Louisiana Health Care Review
The Medicare Quality Improvement Organization
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Louisiana's Medicare Quality Improvement Organization

Your moderator will be with you shortly

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MRSA: A major Public Health Concern

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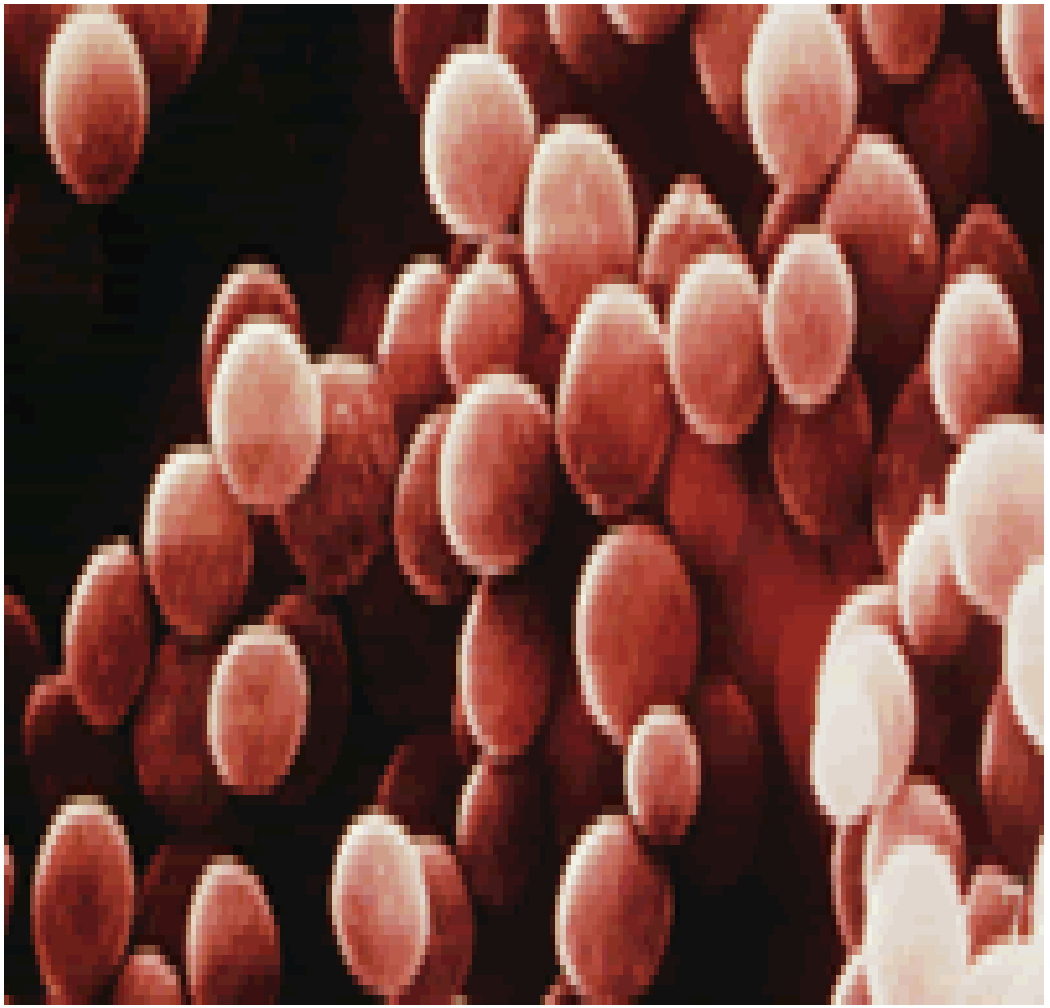
MRSA

Microscopic view of MRSA bacteria
Photo: CDC



History of MRSA

- 1960: First Methicillin resistant strains of *S. aureus* reported 6 months after the antibiotic was marketed
- 1967: Multidrug resistant MRSA detected in Europe, Australia and India
- 1970: MRSA rates begin to fall in Europe
- 1980: Renewed concerns with rise in frequency of Gentamycin-resistant MRSA

MRSA History Continued

- 1990: 16 epidemic strain types identified in the UK and 6 in Central Europe with some clone spread between continents
- 1993: Novel MRSA strains in Australia isolated in patients with no previous healthcare exposure (CA-MRSA)
- 1997: HA- MRSA with reduced susceptibility to Vancomycin reported
- 2002-2004 VRSA isolated

Staph Aureus

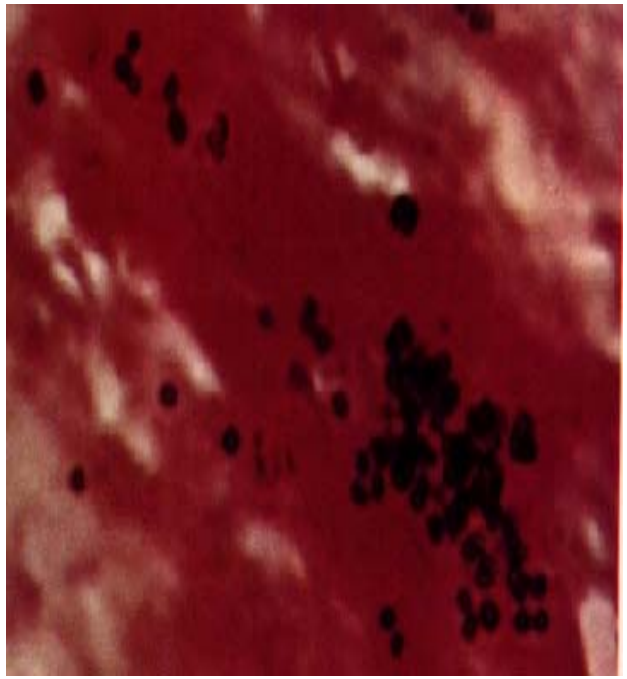
- Gram-positive bacterium
- Frequently colonizes the nose and skin of healthy persons
- Is leading cause of skin & soft tissue infections (SSTI)
  - Abscesses (boils), furuncles, and cellulitis
  - Sometimes misdiagnosed as spider bite
- Can cause serious infections:
  - Bloodstream infections
  - Pneumonia
  - Bone and joint infections
- Transmitted by direct or indirect contact

