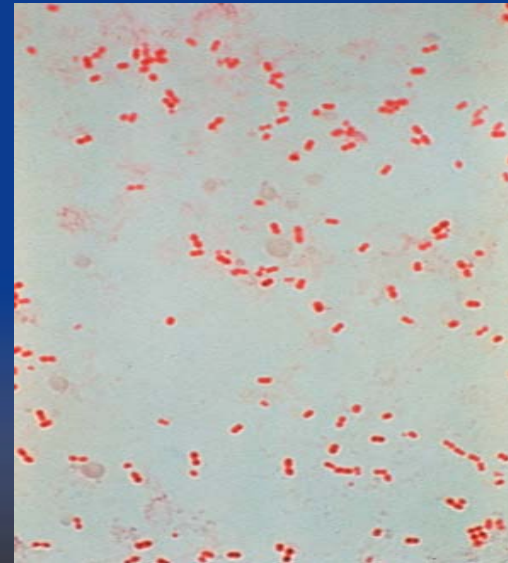
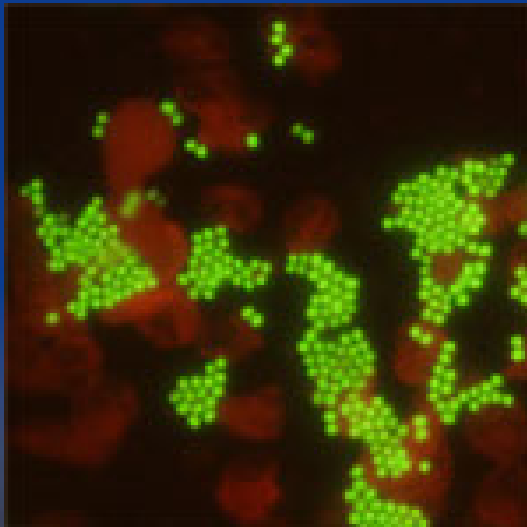




Update from the Clinical and Environmental Microbiology Branch

Roberta B. Carey, PhD
June 12, 2008



Environmental and Applied Microbiology Outbreak Lab Support

■ Transmission due to intrinsic contamination of healthcare items

Heparin pre-filled syringes – *Serratia marcescens*

Alcohol-free mouthwash – *Burkholderia vanimaris*

Fentanyl chloride - *Sphingomonas paucimobilis*

Packed red cells - *Yersinia enterocolitica*

Pooled platelets – Group C *Streptococcus*

Infant formula – *Enterobacter sakazakii*



■ Transmission from extrinsic contamination due to infection control lapses during healthcare delivery (ex. reuse of syringes/needles, multi-dose vials of drug products)

Environmental and Applied Microbiology Outbreak Lab Support

- Develop / evaluate sampling and processing methods for recovery of emerging pathogens from environmental surfaces
 - *Acinetobacter baumannii* transmission from contaminated portable x-ray machine, IV poles, bedrails, sink / counter
 - *Clostridium difficile*



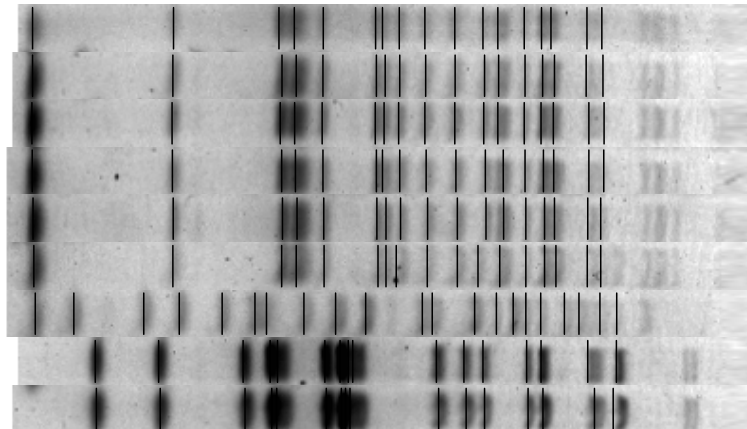
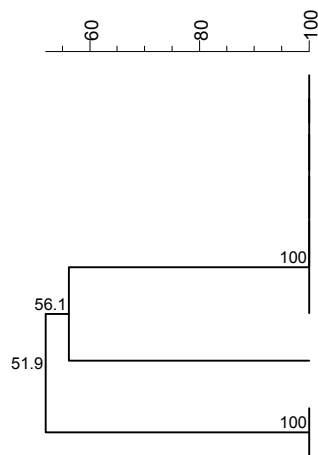
- ◆ Develop genetic typing databases for characterization of emerging pathogens (ex. *A. baumannii* complex, *Enterobacter sakazakii*, *Ralstonia* spp., *Burkholderia cepacia* complex)

