A petri dish containing several bacterial cultures on a yellow agar medium. The cultures are in various stages of growth and are colored in shades of pink, blue, mint green, and black. A small, clear plastic container with a red cross is visible in the lower-left quadrant of the dish. The background is a white, textured surface.

# 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: "The Lowly Snail - A Mighty Tale of Resilience" by Joanne Touchberry. CHROMagar Candida plates with Candida krusei (pink), Candida tropicalis (blue), Candida albicans (mint green), Exophiala jeanselmei (black). <https://www.flickr.com/photos/193578416@N07/51636910700/>*

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## Diagnosis

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- Clinical spectrum of infection ranges from watery diarrhea with lower abdominal pain, cramping, and nausea (with or without low-grade fevers and leukocytosis) to severe or fulminant colitis
- Case definition:  $\geq$  three unformed stools in a 24-hour period without an alternative explanation and positive stool test for *C. difficile*
- Patients with severe disease may have ileus without stool output; these patients generally have colitis on imaging, abdominal pain/distention, and systemic illness
- Nucleic acid tests detect the gene that produces the toxin that causes CDI but not the presence of the toxin itself; thus, given that up to 30% of hospitalized patients can be colonized with *C. difficile* but not actively infected, patients with positive nucleic acid tests who do not have symptoms consistent with CDI should not be treated for CDI
- 30% of patients have recurrent CDI within 30 days of treatment (retest to confirm the diagnosis)
- *C. difficile* testing recommendations
  - Do not test formed stool samples
  - Confirm patient has not received a laxative in the previous 48 hours
  - Do not test infants <1 year of age
  - Do not repeat testing within 7 days

## Treatment

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Discontinue antibiotics not used for CDI treatment whenever possible

If antibiotic therapy is still needed, select the narrowest agent possible and avoid agents with a strong association with CDI (i.e., fluoroquinolones, clindamycin, and third- and fourth-generation cephalosporins)

Discontinue gastric acid suppression medications whenever possible

Do not prescribe anti-motility agents

- **Non-severe CDI**
  - Adults: vancomycin (125 mg orally (PO) 4 times a day) or fidaxomicin for 10 days
  - Children: metronidazole (7.5 mg/kg/dose PO 4 times a day) or vancomycin (10 mg/kg PO 4 times a day) for 10 days
- **Severe** (WBC  $\geq$ 15,000 cells/mL and/or serum creatinine  $\geq$ 1.5 mg/dL associated with CDI) or **fulminant CDI** (hypotension, intestinal perforation, toxic megacolon)
  - Obtain abdominal imaging and prompt surgical consultation
  - Adults: vancomycin 125 mg PO/nasogastric tube (NG) 4 times a day for severe colitis; vancomycin 500 mg PO/NG 4 times per day for fulminant colitis for 10 days
  - Children: vancomycin 10 mg/kg/dose PO/NG 4 times a day for severe or fulminant colitis for 10 days
  - If ileus present, vancomycin can also be administered via rectum as a retention enema, along with metronidazole intravenously for 10 days



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# C diff at UC Davis

Tests  
Diagnosis  
Treatment

## What's Unique?

*We screen all eligible adult patients upon admission for Clostridium difficile with a rectal swab PCR test. This test looks for C diff capable of producing toxin. It identifies colonization, not disease. Colonized patients are at greater risk for disease & transmission.*

### Things to know...

- A positive screening test should not be used for diagnosis & does not require a follow up diagnostic test in the absence of symptoms consistent with C diff infection (CDI)
- Colonized patients will be placed on "Contact Enteric" precautions for the duration of their hospital stay
- In the absence of CDI, colonized patients do not need to continue isolation precautions upon discharge or transfer to another facility
- Hand washing with soap and water is necessary for both colonized and infected patients to further reduce transmission

## What's the Same?

*Everything else.*

- Diagnostic testing with the "stool toxin EIA" is diagnostic in patients with signs and symptoms compatible with CDI. False positives are still possible, however, if:  
*<3 watery BMs/day... on stool softeners... on tube feeds... other causes of diarrhea present*
- Given increases in community-onset C diff infection (CO-CDI) consider early diagnostic testing in those admitted complaining of diarrhea
- There is no utility in tests for cure or repeat testing if < 7 days from last negative test

