2013 Hawaii Statewide Antibiogram for Selected Bacteria of Public Health Significance

The 2013 statewide antibiogram is the second annual antibiogram report released by the Hawaii State Department of Health (HDOH). Similar to the 2012 statewide antibiogram, this report reflects data submitted by the 4 major clinical laboratories throughout the state. Data were compiled based on recommendations from the Clinical and Laboratory Standards Institute (CLSI) M39-A3 Guidelines (See Appendix A).

- Tripler Army Medical Center, Kaiser Permanente, and Diagnostic Laboratory Services each submitted their data in aggregate form.
- Clinical Laboratories of Hawaii (CLH) submitted facility-specific antibiograms for Hilo Medical Center, Kapiolani Medical Center for Women and Children, Kona Community Hospital, Maui Memorial Medical Center, Pali Momi Medical Center, Straub Clinic & Hospital, and Wilcox General Hospital.
- The data represent isolates cultured from January 2013 through December 2013.

- Changes for the 2013 antibiogram
  - CLH also submitted facility-specific antibiograms for Hale Makua, Kula Hospital, and North Hawaii Community Hospital.
  - Methicillin-resistant *Staphylococcus aureus* (MRSA) and methicillin-susceptible *Staphylococcus aureus* (MSSA) susceptibilities are presented separately.
  - Changes in susceptibility of 5% or more compared with 2012 are highlighted.
- **Note: data are presented for surveillance purposes only and are not intended for use in clinical decision making. This antibiogram should not take the place of individual clinical assessment and isolate susceptibility testing.**
- Limitations:
  - CLH did not submit facility-specific antibiograms for all their contracted critical access hospitals. Data from contracted outpatient facilities and long-term care facilities was also not available.
  - One facility did not differentiate MRSA and MSSA; *Staphylococcus aureus* data for this facility are presented in aggregate form only.
  - A distinction was not made between inpatient and outpatient isolates in all laboratories; additionally, not all laboratories distinguished between urine and systemic isolates (See Appendix B). Data presented on the statewide antibiogram are thus presented in aggregate form for those parameters.

Detect and Protect: Tracking Antibiotic Resistant Threats and Improving Prescribing Practices

- Carbapenem-resistant *Enterobacteriaceae* (CRE), classified by the Centers for Disease Control and Prevention (CDC) as an urgent threat, have been associated with high mortality rates and are resistant to all or nearly all antibiotics. CRE have been detected in Hawaii and carbapenem susceptibility testing should be considered for *Enterobacteriaceae,* particularly for those demonstrating extensive ß-lactam resistance. CLSI's M100-S20 guidelines in 2010 recommended modified breakpoints for carbapenem susceptibility testing. Laboratories should consider implementing these guidelines, if they have not already done so. Alternatively, laboratories could consider utilizing a test to detect carbapenemase production (e.g., Modified Hodge Test or polymerase chain reaction [PCR]) in suspect isolates.
- Antimicrobial stewardship is an important strategy to reduce antibiotic resistance. According to CDC, an estimated 30–50% of antibiotics are not necessary or are prescribed inappropriately. Facilities should ensure that the appropriate antibiotics are used for the correct indications and durations to improve patient safety and decrease antibiotic resistance. A new collaborative, the Hawaii Antimicrobial Stewardship Collaborative, will pair facilities with HDOH and pharmacists from the Daniel K Inouye College of Pharmacy at University of Hawaii for technical assistance in implementing and sustaining antimicrobial stewardship programs within facilities.

