

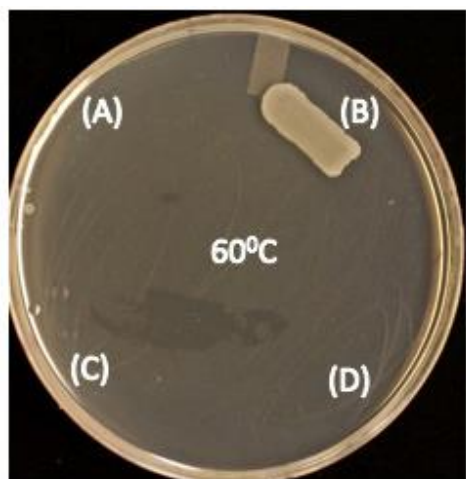
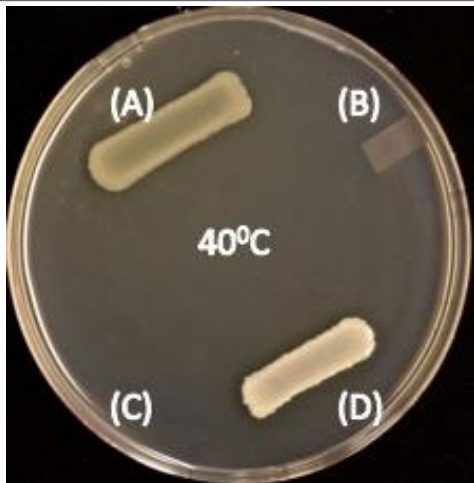
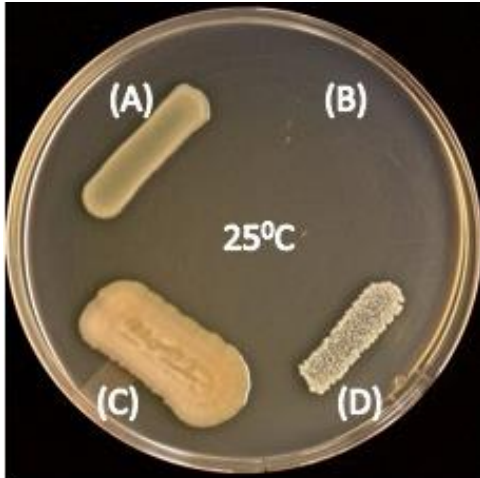
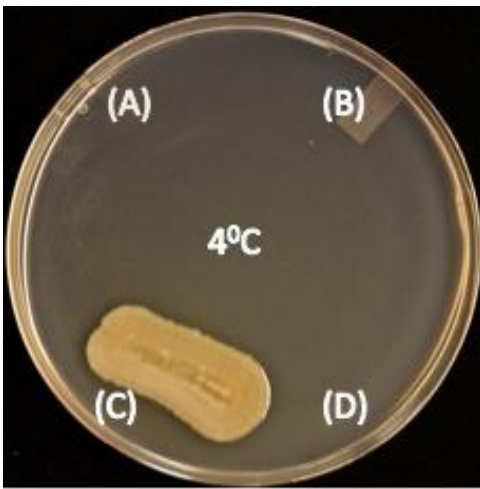
UC Davis Health Antimicrobial Stewardship Program

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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: Temperature experiment: (A) Staphylococcus aureus, (B) Bacillus stearothermophilus, (C) Pseudomonas fluorescens, and (D) Escherichia coli grown on TSA for 24 hrs at varying incubator temperatures (4, 25, 40, and 60°C)
<https://asm.org/Image-Gallery/Temperature-Experiments>



In This Issue

- Asymptomatic Bacteriuria:
What You Need to Know
- GNR Bacteremia:
How to Quickly Rule Out ESBLs
- Test Your Knowledge
- March-April Gold Star Winners

Diagnosis

- Asymptomatic bacteriuria (ASB) is a positive urine culture in a patient with no signs or symptoms of a urinary tract infection (e.g., dysuria, frequency, urgency, fever, flank pain).
- Asymptomatic bacteriuria (ASB) is common and often associated with pyuria (urine containing ≥ 10 white blood cells per high-powered field).

