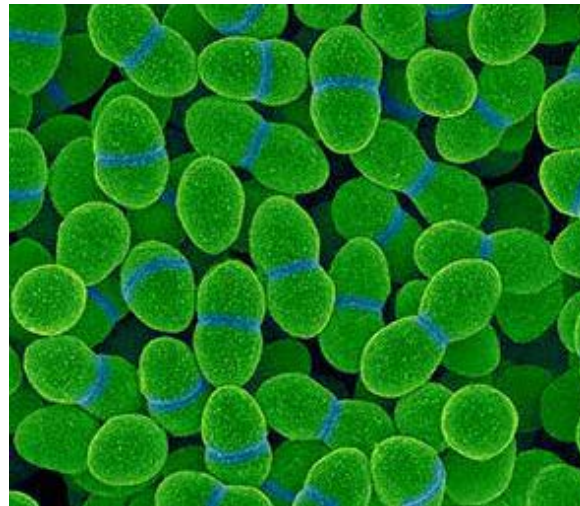


Antibiogram 2007-9

*Nelson and Wairau Hospital Laboratory
antibiotic susceptibility test results from
2007-9 with analysis and implicative
comments*



*Prepared by:
Richard Everts, Medical Microbiologist
Tony Barnett, Laboratory Scientist
February 2010*

This document is not an antibiotic prescribing guideline. These susceptibility results are one of several factors that have been used to develop empiric antibiotic prescribing guidelines for NMDHB inpatients (found on the NMDHB intranet homepage – go to Clinical Applications\Clinical guidelines then search by title) and the Nelson and Marlborough community (found on the NMDHB website – go to www.nmdhb.govt.nz and look under Health Concerns\Clinical Guidelines\Medication.)

Staphylococcus aureus

Isolates from all sources, 1 January 2007 to 30 June 2009. Method of testing: disk diffusion (Kirby-Bauer).

Antibiotic	Percentage Susceptible – NELSON and MARLBOROUGH 2007-9 (No. tested)	Percentage Susceptible – NEW ZEALAND 2007
Penicillin ¹	18% (7398)	13.3%
Flucloxacillin ²	95% (8007)	92.8%
Erythromycin	90% (7675)	88.2%
Doxycycline	98% (6978)	97.9%
Cotrimoxazole	99% (7665)	98.7%

1. Penicillin susceptibility predicts amoxicillin susceptibility
2. Flucloxacillin susceptibility predicts susceptibility to amoxicillin-clavulanate and all cephalosporins

Penicillin susceptibility has fallen from 24% in 2003-4 to 19% in 2005-6 and 18% in 2007-9; the MRSA rate has increased a little from 3% to 5% over these same years. The number of MRSA isolates is also increasing nationally (Figure 1). Nelson and Marlborough have one of the lowest MRSA rates in New Zealand (Figure 2).

Some Nelson and Marlborough isolates are still susceptible to penicillin; if penicillin is reported susceptible then penicillin or amoxicillin will be the most active antibiotics for that isolate and should be used if possible. The relatively low MRSA rate justifies the low empiric use of vancomycin in our district; we recommend flucloxacillin (or cefazolin if mild penicillin allergy) for most infections where *Staphylococcus aureus* or beta-haemolytic streptococci are the most likely organisms (e.g., skin infections, bone and joint infections).

Figure 1. MRSA isolations, 1995-2008

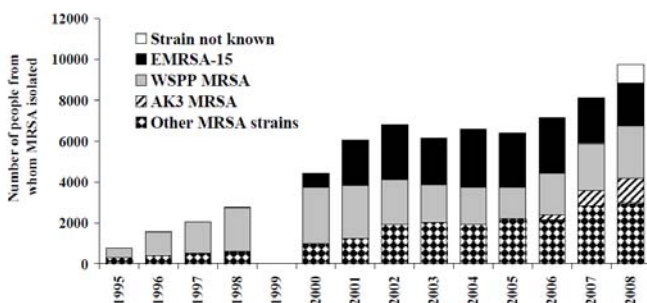
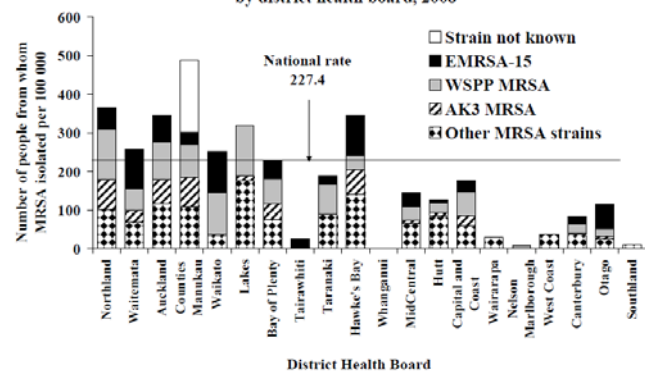


