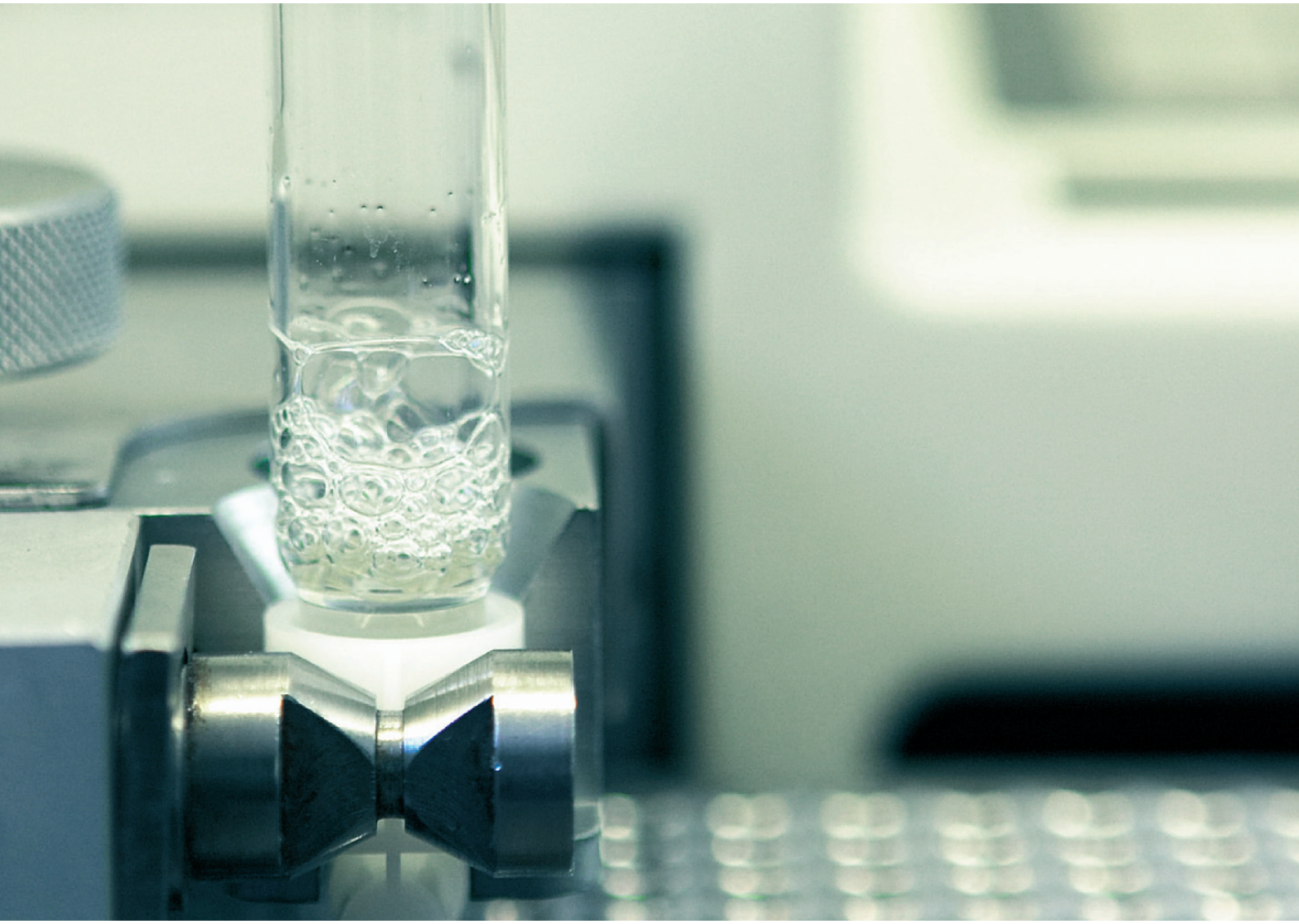
National Food Institute
Technical University of Denmark

The 28th EURL-AR Proficiency Test *Escherichia coli, Salmonella* and *Campylobacter* 2020



Authors: Troels Ronco, Susanne Karlsmose Pedersen, Rene S. Hendriksen
EQAS Coordinator: Susanne Karlsmose Pedersen

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National Food Institute
Technical University of Denmark
Kemitorvet
Building 202
DK-2800 Kgs. Lyngby

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1. Introduction

This report describes and summarizes results of the 28th proficiency test conducted by the National Food Institute (DTU Food) as the EU Reference Laboratory for Antimicrobial Resistance (EURL-AR). This proficiency test focuses on antimicrobial susceptibility testing (AST) of *Escherichia coli*, *Salmonella* and *Campylobacter.* For *E. coli* this is the 13th whereas for *Salmonella* and *Campylobacter* it is the 14th External Quality Assurance System (EQAS) conducted for these microorganisms. The proficiency test includes categorisation of the relevant *E. coli* and *Salmonella* strains as ESBL-, AmpC- and carbapenemase-phenotypes, and identification of the *Campylobacter* species as either *C. jejuni* or *C. coli*.

In 2020, no optional element consisting of genotypic characterisation of antimicrobial resistance genes by PCR and/or sequencing is included in the current PT as this component was included in the DTU Genomic PT launched in 2020 focusing at whole genome sequencing of *E. coli*, *Salmonella* and *Campylobacter* and the identification of antimicrobial resistance genes, chromosomal mutations inducing antimicrobial resistance, upregulated AmpC (relevant for *E. coli*) and subsequently identification of the predicted phenotype of the culture/pre-prepared DNA (further details: https://www.globalsurveillance.eu/projects/genomic-proficiency-test-2020).

The current EQAS aims to: i) monitor the quality of AST results produced by National Reference Laboratories (NRL-AR), ii) identify laboratories which may need assistance to improve their performance in AST, and iii) determine possible topics for further research or collaboration.

When reading this report, the following important considerations should be taken into account:

1) Expected results were generated by performing Minimum Inhibitory Concentration (MIC) determinations for all test strains in two different occasions at the Technical University of Denmark, National Food Institute (DTU Food). Under usual circumstances, these results would be verified by an internationally recognized reference laboratory, though, due to the SARS-CoV-2 pandemic, this year, this procedure was possible for *E. coli*, only. All *E. coli* AST results were verified by testing at the United States Food and Drug Administration (FDA), Centre for Veterinary Medicine, Maryland, US. As for *Salmonella* and *Campylobacter*, bacterial cultures included for the current EQAS were previously verified in relation to AST results by the laboratory in US-FDA. Finally, MIC determination was performed at DTU Food after preparation of the agar stab culture/charcoal swab for shipment to participants to confirm that the vials contained the correct strains corresponding to the expected MIC values.

2) Evaluation is based on interpretations of AST values determined by the participants. This is in agreement with the method used by Member States (MS) to report AST data to the European Food Safety Authority (EFSA), and complies with the main objective of this EQAS, i.e. to evaluate and improve the comparability of surveillance data on antimicrobial susceptibility of *E. coli*, *Salmonella* and *Campylobacter* reported to EFSA by different laboratories, as stated in the protocol.

3) The EURL-AR network agreed on setting the acceptable deviation level for laboratory performance on AST to 5%.

Evaluation of a result as “deviating from the expected interpretation” should be carefully analyzed in a self-evaluation procedure performed by the participant including also considerations related to any corrective actions introduced in the laboratory. Note that it is not considered a mistake to obtain a one-fold dilution

difference in the MIC value of a specific antimicrobial when testing the same strains since methods used for MIC determination have limitations. If, however, the expected MIC is close to the breakpoint value for categorising the strain as susceptible or resistant, a one-fold dilution difference - which is acceptable - may result in two different interpretations, i.e. the same strain can be categorised as susceptible or resistant. This result may be evaluated as correct based on the MIC value produced but incorrect when the evaluation is based on the interpretation of the MIC value. The present report is based on evaluation of AST interpretations, therefore some participants may find their results classified as incorrect even though the actual MIC value they reported is only a one-fold dilution away from the expected MIC value. In these cases, the participants should be confident about the good quality of their performance of AST by MIC. In the organisation of the EQAS, we try to avoid these situations by selecting test strains with MIC values distant from the epidemiological cut offs for resistance, which is not always feasible for all strains and all antimicrobials. Therefore, in 2008, the EURL-AR network unanimously established that if there are less than 75% correct results for a specific strain/antimicrobial combination, the reasons for this situation must be further examined and, on selected occasions explained in detail case by case, these results may subsequently be omitted from the evaluation report.

This report is approved in its final version by a technical advisory group composed by competent representatives from all NRL-ARs. This group meets annually at the EURL-AR workshop.

All conclusions presented in this report are publically available. Participating laboratories are identified by codes and each code is known only by the corresponding laboratory. The full list of laboratory codes is confidential and known only by relevant representatives of the EURL-AR and the EU Commission.

The EURL-AR is accredited by DANAK as provider of proficiency testing (accreditation no. 516); working with zoonotic pathogens and indicator organisms as bacterial isolates (identification, serotyping and antimicrobial susceptibility testing).

2. Materials and Methods

2.1 Participants in EQAS 2020

A pre-notification (Appendix 1) to announce the EURL-AR EQAS on AST of *E. coli*, *Salmonella* and *Campylobacter* was distributed on 6 August 2020 by e-mail to the 45 laboratories in the EURL-AR-network contact list including all EU countries and, in addition, Iceland, North Macedonia, Norway, Serbia, Switzerland and Turkey. All EU MS and also Iceland and Norway, were represented as participants for both *E. coli*, *Salmonella* and *Campylobacter* (see Appendix 2).

Participating laboratories from non EU countries or laboratories not designated as NRL-AR of their country were charged a fee for their participation in the EQAS, whereas the NRLs from EU Member States (one per MS) participated free of charge.

The results evaluated and presented in this report are from the NRLs designated by the MS (n=28) and NRLs in affiliated non-MS (n=2) (Iceland and Norway). Figure 1 illustrates the 30 participating countries.

In total, this report evaluates 30 sets of results from the *E. coli* AST component, 30 sets for the *Salmonella* AST component and 27 sets of results from the *Campylobacter* AST component.

Results from the laboratories not identified by the

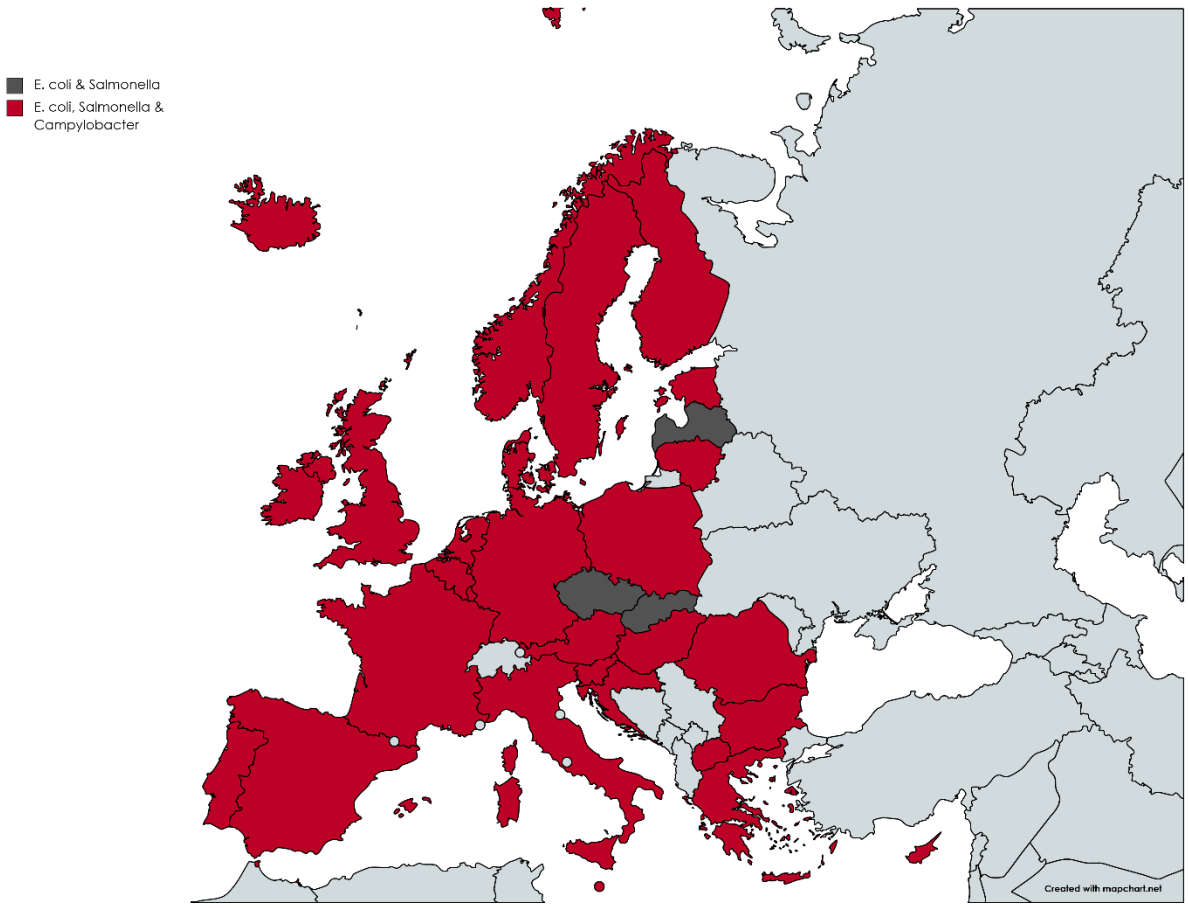

Figure 1: Participating countries that performed antimicrobial susceptibility testing of *E. coli Salmonella* and *Campylobacter* in 2020.

MS as the representing NRL-AR are not further presented or evaluated in this report

2.2 Strains

Eight *E. coli*, eight *Salmonella* and eight *Campylobacter* strains were selected for this trial among isolates from the strain collection at DTU Food on the basis of antimicrobial resistance profiles and their MIC values to the tested antimicrobials. For quality assurance purposes, one strain per bacterial species has been included in all EQAS iterations performed to date, representing an internal control.

Prior to distribution of the test strains, DTU Food performed AST on the test strains and the AST profiles of *E. coli* test strains were verified by the United States Food and Drug Administration (FDA), Centre for Veterinary Medicine, Maryland, US. When MIC values from the different tests were not in agreement but varied +/- one dilution-step, the value obtained by DTU Food was selected as the reference value. The obtained MIC values served as reference for the test strains (Appendix 3a, 3b and 3c). Results for the following antimicrobials were not verified by FDA for *Salmonella:* cefepime, cefotaxime, cefotaxime/clavulanic acid, ceftazidime, ceftazidime/clavulanic acid, colistin, ertapenem, imipenem, temocillin, tigecycline and trimethoprim. Results for the following antimicrobials were not verified by FDA for *E. coli:* ertapenem, temocillin, tigecycline and trimethoprim, and results for the following antimicrobials were not verified by FDA for *Campylobacter*: streptomycin.

Quality assurance reference strains *Escherichia*

coli CCM 3954 (ATCC 25922) and *Campylobacter jejuni* CCM 6214 (ATCC 33560) had been forwarded to all participating laboratories when they were new participants with instructions to store and maintain them for quality assurance purposes and future EQAS trials. Moreover, the EURL-AR has distributed *Acinetobacter baumannii* (2012-70-100-69) and *Campylobacter coli* (2012-70-443-2) for the purpose of performing internal method QC when performing AST for *E. coli, Salmonella,* or *Campylobacter*. The obtained results from the EURL-AR internal method QC strains were captured in the webtool and are presented in the laboratories' individual evaluation report. No further overall analysis of the EURL-AR internal method QC strain results are performed for the purpose of this EQAS report.

2.3 Antimicrobials

The antimicrobials tested in this EQAS are listed in the protocol (Appendix 4b).

The antimicrobials tested correspond to the panel of antimicrobials listed in Decision 2013/652/EU.

The method applied for the AST was the ISO standard, ISO 20776-1 "Clinical laboratory testing and *in vitro* diagnostic test system – Susceptibility testing of infectious agents and evaluation of performance of antimicrobial susceptibility test devices", and, in addition, the following guidelines/standards from the Clinical and Laboratory Standards Institute (CLSI) were applied: Document M7-A11 (2019) "Methods for Dilution Antimicrobial Susceptibility Tests for Bacteria That Grow Aerobically; Eleventh Edition"; document M100, 30th ed. (2020) "Performance Standards for Antimicrobial Susceptibility Testing", document VET01 (2018) "Performance Standards for Antimicrobial Disk and Dilution Susceptibility Tests for Bacteria Isolated From Animals" – Fifth Edition; and document VET06 (2017) "Methods for Antimicrobial Susceptibility Testing of Infrequently Isolated or Fastidious Bacteria Isolated from Animals" – First Edition.

MIC results were interpreted by using the interpretative criteria listed the EQAS protocol (Appendix 4) which represent epidemiological cut-off values developed by EUCAST (www.eucast.org), where these were not available, tentative values were applied (Appendix 4). Results for beta-lactam resistance mechanisms were interpreted according to the most recent EFSA recommendations also included as an appendix in the EQAS protocol (Appendix 4).

Minimum Inhibitory Concentration (MIC) determination of the *E. coli* and *Salmonella* test strains was performed using the Sensititre system (EUVSEC and EUVSEC2) from Trek Diagnostic Systems Ltd, UK. MIC determination for the *Campylobacter* testing was performed using the Sensititre systems (EUCAMP2) from Trek Diagnostic Systems Ltd, UK. Participants of the *Campylobacter* EQAS were additionally requested to identify the species of the *Campylobacter* spp. as either *C. jejuni* or *C. coli*.

Panels of antimicrobials for antimicrobial susceptibility testing included in this EURL-AR EQAS 2020 can be found in Table 1.

2.4 Distribution

On 13 October 2020, bacterial strains in agar stab cultures (*E. coli* and *Salmonella* spp.) or charcoal swabs in transport media (Stuarts) (*Campylobacter* spp.) together with a welcome letter (Appendix 4a) were dispatched in double pack containers (class UN 6.2) to the participating laboratories. The shipment (UN3373, biological substances category B) was sent according to International Air Transport Association (IATA) regulations.

2.5 Procedure

Protocols and all relevant information were uploaded on the EURL-AR website (http://www.eurl-ar.eu), thereby EQAS participants could access necessary information

Escherichia coli and Salmonella 1st panel	*Escherichia coli* and Salmonella 2nd panel	*Campylobacter*
Ampicillin, AMP	Cefepime, FEP	Ciprofloxacin, CIP
Azithromycin, AZI	Cefotaxime + clavulanic acid (F/C)	Gentamicin, GEN
Cefotaxime, FOT	Cefotaxime, FOT	Nalidixic acid, NAL
Ceftazidime, TAZ	Cefoxitin, FOX	Tetracycline, TET
Chloramphenicol, CHL	Ceftazidime, TAZ	Erythromycin, ERY
Ciprofloxacin, CIP	Ceftazidime + clavulanic acid (T/C)	Streptomycin, STR
Colistin, COL	Ertapenem, ETP	
Gentamicin, GEN	Imipenem, IMI	
Meropenem, MERO	Meropenem, MERO	
Nalidixic acid, NAL	Temocillin, TRM	
Sulfamethoxazole, SMX		
Tetracycline, TET		
Tigecycline, TGC		
Trimethoprim, TMP		

Table 1 Panels of antimicrobials used in this EURL-AR EQAS 2020

at any time.

