

# Life after a multi-drug resistant Gram negative outbreak

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# Carbapenemase-producing *Enterobacteriales*

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## Infection Control

- Screening ➤ Identification
- Isolation incl. isolation wards
- Hand hygiene
- Cleaning incl. H<sub>2</sub>O<sub>2</sub>

2

## Infection Prevention

- Education
- Surveillance
- Antibiotic stewardship
- Individualised surgical prophylaxis

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## Infection management

- Empirical
- Targeted
- Susceptibility testing

# Surveillance

	Meropenem	Gentamicin	Amikacin	Colistin	Ciprofloxacin	Tigecycline	Temocilin	Fosfomycin	Aztreonam	Ceftazidime-Avibactam
KPC	Red	Red	Green	Green	Yellow	Green	Yellow	Red	Purple	Green
OXA-48	Yellow	Yellow	Green	Green	Yellow	Green	Purple	Green	Purple	Green
NDM	Red	Yellow	Yellow	Green	Red	Green	Purple	Yellow	Red	Purple
VIM	Red	Yellow	Yellow	Green	Red	Green	Purple	Yellow	Red	Purple
IMP	Red	Yellow	Yellow	Green	Red	Green	Purple	Yellow	Red	Purple

MFT Unpublished data

<50%   50-80%   >80%

**No activity**

NDM/VIM/IMP producers will be Aztreonam S unless organism is also an ESBL producer

# Susceptibility testing e.g.

KPC

Temocillin  
(S MIC  $\leq$  8mg/L **systemic**;  $\leq$  32mg/L **urinary tract infection**)\*

Ceftazidime-Avibactam e-test  
(S MIC  $\leq$  8mg/L)

Tigecycline vitek/e-test  
(S MIC  $\leq$  0.5mg/L)

Amikacin  
(S MIC  $\leq$  8mg/L; R MIC  $>$  16mg/L)

Co-trimoxazole e-test (or refer to Trimethoprim result)  
(S MIC  $\leq$  2mg/L; R MIC  $>$  4mg/L)

Fosfomycin e-test  
(S MIC  $\leq$  32mg/L)

Colistin micro broth dilution  
(S MIC  $\leq$  2mg/L)

\*BSAC legacy breakpoints

Metallo  $\beta$ -lactamases: NDM, IMP, VIM

OXA-48

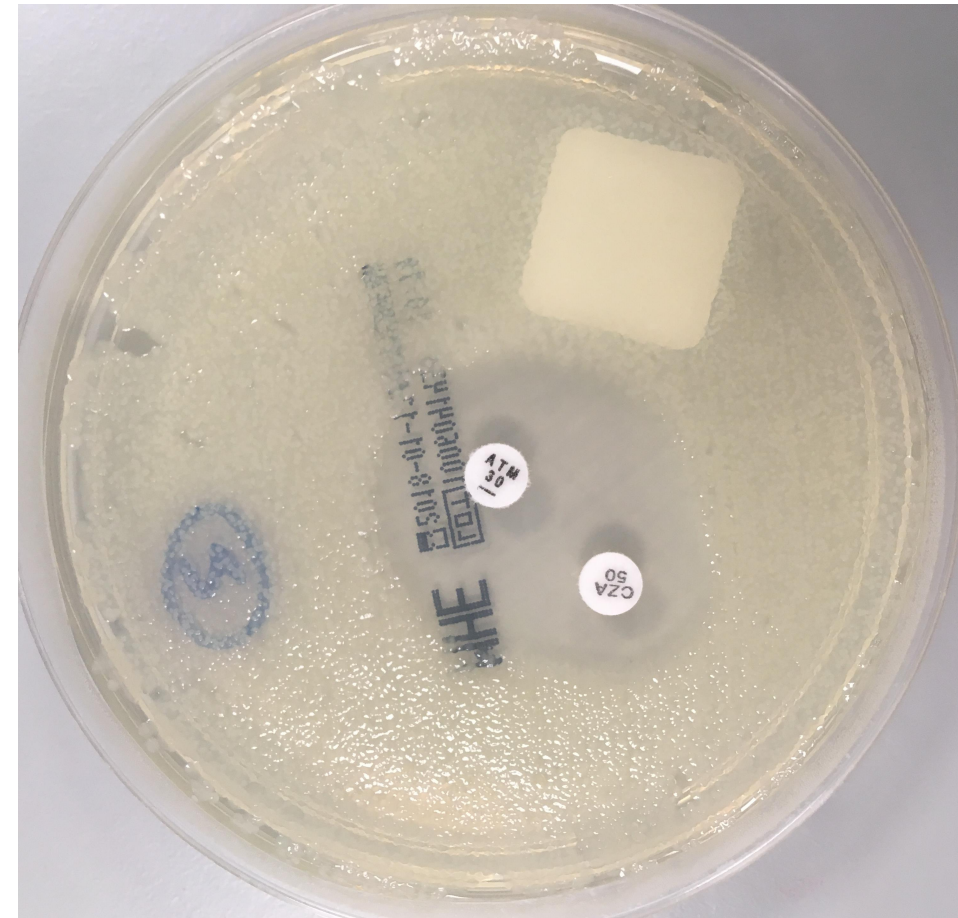
Colistin micro broth dilution  
(S MIC  $\leq$ 2mg/L)

Co-trimoxazole e-test  
(S MIC  $\leq$ 2mg/L; R MIC  $>$ 4mg/L)

Meropenem e-test  
(S MIC  $\leq$ 2mg/L; R  $>$ 8mg/L)

