Conversion between NCCLS Microdilution and BSAC Agar Dilution Methods for Respiratory Pathogens

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Introduction

An algorithm for conversion between minimum inhibitory concentrations (MICs) obtained by American (NCCLS) and British (BSAC) methods would be useful as it would enable direct comparison between countries for surveillance purposes.

Method

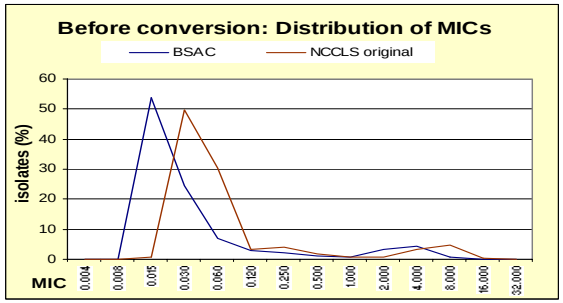
The BSAC Respiratory Resistance Surveillance Programme collected 661 *S. pneumoniae*, 936 *H. influenzae* and *421 M. catarrhalis* isolates from patients with lower respiratory tract infections in the British Isles in 1999-2000. We tested these by both NCCLS microdilution[1] and BSAC agar dilution methods[2] to measure the MICs and compared the results.
We also tested an algorithm, described in the panel, developed to allow conversion between the MIC results obtained by the two methods. Where results for either method were truncated (reported as ≥ or ≤), we truncated both sets of results at the same level.

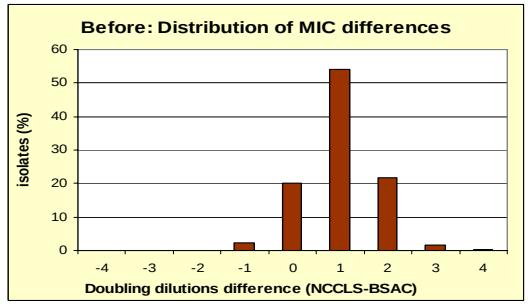
Definitions

E (excellent agreement) means ≥90% of isolates within ±1 doubling dilution and ≥95% within ± 2 dilutions.
G (good agreement) means 80-89% of isolates within ± 1 doubling dilution and ≥95% within ± 2 dilutions.
P (poor agreement) means< 90% of isolates within ± 1 doubling dilution OR < 95% within ± 2 dilutions.

Results

The shapes of the MIC distributions obtained by the two methods were similar and agreement was good or excellent in 27 out of 36 isolate-agent combinations. The conversion algorithm worked well: it increased the number of good or excellent agreements to 34 out of 36. The two remaining poor agreements were for *Moraxella* with ampicillin and amoxicillin.





Before: Level of agreement

76% of isolates were within +/- 1 doubling dilution

98% were within +/- 2 doubling dilutions.

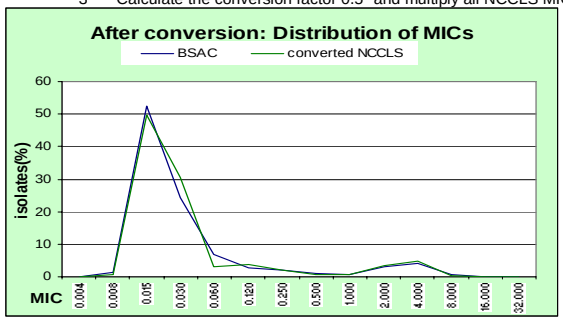
Agreement was poor in this case before conversion.

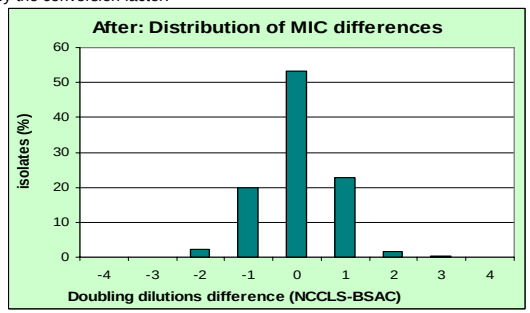
(Truncation was at ≤0.015 and ≥16 mg/L.)

The Conversion Algorithm (applied to each organism-agent combination):

1 Calculate the number of doubling dilutions difference in MIC (NCCLS-BSAC) for each isolate.
2 Find d, the integer nearest to the mean doubling dilutions difference.
3 Calculate the conversion factor 0.5^d and multiply all NCCLS MICs by the conversion factor.

In this case:
Mean difference was 1.01 doubling dilutions, so nearest integer was 1, and factor was 0.5.





After: Level of agreement

96% of isolates are within +/- 1 doubling dilution

100% are within +/- 2 doubling dilutions.

Agreement is excellent after conversion.

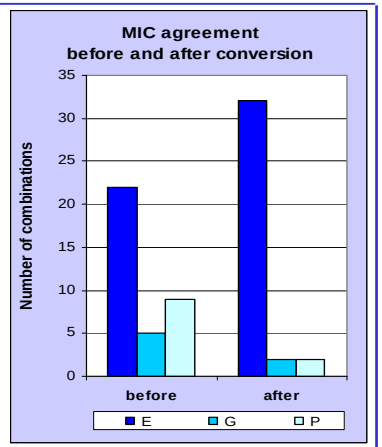
(Truncation was at ≤0.008 and ≥8 mg/L.)

Example: *S. pneumoniae* with cefuroxime

MIC agreement before and after conversion

	S. pneumoniae n = 661				*H.influenzae* n = 936				*M. catarrhalis* n = 421			
	% agree before	factor	% agree after	before / after	% agree before	factor	% agree after	before / after	% agree before	factor	% agree after	before / after
Penicillin	93	1	93	E/E								
Ampicillin					94	1	94	E/E	73	2	79	P/P
Amoxicillin	84	0.5	99	G/E	92	1	92	E/E	43	0.25	78	P/P
Amox-clav					96	1	96	E/E	93	1	93	E/E
Cefaclor	62	0.5	95	P/E	58	2	89	P/G	83	0.5	86	G/G
Cefuroxime	76	0.5	96	P/E	95	1	95	E/E	85	0.5	99	G/E
Cefotaxime	95	1	95	E/E	95	1	95	E/E	96	1	96	E/E
Erythromycin	94	2	98	E/E	96	1	96	E/E	46	0.5	99	P/E
Clindamcyin	95	2	99	E/E								
Ciprofloxacin	98	1	98	E/E	83	2	95	G/E	100	1	100	E/E
Levofloxacin	100	1	100	E/E	96	2	98	E/E	100	1	100	E/E
Moxifloxacin	100	1	100	E/E	98	1	98	E/E	99	1	99	E/E
Tetracycline	88	0.5	99	G/E	98	1	98	E/E	53	2	100	P/E
Trimethoprim	79	2	97	P/E	64	2	92	P/E	90	1	90	E/E

% agree = % of isolates with MICs by the 2 methods within +/- 1 doubling dilution



Acknowledgements

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1 NCCLS document M7-A5 *Methods for Dilution Antimicrobial Susceptibility Tests for Bacteria that Grow Aerobically: Approved Standard - Fifth Edition*
2 J.M. Andrews JAC (2001) **48**, *suppl. S1*, 5-16 *Determination of minimum inhibitory concentrations.*

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