

# Statewide Antibigram

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March 6, 2019

*Maryland Department of Health (MDH)*

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# **Statewide Antibioqram Program**

# Statewide AntibioGrams

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What's available:

- 2013, 2016, 2017 statewide antibiograms for *inpatients* at ~40 acute-care hospitals in Maryland
- Stratified by region and hospital size
- Includes 14 gram negative organisms, 7 gram positive organisms, and 34 antibiotics
- MRSA, MSSA, VRE, ESBL, and *S. pneumoniae* meningitis
- Access at: <https://phpa.health.maryland.gov/pages/hai.aspx>

**2017 Gram Negative Organism Percent Susceptibility  
STATEWIDE — 41 Hospitals**

Class	Antibiotic	Organism	A. baumannii	E. aerogenes	E. cloacae	E. coli	K. pneumoniae	K. oxytoca	P. aeruginosa	C. freundii	M. morganii	P. mirabilis	Providencia spp.	S. marcescens	S. maltophilia	H. influenzae
Aminoglycosides	Amikacin	% S	88	100	100	100	99	100	98	100	99	98	99	99	R	
	Gentamicin	% S	70	99	95	90	94	97	91	94	82	91	30	97	R	
	Tobramycin	% S	82	98	95	89	90	97	96	93	89	90	31	83	R	
Penicillins	Amox/Clav	% S	R	R	R	84	87	93	R	R	R	97	R	R	R	94
	Ampicillin	% S	R	R	R	49	R	R	R	R	R	73	R	R	R	55
	Amp/sulb	% S	70	R	R	55	75	54	R	R	10	87	32	R	R	
	Pip/Tazo	% S	49	83	80	95	89	90	88	84	95	99	95	88	R	
Cephalosporins	Cefazolin	% S	R	R	R	80	83	49	R	R	R	78	R	R	R	
	Ceftriaxone	% S	28	80	73	91	89	91	R	79	86	92	88	92	R	100
	Cefotaxime	% S	36	85	76	91	91	94	R	89	85	94	86	72	*	99
	Ceftazidime	% S	58	81	77	89	84	95	87	86	80	90	85	82	41	
	Cefepime	% S	58	97	92	92	90	95	88	98	95	93	90	98	1	
Carbapenems	Ertapenem	% S	R	98	94	100	97	99	R	99	100	98	100	99	*	
	Imipenem	% S	68	93	97	100	98	98	86	97	60	73	77	78	R	
	Meropenem	% S	60	98	99	100	97	98	89	100	100	100	98	99	R	
Fluoroquinolones	Ciprofloxacin	% S	55	96	93	73	88	96	80	90	71	65	40	93	0	100
	Levofloxacin	% S	60	98	95	74	92	98	79	94	79	71	45	97	87	99
	Moxifloxacin	% S														99
Tetracyclines	Tetracycline	% S	58	89	88	73	80	89	R	82	8	R	R	11	R	74
	Tigecycline	% S	71	99	99	100	97	99		99	R	R	R	99		
Other	Aztreonam	% S	R	82	78	90	88	91	75	79	85	90	85	91	R	
	Trimeth/Sulfa	% S	60	96	87	73	84	93	R	86	66	75	74	98	98	63
	Nitrofurantoin	% S	2	22	37	97	42	85	0	92	R	R	R	R	0	

Numbers in **Green** indicate an increase in susceptibility from 2016.

Numbers in **Red** indicate a decrease in susceptibility from 2016.

\*See methodology

Blank: Not tested

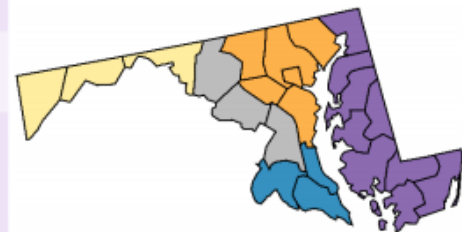
\*: Insufficient number of isolates tested

