

Community- acquired/associated MRSA

Loreen A. Herwaldt, M.D.

Professor

Hospital Epidemiologist

University of Iowa

Outline

- Definitions
- Background information
- Incidence/prevalence
- Nosocomial spread
- USA300 on a burn/trauma unit
- Summary & conclusions

Definitions

Community-acquired MRSA (CA-MRSA)

Patient:

- Had a culture positive for MRSA w/in 48 hours of admission
- Was not: hospitalized, in a nursing home, in hospice care, undergoing dialysis
- Did not have: surgery, or a permanent indwelling catheter or other medical device that passes through the skin

Definitions

- Community-associated MRSA phenotype = MRSA isolates resistant to < 2 non- β -lactam antimicrobial agents
- Community-associated MRSA genotype = MRSA isolates that have PFGE patterns in the USA300 and USA400 groups and are positive for PVL and SCC*meclV*

Table 5. Antimicrobial Susceptibility Profiles of Community-Associated and Health Care–Associated Methicillin-Resistant *Staphylococcus aureus* Isolates

| Type of Antibiotic | No. (%) Susceptible* | | P Value† |
|-------------------------------|-----------------------------------|-------------------------------------|----------|
| | Community-Associated (n = 106) | Health Care–Associated (n = 211) | |
| Oxacillin (methicillin) | 0 | 0 | NA |
| Ciprofloxacin | 84 (79) | 33 (16) | <.001 |
| Clindamycin | 88 (83) | 44 (21) | <.001 |
| Erythromycin | 47 (44) | 18 (9) | <.001 |
| Gentamicin | 100 (94) | 168 (80) | .001 |
| Rifampin | 102 (96) | 199 (94) | .64 |
| Tetracycline | 98 (92) | 194 (92) | .95 |
| Trimethoprim-sulfamethoxazole | 101 (95) | 189 (90) | .13 |
| Vancomycin | 106 (100) | 211 (100) | NA |

Abbreviation: NA, not applicable.

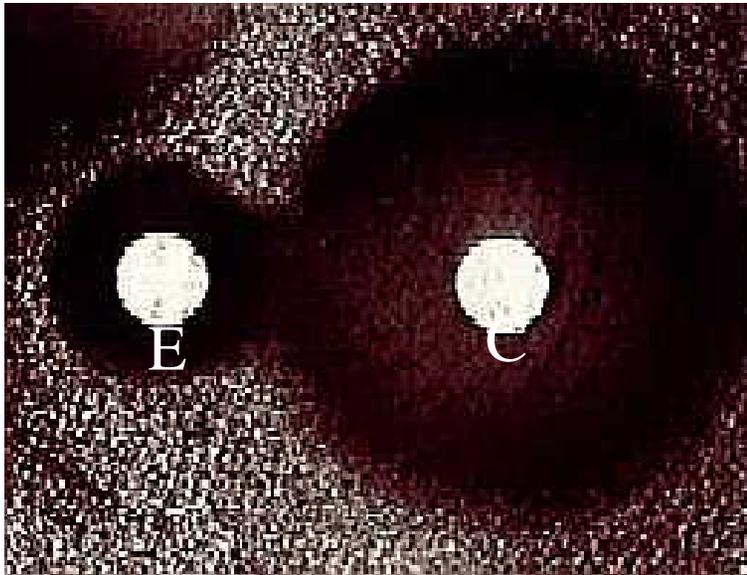
*Tested at the Minnesota Department of Public Health Laboratory by broth microdilution using National Committee for Clinical Laboratory Standards break points.

†Refers to the statistical probability that the percentage susceptible among community-associated isolates differed from the percentage susceptible among health care–associated isolates ($\alpha = .05$).

