


3M Infection Prevention Solutions

Not all resistant Gram-negative bacteria are created equal: Enterobacteriaceae vs. non-fermenters



3M Learning Connection

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House Keeping

Questions

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- Type a question in the question box and click send.



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House Keeping

Continuing Education

Each 1 hour web meeting qualifies for 1 contact hour for nursing. 3M Health Care Provider is approved by the California Board of Registered Nurses CEP 5770.

Post webinar eMail

- Link to Course Evaluation
- CE Certificate Included
- Forward eMail to Others in Attendance

Disclosure

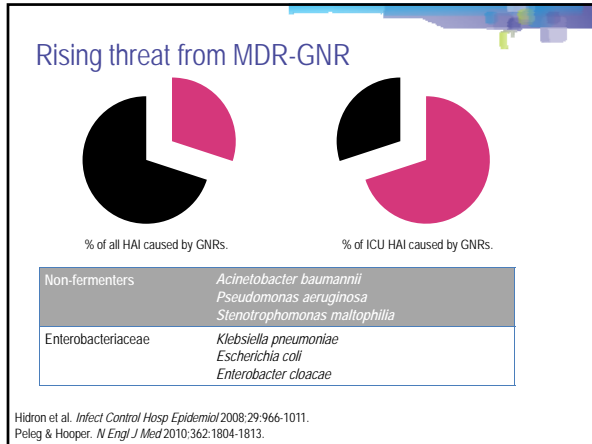
I am employed part-time by Bioquell and received payment from 3M for this webinar.

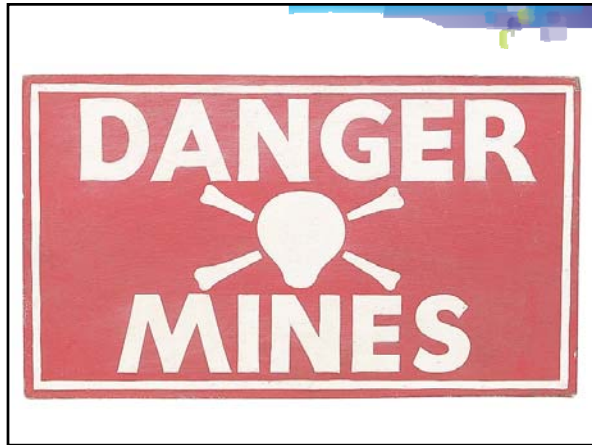
1. [Aug 19: CRE and friends: what's the problem and how to detect them?](#)
2. Sept 16: Not all resistant Gram-negative bacteria are created equal: Enterobacteriaceae vs. non-fermenters
3. Oct 7: Filling the gaps in the guidelines to control resistant Gram-negative bacteria

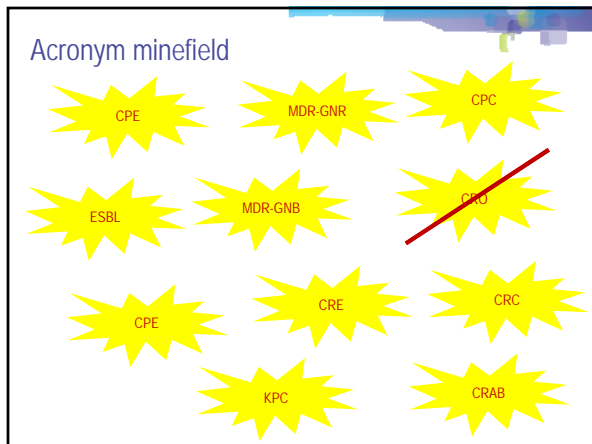
Learner objectives

1. Gain a microbiological overview of the various families of multidrug-resistant Gram-negative rods.
2. Compare the features of the key families: Enterobacteriaceae (including CRE) and non-fermenters (including *A. baumannii*), especially at-risk population and epidemic potential.
3. Discuss how differences in epidemiology affect approaches to infection prevention and control.

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MRSA is a CRO!

