

VRSA: A New and Unwelcome Arrival

Dr. Tammy Lundstrom

August 7, 2003

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**Vancomycin Resistant
*Staphylococcus aureus***

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Hosted by Paul Webber
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A Webber Training Teleclass
www.webbertraining.com

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VRSA

Clinical Background

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Background

- *Staphylococcus aureus* remains a common cause of both community-acquired and nosocomial infections
- 1980s MRSA becomes an increasing problem in hospitals
- 1980s MRSA community acquired endocarditis prevalent in injection drug users
- 2000s community acquired MRSA in children

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How is Vancomycin Resistance Defined?

- Sensitive vancomycin MIC ≤ 4 $\mu\text{g/mL}$
- Glycopeptide (vancomycin) intermediate (GISA) MIC between 4-8 $\mu\text{g/mL}$
- Glycopeptide (vancomycin) resistant (GRSA/VRSA) MIC $> 8\mu\text{g/mL}$

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Background

- 1996
 - First Vancomycin-intermediate *S. aureus* (GISA) discovered in Japan
- July 1997
 - First US GISA patient described in Michigan
- June 2002
 - Total of 8 US patients with GISA known

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Characteristics of GISA Cases

Date	State	Patient	Site	Contacts	Outcome	
7/97	MI	RD/PD	Perit.	0	Cured	
8/97	NJ	RD/HD	BS	0	Cured	
4/99	Ill	RD/HD	BS	0	Died	Endo.
2/00	Nev	Choly	Bile	0	Cured	2/00

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Risk Factors for GISA

- Dialysis (PD or HD)
- Invasive devices
- Previous infection/colonization with *S. aureus*
- Multiple courses of antibiotics including vancomycin for extended time periods

***Multiple close contacts all culture negative

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Risk Factors for *Staphylococcus aureus* with Reduced Susceptibility to Vancomycin (MIC \geq 4 ug/mL)

	<u>Adjusted OR (CI 95%)</u>
19 cases Vancomycin (per week) in prior 1 month	5.6 (2.2-14.3)
Previous MRSA culture in prior 2 nd or 3 rd month	15.5 (1.8- 134.5)

Fridkin et al. Clin Infect Dis 2003; 36:429-39

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**VRSA Case 1
July 2002**

- 40 y/o female
- ESRD on hemodialysis
- Multiple and prolonged courses of vancomycin
- Chronic non-healing diabetic foot infection, requiring several serial amputations
- Several previous MRSA infections

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VRSA Case 1
July 2002

- Multiple skin/soft tissue infections since 1999 treated with a variety of antibiotics
- Total of 6.5 weeks of Vancomycin in the 6 months preceding discovery of VRSA

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VRSA Case 1

Timeline:

8/99 HD

3/01 R 5th MF1 MSSA

5/01 Cellulitis MRSA

2/02 R 1st MT

4/02 R 4th MT MRSA BS; Graft

5/23/02 Line out MRSA

6/14/02 Line out Exit Inf.

6/06/02 Line out

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VRSA Case 1

- 6/14/02 2 separate specimens to 2 different labs
 - Catheter exit site and catheter tip grow VRSA (MIC \geq 1024 micrograms/mL)
- 6/21/02 exit site healed
- Plantar ulcers cultured
 - VRSA, VR E. faecalis, Klebsiella oxytoca, C. albicans

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VRSA Case 1

6/28/02

- Negative swabs for VRSA
 - Nares (VS-MRSA)
 - Axilla
 - Umbilicus (VS-MRSA)
 - Catheter exit site
 - Perirectal (VR E. faecalis)

NEJM 2003; 348:14; 1342-47

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VRSA Case 1

- Hemodialysis Center A
 - Utilized CDC Recommendations for Preventing Transmission of Infections Among Chronic Hemodialysis Patients
- Hospital A
 - Utilized Universal Precautions-Broad
 - Gloves for anticipated contact with non-intact skin or blood/body fluids
 - Masks if splashing anticipated
 - Gowns if soiling/splash anticipated
 - Always use precautions for "phenotypic shedders"

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VRSA Case 1

VRSA susceptibilities

- Chloramphenicol
- Linezolid
- Minocycline
- Quinupristin-dalfopristin
- Tetracycline
- Trimethoprim-sulfamethoxazole

NEJM 2003; 384:14; 1342-47

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VRSA Contact Screening

- Healthcare Contacts
 - Dialysis Center
 - Hospital A
 - Podiatry Clinic
- Social Contacts
 - Close Family
 - Nail Salon

***All Negative

MDCH/CDC

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**VRSA Case 1
Clinical Resolution**

- 7/2/02 outpatient surgical debridement
 - Met at entrance
 - Foot covered
 - Transmitted directly into OR isolation room
 - Gowns, gloves
 - Masks for surgical procedure
 - Recovered in isolation room and discharged