Population	Prevalence of ASB	Prevalence of Pyuria in Persons With ASB
Healthy premenopausal women	< 5%	32%
Women 65-90 years old	6-16%	
Women > 90 years old	22-43%	
Diabetic women	9-27%	70%
People receiving hemodialysis	28%	90%
Female long-term care residents	25-50%	90%
Male long-term care residents	15-35%	90%
Presence of indwelling urinary catheter	100%	50-100%

Treatment

- The majority of patients with ASB and/or asymptomatic pyuria **SHOULD NOT** be treated.
- Studies have demonstrated that treatment of ASB does not prevent urinary tract infections (UTIs), but is associated with adverse events related to antibiotic use and the development of future UTIs that are antibiotic resistant.
- Exceptions
 - Pregnant patients: treatment prevents preterm labor and pyelonephritis.
 - Patients about to undergo a urologic procedure in which mucosal bleeding is expected (not urinary catheter placement): treatment prevents urosepsis.

How can I prevent unnecessary treatment of asymptomatic bacteriuria?

- Do not order urine cultures unless your patient has signs and symptoms of a UTI, including in patients undergoing preoperative evaluation or patients with urinary catheters (except in pregnant patients or those about to undergo a urologic procedure in which mucosal bleeding is expected).

Note:

- Foul-smelling or cloudy urine does not indicate a UTI.
- Mental status change alone does not indicate a UTI.

References

1. Boscia JA, Kobasa WD, Abrutyn E, et al. Lack of association between bacteriuria and symptoms in the elderly. *Am J Med.* 1986 Dec;81(6):979-82. PMID: 3799658.
2. Boscia JA, Kobasa WD, Knight RA, et al. Therapy vs no therapy for bacteriuria in elderly ambulatory nonhospitalized women. *JAMA.* 1987 Feb 27;257(8):1067-71. PMID: 3806896.
3. Cai T, Mazzoli S, Mondaini N, et al. The role of asymptomatic bacteriuria in young women with recurrent urinary tract infections: to treat or not to treat? *Clin Infect Dis.* 2012 Sep;55(6):771-7. PMID: 22677710.
4. Cai T, Nesi G, Mazzoli S, et al. Asymptomatic bacteriuria treatment is associated with a higher prevalence of antibiotic resistant strains in women with urinary tract infections. *Clin Infect Dis.* 2015 Dec 1;61(11):1655-61. PMID: 26270684.
5. Harding GK, Zhanel GG, Nicolle LE, et al. Antimicrobial treatment in diabetic women with asymptomatic bacteriuria. *N Engl J Med.* 2002 Nov 14;347(20):1576-83. PMID: 12432044.
6. Lin K, Fajardo K, U.S. Preventive Services Task Force. Screening for asymptomatic bacteriuria in adults: evidence for the U.S. Preventive Services Task Force reaffirmation recommendation statement. *Ann Intern Med.* 2008 Jul 1;149(1):W20-4. PMID: 18591632.
7. McKenzie R, Stewart MT, Bellantoni MF, et al. Bacteriuria in individuals who become delirious. *Am J Med.* 2014 Apr;127(4):255-7. PMID: 24439075.
8. Nicolle LE. Asymptomatic bacteriuria in the elderly. *Infect Dis Clin North Am.* 1997 Sep;11(3):647-62. PMID: 9378928.
9. Nicolle LE, Bjornson J, Harding GK, et al. Bacteriuria in elderly institutionalized men. *N Engl J Med.* 1983 Dec 8;309(23):1420-5. PMID: 6633618.
10. Nicolle LE, Bradley S, Colgan R, et al. Infectious Diseases Society of America guidelines for the diagnosis and treatment of asymptomatic bacteriuria in adults. *Clin Infect Dis.* 2005 Mar 1;40(5):643-54. PMID: 15714408.
11. Nicolle LE, Mayhew WJ, Bryan L. Prospective randomized comparison of therapy and no therapy for asymptomatic bacteriuria in institutionalized elderly women. *Am J Med.* 1987 Jul;83(1):27-33. PMID: 3300325.
12. Nicolle LE. SHEA Long-Term-Care-Committee. Urinary tract infections in long-term-care facilities. *Infect Control Hosp Epidemiol.* 2001 Mar;22(3):167-75. PMID: 11310697.
13. Nordenstam GR, Brandberg CA, Odén AS, et al. Bacteriuria and mortality in an elderly population. *N Engl J Med.* 1986 May 1;314(18):1152-6. PMID: 3960089.
14. Saint S, Kaufman SR, Rogers MA, et al. Condom versus indwelling urinary catheters: a randomized trial. *J Am Geriatr Soc.* 2006 Jul;54(7):1055-61. PMID: 16866675.
15. Warren JW, Anthony WC, Hoopes JM, et al. Cephalexin for susceptible bacteriuria in afebrile, long-term catheterized patients. *JAMA.* 1982 Jul 23;248(4):454-8. PMID: 7045440.
16. Warren JW, Tenney JH, Hoopes JM, et al. A prospective microbiologic study of bacteriuria in patients with chronic indwelling urethral catheters. *J Infect Dis.* 1982 Dec;146(6):719-23. PMID: 6815281.