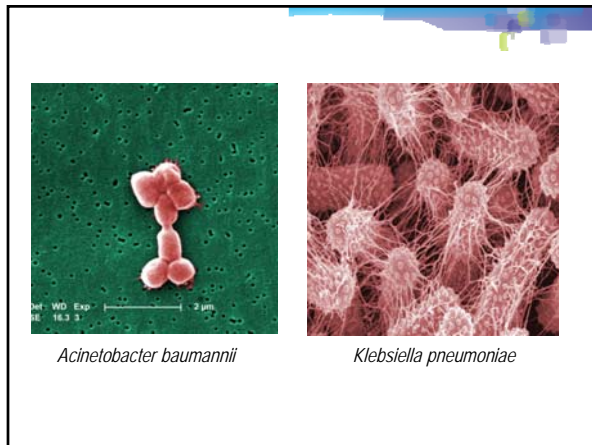


Poll: would you be comfortable explaining the differences between carbapemen-resistant *Klebsiella pneumoniae* and carbapenem-resistant *Acinetobacter baumannii* to a colleague?

A) Yes
B) No

Resistant Enterobacteriaceae v non-fermenters

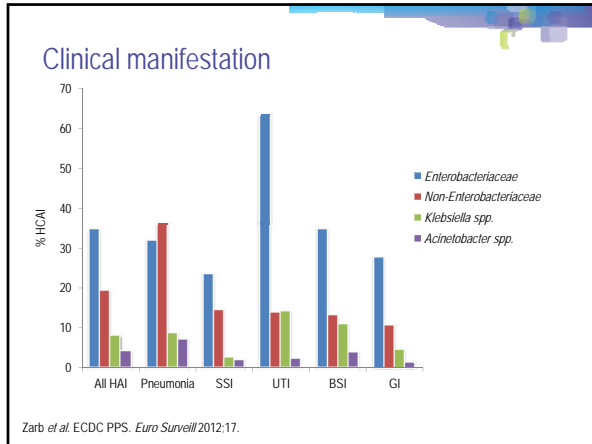
	Enterobacteriaceae (<i>K. pneumoniae</i>)	Non-fermenters (<i>A. baumannii</i>)
Microbiology	Rods	Cocci/bacilli
At-risk population	Primarily acute pts	ICU, burns
Risk factors	Travel	Trauma, ICU stay
Epidemic potential	High	Low
Clinical manifestation	UTI	VAP
Attributable mortality	Stark increase (CPE)	Minimal increase
Prevalence	Emerging (rapidly)	Patchy but stable
Sites of colonisation	GI tract	Resp, GI, skin
Colonization duration	Months to >1 year	Days to weeks
Transmission routes	Hands ++, Env +/-	Hands +, Env ++
Resistance	Mainly acquired	Intrinsic & acquired
Common clones	KPC-producing ST258	Intl clones I-III



Risk factors & at-risk population

	Enterobacteriaceae	Non-fermenters
Risk factors	LOS ICU stay Catheters / devices Ventilation Prior antibiotics Travel	LOS ICU stay Catheters / devices Ventilation Prior antibiotics Trauma (esp. burns)
At-risk population	Patients in acute settings, particularly those with recent travel to areas of high prevalence. Potential for community spread.	High-risk patients in the ICU and burns units: rare cause of community-acquired infection.

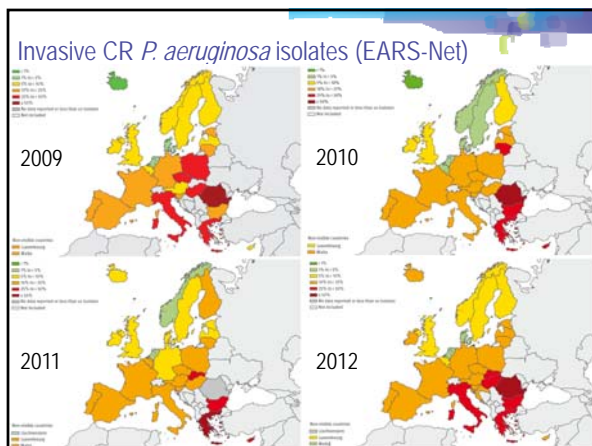
ECDC CPE risk assessment, 2011.
Peleg et al. Clin Microbiol Rev 2008;21:538-582.

