

Clinical Laboratory
Microbiology

Community Health Network

ANTIMICROBIAL
SUSCEPTIBILITY STUDIES
(excluding Laguna Honda Hospital)

January - December 2014

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URINE ISOLATES
JANUARY - DECEMBER 2014

PERCENT OF ISOLATES SUSCEPTIBLE TO ANTIMICROBIAL *

| Enteric Urine Isolates | # Tested | AMP^ | PIPTZ^ | CTAZ^ | CTRX^ | CFPM | GENT | TOB | TMSX | CIPR | LEVO | NITRO | ETP |
|------------------------|----------|------|--------|-------|-------|------|------|-----|------|------|------|-------|-----|
| Citrobacter freundii | 17 | R | 94 | 88 | 88 | 100 | 100 | 100 | 88 | 100 | 100 | 100 | 100 |
| Citrobacter koseri | 18 | R | 94 | 100 | 100 | 100 | 100 | 100 | 94 | 100 | 100 | 83 | 100 |
| Enterobacter aerogenes | 25 | R | 96 | 96 | 96 | 100 | 100 | 100 | 96 | 96 | 100 | 20 | 96 |
| Enterobacter cloacae | 32 | R | 84 | 72 | 69 | 91 | 97 | 91 | 66 | 78 | 81 | 22 | 97 |
| Escherichia coli | 1364 | 48 | 98 | 95 | 93 | 95 | 91 | 90 | 67 | 80 | 81 | 99 | 100 |
| - ESBL | 88 | | 92 | | | | 63 | 48 | 39 | 22 | 22 | 98 | 98 |
| - Non ESBL | 1288 | 51 | 98 | 99 | 99 | 100 | 93 | 93 | 69 | 84 | 85 | 99 | 100 |
| Klebsiella oxytoca | 26 | R | 92 | 96 | 92 | 100 | 100 | 100 | 100 | 100 | 100 | 92 | 100 |
| Klebsiella pneumoniae | 136 | R | 98 | 98 | 96 | 96 | 98 | 96 | 88 | 94 | 97 | 42 | 100 |
| Morgonella morganii | 15 | R | 100 | 87 | 93 | 100 | 93 | 93 | 93 | 80 | 87 | R | 100 |
| Proteus mirabilis | 127 | 87 | 100 | 100 | 99 | 99 | 93 | 92 | 89 | 89 | 92 | R | 100 |

| Non-Enteric Urine Isolates | # Tested | PIPTZ^ | CTAZ^ | CFPM | GENT | TOB | TMSX | CIPR | LEVO | MERO |
|------------------------------|----------|--------|-------|------|------|-----|------|------|------|------|
| Acinetobacter baumannii | 4 | | 75 | 50 | 50 | 75 | 75 | 25 | 50 | 75 |
| Pseudomonas aeruginosa | 33 | 82 | 88 | 85 | 85 | 97 | | 85 | 88 | 91 |
| Stenotrophomonas maltophilia | 5 | | 40 | | | | 100 | | 100 | |

| Gram Positive Urine Isolates | # Tested | AMP^ | AMCL^ | NAF | CZOL^ | CTRX | TMSX | TET | LEVO |
|------------------------------------|---|------|-------|-----|-------|------|------|-----|------|
| Staphylococcus aureus | 67 | 37 | 73 | 73 | 73 | 73 | 93 | 91 | 63 |
| Staphylococcus, Coagulase Negative | 20 | 35 | 35 | 35 | 35 | 35 | 60 | 65 | 50 |
| Staphylococcus saprophyticus | Uncomplicated UTIs respond to achievable urine levels of 1st generation Cephalosporins, Nitrofurantoin, Trimeth/Sulfa, or Fluoroquinolones. | | | | | | | | |

* First isolate per patient for the organism. Statistical validity of % susceptible is decreased if fewer than 30 isolates are tested.
^ Many antimicrobials used to treat urinary tract infections are highly concentrated in the urine. While serum levels may not be effective to treat pyelonephritis, levels achievable in urine (assuming normal renal function) may be effective for cystitis.

