



# LABletter

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### • Outpatient Antibiogram - Antibiotic Susceptibility of Bacteria

- Streptococcus & Enterococcus
- Staphylococci
- Gram Negative Rods
- Campylobacter sp.

### Laboratory Update:

Whooping Cough is Back

### Q&A:

Community-acquired methicillin resistant  
Staphylococcus aureus (CA-MRSA)

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### Special Information Bulletin:

- Specimen Labeling
- Anaerobic Culture Collection

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## Antibiotic Susceptibility of Bacteria

### Outpatient Antibiogram

Influenza season is fast approaching: As of November 11, there have been no verified influenza A or B detections reported in California and only very rare isolations have been reported throughout the U.S. Data is updated weekly at the California Influenza Surveillance Project website: <http://www.dhs.ca.gov/ps/dcdc/VRDL/html/FLU/fluintro.htm>

Once the "flu" reaches our area, however, we always experience increasing numbers of patients with post-influenza respiratory tract infections. Thus it is timely that we are releasing our annual

antibiotic surveillance data, encompassing outreach patient isolates from 2005. Common respiratory infections following influenza are Hemophilus influenzae, Klebsiella pneumoniae, Streptococcus pneumoniae, and more recently, Staphylococcus aureus. See more information on community-acquired methicillin-resistant Staphylococcus aureus in the Q & A section. These bacterial infections secondary to influenza are another reason for EVERY eligible person to receive the influenza vaccine as early as possible.

### Streptococci and Enterococci

Percent Susceptible by Broth Microdilution, Etest, or Disk Diffusion	No. Tested		Penicillin or Ampicillin		Cefuroxime	Ceftriaxone	Vancomycin	Erythromycin	Clindamycin	Trimethoprim/sulfa	Tetracycline (Doxycycline)	Moxifloxacin	Nitrofurantoin (urines only)	Ciprofloxacin	Quinopristin/dalfopristin	Linezolid
	%S	%I	%R	%R												
<b>Streptococci</b>																
Grp. B (Strep. agalactiae) (a)	463	100	0	0	100	77	82									
Viridans (various species) (c)	83	83	15	2	100	100	71	85								
Strep. pneumoniae (d)	84	74	20	6	89	90	100	81	89	81	100					
<b>Enterococcus (no species I.D.) (b,e)</b>																
Enterococcus faecalis (b)	755	100	0	0		100					18	99	88		100	
Enterococcus faecium (b)	23	96	0	4		100					25	92	92		100	
Enterococcus faecium (b)	20	20	0	80		85					61	33	11	90	100	

(a) Penicillin is the drug of choice for all beta hemolytic streptococci; no clinical penicillin resistance has been documented  
 (b) If susceptible, ampicillin is the drug of choice when enterococci must be treated. Ampicillin susceptibility predicts piperacillin susceptibility. Nitrofurantoin or ampicillin is recommended for uncomplicated UTI. Serious infections (septicemia, endocarditis) required both a  $\beta$ -lactam agent and an aminoglycoside. Use vancomycin+aminoglycoside only if strain is ampicillin-resistant or patient is penicillin-allergic. High level resistance to gentamicin also indicates lack of synergy for tobramycin, amikacin and kanamycin.  
 (c) Clinically important species tested  
 (d) Penicillin-susceptible isolates are also susceptible to all other  $\beta$ -lactam agents. Beta-lactamase inhibitor combination drugs do not add additional efficacy to penicillin alone. Penicillin-intermediate strains may respond to increased penicillin dosing, except for meningitis, which requires ceftriaxone or cefotaxime. Infectious diseases consultation is recommended for meningitis in penicillin-allergic patients or those with intermediate or resistant ceftriaxone or cefotaxime results.  
 (e) Daptomycin not generally recommended for Enterococcus spp.

**“Major finding: 35% of all Staphylococcus aureus are oxacillin or methicillin resistant (MRSA) precluding use of any cephalosporin or penicillin agent for primary wound therapy”**

These charts represent the antimicrobial susceptibility profiles of the organisms that the Microbiology Laboratory isolated from outpatient specimens. Please note that these are overall patterns and individual patient isolates may have very different susceptibilities. Interpretation of susceptibility results: Results are reported as minimum inhibitory concentrations (MICs), the minimum amount of drug needed to inhibit growth. Interpretive criteria are based on achievable serum levels. Thus, for certain antibiotics, the amount

excreted into the urine via the kidneys is above the MIC and may be reported as “resistant”, but the agent is effective clinically in this site. Intermediate results (I) especially for beta-lactam agents; indicate that doses higher than standard recommendations may be effective. In other cases, (I) results indicate that the organism may be susceptible or resistant but the in vitro tests are not sensitive enough to determine specifically. For this antibiogram, Intermediate results are not included with the “%S” category.

