



IDCR

INFECTIOUS DISEASES IN CORRECTIONS REPORT
JOINTLY SPONSORED BY MEDICAL EDUCATION COLLABORATIVE, INC.

FORMERLY HEPP Report

March 2007 Vol. 9, Issue 14

ABOUT IDCR

IDCR, a forum for correctional problem solving, targets correctional physicians, nurses, administrators, outreach workers, and case managers. Published monthly and distributed by email and fax, IDCR provides up-to-the moment information on HIV/AIDS, hepatitis, and other infectious diseases, as well as efficient ways to administer treatment in the correctional environment. Continuing Medical Education credits are provided by Medical Education Collaborative (MEC). This activity is jointly sponsored by IDCR and Medical Education Collaborative (MEC). IDCR is distributed to all members of the Society of Correctional Physicians (SCP) within the SCP publication, CorrDocs (www.corrdocs.org).

IDCR and AAHIVM have united to improve the quality of health care delivery in the nation's correctional facilities by leveraging the knowledge, experience and resources of two diverse and accomplished groups of HIV and correctional health care experts.

EXECUTIVE EDITOR

Anne S. De Groot, MD

*Associate Professor of Medicine (Adjunct)
Brown Medical School*

CHIEF EDITOR

David A. Wohl, MD

*Associate Professor of Medicine
University of North Carolina
AIDS Clinical Research Unit*

DEPUTY EDITORS

Joseph Bick, MD

*Chief Medical Officer,
California Medical Facility, California
Department of Corrections*

Renee Ridzon, MD

Consultant

SUPPORTERS

IDCR is grateful for the support of the following companies through unrestricted educational grants:

Major Support: Abbott Laboratories and Roche Pharmaceuticals.

Sustaining: Gilead Sciences, Inc., GlaxoSmithKline, Schering-Plough Corp., Tibotec Therapeutics

METHICILLIN-RESISTANT STAPHYLOCOCCUS AUREUS IN THE CORRECTIONAL SETTING

Joseph Bick, M.D.

*Chief Medical Officer
California Medical Facility
California Department of Corrections*

*Assistant Clinical Professor
Division of Infectious Diseases
University of California, Davis*

Disclosures: None

Introduction

The crowded conditions that exist in many of this nation's jails and prisons create an ideal environment for the transmission of infectious diseases. Congregate living environments, insufficient availability of soap, water, and clean laundry, and barriers to prompt access to health care increase the probability that microorganisms will be transmitted from one person to another. Furthermore, inmates are frequently moved from one location to another with little, if any, advance notice, complicating the diagnosis of infection, recognition of an outbreak, interruption of transmission, and control of disease.

Further complicating the appropriate management of contagious illnesses in the correctional setting is the high prevalence of comorbidities such as mental illness and ongoing substance abuse. Many inmates are distrustful of authority and reluctant to cooperate with health care providers. In addition, some jails and prisons have been slow to ask for assistance from outside agencies when faced with outbreak situations, and published guidelines for the diagnosis and treatment of communicable diseases are not always readily applicable to the correctional setting.

Over the past several years, infections due to methicillin-resistant *Staphylococcus aureus* (MRSA) have been increasingly recognized as a major problem in many jails and prisons. This article will review the epidemiology of *S. aureus* (SA) and MRSA infections, provide recommendations for MRSA diagnosis and treatment, discuss education and prevention measures, and propose new correctional-specific standard and transmission based (contact) precautions for MRSA.

Bacteriology and Epidemiology

SA is a bacterium commonly found colonizing the skin or in the anterior nares of healthy individuals. Up to 50% of those in the general population are colonized with SA, and asymptomatic colonization is much more common than symptomatic infection and disease.¹ The prevalence of SA col-

onization is increased among injection drug users, health care workers (HCWs), diabetics, the incarcerated, and those who have chronic skin conditions or indwelling urinary or vascular catheters.^{1,2,3} In addition to the anterior nares, common colonization sites include the axillae, perineum, rectum, and pharynx. Although SA often colonizes humans without causing disease, it can be responsible for both minor skin infections and life threatening infections of the skin, bone, joints, blood, heart valves, and lungs. SA is easily spread from person to person by contact with the skin of someone who is infected or colonized with the bacteria.

Until World War II, SA was almost universally susceptible to penicillin. Within a few years of the first clinical use of penicillin in the 1940s, penicillin resistance was identified, predominantly in the hospital setting. Penicillin resistance in SA is often due to the production of beta lactamases, enzymes that break down penicillin's beta lactam ring and render the drug inactive. To date, over 200 penicillinases have been identified. Another common resistance mechanism is the production of altered penicillin binding proteins.

In an effort to combat penicillin resistance among SA, semi-synthetic penicillins that were less susceptible to bacterial penicillinases were developed. The first such agent was methicillin, and for this reason SA that is resistant to semi-synthetic penicillins is referred to as MRSA. Within a year of the introduction of the beta-lactamase stable penicillin methicillin in 1960, MRSA strains were identified. By the 1970s, MRSA was increasingly recognized as an important pathogen in hospitals, nursing homes, and other long term care facilities in the United States. Currently, more than half of all health care associated SA infections in hospitals in this country are due to MRSA (HA MRSA).^{4,5}

The prevalence of MRSA colonization is less than that of SA, but is rising. MRSA colonization can be transient or persist for many years.⁶ Risk fac-

Continued on page 3

WHAT'S INSIDE

Editor's Letter.....	pg 2
Spotlight	pg 7
S.P. 101.....	pg 9
Save The Dates	pg 11
News & Reviews	pg 11
Self-Assessment Test	pg 12
Course Evaluation	pg 13

LETTER FROM THE EDITOR

Dear Corrections Colleagues,

Several months ago I was sent an email from a correctional nurse overwhelmed by the number of patients he was caring for with infections caused by methicillin resistant Staphylococcus aureus (MRSA). He was desperate for any information he could use to help him treat and contain his facility's outbreak. This issue is our answer to this plea for comprehensive guidance on the management of this increasingly troublesome infection.

The lead article by Dr. Joseph Bick of the California Department of Corrections is a one-stop resource packed with practical information regarding the containment of MRSA that every correctional clinician should read. In addition, Dr. Bick provides a straightforward review of the proper precautions for prevention of the spread of communicable diseases in a Standard Contact Precautions 101. Dr. Bick writes from experience and those who chose not to follow his lead do so at their own risk.

This month's Spotlight by Todd Correll, PharmD complements Dr. Bick's article by reviewing the slew of recently approved antibiotics for Gram positive infections. Dr. Correll provides a useful overview of the indications, strengths and weaknesses of each of these important agents that you will want to keep handy.

Creating issues of IDCR that you will want to keep handy is what we strive for. A few years ago, this periodical changed its name and focus from viral hepatitis and HIV to embrace other infections commonly encountered among incarcerated individuals. We recognized that correctional providers, such as the nurse who emailed me, desired a source of information regarding infectious diseases that was not only reliable and unbiased but also relevant to the care of the incarcerated. Since then, we have endeavored to provide our colleagues with material they would find useful, if not indispensable. To that nurse up to his ears in MRSA, this issue is for you.

Sincerely,

David A. Wohl, MD
 Associate Professor of Medicine
 Division of Infectious Diseases
 AIDS Clinical Research Unit
 The University of North Carolina - Chapel Hill

Faculty Disclosure

**Disclosures are listed at the beginning of the articles. The employees of Medical Education Collaborative have no financial relationships to disclose. In accordance with the Accreditation Council for Continuing Medical Education Standards for Commercial Support, the faculty for this activity have been asked to complete Conflict of Interest Disclosure forms. Disclosures are listed at the end of articles.*

Associate Editors

Rick Altice, MD
Yale University AIDS Program

David Paar, MD
*Associate Professor of Medicine
 University of Texas, Medical Branch*

Dean Rieger, MD
*Officer/Corporate Medical Director
 Correct Care Solution*

Karl Brown, MD, FACP
*Infectious Disease Supervisor
 PHS-Rikers Island*

Ralf Jürgens
Consultant

Joseph Paris, PhD, MD, FSCP, CCHP
*Former Medical Director
 Georgia Dept. of Corrections*

Lester Wright, MD, MPH
*Chief Medical Officer
 New York State Dept. of Correctional Services*

Bethany Weaver, DO, MPH
*Infectious Disease Consultant
 Armor Correctional Health Services*

David Thomas, MD, JD
*Professor and Chairman,
 Division of Correctional Medicine
 NSU-COM*

Editorial Board

Neil Fisher, MD
*Medical Director, Chief Health Officer
 Martin Correctional Institute*

Lynn Taylor, MD
*Assistant Professor of Medicine
 Brown University School of Medicine
 The Miriam Hospital*

Michael Poshkus, MD
*Associate Clinical Professor
 Brown University School of Medicine
 Medical Program Director
 Rhode Island Department of Corrections*

Louis Tripoli, MD, FACFE
*Vice President of Medical Affairs
 Correctional Medical Services*

Josiah Rich, MD
*Associate Professor of Medicine and
 Community Health
 Brown University School of Medicine*

Steven F. Scheibel, MD
*Medical Director
 Community Oriented Correctional Health Services*

Mary Sylla
*Director of Policy and Advocacy
 Center for Health Justice*

Barry Zack, MPH
*Executive Director
 Centerforce*

Eric Avery, MD
*Associate Clinical Professor of Psychiatry
 University of Texas, Medical Branch*

Zelalem Temesgen, MD, AAHIVS
*Associate Professor of Medicine
 Mayo Clinic College of Medicine
 Director, HIV Clinic Disease Consultant
 Division of Infectious Disease Mayo Clinic*

Jim Montalto
The Corrections Connection

Layout
 Jose Colon
The Corrections Connection

Distribution
 Screened Images Multimedia

Managing Editor
 Elizabeth Closson
 IDCR

Subscribe to IDCR

Fax to **401-272-7562** for any of the following: *(please print clearly or type)*

____ I would like to edit my existing contact information

____ I am a new IDCR subscriber and would like add my contact information

CHECK ONE: How would you like to receive IDCR?

