

## Background

- Staphylococcus caprae* (*S. caprae*) is a coagulase-negative *Staphylococcus* species (CoNS) usually associated with animals and an uncommon cause of healthcare-acquired infections in humans
- An outbreak was suspected in the fall of 2015 when five *S. caprae* infections (blood=3, wound with underlying osteomyelitis=1; paracentesis fluid=1) were identified in patients admitted to the same NICU; review of records revealed no prior isolates
- Four isolates available for testing were identical by repetitive element sequence based-PCR (rep-PCR), and exhibited high-level resistance to mupirocin (MU)
- The identification of the first *S. caprae* isolate was coincident with the introduction of MALDI-TOF for organism identification

## Objective

- To describe the emergence of *S. caprae* in a NICU that has used universal monthly MU prophylaxis since 12/9/13

## Setting

- 101-bed Level IV NICU with comprehensive strategy for preventing MRSA transmission
  - All infants screened for MRSA on admission
  - Weekly surveillance cultures for MRSA using chromogenic plates
  - Cohorting of positive patients
  - Contact precautions
  - Topical MU treatment of positive patients
  - Chlorhexidine bathing twice weekly
  - Hand hygiene (HH) program
- Every 4 weeks, all infants received MU applied to anterior nares and perirectal area twice daily for 5 days beginning 12/9/13

## Methods

- Available archived isolates of invasive CoNS from NICU infants (1/1/14 to 9/1/15) were re-evaluated by MALDI-TOF
- S. caprae* isolates were prospectively identified (9/1/15 to 5/4/16) in children's hospital and four affiliated community hospitals
- MU-minimum inhibitory concentration (MIC) determined by E-test for all prospectively and retrospectively identified *S. caprae* isolates (susceptible  $\leq 4 \mu\text{g/mL}$ , high-level resistance  $\geq 512 \mu\text{g/mL}$ )
- Isolate relatedness assessed by rep-PCR; clonality defined as  $>97\%$  similar
- The University of Louisville Institutional Board Review approved this study

