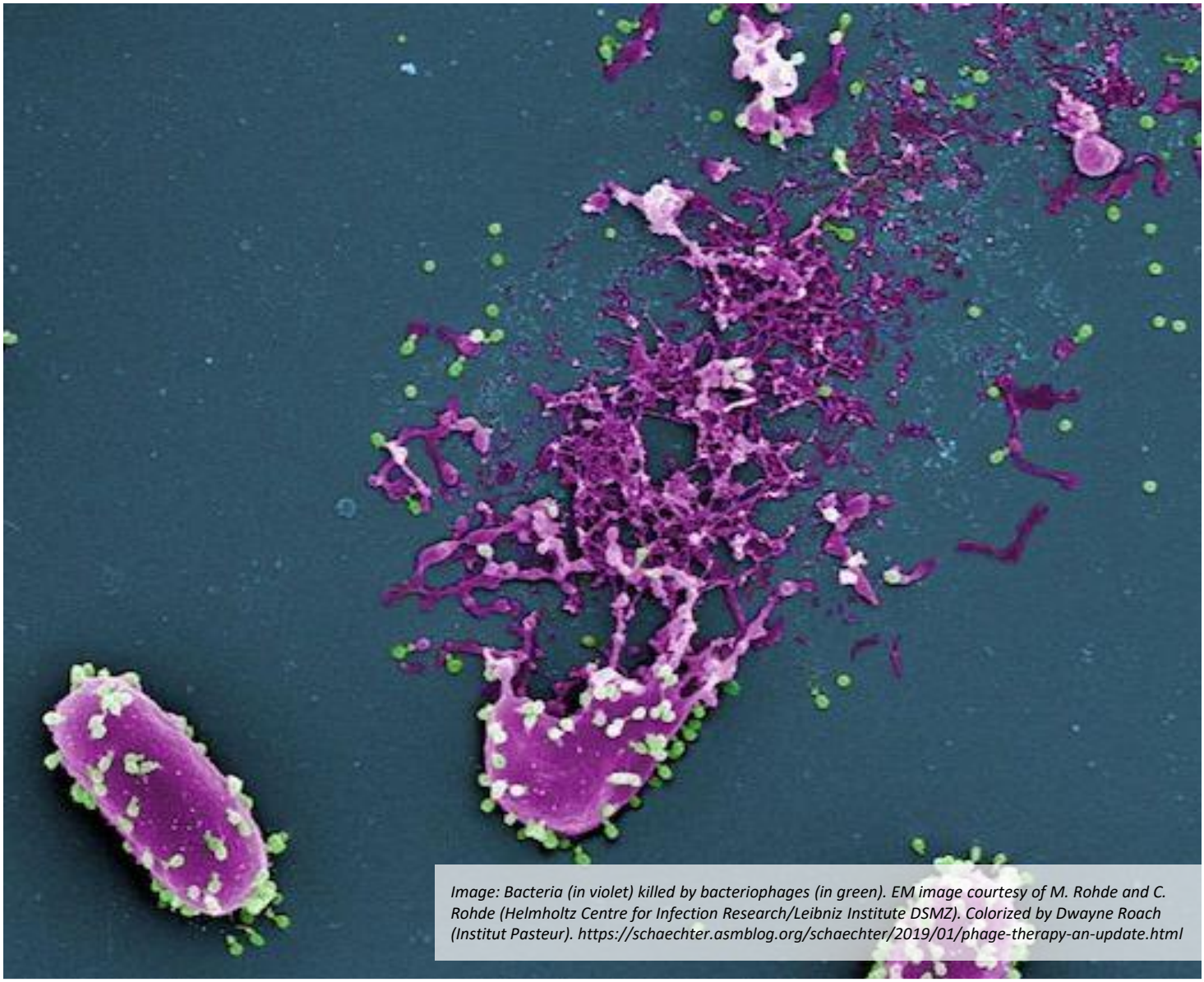

Image: Bacteria (in violet) killed by bacteriophages (in green). EM image courtesy of M. Rohde and C. Rohde (Helmholtz Centre for Infection Research/Leibniz Institute DSMZ). Colorized by Dwayne Roach (Institut Pasteur). https://schaechter.asmblog.org/schaechter/2019/01/phage-therapy-an-update.html

UC Davis Health Antimicrobial Stewardship Program

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In This Issue

Ventilator-Associated Pneumonia (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: *Staphyloccocus 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

Treatment

- **Empiric therapy**
  - Coverage for *Enterobacteriaceae* spp., *P. aeruginosa*, streptococci, and *S. aureus* with an anti-pseudomonal 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 clincial response by day 3

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GNRs in the Hospital - Empiric Rxs from our Antibiogram

Problem: Patients with hospital-onset sepsis may require broad empiric gram negative treatment. **Cefepime** is sufficient in most cases, but for those already or recently on antibiotics what is the next best option while cultures incubate?

