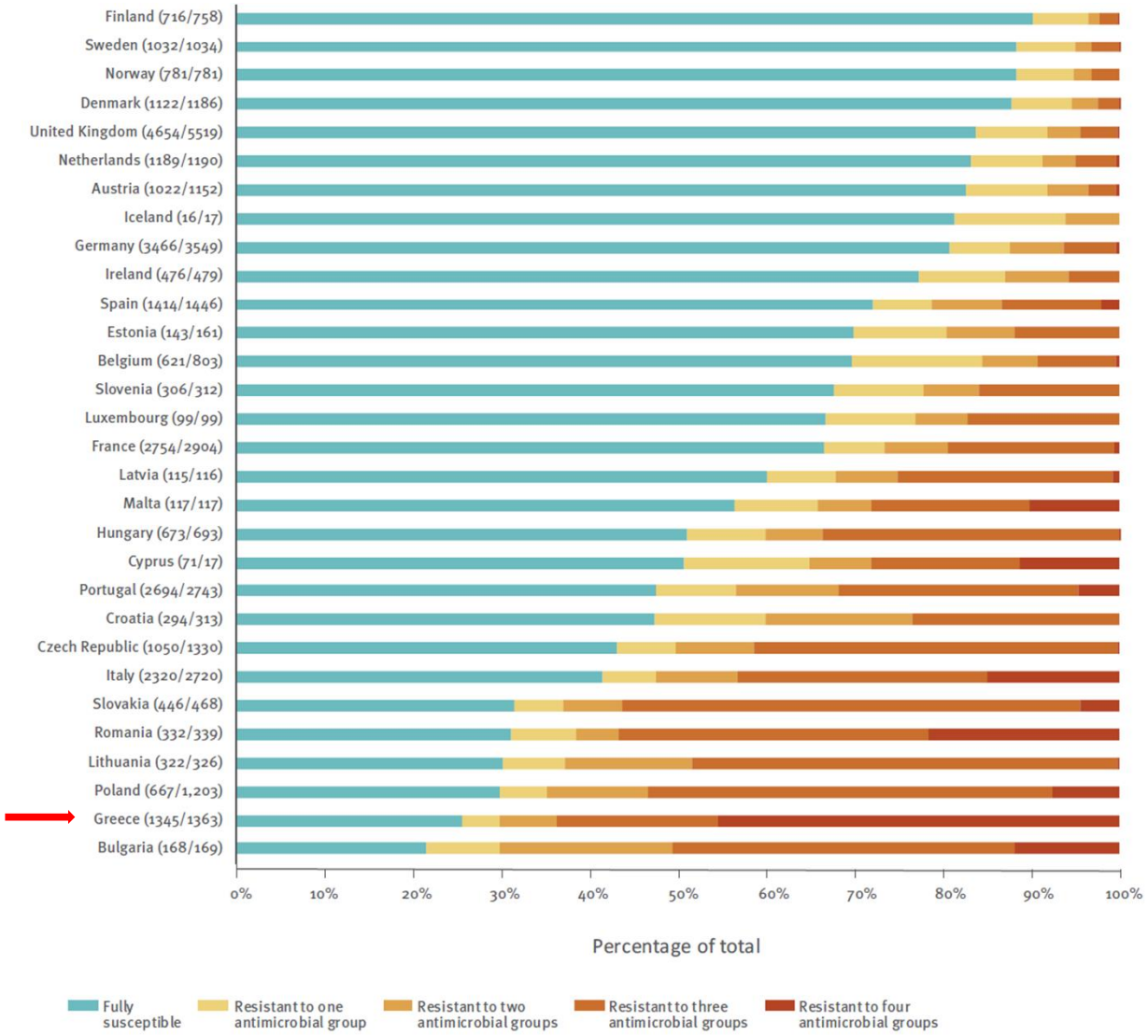
CDDEP THE CENTER FOR Disease Dynamics, Economics & Policy WASHINGTON DC • NEW DELHI

The Center for Disease Dynamics, Economics & Policy. ResistanceMap: Antibiotic resistance. 2019. https://resistancemap.cddep.org/AntibioticResistance.php. Date accessed: October 1, 2019.

Klebsiella pneumoniae
2017

Αντοχή στις καρβαπενέμες





Αντοχή σε 4 αντιμικροβιακές ομάδες

- 3ης γενιάς κεφαλοσπορίνες
- Φλουοροκινολόνες
- Αμινογλυκοσίδες
- Καρβαπενέμες

Συνολικά: 4.5%

Ελλάδα: 45%

Surveillance of antimicrobial resistance in Europe – Annual report of the European Antimicrobial Resistance Surveillance Network (EARS-Net) 2017. Stockholm: ECDC; 2018

Country	Epidemiological stage for the spread of carbapenemase-producing Enterobacteriaceae				Change in epidemiological stage 2015–18
	2010 [11]	2013 [9]	2014–15 [8]	2018	
Albania	NA	2a	1	1	→
Austria	0	2b	2b	2b	→
Belgium	2b	3	4	4	→
Bosnia and Herzegovina[a]	1	1	0	2b	↑
Bulgaria	0	2a	2a	2b	→
Croatia	1	3	3	4	↑
Cyprus	2a	2a	1	2a	↑
Czech Republic	1	2b	2b	3	↑
Denmark	1	2a	4	4	→
Estonia	0	2a	1	1	→
Finland	1	2a	2a	3	↑
France	3	3	4	4	→
Germany	3	3	3	3	→
Greece	5	5	5	5	→
Hungary	3	4	4	4	→
Iceland	0	0	0	1	↑
Ireland	1	4	3	4	↑
Italy	4	5	5	5	→
Kosovo[b]	NA	2b	0	1	↑
Latvia	1	1	1	1	→
Lithuania	1	1	1	1	→
Luxembourg	NA	1	1	1	→
Malta	1	5	5	5	→
Montenegro	NA	0	1	1	→
The Netherlands	2a	2b	2a	2b	→
North Macedonia	NA	0	1	2a	↑
Norway	2a	2a	1	1	→
Poland	4	3	4	4	→
Portugal	1	1	2b	3	↑
Romania	1	1	4	4	→
Serbia	1	1	2b	4	↑
Slovak Republic	NA	2a	4	4	→
Slovenia	0	1	2a	1	↓
Spain	2b	3	4	4	→
Sweden	2a	2b	2a	2b	→
Turkey	NA	2a	5	5	→
United Kingdom[c]	2b	3	3	3	→

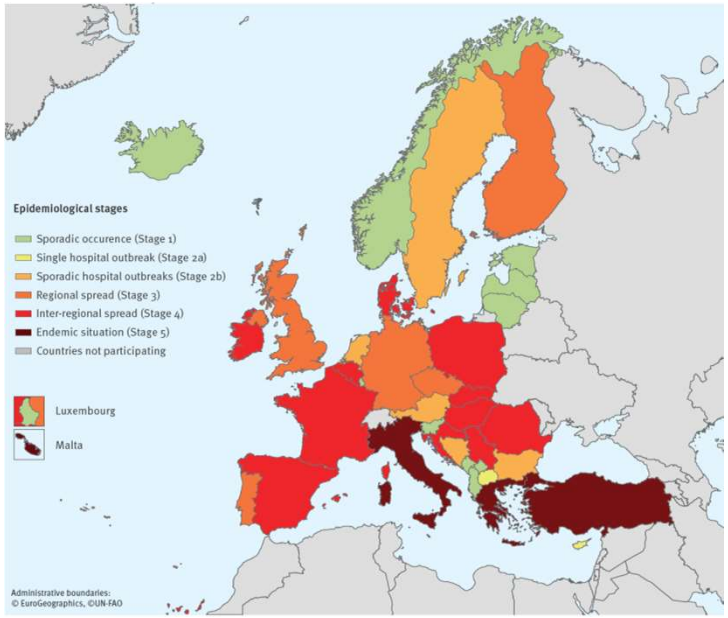
RAPID COMMUNICATION

Worsening epidemiological situation of carbapenemase-producing Enterobacteriaceae in Europe, assessment by national experts from 37 countries, July 2018

Alma Brolund[1,2], Nina Lagerqvist[1,2,3], Sara Byfors[1], Marc J Struelens[4], Dominique L Monnet[4], Barbara Albiger[4], Anke Kohlenberg[4], European Antimicrobial Resistance Genes Surveillance Network (EURGen-Net) capacity survey group[5]

1. Public Health Agency of Sweden, Solna, Sweden
2. These authors contributed equally to this work
3. European Public Health Microbiology Training Programme (EUPHEM), European Centre for Disease Prevention and Control, Stockholm, Sweden
4. European Centre for Disease Prevention and Control, Stockholm, Sweden
5. The members of the capacity survey group are listed at the end of this article

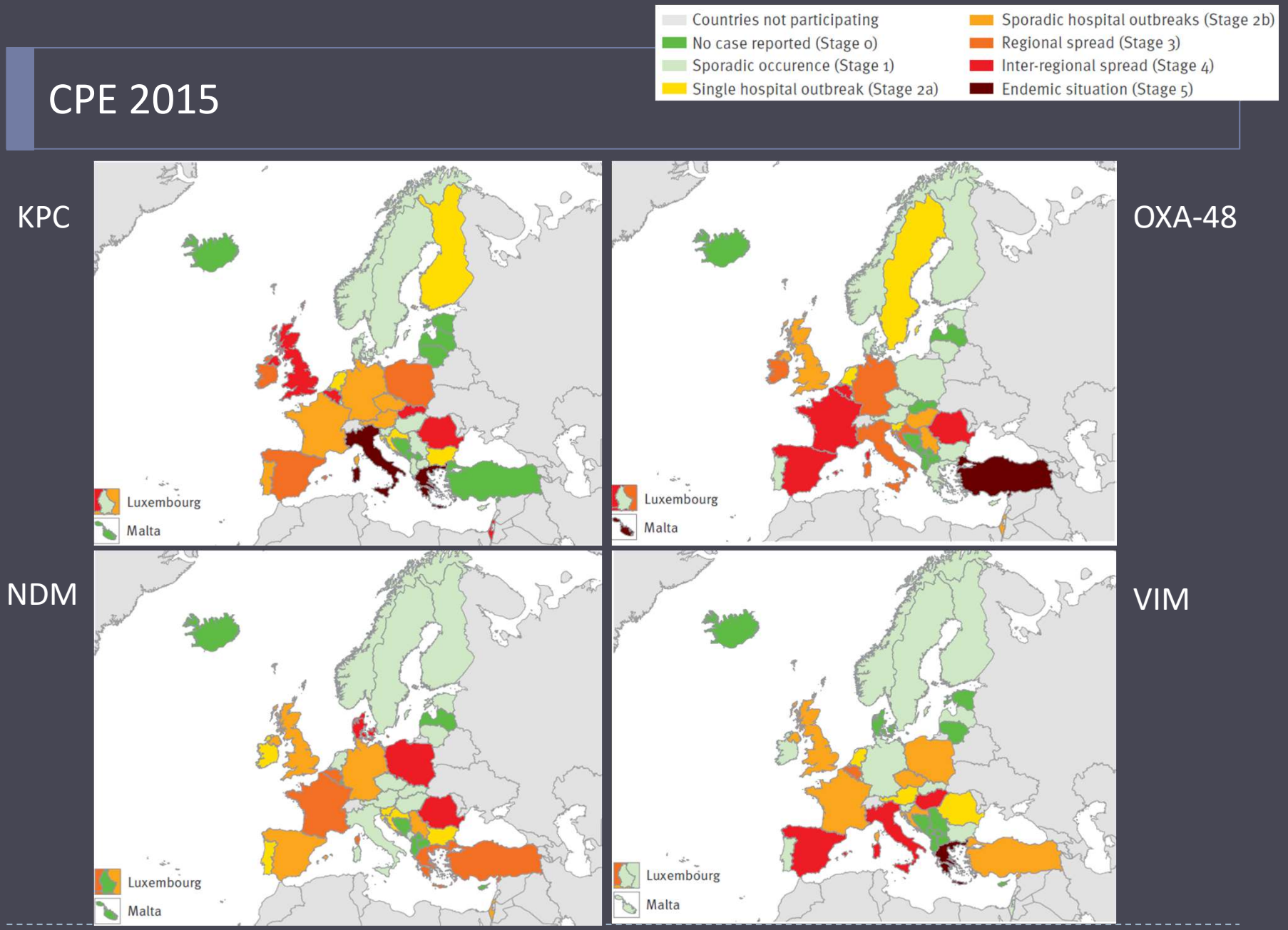
Correspondence: Anke Kohlenberg (Anke.Kohlenberg@ecdc.europa.eu)



Epidemiological stages

- **Stage 0**: no case reported
- **Stage 1**: sporadic occurrence (epidemiologically unrelated single cases)
- **Stage 2a**: single hospital outbreak (two or more epidemiologically associated cases with indistinguishable geno- or phenotype in a single institution)
- **Stage 2b**: sporadic hospital outbreaks (unrelated hospital outbreaks with epidemiologically unrelated introduction or different strains, no autochthonous inter-institutional transmission reported)
- **Stage 3**: regional spread (more than one epidemiologically related hospital outbreak confined to hospitals that are part of the same region or health district, indicating regional autochthonous inter-institutional transmission)
- **Stage 4**: inter-regional spread (multiple epidemiologically related outbreaks occurring in different health districts, indicating inter-regional autochthonous inter-institutional transmission)
- **Stage 5**: endemic situation (most hospitals in a country are repeatedly seeing cases admitted from autochthonous sources)

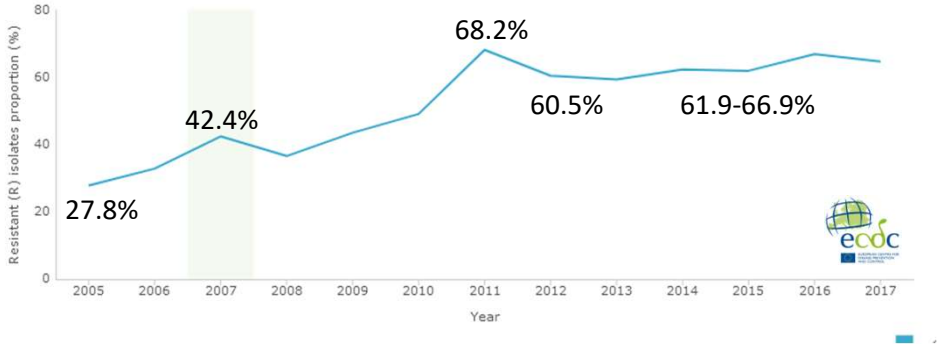
CPE 2015



European Centre for Disease Prevention and Control. Evidence brief: Update on the spread of carbapenemase-producing Enterobacteriaceae in Europe – Summary of the May 2015 expert assessment. Stockholm: ECDC; 2015.

