

Epidemiology of *Staphylococcus aureus* Nasal Colonization among Children with CF and their Household Contacts

Anne Stone, MD

Introduction

- Increased prevalence of MRSA among CF patients
 - 0.1% in 1995
 - 7.0% in 2001
 - 18.9% in 2006
- Prevalence rates increased across all age strata
 - 1995-2001: most prevalent among adults
(0.23%, 8.2%)
 - 2002-2005: most prevalent among adolescents
(10.8%, 20.9%)
- Range of prevalence rates among CF centers (0-57%)

Introduction

- Anterior nares: site of MRSA and MSSA carriage
 - Site of transmission of MSSA among CF patients

Objectives

- To determine the point prevalence of *S. aureus* nasal colonization among CF patients and their household contacts
- To assess potential risk factors for MRSA
- To determine potential transmission of *S. aureus* within households and CF centers

Methods

- Study Subjects: CF patients aged 1-17 years
- Study Sites: 3 CF Centers in NYC area
 - Columbia University Medical Center
 - North Shore-Long Island Jewish Health System
 - New York Medical College

Methods

- Anterior nares cultured in clinic and home
- Case-control study
 - Cases: positive respiratory tract cultures for MRSA within the past 5 years
 - Controls: MRSA negative
- Risk factor questionnaire
 - Crowded living conditions, daycare, participation in team sports

Methods

- Anterior nares swabs cultured on selective media
 - Positive colonies isolated on 5% Sheep Blood Agar
 - *S. aureus* confirmed by coagulase and Protein A detection
- Multiplex PCR assay to assess for the *mecA* gene and to determine SCC*mec* type
- MSSA and MRSA clones compared with Pulsed Field Gel Electrophoresis (*Sma* I)

Results: Participating CF Centers

Center Description	NYMC	LIJ	CUMC
CF patients 1-17 yrs (n)	90	122	98
MRSA prevalence among CF patients (n, %)	11 (12%)	20 (16%)	24 (24%)
Contact precautions for MRSA			
Inpatient	Yes	Yes	Yes
Outpatient	No	No	No

Demographics & Morbidity of CUMC Patients

Demographic	CASES n=19	CONTROLS n=30	p-value
Mean age (range)	10.9 yr (3-17)	8.7 yr (2-17)	0.096
Gender: male	9 (47%)	18 (60%)	0.568
Best FEV ₁ % predicted*	95	105	0.197
Body Mass Index*	18.86	17.68	0.130
Clinic visits*	7.58	5.80	0.049
Courses IV antibiotics*	0.74	0.10	0.001
Co-infection with PA*	10 (53%)	6 (20%)	0.039
Hospitalizations*	0.79	0.33	0.195