UCDH ANTIBIOGRAM
01/01/2021 - 12/31/2021
PERCENT OF ISOLATES SUSCEPTIBLE

Inpatient ICU - Gram Negative Organisms

Category		Single Drug						Combination			
Organism	n	Piperacillin/ Tazobactam	Ceftriaxone	Cefepime	Meropenem	Levofloxacin	Amikacin	Pip-tazo + Amikacin	Pip-tazo + Levofloxacin	Cefepime + Amikacin	Cefepime + Levofloxacin
breakpoints (mcg/mL)		16/4	8	8	2	2	16				
Acinetobacter baumannii complex	28[A]	0	0	67	75	75	85	85	75	85	75
breakpoints (mcg/mL)		16/4	1	2	1	0.5	16				
Enterobacter cloacae complex	38	78	72	92	100	100	100	100	100	100	100
Escherichia coli	95	92	77	81	98	70	100	100	95	100	83
Klebsiella pneumoniae	67	94	80	80	100	84	100	100	97	100	89
breakpoints (mcg/mL)		16/4		8	2	1	16				
Pseudomonas aeruginosa	102	68	-	78	80	70	98	98	85	98	88

Inpatient Non-ICU - Gram Negative Organisms

Category		Single Drug						Combination			
Organism	n	Piperacillin/ Tazobactam	Ceftriaxone	Cefepime	Meropenem	Levofloxacin	Amikacin	Pip-tazo + Amikacin	Pip-tazo + Levofloxacin	Cefepime + Amikacin	Cefepime + Levofloxacin
breakpoints (mcg/mL)		16/4	1	2	1	0.5	16				
Enterobacter cloacae complex	34	70	64	85	100	97	100	100	100	100	100
Escherichia coli	280	95	80	81	99	71	99	100	97	100	87
Klebsiella pneumoniae	87	89	85	86	100	81	100	100	95	100	89
breakpoints (mcg/mL)		16/4		8	2	1	16				
Pseudomonas aeruginosa	112	90	-	92	91	83	99	100	95	100	95

Take Home: Empiric Cefepime ± 1 dose Amikacin > Meropenem

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 diabetes presenting to the ED from home with chest pain and SOB is found to have a STEMI. He is intubated for respiratory failure, undergoes cardiac catheterization with stent placement, and is admitted to the cardiac ICU. On HD5 he develops fevers, chills, and increased respiratory secretions for which he undergoes CXR. A new right-sided infiltrate is noted. He is otherwise stable. His MRSA nasal swab was negative 5 days prior. He is started on 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
   d. Cefepime 2 g IV q8hrs

2. True or False: The patient's nurse asks whether the patient needs vancomycin as well due to the pneumonia's hospital onset. Given his stability, mild illness, and absence of MRSA risk factors or colonization within the prior 7 days vancomycin was not necessary.

3. The patient rapidly improves. He is extubated a few days later, and he is ready for discharge by HD9. He is now tolerating a cardiac diet. 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 750 mg PO daily
   d. Amoxicillin 500 mg PO twice daily

4. A patient who recently received ceftriaxone for a possible UTI develops septic shock on HD5. The source is not immediately clear. What would be the most appropriate GNR treatment?
   a. Cefepime plus a single dose of levofloxacin
   b. Meropenem monotherapy
   c. Cefepime plus a single dose of amikacin

Answers to last Newsletter's quiz: 1. D, 2. True, 3. D, 4. A

ASP Gold Star Winners for September 2022

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

- Lauren Damon (IM)

Fun Microbe Fact:

There are more than 1400 species of bacteria that call your belly button home, with as many as 662 of those not previously identified until the Belly Button Biodiversity Project analyzed them.

https://phys.org/news/2011-07-multiple-strains-bacteria-human-belly.html

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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 by Vocera "Infectious Disease Pharmacist"