Mode of Transmission

- From person to person by colonized hands
- RARELY from environment
- In BURN /HYDROTHERAPY units environment is of concern
- Sometimes by droplets in tracheostomy patients

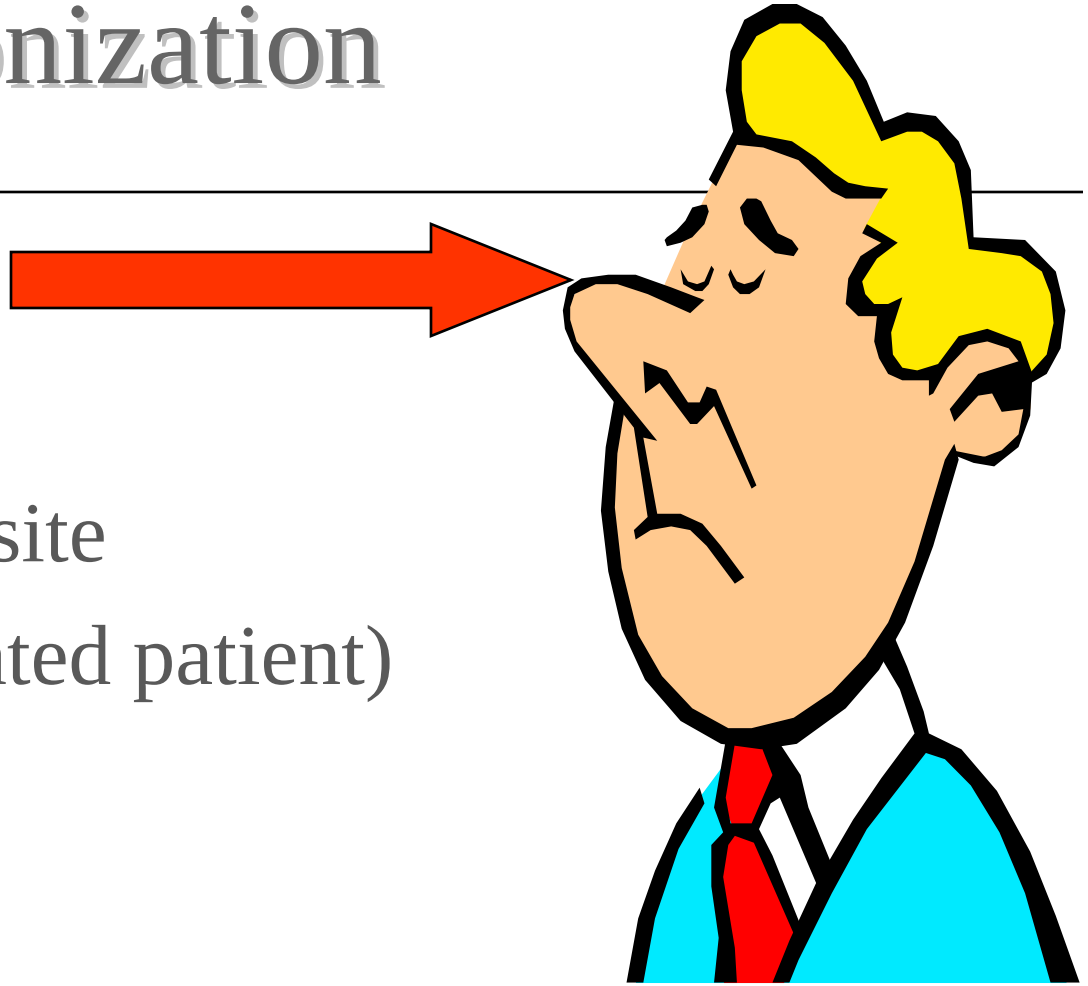
Staph Aureus Colonization

- About 30% of people are COLONIZED
- Average 2.8 strains /person
- Colonization more frequent in
  - Newborns
  - Hemodialysis patients
  - Dermatitis
  - Eczema
  - Diabetics
- HALF LIFE: 40 months



Sites of Colonization

- Nasal Area
- Wound
- Tracheostomy site
- Sputum (intubated patient)
- Armpit
- Groin
- Perineum
- Rectum



Length of Colonization: Marshall

- *Marshall J., 2006. Duration of MRSA carriage according to risk factors of acquisition. ICHE 27 (11): 1206-1212*
- 116 newly detected colonized patients followed for 16 months
- 59% cleared colonization
- Median 7.5 months
- 26% had negative intermittent screens

Methicillin-resistant *Staphylococcus Aureus (MRSA)*

- Resistant to all β lactam antibiotics
  - Note: methicillin no longer used clinically or in lab—look for oxacillin or nafcillin resistance
- Increasingly important cause of healthcare-associated infections since the 1960s
- For 20 yrs, MRSA infections mostly associated with healthcare settings

