

#### THE GOOD, THE BAD AND THE RESISTANT:

# IDENTIFYING AND RESPONDING TO MULTIDRUG-RESISTANT ORGANISMS IN YOUR FACILITY

June 21, 2018





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# The Good, the Bad and the Resistant:



# Identifying and Responding to Multidrug-Resistant Organisms in Your Facility

Katie Steider HAI Epidemiologist

June 21, 2018

# The Good

- "Normal flora"
- "Common commensals"
- Examples:
  - -Staphylococcus epidermidis (skin)
  - -Escherichia coli (intestine)



#### The Good

- Benefits of normal flora:
  - -Outcompete other types of bacteria
  - -Produce products that kill other bacteria
  - -Help develop immunity
  - -Aid in metabolism



# The Bad

- "Pathogens"
  - -Commonly cause disease
- "Opportunistic pathogens"
- Do not provide a benefit to the host
- Examples:
  - -Salmonella species
  - -Streptococcus pyogenes (Strep throat)



### **The Resistant**

- The bacteria are "resistant" to drug(s)
  - Drugs that are used to treat infections do not work
- Can cause serious infections
- There are many ways to develop resistance

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# Multidrug-Resistant Organisms (MDROs)

# "Nightmare Bacteria"

#### **MDROs Cause Serious Infections and Death**

- Cause infection in any part of the body
- CDC estimates that each year, MDROs cause:
  - -2 million infections
  - -23,000 deaths

# **MDROs Can Spread to Others**

- Can be spread by contact with another person or with the environment
- Most common routes of transmission:
  - -Healthcare worker hands
  - -Environmental surfaces
- Spread within and between healthcare facilities



# **People with MDROs May Not Have Symptoms**

Have MDRO?	Have Symptoms?	Person is	Can Spread to Others?	Precautions
Yes	Yes	Infected	Yes	Contact precautions
Yes	No	Colonized	Yes	Contact precautions

# More Vulnerable Persons are More Likely to Have an MDRO

- Vulnerable persons
  - -Increased age
  - -Underlying conditions
  - -More healthcare exposures
  - -Indwelling devices

**MRSA** - Methicillin-resistant Staphylococcus aureus

MDR Acinetobacter -Multi-drug resistant Acinetobacter

MDR Pseudomonas -Multi-drug resistant Pseudomonas **CRE** - Carbapenem-Resistant Enterobacteriaceae

MDROs

**VRE** - Vancomycin-Resistant Enterococci

C Diff - Clostridium difficile

**ESBLs** - Extended Spectrum Beta-Lactamase Producers MDROs

**MRSA** - Methicillin-resistant Staphylococcus aureus

MDR Acinetobacter -Multi-drug resistant Acinetobacter

MDR Pseudomonas -Multi-drug resistant Pseudomonas **CRE** - Carbapenem-Resistant Enterobacteriaceae

**VRE** - Vancomycin-Resistant Enterococci

C Diff - Clostridium difficile

ESBLs - Extended Spectrum Beta-Lactamase Producers

# Extended-Spectrum Beta-Lactamase-Producing Organisms (ESBLs)

- CDC: Serious threat
- ESBL: enzyme that causes resistance to certain drugs
- Considered to be relatively common in the US



# **Public Health Significance of ESBLs**

- Spread from direct/indirect contact with infected/colonized individuals or from contaminated environmental surfaces
- Opportunity for spread within and between healthcare facilities
- Infections are difficult to treat
- Improper treatment may cause organisms to produce another enzyme called carbapenemase

# **Carbapenem-Resistant Enterobacteriaceae (CRE)**

- CDC: Urgent threat
- Resistant to carbapenems
- May produce carbapenemase
- Usually healthcareassociated



# **Public Health Significance of CRE**

- Spread from direct/indirect contact with infected/colonized individuals or from contaminated environmental surfaces
- Opportunity for spread within and between healthcare facilities
- Infections are difficult to treat and associated with high mortality rates

# How Do I Spot an MDRO?

- Use a case definition
- Review lab reports



#### What is a Case Definition?

 "A standard set of criteria for deciding whether, in this investigation, a person should be classified as having the disease or health condition under study"

# **NC DPH MDRO Toolkit Case Definitions**

- CRE
- C. diff
- ESBL
- MRSA
- MDR Acinetobacter
- VRE



Available from: http://epi.publichealth.nc.gov/cd/docs/MDROToolkit\_r2.pdf

# **CRE and ESBL Case Definitions**

Type of MDRO	Definition	Precautions
Carbapenem-Resistant	Enterobacteriaceae are a family of	Contact
Enterobacteriaceae	bacteria that normally live in the human	
(CRE)	gut. CRE are Enterobacteriaceae that	
	have developed resistance to last-	
	resort antibiotics called carbapenems.	
Extended Spectrum Beta-	Extended-spectrum beta-lactamase is	Contact
Lactamase Producers	an enzyme (chemical tool) that allows	
(ESBLs)	bacteria to become resistant to a wide	
	variety of penicillins and	
	cephalosporins.	