*Treat all 1<sup>st</sup> cases of CDI with:*

*Vancomycin 125 mg PO q6h x 10 days*

*Further guidance for recurrent or severe disease available on UCD's [ASP website](#)*

FY2021 HO-CDI SIR: **0.59**  
SIR = Standardized Infection Ratio

2022 HO-CDI SIR goal: **< 0.7**  
SIR = Standardized Infection Ratio

Questions? Email [hs-ASP@ucdavis.edu](mailto:hs-ASP@ucdavis.edu)

# CARBAPENEM-RESISTANT ACINETOBACTER BAUMANNII (CRAB)

## Background

- ❖ Aerobic, gram negative coccobacillus
- ❖ Associated with pneumonia, wound, bloodstream, and urinary tract infections
- ❖ Risk factors: ICU admission, prolonged hospitalization, recent surgery, antimicrobial exposure, central venous catheter use, prior hospitalization
- ❖ Contaminates healthcare facility surfaces and shared medical equipment

## Resistance Mechanisms

- ❖ Beta lactamase enzymes inactivates antibiotics
- ❖ Reduced entry into the target site
  - Reduced number and size of porin channels; upregulation of efflux systems
- ❖ Alteration of the target or cellular functions
  - Point mutations confer quinolone resistance
  - Sulbactam resistance via mutations in penicillin-binding proteins (PBPs)

## Approach to Therapy

- ❖ Consider ID consult for patients with limited treatment options
- ❖ Empiric coverage should be based on local antibiogram
  - UCDMC outpatient/ED *A. baumannii* isolates are 81% susceptible to cefepime and 90% susceptible to meropenem
- ❖ Tetracyclines like minocycline may be effective
  - Newer agents such as eravacycline have activity against CRAB
- ❖ Clinical evidence for use of ampicillin-sulbactam against CRAB
  - The sulbactam component is the active drug

## 2017 NATIONAL ESTIMATES

Cases in hospitalized patients	8,500
Deaths	700
Healthcare costs	\$281M

## PERCENT OF ISOLATES THAT TESTED NON-SUSCEPTIBLE TO OTHER TYPES OF ANTIBIOTICS

Select Antibiotics	2013	2014	2015	2016	2017
Any fluoroquinolone	98%	93%	97%	92%	89%
Any extended-spectrum β-lactam	80%	75%	81%	79%	75%
Ampicillin/sulbactam	62%	62%	59%	64%	61%
Trimethoprim/sulfamethoxazole	84%	74%	81%	77%	66%

