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Euro-GASP external quality assessment scheme for *Neisseria gonorrhoeae* antimicrobial susceptibility testing – 2024

October 2025

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Abbreviations

CLSI	Clinical and Laboratory Standards Institute
ECOFF	Epidemiological cut-off
EEA	European Economic Area
EQA	External quality assessment
ESSTI	European Surveillance of Sexually Transmitted Infections Project
EU	European Union
EUCAST	European Committee on Antimicrobial Susceptibility Testing
Euro-GASP	European Gonococcal Antimicrobial Surveillance Programme
GC	Gonococcal
I	Susceptible, increased exposure
MGS	MIC gradient strip test
MIC	Minimum inhibitory concentration
R	Resistant
S	Susceptible
STI	Sexually transmitted infection
UK	United Kingdom
UKHSA	United Kingdom Health Security Agency
UK NEQAS	United Kingdom National External Quality Assessment Service
WHO	World Health Organization
ÖUH	Örebro University Hospital

Executive summary

Introduction

External quality assessment (EQA) is an essential part of any laboratory-based surveillance system, allowing for the monitoring of performance and comparability of results from participating laboratories, identification of potential issues and deployment of resources and training where necessary. An EQA scheme for antimicrobial susceptibility testing in *Neisseria gonorrhoeae* has been available to laboratories participating in ECDC's European Sexually Transmitted Infections (STI) surveillance network since 2010. This EQA scheme has so far shown high levels of inter-laboratory comparability in the presence of differing methodologies.

Materials and methods

The EQA specimen panel of 10 gonococcal isolates was selected by the United Kingdom Health Security Agency (UKHSA) and Örebro University Hospital (ÖUH) and was distributed by the United Kingdom National External Quality Assessment Service (UK NEQAS). Of the 10 gonococcal isolates provided, one strain was in triplicate and two strains were in duplicate to test intra-laboratory concordance. The remaining isolates were provided singly, such that the *N. gonorrhoeae* antimicrobial susceptibility EQA panel comprised six different strains. The strains were representative of a range of different antimicrobial susceptibility profiles and consisted of five WHO reference strains (WHO H, M, O, Q, and S2) and one clinical strain isolated in the UK in 2023.

Laboratories were requested to test the EQA panel using own routine (i.e. minimum inhibitory concentration (MIC) gradient strip test or agar dilution) and relevant breakpoints (i.e. EUCAST, CLSI, etc.). Antimicrobial agents tested included azithromycin, cefixime, ceftriaxone, ciprofloxacin, gentamicin, spectinomycin, and tetracycline. Strains were also tested for beta-lactamase production. Results were submitted directly to UK NEQAS, who issued individual laboratory reports. The raw results were supplied to UKHSA, who decoded and analysed the results. Antimicrobial susceptibility category concordance (categorical agreement) was assessed using the consensus category (most often reported category) of susceptibility for each tested strain. MIC concordance was assessed by examining MIC results within one (essential agreement) and two doubling dilutions of the modal MIC. Intra-laboratory concordance was examined using the triplicate and the two duplicate strains.

Results

In October 2024, the EQA panel was dispatched to 28 laboratories in 28 European Union/European Economic Area (EU/EEA) countries, 27 (96.4%) of which returned results to UK NEQAS. All laboratories used MIC gradient strip tests for one or more antimicrobials, and all stated that they used EUCAST breakpoints.

Categorical agreement ranged from 94.4% (azithromycin) to 100% (cefixime and spectinomycin). Compared to the 2023 EQA, categorical agreement increased for all antimicrobials except ciprofloxacin and for beta-lactamase detection. Most susceptibility category discrepancies were in strains with MICs close to a resistance breakpoint. Overall, 93.3% and 98.4% of MICs were within one (essential agreement) and two doubling dilutions of the modal MIC, respectively, corresponding to an increase in essential agreement (89.1% in 2023, $p<0.0001$). Essential agreement for individual antimicrobials ranged from 87.2% (spectinomycin) to 99.5% (cefixime). With respect to changes in essential agreement for individual antimicrobials between 2023 and 2024, only tetracycline reached statistical significance (84.8% in 2023 and 92.1% in 2024, $p=0.02$).

At the individual laboratory level, inter-laboratory categorical concordance increased slightly from 98.7% in 2023 to 99.2% in 2024. The same was true for inter-laboratory MIC concordance (87.9% in 2023 to 90.8% in 2024); however, four laboratories reported >5% of MIC results greater than two doubling dilutions from the modal MIC. Intra-laboratory MIC concordance decreased slightly, although the score remained high overall (97.1% in 2023 to 96.2% in 2024).

Discussion and conclusion

Antimicrobial susceptibility testing methods and breakpoints have largely been harmonised across laboratories participating in the 2024 European Gonococcal Antimicrobial Surveillance Programme (Euro-GASP) EQA. Laboratories generally performed well, demonstrating good levels of competency in testing *N. gonorrhoeae* isolates of unknown phenotype. Categorical agreement increased in 2024, with the 90% minimum exceeded for all agents tested. MIC essential agreement also increased, with the 90% minimum exceeded for all antimicrobials except azithromycin and spectinomycin. Inter- and intra-laboratory concordance scores were high for most laboratories, providing confidence in the use of decentralised testing in Euro-GASP. Four laboratories will be supported in working to achieve the Euro-GASP recommended target of 95% of MICs within two doubling dilutions of the modal MIC.

1. Introduction

The European Centre for Disease Prevention and Control (ECDC) is a European Union (EU) agency with a mandate to operate the dedicated surveillance networks (DSNs) and to identify, assess, and communicate current and emerging threats to human health from communicable diseases. Within its mission, ECDC shall:

- Foster the development of sufficient capacity within the Community for the diagnosis, detection, identification and characterisation of infectious agents which may threaten public health.
- The Centre shall maintain and extend such cooperation and support the implementation of quality assurance schemes.' (Article 5.3, EC 851/2004[1]).

As part of its mandate, ECDC commissions and supports External Quality Assessment (EQA) exercises across public health microbiology laboratories in the EU/European Economic Area (EEA) Member States with the objective of:

- strengthen and maintain the high quality and comparability of public health laboratory data at the EU level;
- strengthen and maintain capability for detection and characterisation of pathogens; and
- identify capacity and capability-building needs for the purpose of improving the detection and characterisation of pathogens of public health relevance.[2]

EQAs are conducted within a quality management system and evaluate the performance of laboratories. They are carried out by an outside agency and with materials supplied specially for this purpose. ECDC's disease-specific networks organise a series of EQA for EU/EEA countries. In some networks, ECDC also includes non-EU/EEA countries in its EQA activities. The aim of these EQAs is to identify weak points in the diagnostic capacities of EU/EEA laboratories that are relevant to the surveillance of diseases listed in Commission Implementing Decision (EU) 2018/945; another aim is to ensure comparability of laboratory results from all EU/EEA countries.

The main purposes of EQA schemes include:

- Assessment of the general standard of performance ('state of the art');
- Assessment of the effects of analytical procedures (method principle, instruments, reagents, calibration);
- Evaluation of individual laboratory performance;
- Identification of vulnerabilities;
- Provision of continuing education for participating laboratories; and
- Identification of needs for training activities.

A major aim of the European Sexually Transmitted Infections (STI) surveillance network is to strengthen the surveillance of *Neisseria gonorrhoeae* antimicrobial susceptibility in EU/EEA Member States. An EQA scheme for *N. gonorrhoeae* antimicrobial susceptibility testing was established in 2007 as part of the European Surveillance of STIs (ESSTI) programme funded by the European Commission's Directorate-General for Health and Consumers (DG-SANCO). The EQA has been part of the ECDC STI microbiology project since 2009, with the first ECDC EQA distributed in 2010.

The EQA scheme is available to all laboratories in the STI surveillance network. An EQA scheme is an essential component of the laboratory-based surveillance programme, ensuring comparability of data between and within testing centres, and successful performance in EQA is a requirement for laboratories participating in decentralised testing as part of antimicrobial resistance surveillance across Europe [1,2].

Between 2010 and 2024, the number of laboratories participating in the *N. gonorrhoeae* antimicrobial susceptibility testing EQA increased from 18 to 27; in general, the EQAs have revealed high levels of inter-laboratory comparability even in the presence of different antimicrobial susceptibility testing methodologies. Problems identified in previous EQA distributions included reduced comparability of results determined using discs compared with those determined by agar dilution and minimum inhibitory concentrations (MIC) gradient strip tests, agar media not suitably supporting gonococcal growth, and reduced comparability of results among laboratories using MIC gradient strip tests from a particular manufacturer.

The United Kingdom National External Quality Assessment Service (UK NEQAS) collaborated with the United Kingdom Health Security Agency (UKHSA), Örebro University Hospital (ÖUH) and the ECDC for the EQA described in this report. UK NEQAS is accredited by the United Kingdom Accreditation Service to ISO 17043 (Conformity Assessment – General Requirements for Proficiency Testing). Participation in this EQA scheme for *N. gonorrhoeae* antimicrobial susceptibility provides a mechanism for laboratories in the network to meet the requirements of their local standards, such as ISO 15189:2012 or ISO 15189:2022.

[1] Regulation (EC) no 851/2004 of the European Parliament and of the Council of 21 April 2004 establishing a European Centre for Disease Prevention and Control.

[2] European Centre for Disease Prevention and Control (ECDC). Guide for EU-level external quality assessments (EQAs) for public health microbiology laboratories. Stockholm: ECDC; 2025. Available at: https://www.ecdc.europa.eu/en/publications-data/guide-eu-level-external-quality-assessments-eqas-public-health-microbiology

2. Materials and methods

2.1 Antimicrobial susceptibility testing external quality assessment panel

Members of the STI network and Euro-GASP contact points were invited by ECDC to participate in the EQA scheme. All laboratories that expressed interest in the EQA received 10 gonococcal isolates from UK NEQAS. The isolates included in the panel were selected by UKHSA and ÖUH to demonstrate a range of susceptibility profiles for relevant therapeutic antimicrobial agents and consisted of five WHO reference gonococcal strains (WHO H, M, O, Q, and S2 [3,4]), and one clinical strain from the UK isolated in 2023 (G23-IQA40). To measure intra-laboratory reproducibility, one of these strains was supplied in triplicate (Strain 6 (G23-IQA40), coded in the EQA as ids 2538/2539/2540), and two strains were supplied in duplicate (Strain 1 (WHO H), EQA ids 2531/2532 and Strain 4 (WHO Q), EQA ids 2535/2536). The remaining three strains were supplied as individual isolates (Strain 2 (WHO M), EQA id 2533; Strain 3 (WHO O), EQA id 2534; and Strain 5 (WHO S2), EQA id 2537). Therefore, six different strains were included in the distribution.

Participating laboratories tested the EQA panel of isolates using their own routine methodologies against the following therapeutic antimicrobials where possible:

- Azithromycin
- Cefixime
- Ceftriaxone
- Ciprofloxacin
- Gentamicin
- Spectinomycin
- Tetracycline

The antimicrobials listed are detailed in the 'ECDC Instructions, External Quality Assessment 2024' [5]. Azithromycin, cefixime, ceftriaxone, and ciprofloxacin comprised the 'core' antimicrobials, which are tested annually in Euro-GASP. Gentamicin and spectinomycin are 'snapshot' antimicrobials, which are tested every three years. Tetracycline data were collected for the first time in 2023 due to the interest in whether doxycycline post-exposure prophylaxis could reduce incident gonorrhoea cases across Europe [6]. Participating countries were requested to test any of the above antimicrobials that are tested routinely in their laboratories. Where possible, participating laboratories also tested the EQA panel of isolates for beta-lactamase production.

2.2 Antimicrobial susceptibility testing methods

Laboratories were asked to provide information on the methodology and the clinical breakpoints/guidelines (e.g. European Committee on Antimicrobial Susceptibility Testing (EUCAST) breakpoints (Table 1) [7]) used for determining the category of susceptibility for each antimicrobial. Antimicrobial susceptibility testing results for each isolate were reported as both the category of susceptibility (resistant (R), susceptible, increased exposure (I), susceptible (S)), and the MIC for the MIC gradient strip test (MGS) and agar dilution methods.