## Results

**Table 1: Characteristics of Infants with Positive *S. caprae* Cultures**

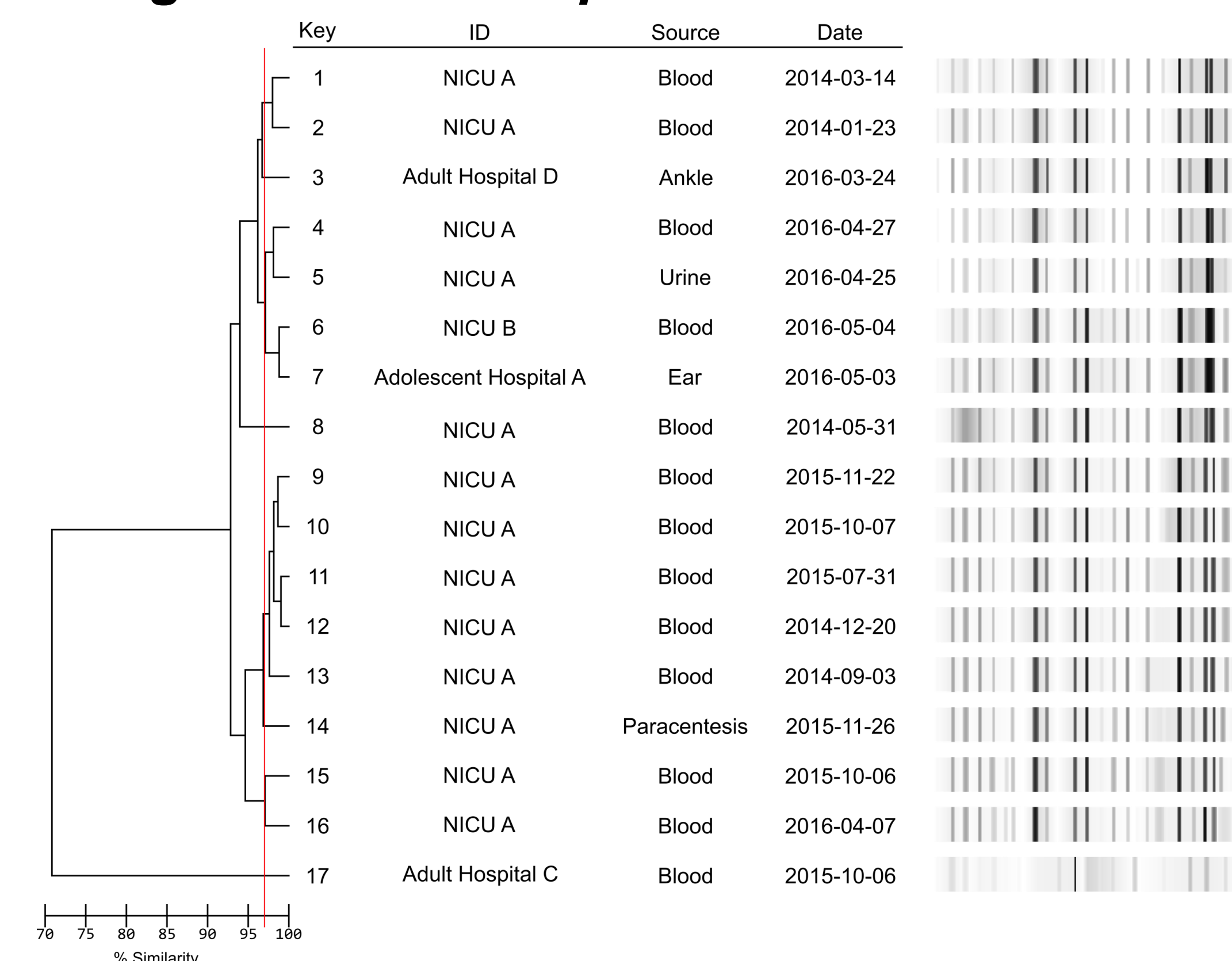
| Key                    | Gender | Race     | Birth weight (grams) | Gestational Age (weeks) | Source             | Age at positive culture (days) | Treated for > 72 hours |
|------------------------|--------|----------|----------------------|-------------------------|--------------------|--------------------------------|------------------------|
| 1                      | M      | Hispanic | 2905                 | 37                      | Blood              | 15                             | Yes                    |
| 2                      | F      | White    | 1055                 | 27                      | Blood              | 7                              | Yes                    |
| 4                      | M      | White    | 655                  | 23                      | Urine              | 10                             | No*                    |
| 5                      | F      | White    | 576                  | 23                      | Blood              | 12                             | No                     |
| 6                      | M      | White    | 740                  | 25                      | Blood              | 13                             | Yes                    |
| 8                      | M      | White    | 510                  | 23                      | Blood              | 30                             | No                     |
| 9                      | F      | White    | 621                  | 24                      | Blood              | 14                             | Yes                    |
| 10                     | F      | White    | 1060                 | 28                      | Blood              | 11                             | Yes                    |
| 11                     | M      | Black    | 2050                 | 32                      | Blood              | 16                             | Yes                    |
| 12                     | M      | Black    | 560                  | 22                      | Blood              | 12                             | No                     |
| 13                     | M      | Black    | 621                  | 24                      | Blood              | 13                             | No                     |
| 14                     | M      | White    | 700                  | 26                      | Paracentesis Fluid | 13                             | No*                    |
| 15                     | M      | White    | 709                  | 25                      | Blood              | 17                             | No                     |
| 16                     | M      | White    | 510                  | 28                      | Blood              | 23                             | Yes                    |
| Specimen not available | F      | White    | 2500                 | 38                      | Wound              | 52                             | Yes                    |

\*Died before third day of treatment of unrelated causes

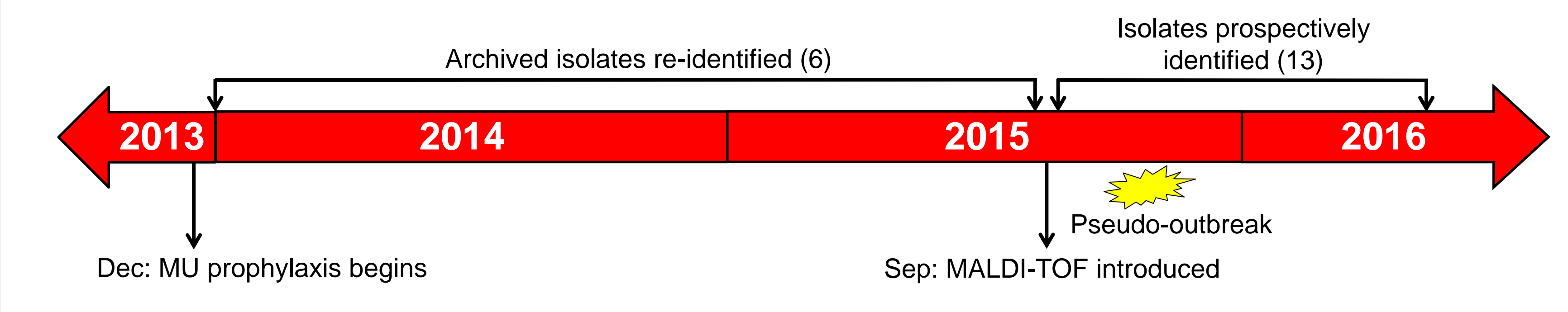
**Table 2: Antibiotic Susceptibilities for *S. caprae* Isolates**

