



## **Clinical Micro*Antibio* + *gram*biology in LTC – How Do I Decipher This?**

**May 17, 2015**

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## **Disclosure**

**Raymond P. Podzorski, Ph.D., D(ABMM)  
May 17, 2017**

**No Disclosures**



## OBJECTIVES


- Review and explain common information that is found in microbiology laboratory reports
- Discuss some of the basic clinical microbiology principles that surround LTC patient cultures
- Review some of the concerning antibiotic resistant bacteria that can be found in LTC patients
- Illustrate how antimicrobial resistance is local
- Describe how an Antibiogram is prepared and can be used
- Present ways to raise your providers awareness of your Antibiogram




## Clinical Micro*Antibio* + *gram*biology Reports



Wisconsin Healthcare-Associated Infections in LTC Coalition




## Clinical Microbiology Reports



### What does that stuff mean/what is it for?

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Laboratory RESULT INQUIRY

Pat: C, Ms. (0000000) Age/Sex: 90Y F HID: Account: 000000000000  
 Loc: Shady Rest

Phys: 1170 Doe, John  
 1484 Doe, Jane

Tests: (all)

T12345 COLL: 02/15/2015 04:05 REC: 02/15/2015 15:25 PHYS: Doe, John  
 Req. No.:


CULTURE WOUND  
 SPEC'M DESCRIPTION: HEEL ULCER BIOPSY (20567)  
 SPECIAL REQUESTS: (20567)  
 CULTURE: MANY ENTEROBACTER CLOACAE  
 FEW MIXED GRAM POSITIVE BACTERIA RESEMBLING NORMAL  
 SKIN FLORA

REPORT STATUS: FINAL 02/19/2015

Susceptibility

ORGANISM:	ENTEROBACTER CLOACAE			
METHOD:	<b>MIC</b>		<b>MIC</b>	
CEFAZOLIN	>8	:R	LEVOFLOXACIN	>8 :R
CIPROFLOXACIN	>4	:R	TOBRAMYCIN	<4 :S
CEFUROXIME	>32	:R	TRIMETH/SUL	<2/38 :S
GENTAMICIN	<4	:S		

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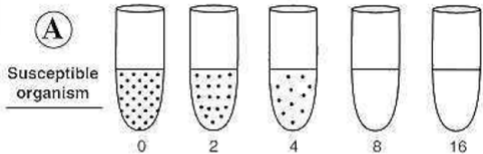
# MIC

Antibiotic susceptibility tests

Minimum inhibitory concentration test

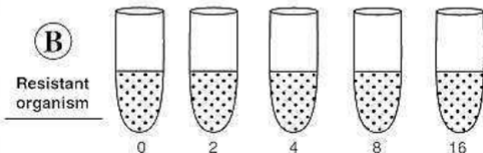
**(A)**

Susceptible organism




**(B)**

Resistant organism



µg/ml antibiotic

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T12345 COLL: 02/15/2015 04:05 REC: 02/15/2015 15:25 PHYS: Doe, John  
 Req. No. :

CULTURE WOUND  
 SPEC'M DESCRIPTION: Foot Wound (20567)  
 SPECIAL REQUESTS: (20567)  
 CULTURE: MANY STAPHYLOCOCCUS AUREUS - **MRSA**  
 MANY ENTEROCOCCUS FAECIUM - **VRE**  
 FEW MIXED GRAM POSITIVE BACTERIA RESEMBLING NORMAL SKIN FLORA

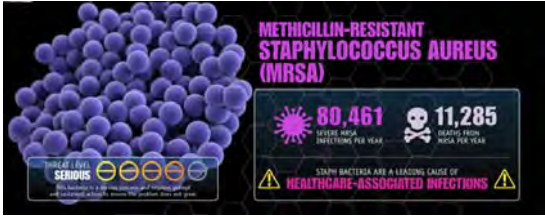
REPORT STATUS: FINAL 03/22/2015

Susceptibility					
ORGANISM:	STAPHYLOCOCCUS AUREUS-MRSA		ENTEROCOCCUS FAECIUM-VRE		
METHOD:	MIC		MIC		
NAFCILLIN	>8 :R	AMPICILLIN	>16	:R	
CLINDAMYCIN	≤0.5 :S	VANCOMYCIN	>32	:R	
DOXYCYCLINE	>4 :R	LINEZOLID	<1	:S	
TRIMETH/SULFA	<2/38 :S				
VANCOMYCIN	≤1 :S				


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## MRSA basics



## VRE basics



## ANTIBIOTIC RESISTANCE THREATS in the United States, 2013



<p><b>HAZARD LEVEL</b> <b>URGENT</b></p> <p>○○○○○</p>	<p>These are high-consequence antibiotic-resistant threats because of significant risks identified across several criteria. These threats may not be currently widespread but have the potential to become so and require urgent public health attention to identify infections and to limit transmission.</p>
<p><b>HAZARD LEVEL</b> <b>SERIOUS</b></p> <p>○○○○○</p>	<p>These are significant antibiotic-resistant threats. For varying reasons (e.g., low or declining domestic incidence or reasonable availability of therapeutic agents), they are not considered urgent, but these threats will worsen and may become urgent without ongoing public health monitoring and prevention activities.</p>
<p><b>HAZARD LEVEL</b> <b>CONCERNING</b></p> <p>○○○○○</p>	<p>These are bacteria for which the threat of antibiotic resistance is low, and/or there are multiple therapeutic options for resistant infections. These bacterial pathogens cause severe illness. Threats in this category require monitoring and in some cases rapid incident or outbreak response.</p>



## *Staphylococcus aureus*

Gram positive cocci, normal bacterial flora of humans

Found colonizing

- nares
- skin
- mouth
- GI tract
- GU tract

**Can cause serious disease upon entry to sterile sites**

## *Enterococcus spp.*

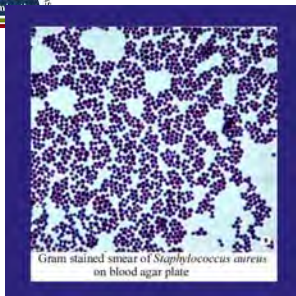
Gram positive cocci, normal bacterial flora of humans

Found colonizing - GI tract

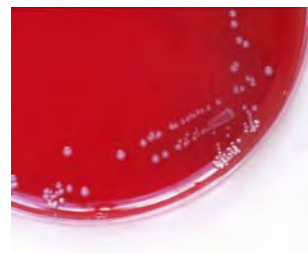
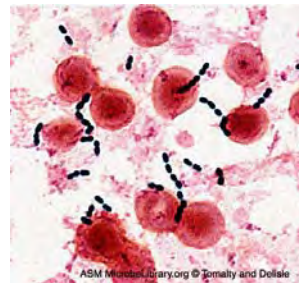
**Can cause serious disease upon entry to sterile sites**



### *Staphylococcus aureus*



### *Enterococcus faecium*





## Wait A Minute!

### Colonized, Infected? What is the Difference?




### Colonized, Infected? What is the Difference?

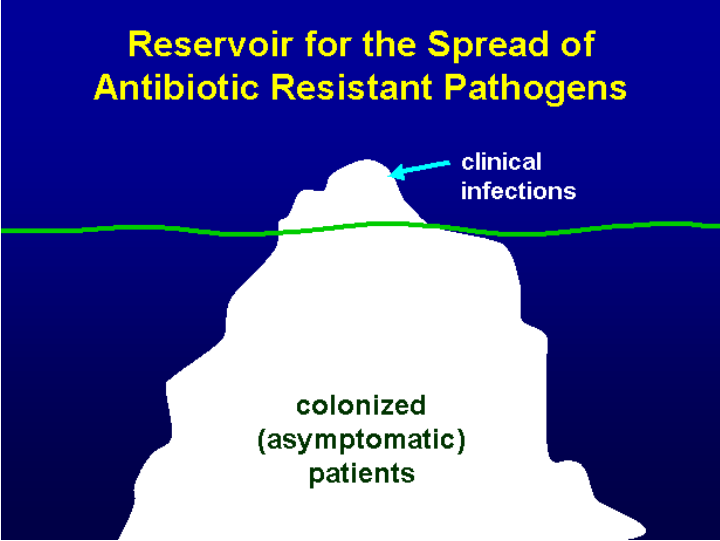
- People who carry bacteria without evidence of infection (fever, increased white blood cell count) are **colonized**
- If an infection develops, it is usually from bacteria that colonize patients
- Bacteria that colonize patients can be transmitted from one patient to another by the hands of healthcare workers

**~ Bacteria can be transmitted even if the patient is not infected ~**

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## The Iceberg Effect




**Reservoir for the Spread of Antibiotic Resistant Pathogens**

clinical infections


colonized (asymptomatic) patients

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## VRE basics

- Vancomycin resistance is typically found in strains of *Enterococcus faecium*
- VRE resistance is plasmid (small, circular, extrachromosomal DNA) mediated and confers high-level vancomycin resistance
- Commonly involved in healthcare associated infections
- Colonization rates in the US appear to be rising



**VANCOMYCIN-RESISTANT ENTEROCOCCUS (VRE)**

20,000 HOSPITALIZATIONS  
1,300 DEATHS FROM SMALL RESISTANT ENTEROCOCCUS INFECTIONS

66,000 ANTIBIOTIC PRESCRIPTIONS

SOME ENTEROCOCCUS STRAINS ARE RESISTANT TO VANCOMYCIN LEAVING FEW OR NO TREATMENT OPTIONS





## How are MRSA and VRE acquired?

- Majority of acquisition of MRSA and VRE is due to spread of the organism person-to-person
- Characterization of 3067 isolates of MRSA from Southern and Eastern Europe, Latin America and U.S.<sup>1</sup>
  - 70% classified into five strains with wide geographic spread
- Many outbreaks of VRE linked to spread of a few strains


<sup>1</sup>Oliveira, Microb Drug Resist 2001;7:349




## Risk Factors for Acquisition

- |  |  |
|--|--|
| <ul style="list-style-type: none"> <li>• <b>MRSA</b> <ul style="list-style-type: none"> <li>◦ Prolonged hospital stay</li> <li>◦ LTC resident</li> <li>◦ Antibiotic use           <ul style="list-style-type: none"> <li>▪ broad spectrum; cephalosporins and fluoroquinolones</li> <li>▪ greater number of antibiotics</li> <li>▪ longer duration of antibiotic therapy</li> </ul> </li> <li>◦ ICU or burn unit</li> <li>◦ wounds</li> <li>◦ Proximity to an MRSA patient/resident</li> </ul> </li> </ul> | <ul style="list-style-type: none"> <li>• <b>VRE</b> <ul style="list-style-type: none"> <li>◦ Prolonged hospital stay</li> <li>◦ LTC resident</li> <li>◦ Antibiotic use           <ul style="list-style-type: none"> <li>▪ Anti-anaerobic Rx</li> <li>▪ 3<sup>rd</sup> Gen. Cephalosporins</li> <li>▪ ?vancomycin</li> </ul> </li> <li>◦ Proximity to a VRE patient/resident</li> </ul> </li> </ul> |
|--|--|


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## What can happen when VRE and MRSA meet?




**MRSA**



**VRE**

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Laboratory RESULT INQUIRY

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 Tests: (all)


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CULTURE WOUND  
 SPEC'M DESCRIPTION: Foot Wound (20567)  
 SPECIAL REQUESTS: (20567)  
 CULTURE: MANY STAPHYLOCOCCUS AUREUS - MRSA  
 MANY ENTEROCOCCUS FAECIUM - VRE  
 FEW MIXED GRAM POSITIVE BACTERIA RESEMBLING NORMAL SKIN FLORA


REPORT STATUS: FINAL 03/22/2015

Susceptibility		STAPHYLOCOCCUS AUREUS-MRSA		ENTEROCOCCUS FAECIM-VRE	
ORGANISM:	MIC			MIC	
METHOD:	>8	:R	AMPICILLIN	>16	:R
NAFCILLIN	<=0.5	:S	VANCOMYCIN	>32	:R
CLINDAMYCIN	>4	:R	LINEZOLID	<1	:S
DOXYCYCLINE	<=2/38	:S			
TRIMETH/SULFA	<=1	:S			
VANCOMYCIN					

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## What happens when VRE and MRSA meet?



**You get one BAD bug!**

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Laboratory RESULT INQUIRY

Pat: C, Ms. (0000000) Age/Sex: 90Y F HID: Account: 000000000000  
 Loc: Shady Rest

Phys: 1170 Doe, John  
 1484 Doe, Jane

Tests: (all)

T12345 COLL: 02/15/2015 04:05 REC: 02/15/2015 15:25 PHYS: Doe, John  
 Req. No.:

CULTURE WOUND  
 SPEC'M DESCRIPTION: HEEL ULCER BIOPSY (20567)  
 SPECIAL REQUESTS: (20567)  
 CULTURE: MANY ESCHERICHIA COLI  
**WARNING: THIS ISOLATE IS AN ESBL**  
 FEW MIXED GRAM POSITIVE BACTERIA RESEMBLING NORMAL SKIN FLORA

REPORT STATUS: FINAL 02/19/2015

Susceptibility

ORGANISM:	MIC	ENTEROBACTER CLOACAE	MIC
METHOD:			
CEFZOLIN	>8	:R	LEVOFLOXACIN >8 :R
CIPROFLOXACIN	>4	:R	TOBRAMYCIN <4 :S
CEFUROXIME	>32	:R	TRIMETH/SUL <2/38 :S
GENTAMICIN	<4	:S	AMIKACIN <8 :S
CEFEPIME	<2	:S	CEFOXITIN >32 :R
CEFTRIAZONE	>32	:R	AZTREONAM >16 :R
PIP/TAZO	>128	:R	ERTAPENEM < 0.25 :S

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Healthcare-associated Infections  
HAI Elimination

## ESBL Basics

**EXTENDED SPECTRUM  
β-LACTAMASE (ESBL) PRODUCING  
ENTEROBACTERIACEAE**

**26,000** DRUG-RESISTANT INFECTIONS

**1,700** DEATHS

**140,000** ENTEROBACTERIACEAE INFECTIONS PER YEAR

**THREAT LEVEL: SERIOUS**

This bacteria is a serious concern and requires prompt and sustained action to ensure the problem does not grow.