Burkholderia in mouthwash

Dice (Opt:0.50%) (Tol 1.3%-1.3%) (H>0.0% S>0.0%) [0.0%-100.0%]

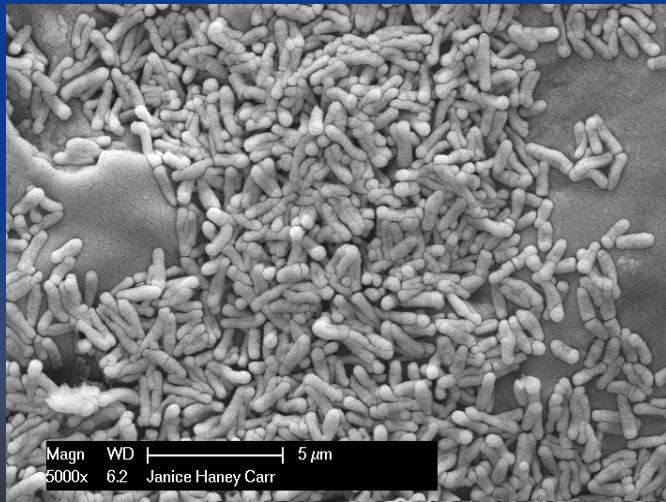
Salmonella 2.50.22 hr

Salmonella 2.50.22 hr



2008-03-23/#1	Alcohol free mouthwash
2008-03-58/#1	Sputum isolate
2008-03-59/#1	Sputum isolate
2008-03-80/#1	Sputum isolate
2008-03-81/#1	BAL isolate
2008-03-87/#1	Urine isolate
2008-03-86/#1	Blood isolate
2008-03-56/#1	Blood isolate
2008-03-57/#1	Sputum isolate

- ◆ Develop / evaluate disinfection protocols for intervention strategies
 - ★ Chlorine and monochloramine disinfection of nontuberculous mycobacteria biofilms
 - ★ Disinfection of healthcare environmental surfaces



M. abscessus isolates growing on polycarbonate

Klebsiella Pneumoniae Carbapenemase

- KPC is a class A β -lactamase
 - ◆ Confers resistance to all β -lactams including extended-spectrum cephalosporins and carbapenems
- Occurs in *Enterobacteriaceae*
 - ◆ Most commonly in *Klebsiella pneumoniae*
 - ◆ Also reported in: *K. oxytoca*, *Citrobacter freundii*, *Enterobacter* spp., *Escherichia coli*, *Salmonella* spp., *Serratia* spp.,
 - ◆ Also reported in *Pseudomonas aeruginosa* (Columbia & Puerto Rico)