Participants were instructed to subculture charcoal swabs immediately and store the agar stabs at 4ºC (dark) until performance of AST. Information related to the handling of the test strains and reference strains (Appendix 4b, 4c, 4d, and 4e) was made available.

The participants were instructed to apply the interpretative criteria listed in the protocol (Appendix 4). Instructions for interpretation of AST results allowed for categorisation of strains as resistant or susceptible. Categorisation as 'intermediate' was not accepted.

The EURL-AR is aware that there are two different types of interpretative criteria of results, i.e. clinical breakpoints and epidemiological cut-off values. The terms 'susceptible', 'intermediate' and 'resistant' should be reserved for classifications made in relation to the therapeutic application of antimicrobial agents. When reporting data using epidemiological cut-off values, bacteria should be reported as 'wild-type' or 'non-wild-type' (Schwarz *et al*., 2010). To simplify the interpretation of results, throughout this report, we will maintain the terms susceptible and resistant, even if referring to wild-type and non-wild-type strains, respectively.

As regards the method for performing the antimicrobial susceptibility testing, the protocol referred to Decision 2013/652/EU and instructed participants to perform the international reference method for antimicrobial susceptibility testing, i.e. dilution methods performed according to the methods described by the European Committee on Antimicrobial Susceptibility Testing (EUCAST) and the Clinical and Laboratory Standards Institute (CLSI), accepted as the international reference method ISO standard 20776-1:2019.

A mandatory part of the proficiency test was to detect ESBL-, AmpC- and carbapenemase-producing strains and interpret results according to the most recent EFSA recommendations as described in the protocol.

Results for QC reference strains were MIC values for the reference strains *E. coli* (ATCC 25922) (for both the *E. coli* and the *Salmonella* trial) and *C. jejuni* (ATCC 33560). The results

were evaluated towards the quality control ranges according to the relevant guidelines; i.e. the CLSI documents VET06 (2017) or M100, 30th ed. (2020) (Appendix 5).

All participating laboratories were invited to submit the obtained results into an electronic record sheet at the EURL-AR webtool through a secured individual login and password.

In addition, participants were encouraged to complete an evaluation form with the aim to improve future EQAS trials.

The database was finally closed and evaluations were made available to participants on 3 June 2021. After this date, the participants were invited to login to retrieve an individual, database-generated report which contained an evaluation of the submitted results including possible deviations from the expected interpretations. Deviations in interpretation (resistant or susceptible) were categorised as 'incorrect', as were also deviations concerning confirmation of an isolate as extended spectrum beta-lactamase- (ESBL-), AmpC- or carbapenemase-producer and deviations in relation to the species detection of *Campylobacter*.

3. Results

The participants were asked to report AST results, i.e. MIC values and the categorisation as resistant or susceptible. Only the categorisation was evaluated, whereas the MIC values were used as supplementary information.

3.1 Data omitted from the report

As mentioned in the introduction, the EURL-AR network established that data should be examined and possibly omitted from the general analysis if less than 75% results were correct based on strain/antimicrobial combination (see Appendix 7a, 7b and 7c for an overview of correct/incorrect results). In the present EQAS, this was the case for *E. coli* for: EC-15.1/F/C, EC-15.2/CHL, EC-15.2/FOT (panel 1), and EC-15.7/SMX (Appendix 7a). The first three of these strain/antimicrobial combinations were omitted based on the fact that the high deviation level was caused by a breakpoint issue. A breakpoint issue is defined as a case where participants obtained a MIC value one dilution step above/below the expected MIC value. For EC-15.1/F/C and EC-15.2/CHL participants obtained a MIC value one dilution step above the expected MIC value, whereas for EC-15.2/FOT (panel 1) participants obtained a MIC value one dilution step below the expected MIC value. Interestingly, for EC-15.2/FOT, the high deviation level was relevant for AST results obtained when testing panel 1, only, whereas for EC-15.2/FOT for panel 2, 100% of submitted interpretations corresponded with the expected. The results for EC-15.7/SMX were omitted from further analysis due to the fact that 18/30 obtained an unexpected result as resistant. Further analysis of this strain revealed that in fact it harboured the sulfonamide resistance gene, *sul2*, only, the full length of the gene was not detected, as the first of 817 bases appeared to be missing. This may be the reason why the strain was observed to express different phenotypes when tested in different laboratories, as the gene could potentially be expressed to some extent, or not. For *Salmonella*, data for S-15.6/TAZ (panel 1 and 2) were omitted based on the fact that the high deviation level was caused by a breakpoint issue. The deviations were caused by participants obtaining a MIC value one dilution step above the expected MIC value. The omitted data has been included in Appendix 7a and 7b.

In addition, some data (S-15.5/FEP/FOT/FOX/TRM (panel 2)) resulted in ≥25% deviations but were included in the current analysis and report. This is discussed in further detail below (see 'Discussion').

Table 2. The number of AST performed and the percentage of correct results for each strain of *E. coli* (panel 1 and panel 2), *Salmonella* (panel 1 and panel 2) and *Campylobacter*.

Strain	No. AST	No. correct	% correct	Strain	No. AST	No. correct	% correct	Strain	No. AST	No. correct	% correct
EC-15.1	661	653	98.8	S-15.1	443	443	100.0	C-15.1	158	162	97.5
EC-15.2	553	547	98.9	S-15.2	656	647	98.6	C-15.2	136	138	98.6
EC-15.3	708	705	99.6	S-15.3	656	652	99.4	C-15.3	159	162	98.1
EC-15.4	708	702	99.2	S-15.4	655	653	99.7	C-15.4	159	162	98.1
EC-15.5	466	466	100.0	S-15.5	475	449	94.5	C-15.5	158	162	97.5
EC-15.6	708	700	98.9	S-15.6	589	579	98.3	C-15.6	158	162	97.5
EC-15.7	678	672	99.1	S-15.7	655	652	99.5	C-15.7	156	160	97.5
EC-15.8	475	473	99.6	S-15.8	656	654	99.7	C-15.8	153	156	98.1

No problems specific for strain/antimicrobial-combinations were identified for *Campylobacter* (Appendix 7c).

3.2 Methods

Results obtained by broth microdilution were accepted and evaluated. For both the *E. coli*, *Salmonella* and the *Campylobacter* trial, all 30, 30 and 27 laboratories, respectively, reported results obtained by broth microdilution. With the aim of concluding on the strains' ESBL-, AmpC- and carbapenemase phenotype, two antimicrobial panels were included in the testing of the *E. coli* and *Salmonella* strains as also specified in the EU regulation 2013/652/EU. Test strains found resistant to cefotaxime, ceftazidime or meropenem on the first panel (see 2013/652/EU, Table 1) were additionally tested on the second panel (see 2013/652/EU, Table 4) according to the protocol indications.

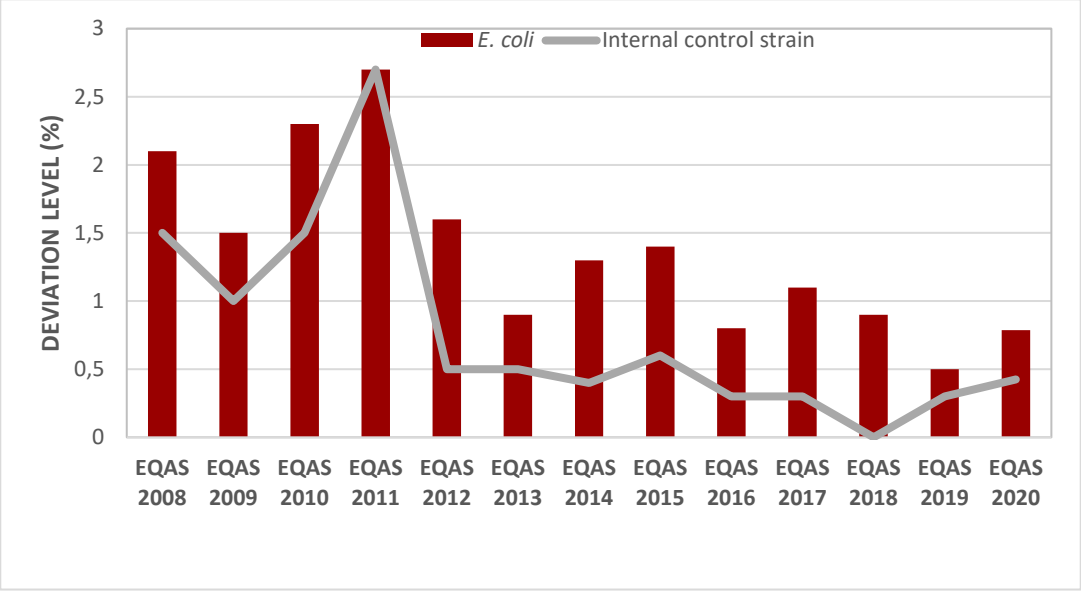

Figure 2: *A comparison between the EURL-AR EQAS's since 2008, showing the total percentage of deviations for antimicrobial susceptibility testing for E. coli performed by participating laboratories*

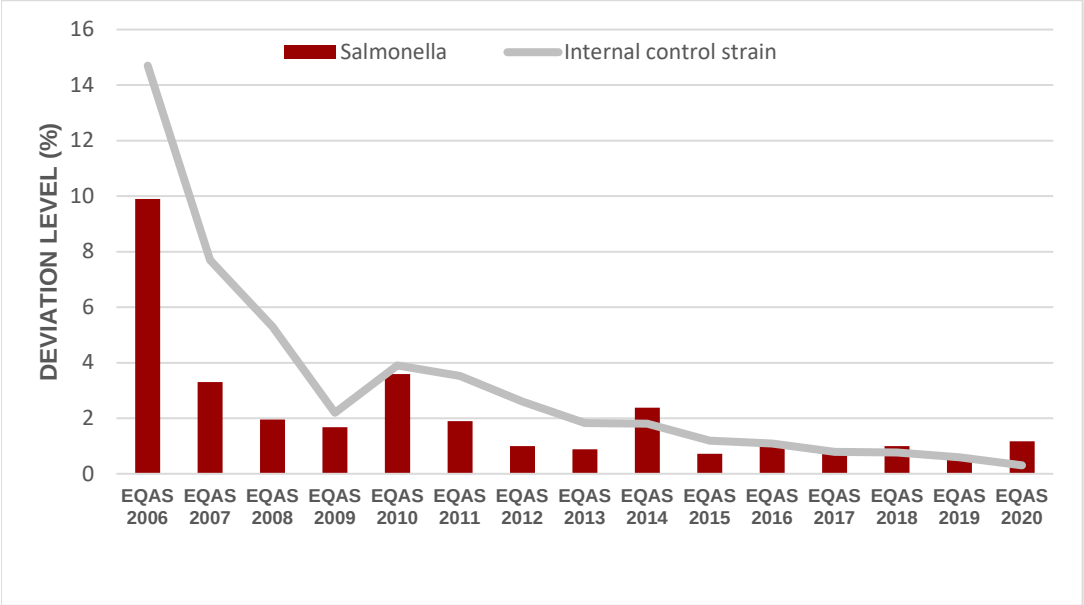

Figure 3: *A comparison between the EURL-AR EQAS's since 2006, showing the total percentage of deviations for antimicrobial susceptibility testing for Salmonella performed by participating laboratories*

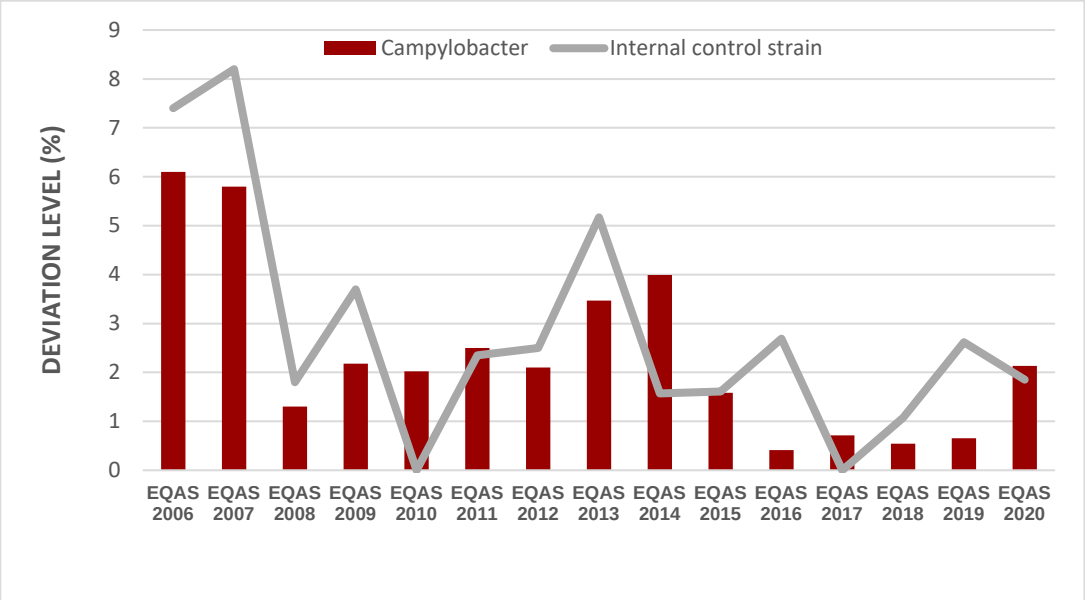

Figure 4: *A comparison between the EURL-AR EQAS's since 2006, showing the total percentage of deviations for antimicrobial susceptibility testing for Campylobacter performed by participating laboratories*

3.3 Performance, overall

The percentage of results in agreement with the expected ranged from 98.8% (EC-15.1) to 100% (EC-15.5) for *E. coli*, from 94.5% (S-15.5) to 100% (S-15.1) *Salmonella*, and from 97.5% (four strains) to 98.6% (C-15.2) for *Campylobacter* (Table 2). On average, the percentage of correct results was 99.2%, 98.8% and 97.8%, for *E. coli, Salmonella* and *Campylobacter*, respectively. When looking at the deviation level for the internal *E. coli* control strain a moderate difference was observed compared to the remaining *E. coli* strains. This difference in the deviation level was comparable to data from 2017 and 2018 (Figure 2). A minor difference in

the deviation level was observed between the internal *Salmonella* control strain and the remaining trial strains (Figure 3) whereas the internal *Campylobacter* control strain mainly followed the trend in deviation compared to remaining *Campylobacter* strains (Figure 4). The list of deviations is reported in Appendices 8a, 8b and 8c.

3.3.1 *E. coli* trial

Table 3 illustrates the percentage of correct AST per antimicrobial for all *E. coli* strains (Appendix 8a).

Table 3: Percentage of correct antimicrobial susceptibility tests per antimicrobial for the *E. coli* trial

Antimicrobial	*Escherichia coli*
Ampicillin	99.6
Azithromycin	99.6
Cefepime	100.0
Cefotaxime	100.0
Cefotaxime/clav. acid	96.7
Cefoxitin	100.0
Ceftazidime	100.0
Ceftazidime/clav. acid	99.3
Chloramphenicol	100.0
Ciprofloxacin	97.9
Colistin	99.6
Ertapenem	96.7
Gentamicin	100.0
Imipenem	97.8
Meropenem	99.3
Nalidixic acid	100.0
Sulfamethoxazole	97.6
Temocillin	96.1
Tetracycline	100.0
Tigecycline	99.6
Trimethoprim	100.0

ESBL/AmpC/carbapenemase-producing *E. coli* test strains

Confirmation of beta-lactamase production is a mandatory component of this EQAS. According to the protocol, which was based on the EFSA recommendations, the confirmatory test for ESBL-, AmpC-, and carbapenemase-producing isolates requires use of both cefotaxime (FOT) and ceftazidime (TAZ) alone and in combination with a β-lactamase inhibitor. The MIC value for either antimicrobial agent (FOT or TAZ) tested in combination with clavulanic acid should be compared to the corresponding MIC value when tested alone. Synergy is defined for one or both cephalosporins if a ≥ 3-dilution-step difference is observed between the two MIC values (i.e. if the FOT:FOT/Cl or TAZ:TAZ/Cl ratio ≥8) (CLSI M100S Table 2A; Enterobacteriaceae). Participants were instructed to use the second panel of antimicrobials to test strains presenting resistance to cefotaxime (FOT), ceftazidime (TAZ) or meropenem (MERO) on panel 1.

The classification of the phenotypic results was based on the most recent EFSA recommendations as indicated in the protocol (Appendix 4).

In this EQAS, all laboratories uploaded results for the strains to be tested on panel 2.

Table 4 presents that test strains EC-15.1 and EC-15.7 were categorised as carbapenemase producers whereas test strains EC-15.3 and EC-15.4 were categorised as ESBL producers. Strains EC-15.5 and EC-15.8 were fully susceptible to all antimicrobials in panel 2 and EC-15.6 fell into the category of ESBL+AmpC. Lastly, the expected categorisation of strain EC-15.2 was reported as an AmpC producer in 9 of 21 results (42.9%), other phenotype in 10 of 21 results (47.6%) and susceptible in 2 of 21 results (9.5%), for this test strain, categorisations as 'other' and as 'AmpC' were both accepted as correct results.

In total, the categorisation as ESBL-, AmpC- or carbapenemase-producer for the eight strains was correct in 167 out of 175 (95.4%) reported results. The results that were incorrect (N=8) were attributed to seven laboratories (#2, #6, #11, #22 (n=2), #25, #30, #39).

3.3.2 *Salmonella* trial

Table 5 illustrates the percentage of correct AST

Strain code		EC-15.1	EC-15.2	EC-15.3	EC-15.4	EC-15.5	EC-15.6	EC-15.7	EC-15.8
Expected phenotype (based on panel 2 phenotype)		Carbapene-mase	AmpC/ Other	ESBL	ESBL	Susceptible	ESBL+AmpC	Carbapenemase	Susceptible
Obtained results	ESBL	*1/29 (3.4%)*		30/30 (100%)	30/30 (100%)	-	-	-	-
	AmpC	-	9/21 (42.9%)	-	-	-	*1/30 (3.3%)*	-	-
	ESBL + AmpC	*1/29 (3.4%)*	-	-	-	-	28/30 (93.3%)	-	-
	Carbapenemase	26/29 (89.7%)	-	-	-	-	-	30/30 (100%)	-
	Other phenotypes	*1/29 (3.4%)*	10/21 (47.6%)	-	-	-	*1/30 (3.3%)*	-	*1/3 (33.3%)*
	Susceptible (Panel 2 components)	-	*2/21 (9.5%)*	-	-	2/2 (100%)	-	-	2/3 (66.6%)
Genetic background		*bla*$_{CTX-M-14}$	No ESBL gene or mutation detected	*bla*$_{CTX-M-1}$	*bla*$_{CTX-M-1}$	No ESBL gene or mutation detected	*bla*$_{CMY-2}$ *bla*$_{CTX-M-27}$	*bla*$_{NDM-5}$ *bla*$_{SHV-12}$	No ESBL gene or mutation detected

Table 4: Overview of ESBL-, AmpC- and carbapenemase-producing *E. coli* test strains and proportion of laboratories that obtained the expected result; number and percentages of laboratories which correctly detected and confirmed the ESBL-, AmpC- and carbapenemase-producing *E. coli* strains. Fields shaded in grey with numbers in *italics* indicate an unexpected result.

per antimicrobial for all *Salmonella* strains. The level of correct AST was 96% (cefepime) or above, for all the *Salmonella* test strains. For cefepime, the seven deviations could be attributed to seven different laboratories (see Appendix 8b).