Gorwitz R, CDC 2007

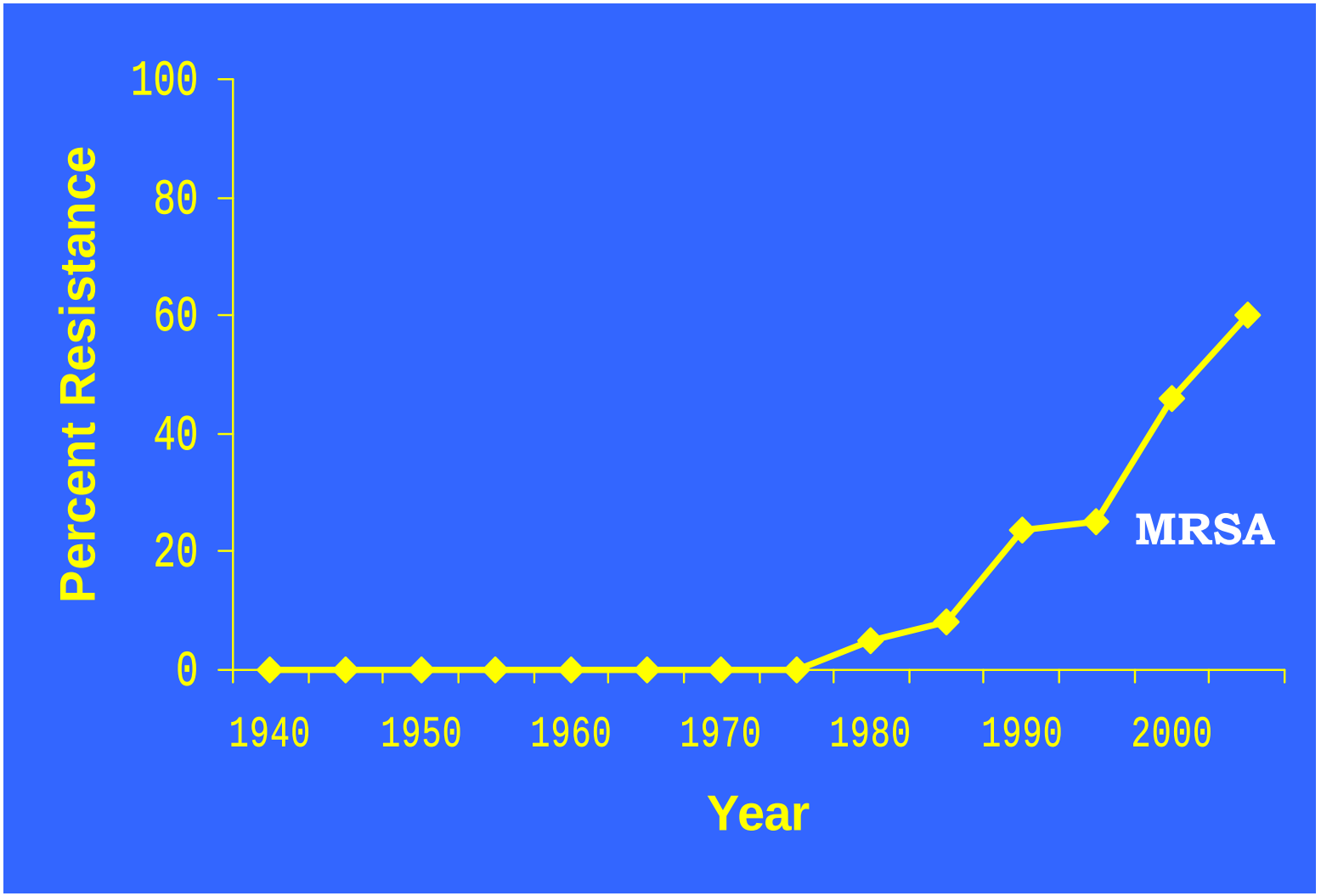
Why is MRSA a Major Concern ?

- Methicillin introduced in 1960
- Resistance appeared in 1963
- Slowly increased in frequency - first in hospitals
- Now in the community
- 2005: % MRSA /SA in hospital acquired infections in USA = >50%
- Potential for large hospital outbreaks
- Treatment is difficult & expensive
- Aggressive strain out in the community

Emergence of MRSA in Healthcare Settings

– Proportion of *S. Aureus* isolates that were MRSA

(Chambers EID 2001, NNIS)



CA – MRSA Epidemiology

One hospital based study found that about 40% of the cases of community acquired MRSA in adults were acquired before admission to the hospital

(*Chambers HF, The Changing Epidemiology of S. Aureus, Emerging Infectious Diseases 2001, 7:179*).