____ Email: _____

____ Fax: _____

NAME: _____ FACILITY: _____

STATE: _____

CIRCLE ALL THAT APPLY:

- Physician Physician Assistant Nurse/Nurse Practitioner Nurse Administrator
 Pharmacist Medical Director/Administrator HIV Case Worker/Counselor Other

METHICILLIN-RESISTANT STAPHYLOCOCCUS... (continued from page 1)

tors for colonization with MRSA include those associated with SA colonization, as well as current or recent hospitalization, residence in a long-term care facility (nursing home, skilled nursing facility, hospice), end stage renal disease (ESRD), dialysis, surgery, a prior history of MRSA disease or colonization, recent or frequent antibiotic therapy, recurrent skin disease, close contact with a person who is infected or colonized with MRSA, overcrowded living conditions such as those encountered in military service and correctional settings, skin or soft tissue infections that respond poorly to beta lactam antibiotics, and participation in athletic activities that involve abrasions, skin to skin contact, and/or sharing of equipment. Although MRSA colonization increases the risk for infection, most of those who are colonized with MRSA do not develop infection and many of those who do develop infection were not previously colonized.

Initially, MRSA infections were predominantly found among residents of hospitals, nursing homes, and other health care facilities and most community-acquired SA infections were not MRSA. Over the past two decades, community-acquired MRSA (CA MRSA) have become increasingly common causes of skin and soft tissue infections (SSTI) outside of the health care setting. Outbreaks have been described in the military, in jails and prisons, in day care settings, among MSM, and in those participating in athletic events.^{7,8,9,10,11,12,13}

Risk factors identified in jail and prison MRSA outbreaks have included prolonged incarceration, the presence of skin lacerations and abrasions, previous antibiotic use, inadequate skin hygiene, draining one's own abscesses or performing one's own wound dressing changes, washing one's own clothing by hand, sharing razors, clothing, linen, or soap, restricted access to medical care, and requiring co-payments to see a clinician.^{11,12,13}

New risk factors for MRSA infection continue to be identified. In one recent report, sexual contact with an infected partner was found to be the likely etiology of MRSA transmission in three households in Manhattan.¹⁴ Most recently, an increasing number of community-acquired SSTIs due to MRSA have been seen in persons with no identifiable risk factors. In one recent study of 280 consecutive patients who were hospitalized with SA infection, clinical and epidemiologic risk factors did not reliably distinguish between MRSA and methicillin-sensitive SA (MSSA).¹⁵ There is ample evidence documenting the role of HCWs in the spread of MRSA from patient to patient and from HCWs to their families. MRSA has been cultured from computer keyboards used by clinicians in hospitals, stethoscopes, blood pressure cuffs, otoscopes, and pagers.^{16,17,18,19,20,21,22} Some HCWs erroneously believe that they do not need to adhere to contact precautions when they enter the rooms of MRSA-infected patients as long as they avoid contact with the MRSA infected person. However, MRSA can be readily cultured from the gloves and the gowns or uniforms of HCWs who have been in the room of MRSA infected patients, regardless of whether they were involved in

direct patient care or were performing other non-patient care activities.²³ Clinicians who examine MRSA infected patients while wearing gloves but not gowns frequently acquire MRSA on their clothing and later transfer MRSA to their hands.²⁴ In addition, MRSA can be cultured from environmental surfaces in most hospital rooms housing MRSA infected or colonized patients. SA can survive for months on environmental surfaces, creating a potential reservoir for later transmission.^{24,25}

HA MRSA has historically been distinguished from CA MRSA based upon antibiotic susceptibility profiles, genetic features, and the presence or absence of toxins such as bacteriocin, enterotoxins, and the Panton-Valentine leukocidin. Over time, some of these distinctions between CA and HA MRSA have begun to fade, and some CA MRSA now have susceptibility profiles that are more similar to those traditionally found in HA MRSA.

Often, microorganisms that develop resistance pay a competitive price and are less virulent. However, HA MRSA appears to be even more virulent than MSSA, leading to longer hospitalizations, higher mortality, and increased costs.^{26,27,28} Contrary to the experience with HA MRSA, the outcomes among patients who have required admission to the hospital with CA MRSA have been found to be quite similar to those with CA MSSA.²⁹

In both the correctional setting and the free community, SSTIs have often been mistakenly attributed to spider bites. This may be due to the sudden appearance of painful lesions, and the common finding of arachnids in correctional settings. In reality, spiders infrequently bite people and most spider bites are benign. The misinterpretation of MRSA skin lesions as spider bites has led to delays in appropriate treatment and misguided vector control measures. HCWs in the correctional setting should be advised to consider "spider bites" as infections due to MRSA until proven otherwise.

Treatment

The first step in adequately treating infections due to MRSA is to ensure rapid access to health care for all inmates who have SSTIs. Access to medical care can be improved by eliminating co-payment requirement for contagious conditions, employing an adequate number of clinical staff, and maintaining a 24/7 clinical operation for urgent medical conditions. One intervention that may be particularly useful in high risk correctional settings is the establishment of wound evaluation and treatment clinics. Utilizing specially trained dedicated health care teams to provide active surveillance for SSTI, promptly initiate treatment, and attend to wound dressings may lead to more rapid diagnosis, treatment, and resolution of skin lesions and less opportunity for transmission to others.

When evaluating SSTIs and other infections in which SA is common, clinicians must maintain a high degree of suspicion for MRSA. When possible, all significant SSTIs

should be cultured. Cultures are especially valuable for establishing the local epidemiology and resistance pattern for SSTI. Once MRSA is identified within a facility as an endemic organism causing SSTI, empiric antibiotic selection should include an agent that has activity against this organism. The ongoing collection of cultures helps guide infection control decisions and assists in definitive antibiotic selection for infections that are rapidly progressing, severe and/or life threatening, or poorly responsive to empiric therapy. Cultures can be collected by either swabbing purulent material obtained at the time of incision and drainage or by aspiration of lesions with a syringe. Surface swabs of open lesions are generally less useful as they often reflect colonization rather than causative infection.

In many cases, incision and drainage of the accumulated purulent material is all that is needed to resolve minor MRSA SSTI infections, and antibiotics are unnecessary. With early lesions that have not yet suppurated, moist heat can be applied with a hot washcloth to promote drainage. Antibiotics should be utilized when sepsis, large facial lesions, periorbital lesions, and/or significant cellulitis are present. Antibiotics should also be strongly considered as part of the treatment for patients who have SSTIs in the setting of immune compromise due to neutropenia, ESRD, diabetes, or HIV infection. Table 1 provides detailed information regarding antimicrobial agents useful in the treatment of MRSA.

The indiscriminate use of antibiotics can lead to increased drug resistance and should be discouraged. MRSA are resistant to all beta lactam antibiotics, including: penicillin, the semi-synthetic penicillins methicillin, nafcillin, oxacillin, dicloxacillin, and cloxacillin, all cephalosporins (including cephalexin, cephalothin, ceftriaxone, cefuroxime, cefazidime, and cefazolin), and penicillins that are co-formulated with clavulanic acid or sulbactam (for example augmentin, timentin, unasyn). In addition, MRSA strains often carry plasmids that lead to resistance to other non-beta lactam antibiotics, such as aminoglycosides, fluoroquinolones, macrolides, and chloramphenicol. Many MRSA strains are susceptible to trimethoprim-sulfamethoxazole, clindamycin, the longer acting tetracyclines minocycline or doxycycline, and rifampin. Rifampin should never be used as a single agent for the treatment of MRSA, as resistance will rapidly evolve.^{30,31}

Clinicians should bear in mind that skin lesions are commonly caused by bacteria other than SA. Group A streptococci (GAS) can cause impetigo and erysipelas, and are commonly resistant to antibiotics that may be used for MRSA such as trimethoprim-sulfamethoxazole and the tetracyclines. If GAS is suspected, it may be prudent to include a second agent with activity against GAS in the initial empiric therapy. Alternatively, clindamycin has the added benefit of being effective against most MRSA as well as GAS, and also has excellent bone penetration.

Continued on page 4

METHICILLIN-RESISTANT STAPHYLOCOCCUS... (continued from page 3)

It is important to note that most MRSA resistant to erythromycin have inducible resistance to clindamycin. This resistance may not be recognized and reported to the clinician unless the laboratory performs additional testing. This test, referred to as a d-zone test or d-test, should be routinely performed upon all SA isolates that are found to be resistant to erythromycin. Unless a d-zone test has demonstrated susceptibility to clindamycin, this agent should not be used for SA that is erythromycin resistant. For more serious infections, vancomycin, linezolid, daptomycin, tigacycline or quinupristin-dalfopristin may be used (Table 1 and Spotlight).

Vancomycin has been used for many years for the treatment of SA and MRSA, and virtually all SA are fully susceptible to vancomycin. However, occasional clinical isolates of SA with reduced susceptibility to vancomycin have been reported for over a decade.^{30,31,32,33} The first documented case of infection caused by vancomycin-resistant *S. aureus* (VRSA) (vancomycin MIC >32 µg/mL) in a patient in the United States was reported in 2002.^{34,35} Other concerns about vancomycin include hypersensitivity reactions, a histamine release syndrome (also known as red man syndrome) related to rapid intravenous infusion, the lack of an oral formulation that can be used for the treatment of systemic infection, and the possibility of vancomycin use contributing to the development of vancomycin resistant enterococcus (VRE).

