Penicillin-resistant *Neisseria meningitidis* bacteraemia, Kimberley region, March 2010

Shivanti D Abeysuriya, David J Speers, Jackie Gardiner, Ronan J Murray

Abstract

A 4-year-old fully immunised male presented to a regional hospital in the West Kimberley with fever and lethargy. Blood cultures yielded serogroup B *Neisseria meningitidis*, resistant to benzylpenicillin (minimum inhibitory concentration (MIC) 1.0 mg/L). The patient was treated with intravenous ceftriaxone and made a complete recovery. Although invasive *N. meningitidis* isolates with reduced penicillin susceptibility are not uncommon in Australia, this is the first report of a benzylpenicillin-resistant isolate (MIC > 0.5 mg/L) causing invasive disease. As benzylpenicillin is currently recommended as first line empiric and definitive therapy for invasive meningococcal disease, the emergence of penicillin-resistant *N. meningitidis* disease is of concern and emphasises the importance of ongoing surveillance for antimicrobial resistance. *Commun Dis Intell* 2010;34(3):324–326.

Keywords: *Neisseria meningitidis;* penicillin resistant; meningococcus; meningococcal disease

Case report

A 4-year-old fully immunised male presented to a regional hospital in the West Kimberley with fever and lethargy. On examination, he was febrile (T = 39.4°C), tachycardic (pulse rate 160 bpm) and tachypnoeic (respiratory rate 26 per minute), however there was no rash or signs of meningism. Blood cultures yielded serogroup B *Neisseria meningitidis*. The patient was treated with intravenous ceftriaxone 900 mg for 5 days and made a complete recovery. A lumbar puncture performed 72 hours after commencing ceftriaxone was negative for *N. meningitidis* on culture and by polymerase chain reaction.

Antimicrobial susceptibility testing was performed in the routine microbiology laboratory by Etest® (AB Biodisk, Solna, Sweden) and results interpreted according to Clinical Laboratory Standards Institute (CLSI) breakpoints.[1] Etest® minimum inhibitory concentration (MIC) results were as follows: benzylpenicillin, 0.5 mg/L (resistant); ceftriaxone, 0.004 mg/L (susceptible); ciprofloxacin, 0.006 mg/L (susceptible); rifampicin 0.012 mg/L (susceptible) and chloramphenicol, 1 mg/L (susceptible). The isolate was beta-lactamase negative by nitrocefin testing.

The isolate was referred to the National Neisseria Network Reference Laboratory, Prince of Wales Hospital, New South Wales for confirmatory susceptibility testing. The identification of the organism was confirmed and susceptibility testing for benzylpenicillin was performed using two alternative methods (Calibrated Dichotomous Susceptibility (CDS) disc testing and MIC determination using agar dilution and CLSI breakpoints). There was no zone to the Pen0.5u disc by the CDS method, indicating resistance, which was confirmed by the MIC method and demonstrated a benzylpenicillin MIC of 1.0 µg/mL (resistant).

Genosubtyping of the *N. meningitidis* isolate was performed by *por*A gene variable region (VR) 1 and 2 DNA sequencing as previously described.[2] When the deduced amino acid sequences of VR1 and VR2 were submitted to the *N. meningitidis por*A VR database (http://neisseria.org/nm/typing/pora), there were only partial matches to VR1 peptides 5–29 (56%) and 21–14 (60%) and VR2 peptides 2–39 (67%) and 16–107 (46%). When compared to a Western Australian database of 81 *N. meningitidis* isolates strains (including 7 from the Kimberley) collected from 2000–2006[3] this genosubtype had not previously been identified.

Discussion

Highly resistant (benzylpenicillin MIC > 256 mg/L), beta-lactamase producing *N. meningitidis* isolates have been sporadically reported from Canada, South Africa, and Spain.[4] However, beta-lactamase-negative *N. meningitidis* strains with increased benzylpenicillin MICs of > 0.06 mg/L have been isolated more commonly from the United Kingdom, Europe, Greece, South America, South Africa, Asia and the United States of America (USA). These relatively resistant *N. meningitidis* isolates have penicillin MICs ranging from 0.01 mg/L to 1 mg/L.[4] Reduced susceptibility in these isolates is due to decreased binding of benzylpencillin due to altered penicillin- binding proteins (PBP2 and PBP3).[4]

In 2008, 108 of 149 (72%) invasive *N. meningitidis* isolates submitted to the Australian National Neisseria Network demonstrated reduced susceptibility to benzylpenicillin (MICs 0.06–0.5 mg/L).[5] To date, this is the first report of an invasive *N. meningitidis* isolate with a benzylpenicillin MIC >0.5 mg/L from Australia (personal communication, John Tapsall, National Neisseria Network Reference Laboratory).

The clinical significance of reduced penicillin susceptibility in *N. meningitidis* is unclear. Treatment failures and higher rates of complications have been observed, although administration of higher doses of penicillin has been reported as clinically effective.[4,6,7,8] Several reports indicate that there is no association between invasive meningococcal disease with decreased susceptibility to penicillin and mortality.[6,8] Current Australian guidelines recommend benzylpenicillin for the treatment of proven meningococcal meningitis, irrespective of penicillin susceptibility.[9] Current USA recommendations for the treatment of bacterial meningitis[10] recommend therapy with third-generation cephalosporins (ceftriaxone or cefotaxime) for meningococcal meningitis until susceptibilities are available, and recommends penicillin or ampicillin for *N. meningitidis* isolates with penicillin MICs of <0.1 mg/L and third-generation cephalosporins for isolates with MICs of 0.1–1.0 mg/L.[10,11]

Decreased susceptibility to benzylpenicillin in invasive *N. meningitidis* isolates is now common in Australia,[5] but fortunately benzylpencillin resistance appears to be rare. This report highlights the importance of culture and susceptibility testing in invasive meningococcal disease, and of ongoing national surveillance for antimicrobial resistance in *N. meningitidis*.

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Author details

Dr Shivanti D Abeysuriya,[1] Microbiology Registrar
Dr David J Speers,[1,2,3] Infectious Diseases Physician and Clinical Microbiologist
Dr Jackie Gardiner,[5] Paediatric Registrar
Dr Ronan J Murray,[1,2,4] Infectious Diseases Physician and Clinical Microbiologist

1. Department of Microbiology, PathWest Laboratory Medicine, Queen Elizabeth II Medical Centre, Nedlands, Western Australia
2. Department of Infectious Diseases, Sir Charles Gairdner Hospital, QEII Medical Centre, Nedlands Western Australia
3. Clinical Senior Lecturer, School of Medicine and Clinical Pharmacology, University of Western Australia, Nedlands Western Australia
4. Clinical Associate Professor, School of Pathology and Laboratory Medicine and School of Biomedical, Biomolecular and Chemical Sciences, University of Western Australia, Crawley Western Australia
5. Derby Regional Hospital, Derby, Western Australia

Corresponding author: Dr Shivanti Abeysuriya, Microbiology Registrar, PathWest Laboratory Medicine WA, Queen Elizabeth Medical Centre, Locked Bag 2009, NEDLANDS 6909 WA. Telephone: +61 8 9346 3122. Facsimile: +61 8 9346 3960. Email: shivanti.abeysuriya@health.wa.gov.au or shivantiabey@yahoo.com

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