Table 1. 2025 European Committee on Antimicrobial Susceptibility Testing (EUCAST) breakpoints

Antimicrobial	MIC breakpoint (mg/L)		
	S ≤	I	R >
Azithromycin	*		*
Cefixime	0.125		0.125
Ceftriaxone	0.125		0.125
Ciprofloxacin	0.03	0.06	0.06
Spectinomycin	64		64
Tetracycline	0.5		0.5

** From January 2019, the EUCAST SIR categories have been removed for azithromycin and replaced with an epidemiological cut-off (ECOFF) value of 1 mg/L. Isolates with azithromycin MIC >1 mg/L are referred to as resistant hereafter. Please note currently there are no EUCAST interpretive criteria for gentamicin [7].*

2.3 Analysis and interpretation of the results

Raw results for the EQA were submitted by each participating laboratory directly to UK NEQAS for the production of individual laboratory reports. The results were also forwarded to UKHSA for further collated analysis.

For the analysis, all MIC results that fell between any whole MIC doubling dilutions on the MGS were rounded up to the next whole MIC doubling dilution. MICs at or beyond either end of the scale were considered equivalent for comparison purposes (e.g. 0.002, <0.002, and ≤0.002). The minimum, maximum, and modal MIC for each strain was established. The number of MIC measurements within one, two, and greater than two doubling dilutions of the modal MIC were established for each strain.

For each laboratory a percentage of overall MIC concordance was calculated based on the number of isolates within two doubling dilutions of the modal MIC for all antimicrobials including beta-lactamase. Essential agreement (MICs within one doubling dilution of the modal MIC) was also examined and used as the basis for an overall MIC score for each participating laboratory. The overall MIC score for each laboratory was calculated based on minor and major faults in the MIC for the core antimicrobials cefixime, ceftriaxone, azithromycin, and ciprofloxacin. Where the MIC result matched the modal result, a score of five was assigned; a one MIC doubling dilution difference from the modal MIC was considered a minor fault and a score of four was given; a difference of two doubling dilutions from the modal MIC was classed as a major fault and given a score of one. An MIC greater than two doubling dilutions from the modal was classed as a very major fault and a score of zero was given. The total score was then converted into a percentage of the maximum score achievable ((10x5) + (10x5) + (10x5) + (10x5) = 200 = 100%).

Consensus categories of susceptibility (categorical agreement) for each strain tested (six in total in this distribution; consensus calculated from all isolates in the triplicate or duplicate sets) were determined once all participating laboratories had reported results back. The 'consensus' was assigned to the category reported most often. The overall concordance for each antimicrobial was established by taking the average of each strain's percentage concordance. The total categorical concordance score was calculated by assigning a score of five for results the same as the consensus, four for a minor fault (susceptible or resistant miscategorised as intermediate or vice versa), three for a major fault (susceptible miscategorised as resistant), and one for a very major fault (resistant miscategorised as susceptible). The overall categorical concordance score for each laboratory was based on the core antimicrobials and beta-lactamase production, and the score was normalised based on the number of agents tested.

Intra-laboratory concordance was examined using the triplicate (Strain 6) and two duplicate strains (Strain 1 and Strain 4). All MIC results for these strains were assigned a score based on the core antimicrobials: five if the same as the other results, four if one MIC doubling dilution different (minor fault), three if two MIC doubling dilutions different (major fault) and zero if greater than two MIC doubling dilutions different (very major fault). These results were then averaged for the total number of results observed and given a percentage error score by comparison to the maximum score possible if there were no faults. The higher the percentage, the more consistent the laboratory MIC test results were. For example, a laboratory testing a single antimicrobial against one triplicate and two duplicate strains would achieve a perfect score as follows:

(triplicate score + duplicate score + duplicate score) / (maximum possible score) * 100

(((5+5+5)/3) + ((5+5)/2) + ((5+5)/2)) / (3*5) * 100 = 100%

3. Results

3.1 2024 EQA panel strain characteristics

Table 2 shows the consensus susceptibility category, the modal MIC, and the susceptibility category concordance percentage for all tests for each strain in the 2024 EQA panel. The reference MIC is also shown for each strain tested. The strains demonstrated a range of phenotypes, and one was fully susceptible to all antimicrobials tested:

- Strain 1 (WHO H) was resistant to cefixime, ceftriaxone, ciprofloxacin, and tetracycline.
- Strain 2 (WHO M) was resistant to ciprofloxacin and tetracycline.
- Strain 3 (WHO O) was resistant to spectinomycin and tetracycline.
- Strain 4 (WHO Q) was resistant to cefixime, ceftriaxone, ciprofloxacin, and tetracycline, and exhibited high-level azithromycin 'resistance' (MIC >256 mg/L).
- Strain 5 (WHO S2) was resistant to tetracycline and had an azithromycin MIC above the ECOFF (>1 mg/L).
- Strain 6 (G23-IQA40) was fully susceptible to all antimicrobials tested.

3.2 EQA participation

In October 2024, 28 laboratories in 28 EU/EEA countries were dispatched 10 gonococcal isolates (QA24) by UK NEQAS for antimicrobial susceptibility testing. In total, 27/28 (96.4%) laboratories returned results to UK NEQAS (Figure 1). Poland did not return susceptibility testing results during the EQA period, while Romania and Lithuania did not participate in the 2024 EQA. Three more countries returned results in 2024 than in the 2023 EQA, with Latvia, Liechtenstein, and Luxembourg joining the scheme. Of the laboratories that returned results, 19/27 (70.4%) participated in Euro-GASP via decentralised testing (79% in the 2023 EQA), including all decentralised laboratories.

Figure 1. Countries participating in the 2024 *N. gonorrhoeae* susceptibility testing EQA scheme

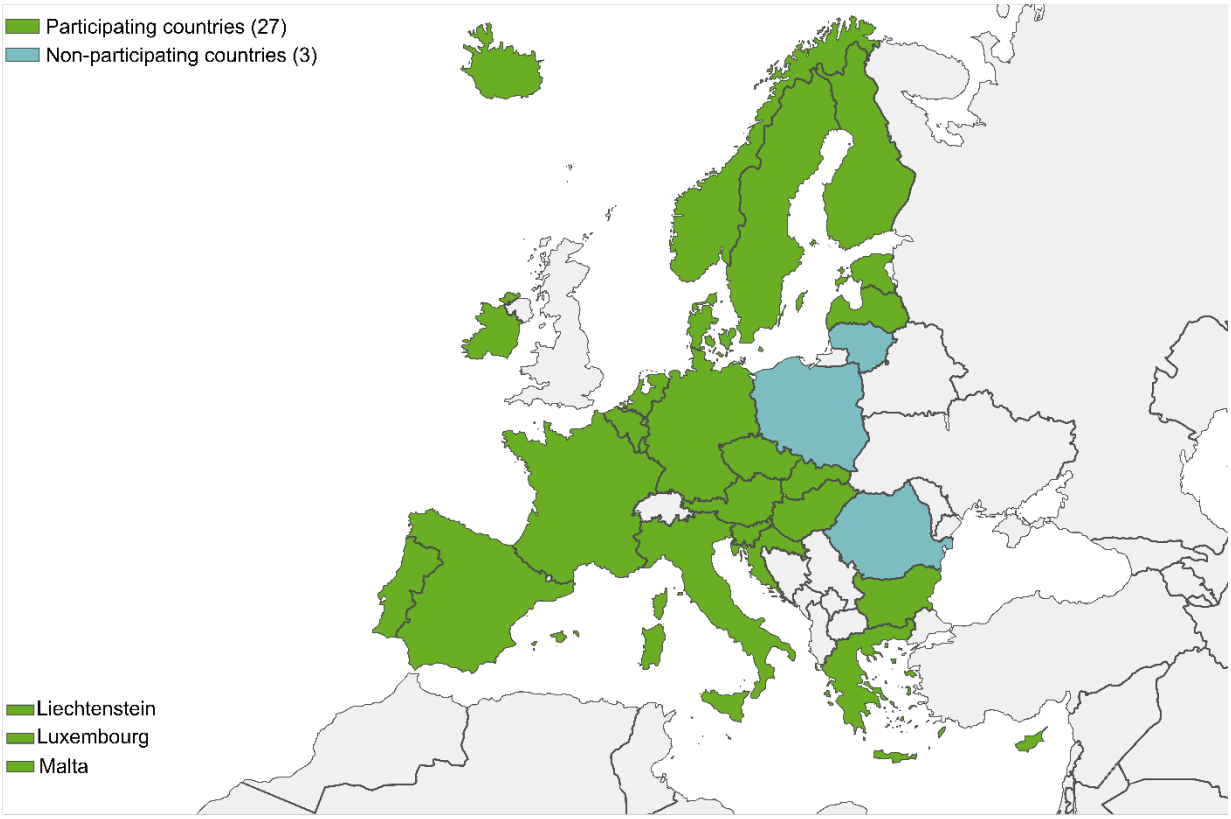


Table 2. Consensus category, modal MIC (range) for MIC gradient strip test and agar dilution (mg/L) and the percentage concordance of susceptibility category for the 2024 EQA panel

Strain		Azithromycin consensus	Cefixime consensus†	Ceftriaxone consensus†	Ciprofloxacin consensus	Gentamicin consensus	Spectinomycin consensus	Tetracycline consensus‡	Beta-lactamase consensus
Strain 1: 2531/2532 (WHO H [4]) CfmR, CroR, CipR, TetR	Consensus category	S	R	S	R	N/A	S	R	NEG
	Modal MIC (range)	0.25 (0.016-1)	0.125 (0.125-2)	0.125 (0.016-0.5)	≥32 (4->32)	4 (2-8)	16 (1-32)	2 (0.25-16)	N/A
	Susceptibility category concordance (%)	100	61.2	86.8	100	N/A	100	93.6	100
	Reference MIC [4]	0.25	0.5	0.25	>32	4	8	4	NEG
Strain 2: 2533 (WHO M [3,4]) CipR,TetR	Consensus category	S	S	S	R	N/A	S	R	POS
	Modal MIC (range)	0.5 (0.125-2)	≤0.016 (<0.016-0.016)	≤0.016 (0.002-0.064)	1 (0.5-4)	4 (2-8)	16 (4-32)	2 (0.5-16)	N/A
	Susceptibility category concordance (%)	95.0	100	100	100	N/A	100	95.8	95.8
	Reference MIC [3,4]	0.5	<0.016	0.016	2	4	16	2	POS
Strain 3: 2534 (WHO O [3,4]) SpecR,TetR	Consensus category	S	S	S	S	N/A	R	R	POS
	Modal MIC (range)	0.5 (0.125-1)	≤0.016 (<0.016-0.032)	≤0.016 (0.004-0.064)	0.008 (<0.002-0.016)	8 (2-8)	≥1024 (1024->1024)	2 (0.5-16)	N/A
	Susceptibility category concordance (%)	100	100	100	100	N/A	100	95.8	95.8
	Reference MIC [3,4]	0.5	0.016	0.032	0.008	4	>1024	2	POS
Strain 4: 3535/2536 (WHO Q [4]) AziR, CfmR, CroR, CipR, TetR	Consensus category	R	R	R	R	N/A	S	R	NEG
	Modal MIC (range)	≥256 (256->256)	2 (0.5-≥2)	0.5 (0.125-1)	≥32 (8->32)	4 (1-8)	16 (4-32)	≥256 (8->256)	N/A
	Susceptibility category concordance (%)	100	100	96.2	100	N/A	100	100	97.8
	Reference MIC [4]	>256	2	0.5	>32	4	8	128	NEG
Strain 5: 2537 (WHO S2 [4]) AziR, TetR	Consensus category	R	S	S	S	N/A	S	R	NEG
	Modal MIC (range)	2 (0.5-8)	≤0.016 (<0.016-0.016)	≤0.016 (0.002-0.032)	0.016 (0.016-0.064)	4 (2-8)	16 (4-32)	2 (0.25-8)	N/A

Strain		Azithromycin consensus	Cefixime consensus†	Ceftriaxone consensus†	Ciprofloxacin consensus	Gentamicin consensus	Spectinomycin consensus	Tetracycline consensus‡	Beta-lactamase consensus
	Susceptibility category concordance (%)	71.4	100	100	96.3	N/A	100	87.5	100
	Reference MIC [4]	2	<0.016	0.008	0.032	8	16	2	NEG
Strain 6: 2538/2539/2540 (G23-IQA40)	Consensus category	S	S	S	S	N/A	S	S	NEG
	Modal MIC (range)	0.032 (0.016-0.25)	≤0.016 (0.008-0.032)	≤0.016 (<0.002-0.032)	≤0.002 (<0.002-0.032)	4 (1-8)	8 (2-16)	≤0.125 (0.032-4)	N/A
	Susceptibility category concordance (%)	100	100	100	100	N/A	100	95.8	100
	Reference MIC*	0.032	≤0.016	≤0.016	≤0.002	4	4	0.125	NEG

** MICs taken from UK NEQAS reference MIC results.*
† MIC results for Strain 1 were more variable than expected. To avoid penalising laboratories unfairly, cefixime and ceftriaxone results for Strain 1 were excluded from overall MIC and susceptibility category concordance scores.
‡ MIC results for Strain 4 were more variable than expected. To avoid penalising laboratories unfairly, a modified scoring system was used for tetracycline for Strain 4 for MIC concordance.
S: susceptible; N/A: not available; MIC: minimum inhibitory concentration; WHO: World Health Organization; BLP: beta-lactamase production; Azi: azithromycin; CfmR: cefixime-resistant; CroR: ceftriaxone-resistant; CipR: ciprofloxacin-resistant; SpcR: spectinomycin-resistant; TetR: tetracycline-resistant; R: resistant; NEG: negative; POS: positive. [3,4]: see 3 and 4 in reference list.
Note: No consensus category of susceptibility was assigned to gentamicin as there are currently no published breakpoints for this antimicrobial.