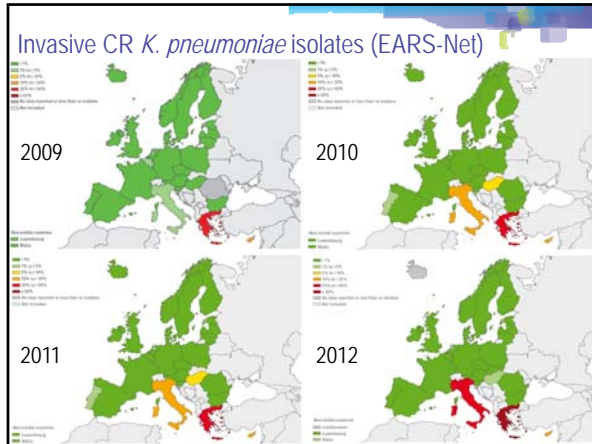


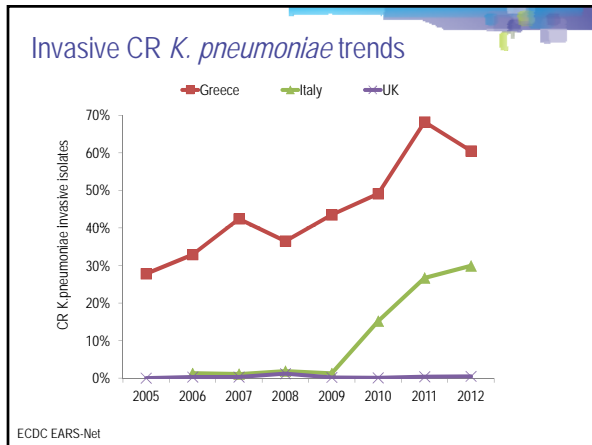
Attributable mortality

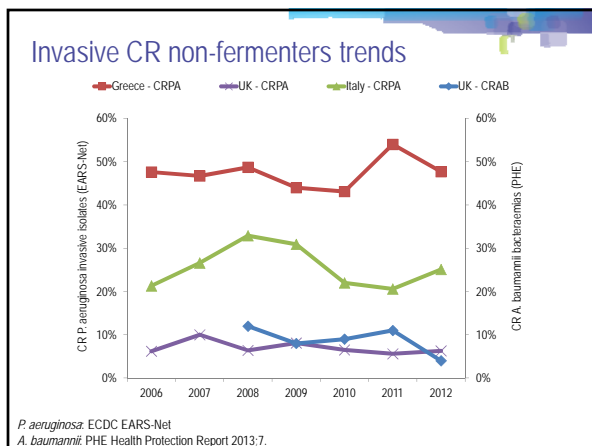
Organism	Enterobacteriaceae		Non fermenters
	AmpC / ESBL	CPE	<i>A. baumannii</i>
Attributable mortality	Moderate	Massive (>50%)	Minimal

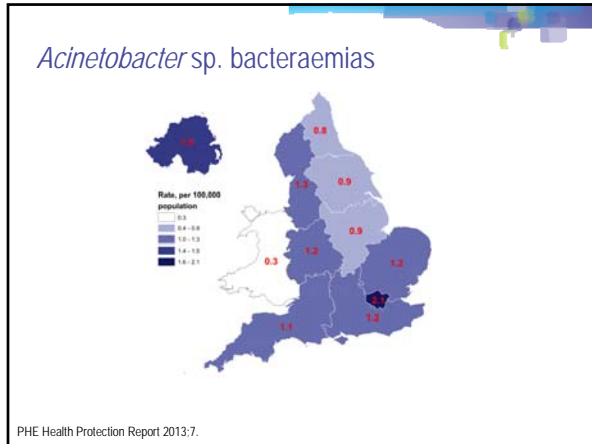
Shorr et al. Crit Care Med 2009;37:1463-1469.
 Patel et al. ICHE 2008;29:1099-1106.
 Falagas et al. Emerg Infect Dis 2014;20:1170-1175.