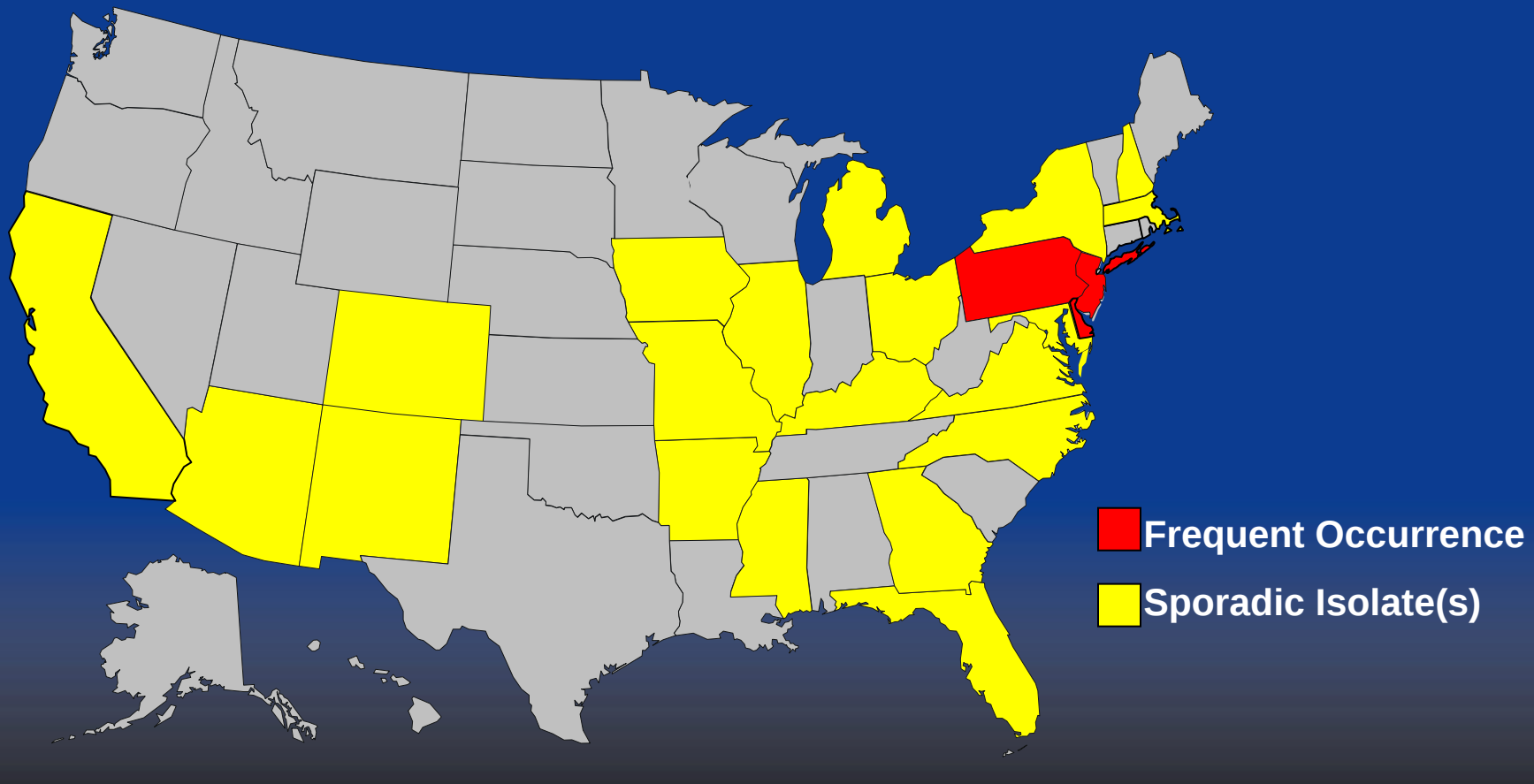
Wild Type *K. pneumoniae* Profile

Antimicrobial	Interpretation		Antimicrobial	Interpretation
Ampicillin	R		Chloramphenicol	S
Pip/Tazo	S		Gentamicin	S
Aztreonam	S		Tobramycin	S
Cefazolin	S		Amikacin	S
Cefoxitin	S		Imipenem	S
Cefotetan	S		Meropenem	S
Cefpodoxime	S		Ertapenem	S
Cefotaxime	S		Trimeth/Sulfa	S
Ceftazidime	S			
Ceftriaxone	S			
Cefepime	S			

Wild Type to Wild Thing: Profile of KPC-Producing *K. pneumoniae*

Antimicrobial	Interpretation	Antimicrobial	Interpretation
Ampicillin	R	Chloramphenicol	R
Amox/clav	R	Ciprofloxacin	R
Pip/Tazo	R	Gentamicin	R
Aztreonam	R	Tobramycin	R
Cefazolin	R	Amikacin	I
Cefoxitin	R	Imipenem	R
Cefotetan	R	Meropenem	R
Cefpodoxime	R	Ertapenem	R
Cefotaxime	R	Trimeth/Sulfa	R
Ceftazidime	R	Polymyxin B	Variable
Ceftriaxone	R	Colistin	Variable
Cefepime	R	Tigecycline	S

Geographical Distribution of KPC-Producers



Who is at risk for an infection with a KPC producing GNB?