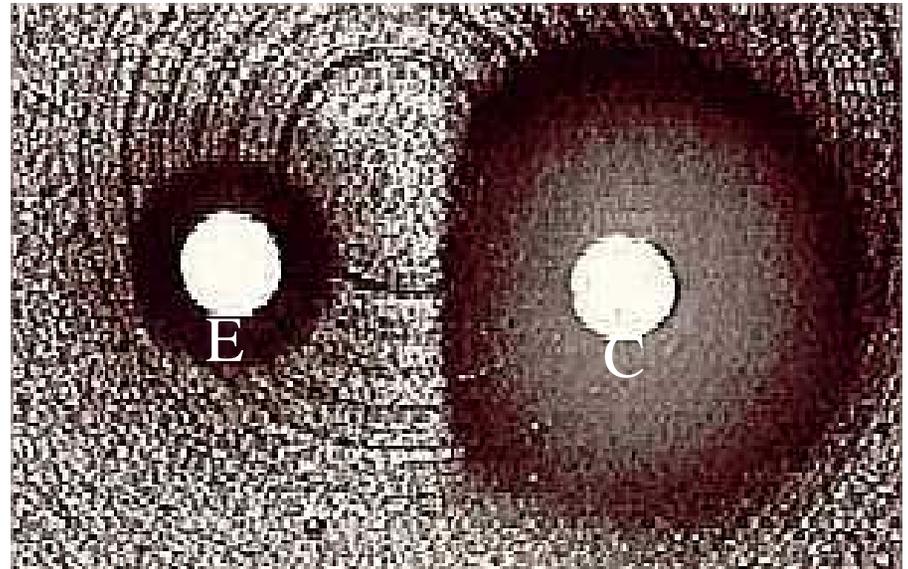
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Clindamycin Susceptible, Erythromycin Resistant?

Mind your “D-test”!



Efflux-mediated resistance (mef).
Resistant to erythromycin but
susceptible to clindamycin



Target site modification (erm).
Resistant to erythromycin and
inducibly **resistant** to clindamycin