| Mycobacterium Tuberculosis Complex | |
|------------------------------------|---------------|
| Antimicrobial (mcg/ml) | % Susceptible |
| Ethambutol | 5 100 |
| Isoniazid | 0.1 88 |
| Pyrazinamide | 100 96 |
| Rifampin | 1 96 |
| Streptomycin | 1 96 |

Twenty five isolates were tested by
San Francisco Department
of Public Health

NOTES:

- Many strains of *Enterobacter*, *Citrobacter* and *Serratia* produce inducible cephalosporinases. Cephalosporins other than cefepime should be used with caution when treating infections caused by these bacteria.
- Escherichia coli*, *Klebsiella pneumoniae*, *K. oxytoca* and *Proteus mirabilis* are routinely screened for extended spectrum beta-lactamases (ESBL). 7% of isolates tested are confirmed ESBL producers [109 patients].
- Campylobacter jejuni/coli* group enteric infections are usually treated with fluoroquinolones or macrolides. Strains resistant to these antimicrobials have been isolated at SFGH.
- Rapid beta-lactamase (penicillinase) tests, which indicate PCN and AMP resistance when positive, are performed on *Haemophilus influenzae*, *Moraxella catarrhalis* and *Neisseria gonorrhoeae*. PCN and/or AMP results in table are based upon this beta-lactamase test. Other resistance mechanisms may exist.
- Streptococcus pneumoniae* isolates recovered from Blood and CSF are tested by MIC method for penicillin (PCN), 3rd generation cephalosporin and vancomycin susceptibility. All other isolates are screened for PCN, erythromycin and tetracycline susceptibility by a disk test. This PCN screening test cannot distinguish between intermediate resistance and full resistance. A statement is added to the report noting that the isolate may be resistant. PCN susceptible strains are also susceptible to cephalosporins active against *S. pneumoniae*. Confirmatory PCN and other antimicrobial MIC's are done automatically on isolates that screen positive for resistance by disk test. For non-meningeal infections, a PCN MIC of 4 mcg/mL is intermediate and ≥ 8 mcg/mL is interpreted as resistant.

| Penicillin (parenteral) | MIC Interpretation (mcg/mL) | | |
|-------------------------|-----------------------------|--------------|-----------|
| | Susceptible | Intermediate | Resistant |
| Nonmeningitis | ≤ 2 | 4 | ≥ 8 |
| Meningitis | ≤ 0.06 | -- | ≥ 0.12 |

- Enterococci isolated from all sites are screened for vancomycin and ampicillin resistance. Enterococci that demonstrate high level aminoglycoside resistance are not killed by the usually synergistic combination of a penicillin or vancomycin plus an aminoglycoside

Incidence of Vancomycin and Ampicillin Resistance

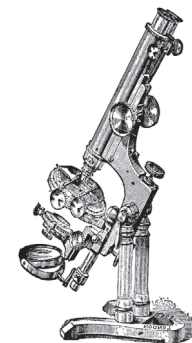
| Antimicrobial | No. isolates tested | No. resistant isolates | No. of patients with resistant Enterococci (Total No. Patients: 406) |
|---------------|---------------------|------------------------|--|
| Vancomycin | 563 | 101 ^ (18%) | 62 (15%) |
| Ampicillin | 563 | 106 ^^ (19%) | 64 (16%) |

^ 50 urines, 7 bloods, 12 wounds, 32 (tissue, fluids)
^^ 60 urines, 11 bloods, 11 wounds, 24 (tissue, fluids)