- Hospitalized patients with:
 - ◆ Increased number of co-morbid conditions
 - ◆ Frequent or prolonged hospitalization
 - ◆ Invasive devices
 - ◆ Antimicrobial exposure (vancomycin, fluoroquinolones, penicillins, and extended-spectrum cephalosporins)
 - ◆ Carbapenemase-producers are most frequently isolated from urine or blood

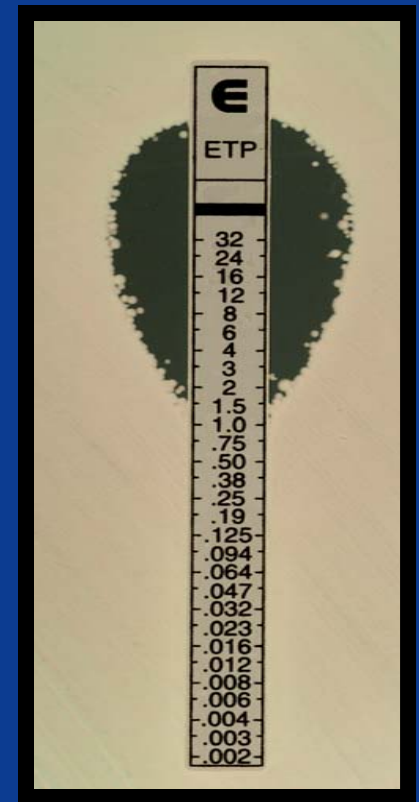
Detection of KPC in the Clinical Lab

Method	Sens/Spec (%) for Detection of KPC-mediated R*		
	Imipenem	Meropenem	Ertapenem
Ref BMD	94/93	94/98	97/89
Disk Diffusion	42/96	71/96	97/82
Etest	55/96	58/96	90/84
Vitek Legacy	55/96	52/98	N/A
Vitek 2	71/98	48/96	94/93
MicroScan	74/96	84/98	100/89
Phoenix	81/96	73/100	100/81

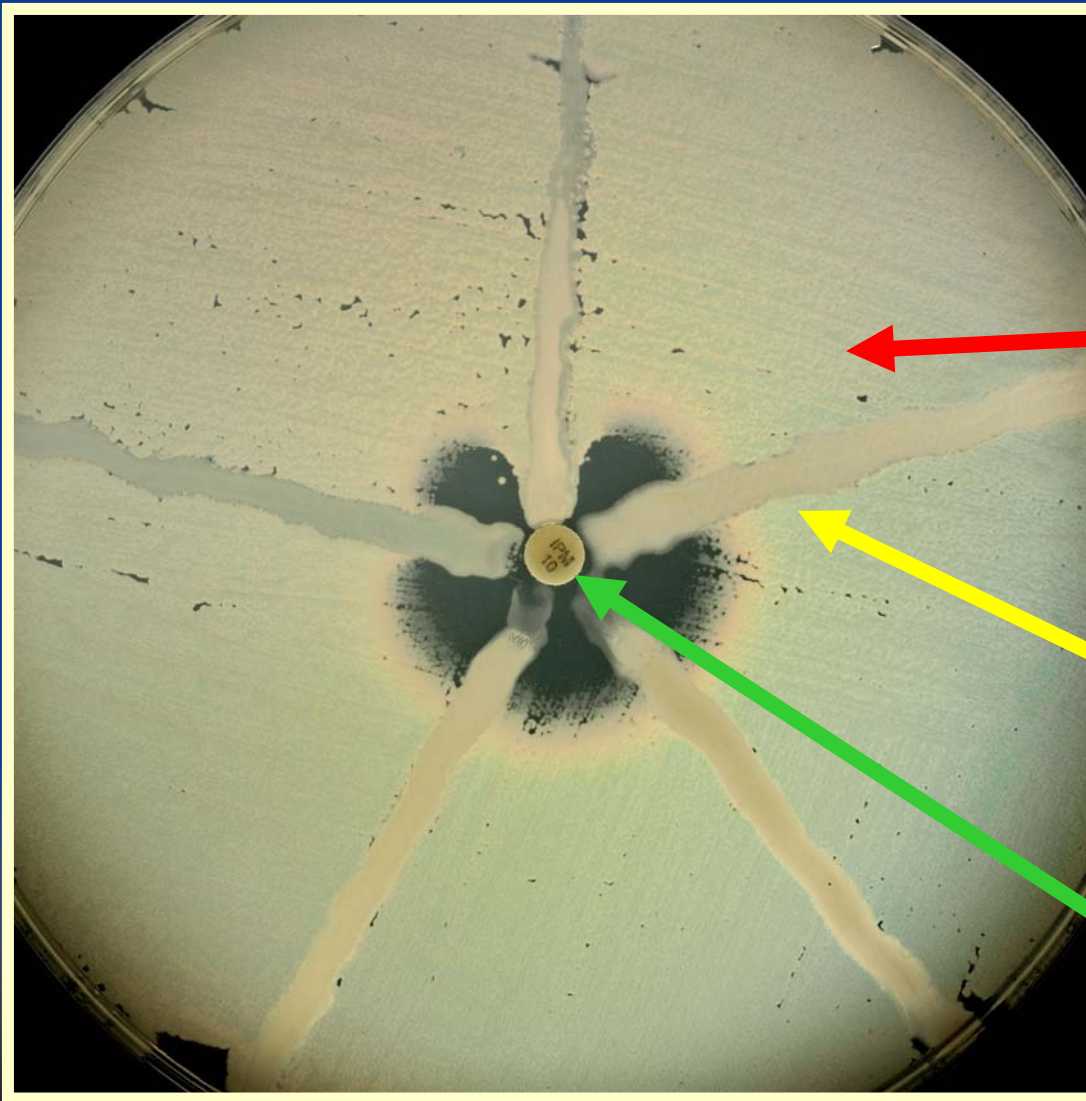
N = 76 *K. pneum*, *K. oxy*, *E. coli*; 31 KPC-producers & 45 non-KPC producers