Make sure your lab does the “D-test” before reporting erythro R, clinda S

CA-MRSA have unique PFGE types: Establishing a national database

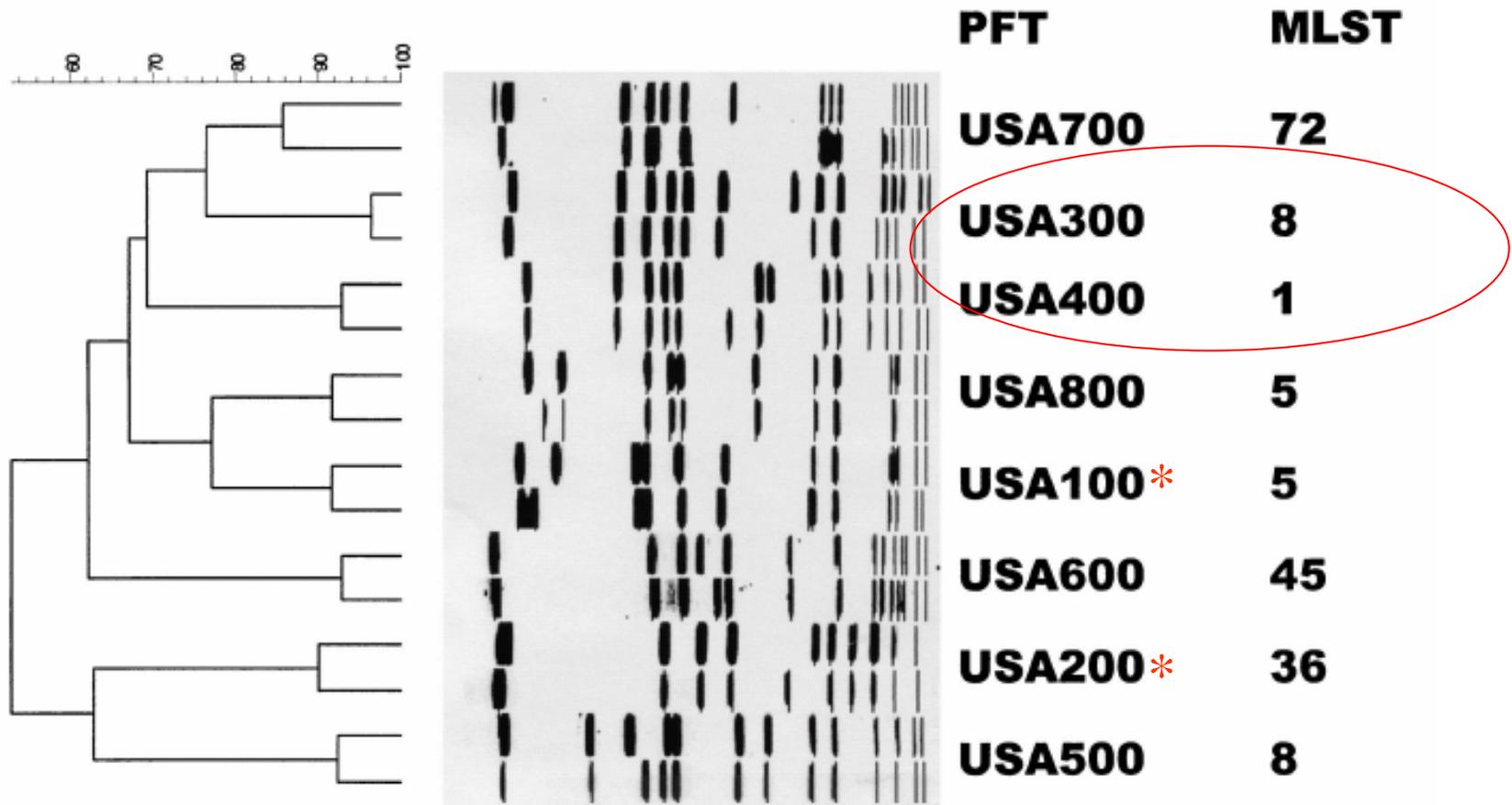


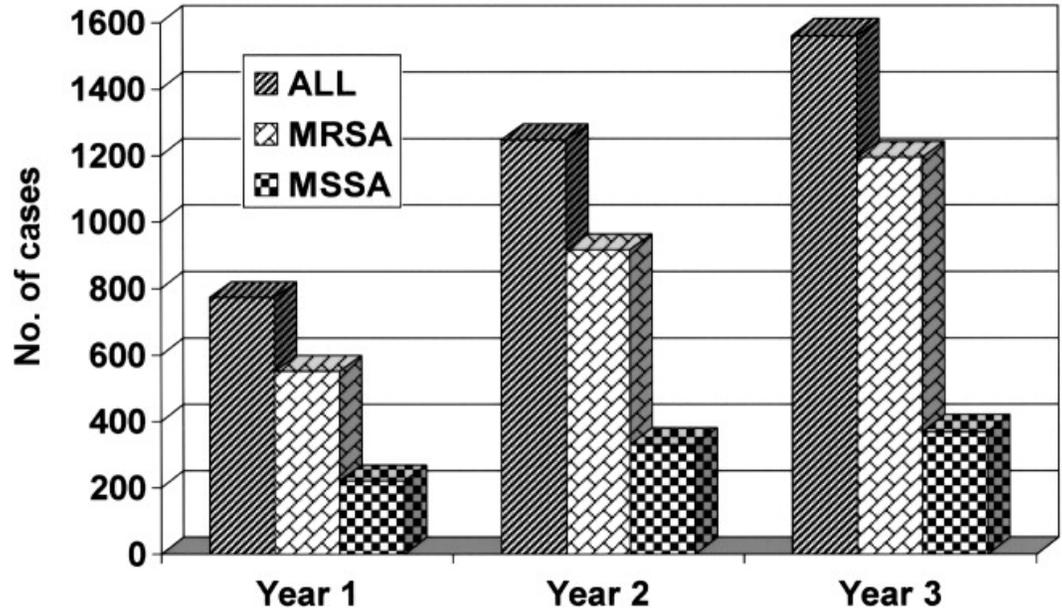
FIG. 1. Dendrogram of PFTs with type strain (most frequent pattern) and a variant strain. Also shown is the corresponding MLST for each PFT (18, 19, 20).

S. aureus Nasal Carriage – NHANES Study, 2001-2002

- MSSA: 32.4% (95% CI, 30.7%-34.1%);
population estimate 89.4 million
- MRSA: 0.8% (95% CI, 0.4%-1.4%);
population estimate 2.34 million
- 75 MRSA isolates, 6 (8%) USA300 (5/6
PVL +); 1 USA400 (1/1 PVL +)

