A close-up photograph of a petri dish containing a red agar medium. A central vertical streak of white bacterial growth is visible, flanked by several horizontal streaks of similar growth. The agar is a vibrant red color, and the bacterial streaks are a pale, creamy white.

# UC Davis Health Antimicrobial Stewardship Program

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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.

*Image: Colonies of Granulicatella adiacens on 5% sheep blood agar (lateral streak line) supported by Staphylococcus aureus (center streak line).  
<https://schaechter.asmblog.org/schaechter/2018/01/a-whiff-of-taxonomy-granicatella-and-abiotrophia.html>*

## In This Issue

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# Urinary Tract Infections (UTI)

## Diagnosis

- **First, ask about SYMPTOMS**
  - Acute cystitis: dysuria, frequency, urgency, suprapubic pain
  - Pyelonephritis: fever, flank pain
  - Catheter-associated UTI (CAUTI): main symptoms are subrapubic pain and fever; patients with catheters may not report dysuria, frequency, or urgency
- If a person has symptoms, obtain a urinalysis (UA) and culture
  - A positive UA shows evidence of inflammation (e.g., elevated white blood cells)
  - A positive urine culture is defined as  $\geq 10,000$ - $100,000$  CFU/mL of a urinary pathogen ( $\geq 1,000$  in patients with urinary catheters)
  - A positive culture in the absence of symptoms does not benefit from treatment in most cases
- If a chronic indwelling catheter is in place, remove and replace it before sending UA and culture

## Treatment

Assess prior urine culture data, as previous susceptibility patterns can help guide antibiotic choice.

- **Uncomplicated acute cystitis** (cystitis in a female without urologic abnormality or catheter):
  - Oral therapy preferred; avoid fluoroquinolones
  - Nitrofurantoin 100 mg PO BID (preferred)
  - Cephalexin 500 mg PO TID
  - TMP/SMX 1 DS tab PO BID
  - Fosfomycin 3 g sachet x 1
- **Uncomplicated pyelonephritis in women**
  - Fluoroquinolones and trimethoprim/sulfamethoxazole are preferred given excellent penetration into the kidney when the isolate is susceptible
  - Levofloxacin 750 mg PO daily (preferred)
  - TMP/SMX 1-2 DS tabs PO BID
  - Ceftriaxone 1 g IV q24h or Cefepime 1 q IV q8h depending on whether nosocomial
- **Complicated UTI** (UTI occurring in the presence of urologic abnormality, pregnancy, or urinary catheter or UTI in men)
  - UTI in men in the absence of obstructive pathology (e.g., renal stone, stricture, enlarged prostate) or urinary catheter is uncommon
  - Remove and do not replace urinary catheters whenever possible
  - Nitrofurantoin 100 mg PO BID
  - Ceftriaxone 1 g IV q24h or Cefepime 1 q IV q8h depending on whether nosocomial
  - TMP/SMX 1 DS tab PO BID

## Duration

<b>Uncomplicated acute cystitis</b>	Nitrofurantoin or cephalosporin: 5 days TMP/SMX: 3 days Fosfomycin: 1 day
<b>Uncomplicated pyelonephritis</b>	TMP/SMX: 7-10 days Fluoroquinolone: 5-7 days IV and Oral cephalosporins: 10-14 days (shorter course if early response)
<b>Complicated UTI (including CAUTI)</b>	Nitrofurantoin or cephalosporin: 10-14 days (7 days if entire course IV) TMP/SMX: 7 days Fluoroquinolone: 5-7 days

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## Influenza: A Refresher

Influenza (flu) is a contagious respiratory illness caused by influenza virus types A & B. Influenza infects the upper and lower airways. Influenza A viruses are classified into subtypes according to two surface antigens: the hemagglutinin (HA) and neuraminidase (NA) antigens, which determine nomenclature (eg, H1N1, H3N2).

Influenza viruses are spread from person to person, through contact with respiratory secretions (through sneezing, coughing, talking, touching), contaminated objects (fomites), or small particle aerosols that are released into the air during breathing.

All inpatients at UCDMC with influenza should be placed on droplet precautions.

### Treatment:

Treatment with antivirals should be *initiated within 48-hours of symptom onset* for greatest benefit.

For most patients, antivirals lessen symptoms and shorten time of illness ~24 hours. Antivirals may also reduce risk for influenza-associated complications in the following high-risk patients: hospitalized, severe/progressive illness, age > 65 or < 2 years, morbid obesity, chronic lung disease (asthma, COPD), weakened immune system (HIV or AIDS, cancer, immunosuppressive medications, etc.), liver, kidney, or heart disease.