Continued

- A Survey of 2 day care centers in Dallas, Texas which each had an index case of CA-MRSA revealed that: 3% and 24% of the children attending were colonized. More importantly 40% of the colonized children had no history of contact with a healthcare facility or a household member with such contact in the previous 2 years.
- (*Chambers HF, The Changing Epidemiology of Staph. Aureus, Emerging Infectious Diseases 2001, 7:180.*

MRSA Furuncle

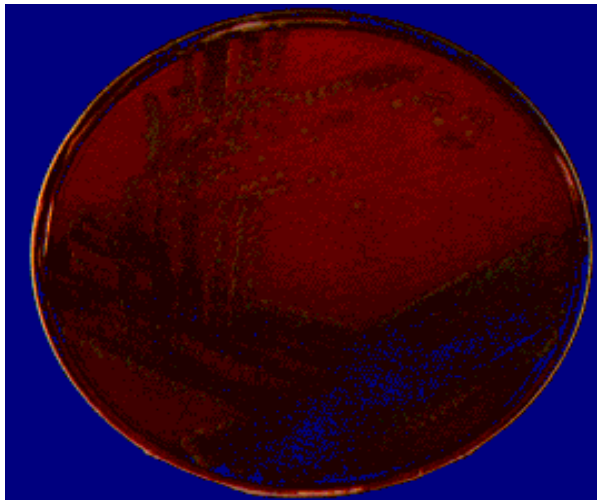
Methicillin resistant *S. aureus* in the leg of an evacuee from Hurricane Katrina- Dallas, Tx – September, 2005 (Photo P. Hicks, Children's Medical Center of Dallas)

HA-MRSA / CA-MRSA

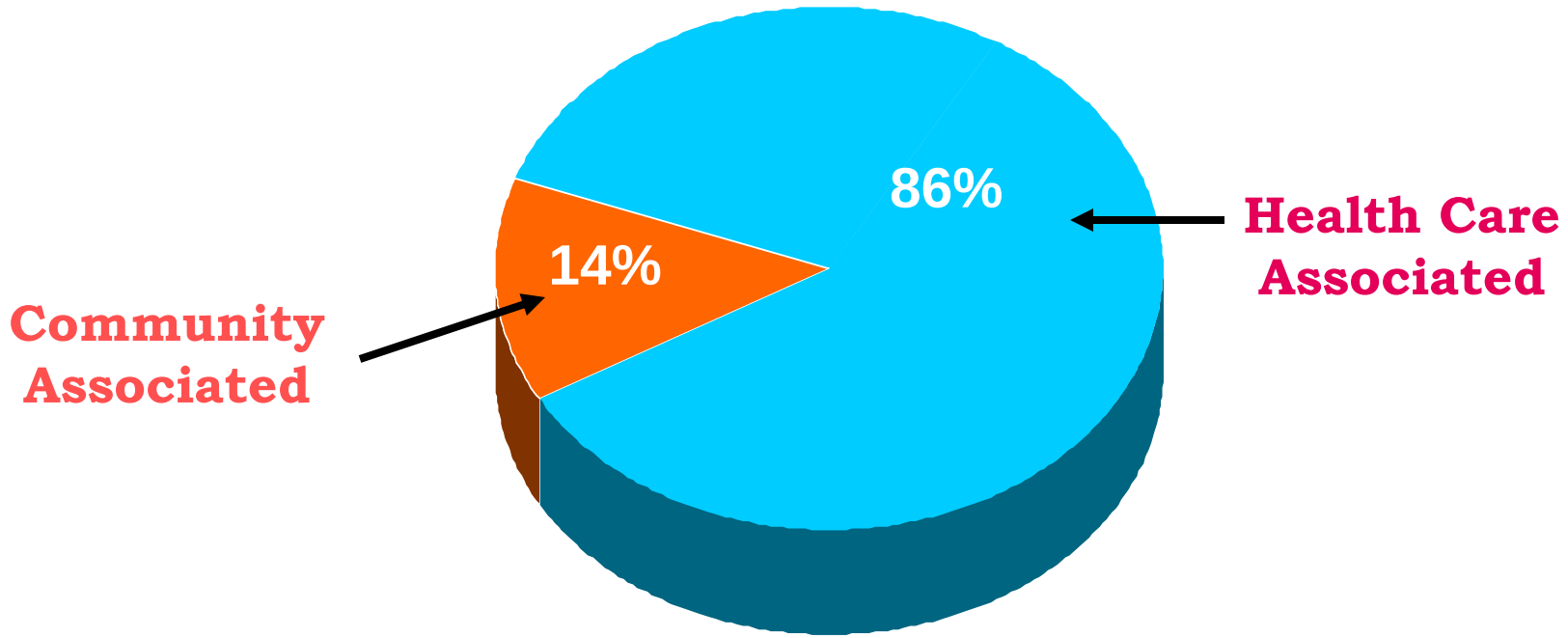
- CA-MRSA strains may be more virulent
  - 1999: 4 cases of lethal MRSA infections among children (MN, ND)
  - hepatic abscess, brain abscess and necrotizing pneumonia
  - super antigens (SEB and SEC, but not TSST-1)
- CA-MRSA typically resistant to methicillin and cephalosporins (β lactams) but NOT to many other antibiotics in contrast to HA-MRSA = multisensitive MRSA
- CA-MRSA = community strain that acquired just 1 resistance gene and retains attributes of wild strain

HA-MRSA is Multiresistant
CA-MRSA is Multisensitive

Antibiotic	% Resistant Strains		
	SA	CA-MRSA	HA-MRSA
Cephalothin	1	90	90
Erythromycin	5	15	72
Clindamycin	2	5	35
Ciprofloxacin	2	5	51
Vancomycin	Some cases of VISA and VRSA		



Most Invasive MRSA Infections Are Healthcare-Associated



Klevens et al JAMA 2007;298:1763-71

Effect of judicious antibiotic use on propagation of MRSA

- Antibiotic judicious use may have no effect on preventing spread of MRSA
- Holland
  - Strict Infection Control applied to MRSA: < 1% resistance
  - Standard precautions only MRSE: 50%-65% resistance
  - Antibiotic Judicious Use similar for both
- Countries with similar patterns of antibiotic use:
  - Strict MRSA control: Finland 0.5%
  - Relaxed MRSA control: UK 27%, Italy 50%

Transmission is the main mode of propagation of MRSA

Failure of Standard Precautions

- MRSA found on hospital computer keyboards used only by clinicians, carried from room to room of hospital on hands

  Devine J, 2001. J Hosp Infect 2001;48:72-75.

