

## HNELHD Cumulative Antibigrams 2022: HNE Commentary

### Antibiogram key

	> 90% of isolates susceptible
	70-90% of isolates susceptible
	< 70% of isolates susceptible
	Not tested, not clinically effective, intrinsically resistant, or no data available from OrgTRx
	Typically restricted or non-first line antibiotic

### Notes:

1. Data processed by OrgTRx (antibiogram) software to exclude multiple isolates so only the first isolate of a given species per patient per year per subset (e.g., urine) is included. Only data captured by OrgTRx is presented.
2. Only organisms with 30 or more isolates are included (CLSI Guidelines M39-ED5 recommended that results should include at least 30 isolates to be considered significant.)
3. During the period covered, antimicrobial susceptibility testing standards used include: EUCAST v11/12 and regional sites may have reported using CDS.
4. The HNE antibiogram captures data from the following sites: All facilities captured under OrgTrx for HNE.
5. Regarding antibiotics: (1) Aminoglycosides: EUCAST v12 does not provide breakpoints for gentamicin for *Pseudomonas*. Where interpretations have been provided, these may be derived from an earlier version of EUCAST or CDS. EUCAST derived results for aminoglycosides based on epidemiological cut-offs may not predict clinical outcomes. In systematic infections, the aminoglycoside must be supported by other active therapy. (2) Penicillin: testing for *Staphylococcus aureus* may be based on a rapid method, and figures provided represent an estimate of susceptibility.
6. Alphabetically, Sectors and Hospital groupings as described in this antibiogram include:
  - a. Calvary Mater Newcastle
  - b. Hunter Valley Sector capturing data from the following sites: Murrurundi Hospital, Muswellbrook Hospital, Scone Hospital, Singleton Hospital
  - c. John Hunter Hospital
  - d. Lake Macquarie capturing data from the following sites: Belmont District Hospital, Morisset Hospital
  - e. Lower Mid North Coast Sector capturing data from the following sites: Bulahdelah District Hospital, Dungog and District Hospital, Gloucester Soldiers Memorial Hospital, Taree Hospital, Wingham Hospital
  - f. Maitland capturing data from the following sites: Cessnock District Hospital, Kurri Kurri Hospital, Maitland Hospital
  - g. Mehi Sector capturing data from the following sites: Bingara Medical Centre, Boggabri Hospital, Narrabri Hospital, Wyallda Hospital
  - h. Peel Sector capturing data from the following sites: Barraba Hospital, Gunnedah Hospital, Manilla Hospital, Quirindi Hospital, Tamworth Base Hospital, Walcha Hospital, Werris Creek Hospital
  - i. Tablelands Sector capturing data from the following sites: Armidale Hospital, Emmaville Hospital, Glen Innes Hospital, Guyra Hospital, Inverell Hospital, Tenterfield Hospital
  - j. Tomaree Community Hospital

## HNELHD Cumulative Antibigrams 2022: HNE Commentary

### Blood Cultures

Infectious Syndrome	Abridged Therapeutic Guidelines (TG) empirical recommendations
<b>Empirical regimens for adults with community-acquired sepsis or septic shock, source not apparent</b>	Gentamicin PLUS Flucloxacillin PLUS Vancomycin PLUS ceftriaxone/cefotaxime (if <i>Neisseria meningitidis</i> suspected)
See eTG Complete > Antibiotic > Empirical regimens for sepsis or septic shock for an unabridged description	

- The most frequent pathogens isolated from blood cultures collected across HNE were *Escherichia coli*, *Staphylococcus aureus*, *Klebsiella pneumoniae*, *Pseudomonas aeruginosa*, and *Enterococcus faecalis*.
- Escherichia coli* isolates demonstrated 59% susceptibility to ampicillin (lowest susceptibility detected at John Hunter Hospital: 54%) and 96% susceptibility to gentamicin (lowest susceptibility detected at John Hunter Hospital: 94%).
- Staphylococcus aureus* isolates demonstrated 88% susceptibility to flucloxacillin (lowest susceptibility detected in Maitland Hospital and associated sector: 80%) and 100% susceptibility to vancomycin. 12% of isolates were MRSA (highest rate of MRSA was detected at Maitland Hospital and associated sector: 20%).
- Klebsiella pneumoniae* isolates showed low susceptibility to ampicillin (1% susceptibility), but high susceptibility to amoxicillin and clavulanic acid (97%). Detected rates of susceptibility to gentamicin were high (100% susceptibility).
- Pseudomonas aeruginosa* isolates demonstrated 100% susceptibility to tobramycin. EUCAST does not provide breakpoints for gentamicin. This species is intrinsically resistant to ampicillin, amoxicillin and clavulanic acid, ceftriaxone and cefotaxime. 99% of isolates were susceptible to ceftazidime.