Antiviral (Class)	Formulations	Adult Treatment Dose	Duration*	Safe in Pregnancy?	UCD Formulary?	Clinical Considerations
Oseltamivir (Tamiflu®, generic)  (Neuraminidase inhibitor)	PO (capsule & suspension)	CrCl ≥ 60 ml/min: 75 mg PO BID  CrCl > 30 < 60: 75 mg x1, then 30 mg BID  CrCl > 10-30: 30 mg daily  ≤10 ml/min: 30 mg every other day  HD dosing: 30 mg x1 then 30 mg after each HD	5 days	Yes Preferred	Yes	Higher doses are no longer recommended in severe illness or immunocompromised patients  Capsules may be opened and mixed with a sweetened liquid  (For pediatrics and/or suspension not available)
Peramivir (Rapivab®)  (Neuraminidase inhibitor)	IV	CrCl ≥ 50 ml/min: 600 mg  CrCl 30-49 ml/min: 200 mg  CrCl 10-29 ml/min: 100 mg  HD dosing: 100 mg given <u>after</u> HD	Single dose*	Yes Alternative	Restricted [ID approval]	*For hospitalized patients, doses may be given daily for up to 5-10 days.  Call pharmacy for repeat dosing in patients with CrCl < 50 ml/min & renal replacement therapy  Should only be used when patient cannot tolerate or absorb enterically administered oseltamivir due to gastric stasis, malabsorption, or GI bleed.

Baloxavir [Xofluza*]  (Endonuclease Inhibitor)	PO (Tablet, suspension)	Weight-based dosing: < 80 kg: 40 mg ≥ 80 mg: 80 mg	Single dose	No No data	Restricted [ID approval]	Avoid administration with polyvalent cations (Ca, Fe, Mg) as co-administration may reduce baloxavir exposure
Zanamivir [Relenza*]  (Neuraminidase inhibitor)	Inhaled  Requires manufacturer-specific inhaler device for administration.	10 mg [provided by 2 inhalations] BID	5 days	Yes Alternative	Not Stocked	Avoid in patients with respiratory conditions e.g., asthma or COPD  The foil blister disk containing zanamivir should <u>not</u> be manipulated, solubilized, or administered via nebulizer.

\* Longer durations may be used in immunocompromised patients. Page ASP on-call, or call ID Pharmacy x3-4026 for guidance

### Prophylaxis:

The CDC does not recommend widespread or routine use of antiviral medication for chemoprophylaxis. The dosing for chemoprophylaxis is lower than the treatment doses listed in the table above and duration varies. *The annual influenza vaccine remains the best way to prevent the flu.* Vaccination can be given well before influenza virus exposures occur and can provide safe and effective immunity throughout the influenza season.

Indications for post-exposure antiviral prophylaxis:

After exposure to influenza, asymptomatic adults and children aged ≥3 months of age with one of the following:

1. Very high risk of developing complications from influenza e.g., severely immunocompromised persons
2. For whom influenza vaccination is contraindicated, unavailable, or expected to have low effectiveness
3. Unvaccinated patients who are household contacts of a person at very high risk of complications from influenza e.g., severely immunocompromised persons

### Vaccination:

Annual influenza vaccine is recommended for everyone 6 months of age and older. For more information on influenza vaccine options, visit the CDC website: <https://www.cdc.gov/flu/prevent/flushot.htm>

### Prevention:

- Avoid close contact with people who are sick
- Stay home when sick (isolate until afebrile > 24 hours)
- Cover nose and mouth with a tissue when coughing and sneezing, then immediately dispose of tissue
- Wash your hands with soap and water, or use alcohol-based hand rub if soap and water not available
- Avoid touching your eyes, nose, mouth
- Clean and disinfect surfaces that may be contaminated with flu virus

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# Mononucleosis – A Better Test Than The Heterophile Ab

**Problem:** Mononucleosis is primarily diagnosed by a positive heterophile antibody (Ab) test in a patient with a compatible clinical syndrome. Test specificity is not perfect, however, and sensitivity is limited early in the disease course (~75% in 1<sup>st</sup> week), especially in young children (< 5 years old).

**Solution:** The EBV Ab profile has improved performance vs the heterophile Ab with improved sensitivity early in disease and in young children. Its turnaround time is the same and there are not substantial cost differences. Because of this, **the EBV Ab profile will become the default EBV serological test at UCD coming in 2023.**

## Clinical Interpretation:

Epstein Barr Antibody Profile (Specimen #22S-213SC0171) (Order 312447509)  
Order: 312447509

Status: Final result Visible to patient: Yes (seen) Dx: MDS (myelodysplastic syndrome), low g...