**\$40,000** IN EXCESS MEDICAL COSTS PER YEAR FOR EACH INFECTION

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Healthcare-associated Infections  
HAI Elimination

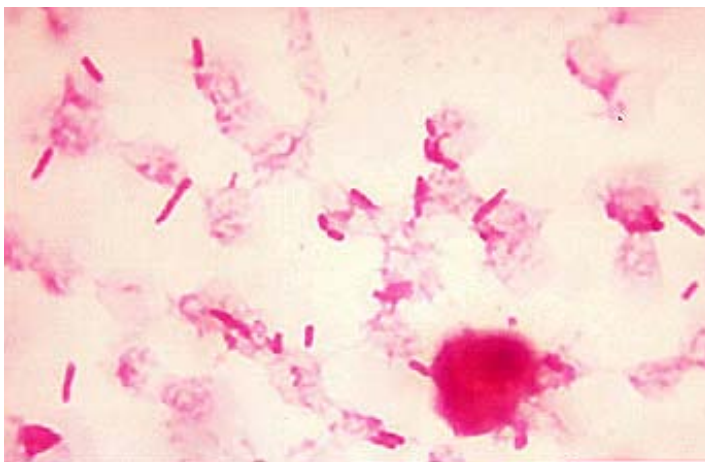
## ESBL Basics

- *Enterobacteriaceae* are common GI flora bacteria with several genera.
- Members of the *Enterobacteriaceae* are common causes of community and healthcare acquired infections.
- *Enterobacteriaceae* are a common cause of infections in Wisconsin patients.
- An estimated 140,000 HAI *Enterobacteriaceae* infections occur each year in the US.



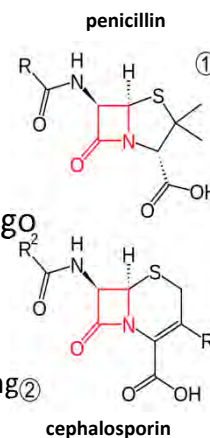
## ESBL Basics

### *Enterobacteriaceae*



## ESBL Basics

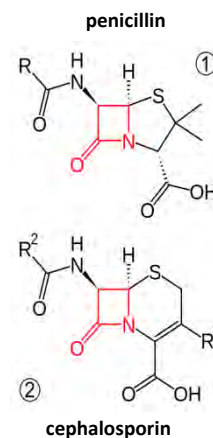
- $\beta$ -lactam antibiotics have long been the mainstay of treating infections caused by *Enterobacteriaceae*.
- However, resistance to  $\beta$ -lactams in the *Enterobacteriaceae* emerged several years ago and has continued to rise.
  - Extended spectrum  $\beta$ -lactamase producing *Enterobacteriaceae* (ESBLs)
  - Plasmid-mediated AmpC-type enzymes producing *Enterobacteriaceae*
- For ESBL bacteria, the remaining treatment option may be carbapenem class antibiotics and this leads to resistance





## ESBL Basics

ESBL =  $\beta$ -lactamases with expanded substrate profile allowing hydrolysis of most cephalosporins, including third-generation cephalosporins, and monobactams




## Wait A Minute!

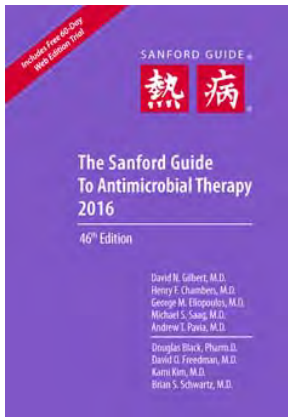
A lot of talk about antibiotics here,  
what is a good source of information  
on antibiotics?

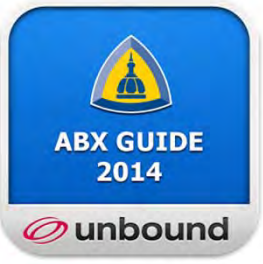


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## Source ABX Information





**Johns Hopkins Medicine  
POC-IT Guides**

Wisconsin Healthcare-Associated Infections in LTC Coalition



Laboratory RESULT INQUIRY

Account: B, Mr. (00000000) Age/Sex: 70Y M HID: ABC  
 Phys: 0000 SMITH, DAVID L Loc: 1234 (9SW)(DISC)  
 1111 SMITH, CHRISTINA  
 Tests: (all)

T12345 COLL: 03/20/2015 04:05 REC: 03/20/2015 15:25 PHYS: SMITH, DAVID L  
 Req. No.:

CULTURE URINE  
 SPEC'M DESCRIPTION: URINE  
 SPECIAL REQUESTS: REFLEX CLEAN CATCH URINE  
 CULTURE: >100,000 COL/ML KLEBSIELLA PNEUMONIAE  
**WARNING: ISOLATE IS A CRE**  
 > 1,000<10,000 COL/ML MIXED GRAM POSITIVE FLORA  
 REPORT STATUS: FINAL 03/22/2015

Susceptibility

ORGANISM:	>100,000 COL/ML KLEBSIELLA PNEUMONIAE			
METHOD:	MIC		MIC	
CEFAZOLIN	>32	:R	CEFTRIAZONE	>32 :R
LEVOFLOXACIN	>8	:R	CEFEPIME	>16 :R
CIPROFLOXACIN	>4	:R	GENTAMICIN	=8 :I
NITROFURANTOIN	>64	:R	IMIPENEM	=8 :R
TRIMETH/SULFA	>2/38	:R	TOBRAMYCIN	>16 :R

**KPC gene detected by WSLH, NDM gene not detected**

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Healthcare-associated Infections  
HAI Elimination

## CRE Basics

**CARBAPENEM-RESISTANT ENTEROBACTERIACEAE**

9,000 DRUG-RESISTANT INFECTIONS PER YEAR

600 DEATHS

7,900 CARBAPENEM-RESISTANT KLEBSIELLA SPP.

1,400 CARBAPENEM-RESISTANT E. COLI

**THREAT LEVEL URGENT**

This bacteria is an immediate public health threat that requires urgent and aggressive action.

**CRE HAVE BECOME RESISTANT TO ALL OR NEARLY ALL AVAILABLE ANTIBIOTICS**

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Healthcare-associated Infections  
HAI Elimination

## CRE Basics

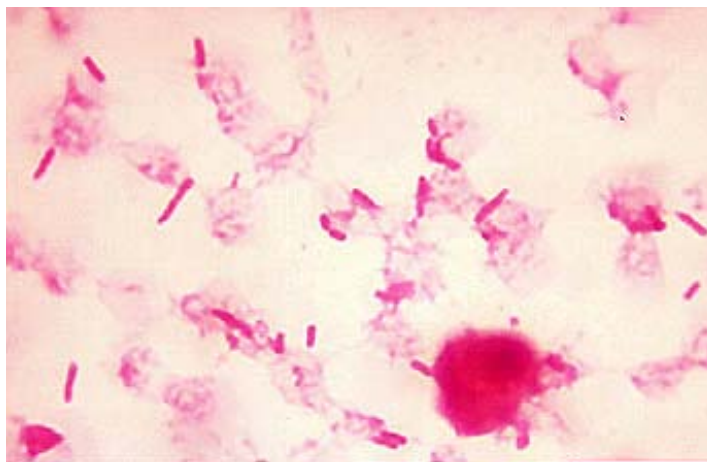
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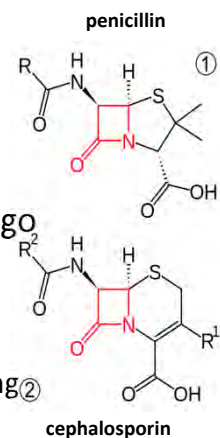
## CRE Basics

### *Enterobacteriaceae*



## CRE Basics

- $\beta$ -lactam antibiotics have long been the mainstay of treating infections caused by *Enterobacteriaceae*.
- However, resistance to  $\beta$ -lactams in the *Enterobacteriaceae* emerged several years ago and has continued to rise.
  - Extended spectrum  $\beta$ -lactamase producing *Enterobacteriaceae* (ESBLs)
  - Plasmid-mediated AmpC-type enzymes producing *Enterobacteriaceae*

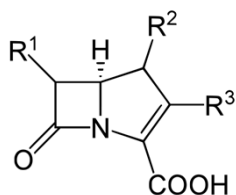




## CRE Basics

- Fortunately, our most potent  $\beta$ -lactam class, carbapenems, remained effective against the *Enterobacteriaceae*.

Doripenem, Ertapenem, Imipenem, Meropenem



carbapenem

- class introduced in 1985
- broadest spectrum of class
- not hydrolyzed by most penases and cephalosporinases
- good Gram negative permeability



## CRE Basics

- Fortunately, our most potent  $\beta$ -lactam class, carbapenems, remained effective against the *Enterobacteriaceae*.

Doripenem, Ertapenem, Imipenem, Meropenem

- Unfortunately, those days are over!



## CRE Basics

- Fortunately, our most potent  $\beta$ -lactam class, carbapenems, remained effective against the *Enterobacteriaceae*.

Doripenem, Ertapenem, Imipenem, Meropenem

- Unfortunately, those days are over!

Enter **C**arbapenem-**R**esistant *Enterobacteriaceae*

**CRE**



## CRE Basics

- Fortunately, our most potent  $\beta$ -lactam class, carbapenems, remained effective against the *Enterobacteriaceae*.

Doripenem, Ertapenem, Imipenem, Meropenem

- Unfortunately, those days are over!

- KPC – *Klebsiella pneumoniae* carbapenemase
- NDM – New Delhi metallo- $\beta$ -lactamase
- IMP, VIM, OXA – less common causes of CRE in US



## CRE Basics

### 2015 Wisconsin CRE Surveillance Definition

(8/2016)

**CRE: Any *Escherichia coli*, *Klebsiella pneumoniae*, *Klebsiella oxytoca*, or *Enterobacter* spp. determined to produce a carbapenemase (i.e., KPC, NDM-1, VIM, IMP, OXA-48) using a recognized test (e.g., polymerase chain reaction, metallo- $\beta$ -lactamase test, modified-Hodge test, Carba-NP).**



State of Wisconsin

Department of Health Services

DIVISION OF PUBLIC HEALTH

1 WEST WILSON STREET  
P O BOX 2659  
MADISON, WI 53701-2659

608-266-1251  
FAX: 608-267-2932  
TTY: 711 or 800-947-3529

Scott Walker  
Governor

Kathy Rhoades  
Secretary

Date: August 16, 2016


To: Infection Preventionists in Wisconsin Skilled Nursing Facilities

From: Jeffrey P. Davis, MD  
Chief Medical Officer and State Epidemiologist for Communicable Diseases

Re: Surveillance for Carbapenem-Resistant *Enterobacteriaceae*

Because CRE are serious, highly drug-resistant healthcare pathogens and because statewide CRE surveillance is the foundation for preventing healthcare-associated CRE transmission, I am expanding mandatory reporting of CRE cases to include all Wisconsin licensed skilled nursing facilities. Beginning with specimens collected on or after September 1, 2016, these facilities will be required to report CRE cases as defined in the NHSN multidrug-resistant (MDRO) module at [http://www.cdc.gov/nhsn/pdfs/lte/ltef-labid-event-protocol\\_current.pdf](http://www.cdc.gov/nhsn/pdfs/lte/ltef-labid-event-protocol_current.pdf).

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**Wisconsin CRE Surveillance Data**  
**Hospital Inpatients 2014/2015** (8/2016)


	2014	2015*
Unique patients with carbapenem non-susceptible isolates	26 (*10)	31
Number (%) patients with CPE isolates	10/26 (38%)	31/31 (100%)
Number of CRE Isolates	38	38
Number (%) CRE isolates that are CPE's	16/38 (42%)	38/38 (100%)
Urine Isolates	23 (61%)	24 (63%)
Blood (sterile site) Isolates	7 (18%)	4 (10%)
Other/Unspecified Isolates	8 (21%)	10 (27%)


CRE = carbapenem-resistant *Enterobacteriaceae*  
 CPE = carbapenemase producing *Enterobacteriaceae*  
 CP-CRE = carbapenemase producing, carbapenem-resistant *Enterobacteriaceae*  
 CPO = carbapenemase producing organism