GRAM-NEGATIVE BACTERIA:

- *Acinetobacter calcoaceticus-baumannii* complex
- *Bacteroides fragilis*
- *Enterobacterales*
 - *Enterobacter cloacae* complex
 - *Escherichia coli*
 - *Klebsiella aerogenes*
 - *Klebsiella oxytoca*
 - *Klebsiella pneumoniae* group
 - *Proteus* spp.
 - *Salmonella* spp.
 - *Serratia marcescens*
- *Haemophilus influenzae*
- *Neisseria meningitidis*
- *Pseudomonas aeruginosa*
- *Stenotrophomonas maltophilia*

GRAM-POSITIVE BACTERIA:

- *Enterococcus faecalis*
- *Enterococcus faecium*
- *Listeria monocytogenes*
- *Staphylococcus* spp.
 - *Staphylococcus aureus*
 - *Staphylococcus epidermidis*
 - *Staphylococcus lugdunensis*
- *Streptococcus* spp.
 - *Streptococcus agalactiae*
 - *Streptococcus pneumoniae*
 - *Streptococcus pyogenes*

YEAST:

- *Candida albicans*
- *Candida auris*
- *Candida glabrata*
- *Candida krusei*
- *Candida parapsilosis*
- *Candida tropicalis*
- *Cryptococcus* (*C. neoformans*/*C. gattii*)

ANTIMICROBIAL RESISTANCE GENES:

- **Carbapenemases**
 - IMP
 - KPC
 - OXA-48-like
 - NDM
 - VIM
- **Colistin Resistance**
 - *mcr-1*
- **ESBL**
 - CTX-M
- **Methicillin Resistance**
 - *mecA/C*
 - *mecA/C* and MREJ (MRSA)
- **Vancomycin Resistance**
 - *vanA/B*

Interpreting Rapid Diagnostic Blood Culture Results



Rapid Diagnostic Blood Culture Test

When blood cultures are initially found to be positive, we use the BioFire Blood Culture Identification (BCID2) Panel to rapidly identify what organism(s) and microbial genes are present in the blood. The BioFire panel can detect 43 different microorganisms and some genes (listed in the panel on the left).

Below, we highlight some important concepts to keep in mind as you are assessing the results of the BioFire rapid diagnostic blood culture panel.

Organism species ("spp.")