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**VRSA Case 1
Clinical Resolution**

- 14 day course TMP/SMX plus metronidazole
- Aggressive foot care
 - Evaluation twice weekly
 - Continued debridement
 - Gentian violet
 - Contact cast
 - Weekly culture

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VRSA Case 1
Clinical resolution

- 8/20/02
 - Last positive culture for VRSA
- 12/02
 - Foot ulcers healed
- 03/03
 - Hospitalized with MRSA catheter tip positive and Pseudomonas aeruginosa bacteremia
 - No evidence VRSA

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VRSA Case 2

- 9/20/02
- Pennsylvania
- Chronic foot ulcers, possible osteomyelitis
- VRSA susceptible to:
 - Chloramphenicol
 - Linezolid
 - Minocycline
 - Quinupristin-dalfopristin
 - Rifampin
 - Trimethoprim-sulfamethoxazole

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VRSA Case 2

- Multiple previous infections with MRSA and VRE
- No previous vancomycin (purported allergy)
- No recent hospitalizations
- Died of cardiac disease

SHEA Abstract

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Conclusions

- Staphylococcus aureus most likely acquired vanA gene from E. faecalis cultured simultaneously from foot ulcer
- Prior vancomycin use and frequent MRSA infections were risk factors for the VRSA
- Aggressive local care cured the infection
- Routine infection control practices were adequate in this case to prevent spread

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Investigators

<u>Detroit MC/Wayne State</u> William Brown Wasif Hafeez Elaine Flanagan Debbie Reid	<u>CDC</u> Scott Fridkin Soju Chang Fred Tenover Denise Cardo
<u>MDCH</u> Matthew Boulton Dawn Siefert G. Stoltman P. Somsel J. Hageman	S. McAllister L. McDougal M. Kellum H. Holmes J. Chaitram P. Raney
<u>Lakeview Podiatry Associates</u> Guy Rupp, DPM	G. Foshier L. Weigel M. Arduino

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References

- MMWR 46(33) 1997
- MMWR 46(35) 1997
- MMWR 48(51) 2000
- Emerging Infectious Diseases 7(6) 2001
- MMWR 51(26) 2002
- MMWR 51(40) 2002

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VRSA
Epidemiological
Investigation

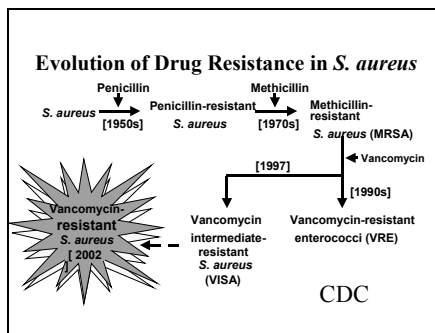
CDC/MDCH/DMC Epidemiology

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Vancomycin Resistant *S aureus* Infections:
Contact Investigation

CDC
Division of Healthcare Quality Promotion

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Public Health Evaluation: Contact Investigation

Step 1: Identify and categorize potential contacts

- Extensive/Moderate/Minimal interaction

Step 2: Culture patients and contacts

- Patients: anterior nares, wounds, and other clinically relevant sites (e.g., catheter exit site)
- Extensive Contacts: anterior nares, skin lesions
- Moderate or Minimal Contacts: anterior nares
- Priority given to those with extensive contact during the 2 weeks before VISA/VRSA culture date

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Public Health Evaluation: Contact Investigation

- **Step 3: Prospective Evaluation**
 - VISA/VRSA case-patient remains in healthcare facility
 - Assess efficacy of infection control precautions
 - Weekly nares cultures of extensive contacts

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VRSA Contact Investigation

- **Objective:** epidemiologic investigation to assess possible spread to healthcare workers (HCWs), patients, and other contacts.
- **Methodology:** swabbing of anterior nares and other clinically relevant sites (e.g., wounds, skin lesion, catheter exit sites)
- **Identification of contacts:** information obtained from HCWs, patients, family members

CDC

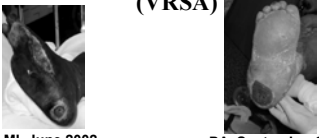
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Vancomycin-Resistant *S. aureus* (VRSA)



MI, June 2002

- 40 y female, hemodialysis
- Diabetes, neuropathic ulcers
- Catheter exit-site and foot wound infected
- Outpatient dialysis
- Healed 3 months

PA, September 2002

- 70 y male, morbid obesity
- Venous stasis ulcers
- Heel wound infected
- Outpatient
- Died 11 weeks