ESBL/AmpC/carbapenemase-producing *Salmonella* test strains

Table 6 shows that test strains S-15.2, S-15.4, S-15.6 and S-15.8 were confirmed ESBL producers and strain S-15.7 was confirmed carbapenemase-producer. For strain S-15.3 the majority (29/30) categorised it to be an AmpC phenotype which is in concordance with the expected result whereas strain S-15.5 was reported as various different phenotypes (Table 6). For strain S-15.5, results from panel 2 were delivered from seven laboratories, of these, five submitted an ESBL-categorisation. One additional laboratory submitted an ESBL categorisation (susceptible to panel 2 antimicrobials) for which the phenotypic background was not reported (i.e. panel 2 results were not submitted).

In total, the categorisation as ESBL-, AmpC- or carbapenemase-producer for the eight strains was correct in 181 out of 187 reported results. Of the results that were considered incorrect (N=6), all could be attributed to six different laboratories (#4, #6, #11, #19, #22, and #39).

3.3.3 *Campylobacter* trial

Table 7 illustrates that the percentage of correct AST per antimicrobial for all *Campylobacter* strains, were above or equal to 97.1% (streptomycin).

Some laboratories observed viability issues related to test strain C-15.2, and therefore four laboratories (#9, #22, #29 and #38) did not submit results for this strain. The same was the case for laboratory #32 related to strain C-15.8.

The participants were requested to identify the *Campylobacter* species as *C. jejuni* or *C. coli*. All 27 laboratories delivered in total 211 results of which 210 were in accordance with the expected. For strain C-15.1, a single laboratory (#18) reported one species identification not in accordance with the expected result. This case of an unexpected result was not related to

Strain code		S-15.1	S-15.2	S-15.3	S-15.4	S-15.5	S-15.6	S-15.7	S-15.8
Expected phenotype (based on panel 2 phenotype)		Susceptible	ESBL	AmpC	ESBL	Other	ESBL	Carbapenemase	ESBL
Obtained results	ESBL	-	30/30 (100%)	-	30/30 (100%)	*1/6 (16.7%)*	29/29 (100%)	-	30/30 (100%)
	AmpC	-	-	29/30 (96.7%)	-	*2/6 (33.3%)*	-	-	-
	ESBL + AmpC	-	-	*1/30 (3.3%)*	-	-	-	-	-
	Carbapenemase	-	-	-	-	-	-	30/30 (100%)	-
	Other	-	-	-	-	1/6 (16.7%)	-	-	-
	Susceptible (Panel 2 components)	2/2 (100%)	-	-	-	*2/6 (33.3%)*	-	-	-
Genetic background		No ESBL gene or mutation detected	*bla*$_{CTX-M-3}$ *bla*$_{OXA-1}$	*bla*$_{CMY-2}$	*bla*$_{CTX-M-14b}$	No ESBL gene or mutation detected	*bla*$_{CTX-M-14}$	*bla*$_{NDM-1}$ *bla*$_{CMY-4}$ *bla*$_{CMY-16}$	*bla*$_{CTX-M-9}$

Table 6: Overview of ESBL-, AmpC- and carbapenemase-producing *Salmonella* test strains and proportion of laboratories that obtained the expected result; number and percentages of laboratories which correctly detected and confirmed the ESBL-, AmpC- and carbapenemase-producing *Salmonella* strains. Fields shaded in grey with numbers in *italics* indicate an unexpected result.

incorrect interpretation of the MIC criteria found in the EC regulation 652/2013.

Table 5: Percentage of correct antimicrobial susceptibility tests per antimicrobial for the *Salmonella* trial

Antimicrobial	*Salmonella*
Ampicillin	99.2
Azithromycin	99.1
Cefepime	96.0
Cefotaxime	98.8
Cefoxitin	98.9
Ceftazidime	99.5
Chloramphenicol	98.8
Ciprofloxacin	100
Colistin	96.7
Ertapenem	98.4
Gentamicin	99.2
Imipenem	99.5
Meropenem	100
Nalidixic acid	100
Sulfonamides	100
Temocillin	96.7
Tetracycline	99.2
Tigecycline	97.5
Trimethoprim	97.9

3.4 Deviations by laboratory

Figures 5, 6 and 7 illustrate the percentage of deviations for each participating laboratory. The laboratories are ranked according to their performance determined by the percentage of deviating results in the antimicrobial susceptibility tests.

3.4.1 E. coli trial

All 30 participating laboratories obtained a result within the acceptance limit (<5% deviations) for the *E. coli* strains. The maximum percentage of deviation was at 3%, presenting acceptable results across the EURL-AR network (Figure 5).

Table 7 Percentage of correct antimicrobial susceptibility tests per antimicrobial for the *Campylobacter* trial

Antimicrobial	*Campylobacter*
Ciprofloxacin	98.1
Erythromycin	97.2
Gentamicin	98.1
Nalidixic acid	98.1
Streptomycin	97.1
Tetracycline	98.6

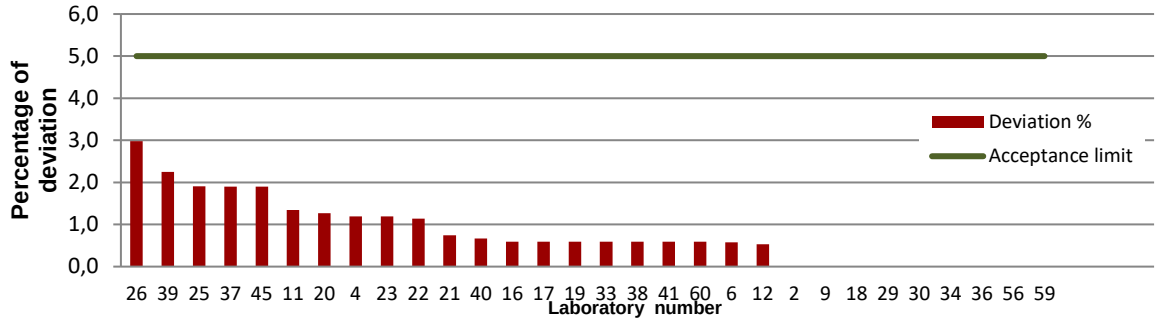

Figure 5: *Individual participants' deviations in percent of their total number of E. coli AST's*

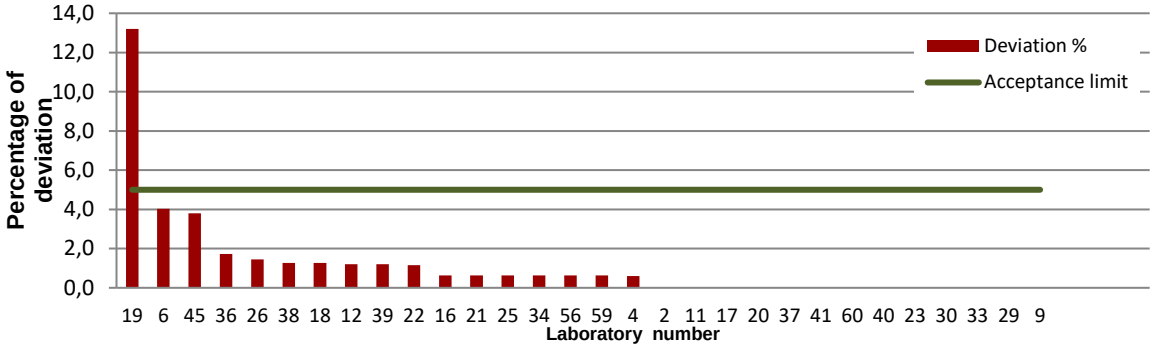

Figure 6: *Individual participants' deviations in percent of their total number of Salmonella AST's*

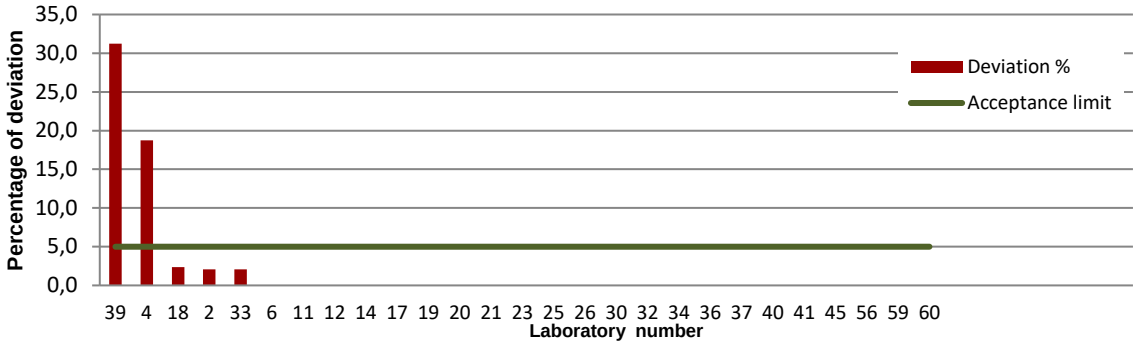

Figure 7: *Individual participants' deviations in percent of their total number of Campylobacter AST's*

3.4.2 Salmonella trial

All but one of the 30 participating laboratories obtained a result within the acceptance limit (<5% deviations) for the *Salmonella* strains. Laboratory #19 had a deviation percent of 13.2%. Apart from this high level of deviations, the maximum percentage of deviations below the acceptance limit, was at 4%, presenting acceptable result across the EURL-AR network (Figure 6).

3.4.3 *Campylobacter* trial

In the *Campylobacter* trial, most laboratories performed well. Applying the 5% acceptance threshold, 25 of 27 participating laboratories performed acceptably, with 13 laboratories having no deviations at all (Figure 7). However, two laboratories presented a deviation level well above the 5% acceptance level. Laboratory #39 and #4 obtained a deviation level of 31.3% and 18.8%, respectively (Figure 7).

3.5 Deviations by reference strains

In the following section, deviations are defined as results of antimicrobial susceptibility tests on the reference strain that are outside the quality control (QC) acceptance intervals (Appendix 5).

Obtained values from the participants' testing of the QC strains are listed in Appendix 6a, 6b and 6c, and in Tables 8, 9 and 10. For the *E. coli*, *Salmonella* and *Campylobacter* trial, 30, 30 and 24 laboratories, respectively, uploaded data from testing of the relevant QC strain. Notably, laboratories #37 and #59 did not deliver any panel 2 results for reference strain *E. coli* ATCC 25922 (both *Salmonella* and *E. coli* trial). Laboratory #4, #6 and #60 did not deliver any results for the *Campylobacter* reference strain (*C. jejuni* ATCC 33560).

Appendix 6a presents the results for the reference strain *E. coli* ATCC 25922 for the *E. coli* trial. Two laboratories produced in total two values outside the outside the acceptance intervals and these two obtained values were only a single dilution step above the upper value of the expected range. Table 8 illustrates the obtained results which are fully presented in Appendix 6a.

In appendix 6b the results for the reference strain *E. coli* ATCC 25922 for the *Salmonella* trial are shown for all laboratories. In total, a single laboratory produced one value outside the acceptable range which is shown in Table 9. Table 10 presents the proportion of the laboratories submitting AST-results for the reference strain *C. jejuni* ATCC 33560. A single laboratory produced a deviation with a value one

Table 8 *E. coli trial*. Obtained values for AST of *E. coli* ATCC 25922. AMP; ampicillin, FEP; cefepime FOT; cefotaxime, F/C; cefotaxime/clavulanic acid FOX; cefoxitin, TAZ; ceftazidime, T/C; ceftazidime/clavulanic acid CHL; chloramphenicol, CIP; ciprofloxacin, COL; colistin, ERT: ertapenem, GEN; gentamicin, IMI; imipenem, MERO; meropenem, NAL; nalidixic acid, SMX; sulfonamides, TET; tetracycline, TGC; tigecycline, TMP; trimethoprim.

MIC determination. *E. coli* ATCC 25922 *E. coli* trial			
Antimicrobial	Proportion outside QC range	Obtained values in MIC steps (min/max)	
		Below lower QC limit	Above upper QC limit
Panel 1, AMP	0/30 (0%)	-	-
Panel 1, FOT	0/30 (0%)	-	-
Panel 1, TAZ	0/30 (0%)	-	-
Panel 1, CHL	0/30 (0%)	-	-
Panel 1, CIP	0/30 (0%)	-	-
Panel 1, COL	0/30 (0%)	-	-
Panel 1, GEN	0/30 (0%)	-	-
Panel 1, MERO	0/30 (0%)	-	-
Panel 1, NAL	0/30 (0%)	-	-
Panel 1, SMX	0/30 (0%)	-	-
Panel 1, TET	0/30 (0%)	-	-
Panel 1, TGC	0/30 (0%)	-	-
Panel 1, TMP	1/30 (3%)	-	*
Panel 2, FEP	0/27 (0%)	-	-
Panel 2, FOT	0/27 (0%)	-	-
Panel 2, FOX	0/27 (0%)	-	-
Panel 2, TAZ	0/27 (0%)	-	-
Panel 2, ETP	0/27 (0%)	-	-
Panel 2, IMI	1/27 (4%)	-	1 step
Panel 2, MERO	0/27 (0%)	-	-

* A value of 5 was reported, i.e. above the acceptance range (0.5-2).

Table 9 *Salmonella trial*. Obtained values for AST of *E. coli* ATCC 25922. AMP; ampicillin, FEP; cefepime FOT; cefotaxime, FOX; cefoxitin, TAZ; ceftazidime, CHL; chloramphenicol, CIP; ciprofloxacin, COL; colistin, ERT: ertapenem, GEN; gentamicin, IMI; imipenem, MER; meropenem, NAL; nalidixic acid, SMX; sulfonamides, TET; tetracycline, TGC; tigecycline, TMP; trimethoprim.

MIC determination. *E. coli* ATCC 25922 Salmonella trial			
Antimicrobial	Proportion outside QC range	Obtained values in MIC steps (min/max)	
		Below lower QC limit	Above upper QC limit
Panel 1, AMP	0/30 (0%)	-	-
Panel 1, FOT	0/30 (0%)	-	-
Panel 1, TAZ	0/30 (0%)	-	-
Panel 1, CHL	0/30 (0%)	-	-
Panel 1, CIP	0/30 (0%)	-	-
Panel 1, COL	0/30 (0%)	-	-
Panel 1, GEN	0/30 (0%)	-	-
Panel 1, MERO	0/30 (0%)	-	-
Panel 1, NAL	0/30 (0%)	-	-
Panel 1, SMX	0/30 (0%)	-	-
Panel 1, TET	0/30 (0%)	-	-
Panel 1, TGC	0/30 (0%)	-	-
Panel 1, TMP	0/30 (0%)	-	-
Panel 2, FEP	0/27 (0%)	-	-
Panel 2, FOT	0/27 (0%)	-	-
Panel 2, FOX	0/27 (0%)	-	-
Panel 2, TAZ	0/27 (0%)	-	-
Panel 2, ETP	0/27 (0%)	-	-
Panel 2, IMI	1/27 (4%)	-	1 step
Panel 2, MERO	0/27 (0%)	-	-

Table 10 Obtained values for AST of *C. jejuni* ATCC 33560. CIP; ciprofloxacin, ERY; erythromycin, GEN; gentamicin, NAL; nalidixic acid, TET; tetracycline.

MIC determination *C. jejuni* ATCC 33560			
Antimicrobial	Proportion outside QC range	Obtained values in MIC steps (min/max)	
		Below lower QC limit	Above upper QC limit
CIP	0/24 (0%)	-	-
ERY	0/24 (0%)	-	-
GEN	0/24 (0%)	-	-
NAL	0/24 (0%)	-	-
TET	1/24 (4%)	-	1 step

dilution step above the acceptable range. In appendix 6c the results for reference strain *C. jejuni* ATCC 33560 are shown.

4. Discussion

This year, the number of participating laboratories for *Salmonella* and *Campylobacter* was a bit lower compared to previously. For, *Salmonella* and *Campylobacter* 33 and 32 laboratories participated in 2019, respectively whereas 30 *Salmonella* and 27 *Campylobacter* laboratories participated in 2020. In contrast, the number participants for *E. coli* was a bit higher in 2020 where 30 laboratories participated compared to 27 in 2019. Since the numbers of laboratories for each trial in 2020 are comparable to 2019 it allows for a fair comparison between the two EQAS periods for all organisms.

As also specified in the EU regulation 2013/652/EU, all participants in the present EQAS performed AST by broth microdilution.

This 2020 proficiency test was the seventh possibility of testing *E. coli*, *Salmonella* and *Campylobacter* strains with the panels designed to follow the requirements of Decision 2013/652/EU.

4.1 *E. coli* trial

Overall, the percentage of correct antimicrobial susceptibility test results of all *E. coli* was averagely 99.2%.

All (n=30) participants obtained satisfactory results according to the level of acceptance (<5% deviation) (Figure 5). Based on these results, follow-up has not been necessary and none of the laboratories were defined as outlier.

As indicated in Figure 2, the results obtained from testing the internal control strain reflected a steady and very good quality of *E. coli* AST results comparable to 2019. Even though the deviation level for the results from testing the *E. coli* strains was higher than in 2019, the deviation level is still of fine quality (Figure 2)

For the *E. coli* reference strain, the obtained results were in general in agreement with the CLSI recommendations.

ESBL/AmpC/carbapenemase-producing *E. coli* test strains

The phenotypic detection of ESBL-, AmpC- and carbapenemase-producing microorganisms remains to be important and is a mandatory part of this EQAS.

Of the six *E. coli* test strains relevant for this component of the EQAS (EC-15.1, EC-15.2, EC-15.3, EC-15.4, EC-15.6, and EC-15.7), two were carbapenemase producers (EC-15.1 and EC-15.7), one was an AmpC-producer/other phenotype (EC-15.2), two were ESBL producers (EC-15.3 and EC-15.4), and one was and ESBL+AmpC producer (EC-15.6).

The two ESBL-producing strains and one of the carbapenemase producers (EC-15.7) presented 100% correct results and caused no difficulties. One carbapenemase producer (EC-15.1, no genetic background for the carbapenem resistance was detected) was categorised as ESBL, ESBL+AmpC and as other phenotypes each by one laboratory (laboratories #2, #22, and #30). The submission as ESBL+AmpC was consistent with the laboratory's obtained phenotype when testing the panel 2 antimicrobials whereas the other two appear to be incorrectly placed in the ESBL- and other-category, respectively.

The expected phenotypic results categorises test strain EC-15.2 into the category 'other' and it was decided to also accept a categorisation as AmpC. The phenotypic profile of the strain i.e., cefoxitin MIC >8, cefotaxime and ceftazidime less than or equal to 1 which placed the strain into the category 'other', though, the criteria for interpretation of ESBL-, AmpC-, and carbapenemase phenotypes as 'other phenotypes' (subgroup 3) mentions that the combination of these phenotypic results for also could include cAmpCs. Moreover, when applying the EUCAST ECOFF (R>0.25) for cefotaxime, the test strain falls in the resistant category. This may be the reason why a number of participants considered this strain to be in the AmpC category. Consequently, it was decided to also accept a categorisation as AmpC for this test strain for the current EQAS, allowing for both a categorisation as 'other' and as 'AmpC' to be accepted as correct results. Two laboratories, however, had not detected the cefoxitin resistance.

Two laboratories failed to identify EC-15.6 as an ESBL+AmpC producer, but categorised this strain as an AmpC (#22) or other phenotypes (#25), respectively. The submission as other phenotype was consistent with the laboratory's obtained phenotype when testing the panel 2 antimicrobials whereas the phenotypic background for the AmpC-categorisation actually presented synergy in relation to ceftazidime vs. ceftazidime/clavulanic acid and consequently would fall into the expected category as an AmpC+ESBL.