### Urinary Isolates

Infectious Syndrome	Abridged Therapeutic Guidelines (TG) empirical recommendations
<b>Empirical antibiotic therapy for nonpregnant women with acute cystitis</b>	Trimethoprim OR Nitrofurantoin OR Cefalexin
<b>Empirical antibiotic therapy for men with acute cystitis</b>	Trimethoprim OR Nitrofurantoin OR Cefalexin
<b>Treatment of nonsevere pyelonephritis in adults</b>	amoxicillin+clavulanate OR ciprofloxacin
<b>Treatment of severe pyelonephritis in adults</b>	Gentamicin AND Ampicillin/Amoxicillin OR Ceftriaxone/Cefotaxime
See eTG Complete > Antibiotic > Acute cystitis in adults and Acute pyelonephritis in adults for an unabridged description	

## HNELHD Cumulative Antibigrams 2022: HNE Commentary

- The five most frequently isolated pathogens from urine samples were: *Escherichia coli*, *Enterococcus faecalis*, *Klebsiella pneumoniae*, *Proteus mirabilis*, and *Enterobacter cloacae* complex.
- *Escherichia coli* demonstrated mixed rates of susceptibility to first line oral agents for cystitis and non-severe pyelonephritis (81% trimethoprim susceptibility [lowest percentage susceptibility: John Hunter Hospital: 79%], and 99% nitrofurantoin susceptibility [lowest percentage susceptibility: Peel Sector: 98%]). The isolates showed variable susceptibility to first line intravenous therapy options for severe pyelonephritis (95% gentamicin susceptibility [lowest percentage susceptibility: Tomaree Community Hospital: 93%] and 62% ampicillin susceptibility [lowest percentage susceptibility: Tomaree Community Hospital: 57%]). 95% of isolates were susceptible to ceftriaxone.
- *Enterococcus faecalis* isolates demonstrated high rates of susceptibility were observed to first line oral agents (100% nitrofurantoin susceptibility, 100% amoxicillin susceptibility) and intravenous therapies (100% vancomycin susceptibility). 0% of isolates were vancomycin resistant enterococci (VRE).
- *Klebsiella pneumoniae* isolates showed susceptibility to oral options (89% trimethoprim susceptibility [lowest percentage susceptibility: Tablelands Sector: 85%]) and a first line intravenous option (98% gentamicin susceptibility [lowest percentage susceptibility: Maitland: 94%]). Isolates were not susceptible to ampicillin (0% susceptibility).
- Isolates of *Pseudomonas aeruginosa* demonstrated high rates of susceptibility to oral options (94% ciprofloxacin susceptibility, lowest percentage susceptibility: Maitland: 92%) and high susceptibility to intravenous therapy (99% tobramycin susceptibility, lowest percentage susceptibility: John Hunter Hospital: 97%). 95% of isolates were susceptible to ceftazidime.
- *Proteus mirabilis* isolates showed mixed susceptibility to oral (86% trimethoprim susceptibility, 98% norfloxacin susceptibility) and intravenous options (98% gentamicin susceptibility). Susceptibility to ampicillin was 87%.
- *Enterobacter cloacae* was a commonly isolated pathogen. It is a member of the ESCHPPM group, and which are considered intrinsically resistant to amoxicillin, augmentin, cefazolin and cefalexin. Resistance to third generation cephalosporins or piperacillin/tazobactam may develop during therapy for infection with these organisms and so these antibiotics are not routinely reported. 79% of isolates demonstrated susceptibility to trimethoprim, and 90% demonstrated susceptibility to gentamicin. Other frequently isolated ESCHPPM organisms may include *Enterobacter (Klebsiella) aerogenes*, *Serratia marcescens*, *Hafnia alvei*, *Citrobacter freundii* complex, *Proteus vulgaris*, and *Morganella morganii*.
- *Enterococcus faecium* is an isolate of note that demonstrated low rates of susceptibility (4%) to ampicillin and 51% vancomycin susceptibility (lowest percentage susceptibility: John Hunter Hospital: 43%). 49% of isolates were vancomycin resistant enterococci (VRE).