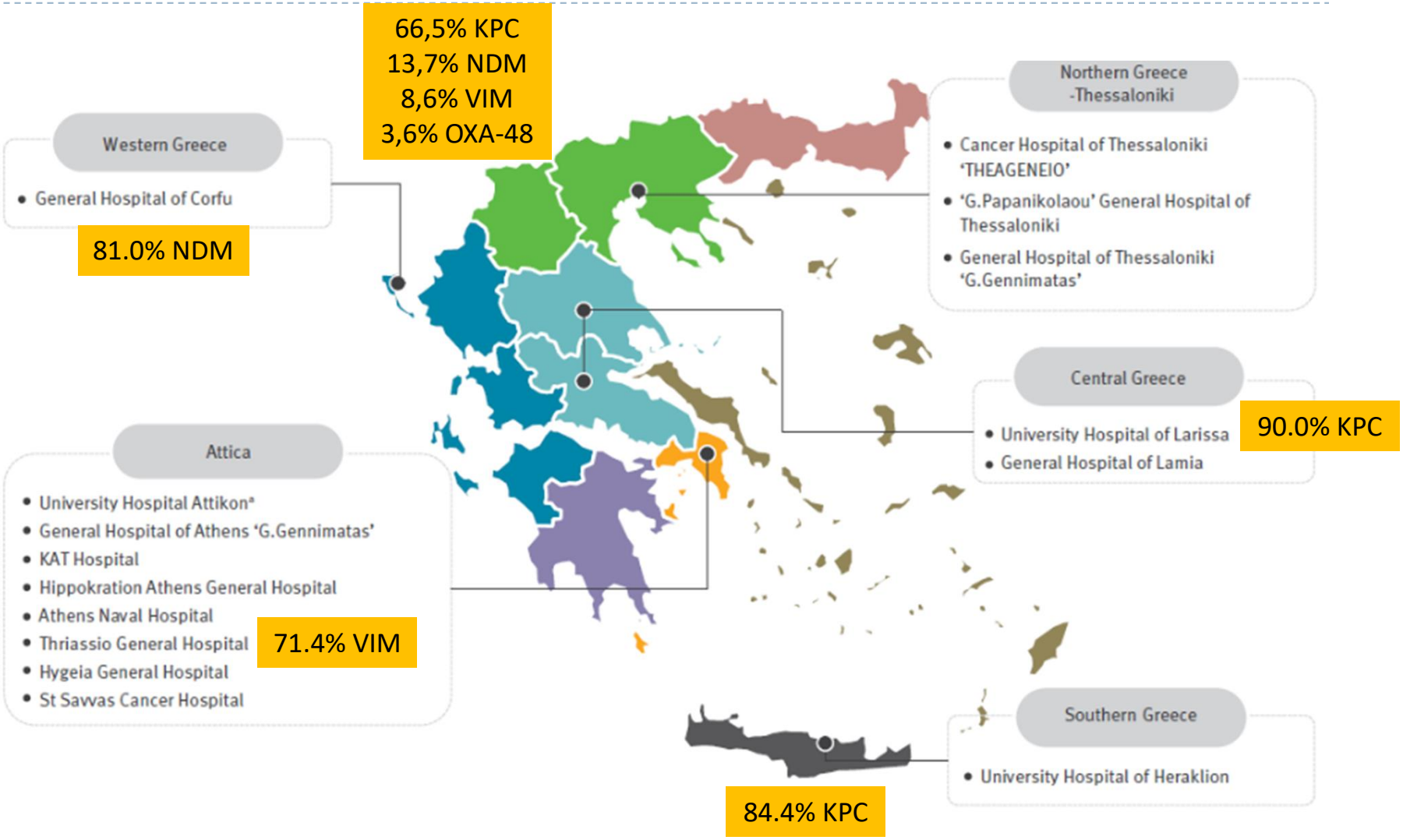
Επιδημιολογία των στελεχών *Klebsiella pneumoniae* που παράγουν καρβαπενεμάση στην Ελλάδα, 2007 - 2016

Καρβαπενεμάση	2014-2016	2011-2012	2007
KPC	66,5%	82,6%	-
NDM	**13,7%**	-	-
VIM	8,6%	9,7%	100%
OXA-48	**3,6%**	-	-
Διπλή καρβαπενεμάση	6,3%	7,7%	-



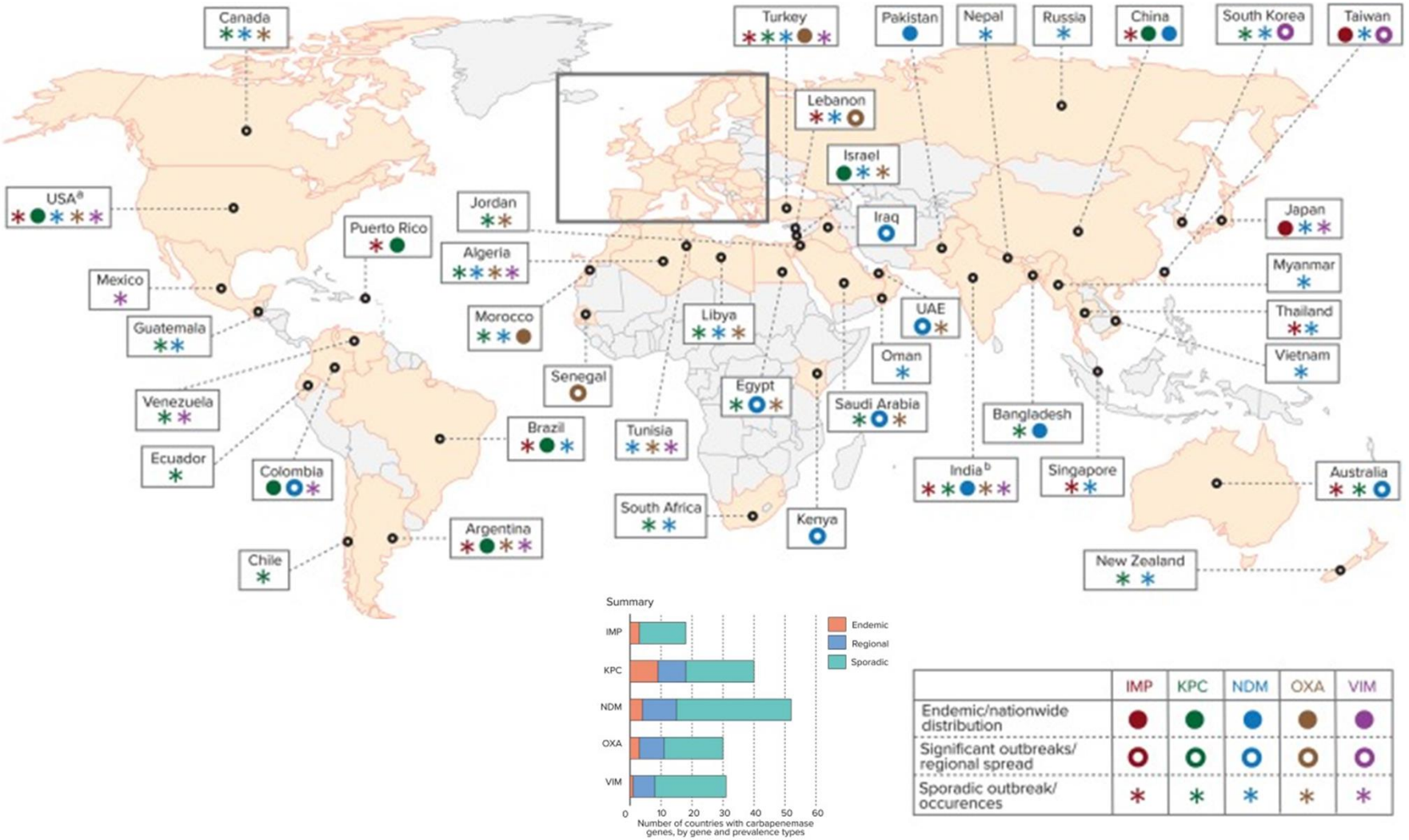
Galani I, et al. Euro Surveill 2018; 23(31):pii=1700775
Maltezou et al. J Glob Antimicrob Res 2014;2:11
Vatopoulos A. Euro Surveill 2008;13(4). pii: 8023

Geographical map showing the location of participating hospitals providing *Klebsiella pneumoniae* clinical isolates, Greece, 2014–2016 (n = 15)



Galani I, et al. Euro Surveill2018;23(31):pii=1700775

Παγκόσμια κατανομή των καρβαπενεμασών στα Εντεροβακτηριακά



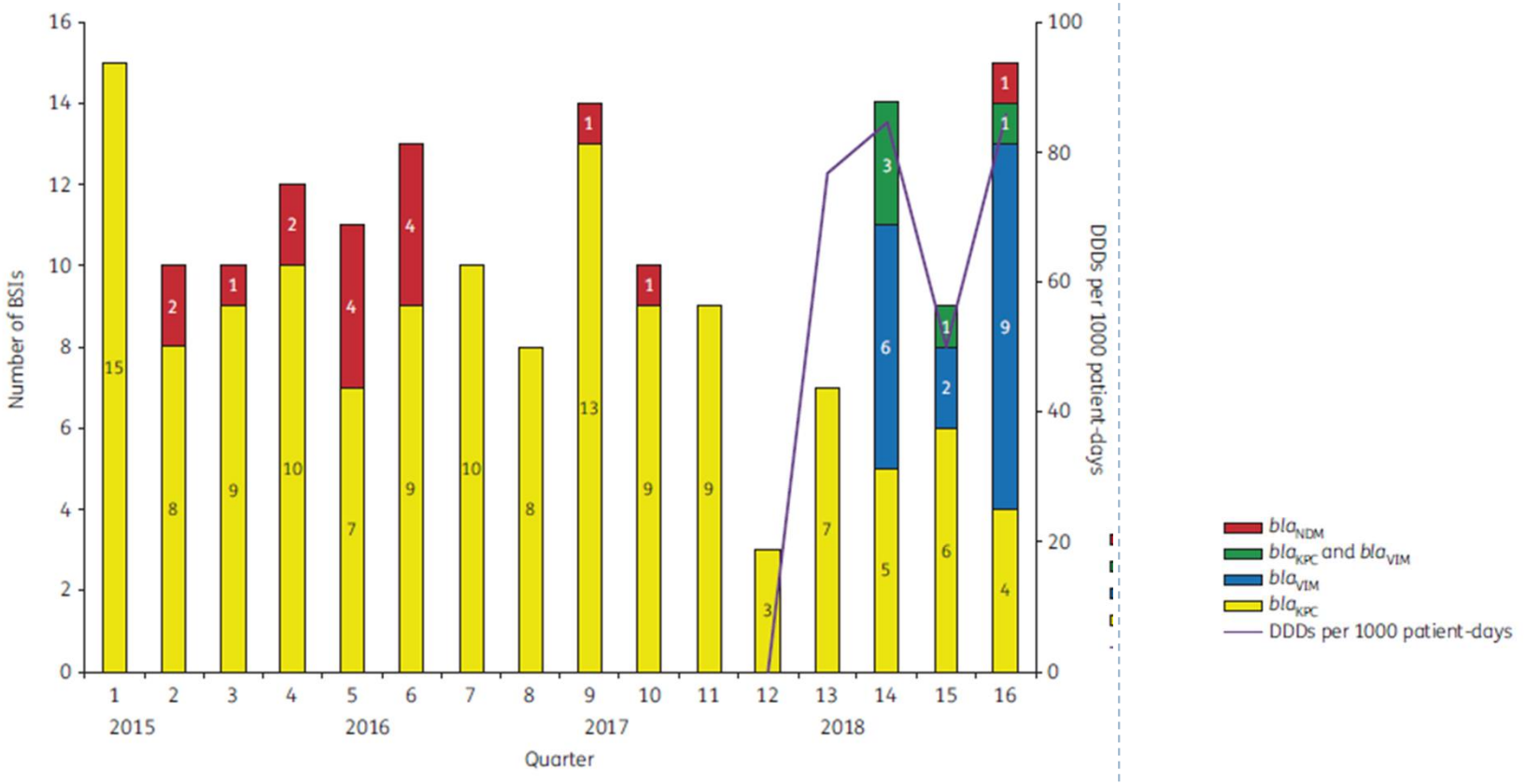
Logan & Weinstein. J Infect Dis 2017; 215(suppl_1): S28-S36

J Antimicrob Chemother
doi:10.1093/jac/dkz125

Journal of Antimicrobial Chemotherapy

Reversal of carbapenemase-producing *Klebsiella pneumoniae* epidemiology from bla_{KPC}- to bla_{VIM}-harbouring isolates in a Greek ICU after introduction of ceftazidime/avibactam

Matthaios Papadimitriou-Olivgeris[1]†, Christina Bartzavali[2], Anastasia Lambropoulou[2], Anastasia Solomou[3], Ekaterini Tsiata[4], Evangelos D. Anastassiou[2], Fotini Fligou[3], Markos Marangos[1], Iris Spiliopoulou[2] and Myrto Christofidou[2]*



Αντιβιοτικά με *in vitro* δράση έναντι των CPE

Drug / Company	Description	Mechanism Coverage			CRE Trial	Dosing	Indications
		KPC	MBL	OXA-48			
Plazomicin / Zemdri	IV aminoglycoside	✓	✓	✓	✓	IV 1x/day	cUTI CRE: BSI & HAP/VAP
Avycaz / Zavicefta	IV BL/BLI (ceftazidime + avibactam)	✓	✗	✓	✗	IV 3x/day	*Label:* cUTI, cIAI *Development:* HAP/VAP
Carbavance / Vabomere	IV BL/BLI (meropenem + RPX-7009)	✓	✗	✗	✓	IV 3x/day	cUTI CRE: mixed infections
Relebactam + imipenem / Recarbrio	IV BL/BLI (imipenem + MK-7655)	✓	✗	✗	✓	IV 4x/day	HAP/VAP CRE: mixed infections
Eravacycline / Xeraba	IV/oral tetracycline	✓	✓	✓	✗	TBD	cUTI (failed) cIAI

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First Report of Ceftazidime-Avibactam Resistance in a KPC-3-Expressing *Klebsiella pneumoniae* Isolate

Romney M. Humphries,[a] Shangxin Yang,[a] Peera Hemarajata,[a] Kevin W. Ward,[a] Janet A. Hindler,[a] Shelley A. Miller,[a] Aric Gregson[b]

Department of Pathology and Laboratory Medicine, University of California, Los Angeles, Los Angeles, California, USA[a]; Department of Medicine, Division of Infectious Diseases, University of California, Los Angeles, Los Angeles, California, USA[b]

TABLE 1 Antimicrobial susceptibility results for carbapenem-resistant *K. pneumoniae* isolates[a]

Antimicrobial(s)	MIC (μg/ml) (interpretation[b]) for *K. pneumoniae* isolate: 1	2	3
Amikacin	16 (S)	16 (S)	16 (S)
Ampicillin	>32 (R)	>32 (R)	>32 (R)
Ampicillin-sulbactam	>32 (R)	>32 (R)	>32 (R)
Aztreonam	>32 (R)	>32 (R)	>32 (R)
Cefepime	32 (R)	>32 (R)	>32 (R)
Ceftazidime	>32 (R)	>32 (R)	>32 (R)
Ceftazidime-avibactam	**4/4 (S)**	**32/4 (R)**	**8/4 (S)**
Ceftolozane-tazobactam	>256/4 (R)	>256/4 (R)	>256/4 (R)
Ceftriaxone	>32 (R)	>32 (R)	>32 (R)
Chloramphenicol	**≤4 (S)**	**>16 (R)**	**>16 (R)**
Ciprofloxacin	>2 (R)	>2 (R)	>2 (R)
Colistin	≤0.5 (S)	≤0.5 (S)	≤0.5 (S)
Doxycycline	**2 (S)**	**16 (R)**	**16 (R)**
Ertapenem	>2 (R)	>2 (R)	>2 (R)
Gentamicin	1 (S)	2 (S)	2 (S)
Imipenem	8 (R)	128 (R)	128 (R)
Meropenem	16 (R)	128 (R)	128 (R)
Minocycline	**2 (S)**	**>16 (R)**	**>16 (R)**
Piperacillin-tazobactam	>256/4 (R)	>256/4 (R)	>256/4 (R)
Tigecycline	**1 (S)**	**8 (R)**	**8 (R)**
Tobramycin	10 (R)	>10 (R)	>10 (R)
Trimethoprim-sulfamethoxazole	**≤1/20 (S)**	**2/40 (S)**	**2/40 (S)**

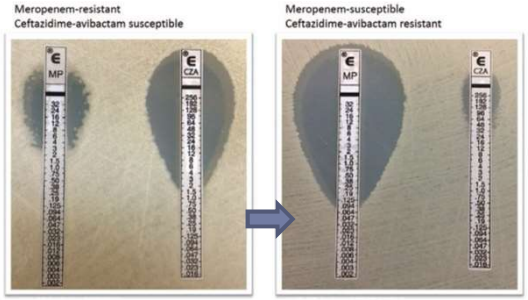
15 Φεβρουαρίου 2015

Humphries et al. Antimicrob Agents Chemother. 2015; 59:6605-7

Αντοχή στους “νέους” αναστολείς

Ceftazidime/Avibactam

- Δραστικό έναντι KPC (A), OXA-48, AmpC (C)
- Ανάπτυξη αντοχής υπό αγωγή



- KPC-23 (KPC-9)


Clinical Microbiology and Infection 25 (2019) 763.e5–763.e8

Contents lists available at ScienceDirect

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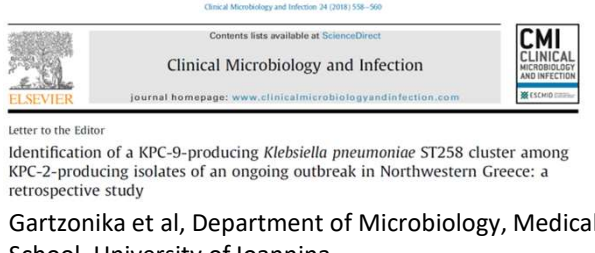
journal homepage: www.clinicalmicrobiologyandinfection.com

Research note

Genomic characterization of a KPC-23-producing *Klebsiella pneumoniae* ST258 clinical isolate resistant to ceftazidime-avibactam

I. Galani [1,*], A. Antoniadou [1], I. Karaiskos [2], K. Kontopoulou [3], H. Giamarellou [2], M. Souli [1]

[1] Fourth Department of Internal Medicine, Infectious Diseases Laboratory, Molecular Biology Section, National and Kapodistrian University of Athens, School of Medicine, Athens, Greece
[2] First Internal Medicine & Infectious Diseases Clinic, Hygeia General Hospital, Athens, Greece
[3] Department of Microbiology, General Hospital of Thessaloniki 'G. Gennimatas', Thessaloniki, Greece


Clinical Microbiology and Infection 24 (2018) 558–560

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journal homepage: www.clinicalmicrobiologyandinfection.com