Figure 2. Annualised incidence of MRSA by district health board, 2008



Coagulase-negative staphylococci

Most isolates are *Staphylococcus epidermidis*. Isolates from all sources, 1 January 2007 to 30 June 2009. Method of testing: disk diffusion (Kirby-Bauer).

Antibiotic	Percentage Susceptible – NELSON and MARLBOROUGH 2007-9 (No. tested)	Percentage Susceptible – NEW ZEALAND 2008
Penicillin ¹	18% (229)	14%
Flucloxacillin ²	66% (726)	43%
Vancomycin	100% (56)	99%
Erythromycin	69% (229)	55%
Doxycycline	88% (223)	87%
Cotrimoxazole	72% (227)	72%

1. Penicillin susceptibility predicts amoxicillin susceptibility
2. Flucloxacillin susceptibility predicts susceptibility to amoxicillin-clavulanate (Augmentin) and all cephalosporins

Enterococcus spp.

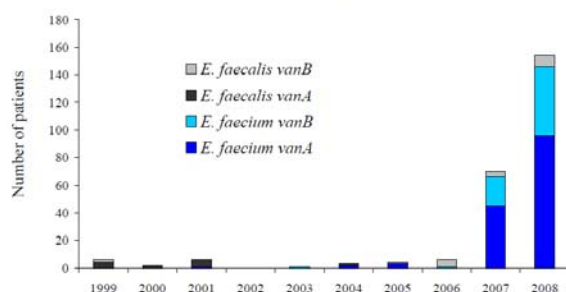
All sources, 1 January 2007 to 30 June 2009. Method: disk diffusion (Kirby-Bauer).

Antibiotic	Percentage Susceptible – NELSON and MARLBOROUGH 2007-9 (No. tested)	Percentage Susceptible – NEW ZEALAND 2008
Amoxicillin ¹	98% (1276)	96%
Nitrofurantoin	99% (1170)	99%
Vancomycin	100% (1276)	98%
High-level gentamicin ²	65% (1170)	68%

1. Amoxicillin susceptibility predicts penicillin and amoxicillin-clavulanate susceptibility
2. Only tested on blood isolates; predicts for synergistic effect when given with amoxicillin or vancomycin, not active against enterococci when used alone

No clinically significant GRE (glycopeptide-resistant enterococci) have been isolated in the Nelson-Marlborough district from 2003-2009, thanks largely to low vancomycin use. In contrast, hundreds of GRE have been isolated in Auckland and Waikato since 2007.

Figure 1. Species and van genotype of VRE isolated in New Zealand, 1999-2008



Amoxicillin is still the empiric treatment for suspected enterococcal infections in this region. Enterococci are occasional causes of urine infections - trimethoprim will not be active – if urine gram-stain microscopy shows

gram-positive cocci, add amoxicillin to cover enterococci.

Streptococcus pneumoniae

Isolates from all sources, 1 January 2007 to 30 June 2009. Method of testing: disk diffusion (Kirby-Bauer) with further testing of resistant organisms by e-test.

Antibiotic	Percentage Susceptible – NELSON and MARLBOROUGH 2007-9 (No. tested)	Percentage Susceptible – NEW ZEALAND 2007 ³
Penicillin	96% (185) ¹	94%
Ceftriaxone	98% (93) ²	97%
Clarithromycin	95% (121)	86%
Doxycycline	96% (108)	91.5%

1. Penicillin-susceptible: MIC < 0.06 mcg/ml for meningeal or middle ear isolates; MIC < 2 for other isolates
2. Ceftriaxone-susceptible: MIC < 0.5 mcg/ml for meningeal or middle ear isolates; MIC < 1 for other isolates
3. Based on rates for invasive isolates only; includes intermediate susceptibility.

Nelson and Marlborough susceptibility results for pneumococci have remained stable over the last seven years.