Preventive and Infection Control Strategies

In 2003, the Society for Health Care Epidemiology of America (SHEA) released guidelines for preventing the nosocomial transmission of MRSA within hospitals.³⁶ These guidelines included three main points:

1. Actively screening all at-risk patients at the time of admission for infection or colonization with MRSA.
2. Use of contact precautions for all those found to be colonized or infected with MRSA.
3. Limitations on antibiotic use to decrease the likelihood of antibiotic resistance.

These guidelines represent a significantly more aggressive approach to the detection of antibiotic resistant bacteria than has been utilized in the past, and not all infection control practitioners have embraced these new recommendations. The Health Care Infection Control Practices Advisory Committee (HIC-PAC) of the Centers for Disease Control and Prevention (CDC) has proposed an alternate approach, recommending that hospitals only implement active surveillance if other measures fail to control the transmission of resistant bacteria.

Most recently, state governments have waded into the debate. At least two states (Illinois and Maryland) have proposed legislation that would mandate active screening of all hospitalized patients for MRSA. SHEA and the Association of Practitioners in Infection Control (APIC) have come out in opposition to legislative mandates for active surveillance.³⁷ It should be noted that there are limited data to support these intensified

screening and isolation strategies. In the United States the most compelling data for routine surveillance come from experiences in the control of hospital outbreaks and high risk settings such as intensive care units and hemodialysis units. Proponents of more widespread screening in the hospital setting often cite the experience in Denmark and Holland. These countries have maintained a very aggressive practice of isolating all newly admitted patients, screening them for MRSA, and attempting environmental eradication measures. In some hospitals in Denmark and Holland, MRSA represents only a few percent of all SA isolated. It is significant, however, that the prevalence of MRSA in the community in these countries is significantly lower than that seen in most parts of the United States. The high prevalence of CA MRSA in this country may overwhelm efforts to actively screen and isolate all those admitted to hospitals.

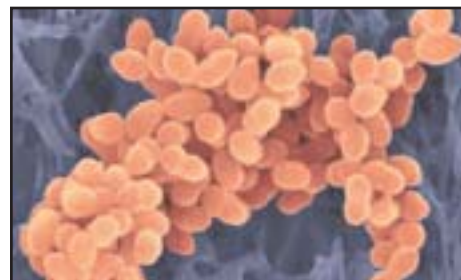
Health care and correctional facilities considering a more intensive approach to screening for MRSA and isolation must consider a number of potential negative consequences. The workload involved in collecting and processing specimens is formidable. Facilities must have a physical plant that will allow for single cell contact isolation or cohorting of those who are found to be infected or colonized. Tracking all involved patients and cultures will require a functioning information technology system, and the financial costs associated with routine culturing could be significant. Studies have demonstrated that hospitalized patients who are placed in isolation experience twice as many adverse events, are less likely to have vital signs performed, have more days without a doctor's progress note, have longer lengths of stay, and are more likely to file a formal complaint as compared to those who are not isolated.⁽³⁸⁾

Evidence-based experience with MRSA control measures in the correctional setting is quite limited. Suggested interventions include wide spread screening for skin disease, implementation of standardized antimicrobial treatment recommendations, improvements in laundry practices, inmate education, the use of chlorhexidine containing soaps, and the use of alcohol-based hand rubs. In 2003, the Federal Bureau of Prisons issued recommendations that include reporting and tracking of patients with MRSA, draining abscesses, culturing skin lesions, and selecting antibiotics known to be effective against MRSA.³⁹ Clearly, more research is needed to define best practices within jails and prisons for MRSA prevention, diagnosis, and treatment.

Can MRSA be Eradicated?

In general, routine eradication of MRSA colonization has not been shown to be practical or efficacious. In some cases in which the same person develops repeated episodes of infection, clearance of the organism from the nose can be beneficial in preventing additional infections. Mupirocin calcium 2% ointment (Bactroban) applied to both anterior nares twice daily for 5-7 days is commonly used for this purpose. One recent encouraging study utilized a triple approach with an oral regimen of rifampin and doxycycline, intranasal 2% mupirocin ointment, and 2%

chlorhexidine gluconate for washing.⁽⁴⁰⁾ In this study, 112 hospitalized patients who were colonized with MRSA were randomized to receive this decolonization therapy for seven days or no treatment. Of those treated, 74% had negative MRSA cultures at 3 months, while only 32% of those who were not treated were culture-negative at follow-up. Eight months later, 54% of those who were treated remained culture-negative. This same study found that patients who were colonized with mupirocin-resistant MRSA at baseline were more than nine times likely to fail treatment. Although worthy of further study, widespread utilization of this approach within the correctional setting cannot be recommended at this time.



MRSA Source: CDC

Education: Inmates

All inmates should be educated about the importance of seeking prompt evaluation and treatment for all potentially contagious conditions. Specific educational points concerning MRSA include:

Education: Employees

Wash hands regularly with soap and water. If hands are not visibly soiled, alcohol-based hand cleansers are a reasonable alternative.

Maintain good hygiene by showering regularly.

Do not share personal items that can transmit infectious agents, such as clothing, towels, bedding, razors, hair brushes and combs, and soap.

Utilize the institutional laundry, and have clothes washed regularly especially if they have come into contact with wounds or wound drainage.

Keep all wounds covered with a clean, dry bandage.

Do not assist other inmates in the drainage or bandaging of wounds. Leave these activities to trained medical staff.

1996, the CDC and the HICPAC jointly issued new guidelines for routine infection control precautions.⁽⁴¹⁾ These precautions, termed standard precautions, have replaced universal precautions. During new employee orientation and again during annual in-service training, all employees should be edu-

Continued on page 5

METHICILLIN-RESISTANT STAPHYLOCOCCUS...
(continued from page 4)

cated concerning standard precautions that have been specifically modified for relevance in the correctional setting (See Standard Precautions 101). All employees should be made aware of their role in facilitating the rapid evaluation of all inmates who may have skin and other soft tissue infections.

In addition to standard precautions, the CDC has published transmission-based precautions to be used based upon the mechanism of transmission of specific organisms. Transmission-based precautions fall into three main categories: airborne, droplet, and contact. Airborne precautions are to be used for organisms that are transmitted via the respiratory route by small particle aerosols, such as *Mycobacterium tuberculosis* and *Varicella zoster virus*. Droplet precautions are used for organisms that are transmitted by larger droplets either through the air for short distances or by contaminated surfaces, such as influenza virus. Contact precautions are to be used for organisms that are transmitted by contact with the skin of an infected or colonized person or with contaminated surfaces. Examples include most diarrheal pathogens, lice, scabies, and MRSA. All correctional employees should be familiar with transmission based (contact) precautions that are appropriate for the correctional setting (See Standard Precautions 101).

The importance of infection control measures cannot be overemphasized, as even many healthcare professionals neglect hand washing. In an effort to improve hand hygiene, the use of alcohol-containing antiseptic scrubs is increasingly being encouraged. However, security concerns may lead to these particular disinfectants not being universally embraced in the correctional setting. Environmental surfaces that are used by multiple people should be routinely decontaminated.

Inmates commonly wash their own clothes using soap and tap water. This process may remove soil and odors, but does little to kill pathogenic organisms. Inmates should be educated that the only way to reliably remove organisms that can cause disease is to use the institutional laundry. A laundry temperature of at least 71 degrees Celsius (160 degrees F) for a minimum of 25 minutes has commonly been recommended to effectively kill microorganisms.⁴² Lower temperature washing at 22-50 degrees Celsius can effectively reduce microorganism concentrations when adequate amounts of chlorine bleach are utilized.^{43,44} The high temperatures achieved during drying and ironing are also microbicidal.

The involvement of experts in infection control and infectious diseases can be useful in both managing individual patients and establishing protocols specific to the unique needs

of each facility. Correctional facilities experiencing outbreaks of MRSA should seek assistance from their local and state health departments. MRSA outbreaks can be reported to CDC through state departments of corrections and state health departments (telephone: 800.893.0485). Preventing MRSA infections among inmates might be an important measure for preventing MRSA in the community outside the correctional facility. Additional information about MRSA is available at the CDC website (www.cdc.gov).⁴⁵

Conclusions

Infections due to MRSA have become an increasingly common cause of morbidity and mortality in this country. Outbreaks have been recognized within health care settings, long-term care facilities, and in a variety of community settings. Congregate living environments such as jails and prisons have been particularly impacted by this pathogen. A variety of measures can be implemented that can improve the prevention, early diagnosis, and treatment of disease attributable to MRSA. Research on best practices in jails and prisons is urgently needed to help guide correctional professionals in best addressing this problematic pathogen.