**AEROBIC ISOLATES NON-URINE SOURCES
JANUARY THROUGH DECEMBER 2014**

PERCENT OF ISOLATES SUSCEPTIBLE TO ANTIMICROBIAL *

| Enteric Isolates | # Tested | AMP | PIPTZ | CTAZ | CTRX | CFPM | GENT | TOB | TMSX | CIPR | LEVO | ETP |
|------------------------|----------|-----|-------|------|------|------|------|-----|------|------|------|-----|
| Citrobacter freundii | 24 | R | 100 | 96 | 92 | 100 | 96 | 96 | 88 | 96 | 96 | 100 |
| Enterobacter aerogenes | 32 | R | 91 | 84 | 81 | 100 | 100 | 100 | 100 | 97 | 100 | 97 |
| Enterobacter cloacae | 68 | R | 91 | 84 | 84 | 94 | 99 | 94 | 77 | 94 | 99 | 97 |
| Escherichia coli | 185 | 41 | 97 | 95 | 91 | 92 | 95 | 94 | 65 | 79 | 80 | 100 |
| - ESBL | 15 | | 87 | | | | 73 | 60 | 27 | 7 | 7 | 100 |
| - Non ESBL | 171 | 44 | 98 | 99 | 99 | 100 | 96 | 96 | 68 | 85 | 85 | 100 |
| Klebsiella oxytoca | 34 | 3 | 97 | 100 | 97 | 100 | 97 | 97 | 97 | 100 | 100 | 100 |
| Klebsiella pneumoniae | 111 | R | 98 | 96 | 94 | 96 | 98 | 97 | 89 | 96 | 96 | 100 |
| Proteus mirabilis | 63 | 94 | 100 | 100 | 100 | 100 | 98 | 98 | 83 | 87 | 92 | 100 |
| Salmonella sp. | 10 | 100 | | R | 100 | | | | 100 | 90 | 100 | |
| Serratia marcescens | 25 | R | 84 | 84 | 96 | 100 | 100 | 80 | 96 | 100 | 100 | 100 |
| Shigella flexneri | 14 | 7 | | R | | | | | 7 | 100 | 100 | |
| Shigella sonnei | 45 | 89 | | R | | | | | 0 | 18 | 18 | |



| Gram Positive Isolates & Miscellaneous | # Tested | PCN | AMP | AMCL | NAF | CZOL | CTRX | ERYT | CLIN | TET | VAN | GENT | TOB | TMSX | LEVO | |
|---|----------|-----|-----|------|-----|------|------|------|-----------------|-----------------|-----|------|-----|------|------|---|
| Staphylococcus aureus | 879 | 15 | 19 | 57 | 57 | 57 | 57 | 44 | 79 [^] | 94 | 100 | | | 97 | 69 | |
| - Methicillin Resistant | 387 | 0 | 0 | 0 | 0 | 0 | 0 | 10 | 69 [^] | 94 | 100 | | | 96 | 42 | |
| - Methicillin Susceptible | 510 | 26 | 33 | 100 | 100 | 100 | 100 | 70 | 86 [^] | 94 | 100 | | | 98 | 89 | |
| Staphylococcus, Coagulase Negative | 363 | 25 | 49 | 55 | 55 | 55 | 55 | 38 | 56 [^] | 75 | 100 | | | 71 | 73 | |
| Staphylococci resistant to Nafcillin are resistant to PCN, AMP, AMCL, PIPTZ, Cephems (CZOL, CTAX, CTRX, CFPM), & Carbapenems. | | | | | | | | | | | | | | | | |
| Streptococcus pyogenes, Group A | 39 | 100 | | | S | | | 100 | 49 | 47 [^] | | 100 | R | R | | |
| Streptococcus agalactiae, Group B | 22 | 100 | | | | | | 100 | 46 | 64 [^] | | 100 | R | R | | |
| Streptococcus pneumoniae (See Note # 5) | 87/65 | 99 | | | | | | 99 | 70 | 82 | 82 | 100 | R | R | 62 | |
| 87 isolates tested against PCN, ERYT and TET. 65 isolates were tested against the other antimicrobials. | | | | | | | | | | | | | | | | |
| Haemophilus influenzae (See Note # 4) | 66 | | 83 | S | | R | S | R | | | | | R | R | S | S |
| Moraxella catarrhalis (See Note # 4) | 17 | R | 0 | S | | R | S | | | | | | S | S | S | S |

* First isolate per patient for the organism. Statistical validity of % susceptible is decreased if fewer than 30 isolates are tested.