R: Intrinsically resistant

			SMALL HOSPITALS ( < 150 Beds) 13 Hospitals						MEDIUM HOSPITALS (150-299 Beds) 19 Hospitals						LARGE HOSPITALS ( ≥ 300 Beds) 9 Hospitals					
Class	Antibiotic	Organism	A. baumannii	E. aerogenes	E. cloacae	E. coli	K. pneumoniae	P. aeruginosa	A. baumannii	E. aerogenes	E. cloacae	E. coli	K. pneumoniae	P. aeruginosa	A. baumannii	E. aerogenes	E. cloacae	E. coli	K. pneumoniae	P. aeruginosa
Aminoglycosides	Amikacin	%S	92	100	99	100	99	98	84	100	100	100	99	98	92	100	100	100	99	97
	Gentamicin	%S	70	99	95	90	94	90	64	98	96	90	94	90	75	99	95	89	93	93
	Tobramycin	%S	81	99	94	89	91	96	80	98	96	89	90	95	86	97	95	87	89	96
Penicillins	Amox/Clav	%S	R	R	R	83	88	R	R	R	R	85	85	R	R	R	R	82	94	R
	Ampicillin	%S	R	R	R	49	R	R	R	R	R	49	R	R	R	R	R	47	R	R
	Amp/sulb	%S	63	R	R	55	78	R	65	R	R	55	75	R	75	R	R	53	74	R
	Pip/Tazo	%S	55	86	85	97	90	92	33	85	83	95	89	87	57	79	75	95	88	88
Cephalosporins	Cefazolin	%S	R	R	R	75	78	R	R	R	R	81	85	R	R	R	R	79	81	R
	Ceftriaxone	%S	33	88	79	92	88	R	39	77	74	90	88	R	15	79	70	91	90	R
	Cefotaxime	%S	36	84	82	91	88	R	37	85	74	89	84	R			74	93	99	R
	Ceftazidime	%S	63	86	85	92	88	88	53	77	73	87	80	84	*	87	68	88	90	89
	Cefepime	%S	58	98	95	93	88	87	53	97	91	92	89	88	65	97	93	93	91	90
Carbapenems	Ertapenem	%S	R	100	97	100	98	R	R	99	97	100	97	R	R	97	91	100	97	R
	Imipenem	%S	66	95	96	99	98	88	74	89	99	100	97	84	66	100	96	100	99	87
	Meropenem	%S	63	100	99	100	97	89	55	97	99	100	97	90	69	99	99	100	98	87
Fluoroquinolones	Ciprofloxacin	%S	57	99	94	72	87	78	48	96	92	74	89	80	62	95	92	70	86	82
	Levofloxacin	%S	66	99	95	72	89	77	57	97	95	74	92	79	55	99	94	75	92	81
Tetracyclines	Tetracycline	%S	65	89	88	73	82	R	59	92	89	75	81	R	55	86	88	71	79	R
	Tigecycline	%S	*	97	98	100	94		70	98	98	100	98		69	100	100	100	100	
Other	Aztreonam	%S	R	83	82	90	86	74	R	86	80	88	86	75	R	78	75	91	91	77
	Trimeth/Sulfa	%S	64	93	90	73	85	R	54	96	88	74	84	R	65	98	85	70	84	R
	Nitrofurantoin	%S	*	22	40	96	51	0	0	24	29	97	43	0		18	45	96	36	0