### Other Isolates Commentary

The Cumulative Antibigram for “Other Isolates” provides summary data of antibiotic resistance patterns for organisms obtained from sites other than blood and urine. Chiefly these bacteria are collected from skin, soft tissue, respiratory tract and surgical sites.

## HNELHD Cumulative Antibigrams 2022: HNE Commentary

Infectious Syndrome	Abridged Therapeutic Guidelines (TG) empirical recommendations
Empirical regimens for adults with community-acquired sepsis or septic shock, source not apparent	Gentamicin PLUS Flucloxacillin PLUS Vancomycin PLUS ceftriaxone/cefotaxime (if <i>Neisseria meningitidis</i> suspected)
Empirical therapy for cellulitis and erysipelas without systemic features > purulent cellulitis	Dicloxacillin OR Flucloxacillin OR Cefalexin (if delayed non-severe hypersensitivity to penicillins) OR trimethoprim+sulfamethoxazole OR clindamycin (if increased risk of MRSA or immediate hypersensitivity to penicillins)
Empirical antibiotic therapy for peritonitis due to perforated viscus	Gentamicin PLUS metronidazole PLUS Ampicillin OR Piperacillin+tazobactam OR Ceftriaxone/Cefotaxime PLUS metronidazole
Empirical therapy: low-severity CAP in adults	Amoxicillin OR Doxycycline OR Clarithromycin (if non-immediate hypersensitivity to penicillin or suspected atypical cause)
Empirical therapy: moderate-severity CAP in adults	Benzylpenicillin PLUS (Doxycycline OR clarithromycin) OR Ceftriaxone/Cefotaxime PLUS (Doxycycline OR clarithromycin) (if immediate non-severe or delayed non-severe hypersensitivity to penicillin)
Empirical therapy: high-severity CAP in adults	(Ceftriaxone OR Cefotaxime) PLUS Azithromycin OR Benzylpenicillin PLUS Gentamicin PLUS Azithromycin
See eTG Complete > Antibiotic > for an unabridged description	

- Frequently isolated pathogens included: *Staphylococcus aureus*, *Streptococcus pyogenes* (Group A), *Haemophilus influenzae*, and *Escherichia coli*
- Staphylococcus aureus* was frequently isolated from the samples collected at HNE. Isolates demonstrated high rates of susceptibility to flucloxacillin (83% susceptibility; lowest percentage susceptibility: John Hunter Hospital: 77%), as the recommended first line oral agent and cefalexin as the second line agent recommended for use in penicillin hypersensitivity. Isolates susceptible to flucloxacillin are considered susceptible to cefazolin. 17% of isolates were MRSA. First line oral agents for the treatment of *Staphylococcus aureus* demonstrated high rates of susceptibility (85% clindamycin susceptibility [lowest percentage susceptibility: John Hunter Hospital: 83%], 97% sulfamethoxazole and trimethoprim susceptibility [lowest percentage susceptibility: Lake Macquarie: 95%], and 96% doxycycline susceptibility [lowest percentage susceptibility: Lake Macquarie: 95%]).
- Streptococcus pyogenes* (Group A) isolates demonstrated 100% Benzylpenicillin susceptibility. This organism is frequently isolated from skin and soft tissue infections. Invasive Group A streptococcal (iGAS) infection can result in serious disease.
- A respiratory pathogen of note was *Haemophilus influenzae*. Isolates demonstrated 55% ampicillin susceptibility (lowest percentage susceptibility: Lower Mid North Coast Sector: 35%), 100% ceftriaxone susceptibility (lowest percentage susceptibility: Lake Macquarie: 98%), and

## HNELHD Cumulative Antibigrams 2022: HNE Commentary

84% amoxicillin and clavulanic acid susceptibility (lowest percentage susceptibility: Lower Mid North Coast Sector: 76%). 99% of isolates were susceptible to doxycycline.