Think KPC when...

- *Enterobacteriaceae* – especially *Klebsiella pneumoniae* that are resistant to extended-spectrum cephalosporins
- Carbapenem MIC of 2 or 4 µg/ml
- Ertapenem or meropenem disk diffusion zone of ≤ 22 mm
 - ◆ Imipenem disk diffusion test is not a good screen test



Confirm KPC with Modified Hodge Test



Lawn of *E. coli* ATCC 25922
1:10 dilution of a
0.5 McFarland suspension

Test isolates

Carbapenem disk

Described by Lee et al. CMI, 7, 88-102. 2001.

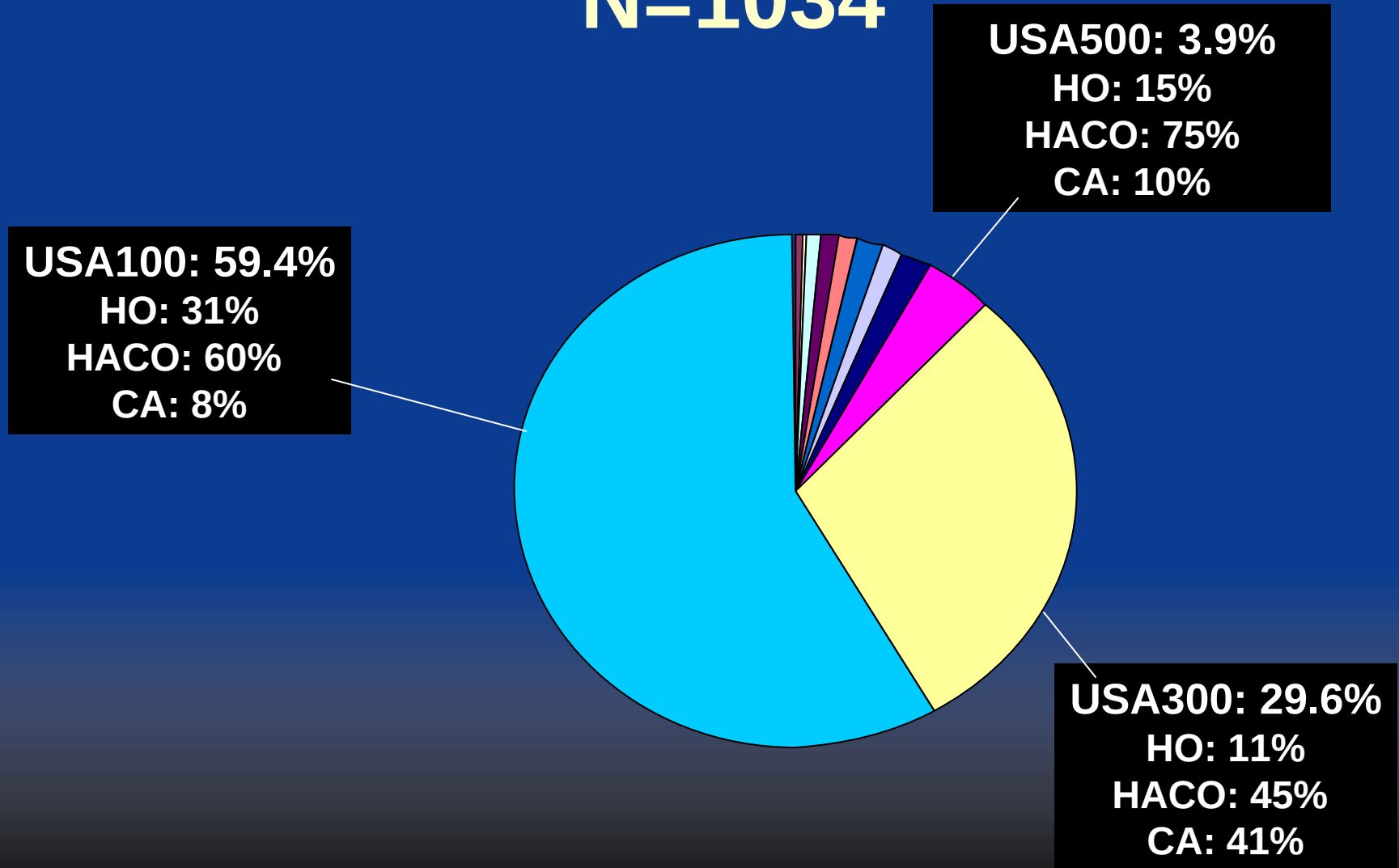
9 VRSA Cases

Case	State	Year	Source	Diagnosis	Underlying Conditions
1	MI	2002	Plantar ulcers & Catheter tip	Plantar soft tissue infection	Diabetes
2	PA	2002	Plantar ulcer	Osteomyelitis	Obesity
3	NY	2004	Urine from a nephrostomy tube	No infection	Multiple sclerosis, Diabetes