		BALTIMORE METRO AREA 22 HOSPITALS						NATIONAL CAPITOL REGION 10 HOSPITALS						SOUTHERN MARYLAND 3 HOSPITALS						WESTERN MARYLAND 3 HOSPITALS						EASTERN SHORE 3 HOSPITALS							
Class	Antibiotic	Organism	A. baumannii	E. aerogenes	E. cloacae	E. coli	K. pneumoniae	P. aeruginosa	A. baumannii	E. aerogenes	E. cloacae	E. coli	K. pneumoniae	P. aeruginosa	A. baumannii	E. aerogenes	E. cloacae	E. coli	K. pneumoniae	P. aeruginosa	A. baumannii	E. aerogenes	E. cloacae	E. coli	K. pneumoniae	P. aeruginosa	A. baumannii	E. aerogenes	E. cloacae	E. coli	K. pneumoniae	P. aeruginosa	
Aminoglycosides	Amikacin	%S	92	100	100	100	99	98	79	100	100	99	97	98			100	100	98	99	*	100	100	100	99	97	100	*	100	100	100	97	
	Gentamicin	%S	73	99	95	88	93	92	59	97	94	90	90	86	69	98	98	91	95	93	*	100	97	92	98	91	80	*	93	89	98	89	
	Tobramycin	%S	87	97	96	87	89	96	70	97	95	88	84	94	89	98	93	91	93	98	*	100	96	93	97	96	89	*	94	89	95	98	
Penicillins	Amox/Clav	%S	R	R	R	84	91	R	R	R	R	85	79	R	R	R	R	83	92	R	R	R	R	84	85	R	R	R	R	R	R		
	Ampicillin	%S	R	R	R	47	R	R	R	R	R	48	R	R	R	R	R	R	50	R	R	R	R	53	R	R	R	R	R	R	50	R	R
	Amp/sulb	%S	74	R	R	52	72	R	59	R	R	53	69	R	72	R	R	56	82	R	*	R	R	60	86	R	72	R	R	55	83	R	
	Pip/Tazo	%S	55	81	81	95	89	86	30	85	78	95	84	89	60	90	83	96	92	94	*	85	80	94	93	96		*	88	97	96	93	
Cephalosporins	Cefazolin	%S	R	R	R	81	82	R	R	R	R	81	78	R	R	R	R	71	80	R	R	R	R	80	92	R	R	R	R	81	92	R	
	Ceftriaxone	%S	23	79	74	90	89	R	34	79	67	88	82	R	20	90	82	94	91	R	*	80	75	93	95	R	53	*	76	91	92	R	
	Cefotaxime	%S	28	91	75	91	93	R	35	84	74	91	86	R						R	*					R	47	*	83	91	93	R	
	Ceftazidime	%S	54	72	81	85	79	89	53	80	72	88	81	84	61	89	86	94	91	91	*	100	80	97	87	98	83	*	85	91	94	86	
	Cefepime	%S	61	96	93	93	90	89	46	97	90	88	82	84		100	94	94	91	93	*	99	90	95	96	92	72	*	98	91	93	87	
Carbapenems	Ertapenem	%S	R	98	94	100	98	R	R	98	96	100	96	R	R	100	100	100	100	R	R	100	93	100	94	R	R	*	80	100	97	R	
	Imipenem	%S	69		97	100	99	86	60	93	99	100	97	85	66	100	95	99	97	89								*	91	100	100	87	
	Meropenem	%S	63	96	98	100	98	88	52	99	99	100	96	88							*	99	99	100	98	94	84	*	100	100	99	93	
Fluoroquinolones	Ciprofloxacin	%S	58	95	93	70	88	81	39	96	91	74	81	78	64	98	94	73	91	76	*	99	93	78	96	83	78	*	94	71	93	83	
	Levofloxacin	%S	59	99	96	72	91	81	50	97	93	73	86	75	67	98	95	73	90	76	*	100	95	78	97	82	80	*	92	71	96	82	
Tetracyclines	Tetracycline	%S	57	87	89	72	79	R	53	90	85	75	80	R			95	76	88	R	*	95	84	80	87	R	78	*	95	71	82	R	
	Tigecycline	%S	70	100	99	100	98		*	97	96	100	96															*	99	100	97		
Other	Aztreonam	%S	R	80	79	90	89	77		88	72	86	82	68			81	94	94	77					100		*	80	90	93	79		
	Trimeth/Sulfa	%S	62	97	86	71	83	R	49	96	88	68	80	R	64	91	88	76	89	R	*	97	89	80	93	R	78	*	89	74	87	R	
	Nitrofurantoin	%S	*	18	40	96	41	0		24	31	96	39		11	6	40	97	45	0	*	26	35	98	47	0		*	38	98	51		