# Lab Reports: Look for Organism Identity

- Organism identification
  - -May use a culture or "NAAT" ("nucleic acid amplification test")

# Lab Reports: Look for Susceptibility Results

- Antimicrobial susceptibility results
  - –Also called "MICs" ("minimum inhibitory concentration") with "interps" ("interpretation")
  - -Look for interpretations:
    - S = "susceptible"; listed drug can be used to treat
    - I = "intermediate"; listed drug may not be effective treatment
    - R = "resistant"; listed drug can not be used to treat

# **Identify CRE Using a Case Definition**

CDC case definition: Enterobacteriaceae resistant to imipenem, meropenem, doripenem, or ertapenem OR documentation that the isolate possesses a carbapenemase

# **Identify CRE Using a Case Definition**

CDC case definition: Enterobacteriaceae resistant to imipenem, meropenem, doripenem, or ertapenem OR documentation that the isolate possesses a carbapenemase

Table 1. Genera of Enterobacteriaceae						
C	Common Genera of	Enterobacteriacea	9			
Escherichia	Klebsiella	Providencia	Serratia			
Enterobacter	Proteus	Salmonella	Shigella			
Common Genera of EnterobacteriaceaeEscherichiaKlebsiellaProvidenciaSerratiaEnterobacterProteusSalmonellaShigellaOther Genera of EnterobacteriaceaeAlishewanellaCedeceaLeminorellaRahnellaAlterococcusCitrobacterMoellerellaRaoultellaAquamonasCronobacterMorganellaSamsoniaAranicolaDickeyaObesumbacteriumSodalisArsenophonusEdwardsiellaPantoeaTatumellaBlochmanniaEwingellaPhlomobacterWigglesworthiaBrenneriaGrimontellaPhotorhabdusXenorhabdus						
Alishewanella	Cedecea	Leminorella	Rahnella			
Alterococcus	Citrobacter	Moellerella	Raoultella			
Aquamonas	Cronobacter	Morganella	Samsonia			
Aranicola	Dickeya	Obesumbacterium	Sodalis			
Arsenophonus	Edwardsiella	Pantoea	Tatumella			
Azotivirga	Erwinia	Pectobacterium	Trabulsiella			
Blochmannia	Ewingella	Phlomobacter	Wigglesworthia			
Brenneria	Grimontella	Photorhabdus	Xenorhabdus			
Buchnera	Hafnia	Poodoomaamaana	Yersinia			
Budvicia	Kluyvera	Plesiomonas	Yokenella			
Buttiauxella	Leclercia	Pragia				

# Majority of CRE are the "Big 3"

- **1**. Escherichia coli
- 2. Enterobacter species
- **3. Klebsiella species** *Klebsiella pneumoniae Klebsiella oxytoca*

Look for these on lab reports!

Order		0	ULTUR	E, URINE [URC] (Order 308868132
Ordering Provider				
Authorizing				
Acknowledgement Info				
For At Placing Order 05/17/17 1927		Acknowledged By		Acknowledged On 05/17/17 1957
Task Unit Sec Ack		Completed by		Date/Time Wed May 17, 2017 7:29 PM
Order Info		1.5		
Priority: STAT	Start: 05/17/1	7 1927		Process Instructions: ** Minimum Specimen Requirements: 25 ML Urine ** **Submit urine in a container with NO preservative** **Use Orange Screw-capped urine cup, White Screw-caped urine tube or Red top tubes**
Drder Frequency				
Antibiotic		Organism >100,000 cfu/ml cloacae	enterol	Organism bacter
AMP/SULBACTAM	MIC	RESISTANT	Final	
AMPICILLIN	MIC	RESISTANT	Final	
AUGMENTIN	MIC	RESISTANT	Final	
CIPROFLOXACIN	MIC	RESISTANT	Final	
ERTAPENEM	MIC	RESISTANT	Final	
GENTAMICIN	MIC	SUSCEPTIBLE	Final	
NITROFURANTOIN	MIC	SUSCEPTIBLE	Final	
PIPERACILLIN/TAZOBACTAM	MIC	RESISTANT	Final	
TRIMETH- SULFAMETHOXAZOLE	MIC	SUSCEPTIBLE	Final	
ab and Collection				11 E B
OULTORE, UNINE OF 0/3/2017				
CULTURE URINE on 6/6/2017				
outrone, online on dia/2017				
eviewed by List				
lew SmartLink Info				
Culture, Urine (Order #308868172) d	on 6/3/17			