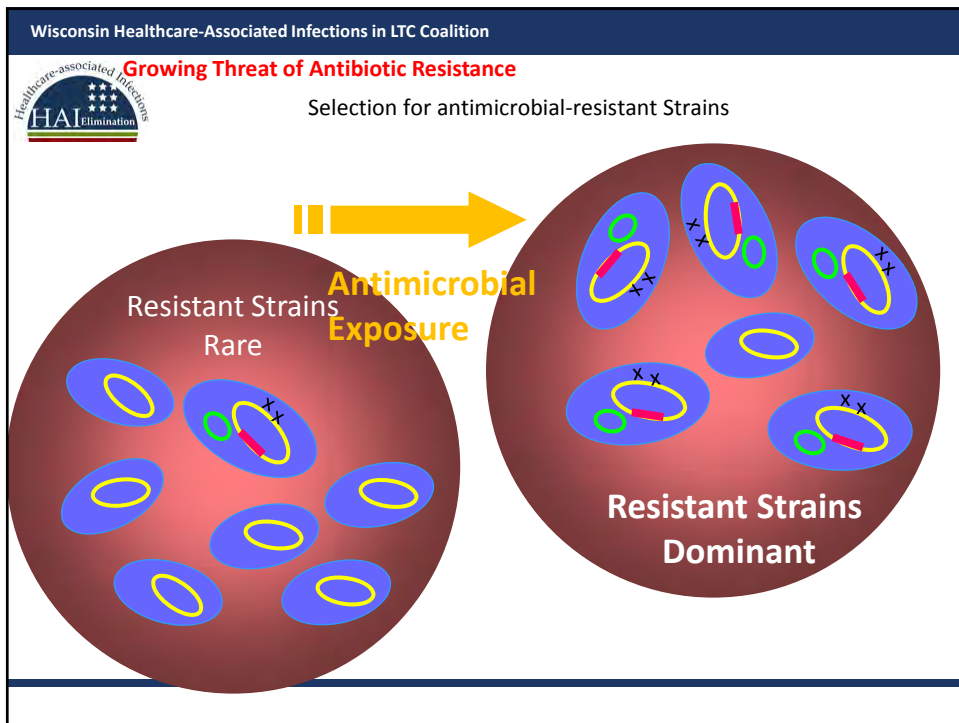
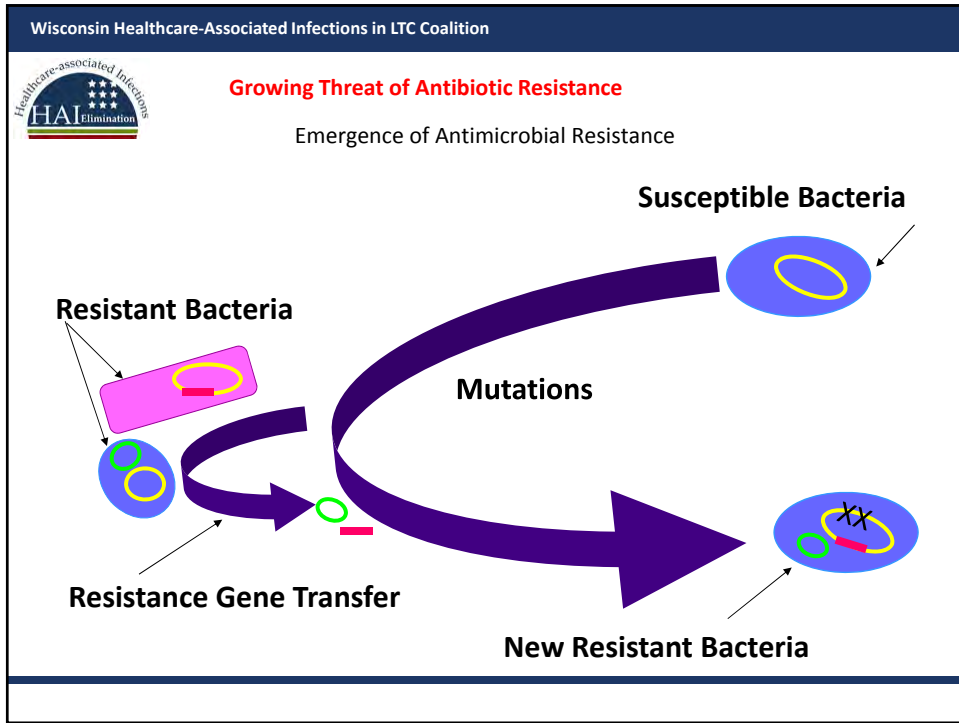
Wisconsin Division of Public Health, Healthcare-Associated Infections Prevention Program

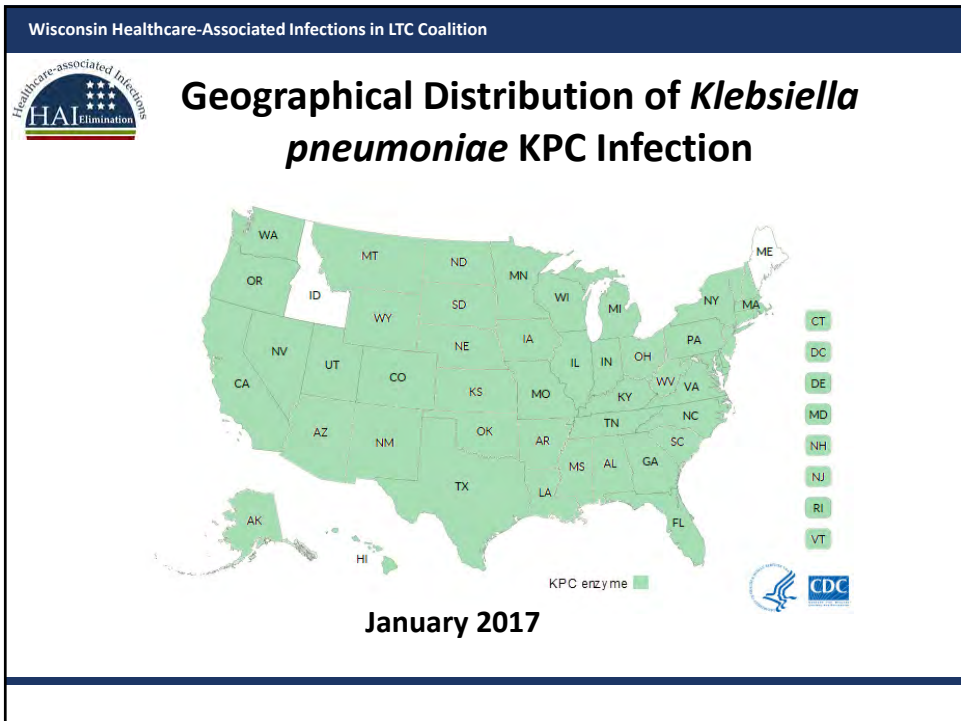
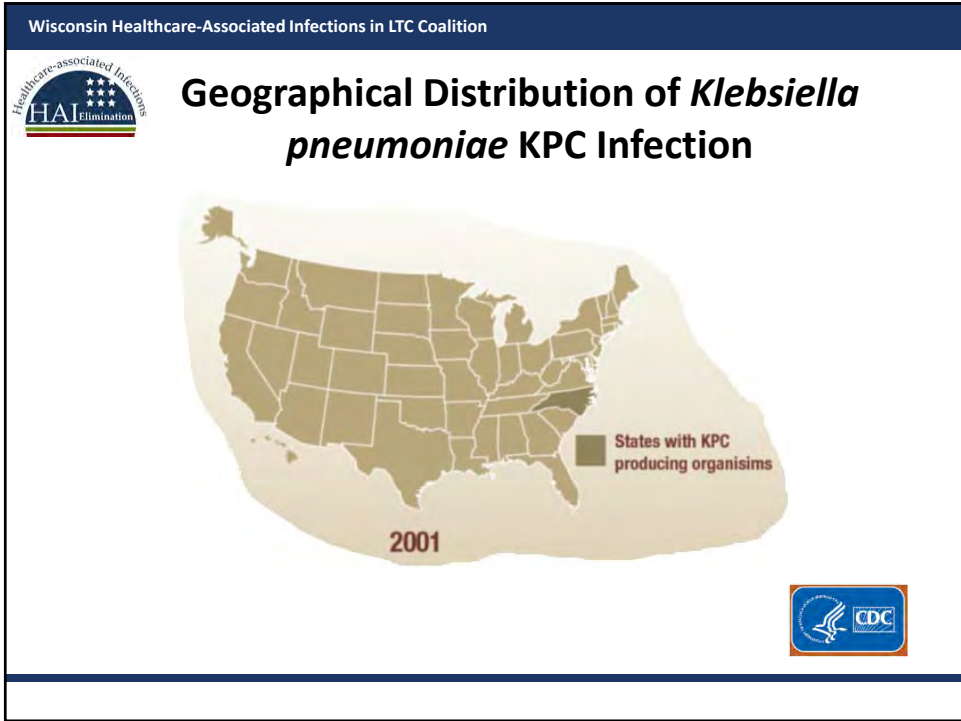
\* new CRE definition

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**Wait A Minute!**  
**How do these bacteria become resistant if they did not start out that way?**









## Clinical Micro*Antibio* + *gram*biology Reports



## *Antibiogram* Reports







## What is an Antibiogram?


- **A cumulative susceptibility report from the past year of your facilities bacterial isolates**
- **Gives you a picture of the prevalence of antimicrobial resistance in your facility**
- **A tool providers can use as a guide to facility specific resistance patterns**
- **If the number of unique isolates allow, a tool to aid in the choice of empiric antibiotic therapy**
- **Provide information on organism incidence by body site for your facility**



## Benefits of an Antibiogram

- **Raises the awareness of antimicrobial resistance problems in a facility**
- **Supports the use of optimal empiric antimicrobial therapy (if numbers allow)**
- **Assists in identifying the most cost-effective antibiotic for a resident (if numbers allow)**
- **Assists in identifying opportunities to reduce inappropriate antibiotics**


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## Benefits of an Antibiogram

- Supports the facilities infection control surveillance program
- Supports antimicrobial stewardship by tracking the emergence of antibiotic resistant bacteria
- Can improve resident outcomes by:
  - Reducing resident’s exposure to broad spectrum antibiotics and thereby helping to reduce selection for MDROs
  - Reduce treatment failures
- Reduce healthcare related costs

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## 2013 Wisconsin State Antibiogram

Organism	max n	Percentage Susceptible													
		Gentamicin	Tobramycin	Levofloxacin	Ciprofloxacin	Ampicillin	Ampicillin-sulbactam	Piperacillin-tazobactam	Cefazolin	Ceftriaxone	Ceftazidime	Cefepime	Imipenem	TMP/SMX	Nitrofurantoin
Escherichia coli	7504	94	95	82	82	61	68	97	90	97	97	98	99	81	94
Klebsiella pneumoniae	1360	99	99	98	98		89	97	96	98	98	98	99	94	37
Proteus mirabilis	6375	93	93	81	77	83	91	99	89	97	96	98		83	
Enterobacter cloacae	2831	99	99	97	97			87		84	86	98	98	92	28
Pseudomonas aeruginosa	8493	87	96	77	79			93			90	82	87		

Wisconsin Healthcare-Associated Infections in LTC Coalition

### Antibiotic Resistance is Local

**LTC-A**

Gram Negatives % Susceptible (all sources)	<i>Escherichia coli</i> (83)	<i>Klebsiella pneumoniae</i> (20)	<i>Pseudomonas aeruginosa</i> (21)	<i>Proteus mirabilis</i> (31)
Ampicillin	51	*	*	76
Amoxicillin/Clavulanate	83	88	*	*
Ampicillin/Sulbactam	59	82	*	*
Aztreonam	100	100	*	*
Cefazolin	93	89	*	*
Cefepime	*	100	81	*
Ceftazidime	*	100	90	*
Ceftriaxone	99	100	*	100
Cefuroxime	88	94	*	94
Ciprofloxacin	50	89	67	62
Gentamicin	*	88	81	94
Imipenem	100	100	*	*
Nitrofurantoin*	93	74	*	*
Piperacillin/Tazobactam	*	*	*	*
Ticarcillin/Clavulanate	*	88	*	*
Tobramycin	*	88	100	*
Trimethoprim/sulfamethoxazole	79	95	*	67

\* urine isolates only; (number of isolates)

**Hospital**

Gram Negatives % Susceptible (all sources)	<i>Enterobacter cloacae</i> (79)	<i>Escherichia coli</i> (1,486)	<i>Klebsiella pneumoniae</i> (31)	<i>Pseudomonas aeruginosa</i> (226)	<i>Proteus mirabilis</i> (127)
Ampicillin	*	60	*	*	89
Amoxicillin/Clavulanate	*	87	96	*	*
Ampicillin/Sulbactam	*	65	85	*	*
Aztreonam	*	98	99	77	*
Cefazolin	*	89	97	*	100
Cefepime	100	*	100	86	*
Ceftazidime	82	*	100	90	*
Ceftriaxone	*	97	99	*	100
Cefuroxime	*	91	92	*	100
Ciprofloxacin	93	76	95	67	72
Gentamicin	100	*	98	83	89
Meropenem	100	100	100	86	*
Nitrofurantoin*	35	98	61	*	*
Piperacillin/Tazobactam	91	97	95	93	100
Ticarcillin/Clavulanate	73	*	97	89	*
Tobramycin	98	*	98	96	*
Trimethoprim/sulfamethoxazole	89	82	91	*	83

\* urine isolates only; (number of isolates)

**LTC - B**

Gram Negatives % Susceptible (all sources)	<i>Acinetobacter baumannii</i> (31)	<i>Escherichia coli</i> (81)	<i>Providencia stuartii</i> (57)	<i>Pseudomonas aeruginosa</i> (87)	<i>Proteus mirabilis</i> (81)
Ampicillin	*	25	*	*	67
Amoxicillin/Clavulanate	*	50	*	*	*
Ampicillin/Sulbactam	62	29	50	*	*
Aztreonam	*	52	77	50	*
Cefazolin	*	47	0	*	67
Cefepime	7	*	57	44	*
Ceftazidime	29	*	29	51	*
Ceftriaxone	*	51	71	*	77
Cefuroxime	*	47	29	*	74
Ciprofloxacin	0	19	7	31	34
Gentamicin	20	*	43	35	77
Imipenem	*	100	88	49	*
Meropenem	57	100	93	52	100
Nitrofurantoin*	*	85	*	*	*
Piperacillin/Tazobactam	*	57	75	76	73
Ticarcillin/Clavulanate	7	*	93	53	*
Tobramycin	13	*	43	74	*
Trimethoprim/sulfamethoxazole	17	44	36	*	55

\* urine isolates only; (number of isolates)

Wisconsin Healthcare-Associated Infections in LTC Coalition

### Antibiotic Resistance is Local

**LTC-A**

Gram Negatives % Susceptible (all sources)	<i>Escherichia coli</i> (83)	<i>Klebsiella pneumoniae</i> (20)	<i>Pseudomonas aeruginosa</i> (31)	<i>Proteus mirabilis</i> (31)
Ampicillin	51	*	*	76
Amoxicillin/Clavulanate	83	88	*	*
Ampicillin/Sulbactam	59	82	*	*
Aztreonam	100	100	*	*
Cefazolin	93	89	*	*
Cefepime	*	100	81	*
Ceftazidime	*	100	90	*
Ceftriaxone	99	100	*	100
Cefuroxime	88	94	*	94
Ciprofloxacin	50	89	67	62
Gentamicin	*	88	81	94
Imipenem	100	100	*	*
Nitrofurantoin*	93	74	*	*
Piperacillin/Tazobactam	*	*	*	*
Ticarcillin/Clavulanate	*	88	*	*
Tobramycin	*	88	100	*
Trimethoprim/sulfamethoxazole	79	95	*	67