Table 1. Antibiotic Treatment Options for MRSA

Antibiotic	Route	Indications	Routine Dose	Major Side Effects
Trimethoprim-Sulfamethoxazole (Septra, Bactrim)	PO, IV	Skin and soft tissue infections. Not specifically FDA approved for infections due to MRSA.	1 double strength tablet (160 mg TMP/800 mg SMX) po bid	Anemia, neutropenia, rash, pruritus, Stevens-Johnson syndrome. Not recommended during the third trimester of pregnancy.
Minocycline (Minocin) and Doxycycline (Doryx)	PO	Skin and soft tissue infections. Not specifically FDA approved for infections due to MRSA.	100 mg po bid	Photosensitivity, rash. Not recommended for use during pregnancy.
Clindamycin (cleocin)	PO, IV	Skin and soft tissue infections, bone infections. Not specifically FDA approved for infections due to MRSA.	300-600 mg po tid-qid	Rash, Clostridium difficile colitis
Rifampin (Rifampicin)	PO	Should not be used as a single agent. May be used in combination for treatment and eradication of MRSA.	600 mg po qd	Rash, liver inflammation. High frequency of drug-drug interactions.
Vancomycin (Vancocin)	IV	Endocarditis, bacteremia, bone/joint infections.	1000 mg q 12 hours	Hypersensitivity reactions, red man syndrome.
Quinupristin -Dalfopristin (Synercid)	IV	Skin and soft tissue infections.	7.5 mg/kg q 8-12 hours	Arthralgias, myalgias.
Linezolid (Zyvox)	IV, PO	Skin and soft tissue infections, pneumonia.	600 mg q 12 hours	Bone marrow suppression. Note: Not recommended for routine oral use due to potential for inducing resistance, toxicity, and high cost.
Daptomycin (Cubicin)	IV	Skin and soft tissue infections.	4 to 6 mg/kg q day	Myopathy.

METHICILLIN-RESISTANT STAPHYLOCOCCUS...

(continued from page 5)

References

- 1 Kluytmans J, Van Belkum A, Verbrugh H. Nasal Carriage of *Staphylococcus Aureus*: Epidemiology, Underlying Mechanisms, and Associated Risks. *Clin Microbiol Rev* 1997;10:505-20
- 2 Tuazon CV, Sheagren JN. Increased Rate of Carriage of *Staphylococcus Aureus* Among Narcotic Addicts. *J Infect Dis* 1974;129:275
- 3 Kirmani N, Tuazon CV, Murray HW et al. *Staphylococcus Aureus* Carriage Rate of Patients Receiving Long term Hemodialysis. *Arch Intern Med* 1978; 138: 165-167
- 4 Tuazon CV, Perez A, Kishaba T et al. *Staphylococcus Aureus* Among Insulin Injecting Diabetic Patients: An Increased Carriage Rate. *JAMA* 1975;231:1272
- 5 Chambers HF. The Changing Epidemiology of *Staphylococcus Aureus*? *Emerg Infect Dis*. 2001; 7:178-82.
- 6 National Nosocomial Infections Surveillance System. National Nosocomial Infections Surveillance (NNIS) System report, data summary from January 1992 through June 2003, issued August 2003. *Am J Infect Control*. 2003;31:481-98
- 7 Sanford MD, Widmer AF, Bale MJ, et al. Efficient Detection and Long-Term Persistence of the Carriage of Methicillin-Resistant *Staphylococcus Aureus*. *Clin Infect Dis*. 1994; 19:1123-1128
- 8 Zinderman CE, Conner B, Malakooti, MA et al. Community-Acquired Methicillin-Resistant *Staphylococcus Aureus* Among Military Recruits. *Emerging Infect Dis*. May 2004;10(5):941-44
- 9 Kazakova SV, Hageman JC, Matava M et al. A Clone of Methicillin-Resistant *Staphylococcus Aureus* Among Professional Football Players. *N Engl J Med*. Feb 2005;352(5):468-75
- 10 Adcock PM, Pastor P, Medley F. Methicillin Resistant *Staphylococcus Aureus* in Two Day Care Centers. *J Infect. Dis*. Aug 1998;178(2):577-80
- 11 Methicillin-Resistant *Staphylococcus Aureus* Infections Among Competitive Sports Participants-Colorado, Indiana, Pennsylvania, and Los Angeles County, 2000-2003. *MMWR* 2003;52:793-95
- 12 Methicillin-Resistant *Staphylococcus Aureus* Skin or Soft Tissue Infections in a State Prison-Mississippi, 2000. *MMWR* 2001;50:919-22
- 13 Outbreaks of Community-Associated Methicillin-Resistant *Staphylococcus Aureus* Skin Infections-Los Angeles County, California, 2002-2003. *MMWR* 2003;52:88
- 14 Methicillin-Resistant *Staphylococcus Aureus* Infections in Correctional Facilities-Georgia, California, and Texas, 2001-2003. *MMWR* 2003;52:992-96
- 15 ONTR
- 16 Cook, H, Fuquay E, Vasquez G et al. Heterosexual Transmission of Community-Associated Methicillin-Resistant *Staphylococcus Aureus*. *CID* 2007;44:410-13
- 17 Miller L, Perdreaux-Remington F, Bayer A, et al. Clinical and Epidemiologic Characteristics Cannot Distinguish Community-Associated Methicillin-Resistant *Staphylococcus Aureus* Infection from Methicillin-Susceptible *S. Aureus* Infection: A Prospective Investigation. *CID* 2007;44:471-482
- 18 Eveillard M, Martin Y, Hidri N, et al. Carriage of Methicillin Resistant *Staphylococcus Aureus* Among Hospital Employees: Prevalence, Duration, and Transmission to Households. *Infect Control Hosp Epidemiol*. 2004;25:114-20
- 19 Devine J, Cooke RP, Wright EP. Is Methicillin-Resistant *Staphylococcus aureus* (MRSA) Contamination of Ward-Based Computer Terminals a Surrogate Marker for Nosocomial MRSA Transmission and Handwashing Compliance. *J Hosp Infect* 2001;48:72-75.
- 20 Bernard L, Kereveur A, Durand D, et al. Bacterial Contamination of Hospital Physicians' Stethoscopes. *Infect Control Hosp Epidemiol* 1999;20:626-28.
- 21 Breathnach AS, Jenkins DR, Pedler SJ. Stethoscopes as Possible Vectors of Infection by *Staphylococci*. *BMJ* 1992;305:1573-74.
- 22 Smith MA, Mathewson JJ, Ulert IA, et al. Contaminated Stethoscopes Revisited. *Arch Intern Med* 1996; 156: 82-84.
- 23 Cohen HA, Amir J, Matalon A, et al. Stethoscopes and Oscopes: A Potential Vector of Infection? *Fam Pract* 1997;14:446-49.
- 24 Singh D, Kaur H, Gardner WG, et al. Bacterial Contamination of Hospital Pagers. *Infect Control Hosp Epidemiol* 2002;23:274-76.
- 25 Boyce JM, Chenevert C. Isolation Gowns Prevent Health Care Workers From Contaminating Their Clothing, and Possibly Their Hands, With Methicillin-Resistant *Staphylococcus Aureus* and Resistant Enterococci. 8th Annual Meeting of the Society for Healthcare Epidemiology of America; April 1998; Abstract S74:52.
- 26 Boyce JM, Potter-Bynoe G, Chenevert C, et al. Environmental Contamination Due to Methicillin-Resistant *Staphylococcus Aureus*: Possible Infection Control Implications. *Infect Control Hosp Epidemiol* 1997;18:622-27.
- 27 Neely AN, Maley MP. Survival of Enterococci and *Staphylococci* On Hospital Fabrics and Plastics. *J Clin Microbiol* 2000;38:724-26.
- 28 Engemann JJ, Carmeli Y, Cosgrove SE, et al. Adverse Clinical and Economic Outcomes Attributable to Methicillin Resistance Among Patients With *Staphylococcus Aureus* Surgical Site Infection. *Clin Infect Dis* 2003;36:592-98
- 29 Cosgrove SE, Qi Y, Kaye S, et al. The Impact of Methicillin Resistance in *Staphylococcus Aureus* Bacteremia on Patient Outcomes: Mortality, length of Stay, and Hospital Charges. *Infect Control Hosp Epidemiol* 2005;26:166-74
- 30 Cosgrove SE, Sakoulas G, Perencevich EN, et al. Comparison of Mortality Associated with Methicillin-Resistant and Methicillin-Susceptible *Staphylococcus Aureus* Bacteremia: a Meta-Analysis. *Clin Infect Dis* 2003;36:53-59
- 31 Miller L, Quan C, Shay A et al. A Prospective Investigation of Outcomes After Hospital Discharge for Endemic, Community Acquired Methicillin -Resistant and Susceptible *Staphylococcus Aureus* Skin Infection. *CID* 2007;44:483-92
- 32 L AND
- 33 Schmitz FJ, Fluit AC, Hafner D, et al. Development of Resistance to Ciprofloxacin, Rifampin, and Mupirocin in Methicillin-Susceptible and Resistant *Staphylococcus Aureus* Isolates. *Antimicrob Agents Chemother* 2000;44:3229-31.
- 34 O'Neill AJ, Cove JH, Chopra I. Mutation Frequencies for Resistance to Fusidic Acid and Rifampin in *Staphylococcus Aureus*. *J Antimicrob Chemother* 2001;47:647-50.
- 35 Hiramatsu K, Hanaki H, Ino T, et al. Methicillin-Resistant *Staphylococcus Aureus* Clinical Strain with Reduced Vancomycin Susceptibility. *J Antimicrob Chemother* 1997;40:135-36
- 36 Fridkin SK, Hageman J, McDougal LK, et al, Vancomycin-Intermediate *Staphylococcus Aureus* Epidemiology Study Group. Epidemiological and Microbiological Characterization of Infections Caused by *Staphylococcus Aureus* with Reduced Susceptibility to Vancomycin, United States, 1997-2001. *Clin Infect Dis*. 2003;36:429-39
- 37 *Staphylococcus Aureus* Resistant to Vancomycin- United States, 2002. *MMWR* 2002;51(26): 565-67
- 38 Liu C, Chambers HF. *Staphylococcus Aureus* with Heterogeneous Resistance to Vancomycin: Epidemiology, Clinical Significance, and Critical Assessment of Diagnostic Methods. *Antimicrob Agents Chemother*. 2003;47:3040-45
- 39 Muto CA, Jernigan JA, Ostrowsky BE et al. SHEA Guidelines for Preventing Nosocomial Transmission of Multidrug Resistant Strains of *Staphylococcus Aureus* and Enterococcus. *Infect Control Hosp Epidemiol* 2003;24:362-86
- 40 Weber S, Huang S, Oriola, S. Legislative Mandates for the Use of Active Surveillance Cultures to Screen for Methicillin Resistant *Staphylococcus Aureus* and Vancomycin Resistant Enterococci. Position Statement from the Joint SHEA and APIC Task Force. 2007.
- 41 Stelfox HT, Bates DW, Redelmeier DA. Safety of Patients Isolated for Infection Control. *JAMA* 2003;290:1890-1905.
- 42 Federal Bureau of Prisons. Clinical Practice Guidelines for the Management of Methicillin-Resistant *Staphylococcus Aureus* (MRSA) Infections (October 2003). <http://www.nicic.org/Resources/BOPMedicalGuidelines.aspx>
- 43 Simor A, Phillips E, McGeer A, et al. Randomized Controlled Trial of Chlorhexidine Gluconate for Washing, Intranasal Mupirocin, and Rifampin and Doxycycline Versus No Treatment for the Eradication of Methicillin-Resistant *Staphylococcus Aureus* Colonization. *Clin Infect Dis* 2007;44: 178-85.
- 44 Garner JS. Guideline for Isolation Precautions in Hospitals. Hospital Infection Control Practices Advisory Committee. *Infect Control Hosp Epidemiol* 1996;17:53-80
- 45 Walter WG, Schillinger JE. Bacterial Survival in Laundered Fabrics. *Appl Microbiol* 1975;29: 368-73
- 46 Christian RR, Manchester JT, Mellor MT. Bacteriological Quality of Fabrics Washed at Lower- Than-Standard Temperatures in a Hospital Laundry Facility. *Appl Env Microbiol* 1983;45:591-97.
- 47 Blaser MJ, Smith PF, Cody HJ, Wang WL, LaForce FM. Killing of Fabric-Associated Bacteria in Hospital Laundry by Low Temperature Washing. *J Infect Dis* 1984;149:48-57.
- 48 http://www.cdc.gov/ncidod/dhqp/ar_mrsa.html