- *Pseudomonas aeruginosa* can be a respiratory and skin coloniser, but also cause invasive infections. Isolates demonstrated 98% tobramycin susceptibility (lowest percentage susceptibility: Lower Mid North Coast Sector: 96%), 94% ceftazidime susceptibility (lowest percentage susceptibility: Lower Mid North Coast Sector: 89%), and 92% ciprofloxacin susceptibility (lowest percentage susceptibility: Lower Mid North Coast Sector: 89%).
- Group C *Streptococcus* and Group G *Streptococcus* isolates demonstrate 100% benzylpenicillin susceptibility. This organism may cause skin and soft tissue infections.

## HNELHD Cumulative Antibigrams 2022: HNE: Blood

	Ampicillin		Amoxicillin and Clavulanic acid		Benzylpenicillin		Cefazolin		Flucloxacillin		Gentamicin		Sulfamethoxazole and trimethoprim		Amikacin		Cefepime		Ceftazidime		Ceftioxone		Ciprofloxacin		Meropenem		Piperacillin and Tazobactam		Tobramycin		Vancomycin	
Organism	%S	n	%S	n	%S	n	%S	n	%S	n	%S	n	%S	n	%S	n	%S	n	%S	n	%S	n	%S	n	%S	n	%S	n	%S	n	%S	n
Gram-negative																																
Escherichia coli	59	717	83	711			66	713			96	715	83	718	99	703	100	217	95	590	93	717	92	717	100	713	95	704	95	715		
Klebsiella pneumoniae	1	124	97	124			92	123			100	124	100	123	100	124	100	39	100	104	100	124	99	123	100	124	97	117	100	124		
Pseudomonas aeruginosa															100	91			99	91			96	91	97	91	95	91	100	91		
Proteus mirabilis	96	49	98	49			80	45			96	49	88	49	96	49			100	38	100	49	100	49	100	49	100	49	100	49		
Enterobacter cloacae complex											89	46	70	46	100	46							93	46	96	46			87	46		
Serratia marcescens											100	39	100	39	100	39							95	39	100	39			79	34		
Gram-positive																																
Staphylococcus aureus					19	369			88	369			97	369																	100	149
Enterococcus faecalis	100	80																												100	80	
Streptococcus pneumoniae					98	65																										
Streptococcus sp. (Group C)					100	52																								100	52	
Streptococcus sp. (Group B)					100	50																								100	52	
Streptococcus pyogenes (Group A)					100	31																								100	31	

## HNELHD Cumulative Antibiotograms 2022: HNE: Urine

	Ampicillin		Benzylpenicillin		Cefalexin		Cefazolin (Urine)		Flucloxacillin		Gentamicin		Nitrofurantoin		Trimethoprim		Amikacin		Cefepime		Ceftazidime		Ceftioxone		Ciprofloxacin		Meropenem		Norfloxacin		Piperacillin and Tazobactam		Tobramycin		Vancomycin	
Organism	%S	n	%S	n	%S	n	%S	n	%S	n	%S	n	%S	n	%S	n	%S	n	%S	n	%S	n	%S	n	%S	n	%S	n	%S	n	%S	n	%S	n	%S	n
<b>Gram-negative</b>																																				
<i>Escherichia coli</i>	62	7383			94	899	86	6510			95	7379	99	7376	81	7381	99	6469	99	6396	98	6481	95	6531	93	6442	100	6476	88	7369	96	6428	95	6463		
<i>Klebsiella pneumoniae</i>	0	900			93	96	93	738			98	900			89	899	100	809	99	795	98	804	96	814	96	798	100	809	93	899	92	809	97	806		
<i>Proteus mirabilis</i>	87	518			99	68					98	517			86	518	100	451	99	446	100	450	100	454	99	447	100	449	98	517	99	446	99	448		
<i>Enterobacter cloacae complex</i>											90	318			79	318	98	311	98	282				309	93	291	98	312	89	317			90	307		
<i>Klebsiella oxytoca</i>	0	213					32	186			96	213			93	213	99	185	99	182	95	185	92	187	98	183	98	185	96	213	88	185	95	184		
<i>Klebsiella aerogenes</i>											99	165			98	165	100	155	99	147					98	155	100	157	93	164			99	155		
<i>Morganella morganii</i>											99	137			91	137	100	130	100	117					98	123	99	133	96	137			98	130		
<i>Pseudomonas aeruginosa</i>											100	105					98	639	95	530	95	648			94	650	99	655	98	103	93	655	99	651		
<i>Serratia marcescens</i>											100	95			99	95	100	86	100	79					96	81	100	86	93	95			65	85		
<b>Gram-positive</b>																																				
<i>Enterococcus faecalis</i>	100	1144										100	1143																						100	1133
<i>Enterococcus faecium</i>	4	158																																	51	159
<i>Staphylococcus aureus</i>			28	151					91	224	97	101	98	45	95	148									94	101									100	104
<i>Streptococcus sp. (Group B)</i>	100	41	100	41								100	40																						100	39