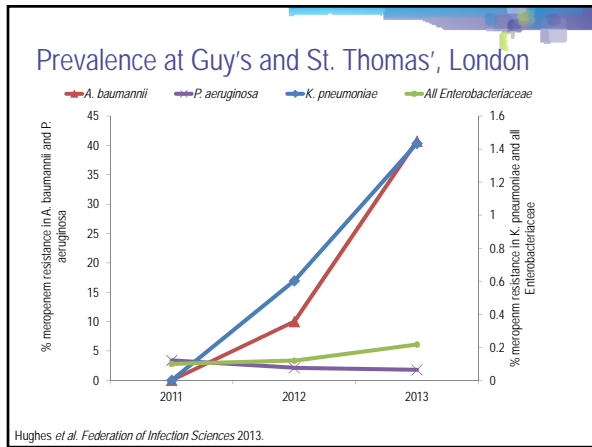


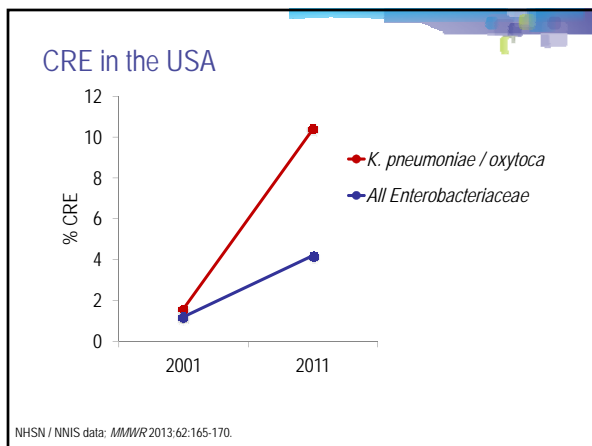


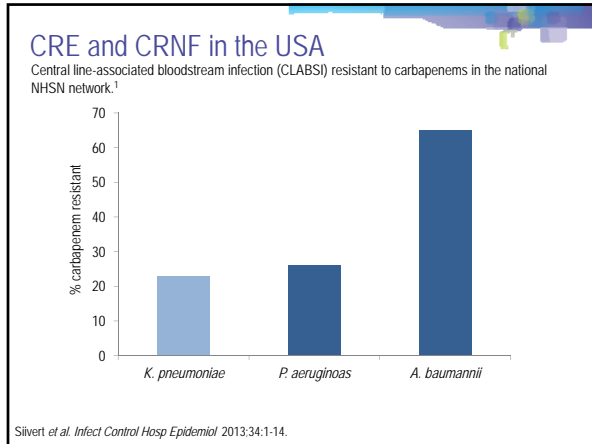


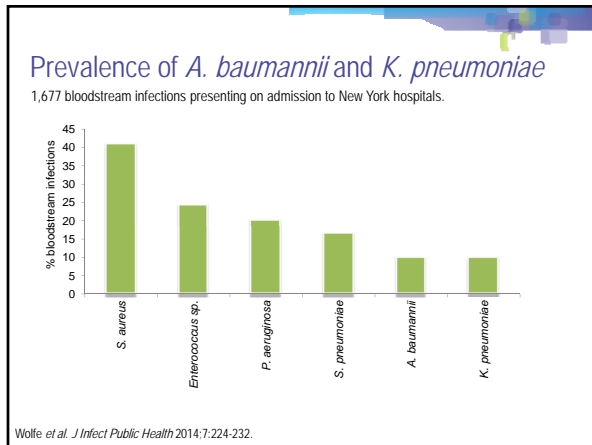


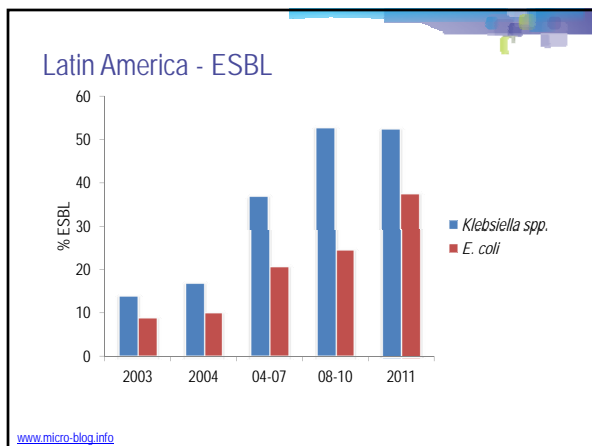


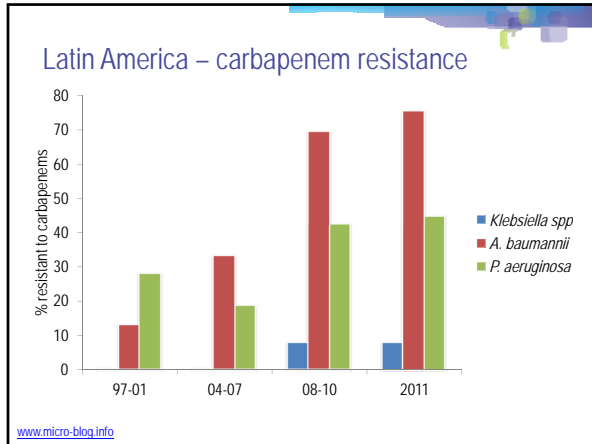






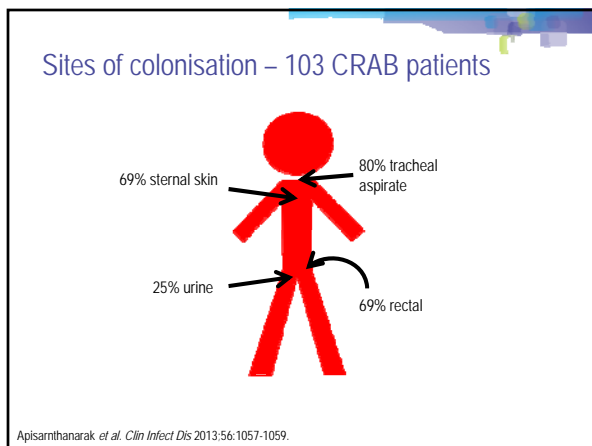


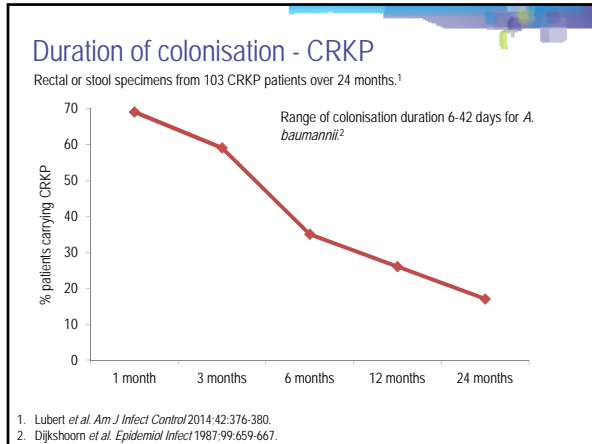




Poll: which is the most common pathogen in your hospital at the moment?:

A) Antibiotic-resistant Enterobacteriaceae (e.g. *K. pneumoniae* including CRE)
B) Antibiotic-resistant non-fermenters (e.g. *Acinetobacter baumannii*)