3.3 Antimicrobial susceptibility testing methods

All laboratories returned information on the type of antimicrobial susceptibility test, breakpoints/guidelines, and agar base used in the 2024 EQA (Table 3). All laboratories used MGSs for one or more antimicrobials, with 25/27 (92.6%) laboratories providing manufacturer details. Laboratories reported using MGSs from the following manufacturers: bioMérieux (17/25, 68.0%), Liofilchem (6/25, 24.0%), bioMérieux and Liofilchem (1/25, 4.0%), and Liofilchem and Bioanalyse (1/25, 4.0%). With respect to media used, the breakdown in 2024 was similar to 2023, with GC agar base most commonly used (33.3%, Table 3). The use of GC agar base has continued to decrease since 2020 (44% in 2020, 42% in 2021, 35.0% in 2023, and 33.3% in 2024).

Table 3. Antimicrobial susceptibility testing methods used by participating laboratories, 2024 EQA

	Number of participating laboratories (n (%))	
Type of susceptibility test used	**2023**	**2024**
MIC gradient strip tests	22 (100)	27 (100)
Agar dilution	2 (9.0)*	2 (7.4)*
Testing guidelines used		
EUCAST	24 (100)	27 (100)
Agar base used†		
GC agar base	7 (35.0)	9 (33.3)
Chocolatised blood agar	6 (30.0)	7 (25.9)
Thayer-Martin / Mueller-Hinton	4 (20.0)	6 (22.2)
PolyVitex	3 (15.0)	5 (18.5)

** Laboratories that reported using agar dilution also reported use of gradient strips for a subset of antimicrobials*
† 20/24 laboratories provided information on media used in 2023 and 27/27 in 2024
‡ Some percentages may not add up to 100% due to rounding.

3.4 Interpretation of MICs

All 27 laboratories reported adherence to the EUCAST breakpoints [7] (Table 3). Most laboratories that tested gentamicin did not interpret categories of susceptibility as there are currently no internationally defined interpretive criteria for this antimicrobial. However, three laboratories did submit categories of susceptibility for gentamicin, using local interpretive criteria; these data were not analysed in this report.

3.5 Modifications to EQA scoring for atypical results

Atypical results were observed for a subset of antimicrobials for two new WHO reference strains that were included in the EQA panel for the first time in 2024. Cefixime and ceftriaxone MIC results for Strain 1 (WHO H, specimens 2531 and 2532) were more variable than expected across the laboratories participating in the 2024 EQA. Susceptibility category concordance for cefixime and ceftriaxone for Strain 1 was low compared to other strains in the 2024 EQA panel (Table 2). Additionally, the modal MICs were one to two doubling dilutions lower than the reference MICs for this strain (Table 2). WHO H carries mosaic *penA* allele 34.009 including a PBP2 T534A mutation, which confers resistance to cefixime and ceftriaxone [4]. The possibility that this mutation is unstable under certain laboratory conditions cannot be excluded. To avoid penalising laboratories unfairly, cefixime and ceftriaxone results for Strain 1 were excluded from the overall interlaboratory MIC and SIR concordance scores. Similarly, Strain 1 results were excluded when calculating MIC measurements that were one, two, and greater than two MIC doubling dilutions from the modal MIC for cefixime and ceftriaxone. Strain 1 cefixime and ceftriaxone MIC results were, however, largely consistent within laboratories, so Strain 1 was included in the overall intra-laboratory concordance score.

The tetracycline MIC distribution for Strain 4 (WHO Q, specimens 2535 and 2536) was also atypical, with only 56.5% of MIC results within one doubling dilution of the modal MIC. This contrasted with tetracycline results obtained for the other five EQA strains, for which 87.5-94.4% of MICs were within one doubling dilution of the modal MIC. In WHO Q, high-level tetracycline resistance is conferred by *tet(M)*, which is carried on a conjugative plasmid [4]. It is possible that levels of expressed TetM varied under certain laboratory conditions. To avoid

penalising laboratories unfairly, tetracycline MICs for Strain 4 were scored as follows when calculating overall inter-laboratory MIC concordance: a MIC corresponding to high-level tetracycline resistance was awarded 5 points (i.e. MIC >8 mg/L); an MIC corresponding to low-level tetracycline resistance was awarded 1 point (i.e. MIC >0.5 mg/L and ≤8 mg/L); an MIC corresponding to tetracycline susceptibility was awarded 0 points (i.e. MIC ≤0.5 mg/L). Strain 4 results were excluded when calculating MIC measurements that were one, two, and greater than two MIC doubling dilutions from the modal MIC for tetracycline. There was no impact on susceptibility category scoring, and tetracycline was not considered in the intra-laboratory concordance scoring.

3.6 Coded breakdown of completeness and concordance

Due to the confidential nature of the EQA scheme, only coded laboratory breakdowns for category of susceptibility concordance, beta-lactamase detection concordance, and MIC values for MIC gradient strip tests and agar dilution method are shown in the Annex (Tables A1.1 to A1.14).

A subset of laboratories did not test one or more of the antimicrobials of interest (Table 4). Additionally, incomplete MIC results were submitted by three laboratories: 93995 did not submit any results for isolates 2532 and 2536; 93997 did not submit any results for isolate 2536; and 94937 did not submit cefixime results for six isolates (2533, 2535, 2536, 2538, 2539, and 2540).

Table 4. Summary of testing completeness across antimicrobials of interest

Antimicrobial	Details of laboratories that did not test antimicrobials of interest		Annex tables
	n	Laboratory identifiers	
Azithromycin	3	90984, 92629, and 93995	A1.1 and A1.2
Cefixime	2	90902 and 92629	A1.3 and A1.4
Ceftriaxone	0	N/A	A1.5 and A1.6
Ciprofloxacin	0	N/A	A1.7 and A1.8
Spectinomycin	9	90902, 90984, 92613, 92621, 92624, 92629, 93997, 94936, and 94938	A1.9 and A1.10
Gentamicin	12	90902, 90984, 92613, 92621, 92623, 92624, 92629, 92784, 93997, 94936, 94938, and 95587	A1.11
Tetracycline	3	90902, 92624, and 92629	A1.13 and A1.14
Beta-lactamase production	3	92629, 94936, and 95589	A1.12

Laboratories that did not test a particular antimicrobial did not return any corresponding susceptibility category results, except for a single azithromycin result submitted by laboratory 90984 (Table A1.1). Eight laboratories submitted incomplete antimicrobial susceptibility category results for one or more antimicrobials (Table 5).

Table 5. Summary of completeness of antimicrobial susceptibility category results across antimicrobials tested

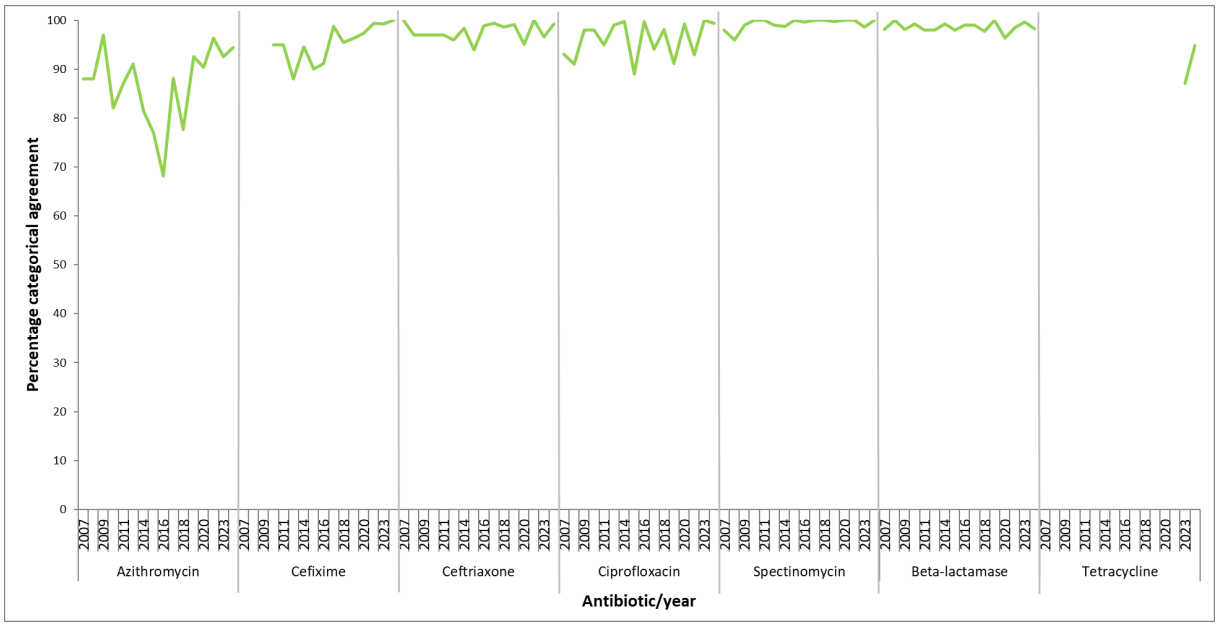
Antimicrobial	Details of incomplete antimicrobial susceptibility category results		Annex table
	Laboratory identifier	Specimens without results	
Azithromycin	90902	All	A1.1
	92623	All	
	92626	2531, 2532, 2533, 2534, 2538, 2539, and 2540	
	92784	All	
	93997	2536	
Cefixime	93995	2532 and 2536	A1.3
	93997	2536	
	94937	2533, 2535, 2536, 2538, 2539, and 2540	
Ceftriaxone	93995	2532 and 2536	A1.5
	93997	2536	
Ciprofloxacin	90984	2534	A1.7
	93995	2532 and 2536	
	93997	2536	
Spectinomycin	93995	2532 and 2536	A1.9
Tetracycline	93995	2532 and 2536	A1.13
	93997	2536	
Beta-lactamase production	93995	2532 and 2536	A1.12
	93997	2536	

3.7 Susceptibility category concordance

The highest levels of categorical agreement were seen for cefixime and spectinomycin (both 100%, Tables A1.3 and A1.9), closely followed by ciprofloxacin (99.4%, Table A1.7) and ceftriaxone (99.2%, Table A1.5). The lowest level of categorical agreement was for azithromycin, with 94.4% concordance (Table A1.1). Consensus susceptibility categories were not assigned for gentamicin as there are currently no published breakpoints for interpretation of results.

