2017 Canterbury Antimicrobial Susceptibility Report

General comment on cumulative susceptibility reporting

- Specimens are more likely to be sent for culture and susceptibility testing when there has been treatment failure and in cases where healthcare associated infection is suspected. As a result susceptibility results are biased towards overcalling resistance.
- Resistance bias is considerably increased when looking at susceptibility to third line (reserve) antimicrobials, against which typically only a resistant subset of isolates is tested.
- The patient population is far from homogeneous in terms of risk factors for being infected by an antimicrobial resistant organism. It will almost always be more appropriate to inquire after risk factors for antimicrobial resistance rather than to base treatment decisions on aggregated local susceptibility rates. Pertinent risk factors includes:
    - residence in long-term care;
    - recent hospitalisation, particularly in intensive care;
    - recent antibiotic administration;
    - recent travel to an area with high endemic rates of antimicrobial resistance
- It would in principle be ideal to be able to give rates stratified by other risk factors, but this would generally result in the rates for any stratum being based on too small a sample to have meaningful precision. Bear in mind that a resistance rate of 30% based on a sample size of 100 reflects a 95% confidence interval of 21% to 39%!
- The problem of resistance to antimicrobials has developed to crisis proportions globally, and although New Zealand lags much of the rest of the world, we are ever more frequently faced with cases of infection for which there is no readily available, effective and safe treatment. It must be borne in mind that every use of antimicrobials, justified or not, contributes to the pressure for the emergence and selection for resistance factors, this being particularly true for broad spectrum agents such as the fluoroquinolones, third generation cephalosporins and co-amoxyclav. This does not mean that we should abandon use of antimicrobials, but it behoves us to use them prudently, only in situations where they are of proven clinically relevant utility, using narrow spectrum agents in preference to broad spectrum.
- Most mild to moderate infections seen in general practice are self-limiting, their resolution at best modestly accelerated by administering antimicrobials. The first question to ask is not “which antibiotic?” but rather: “is an antibiotic really necessary, or would it be better to provide symptom relief and health advice aimed at reducing the risk factors for infections.

Specific organism-antimicrobial combinations (quoted as percentage susceptible):

Skin and soft tissue infections

β-haemolytic streptococci

Streptococcus pyogenes	Susceptibility (%)	C.I.	Number tested
Penicillin	100.0	-	-
Erythromycin	95.5	± 0.61`	4134
Clindamycin	96.6	± 0.6	4134
Co-trimoxazole	0.0	-	-

Notes:

1. The β-haemolytic streptococci are inherently susceptible to the penicillins and cephalosporins, and are not routinely tested for susceptibility to these agents. Similarly, all *Str. pyogenes* (group A streptococci) and most group C and G streptococci re resistant to co-trimoxazole.
2. Although streptococci are susceptible in vitro to flucloxacillin and other anti-staphylococcal penicillins, flucloxacillin is very highly protein bound, so that free drug levels in tissue, while adequate to treat staphylococci, may be inadequate for streptococci.

Staphylococcus aureus

Staphylococcus aureus	Susceptibility (%)	C.I.	Number tested
1st line agents			
Penicillin	18.7	± 0.9	7563
Methicillin	95.0	± 0.5	7562
Erythromycin	87.9	± 0.7	7560
Clindamycin	91.7	± 0.6	7559
Co-trimoxazole	98.8	± 0.2	7556
2nd line agents			
Fusidic Acid	79.6	± 4.0	393
Gentamicin	93.6	± 2.4	388
Ciprofloxacin	79.9	± 3.9	398
Mupirocin	92.9	± 2.4	436
Rifampicin	99.5	± 0.7	383
Vancomycin	100.0	± 0.0	254

Notes:

1. The surprisingly high proportion (19%) of *Staphylococcus aureus* susceptible to penicillin. For such isolates penicillin remains the drug of choice.
2. Suscptibility or resistance to methicillin implies corresponding susceptibility or resistance to all antistaphylococcal penicillins (such as flucloxacillin), cephalosporins and β-lactam- β-lactamase combinations (co-amoxyclav, Augmentin)
3. Second line agents have for the most part been tested against isolates resistant to methicillin. Susceptibility rates for methicillin susceptible *Staph. aureus* will in general be higher than those for MRSA.

Urinary Tract Infections

Urinary Enterobacteraceae

Urinary Enterobacteraceae. The great majority of urinary tract infections in community practice are caused by gram-negative bacilli of the family Enterobacteriaceae. The predominant species is *Escherichia coli*. The results below are pooled from reports of coliform and named members of the Enterobacteriaceae isolated from specimens of urine.

Urinary enterics	Susceptibility (%)	C.I.	Number tested
1st line agents			
Nitrofurantoin	95.6	± 0.4	11488
Trimethoprim	75.1	± 0.8	11486
Ampicillin	49.4	± 0.9	11491
Cefaclor	95.6	± 0.4	11487
Co-amoxyclav	79.9	± 0.7	11454
Gentamicin	67.1	± 10.8	73
Quinolones			
Ciprofloxacin (Low)	74.6	± 0.8	11490
Ciprofloxacin (High)	90.3	± 0.6	11490

Notes:

1. Ciprofloxacin susceptibility has been tested using both a high and a low threshold. The implication of an organism's having low level resistance but remaining susceptible to high levels of the drug is that there may be treatment failure if the drug is not used at full dosage, or if a less potent quinolone such as norfloxacin is used. There is also an increased risk of acquisition of further resistance factors during treatment, leading to full resistance. Such organisms are reported as "I", that is, as having intermediate susceptibility.
2. We do not test or report norfloxacin susceptibility as we believe there is no indication for the use of this drug.