4	MI	2005	Toe wound	Gangrene	Diabetes
5	MI	2005	Surgical site wound after panniculectomy	Surgical site infection	Obesity
6	MI	2005	Plantar ulcer	Osteomyelitis	MVA
7	MI	2006	Triceps wound	Necrotizing fasciitis	Diabetes
8	MI	2007	Toe wound	Osteomyelitis	Diabetes
9	MI	2007	Surgical site wound after foot amputation	Osteomyelitis	Diabetes

Summary of Michigan VRSA

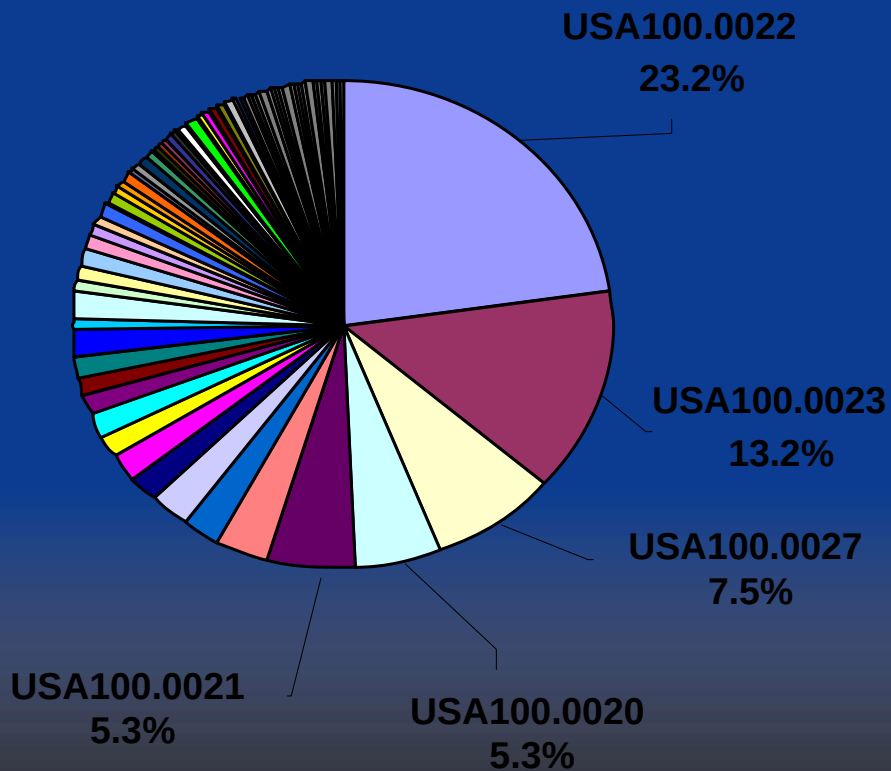
- 7 unique VRSA isolates
- Two outcomes of VRE *vanA* plasmid in *S. aureus*
 - ◆ *S. aureus* maintains VRE *vanA* plasmid
 - ◆ Tn1546-like element integrates into *S. aureus* plasmid
- Inc18-like *vanA* plasmid
 - ◆ Associated with 5 of 7 MI VRSA
 - ◆ Found more often in MI VRE than other geographical locations
 - ◆ Found more often in *E. faecalis* than other species of VRE