**Staphylococci**

Percent Susceptible by Broth Microdilution	No. Tested	Antibiotics										
		Penicillin (a)	Nafcillin, Oxacillin (b,c)	1st generation Cepheems (c)	Vancomycin	Erythromycin	Clindamycin	Gentamicin	Trimeth/Sulfa	Ciprofloxacin	Tetracycline (Doxy)	Linezolid
Staphylococcus aureus, ALL(b)	1306	11	65	65	100	50	89	99	99	75	99	100
MRSA (ONLY) (c)	462	0	0	0	100	4	78	98	99	34	93	100
Staph. lugdunensis	17	53	100	100	100	88	100	100	100			100
Staph. coagulase negative (other)	55	16	47	47	100	43	77	85	87	86		100

(a) Penicillin-resistant staphylococci should be considered resistant to all penicillinase-sensitive penicillins, including ampicillin, amoxicillin, mezlocillin, piperacillin and ticarcillin. (b) For empiric therapy where S. aureus is a potential pathogen, nafcillin and first generation cepheems are recommended drugs of choice for infections other than serious or systemic, for which vancomycin should be used until the susceptibility results are available. (c) Oxacillin resistant staphylococci (MRSA & MRSE) should be considered resistant to all penicillins, cephalosporins, imipenem and beta-lactams including combinations with clavulanic acid, sulbactam and tazobactam. Oxacillin susceptibility predicts susceptibility to all other beta-lactams.

**Haemophilus Influenzae**

For infections with  $\beta$ -lactamase-producing H.influenzae: cefuroxime, cefotaxime, trimethoprim/sulfamethoxazole, amoxicillin/clavulanate or azithromycin is recommended. Cefotaxime or ceftriaxone is drug of choice for CNS infections. At Stanford, 77% of H.influenzae are ampicillin susceptible.

**Campylobacter sp.**

(n = 45)

% Resistant

Ciprofloxacin	24% R
Doxycycline	49% R
Erythromycin	0% R

**Gram Negative Rods (a)**

Percent Susceptible by Broth Microdilution	No. Tested (b)	PENICILLINS			CEPHEMS				Lactams		AMINO GLYC'S		OTHERS			Urine Only		
		Ampicillin	Amp/Sulbactam	Pip/Tazobactam	Cefazolin	Cefuroxime P.O.	Cefotaxime	Ceftriaxone	Cefepime	Aztreonam (c)	Imipenem	Gentamicin	Tobramycin	Ciprofloxacin	Levofloxacin	Trimeth/Sulfamethox	1ST GENERATION Cep'h's [oral]	Nitrofurantoin
Acinetobacter baumannii	22		91					86	23	95	86	82	95	100	100			
Acinetobacter lwoffii	17		100						76	47	100	100	100	100	100	94		
Citrobacter freundii	41		83	100	2	90	100	98	100	66	100	95	95	98	98	85		97
Citrobacter koseri	53	0	100	100	100	34	100	100	100		100	100	100	100	100	100		96
Enterobacter aerogenes	58	9	70	100	3	97	100	100	100	100	100	100	100	100	100	100		8
Enterobacter cloacae	52	12	24	90	2		82	79	100	89	98	98	98	92	92	94		26
Escherichia coli	2640	59	69	100	94	84	94	99	99	98	100	94	94	89	89	78	56	97
Klebsiella oxytoca	63	6	82	100	70	97	100	100	100	97	100	100	100	98	100	100		83
Klebsiella pneumoniae	293	0	92	99	99	92	100	100	100	100	100	99	100	99	99	94	96	22
Morganella morganii	18	11	11	100	11	17		100	100	100		83	89	89	77		0	
Proteus mirabilis	217	85	92	100	95	98	100	100	100	99		89	91	94	97	90		0
Pseudomonas aeruginosa	346								88	84	96	79	97	83	82			
Salmonella spp. (d)	19	84						90						100		95		
Serratia marcescens	55	2	4	84	0		77	90	95	87	100	98	93	91	96	93		
Shigella spp.	20	20						100						100		5		
Stenotrophomonas maltophilia	57																	

