Table 1. Percentages of Susceptible Strains to Antibiotics Among 2800 Gram-Positive Bacteria - AUBMC 1/7/08 - 30/6/09

<table>
<thead>
<tr>
<th>Bacteria</th>
<th>Ampicillin</th>
<th>Penicillin</th>
<th>Aztreonam</th>
<th>Carbenicillin</th>
<th>Chloramphenicol</th>
<th>Erythromycin</th>
<th>Gentamicin</th>
<th>Levofloxacin</th>
<th>Linezolid</th>
<th>Minocycline</th>
<th>Moxifloxacin</th>
<th>Tetracycline</th>
<th>Gentamicin</th>
<th>Vancomycin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bacillus spp</td>
<td>60</td>
<td>60</td>
<td>65</td>
<td>80</td>
<td>50</td>
<td></td>
<td>100</td>
<td>100</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Enterococcus spp</td>
<td>92</td>
<td>92</td>
<td></td>
<td>18</td>
<td>98</td>
<td>99.8</td>
<td>100</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Staphylococcus aureus</td>
<td>4</td>
<td>4</td>
<td>80</td>
<td>80</td>
<td>82</td>
<td>85</td>
<td>92</td>
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<td>100</td>
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</tr>
<tr>
<td>Coag. Neg. Staphylococci</td>
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<td>5</td>
<td>25</td>
<td>25</td>
<td>27</td>
<td>50</td>
<td>74</td>
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<tr>
<td>Streptococcus agalactiae</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Streptococcus pneumoniae</td>
<td>28</td>
<td>28</td>
<td></td>
<td>28</td>
<td>55</td>
<td>73</td>
<td>99.8</td>
<td>99.8</td>
<td>35</td>
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</tr>
<tr>
<td>Streptococcus pyogenes</td>
<td>100</td>
<td>100</td>
<td></td>
<td>95</td>
<td>98</td>
<td>100</td>
<td>100</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Streptococcus viridans group</td>
<td>90</td>
<td>90</td>
<td></td>
<td>75</td>
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</tr>
</tbody>
</table>

- Ciprofloxacin = 90%, Chloramphenicol = 82%, Imipenem = 100%.
- Extrapalated based on 1ug oxacillin disc.
- Vancomycin resistant enterococci (VRE) = 0.2%, Norfloxacin = 68%, Tetracycline = 22%.
- MRSA = 20%, Glycopeptides intermediate S. aureus (GISA) = 0%, Norfloxacin = 96%, Gentamicin = 95%; Clindamycin is also extrapalated based on D-test.

Table 2. Percentages of Susceptible Strains to Antibiotics Among 5956 Gram-Negative Bacteria - AUBMC 1/7/08 - 30/6/09

<table>
<thead>
<tr>
<th>Bacteria</th>
<th>Ampicillin</th>
<th>Carbenicillin</th>
<th>Carbenicillin</th>
<th>Ceftriaxone</th>
<th>Cefotaxime</th>
<th>Ciprofloxacin</th>
<th>Gentamicin</th>
<th>Levofloxacin</th>
<th>Linezolid</th>
<th>Minocycline</th>
<th>Moxifloxacin</th>
<th>Ofloxacin</th>
<th>Tetracycline</th>
<th>Gentamicin</th>
<th>Vancomycin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acinetobacter spp</td>
<td>4</td>
<td>20</td>
<td></td>
<td>16</td>
<td>16</td>
<td>38</td>
<td>13</td>
<td>30</td>
<td>25</td>
<td>22</td>
<td>21</td>
<td>10</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Citrobacter spp</td>
<td>0</td>
<td>55</td>
<td>55</td>
<td>60</td>
<td>85</td>
<td>90</td>
<td>95</td>
<td>95</td>
<td>100</td>
<td>85</td>
<td>94</td>
<td>100</td>
<td>93</td>
<td>89</td>
<td>84</td>
</tr>
<tr>
<td>Enterobacter spp</td>
<td>0</td>
<td>90</td>
<td>0</td>
<td>63</td>
<td>99</td>
<td>65</td>
<td>0</td>
<td>63</td>
<td>88</td>
<td>90</td>
<td>94</td>
<td>100</td>
<td>96</td>
<td>96</td>
<td>99</td>
</tr>
<tr>
<td>Escherichia coli***</td>
<td>78</td>
<td>92</td>
<td></td>
<td>100</td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Haemophilus influenzae***</td>
<td>78</td>
<td>92</td>
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<td></td>
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<td></td>
</tr>
<tr>
<td>Klebsiella spp</td>
<td>0</td>
<td>74</td>
<td>75</td>
<td>65</td>
<td>70</td>
<td>86</td>
<td>77</td>
<td>93</td>
<td>70</td>
<td>73</td>
<td>80</td>
<td>80</td>
<td>89.9</td>
<td>78</td>
<td>80</td>
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<tr>
<td>Morganella spp</td>
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<td>8</td>
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<td>70</td>
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<td>97</td>
<td>100</td>
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<td>88</td>
<td>90</td>
<td>100</td>
</tr>
<tr>
<td>Moraxella catarrhalis*</td>
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</tr>
<tr>
<td>Proteus spp</td>
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<td>85</td>
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<td>100</td>
<td>100</td>
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<td>100</td>
<td>99</td>
<td>100</td>
<td>82</td>
<td>86</td>
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<tr>
<td>Pseudo aeruginosa</td>
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<tr>
<td>Pseudomonas spp</td>
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<tr>
<td>Salmonella typhi*</td>
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<td></td>
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</tr>
<tr>
<td>Salmonella spp</td>
<td>73</td>
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<td></td>
<td>96</td>
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</tr>
<tr>
<td>Shigella spp</td>
<td>72</td>
<td></td>
<td></td>
<td>86</td>
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</tr>
<tr>
<td>Serratia spp</td>
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<td>4</td>
<td>96</td>
<td>0</td>
<td>10</td>
<td>100</td>
<td>84</td>
<td>10</td>
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<td>100</td>
<td>100</td>
<td>89</td>
<td>96</td>
<td>96</td>
<td>86</td>
</tr>
</tbody>
</table>