SPOTLIGHT - NEWER ANTIBIOTICS FOR THE TREATMENT OF INFECTIONS CAUSED BY GRAM POSITIVE COCCI

Todd Correll, PharmD

University of North Carolina Infectious Diseases Clinic

Disclosures: Speaker - Gilead Sciences

Introduction

Over the past several years a number of new antimicrobial agents have been approved by the United States Food and Drug Administration (FDA) for the treatment of Gram positive infections, and additional drugs for such organisms are likely to be developed. Tigecycline, daptomycin, linezolid and quinupristin-dalfopristin are therapeutic alternatives to vancomycin when clinical failure to this drug occurs, in cases of infection with vancomycin resistant organisms or following intolerable side effects attributed to vancomycin. Although these newer agents provide alternative options to treat many Gram positive infections, vancomycin still remains the treatment of choice for many drug-resistant Gram positive organisms. In clinical trials, these newer agents have often been proven to be non-inferior to (that is, not significantly worse than) vancomycin, but these studies have rarely been powered sufficiently to demonstrate superiority over vancomycin. While the new antimicrobials have broadened the treatment options for a variety of difficult-to-treat infections, they are also associated with an increase in drug acquisition costs and may cause significant adverse drug effects. Additionally, these drugs are not resistance-proof and reduced susceptibility to each has been documented. Below, we review the major new antimicrobials for Gram positive infections and highlight their relative strengths and limitations.

Tigecycline

Tigecycline is a glycylcycline antibiotic derived from the tetracyclines. Similar to the tetracyclines, tigecycline is a bacteriostatic agent and inhibits bacterial growth by binding to the 30S ribosomal subunit. Cross-resistance between tigecycline and the tetracyclines is not universal due to tigecycline's ability to overcome two key mechanisms of resistance: antibiotic efflux and ribosomal protection. Its spectrum of activity includes Gram positive, Gram negative and anaerobic organisms, including methicillin-sensitive and -resistant *Staphylococcus* species (i.e. MSSA and MRSA), vancomycin-sensitive (VSE) and -resistant *Enterococcus* species (VRE), *Streptococcus* species, *E. coli*, *Acinetobacter* species, *Klebsiella* species, *Enterobacter* species, *S. maltophilia*, *Citrobacter* species, and *Serratia*. The drug has excellent activity against anaerobic organisms including *Bacteroides* species.

Tigecycline also has *in vitro* activity against *Mycobacterium* species, but there are limited clinical data to support its use for these organisms. Importantly, tigecycline does not have anti-pseudomonal activity and has limited activity against *Proteus* species and *Providencia* species.

Tigecycline is only available as an injection and is administered parenterally as a 1-hour infusion. It has an extended half-life ranging from 37 to 67 hours and undergoes hepatic metabolism. Tigecycline produced high levels in tissues, including the lung, skin and gastrointestinal organs; however, levels do not routinely exceed the MIC of the organism in the serum or urine. Tigecycline also does not penetrate into the central nervous system (CNS) and is not eliminated through the kidneys. Thus, tigecycline should not routinely be used for catheter-related blood infections, bacteremias, endocarditis, brain abscesses, meningitis or

urinary tract infections due to poor penetration to these sites of infection. Tigecycline requires a 100 mg IV loading dose followed 50 mg IV every 12 hours (See Table 2). Dose reduction is recommended for patients with moderate-to-severe liver dysfunction. The overall incidence of adverse events did not differ between tigecycline and the comparator agents in randomized studies with the exception of nausea and vomiting, which occurred in 20-35% of patients.^{1,2} The frequency and severity of these symptoms tend to be dose related and dissipate after the first 2-3 days of therapy in the majority of patients. Premedication with antiemetic agents (i.e. promethazine) 30 minutes prior to the tigecycline administration may decrease the incidence of nausea and vomiting. Other side effects included headache and pruritis.

Tigecycline is FDA-approved for the management of complicated skin and soft tissue infections and complicated intra-abdominal infections. A New Drug Application has been submitted to the FDA for the treatment of hospital-acquired pneumonia and ventilator-associated pneumonia.

Daptomycin

Daptomycin is a cyclic lipopeptide antibiotic and the first member of the class to be FDA approved. Daptomycin is bactericidal, and its mechanism of action is through the insertion of the drug's lipophilic tail into the bacterial cell membrane causing cell wall depolarization. This allows for potassium efflux leading to inhibition of DNA, RNA and protein synthesis - ultimately resulting in cell death. Unlike vancomycin and beta-lactam agents such as penicillins, daptomycin does not cause bacterial cell lysis and thus, endotoxins from being released. This, theoretically, can be advantageous as some toxins released from infected cells can cause inflammatory reactions. Its spectrum of activity is limited to Gram positive organisms, including MRSA and MSSA, Glycopeptide-Intermediately Resistant *Staphylococcus*, vancomycin-sensitive and -resistant *Enterococcus* species and *Streptococcus* species. Like vancomycin and beta-lactams, daptomycin has been shown to have synergistic effects when used with aminoglycosides and rifampin.

Daptomycin is only available as an injection and is administered parenterally as a 30-minute infusion. Similar to aminoglycosides and fluorquinolones, daptomycin displays concentration-dependent-killing and a post-antibiotic effect. Its half-life is approximately 8 hours, allowing for once-daily dosing. Early studies demonstrated an increase risk of rhabdomyolysis when daptomycin was administered twice a day. However, the risk of rhabdomyolysis is low when administering daptomycin once-daily. Daptomycin obtains high concentrations in the serum and in most tissue compartments. It undergoes renal elimination requiring dose reductions for patients with severe renal dysfunction. Daptomycin does not penetrate the cerebral spinal fluid (CSF) and should not be used for the management of meningitis or brain abscesses. Additionally, daptomycin is inactivated in the lung by surfactant and is not effective for the treatment of pneumonia.

The dose of daptomycin is 4-6 mg/kg IV daily depending on the site of infection (See Table 2). Elevated creatine phosphokinase (CPK) may occur with daptomycin therapy. Baseline CPK level and follow-up levels should be monitored. If elevations occur, daptomycin should be discontinued in patients who are asymptomatic with CPK levels 10 times the upper limit

of normal or in patients who are symptomatic with CPK levels 5 times the upper limit of normal.

Daptomycin is FDA-approved for the management of complicated skin and soft tissue infections and *Staphylococcus* bacteremias with or without right-sided, native valve endocarditis.

Linezolid

Linezolid is the first antimicrobial agent in the oxazolidinone class and exerts its antibacterial effect by binding to the 50S subunit of the ribosome, preventing 70S formation and resulting in inhibition of bacterial synthesis. Its spectrum of activity consists of Gram positive organisms, including methicillin-sensitive and -resistant *Staphylococcus* species, vancomycin-sensitive and -resistant *Enterococcus* species, *Streptococcus* species.

Linezolid is available in oral and injectable formulations. Due to high bioavailability, linezolid can be converted from the intravenous formulation to the oral formulation at the same dose. Linezolid achieves high concentrations in the lung, liver, spleen, skin and vascular system. Linezolid concentrations 30-60% of plasma levels have been identified in the CSF in case reports. Approximately 60-70% of the drug is eliminated via the biliary system with remaining drug elimination via the kidney. The standard dose is 600 mg IV or PO every 12 hours (see Table 2). Dose reductions are not required for patients with renal or hepatic dysfunction.