- Organism
- Susceptibility

Antibiotic		Organism	
		>100,000 cfu/ml	enterobacter
		cloacae	
AMP/SULBACTAM	MIC	RESISTANT	Final
AMPICILLIN	MIC	RESISTANT	Final
AUGMENTIN	MIC	RESISTANT	Final
CIPROFLOXACIN	MIC	RESISTANT	Final
ERTAPENEM	MIC	RESISTANT	Final
GENTAMICIN	MIC	SUSCEPTIBLE	Final
NITROFURANTOIN	MIC	SUSCEPTIBLE	Final
PIPERACILLIN/TAZOBACTAM	MIC	RESISTANT	Final
TRIMETH-	MIC	SUSCEPTIBLE	Final
SULFAMETHOXAZOLE	1912		1.11.11.11.11

- Organism
- Susceptibility

Antibiotic	Organism >100,000 cfu/ml enterobacter cloacae			
AMP/SULBACTAM	MIC	RESISTANT	Final	
AMPICILLIN	MIC	RESISTANT	Final	
AUGMENTIN	MIC	RESISTANT	Final	
CIPROFLOXACIN	MIC	RESISTANT	Final	
ERTAPENEM	MIC	RESISTANT	Final	
GENTAMICIN	MIC	SUSCEPTIBLE	Final	
NITROFURANTOIN	MIC	SUSCEPTIBLE	Final	
PIPERACILLIN/TAZOBACTAM	MIC	RESISTANT	Final	
TRIMETH- SULFAMETHOXAZOLE	MIC	SUSCEPTIBLE	Final	

- Organism
  - -Organism = Enterobacter cloacae
- Susceptibility
  - -Resistant (R) to

Antibiotic	Organism >100,000 cfu/ml enterobacter cloacae			
AMP/SULBACTAM	MIC	RESISTANT	Final	
AMPICILLIN	MIC	RESISTANT	Final	
AUGMENTIN	MIC	RESISTANT	Final	
CIPROFLOXACIN	MIC	RESISTANT	Final	
ERTAPENEM	MIC	RESISTANT	Final	
GENTAMICIN	MIC	SUSCEPTIBLE	Final	
NITROFURANTOIN	MIC	SUSCEPTIBLE	Final	
PIPERACILLIN/TAZOBACTAM	MIC	RESISTANT	Final	
TRIMETH- SULFAMETHOXAZOLE	MIC	SUSCEPTIBLE	Final	

#### • CRE

- -Organism = Enterobacter cloacae
- -Resistant (R) to ertapenem

Antibiotic	Organism >100,000 cfu/ml enterobacter cloacae			
AMP/SULBACTAM	MIC	RESISTANT	Final	
AMPICILLIN	MIC	RESISTANT	Final	
AUGMENTIN	MIC	RESISTANT	Final	
CIPROFLOXACIN	MIC	RESISTANT	Final	
ERTAPENEM	MIC	RESISTANT	Final	
GENTAMICIN	MIC	SUSCEPTIBLE	Final	
NITROFURANTOIN	MIC	SUSCEPTIBLE	Final	
PIPERACILLIN/TAZOBACTAM	MIC	RESISTANT	Final	
TRIMETH- SULFAMETHOXAZOLE	MIC	SUSCEPTIBLE	Final	

# **Take Steps to Prevent CRE Spread**

- **1.** Notify caregivers, patient, and family
- 2. Ensure implementation of infection control measures (contact precautions)
- 3. Review healthcare exposures
- 4. Identify any close contacts
- 5. Contact your local health department for assistance

# **Identify ESBL Using a Case Definition**

Type of MDRO	Definition	Precautions
Extended Spectrum Beta-	Extended-spectrum beta-lactamase is	Contact
Lactamase Producers	an enzyme (chemical tool) that allows	
(ESBLs)	bacteria to become resistant to a wide	
	variety of penicillins and	
	cephalosporins.	
Found in: • Klebsiella pneumoniae • Klebsiella oxytoca • Escherichia coli	<ul> <li>Burkholderia</li> <li>Citrobacter</li> <li>Enterobacter</li> <li>Morganella</li> <li>Proteus</li> <li>Salmonella</li> <li>Salmonella</li> </ul>	

- Acinetobacter
- Pseudomonas

# **Identify ESBL Using a Case Definition**

Suspect ESBL if: Resistance to one or more extendedspectrum third generation cephalosporins.