Letter to the Editor

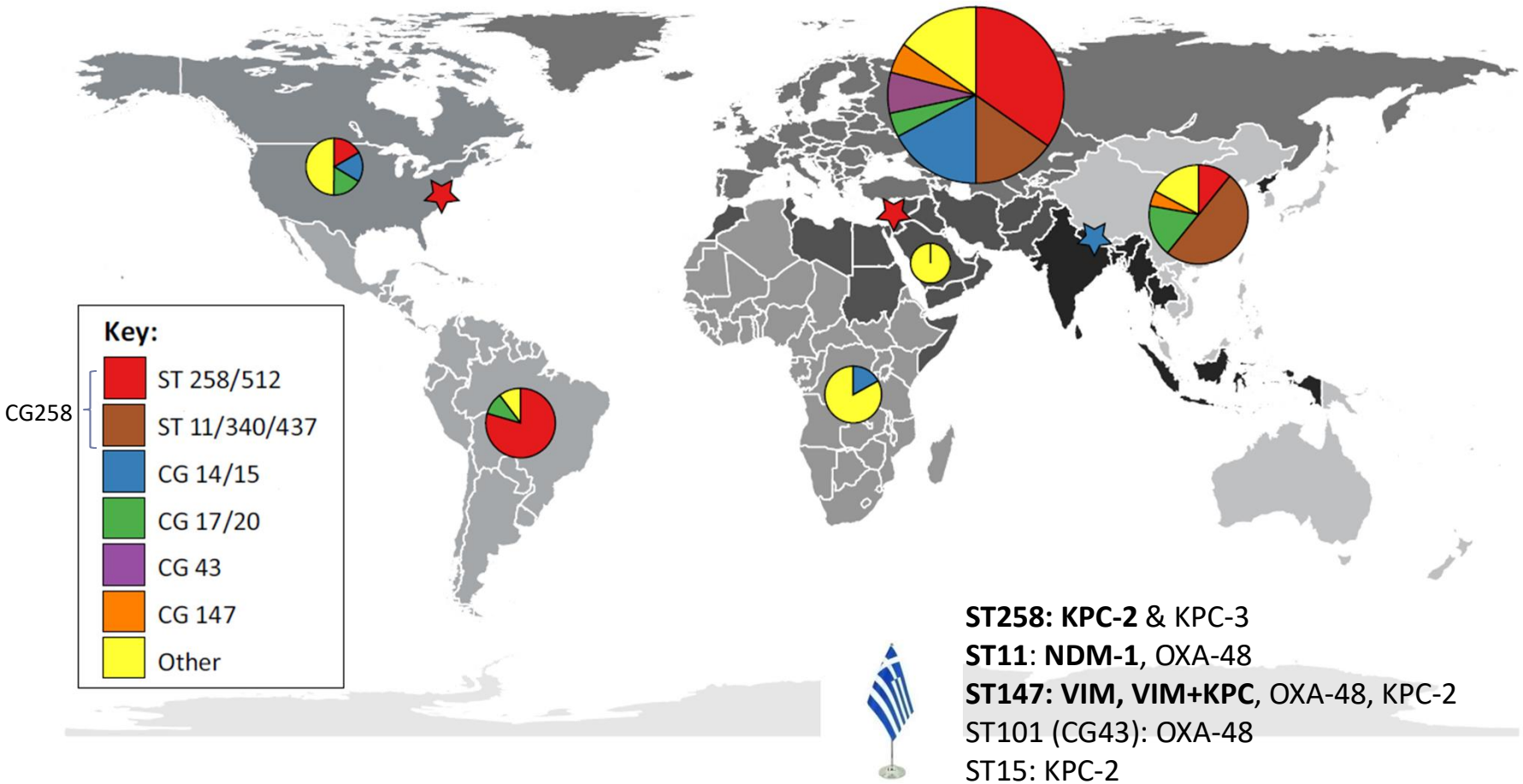
Identification of a KPC-9-producing *Klebsiella pneumoniae* ST258 cluster among KPC-2-producing isolates of an ongoing outbreak in Northwestern Greece: a retrospective study

Gartzonika et al, Department of Microbiology, Medical School, University of Ioannina

Meropenem/Vaborbactam

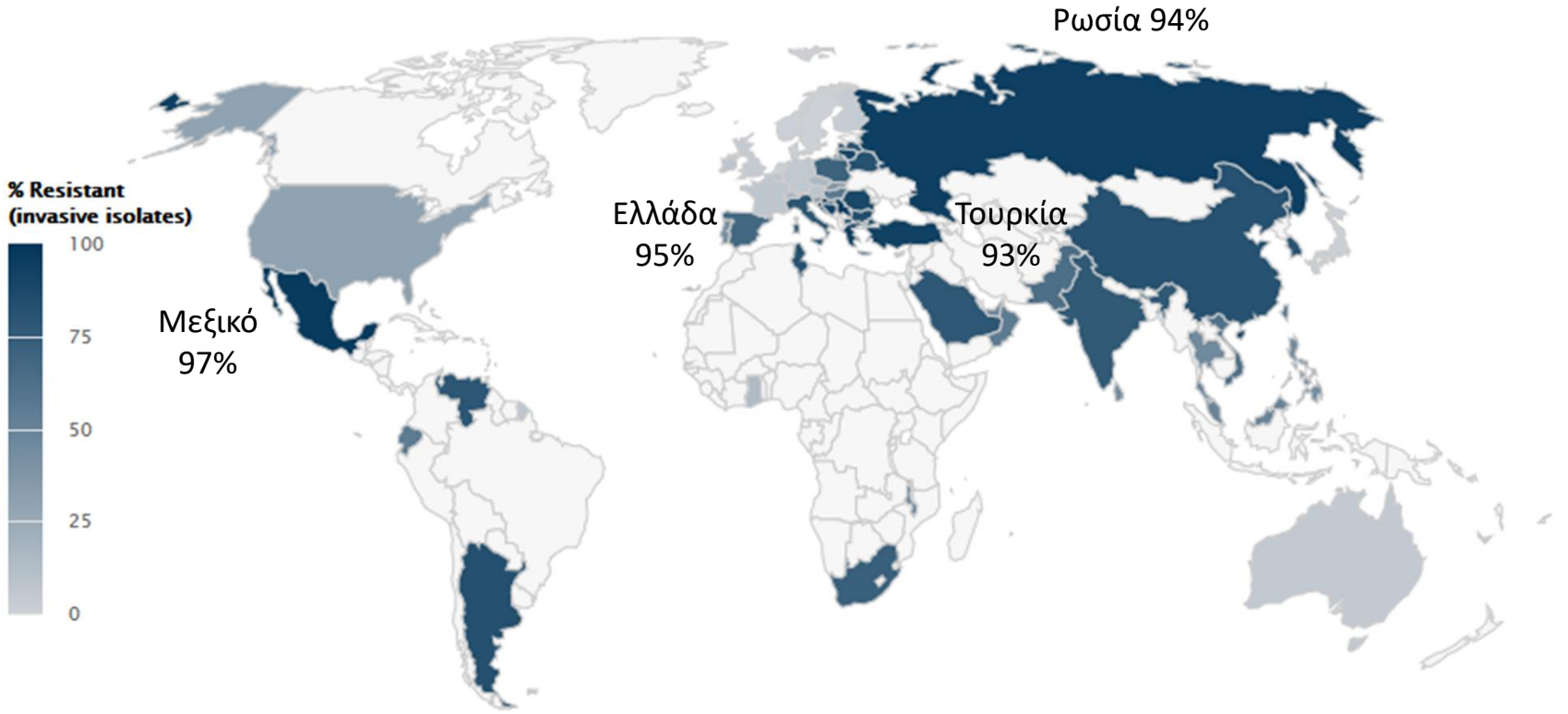
- Δραστικό έναντι KPC (A), AmpC (C)
- Αντοχή έχει αναφερθεί σε στελέχη με μεταλλαγές στις πορίνες

Κατανομή των στελεχών *Klebsiella pneumoniae* σύμφωνα με το Clonal Group (CG)



Wyres & Holt. Trends Microbiol 2016; 24: 944-956

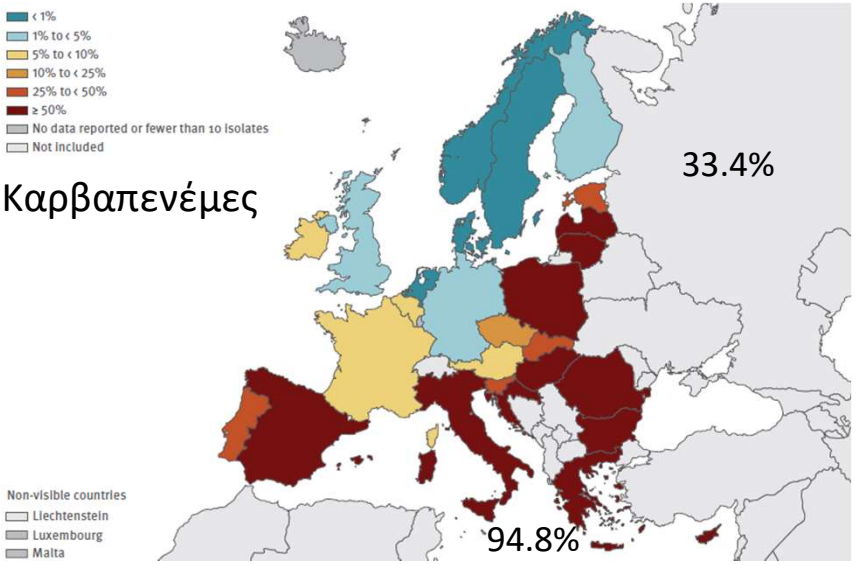
Αντοχή του *Acinetobacter baumannii* στις καρβαπενέμες 2017

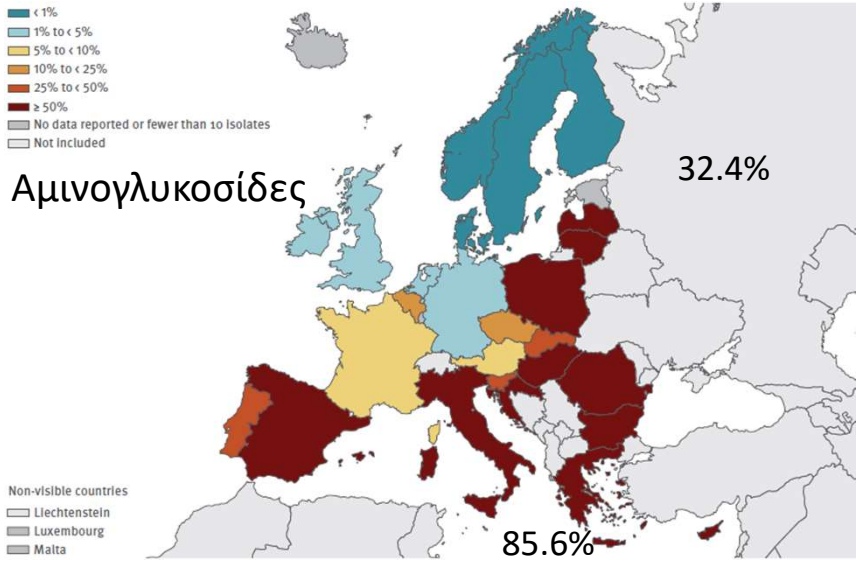


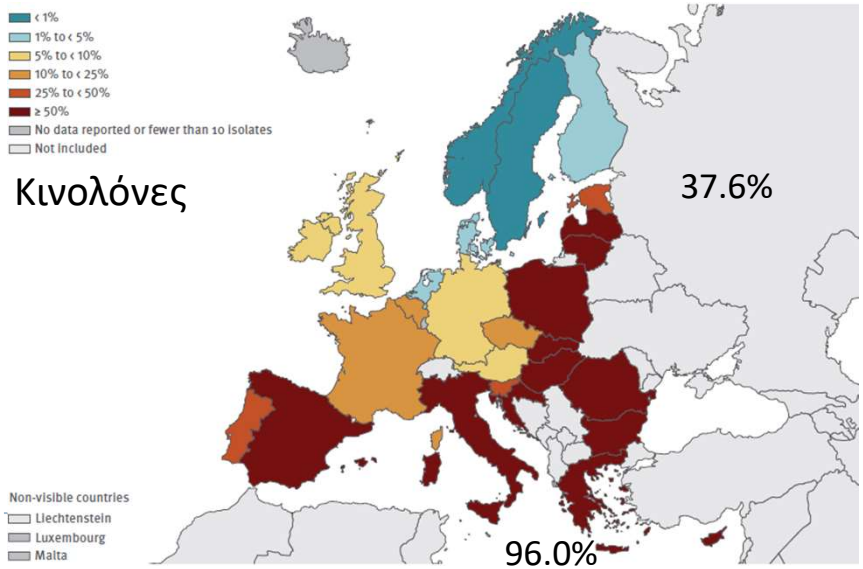
CDDEP THE CENTER FOR Disease Dynamics, Economics & Policy WASHINGTON DC • NEW DELHI

The Center for Disease Dynamics, Economics & Policy. ResistanceMap: Antibiotic resistance. 2019. https://resistancemap.cddep.org/AntibioticResistance.php. Date accessed: October 1, 2019.

Acinetobacter spp
2017

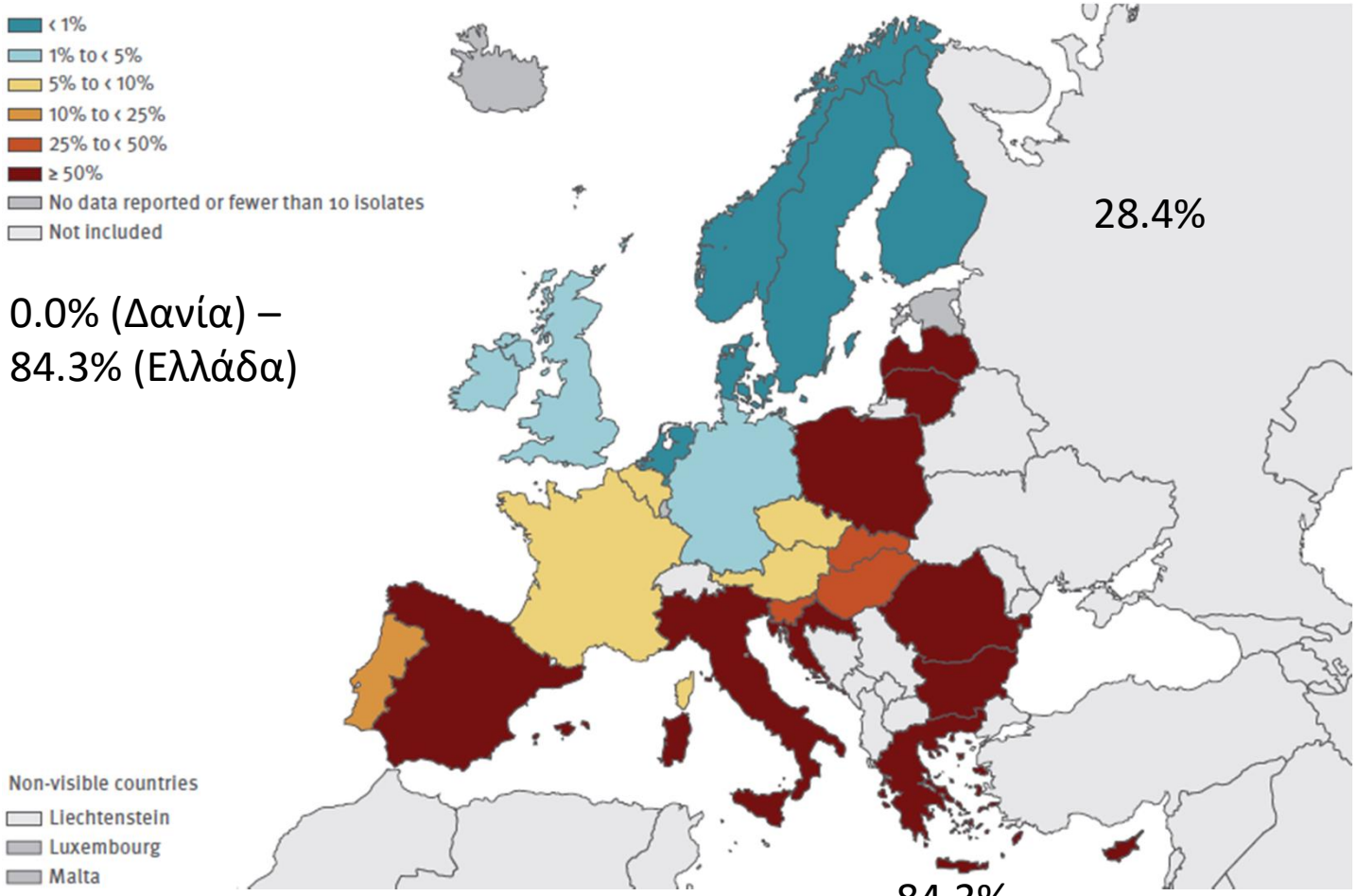






Acinetobacter spp

Πολυαντοχή (αντοχή σε κινολόνες, αμινογλυκοσίδες, καρβαπενέμες) 2017



JOURNAL OF MEDICAL MICROBIOLOGY

SHORT COMMUNICATION

Dafopoulou *et al.*, *Journal of Medical Microbiology* 2018;67:496–498

DOI 10.1099/jmm.0.000708

MICROBIOLOGY SOCIETY

Changes in antimicrobial resistance of clinical isolates of *Acinetobacter baumannii* group isolated in Greece, 2010–2015

K. Dafopoulou,* A. Tsakris and S. Pournaras on behalf of The Greek Study Group on *Acinetobacter* Antimicrobial Resistance

Table 1. Antimicrobial resistance trends of isolates of *A. baumannii* group between 2010 and 2015