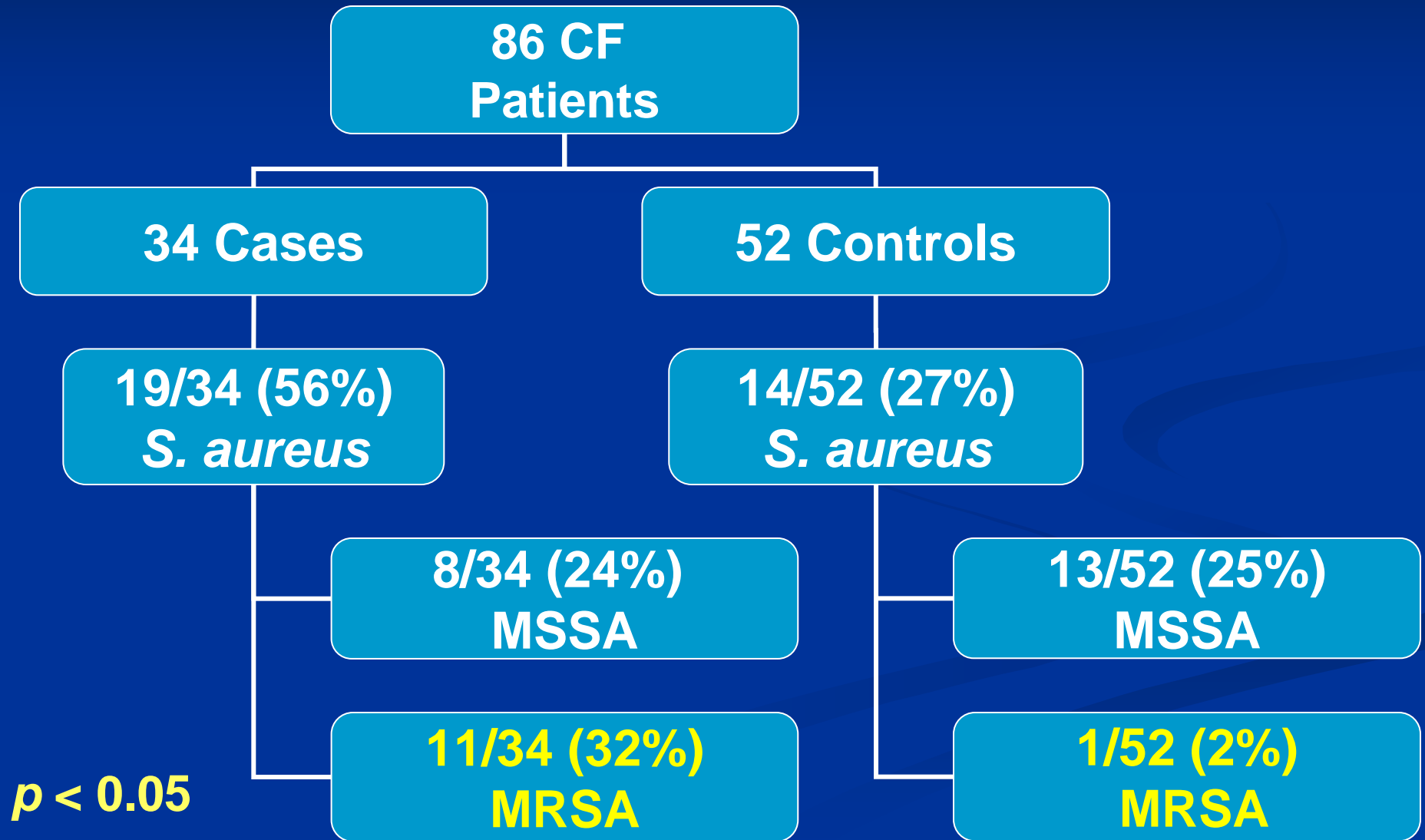
* Within past 1 year

Demographics & Morbidity of LIJ Patients

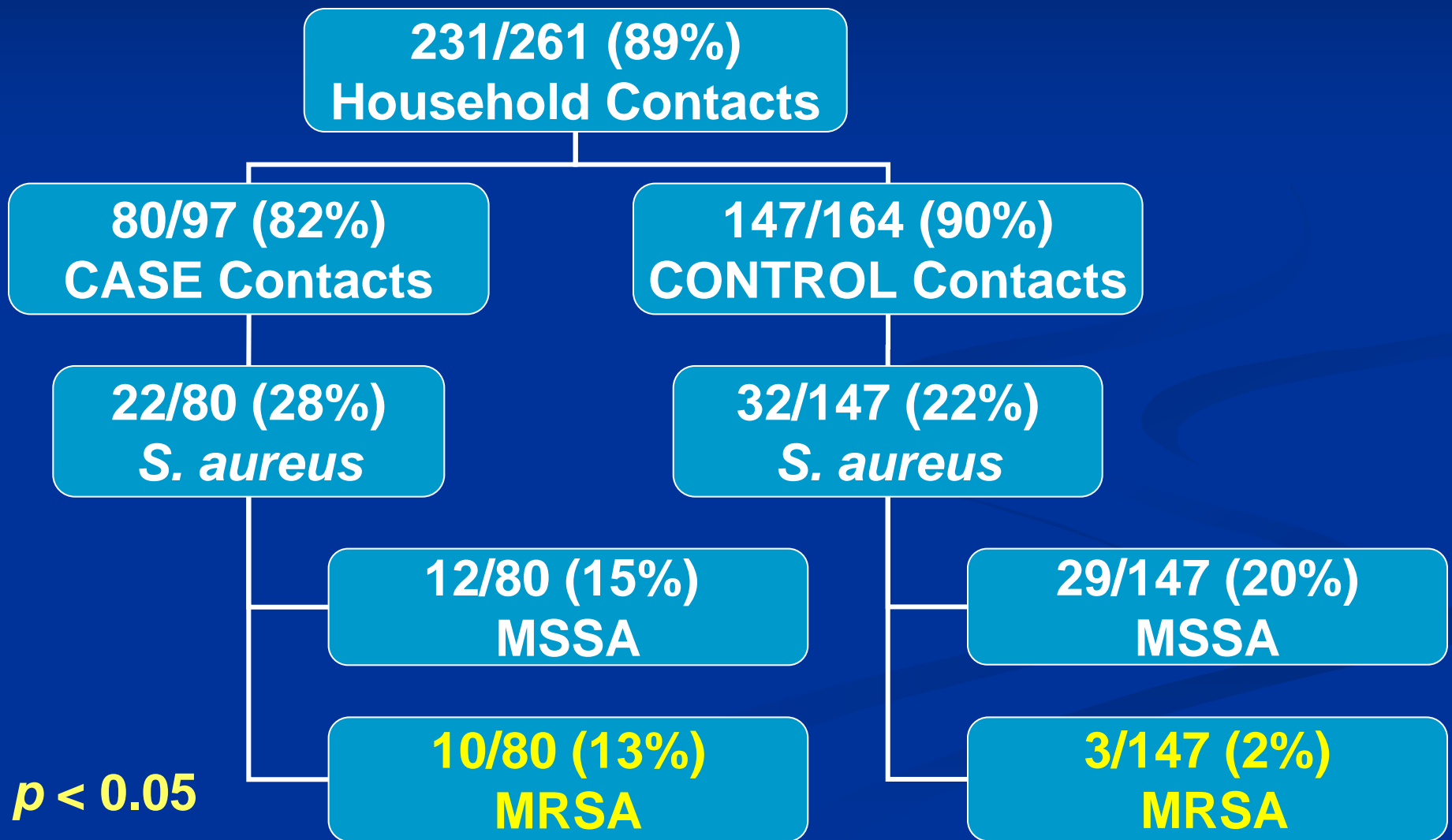
Demographic	CASES n=15	CONTROLS n=22	p-value
Mean age (range)	10.9 yr (5-16)	11.2 yr (4-17)	0.850
Gender: male	8 (53%)	13 (59%)	0.749
Best FEV ₁ % predicted*	100	98	0.776
Body Mass Index*	18.67	19.50	0.511
Clinic visits*	8.53	9.73	0.546
Courses IV antibiotics*	0.40	0.36	0.903
Co-infection with PA*	10 (67%)	7 (32%)	0.050
Hospitalizations*	0.40	0.14	0.261

* Within past 1 year

Anterior Nares Cultures: CF Patients



Anterior Nares Cultures: Household Contacts



Household Contacts with Nasal Carriage n=54

<i>S. aureus</i>	Parents n=141 (41.6 yrs)*	Non-parents n=86 (13.0 yrs)*	p-value
MSSA	24 (17%)	17 (20%)	0.599
MRSA	5 (4%)	8 (9%)	0.083
Total	29 (21%)	25 (29%)	0.152