Categorical agreement data were compared with previous EQA distributions from both ESSTI (QA2007, QA2008 and QA2009) [8] and ECDC Euro-GASP (QA2010-23) [9-20] (Figure 2). Categorical agreement scores achieved in 2024 were consistent with or slightly higher than in the 2023 EQA for most antimicrobials tested (Figure 2). The exceptions were ciprofloxacin (100% in 2023 and 99.4% in 2024) and beta-lactamase detection (99.6% in 2023 and 98.2% in 2024). Concordance for ciprofloxacin and beta-lactamase detection have fluctuated over time, but the 2024 EQA results for these antimicrobials remained higher than the five-year low (91.1% for ciprofloxacin in 2019; 96.3% for beta-lactamase detection in 2020) (Figure 2). The largest increase in concordance relative to the 2023 EQA was for tetracycline (87.1% in 2023 and 94.8% in 2024), which could partly be attributed to the fact that QA23 included a strain with a modal MIC close to the tetracycline breakpoint, whereas QA24 did not.

Figure 2. Longitudinal comparison of EQA interlaboratory antimicrobial categorical agreement, EU/EEA, 2007–2024



Note: Cefixime and tetracycline were added to the EQA scheme in 2010 and 2023, respectively.
ESSTI EQA distributions (2007 – 2009) constituted 30 isolates (10 strains in triplicate).
The number of laboratories participating in the EQA changed over time: 19 laboratories (2007 and 2008), 16 laboratories (2009), 18 laboratories (2010), 20 laboratories (2011), 19 laboratories (2012), 21 laboratories (2014), 26 laboratories (2015), 27 laboratories (2016), 28 laboratories (2017), 27 laboratories (2018), 28 laboratories (2019), 25 laboratories (2020), 26 laboratories (2021), 24 laboratories (2023), and 27 laboratories (2024).

3.8 MIC concordance

MIC essential agreement (results within one doubling dilution of the modal MIC) was at 93.3% for all antimicrobials tested (Table 6), which was higher than the level of essential agreement achieved in the 2023 EQA (89.1%, $p<0.0001$) [20]. The highest level of essential agreement was for cefixime (99.5%) and the lowest was for spectinomycin (87.2%) (Table 6). This contrasted with the results of the 2023 EQA in which the highest level of essential agreement was for ceftriaxone (99.5%) and the lowest was for tetracycline (84.8%) [20]. For all MIC results combined, 98.4% were within two doubling dilutions of the modal MIC (Table 6). When MIC concordance data were compared with previous ECDC Euro-GASP EQA distributions (QA2010-23) [9-20], essential agreement was higher than in 2023 for all antimicrobials except ceftriaxone and spectinomycin (Figure 3); however, the only significant difference compared to 2023 was for tetracycline (84.8% in 2023 and 92.1% in 2024, $p=0.02$).

Overall, 1.6% of MIC results were greater than two doubling dilutions from the modal MIC. Tetracycline had the highest proportion of isolates with an MIC greater than two doubling dilutions from the modal MIC (4.7%), while cefixime, ceftriaxone, and gentamicin had the lowest (0.0%) (Table 6). In total, 7/27 (25.9%) laboratories had one or more MIC results greater than two doubling dilutions from the modal MIC across all antimicrobials tested, which was a smaller proportion than in 2023 (7/22, 31.8%). No clear pattern could be discerned with respect to MGS manufacturer and/or agar base used. Three of the seven laboratories reported >5% of results greater than two doubling dilutions from the modal MIC. These three laboratories plus one additional laboratory reported >5% of results greater than two doubling dilutions from the modal MIC across the core antimicrobials. One laboratory has not participated in Euro-GASP in recent years, and one participates via centralised testing. The remaining two

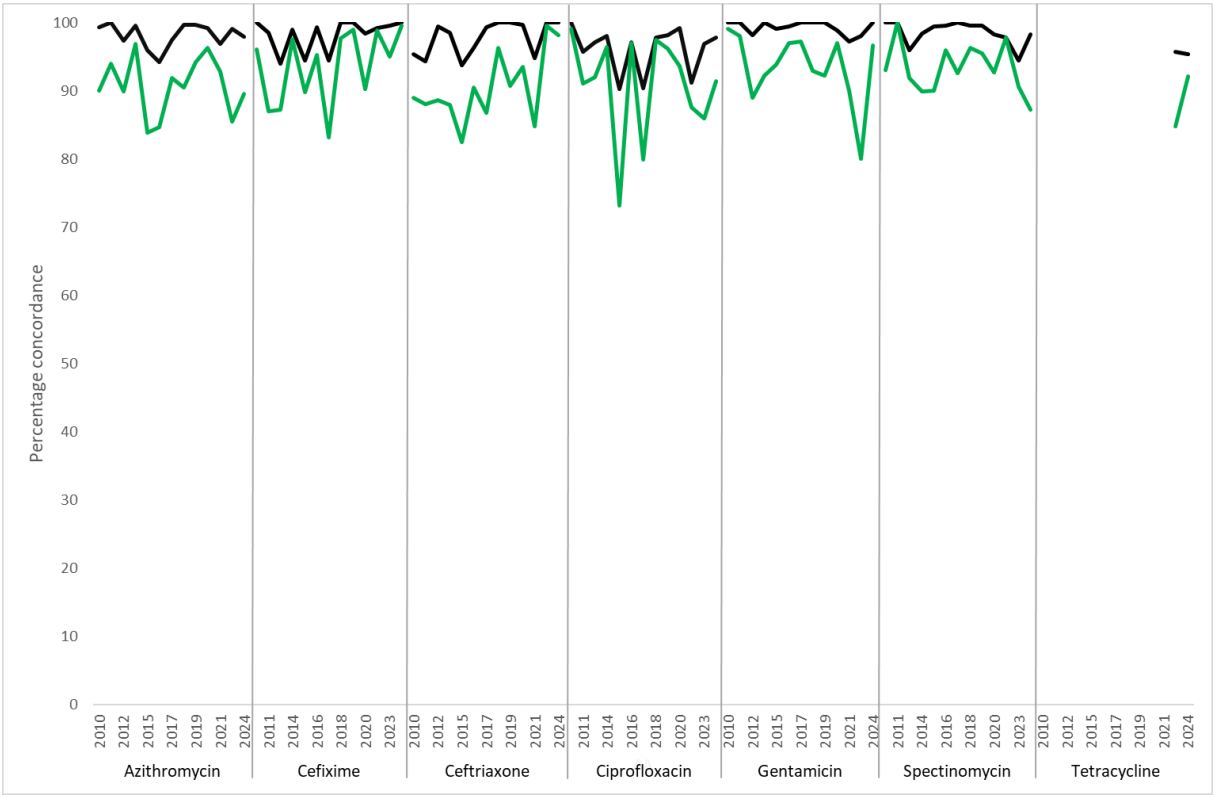
laboratories participate via decentralised testing; one had results greater than two doubling dilutions from the modal MIC only for azithromycin, while the other had discrepancies for azithromycin, spectinomycin, and tetracycline. These laboratories will be supported to improve the quality of their susceptibility testing. In the 2023 EQA, two laboratories reported >5% of results greater than two doubling dilutions from the modal MIC. One of these laboratories improved their performance in 2024 with below 5% of results more than two doubling dilutions from the modal MIC.

Table 6. Variation from modal MIC for QA24

QA24	Azi		Cfm†		Cro†		Cip		Gen		Spc		Tet‡		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Within +/- 1 doubling dilution	214	89.5	191	99.5	210	98.1	244	91.4	143	96.6	156	87.2	176	92.1	1334	93.3
Within +/- 2 doubling dilutions	234	97.9	192	100	214	100	261	97.8	148	100	176	98.3	182	95.3	1407	98.4
More than +/- 2 doubling dilutions	5	2.1	0	0.0	0	0.0	6	2.2	0	0.0	3	1.7	9	4.7	23	1.6
Total no. of isolates with MIC data	239		192		214		267		148		179		191		1430	

Azi: azithromycin; Cfm: cefixime; Cro: ceftriaxone; Cip: ciprofloxacin; Gen: gentamicin; Spc: spectinomycin; Tet: tetracycline; No.: number of isolates.
** Some percentages may not add up to 100% due to rounding.*
† Cefixime and ceftriaxone MIC results for Strain 1 were more variable than expected; therefore, Strain 1 was excluded from these calculations.
‡ Tetracycline MIC results for Strain 4 were more variable than expected; therefore, Strain 4 was excluded from these calculations.

Figure 3. Longitudinal comparison of EQA interlaboratory MIC concordance, percentage of essential agreement (green line) and percentage of results within two doubling dilutions of the modal MIC (black line), EU/EEA, 2010–2024

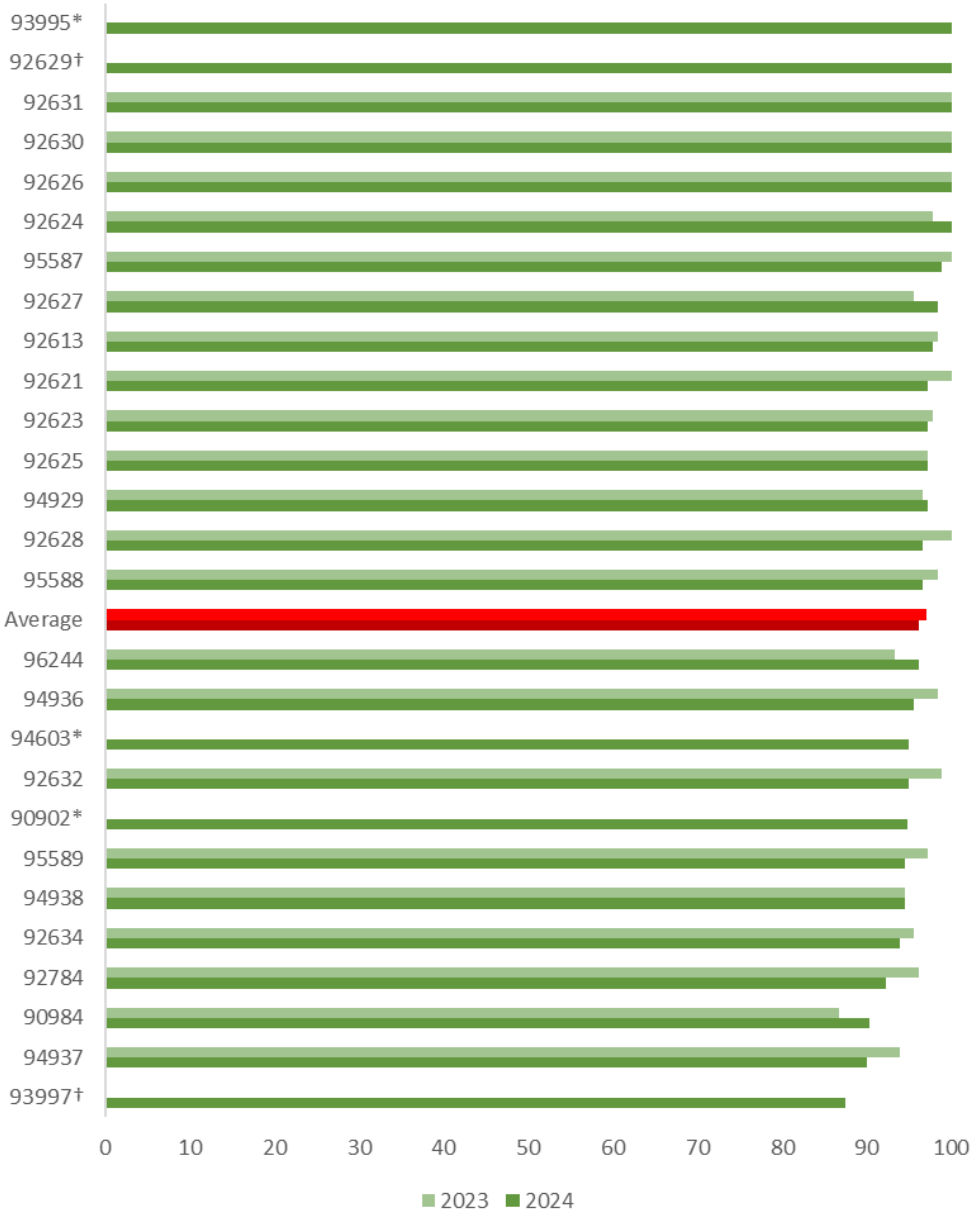


Note: Tetracycline was added to the EQA scheme in 2023.
The number of laboratories participating in the EQA changed over time: 18 laboratories (2010), 20 laboratories (2011), 19 laboratories (2012), 21 laboratories (2014), 26 laboratories (2015), 27 laboratories (2016), 28 laboratories (2017), 27 laboratories (2018), 28 laboratories (2019), 25 laboratories (2020) and 26 laboratories (2021), 24 laboratories (2023), and 27 laboratories (2024).