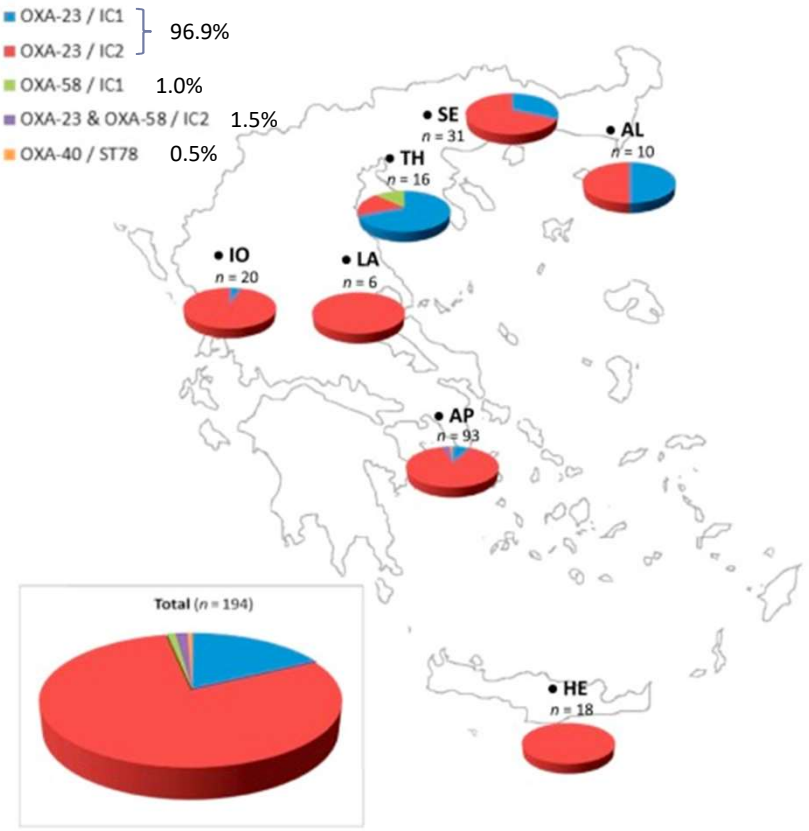
Antibiotic	Resistant % (*n*)						*P* value
Year (*n*)	2010 (1870)	2011 (2154)	2012 (2479)	2013 (1903)	2014 (2070)	2015 (2170)	
Amikacin	74.8 (1398)	70.7 (1524)	70.7 (1753)	72.9 (1387)	73.1 (1513)	73.9 (1603)	0.750
Gentamicin	69.3 (1295)	74.8 (1612)	83.5 (2069)	83.9 (1597)	83.7 (1732)	86.4 (1874)	0.014
Tobramycin	59.8 (1118)	56.7 (1221)	62.7 (1554)	64.8 (1233)	67.6 (1399)	76.8 (1666)	0.011
Amp/sul*	46.2 (864)	70.0 (1508)	80.5 (1996)	80.9 (1540)	83.9 (1737)	88.2 (1914)	0.021
Imipenem	90.3 (1688)	93.1 (2006)	94.6 (2345)	94.0 (1788)	92.5 (1914)	94.5 (2051)	0.198
Meropenem	82.6 (1544)	84.0 (1809)	91.7 (2273)	91.9 (1749)	94.1 (1948)	94.8 (2057)	0.006
Levofloxacin	95.5 (1786)	95.5 (2058)	95.1 (2358)	93.9 (1787)	95.6 (1979)	95.9 (2081)	0.879
Tmp/smx†	90.2 (1686)	84.8 (1827)	70.1 (1738)	64.8 (1234)	61.7 (1277)	69.1 (1499)	0.035
Minocycline	5.2 (97)	23.5 (506)	47.2 (1170)	50.6 (963)	47.4 (981)	58.5 (1270)	0.013
Colistin	7.1 (133)	5.4 (116)	5.8 (144)	10.7 (204)	9.6 (199)	7.5 (163)	0.317

*Amp/sul, ampicillin/sulbactam.

†Tmp/smx, trimethoprim/sulfamethoxazole.

Predominance of international clone 2 OXA-23-producing-*A. baumannii* clinical isolates in Greece, 2015: results of a nationwide study

	Σύνολο στελεχών	IC1 18.6%	IC2 80.9%
	% Ευαισθησία		
Μινοκυκλίνη	71.6	100	65.0
Τετρακυκλίνη	10.3	53.3	1.3
Τιγεκυκλίνη	1/2 $MIC_{50/90}$		
Τομπραμυκίνη	22.9	65.2	16.4
Κοτριμοξαζόλη	34.6	13.9	37.6
Κολιστίνη	72.7		
MDR	3.1		
XDR	78.4		
PDR	18.6		



MICROBIAL DRUG RESISTANCE
Volume 00, Number 00, 2019

DOI: 10.1089/mdr.2019.0075

Dissemination of International Clone II *Acinetobacter baumannii* Strains Coproducing OXA-23 Carbapenemase and 16S rRNA Methylase ArmA in Athens, Greece

Konstantina Nafplioti,[1] Irene Galani,[1,2] Evdokia Angelidis,[1] Panagiota Adamou,[1] Eleni Moraitou,[3] Panagiota Giannopoulou,[4] Paraskevi Chra,[5] Maria Damala,[6] Evangellos Vogiatzakis,[3] Eleftheria Trikka-Graphakos,[4] Vasiliki Baka,[5] Eleni Prifti,[6] Anastasia Antoniadou,[1,2] and Maria Souli[1]

- 2015-2016
- 5 Νοσοκομεία της Αθήνας
- Στελέχη ανθεκτικά σε όλες τις αμινογλυκοσίδες (67.8%)
- 98.4% OXA-23 (IC2)
- 84.6% αντοχή στην κολιστίνη
- 66.8% PDR

	% Αντοχή
Κολιστίνη	84.6*
Μινοκυκλίνη	77.8
Τιγεκυκλίνη	4/8 ($MIC_{50/90}$)
Κοτριμοξαζόλη	80.9

* με BMD σύμφωνα με οδηγίες EUCAST-CLSI

Nafplioti et al. Microb Drug Resist 2019

The Biggest Threats

Urgent Threats

- *Clostridioides difficile*
- Carbapenem-resistant Enterobacteriaceae (CRE)
- Drug-resistant *Neisseria gonorrhoeae*

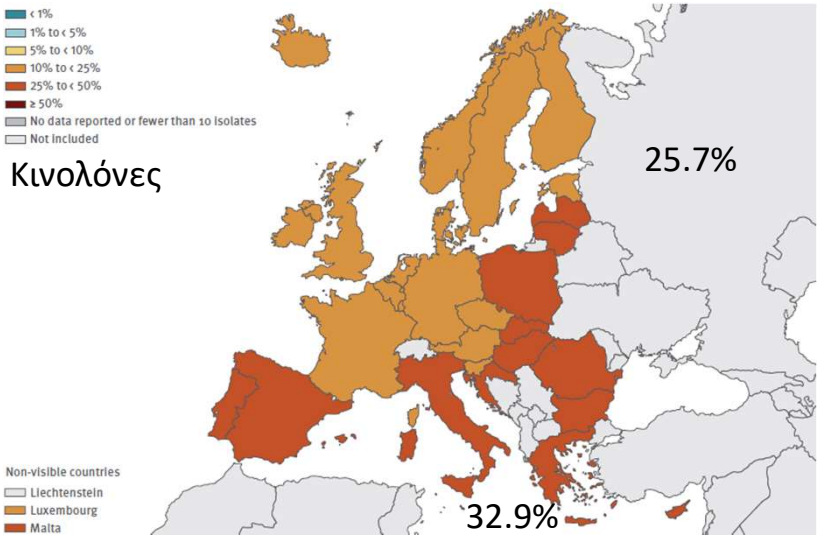
Serious Threats

- Multidrug-resistant *Acinetobacter*
- Drug-resistant *Campylobacter*
- Fluconazole-resistant *Candida*
- Extended-spectrum Beta-lactamase producing Enterobacteriaceae
- Vancomycin-resistant *Enterococcus* (VRE)
- Multidrug-resistant *Pseudomonas aeruginosa*
- Drug-resistant non-typhoidal *Salmonella*
- Drug-resistant *Salmonella* Serotype Typhi
- Drug-resistant *Shigella*
- Methicillin-resistant *Staphylococcus aureus* (MRSA)
- Drug-resistant *Streptococcus pneumoniae*
- Drug-resistant Tuberculosis

Concerning Threats

- Vancomycin-resistant *Staphylococcus aureus* (VRSA)
- Erythromycin-Resistant Group A *Streptococcus*
- Clindamycin-resistant Group B *Streptococcus*

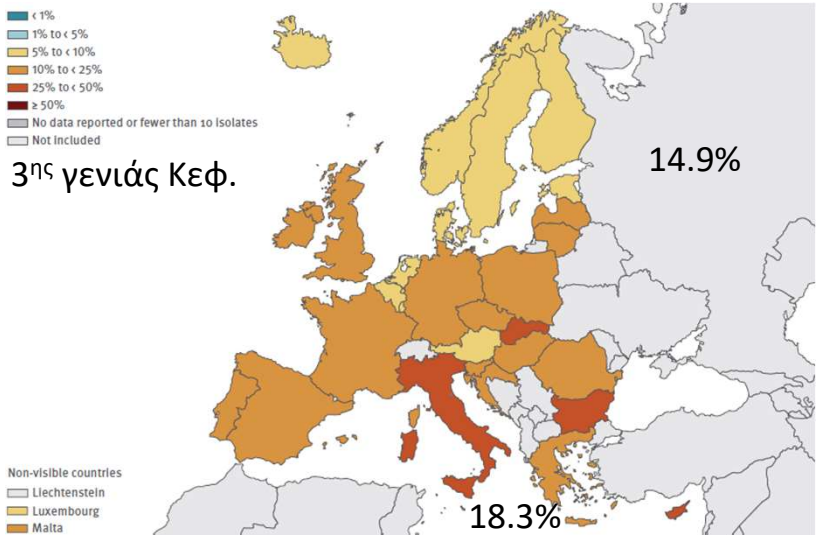
Escherichia coli
2017



Κινολόνες

25.7%

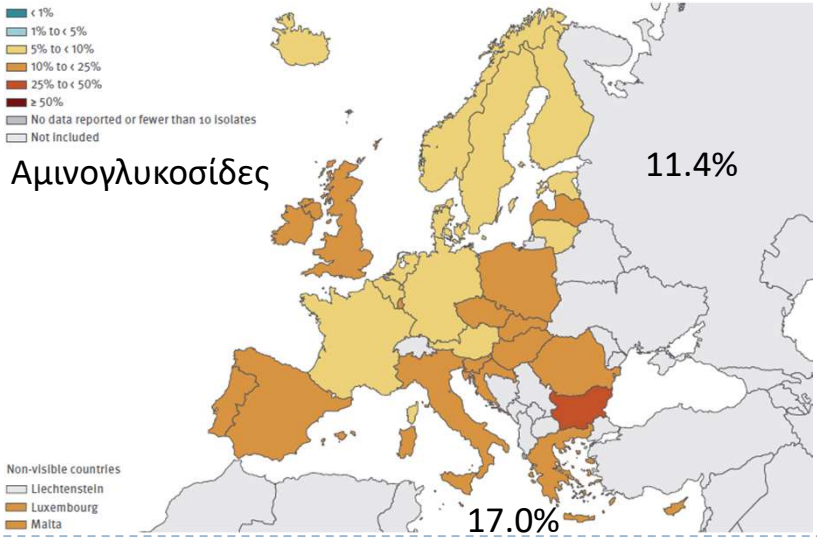
32.9%



3ης γενιάς Κεφ.

14.9%

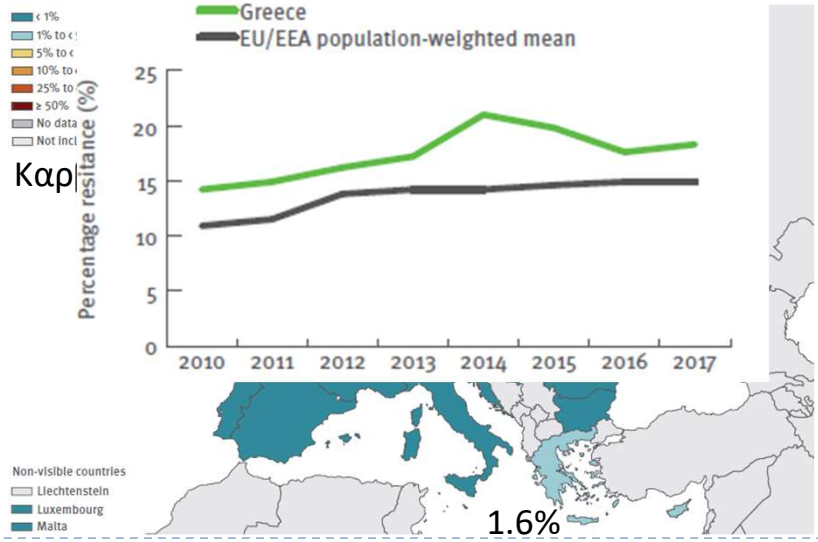
18.3%



Αμινογλυκοσίδες

11.4%

17.0%



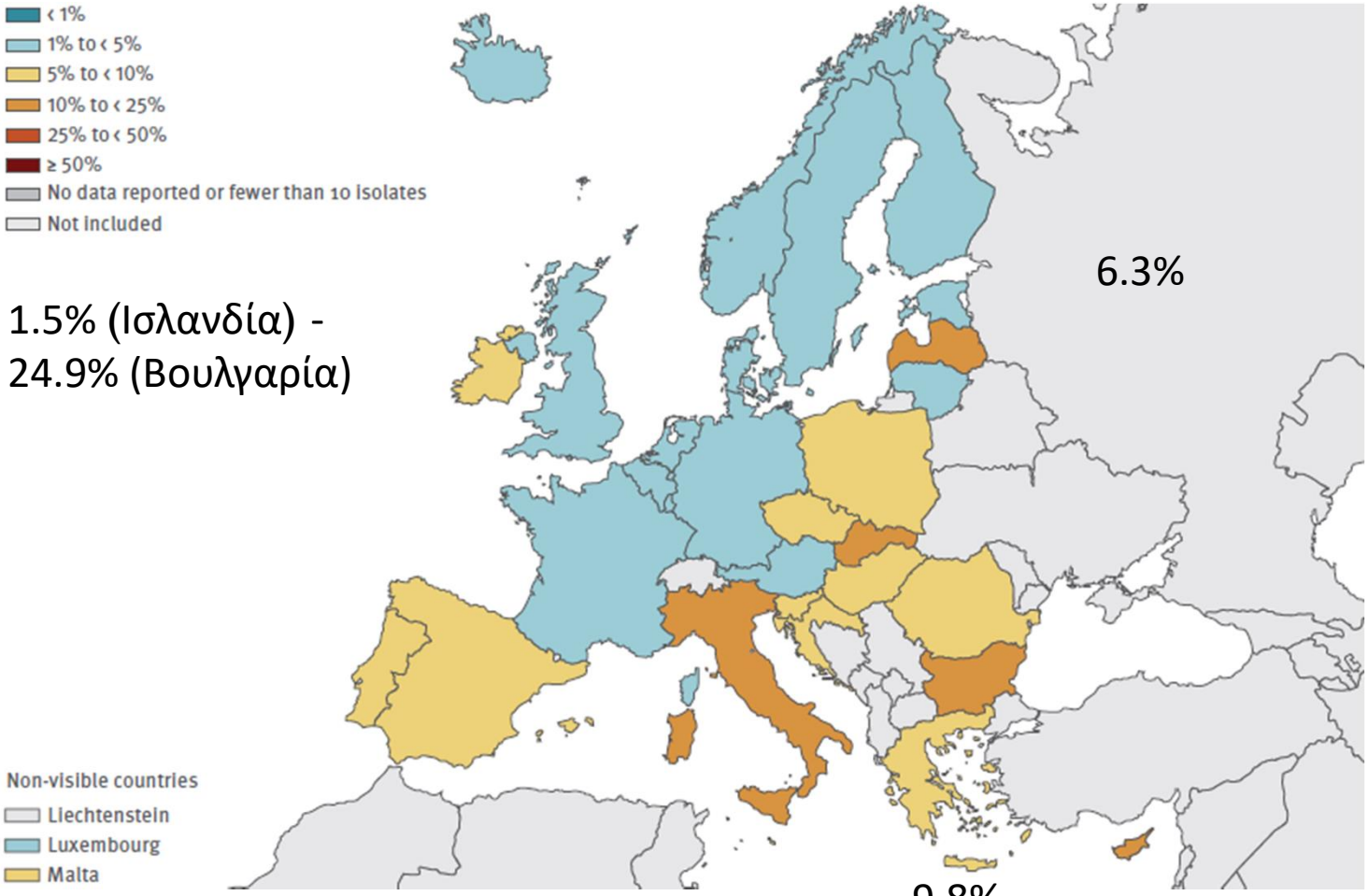
Καρ

1.6%

Surveillance of antimicrobial resistance in Europe – Annual report of the European Antimicrobial Resistance Surveillance Network (EARS-Net) 2017. Stockholm: ECDC; 2018