Antibiotic	Trade Name
Cefepime	Maxipime (Bristol-Myers Squibb)
Cefixime	Suprax (Lederle)
Cefotaxime	Claforan (Hoechst-Roussel)
Cefpodoxime proxetil	Vantin (Pharmacia/Pfizer)
Coftazidima	Fortaz & Ceptaz (Glaxo SK), Tazidime
Centaziulme	(Lilly), Tazicef (Glaxo SK)
Ceftibuten	Cedax (Schering Plough)
Ceftizoxime	Cefizox (Fujisawa)
Cetriaxone	Rocephin (Roche)
Cefdinir	Omnicef
Cefditoren pivoxil	Spectracef (Vansen Pharma Inc)

#### Microbiology Report VIDANT DUPLIN HOSPITAL

### What Do You Think?

. 4

Name Pallent I Date of Attd. Ph	D Birth ys		Specimen Source Ward of leo	SWAB RECTAL SWAB		Status Status Date Collected Reg Phys	Final 7/27/2017	
1 2 3	Klebsiella oxytoca Escherichia coll Escherichia coll ESBL				Status: Status: Status:	Final Final Final		7/24/201 7/27/201 7/27/201
1 K.	oxytoca			2 E. coll				
Drug	1990 <b>-</b> 1997 - 1997 -	MIC	Interps	Drug		M	IC Interps	
Amp/Su	lbactam	<=8/4	5	Amp/Sulbactam	518	16	1 84	
Ampioil	In	>16	R	Ampicillin		>	16 R	
Cefazol	in	16	1	Cefazolin			4 8	
Cefenin	10	<=2	S	Cefepime		<	=2 S	
Cofniev	ime	<=2	S	Cefotaxime		•	-2 5	
Cafalou	ime ESPI	4=1	1000	Cefotaxime-ESBL		•	=1	
Colleiax	ING-EGOL	a=4	8	Cafiriaxone		<	=1 S	
Cennax	une		6	Cintolioxadia		<	=1 8	
Ciprotio	xacin		0	Ertanenem		<=1	16 5	
Enspen	em	×=0.5		Contomicin			=4 8	
Gentam	licin	<=4	5	Gentamicin				
Merope	nem	<=1	8	Meropenem			40 0	
Pip/Taz	0	<=16	S	Pip/Tazo			10 0	
Trimeth	/Sulfa.	<=2/38	8	Trimeth/Sulfa		<=2/	38 5	
Antikac Amp/Su Ampicil Cefezol Cefepin Cefetax	in Jibactam Jibactam Iin me dime-ESBL cone poxacin sem nicin sore sore sore sore sore sore sore sore	<pre>&lt;=8 &gt;16/8 &gt;16/8 &gt;16 &gt;16 &gt;16 &gt;16 &gt;32 &gt;1 =&gt;32 &gt;1 =&gt;32 &lt;=0.5 &gt;8 &lt;&lt;=1 &lt;=16 &gt;8 &gt;2/38 &gt;2/38</pre>	SRRR RRRELL ESBL ERSRS RS RR SSRR					
S - 1 P MIC - R- EBL? - IB	Busephote Intermediate Resistent regent (mgl.) Produce research largeristion Supposed 2580, Contribution Indectabutie Sciences, Appendix Recetabutie Sciences, Appendix Recetabuties and Appendix Reported Intervention during and GB isolatis, side technique Set	NR = POB = NBC = neaded to diffu pince of *8uso step/ is recommende to recommende end use.	Not Reported Not Rested Positive Regaritive	Blank - COSL - Blao - TEG - TEG - No possass induction beto-lectar of bate-lectarn civitys.	Data not evellett Exispeted apadin Bata-Indenese ; Thymtelina dapar mases; polentiet	e, or drug not solvier um bele-isoternase pative vieril strain ly frey mity become	data or taxind realated to all beh	e-laciam druga.
For blood	and the second se	· · · · · · · · · · · · · · · · · · ·		411115		Chestine	Einal	
For blood RUD: Un-			Specimen	SWAB		SUBIUS	FILLES	
For blood RUD: Un-			Specimen	BWAB		Status Date	Filles 7/27/2017	
For blood RUO: Un- Name Patient			Specimen Source	RECTAL SWAB		Status Date	7/27/2017	

- Organism(s)
- Susceptibility

1 K. oxvtoca			2 E. coll		
Drug	MIC	Interps	Drug	MIC	Interps
Amp/Sulbactam	<=8/4	S	Amp/Sulbactam	16/8	1
Ampioillin	>16	R	Ampiciliin	>16	R
Cefazolio	16	1	Cefazolin	4	s
Cefeolme	<=2	S	Cefepime	<=2	S
Cefniaxima	<=2	S	Cefotaxime	<=2	5
Cefetaxime-ESBI	<=1		Cefotaxime-ESBL	<=1	
Cefiriaxona	<=1	8	Cafiriaxone	<=1	S
Clorofloxacin	<=1	S	Ciprofloxacin	<=1	S
Edenenem	<=0.5	S	Ertapenem	<=0.5	S
Gentemicia	<=4	S	Gentamicin	<=4	S
Meronenem	<=1	S	Meropenem	<=1	S
Dip/Tero	<=16	s	Pip/Tazo	<=16	8
Trimelb/Sulin	<=2/38	8	Trimeth/Sulfa	<=2/38	S
Drug Amikacin Amp/Sulbectam Ampicillin Cefezolin	<u>MIC</u> <=8 >16/8 >16 >16	Interps S R R*			
Cefepime	_>18	Rª			
Cefotaxime	>32	ESBL			
Ccfotaxime-ESBL	>1	ESBL			
Ceftriaxone	>32	ESBL			
Clprofloxacin	>2	R			
Entapenem	<=0.5	S			
Gentamicin	>8	R			
Meropenem	<=1	S			
Pip/Tazo	<=16	8			
Tobramycin	>8	R			
Trimeth/Sulfa	>2/38	R			