3.9 Intra-laboratory concordance

Intra-laboratory concordance was examined based on the core antimicrobials using the triplicate (Strain 6) and two duplicate strains (Strain 1 and Strain 4). Figure 4 shows the 2024 intra-laboratory concordance scores in comparison with the average scores for 2024 (96.2%) and 2023 (97.1%). Although the average score decreased slightly in 2024, many laboratories performed well: 19/27 (70.4%) laboratories scored 95% or higher, including six laboratories that obtained a perfect score of 100%. In 2023, four laboratories had an intra-laboratory concordance score below 95%, one of which improved to score over 95% in 2024. Of the eight laboratories that scored less than 95% in 2024, four achieved essential agreement, while three had one major fault each and one had a very major fault. Four of the eight laboratories either have not participated in Euro-GASP in recent years or submit small numbers of isolates, including the single laboratory with a very major error. The remaining four laboratories participate via decentralised testing, two of which achieved essential agreement across all replicates tested.

Figure 4. Intra-laboratory MIC concordance percentage 2023 vs 2024

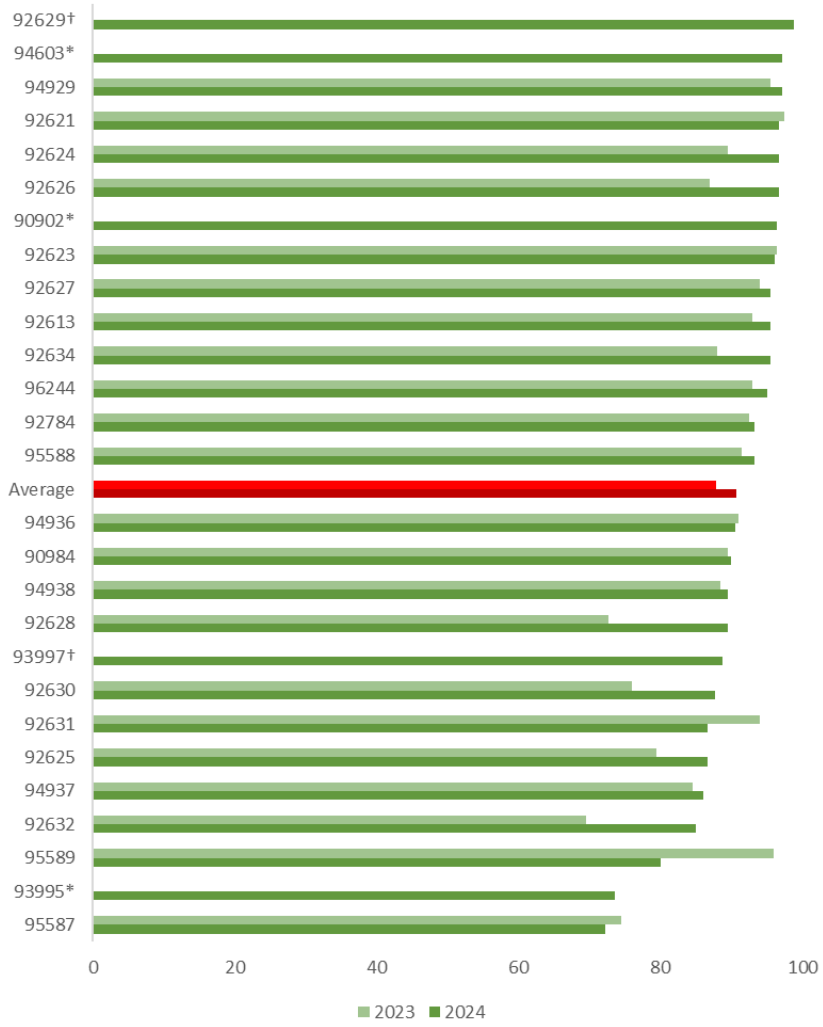


** Did not participate in the 2023 EQA*
† MIC values were not available for the core antimicrobials in 2023

3.10 Overall EQA scores

Figure 5 shows the overall inter-laboratory MIC concordance scores for the core antimicrobials, including the average scores for 2024 (90.8%) and 2023 (87.9%). Several laboratories performed well, with 12/27 (44.4%) scoring 95% or higher. There were also indications of improvement between 2023 and 2024: of the laboratories with EQA results available for both 2023 and 2024, 16/22 (72.7%) achieved higher MIC concordance scores in 2024.

Figure 5. EQA overall MIC scores, 2023 vs 2024

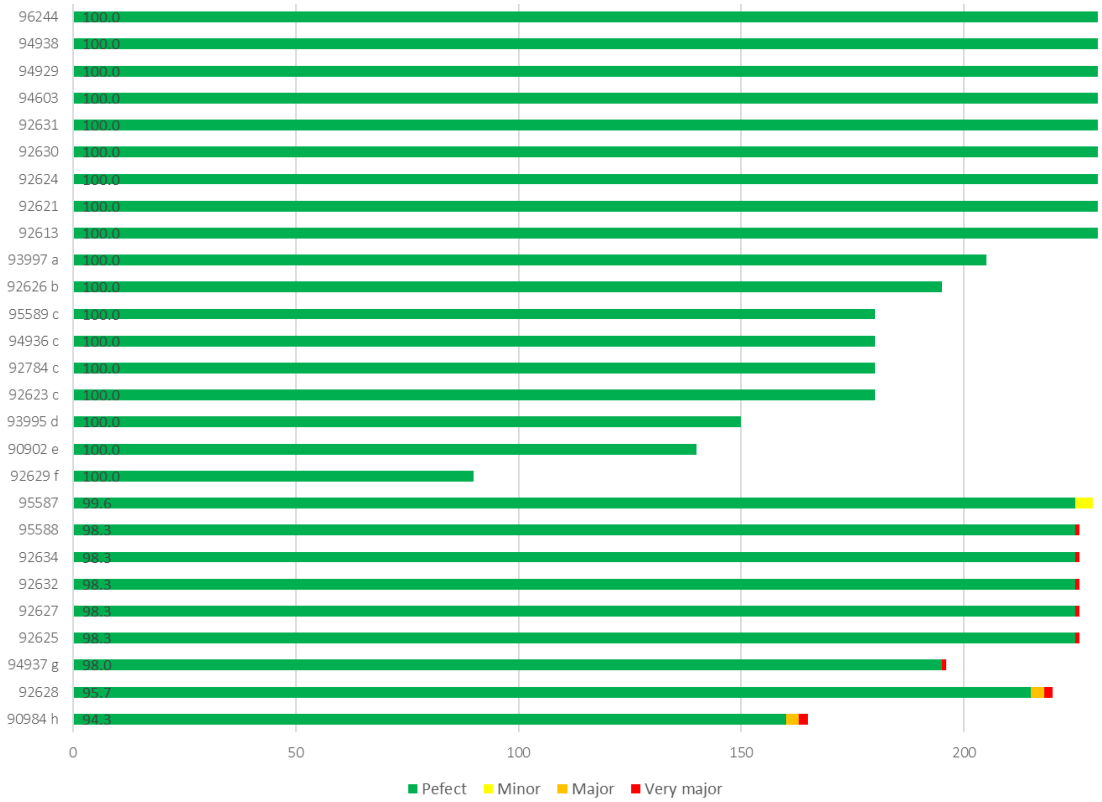


** Did not participate in the 2023 EQA*
† MIC values were not available for the core antimicrobials in 2023

The average inter-laboratory categorical concordance score for the core antimicrobials and beta-lactamase also improved slightly between 2023 (98.7%) and 2024 (99.2%). The scores for overall categorical agreement are shown in Figure 6. Only one laboratory scored below 95% in 2024, while 18 laboratories achieved a perfect score of 100%. Eight laboratories had very major faults (calling a resistant isolates susceptible) across the core antimicrobials and beta-lactamase detection. Six laboratories correctly interpreted the reported azithromycin MIC for Strain 5 (WHO S2); however, the MICs detected were one (n=5) to two (n=1) doubling dilutions below the modal MIC (2 mg/L), resulting in a very major error in susceptibility category interpretation.

Similarly, one laboratory correctly interpreted the reported ceftriaxone MICs for the duplicate Strain 4 (WHO Q); however, the MICs detected were two doubling dilutions below the modal MIC (0.5 mg/L), resulting in a very major error in susceptibility category concordance. Among the eight laboratories with very major faults in categorical agreement, six participate in Euro-GASP via decentralised testing, one via centralised testing, and one has not participated in recent years. The two laboratories that had multiple susceptibility category errors submit small numbers of isolates to Euro-GASP.

Figure 6. EQA overall categorical agreement scores, 2024



Maximum possible score for all laboratories was 250 unless otherwise specified
a Maximum possible score was 205
b Maximum possible score was 195
c Maximum possible score was 180
d Maximum possible score was 150
e Maximum possible score was 140
f Maximum possible score was 90
g Maximum possible score was 200
h Maximum possible score was 175

4. Discussion

Participation in the 2024 Euro-GASP EQA was high, with the panel distributed to 28 laboratories in 28 countries. In total, 27/28 (96.4%) laboratories returned results for between two and eight tests each. The QA24 panel included three new WHO reference strains: WHO H, Q, and S2 [4]. Cefixime and ceftriaxone results for WHO H were unusually variable, as were the tetracycline results for WHO Q; therefore, a modified scoring system was used to avoid penalising laboratories unfairly. Further investigations are required to explore possible reasons for the atypical results; however, it appears that the antimicrobial resistance mechanisms present in WHO H and Q mean that these strains are not ideal for EQA inclusion.

Antimicrobial susceptibility testing methods and breakpoints used by Euro-GASP EQA participants have changed over time, although there has been greater consistency in recent years [21]. Susceptibility testing methods and breakpoints were largely consistent among participating laboratories in 2024. All laboratories reported using EUCAST guidelines to interpret MIC results. Similarly, all laboratories used MGSs to perform antimicrobial susceptibility testing for at least one antimicrobial. With respect to MGS manufacturers, bioMérieux (72.0%) and Liofilchem (32.0%) were most commonly used. The agar base used for testing varied more. Although the use of GC agar has been decreasing since 2020, it remained the most commonly used agar base (33.3%), followed by chocolatised blood agar (25.9%). There was no clear link between EQA performance and MGS manufacturer and/or agar base used; however, the variety of different combinations resulted in small numbers.

Categorical agreement and essential agreement should both be at least 90% for each antimicrobial [21]. This standard was exceeded for categorical agreement in the 2024 EQA, with scores ranging from 94.4% for azithromycin to 100% for cefixime and spectinomycin. Categorical agreement increased for all antimicrobials, except ciprofloxacin (100% in 2023 to 99.4% in 2024) and beta-lactamase detection (99.6% in 2023 to 98.2% in 2024). Fluctuations in categorical agreement over time have often been due to the inclusion or exclusion of strains with a modal MIC on or close to the resistance breakpoint, as was the case for the improved tetracycline and ceftriaxone scores in 2024. In contrast, errors in categorical agreement for ciprofloxacin and beta-lactamase detection in the 2024 EQA were limited to a single laboratory each. In terms of overall MIC concordance, essential agreement also increased between 2023 and 2024 (89.1% to 93.3%, $p<0.0001$). At the individual antimicrobial level, the only significant difference was for tetracycline (84.8% in 2023 and 92.1% in 2024, $p=0.02$). The recommended minimum standard of 90% essential agreement was met for all antimicrobials except azithromycin (89.5%) and spectinomycin (87.2%).