USA Types Observed Among 2005 Invasive ABCs Isolates N=1034

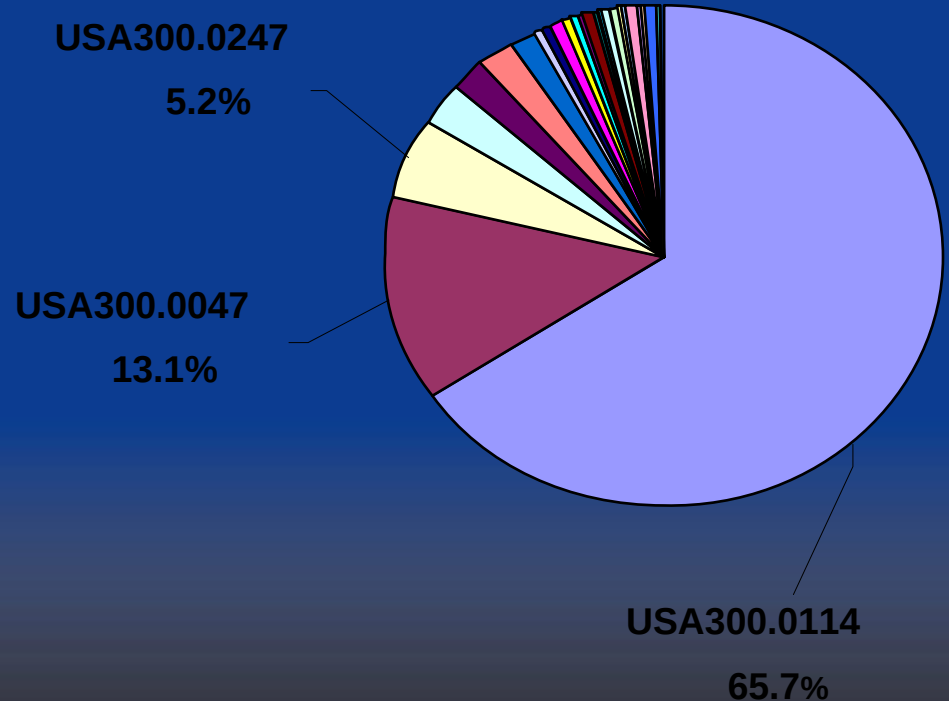


USA300 Patterns Less Diverse

USA100



USA300



MRSA Carriage Study in HIV+ Population

- 601 patients enrolled at their routine clinic visit
- Nares and groin screened for MRSA and MSSA at baseline, 6 mo, 12 mo
- Compare sensitivity of direct plating vs. broth enrichment

Lessons Learned So Far

- 31% of patients had MSSA
 - ◆ 27% nares and 18% groin positive
 - ◆ Similar to NHANES nasal carriage
- 13.5% of patients had MRSA
 - ◆ 11% nares and 8% groin positive
 - ◆ Almost 10X more than healthy adults
- Additional 3% patients positive with groin cultures
- Additional 15% nasal cultures positive with broth
- Additional 29% groin cultures positive with broth

Acknowledgements

- Those who shared slides
 - ◆ Brandi Limbago (Team Leader)
 - ◆ Judith Noble-Wang (Team Leader)
 - ◆ Jean Patel (Team Leader)
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