- Organism(s)
  - 1. Klebsiella oxytoca
  - 2. Escherichia coli
  - 3. Escherichia coli ESBL
- Susceptibility carbapenems
  - 1. Klebsiella oxytoca
    - Susceptible (S) to ertapenem, meropenem
  - 2. Escherichia coli
    - Susceptible (S) to ertapenem, meropenem
  - 3. Escherichia coli ESBL
    - Susceptible (S) to ertapenem, meropenem

1 K. oxytoca			2 E. coll		
Drug	MIC I	nterps	Drug	MIC	Interpa
Amo/Sulbactam	<=8/4	S	Amp/Sulbactam	16/8	1
Ampicillin	>16	R	Ampicillin	>16	R
Cefazolin	16	1	Cefazolin	4	8
Cefeoime	<=2	S	Cefepime	<=2	S
Cefotaxime	<=2	S	Cefotaxime	<=2	5
Cefetaxime-ES8L	<=1		Cefotaxime-ESBL	<=1	
Cefiriaxone	<=1	8	Cefiriaxone	<=1	S
Clorofloxacin	<=1	S	Ciprofloxacin	<=1	S
Enapenem	<=0.5	S	Ertapenem	<=0.5	S
Gentamicin	<=4	Ş	Gentamicin	<=4	S
Meropenem	<=1	8	Meropenem	<=1	8
Pin/Tazo	<=16	S	Pip/Tazo	<=16	8
Trimeth/Sulfa.	<=2/38	S	Trimeth/Sulfa	<=2/38	S
p E. Coll ESBL Drug Amikacin Amp/Sulbectam Ampicillin Cefazolin	MIC <=8 >16/8 >16 >16	Interps S R R* R*			
Cefepime	_>16-	RA			
Cefotaxime	>32	ESBL			
Cefotaxime-ESBL	>1	ESBL			
Ceftriaxone	>32	ESBL			
Ciprofloxacin	>2	R			
Ertapenem	<=0.5	8			
Gentamicin	>8	R			
Maropanam	<=1	S			
Pip/Tazo	<=16	8			
Tobramycin	>8	R			
Trimeth/Sulfa	>2/38	R			

- Organism(s)
  - 1. Klebsiella oxytoca
  - 2. Escherichia coli
  - 3. Escherichia coli ESBL
- Susceptibility carbapenems
  - **1.** Klebsiella oxytoca
    - Susceptible (S) to



ertapenem, meropenen

- 3. Escherichia coli ESBL
  - Susceptible (S) to ertapenem, meropenem

1 K. oxvtoca			2 E. coll		
Drug	MIC	Interps	Drug	MIC	Interps
Amo/Sulbsctam	<=8/4	S	Amp/Sulbactam	16/8	1
Ampicillin	>16	R	Ampicillin	>16	R
Cefazolin	16	1	Cefazolin	4	5
Cefeoime	<=2	S	Cefepime	<=2	S
Cefotexime	<=2	S	Cefotaxime	<=2	5
Cefotaxime-ESBL	<=1		Cefotaxime-ESBL	<=1	
Cefiriaxone	<=1	8	Cefiriaxone	<=1	S
Ciorofloxacin	<=1	S	Ciprofloxacin	<=1	S
Ertapenem	<=0,5	S	Ertapenem	<=0.5	Ş
Gentamicin	<=4	Ş	Gentamicin	<=4	S
Meropenem	<=1	S	Meropenem	<=1	8
Pin/Tazo	<=16	S	Pip/Tazo	<=16	8
Trimeth/Sulfa.	<=2/38	8	Trimeth/Sulfa	<=2/38	S
β E. coli ESBL Drug	MIC	Interps			
Amikacin	<=8	s			
Amp/Sulbectam	>16/8	R			
Ampicillin	>16	R"			
Cefazolin	>16	R*			
Cefepime	->18-	-RA			
Cefotaxime	>32	ESBL			
ocionadime-ESBL	>1	ESBL			
Ceftriaxone	>32	ESBL			
optulloxacin	>2	R			
Ertapenem	<=0.5	S			
nicin	>8	R			
Meropenem	<=1	S			
Pip/Tazo	<=16	8			
Tobramycin	>8	R			
Trimeth/Sulfa	>2/38	R			