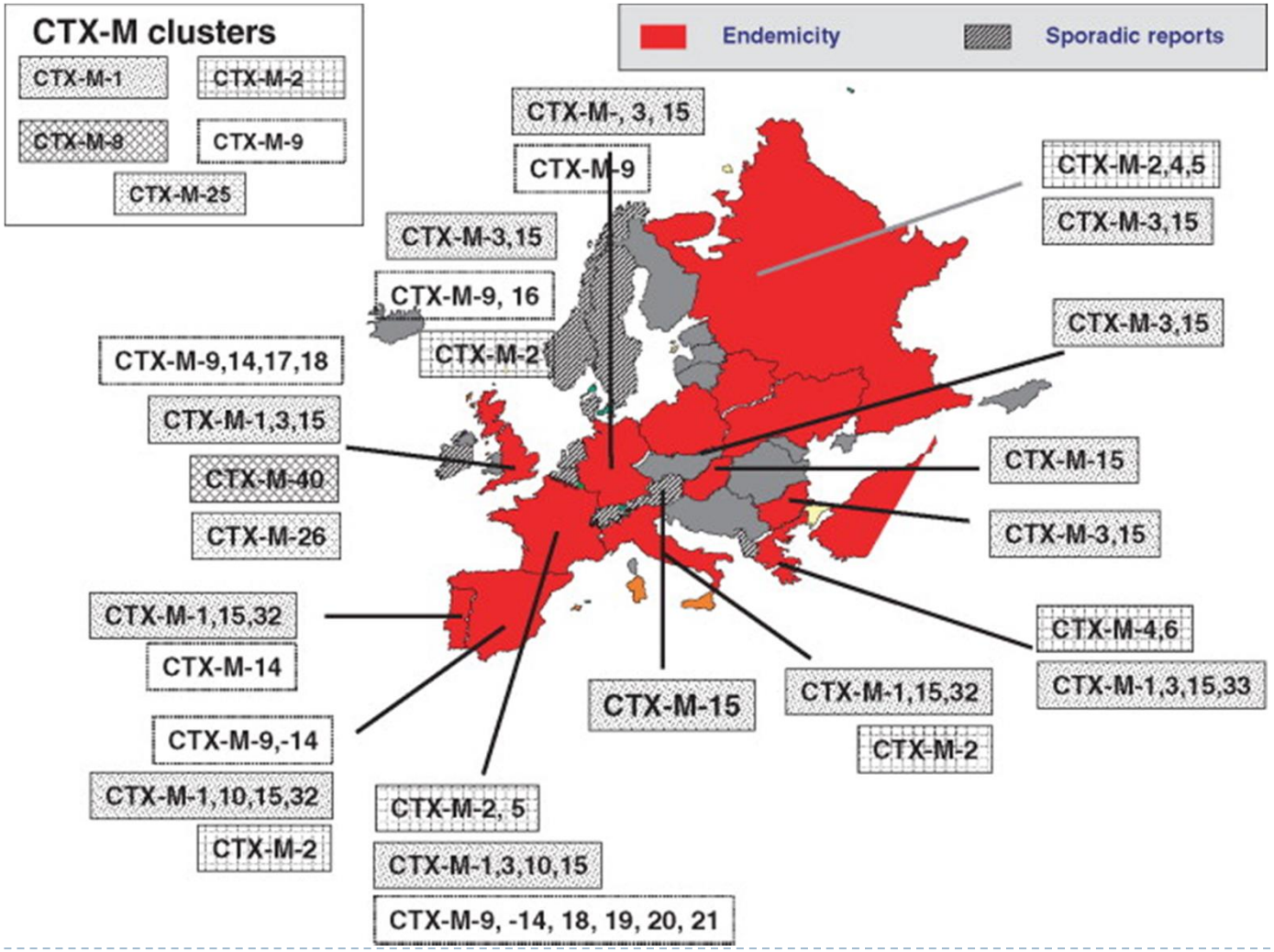
Escherichia coli
2017

Πολυαντοχή (3η γενιά CEPH, FQ & AMK)



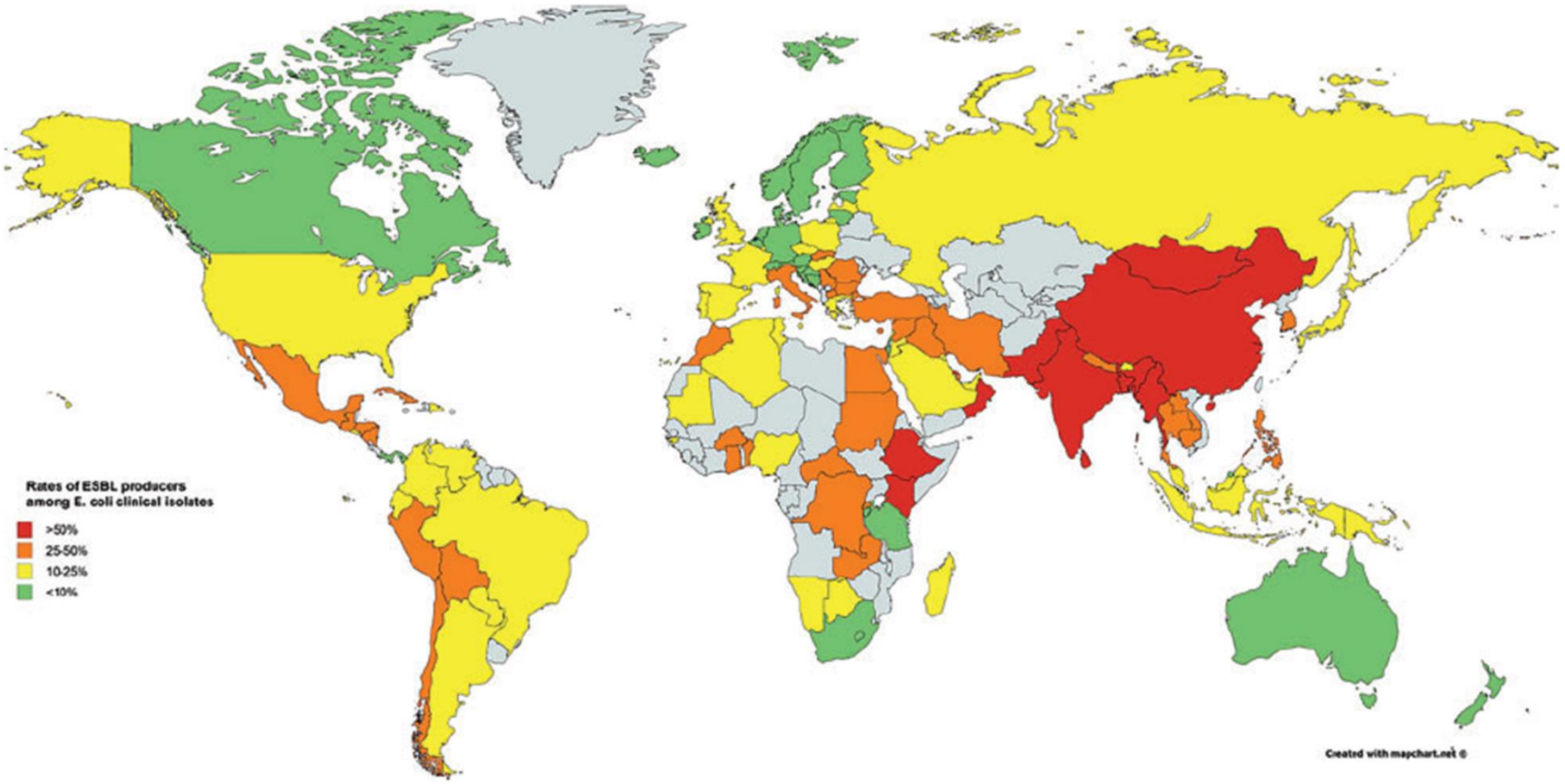
Surveillance of antimicrobial resistance in Europe – Annual report of the European Antimicrobial Resistance Surveillance Network (EARS-Net) 2017. Stockholm: ECDC; 2018

Κατανομή των ενζύμων τύπου CTX-M στην Ευρώπη



Cantón et al. Clin Microbiol Infect. 2008 ; 14 Suppl 1: 144-53

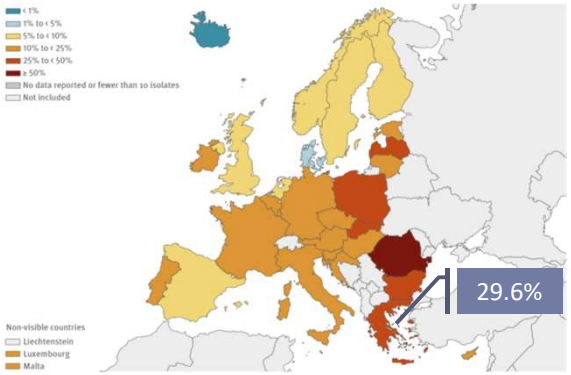
Ποσοστά κλινικών στελεχών *E. coli* που παράγουν ESBL (2014)



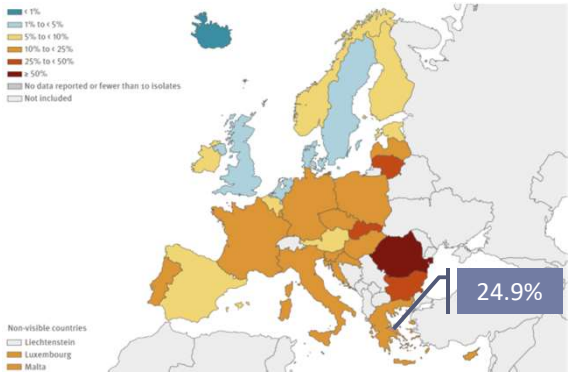
Doi et al. J Travel Med 2017; 24(suppl_1): S44-S51

Pseudomonas aeruginosa
2017

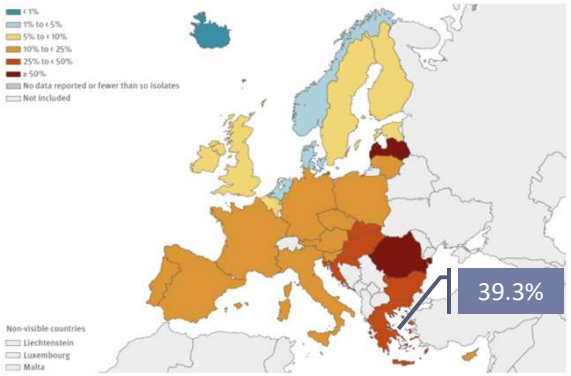
P/T



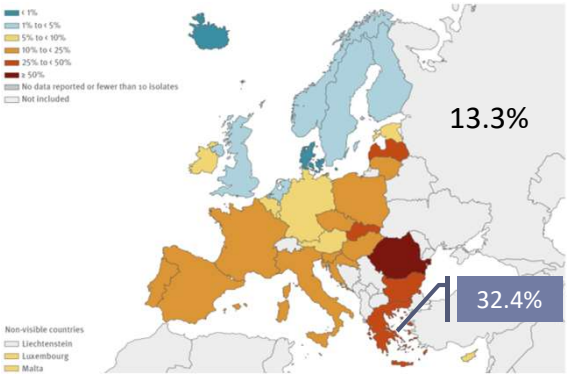
Ceftazidime



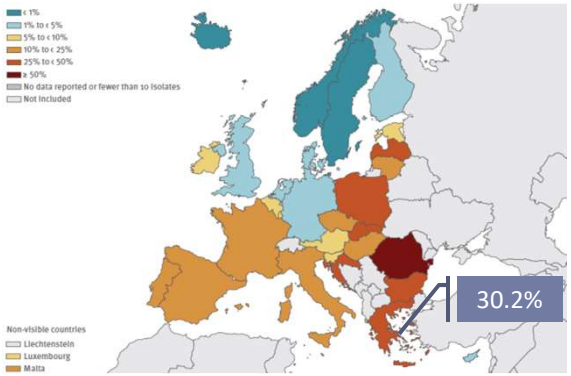
Carbapenems



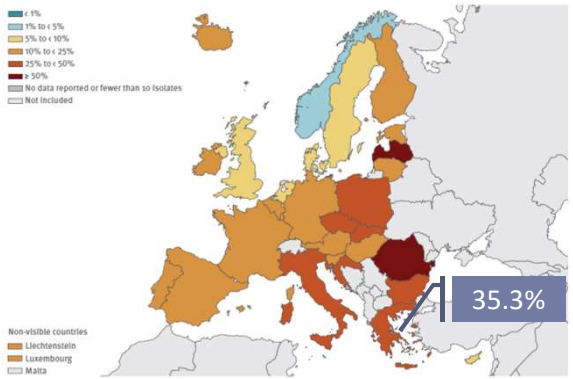
MDR



Aminoglycosides



Fluoroquinolones

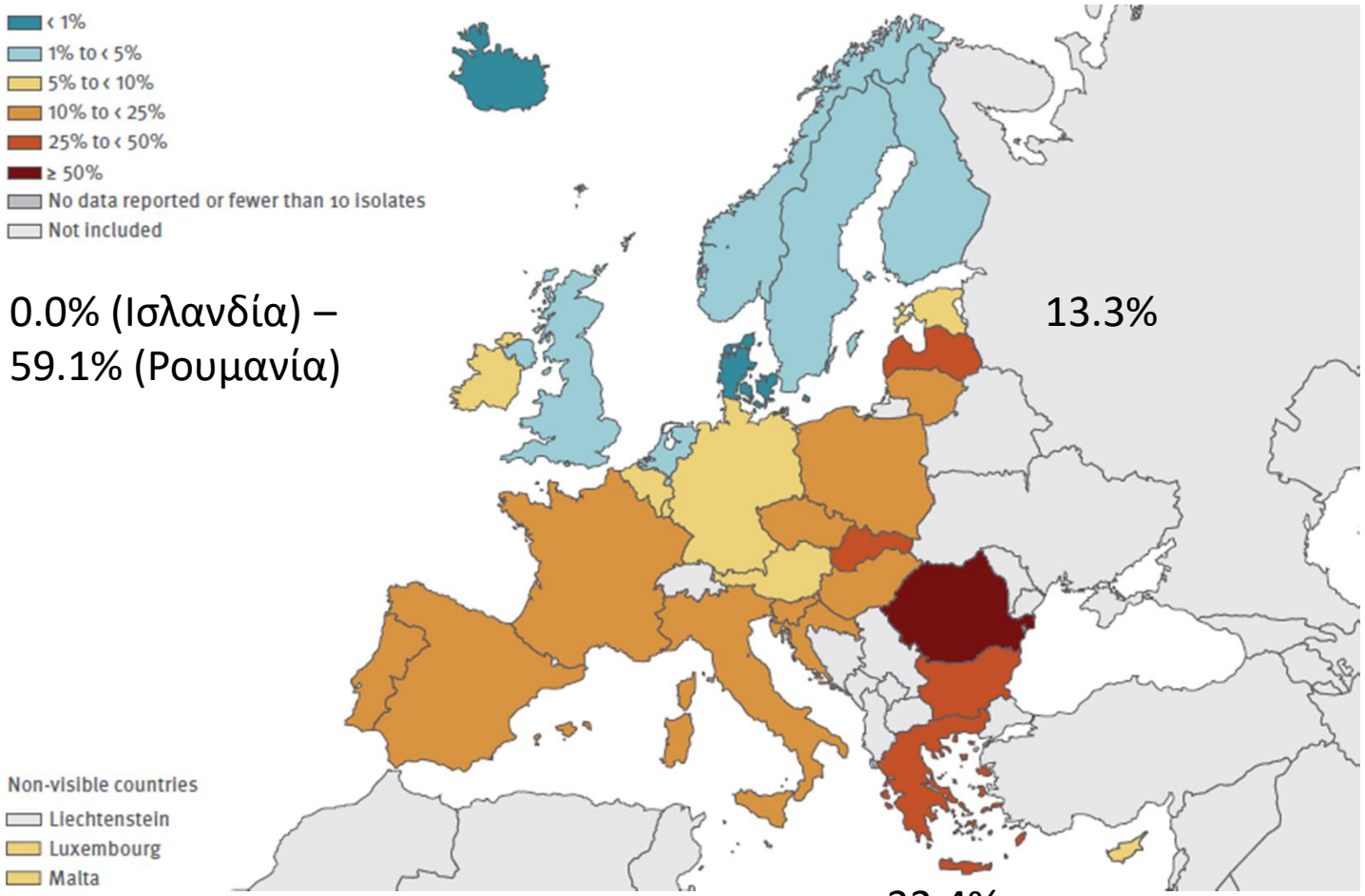


0.0% (Ισλανδία) –
59.1% (Ρουμανία)

ECDC. Surveillance of antimicrobial resistance in Europe – Annual report of the European Antimicrobial Resistance Surveillance Network (EARS-Net) 2017. Stockholm: ECDC; 2018.