\* urine isolates only; (number of isolates)

**Hospital**

Gram Negatives % Susceptible (all sources)	<i>Enterobacter cloacae</i> (79)	<i>Escherichia coli</i> (1,486)	<i>Klebsiella pneumoniae</i> (31)	<i>Pseudomonas aeruginosa</i> (226)	<i>Proteus mirabilis</i> (127)
Ampicillin	*	60	*	*	89
Amoxicillin/Clavulanate	*	87	96	*	*
Ampicillin/Sulbactam	*	65	85	*	*
Aztreonam	*	98	99	77	*
Cefazolin	*	89	97	*	100
Cefepime	100	*	100	86	*
Ceftazidime	82	*	100	90	*
Ceftriaxone	*	97	99	*	100
Cefuroxime	*	91	92	*	100
Ciprofloxacin	93	76	95	67	72
Gentamicin	100	*	98	83	89
Meropenem	100	100	100	86	*
Nitrofurantoin*	35	98	61	*	*
Piperacillin/Tazobactam	91	97	95	93	100
Ticarcillin/Clavulanate	73	*	97	89	*
Tobramycin	98	*	98	96	*
Trimethoprim/sulfamethoxazole	89	82	91	*	83

\* urine isolates only; (number of isolates)

**LTC - B**

Gram Negatives % Susceptible (all sources)	<i>Acinetobacter baumannii</i> (31)	<i>Escherichia coli</i> (81)	<i>Providencia stuartii</i> (57)	<i>Pseudomonas aeruginosa</i> (87)	<i>Proteus mirabilis</i> (81)
Ampicillin	*	25	*	*	67
Amoxicillin/Clavulanate	*	50	*	*	*
Ampicillin/Sulbactam	62	29	50	*	*
Aztreonam	*	52	77	50	*
Cefazolin	*	47	0	*	67
Cefepime	7	*	57	44	*
Ceftazidime	29	*	29	51	*
Ceftriaxone	*	51	71	*	77
Cefuroxime	*	47	29	*	74
Ciprofloxacin	0	19	7	31	34
Gentamicin	20	*	43	35	77
Imipenem	*	100	88	49	*
Meropenem	57	100	93	52	100
Nitrofurantoin*	*	85	*	*	*
Piperacillin/Tazobactam	*	57	75	76	73
Ticarcillin/Clavulanate	7	*	93	53	*
Tobramycin	13	*	43	74	*
Trimethoprim/sulfamethoxazole	17	44	36	*	55

\* urine isolates only; (number of isolates)

Wisconsin Healthcare-Associated Infections in LTC Coalition

### Antibiotic Resistance is Local

**LTC-A**

Gram Negatives % Susceptible (all sources)	<i>Escherichia coli</i> (83)	<i>Klebsiella pneumoniae</i> (90)	<i>Pseudomonas aeruginosa</i> (31)	<i>Proteus mirabilis</i> (31)
Ampicillin	51	*	*	76
Amoxicillin/Clavulanate	83	88	*	*
Ampicillin/Sulbactam	59	82	*	*
Aztreonam	100	100	*	*
Cefazolin	93	89	*	*
Cefepime	*	100	81	*
Ceftazidime	*	100	90	*
Ceftriaxone	99	100	*	100
Ceruxime	*	*	*	*
Ciprofloxacin	50	89	67	62
Gentamicin	*	88	81	94
Imipenem	100	100	*	*
Nitrofurantoin*	93	74	*	*
Piperacillin/Tazobactam	*	*	*	*
Ticarcillin/Clavulanate	*	88	*	*
Tobramycin	*	88	100	*
Trimethoprim/sulfamethoxazole	79	95	*	67

\* urine isolates only; (number of isolates)

**Hospital**

Gram Negatives % Susceptible (all sources)	<i>Enterobacter cloacae</i> (79)	<i>Escherichia coli</i> (1,486)	<i>Klebsiella pneumoniae</i> (31)	<i>Pseudomonas aeruginosa</i> (226)	<i>Proteus mirabilis</i> (127)
Ampicillin	*	60	*	*	89
Amoxicillin/Clavulanate	*	87	96	*	*
Ampicillin/Sulbactam	*	65	85	*	*
Aztreonam	*	98	99	77	*
Cefazolin	*	89	97	*	100
Cefepime	100	*	100	86	*
Ceftazidime	82	*	100	90	*
Ceftriaxone	*	97	99	*	100
Ceruxime	*	*	*	*	99
Ciprofloxacin	93	76	95	67	72
Gentamicin	100	*	98	83	89
Meropenem	100	100	100	86	*
Nitrofurantoin*	35	98	61	*	*
Piperacillin/Tazobactam	91	97	95	93	100
Ticarcillin/Clavulanate	73	*	97	89	*
Tobramycin	98	*	98	96	*
Trimethoprim/sulfamethoxazole	89	82	91	*	83

\* urine isolates only; (number of isolates)

**LTC - B**

Gram Negatives % Susceptible (all sources)	<i>Acinetobacter baumannii</i> (31)	<i>Escherichia coli</i> (81)	<i>Providencia stuartii</i> (57)	<i>Pseudomonas aeruginosa</i> (87)	<i>Proteus mirabilis</i> (81)
Ampicillin	*	23	*	*	67
Amoxicillin/Clavulanate	*	50	*	*	*
Ampicillin/Sulbactam	62	29	50	*	*
Aztreonam	*	52	77	50	*
Cefazolin	*	47	6	*	67
Cefepime	7	*	57	44	*
Ceftazidime	29	*	29	51	*
Ceftriaxone	*	51	71	*	77
Ceruxime	*	47	29	*	74
Ciprofloxacin	0	19	7	31	34
Gentamicin	20	*	43	35	77
Imipenem	*	100	88	49	*
Meropenem	57	100	93	52	100
Nitrofurantoin*	*	85	*	*	*
Piperacillin/Tazobactam	*	57	75	76	73
Ticarcillin/Clavulanate	7	*	93	53	*
Tobramycin	13	*	43	74	*
Trimethoprim/sulfamethoxazole	17	44	36	*	55

\* urine isolates only; (number of isolates)

Wisconsin Healthcare-Associated Infections in LTC Coalition

### Antibiotic Resistance is Local

**LTC-A**

Gram Negatives % Susceptible (all sources)	<i>Escherichia coli</i> (83)	<i>Klebsiella pneumoniae</i> (20)	<i>Pseudomonas aeruginosa</i> (21)	<i>Proteus mirabilis</i> (21)
Ampicillin	51	*	*	76
Amoxicillin/Clavulanate	83	88	*	*
Ampicillin/Sulbactam	59	82	*	*
Aztreonam	100	100	*	*
Cefazolin	93	89	*	*
Cefepime	*	100	81	*
Ceftazidime	*	100	90	*
Ceftriaxone	99	100	*	100
Ceruxime	88	94	*	94
Ciprofloxacin	50	89	67	62
Gentamicin	*	88	81	94
Imipenem	100	100	*	*
Nitrofurantoin*	93	74	*	*
Piperacillin/Tazobactam	*	*	*	*
Ticarcillin/Clavulanate	*	88	*	*
Tobramycin	*	88	100	*
Trimethoprim/sulfamethoxazole	79	95	*	67

\* urine isolates only; (number of isolates)

**Hospital**

Gram Negatives % Susceptible (all sources)	<i>Enterobacter cloacae</i> (79)	<i>Escherichia coli</i> (1,486)	<i>Klebsiella pneumoniae</i> (31)	<i>Pseudomonas aeruginosa</i> (226)	<i>Proteus mirabilis</i> (127)
Ampicillin	*	60	*	*	89
Amoxicillin/Clavulanate	*	87	96	*	*
Ampicillin/Sulbactam	*	65	85	*	*
Aztreonam	*	98	99	77	*
Cefazolin	*	89	97	*	100
Cefepime	100	*	100	86	*
Ceftazidime	82	*	100	90	*
Ceftriaxone	*	97	99	*	100
Ceruxime	*	91	92	*	100
Ciprofloxacin	93	76	95	67	72
Gentamicin	100	*	98	83	89
Meropenem	100	100	100	86	*
Nitrofurantoin*	35	98	61	*	*
Piperacillin/Tazobactam	91	97	95	93	100
Ticarcillin/Clavulanate	73	*	97	89	*
Tobramycin	98	*	98	96	*
Trimethoprim/sulfamethoxazole	89	82	91	*	83


\* urine isolates only; (number of isolates)

**LTC - B**

Gram Negatives % Susceptible (all sources)	<i>Acinetobacter baumannii</i> (31)	<i>Escherichia coli</i> (81)	<i>Providencia stuartii</i> (57)	<i>Pseudomonas aeruginosa</i> (87)	<i>Proteus mirabilis</i> (81)
Ampicillin	*	23	*	*	67
Amoxicillin/Clavulanate	*	50	*	*	*
Ampicillin/Sulbactam	62	29	50	*	*
Aztreonam	*	52	77	50	*
Cefazolin	*	47	6	*	67
Cefepime	7	*	57	44	*
Ceftazidime	29	*	29	51	*
Ceftriaxone	*	51	71	*	77
Ceruxime	*	47	29	*	74
Ciprofloxacin	0	19	7	31	34
Gentamicin	20	*	43	35	77
Imipenem	*	100	88	49	*
Meropenem	57	100	93	52	100
Nitrofurantoin*	*	85	*	*	*
Piperacillin/Tazobactam	*	57	75	76	73
Ticarcillin/Clavulanate	7	*	93	53	*
Tobramycin	13	*	43	74	*
Trimethoprim/sulfamethoxazole	17	44	36	*	55

\* urine isolates only; (number of isolates)


Wisconsin Healthcare-Associated Infections in LTC Coalition



## 2013 Wisconsin State Antibigram

Organism	max n	Genta micin	Tobram ycin	Levoflox acin	Ciproflox acin	Ampic illin	Ampicillin- sulbactam	Percentage Susceptible							TMP/SMX	Nitrofu ranto in
								Piperacillin- tazobactam	Cefaz olin	Ceftria xone	Ceftazi dime	Cefepi me	Impen em			
<i>Escherichia coli</i>	75804	94	95	82	82	61	68	97	90	97	97	98	99	81	94	
<i>Klebsiella pneumoniae</i>	13360	99	99	98	98		89	97	96	98	98	98	99	94	37	
<i>Proteus mirabilis</i>	6375	93	93	81	77	83	91	99	89	97	96	98		83		
<i>Enterobacter cloacae</i>	2831	99	99	97	97			87		84	86	98	98	92	28	
<i>Pseudomonas aeruginosa</i>	8493	87	96	77	79			93		90	82	87				

Wisconsin Healthcare-Associated Infections in LTC Coalition



## Antibiotic Resistance is Local

### LTC-A

Gram Negatives % Susceptible (all sources)	max n	<i>Escherichia coli</i> (83)	<i>Klebsiella pneumoniae</i> (20)	<i>Pseudomonas aeruginosa</i> (21)	<i>Proteus mirabilis</i> (21)
Amoxicillin/Clavulanate	83	88	*	*	*
Ampicillin/Sulbactam	59	82	*	*	*
Aztreonam	100	100	*	*	*
Cefazolin	93	89	*	*	*
Cefepime	*	100	81	*	*
Ceftazidime	*	100	90	*	*
Ceftriaxone	99	100	*	100	*
Cefuroxime	88	94	*	94	*
Ciprofloxacin	50	89	67	62	*
Gentamicin	*	88	81	94	*
Imipenem	100	100	*	*	*
Nitrofurantoin*	93	74	*	*	*
Piperacillin/Tazobactam	*	*	*	*	*
Ticarcillin/Clavulanate	*	88	*	*	*
Tobramycin	*	88	100	*	*
Trimethoprim/sulfamethoxazole	79	95	*	*	67

\* urine isolates only; (number of isolates)

### Hospital

Gram Negatives % Susceptible (all sources)	max n	<i>Enterobacter cloacae</i> (79)	<i>Escherichia coli</i> (1,486)	<i>Klebsiella pneumoniae</i> (311)	<i>Pseudomonas aeruginosa</i> (226)	<i>Proteus mirabilis</i> (127)
Amoxicillin/Clavulanate	*	87	96	*	*	
Ampicillin/Sulbactam	*	65	85	*	*	
Aztreonam	*	98	99	77	*	
Cefazolin	*	89	97	*	100	
Cefepime	100	*	100	86	*	
Ceftazidime	82	*	100	90	*	
Ceftriaxone	*	97	99	*	100	
Cefuroxime	*	94	92	*	100	
Ciprofloxacin	93	76	95	67	72	
Gentamicin	100	*	98	83	89	
Meropenem	100	100	100	86	*	
Nitrofurantoin*	35	98	61	*	*	
Piperacillin/Tazobactam	94	87	85	83	100	
Ticarcillin/Clavulanate	73	*	97	89	*	
Tobramycin	98	*	98	96	*	
Trimethoprim/sulfamethoxazole	89	82	91	*	83	

\* urine isolates only; (number of isolates)

### LTC - B

Gram Negatives % Susceptible (all sources)	max n	<i>Acinetobacter baumannii</i> (31)	<i>Escherichia coli</i> (88)	<i>Providencia stuartii</i> (57)	<i>Pseudomonas aeruginosa</i> (87)	<i>Proteus mirabilis</i> (81)
Amoxicillin/Clavulanate	*	50	*	*	*	
Ampicillin/Sulbactam	62	29	80	*	*	
Aztreonam	*	52	77	30	*	
Cefazolin	*	47	0	*	67	
Cefepime	7	*	57	44	*	
Ceftazidime	29	*	29	51	*	
Ceftriaxone	*	51	71	*	77	
Cefuroxime	*	47	29	*	74	
Ciprofloxacin	0	19	7	31	34	
Gentamicin	20	*	43	35	77	
Imipenem	*	100	88	49	*	
Meropenem	57	100	93	52	100	
Nitrofurantoin*	*	83	*	*	*	
Piperacillin/Tazobactam	*	57	75	76	73	
Ticarcillin/Clavulanate	7	*	93	53	*	
Tobramycin	13	*	43	74	*	
Trimethoprim/sulfamethoxazole	17	44	36	*	55	