2013 Hawaii Statewide Antibiogram

Gram-Positive Organisms

		Penicillins			Cephalosporins		Quinolones		Other Antibiotics							
Percent Susceptible (Number of isolates tested)	# of all isolates from all sources	Ampicillin	Oxacillin	Penicillin	Cefazolin	Ceftriaxone	Levofloxacin	Moxifloxacin	Clindamycin	Erythromycin	Linezolid	Nitrofurantoin	Rifampin	Tigecycline	Trimethoprim/ Sulfamethoxazole	Vancomycin
Enterococcus sp.(unspeciated)	4,122	**90** (4,069)		**91** (2,057)			**31** (2,094)				**100** (3,493)	**97** (2,582)		**92** (138)		**96** (4,122)
Enterococcus faecalis	1,309	**99** (1,309)		**99** (1,309)			**80** (1,004)				**100** (608)	**99** (751)	**49** (263)	**100** (396)		**100** (1,309)
Enterococcus faecium	161	**23** (161)		**22** (160)			**19** (161)				**99** (160)					**34** (161)
All *Staphylococcus aureus**	19,235		**77** (16,242)		**72** (4,402)	**57** (1,897)	**77** (11,793)	**83** (13,285)	**80** (18,971)	**55** (19,030)	**100** (19,229)		**99** (18,073)	**100** (6,149)	**97** (19,238)	**100** (19,235)
Methicillin-resistant *Staphylococcus aureus* (MRSA)*†	6,181		**0** (3,187)		**0** (1,254)	**0** (301)	**48** (3,627)	**59** (4,519)	**69** (6,082)	**17** (6,109)	**100** (6,174)		**100** (6,170)	**100** (1,956)	**94** (6,181)	**100** (6,179)
Methicillin-susceptible *Staphylococcus aureus* (MSSA)*†	11,903		**100** (11,804)		**100** (3,148)	**98** (345)	**93** (6,915)	**95** (8,766)	**86** (11,638)	**75** (11,670)	**100** (11,804)		**99** (11,903)	**100** (4,193)	**98** (11,806)	**100** (11,805)
Streptococcus pneumoniae	516			**89** (516)		**95** (432)	**100** (285)	**99** (166)	**88** (108)	**72** (242)					**76** (434)	**100** (437)

Comparison to 2012 susceptibility‡: 10% or greater increase | 5–9% increase | 5–9% decrease | 10% or greater decrease

Note: data are presented for surveillance purposes only and are not intended for use in clinical decision making. This antibiogram should not take the place of individual clinical assessment and isolate susceptibility testing.

* The vancomycin susceptibilities presented reflect *Staphylococcus aureus* isolates with MIC ≤ 4 μg/mL; treatment failures have been reported in the literature for isolates with a vancomycin MIC of 2 μg/mL.

† Data exclude the one facility that did not differentiate MRSA and MSSA isolates.

‡ All changes were found to be statistically significant, $p<0.05$.