Long-term use of linezolid has been associated with optic neuritis, peripheral neuropathy and bone marrow suppression. The most commonly reported hematologic side effect attributed to linezolid is thrombocytopenia - occurring in up to 30% of recipients. However, more recent data has demonstrated the risk of linezolid-induced thrombocytopenia is similar to vancomycin when administered for less than 14 days.³ Linezolid is a weak MOA-I type B inhibitor and has been associated with serotonin syndrome when used concomitantly with serotonergic agents. Serotonin syndrome secondary to linezolid is uncommon and does not preclude the use of linezolid with serotonergic agents. However, patients should be carefully monitored for clinical signs and symptoms of serotonin syndrome when initiating these agents together.⁴⁻⁶

Linezolid is FDA-approved for the treatment of vancomycin-resistant *Enterococcus faecium* infections (VRE), nosocomial pneumonia, complicated and uncomplicated skin and soft tissue infections and community acquired pneumonia.

Quinupristin-dalfopristin

Quinupristin-dalfopristin is a 30:70 mixture of a streptogramin B and A. Quinupristin-dalfopristin inhibits bacterial synthesis by binding to the 50S ribosomal subunit. When administered individually, quinupristin and dalfopristin exert modest antimicrobial activity and are usually bacteriostatic. When administered concomitantly, quinupristin and dalfopristin are more potent and able to overcome antimicrobial resistance. The spectrum of activity of this drug is limited to Gram positive organisms, including methicillin-sensitive and -resistant *Staphylococcus* spp and *Streptococcus* spp. Of note, Quinupristin-dalfopristin is only active against *Enterococcus faecium*, including vancomycin-resistant strains, and is not active against *Enterococcus faecalis*.

SPOTLIGHT - NEWER ANTIBIOTICS...
(continued from page 7)

Quinupristin-dalfopristin is only available as an injection and is preferably administered through a central venous catheter as it is often causes thrombophlebitis. The recommended quinupristin-dalfopristin dose is 7.5 mg/kg IV every 8 to 12 hours (See Table 2). It undergoes extensive hepatic metabolism and is not renally eliminated. Quinupristin-dalfopristin inhibits CYP450 3A4, which may result in increased drug concentrations for agents metabolized by this hepatic process. Due to its hepatic metabolism, quinupristin-dalfopristin may cause elevations of AST and/or ALT as well as elevations in total bilirubin. Approximately 10% of patients will develop severe arthralgias and myalgias during quinupristin-dalfopristin therapy. Due to alternative agents with more extensive clinical data and more tolerable side effect profiles, quinupristin-dalfopristin should be reserved for treatment failures or when alternate agents cannot be administered.

Quinupristin-dalfopristin is FDA-approved for the management of vancomycin Resistant *Enterococcus faecium* infections, including bacteremia and complicated skin and soft tissue infections.

Gram positive agents in drug development

Several pharmaceutical companies have Gram positive agents in clinical trials. Oritavancin, dalbavancin and televancin are members of a new antibiotic class called the lipoglycopeptides. Lipoglycopeptides possess Gram positive antibacterial activity including organisms with decreased vancomycin susceptibilities. Dalbavancin and televancin have received

Fast Track status from the FDA for approval consideration and may be available by the middle of 2007 to early 2008. Another agent which has received Fast Track status is ceftobiprole, a cephalosporin with broad Gram negative and Gram positive antimicrobial activity, including *Pseudomonas* and methicillin-resistant *Staphylococcus* spp. Similar to other cephalosporins, ceftobiprole is not effective against *Enterococcus* spp.

Conclusion

As Gram positive infections - including antimicrobial resistant strains - continue to emerge as a major cause of community, institutional and hospital acquired infections, development of new agents to treat these infections is critical. Newer agents for infections caused by Gram positive organisms have a number of strengths and limitations compared to older agents such as vancomycin. Clinicians need to become familiar with these drugs in order to prescribe them safely and appropriately.

We would like to encourage our readers who receive IDCR via mail to change your subscription to either fax or email. Please fill out the subscription information below or change your subscription online at www.IDCRonline.org.

References

- 1 Babinchak T, Ellis-Grosse E, Dartios N, et al. The Efficacy and Safety of Tigecycline for the Treatment of Complicated Intra-Abdominal Infections: Analysis of Pooled Clinical Trial Data. *Clinical Infectious Diseases* 2005;41:S354-67.
- 2 Ellis-Grosse EJ, Babinchak T, Dartois N, et al. The Efficacy and Safety of Tigecycline for the Treatment of Skin and Skin-Structure Infections: Results of 2 Double-Blind Phase 3 Comparison Studies with Vancomycin-Aztreonam. *Clinical Infectious Diseases* 2005;41:S341-53.
- 3.Rao N, Ziran BH, Wagener MM, Santa ER, Yu VL. Similar hematologic effects of long-term linezolid and vancomycin therapy in a prospective observational study of patients with orthopedic infections. *Clinical Infectious Diseases* 2004;38(8):1058-64.
- 4.Huang V, Gortney JS. Risk of serotonin syndrome with concomitant administration of linezolid and serotonin agonists. *Pharmacotherapy*. 2006 Dec;26(12):1784-93.
- 5.Taylor JJ, Wilson JW, Estes LL. Linezolid and serotonergic drug interactions: a retrospective survey. *Clinical Infectious Diseases* 2006;43(2):180-87.
- 6.Lawrence KR, Adra M, Gillman PK. Serotonin toxicity associated with the use of linezolid: a review of post-marketing data. *Clinical Infectious Diseases* 2006;42(11):1578-83.

Table 2. New Agents for the Management of Gram Positive Infections

Agent	Adult Dose & Frequency	In Vitro Activity	FDA-Approved Indications	Side Effect Profile/Comments
Linezolid (Zyvox)	600 mg IV or PO Q12h No dose adjustments for renal or hepatic dysfunction	- <i>S. aureus</i> (MSSA and MRSA) - <i>Streptococcus</i> spp - <i>Enterococcus</i> spp (including VRE)	- Vancomycin-resistant <i>Enterococcus faecium</i> infections - Nosocomial pneumonia - Complicated & uncomplicated skin and soft-tissue infection - Community-acquired pneumonia	- Bone marrow suppression, especially thrombocytopenia - Prolonged use (>14 days) - Overdoses - GI intolerance - Rare events include serotonin syndrome when administered with concomitant serotonergic agents, optic neuritis and peripheral neuropathy
Daptomycin (Cubicin)	Superficial infections: 4 mg/kg IV Q24h Severe or systemic infections: 6 mg/kg IV Q24h Dose adjustment for renal dysfunction (CrCl <30 including HD): 4 to 6 mg/kg Q48h	- <i>S. aureus</i> (MSSA and MRSA) - <i>Streptococcus</i> spp - <i>Enterococcus</i> spp (including VRE)	- Complicated skin and soft-tissue infection - <i>Staphylococcus</i> bacteremia - Right-sided native valve endocarditis due to <i>Staphylococcus</i>	- Elevations in CK that may cause rhabdomyolysis - Inactivated by surfactant and should not be used for treatment of pneumonia
Tigecycline (Tygacil)	100 mg IV Loading dose followed 12 hours after by 50 mg IV Q12h Dose adjustment for severe hepatic dysfunction: 100 mg IV Loading dose followed 12 hours after by 25 mg IV Q12h	Gram Positive - <i>S. aureus</i> (MSSA and MRSA) - <i>Streptococcus</i> spp - <i>Enterococcus</i> spp (including VRE) Gram Negative - <i>Acinetobacter</i> spp - <i>E. coli</i> - <i>Klebsiella</i> spp. - <i>Enterobacter</i> spp. - <i>Citrobacter</i> spp - <i>S. maltophilia</i> - <i>Serratia</i> spp	- Complicated intra abdominal infections - Complicated skin and soft-tissue infection - New Drug Application (NDA) submitted for hospital-acquired pneumonia	- Nausea and vomiting (15-25%); usually diminishes after 2-3 days of therapy - Does not concentrate in serum or urine; should not be routinely used for bacteremias and/or urinary tract infections
Quinupristin/Dalfopristin (Synercid)	7.5 mg/kg IV Q8-12h No dose adjustment is needed for hepatic or renal dysfunction needed for hepatic or renal dysfunction	Anaerobes - <i>S. aureus</i> (MSSA and MRSA) - <i>Streptococcus</i> spp - <i>Enterococcus faecium</i> (including VRE)	- Vancomycin-resistant <i>Enterococcus faecium</i> infections including bacteremia - Complicated skin and soft-tissue infection	- Arthralgias and/or myalgias - Thrombophlebitis - Inflammation and/or pain at infusion site - Drug interactions may occur as inhibits CYP3A4, a major metabolic pathway for certain medications

STANDARD PRECAUTIONS 101

Proposed Standard Precautions For All Patient Care Activities Within the Correctional Setting