\* urine isolates only; (number of isolates)

Wisconsin Healthcare-Associated Infections in LTC Coalition

### Antibiotic Resistance is Local

**LTC-A**

Gram Negatives % Susceptible (all sources)	<i>Escherichia coli</i> (83)	<i>Klebsiella pneumoniae</i> (20)	<i>Pseudomonas aeruginosa</i> (21)	<i>Proteus mirabilis</i> (21)
Ampicillin	51	*	*	76
Amoxicillin/Clavulanate	83	88	*	*
Ampicillin/Sulbactam	59	82	*	*
Aztreonam	100	100	*	*
Cefazolin	93	89	*	*
Cefepime	*	100	81	*
Ceftazidime	*	100	90	*
Ceftriaxone	99	100	*	100
Cerivoxime	50	39	67	62
Ciprofloxacin	*	88	81	94
Gentamicin	100	100	100	*
Imipenem	93	74	*	*
Nitrofurantoin*	*	*	*	*
Piperacillin/Tazobactam	*	*	*	*
Ticarcillin/Clavulanate	*	88	*	*
Tobramycin	*	88	100	*
Trimethoprim/sulfamethoxazole	79	95	*	67

\* urine isolates only; (number of isolates)

**Hospital**

Gram Negatives % Susceptible (all sources)	<i>Enterobacter cloacae</i> (79)	<i>Escherichia coli</i> (1,386)	<i>Klebsiella pneumoniae</i> (311)	<i>Pseudomonas aeruginosa</i> (226)	<i>Proteus mirabilis</i> (127)
Ampicillin	*	60	*	*	89
Amoxicillin/Clavulanate	*	87	96	*	*
Ampicillin/Sulbactam	*	65	85	*	*
Aztreonam	*	98	99	77	*
Cefazolin	*	89	97	*	100
Cefepime	100	*	100	86	*
Ceftazidime	82	*	100	90	*
Ceftriaxone	*	97	99	*	100
Cerivoxime	93	76	95	67	72
Ciprofloxacin	100	*	98	83	89
Gentamicin	100	100	100	86	*
Meropenem	35	98	61	*	*
Nitrofurantoin*	91	97	95	93	100
Piperacillin/Tazobactam	73	*	97	89	*
Ticarcillin/Clavulanate	98	*	98	96	*
Tobramycin	89	82	91	*	83
Trimethoprim/sulfamethoxazole	89	82	91	*	83


\* urine isolates only; (number of isolates)

**LTC - B**

Gram Negatives % Susceptible (all sources)	<i>Acinetobacter baumannii</i> (3)	<i>Escherichia coli</i> (81)	<i>Providencia stuartii</i> (57)	<i>Pseudomonas aeruginosa</i> (87)	<i>Proteus mirabilis</i> (81)
Ampicillin	*	25	*	*	67
Amoxicillin/Clavulanate	*	50	*	*	*
Ampicillin/Sulbactam	62	29	50	*	*
Aztreonam	*	52	77	50	*
Cefazolin	*	47	0	*	67
Cefepime	7	*	57	44	*
Ceftazidime	29	*	29	51	*
Ceftriaxone	*	51	71	*	77
Cerivoxime	*	47	29	*	74
Ciprofloxacin	0	19	7	31	34
Cefepime	33	*	43	36	37
Imipenem	*	100	88	49	*
Meropenem	57	100	93	52	100
Nitrofurantoin*	*	85	*	*	*
Piperacillin/Tazobactam	*	37	75	76	73
Ticarcillin/Clavulanate	7	*	93	53	*
Tobramycin	13	*	43	74	*
Trimethoprim/sulfamethoxazole	17	44	36	*	55

\* urine isolates only; (number of isolates)

Wisconsin Healthcare-Associated Infections in LTC Coalition




## Recommendations M39-A4

M39-A4  
Vol. 29, No. 6  
Replaces M39-A3  
Vol. 21 No. 28

### Analysis and Presentation of Cumulative Antimicrobial Susceptibility Test Data; Approved Guideline—Third Edition

This document describes methods for recording and analysis of antimicrobial susceptibility test data, consisting of cumulative and ongoing summaries of susceptibility patterns of clinically significant microorganisms.

A guideline for global application developed through the Clinical and Laboratory Standards Institute consensus process.



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### WHICH ANTIBIOTICS/BACTERIA TO REPORT IN ANTIBIOGRAM?

- Only Antibiotics Routinely Tested
- When Using Surrogates Report The Agent Represented by the Surrogate
- Include Selective Report and Supplemental Report Antibiotics, Not Just the Primary Reports (Cascade)
- Do Not Include The Results of Agents Tested Selectively Against Isolates with significant resistance
- Report only species with > 30 isolates
- Include only the first isolate/species per patient



### WHICH ANTIBIOTICS/BACTERIA TO REPORT IN ANTIBIOGRAM?

- Only Antibiotics Routinely Tested
- When Using Surrogates Report The Agent Represented by the Surrogate
- Include Selective Report and Supplemental Report Antibiotics, Not Just the Primary Reports (Cascade)
- Do Not Include The Results of Agents Tested Selectively Against Isolates with significant resistance
- Report only species with > 30 isolates
- Include only the first isolate/species per patient



## CLSI Recommendations M39-A4

**'And thirdly, the code is more what you'd call "guidelines" than actual rules.'**

*Captain Barbosa, Pirates of the Caribbean: The Curse of the Black Pearl, 2003*

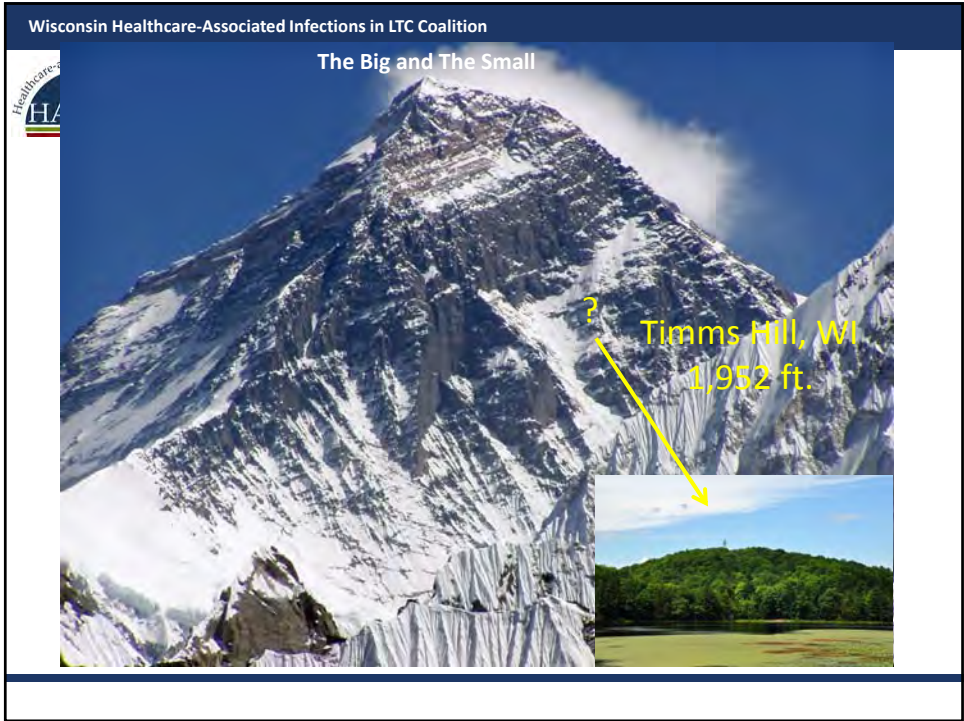


The Big and The Small

← ? Mt. Everest  
29,035 ft.







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Healthcare-associated Infections  
HAI Elimination


### Why the “30” isolates?

95% Confidence (CI) Table


Sample Size	Susceptible or Resistant Rate																	
	10%		20%		30%		40%		50%		60%		70%		80%		90%	
10	0	45	1	56	6	65	12	74	19	81	26	88	35	94	44	99	55	100
20	0	33	6	44	12	54	19	64	27	73	36	81	46	88	56	94	67	100
30	2	27	8	39	15	50	23	59	31	69	41	77	50	85	61	92	73	98
40	3	24	9	36	17	47	25	57	34	66	43	75	53	83	64	91	76	97
50	3	22	10	34	18	45	27	55	36	64	45	73	55	82	66	90	78	97
60	4	21	11	33	19	43	28	53	37	63	47	72	57	81	67	89	79	96
70	4	20	12	32	20	42	29	52	38	62	48	71	58	80	68	88	80	96
80	5	19	12	31	20	41	29	52	39	61	48	71	59	80	69	88	81	95
90	5	18	12	30	21	41	30	51	39	61	49	70	59	79	70	88	82	95
100	5	18	13	29	21	40	30	50	40	60	50	70	60	79	71	87	82	95
200	6	15	15	26	24	37	33	47	43	57	53	67	63	76	74	85	85	94
400	7	13	16	24	26	35	35	45	45	55	55	65	65	74	76	84	87	93
600	8	13	17	23	26	34	36	44	46	54	56	64	66	74	77	83	87	92
1000	8	12	18	23	27	33	37	43	47	53	57	63	67	73	77	82	88	92

CLSI M39-A4

Wisconsin Healthcare-Associated Infections in LTC Coalition



### Lots of Data Points



A target with a red outer ring, a blue middle ring, and a red bullseye. Three arrows with green fletching and orange shafts are clustered in the bullseye, while one arrow with grey fletching is in the blue ring. This represents a high volume of data points that are all very accurate.

Wisconsin Healthcare-Associated Infections in LTC Coalition



### Few Data Points




A target with a red outer ring, a white middle ring, and a red bullseye. Six arrows with yellow shafts and red fletching are scattered around the target, with only one arrow hitting the bullseye. This represents a low volume of data points with low accuracy.

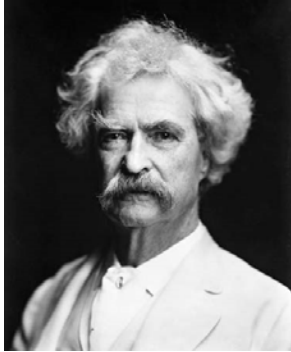
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HAI Elimination

## Do you recognize these men?



**Benjamin Disraeli**  
British Prime Minister  
from 1874-1880



**Mark Twain**  
Samuel Clemens  
American Author  
1835-1910

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Healthcare-associated Infections  
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## What's the point?

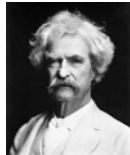
### There are three kinds of lies: *"Lies, Damn Lies, and Statistics"*

"Lies, damned lies, and statistics" is a phrase describing the persuasive power of numbers, particularly the use of statistics to bolster weak arguments. It is also sometimes colloquially used to doubt statistics used to prove an opponent's point.

The term was popularized in the United States by Mark Twain (among others), who attributed it to the 19th-century British Prime Minister Benjamin Disraeli (1804-1881)



$$p \pm z_{1-\alpha/2} \sqrt{\frac{p(1-p)}{n}}$$




Wisconsin Healthcare-Associated Infections in LTC Coalition



## Tranquil Towers

**Data From Bacteria With < 30 Isolates is for Informational Purposes Only and Should Not Be used to Select Empiric Antibiotic Therapy**



Gram Negatives % Susceptible (all sources)	<i>Escherichia coli</i> (10)	<i>Klebsiella pneumoniae</i> (8)	<i>Pseudomonas aeruginosa</i> (8)	<i>Proteus mirabilis</i> (7)
Ampicillin	64	*	*	33
Amoxicillin/Clavulanate	91	85	*	*
Ampicillin/Sulbactam	64	85	*	*
Aztreonam	100	90	*	*
Cefazolin	91	90	*	*
Ceftazidime	*	90	90	*
Ceftriaxone	99	90	*	100
Cefuroxime	88	90	*	94
Ciprofloxacin	50	80	67	62
Gentamicin	*	88	81	94
Imipenem	100	90	*	*
Nitrofurantoin*	93	74	*	*
Piperacillin/Tazobactam	*	*	*	*
Ticarcillin/Clavulanate	*	88	*	*
Tobramycin	*	88	100	*
Trimethoprim/sulfamethoxazole	79	85	*	67


Gram Positive % Susceptible (all sources)	<i>Enterococcus faecalis</i> (7)	<i>Enterococcus faecium</i> (10)	<i>Staphylococcus aureus</i> (13)
Amoxicillin/Clavulanate	*	*	53
Ampicillin	100	10	*
Ampicillin/Sulbactam	*	*	53
Cefazolin	*	*	53
Ceftriaxone	*	*	*
Ciprofloxacin	*	*	*
Clindamycin	*	*	*
Erythromycin	*	*	*
Gentamicin	*	*	*
Linezolid	100	100	100
Meropenem	*	*	*
Moxifloxacin	*	*	*
Nitrofurantoin*	100	100	100
Naftillin	*	*	53
Penicillin	100	10	*
Tetracycline	*	*	*
Trimethoprim/sulfamethoxazole	*	*	100
Vancomycin	100	10	100

**ORGANISM INCIDENCE BY BODY SITE AT TRANQUIL TOWERS 2016**

BODY SITE	PERCENT INCIDENCE
<b>BLOOD (4 ISOLATES)</b>	
<i>Staphylococcus aureus</i>	50
<i>Escherichia coli</i>	50
<b>RESPIRATORY (1)</b>	
<i>Streptococcus pneumoniae</i>	100
<b>WOUND/ABSCCESS/TISSUE/FLUID (20)</b>	
<i>Staphylococcus aureus</i>	42
<i>Pseudomonas aeruginosa</i>	22
<i>Enterococcus faecium</i>	14
All Others	22
<b>URINE (44)</b>	
<i>Escherichia coli</i>	21
<i>Klebsiella pneumoniae</i>	19
<i>Pseudomonas aeruginosa</i>	13
<i>Enterococcus faecalis</i>	10
<i>Proteus mirabilis</i>	10
<i>Enterococcus faecium</i>	5
All Others	22