### Results

#### Epstein Barr Antibody Profile

0 Result Notes

Component	Ref Range & Units	3 mo ago
EBV NA Ab, IgG	Negative	<b>Positive !</b>
EBV EA Ab, IgG	Negative	
EBV VCA Ab, IgG	Negative	<b>Positive</b>
EBV VCA Ab, IgM	Negative	

Comment: This test is performed on the Bioplex 2200. Indicates a past infection with EBV. Evaluate in conjunction with other EBV antibodies and clinical status of patient.

Comment: This test is performed on the Bioplex 2200. No IgG antibodies to EBV Early Antigen detected. Evaluate antibodies and clinical status of patient.

Comment: This test is performed on the Bioplex 2200. Indicates a current or previous infection with EBV. Evaluate antibodies and clinical status of patient.

Comment: This test is performed on the Bioplex 2200. Indicates no current infection; however, specimens with detectable levels of IgM antibody. If a primary infection is less than 7 days.

Resulting Agency

Panel includes Ab testing for 4 viral antigens:

VCA IgM & IgG turn + at sx onset

EBNA IgG turns + wks – mos after infxn

Combination of Ab results guide interpretation:

- VCA IgM/IgG assess acute infection
- EBNA IgG assess prior or resolving infection
- EBNA IgG less useful

### Narrative

Patterns of serological response to EBV Infection:

CLINICAL STAGE	EBNA	EBEA	VCA-IGG	VCA-IGM
No Previous/Susceptible	Negative	Negative	Negative	Negative
Acute Infection	Negative	POSITIVE or Negative	POSITIVE	POSITIVE
Recent Infection	POSITIVE or Negative	POSITIVE or Negative	POSITIVE	POSITIVE or Negative
Past Infection	POSITIVE	Negative	POSITIVE	Negative
Reactivation *	POSITIVE	POSITIVE	POSITIVE	POSITIVE Or Negative

\* Antibody to the EA with a positive EBNA does not necessarily indicate that a patient's current medical condition is caused by EBV reactivation. Healthy individuals with no symptoms can have antibodies to early antigen for years after initial EBV infection. Reactivation can occur subclinically. (Table based on CDC website and ARUP Consult.)



## 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](mailto:hs-ASP@ucdavis.edu) to be entered into a raffle for a free lunch!

A 63-year-old female with Type II diabetes is seen in the ED following 24 hours of vomiting and dysuria. She is hemodynamically and afebrile. Exam is notable for some right-sided CVA tenderness, but she is otherwise non-toxic appearing. Her CBC is unremarkable, and she is discharged home.

1. What empiric antibiotic course is most appropriate for this patient?
  - a. Nitrofurantoin 100 mg PO BID x 10-14 days
  - b. Fosfomycin 3 g sachet PO x 1
  - c. Levofloxacin 750 mg PO daily x 5-7 days
2. True or False: A urine culture growing >100,000 CFUs of *Pseudomonas aeruginosa* in a stable patient with a foley catheter (bladder catheter was switched out prior to obtaining the culture) and no fever or localizing symptoms still requires treatment with antibiotics to prevent complications.
3. When should urine cultures be obtained in a patient with a foley catheter in place?
  - a. When the urine appears cloudy / foul smelling & after the catheter has been replaced
  - b. When symptoms suggestive of a UTI are present & after the catheter has been replaced
  - c. Immediately when symptoms suggestive of a UTI are present to prevent delay
4. True or False: In testing for mononucleosis, the EBV antibody profile has improved sensitivity early in disease and in young children compared to the heterophile antibody.

Answers to last Newsletter's quiz: 1. D, 2. T, 3. C, 4. C

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## ASP Gold Star Winners for November 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:

- Christina Sollinger (NICU)
- Kristine Markham (PICU)