(a) Until final identifications are available, reports describe gram negative rods as lactose-fermenters (LF; such as E.coli, Klebsiella, Enterobacter, Citrobacter); non-lactose fermenters (NLF, such as Proteus, Serratia, Salmonella, Shigella), or non-fermenters (NF, such as Pseudomonas, Acinetobacter, Stenotrophomonas, and others, most of which are intrinsically more resistant to many antibiotics). (b) Not all isolates tested against every antibiotic listed. Not all data corrected for duplicates. (c) Unlike aztreonam, aminoglycosides have synergistic activity with  $\beta$ -lactams (ex: piperacillin, ampicillin) against aerobic gram negative rods and enterococci. Aztreonam should only be used for treating documented infections due to susceptible organisms in patients with anaphylactic reactions to  $\beta$ -lactams. In patients with renal insufficiency, aminoglycosides can be administered safely when doses are adjusted for patient's renal function. (d) Infectious Diseases consultation strongly recommended for determining treatment of Salmonella sp. recovered from blood.

## For Best Patient Care with Fast, Accurate Test Results:

### Specimen Labeling Requirements

To improve the accuracy of patient identification, **all specimens** submitted to the Laboratory for testing **must have at least 2 patient identifiers**.

Please submit all specimens labeled with patient's name, date of birth, or other unique identifier (ID#) as follows:

#### Specimen collection tubes, vials or containers:

- Each collection tube, vial or container must be clearly labeled directly on the slide and/or specimen collection container with patient's name, date of birth, or other unique identifier (ID#), including Liquid Based Cytology such as ThinPrep® or SurePath®, cultures & any specimen in miscellaneous containers.

#### Slides:

- Each slide must be clearly labeled with patient's name, date of birth, or other unique identifier (ID#)
- A label placed on the outside of a slide container is not considered acceptable.
- Use **pencil** to label the slides. (Pen washes off in processing).
- Please place slides in appropriate carrier and submit with a matching requisition.

#### All specimens must be submitted with a matching requisition

Reference: *The Joint Commission on Accreditation of Healthcare Organizations (JCAHO) Laboratory Services National Patient Safety Goals & the College of American Pathologists (CAP) includes a directive to use at least two patient identifiers when providing care, treatment or services.*

### Anaerobic Cultures – The best specimens give fast, accurate test results

Please:

- Submit tissue or aspirates only.
- Submit tissue or aspirated fluids in Anaerobic Transport media.
- Transport promptly at **Room Temperature**.
- See “**Microbiology at Stanford Quality Collection and Handling Brochure**” for specimen collection information. Request brochure from your Sales/Service Representative.
- **Swabs are not acceptable for anaerobic culture:** See “**Microbiology at Stanford Quality Collection and Handling Brochure**” for complete list of unsuitable specimens.
- Swab samples for anaerobic culture are not suitable for the following reasons:
  - Air is toxic to anaerobes.
  - Contamination (swabs can pick up small numbers of normal subsurface anaerobic organisms)
  - Adsorbed bacteria do not release from the swab material causing inconsistent inoculum deposition on all plates.
  - Anaerobes, which are most viable in the tissue at the edge of the infectious process, are not picked up in the swab, which only holds 0.05 ml of liquid sample because the most liquid portion adsorbs first and saturates the swab.

## Laboratory Update:

*Whooping Cough is back and on the rise.*

Our local area is catching up to the rest of the country in experiencing a dramatic increase in cases of whooping cough, particularly in school-age young adults. Palo Alto High School reported an outbreak beginning in late October. Since then >35 suspected cases and 7 laboratory-confirmed cases (Stanford Clinical Laboratory) have been diagnosed.

Caused by the bacterium *Bordetella pertussis*, the disease is characterized by a protracted course marked by a persistent cough, often resulting in an expiratory “whoop” sound at the end when the patient can finally breathe again. Beyond 10 years after the initial vaccine (DPT) was given, immunity wanes and the disease can flare up. Symptoms in vaccinated patients are usually milder and may not be recognized as pertussis. Treatment early in the course of disease can prevent spread to other susceptible hosts but does little to mitigate the symptoms.

**The test of choice** is molecular amplification of specific genes in the bacterium's chromosome by polymerase chain reaction (PCR). A much less sensitive (30% vs. PCR) test, direct microscopic detection by fluorescent antibody (DFA), is also performed at our laboratory, but only if PCR testing will be delayed. **It is recommended that both tests be ordered:**

See following test ordering information.