2013 Hawaii Statewide Antibiogram

Gram-Negative Organisms

		Penicillins			Cephalosporins				Carbapenems				Quinolones		Other Antibiotics		
Percent Susceptible (Number of isolates tested)	# of all isolates from all sources	Amoxicillin/ Clavulanic Acid	Ampicillin/ Sulbactam	Piperacillin/ Tazobactam	Cefuroxime	Ceftriaxone	Ceftazidime	Cefepime	Doripenem	Ertapenem	Imipenem	Meropenem	Ciprofloxacin	Levofloxacin	Amikacin	Nitrofurantoin	Trimethoprim/ Sulfamethoxazole
Acinetobacter sp.	298						**77** (280)	**85** (245)			**97** (192)	**100** (221)	**97** (298)	**95** (278)	**100** (243)		**85** (248)
Enterobacter sp.	1,656	*	*	*	*	*	*	**98** (1,309)	**99** (278)	**100** (468)	**98** (473)	**100** (655)	**96** (1,642)	**94** (719)	**99** (1,656)	**29** (761)	**90** (1,591)
Escherichia coli	44,453	**87** (20,098)	**62** (26,873)	**98** (27,855)	**91** (19,343)	**96** (40,746)	**94** (23,419)	**95** (34,860)	**100** (13,423)	**100** (17,590)	**100** (18,737)	**100** (21,333)	**81** (44,426)	**78** (21,597)	**100** (44,453)	**97** (33,040)	**76** (44,170)
Klebsiella pneumoniae	7,727	**95** (3,540)	**78** (4,993)	**95** (4,828)	**90** (3,783)	**98** (7,191)	**97** (4,585)	**98** (6,262)	**100** (2,672)	**100** (3,422)	**100** (3,605)	**100** (4,138)	**97** (7,715)	**93** (4,259)	**100** (7,727)	**51** (4,011)	**89** (7,606)
Proteus mirabilis	3,641	**100** (1,833)	**96** (2,257)	**100** (2,289)	**99** (1,708)	**99** (3,355)	**99** (2,144)	**99** (2,982)		**100** (1,541)	**75** (797)	**100** (1,973)	**93** (3,460)	**94** (1,956)	**99** (3,623)	**0** (950)	**86** (3,641)
Pseudomonas aeruginosa	4,762			**94** (2,811)			**89** (2,439)	**92** (4,716)	**97** (1,345)		**90** (1,977)	**93** (2,448)	**85** (4,667)	**82** (3,856)	**97** (4,761)		
Serratia marcescens	407	*	*	*	*	*	*	**99** (301)		**100** (54)	**91** (56)	**99** (128)	**97** (405)	**99** (166)	**99** (407)	**0** (112)	**98** (369)

Comparison to 2012 susceptibility†: 10% or greater increase | 5–9% increase | 5–9% decrease | 10% or greater decrease

Note: data are presented for surveillance purposes only and are not intended for use in clinical decision making. This antibiogram should not take the place of individual clinical assessment and isolate susceptibility testing.

* Because of the presence of inducible beta-lactamase, these organisms should be considered resistant to the antimicrobial indicated.

† All changes were found to be statistically significant, $p<0.05$.

Appendix A: Summary of the recommendations contained in CLSI M39-A3 Guidelines

- Analyze/present cumulative antibiogram report at least annually
- Include only final, verified test results
- Include only species with testing data for ≥30 isolates
- Include only diagnostic isolates
- Eliminate duplicate isolates
- Include only antimicrobial agents routinely tested
- Report percent susceptible and do not include percent intermediate
- Suggested supplemental analyses:
    - For *Streptococcus pneumoniae* and cefotaxime/ceftriaxone/penicillin: report percent susceptible for both meningitis and non-meningitis breakpoints.
    - For viridans group streptococci and penicillin: list both percent intermediate and percent susceptible.
    - Analyze by clinically important organism resistance characteristics: for example, present separate analyses for oxacillin-resistant *S. aureus* (MRSA) and oxacillin-susceptible *S. aureus,* or for ESBL-producing Gram-negative bacilli
    - Differentiate *Enterococcus faecalis* and *E. faecium,* and present their susceptibility patterns separately
    - Differentiate by specimen type or infection site (e.g. urine and blood isolates), or site of care (e.g. ICU, outpatient clinic)

Appendix B: Additional factors that can impact aggregate antibiogram data

- Interpretation and clinical utility of particular pathogen-antibiotic combinations may differ depending on site of infection, in particular for urinary or central nervous system infections; additionally, susceptibility testing performed at different laboratories may vary depending on site of culture, and different minimum inhibitory concentration (MIC)* "breakpoints" may be given for antibiotics most frequently used to treat urinary tract infections—for instance, nitrofurantoin and trimethoprim-sulfamethoxazole
- Patient population served: for example, substantial differences may be seen in susceptibility patterns in the outpatient and inpatient setting
- Culturing practices: for example, susceptibility patterns may be biased if local practice involves culturing for uncomplicated infections only in the context of treatment failure
- Laboratory antimicrobial susceptibility testing and reporting policies
- Temporal outbreaks

* The MIC is defined as the lowest concentration of a drug that will inhibit the visible growth of an organism after overnight incubation.