In general, the testing and interpretation of results for the ESBL- and carbapenemase-producing strains appeared to cause slight difficulties, though even if no acceptance limit

has been defined for this component of the EQAS, the overall result appears satisfactory.

4.2 *Salmonella* trial

Overall, the percentage of correct antimicrobial susceptibility test results of *Salmonella* was 98.8%. All (n=30) participants except for Lab #19, obtained satisfactory results according to the level of acceptance (<5% deviation) (Figure 6). A follow up mail was forwarded to Lab #19 who reported back that it would seem that a switch had occurred with two isolates in the laboratory which caused the results from strains S-15.5 and S-15.6 to be swapped.

As indicated in Figure 3, the overall quality of the results for *Salmonella* strains in the 2020-EQAS were good even though the deviation level was twice as high compared to 2019. In contrast, the deviation level obtained from testing the internal control strain was twice as low as in 2019 reflecting a very good quality.

ESBL/AmpC/carbapenemase-producing *Salmonella* test strains

Of the six *Salmonella* test strains relevant for this component of the EQAS (S-15.2, S-15.3, S-15.4, S-15.6, S-15.7 and S-15.8), one was an AmpC-producer (S-15.3) another was a carbapenemase producer (S-15.7), and four were ESBL-producers (Table 6). The AmpC-producing strain S-15.3 was also found to be an ESBL+AmpC-producer by laboratory #38, which equals to 1/30 (6.7%) of all laboratories, due to a value two steps above the expected value for cefotaxime/clavulanic acid. In addition, for strain S-15.5, four laboratories (#11, #19, #22 and #39) detected the obtained ESBL-phenotype value to be different from the expected value.

Data related to S-15.5 and four panel 2 antimicrobials, i.e. cefepime, cefotaxime, cefoxitin and temocillin resulted in ≥25% deviations but were included in the current analysis and report. The reason was that results from panel 1 for seven laboratories gave rise to proceeding with testing panel 2, or panel 1 and panel 2 were tested simultaneously. Panel 1 antimicrobials for S-15.5 were expected to express susceptibility to cefotaxime, ceftazidime as well as meropenem. Hence, concerning the procedure described in the protocol it would not be required to perform testing on panel 2 antimicrobials. The low number of submitted results causes few deviations to render a high deviation level. The deviating results appear to be caused by participants obtaining a MIC value one dilution step above/below the expected MIC value (breakpoint issues), whereas, based on the reported MIC value, others appear to be caused by typos when submitting the interpretation. The EQAS organizers found that this line of reasoning could not form the basis of omitting these strain/antimicrobial combinations in question.

In general, the testing and interpretation of results for the ESBL- and carbapenemase-producing strains appeared not to cause difficulties and even if no acceptance limit has been defined for this component of the EQAS, the overall result appears satisfactory.

4.3 *Campylobacter* trial

For the *Campylobacter* component of this year's EQAS, 27 laboratories submitted results leading to an overall percentage of correct AST results at 97.8%. All participants obtained satisfactory results according to the level of acceptance (<5% deviation) except for Lab #4 and #39 that had a deviation percent of 18.8% and 31.3%, respectively. The nine deviations for laboratory #4 were related to four strains (C-15.3, C-15.4, C-15.5 and C-15.8) and testing of ciprofloxacin, erythromycin, nalidixic acid, streptomycin and tetracycline. In all cases the obtained value was several dilution steps from the expected value. For laboratory #39, the 15 deviations were related to five strains (C-15.1, C-15.2, C-15.4, C-15.6 and C-15.7) and testing of ciprofloxacin, erythromycin, gentamicin, nalidixic acid,

streptomycin and tetracycline. As for laboratory #39, the obtained values were several dilution steps from the expected values. A follow up mail was forwarded to these laboratories and Lab #4 reported that when performing retests on the non-conformities, the expected results were obtained, consequently, it was concluded that the initial mistake could be due to inversion of the isolates. No reply was received prior to publication of this report in relation follow-up from Lab #39.
For the remaining laboratories the deviation percentage was not above 2.4 and 22 of all laboratories had no deviations at all (Figure 7).

Even though it appears that the deviation level for the overall AST results had increased in 2020 for the *Campylobacter* strains compared to 2019, the data still reflects an acceptable quality. For the internal control strain a minor decrease in the deviation level was observed in 2020 compared to the EQAS 2019 revealing acceptable quality. (Figure 3).

All participating laboratories except three (#4, #6 and #60) uploaded data for tests performed on the *C. jejuni* reference strain. Of the 24 laboratories that submitted results for the references strain only a single deviation was observed reflecting good overall quality (Table 10).

5. Conclusions

The goal of the EURL-AR EQAS is to have all participating NRLs performing antimicrobial susceptibility testing of the test strains with a deviation level below 5%. This year, this goal was reached for all laboratories in relation to *E. coli* whereas for the *Salmonella* trial and *Campylobacter* trial, one laboratory (#19) and two laboratories (#4 and #39), respectively exhibited a deviation level higher than 5%.

Compared to the EQAS 2019, the performance of the NRL's in 2020 appears to have decreased slightly for *E. coli* presented by the deviation levels in 2020 for *E. coli* (0.8% in 2020 and 0.5% in 2019), *Salmonella* (1.2% in 2020 and 0.6% in 2019) and *Campylobacter* test strains (2.1% in 2020 and 0.7% in 2019) (Figure 2, 3 and 4). However, the data still reflect a high overall level of performance.

The test covering the identification of the phenotype of *E. coli* test strains and the *Salmonella* test strains producing beta-lactamases of the ESBL-, AmpC, and carbapenemase type rendered eight deviations (95.4% correct categorisations) and six deviations (96.8% correct categorisations), respectively. This is a priority area within the EURL-AR activities, and the focus on identifying ESBL-, AmpC-, and carbapenemase-producing organisms is encouraged.

Finally, the EURL-AR is open to suggestions to improve future EQAS trials and invites the entire network to contribute with ideas for training courses and specific focus areas to expand the network's knowledge in antimicrobial resistance.

6. References

European Commission, 2013/652/EU: Commission Implementing Decision of 12 November 2013 on the monitoring and reporting of antimicrobial resistance in zoonotic and commensal bacteria.

Schwarz S, Silley P, Simjee S, Woodford N, van DE, Johnson AP & Gaastra W. (2010) Editorial: assessing the antimicrobial susceptibility of bacteria obtained from animals. J Antimicrob Chemother 65: 601-604

EU Reference Laboratory for Antimicrobial Resistance
External Quality Assurance System (EQAS) 2020

DTU Food
National Food Institute

G00-06-001/23.06.2017

EQAS 2020 for *E. coli, Salmonella* and *Campylobacter*

The EURL-AR announces the launch of another EQAS, thus providing the opportunity for proficiency testing which is considered an essential tool for the generation of reliable laboratory results of consistently good quality.

This EQAS consists of antimicrobial susceptibility testing of eight *Escherichia coli* isolates, eight *Salmonella* isolates and eight *Campylobacter* isolates. Additionally, quality control (QC) strains *E. coli* ATCC 25922 (CCM 3954) and *C. jejuni* ATCC 33560 (CCM 6214) will be distributed to new participants.

It is the recipients' responsibility to comply with national legislation, rules and regulation regarding the correct use and handling of the provided strains and to possess the proper equipment and protocols to handle these strains.

This EQAS is specifically for NRL's on antimicrobial resistance (NRL-AR). Laboratories designated to be NRL-AR do not need to sign up to participate but are automatically regarded as participants. You may contact the EQAS-Coordinator if you wish to inform of changes in relation to your level of participation in compared to previous years. The EURL-AR will be able to cover the expenses for one parcel, only, per EU Member State. Therefore, countries with more than one laboratory registered on the EURL-AR contact-list will be contacted directly to confirm which laboratory will be included for participation free of charge.

The invitation to participate in the proficiency test is extended to additional participants besides official NRLs and to participants from laboratories which are involved in the network but are not designated NRLs (cost for participation will be 100 EUR).

TO AVOID DELAY IN SHIPPING THE ISOLATES TO YOUR LABORATORY

The content of the parcel is "UN3373, Biological Substance Category B": Eight *E. coli* strains, eight *Salmonella* strains, eight *Campylobacter* and for new participants also the QC strains mentioned above. Please provide the EQAS coordinator with documents or other information that can simplify customs procedures (e.g. specific text that should be written on the proforma invoice). To avoid delays, we kindly ask you to send this information already at this stage.

TIMELINE FOR RESULTS TO BE RETURNED TO THE NATIONAL FOOD INSTITUTE

Shipment of isolates and protocol: The isolates will be shipped in October 2020. The protocol for this proficiency test will be available for download from the website (https://www.eurl-ar.eu/eqas.aspx).

Submission of results: Results must be submitted to the National Food Institute **no later than 11 December 2020** via the password-protected webtool.
Upon reaching the deadline, each participating laboratory is kindly asked to enter the password-protected webtool once again to download an automatically generated evaluation report.

EQAS report: A report summarising and comparing results from all participants will be issued. In the report, laboratories will be presented coded, which ensures full anonymity as to the participants'

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obtained results. The EURL-AR and the EU Commission, only, will have access to un-coded results. The report will be publicly available.

Next EQAS: The next EQAS provided by the EURL-AR will be on selective isolation of presumptive ESBL-, AmpC- and carbapenemase-producing *Escherichia coli* from meat and caecal samples (Matrix EQAS) and is planned to be carried out in November 2020.

Please contact me if you have comments or questions regarding the EQAS.

Sincerely,

Susanne Karlsmose Pedersen (suska@food.dtu.dk)
EURL-AR EQAS-Coordinator

Participant list

E. coli	*Salmonella*	*Campylobacter*	Institute	Country
X	X	X	Austrian Agency for Health and Food Safety	Austria
X	X	X	Sciensano	Belgium
X	X	X	Nacional Diagnostic and Research Veterinary Institute	Bulgaria
X	X	X	Croatian Veterinary Institute	Croatia
X	X	X	Veterinary Services	Cyprus
X	X	-	State Veterinary Institute Praha	Czech Republic
X*	X*	X*	National Food Institute	Denmark
X	X	X	Danish Veterinary and Food Administration, DVFA	Denmark
X	X	X	Estonian Veterinary and Food Laboratory	Estonia
X	X	X	Finnish Food Authority	Finland
-	-	X	Agence nationale de sécurité sanitaire ANSES – Laboratoire de Ploufragan-Plouzané-Niort	France
X	X	-	Agence nationale de sécurité sanitaire ANSES – Laboratoire de Fougères	France
X	X	X	German Federal Institute for Risk Assessment	Germany
X	X	X	Veterinary Laboratory of Chalkis	Greece
X	X	X	National Food Chain Safety Office, Veterinary Diagnostic Directorate	Hungary
X	X	X	Keldur, Institute for Experimental Pathology	Iceland
X	X	X	Central Veterinary Research Laboratory	Ireland
X	X	X	Istituto Zooprofilattico Sperimentale del Lazio e della Toscana	Italy
X	X	-	Institute of Food Safety, Animal Health and Enviroment "BIOR"	Latvia
X	X	X	National Food and Veterinary Risk Assessment Institute	Lithuania
X	X	X	Laboratoire national de Santé	Luxembourg
X	X	X	Public Health Laboratory	Malta
-	X*	X*	Wageningen Food Safety Research (WFSR)	Netherlands
X	X	X	Wageningen Bioveterinary Research (WBVR)	Netherlands
X	X	X	Veterinærinstituttet	Norway
X	X	X	National Veterinary Research Institute	Poland
X	X	X	Instituto Nacional de Investigação Agrária e Veterinária	Portugal
X	X	X	Institute for Hygiene and Veterinary Public Health	Romania
X*	X*	X*	Institute for Diagnosis and Animal Health	Romania
X	X	-	State Veterinary and Food Institute (SVFI)	Slovakia
X	X	X	National Veterinary Institute	Slovenia
-	-	X	Laboratorio Central de Sanidad, Animal de Algete	Spain
X*	X*	X*	VISAVET Health Surveillance Center, Complutense University	Spain
X	X	-	Centro Nacional de Alimentación (AECOSAN)	Spain
X	X	X	National Veterinary Institute, SVA	Sweden
X	X	X	Animal & Plant Health Agency	United Kingdom

Designated NRL-AR by the compentent authority of the member state
Non-NRL-AR enrolled by the EURL-AR
Not a Member State of the EU
* Submitted results were not included in the current report (allows for one dataset per country, only)

Reference values (MIC-value and interpretation) - *E. coli*

	Ampicillin AMP		Azithromycin AZI		Cefepime FEP		Cefotaxime FOT		Cefotaxime/clav F/C		F:F/C ratio	Cefoxitin FOX		Ceftazidime TAZ		Ceftazidime/clav T/C		T:T/C ratio	Chloramphenicol CHL		Ciprofloxacin CIP		Colistin COL		Ertapenem ETP	
EURL 2020 EC-15.1	>64	RESIST	= 64	RESIST	= 32	RESIST	> 64	RESIST	= 0.25	SUSC	>=8	= 64	RESIST	= 2	RESIST	= 0.5	SUSC	<8	= 128	RESIST	> 8	RESIST	<= 1	SUSC	= 2	RESIST
EURL 2020 EC-15.2	= 8	SUSC	= 8	SUSC	= 0.25	RESIST	= 0.5	RESIST	= 0.25	SUSC	<8	= 16	RESIST	<= 0.5	SUSC	= 0.25	SUSC	<8	= 16	SUSC	> 8	RESIST	<= 1	SUSC	= 0.03	SUSC
EURL 2020 EC-15.3	>64	RESIST	= 8	SUSC	>32	RESIST	>64	RESIST	<= 0.06	SUSC	>=8	= 4	SUSC	= 4	RESIST	= 0.25	SUSC	>=8	<= 8	SUSC	<= 0.015	SUSC	<= 1	SUSC	<= 0.015	SUSC
EURL 2020 EC-15.4	>64	RESIST	= 64	RESIST	= 8	RESIST	= 32	RESIST	<= 0.06	SUSC	>=8	= 2	SUSC	= 1	RESIST	<= 0.12	SUSC	>=8	= 64	RESIST	= 0.12	RESIST	<= 1	SUSC	<= 0.015	SUSC
EURL 2020 EC-15.5	= 4	SUSC	= 8	SUSC	<=0.06	SUSC	<= 0.25	SUSC	<= 0.06	SUSC	<8	= 4	SUSC	<= 0.25	SUSC	<= 0.12	SUSC	<8	<= 8	SUSC	<= 0.015	SUSC	<= 1	SUSC	<= 0.015	SUSC
EURL 2020 EC-15.6	>64	RESIST	= 8	SUSC	= 16	RESIST	>64	RESIST	= 4	RESIST	>=8	= 32	RESIST	= 32	RESIST	= 8	RESIST	<8	> 128	RESIST	> 8	RESIST	<= 1	SUSC	= 0.06	SUSC
EURL 2020 EC-15.7	>64	RESIST	= 2	SUSC	>32	RESIST	>64	RESIST	> 64	RESIST	<8	> 64	RESIST	> 128	RESIST	> 128	RESIST	<8	<= 8	SUSC	= 0.5	RESIST	<= 1	SUSC	> 2	RESIST
EURL 2020 EC-15.8	>64	RESIST	>64	RESIST	<=0.06	SUSC	<= 0.25	SUSC	<= 0.06	SUSC	<8	= 4	SUSC	<= 0.25	SUSC	<= 0.12	SUSC	<8	= 128	RESIST	= 8	RESIST	= 8	RESIST	<= 0.015	SUSC

	Gentamicin GEN		IMIPENEM IMI		MEROPENEM MERO		Nalidixic acid NAL		Sulfamethoxazole SMX		TEMOCILLIN TRM		Tetracycline TETRA		TIGECYCLINE TGC		Trimethoprim TMP		ESBL-category	Relevant genes
EURL 2020 EC-15.1	> 32	RESIST	= 0.5	SUSC	= 0.25	RESIST	> 128	RESIST	> 1024	RESIST	= 8	SUSC	> 64	RESIST	<= 0.25	SUSC	> 32	RESIST	carbapenemase-phenotype	CTX-M-14
EURL 2020 EC-15.2	= 0.5	SUSC	<= 0.12	SUSC	<= 0.03	SUSC	> 128	RESIST	<= 8	SUSC	= 16	SUSC	<= 2	SUSC	= 0.5	SUSC	<= 0.25	SUSC	AmpC-phenotype Other phenotype	No ESBL gene or mutation detected
EURL 2020 EC-15.3	= 1	SUSC	<= 0.12	SUSC	<= 0.03	SUSC	<= 4	SUSC	<= 8	SUSC	= 4	SUSC	<= 2	SUSC	<= 0.25	SUSC	<= 0.25	SUSC	ESBL-phenotype	CTX-M-1
EURL 2020 EC-15.4	<= 0.5	SUSC	= 0.25	SUSC	<= 0.03	SUSC	<= 4	SUSC	> 1024	RESIST	= 4	SUSC	> 64	RESIST	<= 0.25	SUSC	> 32	RESIST	ESBL-phenotype	CTX-M-1
EURL 2020 EC-15.5	<= 0.5	SUSC	= 0.25	SUSC	<= 0.03	SUSC	<= 4	SUSC	<= 8	SUSC	= 8	SUSC	<= 2	SUSC	<= 0.25	SUSC	<= 0.25	SUSC	Susceptible (to panel 2 antimicrobials)	No ESBL gene or mutation detected
EURL 2020 EC-15.6	<= 0.5	SUSC	= 0.5	SUSC	= 0.06	SUSC	> 128	RESIST	= 16	SUSC	= 16	SUSC	= 64	RESIST	<= 0.25	SUSC	> 32	RESIST	ESBL+AmpC-phenotype	CMY-2, CTX-M-27
EURL 2020 EC-15.7	<= 0.5	SUSC	= 16	RESIST	> 16	RESIST	> 128	RESIST	<= 8	SUSC	= 32	RESIST	= 32	RESIST	<= 0.25	SUSC	> 32	RESIST	carbapenemase-phenotype	NDM-5, SHV-12
EURL 2020 EC-15.8	> 32	RESIST	= 0.25	SUSC	<= 0.03	SUSC	> 128	RESIST	> 1024	RESIST	= 4	SUSC	= 64	RESIST	<= 0.25	SUSC	> 32	RESIST	Susceptible (to panel 2 antimicrobials)	No ESBL gene or mutation detected