- Extended Spectrum β-Lactamases (ESBLs): E. coli = 22%, Klebsiella pneumoniae = 27%.
- H. influenzae: β-Lactamase Pos = 22%, Levofloxacin = 100%, Ceftriaxone = 100%, Azithro = 100%.
- Moraxella : β-Lactamase Pos = 97%, Levofloxacin = 100%, Azithro = 100%, Erythromycin = 100%.
- Cefixime : S. typhi = 100%, Salmonella spp = 96%, Nalidixic acid R for Salmonella spp = 25%.

Antimicrobial Susceptibility Patterns of Bacterial Isolates
at the
American University of Beirut
Medical Center
July 1, 2008 - June 30, 2009

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**FURTHER RELEVANT INFORMATION**

**S. aureus & Coagulase – Negative Staph (CNS):**
- S. aureus Meth-R (MRSA) = 20%; CNS Meth-R = 75%.
- Cefoxitin disc (30ug), best surrogate for detecting mec-A mediated Reid in MRSA.
- D-test is used to detect inducible clinda R (by erm gene) for isolates showing R to erytho & S or to clinda.

**S. lugdunensis** can be confused with S. aureus since it shows coag Pos in slide & Neg in tube, can cause high M & M, & aggressive infection esp in endocarditis.

**S. pneumoniae:**
- Penicillin by MIC: S = -40%, I = 45 - 48%, Fully R = 12 - 15%.
- Anx/Clav by MIC: S = 100%, by disc diffusion (DD) extrapolation to Oxa S = 28%.
- R strains by Oxa disc warrant requesting MICs testing eg. Pen, ceftraxone.
- One strain showed R to levofloxacin and I to ceftraxone.

**H. influenzae:**
- Serotypes:
  - b = 78%, not b = 22%; one BLNR strain detected.
- All Amp R strains except one were β-lactamase Pos.

**Enterococcus spp:**
- Two VRE detected.
- No HLR detected using 120ug gentamcin & 300ug streptomycin discs.

**β-haemolytic streptococci groups A, B, C, G:**
- All are uniformly susceptible to Penicillin.
- Prevalence: A = 60%, B = 35%, G = 4%, C = 1%.

**Salmonella & Shigella spp Serotypes:**
- Salmonella  eenteritidis 33%, typhimurium 20%, group C 12%, paratyphi B 6% typhi 3%, group B 3% nonotypable 23%.
- Salmonella Resistant to Nalidixic Acid = 25% FQ vs. Strains:R if Nalidixic acid, may show clinical failure to FQ
- Shigella: sonnei (grp D) 87%, flexneri (grp B) 5%, boydii (grp C) 5% dysenteriae (grp A) 3%.