\* urine isolates only; (number of isolates)

Wisconsin Healthcare-Associated Infections in LTC Coalition



## Tranquil Towers

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Cefazolin	91	90	*	*
Ceftazidime	*	90	90	*
Ceftriaxone	99	90	*	100
Cefuroxime	88	90	*	94
Ciprofloxacin	50	80	67	62
Gentamicin	*	88	81	94
Imipenem	100	90	*	*
Nitrofurantoin*	93	74	*	*
Piperacillin/Tazobactam	*	*	*	*
Ticarcillin/Clavulanate	*	88	*	*
Tobramycin	*	88	100	*
Trimethoprim/sulfamethoxazole	79	85	*	67


Gram Positive % Susceptible (all sources)	<i>Enterococcus faecalis</i> (7)	<i>Enterococcus faecium</i> (10)	<i>Staphylococcus aureus</i> (13)
Amoxicillin/Clavulanate	*	*	53
Ampicillin	100	10	*
Ampicillin/Sulbactam	*	*	53
Cefazolin	*	*	53
Ceftriaxone	*	*	*
Ciprofloxacin	*	*	*
Clindamycin	*	*	*
Erythromycin	*	*	*
Gentamicin	*	*	*
Linezolid	100	100	100
Meropenem	*	*	*
Moxifloxacin	*	*	*
Nitrofurantoin*	100	100	100
Naftillin	*	*	53
Penicillin	100	10	*
Tetracycline	*	*	*
Trimethoprim/sulfamethoxazole	*	*	100
Vancomycin	100	10	100

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<i>Proteus mirabilis</i>	10
<i>Enterococcus faecium</i>	5
All Others	22


\* urine isolates only; (number of isolates)

Wisconsin Healthcare-Associated Infections in LTC Coalition

 **WHICH ANTIBIOTICS/BACTERIA TO REPORT IN ANTIBIOGRAM?**

- Only Antibiotics Routinely Tested
- When Using Surrogates Report The Agent Represented by the Surrogate
- **Include Selective Report and Supplemental Report Antibiotics, Not Just the Primary Reports (Cascade)**
- Do Not Include The Results of Agents Tested Selectively Against Isolates with significant resistance
- Report only species with > 30 isolates
- Include only the first isolate/species per patient

Wisconsin Healthcare-Associated Infections in LTC Coalition


 **Here is Some of What They Tested**

**Urine – *E. coli***


**“Primary Report”:**

AMPICILLIN - S  
 CEFAZOLIN – S  
 CEPHALEXIN - S  
 CIPROFLOXACIN - S  
 NITROFURANTOIN - S  
 TRIMETHOPRIM/SULFAMETHOXAZOLE (TMP/SMX) - S  
 CEFTRIAXONE - S  
 IMIPENEM - S  
 CEFEPIME - S  
 TICARCILLIN/CLAVULANATE -  
 GENTAMICIN - S  
 TOBRAMYCIN – S  
**Plus 10 more!**

**Many of these would be included in your AntibioGram!**




Wisconsin Healthcare-Associated Infections in LTC Coalition




Here is Your Patient's Report

Urine – *E. coli*  
Primary Report:

AMPICILLIN - **S**  
CEFAZOLIN – **S**  
CEPHALEXIN - **S**  
CIPROFLOXACIN - **S**  
NITROFURANTOIN - **S**  
TRIMETHOPRIM/SULFAMETHOXAZOLE (TMP/SMX) - **S**




Wisconsin Healthcare-Associated Infections in LTC Coalition



When You Have This – Report a Few More

Urine – *E. coli*  
Primary Report:

AMPICILLIN - **R**  
CEFAZOLIN – **R**  
CEPHALEXIN - **R**  
CIPROFLOXACIN - **S**  
NITROFURANTOIN - **S**  
TRIMETHOPRIM/SULFAMETHOXAZOLE (TMP/SMX) - **S**



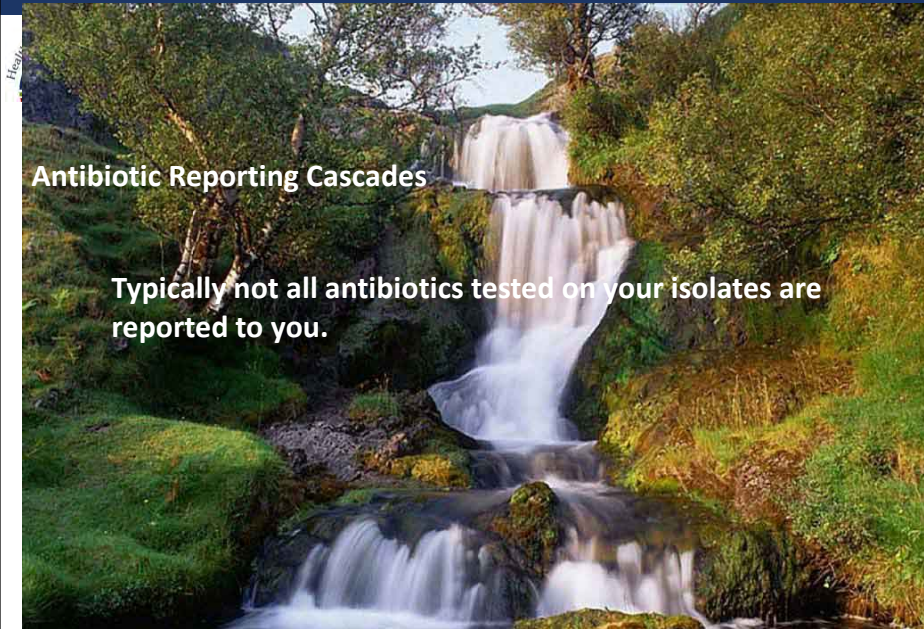




## When You Have This – Report a Few More

Urine – *E. coli*  
Cascade Report:

- AMPICILLIN - R
- CEFAZOLIN – R
- CEPHALEXIN - R
- CIPROFLOXACIN - S
- NITROFURANTOIN - S
- TRIMETHOPRIM/SULFAMETHOXAZOLE (TMP/SMX) - S
- CEFTRIAXONE - S



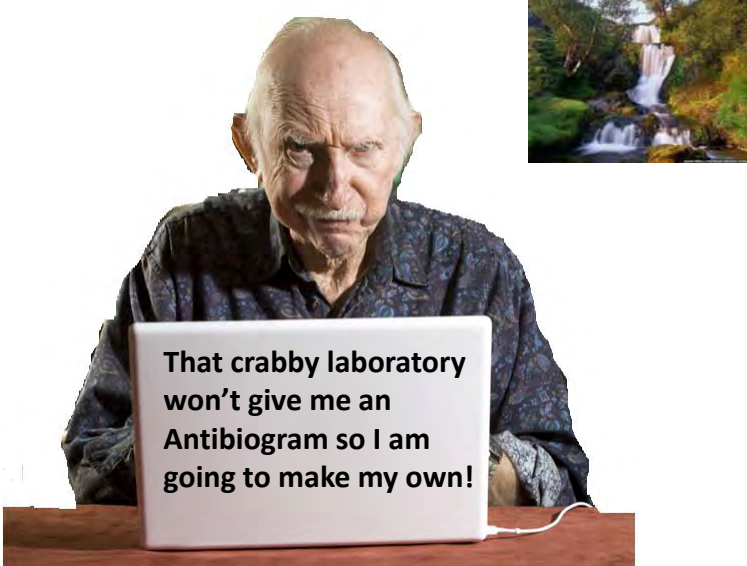
## Antibiotic Reporting Cascades

Typically not all antibiotics tested on your isolates are reported to you.

Wisconsin Healthcare-Associated Infections in LTC Coalition

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HAI Elimination

Pitfalls When Making Your Own Antibioqram



That crabby laboratory  
won't give me an  
Antibioqram so I am  
going to make my own!

Wisconsin Healthcare-Associated Infections in LTC Coalition

Healthcare-associated Infections  
HAI Elimination

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- Report only species with > 30 isolates
- Include only the first isolate/species per patient





## Include Only the First Isolate of a Given Species per Patient per Analysis Period (year)

Why? Including multiple isolates from an individual patient can significantly bias data in favor of that particular isolate.



## Include Only the First Isolate of a Given Species per Patient per Analysis Period (year)

### Ms. Reservoir

#### **7/2/16 urine > 100,000 CFU/ml *K. pneumoniae***

CFZ-R, CFX-R, CIP-R, FD-R, TMP-SMX-R, CFX-R, IMP-R, CPE-R, Gent-S

#### **7/6/16 urine > 100,000 CFU/ml *K. pneumoniae***

CFZ-R, CFX-R, CIP-R, FD-R, TMP-SMX-R, CFX-R, IMP-R, CPE-R, Gent-S


#### **7/6/16 Blood Culture - *K. pneumoniae***

CFZ-R, CFX-R, CIP-R, CFT, CFX-R, IMP-R, CPE-R, Gent-S, To-R, Pip/Tazo-R, AZT-R, TIG-S

#### **7/7/16 Blood Culture - *K. pneumoniae***

CFZ-R, CFX-R, CIP-R, CFT, CFX-R, IMP-R, CPE-R, Gent-S, To-R, Pip/Tazo-R, AZT-R, TIG-S

**Wisconsin Healthcare-Associated Infections in LTC Coalition**



**Data From Bacteria With < 30 Isolates is for Informational Purposes Only and Should Not Be used to Select Empiric Antibiotic Therapy**

## Shady Rest

Gram Negatives % Susceptible (all sources)	ORGANISM INCIDENCE BY BODY SITE AT SHADY REST 2016			
	<i>Escherichia coli</i> (11)	<i>Klebsiella pneumoniae</i> (10)	<i>Pseudomonas aeruginosa</i> (8)	<i>Proteus mirabilis</i> (7)
Amoxicillin	64	*	*	33
Amoxicillin/Clavulanate	91	85	*	*
Ampicillin/Sulbactam	64	85	*	*
Aztreonam	100	90	*	*
Cefazolin	91	90	*	*
Cefazidime	*	90	90	*
Ceftriaxone	99	90	*	100
Cefuroxime	88	90	*	94
Ciprofloxacin	50	80	67	62
Gentamicin	*	88	81	94
Imipenem	100	90	*	*
Meropenem	93	74	*	*
Nitrofurantoin*	*	*	*	*
Piperacillin/Tazobactam	*	*	*	*
Ticarcillin/Clavulanate	*	88	*	*
Tobramycin	*	88	100	*
Trimethoprim/sulfamethoxazole	79	85	*	67

\* urine isolates only; (number of isolates)


Gram Positive % Susceptible (all sources)	ORGANISM INCIDENCE BY BODY SITE AT SHADY REST 2016		
	<i>Enterococcus faecalis</i> (7)	<i>Enterococcus faecium</i> (10)	<i>Staphylococcus aureus</i> (13)
Amoxicillin/Clavulanate	*	*	53
Amoxicillin	100	10	*
Ampicillin/Sulbactam	*	*	53
Cefazolin	*	*	53
Ceftriaxone	*	*	*
Ciprofloxacin	*	*	*
Clindamycin	*	*	*
Erythromycin	*	*	*
Gentamicin	*	*	*
Linezolid	100	100	100
Meropenem	*	*	*
Moxifloxacin	*	*	*
Nitrofurantoin*	100	100	100
Nafcillin	*	*	53
Penicillin	100	10	*
Tetracycline	*	*	*
Trimethoprim/sulfamethoxazole	*	*	100
Vancomycin	100	10	100

\* For serious *Enterococcus* spp. infection combination therapy of penicillin, ampicillin, or vancomycin (for susceptible strains), plus an aminoglycoside, is usually indicated, unless high-level resistance to both gentamicin and streptomycin is documented.  
\* urine isolates only; (number of isolates)

ORGANISM INCIDENCE BY BODY SITE AT SHADY REST 2016

BODY SITE	PERCENT INCIDENCE
<b>BLOOD (4 ISOLATES)</b>	
<i>Staphylococcus aureus</i>	50
<i>Escherichia coli</i>	50
<b>RESPIRATORY (1)</b>	
<i>Streptococcus pneumoniae</i>	100
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**Wisconsin Healthcare-Associated Infections in LTC Coalition**



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## Shady Rest

Gram Negatives % Susceptible (all sources)	ORGANISM INCIDENCE BY BODY SITE AT SHADY REST 2016			
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Amoxicillin/Clavulanate	91	60	*	*
Ampicillin/Sulbactam	64	60	*	*
Aztreonam	100	70	*	*
Cefazolin	91	70	*	*
Cefazidime	*	70	90	*
Ceftriaxone	99	70	*	100
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Nitrofurantoin*	*	*	*	*
Piperacillin/Tazobactam	*	*	*	*
Ticarcillin/Clavulanate	*	88	*	*
Tobramycin	*	88	100	*
Trimethoprim/sulfamethoxazole	79	65	*	67

\* urine isolates only; (number of isolates)

Gram Positive % Susceptible (all sources)	ORGANISM INCIDENCE BY BODY SITE AT SHADY REST 2016		
	<i>Enterococcus faecalis</i> (7)	<i>Enterococcus faecium</i> (10)	<i>Staphylococcus aureus</i> (13)
Amoxicillin/Clavulanate	*	*	53
Amoxicillin	100	10	*
Ampicillin/Sulbactam	*	*	53
Cefazolin	*	*	53
Ceftriaxone	*	*	*
Ciprofloxacin	*	*	*
Clindamycin	*	*	*
Erythromycin	*	*	*
Gentamicin	*	*	*
Linezolid	100	100	100
Meropenem	*	*	*
Moxifloxacin	*	*	*
Nitrofurantoin*	100	100	100
Nafcillin	*	*	53
Penicillin	100	10	*
Tetracycline	*	*	*
Trimethoprim/sulfamethoxazole	*	*	100
Vancomycin	100	10	100

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## Wisconsin Healthcare-Associated Infections in LTC Coalition



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## Wisconsin Healthcare-Associated Infections in LTC Coalition