**2017 Gram Positive Organism  
Percent Susceptibility  
STATEWIDE — 41 Hospitals**

Class	Antibiotic	Organism	E. faecalis	E. faecium	Enterococcus spp.	All S. aureus	MRSA	MSSA	Staph, coag neg.	S. pneumoniae	Viridans group
Penicillins	Penicillin	% S	97	18	88	10	0	12	11	88	84
	Ampicillin	% S	99	18	89	1	2	0	3		*
	Oxacillin	% S	0	0	*	53	0	100	46	*	
	Amox/Clav	% S				53	0	100	48	91	
	Amp/ Subl	% S				60	0	99	50		
Cephalosporins	Cefazolin	% S	R	R	R	51	0	100	41	*	
	Cefuroxime	% S	R	R	R					73	
	Cefotaxime	% S	R	R	R					94	*
	Ceftriaxone	% S	R	R	R	57	0	100	43	99	97
	Cefepime	% S	R	R	R					95	*
Carbapenems	Meropenem	% S	*							81	*
Quinolones	Ciprofloxacin	% S	61	11	69	52	14	80	58		
	Levofloxacin	% S	70	12	71	51	15	83	57	99	*
	Moxifloxacin	% S				68	41	91	75	99	90
Macrolides	Azithromycin	% S								52	
	Clarithromycin	% S								56	
	Erythromycin	% S	13	3	18	39	11	58	34	59	55
Tetracyclines	Tetracycline	% S	22	15	24	90	90	93	79	87	*
	Tigecycline	% S	100	*		*	100	100			*
Other	Gentamicin	% S	R	R	R	96	94	99	86		
	Trimeth/sulfa	% S	R	R	R	93	91	96	65	78	*
	Rifampin	% S	56	10	37	99	94	99	99		
	Clindamycin	% S	R	R	R	66	56	76	57	85	*
	Daptomycin	% S	99	92	98	100	100	98	99		
	Nitrofurantoin	% S	95	24	89	99	98	100	100	*	
	Linezolid	% S	98	96	98	100	99	98	99	100	*
Vancomycin	% S	91	37	88	100	100	100	100	100	100	

**2017 ESBL Table**

	Amikacin	Gentamicin	Tobramycin	Amox/Clav	Ampicillin	Amp/sulb	Pip/Tazo	Cefazolin	Ceftriaxone	Cefotaxime	Cefepime	Ertapenem	Meropenem	Ciprofloxacin	Levofloxacin	Tetracycline	Aztreonam	Trimeth/Sulfa	Nitrofurantoin
E. coli ESBL	98	66	53	32	0	37	44	0	1	16	23	100	100	10	13	39	*	36	89
K. pneumoniae ESBL	96	46	32	9	0	25	35	0	*	47	46	96	92	29	48	38	0	49	29

**2017 VRE Table**

	Penicillin	Ampicillin	Ciprofloxacin	Levofloxacin	Erythromycin	Tetracycline	Tigecycline	Rifampin	Daptomycin	Nitrofurantoin	Linezolid	Vancomycin
VR-E. faecalis	100	96	0	33	0	2	100		98	75	100	0
VR-E. Faecium	0	2	0	18	0	2	100	7	100	27	97	0
VR-Enterococcus spp.	40	43	0	2	0	11			98	100	98	0

**2017 S. pneumoniae Meningitis**

S. pneumoniae	Penicillin	Ceftriaxone
Meningitis	71	92
Non-meningitis	88	99

# Challenges

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- Three months to receive all the antibiograms used
- PDFs, MS Word, MS Excel, Faxes, Oh My!
- Varying formats, antibiotics and organisms
- Susceptibility outliers
- Human error
- Cascade testing
- CLSI guidelines not consistently followed

	<i>ENTEROCOCCUS FAECIUM</i> •		<i>VREf</i> **	
	8		9	
<b>VANCOMYCIN</b>	↓	50	↓	56

• Reflects low number of isolates

\* Vancomycin Resistant *E. faecium* (VREf). Low number of isolates.



# Future Steps

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- This April we will be requesting 2018 antibiograms from acute care hospital labs
- Updating/revamping our HAI website — will include all current statewide antibiograms, and other state/regional antibiograms (VA, DC, etc.)
- Long-term care statewide antibiograms??
  - In a few years optimistically ☺

# Contact Information

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