Area	Comments	Recommendations
Hand hygiene: Hand washing	Most infections are transmitted from person to person, often on the hands of health care workers. Routine use of soap and water is the most effective way to remove dirt and potentially pathogenic organisms. Alcohol-based hand washes are also very effective, and may be useful adjuncts to hand washing with soap and water. Potential safety and security issues must be addressed prior to the introduction of alcohol-based hand washes.	Hands should be washed routinely, regardless of whether gloves were worn: <ul style="list-style-type: none"> - after touching body fluids or contaminated items - before eating - after using the restroom - when hands are visibly dirty - before moving from one patient to another - when moving from a contaminated to a clean site on the same patient
Hand hygiene: Artificial fingernails	The wearing of artificial fingernails by HCWs has been associated with the transmission of resistant organisms.	HCWs should avoid wearing artificial fingernails while providing health care.
Hand hygiene: Rings	The wearing of rings by HCWs has been associated with an increased risk for transmission of bacteria to patients.	HCWs should limit the wearing of rings while providing health care.
Personal protective equipment: Gloves		Gloves should be worn if contact with blood or another potentially contagious body fluid is likely. Sweat is not a potentially infectious fluid. Gloves do not replace the need for hand washing. Gloves are intended for single use.
Personal protective equipment: Goggles and face shield		Goggles and face shields are not a part of standard precautions. Consider the use of goggles or face shields if involved in a procedure that may lead to splashing of body fluids.
Personal protective equipment: Gowns	Disposable gown	A gown should be used if contact with blood, potentially contagious body fluids, or a contaminated environmental surface is likely.
Sharps		Always have a puncture resistant leak proof container at the site where a sharp instrument is used. If necessary to use a sharp instrument in a cell, take along a portable sharps container for immediate disposal of used sharp instrument. Immediately dispose of all used sharps in a sharps container. Do not transport used sharps except in an approved sharps container. Do not pass used sharps from person to person. Do not bend, break, or recap sharps prior to disposal.
Housing of inmate patients	Overcrowding can facilitate the transmission of many contagious illnesses.	Avoid overcrowding.
Patient hygiene	Poor hygiene can facilitate the transmission of many contagious illnesses.	Inmates should have access to: <ul style="list-style-type: none"> - soap and water - showers
Laundry	Inadequate supply of clean clothing and linen can facilitate the transmission of many contagious illnesses.	Inmates should be provided an ample supply of clean laundry. Inmates who have conditions that predispose to soiling clothing with blood/body fluids should be provided additional laundry access. Inmates should be discouraged from washing their own clothing. Soap and water can remove dirt and odors, but cannot disinfect clothing. Laundry must either reach a temperature of 160 degrees F for a minimum of twenty-five minutes or be done with sufficient bleach to allow for cold disinfection. Clothes dryers also serve as disinfecting agents and pediculicides. Clothing that has been soiled with blood, purulent matter, and other potentially contagious body fluids should be bagged by the user and then placed in a leak proof bag prior to transport to the laundry. Laundry workers should utilize appropriate PPE.
Housekeeping	Environmental surfaces can be a source of transmission of contagious organisms.	All inmate housing areas should be cleaned on a regular schedule utilizing approved disinfectants. Common areas such as booking and bus screen areas, showers, toilets, day rooms, gymnasiums, weight equipment, and clinic waiting rooms should be cleaned frequently.
Transportation	Transportation vehicles can be a source of transmission for a variety of contagious illnesses.	Perform transportation in a hygienic manner while adhering to all listed standard precautions.
Access to medical care	Barriers to health care have been found to be a risk factor for MSRA infection.	Attempts should be made to remove barriers to access to care for those who have potentially contagious skin and soft tissue infections.

Proposed Transmission Based (Contact) Precautions for Patients with Confirmed/Suspected MRSA in the Correctional Setting

Area	Comments	Recommendations
Hand hygiene	As per standard precautions.	As per standard precautions.
Personal protective equipment	Gloves	Gloves should be worn whenever entering the room of a patient who is on contact precautions for MRSA. Gloves should be removed and discarded prior to leaving the patient's room.
Personal protective equipment	Eye protection, face shields	Eye protection and face shields are generally not a part of standard precautions to prevent the transmission of MRSA. These items should only be used during procedures that are likely to cause splashing of body fluids into the eyes or mouth.
Personal protective equipment	Disposable gown	A gown should be worn whenever entering the room of a patient who is on contact precautions for MRSA.
Sharps	Sharps injuries are not a common mechanism for the transmission of MRSA.	As per standard precautions.
Patient care equipment	Patient care equipment (stethoscopes, blood pressure cuffs, otoscopes, etc.) can become contaminated and lead to transmission of pathogenic organisms.	Avoid sharing patient care equipment that has been used on patients who are on contact precautions. If sharing is unavoidable, clean/disinfect the equipment before re-use.
Housing of inmate patients	Overcrowding and contact with a person who is infected or colonized with MRSA have been found to be risk factors for MRSA infection.	In addition to the measures noted in standard precautions: <ul style="list-style-type: none"> - If available, utilize single cell housing for inmates who have draining skin lesions presumed or confirmed to be secondary to MRSA. - If single cell housing is not available, cohort those who have draining skin lesions in a dedicated dormitory setting. - Inmates who have draining skin lesions and who are unable or unwilling to maintain personal hygiene should be placed in an infirmary setting.
Patient hygiene	Poor hygiene has been found to be a risk factor for MRSA infection.	As per standard precautions.
Access to medical care	Barriers to health care have been shown to be risk factors for MRSA infection.	In addition to the details in standard precautions, consideration should be given to the establishment of dedicated wound care clinics and/or wound care teams that attend to inmates in their cells/dorms.
Laundry	Inadequate supply of clean clothing and linen has been found to be a risk factor for MRSA infection.	As per standard precautions.
Housekeeping/sanitation	Environmental surfaces can be a source of MRSA transmission.	As per standard precautions. In addition, implement frequent and terminal cleaning/disinfection of clinical areas and housing of those who are infected with MRSA. Surfaces should be cleaned with either a 1:100 solution of diluted bleach or an EPA-registered hospital disinfectant.
Transportation		In addition to the details in standard precautions: <ul style="list-style-type: none"> - Limit inmate movement to that which is medically/legally necessary. - Utilize dressings that entirely cover any skin lesions and contain any drainage precautions. - Use disposable or washable restraints. - Clean transportation vehicle after transport of the infected person.
Inmate activities	A variety of activities have been shown to lead to person-to-person transmission of MRSA.	In addition to the details in standard precautions, those who have draining wounds should be excluded from: <ul style="list-style-type: none"> - Communal/contact athletic activities - Culinary employment - School attendance - Chapel - Other non-essential group activities

RESOURCES

Bureau of Prisons Clinical Practice Guidelines for the Management of MRSA. August 2005.
www.bop.gov/news/PDFs/mrsa.pdf

County of Los Angeles, Department of Health Services, Public Health. Guidelines for Reducing the Spread of Staph/CAMRSA in Non-Healthcare Settings.
www.lapublichealth.org/acd/docs/MRSA/MRSA_Guideline_12_20_04.pdf

King County Public Health, Seattle, WA. Interim Guidelines for Evaluation and Management of Community-Associated MRSA Infections in Outpatient Settings. September 2004.
www.metrokc.gov/health/providers/epidemiology/MRSA-guidelines.pdf

CDC's website on Healthcare-Associated MRSA (HA-MRSA)
http://www.cdc.gov/ncidod/dhqp/ar_mrsa.html

CDC's website for Providers on CA-MRSA Information.
www.cdc.gov/ncidod/dhqp/ar_mrsa_ca.html

CDC. Methicillin-Resistant Staphylococcus aureus Infections in Correctional Facilities- Georgia, California, and Texas, 2001-2003. MMWR. October 17, 2003;52(41):992-96.
www.cdc.gov/mmwr/preview/mmwrhtml/mm5241a4.htm

CDC. Methicillin-Resistant Staphylococcus aureus Skin or Soft Tissue Infections in a State Prison --- Mississippi, 2000. MMWR. October 26, 2001;50(42):919-22.
www.cdc.gov/mmwr/preview/mmwrhtml/mm5042a2.htm

Slides from the NCCHC Pre-conference Seminar Infectious Diseases in Corrections: An Expert Panel October 28, 2006
<http://www.idcronline.org/archives.html>

Department of Health and Human Services 2006 Adult and Adolescent Antiretroviral Treatment Guidelines
<http://www.aidsinfo.nih.gov/guidelines/>

International AIDS Society-USA Panel 2006 Recommendations of the Treatment for Adult HIV Infection
<http://jama.ama-assn.org/cgi/content/full/296/7/827>

CDC's Revised Recommendations for HIV Testing of Adults, Adolescents, and Pregnant Women in Health-Care Settings
<http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5514a1.htm>

American Academy of HIV Medicine
<http://www.aahivm.org/>

SAVE THE DATES

Academic and Health Policy Conference on Correctional Health

Sponsored by the University of Massachusetts Medical School and UMass Correctional Health
Boston, MA
March 29-30, 2007
Visit: www.umassmed.edu/commedinterior.aspx?id=33110

A System-wide Approach to Managing Chronically Ill Patients in Correctional Health Care

Quincy, MA
March 31, 2007
Sponsored by the National Commission on Correctional Health Care and the Academy of Correctional Health Professionals
Visit: www.correctionalhealth.org/education/seminar_quincy.html

16th Annual HIV Conference of the Florida/Caribbean AIDS Education and Training Center

Orlando, FL
March 30-31, 2007
Visit: www.faetc.org/Conference/

Occupational & Non-Occupational Post Exposure Prophylaxis

Albany Medical College
Accredited Satellite Videoconference & Webstream
April 11, 2007
12:30 - 2:30 p.m. (E.T.)
Visit: www.amc.edu/hivconference
Email: ybarraj@mail.amc.edu
Phone: 518.262.4674

Updates in Correctional Health Care

Orlando, FL
May 5-8, 2007
Visit: www.ncchc.org/education/index.html

Hepatitis in Corrections

Sponsored by the University of Texas Medical Branch and the Texas/Oklahoma AIDS Education and Training Center
May 18, 2007
Moody Gardens Convention Center
Galveston, TX
Email: Victoria.Korschgen@vikorsch@utmb.edu
CME and CNE Credits Available

The 34th Annual International Conference on Global Health

May 29 - June 1, 2007
Washington, D.C.
Visit: www.globalhealth.org/2007_conference/

Correctional Mental Health Seminar

Las Vegas, NV
July 15-16, 2007
Visit: www.ncchc.org/education/MH2007/lasvegas.html

IAS 2007: 4th IAS Conference on HIV Pathogenesis, Treatment and Prevention

Sydney, Australia
July 22-27, 2007
Visit: www.ias2007.org/start.aspx

NEWS AND LITERATURE REVIEWS

Personal Hygiene and Methicillin Resistant Staphylococcus Aureus (MRSA) Infection

Investigators from the Missouri Department of Health and Senior Services conducted a case-control study to examine the risk factors for MRSA infection during a 2002-2003 outbreak in a Missouri women's correctional facility. The study, which largely focused on personal hygiene factors, found that MRSA infection was significantly associated with low composite hygiene scores among the prisoners, after controlling for socio-demographic and other risk factors. The composite hygiene score was created on the basis of three individual hygiene practices: the frequency of hand washing per day, showers per week, and number of personal items shared with other inmates. Of the 55 confirmed MRSA cases, thirty were still available for interview at the time of investigation and 80 inmates were randomly selected as controls. Transmission among inmates appeared to be responsible for the outbreak as pulsed-field gel electrophoresis demonstrated that MRSA isolates were indistinguishable.