For empirical treatment of suspected bacterial meningitis in adults, ceftriaxone is the drug of choice in this district. If gram-positive cocci are seen on microscopy of the CSF, vancomycin should be added because the national rate of ceftriaxone resistance or intermediate susceptibility was 14.1% in 2007. *In-vitro* penicillin and ceftriaxone "resistance" is less important for treatment of pneumococcal infections at other sites.

Increasing resistance to clarithromycin and doxycycline nationally and overseas is the reason why these drugs are no longer recommended for single-agent treatment of pneumonia elsewhere; in Nelson/Marlborough these drugs are still highly active and recommended for community-acquired pneumonia in patients with beta-lactam allergy and without serious co-morbidity or prior antibiotic treatment. Despite *in-vitro* susceptibility, ciprofloxacin is not active enough for treatment of serious pneumococcal infections.

Neisseria gonorrhoeae

All sources, 1 January 2007 to 30 June 2009. Method: disk diffusion (Kirby-Bauer).

Antibiotic	Percentage Susceptible - NELSON and MARLBOROUGH 2007-9 (No. tested)	Percentage Susceptible - NEW ZEALAND 2008
Penicillin	84% (102)	93.5%
Ciprofloxacin	74% (102)	77%

In Nelson and Marlborough, ciprofloxacin resistance in gonococci has increased from 4% in 2003-4 to 8% in 2005-6 and 26% in 2007-9. The empiric choice for treatment of gonococcal infections is now ceftriaxone, to which there is no known resistance.

Haemophilus influenzae

All sources, 1 January 2007 to 30 June 2009. Method: disk diffusion (Kirby-Bauer) and beta-lactamase test.

Antibiotic	Percentage Susceptible - NELSON and MARLBOROUGH 2007-9 (No. tested)	Percentage Susceptible - NEW ZEALAND 2008
Amoxicillin	68% (491)	75%
Amoxicillin-clavulanate ¹	99% (483)	96%
Clarithromycin	93% (469)	100%
Doxycycline	100% (435)	99%
Ciprofloxacin	100% (247)	100%

1. Amoxicillin-clavulanate susceptibility predicts susceptibility to second-generation cephalosporins (e.g., cefuroxime). There is no known resistance to third-generation cephalosporins.

Although here is increasing resistance of *Haemophilus influenzae* to amoxicillin, studies show no difference between amoxicillin and broader spectrum antibiotics such as amoxicillin-clavulanate or cefaclor for empirical treatment of infectious exacerbations of Chronic Obstructive Pulmonary Disease.

E. coli

All sources, 1 January 2007 to 30 June 2009. Method: disk diffusion (Kirby-Bauer).

Antibiotic	Percentage Susceptible - NELSON and MARLBOROUGH 2007-9 (No. tested)	Percentage Susceptible - NEW ZEALAND ¹ 2008
Amoxicillin	55% (10349)	49%

Amoxicillin-clavulanate	88% (10348)	89%
Cefuroxime	96% (442)	98%
Ceftriaxone	95% (21)	98%
Fluoroquinolones	91% (9621) ²	96%
Gentamicin	97% (6087)	97%
Cotrimoxazole	83% (436)	77%

1. Based on national data from urinary isolates, which are similar to results for bloodstream isolates
2. Based on norfloxacin testing of urinary isolates.

The stable susceptibility results for amoxicillin-clavulanate (Augmentin[®]) supports its continued empiric use in Nelson/Marlborough for common infections where coliforms (together with staphylococci, streptococci and anaerobes) are likely to be causative, such as diabetic foot infections, wound infections and intra-abdominal infections. (For more severe infections in those sites, a broader-spectrum cephalosporin such as ceftriaxone is indicated (active against the vast majority of coliforms).

In Nelson and Marlborough, fluoroquinolone resistance in *E. coli* has increased from 3% in 2003-4 to 2% in 2005-6 and 9% in 2007-9. This is significantly worse than the New Zealand average and reflects local overuse.

The incidence of ESBL-producing *E. coli* and other enterobacteriaceae is increasing dramatically in New Zealand and overseas (Figure 1 below). The local incidence is relatively low (Figure 2 below) but clinical isolates referred for surveillance purposes are only the tip of the iceberg. A survey of stool samples in Nelson in August and September 2008 revealed that 3.4% of 208 samples contained ESBL-producing organisms.