Kuehnert, et al JID 2006;193:172-9

Surveillance for CA-*S. aureus*, Texas Children's Hospital



- 8/1/01-7/31/04
- USA300:
2000 ~50 of CA-MRSA
2003 > 90% of CA-MRSA

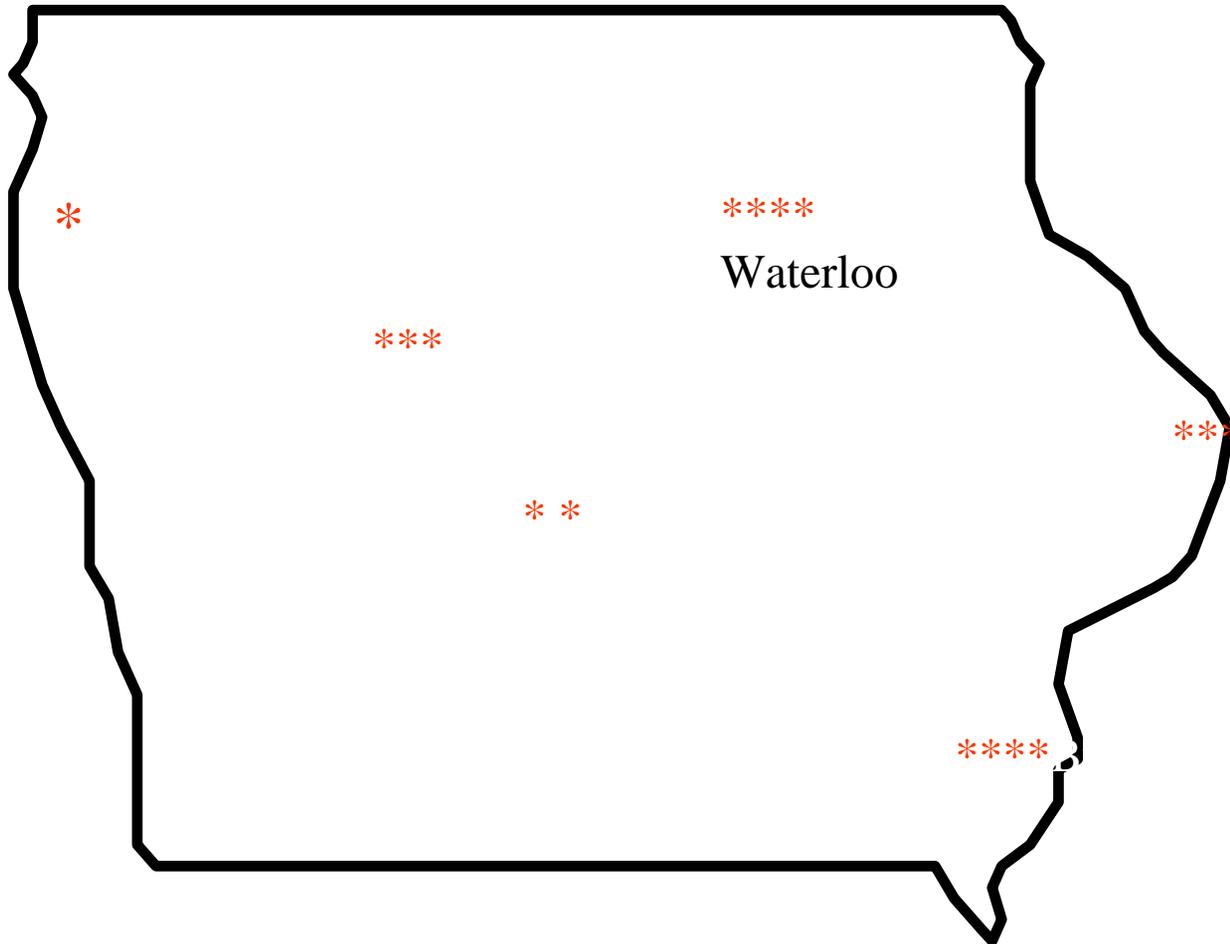
Kaplan, et al. CID 2005;40:1785-91

Iowa: Healthcare-associated vs Community-acquired MRSA

| Origin | <u>SCCmec type:</u> * | | PVL +** |
|--------------------------------|-----------------------|---------|---------|
| | II | IV | |
| Healthcare assoc. (N = 133) | 124 (93) | 9 (7) | 2 (2) |
| Comm. acquired (N = 60) | 40 (66) | 20 (33) | 15 (25) |
| Total | 164 (85) | 29 (15) | 17 (9) |

*N, (row percent); **all PVL+ isolates were SCCmec type IV.