Pseudomonas aeruginosa
2017

Πολυαντοχή (αντοχή σε ≥3 ομάδες από τις PIP/TAZO, CAZ, FQ, AMK & CARB)



Surveillance of antimicrobial resistance in Europe – Annual report of the European Antimicrobial Resistance Surveillance Network (EARS-Net) 2017. Stockholm: ECDC; 2018

Liakopoulos et al. BMC Infectious Diseases 2013, 13:505
http://www.biomedcentral.com/1471-2334/13/505

BMC Infectious Diseases

RESEARCH ARTICLE Open Access

Carbapenemase-producing *Pseudomonas aeruginosa* from central Greece: molecular epidemiology and genetic analysis of class I integrons

Apostolos Liakopoulos[1,2], Angeliki Mavroidi[1], Efstathios A Katsifas[2], Alexandros Theodosiou[3], Amalia D Karagouni[2], Vivi Miriagou[4] and Efthymia Petinaki[1,5*]

Πανεπιστημιακό Νοσοκομείο Λάρισας, Γενικό Νοσοκομείο Βόλου, Γενικό Νοσοκομείο Τρικάλων

- 568 στελέχη *P. aeruginosa* του 2011
- 50% IMP-R (MIC ≥16 mg/L)
- **14.1% παρήγαγαν VIM**
- **ST111** (bla_{VIM-2}) και **ST235** (bla_{VIM-4})
- Ένα στέλεχος bla_{VIM-17} (ST1457)

MICROBIAL DRUG RESISTANCE
Volume 00 Number 00, 2018
© Mary Ann Liebert, Inc.
DOI: 10.1089/mdr.2018.0266

Molecular Epidemiology of Endemic Carbapenem-Resistant Gram-Negative Bacteria in an Intensive Care Unit

Theodoros Karampatakis[1,2] Katerina Tsergouli,[2] Lida Politi,[3] Georgia Diamantopoulou,[3] Elias Iosifidis,[1,4] Charalampos Antachopoulos,[1,4] Aggeliki Karyoti,[2,4] Eleni Mouloudi,[5] Athanassios Tsakris,[3] and Emmanuel Roilides[1,4]

Γενικό Νοσοκομείο Θεσσαλονίκης "Ιπποκράτειο" ΜΕΘ

- 105 στελέχη *P. aeruginosa* (2012-2014)
- 16.2% ήταν CRPA
- **14.3% παρήγαγαν VIM**
- Ένα στέλεχος παρήγαγε VIM και KPC (0.95%)

J Antimicrob Chemother 2018; 73: 2777–2781
doi:10.1093/jac/dky267 Advance Access publication 11 July 2018

Journal of Antimicrobial Chemotherapy

In vitro activity of ceftazidime/avibactam against isolates of *Pseudomonas aeruginosa* collected in European countries: INFORM global surveillance 2012–15

Krystyna M. Kazmierczak[1]*, Boudewijn L. M. de Jonge[2]†, Gregory G. Stone[2]‡ and Daniel F. Sahm[1]

Ελληνικά νοσοκομεία

- 317 στελέχη *P. aeruginosa* (2012-2015)
- 30% αντοχή στις καρβαπενέμες
- **12.9% παρήγαγαν VIM**
- Δεν ανιχνεύθηκαν GES καρβαπενεμάσες

J Antimicrob Chemother
doi:10.1093/jac/dkz030

JAC 2019 Feb 8.

Journal of Antimicrobial Chemotherapy

High incidence of MDR and XDR *Pseudomonas aeruginosa* isolates obtained from patients with ventilator-associated pneumonia in Greece, Italy and Spain as part of the MagicBullet clinical trial

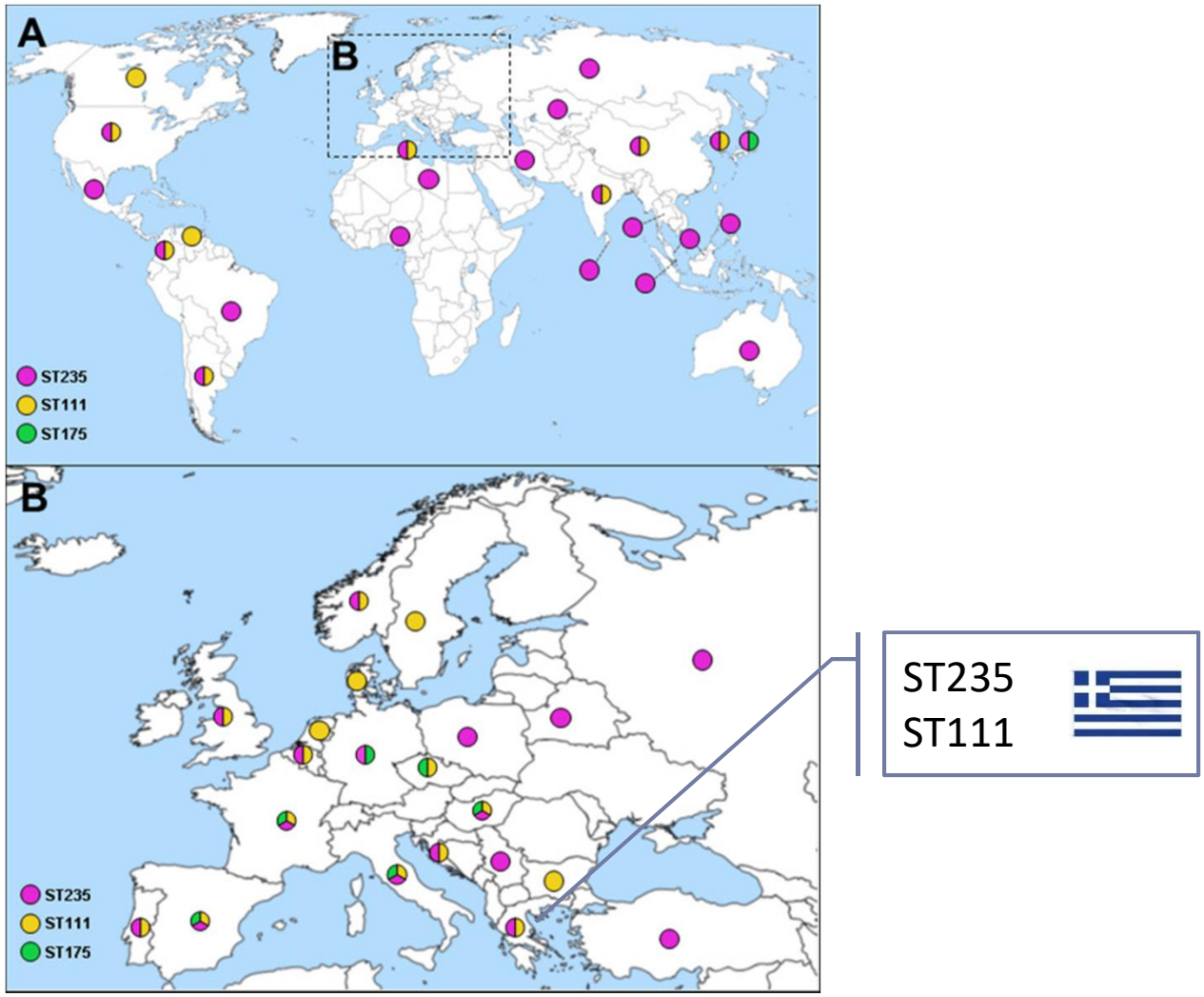
Astrid Pérez[1]†, Eva Gato[1]†, José Pérez-Llarena[1], Felipe Fernández-Cuenca[2,3], María José Gude[1], Marina Oviaño[1], María Eugenia Pachón[2], José Garnacho[4], Verónica González[4], Álvaro Pascual[2,3,5], José Miguel Cisneros[4] and Germán Bou[1]*

3 Ελληνικά νοσοκομεία

- 41 στελέχη *P. aeruginosa* (2012 - 2015)
  - **ST-111** (n=35)
  - **ST-235** (n = 2)

  High risk clones
  Όλα τα στελέχη ήταν MDR/XDR/PDR
- ST-395 (n = 1), ST-244 (n=2), ST-641 (n=1)

World distribution (A) and European distribution (B) of ST235, ST111 and ST175 high-risk clones according to literature review



Aguilar-Rodea et al. PLoS One 2017; 12(3): e0172882

In vitro activity of ceftolozane-tazobactam alone and in combination with amikacin against MDR *Pseudomonas aeruginosa* isolates from Greece

Galani I, Papoutsaki V, Karantani I, Karaiskos I, Galani L, Adamou P, Deliolanis I, Kodonaki A, Papadogeorgaki H, Maraki S, Damala M, Prifti E, Vagiakou H, Petinaki E, Fountoulis K, Tsiplakou S, Kirikou H, Antoniadou A, Giamarellou H

- Infectious Diseases Laboratory, 4th Department of Internal Medicine, National and Kapodistrian University of Athens
- Microbiology Laboratory, Hygeia General Hospital

- Hygeia General Hospital
- University Hospital “Attikon” (4th Dept)
- Laiko, General Hospital of Athens
- University Hospital of Heraklion
- "Alexandra" General Hospital of Athens
- General Hospital of Athens ‘G. Gennimatas’
- University Hospital of Larissa
- Evangelismos General Hospital
- KAT Hospital
- Agia Sofia Children’s Hospital

•13.1% των MDR στελεχών παρήγαγαν GES-1 (ESBL)
•8.8% των MDR στελεχών παρήγαγαν GES-5 (καρβαπενεμάση)
•Αντοχή στην κεφτολοζάνη/ταζομπακτάμη

In 29th ECCMID, Amsterdam, 13-16 April 2019
Υπό δημοσίευση

The Biggest Threats - Gram-(+)

Urgent Threats

- *Clostridioides difficile*
- Carbapenem-resistant Enterobacteriaceae (CRE)
- Drug-resistant *Neisseria gonorrhoeae*

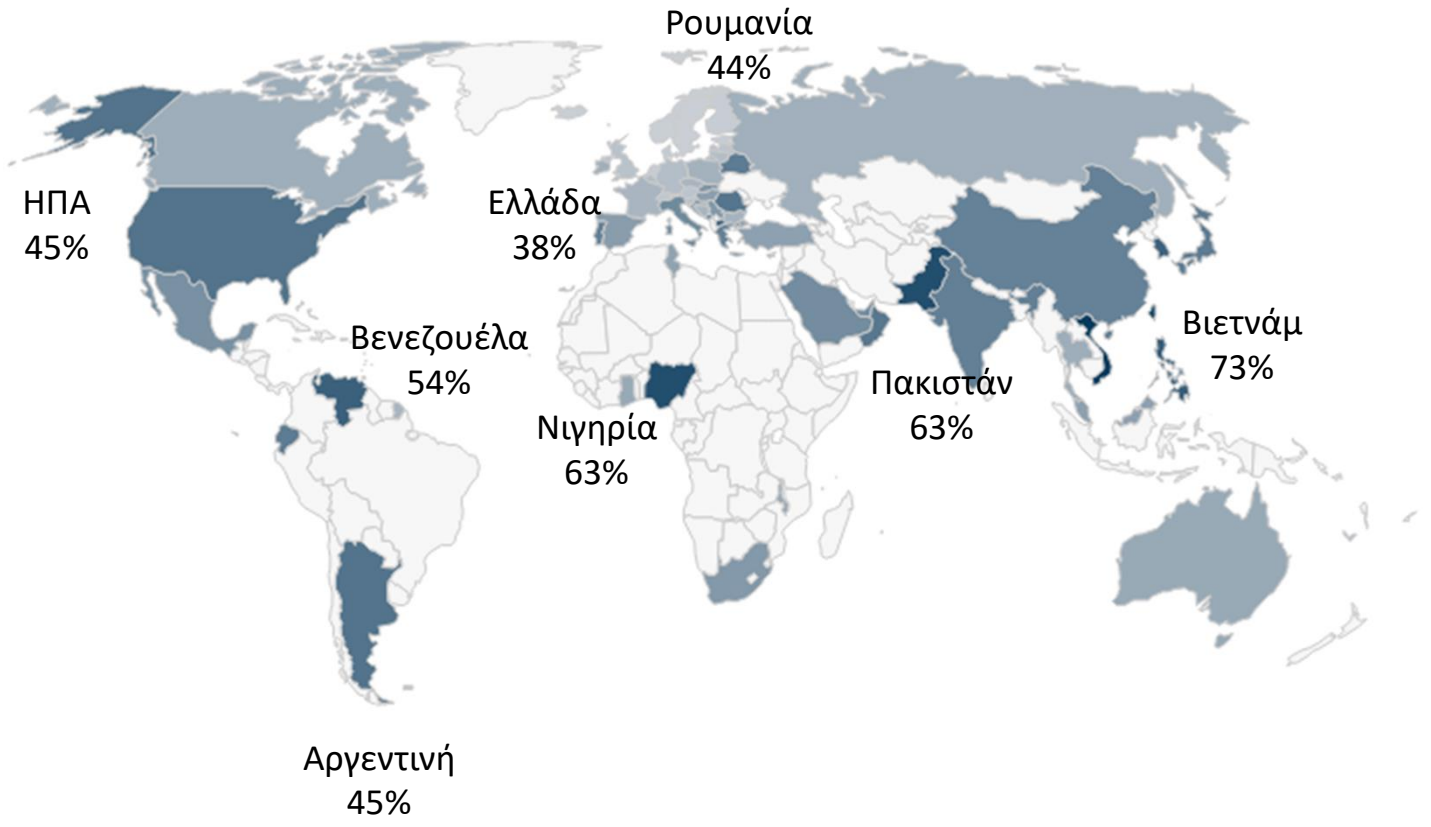
Serious Threats

- Multidrug-resistant *Acinetobacter*
- Drug-resistant *Campylobacter*
- Fluconazole-resistant *Candida*
- Extended-spectrum Beta-lactamase producing Enterobacteriaceae
- Vancomycin-resistant *Enterococcus* (VRE)
- Multidrug-resistant *Pseudomonas aeruginosa*
- Drug-resistant non-typhoidal *Salmonella*
- Drug-resistant *Salmonella* Serotype Typhi
- Drug-resistant *Shigella*
- Methicillin-resistant *Staphylococcus aureus* (MRSA)
- Drug-resistant *Streptococcus pneumoniae*
- Drug-resistant Tuberculosis

Concerning Threats

- Vancomycin-resistant *Staphylococcus aureus* (VRSA)
- Erythromycin-Resistant Group A *Streptococcus*
- Clindamycin-resistant Group B *Streptococcus*

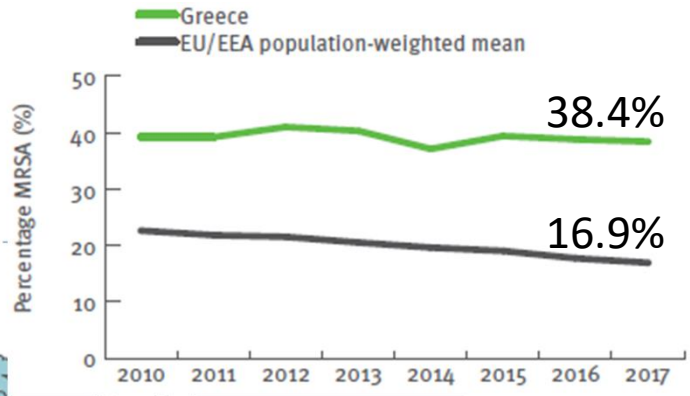
Αντοχή του *Staphylococcus aureus* στην Οξακιλλίνη (MRSA), 2017

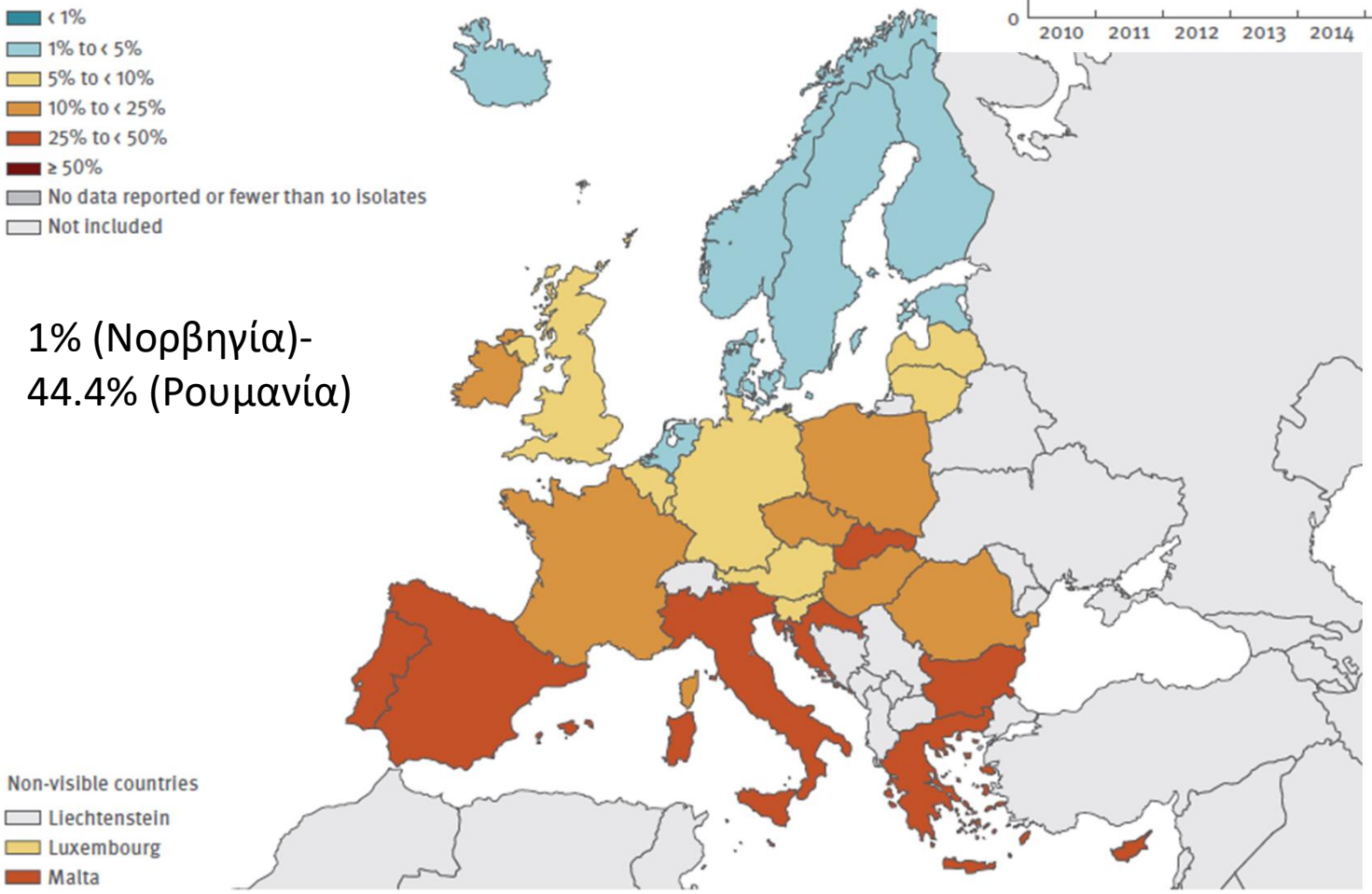


CDDEP THE CENTER FOR Disease Dynamics, Economics & Policy WASHINGTON DC • NEW DELHI

The Center for Disease Dynamics, Economics & Policy. ResistanceMap: Antibiotic resistance. 2019. https://resistancemap.cddep.org/AntibioticResistance.php. Date accessed: October 1, 2019.