## Fosfomycin Only Tested and Reported When Isolate is Resistant to Many other Antibiotics

Urine Culture Results	Collect Date	Routine Test and Report			Routine Test and Report if Needed				MDR Only
		Amp.	Nitrofurantoin	Vancomycin	Linezolid	Ciproflox.	Levoflox.	Tetracycline	Fosfomycin
Hur, Barb; E. faecalis	1/1/2012	R	S	R	S	R	R	R	S
Esther, Maggie; E. faecalis	3/7/2012	S	S	S	S	S	S	S	
Woman, Cat; E. faecalis	4/1/2012	S	S	S	S	S	S	S	
Hur, Ben; E. faecalis	5/19/2012	S	S	S	S	S	S	R	
Granger, Hermione; E. faecalis	6/6/2012	S	S	S	S	R	R	R	
James, Jill; E. faecalis	7/7/2012	S	S	S	S	R	R	R	
James, Jill; E. faecalis	8/15/2012	S	S	S	S	R	R	R	
Hontas, Poca; E. faecalis	8/19/2012	S	S	S	S	S	S	S	
Johnson, Merida; E. faecalis	9/19/2012	S	S	S	S	S	S	R	
Idaho, Phyllis; E. faecalis	10/21/2012	S	S	S	S	R	R	R	
Google, Searss; E. faecalis	11/11/2012	S	S	S	S	S	S	R	
James, Jill; E. faecalis	12/12/2012	S	S	S	S	R	R	R	
DeWitt, Rose; E. faecalis	12/21/2012	R	R	R	R	R	R	R	S



## How Do You Get An Antibigram?

- 1. Contact the laboratory that provides microbiology services to your facility**
  1. Marketing Person/Sales Representative
  2. Laboratory Manager
  3. Microbiology Supervisor
- 2. Make an agreement on the production and delivery of an Antibigram for your facility**
- 3. Determine the specifications for the Antibigram**
- 4. Determine a format for the Antibigram**
- 5. Determine what you want your Antibigram to look like**



## How Do You Get An Antibigram?

**OR**


### You can make one yourself!

- 1. Facility will establish a system to capture and review micro reports**
- 2. The captured micro reports will compliment Abx usage data collection**
- 3. The captured micro reports will support the Abx time out function**
- 4. Somebody in the facility that does this is going to learn a lot of micro**
- 5. This exercise will improve the ability to identify new MDROs**
- 6. These skills will aid in outbreak recognition**
- 7. These skills will help identify and define outcome measures which can be addressed through Quality Improvement projects**

Dr. Joe Boero  
 Certified Medical Director  
 Wisconsin Association of Medical Directors



**Wisconsin Healthcare-Associated Infections in LTC Coalition**



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## Shady Rest

**Gram Negatives % Susceptible (all sources)**

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Amoxicillin	64	*	*	33
Amoxicillin/Clavulanate	91	85	*	*
Ampicillin/Sulbactam	64	85	*	*
Aztreonam	100	90	*	*
Cefazolin	91	90	*	*
Cefazidime	*	90	90	*
Ceftriaxone	99	90	*	100
Cefuroxime	88	90	*	94
Ciprofloxacin	50	80	67	62
Gentamicin	*	88	81	94
Imipenem	100	100	*	*
Nitrofurantoin*	93	74	*	*
Piperacillin/Tazobactam	*	*	*	*
Ticarcillin/Clavulanate	*	88	*	*
Tobramycin	*	88	100	*
Trimethoprim/sulfamethoxazole	79	85	*	67

\* urine isolates only; (number of isolates)

**Gram Positive % Susceptible (all sources)**

	<i>Enterococcus faecalis</i> (7)	<i>Enterococcus faecium</i> (10)	<i>Staphylococcus aureus</i> (13)
Amoxicillin/Clavulanate	*	*	53
Ampicillin	100	10	*
Ampicillin/Sulbactam	*	*	53
Cefazolin	*	*	53
Ceftriaxone	*	*	*
Ciprofloxacin	*	*	*
Clindamycin	*	*	*
Erythromycin	*	*	*
Gentamicin	*	*	*
Linezolid	100	100	100
Meropenem	*	*	*
Moxifloxacin	*	*	*
Nitrofurantoin*	100	100	100
Nafcillin	*	*	53
Penicillin	100	10	*
Tetracycline	*	*	*
Trimethoprim/sulfamethoxazole	*	*	100
Vancomycin	100	10	100

\* urine isolates only; (number of isolates)

**ORGANISM INCIDENCE BY BODY SITE AT SHADY REST 2016**

**BLOOD (4 ISOLATES)**

<i>Staphylococcus aureus</i>	50
<i>Escherichia coli</i>	50

**RESPIRATORY (1)**

<i>Streptococcus pneumoniae</i>	100
---------------------------------	-----


**WOUND/ABSCESS/TISSUE/FLUID (20)**

<i>Staphylococcus aureus</i>	42
<i>Pseudomonas aeruginosa</i>	22
<i>Enterococcus faecium</i>	14
All Others	22

**URINE (44)**

<i>Escherichia coli</i>	21
<i>Klebsiella pneumoniae</i>	19
<i>Pseudomonas aeruginosa</i>	13
<i>Enterococcus faecalis</i>	10
<i>Proteus mirabilis</i>	10
<i>Enterococcus faecium</i>	5
All Others	22

**Wisconsin Healthcare-Associated Infections in LTC Coalition**



**Antibiogram for dd/mm/yyyy to dd/mm/yyyy**

Your Nursing Home Name / Clinical Lab Name

Antibiotic Tested	Gram Negative				Gram Positive			
	<i>Escherichia coli</i>	<i>Klebsiella pneumoniae</i>	<i>Proteus mirabilis</i>	<i>Pseudomonas aeruginosa</i>	<i>Staphylococcus aureus</i> non-MRSA	MRSA †	<i>Staphylococcus coag. Neg</i>	<i>Enterococcus sp</i>
# of Isolates:	165	75	39	33	10*	35	18	68
<b>Oral or Oral Equivalent</b>								
Amoxicillin	46%	0%	62%		50%	0%	50%	96%
Amox / Clav	77%	96%	100%					
Cefazolin	70%	93%	88%		100%	0%	50%	
Cefoxitin	82%	100%	100%					
Ceftriaxone	85%	79%	92%					
Ciprofloxacin	58%	79%	62%	56%		0%	0%	47%
Levofloxacin	59%	79%	62%	57%	33%	20%	0%	64%
Nitrofurantoin	100%	0%	0%		100%	100%	100%	100%
TMP / SMX	64%	79%	54%		67%	100%	100%	
Tetracycline	64%	60%	0%		100%	100%	80%	38%
Oxacillin					100%	0%	50%	
Clindamycin					50%	50%	100%	
Erythromycin					50%	0%	0%	
Linezolid					100%	100%		100%
<b>IV Only</b>								
Pip / Taz	98%	96%	100%	100%				
Cefepime	89%	95%	92%	91%				
Ceftazidime								
Gentamicin	85%	83%	92%	91%	100%	100%	67%	
Imipenem	100%	100%	100%	71%				
Vancomycin					100%	100%	100%	100%

\* Organisms with fewer than 30 isolates should be interpreted with caution, as small numbers may bias the group susceptibilities


† MRSA = Methicillin-resistant Staph aureus, represents a subset of all Staph aureus isolates

‡ N= pooled isolates by species from urine, wound, sputum and blood specimens

Abbreviations: PIP/TAZ = Piperacillin/Tazobactam; TMP/SMX= Trimethoprim/sulfamethoxazole ;Amox/Clav = Amoxicillin/Clavulanate

Please direct questions to: insert program champion name, phone, e-mail


Wisconsin Healthcare-Associated Infections in LTC Coalition



## How Do You Get Your Antibigram Noticed

- Post the Antibigram on you institution’s intra-web
- Provide Antibigrams to prescribers and pharmacists
- Present the Antibigram at relevant institutional meetings
- Take opportunities to educate prescribers about the Antibigram throughout the year
- Present a comparison of the current Antibigram data to previous years reports

Wisconsin Healthcare-Associated Infections in LTC Coalition



### Data From Bacteria With < 30 Isolates is for Informational Purposes Only and Should Not Be used to Select Empiric Antibiotic Therapy

## Shady Rest


Gram Negatives % Susceptible (all sources)	<i>Escherichia coli</i> (11)	<i>Klebsiella pneumoniae</i> (10)	<i>Pseudomonas aeruginosa</i> (8)	<i>Proteus mirabilis</i> (7)
Ampicillin	64	*	*	33
Amoxicillin/Clavulanate	91	85	*	*
Ampicillin/Sulbactam	64	85	*	*
Attreonam	100	90	*	*
Cefazolin	91	90	*	*
Cefazidime	*	90	90	*
Ceftriaxone	99	90	*	100
Cefuroxime	88	90	*	94
Ciprofloxacin	80	80	67	62
Gentamicin	*	88	81	94
Imipenem	100	100	*	*
Nitrofurantoin*	93	74	*	*
Piperacillin/Tazobactam	*	*	*	*
Ticarcillin/Clavulanate	*	88	*	*
Tobramycin	*	88	100	*
Trimethoprim/sulfamethoxazole	79	85	*	67

\* urine isolates only; (number of isolates)

Gram Positive % Susceptible (all sources)	<i>Enterococcus faecalis</i> (7)	<i>Enterococcus faecium</i> (10)	<i>Staphylococcus aureus</i> (13)
Amoxicillin/Clavulanate	*	*	53
Ampicillin	100	10	*
Ampicillin/Sulbactam	*	*	53
Cefazolin	*	*	53
Ceftriaxone	*	*	*
Ciprofloxacin	*	*	*
Clindamycin	*	*	*
Erythromycin	*	*	*
Gentamicin	*	*	*
Linezolid	100	100	100
Meropenem	*	*	*
Moxifloxacin	*	*	*
Nitrofurantoin*	100	100	100
Nafcillin	*	*	53
Penicillin	100	10	*
Tetracycline	*	*	*
Trimethoprim/sulfamethoxazole	*	*	100
Vancomycin	100	10	100

\* For serious *Enterococcus* spp. infection combination therapy of penicillin, ampicillin, or vancomycin (for susceptible strains), plus an aminoglycoside, is usually indicated, unless high-level resistance to both gentamicin and streptomycin is documented.  
\* urine isolates only; (number of isolates)

Things your Antibigram won't tell you!



*Pseudomonas aeruginosa* 13  
*Enterococcus faecalis* 10  
*Proteus mirabilis* 10  
*Enterococcus faecium* 5  
All Others 22

Wisconsin Healthcare-Associated Infections in LTC Coalition

**Data From Bacteria With < 30 Isolates is for Informational Purposes Only and Should Not Be used to Select Empiric Antibiotic Therapy**

**Shady Rest**

Things your Antibiogram won't tell you!

**Gram Negatives % Susceptible (all sources)**

	<i>Escherichia coli</i> (11)	<i>Klebsiella pneumoniae</i> (10)	<i>Pseudomonas aeruginosa</i> (8)	<i>Proteus mirabilis</i> (7)
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Amoxicillin/Clavulanate	91	85	*	*
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Aztreonam	100	90	*	*
Cefazolin	91	90	*	*
Cefazidime	*	90	90	*
Ceftriaxone	99	90	*	100
Cefuroxime	88	90	*	94
Ciprofloxacin	50	80	67	62
Gentamicin	*	88	81	94
Imipenem	100	100	*	*
Nitrofurantoin*	66	84	*	*
Piperacillin/Tazobactam	*	*	*	*
Ticarcillin/Clavulanate	*	88	*	*
Tobramycin	*	88	100	*
Trimethoprim/sulfamethoxazole	79	85	*	67

\* urine isolates only; (number of isolates)

**Gram Positive % Susceptible (all sources)**

	<i>Enterococcus faecalis</i> (7)	<i>Enterococcus faecium</i> (10)	<i>Staphylococcus aureus</i> (13)
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Erythromycin	*	*	*
Gentamicin	*	*	*
Linezolid	100	100	100
Meropenem	*	*	*
Moxifloxacin	*	*	*
Nitrofurantoin*	100	100	100
Nafcillin	*	*	53
Penicillin	100	10	*
Tetracycline	*	*	*
Trimethoprim/sulfamethoxazole	*	*	100
Vancomycin	100	10	100

<sup>‡</sup> For serious *Enterococcus* spp. infection combination therapy of penicillin, ampicillin, or vancomycin (for susceptible strains), plus an aminoglycoside, is usually indicated, unless high-level resistance to both gentamicin and streptomycin is documented.  
\* urine isolates only; (number of isolates)

**ORGANISM INCIDENCE BY BODY SITE AT SHADY REST 2016**

<i>Pseudomonas aeruginosa</i>	13
<i>Enterococcus faecalis</i>	10
<i>Proteus mirabilis</i>	10
<i>Enterococcus faecium</i>	5
All Others	22

Wisconsin Healthcare-Associated Infections in LTC Coalition

**Data From Bacteria With < 30 Isolates is for Informational Purposes Only and Should Not Be used to Select Empiric Antibiotic Therapy**

**Shady Rest**

CRE/MDRO

**Gram Negatives % Susceptible (all sources)**


	<i>Escherichia coli</i> (11)	<i>Klebsiella pneumoniae</i> (10)	<i>Pseudomonas aeruginosa</i> (8)	<i>Proteus mirabilis</i> (7)
Ampicillin	64	*	*	33
Amoxicillin/Clavulanate	91	85	*	*
Ampicillin/Sulbactam	64	85	*	*
Aztreonam	100	90	*	*
Cefazolin	91	90	*	*
Cefazidime	*	90	90	*
Ceftriaxone	99	90	*	100
Cefuroxime	88	90	*	94
Ciprofloxacin	50	80	67	62
Gentamicin	*	88	81	94
Imipenem	100	100	*	*
Nitrofurantoin*	66	84	*	*
Piperacillin/Tazobactam	*	*	*	*
Ticarcillin/Clavulanate	*	88	*	*
Tobramycin	*	88	100	*
Trimethoprim/sulfamethoxazole	79	85	*	67


\* urine isolates only; (number of isolates)