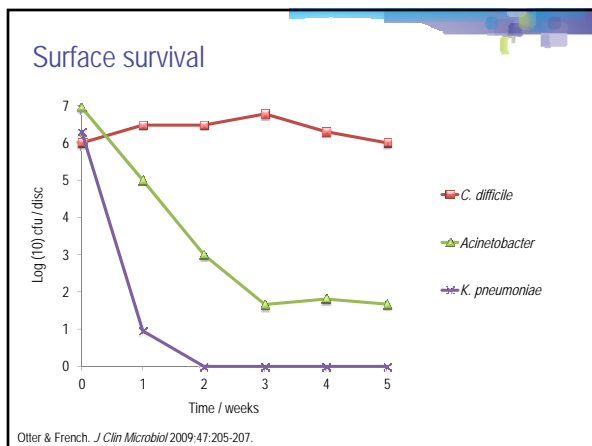


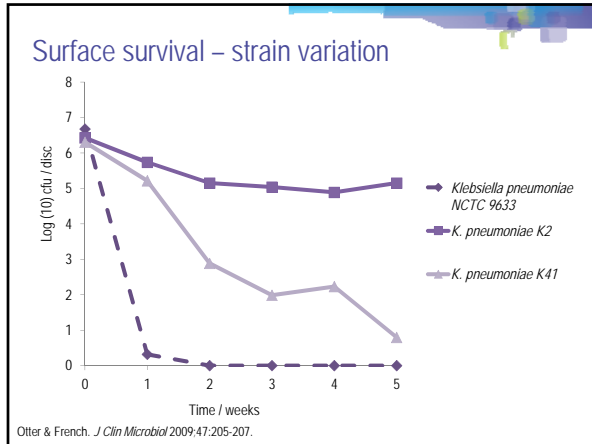


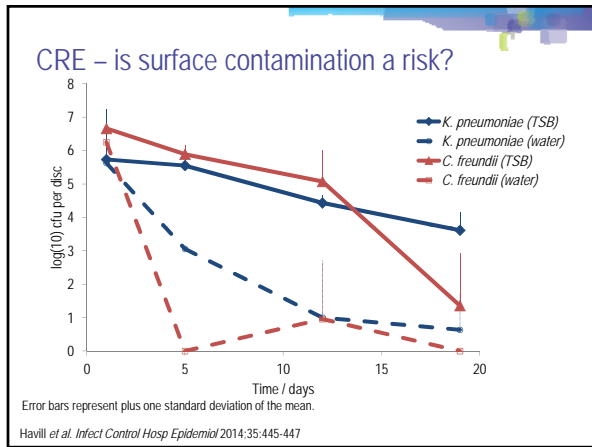
Duration of colonisation

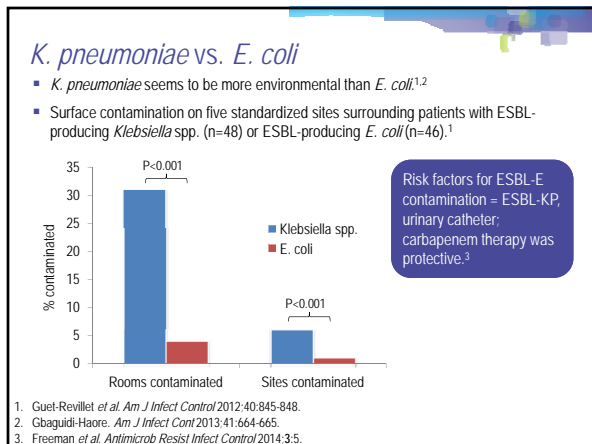
Author	Year	Setting	N pts	Organism	Duration of colonization
Bird ¹	1998	Elderly care facilities, Scotland	38	ESBL <i>K. pneumoniae</i>	Mean 160 days (range 7-548)
Pacio ²	2003	Long term care facility, USA	8	Resistant Gram-negative rods	Median 77 days (range 47-189)
Zahar ³	2010	Paediatric hospital, France	62	ESBL Enterobacteriaceae	Median 132 days (range 65-228)
O'Fallon ⁴	2009	Long term care facility, USA	33	Resistant Gram-negative rods	Median 144 days (range 41-349)
Zimmerman ⁵	2013	Patients discharged from hospital, Israel	97	CRE	Mean 387 days

- Bird et al. *J Hosp Infect* 1998;40:243-247.
- Pacio et al. *Infect Control Hosp Epidemiol* 2003;24:246-250.
- Zahar et al. *J Hosp Infect* 2010;75:76-78.
- O'Fallon et al. *Clin Infect Dis* 2009;48:1375-1381.
- Zimmerman et al. *Am J Infect Control* 2013;41:190-194.









CRE surface contamination in hospitals

- An Israeli hospital investigated CRE environmental contamination in the vicinity of 34 CRE-carriers; mainly *K. pneumoniae*.
- CRE was detected in the surrounding environment of most (88%) of the patients sampled.

Surface	% sites contaminated with CRE
Pillow	32
Crotch	30
Legs	23
Infusion pump	16
Bedside table	14

Lerner et al. *J Clin Microbiol* 2013;51:177-1781.