Some of the organisms on the BioFire panel are listed as a "spp." which is the abbreviation for "species." If the BioFire panel lists one of these, it means that the organism present is part of that genus but is not one of the other species listed on the panel. For example: if BioFire detects "*Streptococcus spp.*" then the species is not *agalactiae*, *pneumoniae*, or *pyogenes*, as these species are listed on the panel. Instead, it could be an unlisted species such as viridans group *Streptococcus* or *Streptococcus anginosus* group.

Streptococcus spp.	Not Detected	Detected !
Comment: An organism of the Streptococcus genus has been detected that is not identified by this panel. Refer to culture results for organism identification.		
Streptococcus agalactiae (Group B)	Not Detected	Not Detected
Streptococcus pneumoniae	Not Detected	Not Detected
Streptococcus pyogenes (Group A)	Not Detected	Not Detected

ESBL-producing *E. coli*

When the BioFire panel detects the presence of a gram-negative organism that may carry genes that confer antibiotic resistance, it will reveal the PCR results for those genes (shown in the image below).

CTX-M - beta lactam resistance	Not Detected	Not Detected
KPC - carbapenem resistance	Not Detected	Not Detected
IMP - beta lactam resistance	Not Detected	Not Detected
NDM - beta lactam resistance	Not Detected	Not Detected
OXA-48-like - beta lactam resistance	Not Detected	Not Detected
VIM - beta lactam resistance	Not Detected	Not Detected

CTX-M is the most common gene conferring production of extended-spectrum beta-lactamases (ESBL) in *E. coli*. If a BioFire panel detects the presence of *E. coli* but does **not** detect the CTX-M gene, then we can confidently infer that the *E. coli* present is **not** an ESBL-producing organism and carbapenems are likely not needed. If CTX-M is present, then therapy should be broadened to meropenem or ertapenem.

Test Your Knowledge

Would you like to win a \$10 gift certificate to Starbucks? Complete the following post-newsletter quiz and submit to 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 nausea and vomiting after visiting with her grandchildren who had recent GI symptoms as well. She becomes slightly altered and her glucose is noted to be 523. Aside from the nausea she denies any other symptoms. She is hemodynamically stable and afebrile. Apart from a mild AKI and acidemia the rest of her initial labs are otherwise unremarkable.

1. What type of urinalysis should you order to assess for glucosuria or ketonuria?
 - a. Urinalysis with Reflex
 - b. Urinalysis - Complete
2. True or False: A urinalysis with reflex is ordered accidentally and shows a positive leukocyte esterase and nitrites in addition to glucosuria and ketonuria. Mental status changes alone are indicative of a UTI and should be treated with antibiotics if the urine culture grows bacteria.
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: A patient with dysuria, urinary frequency, and fevers is admitted for probable UTI. They are started on ceftriaxone. Blood cultures turn positive at 24 hours for *E. coli* with a positive BCID flag for CTX-M. The patient is still febrile, but otherwise stable. They should stay on their empiric ceftriaxone until drug susceptibility testing is completed on the *E. coli*.

Answers to last Newsletter's quiz: 1. B, 2. F, 3. A, 4. T

ASP Gold Star Winners for March & April



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 Cralle (Vasc Surg)
- Kristine Markham (Peds)
- Jess Witkowski (Peds)

Quick Antibiotic Fact:

Penicillin

Most beta-hemolytic Streptococci remain uniformly susceptible to penicillin for which it remains the drug of choice.

Contact Us

The Antimicrobial Stewardship Program team members

Adult ASP Physicians:

Stuart Cohen, MD
Archana Maniar, MD
Sarah Waldman, MD
Scott Crabtree, MD
Natascha Tuznik, DO
Christian Sandrock, MD
Larissa May, MD
Alan Koff, MBBS

Pediatric ASP Physicians:

Natasha Nakra, MD
Jean Wiedeman, MD
Ritu Cheema, MD
Elizabeth Partridge, MD

ASP Pharmacists:

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

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"