- 42% of nurses' gloves became contaminated with MRSA when they touched surfaces in MRSA patient room even without touching patient

  Boyce JM 1997. Infect Control Hosp Epidemiology; 18:622-627

Failure of Standard Precautions

- 65% of HCW gowns or uniforms were contaminated with MRSA after performing routine “morning care” for patients with wound or urine MRSA.
  Boyce JM 1997. Infect Control Hosp Epidemiology; 18:622-627
- White coats contaminated 69% of the time with VRE or MRSA after patient examination; organisms transferred to HCW hands 27% of the time after touching white coats.
  Boyce JM, 1997.Infect Control Hosp Epidemiology;18:622-627
- Isolation gowns prevent HCW from contaminating clothing and possibly hands, with MRSA and resistant enterococci.
  8th SHEA Annual Meeting; April 5-7, 1998; Orlando, FL. Abstract S74:52.

Emergence of MRSA in the Community

- 1990's: Strains of MRSA distinct from those already established in healthcare settings (HA-MRSA) emerged worldwide as a cause of infection among otherwise healthy adults and children in the community (CA-MRSA)
- Genetic characteristics of these strains suggested they originated in the community and did not spread from hospitals

Gorwitz R, CDC 2007

Factors Facilitating Transmission (5 “C”s)

- Contact
- Crowding
- Contaminated items
- Compromised skin integrity
- Cleanliness (lack thereof)

Bartlett J, Medscape 2007

Persons at Risk for CA-MRSA

- Household contacts of patient with proven CA-MRSA
- Children
- Day-care center contacts of hospitalized patients with MRSA infection
- Men who have sex with men
- Soldiers
- Incarcerated persons
- Hurricane evacuees in shelters

Daum, NEJM, 2007

Continued

- Athletes, particularly those involved in contact sports
- Native Americans/Alaskan Natives
- Pacific Islanders
- Persons with a previous CA-MRSA infection
- Intravenous drug users
- Tattoo

Daum, NEJM 2007

Community-Associated MRSA:
CDC Population-Based Surveillance Definition

- MRSA culture in outpatient setting or 1st 48 hours of hospitalization AND patient lacks risk factors for healthcare-associated MRSA:
  - Hospitalization
  - Surgery
  - Long-term care
  - Dialysis
  - Indwelling devices
  - Previous MRSA infection

Prevention of CA-MRSA

- Community-acquired *S. Aureus* infections in immunocompetent hosts cannot be prevented because the organism is ubiquitous and there is no vaccine
  (Redbook 2000)
- Promote good hygienic standards
  - Handwashing, plain soap OK
  - Showers
  - Do not pick, press, touch wounds, boils and other skin infections

Distinctions Between CA-MRSA and HA-MRSA Now Blurring

- Strain characteristics (genotypes & susceptibility profiles) are becoming less closely linked to epidemiologic case classifications (CA-MRSA vs. HA-MRSA)
  - Movement of “community strains” into healthcare settings
  - Emerging resistance to non-beta-lactam agents in “community strains”

Gorwitz R, CDC 2007

HA-MRSA is NOT a Superbug

- Many strains cause SPORADIC cases
- Only some strains (E-MRSA) cause EPIDEMICS
- Most MRSA are simple COLONIZERS
- HA-MRSA are NOT more virulent than other SA

MRSA in U.S. Hospitals

Table 1. Prevalence of MRSA in US Hospitals[7]

Survey	Number of Hospitals	*Staphylococcus aureus* or MRSA (%)
AHA[a]	494	36
SENTRY[b]	30	34
TSN[c]	118	37
ICARE[d]	41	33
NNIS[e]	315	55

MRSA = Methicillin-resistant *Staphylococcus aureus*; AHA = American Hospital Association Survey; SENTRY = SENTRY Antimicrobial Surveillance Program; TSN = The Surveillance Network; ICARE = Intensive Care Antimicrobial Resistance Epidemiology; NNIS = National Nosocomial Infections Surveillance System.

[a]1999-2001 isolates, nosocomial and community onset included.