Resistant

Reference values (MIC-value and interpretation) - *Salmonella*

	Ampicillin AMP		Azithromycin AZI		Cefepime FEP		Cefotaxime FOT		Cefotaxime/clav F/C	F:F/C ratio	Cefoxitin FOX		Ceftazidime TAZ		Ceftazidime/clav T/C	T:T/C ratio	Chloramphenicol CHL		Ciprofloxacin CIP		Colistin COL		Ertapenem ETP	
EURL 2020 S-15.1	<= 1	SUSC	= 8	SUSC	<= 0.06	SUSC	<= 0.25	SUSC	<= 0.06	<8	= 2	SUSC	<= 0.25	SUSC	= 0.25	<8	<= 8	SUSC	<= 0.015	SUSC	= 2	SUSC	<= 0.015	SUSC
EURL 2020 S-15.2	> 64	RESIST	> 64	RESIST	> 32	RESIST	> 64	RESIST	= 0.25	>=8	= 4	SUSC	= 16	RESIST	= 1	>=8	> 128	RESIST	= 1	RESIST	= 2	SUSC	= 0.06	SUSC
EURL 2020 S-15.3	> 64	RESIST	= 8	SUSC	= 0.5	RESIST	= 16	RESIST	= 16	<8	= 64	RESIST	= 16	RESIST	= 16	<8	> 128	RESIST	<= 0.015	SUSC	= 2	SUSC	= 0.03	SUSC
EURL 2020 S-15.4	> 64	RESIST	= 4	SUSC	> 32	RESIST	> 64	RESIST	= 0.25	>=8	= 8	SUSC	= 8	RESIST	= 0.5	>=8	<= 8	SUSC	= 0.12	RESIST	= 2	SUSC	= 0.03	SUSC
EURL 2020 S-15.5	= 2	SUSC	= 8	SUSC	= 0.12	SUSC	= 0.5	SUSC	= 0.25	<8	= 32	RESIST	= 1	SUSC	= 0.5	<8	<= 8	SUSC	= 0.03	SUSC	= 4	RESIST	<= 0.015	SUSC
EURL 2020 S-15.6	> 64	RESIST	> 64	RESIST	= 4	RESIST	= 32	RESIST	= 0.12	>=8	= 4	SUSC	= 2	SUSC	= 0.5	<8	> 128	RESIST	<= 0.015	SUSC	<= 1	SUSC	<= 0.015	SUSC
EURL 2020 S-15.7	> 64	RESIST	> 64	RESIST	= 32	RESIST	> 64	RESIST	> 64	<8	> 64	RESIST	> 128	RESIST	> 128	<8	> 128	RESIST	= 8	RESIST	= 2	SUSC	= 2	RESIST
EURL 2020 S-15.8	> 64	RESIST	= 4	SUSC	= 2	RESIST	= 8	RESIST	= 0.12	>=8	= 2	SUSC	= 1	SUSC	= 0.25	<8	<= 8	SUSC	= 0.25	RESIST	= 2	SUSC	<= 0.015	SUSC

	Gentamicin GEN		IMIPENEM IMI		MEROPENEM MERO		Nalidixic acid NAL		Sulfamethoxazole SMX		TEMOCILLIN TRM		Tetracycline TETRA		TIGECYCLINE TGC		Trimethoprim TMP		ESBL-category	Relevant genes
EURL 2020 S-15.1	<= 0.5	SUSC	= 0.25	SUSC	<= 0.03	SUSC	<= 4	SUSC	<= 8	SUSC	= 8	SUSC	<= 2	SUSC	<= 0.25	SUSC	<= 0.25	SUSC	Susceptible (to panel 2 antimicrobials)	No ESBL gene or mutation detected
EURL 2020 S-15.2	= 32	RESIST	= 0.25	SUSC	= 0.06	SUSC	> 128	RESIST	> 1024	RESIST	= 16	SUSC	> 64	RESIST	= 1	SUSC	> 32	RESIST	ESBL-phenotype	CTX-M-3, OXA-1
EURL 2020 S-15.3	<= 0.5	SUSC	= 0.25	SUSC	<= 0.03	SUSC	<= 4	SUSC	> 1024	RESIST	= 8	SUSC	> 64	RESIST	= 0.5	SUSC	<= 0.25	SUSC	AmpC-phenotype	CMY-2
EURL 2020 S-15.4	<= 0.5	SUSC	= 0.25	SUSC	= 0.06	SUSC	= 128	RESIST	= 1024	RESIST	= 8	SUSC	= 64	RESIST	<= 0.25	SUSC	> 32	RESIST	ESBL-phenotype	CTX-M-14b
EURL 2020 S-15.5	> 32	RESIST	= 0.25	SUSC	= 0.06	SUSC	<= 4	SUSC	> 1024	RESIST	= 32	RESIST	<= 2	SUSC	<= 0.25	SUSC	<= 0.25	SUSC	Other-phenotype	No ESBL gene or mutation detected
EURL 2020 S-15.6	<= 0.5	SUSC	= 0.25	SUSC	<= 0.03	SUSC	<= 4	SUSC	= 1024	RESIST	= 8	SUSC	> 64	RESIST	= 2	RESIST	> 32	RESIST	ESBL-phenotype	CTX-M-14
EURL 2020 S-15.7	<= 0.5	SUSC	= 4	RESIST	= 2	RESIST	> 128	RESIST	> 1024	RESIST	= 128	RESIST	> 64	RESIST	<= 0.25	SUSC	> 32	RESIST	Carbapenemase-phenotype	NDM-1, CMY-4, CMY-16
EURL 2020 S-15.8	<= 0.5	SUSC	= 0.25	SUSC	<= 0.03	SUSC	> 128	RESIST	= 16	SUSC	= 4	SUSC	= 32	RESIST	<= 0.25	SUSC	= 0.5	SUSC	ESBL-phenotype	CTX-M-9

Resistant

Reference values (MIC-value and interpretation) - *Campylobacter*

Species	Code	Ciprofloxacin CIP		Erythromycin ERY		Gentamicin GEN		Nalidixic acid NAL		Streptomycin STR		Tetracycline TET	
C. jejuni	EURL 2020 C-15.1	<=0.12	SUSC	<=1	SUSC	<=0.12	SUSC	2	SUSC	0.5	SUSC	<=0.5	SUSC
C. coli	EURL 2020 C-15.2	>16	RESIST	>128	RESIST	0.25	SUSC	>64	RESIST	1	SUSC	>64	RESIST
C. jejuni	EURL 2020 C-15.3	16	RESIST	<=1	SUSC	0.25	SUSC	>64	RESIST	1	SUSC	64	RESIST
C. jejuni	EURL 2020 C-15.4	8	RESIST	<=1	SUSC	<=0.12	SUSC	>64	RESIST	0.5	SUSC	64	RESIST
C. coli	EURL 2020 C-15.5	<=0.12	SUSC	<=1	SUSC	0.5	SUSC	4	SUSC	16	RESIST	1	SUSC
C. jejuni	EURL 2020 C-15.6	<=0.12	SUSC	<=1	SUSC	<=0.12	SUSC	4	SUSC	0.5	SUSC	64	RESIST
C. jejuni	EURL 2020 C-15.7	<=0.12	SUSC	<=1	SUSC	0.25	SUSC	4	SUSC	>16	RESIST	8	RESIST
C. coli	EURL 2020 C-15.8	>16	RESIST	8	SUSC	0.5	SUSC	>64	RESIST	16	RESIST	>64	RESIST

Resistant

G00-06-001/23.06.2017

EURL-AR External Quality Assurance System 2020

- *E. coli, Salmonella* and *Campylobacter*

Id: «Lab_no_»
«Name»
«Institute__»
«Country»

Kgs. Lyngby, October 2020

Dear «Nameall»,

Please find enclosed the bacterial strains for the EURL-AR EQAS 2020: eight *Escherichia coli*, eight *Salmonella spp.* and eight *Campylobacter* spp. Upon arrival to your laboratory, the strains should be stored in a dark place at 4°C for stabs, and in a dark and cool place for freeze-dried strains. Charcoal swabs must be subcultured immediately upon arrival.

On the EURL-AR-website (https://www.eurl-ar.eu/eqas.aspx) the following documents relevant for this EURL-AR EQAS are available:

- Protocol for antimicrobial susceptibility testing of *E. coli*, *Salmonella* and *Campylobacter* and test forms for reporting results
- Instructions for Opening and Reviving Lyophilised Cultures
- Subculture and Maintenance of Quality Control Strains
- Guideline for submission of results via the webtool

We ask you to test these *E. coli*, *Salmonella* and *Campylobacter* strains for antimicrobial susceptibility. Detailed description of the procedures to follow for antimicrobial susceptibility testing and for submitting your results via the webtool can be found in the protocol.

All participants registered with an account in the submission webtool will receive a separate email presenting the relevant personal username and password. The email will be sent by the time when the webtool has gone through internal quality control and has been approved for user access. I will let you know when to look out for it.

	Personal username	**Personal password**
Accessing the webtool (see the PT protocol, item 5)	*See underlined text above*	*See underlined text above*

Results should be submitted to the database no later than **11th December 2020**.

Please acknowledge receipt of this parcel immediately upon arrival (to suska@food.dtu.dk).
Do not hesitate to contact me for further information.

Yours sincerely,

Susanne Karlsmose Pedersen
EURL-AR EQAS-Coordinator

EU Reference Laboratory for Antimicrobial Resistance
External Quality Assurance System (EQAS) 2020

DTU Food
National Food Institute

PROTOCOL

For antimicrobial susceptibility testing of *Escherichia coli*, *Salmonella* and *Campylobacter*

1 INTRODUCTION

The organisation and implementation of an External Quality Assurance System (EQAS) on antimicrobial susceptibility testing (AST) of *Escherichia coli*, *Salmonella* and *Campylobacter* is among the tasks of the EU Reference Laboratory for Antimicrobial Resistance (EURL-AR). The current EQAS 2020 will include AST of eight *E. coli, Salmonella* and *Campylobacter* strains and AST of reference strains *E. coli* ATCC 25922 (CCM 3954), *Acinetobacter baumannii* 2012-70-100-69 (EURL-AR QC-strain), *Campylobacter jejuni* ATCC 33560 (CCM 6214) and *Campylobacter coli* 2012-70-443-2 (EURL-AR QC-strain).

The reference strains are included in the parcel only for new participants of the EQAS who did not receive them previously. The ATCC reference strains are original CERTIFIED cultures provided free of charge, and should be used for future internal quality control for antimicrobial susceptibility testing in your laboratory. The EURL-AR QC-strains are provided for the purpose of additional QC of the broth microdilution plates. The reference strains will not be included in the years to come and we therefore encourage you to take proper care of these strains for example by handling and maintaining them as suggested in the manual ‘Subculture and Maintenance of QC Strains’ available on the EURL-AR website (see www.eurl-ar.eu).

Various aspects of the proficiency test scheme may from time to time be subcontracted. When subcontracting occurs it is placed with a competent subcontractor and the National Food Institute is responsible to the scheme participants for the subcontractor's work.

2 OBJECTIVES

This EQAS aims to support laboratories to assess and, if necessary, to improve the quality of results obtained by AST of pathogens of food- and animal-origin, with special regard to *E. coli*, *Salmonella* and *Campylobacter*. Further objectives are to evaluate and improve the comparability of surveillance data on antimicrobial susceptibility of *E. coli*, *Salmonella* and *Campylobacter* reported to EFSA by different laboratories.

3 OUTLINE OF THE EC/SALM/CAMP EQAS 2020

3.1 Shipping, receipt and storage of strains

In October 2020, the National Reference Laboratories for Antimicrobial Resistance (NRL-AR) will receive a parcel containing eight *E. coli*, eight *Salmonella* and *Campylobacter* strains from the National Food Institute. This parcel will also contain reference strains, but only for participants who did not receive them previously.

All strains belong to UN3373, Biological substance, category B. Extended spectrum beta-lactamase (ESBL)-producing strains as well as carbapenemase producing strains are included in the selected material. It is the recipients' responsibility to comply with national legislation, rules and regulation regarding the correct use and handling of the provided strains and to possess the proper equipment and protocols to handle these strains.

The *E. coli* and *Salmonella* test strains are shipped as stab cultures, the *Campylobacter* test strains are shipped as a charcoal swabs and the reference strains are shipped lyophilised. Upon arrival to your laboratory, the strains should be stored in a dark place at 4°C for stabs and charcoal swabs, and in a dark and cool place for freeze-dried strains. Charcoal swabs must be subcultured immediately upon arrival. A suggested procedure for reconstitution of the lyophilised reference strains is presented below.

3.2 QC reference strains

For a suggested procedure for reconstitution of the lyophilised, please refer to the document 'Instructions for opening and reviving lyophilised cultures' on the EURL-AR-website (see www.eurl-ar.eu).

Note that, for the testing of the *E. coli* ATCC25922 reference strain, the two compounds, sulfamethoxazole and sulfisoxazole, are regarded as comparable, i.e. the obtained MIC-value from

the testing of sulfamethoxazole will be evaluated against the acceptance range listed in CLSI M100 for sulfisoxazole.

3.3 Antimicrobial susceptibility testing

Participants should perform minimum inhibitory concentration (MIC) determination using the methods stated in the Commission Implementing Decision 2013/652/EU (international reference method ISO standard 20776-1:2006). **Results should be produced according to the laboratory's routine procedures for antimicrobial susceptibility testing by MIC determination.** For interpretation of the results, please use the cut-off values listed in Tables 1, 2, 3, 4 and 5 in this document. These values (except where indicated) represent the current epidemiological cut-off values developed by EUCAST (www.eucast.org), and allow categorisation of bacterial isolates into two categories: resistant and susceptible. A categorisation as intermediate is not accepted**.**

As the current regulation and recommendations focus on broth microdilution testing only, results obtained by other methods cannot be submitted for evaluation.

Beta-lactam and carbapenem resistance

Confirmatory tests for ESBL/AmpC/Carbapenemase production are mandatory on all strains resistant to cefotaxime (FOT), ceftazidime (TAZ) and/or meropenem (MERO) and should be performed by testing the second panel of antimicrobials (Table 2 in this document corresponding to Table 4 in Commission Implementing Decision 2013/652/EU).

Confirmatory test for AmpC-, ESBL- and carbapenemase production requires use of both cefotaxime (FOT) and ceftazidime (TAZ) alone and in combination with a β-lactamase inhibitor (clavulanic acid). Synergy is defined as i) a ≥ 3 twofold concentration decrease in an MIC for either antimicrobial agent tested in combination with clavulanic acid vs. the MIC of the agent when tested alone (MIC FOT:FOT/Cl or TAZ:TAZ/Cl ratio ≥ 8) (CLSI M100 Table 3A, Tests for ESBLs). The presence of synergy indicates ESBL production.

Confirmatory test for carbapenemase production requires the testing of meropenem (MERO).

Detection of AmpC-type beta-lactamases can be performed by testing the bacterium for susceptibility to cefoxitin (FOX). Resistance to FOX could indicate the presence of an AmpC-type beta-lactamase.

The classification of the phenotypic beta-lactam resistance results should be based on the most recent EFSA recommendations (see appendix to this protocol). It is important to notice that two cut-off values apply for cefotaxime and ceftazidime: the EUCAST cut-off values, those that define define R/S (see Tables 1, 2, 3 and 4), and the screening cut-off values (FOT>1 and TAZ>1) which are those applied to categorise bacterial phenotypes as ESBL, AmpC, carbapenemase, etc., based on panel 2 results (see Appendix).

3.3.1 *E. coli*

The interpretative criteria that should be applied for categorizing the *E. coli* test strain as resistant or susceptible are those listed in Tables 1 and 2.

Table 1: Antimicrobials recommended for AST of *E. coli* spp. and interpretative criteria according to table 1 in EC regulation 652/2013

Antimicrobial	MIC (µg/mL) (R>)
Ampicillin (AMP)	8
Azithromycin (AZI)	16*
Cefotaxime (FOT)	0.25
Ceftazidime (TAZ)	0.5
Chloramphenicol (CHL)	16
Ciprofloxacin (CIP)	0.064
Colistin (COL)	2
Gentamicin (GEN)	2
Meropenem (MERO)	0.125
Nalidixic acid (NAL)	8
Sulfonamides (SMX)	64
Tetracycline (TET)	8
Tigecycline (TGC)	0.5
Trimethoprim (TMP)	2

* Tentative ECOFF

Table 2: Antimicrobials recommended for additional AST of *E. coli* spp. resistant to cefotaxime, ceftazidime or meropenem and interpretative criteria according to table 4 in EC regulation 652/2013

Antimicrobial	MIC (µg/mL) (R>)
Cefepime, FEP	0.125
Cefotaxime, FOT	0.25
Cefotaxime + clavulanic acid (F/C)	0.25
Cefoxitin, FOX	8
Ceftazidime, TAZ	0.5
Ceftazidime+ clavulanic acid (T/C)	0.5
Ertapenem, ETP	0.064*
Imipenem, IMI	0.5
Meropenem, MERO	0.125
Temocillin, TRM	16

* Tentative ECOFF

3.3.2 Salmonella

The interpretative criteria that should be applied for categorizing the *Salmonella* test strain as resistant or susceptible are those listed in Tables 3 and 4.

Table 3: Antimicrobials recommended for AST of *Salmonella* spp. and interpretative criteria according to table 1 in EC regulation 652/2013

Antimicrobial	MIC (µg/mL) (R>)
Ampicillin (AMP)	8
Azithromycin (AZI)	16*
Cefotaxime (FOT)	0.5
Ceftazidime (TAZ)	2
Chloramphenicol (CHL)	16
Ciprofloxacin (CIP)	0.064
Colistin (COL)	2*
Gentamicin (GEN)	2
Meropenem (MERO)	0.125
Nalidixic acid (NAL)	8
Sulfonamides (SMX)	256*
Tetracycline (TET)	8
Tigecycline (TGC)	1*
Trimethoprim (TMP)	2

* Tentative ECOFF

Table 4: Antimicrobials recommended for additional AST of *Salmonella* spp. resistant to cefotaxime, ceftazidime or meropenem and interpretative criteria according to table 4 in EC regulation 652/2013

Antimicrobial	MIC (µg/mL) (R>)
Cefepime, FEP	0.125*
Cefotaxime, FOT	0.5
Cefotaxime + clavulanic acid (F/C)	Not applicable
Cefoxitin, FOX	8
Ceftazidime, TAZ	2
Ceftazidime+ clavulanic acid (T/C)	Not applicable
Ertapenem, ETP	0.06*
Imipenem, IMI	1
Meropenem, MERO	0.125
Temocillin, TRM	16*

* Tentative ECOFF

3.3.3 *Campylobacter*

The interpretative criteria that should be applied for categorizing the *Campylobacter* test strain as resistant or susceptible are those listed in Table 5.

The obtained values of the *C. jejuni* QC reference strain will be evaluated according to the values listed in the CLSI document VET06, 1st ed., i.e. based on incubation at 36-37ºC for 48 hours or 42ºC for 24 hours.

Table 5: Antimicrobials recommended for AST of *Campylobacter jejuni* and *C. coli* and interpretative criteria according to table 2 in EC regulation 652/2013

Antimicrobial	*C. jejuni*	*C. coli*
	MIC (µg/mL) (R>)	MIC (µg/mL) (R>)
Ciprofloxacin (CIP)	0.5	0.5
Erythromycin (ERY)	4	8
Gentamicin (GEN)	2	2
Nalidixic acid (NAL)	16	16
Streptomycin (STR)	4	4
Tetracycline (TET)	1	2

Identification of *Campylobacter* species

Species identification of the *Campylobacter* test strains must be performed by the NRLs using in-house methods or adopting the protocol available on the EURL-AR website under: http://eurl-ar.eu/233-protocols.htm.

4 REPORTING OF RESULTS AND EVALUATION

Test forms are available for recording your results before you enter them into the web tool.

We recommend reading carefully the web tool manual before submitting your results.

Results must be submitted no later than December 11th 2020.

After the deadline, when all participants have uploaded results, you will be able to login to the webtool once again to view and print an automatically generated report evaluating your results. Results in agreement with the expected interpretation are categorised as ‘correct’, while results deviating from the expected interpretation are categorised as ‘incorrect’.

All results will be summarized in a report which will be publicly available. The data in the report will be presented with laboratory codes. A laboratory code is known to the individual laboratory,

whereas the complete list of laboratories and their codes is confidential and known only to the EURL-AR and the EU Commission. All conclusions will be public.

If you have questions, please do not hesitate to contact the EQAS Coordinator:

Susanne Karlsmose Pedersen
National Food Institute,
Technical University of Denmark
Kemitorvet, Building 204, DK-2800 Lyngby
Denmark
Tel: +45 3588 6601
E-mail: suska@food.dtu.dk

5 HOW TO SUBMIT RESULTS VIA THE WEBTOOL

The 'guideline for submission of results via webtool' is available for download directly from the EURL-AR website (https://www.eurl-ar.eu/eqas.aspx).