Figure 1. ESBL-producing Enterobacteriaceae, 1999-2008

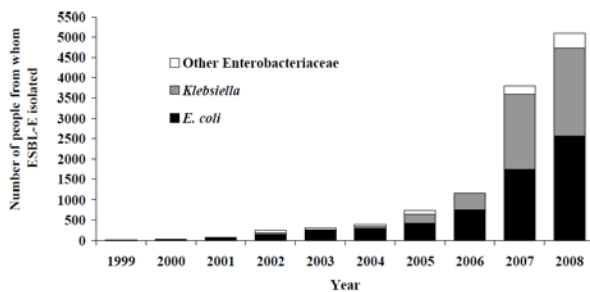
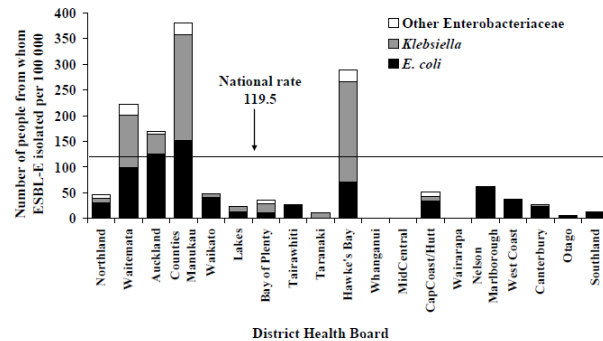


Figure 2. Annualised incidence of ESBL-producing Enterobacteriaceae by DHB, 2008



Urinary organisms

From all urine samples, 1 January 2007 to 30 June 2009. Method: various – mostly disk diffusion (Kirby-Bauer).

Antibiotic	Percentage Susceptible – NELSON and MARLBOROUGH 2007-9 (No. tested)	Percentage Susceptible – NEW ZEALAND 2008
Trimethoprim	77% (11342)	-
Amoxicillin	54% (11375)	-
Amoxicillin-clavulanate	87% (11375)	-
Nitrofurantoin	90% (11375)	-
Norfloxacin	90% (11375)	-
Gentamicin	98% (10955)	-

For treatment of uncomplicated cystitis (no indwelling urinary catheter, obstruction, reflux, transplant, recent instrumentation or frequent recent antibiotics), trimethoprim and nitrofurantoin are recommended as first-line choices in the Nelson-Marlborough district. For various reasons, including concentration of antibiotics in urine and the natural resolution rate of urine infections, half of cystitis infections caused by *in-vitro* "resistant" strains are cured *in-vivo* with these antibiotics.

In Nelson and Marlborough, fluoroquinolone resistance in all urinary isolates has increased from 4% in 2003-4 to 7% in 2005-6 and 10% in 2007-9. This reflects local overuse.

Pseudomonas aeruginosa

All sources, 1 January 2007 to 30 June 2009. Method: disk diffusion (Kirby-Bauer).

Antibiotic	Percentage Susceptible – NELSON and MARLBOROUGH 2007-9 (No. tested)	Percentage Susceptible – NEW ZEALAND 2008
Ciprofloxacin	86% (1259)	93%
Gentamicin	99% (1573)	96%
Cefepime	100% (1179)	97%
Ceftazidime	99% (1168)	97%
Piperacillin-tazobactam	99% (1162)	97%

For infections where *Pseudomonas aeruginosa* or other non-fermentative gram-negative bacilli may be causative (e.g., neutropenic fever, exacerbation of cystic fibrosis or bronchiectasis, severe hospital-acquired pneumonia or severe abdominal wound infection or severe intra-abdominal infections), cefepime is the recommended first choice empiric agent at Nelson and Wairau Hospitals. This is based on its excellent local susceptibility profile (above), slightly better activity against gram-positive cocci than ceftazidime, lower cost, convenient twice daily dosing and apparent lower risk of promoting resistance compared with other anti-pseudomonal antibiotics.

In Nelson and Marlborough, fluoroquinolone resistance in *Pseudomonas aeruginosa* has increased from 8% in 2003-4 to 9% in 2005-6 and 14% in 2007-9. This is significantly worse than the New Zealand average and reflects local overuse of fluoroquinolones.

References

Institute of Environmental Science and Research Ltd. (ESR), Wellington, New Zealand. Public Health Surveillance Report: Antimicrobial resistance data from hospital and community laboratories, 2008. www.wurv.esr.cri.nz