[^] Clindamycin results determined by two tests (MIC and inducible Clindamycin resistance test).

| Non Enteric Isolates | # Tested | PIPTZ | CTAZ | CFPM | GENT | TOB | TMSX | CIPR | LEVO | MERO |
|------------------------------|----------|-------|------|------|------|-----|------|------|------|------|
| Acinetobacter baumannii | 20 | | 100 | 90 | 100 | 95 | 90 | 100 | 100 | 100 |
| Acinetobacter lwoffii | 3 | | 67 | 100 | 100 | 100 | 100 | 67 | 100 | 100 |
| Pseudomonas aeruginosa | 79 | 91 | 94 | 94 | 82 | 95 | | 87 | 87 | 87 |
| Stenotrophomonas maltophilia | 24 | | 21 | | | | 100 | | 79 | |

| Abbrev | Antimicrobial | Cost / Day | Std. Adult Regimen |
|--------|---------------------------|------------|-----------------------|
| AMCL | Amoxicillin / clavulanate | \$0.80 | 875 mg Q 12 hr PO |
| AMP | Ampicillin | \$9.70 | 2 gm Q 6 hr IV |
| AMSL | Ampicillin / sulbactam | \$10.90 | 3 gm Q 6 hr IV |
| AZTH | Azithromycin | \$2.80 | 500 mg Q 24 hr IV |
| AZTR | Aztreonam | \$130.50 | 2 gm Q 8 hr IV |
| CZOL | Cefazolin | \$2.70 | 1 gm Q 8 hr IV |
| CFPM | Cefepime | \$14.70 | 2 gm Q 8 hr IV |
| CFTAR | Ceftaroline | \$235.70 | 600 mg Q 12 hr IV |
| CTRX | Ceftriaxone | \$1.30 | 1 gm Q 24 hr IV |
| CIPR | Ciprofloxacin | \$0.30 | 500 mg Q 12 hr PO |
| CIPR | Ciprofloxacin | \$3.40 | 400 mg Q 12 hr IV |
| CLIN | Clindamycin | \$16.00 | 600 mg Q 8 hr IV |
| CLIN | Clindamycin | \$0.50 | 300 mg Q 6 hr PO |
| DAPTO | Daptomycin | \$379.20 | 500 mg Q 24 hr IV |
| DOXY | Doxycycline | \$3.40 | 100 mg Q 12 hr PO |
| ETP | Ertapenem | \$65.90 | 1 gm Q 24 hr IV |
| GENT | Gentamicin | \$2.40 | 80 mg Q 8 hr IV |
| LEVO | Levofloxacin | \$0.40 | 750 mg Q 24 hr PO |
| LEVO | Levofloxacin | \$3.30 | 750 mg Q 24 hr IV |
| LZLD | Linezolid | \$208.20 | 600 mg Q 12 hr PO |
| LZLD | Linezolid | \$96.40 | 600 mg Q 12 hr IV |
| MERO | Meropenem | \$26.70 | 1 gm Q 8 hr IV |
| METR | Metronidazole | \$2.00 | 500 mg Q 8 hr PO |
| NAF | Nafcillin | \$50.60 | 2 gm Q 4 hr IV |
| NITRO | Nitrofurantoin | \$2.40 | 100 mg Q 12 hr PO |
| PCN | Penicillin | \$19.00 | 3 MU Q 4 hr IV |
| PIPTZ | Piperacillin / tazobactam | \$20.20 | 4.5 gm Q 6 hr IV |
| TMSX | Trimethoprim / sulfa | \$0.30 | 160 mg TMP Q 12 hr PO |
| TMSX | Trimethoprim / sulfa | \$34.10 | 320 mg TMP Q 12 hr IV |
| TOB | Tobramycin | \$2.50 | 80 mg Q 8 hr IV |
| VAN | Vancomycin | \$5.20 | 1 gm Q 12 hr IV |

Note: This table is intended to compare inpatient cost of commonly used antimicrobials. Many dosing regimens vary by indication.

| Abbrev | Interpretation |
|--------|----------------|
| S | Susceptible |
| I | Intermediate |
| R | Resistant |

ANAEROBIC BACTERIA

Routine antimicrobial susceptibility testing is not performed because empirical therapy and appropriate surgical treatment are usually sufficient, and because infections are frequently due to multiple bacteria, not all of which may be cultured. In special circumstances, e.g., brain abscess, endocarditis, joint infection, recurrent bacteremia, testing is available upon approval by the Microbiology Resident (pager: 415 433-1438).

Beta-lactamase tests are performed on Gram-negative anaerobic bacteria, e.g., Bacteroides and Fusobacteria.