Science for Communities
He Pūtaiao, He Tāngata

Antimicrobial susceptibility of invasive *Neisseria meningitidis*, 2024

The purpose of this report is to describe antibiotic susceptibilities of *Neisseria meningitidis* from clinical cases of meningococcal disease in Aotearoa New Zealand in 2024. Data will inform clinical and public health interventions, to treat and prevent invasive meningococcal disease.

Background

In 2024, a total of 40 laboratory-confirmed cases of invasive *N. meningitidis* were reported to EpiSurv. From these cases, 26 viable meningococcal isolates were received at ESR and underwent further characterisation and susceptibility testing.

Key findings

- All isolates were fully susceptible to ciprofloxacin, ceftriaxone and rifampicin.
- All but one isolate (25/26, 96.2%) was susceptible to penicillin, according to the European Committee on Antimicrobial Susceptibility testing (EUCAST) breakpoint of 0.5 mg/L. However, 11 of the 26 (42.3%) isolates had intermediate susceptibility to penicillin according to the Clinical and Laboratory Standards Institute (CLSI) breakpoints.
- The overall proportion of isolates with reduced susceptibility to penicillin (12/26, 46.2%) is lower than any of the previous 10 years.

Methods

All viable meningococcal isolates received at ESR from cases of invasive disease were tested. Ceftriaxone, ciprofloxacin, penicillin and rifampicin minimum inhibitory concentrations (MICs) were determined by gradient strip on Mueller-

Hinton agar with 5% horse blood and 20 mg/L β-NAD (MH-F). MICs were interpreted according to EUCAST breakpoints.[1] Group, PorA and strain information were provided by the Invasive Pathogens Laboratory, ESR.

Results

The 26 meningococcal isolates tested for susceptibility included 16 group B isolates, six group Y isolates, three group W isolates, and one non-groupable isolate. There were seven isolates belonging to the B:P1.7-12,14 strain and three isolates belonging to the B:P1.7-2,4 strain.

All 2024 isolates were susceptible to ciprofloxacin, ceftriaxone and rifampicin (Table 1).

Table 1. Antimicrobial susceptibility, MIC range and MIC_{90} of *N. meningitidis* from invasive disease cases, 2024

Antimicrobial	Number (percent)		MIC range (mg/L)	MIC_{90} (mg/L)
	Susceptible	Resistant		
Penicillin[#]	25 (96.2)	1 (3.9)	0.03-0.5	0.25
Ciprofloxacin	26 (100.0)	0 (0.0)	0.002-0.008	0.008
Ceftriaxone	26 (100.0)	0 (0.0)	<0.002-0.008	0.002
Rifampicin	26 (100.0)	0 (0.0)	0.008-0.25	0.12

penicillin susceptible, MIC ≤0.25 mg/L; resistant, MIC >0.25 mg/L

All but one isolate (25/26, 96.2%) were penicillin susceptible (Table 1). One serogroup B isolate, with the P1.7-12,14 PorA, was penicillin resistant and had a penicillin MIC of 0.5 mg/L.

INSTITUTE OF ENVIRONMENTAL SCIENCE AND RESEARCH LIMITED
Kenepuru Science Centre: 34 Kenepuru Drive, Kenepuru, Porirua 5022 | PO Box 50348, Porirua 5240, New Zealand
T: +64 4 914 0700 F: +64 4 914 0770
www.esr.cri.nz

Despite low penicillin resistance in meningococcal isolates, 11 (46.2%) had a penicillin MIC ≥0.12 mg/L (Figure 1). Of these, eight isolates had a penicillin MIC of 0.25mg/L and three had a penicillin MIC of 0.12 mg/L. All eleven isolates would be classified as penicillin-intermediate using CLSI breakpoints.[2]