- Susceptibility 3rd generation cephalosporins
  - 1. Klebsiella oxytoca
    - Susceptible (S) to cefepime, cefotaxime, ceftriaxone
  - 2. Escherichia coli
    - Susceptible (S) to cefepime, cefotaxime, ceftriaxone
  - 3. Escherichia coli ESBL
    - Resistant (R) to cefepime
    - Resistant (ESBL) to cefotaxime, ceftriaxone

1 K. oxytoca			2 E. coll	12000	1996-1997
Drug	MIC	Interps	Drug	MIC	Interps
Amp/Sulbactam	<=8/4	S	Amp/Sulbactam	16/8	1
Amploillin	>16	R	Ampicillin	>16	R
Cefazolin	16	1.	Cefazolin	4	S
Cefepime	<=2	S	Cefepime	<=2	S
Cefotaxime	<=2	S	Cefotaxime	<=2	5
Cefctaxime-ESBL	<=1	104036	Cefotaxime-ESBL	<=1	1.1
Cefiriaxone	<=1	8	Cafiriaxone	<=1	S
Ciprofloxacin	<=1	S	Ciptofloxaoln	<=1	S
Ertapenem	<=0,5	S	Ertapenem	<=0.5	S
Gentamicin	<=4	Ş	Gentamicin	<=4	S
Meropenem	<=1	8	Meropenem	<=1	S
Pip/Tazo	<=16	S	Pip/Tazo	<=16	8
Trimeth/Sulfa_	<=2/38	S	Trimeth/Sulfa	<=2/38	S
Drug Almikacin Amp/Sulbectam Ampicillin Cefezoin	<u>MIC</u> <=8 >16/8 >16 >18	Interps S R R* R*			
Cefepime	_>46-	RA			
Cefotaxime	>32	ESBL			
Cetotaxime-ESBL	>1	ESBL			
Ceffriaxone	>32	ESBL			
Ciprofloxacin	>2	R			
Ertapenem	<=0.5	S			
Gentamicin	>8	R			
Maropenem	<=1	s			
Pip/Tazo	<=16	8			
Tobramycin	>8<	R			
Trimeth/Sulfa	>2/38	R			

- Susceptibility 3rd generation cephalosporins
  - 1. Klebsiella oxytoca NOT ESBL
    - Susceptible (S) to cefepime, cefotaxime, ceftriaxone
  - 2. Escherichia coli NOT ESBL
    - Susceptible (S) to cefepime, cefotaxime, ceftriaxone
  - 3. Escherichia coli ESBL
    - Resistant (R) to cefepime<sup>L</sup>
    - Resistant (ESBL) to cefotaxime, ceftriaxone

1 K. oxytoca			2 E. coll	MIC	Interes
Drug	MIC	Interps	Unig Anna Sulfanataon	16/8	Interba
Amp/Sulbactam	<=8/4	5	Amp/subactam	10/0	D
Ampioillin	>18	R	Ampiciain	-10	
Cefazolin	16	17	Getazolin	7	9
Cefepime	<=2	S	Cetepime	<=z	0
Cefotexime	<=2	S	Celotaxime		9
Cefctaxime-ESBL	<=1	17125	Cefotaxime-ESBL	<=[	
Cefiriaxone	<=1	8	Cattriaxone	<=1	5
Ciprofloxacin	<=1	S	Ciprofloxacin	<=1	8
Ertapenem	<=0.5	S	Ertapenem	<=0.5	5
Gentamicin	~=4	S	Gentamicin	<=4	S
Meropenem	<=1	8	Meropenem	<=1	S
Plp/Tazo	<=16	S	Pip/Tazo	<=16	8
Trimeth/Sulfa.	<=2/38	S	Trimeth/Sulfa	<=2/38	S
8 E. coli ESBL					
Drug	MIC	Interps			
Amikacin	<=8	S			
Amp/Sulbectam	>16/8	R			
AmpicIllin	>16	R"			
Cefazolin	>18	R*			
Cefepime	_>10-	Ra			
Cefotaxime	>32	ESBL			
Cetotaxime-ESBL	>1	ESBL			
Ceftriaxone	>32	ESBL			
Ciprofloxacin	>2	R			
Ertapenem	<=0.5	S			
Gentemicin	>8	R			
Maropanam	<=1	S			
Pip/Tazo	<=16	8			
Tobramycin	>8	R			
Trimeth/Sulfa	>2/38	R			

# So you have an ESBL, now what?

- **1.** Notify caregivers, patient, and family
- 2. Ensure implementation of infection control measures (preemptive contact precautions)
- 3. If 2+ ESBLs, contact your local health department for assistance