Please use the special specimen transport kit (with directions for collection inside)

- Send both a slide for DFA and the nasopharyngeal sample for PCR. The Lab will credit the DFA if it is not performed.
- Because a related organism, *Bordetella parapertussis*, causes whooping cough-like disease, the tests include detection of *B. parapertussis* as well.

#### Bordetella pertussis Detection, PCR: Test code: BPERP

Specimen Type:	Nasopharyngeal swab or aspirate
Special Handling:	Special collection kit available from the Supply Dept (Outreach) or the Micro Lab (Hospital). Transport <b>Refrigerated</b> .
Methodology:	Real Time PCR
TAT:	5 Days

#### Bordetella Antigen, Direct Fluorescent Antibody Stain: Test code: BPPDFA

Specimen Type:	2 Nasopharyngeal slides (Nasopharyngeal swab or aspirate)
Special Handling:	Special collection kit available from the Supply Dept (Outreach) or the Micro Lab (Hospital). Transport <b>Refrigerated</b> .
Methodology:	Direct fluorescent antibody (DFA)
TAT:	5 Days

**Q&A:** Submit Q&A topics of interest to: [labmarketing@stanfordmed.org](mailto:labmarketing@stanfordmed.org)

An opportunity for the Bay Area Medical Community to request specific Q&A topics to our medical directors that are relevant to patient's clinical needs.



Ellen Jo Baron, Ph.D.

## **Community-Acquired Methicillin Resistant Staphylococcus aureus (CA-MRSA)**

Q&A with Ellen Jo Baron, PhD, Director of Microbiology at Stanford University Medical Center Clinical Laboratory

Q1: How are CA-MRSA and conventional S. aureus (or MRSA) different?

A1: The strains of Staphylococcus aureus being referred to as CA-MRSA are genetically different from conventional hospital-acquired MRSA, and they are usually susceptible to a variety of antibiotics for which the conventional MRSA is resistant. CA-MRSA seems to be more able to adhere to nasal mucosa and to more easily invade into tissue. The more notorious clones of CA-MRSA contain a gene that encodes for production of a potent virulence factor called Panton-Valentine leukocidin (PVL), which is associated with destructive skin and soft tissue infections and necrotizing pneumonias. These clones have achieved worldwide dominance very quickly. In fact, since so many outpatients enter the hospital colonized with MRSA, it is no longer possible or even appropriate to separate the hospital from the community strains and antimicrobial susceptibility results become the key to treatment.

Q2: What are the signs and symptoms of out-patient infection with the PVL-positive MRSA?

A2: Patients experience lesions they characterize as "spider bites" but they are actually furuncles. It is spread skin-to-skin and has caused outbreaks in sports teams, day care, prisons, and other groups. More serious infections include severe joint inflammation, osteomyelitis, sepsis, and necrotizing pneumonia, with or without bacteremia and septic shock.

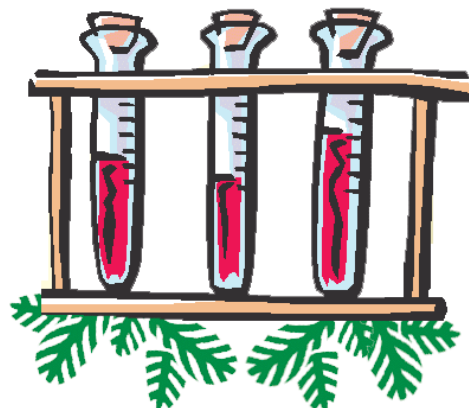
Q3: Can the laboratory differentiate the different types of S. aureus?

A3: A few microbiology laboratories can identify some clones of MRSA, such as the most common USA300 strain, by their band patterns on pulsed-field gel electrophoresis (PFGE). However, it is impossible to determine if the strains carry PVL or other virulence determinants without sequencing the gene; and except for epidemiological studies, there is no clinical reason to do that.

Q4: How should physicians treat patients who present with early lesions of MRSA infection?

A4: Although drainage and good hygiene are probably the most effective treatments for less serious infections, adjunctive antibiotics may also be added for more serious situations. Trimethoprim-sulfamethoxazole, clindamycin, linezolid, and vancomycin have all been suggested for empiric therapy. In vitro clindamycin susceptibility must be confirmed by special laboratory procedures. Of course, therapy should be modified as soon as the actual antimicrobial susceptibility pattern of the organism is known.

**Happy Holidays  
from the Stanford Lab!**



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