Access the webtool using this address: https://amr-eqas.dtu.dk. Please follow the guideline carefully and **remember to access the webtool via an 'incognito' website**.

When you submit your results, remember to have by your side the completed test forms.

Do not hesitate to contact us if you experience difficulties with the webtool.

Before finally submitting your input for *E. coli*, *Salmonella* and *Campylobacter*, respectively, please ensure that you have filled in all the relevant fields as **you can only 'finally submit' once for each organism!** 'Final submit' blocks data entry.

⇨ About login to the webtool:

When first given access to login to the webtool, your **personal** loginID and password were sent to you by email. This is relevant for two email addresses connected to each NRL-AR (the EURL-AR defined a primary and a secondary contact).
Note that:

a) If the EURL-AR has only one contact person for an NRL, this person is registered both as primary and secondary contact. Should you like to add another person as the secondary contact, please contact suska@food.dtu.dk
b) If your laboratory has two or more contact points on the EURL-AR contact list, two have been defined as the primary and secondary contact. Should you like to make changes to the primary and secondary contact or should you like more than the two persons to be able to access the webtool, please contact suska@food.dtu.dk.

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All participants registered with an account in the submission webtool will receive a separate email presenting the relevant personal username and password. The email will be sent by the time when the webtool has gone through internal quality control and has been approved for user access. The EQAS Coordinator will let all participants know when to look out for it.

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APPENDIX

Criteria for interpretation of *E. coli* and *Salmonella*, panel 2 results

1. ESBL-Phenotype
- FOT or TAZ > 1 mg/L AND
- MERO ≤ 0.12 mg/L AND
- FOX ≤ 8 mg/L AND
- SYN FOT/CLV and/or TAZ/CLV

2. AmpC-Phenotype
- FOT or TAZ > 1 mg/L AND
- MERO ≤ 0.12 mg/L AND
- FOX > 8 mg/L AND
- No SYN FOT/CLV nor TAZ/CLV
- (Not excluded presence of ESBLs)

3. ESBL + AmpC-Phenotype
- FOT or TAZ > 1 mg/L AND
- MERO ≤ 0.12 mg/L AND
- FOX >8 mg/L AND
- SYN FOT/CLV and/or TAZ/CLV

4. Carbapenemase-Phenotype
- MERO > 0.12 mg/L
- Needs confirmation
- (Not excluded presence of ESBLs or AmpC)

Susceptible

FOT-TAZ-FOX-MEM ≤ ECOFF

5. Other phenotypes

1) If FOT or TAZ > 1 mg/ml AND
- MEM ≤ 0.12 mg/L AND
- FOX ≤ 8 mg/L AND
- NO SYN FOT/CLV nor TAZ/CLV
- Not excluded CPs (consult EURL)

2) If FOT and/or TAZ ≤ 1 mg/L AND > ECOFF AND
- MERO ≤ 0.12 mg/L
- FOX ≤ 8 mg/L

3) If FOT and TAZ ≤ 1 mg/L
- MERO ≤ 0.12 mg/L
- FOX > 8 mg/L

*cAmpCs could be included here

4) If MERO ≤ 0.12 mg/L BUT
- ETP > ECOFF AND/OR
- IMI > ECOFF
- Not excluded CPs, needs confirmation (consult EURL)

5) Any other combinations not described in previous boxes (consult EURL)

Please refer to: EFSA (European Food Safety Authority) and ECDC (European Centre for Disease Prevention and Control), 2020. The European Union summary report on antimicrobial resistance in zoonotic and indicator bacteria from humans, animals and food in 2017/2018. EFSA Journal 2020;18 (3). https://doi.org/10.2903/j.efsa.2020.6007 (Annex A).

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E. coli, Salmonella and *Campylobacter*

TEST FORMS

Name:
Name of laboratory:
Name of institute:
City:
Country:
E-mail:
Fax:

Comments:

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TEST FORM – *E. coli*

Which method did you use for antimicrobial susceptibility testing of *E. coli* in this EQAS?

- ☐ MIC - Broth microdilution
- ☐ MIC – Agar dilution (note: not evaluated in the final report)

Which standard(s(/guideline(s) did you use when performing AST?

- ☐ CLSI
- ☐ EUCAST
- ☐ ISO 20776-1:2006
- ☐ TREK

Which incubation conditions did you use? °C/ h

Which solvent was used for the preparation of the 0.5 McFarland solution

- ☐ Water
- ☐ Saline
- ☐ Mueller Hinton broth

The inoculum was prepared by adding µl of 0.5 McFarland solution in mL MH broth

What was the expected inculum size? * ^ CFU/mL (indicate for example 5 times 10 to the power of 5 using this format '5 * 10 ^ 5')

Comments or additional information:

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TEST FORM - *Salmonella*

Which method did you use for antimicrobial susceptibility testing of *Salmonella* in this EQAS?

- ☐ MIC - Broth microdilution
- ☐ MIC – Agar dilution (note: not evaluated in the final report)

Which standard(s(/guideline(s) did you use when performing AST?

- ☐ CLSI
- ☐ EUCAST
- ☐ ISO 20776-1:2006
- ☐ TREK

Which incubation conditions did you use? °C/ h

Which solvent was used for the preparation of the 0.5 McFarland solution

- ☐ Water
- ☐ Saline
- ☐ Mueller Hinton broth

The inoculum was prepared by adding µl of 0.5 McFarland solution in mL MH broth

What was the expected inculum size? * ^ CFU/mL (indicate for example 5 times 10 to the power of 5 using this format '5 * 10 ^ 5')

Comments or additional information:

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TEST FORM - *Campylobacter*

Which method did you use for antimicrobial susceptibility testing of *Campylobacter* in this EQAS?

- ☐ MIC - Broth microdilution
- ☐ MIC – Agar dilution (note: not evaluated in the final report)

Which standard(s(/guideline(s) did you use when performing AST?

- ☐ CLSI
- ☐ EUCAST
- ☐ ISO 20776-1:2006
- ☐ TREK

Which incubation conditions did you use?

- ☐ 36-37ºC, 48 hours
- ☐ 42ºC, 24 hours

Which solvent was used for the preparation of the 0.5 McFarland solution

- ☐ Water
- ☐ Saline
- ☐ Mueller Hinton broth

The inoculum was prepared by adding µl of 0.5 McFarland solution in mL cation-adjusted Mueller Hinton broth supplemented with lysed horse blood (CAMHB-LHB).

What was the expected inculum size? * ^ CFU/mL (indicate for example 5 times 10 to the power of 5 using this format '5 * 10 ^ 5')

Comments or additional information:

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TEST FORM

Strain	Antimicrobial	Results and interpretation		
		≤ / >	MIC-value (µg/ml)	S / R
E. coli EURL EC-15.X	Ampicillin, AMP			
	Azithromycin, AZI			
	Cefotaxime, FOT			
	Ceftazidime, TAZ			
	Chloramphenicol, CHL			
	Ciprofloxacin CIP			
	Colistin, COL			
	Gentamicin, GEN			
	Meropenem, MERO			
	Nalidixic acid, NAL			
	Sulfamethoxazole, SMX			
	Tetracycline, TET			
	Tigecycline, TGC			
	Trimethoprim, TMP			

All strains resistant to cefotaxime (FOT), ceftazidime (TAZ) or meropenem (MERO) must be included for testing in the second panel as part of confirmatory tests for ESBL-, AmpC or carbapenemase production. See further description in the protocol, section '3.3'.

Strain	Antimicrobial	Results and interpretation		
		≤ / >	MIC-value (µg/ml)	S / R
E. coli EURL EC-15.X	Cefepime, FEP			
	Cefotaxime, FOT			
	Cefotaxime + clavulanic acid (F/C)			
	Cefoxitin, FOX			
	Ceftazidime, TAZ			
	Ceftazidime+ clavulanic acid (T/C)			
	Ertapenem, ETP			
	Imipenem, IMI			
	Meropenem, MERO			
	Temocillin, TRM			

Interpretation of PANEL 2 results:

☐ ESBL-phenotype
☐ ESBL+AmpC-phenotype
☐ AmpC-phenotype
☐ Carbapenemase-phenotype
☐ Other phenotype
☐ Susceptible (to panel 2 antimicrobials)

Comments:

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TEST FORM

AST of reference strain *E. coli* ATCC 25922

	Antimicrobial	MIC-value (µg/ml)
1st panel	Ampicillin, AMP	
	Azithromycin, AZI	
	Cefotaxime, FOT	
	Ceftazidime, TAZ	
	Chloramphenicol, CHL	
	Ciprofloxacin, CIP	
	Colistin, COL	
	Gentamicin, GEN	
	Meropenem, MERO	
	Nalidixic acid, NAL	
	Sulfamethoxazole, SMX*	
	Tetracycline, TET	
	Tigecycline, TGC	
	Trimethoprim, TMP	
2nd panel	Cefepime, FEP	
	Cefotaxime, FOT	
	Cefotaxime + clavulanic acid (F/C)	
	Cefoxitin, FOX	
	Ceftazidime, TAZ	
	Ceftazidime+ clavulanic acid (T/C)	
	Ertapenem, ETP	
	Imipenem, IMI	
	Meropenem, MERO	
	Temocillin, TRM	

* for the testing of the *E. coli* ATCC25922 reference strain, sulfamethoxazole and sulfisoxazole, are regarded as comparable, i.e. the obtained MIC-value from the testing of sulfamethoxazole will be evaluated against the acceptance range listed in CLSI M100 for sulfisoxazole (CLSI M100, Table 3).

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AST of reference strain *Acinetobacter baumannii* (2012-70-100-69)

	Antimicrobial	MIC-value (µg/ml)
1st panel	Ampicillin, AMP	
	Azithromycin, AZI	
	Cefotaxime, FOT	
	Ceftazidime, TAZ	
	Chloramphenicol, CHL	
	Ciprofloxacin, CIP	
	Colistin, COL	
	Gentamicin, GEN	
	Meropenem, MERO	
	Nalidixic acid, NAL	
	Sulfamethoxazole, SMX*	
	Tetracycline, TET	
	Tigecycline, TGC	
	Trimethoprim, TMP	
2nd panel	Cefepime, FEP	
	Cefotaxime, FOT	
	Cefotaxime + clavulanic acid (F/C)	
	Cefoxitin, FOX	
	Ceftazidime, TAZ	
	Ceftazidime+ clavulanic acid (T/C)	
	Ertapenem, ETP	
	Imipenem, IMI	
	Meropenem, MERO	
	Temocillin, TRM	

* Sulfamethoxazole and sulfisoxazole, are regarded as comparable, i.e. the obtained MIC-value from the testing of sulfamethoxazole will be evaluated against the acceptance range listed in CLSI M100 for sulfisoxazole (CLSI M100, Table 3).

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TEST FORM

Strain	Antimicrobial	Results and interpretation		
		≤ / >	MIC-value (µg/ml)	S / R
Salmonella EURL S-15.X	Ampicillin, AMP			
	Azithromycin, AZI			
	Cefotaxime, FOT			
	Ceftazidime, TAZ			
	Chloramphenicol, CHL			
	Ciprofloxacin CIP			
	Colistin, COL			
	Gentamicin, GEN			
	Meropenem, MERO			
	Nalidixic acid, NAL			
	Sulfamethoxazole, SMX			
	Tetracycline, TET			
	Tigecycline, TGC			
	Trimethoprim, TMP			

All strains resistant to cefotaxime (FOT), ceftazidime (TAZ) or meropenem (MERO) must be included for testing in the second panel as part of confirmatory tests for ESBL-, AmpC or carbapenemase production. See further description in the protocol, section '3.3'.

Strain	Antimicrobial	Results and interpretation		
		≤ / >	MIC-value (µg/ml)	S / R
Salmonella EURL S-15.X	Cefepime, FEP			
	Cefotaxime, FOT			
	Cefotaxime + clavulanic acid (F/C)			
	Cefoxitin, FOX			
	Ceftazidime, TAZ			
	Ceftazidime+ clavulanic acid (T/C)			
	Ertapenem, ETP			
	Imipenem, IMI			
	Meropenem, MERO			
	Temocillin, TRM			

Interpretation of PANEL 2 results:

☐ ESBL-phenotype
☐ ESBL+AmpC-phenotype
☐ AmpC-phenotype
☐ Carbapenemase-phenotype
☐ Other phenotype
☐ Susceptible (to panel 2 antimicrobials)

Comments:

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TEST FORM

AST of reference strain *E. coli* ATCC 25922

	Antimicrobial	MIC-value (µg/ml)
1st panel	Ampicillin, AMP	
	Azithromycin, AZI	
	Cefotaxime, FOT	
	Ceftazidime, TAZ	
	Chloramphenicol, CHL	
	Ciprofloxacin, CIP	
	Colistin, COL	
	Gentamicin, GEN	
	Meropenem, MERO	
	Nalidixic acid, NAL	
	Sulfamethoxazole, SMX*	
	Tetracycline, TET	
	Tigecycline, TGC	
	Trimethoprim, TMP	
2nd panel	Cefepime, FEP	
	Cefotaxime, FOT	
	Cefotaxime + clavulanic acid (F/C)	
	Cefoxitin, FOX	
	Ceftazidime, TAZ	
	Ceftazidime+ clavulanic acid (T/C)	
	Ertapenem, ETP	
	Imipenem, IMI	
	Meropenem, MERO	
	Temocillin, TRM	

* for the testing of the *E. coli* ATCC25922 reference strain, sulfamethoxazole and sulfisoxazole, are regarded as comparable, i.e. the obtained MIC-value from the testing of sulfamethoxazole will be evaluated against the acceptance range listed in CLSI M100 for sulfisoxazole (CLSI M100, Table 3).

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AST of reference strain *Acinetobacter baumannii* (2012-70-100-69)

	Antimicrobial	MIC-value (µg/ml)
1st panel	Ampicillin, AMP	
	Azithromycin, AZI	
	Cefotaxime, FOT	
	Ceftazidime, TAZ	
	Chloramphenicol, CHL	
	Ciprofloxacin, CIP	
	Colistin, COL	
	Gentamicin, GEN	
	Meropenem, MERO	
	Nalidixic acid, NAL	
	Sulfamethoxazole, SMX*	
	Tetracycline, TET	
	Tigecycline, TGC	
	Trimethoprim, TMP	
2nd panel	Cefepime, FEP	
	Cefotaxime, FOT	
	Cefotaxime + clavulanic acid (F/C)	
	Cefoxitin, FOX	
	Ceftazidime, TAZ	
	Ceftazidime+ clavulanic acid (T/C)	
	Ertapenem, ETP	
	Imipenem, IMI	
	Meropenem, MERO	
	Temocillin, TRM	

* Sulfamethoxazole and sulfisoxazole, are regarded as comparable, i.e. the obtained MIC-value from the testing of sulfamethoxazole will be evaluated against the acceptance range listed in CLSI M100 for sulfisoxazole (CLSI M100, Table 3).

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TEST FORM

Strain	Antimicrobial	Interpretation	
		MIC-value (µg/ml)	S / R
Campylobacter EURL C-15.1 ☐ *C. jejuni* ☐ *C. coli*	Ciprofloxacin		
	Erythromycin		
	Gentamicin		
	Nalidixic acid		
	Streptomycin		
	Tetracycline		
Campylobacter EURL C-15.2 ☐ *C. jejuni* ☐ *C. coli*	Ciprofloxacin		
	Erythromycin		
	Gentamicin		
	Nalidixic acid		
	Streptomycin		
	Tetracycline		
Campylobacter EURL C-15.3 ☐ *C. jejuni* ☐ *C. coli*	Ciprofloxacin		
	Erythromycin		
	Gentamicin		
	Nalidixic acid		
	Streptomycin		
	Tetracycline		
Campylobacter EURL C-15.X ☐ *C. jejuni* ☐ *C. coli*	Ciprofloxacin		
	Erythromycin		
	Gentamicin		
	Nalidixic acid		
	Streptomycin		
	Tetracycline		

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TEST FORM

Susceptibility testing of *Campylobacter jejuni* reference strain ATCC 33560

Strain	Antimicrobial	MIC-value (µg/ml)	
		36 °C/48 hours	42 °C/24 hours
C. jejuni ATCC 33560	Ciprofloxacin		
	Erythromycin		
	Gentamicin		
	Nalidixic acid		
	Streptomycin		
	Tetracycline		

Susceptibility testing of *Campylobacter coli* reference strain (2012-70-443-2)

Strain	Antimicrobial	MIC-value (µg/ml)
C. coli (2012-70-443-2)	Ciprofloxacin	
	Erythromycin	
	Gentamicin	
	Nalidixic acid	
	Streptomycin	
	Tetracycline	

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INSTRUCTIONS FOR OPENING AND REVIVING LYOPHILISED CULTURES

Instructions adjusted from Czech Collection of Microorganisms (CCM) document 'Instructions for Opening and Reviving of Freeze-Dried Bacteria and Fungi' available on http://www.sci.muni.cz.

Lyophilised cultures are supplied in vacuum-sealed ampoules. Care should be taken in opening the ampoule. All instructions given below should be followed closely to ensure the safety of the person who opens the ampoule and to prevent contamination of the culture.

a. Check the number of the culture on the label inside the ampoule
b. Make a file cut on the ampoule near the middle of the plug (see Figure 1)
c. Disinfect the ampoule with alcohol-dampened gauze or alcohol-dampened cotton wool from just below the plug to the pointed end
d. Apply a red-hot glass rod to the file cut to crack the glass and allow air to enter slowly into the ampoule
e. Remove the pointed end of the ampoule into disinfectant
f. Add about 0.3 ml appropriate broth to the dried suspension using a sterile Pasteur pipette and mix carefully to avoid creating aerosols. Transfer the contents to one or more suitable solid and /or liquid media
g. Incubate the inoculated medium at appropriate conditions for several days
h. Autoclave or disinfect effectively the used Pasteur pipette, the plug and all the remains of the original ampoule before discarding

Notes:

- Cultures should be grown on media and under conditions as recommended in the CCM catalogue (see http://www.sci.muni.cz)
- Cultures may need at least one subculturing before they can be optimally used in experiments
- Unopened ampoules should be kept in a dark and cool place!

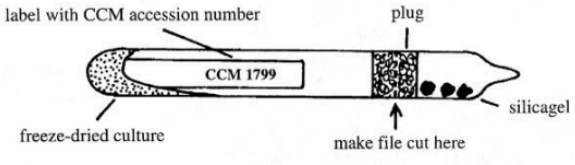

Figure 1: from CCM document 'Instructions for Opening and Reviving of Freeze-Dried Bacteria and Fungi' available on http://www.sci.muni.cz

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SUBCULTURE AND MAINTENANCE OF QUALITY CONTROL STRAINS

1 PURPOSE AND REFERENCES

Improper storage and repeated subculturing of bacteria can produce alterations in antimicrobial susceptibility test results. The Clinical and Laboratory Standards Institute (CLSI) has published guidelines for Quality Control (QC) stock culture maintenance to ensure consistent antimicrobial susceptibility test (AST) results.

The following can be regarded as a summary of information that should be followed for subculturing and maintaining QC-strains when performing AST by broth dilution methods. For full information related to this subject, the following standards are relevant: M100 (Performance Standards for Antimicrobial Susceptibility Testing) and M7 (Methods for Dilution Antimicrobial Susceptibility Test for Bacteria That Grow Aerobically; Approved Standard).

2 DEFINITION OF TERMS

Reference Culture: A reference culture is a microorganism preparation that is acquired from a culture type collection.