3. There remains a high rate of susceptibility to first line agents nitrofurantoin and trimethoprim.
4. While there is a high rate of susceptibility to the broad spectrum agents co-amoxyclav and the fluoroquinolones, it must be questioned whether it is ethically defensible to use these agents for the treatment of a self-limiting disease such as uncomplicated cystitis, which will resolve on any or no antimicrobial therapy. Complicated urinary tract infection, such as pyelonephritis, does however require treatment with an agent with a high probability of success, and gentamicin i.v. would be an appropriate first choice for empirical treatment. The β-hamolytic streptococci are inherently susceptible to the penicillins and

Pseudomonas aeruginosa

As a cause of urinary tract infection, *Pseudomonas aeruginosa* is seen particularly in the context of neurogenic bladder, and a clinical diagnosis can sometimes be made on the characteristic odour and colour of the urine.

Pseudomonas aeruginosa	Susceptibility (%)	C.I.	Number tested
Trimethoprim	0.0	-	-
Nitrofurantoin	0.0	-	-
Amoxycillin	0.0	-	-
Co-amoxyclav	0.0	-	-
Cefaclor	0.0	-	-
Gentamicin	84.8	± 9.2	59
Ciprofloxacin	81.8	± 7.6	176
Ceftazidime	92.5	± 7.1	53

Enterococci

Enterococcus faecalis	Susceptibility (%)	C.I.	Number tested
Ampicillin	99.8	± 2.0	106
Cefaclor	0.0	-	-
Ciprofloxacin	0.0	-	-
Nitrofurantoin	99.8	± 1.8	109
Trimethoprim	0.0	-	-

Respiratory tract infections

Causes of pneumonia not included in routine sputum culture are *Mycoplasma* (usually affects adolescents and young adults) and *Legionella* (usually affects the older adult). These organisms are susceptible to the macrolides (erythromycin, roxithromycin) but not to β-lactams (penicillins, cephalosporins).

Infections such as bronchitis and sinusitis seldom require antimicrobial treatment.

Chronic respiratory infections and exacerbations of conditions such as bronchiectasis and chronic obstructive pulmonary diseases are problematic from the point of view of laboratory guidance. There are typically multiple different organisms, and what grows most abundantly in the petri dish is not necessarily related to the changed clinical state. The organisms are in a thick biofilm, poorly penetrated by most antimicrobials and *in vitro* susceptibility testing by standard methods is a very poor predictor of clinical response. The best guides to management are the results of randomised controlled trials, where the best results are with long-term, low-dose macrolides, inhaled antimicrobials, and physiotherapy.

Where pneumonia is diagnosed, empiric treatment should cover the pneumococcus and *Legionella*, as these are the organisms associated with poor outcomes if untreated.

Streptococcus pneumoniae

Streptococcus pneumoniae	Susceptibility (%)	C.I.	Number tested
Cotrimoxazole	74.3	± 4.4	381
Erythromycin	73.4	± 4.4	380
Penicillin	83.2	± 4.1	322
Tetracycline	69.7	± 6.1	221
Ciprofloxacin	0.0	-	-

Haemophilus influenzae

Haemophilus influenzae	Susceptibility (%)	C.I.	Number tested
Ampicillin	74.3	± 2.7	988
Co-amoxyclav (Augmentin)	93.6	± 1.5	985
Cotrimoxazole	70.0	± 2.9	986
Tetracycline	98.6	± 0.9	707

Moraxella catarrhalis

Moraxella catarrhalis	Susceptibility (%)	C.I.	Number tested

Ampicillin	0	-	-
Cefaclor	100.0	-	-
Co-amoxyclav (Augmentin)	100.0	-	-

Notes:

1. Pneumococci from different sites are tested against differing panels of antimicrobials, so the results for, say, penicillin and erythromycin are not necessarily for the same set of organisms. Penicillin and moxifloxacin are put up for invasive pneumococci only. This does have the effect that a higher rate of susceptibility is recorded than if the set included superficial colonising pneumococci from the upper respiratory tract, which much more frequently display reduced susceptibility to penicillin. The numbers of invasive pneumococci encountered is small, resulting in wide confidence intervals. Vancomycin susceptibility is, as would be expected, 100%.
2. A high rate of susceptibility to penicillin of invasive pneumococci in our environment means that the penicillins and first generation cephalosporins are acceptable first line empirical agents for treatment of community acquired pneumonia. In a patient for whom immediate commencement of effective therapy is vital, as in suspected pneumococcal meningitis or severe pneumococcal pneumonia, early empirical use of vancomycin or moxifloxacin may be contemplated, but therapy should be reviewed on clinical response and susceptibility testing.