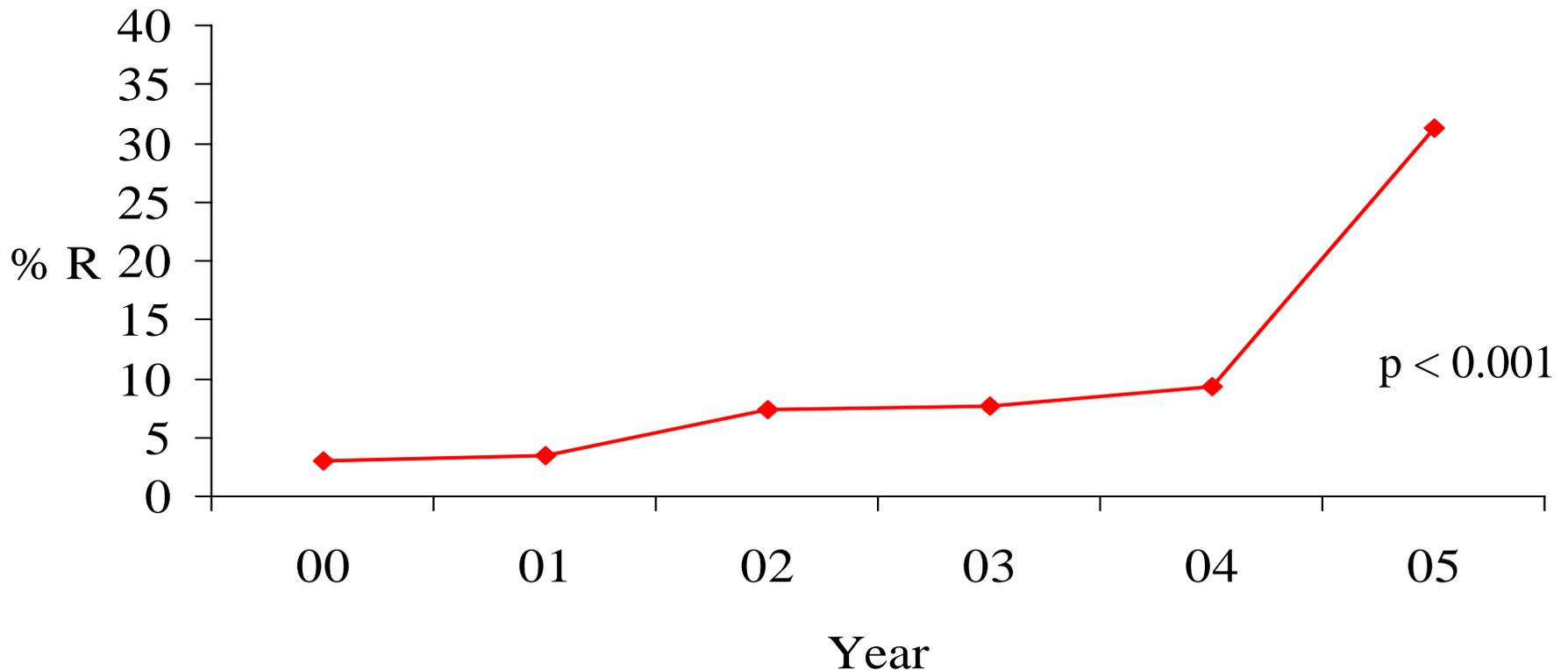
Geographic Distribution of 17 PVL+ CA-MRSA in Iowa



SCCmec IV, PVL+ MRSA

- 15 were community-acquired:
 - 12/15 caused skin and soft tissue infections
 - All 15 had ≤ 2 co-resistances
- 2 were healthcare-associated
 - 1 nosocomial, 0 co-resistances
 - 1 LTCF associated, bloodstream infection in a 70 year old
- Most were USA400 (MW2, Minnesota cluster)

CA-MRSA phenotype in Iowa 0-1 coresistances among isolates submitted at UHL as part of mandatory reporting of “MRSA invasive disease”



Beekmann SE, et al. Unpublished data.