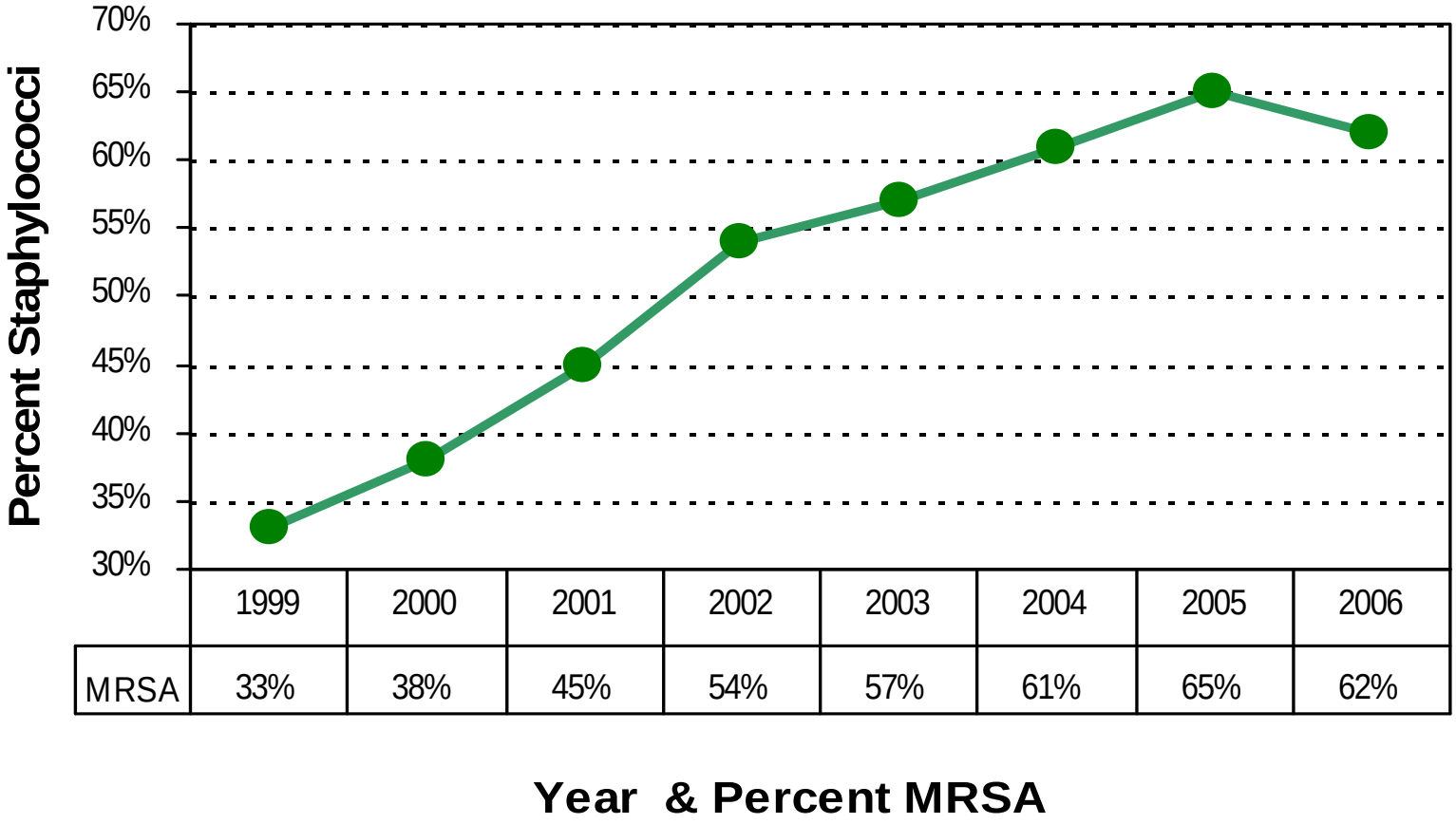
[b]1997-1999 isolates, nosocomial and community onset included.

[c]2000 isolates, nosocomial and community onset included.

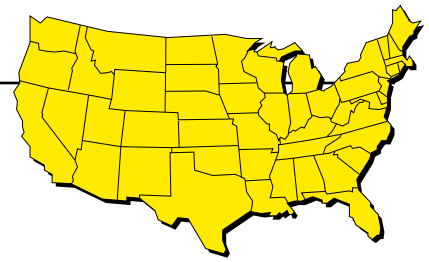
[d]1996-1997 nosocomial isolates from intensive care unit and general wards.

[e]2000 nosocomial isolate ICU isolates only.

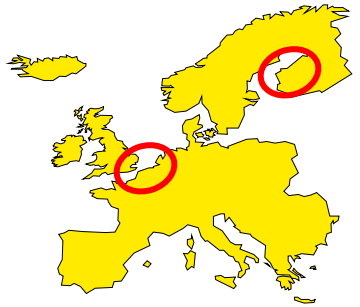
Proportion of MRSA among Staphylococci isolated in Hospitals Louisiana,1999-2006



HA-MRSA



- Appeared in 1960s
- Slowly increased in frequency in hospitals
- USA 1999: 50% of HA staphylococcal infections due to MRSA