06-15-2017 07:16PM FROM-DUPLIN HEALTH DEPT

+9102962139

T-737 P.006/006 F-562

Kenansville NC 28349 Accession/Specimen # 00582435980 Fasting No Test Urine Culture, Routine Source of Specimen: Urine Urine Culture, Routine	Order # 104802 Total volume: Results clean catch	Client Phone Collected 1/5/2017 4:28:00PM Reported 1/8/2017 1:35:00PM Flag Units	Physician Name Report Status Final Reference Interval - La
Accession/Specimen # 00682435980 Fasting No Test Urine Culture, Routine Source of Specimen: Urine Urine Culture, Routine	Order # 104802 Total volume: Results clean catch	Collected 1/5/2017 4:28:00PM Reported 1/8/2017 1:35:00PM Flag Units	Physician Name Report Status Final Reference Interval - La
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Urine Culture, Routine Source of Specimen: Urine Urine Culture, Routine	clean catch		
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Unne Culture, Routine	hinal cecord	Contraction of the second s	
	( ) mai report	Abnomal	
Result			
Lideo Culturo, Dauto			
Dane Culture, Routine Result 1	M-L-L-I	Abasemal	8
Result 1	Klebsiella	Abhormai	2.
25,000-50.0	pneumoniae	nite per mt	83
Antimicrobial Suscentibilit	a corony rorentity t	TACE NOT INT	
renting of the output int	S		
** 5	= Susceptible; I =	Intermediate; R = Resi:	stant **
	P = Positiv	e: N = Negative	
	MICS are expressed	in micrograms per mL	343 (CO)
Antibiot	10	RSLT#1 RSLT#2 RS:	LT#3 RSLT#4
Amoxicillin	/Clavulanic Acid	R	
Ampicillin		R	
Cerazolin		R	
Cerepime		R	
- Celtriaxone		R	
Ceruroxime		- R	
Cephalothin	-	R	
ciprofioxac.	Ln.	R	
Artapenem Control		S	
Gentamicin		5	
Impenem	2	3	
Levoiloxaci		R	
Nicrofuranti Pinawatilii	210	1	
Terraquelia	1	R D	
Tobramycin		D D	
Trimethoorin	n/Sulfa	8	
			U
Performing facilities :		ci.	
BN - LabCorp Burlington			
MD Hancock, William F MD			
1447 York Court Burlington NC 272153361 (800) 762 4344			

- Organism
- Susceptibility

Result					
Urine Culture, Routine Result 1 Klebsiel	la Abnorma	al			BN
pneumonia	16				
25,000-50,000 colony forming	units per	mL '			35 11
Antimicrobial Susceptibility			(ā)		BN
S = Susceptible: T			Panistant		3
D - Daviti	- incerner	lagotivo	Resiscant		
MTCS AND ANALYSIS	tie; A = p	regarive			
Annihistis	Darmas	ograms per	: RL		
Anciologic and a set of	RSLTWI	RSLT#2	RSLT#3	RSLT#4	
Ampiritin/Clavulanic Acid	R				
Ampicitiza	R				
Cerazolin	R				
Cefepime	R				
- Ceftriaxone	R				
Cefuroxime	- R				
Cephalothin	R				
Ciprofloxacin	R				
Ertapenem	S				
Gentamicin	5				
Imipenem	\$				
Levofloxacin	8				
Nitrofurantoin	T				
Piperacillin	B				
Tetracycline	R				
Tobramycin	R				
Trimethoprim/Sulfa	R				

- Organism
- Susceptibility

Result		
Urine Culture, Routine Result 1 25,000-50,000 colony form Antimicrobial Susceptibility	osiella Abnormal Ing units per mL	BM
** S = Susceptible:	T = Intermediate: B = Resistant **	3 <sup>100</sup>
P = Po	sitive: N = Negative	
MICS are expr	essed in micrograms per mL	
Antibiotic	RSLT#1 RSLT#2 RSLT#3 RS	SLT#4
Amoxicillin/Clavulanic Ac	LC R	17
Ampicillin	R	
Cefazolin	R	
Cefepime	R	
- Ceftriaxone	R	
Cefuroxime	-*R	
Cephalothin	R	
Ciprofloxacin	R	
Ertapenem	S	
Gentamicin	5	
Imipenem	3	
Levofloxacin	R	
Nitrofurantoin	I	
Piperacillin	Ŕ	
Tetracycline	R	
Tobramycin	R	
Trimethoprim/Sulfa	R	