CA-MRSA: Risk of Nasal Carriage

- 812 soldiers
- 3% carried MRSA, 28% carried MSSA
- 9/24 (38%) CA-MRSA carriers acquired infection; 8/229 (3%) MSSA carriers acquired infection (RR, 10.7, $p < 0.001$)
- Previous antibiotic use was a risk factor for CA-MRSA carrier state ($p = 0.03$)

Ellis MW, et al. Clin Infect Dis 2004;39:971-979.

Hospital Transmission of Community-Acquired Methicillin-Resistant *Staphylococcus aureus* among Postpartum Women

Lisa Saiman,^{1,4} Mary O'Keefe,⁴ Philip L. Graham III,¹ Fann Wu,² Battouli Saïd-Salim,⁵ Barry Kreiswirth,⁵ Anita LaSala,³ Patrick M. Schlievert,⁶ and Phyllis Della-Latta²

¹Departments of Pediatrics, ²Pathology, and ³Obstetrics and Gynecology, Columbia University, and ⁴Department of Epidemiology, New York–Presbyterian Medical Center, New York, New York; ⁵Public Health Research Institute, Newark, New Jersey; and

⁶Department of Microbiology, University of Minnesota, Minneapolis

CID 2003;37:1313

CA-MRSA-- Nosocomial Acquisition

MRSA strains sent to German national reference center 12/02-1/04:

- 9 community-acquired cases
- 19 nosocomial cases: 2 SSI; 1 sepsis on surgical ward; 1 wound infection & 1 pneumonia on Int Med; 2 wound infections on derm; 2 nasal colonization

Witte Eur J Clin Microbiol Infect Dis 2005;24:1-5

Healthcare-associated Outbreaks & Community-acquired infections

- Area of SE Germany; 12/03-9/04
- 117 cases of PVL-MRSA colon/infection
- Outbreak I
 - 2 hospitals, 5 LTCFs, 1 home for disabled persons, 1 hemodialysis clinic, 1 transport service
 - 52 patients, 21 staff, 2 contract workers
 - 9.1% of residents and 9.7% of staff in 2 LTCFs were colonized

Linde et al. Eur J Clin Microbiol Infect Dis
2005;24:419-22

Healthcare-associated Outbreaks & Community-acquired infections

- Outbreak II—NICU; 5/20 (25%) patients & 3/131 (2.3%) staff
- Outbreaks I & II: 28.1% of patients & 16.6% of staff had clinical disease
 - Outbreak I: 2 pts had pneumonia, 5 device-related infection, 7 abscesses
 - Outbreak II: 2/5 clinical disease
- 34 community-acquired cases: 4 pneumonia, 25 abscesses

USA300 in a Burn Center

In November 2005, the Burn Center Director reported that several patients had multiple MRSA abscesses, a clinical presentation that the burn surgeons had not encountered previously.

Patient Characteristics

| Age & Sex | Admissions to unit | Admiss Dx | Admiss nares cx | Date USA 300 |
|--------------|--------------------------------|-----------------|-----------------|--------------|
| 43 yo male | 10/2-11/05 10/16-25/05 | Burn 33 absc | - + | NA 10/16 |
| 22 yo female | 11/2-7/05 | 4 absc | - | 11/2/05 |
| 42 yo female | 10/28-11/15/05 | Burn | - | 11/5/05 |
| 71 yo male | 11/21-12/23/05 1/09-1/12/06 | Burn >6 absc | - + | NA 1/9/06 |

Clinical Syndrome

| Patient | Infections | Fever | WBC |
|--------------|--|-------------------------------|--------|
| 43 yo male | 2 d before 2 nd admiss draining pustules; none in grafted areas | Subjective; + chills & sweats | 9-11.5 |
| 22 yo female | 4 abscesses | 100 F; 1 chill | 8.1 |
| 42 yo female | Film donor site; L neck abscess | “febrile” 11/4 | 15.4 |
| 71 yo male | 2 mm-3 x 3 cm abscesses | 38.5 C | 9-11 |

Patient #1



Culture Survey of Healthcare Workers

- Cultured 99 HCWs on unit
- 3 (3%) carried MRSA
- Only 1 had USA300

Case Finding

- Searched the MRSA database for all patients from burn unit since 2/2002 when active surveillance on admission was begun (n = 102)
- Identified 15 total patients with USA300, including the 4 patients described previously