Staphylococcus aureus
Resistance to meticillin (MRSA)
2017



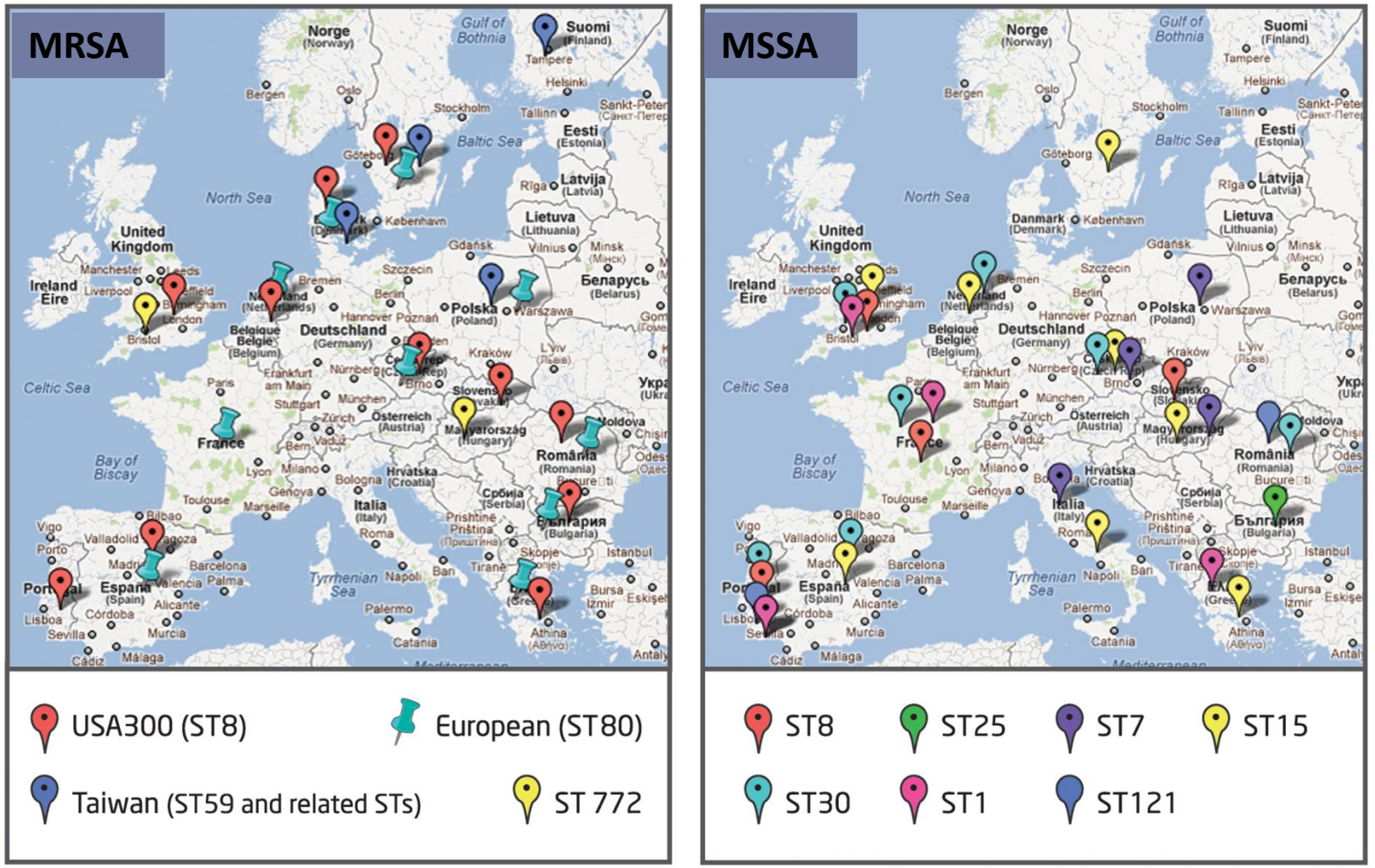


1% (Νορβηγία)-
44.4% (Ρουμανία)

10% from ICU

Surveillance of antimicrobial resistance in Europe – Annual report of the European Antimicrobial Resistance Surveillance Network (EARS-Net) 2017. Stockholm: ECDC; 2018

Επιπολασμός των κλώνων MRSA και MSSA της κοινότητας στην Ευρώπη



Rolo et al. PLoS One. 2012; 7:e34768

ORIGINAL ARTICLE BACTERIOLOGY

A 12-year survey of methicillin-resistant *Staphylococcus aureus* infections in Greece: ST80-IV epidemic?

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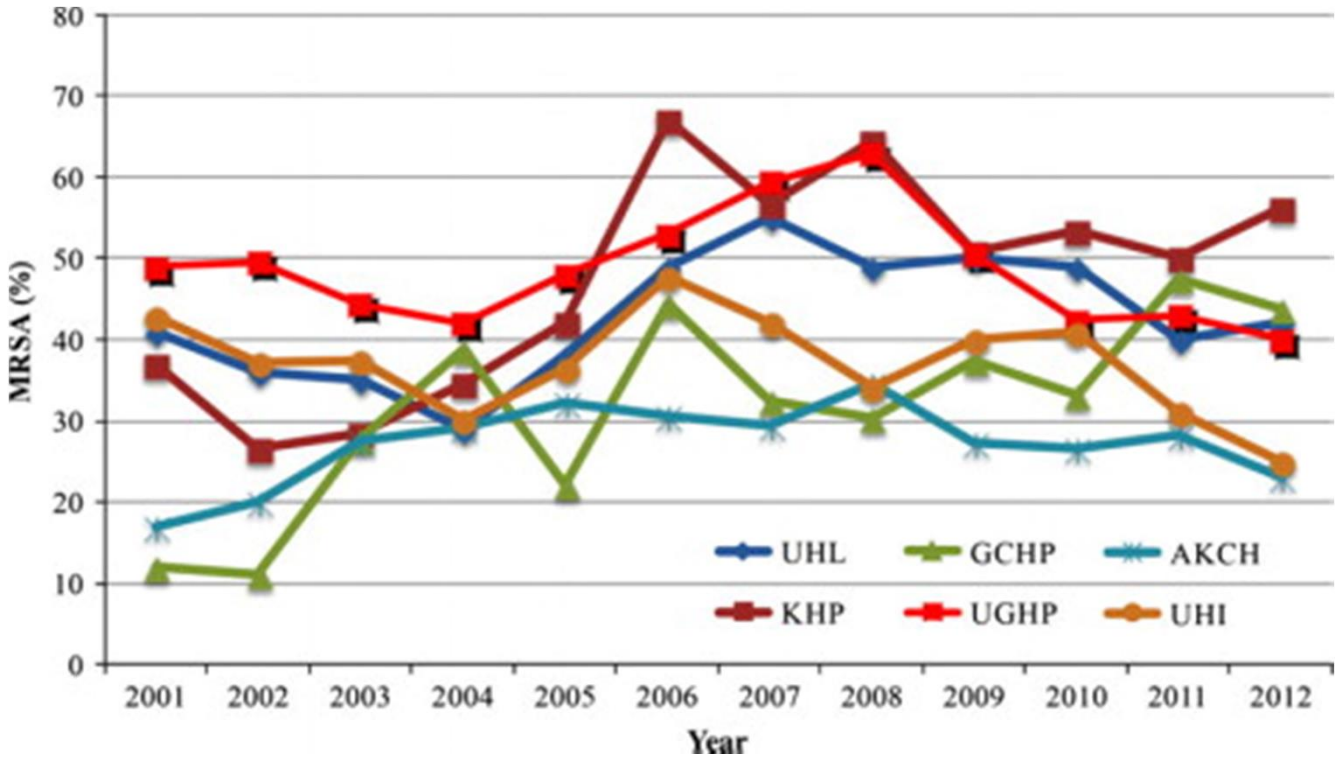
Πανεπιστημιακό Νοσοκομείο Πατρών	Πανεπιστημιακό Νοσοκομείο Λάρισας	Γενικό Νοσοκομείο Παίδων Π. & Α. Κυριακού
Καραμανδάνειο - Γενικό Νοσοκομείο παίδων Πατρών	Πανεπιστημιακό Νοσοκομείο Ιωαννίνων	Γενικό Νοσοκομείο Παίδων Πεντέλης

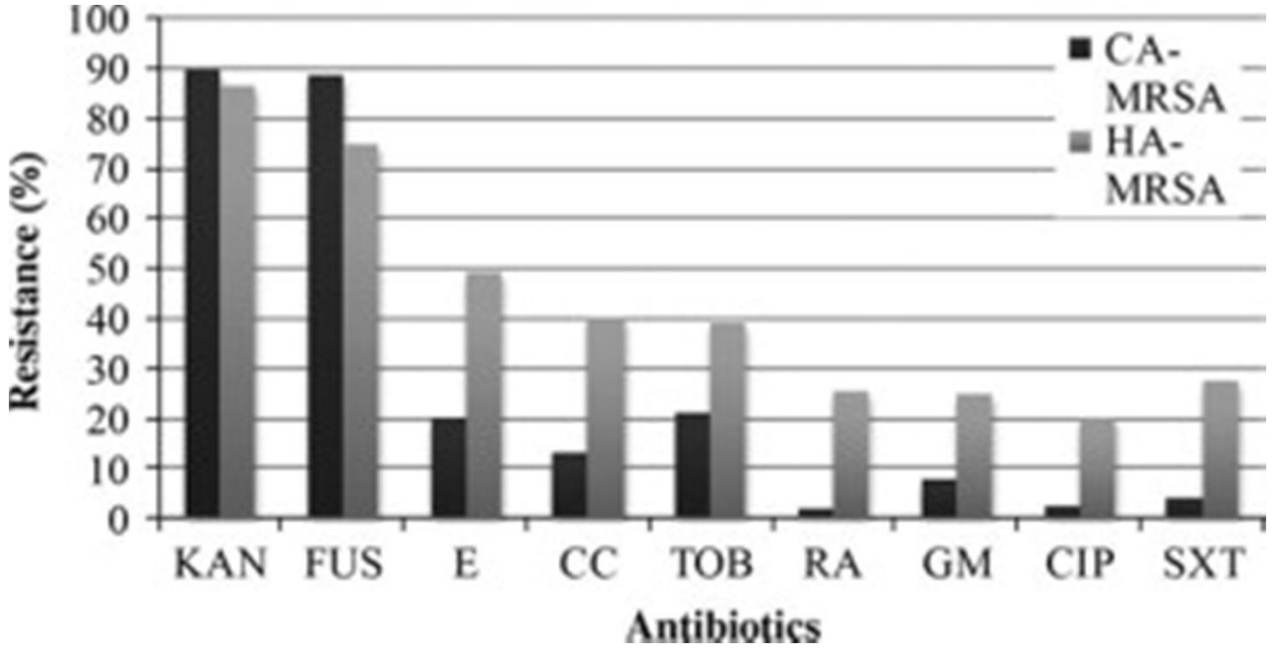
Ετήσιο ποσοστό του MRSA μεταξύ των λοιμώξεων από *S. aureus* στα συμμετέχοντα νοσοκομεία



AKCH: 'Π. & Α. Κυριακού; **GCHP**: Γενικό Νοσοκομείο Παίδων Πεντέλης; **KHP**, Καραμανδάνειο - Γενικό Νοσοκομείο παίδων Πατρών ; **UGHP:**, Πανεπιστημιακό Νοσοκομείο Πατρών; **UHI**: Πανεπιστημιακό Νοσοκομείο Ιωαννίνων; **UHL:** Πανεπιστημιακό Νοσοκομείο Λάρισας.

Drougka et al. Clin Microbiol Infect. 2014; 20: O796-803

Ποσοστά αντοχής των CA-MRSA και HA-MRSA, όπως προσδιορίζεται με τη μέθοδο διάχυσης δίσκου



KAN: καναμυκίνη
TOB: τομπραμυκίνη
SXT: σουλφ/τριμεθ

FUS: φουσιδικό οξύ
RA: ριφαμπικίνη

E: ερυθρομυκίνη
GM: γενταμικίνη

CC: κλινταμυκίνη
CIP: σιπροφλοξασίνη

Drougka et al. Clin Microbiol Infect. 2014; 20: O796-803

Συχνότητα εμφάνισης των κλώνων MRSA κατά τη διάρκεια των 12 ετών της περιόδου της μελέτης (2001-2012), ανά έτος

	MRSA total	ST80-IV *N* (%)	ST239-III *N* (%)	ST30-IV *N* (%)	ST377-V *N* (%)	Other STs *N* (%)
2001	84	24 (28.6)	41 (48.8)	18 (21.4)	–	1 (1.2)
2002	155	54 (34.8)	79 (51.0)	19 (12.3)	–	3 (1.9)
2003	167	75 (45.0)	64 (38.3)	27 (16.2)	–	1 (0.5)
2004	315	157 (49.8)	117 (37.2)	36 (11.4)	4 (1.3)	1 (0.3)
2005	377	197 (52.3)	131 (34.7)	43 (11.4)	4 (1.1)	2 (0.5)
2006	496	280 (56.5)	144 (29.0)	58 (11.7)	5 (1.0)	9 (1.8)
2007	610	404 (66.2)	113 (18.5)	65 (10.7)	5 (0.8)	23 (3.8)
2008	847	589 (69.5)	120 (14.2)	67 (7.9)	26 (3.1)	45 (5.3)
2009	553	378 (68.4)	89 (16.1)	45 (8.1)	7 (1.3)	34 (6.1)
2010	561	368 (65.6)	72 (12.8)	39 (7.0)	7 (1.2)	75 (13.4)
2011	198	128 (64.6)	38 (19.2)	16 (8.1)	–	16 (8.1)
2012	251	184 (73.3)	43 (17.1)	20 (8.0)	2 (0.8)	2 (0.8)
Total	4614	2838 (61.6)	1051 (22.5)	453 (9.8)	60 (1.4)	212 (4.7)

ST, sequence type.