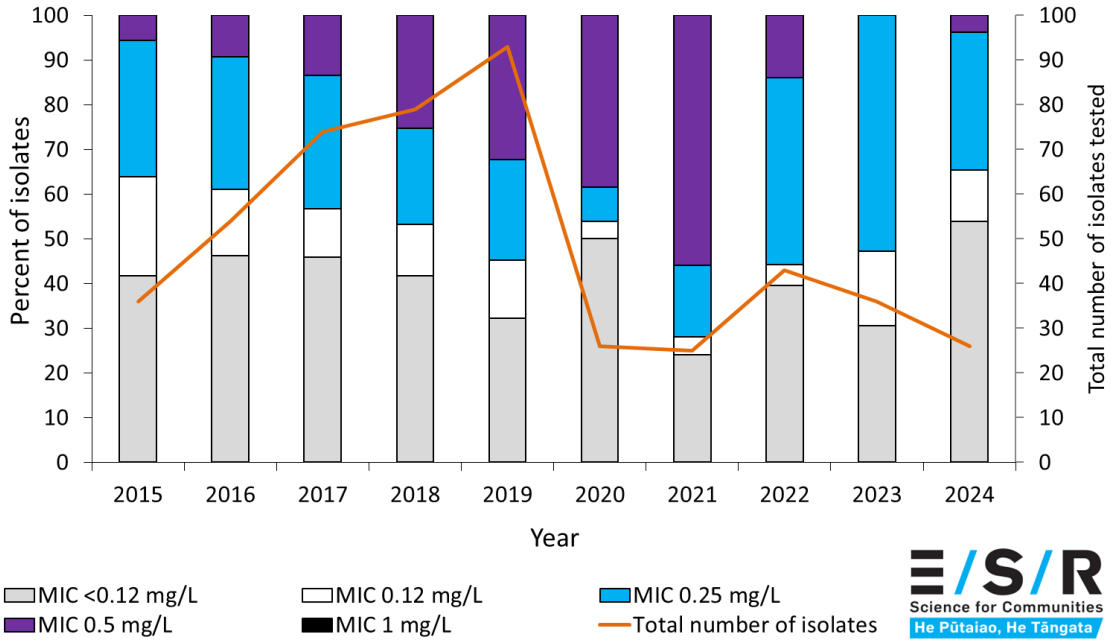

Figure 1. Penicillin susceptibility of *N. meningitidis* from invasive disease, 2015-2024

Our data indicate that the B:P1.7-12.14 strain is likely to have a penicillin MIC ≥0.12 mg/L, although isolates are often not penicillin-resistant. In 2025, all isolates belonging to the B:P1.7-12,14 strain had a penicillin MIC ≥0.12 mg/L and this strain accounted for 58.3% (7/12) of all isolates with a penicillin MIC ≥0.12 mg/L. The B:P1.7-12,14 strain was first detected in New Zealand in 2015 and, while rare internationally, it has become a dominant group B strain.[3]

Five *penA* mutations have a high correlation with reduced penicillin susceptibility.[4] Our data confirmed the correlation between elevated penicillin MICs and the presence of these mutations. In 2024, all isolates with a penicillin MIC ≥0.12 mg/L

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had a mutation in the *penA* gene, reported to confer resistance to penicillin. All isolates with wildtype *penA* had a penicillin MIC less than 0.12 mg/L.

In 2024 most viable meningococcal isolates were from cases of meningococcal disease reported from the North Island (22/26, 84.6%). Of the 12 isolates with a penicillin MIC ≥0.12 mg/L, 11 (91.7%) were from cases in the North Island and one (8.3%) was from a case in the South Island.

Rifampicin resistance is rare among meningococci from invasive disease in New Zealand. In total, seven rifampicin-resistant isolates have been identified: one group C (C:2a:P1.5-1,10-1) isolate in 2011, one group B (B:4:P1.19,15) isolate and one group C (C:2a:P1.5-1,10-8) isolate in 2009, one group B (B:4:P1.4) isolate in 2003, one group C (C:2b:P1.2) isolate in 1997, one group B (B:15:P1.7,16) isolate in 1992, and one group A isolate in 1986.

Ciprofloxacin resistance is also rare among meningococci from invasive disease in New Zealand. Four ciprofloxacin-resistant isolates have been identified: one group C isolate in 2010 (C:P1.20,23-7), 2017 (C:P1.5,2), and 2023 (C:P1.5,2), as well as a group X isolate in 2018. A mutation in the *gyrA* gene was found in the 2023 isolate, that is likely to explain the ciprofloxacin resistance found in this isolate. The USA has reported a rise in ciprofloxacin resistance in *N. meningitidis*,[5] highlighting the need for vigilance in New Zealand.

No resistance to ceftriaxone has ever been identified among meningococci isolated from cases of invasive disease in New Zealand.

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T: +64 4 914 0700 F: +64 4 914 0770
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1 The European Committee on Antimicrobial Susceptibility Testing. Breakpoint tables for interpretation of MICs and zone diameters, version 14.0, 2024 (www.eucast.org).

2 Clinical and Laboratory Standards Institute. Performance standards for antimicrobial susceptibility testing. 34nd ed. Wayne, USA: CLSI; 2024. CLSI supplement M100.

3 ESR, Invasive meningococcal disease report January – December 2024. Accessed from: www.esr.cri.nz

4 Thulin S, Olcén P, Fredlund H, Unemo M. Total variation in the *penA* gene of *Neisseria meningitidis:* correlation between susceptibility to beta-lactam antibiotics and *penA* gene heterogeneity. Antimicrob Agents Chemother. 2006 Oct;50(10):3317-24.

5 Berry I, Rubis AB, Howie RL, Sharma S, Marasini D, Marjuki H, Crowe S, McNamara LA. Selection of antibiotics as prophylaxis for close contacts of patients with meningococcal disease in areas with ciprofloxacin resistance - United States, 2024. MMWR Morb Mortal Wkly Rep. 2024 Feb 8;73(5):99-103. doi: 10.15585/mmwr.mm7305a2. PMID: 38329923; PMCID: PMC10861203.

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