* Mean age

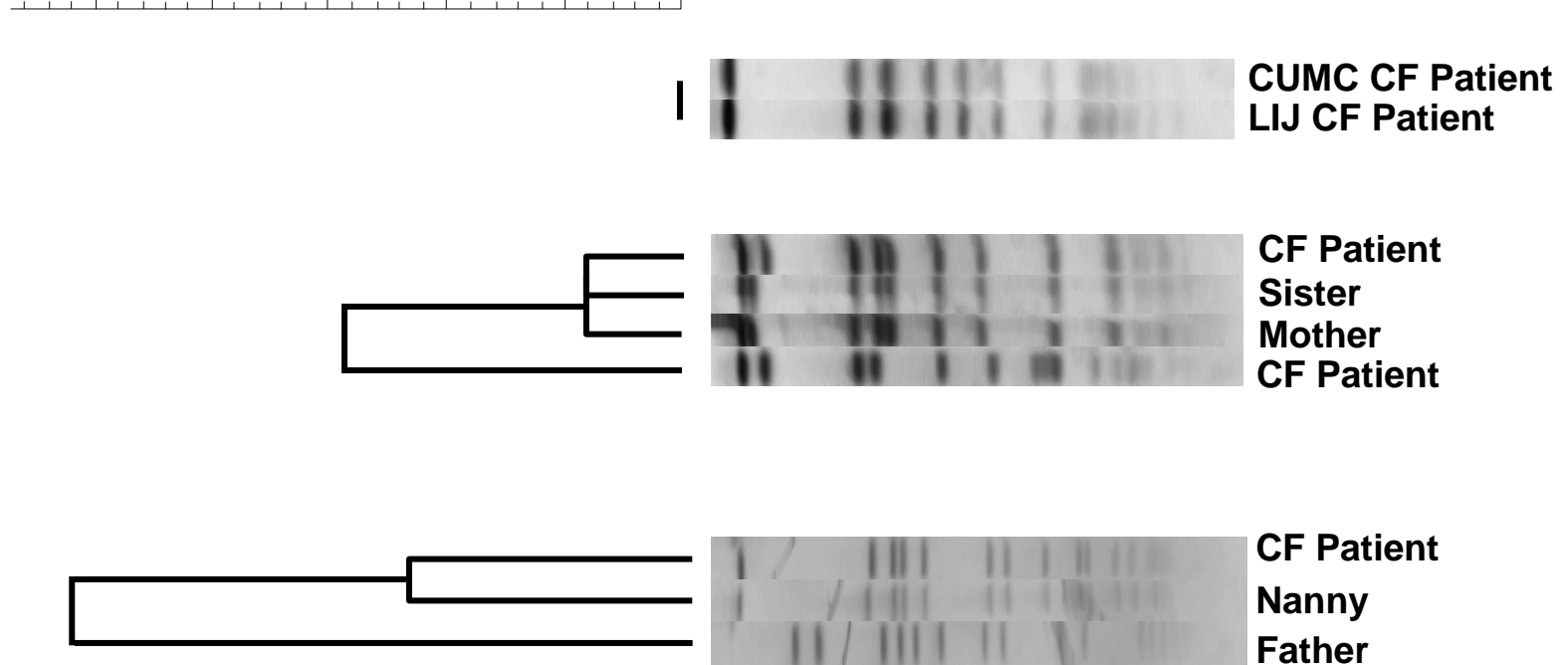
SCC*mec* typing of 25 MRSA isolates

Participant Status	SCC <i>mec</i> II	SCC <i>mec</i> IVa
CASES	9	2
CONTROLS	0	1
CASE Contacts	6	4
CONTROL Contacts	1	2
Total	16 (64%)	9 (36%)

