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Letter to the Editor

Transport time, not transport method, predicts *Neisseria gonorrhoeae* culture yield in an urban setting

Arthur Wong, Tanya L Applegate, Alison Mahony, George Xu, Rebecca Houghton, Tiffany Hogan, Monica Lahra

Abstract

Antimicrobial resistance (AMR) in *Neisseria gonorrhoeae* poses a pressing public health threat. Current surveillance programs via antimicrobial susceptibility testing (AST) depend on successfully cultivating the organism via bacterial culture. However, AST is more challenging in extragenital sites and in remote clinical settings where there is a delay between sample collection and testing. This study evaluated whether an enhanced specimen transport system involving direct plating of samples onto selective agar with carbon dioxide enrichment (Bio-Bag™ Type C, Becton Dickinson) improved *N. gonorrhoeae* recoverability compared to the standard method of rayon swabs in Amies gel (Transystem™, Copan Diagnostics). Men with urethral or rectal gonorrhoea confirmed by nucleic acid amplification testing were consecutively recruited from an urban Sydney clinic. Among 33 rectal samples, enhanced transport yielded a slightly higher culture positivity rate (72.7%) than the standard method (69.7%), though this difference was not statistically significant (p = 0.790). Notably, rectal specimens arriving at the laboratory within five hours had significantly higher culture yields (100%) than those with longer transport times (61.5%; p = 0.049). Future studies of the impact of enhanced transport in rural and remote settings are critical to enhance AMR surveillance.

Keywords: *Neisseria gonorrhoeae*; bacterial culture; antimicrobial resistance; antimicrobial susceptibility testing

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Antimicrobial resistance (AMR) in *Neisseria gonorrhoeae* is an urgent global threat with few alternate options, for which disease control is almost entirely reliant on effective treatment. Antimicrobial susceptibility testing (AST) is currently dependent on bacterial culture, and is critical for clinical and AMR surveillance data.[1] However, fewer than 1% of infections globally have AST, limiting insights into the AMR landscape.

In Australia, one in four gonococcal infections have AST,[2] varying by jurisdiction, with less than 10% in one remote setting.[3] Since 2022, in Australia and elsewhere, there have been increasing reports of ceftriaxone resistance and extensively drug-resistant (XDR) *N. gonorrhoeae*, including 14 XDR cases reported in Australia.[3] In this context, improved gonococcal AMR surveillance is critical.

Gonococcal culture yields are lower from extra-genital sites, and with delay from specimen collection to laboratory.[4] Improved yield using an enhanced specimen transport method has been reported.[5] We investigated whether a similar system improved recoverability of *N. gonorrhoeae* and had potential utility in regional to remote areas with longer transport time to the laboratory.

Men with urethral and/or rectal gonorrhoea confirmed by nucleic acid amplification testing (cobas® CT/NG Test, Roche Diagnostics) were consecutively recruited from a Sydney clinic. Swabs for culture were collected, and two specimen transport methods were compared, a standard rayon swab in Amies gel (Transystem™, Copan Diagnostics) versus an enhanced method with direct plating of swabs in the clinic onto selective agar transported to the laboratory in a carbon dioxide-enriched bag (Bio-Bag™ Type C, Becton Dickinson). Transport to the laboratory (approximately 8 kilometres) occurred three times daily. We also compared the impact of transport time for the standard swab (< 5 hours versus > 5 hours) and the presence or absence of symptoms on culture yield.

This study received ethical approval from the South Eastern Sydney Local Health District Human Research Ethics Committee (2023/ETH02474).

In the study, there were 24 participants with urethral gonorrhoea and 33 with rectal gonorrhoea. Patients with urethral gonorrhoea were all symptomatic (24/24; 100%) and *N. gonorrhoeae* was isolated from all symptomatic patients transported by standard and enhanced specimen methods. Patients with rectal gonorrhoea were mostly asymptomatic (29/33; 88%), with 12% (4/33) symptomatic. *N. gonorrhoeae* was isolated from all symptomatic patients (4/4; 100%), whereas asymptomatic patients had a lower positive culture rate (19/29; 66%) but the difference was not statistically significant ($p = 0.159$). In rectal samples, enhanced transport had a slightly higher culture positive rate (72.7%; 24/33) when compared to the standard method (69.7%; 23/33) but this was not significant ($p = 0.790$). Rectal specimens transported in < 5 hours were more likely to yield growth compared to those transported in > 5 hours (100% versus 61.5%; $p = 0.049$) (Table 1).

Higher culture yield from urethral samples was anticipated, as all patients were symptomatic.[6] Enhanced transport slightly improved rectal culture yield compared to standard; however, the difference was smaller than reported,[5,7] possibly due to the proximity of the laboratory. With standard transport method, expedited time to laboratory was a significant predictor of culture yield, further highlighting the advantage of short sample transport time. Future studies of the impact of enhanced transport in rural and remote settings are critical to enhance AMR surveillance.[8,9]

Table 1: Associations between culture positivity and transport method, rectal symptoms and time for the inoculated rectal sample swab in Amies transport media (standard transport method) to arrive in the laboratory

Category	Value	Total	Culture positive	%	*p* value (χ^2)
Transport method	Standard	33	23	69.7%	0.790
	Enhanced	33	24	72.7%	
Rectal symptoms	No	29	19	66.0%	0.159
	Yes	4	4	100.0%	
Time from collection to laboratory	< 5 hours	7	7	100.0%	0.049
	≥ 5 hours	26	16	61.5%	

Author details

Arthur Wong,[1,2]

Tanya L Applegate,[2]

Alison Mahony,[1]

George Xu,[1]

Rebecca Houghton,[1]

Tiffany Hogan,[3,4]

Monica Lahra[3,4]

1. Sydney Sexual Health Centre, Sexual Health & Bloodborne Viruses Service, South Eastern Sydney Local Health District, Sydney, New South Wales, Australia
2. The Kirby Institute, University of New South Wales, Sydney, New South Wales, Australia
3. WHO Collaborating Centre for STI and AMR, Sydney, New South Wales, Australia
4. Department of Microbiology, NSW Health Pathology Randwick, Sydney, New South Wales, Australia

Corresponding author

Dr Arthur Wong

Sydney Sexual Health Centre, Sexual Health & Bloodborne Viruses Service, South Eastern Sydney Local Health District, Sydney, New South Wales, Australia

Email: Arthur.wong@health.nsw.gov.au

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