Reference Stock Culture: A reference stock culture is a microorganism preparation that is derived from a reference culture. Guidelines and standards outline how reference stock cultures must be processed and stored.

Working Stock Cultures: A working stock culture is growth derived from a reference stock culture. Guidelines and standards outline how working stock cultures must be processed and how often they can be subcultured.

Subcultures (Passages): A subculture is simply the transfer of established microorganism growth on media to fresh media. The subsequent growth on the fresh media constitutes a subculture or passage. Growing a reference culture or reference stock culture from its preserved status (frozen or lyophilized) is not a subculture. The preserved microorganism is not in a stage of established growth until it is thawed or hydrated and grown for the first time.

3 IMPORTANT CONSIDERATIONS

- Do not use disc diffusion strains for MIC determination.
- Obtain QC strains from a reliable source such as ATCC.
- CLSI requires that QC be performed either on the same day or weekly (after QC-validation).
- Any changes in materials or procedure must be validated with QC before implemented
- For example: Agar and broth methods may give different QC ranges for drugs such as glycopeptides, aminoglycosides and macrolides.

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- Periodically perform colony counts to check the inoculum preparation procedure.
- Ideally, test values should be in the middle of the acceptable range.
- Graphing QC data points over time can help identify changes in data helpful for troubleshooting problems.

4 STORAGE OF REFERENCE STRAINS

Preparation of stock cultures

- Use a suitable stabilizer such as 50% fetal calf serum in broth, 10-15% glycerol in tryptic soy broth, defibrinated sheep blood or skim milk to prepare multiple aliquots.
- Store at -20°C, -70°C or liquid nitrogen (alternatively, freeze dry.)
- Before using rejuvenated strains for QC, subculture to check for purity and viability.

Working cultures

- Set up on agar slants with appropriate medium, store at 4-8°C and subculture weekly.
- Replace the working strain with a stock culture at least monthly.
- If a change in the organisms inherent susceptibility occurs, obtain a fresh stock culture or a new strain from a reference culture collection e.g. ATCC.

5 FREQUENCY OF TESTING

Weekly vs. daily testing

Weekly testing is possible if the laboratory can demonstrate satisfactory performance with daily testing according to the descriptions in the CLSI guidelines.

- Documentation showing reference strain results from 20 or 30 consecutive test days were within the acceptable range.
- For each antimicrobial/organism combination, no more one out of 20 or three out of 30 MIC values may be outside the acceptable range.

When the above are fulfilled, each quality control strain may be tested once a week and whenever any reagent component is changed.

Corrective Actions

If an MIC is outside the range in weekly testing, corrective action is required as follows:

- Repeat the test if there is an obvious error e.g. wrong strain or incubation conditions used
- If there is no obvious error, return to daily control testing

If five acceptable QC results are available, no additional days of QC-testing are needed.

If the problem cannot be resolved, continue daily testing until the errors are identified.

Repeat the 30 days validation before resuming weekly testing.

Quality Control ranges for ATCC reference strains

E. coli ATCC 25922	
Antimicrobial	**MIC**
Ampicillin, AMP	2-8
Azithromycin, AZI	none
Cefepime, FEP	0.016-0.12
Cefotaxime, FOT	0.03-0.12
Cefotaxime + clavulanic acid, F/C	none
Cefoxitin, FOX	2-8
Ceftazidime, TAZ	0.06-0.5
Ceftazidime + clavulanic acid, T/C	none
Chloramphenicol, CHL	2-8
Ciprofloxacin, CIP	0.004-0.016
Colistin, COL	0.25-2
Ertapenem, ETP	0.004-0.016
Gentamicin, GEN	0.25-1
Imipenem, IMI	0.06-0.25
Meropenem, MERO	0.008-0.06
Nalidixic acid, NAL	1-4
Sulfamethoxazole, SMX	8-32
Temocillin, TRM	none
Tetracycline, TET	0.5-2
Tigecycline, TGC	0.03-0.25
Trimethoprim, TMP	0.5-2

Ranges are according to CLSI M100 29th edition

Campylobacter jejuni ATCC 33560				
Antimicrobial	**Microbroth (36-37°C/48h)**	**Microbroth (42°C/24h)**	**Agar dilution (36-37°C/48h)**	**Agar dilution (42°C/24h)**
Ciprofloxacin, CIP	0.06-0.25	0.03-0.12	0.12-1	0.06-0.5
Erythromycin, ERY	0.5-2	0.25-2	1-8	1-4
Gentamicin, GEN	0.5-2	0.25-2	0.5-2	0.5-4
Nalidixic acid, NAL	4-16	4-16	None	None
Tetracycline, TET	0.25-2	0.25-1	None	None

Ranges are according to CLSI (VET06, 1st ed.)

Test results from the reference strain *E. coli* ATCC 25922 obtained by microbroth dilution, *E. coli* trial

Lab no.	Panel	Antimicrobial	Operator	Value	Low limit	High limit	Mark
2	1	Ampicillin	=	8	2	8	1
2	1	Cefotaxime	<=	0.25	0.03	0.125	1
2	1	Ceftazidime	<=	0.5	0.06	0.5	1
2	1	Chloramphenicol	<=	8	2	8	1
2	1	Ciprofloxacin	<=	0.015	0.004	0.016	1
2	1	Colistin	=	2	0.25	2	1
2	1	Gentamicin	=	1	0.25	1	1
2	1	Meropenem	<=	0.03	0.008	0.06	1
2	1	Nalidixic acid	<=	4	1	4	1
2	1	Sulfamethoxazole	=	32	8	32	1
2	1	Tetracycline	<=	2	0.5	2	1
2	1	Tigecycline	<=	0.25	0.03	0.25	1
2	1	Trimethoprim	=	1	0.5	2	1
2	2	Cefepime	<=	0.06	0.016	0.125	1
2	2	Cefotaxime	<=	0.25	0.03	0.125	1
2	2	Cefoxitin	=	4	2	8	1
2	2	Ceftazidime	<=	0.25	0.06	0.5	1
2	2	Ertapenem	<=	0.015	0.004	0.016	1
2	2	Imipenem	=	0.25	0.06	0.25	1
2	2	Meropenem	<=	0.03	0.008	0.06	1
4	1	Ampicillin	=	4	2	8	1
4	1	Cefotaxime	<=	0.25	0.03	0.125	1
4	1	Ceftazidime	<=	0.5	0.06	0.5	1
4	1	Chloramphenicol	<=	8	2	8	1
4	1	Ciprofloxacin	<=	0.015	0.004	0.016	1
4	1	Colistin	<=	1	0.25	2	1
4	1	Gentamicin	<=	0.5	0.25	1	1
4	1	Meropenem	<=	0.03	0.008	0.06	1
4	1	Nalidixic acid	<=	4	1	4	1
4	1	Sulfamethoxazole	=	32	8	32	1
4	1	Tetracycline	<=	2	0.5	2	1
4	1	Tigecycline	<=	0.25	0.03	0.25	1
4	1	Trimethoprim	=	0.5	0.5	2	1
4	2	Cefepime	<=	0.06	0.016	0.125	1
4	2	Cefotaxime	<=	0.25	0.03	0.125	1
4	2	Cefoxitin	=	2	2	8	1
4	2	Ceftazidime	<=	0.25	0.06	0.5	1
4	2	Ertapenem	<=	0.015	0.004	0.016	1
4	2	Imipenem	<=	0.12	0.06	0.25	1
4	2	Meropenem	<=	0.03	0.008	0.06	1
6	1	Ampicillin	=	8	2	8	1
6	1	Cefotaxime	<=	0.25	0.03	0.125	1
6	1	Ceftazidime	<=	0.5	0.06	0.5	1
6	1	Chloramphenicol	<=	8	2	8	1
6	1	Ciprofloxacin	<=	0.015	0.004	0.016	1
6	1	Colistin	<=	1	0.25	2	1
6	1	Gentamicin	<=	0.5	0.25	1	1
6	1	Meropenem	<=	0.03	0.008	0.06	1
6	1	Nalidixic acid	<=	4	1	4	1
6	1	Sulfamethoxazole	=	32	8	32	1
6	1	Tetracycline	<=	2	0.5	2	1
6	1	Tigecycline	<=	0.25	0.03	0.25	1
6	1	Trimethoprim	=	0.5	0.5	2	1
6	2	Cefepime	=	0.12	0.016	0.125	1
6	2	Cefotaxime	<=	0.25	0.03	0.125	1
6	2	Cefoxitin	=	4	2	8	1
6	2	Ceftazidime	<=	0.25	0.06	0.5	1
6	2	Ertapenem	<=	0.015	0.004	0.016	1
6	2	Imipenem	=	0.25	0.06	0.25	1
6	2	Meropenem	<=	0.03	0.008	0.06	1
9	1	Ampicillin	=	4	2	8	1
9	1	Cefotaxime	<=	0.25	0.03	0.125	1
9	1	Ceftazidime	<=	0.5	0.06	0.5	1
9	1	Chloramphenicol	<=	8	2	8	1
9	1	Ciprofloxacin	<=	0.015	0.004	0.016	1
9	1	Colistin	<=	1	0.25	2	1
9	1	Gentamicin	<=	0.5	0.25	1	1
9	1	Meropenem	<=	0.03	0.008	0.06	1
9	1	Nalidixic acid	<=	4	1	4	1
9	1	Sulfamethoxazole	=	16	8	32	1
9	1	Tetracycline	<=	2	0.5	2	1
9	1	Tigecycline	<=	0.25	0.03	0.25	1

Lab no.	Panel	Antimicrobial	Operator	Value	Low limit	High limit	Mark
9	1	Trimethoprim	=	0.5	0.5	2	1
9	2	Cefepime	<=	0.06	0.016	0.125	1
9	2	Cefotaxime	<=	0.25	0.03	0.125	1
9	2	Cefoxitin	=	2	2	8	1
9	2	Ceftazidime	<=	0.25	0.06	0.5	1
9	2	Ertapenem	<=	0.015	0.004	0.016	1
9	2	Imipenem	<=	0.12	0.06	0.25	1
9	2	Meropenem	<=	0.03	0.008	0.06	1
11	1	Ampicillin	=	4	2	8	1
11	1	Cefotaxime	<=	0.25	0.03	0.125	1
11	1	Ceftazidime	<=	0.5	0.06	0.5	1
11	1	Chloramphenicol	<=	8	2	8	1
11	1	Ciprofloxacin	<=	0.015	0.004	0.016	1
11	1	Colistin	<=	1	0.25	2	1
11	1	Gentamicin	<=	0.5	0.25	1	1
11	1	Meropenem	<=	0.03	0.008	0.06	1
11	1	Nalidixic acid	<=	4	1	4	1
11	1	Sulfamethoxazole	=	32	8	32	1
11	1	Tetracycline	<=	2	0.5	2	1
11	1	Tigecycline	<=	0.25	0.03	0.25	1
11	1	Trimethoprim	=	0.5	0.5	2	1
11	2	Cefepime	<=	0.06	0.016	0.125	1
11	2	Cefotaxime	<=	0.25	0.03	0.125	1
11	2	Cefoxitin	=	2	2	8	1
11	2	Ceftazidime	<=	0.25	0.06	0.5	1
11	2	Ertapenem	<=	0.012	0.004	0.016	1
11	2	Imipenem	=	0.25	0.06	0.25	1
11	2	Meropenem	<=	0.03	0.008	0.06	**1**
12	1	Ampicillin	=	4	2	8	1
12	1	Cefotaxime	<=	0.25	0.03	0.125	1
12	1	Ceftazidime	<=	0.5	0.06	0.5	1
12	1	Chloramphenicol	<=	8	2	8	1
12	1	Ciprofloxacin	<=	0.015	0.004	0.016	1
12	1	Colistin	=	2	0.25	2	1
12	1	Gentamicin	<=	0.5	0.25	1	1
12	1	Meropenem	<=	0.03	0.008	0.06	1
12	1	Nalidixic acid	<=	4	1	4	1
12	1	Sulfamethoxazole	=	32	8	32	1
12	1	Tetracycline	<=	2	0.5	2	1
12	1	Tigecycline	<=	0.25	0.03	0.25	1
12	1	Trimethoprim	=	0.5	0.5	2	1
12	2	Cefepime	<=	0.06	0.016	0.125	1
12	2	Cefotaxime	<=	0.25	0.03	0.125	1
12	2	Cefoxitin	=	4	2	8	1
12	2	Ceftazidime	<=	0.25	0.06	0.5	1
12	2	Ertapenem	<=	0.015	0.004	0.016	1
12	2	Imipenem	<=	0.12	0.06	0.25	1
12	2	Meropenem	<=	0.03	0.008	0.06	1
16	1	Ampicillin	=	4	2	8	1
16	1	Cefotaxime	<=	0.25	0.03	0.125	1
16	1	Ceftazidime	<=	0.5	0.06	0.5	1
16	1	Chloramphenicol	<=	8	2	8	1
16	1	Ciprofloxacin	<=	0.015	0.004	0.016	1
16	1	Colistin	<=	1	0.25	2	1
16	1	Gentamicin	<=	0.5	0.25	1	1
16	1	Meropenem	<=	0.03	0.008	0.06	1
16	1	Nalidixic acid	<=	4	1	4	1
16	1	Sulfamethoxazole	<=	8	8	32	1
16	1	Tetracycline	<=	2	0.5	2	1
16	1	Tigecycline	<=	0.25	0.03	0.25	1
16	1	Trimethoprim	=	0.5	0.5	2	1
16	2	Cefepime	=	0.12	0.016	0.125	1
16	2	Cefotaxime	<=	0.25	0.03	0.125	1
16	2	Cefoxitin	=	2	2	8	1
16	2	Ceftazidime	<=	0.25	0.06	0.5	1
16	2	Ertapenem	<=	0.015	0.004	0.016	**1**
16	2	Imipenem	=	0.25	0.06	0.25	1
16	2	Meropenem	<=	0.03	0.008	0.06	1
17	1	Ampicillin	=	8	2	8	1
17	1	Cefotaxime	<=	0.25	0.03	0.125	1
17	1	Ceftazidime	<=	0.5	0.06	0.5	**1**
17	1	Chloramphenicol	<=	8	2	8	1
17	1	Ciprofloxacin	<=	0.015	0.004	0.016	1

Lab no.	Panel	Antimicrobial	Operator	Value	Low limit	High limit	Mark
17	1	Colistin	<=	1	0.25	2	1
17	1	Gentamicin	<=	0.5	0.25	1	1
17	1	Meropenem	<=	0.03	0.008	0.06	1
17	1	Nalidixic acid	<=	4	1	4	1
17	1	Sulfamethoxazole	<=	8	8	32	1
17	1	Tetracycline	<=	2	0.5	2	1
17	1	Tigecycline	<=	0.25	0.03	0.25	1
17	1	Trimethoprim	=	0.5	0.5	2	1
17	2	Cefepime	<=	0.06	0.016	0.125	1
17	2	Cefotaxime	<=	0.25	0.03	0.125	1
17	2	Cefoxitin	=	2	2	8	1
17	2	Ceftazidime	=	0.5	0.06	0.5	1
17	2	Ertapenem	<=	0.015	0.004	0.016	1
17	2	Imipenem	=	0.25	0.06	0.25	1
17	2	Meropenem	<=	0.03	0.008	0.06	1
18	1	Ampicillin	=	4	2	8	1
18	1	Cefotaxime	<=	0.25	0.03	0.125	1
18	1	Ceftazidime	<=	0.5	0.06	0.5	1
18	1	Chloramphenicol	<=	8	2	8	1
18	1	Ciprofloxacin	<=	0.015	0.004	0.016	1
18	1	Colistin	<=	1	0.25	2	1
18	1	Gentamicin	<=	0.5	0.25	1	1
18	1	Meropenem	<=	0.03	0.008	0.06	1
18	1	Nalidixic acid	<=	4	1	4	1
18	1	Sulfamethoxazole	=	16	8	32	1
18	1	Tetracycline	<=	2	0.5	2	1
18	1	Tigecycline	<=	0.25	0.03	0.25	1
18	1	Trimethoprim	=	1	0.5	2	1
18	2	Cefepime	<=	0.06	0.016	0.125	1
18	2	Cefotaxime	<=	0.25	0.03	0.125	1
18	2	Cefoxitin	=	4	2	8	1
18	2	Ceftazidime	=	0.5	0.06	0.5	1
18	2	Ertapenem	<=	0.015	0.004	0.016	1
18	2	Imipenem	<=	0.12	0.06	0.25	1
18	2	Meropenem	=	0.06	0.008	0.06	1
19	1	Ampicillin	=	4	2	8	1
19	1	Cefotaxime	<=	0.25	0.03	0.125	1
19	1	Ceftazidime	<=	0.5	0.06	0.5	1
19	1	Chloramphenicol	<=	8	2	8	1
19	1	Ciprofloxacin	<=	0.015	0.004	0.016	1
19	1	Colistin	<=	1	0.25	2	1
19	1	Gentamicin	<=	0.5	0.25	1	1
19	1	Meropenem	<=	0.03	0.008	0.06	1
19	1	Nalidixic acid	<=	4	1	4	1
19	1	Sulfamethoxazole	=	16	8	32	1
19	1	Tetracycline	<=	2	0.5	2	1
19	1	Tigecycline	<=	0.25	0.03	0.25	1
19	1	Trimethoprim	=	0.5	0.5	2	1
19	2	Cefepime	<=	0.06	0.016	0.125	1
19	2	Cefotaxime	<=	0.25	0.03	0.125	1
19	2	Cefoxitin	=	4	2	8	1
19	2	Ceftazidime	<=	0.25	0.06	0.5	1
19	2	Ertapenem	<=	0.015	0.004	0.016	1
19	2	Imipenem	<=	0.12	0.06	0.25	1