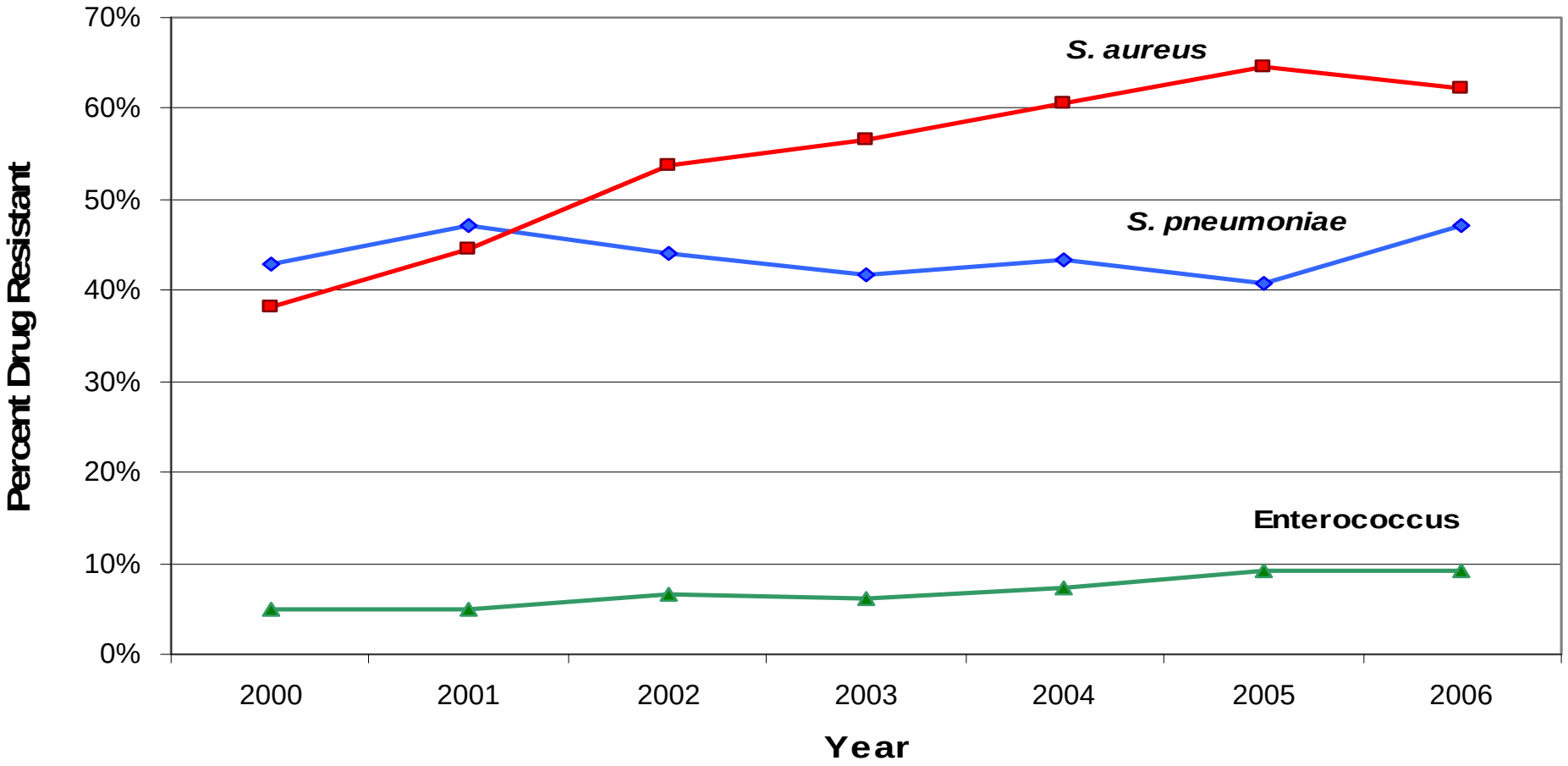


- Denmark 1960:
  - Proportion of MRSA/SA blood isolates reached 33%
  - Policy to control transmission - reduced to < 1%
- Finland /Netherlands: MRSA proportion < 0.5%
- Stringent infection control practices, not antibiotic control, may have been most important factor in limiting MRSA

