Vancomycin dependent Enterococcus faecium's response to a Vancomycin E-test (Mueller-Hinton Agar - 24+hours, 37°C). Vancomycin dependence may develop from the loss of a functional D-Ala:D-Ala ligase in the VRE strain, which is then unable to survive unless vancomycin induces the production of D-Ala:D-Lac ligase to compensate. This dependence involves mutations to the dll gene which encodes the enterococcal D-Ala:D-Ala ligase protein. From: http://thunderhouse4-yuri.blogspot.com/2014/01/vancomycin-dependant-enterococcus-vde.html

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The UC Davis Antimicrobial Stewardship Program (ASP) was first established in 1986 and then expanded in pediatrics in 2011 and hospital wide in 2013 in response to the growing challenge of antibiotic resistance. Due to increasing antibiotic resistance, patients are at a higher risk for adverse effects and poor outcomes and treatment strategies become more complex.

Antibiotics are life-saving drugs and their use has important implications for patient care and public health. With this in mind, the UC Davis Health ASP strives to ensure all patients receive optimal
antibiotic therapy when indicated. We thank you for your support in putting this very important program into action.

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Ventilator-Associated Pneumonia (VAP)

VAP Diagnosis

- Pneumonia occurring greater than 48 hours after endotracheal intubation
  - Clinical symptoms include purulent tracheal secretions, new infiltrate on chest imaging, worsening oxygenation (usually in association with leukocytosis and/or fever/hypothermia)
- Microbiology: *Staphylococcus aureus*, *Enterobacteriaceae* spp., *Pseudomonas aeruginosa*
  - *Enterococcus* spp. and *Candida* spp. that grow in sputum cultures are highly likely to be colonizers and do not require treatment
- If pneumonia develops within 48 hours of intubation, common organisms are *Streptococcus pneumoniae*, *Haemophilus influenzae*, and *S. aureus*; treat as community-acquired pneumonia
- Obtain endotracheal aspirate and send for Gram-stain and culture
- VAP is unlikely with bacterial burdens below the following thresholds:
  - Protected specimen brush <1,000 CFU/mL
  - Bronchoscopic alveolar lavage fluid <10,000 CFU/mL
  - Endotracheal aspirate <100,000 CFU/mL
• Obtain blood cultures; may be positive in up to 15% of patients
• Consider obtaining *Legionella* urine antigen in patients with immunocompromise

**VAP Treatment**

**Empiric therapy**

• **Coverage for** *Enterobacteriaceae* spp., *P. aeruginosa*, streptococci, and *S. aureus* with an antipseudomonal β-lactam; consider combination therapy with an aminoglycoside with pseudomonal activity if severely ill

• **Coverage for** methicillin-resistant *S. aureus* (MRSA) should be considered if the patient has known history of MRSA colonization or infection, intravenous drug use, necrotizing pneumonia, a recent stay in a nursing home or skilled nursing facility, or prolonged hospitalization with unknown MRSA colonization status

• For all: Cefepime 2 g IV q8hrs

• Add MRSA coverage if indicated or critically ill: Vancomycin per pharmacy

• Add a 2nd empiric gram negative antibiotic if critically ill: Amikacin 10-15 mg/kg IV x 1

**Narrowing and oral therapy**

• If an alternate diagnosis is identified, stop VAP-targeted therapy

• If patient is able to be weaned from a ventilator within 1-2 days, VAP is less likely; consider stopping therapy

• Use respiratory culture results to narrow therapy
  
  − Discontinue antibiotics directed at MRSA and *Pseudomonas* spp. if not recovered
  
  − If a second agent directed at Gram-negative organisms was started empirically, discontinue if an appropriate β-lactam is available for treatment

• After clinical improvement is observed and oral medications can be tolerated, consider conversion from intravenous to oral therapy:

  • Levofloxacin 750 mg PO q24hrs

**Duration**

• 7 days if clinical response by day 3

**References**


**Would You Like Some Salt With That? Sodium in IV Antibiotics.**

IV antibiotics often come with more than just the antibiotic. Sodium is a significant portion of the carrier fluid in many IV ready to use (RTU) formulations or in the IV fluid diluent necessary for the administration of many intravenous antibiotics. In some cases, the amount of sodium infused can exceed 2 g per a day making the treatment of many conditions, congestive heart failure to name just one, significantly more difficult to manage. Yet another reason to switch from IV to PO when it's safe to do so.
Test Your Knowledge

Would you like to win a $10 gift certificate to the sunshine café? Complete the following post-newsletter quiz and submit to hs-ASP@ucdavis.edu to be entered into a raffle for a free lunch.