Source: Centers for Disease Control and Infection

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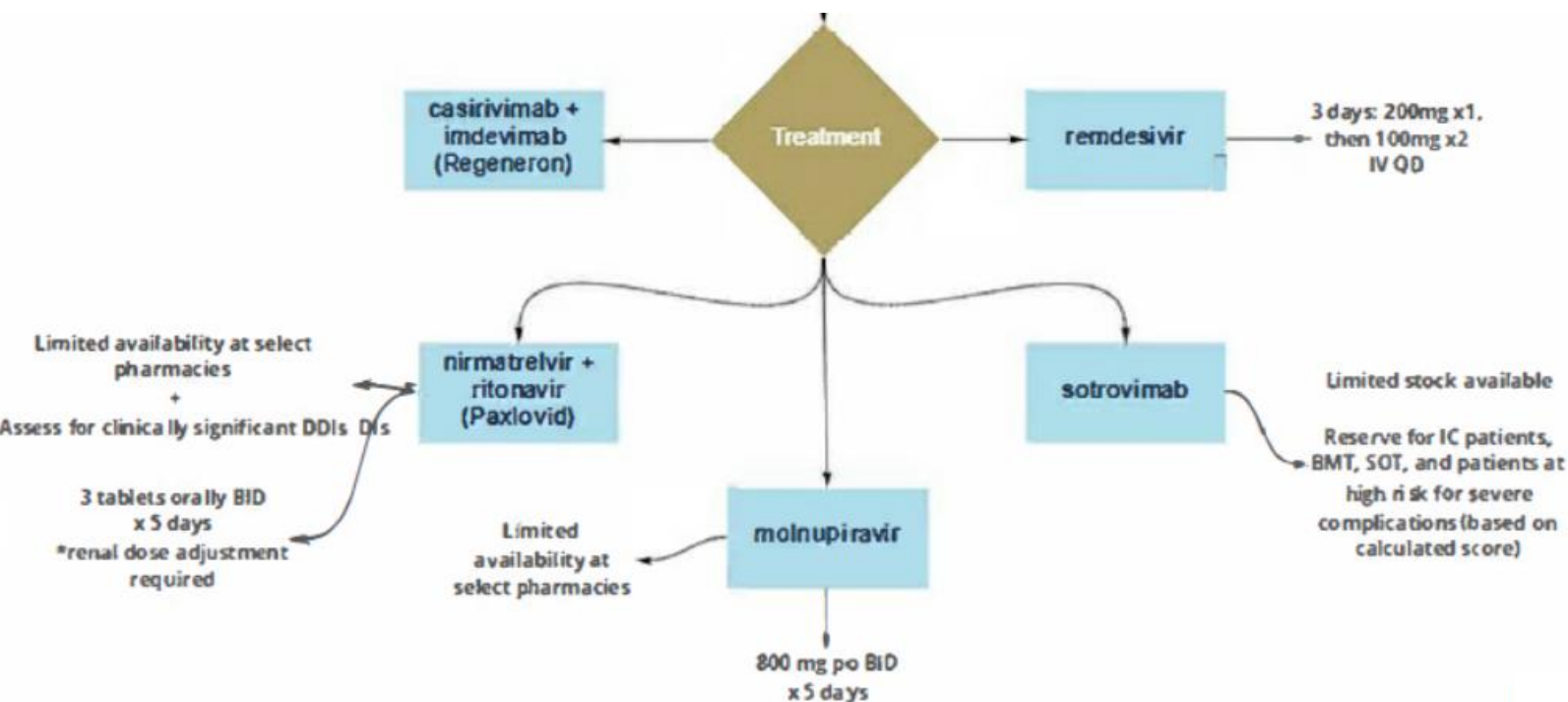
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# NEW OUTPATIENT COVID-19 THERAPEUTICS

- Contact “COVID-19 Therapeutics Attending” for questions & guidance



## 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 50-year-old man presents to the ED with chest pain, and is found to have a NSTEMI. Upon admission his C diff rectal swab PCR returns positive, and he is placed on Contact Enteric isolation. For reasons that are not entirely clear a urinalysis is obtained and returns positive for leukocyte esterase. He is started on ceftriaxone for UTI. On HD5 he develops new diarrhea having 6 Bristol stool class 7 BMs overnight. He is otherwise stable and well. A C diff stool toxin EIA returns positive. This is his first episode of CDI.

1. What antibiotic is most appropriate at this time?
  - a. Vancomycin 1 g q12hrs + Cefepime 2 g q8hrs
  - b. Cefazolin 2 g q8hrs
  - c. Vancomycin 1 g q12hrs
  - d. Clindamycin 900 mg q8hrs
2. True or False: The patient's nurse asks whether he should have been treated upon admission because his screening swab was positive. Because the patient was not having any symptoms of CDI at the time, however, the patient is only colonized, and treatment is not indicated.
3. While reviewing the patient's chart you see he is also on pantoprazole. It was started a few years ago for heartburn and he has taken it ever since. The overnight resident had also started him on loperamide after his diarrhea started. He remains on ceftriaxone with no end date ordered. What additional interventions may improve outcomes?
  - a. Stop the patient's loperamide
  - b. Stop the patient's PPI
  - c. Stop the patient's ceftriaxone
  - d. Stop all the above

Answers to last Newsletter's quiz: 1. B, 2. True, 3. D., 4. False (updated)

## ASP Gold Star Winners for January 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:

- Dwayne Walker (EM Pharm) • Gabe Wilds (PMR)
- Emily Hsu (ICU Pharm)

### Fun Microbe Fact:

It takes 1 million organisms of salmonella bacteria to infect mice with normal microbiomes. After a single dose of antibiotics, it took only 10 organisms to infect them. That is a one hundred-thousand-fold difference.

Source: <https://microbe.med.umich.edu/some-interesting-facts-missing-microbes>

## Contact Us

The Antimicrobial Stewardship Program team members

### Adult ASP Physicians:

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### Pediatric ASP Physicians:

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### ASP Pharmacists:

Monica Donnelley, PharmD  
Nicola Clayton, PharmD  
Jen Curello, PharmD  
James Go, PharmD

**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"**