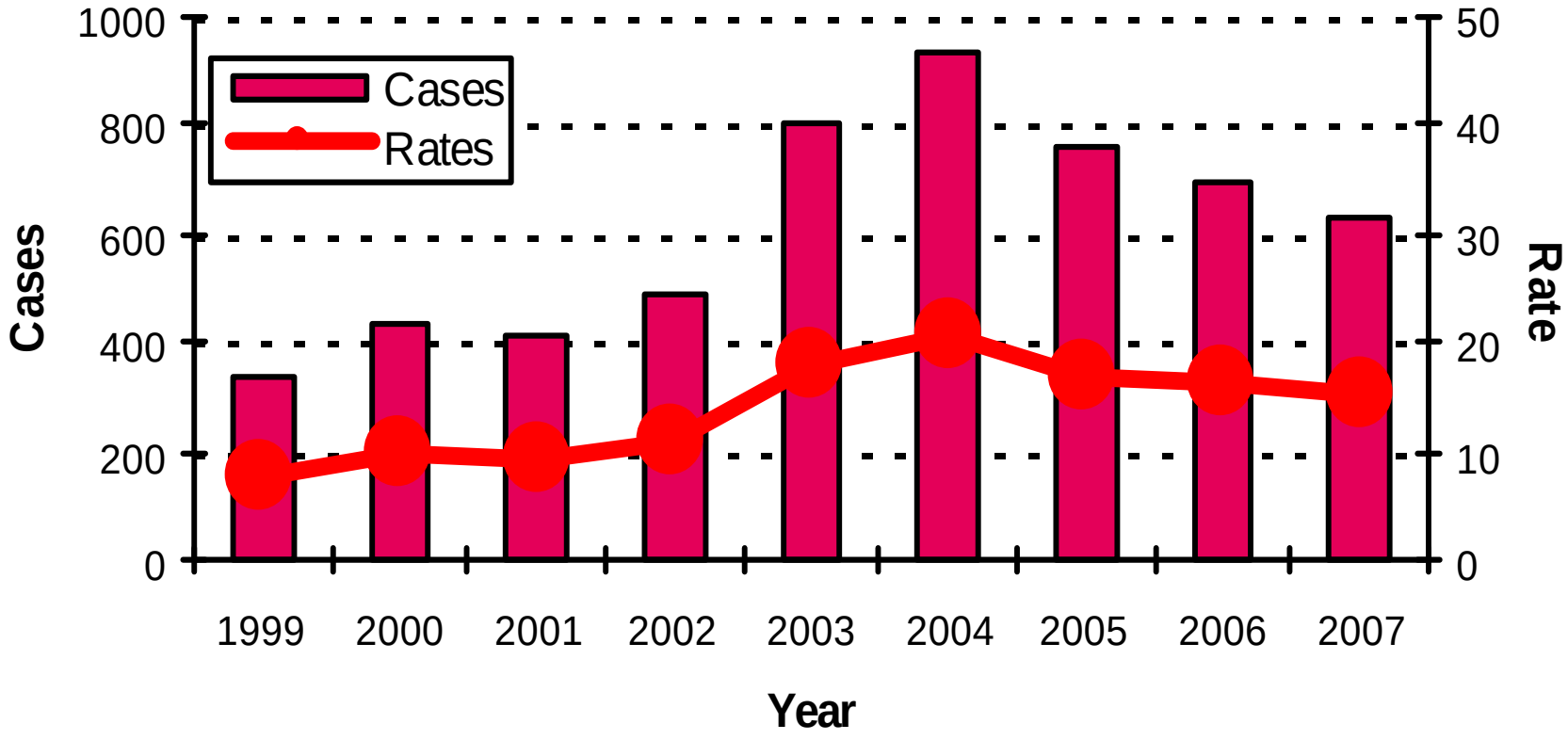
Epidemiologic Surveillance

- Screening
- Laboratory surveillance
- Surveillance of Healthcare-associated infections
- List of MRSA cases
- Search for linkages & outbreaks

Trend Analysis
Louisiana, 2000-2006



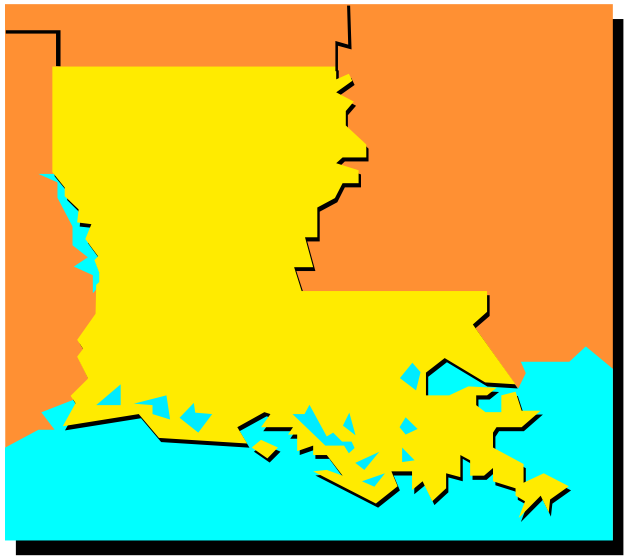
Number of MRSA invasive disease cases- Louisiana 1999-2007



MRSA in Louisiana

Active surveillance for MRSA

	Louisiana	USA NNIS
1997-1999:	33%	29%
2000:	38%	52%
2001:	45%	
2002:	54%	
2003:	57%	
2004:	58%	
2005:	65%	
2006:	62%	



MRSA Prevalence in Louisiana

A prevalence study was carried out by OPH in Louisiana in 2004. A sample of 400 individuals from offices workers, college students and parents at well baby clinics was selected. These individuals had no connection with health care settings (no recent or chronic disease, no family members with frequent contacts with medical care). Among this sample only 1% was found to be colonized with MRSA.

Control of HA-MRSA

- Screening of patients
- Screening of Staff
- Isolation and Barrier nursing
- Hand hygiene
- Environmental Cleaning
- Decolonization Therapy
- Multifaceted Control Programs

Screening of Patients

- Colonized and infected patients represent MRSA reservoir in healthcare facilities
- Value of aggressive search and destroy strategies in highly endemic areas is controversial
- Effectiveness of screening cultures to reduce MRSA transmission has not been established in randomized trials

Continuation…

- Despite the concerns several published guidelines have recommended screening of high risk inpatients
- Commonly used strategies are: screening of ICU patients, those thought to be at risk for MRSA, roommates of MRSA patients and the elderly
- Most published cost analysis have concluded that the combination of surveillance cultures and barrier precautions results in savings

Screening of Staff

- In countries with aggressive MRSA control policies - healthcare workers are routinely screened
- In other countries - screening reserved for situations in which no apparent index case is identified

Isolation and Handwashing

- Private room when possible or cohort with other MRSA patients
- Contact Precautions
- Gloves, Gowns and Masks
- Hand hygiene: alcohol based hand rub or soap and water before and after gloves

Environmental Cleaning

- CDC recommends that hospitals have adequate procedures for cleaning of environmental surfaces
- Patients on contact precautions should have dedicated non-critical equipment
- Further studies on this issue needed

Decolonization

- No consensus on decolonization therapies
- Muporicin regimes often fail
- Widespread or long-term use should be avoided due to risk of emergence of Muporicin resistant strains of MRSA

Multifaceted MRSA control programs

- Screening cultures
- Contact Precautions
- Appropriate Hand Hygiene
- Automatic alerts of readmission of colonized patients with or without decolonization of colonized individuals
- No conclusive evidence that antibiotic control strategies have any effect on the spread of MRSA

Role of Public Health

Consult with Public Health Epidemiologist when culture-proven MRSA cases have been detected in a cluster among epidemiologically-linked individuals in a group or community

- Outbreak management
- Possible genotyping (to determine clonality/linkage)

Think about it…..

Questions?

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