A 50 year old man with morbid obesity and diabetes presents to the ED from home with chest pain and SOB is found to have a STEMI with new onset heart failure. He is intubated for respiratory failure, undergoes cardiac catheterization with stent placement, and is admitted to the cardiac ICU where he responds to diuresis and medical therapy over the following days. On HD5 he develops fevers, chills, and increased respiratory secretion production for which he undergoes CXR. A new right-sided infiltrate is noted. He is otherwise stable and non-toxic appearing though his WBC count trended up from 8.5 to 10 this morning. He has no history of prior infections or drug use. His MRSA nasal swab was negative 5 days prior. He is started on intravenous antibiotics.

1. Which antibiotic regimen would be most appropriate?
   a. Meropenem 1 g IV q8hrs
   b. Cefadroxil 500 mg IV q12hrs
   c. Ceftriaxone 2 g IV q24hrs + Azithromycin 500 mg IV x 1
2. True or False: The patient's nurse asks whether the patient needed to have been treated with vancomycin as well given the pneumonia's hospital onset. Given the patient's stability, relatively mild illness, and absence of MRSA risk factors or colonization within the prior 7 days vancomycin was not necessary as the probability of MRSA infection was very low.

3. The patient rapidly improves, he is extubated a few days later, and he is ready for discharge by HD9. He has tolerated his antibiotics and is now tolerating a full cardiac diet without event. His most recent QTc on EKG is 410. Which regimen would be best to complete his antibiotic treatment for his ventilator acquired pneumonia (VAP)?
   a. Trimethoprim-Sulfamethoxazole 1 DS tab PO daily
   b. Azithromycin 250 mg PO daily
   c. Levofloxacin 500 mg PO daily
   d. Amoxicillin 500 mg PO twice daily

4. Which IV antibiotics come with more than the daily recommended allowance of sodium (> 2.3 g) in a typical daily dosing?
   a. Penicillin G, Ampicillin, Nafcillin, Piperacillin-Tazobactam, Linezolid
   b. Piperacillin-Tazobactam, Vancomycin, Trimethoprim-Sulfamethoxazole
   c. Ciprofloxacin, Levofloxacin, Piperacillin-Tazobactam
   d. None of the above

ASP Gold Star Recognition

The following staff have been recognized by the Antimicrobial Stewardship team for their dedication to combating antimicrobial resistance and commitment to the principles of antimicrobial stewardship:

- Blair Colwell (Peds)
- Swati Patki (IM)

Meet the Stewardship Team

Alan Koff is an Infectious Diseases physician working with the Antimicrobial Stewardship team. After completing medical school in Australia, he moved to Connecticut where he did Internal Medicine residency and Infectious Diseases fellowship. He has an interest in clinical ID and treatment of infections in patients who are immunosuppressed. In his free time, he enjoys hiking and spending time with his family and dogs.
Fun Microbe Fact

*Pseudomonas natriegens*, an ocean-dwelling bacterium, has one of the shortest generation times known. It can go from birth to reproduction in 10 minutes flat. In five hours a single cell could theoretically give rise to more than 1 billion offspring.


Contact Us

The Antimicrobial Stewardship Program Team Members

Adult ASP Physicians:

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- Archana Maniar, MD
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- Natasha Nakra, MD
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ASP Pharmacists:

- Monica Donnelley, PharmD, BCIDP
Antibiotic questions? Contact us.

See the On-Call Schedule for the ASP attending/fellow of the day

Contact the ASP Pharmacist at 916-703-4099 or Vocera "Infectious Disease Pharmacist"