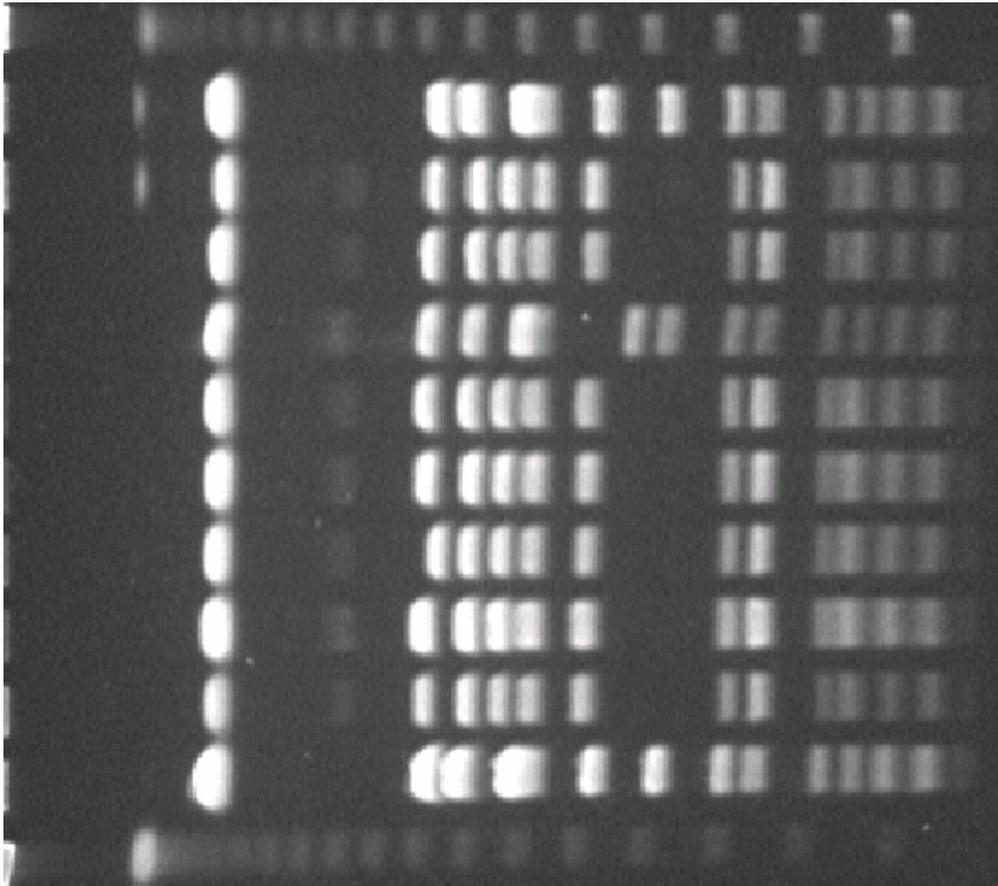
Results

- 1/15 was a HCW; 20 yo female nursing assistant on BC:
 - Admitted 9/03, 1/04, 1/05 w/ MRSA abscesses
 - She last worked on the unit during 6/05
 - We cannot determine whether she acquired the isolate on the burn unit
 - She cared for a patient who was admitted 8/21-27/03 for a perirectal abscess

Results

- 2/15 were prisoners
- 2/15 were morbidly obese
- 9/15 (60%) were women
- Median age was 42 years
- Acquisition:
 - Nosocomial = 2
 - Community = 9 (1 may have been acquired in another hospital)
 - Possible nosocomial/possible community = 3

Burn Unit CA-MRSA Genotypes



Lambda ladder

NCTC

USA300 (from CDC type collection)

Nursing student

Prior community SSTI patient

Patient 1

Patient 2

Patient 3

Patient 4

USA300 (from CDC type collection)

NCTC

Lambda ladder

All patient isolates were PVL positive and SCCmec type IV

Summary & Conclusions

- CA-MRSA tends to:
 - Be susceptible to more antimicrobial classes than nosocomial MRSA
 - Cause skin & soft tissue infections (SSTI)
- CA-MRSA can cause healthcare-associated infections
- SSTI & invasive infections caused by USA300 are increasing in Iowa
- Patients may need Rx or decolonization > 1 time