## HNELHD Cumulative Antibiotigrams 2022: HNE: Other

	Amoxicillin and Clavulanic acid		Ampicillin		Benzylpenicillin		Cefazolin		Doxycycline		Erythromycin		Flucloxacillin		Gentamicin		Mupirocin		Sulfamethoxazole and trimethoprim		Amikacin		Cefepime		Ceftazidime		Ceftioxone		Ciprofloxacin		Clindamycin		Fusidic acid		Linezolid		Meropenem		Piperacillin and Tazobactam		Rifampicin		Teicoplanin		Tobramycin		Vancomycin		
Organism	%S	n	%S	n	%S	n	%S	n	%S	n	%S	n	%S	n	%S	n	%S	n	%S	n	%S	n	%S	n	%S	n	%S	n	%S	n	%S	n	%S	n	%S	n	%S	n	%S	n	%S	n	%S	n					
Gram-negative																																																	
Haemophilus influenzae	84	686	55	689					99	687									73	691							100	690																					
Escherichia coli	82	528	54	533				73	517					94	533				83	533	100	530	98	383	95	394	93	531	91	530						100	528	93	530					94	532				
Enterobacter cloacae complex														91	204				86	204	100	204	95	153				94	204						95	204								88	203				
Pseudomonas aeruginosa														99	169						97	811	93	611	94	809		92	816						97	813	91	813						98	816				
Klebsiella pneumoniae	87	143	0	145				84	127					94	145				93	145	100	144	99	102	92	106	92	143	97	145					97	145	90	143					94	145					
Serratia marcescens														98	135				99	133	99	135	100	112				99	135						99	135								63	135				
Proteus mirabilis	98	112	93	114				92	63					98	114				89	114	100	113	100	71	99	72	99	113	100	113					100	113	100	113					100	113					
Morganella morganii														97	68				94	68	100	68	98	52				96	68						100	68							97	66					
Klebsiella oxytoca	91	67	0	67				33	66					96	67				96	67	100	67	95	55	93	55	93	67	99	67					96	67	94	67					96	67					
Klebsiella aerogenes														100	42				100	42	100	42	100	35				98	42						98	42							100	42					
Gram-positive																																																	
Staphylococcus aureus					19	5704			96	5704	85	5705	83	5703	97	4959	98	5085	97	5701								94	4829	85	4884	97	4942	100	4672					100	4927	100	4503			100	4963		
Streptococcus pyogenes (Group A)			100	132	100	711			72	706	87	711																																		100	707		
Streptococcus sp. (Group C)			100	33	100	273			71	272	82	273																																		100	270		
Streptococcus sp. (Group B)			100	102	100	138			32	143	74	144																		86	42															100	142		
Streptococcus pneumoniae			100	33	89	118			86	140	82	141																																		100	36		
Enterococcus faecalis			99	117																													100	102							99	102			99	116			
Enterococcus faecium			18	72																													100	69							95	73			53	76			