**ESBL: K. pneumoniae (27%) & E. coli (22%)**
- % S for Tigecycline and Doripenem
- ESBLs E. coli 100%
- ESBLs K. pneumoniae 81%

**Doripenem:**
- FDA approved as a new carbapenem
- Carbapenemase (kpc gene): detected by etarmedon disc & modified Hodge test

**Prevalence of recovered species among:**

**Acinetobacter:** A. anitratus 55%, A. baumannii 44%, A. lwolfii 1%.
- **Klebsiella**: K. pneumoniae 94%, K. oxytoca 6%.
- **Proteus:** P. mirabilis 90%, P. vulgaris 10%.
- **Enterobacter:** E. cloacae 66%, E. aerogenes 30%, E. agglomerans 3%, E. sakazakii 1%.
- **Pseudomonas:** P. aeruginosa 85%, Others: 15%
- [Stenotrophomonas maltophilia 55%, Burkholderia cepacia 22%, P. putrifer 8%, P. pickettii 1%. Not specified 14%]

**Limited Susceptibility by Disk Diffusion (DD):**
- S. maltophilia: DD breakpoints approved for ceftazidime, carbapenem, minocycline, SXT & levofloxacin.
- B. cepacia: DD breakpoints approved for ceftazidime, minocycline, & SXT. These together with levofloxacin can also be assessed by MICs.

**Mycobacterium tuberculosis:**
- Nationwide Resistance (%) among AFB smear-positive TB cases (New vs Previ-
ous-treated): Overall: (19 vs 75), INH (12 vs 63), RIF (3 vs 56), STM (12 vs 44), ETH (3 vs 44), MDR (1 vs 62).
- The prevalence of MOTT in this study was 8% (Ref # 1).

**MOTT: Mycobacterium other than tuberculosis spp. (Ref # 7):**

**Respiratory (77%):** M. smidia 54%, M. immunogenens 12%, M. fortuitum 8.5% M. cheloniae/abcexcelus 8.5%, M. avium 7%.
- M. intracellulare 7%, M. goadone 65.6%, M. szulgii 2.5%. M. xenopi 1%.
- Skin/biopsy (23%): M. marinum 69.5%, M. fortuitum 13%,
- M. cheloniae 8.7%, M. cheloniae/abcexcelus 8.7%.

**MOTT recovery overall among clinical specimens:** 25-30%.

**Candida spp:**
- Candida albicans 60% Non albicans: 40%.
- C. dubliniensis: imp pathogen mostly in HIV pts, could be confused with C. albicans being germ tube Pos, but show Neg growth at 45°C. It is routinely screened for.

**Infection Control Aspects During This Report Period**

**Sites:**
- Respiratory: EAP 26%.
- UTI/Cath: 29%.
- Surgical/Wound: 18%.
- Blood: 17%.
- Catheter/Lines: 5%.
- GI: 3%.

**Pathogenic:**
- Gram-ve:
  - E. coli: 18%.
  - K. pneumoniae: 9%.
- Gram+ve:
  - Coag neg.staph: 20%.
  - S. aureus: 5%.
  - Enterocyt 4%.
- Fungi:
  - Candida albicans 5%.
  - Non albicans: 2%

[Data provided by Infection Control and Prevention Program]

**Legionella Pos. of total tested: 2%**

**GI Etiology Pos. of total tested: Rotavirus 5% C. difficile 4% S. maltophila 3% Campylobacter 4% Shigella spp. 1%**

**CLSI: Verification of AB results & Confirmation of Organism ID Needed for:**
- Enterobacteriaceae: if R or I to carbapenem.
- C. freundii, Enterobacter spp. S. marcescens: if S to Ampicillin or cephalothin.
- E. coli & Klebsiella spp: if ESBL, confirm positive.
- Klebsiella spp., P. vulgaris & Providencia spp: if S to Ampicillin.
- Salmonella spp.: if R or I to 3rd gen. cephalosporin, FQ or nalidixic acid.
- P. aeruginosa: if R to concurrent genta & tobra & amikacin.
- S. maltophilia: if S to carbapenem or R to SXT.
- H. influenzae: if β-lactamase Neg & amp-R (BLNR) or amox/clav-R

**Acknowledgements to Bacteriology Staff Excellent Technical Assistance**

Hassan Beyh, Sohair Sabi, Lina Itani, Ramia Hammoud, Nadia Ayass, Aline Avedsisson, Rima Asmar, Maguy Malak, Ihab Ziauat.

Logistic Support: Mohammad Nazzell and Ayat Haidar

**RELATED ARTICLES**
1. Araj GF, Saade M, Itani LY. Nationwide study of drug resistance among acid-fast bacilli smear positive pulmonary tuberculosis cases in Lebanon.