CDC

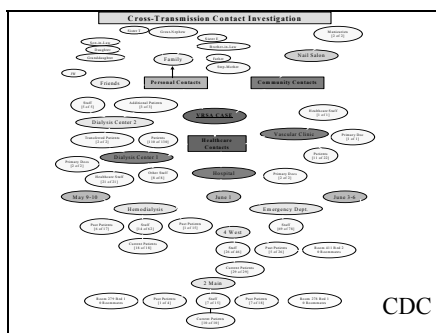
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**Contact Investigation
VRSA, MI**

- Personal contacts: family members, friends
- Community contacts: nail salon
- Healthcare contacts: healthcare workers and patients (current and past)
 - Dialysis Center 1
 - Dialysis Center 2
 - Vascular Clinic
 - Hospital: hemodialysis unit, 2 wards, ED
- Environmental samples

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Contact Investigation in Healthcare Settings: VRSA MI			
<u>Contacts</u>	<u># Available</u>	<u>S. aureus</u>	<u>MRSA</u>
<i>Hosp A</i>			
HCWs	118 (58%)	42 (36%)	3 (3%)
Concurrent patients	50 (100%)	19 (33%)	7 (12%)
Previous patients	20 (25%)	4 (20%)	3 (15%)
<i>Dialysis Centers</i>			
HCWs	36 (100%)	8 (22%)	0
Concurrent patients	115 (85%)	30 (26%)	13 (11%)
<i>Outpatient office</i>			
HCWs	2 (100%)	0	0
Previous patients	11 (50%)	2 (18%)	0

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Contact Investigation in Social Settings VRSA, MI			
<u>Contacts Available</u>	<u>#</u>	<u>S. aureus</u>	<u>MRSA</u>
Household/family (100%)	10	5 (50%) (20%)	2
Social contacts (100%)	2	0	0

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Contact Investigation VRSA, MI	
■ Total contacts anticipated: 547	
■ Total contacts swabbed: 371 (68%)	
■ Total positive cultures for <i>S. aureus</i> : 110 (30%)	
■ Total positive cultures for MRSA: 28 (8%)	
■ No VRSA	CDC

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**Contact Investigation
VRSA, MI**

- Prospective evaluation: continued swabbing until patient was negative for 3 weeks
 - VRSA Case-Patient – weekly
 - Dialysis Center 1: dedicated nurses – weekly
 - Vascular Hospital: primary physicians – weekly
 - VRSA Investigator – weekly
 - Dialysis Center 1: patients – 2 months (Aug & Sept)

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**Infection Control at Dialysis
Center After Identification of
VRSA**

- Staff of VRSA patient
 - Dedicated (technician and nurse)
 - Glove, gown, and mask, hand hygiene between tasks
- VRSA-Patient
 - Last shift, dedicated equipment (except scale), remote module
 - Foot dressing inspected and wrapped before entering unit
 - Wash hands and graft with chlorohexidine soap
 - Foot care at home:
 - change dressings with gloves, hand hygiene before/after
 - restrict care to single room

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VRSA, PA



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**Contact Investigation
VRSA, PA**

- *S. aureus* carriage study of contacts
 - Primary contact: physical contact with case-patient
 - Secondary contact: disruption of skin integrity & received care from primary contact on same day
- Environmental sampling

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**Contact Investigation
VRSA, PA**

<u>Contact Type(#)</u>	<u># Cultured</u>	<u>#Colonized with MRSA</u>
Primary (220)	205 (93%)	14 (7%)
Secondary (63)	57 (90%)	7 (12%)
Total (283)	262 (93%)	21 (8%)

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**Contact Investigation
VRSA, PA**

- No VRSA identified among contacts
- No VRSA identified among *S. aureus* clinical isolates
- No VRSA identified in case-patient's home

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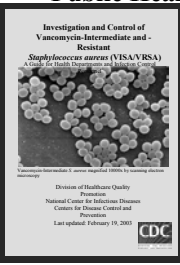
VRSA PA: Infection Control

- Hospital/in-patient: as per HICPAC guidelines
- Out-patient/household:
 - Dedicated care-taker
 - Schedule as last appointment
 - Minimize contact; contact precautions
 - Dedicated, disposable equipment
 - Hand hygiene

MMWR July 11, 1997;46:626-628, and Smith, NEJM 1999;340:493-501. CDC

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Public Health Evaluation



Investigation and Control of Vancomycin-Intermediate and -Resistant *Staphylococcus aureus* (VISA/VRSA)
A Guide for Health Care Personnel

- Definitions
- Laboratory surveillance and diagnostics
- Contact investigation
- Decolonization
- Infection control issues
 - Hospital
 - Dialysis
 - Home healthcare

www.cdc.gov/ncidod/hip/vanco/vanco.htm CDC

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PREVENTION IS PRIMARY!

*Protect patients...protect healthcare personnel...
promote quality healthcare!*

Division of Healthcare Quality Promotion