Persistent contamination

Disinfection	% sites contaminated with <i>A. baumannii</i>	% sites contaminated with MRSA
2 x bleach disinfection	12.5	4.5
4 x bleach disinfection	2.5	2.5

140 samples from 9 rooms after 2xbleach
5705 samples from 312 rooms after 4xbleach

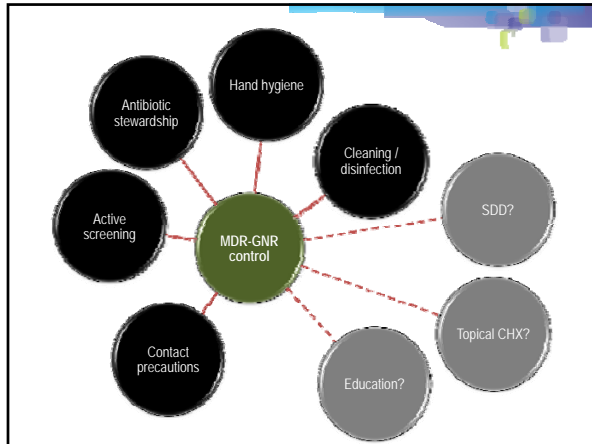
26.6% of rooms remained contaminated with either MRSA or *A. baumannii* following 4 rounds of bleach disinfection

Manian et al. *Infect Control Hosp Epidemiol* 2011;32:667-672.

Enterobacteriaceae are “less environmental”

Organism	Odds ratio
Nseir <i>A.baumannii</i>	4.2
Nseir <i>P.aeruginosa</i>	2.3
Nseir ESBL	1.6
Ajao ESBL	1.4

Nseir et al. *Clin Microbiol Infect* 2011;17:1201-1208.
Ajao et al. *Infect Control Hosp Epidemiol* 2013;34:453-458.

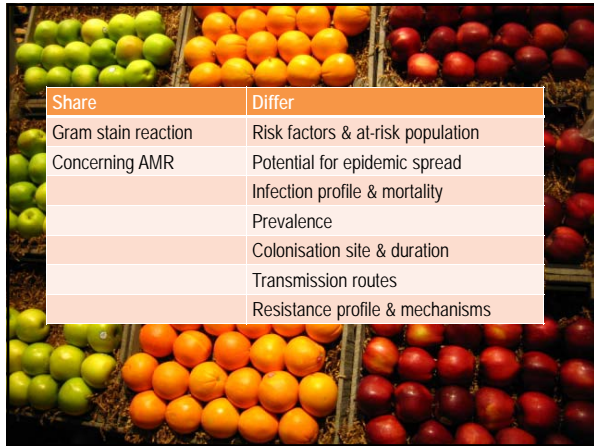


Poll: which do you consider the most important control measure to prevent the transmission of antibiotic-resistant Enterobacteriaceae (including CRE)?

- A. Active surveillance and contact precautions.
- B. Contact precautions for confirmed cases (without active screening).
- C. Antibiotic stewardship
- D. Hand hygiene.
- E. Cleaning / disinfection.

Poll: which do you consider the most important control measure to prevent the transmission of antibiotic-resistant non-fermenters (such as *A. baumannii*)?

- A. Active surveillance and contact precautions.
- B. Contact precautions for confirmed cases (without active screening).
- C. Antibiotic stewardship
- D. Hand hygiene.
- E. Cleaning / disinfection.



Summary

1. Resistant Gram-negative rods represent a more serious threat than the 'usual suspects', mainly due to the threat of pan-drug resistance.
2. Enterobacteriaceae (mainly *K. pneumoniae*) and non-fermenters (mainly *A. baumannii*) have fundamental differences in their epidemiology.
3. CRE and CRNF are both emerging problems, but they are not the same problem. CRQ
4. The prevention and control strategy will look different for Enterobacteriaceae vs. non-fermenters.

Learner objectives

1. Gain a microbiological overview of the various families of multidrug-resistant Gram-negative rods.
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Oct 7 2014 Filling the gaps in the guidelines to control resistant Gram-negative bacteria

1. Provide an overview of the available guidelines to control CRE and other resistant Gram-negative bacteria.
2. Identify gaps in the guidelines, in terms of definitions of standard precautions, outbreak epidemiology and who should be on the 'guidelines writing dream team'.
3. Discuss controversial areas in terms of effective interventions: patient isolation, staff cohorting and selective digestive decontamination.

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Questions?



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Resources

- [CDC CRE Toolkit.](#)
- [AHRQ CRE Toolkit.](#)
- [UK Public Health England CPE Toolkit.](#)
- [ESCMID MDR-GNR control guidelines.](#)

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Acknowledgements

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['Klebsiella pneumoniae'](#)

Thank you!

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