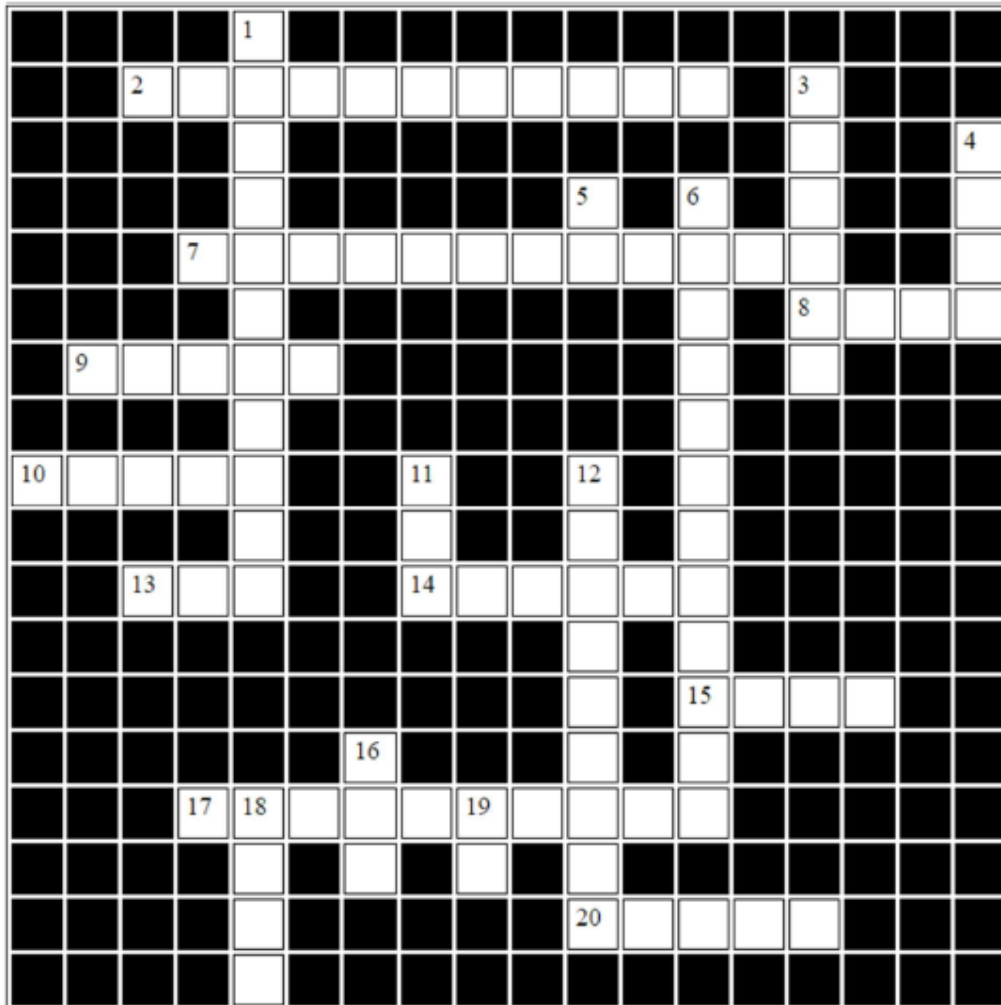
### Quick Antibiotic Fact:

#### Ertapenem

A carbapenem that doesn't kill *Acinetobacter*, *Pseudomonas*, or *Enterococcus* (the APEs). Meropenem is better for A&P, Imipenem for E.



# WORLD ANTIMICROBIAL AWARENESS WEEK MINI CROSSWORD CHALLENGE



### Across

2. Antimicrobial \_\_\_\_: efforts to improve antimicrobial prescribing practices
7. When this *Streptococcus* spp. is cultured in the blood, consider colonoscopy; note taxonomic reclassification in 2003
8. '\_\_\_\_penem': carbapenem lacking coverage against *Acinetobacter*, *Pseudomonas*, and *Enterococcus*
9. Emerging *Candida* spp. with multi-drug resistance, first described in 2009
10. *Staphylococcus aureus*: Gram positive \_\_\_\_ in clusters
13. Asymptomatic Bacteriuria: Symptom Free \_\_\_\_, Let it Be (National campaign from Association of Medical Microbiology and Infectious Disease Canada)
14. '\_\_\_\_mycin': lincosamide associated with high risk of *Clostridioides difficile* infection
15. '\_\_\_\_cycline': associated with photosensitivity and esophagitis
17. Discovered by Sir Alexander Fleming in 1928 and treatment of choice for syphilis
20. '\_\_\_\_mycin': associated with rhabdomyolysis and eosinophilic pneumonia

### Down

1. Third-generation cephalosporin with activity against *Pseudomonas* spp.
3. *Candida* spp. inherently resistant to fluconazole
4. Possesses the *mecA* gene which produces penicillin binding protein 2a (PBP2a)
5. Prolongation with fluoroquinolones, macrolides, and azoles
6. Class of antifungals that poorly penetrate the CSF, urine, and eyes
11. Lowest concentration at which a drug prevents visible growth of a bacteria
12. Associated with thrombocytopenia and serotonin syndrome
16. Undetectable = untransmissible (U = U)
18. Enzymes produced by some *Enterobacterales* that can render penicillins and cephalosporins ineffective
19. Improved patient outcomes when consulted for *Staphylococcus aureus* and *Enterococcus* spp. bacteremia, and candidemia

## Contact Us

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**Antibiotic questions? Contact us.**

<https://health.ucdavis.edu/antibiotic-stewardship/>

**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"**