Based on these results, the authors conclude that a prison environment can easily become contaminated by MRSA, especially due to the inmates' improper care of infected skin lesions, poor personal hygiene, and close contact within a confined space. The study was limited by the recall bias of participants and the findings may not be applicable to other populations as all subjects were adult women. However, the authors assert that targeted education about MRSA infection, especially the importance of proper personal hygiene, should be an integral part of efforts to eliminate and prevent MRSA infections in prison settings, where inherent restrictions complicate the implementation of certain control measures.

Personal Hygiene and Methicillin Resistant Staphylococcus Aureus Infection. Turabelidze, G. et al. Emerging Infectious Diseases. 2006;12(3):422-27.

Meticillin-Resistant Staphylococcus Aureus Among U.S. Prisoners and Military Personnel: Review and Recommendations for Future Studies

In this study, published in *The Lancet*, investigators reviewed published research examining the prevalence and transmission dynamics of MRSA infection in two high-risk groups: prisoners and military enlistees. Significant risk factors included prison occupation, gender, comorbidities, prior skin infection, and previous antibiotic use. Although several studies suggest that crowded living and work environments, demanding physical activity, and poor hygiene are important risk factors, the authors found few studies that directly tested the epidemiological association with these suggested risk factors. Given the inherent barriers to infection control measures in these populations, the authors are concerned by the overall lack of research in these areas. Additionally, most of the identified studies were retrospective in design, with only one study utilizing prospective surveillance for MRSA colonization. Thus, the authors propose that future research seek to quantify the prevalence of MRSA infection among the entire population in prisons and military settings, rather than only those individuals affected by outbreaks. A more thorough examina-

tion of MRSA acquisition and transmission patterns in these settings might elucidate improved preventive strategies in other crowded and closed settings.

Meticillin-Resistant Staphylococcus Aureus Among U.S. Prisoners and Military Personnel: Review and Recommendations for Future Studies. Allelo, A.E. et al. The Lancet. 2006;6:335-41.

Feasibility and Acceptability of Rapid HIV Testing in Jail

In a study of 100 randomly selected male inmates within the Rhode Island Department of Corrections Jail (RIDOC) - the central facility serving the entire state of Rhode Island - researchers found that there was high acceptance of rapid HIV testing (95/100). Participants in the study completed a questionnaire regarding risk-behavior, incarceration history, HIV-testing history, and attitudes towards testing. Each prisoner then received individualized HIV risk reduction counseling and the option of rapid HIV testing via the OraQuick Rapid HIV test (a blood-based test that returns results in 20-30 minutes). Almost all participants agreed that jail is a good place to perform HIV screening (96/100) and most supported partner notification by the state (83/100).

The findings of this study are significant, the authors suggest, because rapid testing, unlike the more traditional screening methods, allows for the immediate delivery of results and post-test prevention counseling. In this study, all participants received rapid test results and individualized risk reduction counseling prior to release. Despite the improved delivery of final negative results, the obstacle of providing confirmatory results for those subjects with rapid test preliminary positives remains. The one preliminary positive participant in the study was released from the facility prior to receiving his confirmatory test result. In assessing the limitations of the study, the investigators note the small size of the study and the relative comfort of RIDOC inmates with HIV testing in the corrections setting. Nonetheless, the authors highlight the feasibility and overall high acceptance of rapid HIV testing and suggest that further studies are needed to incorporate rapid testing into jail HIV-screening programs.

Feasibility and Acceptability of Rapid HIV Testing in Jail. Beckwith, C.G. et al. AIDS Patient Care and STDs. 2007;21(1):41-47.

Compiled by Ross Boyce, MS1



SELF-ASSESSMENT TEST FOR CONTINUING MEDICAL EDUCATION CREDIT

This activity has been planned and implemented in accordance with the Essential Areas and Policies of the Accreditation Council for continuing Medical Education through the joint sponsorship of Medical Education Collaborative, Inc. (MEC) and IDCR. MEC is accredited by the ACCME to provide continuing medical education for physicians.

Medical Education Collaborative designates this educational activity for a maximum of 1.5 AMA PRA Category 1 Credit(s)TM. Physicians should only claim credit commensurate with the extent of their participation in the activity. Statements of credit will be mailed within 6 to 8 weeks following the program.

Objectives:

- The learner will be able to describe the recommended testing and treatment regimes for MRSA and other gram-positive infections.
- The learner will become familiar with the transmission based precautions specifically designated for both health care workers and inmates as part of the eradication of MRSA in correctional facilities.
- The learner will be able to describe the 2003 Society for Health Care Epidemiology of America (SHEA) guidelines for preventing the nosocomial transmission of MRSA.

1. True or false. Clinicians who examine MRSA infected patients while wearing gloves but not gowns do not frequently acquire MRSA on their clothing and later transfer MRSA to their hands.

TRUE or FALSE?
2. Which of the following should never be used as a single agent for the treatment of MRSA due to rapidly evolving resistance:
 - A. trimethoprim-sulfamethoxazole
 - B. rifampin
 - C. clindamycin,
 - D. tetracyclines minocycline
 - E. doxycycline
3. True or False. Unless a d-zone test has demonstrated susceptibility to clindamycin, this agent should not be used for SA that is erythromycin resistant.

TRUE or FALSE?
4. Which of the following are part of the 2003 Society for Health Care Epidemiology of America (SHEA) guidelines for preventing the nosocomial transmission of MRSA within hospitals?
 - A. Limitations on antibiotic use to decrease the likelihood of antibiotic resistance
 - B. Actively screening all at-risk patients at the time of admission for infection or colonization with MRSA
 - C. Screening for MRSA carriage
 - D. Use of contact precautions for all those found to be colonized or infected with MRSA
 - E. A, B, and D ONLY
5. Which of the following is NOT a part of inmate education as part of the routine eradication of MRSA from correctional facilities?
 - A. Have clothes washed regularly by the institutional laundry service
 - B. Basic skills in the drainage or bandaging of a wound
 - C. Do not share personal items that can transmit infectious agents, such as clothing, towels, bedding, razors, hair brushes and combs, and soap
 - D. Maintain good hygiene by showering regularly

In order to receive credit, participants must score at least a 70% on the post test and submit it along with the credit application and evaluation form to the address/fax number indicated. Statements of credit will be mailed within 6-8 weeks following the program.

Instructions:

- Applications for credit will be accepted until March 31, 2008.
- Late applications will not be accepted.
- Please anticipate 6-8 weeks to receive your certificate.



Please print clearly as illegible applications will result in a delay.

Name: _____ Profession: _____

License #: _____ State of License: _____

Address: _____

City: _____ State: _____ Zip: _____ Telephone: _____

Please check which credit you are requesting ACCME or Non Physicians

I certify that I participated in IDCR monograph - March 2007 Issue

Please fill in the number of actual hours that you attended this activity.

Date of participation: _____

Number of Hours (max. 1): _____

Signature: _____

Please Submit Completed Application to:

Medical Education Collaborative
 651 Corporate Circle, Suite 104, Golden CO 80401
 Phone: 303-420-3252 FAX: 303-420-3259
 For questions regarding the accreditation of this activity, please call 303-420-3252

COURSE EVALUATION

I. Please evaluate this educational activity by checking the appropriate box:

Activity Evaluation					
	<i>Excellent</i>	<i>Very Good</i>	<i>Good</i>	<i>Fair</i>	<i>Poor</i>
Faculty					
Content					
How well did this activity avoid commercial bias and present content that was fair and balanced?					
What is the likelihood you will change the way you practice based on what you learned in this activity?					
Overall, how would you rate this activity?					

II. Course Objectives

Were the following overall course objectives met? At the conclusion of this presentation, are you able to:

- | | | | |
|--|------------|-----------|-----------------|
| • The learner will be able to describe the recommended testing and treatment regimes for MRSA and other gram-positive infections. | YES | NO | SOMEWHAT |
| • The learner will become familiar with the transmission based precautions specifically designated for both health care workers and inmates as part of the eradication of MRSA in correctional facilities. | YES | NO | SOMEWHAT |
| • The learner will be able to describe the 2003 Society for Health Care Epidemiology of America (SHEA) guidelines for preventing the nosocomial transmission of MRSA | YES | NO | SOMEWHAT |

III. Additional Questions

a. Suggested topics and/or speakers you would like for future activities.

b. Additional Comments