Drougka et al. Clin Microbiol Infect. 2014; 20: O796-803

Ποσοστά επιπολασμού του MRSA και σύγκριση μεταξύ CA- και HA-λοιμώξεων , που προσδιορίζονται σύμφωνα με επιδημιολογικά κριτήρια

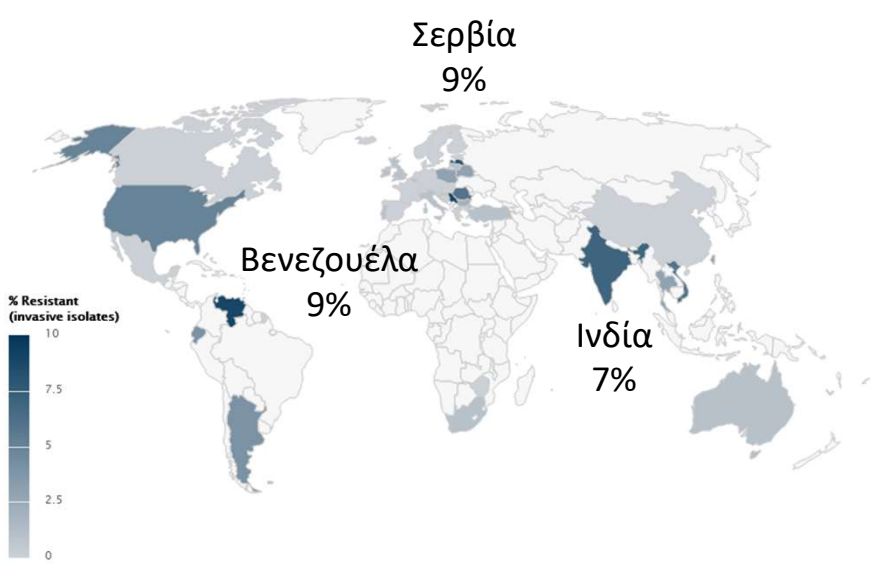
	Total *N*	CA-MRSA *N* (%)	HA-MRSA *N* (%)	p
ST80-IV	2838	2520 (88.8)	318 (11.2)	<0.001
ST30-IV	453	319 (70.4)	134 (29.6)	<0.001
ST377-V	60	46 (76.7)	14 (23.3)	<0.001
ST239-III	1051	346 (32.9)	705 (60.8)	<0.001
ST225-II	52	8 (15.4)	44 (84.6)	<0.001
Other clones	160	106 (66.3)	54 (33.7)	<0.001
PVL in total	2946	2602 (88.3)	344 (11.7)	<0.001
PVL in ST80-IV	2825	2515 (96.7)	310 (90.1)	<0.001
PVL in ST30-IV	8	6 (0.2)	2 (0.6)	<0.001
PVL in ST377-V	54	42 (1.6)	12 (3.5)	0.453
PVL in ST239-III	7	5 (0.2)	2 (0.6)	<0.001
PVL in ST225-II	4	–	4 (1.2)	–
PVL in other clones	48	34 (1.3)	14 (4.0)	0.606
tst in total	111	43 (38.74)	68 (61.26)	0.034
tst in ST30-IV	76	35 (81.40)	41 (60.29)	0.080
tst in ST239-III	18	6 (13.95)	12 (17.65)	0.635
tst in ST225-II	10	–	10 (14.71)	–
tst in other clones	7	2 (4.65)	5 (7.35)	0.119
egc in total	495	322 (65.1)	173 (34.9)	<0.001
egc in ST80-IV	222	148 (46.0)	74 (42.8)	0.758
egc in ST30-IV	102	64 (19.9)	38 (22.0)	1
egc in ST239-III	52	41 (12.7)	8 (4.5)	0.960
egc in ST225-II	13	5 (1.5)	8 (4.5)	0.196
egc in other clones	106	64 (19.9)	42 (24.3)	0.767

PVL, Panton–Valentine leukocidin; ST, sequence type.

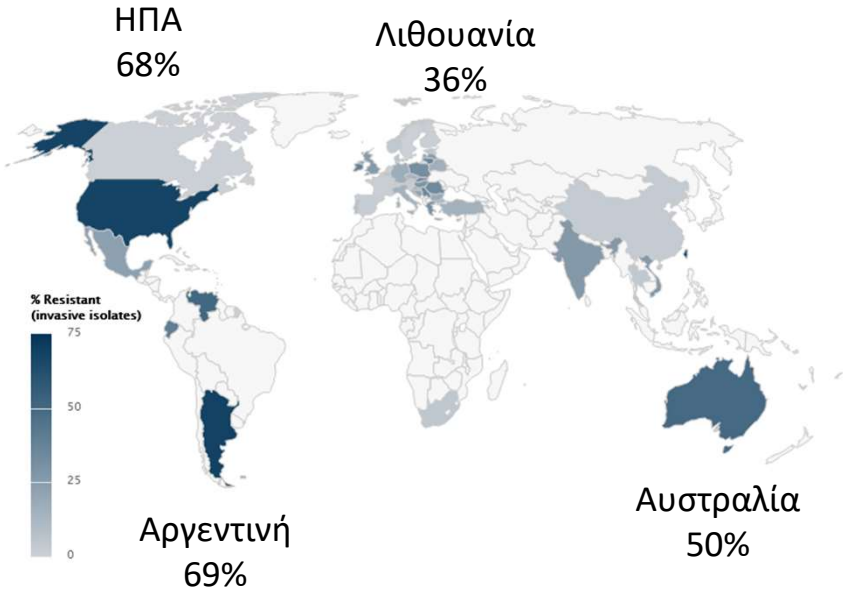
Drougka et al. Clin Microbiol Infect. 2014; 20: O796-803

Αντοχή του *Enterococcus* στην βανκομυκίνη (VRE) 2017

Enterococcus faecalis



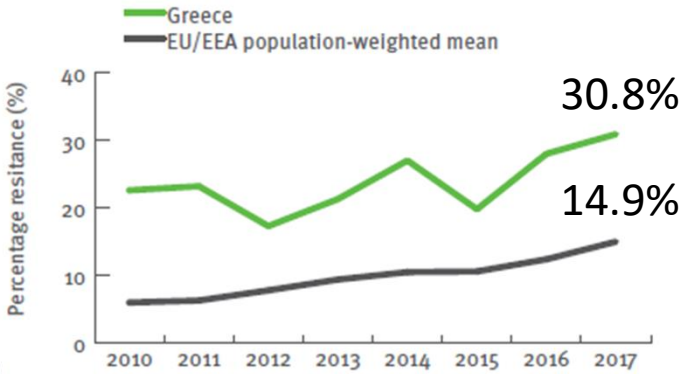
Enterococcus faecium

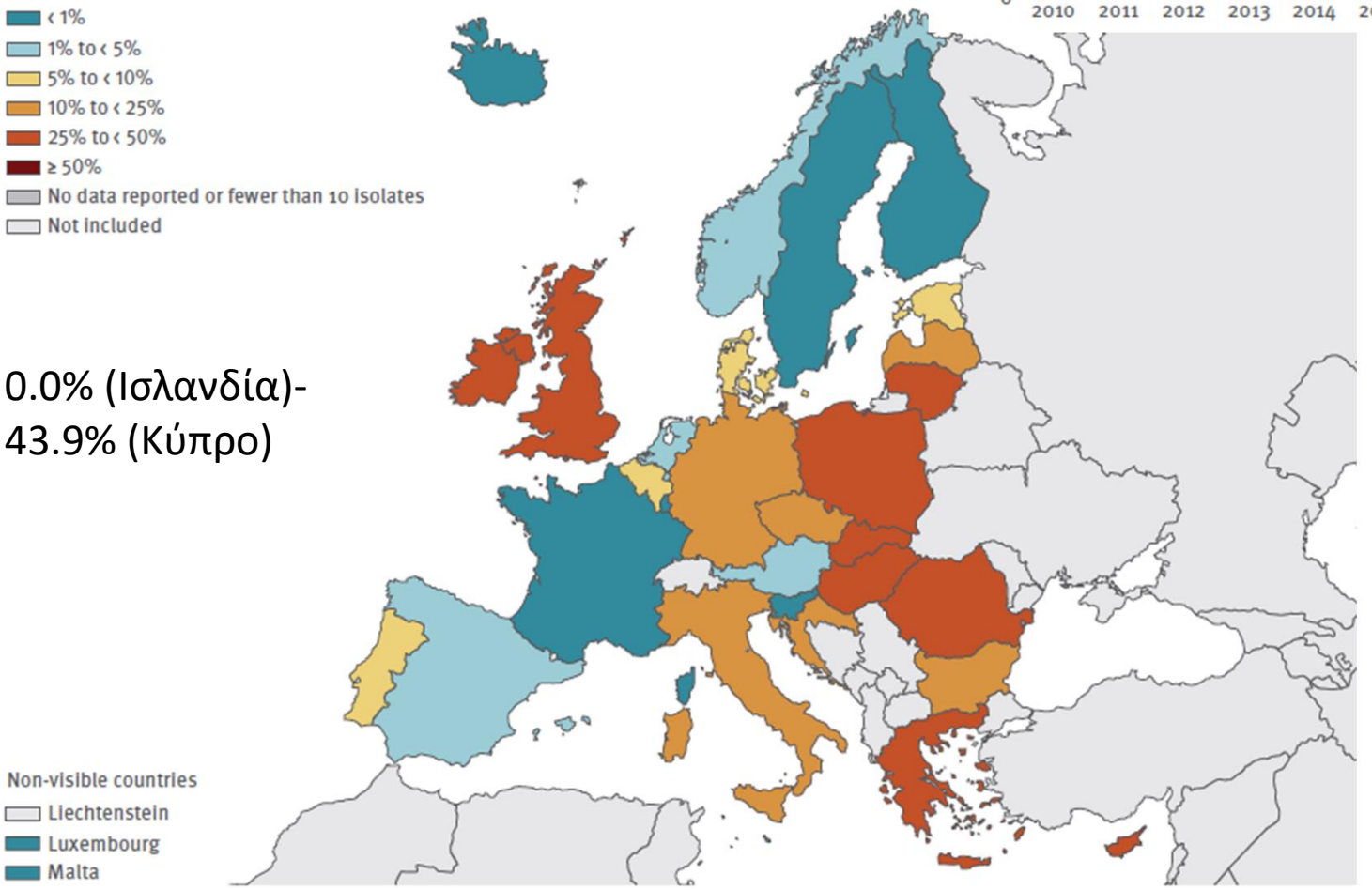


CDDEP THE CENTER FOR Disease Dynamics, Economics & Policy WASHINGTON DC • NEW DELHI

The Center for Disease Dynamics, Economics & Policy. ResistanceMap: Antibiotic resistance. 2019. https://resistancemap.cddep.org/AntibioticResistance.php. Date accessed: October 1, 2019.

Enterococcus faecium
ανθεκτικός στην βανκομυκίνη (**VRE**)
2017





0.0% (Ισλανδία)-
43.9% (Κύπρο)

Surveillance of antimicrobial resistance in Europe – Annual report of the European Antimicrobial Resistance Surveillance Network (EARS-Net) 2017. Stockholm: ECDC; 2018

Enterococcus faecium
ανθεκτικός στην βανκομυκίνη (**VRE**)

- 9 διαφορετικά γονίδια/ οπερόνια αντοχής (*van*)
  - *vanA, vanB, vanC1/C2/C3, vanD, vanE, vanG, vanL, vanM & vanN*
- *vanA-E.faecium* (κυρίως CC17)
- *vanB-E.faecium*
- *vanA-E.faecalis*

} σποραδικά

- Ενδογενής αντοχή (***vanC***)
  - *E. casseliflavus, E. gallinarum, E. flavescens*

	Vancomycin MIC	Teicoplanin MIC
vanA	>64	16-512
vanB	4-1024	<=0.5

JOURNAL OF CLINICAL MICROBIOLOGY, Sept. 2008, p. 3091–3093 Vol. 46, No. 9
0095-1137/08/$08.00+0 doi:10.1128/JCM.00712-08

VanB Phenotype-*vanA* Genotype *Enterococcus faecium* with Heterogeneous Expression of Teicoplanin Resistance▽

Il Joong Park,[1] Wee Gyo Lee,[1]* Jong Hee Shin,[2] Kyung Won Lee,[3] and Gun Jo Woo[4]

Department of Laboratory Medicine, Ajou University School of Medicine, Suwon, Korea[1]; Department of Laboratory Medicine, Chonnam National University Medical School, Gwangju, Korea[2]; Department of Laboratory Medicine, Yonsei University College of Medicine, Seoul, Korea[3]; and Center for Food Safety Evaluation, Korea Food and Drug Administration, Seoul, Korea[4]

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Short Communication

First description in Europe of the emergence of *Enterococcus faecium* ST117 carrying both *vanA* and *vanB* genes, isolated in Greece

C.C. Papagiannitsis[a,b], E. Malli[a], Z. Florou[a], M. Medvecky[c], S. Sarrou[a], J. Hrabak[b], E. Petinaki[a,*]

Αντοχή του *Staphylococcus aureus* στη Βανκομυκίνη (VRSA)

VRSA → υψηλή αντοχή στη βανκομυκίνη

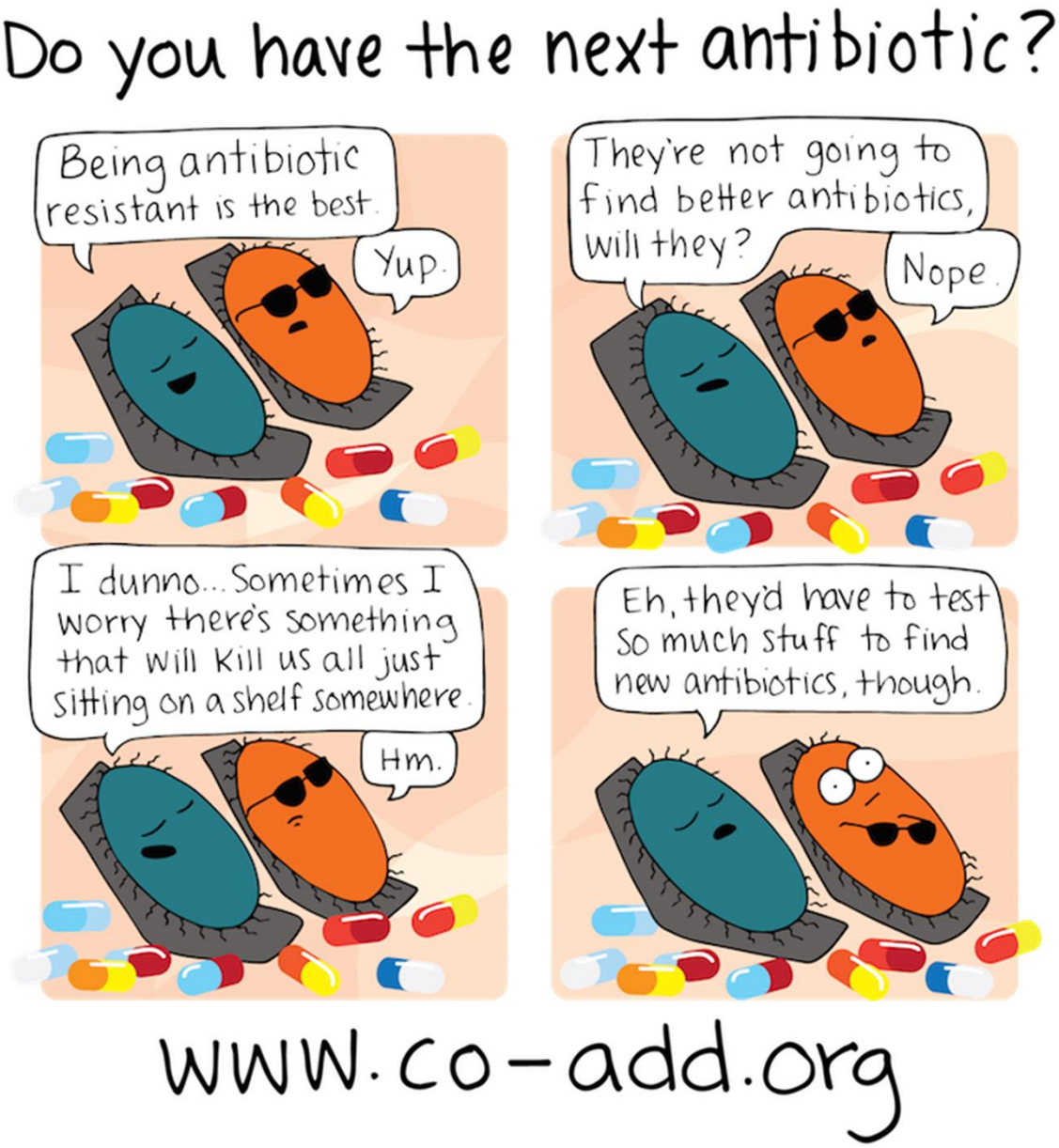
↓

In vivo* μεταφορά του *vanA

- Σεπτέμβριος 2002
- Pennsylvania USA
- Οστεομυελίτιδα
- *S. aureus* MIC > 64 μg/ml (E-test)

- 14 επιβεβαιωμένα κρούσματα στις ΗΠΑ (κυρίως USA100 –CC5-SCC*mec* type II)
- 16 στην Ινδία, 6 στο Ιράν και 1 στο Πακιστάν
- Το 2013 το πρώτο κρούσμα στην Ευρώπη (Πορτογαλία), ST105, SCC*mec* type II
  - Έλκος μαλακών μορίων
  - Βανκομυκίνη MIC >256, Τεϊκοπλανίνη MIC 24μg/ml
  - *mecA, vanA*
- VRSA/VISA έχουν απομονωθεί από χοίρους, αίγες και βοοειδή

2014
47.4% MRSA↓(39.2%-2017)
20.1% VRE↓(7.2%-2017)


Do you have the next antibiotic?
Being antibiotic resistant is the best.
Yup.
They're not going to find better antibiotics, will they?
Nope.
I dunno... Sometimes I worry there's something that will kill us all just sitting on a shelf somewhere.
Hm.
Eh, they'd have to test so much stuff to find new antibiotics, though.
www.co-add.org

Ερωτήσεις?


WHY?
WHERE?
WHEN?
WHAT?
WHO?
HOW?
WHICH?
WHOSE?