| Key | ID                    | Source       | Date       | Ox | Ery | Gent | Rif | Levo | Dap | Mero | Lzd    | Vanc  | MU (E-test) |
|-----|-----------------------|--------------|------------|----|-----|------|-----|------|-----|------|--------|-------|-------------|
| 1   | NICU A                | Blood        | 2014-03-14 | R  | R   | R    | S   | S    | S   | R    | S (1)  | S (1) | R           |
| 2   | NICU A                | Blood        | 2014-01-23 | R  | R   | R    | S   | S    | S   | R    | S (1)  | S (1) | R           |
| 4   | NICU A                | Blood        | 2016-04-27 | R  | R   | R    | S   | S    | S   | R    | S (2)  | S (2) | R           |
| 5   | NICU A                | Urine        | 2016-04-25 | R  | R   | R    | R   | S    | R   | R    | R (>4) | S (2) | R           |
| 6   | NICU B                | Blood        | 2016-05-04 | R  | R   | R    | S   | S    | S   | R    | S (1)  | S (1) | R           |
| 8   | NICU A                | Blood        | 2014-05-31 | R  | R   | R    | S   | S    | S   | R    | S (1)  | S (1) | R           |
| 9   | NICU A                | Blood        | 2015-11-22 | R  | R   | R    | S   | S    | S   | R    | S (2)  | S (2) | R           |
| 10  | NICU A                | Blood        | 2015-10-07 | R  | R   | R    | S   | S    | S   | R    | S (1)  | S (2) | R           |
| 11  | NICU A                | Blood        | 2015-07-31 | R  | R   | R    | S   | S    | S   | N/A  | S (2)  | S (2) | R           |
| 12  | NICU A                | Blood        | 2014-12-20 | R  | R   | R    | S   | S    | S   | R    | S (1)  | S (1) | R           |
| 13  | NICU A                | Blood        | 2014-09-03 | R  | R   | R    | S   | S    | S   | R    | S (1)  | S (1) | R           |
| 14  | NICU A                | Paracentesis | 2015-11-26 | R  | R   | R    | S   | S    | S   | R    | S (4)  | S (2) | R           |
| 15  | NICU A                | Blood        | 2015-10-06 | R  | R   | R    | S   | S    | S   | R    | S (1)  | S (2) | R           |
| 16  | NICU A                | Blood        | 2016-04-07 | R  | R   | R    | S   | S    | S   | R    | S (1)  | S (1) | R           |
| 3   | Adult Hospital D      | Ankle        | 2016-03-24 | S  | S   | S    | S   | S    | S   | S    | S (1)  | S (1) | S           |
| 7   | Adolescent Hospital A | Ear          | 2016-05-03 | S  | S   | S    | S   | S    | S   | S    | S (1)  | S (1) | S           |
| 17  | Adult Hospital C      | Blood        | 2015-10-06 | S  | S   | S    | S   | S    | S   | S    | S (1)  | S (1) | S           |

**Figure 1: Dendrogram of All *S. caprae* Isolates**



**Figure 2: Timeline**



- 7 additional isolates of *S. caprae* were identified through 5/4/16 (Figure 2)
  - 4 from NICU patients (blood=3, urine =1)
  - 3 from non-NICU patients (blood=1, ankle=1, ear=1)
- Twenty-one archived CoNS isolates from 19 patients were evaluated by MALDI-TOF
- 6 initially biochemically identified as *S. epidermidis* were re-identified as *S. caprae* (earliest isolate 1/23/14)
- Demographic and clinical characteristics presented in Table 1
- Spectrum of clinical illness similar to that caused by other CoNS in this population
- Patients were not clustered geographically and review of pseudo-outbreak group did not identify a healthcare worker who was epidemiologically linked
- For the review period: *S. caprae* was identified in 17% of blood cultures that grew any CoNS (NICU A); *S. caprae* was identified in 3% of blood cultures that grew any CoNS (NICU B)
- 3/3 non-NICU isolates were susceptible to MU and all systemic antibiotic tested (Table 2)
- 10/10 available NICU isolates had high level MU resistance (Table 2)
- One MU-resistant isolate also was resistant to linezolid, rifampin, and daptomycin
- Rep-PCR grouped the MU-resistant NICU isolates into two primary clusters (Figure 1)

## Limitations

- Not all *S. caprae* isolates were available for testing (n=1)
- Not all archived isolates of CoNS were available for re-identification (n=1)
- CoNS other than *S. caprae* were not tested for MU resistance
- No archived isolates available from before the initiation of MU prophylaxis in 12/9/13

## Conclusions

- S. caprae* is a common pathogen in this NICU, but rare in other pediatric/ adult patients
- A pseudo-outbreak was associated with MALDI-TOF implementation
- Isolates from the NICU are polyclonal
- It is possible that MU prophylaxis is driving MU resistance of *S. caprae*

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