Breakdown of EQA susceptibility testing results by laboratory allowed for detailed analysis of individual laboratory performance. Inter-laboratory categorical concordance scores based on the core antimicrobials and beta-lactamase detection were high, with the average increasing slightly between 2023 (98.7%) and 2024 (99.2%). Only one laboratory scored below 95% for categorical concordance, which was due to incorrectly reporting beta-lactamase production in one specimen and failing to detect it in another two specimens. This laboratory submits small numbers of isolates to Euro-GASP. For the core antimicrobials, a further seven laboratories had between one and two very major faults each (calling a resistant isolate susceptible), one of which also had a major fault (calling a susceptible isolate resistant). Susceptibility category errors were rare overall and were mainly seen in strains with a modal MIC close to the resistance breakpoint. This highlights the importance of considering the MIC alongside the susceptibility category when interpreting susceptibility results.

The average inter-laboratory MIC concordance score based on the core antimicrobials increased between 2023 (87.9%) and 2024 (90.8%). Intra-laboratory MIC concordance decreased slightly but remained high (97.1% in 2023 and 96.2% in 2024). There were, however, four laboratories that reported >5% of results greater than two doubling dilutions from the modal MIC across either all antimicrobials ($n=3$) or the core antimicrobials ($n=4$). One of these laboratories has not participated in Euro-GASP in recent years, one participates via centralised testing, and two participate via decentralised testing. With respect to the decentralised laboratories, both had discrepancies for azithromycin while one also had discrepancies for the non-core antimicrobials spectinomycin and tetracycline. The potential impact on Euro-GASP data quality is likely to be limited; however, all four laboratories will be supported in exploring possible reasons for the observed discrepancies with the aim of achieving the Euro-GASP recommended target of 95% of MICs within two doubling dilutions of the modal MIC.

5. Conclusion

The Euro-GASP EQA is important to ensure that results from different laboratories participating in Euro-GASP are comparable and that significant over- and under-reporting of antimicrobial resistance does not occur. It is also important that reference laboratories have access to appropriate internal quality control strains such as the WHO reference strain panel [3,4] to routinely ensure their own quality assurance in a variety of diagnostic and antimicrobial susceptibility testing. Antimicrobial susceptibility results from Euro-GASP contribute to the evidence base of gonorrhoea treatment guidelines and local susceptibility testing can be used for individual patient management, so confidence in reporting is essential.

The laboratories that participated in the 2024 Euro-GASP EQA scheme for antimicrobial susceptibility testing of *N. gonorrhoeae* demonstrated good levels of competency in recovering and testing strains of unknown phenotype. Although intra-laboratory MIC concordance decreased slightly for the QA24 distribution, the score was high overall, indicating consistency of testing within laboratories. Inter-laboratory MIC concordance and susceptibility category concordance both increased between 2023 and 2024, providing reassurance that antimicrobial susceptibility testing data submitted by members of the Euro-GASP network are comparable and of a high quality. Taken together, the results of the 2024 EQA indicate that Euro-GASP antimicrobial surveillance data continue to be a good standard.

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Annex. QA24 detailed results

Table A1.1 Country coded category of susceptibility concordance – azithromycin

		Laboratory codes																														
	Strain	90902	90984	92613	92621	92623	92624	92625	92626	92627	92628	92629	92630	92631	92632	92634	92784	93995	93997	94603	94929	94936	94937	94938	95587	95588	95589	96244	Total	No. S	No. I	No. R	Consensus	Concordance (%)
1	2531	N	N	S	S	N	S	S	N	S	S	N	S	S	S	S	N	N	S	S	S	S	S	S	S	S	S	S	40	40	0	0	S	100
	2532	N	N	S	S	N	S	S	N	S	S	N	S	S	S	S	N	N	S	S	S	S	S	S	S	S	S	S						
2	2533	N	S*	S	S	N	S	S	N	S	R	N	S	S	S	S	N	N	S	S	S	S	S	S	S	S	S	S	20	19	0	1	S	95.0
3	2534	N	N	S	S	N	S	S	N	S	S	N	S	S	S	S	N	N	S	S	S	S	S	S	S	S	S	S	20	20	0	0	S	100
4	2535	N	N	R	R	N	R	R	R	R	R	N	R	R	R	R	N	N	R	R	R	R	R	R	R	R	R	R	41	0	0	41	R	100
	2536	N	N	R	R	N	R	R	R	R	R	N	R	R	R	R	N	N	N	R	R	R	R	R	R	R	R	R						
5	2537	N	N	R	R	N	R	S	R	S	R	N	R	R	S	S	N	N	R	R	R	R	S	R	R	S	R	R	21	6	0	15	R	71.4
6	2538	N	N	S	S	N	S	S	N	S	S	N	S	S	S	S	N	N	S	S	S	S	S	S	S	S	S	S	60	60	0	0	S	100
	2539	N	N	S	S	N	S	S	N	S	S	N	S	S	S	S	N	N	S	S	S	S	S	S	S	S	S	S						
	2540	N	N	S	S	N	S	S	N	S	S	N	S	S	S	S	N	N	S	S	S	S	S	S	S	S	S	S						
																																Total	94.4

N: no result; not retrieved or susceptibility category not supplied.
** The submitted result was excluded from analyses due to the lack of an underlying MIC result.*

Table A1.2. Country coded MIC values (mg/L) – azithromycin

		Laboratory codes																														
	Strain	90902	90984	92613	92621	92623	92624	92625	92626	92627	92628	92629	92630	92631	92632	92634	92784	93995	93997	94603	94929	94936	94937	94938	95587	95588	95589	96244	Modal MIC	Min MIC	Max MIC	2 dilutions different	>2 dilutions different
1	2531	0.25	N	0.5	0.25	0.5	0.25	0.032	0.125	0.125	0.25	N	0.25	0.125	0.25	0.5	0.5	N	0.5	0.5	0.125	0.5	0.125	0.125	1	0.125	0.5	0.25	0.25	0.016	1	3	2
	2532	0.25	N	0.5	0.25	0.25	0.25	0.016	0.125	0.125	0.25	N	0.25	0.125	0.125	0.25	0.5	N	0.25	0.25	0.25	0.5	0.064	0.125	1	0.125	0.5	0.25					
2	2533	1	N	0.5	0.5	0.5	0.5	0.25	0.25	0.5	2	N	0.5	0.5	0.25	0.25	0.5	N	0.25	1	0.5	0.5	0.125	0.25	1	0.25	1	0.5	0.5	0.125	2	2	0
3	2534	0.5	N	0.5	0.25	0.5	0.5	0.25	0.25	0.25	0.5	N	0.5	0.5	0.25	0.25	1	N	0.5	0.5	0.25	0.5	0.125	0.25	1	0.25	1	0.5	0.5	0.125	1	1	0
4	2535	256	N	>256	>256	>256	>256	>256	>256	>256	>256	N	>256	>256	>256	>256	>=256	N	>256	>256	>256	>256	256	>256	>256	>256	>256	>256	≥256	256	>256	0	0
	2536	256	N	>256	>256	>256	>256	>256	>256	>256	>256	N	>256	>256	>256	>256	>=256	N	N	>256	>256	>256	256	>256	>256	>256	>256	>256					
5	2537	2	N	4	2	2	2	0.5	2	1	2	N	2	2	1	1	2	N	4	2	2	2	1	2	4	1	8	2	2	0.5	8	2	0
6	2538	0.064	N	0.032	0.032	0.064	0.032	0.016	0.032	0.032	0.032	N	0.125	0.125	0.032	0.032	0.064	N	0.064	0.032	0.032	0.064	0.016	0.016	0.125	0.032	0.25	0.032	0.032	0.016	0.25	12	3
	2539	0.032	N	0.064	0.032	0.064	0.032	0.032	0.032	0.032	0.032	N	0.125	0.125	0.032	0.064	0.064	N	0.25	0.032	0.032	0.125	0.016	0.016	0.125	0.032	0.125	0.064					
	2540	0.064	N	0.032	0.032	0.064	0.032	0.016	0.032	0.032	0.032	N	0.125	0.125	0.032	0.032	0.064	N	0.125	0.032	0.032	0.064	0.032	0.032	0.125	0.032	0.25	0.064					

N: no result; not retrieved, not tested or MIC not supplied.
Note: Laboratories 90984, 92629, and 93995 did not submit azithromycin data.

Table A1.3. Country coded category of susceptibility concordance – cefixime

		Laboratory codes																														
	Strain	90902	90984	92613	92621	92623	92624	92625	92626	92627	92628	92629	92630	92631	92632	92634	92784	93995	93997	94603	94929	94936	94937	94938	95587	95588	95589	96244	Total	No. S	No. I	No. R	Consensus	Concordance (%)
1*	2531	N	S	R	R	R	R	R	R	R	S	N	R	R	S	R	S	S	R	S	R	R	R	R	S	S	S	S	49	19	0	30	ND*	ND*
	2532	N	S	R	R	R	R	R	R	R	R	N	R	R	S	R	S	N	S	S	R	R	R	R	S	S	S	S						
2	2533	N	S	S	S	S	S	S	S	S	S	N	S	S	S	S	S	S	S	S	S	S	N	S	S	S	S	S	24	24	0	0	S	100
3	2534	N	S	S	S	S	S	S	S	S	S	N	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	25	25	0	0	S	100
4	2535	N	R	R	R	R	R	R	R	R	R	N	R	R	R	R	R	R	R	R	R	R	N	R	R	R	R	R	46	0	0	46	R	100
	2536	N	R	R	R	R	R	R	R	R	R	N	R	R	R	R	R	N	N	R	R	R	N	R	R	R	R	R						
5	2537	N	S	S	S	S	S	S	S	S	S	N	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	25	25	0	0	S	100
6	2538	N	S	S	S	S	S	S	S	S	S	N	S	S	S	S	S	S	S	S	S	S	N	S	S	S	S	S	72	72	0	0	S	100
	2539	N	S	S	S	S	S	S	S	S	S	N	S	S	S	S	S	S	S	S	S	S	N	S	S	S	S	S						
	2540	N	S	S	S	S	S	S	S	S	S	N	S	S	S	S	S	S	S	S	S	S	N	S	S	S	S	S						
																																	Total	100

N: no result; not retrieved or susceptibility category not supplied. ND: not determined.
** Results excluded from susceptibility category concordance calculations.*

Table A1.4. Country coded MIC values (mg/L) – cefixime

		Laboratory codes																											Modal MIC	Min MIC	Max MIC	2 dilutions different	>2 dilutions different
	Strain	90902	90984	92613	92621	92623	92624	92625	92626	92627	92628	92629	92630	92631	92632	92634	92784	93995	93997	94603	94929	94936	94937	94938	95587	95588	95589	96244					
1*	2531	N	0.125	2	1	0.25	0.5	0.25	0.25	0.5	0.125	N	0.25	0.5	0.125	1	0.125	0.125	0.25	0.125	0.25	0.25	0.5	0.5	0.125	0.125	0.125	0.125	0.125	0.125	2	11	6
	2532	N	0.125	2	1	0.25	0.5	0.25	0.25	0.5	0.25	N	0.25	0.5	0.125	1	0.125	N	0.125	0.125	0.25	0.5	0.5	0.5	0.125	0.125	0.125	0.125						
2	2533	N	<0.016	<0.016	0.016	<0.016	<0.016	<0.016	<0.016	<0.016	<0.016	N	<0.016	<0.016	<0.016	<=0.016	<=0.016	0.016	<0.016	<=0.016	<0.016	0.016	N	<0.016	<0.016	<0.016	<=0.016	<0.016	<0.016	≤0.016	<0.016	0.016	0	0
3	2534	N	<0.016	0.016	0.016	0.016	<0.016	<0.016	<0.016	<0.016	<0.016	N	0.016	<0.016	<0.016	0.032	<0.016	0.016	<0.016	<=0.016	0.016	0.016	0.032	0.016	<0.016	<=0.016	<0.016	0.016	≤0.016	<0.016	0.032	0	0
4	2535	N	2	2	>=2	2	2	1	2	2	1	N	2	2	1	2	2	2	1	1	2	2	N	2	1	1	2	0.5	2	0.5	≥2	1	0
	2536	N	2	2	>=2	2	2	1	2	2	1	N	2	2	1	2	2	N	N	2	2	2	N	2	1	1	2	1					
5	2537	N	<0.016	<0.016	0.016	<0.016	<0.016	<0.016	<0.016	<0.016	<0.016	N	<0.016	<0.016	<0.016	0.016	<0.016	0.016	<0.016	<=0.016	<0.016	0.016	0.016	<0.016	<0.016	<=0.016	<0.016	<0.016	≤0.016	<0.016	0.016	0	0
6	2538	N	<0.016	<0.016	0.008	<0.016	<0.016	<0.016	<0.016	<0.016	<0.016	N	<0.016	<0.016	<0.016	0.016	<0.016	0.016	<0.016	<=0.016	<0.016	0.016	N	0.016	<0.016	<0.016	<=0.016	<0.016	<0.016	≤0.016	0.008	0.032	0	0
	2539	N	<0.016	<0.016	0.008	<0.016	<0.016	<0.016	<0.016	<0.016	<0.016	N	<0.016	<0.016	<0.016	0.016	<0.016	0.016	0.032	<=0.016	<0.016	0.016	N	<0.016	<0.016	<0.016	<=0.016	<0.016	<0.016					
	2540	N	<=0.016	<0.016	0.008	<0.016	<0.016	<0.016	<0.016	<0.016	<0.016	N	<0.016	<0.016	<0.016	0.016	<0.016	0.016	0.032	<=0.016	<0.016	0.016	N	<0.016	<0.016	<0.016	<=0.016	<0.016	<0.016					