**Gram Positive % Susceptible (all sources)**

	<i>Enterococcus faecalis</i> (7)	<i>Enterococcus faecium</i> (10)	<i>Staphylococcus aureus</i> (13)
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Ampicillin	100	10	*
Ampicillin/Sulbactam	*	*	53
Cefazolin	*	*	53
Ceftriaxone	*	*	*
Ciprofloxacin	*	*	*
Clindamycin	*	*	*
Erythromycin	*	*	*
Gentamicin	*	*	*
Linezolid	100	100	100
Meropenem	*	*	*
Moxifloxacin	*	*	*
Nitrofurantoin*	100	100	100
Nafcillin	*	*	53
Penicillin	100	10	*
Tetracycline	*	*	*
Trimethoprim/sulfamethoxazole	*	*	100
Vancomycin	100	10	100

<sup>‡</sup> For serious *Enterococcus* spp. infection combination therapy of penicillin, ampicillin, or vancomycin (for susceptible strains), plus an aminoglycoside, is usually indicated, unless high-level resistance to both gentamicin and streptomycin is documented.  
\* urine isolates only; (number of isolates)

Wisconsin Healthcare-Associated Infections in LTC Coalition	
	CURRENT LOCATION : S7NE 1234567891 Badger, Jane A 92Y F 7000 Welby, Marcus HOSP. ID: WMH DIAG: 92 years old
	----- ACC # : Z12345 ORD. LOC: S7NE EVENT START DATE: 02/25/2016 CULTURE URINE TRANSPORT: 0.4 HOURS COLL: 02/25/2016(1647) REC: 02/25/2016(1709)
	SPEC DESC: URINE SPEC REQ : REFLEX CLEAN CATCH URINE  CULTURE : 1. >10,000<50,000 COL/ML MIXED GRAM POSITIVE AND GRAM NEGATIVE FLORA  REPORT : FINAL 02/27/2016

Wisconsin Healthcare-Associated Infections in LTC Coalition	
	CURRENT LOCATION : S7NE 1234567891 Badger, Jane A 92Y F 7000 Welby, Marcus HOSP. ID: WMH DIAG: 92 years old
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	SPEC DESC: URINE SPEC REQ : REFLEX CLEAN CATCH URINE  CULTURE : 1. >10,000<50,000 COL/ML MIXED GRAM POSITIVE AND <b>GRAM</b> <b>NEGATIVE FLORA</b>  REPORT : FINAL 02/27/2016



**Wisconsin Healthcare-Associated Infections in LTC Coalition**



**CURRENT LOCATION : S7NE**  
 1234567891 Badger, Jane A 92Y F 7000 Welby, Marcus  
 HOSP. ID: WMH  
 DIAG: 92 years old

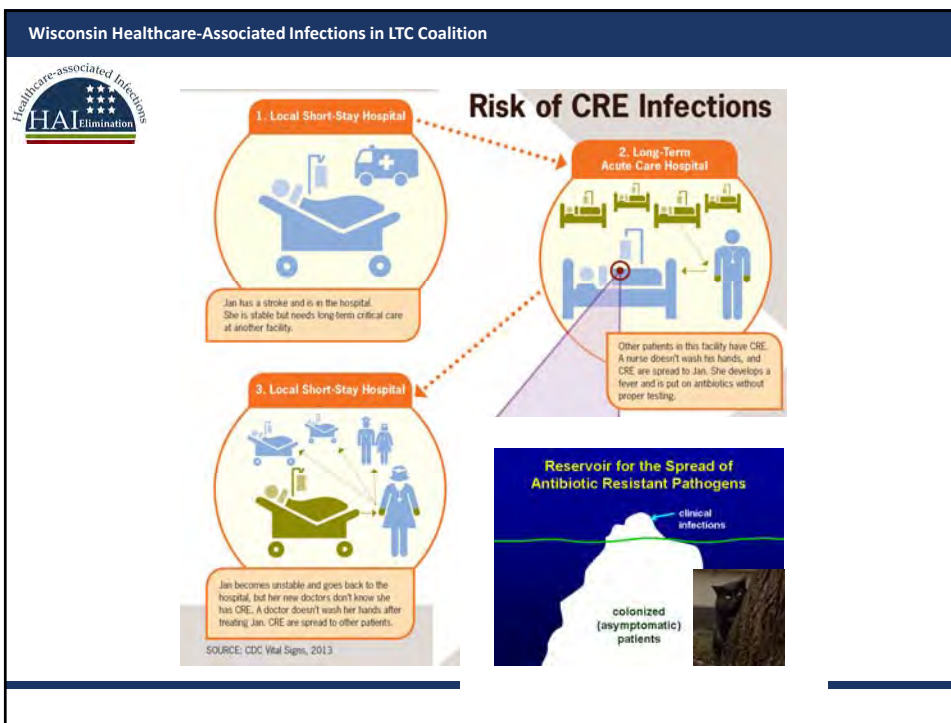
---

ACC # : Z12345 ORD. LOC: S7NE EVENT START DA  
 CULTURE URINE TRANSPORT: 0.4 HOUR  
 COLL: 02/25/2016(1647) REC: 02/25/2016(1709)



SPEC DESC: URINE  
 SPEC REQ : REFLEX CLEAN CATCH URINE

CULTURE : 1. >10,000<50,000 COL/ML MIXED GRAM POSITIVE AND **GRAM NEGATIVE FLORA**


REPORT : FINAL 02/27/2016

Wisconsin Healthcare-Associated Infections in LTC Coalition



**Key to Helping Prevent Spread!**



Wisconsin Healthcare-Associated Infections in LTC Coalition




**Bad Bugs  
Need Drugs**



Ten new **ANTIBIOTICS** by 2020

Wisconsin Healthcare-Associated Infections in LTC Coalition



### The END

**CRE**

?

**CTX-M**

**MIC**

**VRE**

?

**ESBL**

**KPC**




**THREAT LEVELS**

**MRSA**



?

Detailed description: A conceptual diagram titled 'The END' showing various antibiotic resistance genes and pathogens. The text 'The END' is at the top. Below it, 'CRE' is written in large red letters. To the left is a blue question mark. Below 'CRE' are 'CTX-M' and 'MIC'. In the center is a red question mark inside a circle. To the right is 'ESBL' in red. Below 'ESBL' is another blue question mark. At the bottom left is 'KPC' and at the bottom center is 'THREAT LEVELS'. At the bottom right is 'MRSA' in red.

Wisconsin Healthcare-Associated Infections in LTC Coalition



### Collection of Common Specimens for Laboratory Testing From LTC Residents



Detailed description: A collection of images showing various medical specimens and collection methods. The top row includes an illustration of a nasopharyngeal swab, a sputum collection cup with two tubes, and a blood culture bottle. The bottom row shows a sputum collection cup, two sputum tubes, a nasopharyngeal swab and other tubes, and a blood culture bottle with a swab.



## Collection of Urine Specimens for Culture from LTC Residents

Urine specimens for culture should be processed ASAP, within 1-2 hours, or refrigerated or placed in boric acid for storage and transport. Refrigerated/boric acid specimens must be cultured within 24 hours of collection.



Ref. Clin. Infect. Dis. 2009. 48:149-71; Clin. Infect. Dis. 2010. 50:625-63; Infect. Control Hosp. Epidemiol. 2012. 33:965-77.



## Collection of Urine Specimens for Culture from LTC Residents

**For cooperative and functionally capable residents  
– mid-stream clean catch specimen.**

**Female residents:** Wash hands thoroughly with soap and water, rinse, and dry.

Spread labia with one hand and keep it continuously apart.  
Take an open sterile cup in the other hand (careful not to contaminate).

When over a toilet void 20 to 25 ml into the toilet and catch a portion of the rest of the urine into the cup without stopping the stream. Do not touch the legs, vulva, or clothing with the cup.

Securely place the lid on the cup.



## Collection of Urine Specimens for Culture from LTC Residents

**For cooperative and functionally capable residents  
– mid-stream clean catch specimen.**

**Male residents:** Wash hands thoroughly with soap and water, rinse, and dry.

If necessary retract the foreskin completely.

When over a toilet void 20 to 25 ml into the toilet and catch a portion of the rest of the urine into the cup without stopping the stream. Do not touch the cup with the penis.

Securely place the lid on the cup.



## Collection of Urine Specimens for Culture from LTC Residents

**For residents not capable of providing a  
mid-stream clean catch specimen themselves.**

**Female residents:** Perform an in-and-out catheterization using sterile technique.

**Male residents:** Use a freshly applied, clean condom catheter and monitor bag frequently. Collect urine specimen as soon as 5-10 ml is available.

Perform an in-and-out catheterization using sterile technique.  
Securely place the lid on the cup.



## Collection of Urine Specimens for Culture from LTC Residents

For residents not capable of providing a  
mid-stream clean catch specimen themselves.

### Resident with indwelling catheter for $\leq$ 14 days

Obtain specimen by sampling through the catheter port using sterile  
technique – **DO NOT COLLECT URINE FROM THE BAG**

If port not present you may puncture the catheter tubing with a needle  
and syringe using sterile technique – **DO NOT COLLECT URINE FROM THE  
BAG**

### Resident with indwelling catheter for $>$ 14 days

Change catheter prior to collection (sterile technique) and collected as  
described above – **DO NOT COLLECT URINE FROM THE BAG**



## Collection of Urine Specimens for Culture from LTC Residents

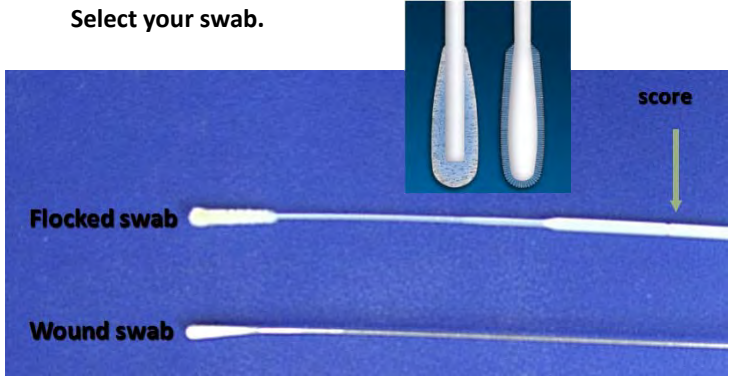
### Common Mistakes Associated with Urine Specimens from LTC Residents

- Collecting urine specimen for testing that is not necessary
- Leaving unpreserved urine specimen at room temperature for  $>$  2 hours
- Collecting urine from the bag of a patient with a with a indwelling catheter
- Collecting a “first-stream” urine specimen for culture

Wisconsin Healthcare-Associated Infections in LTC Coalition

Healthcare-associated Infections  
HAI Elimination

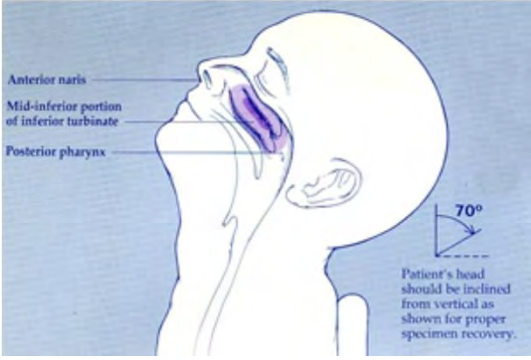
## Collection of an NP Specimens for Respiratory Virus Testing

1. Select your swab.
 
2. Use a Flocked swab if possible, or what comes in the collection kit.

Wisconsin Healthcare-Associated Infections in LTC Coalition

Healthcare-associated Infections  
HAI Elimination

## Collection of an NP Specimens for Respiratory Virus Testing

3. Have them blow their nose; choose your sampling area.
 
4. Follow the collection instructions if provided, ideally you want to sample from the mid-inferior area on back.



## Collection of an NP Specimens for Respiratory Virus Testing

### 5. Choose your testing technology.



### 6. Nucleic Acid Amplification Technology (NAAT) is much better than rapid antigen tests for the detection of respiratory viruses from NP specimens.



## Influenza?? *Haemophilus influenzae*??

**Influenza** – virus, A, B, and C; RNA viruses that cause an acute viral disease of the respiratory tract, A and B cause seasonal epidemics while C causes mild respiratory symptoms. Recommend to vaccinate annually against A and B.

***Haemophilus influenzae*** – small bacteria, first isolated by German physician Richard Pfeiffer from patients during the influenza pandemic of 1890 and was erroneously thought to be the cause of the pandemic and was named accordingly, *Bacillus influenza*.

***H. influenzae*** – common colonizer of the URT in children and adults and can cause infection in the upper (sinus, ear) and lower (lungs) respiratory tract, and meningitis. Is an important cause of secondary (super infection) lower respiratory tract infections in influenza suffers and is often found as the predominate bacteria in the lungs at autopsy. Hib vaccine recommended for all children in the US.



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Healthcare-associated Infections  
**HAI** Elimination

## Influenza Viruses

The diagram illustrates the structure and genome organization of three types of influenza viruses: Influenza A, Influenza B, and Influenza C. Each virus is shown as a spherical particle with a lipid bilayer envelope and surface proteins. Influenza A and B have hemagglutinin (HA) and neuraminidase (NA) surface proteins. Influenza A also has M2 ion channel proteins. Influenza B has neuraminidase (NB) surface proteins. Influenza C has hemagglutinin-esterase-furinase (HEF) surface proteins. The genomes of all three viruses are segmented and contain the following genes: PB1, NP, PA, NS, M, and NA. The M segment encodes the matrix protein (M1 and M2 in A, M in B and C).

Structure and genome organisation of influenza viruses  
Expert Reviews in Molecular Medicine ©2001 Cambridge University Press

Wisconsin Healthcare-Associated Infections in LTC Coalition

Healthcare-associated Infections  
**HAI** Elimination

## *Haemophilus influenzae* - Sputum

The image shows a microscopic view of sputum stained with Gram stain. The bacteria are small, pleomorphic, and gram-negative, appearing as thin, pinkish-red rods. They are often seen in pairs or small groups, and some may show a characteristic "safety pin" appearance. The background is a light pink color, indicating the presence of other cells and mucus in the sputum.