PFGE of Shared Isolates

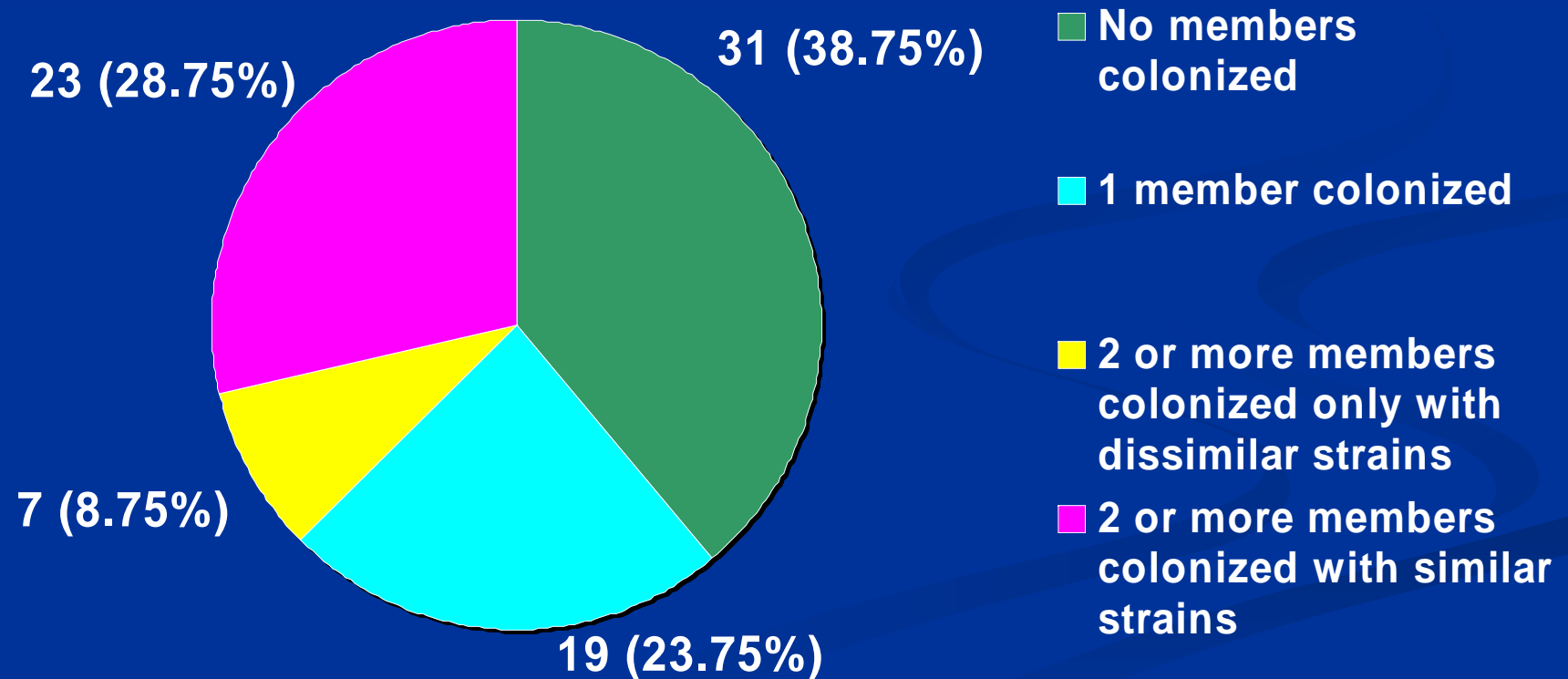
% Similarity

50% 60% 70% 80% 90% 100%



Household Analysis

n=80



Limitations

- Data may not be generalizable
 - 86 CF patients
 - 2/3 centers
 - 25 MRSA isolates
 - Point prevalence study
- Direction of MRSA transmission unknown
 - Lungs ↔ Anterior Nares
 - CF patient ↔ Household Contact
- Importance of colonization of other body sites with MRSA / MSSA is unknown

Summary & Conclusions

- Culturing respiratory tract secretions appeared adequate to detect MRSA carriage.
 - Culturing the anterior nares alone may not detect all infected/ colonized patients.
- Most MRSA appeared to be *SCCmec* type II
 - This epidemiology may change as the prevalence of CA-MRSA increases.

Summary & Conclusions

- Both MSSA and MRSA appeared to be shared within households.
 - Infection control community struggling with implications of MRSA colonized visitors in the healthcare setting.
- Speculations regarding risks for MRSA
 - Infection control practices, familial transmission
 - Subpopulations at risk

Co-authors:

Columbia:

- Lynne Quittell, MD
- Juyan Zhou, MS MPH
- Luis Alba, BS
- Meera Bhat, MS
- Franklin D. Lowy, MD
- Lisa Saiman, MD MPH

LIJ:

- Joan DeCelie-Germana, MD
- Sujatha Rajan, MD
- Lynn Bonitz, RN MS

NYMC:

- John J. Welter, MD
- Allen Dozor, MD
- Ingrid Gherson, BS