N: no result; not retrieved, not tested or MIC not supplied.
Note: Laboratories 90902 and 92629 did not submit cefixime data.
** Results excluded from MIC concordance calculations.*

Table A1.5. Country coded category of susceptibility concordance – ceftriaxone

		Laboratory codes																																
	Strain	90902	90984	92613	92621	92623	92624	92625	92626	92627	92628	92629	92630	92631	92632	92634	92784	93995	93997	94603	94929	94936	94937	94938	95587	95588	95589	96244	Total	No. S	No. I	No. R	Consensus	Concordance (%)
1*	2531	S	S	R	S	S	S	S	S	S	S	S	S	S	S	S	S	S	R	S	S	S	S	R	S	S	S	S	53	46	0	7	ND*	ND*
	2532	S	S	R	S	S	S	S	S	S	S	S	S	S	S	R	S	N	S	S	S	R	S	R	S	S	S	S						
2	2533	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	27	27	0	0	S	100.0
3	2534	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	27	27	0	0	S	100
4	2535	R	R	R	R	R	R	R	R	R	S	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	52	2	0	50	R	96.2
	2536	R	R	R	R	R	R	R	R	R	S	R	R	R	R	R	R	N	N	R	R	R	R	R	R	R	R	R						
5	2537	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	27	27	0	0	S	100.0
6	2538	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	81	81	0	0	S	100
	2539	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S						
	2540	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S						
																																	Total	99.2

N: no result; not retrieved or susceptibility category not supplied.
** Results excluded from susceptibility category concordance calculations.*

Table A1.6. Country coded MIC values (mg/L) – ceftriaxone

		Laboratory codes																															
	Strain	90902	90984	92613	92621	92623	92624	92625	92626	92627	92628	92629	92630	92631	92632	92634	92784	93995	93997	94603	94929	94936	94937	94938	95587	95588	95589	96244	Modal MIC	Min MIC	Max MIC	2 dilutions different	>2 dilutions different
1*	2531	0.125	0.125	0.5	0.125	0.125	0.125	0.064	0.064	0.064	0.032	0.125	0.064	0.125	0.032	0.125	0.032	0.032	0.25	0.064	0.125	0.125	0.125	0.25	0.125	0.032	0.064	0.064	0.125	0.016	0.5	9	2
	2532	0.064	0.125	0.5	0.064	0.125	0.125	0.064	0.064	0.064	0.064	0.125	0.064	0.125	0.016	0.25	0.016	N	0.125	0.064	0.125	0.25	0.125	0.25	0.125	0.032	0.032	0.064					
2	2533	0.004	0.004	0.008	0.008	0.008	0.008	<0.016	0.004	0.008	0.004	0.008	0.016	0.002	0.004	0.008	0.004	0.064**	0.016	<=0.016	<0.016	0.016	0.002	0.008	0.016	0.004	0.008	0.008	≤0.016	0.002	0.064	1	0
3	2534	0.032	0.016	0.032	0.016	0.016	0.016	<0.016	0.016	0.016	0.004	0.016	0.032	0.004	0.004	0.032	0.008	0.064**	<0.016	<=0.016	0.016	0.032	0.008	0.016	0.016	0.008	0.008	0.016	≤0.016	0.004	0.064	1	
4	2535	0.5	0.5	1	0.25	0.5	0.5	0.5	0.25	0.5	0.125	0.5	0.25	0.25	0.25	0.5	0.5	0.5	1	1	1	1	0.5	0.5	1	0.25	0.5	0.25	0.5	0.125	1	2	0
	2536	0.5	0.25	1	0.25	0.5	0.5	0.5	0.25	1	0.125	0.5	0.25	0.25	0.25	0.5	0.25	N	N	0.5	1	1	0.5	0.5	1	0.25	0.5	0.25					
5	2537	0.008	0.004	0.008	0.004	0.004	0.004	<0.016	0.002	0.004	0.004	0.008	0.008	0.008	0.008	0.016	0.002	0.032**	<0.016	<=0.016	<0.016	0.008	0.004	0.008	0.016	0.002	0.004	0.004	≤0.016	0.002	0.032	0	0
6	2538	0.002	0.004	0.004	0.004	0.004	0.004	<0.016	<0.002	0.004	0.004	0.004	<0.002	0.004	<0.002	0.008	<0.002	0.032**	<0.016	<=0.016	<0.016	0.004	0.004	0.004	0.008	0.002	0.004	0.002	≤0.016	<0.002	0.032	0	0
	2539	0.004	0.004	0.002	0.002	0.004	0.004	<0.016	<0.002	0.004	0.004	0.004	<0.002	0.004	<0.002	0.008	0.002	0.032**	<0.016	<=0.016	<0.016	0.004	0.002	0.002	0.008	0.002	0.002	0.004					
	2540	0.002	0.032	0.002	0.002	0.004	0.004	<0.016	<0.002	0.004	0.004	0.004	<0.002	0.004	<0.002	0.008	<0.002	0.032**	<0.016	<=0.016	<0.016	0.004	0.002	0.004	0.008	0.002	0.002	0.004					

N: no result; not retrieved, not tested or MIC not supplied.
** Results excluded from MIC concordance calculations.*
† The submitted result did not correspond to a standard MIC value. The submitting laboratory proposed a correction, which was rounded up to the next full MIC gradient strip dilution.

Table A1.7. Country coded category of susceptibility concordance – ciprofloxacin

		Laboratory codes																														
	Strain	90902	90984	92613	92621	92623	92624	92625	92626	92627	92628	92629	92630	92631	92632	92634	92784	93995	93997	94603	94929	94936	94937	94938	95587	95588	95589	96244	Total	No. S	No. I	No. R	Consensus	Concordance (%)
1	2531	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	53	0	0	53	R	100
	2532	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	N	R	R	R	R	R	R	R	R	R	R						
2	2533	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	27	0	0	27	R	100
3	2534	S	N	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S*	S	S	S	S	S	S	S	S	26	26	0	0	S	100
4	2535	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	52	0	0	52	R	100
	2536	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	N	N	R	R	R	R	R	R	R	R	R						
5	2537	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	I	S	S	S	27	26	1	0	S	96.3
6	2538	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	81	81	0	0	S	100
	2539	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S						
	2540	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S						
																																Total	99.4

N: no result; not retrieved or susceptibility category not supplied.
** The submitting laboratory proposed a correction to the underlying MIC result, which also required a correction to the category of susceptibility.*

Table A1.8. Country coded MIC values (mg/L) – ciprofloxacin

		Laboratory codes																											Modal MIC	Min MIC	Max MIC	2 dilutions different	>2 dilutions different
	Strain	90902	90984	92613	92621	92623	92624	92625	92626	92627	92628	92629	92630	92631	92632	92634	92784	93995	93997	94603	94929	94936	94937	94938	95587	95588	95589	96244					
1	2531	>32	16	>32	>32	>32	>32	>32	>32	>=32	>32	32	>32	>32	8	>32	8	32	>32	>32	>32	>32	16	>32	>32	16	8	32	≥32	4	>32	5	1
	2532	>32	16	>32	>32	32	>32	>32	>32	>=32	>32	32	>32	>32	4	>32	>=32	N	>32	>32	>32	>32	32	8	>32	>32	8	32					
2	2533	0.5	0.5	1	1	1	2	1	1	1	0.5	1	2	2	0.5	1	1	1	2	1	1	2	1	0.5	4	1	1	1	1	0.5	4	1	0
3	2534	0.008	0.008	0.008	0.004	0.008	0.016	0.002	0.008	0.008	<0.002	0.008	0.008	0.004	0.004	0.008	0.008	0.016	0.008	0.016*	0.008	0.016	0.008	0.008	0.016	0.008	0.004	0.008	0.008	<0.002	0.016	2	0
4	2535	32	8	>32	16	>32	>32	>32	>32	>32	>32	32	16	16	8	>32	>=32	32	>32	>32	>32	>32	16	8	>32	16	16	32	≥32	8	>32	7	0
	2536	32	8	>32	16	>32	>32	>32	>32	>32	>32	32	16	16	8	16	>=32	N	N	>32	>32	>32	32	8	>32	>32	8	32					
5	2537	0.016	0.016	0.032	0.016	0.032	0.032	0.016	0.016	0.016	0.016	0.032	0.032	0.032	0.016	0.016	0.016	0.032	0.016	0.016	0.016	0.032	0.016	0.016	0.064	0.032	0.016	0.016	0.016	0.016	0.064	1	0
6	2538	0.002	0.002	<0.002	<0.002	0.004	0.004	<0.002	0.002	0.004	0.002	0.002	0.004	0.004	0.002	0.002	0.002	0.032*	<0.002	<=0.002	0.002	0.004	0.004	<0.002	0.016	0.002	<0.002	0.002	≤0.002	<0.002	0.032	1	5
	2539	0.002	0.002	0.002	<0.002	0.002	0.004	<0.002	0.002	0.004	0.002	0.002	0.004	0.004	0.002	0.002	0.002	0.032*	<0.002	<=0.002	0.002	0.004	0.002	<0.002	0.016	0.002	<0.002	0.002					
	2540	0.002	<0.002	0.002	<0.002	0.004	0.004	<0.002	0.002	0.004	0.002	0.002	0.004	0.004	0.002	0.002	0.002	0.032*	<0.002	<=0.002	0.004	0.004	0.004	<0.002	0.008	0.002	0.002	0.002					

N: no result; not retrieved, not tested or MIC not supplied.
** The submitted result did not correspond to a standard MIC value. The submitting laboratory proposed a correction, which was rounded up to the next full MIC gradient strip dilution.*

Table A1.9. Country coded category of susceptibility concordance – spectinomycin

		Laboratory codes																														
	Strain	90902	90984	92613	92621	92623	92624	92625	92626	92627	92628	92629	92630	92631	92632	92634	92784	93995	93997	94603	94929	94936	94937	94938	95587	95588	95589	96244	Total	No. S	No. I	No. R	Consensus	Concordance (%)
1	2531	N	N	N	N	S	N	S	S	S	S	N	S	S	S	S	S	S	N	S	S	N	S	N	S	S	S	S	35	35	0	0	S	100
	2532	N	N	N	N	S	N	S	S	S	S	N	S	S	S	S	S	N	N	S	S	N	S	N	S	S	S	S						
2	2533	N	N	N	N	S	N	S	S	S	S	N	S	S	S	S	S	S	N	S	S	N	S	N	S	S	S	S	18	18	0	0	S	100
3	2534	N	N	N	N	R	N	R	R	R	R	N	R	R	R	R	R	R	N	R	R	N	R	N	R	R	R	R	18	0	0	18	R	100
4	2535	N	N	N	N	S	N	S	S	S	S	N	S	S	S	S	S	S	N	S	S	N	S	N	S	S	S	S	35	35	0	0	S	100
	2536	N	N	N	N	S	N	S	S	S	S	N	S	S	S	S	S	N	N	S	S	N	S	N	S	S	S	S						
5	2537	N	N	N	N	S	N	S	S	S	S	N	S	S	S	S	S	S	N	S	S	N	S	N	S	S	S	S	18	18	0	0	S	100
6	2538	N	N	N	N	S	N	S	S	S	S	N	S	S	S	S	S	S	N	S	S	N	S	N	S	S	S	S	54	54	0	0	S	100
	2539	N	N	N	N	S	N	S	S	S	S	N	S	S	S	S	S	S	N	S	S	N	S	N	S	S	S	S						
	2540	N	N	N	N	S	N	S	S	S	S	N	S	S	S	S	S	S	N	S	S	N	S	N	S	S	S	S						
																																	Total	100

N – not retrieved or susceptibility category not supplied.