Ceftazidime-Avibactam/Aztreonam synergy test

Ceftazidime-Avibactam e-test  
(S MIC  $\leq$ 8mg/L)



# Approach to treatment

Antibiotic susceptibility results for 55 episodes of KPC-PE bacteraemia 2010-2014			
Antibiotic	% Sensitive	% Intermediate	% Resistant
Meropenem	0	5	95
Ciprofloxacin	43	0	57
Tigecycline	48	37	15
Gentamicin	38	3	59
Amikacin	82	10	8
<b>Temocillin</b>	<b>63</b>	<b>-</b>	<b>37</b>
Colistin	93	-	7
Fosfomycin	42	-	58

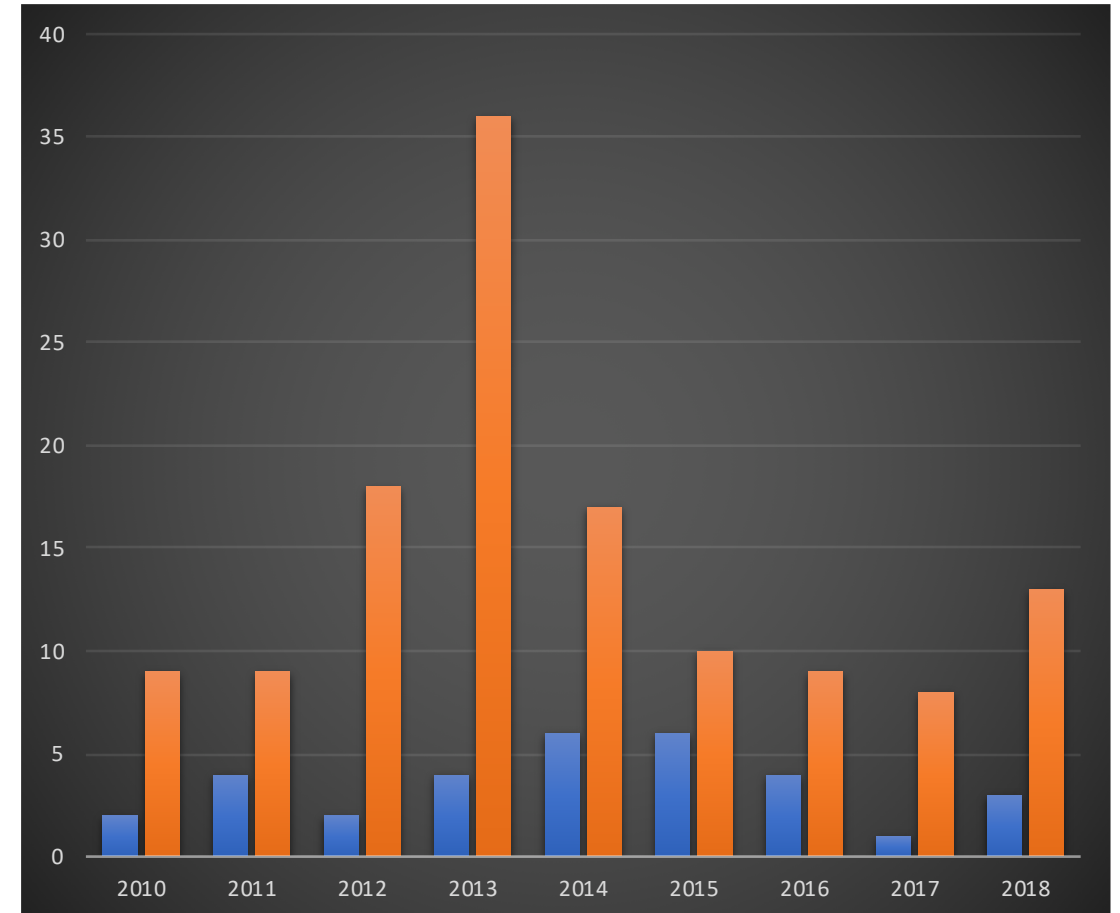
Susceptibility testing performed by the Vitek 2 Automated System for all except temocillin and colistin, for which susceptibility was determined by E-test. Breakpoints as defined by BSAC.

Data from poster presented at ECCMID 2016  
 Clinical outcomes and predictors of mortality following bacteraemia with KPC-producing Enterobacteriales in a large teaching hospital in the UK: a retrospective case note review.  
 L.C.Sweeney et al

- Know your epidemiology
- Antibigram & MIC
  - Dose increase/prolonged infusion
- Consider source, route, duration
  - Penetration to site of infection
  - Dosing options
  - IV/po/nebulised
- Consider side effects/toxicity
- Combination therapy/synergy
- Try to use a  $\beta$ lactam
  - Meropenem – MIC permitting
  - Temocillin
  - Ceftazidime-Avibactam

- Detection, detection, detection
- Screening - epidemiology; susceptibility patterns to guide empirical treatment
- Combination therapy
- Dose adjustments based on MIC
- Monitoring
  - Drug monitoring e.g. tdm
  - Patient monitoring – regular Microbiologist/Antimicrobial Pharmacist review
- Collection and review of data
- Sharing experience

# Outcomes



Graph 1: Number of bacteraemias per annum (orange) vs crude mortality (blue)  
MFT unpublished data

# The Future

Cefiderocol

Meropenem-  
Vaborbactam

Aztreonam-  
Avibactam

Imipenem-  
Relebactam

Plazomycin



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