- Organism
- Susceptibility

Result		
Utine Culture, Routine Result 1 25,000-50,000 colony forms Antimicrobial Susceptibility	bsiella Abnormal ionias ing units per mL	BN
** S = Susceptible;	I = Intermediate; R = Resistant **	. 55
P = Pos	sitive; N = Negative	
MICS are expre	essed in micrograms per mL	
Antibiotic	RSLT#1 RSLT#2 RSLT#3 RSLT#4	
Amexicillin/Clavulanic Aci	iđ R	
Ampicillin	R	
Cefazolin	R	
Cefspime	R	
- Caftriaxone	R	
Cefuroxime	- R	
Cephalothin	R	
Ciprofloxacin	R	
Ertapenem	S	
Gentamicin	5	
Imipenem	s	
Levofloxacin	R	
Nitrofurantoin	I	
Piperacillin	Ř	
Tetracycline	R	
Tobramycin	R	
Trimethoprim/Sulfa	R	

- ESBL
- Organism = K.
   pneumoniae
- Resistant (R) to cefepime and ceftriaxone

Result			
Urine Culture, Routine Result 1 25,000-50,000 colony Antimicrobial Susceptibility	Klebsiella pneumoniac Forming un	Abnormal lits per mL	BN BN
** S = Suscept F MICS are	ible; I = I = Positive expressed	Intermediate; R = Resistant * 2; N = Negative in micrograms per mL	
Antibiotic	P	SLT#1 RSLT#2 RSLT#3	RSLT#4
Amexicillin/Clavulan Ampicillin Cefazolin Cefepime Ceftriaxone Cefuroxime Cephalothin Ciprofloxacin Ertapenem	ic Acid	R R R R R R R S	
Gentamicin Imipenem Levofloxacin Nitrofurantoin Piperacillin Tetracyoline Tobramycin Trimethoprim/Sulfa		5 S R I R R R	

# **How Can My Facility Prevent MDROs?**

- **1.** Staff education
- 2. Laboratory notification
- 3. Cohort residents
- 4. Contact precautions
- 5. Hand Hygiene
- 6. Environmental cleaning
- 7. Communicate MDRO status
- 8. Review infection prevention policies and procedures
- 9. Antimicrobial Stewardship

# **1. Staff Education**

- In service education on infection prevention
- NC administrative code 10A NCAC 41A .0206



# **2. Laboratory Notification**

- Establish process for notification
  - What organisms are epidemiologically important?
  - Who is the point of contact for results?
  - Are isolates available for additional testing?



#### **3. Cohort Residents with MDROs**

• Consider: physical location, ancillary services/care, environmental cleaning, equipment



# **4. Contact Precautions**

- Use gowns and gloves when providing care for colonized and infected individuals at higher risk for transmission
- Consider the 5 Cs:
  - 1. Continent
  - 2. Contained
  - 3. Cognizant
  - 4. Compliant
  - 5. Clean



# **5. Hand Hygiene**

- Alcohol-based hand rub (60-95% ethanol or isopropanol) is the preferred hand hygiene agent when hands are not visibly soiled
- Ensure that hand hygiene agents are available for staff, residents, and visitors



# **5. Hand Hygiene**

- Remember your 5 Moments of Hand Hygiene:
  - 1. Before touching a patient
  - 2. Before clean/aseptic procedures
  - 3. After body fluid exposure/risk
  - 4. After touching a patient
  - 5. After touching patient surroundings



# **6. Environmental Cleaning**

- Notify environmental services of room(s) housing patients with a MDRO
  - Clean these rooms last, when feasible
- Conduct frequent cleaning of high touch surfaces with Environmental Protection Agency (EPA)-registered disinfectants



# 7. Communicate CRE Status to Transferring and Receiving Facilities



# 8. Review Infection Prevention Policies and Procedures

- Review annually
- Assess staff competency with specific attention to the following:
  - Hand hygiene
  - Donning and doffing of PPE
  - Contact precautions

# 9. Antimicrobial Stewardship

 Refer to https://www.cdc.gov/lon gtermcare/prevention/an tibiotic-stewardship.html



The Core Elements of Antibiotic Stewardship for Nursing Homes



#### Contact

**Katie Steider** 

HAI Epidemiologist

katie.steider@dhhs.nc.gov



# Please either...

- Un-mute your line
- Type in the chat box



# THANK YOU FOR YOUR TIME AND SUPPORTING RESIDENT SAFETY!



dreamstime....



# **ADDITIONAL RESOURCES**

- Statewide Program for Infection Control & Epidemiology (SPICE)
  - <u>https://spice.unc.edu/</u>
- Infection Management & Antibiotic Stewardship (UNC)
  - <u>https://nursinghomeinfections.unc.edu/</u>
- Centers for Disease Control & Prevention (CDC)
  - <u>https://www.cdc.gov/longtermcare/prevention/antibiotic-stewardship.html</u>
- Agency for Healthcare Research & Quality (AHRQ)
  - <u>https://www.ahrq.gov/nhguide/index.html</u>
- Minnesota Department of Health (MDH)
  - <u>http://www.health.state.mn.us/divs/idepc/dtopics/antibioticresistance/asp/lt</u> <u>c/index.html</u>