Table A1.10. Country coded MIC values (mg/L) – spectinomycin

		Laboratory codes																														
	Strain	90902	90984	92613	92621	92623	92624	92625	92626	92627	92628	92629	92630	92631	92632	92634	92784	93995	93997	94603	94929	94936	94937	94938	95587	95588	95589	96244	Modal MIC	Min MIC	Max MIC	2 dilutions different	>2 dilutions different
1	2531	N	N	N	N	16	N	4	8	8	1	N	16	16	16	16	16	16	N	16	16	N	4	N	16	8	32	16	16	1	32	3	3
	2532	N	N	N	N	16	N	2	8	8	1	N	16	16	16	16	16	N	N	8	8	N	4	N	16	8	16	16					
2	2533	N	N	N	N	16	N	8	16	16	16	N	16	16	16	16	16	16	N	8	16	N	4	N	16	8	32	16	16	4	32	1	0
3	2534	N	N	N	N	>1024	N	>1024	>1024	>1024	>1024	N	>1024	>1024	>1024	>1024	>=1024	1024	N	>1024	>1024	N	1024	N	>1024	>1024	>1024	>1024	≥1024	1024	>1024	0	0
4	2535	N	N	N	N	16	N	4	16	16	4	N	16	16	16	16	32	32	N	8	8	N	4	N	16	8	32	16	16	4	32	6	0
	2536	N	N	N	N	16	N	4	8	16	4	N	16	16	16	16	32	N	N	8	8	N	4	N	16	8	32	16					
5	2537	N	N	N	N	16	N	4	8	8	16	N	16	16	16	16	16	16	N	8	8	N	8	N	16	8	32	16	16	4	32	1	0
6	2538	N	N	N	N	16	N	2	4	8	2	N	16	8	8	8	16	4	N	4	4	N	2	N	8	4	16	8	8	2	16	9	0
	2539	N	N	N	N	8	N	2	4	8	2	N	16	8	8	8	8	8	N	4	4	N	2	N	8	8	16	8					
	2540	N	N	N	N	16	N	2	4	8	2	N	16	8	8	8	8	4	N	4	8	N	2	N	8	4	16	8					

N: no result; not retrieved, not tested or MIC not supplied.
Note: Laboratories 90902, 90984, 92613, 92621, 92624, 92629, 93997, 94936, and 94938 did not submit spectinomycin data.

Table A1.11. Country coded MIC values (mg/L) – gentamicin

		Laboratory codes																														
	Strain	90902	90984	92613	92621	92623	92624	92625	92626	92627	92628	92629	92630	92631	92632	92634	92784	93995	93997	94603	94929	94936	94937	94938	95587	95588	95589	96244	Modal MIC	Min MIC	Max MIC	2 dilutions different	>2 dilutions different
1	2531	N	N	N	N	N	N	2	8	4	4	N	4	4	4	4	N	2	N	8	4	N	2	N	N	4	4	8	4	2	8	0	0
	2532	N	N	N	N	N	N	2	8	4	2	N	4	4	4	2	N	N	N	8	4	N	2	N	N	4	4	8					
2	2533	N	N	N	N	N	N	4	8	4	4	N	4	4	2	2	N	2	N	8	4	N	2	N	N	4	4	8	4	2	8	0	0
3	2534	N	N	N	N	N	N	2	8	8	2	N	4	4	4	8	N	4	N	8	8	N	4	N	N	8	4	8	8	2	8	2	0
4	2535	N	N	N	N	N	N	2	8	8	4	N	4	4	4	2	N	4	N	8	8	N	1	N	N	4	4	8	4	1	8	1	0
	2536	N	N	N	N	N	N	2	4	8	4	N	4	4	4	4	N	N	N	4	8	N	2	N	N	4	4	8					
5	2537	N	N	N	N	N	N	4	8	4	4	N	8	8	2	4	N	4	N	8	4	N	4	N	N	8	4	8	4	2	8	0	0
6	2538	N	N	N	N	N	N	2	4	4	2	N	4	4	2	8	N	2	N	4	4	N	2	N	N	4	4	8	4	1	8	2	0
	2539	N	N	N	N	N	N	4	4	4	2	N	4	4	2	4	N	2	N	4	8	N	1	N	N	4	4	8					
	2540	N	N	N	N	N	N	2	4	4	2	N	4	4	2	4	N	2	N	4	4	N	1	N	N	4	4	8					

N: no result; not retrieved, not tested or MIC not supplied.
Note: Laboratories 90902, 90984, 92613, 92621, 92623, 92624, 92629, 92784, 93997, 94936, 94938, and 95587 did not submit gentamicin data.

Table A1.12. Country coded concordance – beta-lactamase

		Laboratory codes																														
	Strain	90902	90984	92613	92621	92623	92624	92625	92626	92627	92628	92629	92630	92631	92632	92634	92784	93995	93997	94603	94929	94936	94937	94938	95587	95588	95589	96244	Total	No. S	No. I	No. R	Consensus	Concordance (%)
1	2531	S	S	S	S	S	S	S	S	S	S	N	S	S	S	S	S	S	S	S	S	N	S	S	S	S	N	S	47	47	0	0	S	100
	2532	S	S	S	S	S	S	S	S	S	S	N	S	S	S	S	S	N	S	S	S	N	S	S	S	S	N	S						
2	2533	R	S	R	R	R	R	R	R	R	R	N	R	R	R	R	R	R	R	R	R	N	R	R	R	R	N	R	24	1	0	23	R	95.8
3	2534	R	S	R	R	R	R	R	R	R	R	N	R	R	R	R	R	R	R	R	R	N	R	R	R	R	N	R	24	1	0	23	R	95.8
4	2535	S	S	S	S	S	S	S	S	S	S	N	S	S	S	S	S	S	S	S	S	N	S	S	S	S	N	S	46	45	0	1	S	97.8
	2536	S	R	S	S	S	S	S	S	S	S	N	S	S	S	S	S	N	N	S	S	N	S	S	S	S	N	S						
5	2537	S	S	S	S	S	S	S	S	S	S	N	S	S	S	S	S	S	S	S	S	N	S	S	S	S	N	S	24	24	0	0	S	100
6	2538	S	S	S	S	S	S	S	S	S	S	N	S	S	S	S	S	S	S	S	S	N	S	S	S	S	N	S	72	72	0	0	S	100
	2539	S	S	S	S	S	S	S	S	S	S	N	S	S	S	S	S	S	S	S	S	N	S	S	S	S	N	S						
	2540	S	S	S	S	S	S	S	S	S	S	N	S	S	S	S	S	S	S	S	S	N	S	S	S	S	N	S						
																																Total	98.2

N: no result; not retrieved or beta-lactamase result not supplied.
Note: Laboratories 92629, 94936, and 95589 did not submit beta-lactamase testing results.

Table A1.13. Country coded category of susceptibility concordance – tetracycline

		Laboratory codes																															
	Strain	90902	90984	92613	92621	92623	92624	92625	92626	92627	92628	92629	92630	92631	92632	92634	92784	93995	93997	94603	94929	94936	94937	94938	95587	95588	95589	96244	Total	No. S	No. I	No. R	Consensus	Concordance (%)
1	2531	N	R	R	R	R	N	S	R	R	R	N	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	47	3	0	44	R	93.6
	2532	N	R	R	R	R	N	S	R	R	R	N	R	R	R	R	R	N	R	R	R	R	S	R	R	R	R	R						
2	2533	N	R	R	R	R	N	S	R	R	R	N	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	24	1	0	23	R	95.8
3	2534	N	R	R	R	R	N	S	R	R	R	N	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	24	1	0	23	R	95.8
4	2535	N	R	R	R	R	N	R	R	R	R	N	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	46	0	0	46	R	100
	2536	N	R	R	R	R	N	R	R	R	R	N	R	R	R	R	R	N	N	R	R	R	R	R	R	R	R	R						
5	2537	N	R	R	R	R	N	S	R	R	R	N	R	R	R	S	R	S	R	R	R	R	R	R	R	R	R	R	24	3	0	21	R	87.5
6	2538	N	S	S	S	S	N	S	S	S	S	N	S	S	S	S	S	S	S	S	S	S	S	S	R	S	S	S	72	69	0	3	S	95.8
	2539	N	S	S	S	S	N	S	S	S	S	N	S	S	S	S	S	S	S	S	S	S	S	S	R	S	S	S						
	2540	N	S	S	S	S	N	S	S	S	S	N	S	S	S	S	S	S	S	S	S	S	S	S	R	S	S	S						
																																Total	94.8

N – not retrieved or susceptibility category not supplied.

Table A1.14. Country coded MIC values (mg/L) – tetracycline

		Laboratory codes																														
	Strain	90902	90984	92613	92621	92623	92624	92625	92626	92627	92628	92629	92630	92631	92632	92634	92784	93995	93997	94603	94929	94936	94937	94938	95587	95588	95589	96244	Modal MIC	Min MIC	Max MIC	2 dilutions different	>2 dilutions different
1	2531	N	2	4	4	2	N	0.5	2	4	2	N	2	1	1	1	2	4	1	2	2	2	2	2	16	4	1	2	2	0.25	16	1	3
	2532	N	2	4	4	2	N	0.25	2	4	2	N	2	1	1	1	1	N	2	4	2	4	2	2	16	4	2	2					
2	2533	N	2	4	4	2	N	0.5	2	4	2	N	2	2	1	1	2	4	2	2	4	4	4	2	16	4	2	2	2	0.5	16	1	1
3	2534	N	2	4	4	2	N	0.5	4	4	1	N	2	1	1	1	2	4	1	2	2	2	4	4	16	4	2	2	2	0.5	16	1	1
4*	2535	N	32	128	64	128	N	16	>256	128	>256	N	8	32	64	64	64	256	128	>256	128	>256	256	64	>256	128	64	128	≥256	8	>256	11	9
	2536	N	32	128	64	256	N	16	>256	256	>256	N	8	32	64	8	64	N	N	256	64	>256	256	128	>256	128	64	128					
5	2537	N	1	2	2	1	N	0.25	1	2	2	N	2	1	1	0.5	2	2	1	2	1	2	4	2	8	2	1	1	2	0.25	8	2	1
6	2538	N	0.064	0.25	<=0.125	0.125	N	0.032	0.25	0.25	0.125	N	0.25	0.125	0.064	0.125	0.125	0.125	0.125	0.032	0.125	0.25	0.5	0.125	2	0.125	0.125	0.125	≤0.125	0.032	4	1	3
	2539	N	0.064	0.25	<=0.125	0.125	N	0.032	0.25	0.25	0.125	N	0.25	0.125	0.064	0.064	0.125	0.25	0.064	0.125	0.125	0.25	0.25	0.125	2	0.25	0.125	0.125					
	2540	N	0.125	0.25	<=0.125	0.125	N	0.032	0.125	0.25	0.125	N	0.25	0.125	0.064	0.064	0.125	0.25	0.064	0.125	0.125	0.25	0.25	0.125	4	0.25	0.125	0.125					

N: no result; not retrieved, not tested or MIC not supplied.
Note: Laboratories 90902, 92624, and 92629 did not submit tetracycline data.
** MIC results >8 mg/L were scored equivalently. Only laboratories with MIC results ≤8 mg/L were penalised.*

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