Lab no.	Panel	Antimicrobial	Operator	Value	Low limit	High limit	Mark
19	2	Meropenem	<=	0.03	0.008	0.06	1
20	1	Ampicillin	=	4	2	8	1
20	1	Cefotaxime	<=	0.25	0.03	0.125	1
20	1	Ceftazidime	<=	0.5	0.06	0.5	1
20	1	Chloramphenicol	<=	8	2	8	1
20	1	Ciprofloxacin	<=	0.015	0.004	0.016	1
20	1	Colistin	<=	1	0.25	2	1
20	1	Gentamicin	<=	0.5	0.25	1	1
20	1	Meropenem	<=	0.03	0.008	0.06	1
20	1	Nalidixic acid	<=	4	1	4	1
20	1	Sulfamethoxazole	<=	8	8	32	1
20	1	Tetracycline	<=	2	0.5	2	1
20	1	Tigecycline	<=	0.25	0.03	0.25	1
20	1	Trimethoprim	=	0.5	0.5	2	1
20	2	Cefepime	<=	0.06	0.016	0.125	1
20	2	Cefotaxime	<=	0.25	0.03	0.125	1
20	2	Cefoxitin	=	2	2	8	1
20	2	Ceftazidime	<=	0.25	0.06	0.5	1
20	2	Ertapenem	<=	0.015	0.004	0.016	1
20	2	Imipenem	<=	0.12	0.06	0.25	1
20	2	Meropenem	<=	0.03	0.008	0.06	1
21	1	Ampicillin	=	4	2	8	1
21	1	Cefotaxime	<=	0.25	0.03	0.125	1
21	1	Ceftazidime	<=	0.5	0.06	0.5	1
21	1	Chloramphenicol	<=	8	2	8	1
21	1	Ciprofloxacin	<=	0.015	0.004	0.016	1
21	1	Colistin	<=	1	0.25	2	1
21	1	Gentamicin	<=	0.5	0.25	1	**1**
21	1	Meropenem	<=	0.03	0.008	0.06	1
21	1	Nalidixic acid	<=	4	1	4	1
21	1	Sulfamethoxazole	=	16	8	32	1
21	1	Tetracycline	<=	2	0.5	2	1
21	1	Tigecycline	<=	0.25	0.03	0.25	1
21	1	Trimethoprim	=	5	0.5	2	**0**
21	2	Cefepime	<=	0.06	0.016	0.125	1
21	2	Cefotaxime	<=	0.25	0.03	0.125	1
21	2	Cefoxitin	=	4	2	8	1
21	2	Ceftazidime	<=	0.25	0.06	0.5	1
21	2	Ertapenem	<=	0.015	0.004	0.016	1
21	2	Imipenem	=	0.25	0.06	0.25	1
21	2	Meropenem	<=	0.03	0.008	0.06	1
22	1	Ampicillin	=	2	2	8	1
22	1	Cefotaxime	<=	0.25	0.03	0.125	1
22	1	Ceftazidime	<=	0.5	0.06	0.5	1
22	1	Chloramphenicol	<=	8	2	8	1
22	1	Ciprofloxacin	<=	0.015	0.004	0.016	1
22	1	Colistin	<=	1	0.25	2	1
22	1	Gentamicin	<=	0.5	0.25	1	1
22	1	Meropenem	<=	0.03	0.008	0.06	1
22	1	Nalidixic acid	<=	4	1	4	1
22	1	Sulfamethoxazole	=	16	8	32	1
22	1	Tetracycline	<=	2	0.5	2	1
22	1	Tigecycline	<=	0.25	0.03	0.25	1
22	1	Trimethoprim	=	0.5	0.5	2	1
22	2	Cefepime	<=	0.06	0.016	0.125	1
22	2	Cefotaxime	<=	0.25	0.03	0.125	1
22	2	Cefoxitin	=	2	2	8	1
22	2	Ceftazidime	<=	0.25	0.06	0.5	1
22	2	Ertapenem	<=	0.015	0.004	0.016	1
22	2	Imipenem	<=	0.12	0.06	0.25	1
22	2	Meropenem	<=	0.03	0.008	0.06	1
23	1	Ampicillin	=	2	2	8	1
23	1	Cefotaxime	<=	0.25	0.03	0.125	1
23	1	Ceftazidime	<=	0.5	0.06	0.5	1
23	1	Chloramphenicol	<=	8	2	8	1
23	1	Ciprofloxacin	<=	0.015	0.004	0.016	1
23	1	Colistin	<=	1	0.25	2	1
23	1	Gentamicin	<=	0.5	0.25	1	1
23	1	Meropenem	<=	0.03	0.008	0.06	1
23	1	Nalidixic acid	<=	4	1	4	1
23	1	Sulfamethoxazole	=	16	8	32	1
23	1	Tetracycline	<=	2	0.5	2	1
23	1	Tigecycline	<=	0.25	0.03	0.25	1
23	1	Trimethoprim	=	0.5	0.5	2	1

Lab no.	Panel	Antimicrobial	Operator	Value	Low limit	High limit	Mark
23	2	Cefepime	<=	0.06	0.016	0.125	1
23	2	Cefotaxime	<=	0.25	0.03	0.125	1
23	2	Cefoxitin	=	2	2	8	1
23	2	Ceftazidime	<=	0.25	0.06	0.5	1
23	2	Ertapenem	<=	0.015	0.004	0.016	1
23	2	Imipenem	<=	0.12	0.06	0.25	1
23	2	Meropenem	<=	0.03	0.008	0.06	1
25	1	Ampicillin	=	4	2	8	1
25	1	Cefotaxime	<=	0.25	0.03	0.125	1
25	1	Ceftazidime	<=	0.5	0.06	0.5	1
25	1	Chloramphenicol	<=	8	2	8	1
25	1	Ciprofloxacin	<=	0.015	0.004	0.016	1
25	1	Colistin	<=	1	0.25	2	1
25	1	Gentamicin	<=	0.5	0.25	1	1
25	1	Meropenem	<=	0.03	0.008	0.06	1
25	1	Nalidixic acid	<=	4	1	4	1
25	1	Sulfamethoxazole	<=	8	8	32	1
25	1	Tetracycline	<=	2	0.5	2	1
25	1	Tigecycline	<=	0.25	0.03	0.25	1
25	1	Trimethoprim	=	0.5	0.5	2	1
25	2	Cefepime	<=	0.06	0.016	0.125	1
25	2	Cefotaxime	<=	0.25	0.03	0.125	1
25	2	Cefoxitin	=	2	2	8	1
25	2	Ceftazidime	<=	0.25	0.06	0.5	1
25	2	Ertapenem	<=	0.015	0.004	0.016	1
25	2	Imipenem	=	0.5	0.06	0.25	**0**
25	2	Meropenem	<=	0.03	0.008	0.06	1
26	1	Ampicillin	=	4	2	8	1
26	1	Cefotaxime	<=	0.25	0.03	0.125	1
26	1	Ceftazidime	<=	0.5	0.06	0.5	1
26	1	Chloramphenicol	<=	8	2	8	1
26	1	Ciprofloxacin	<=	0.015	0.004	0.016	1
26	1	Colistin	<=	1	0.25	2	1
26	1	Gentamicin	=	1	0.25	1	1
26	1	Meropenem	<=	0.03	0.008	0.06	1
26	1	Nalidixic acid	<=	4	1	4	1
26	1	Sulfamethoxazole	=	16	8	32	1
26	1	Tetracycline	<=	2	0.5	2	1
26	1	Tigecycline	<=	0.25	0.03	0.25	1
26	1	Trimethoprim	=	0.5	0.5	2	1
29	1	Ampicillin	=	8	2	8	1
29	1	Cefotaxime	<=	0.25	0.03	0.125	1
29	1	Ceftazidime	<=	0.5	0.06	0.5	1
29	1	Chloramphenicol	=	8	2	8	1
29	1	Ciprofloxacin	<=	0.015	0.004	0.016	1
29	1	Colistin	<=	1	0.25	2	1
29	1	Gentamicin	<=	0.5	0.25	1	1
29	1	Meropenem	<=	0.03	0.008	0.06	1
29	1	Nalidixic acid	<=	4	1	4	1
29	1	Sulfamethoxazole	=	32	8	32	1
29	1	Tetracycline	<=	2	0.5	2	1
29	1	Tigecycline	<=	0.25	0.03	0.25	1
29	1	Trimethoprim	=	0.5	0.5	2	1
29	2	Cefepime	<=	0.06	0.016	0.125	1
29	2	Cefotaxime	<=	0.25	0.03	0.125	1
29	2	Cefoxitin	=	4	2	8	1
29	2	Ceftazidime	<=	0.25	0.06	0.5	1
29	2	Ertapenem	<=	0.015	0.004	0.016	1
29	2	Imipenem	<=	0.12	0.06	0.25	1
29	2	Meropenem	<=	0.03	0.008	0.06	1
30	1	Ampicillin	=	4	2	8	1
30	1	Cefotaxime	<=	0.25	0.03	0.125	1
30	1	Ceftazidime	<=	0.5	0.06	0.5	1
30	1	Chloramphenicol	<=	8	2	8	1
30	1	Ciprofloxacin	<=	0.015	0.004	0.016	1
30	1	Colistin	<=	1	0.25	2	1
30	1	Gentamicin	<=	0.5	0.25	1	1

Lab no.	Panel	Antimicrobial	Operator	Value	Low limit	High limit	Mark
30	1	Meropenem	<=	0.03	0.008	0.06	1
30	1	Nalidixic acid	<=	4	1	4	1
30	1	Sulfamethoxazole	=	16	8	32	1
30	1	Tetracycline	<=	2	0.5	2	1
30	1	Tigecycline	<=	0.25	0.03	0.25	1
30	1	Trimethoprim	=	0.5	0.5	2	1
30	2	Cefepime	=	0.12	0.016	0.125	1
30	2	Cefotaxime	<=	0.25	0.03	0.125	1
30	2	Cefoxitin	=	2	2	8	1
30	2	Ceftazidime	=	0.5	0.06	0.5	1
30	2	Ertapenem	<=	0.015	0.004	0.016	1
30	2	Imipenem	=	0.25	0.06	0.25	1
30	2	Meropenem	<=	0.03	0.008	0.06	1
33	1	Ampicillin	=	4	2	8	1
33	1	Cefotaxime	<=	0.25	0.03	0.125	1
33	1	Ceftazidime	<=	0.5	0.06	0.5	1
33	1	Chloramphenicol	<=	8	2	8	1
33	1	Ciprofloxacin	<=	0.015	0.004	0.016	1
33	1	Colistin	<=	1	0.25	2	1
33	1	Gentamicin	<=	0.5	0.25	1	1
33	1	Meropenem	<=	0.03	0.008	0.06	1
33	1	Nalidixic acid	<=	4	1	4	1
33	1	Sulfamethoxazole	=	16	8	32	1
33	1	Tetracycline	<=	2	0.5	2	1
33	1	Tigecycline	<=	0.25	0.03	0.25	1
33	1	Trimethoprim	=	0.5	0.5	2	1
33	2	Cefepime	<=	0.06	0.016	0.125	1
33	2	Cefotaxime	<=	0.25	0.03	0.125	1
33	2	Cefoxitin	=	8	2	8	1
33	2	Ceftazidime	<=	0.25	0.06	0.5	1
33	2	Ertapenem	<=	0.015	0.004	0.016	1
33	2	Imipenem	<=	0.12	0.06	0.25	1
33	2	Meropenem	<=	0.03	0.008	0.06	1
34	1	Ampicillin	=	2	2	8	1
34	1	Cefotaxime	<=	0.25	0.03	0.125	1
34	1	Ceftazidime	<=	0.5	0.06	0.5	1
34	1	Chloramphenicol	<=	8	2	8	1
34	1	Ciprofloxacin	<=	0.015	0.004	0.016	1
34	1	Colistin	<=	1	0.25	2	1
34	1	Gentamicin	<=	0.5	0.25	1	1
34	1	Meropenem	<=	0.03	0.008	0.06	1
34	1	Nalidixic acid	<=	4	1	4	1
34	1	Sulfamethoxazole	=	16	8	32	1
34	1	Tetracycline	<=	2	0.5	2	1
34	1	Tigecycline	<=	0.25	0.03	0.25	1
34	1	Trimethoprim	=	0.5	0.5	2	1
34	2	Cefepime	<=	0.06	0.016	0.125	1
34	2	Cefotaxime	<=	0.25	0.03	0.125	1
34	2	Cefoxitin	=	2	2	8	1
34	2	Ceftazidime	<=	0.25	0.06	0.5	1
34	2	Ertapenem	<=	0.015	0.004	0.016	1
34	2	Imipenem	<=	0.12	0.06	0.25	1
34	2	Meropenem	<=	0.03	0.008	0.06	1
36	1	Ampicillin	=	4	2	8	1
36	1	Cefotaxime	<=	0.25	0.03	0.125	1
36	1	Ceftazidime	<=	0.5	0.06	0.5	1
36	1	Chloramphenicol	<=	8	2	8	1
36	1	Ciprofloxacin	<=	0.015	0.004	0.016	1
36	1	Colistin	<=	1	0.25	2	1
36	1	Gentamicin	<=	0.5	0.25	1	1
36	1	Meropenem	<=	0.03	0.008	0.06	1
36	1	Nalidixic acid	<=	4	1	4	1
36	1	Sulfamethoxazole	<=	8	8	32	1
36	1	Tetracycline	<=	2	0.5	2	1
36	1	Tigecycline	<=	0.25	0.03	0.25	1
36	1	Trimethoprim	=	0.5	0.5	2	1
36	2	Cefepime	<=	0.06	0.016	0.125	1

Lab no.	Panel	Antimicrobial	Operator	Value	Low limit	High limit	Mark
36	2	Cefotaxime	<=	0.25	0.03	0.125	1
36	2	Cefoxitin	=	4	2	8	1
36	2	Ceftazidime	=	0.5	0.06	0.5	1
36	2	Ertapenem	<=	0.015	0.004	0.016	1
36	2	Imipenem	<=	0.12	0.06	0.25	1
36	2	Meropenem	<=	0.03	0.008	0.06	1
37	1	Ampicillin	=	4	2	8	1
37	1	Cefotaxime	<=	0.25	0.03	0.125	1
37	1	Ceftazidime	<=	0.5	0.06	0.5	1
37	1	Chloramphenicol	<=	8	2	8	1
37	1	Ciprofloxacin	<=	0.015	0.004	0.016	1
37	1	Colistin	<=	1	0.25	2	1
37	1	Gentamicin	=	1	0.25	1	1
37	1	Meropenem	<=	0.03	0.008	0.06	1
37	1	Nalidixic acid	<=	4	1	4	1
37	1	Sulfamethoxazole	=	16	8	32	1
37	1	Tetracycline	<=	2	0.5	2	1
37	1	Tigecycline	<=	0.25	0.03	0.25	1
37	1	Trimethoprim	=	1	0.5	2	1
37	2	Cefepime	=		0.016	0.125	
37	2	Cefotaxime	=		0.03	0.125	
37	2	Cefoxitin	=		2	8	
37	2	Ceftazidime	=		0.06	0.5	
37	2	Ertapenem	=		0.004	0.016	
37	2	Imipenem	=		0.06	0.25	
37	2	Meropenem	=		0.008	0.06	
38	1	Ampicillin	=	8	2	8	1
38	1	Cefotaxime	<=	0.25	0.03	0.125	1
38	1	Ceftazidime	<=	0.5	0.06	0.5	1
38	1	Chloramphenicol	<=	8	2	8	1
38	1	Ciprofloxacin	<=	0.015	0.004	0.016	1
38	1	Colistin	=	2	0.25	2	1
38	1	Gentamicin	<=	0.5	0.25	1	1
38	1	Meropenem	<=	0.03	0.008	0.06	1
38	1	Nalidixic acid	<=	4	1	4	1
38	1	Sulfamethoxazole	=	16	8	32	1
38	1	Tetracycline	<=	2	0.5	2	1
38	1	Tigecycline	<=	0.25	0.03	0.25	1
38	1	Trimethoprim	=	0.5	0.5	2	1
38	2	Cefepime	<=	0.06	0.016	0.125	1
38	2	Cefotaxime	<=	0.25	0.03	0.125	1
38	2	Cefoxitin	=	4	2	8	1
38	2	Ceftazidime	<=	0.25	0.06	0.5	1
38	2	Ertapenem	<=	0.015	0.004	0.016	1
38	2	Imipenem	=	0.25	0.06	0.25	1
38	2	Meropenem	<=	0.03	0.008	0.06	1
39	1	Ampicillin	=	4	2	8	1
39	1	Cefotaxime	<=	0.25	0.03	0.125	1
39	1	Ceftazidime	<=	0.5	0.06	0.5	1
39	1	Chloramphenicol	<=	8	2	8	1
39	1	Ciprofloxacin	<=	0.015	0.004	0.016	1
39	1	Colistin	<=	1	0.25	2	1
39	1	Gentamicin	<=	0.5	0.25	1	1
39	1	Meropenem	<=	0.03	0.008	0.06	1
39	1	Nalidixic acid	<=	4	1	4	1
39	1	Sulfamethoxazole	=	32	8	32	1
39	1	Tetracycline	<=	2	0.5	2	1
39	1	Tigecycline	<=	0.25	0.03	0.25	1
39	1	Trimethoprim	=	1	0.5	2	1
39	2	Cefepime	<=	0.06	0.016	0.125	1
39	2	Cefotaxime	<=	0.25	0.03	0.125	1
39	2	Cefoxitin	=	4	2	8	1
39	2	Ceftazidime	=	0.5	0.06	0.5	1
39	2	Ertapenem	<=	0.015	0.004	0.016	1
39	2	Imipenem	=	0.25	0.06	0.25	1
39	2	Meropenem	<=	0.03	0.008	0.06	1
40	1	Ampicillin	=	2	2	8	1
40	1	Cefotaxime	=	0.12	0.03	0.125	1
40	1	Ceftazidime	=	0.5	0.06	0.5	1
40	1	Chloramphenicol	=	8	2	8	1
40	1	Ciprofloxacin	=	0.015	0.004	0.016	1
40	1	Colistin	=	1	0.25	2	1
40	1	Gentamicin	=	0.5	0.25	1	1
40	1	Meropenem	=	0.03	0.008	0.06	1
40	1	Nalidixic acid	=	4	1	4	1
40	1	Sulfamethoxazole	=	16	8	32	1
40	1	Tetracycline	=	2	0.5	2	1
40	1	Tigecycline	=	0.25	0.03	0.25	1
40	1	Trimethoprim	=	0.5	0.5	2	1
40	2	Cefepime	=	0.06	0.016	0.125	1
40	2	Cefotaxime	=	0.12	0.03	0.125	1

Lab no.	Panel	Antimicrobial	Operator	Value	Low limit	High limit	Mark
40	2	Cefoxitin	=	4	2	8	1
40	2	Ceftazidime	=	0.5	0.06	0.5	1
40	2	Ertapenem	=	0.015	0.004	0.016	1
40	2	Imipenem	=	0.25	0.06	0.25	1
40	2	Meropenem	=	0.03	0.008	0.06	1
41	1	Ampicillin	=	2	2	8	1
41	1	Cefotaxime	<=	0.25	0.03	0.125	1
41	1	Ceftazidime	<=	0.5	0.06	0.5	1
41	1	Chloramphenicol	<=	8	2	8	1
41	1	Ciprofloxacin	<=	0.015	0.004	0.016	1
41	1	Colistin	<=	1	0.25	2	1
41	1	Gentamicin	=	1	0.25	1	1
41	1	Meropenem	<=	0.03	0.008	0.06	1
41	1	Nalidixic acid	<=	4	1	4	1
41	1	Sulfamethoxazole	=	16	8	32	1
41	1	Tetracycline	<=	2	0.5	2	1
41	1	Tigecycline	<=	0.25	0.03	0.25	1
41	1	Trimethoprim	<=	0.5	0.5	2	1
41	2	Cefepime	<=	0.06	0.016	0.125	1
41	2	Cefotaxime	<=	0.25	0.03	0.125	1
41	2	Cefoxitin	=	2	2	8	1
41	2	Ceftazidime	<=	0.5	0.06	0.5	1
41	2	Ertapenem	<=	0.015	0.004	0.016	1
41	2	Imipenem	<=	0.12	0.06	0.25	1
41	2	Meropenem	<=	0.03	0.008	0.06	1
45	1	Ampicillin	=	4	2	8	1
45	1	Cefotaxime	<=	0.25	0.03	0.125	1
45	1	Ceftazidime	<=	0.5	0.06	0.5	1
45	1	Chloramphenicol	<=	8	2	8	**1**
45	1	Ciprofloxacin	<=	0.015	0.004	0.016	1
45	1	Colistin	<=	1	0.25	2	1
45	1	Gentamicin	<=	0.5	0.25	1	1
45	1	Meropenem	<=	0.03	0.008	0.06	1
45	1	Nalidixic acid	<=	4	1	4	1
45	1	Sulfamethoxazole	=	16	8	32	1
45	1	Tetracycline	=	2	0.5	2	1
45	1	Tigecycline	<=	0.25	0.03	0.25	1
45	1	Trimethoprim	=	0.5	0.5	2	1
45	2	Cefepime	<=	0.06	0.016	0.125	1
45	2	Cefotaxime	<=	0.25	0.03	0.125	1
45	2	Cefoxitin	=	4	2	8	1
45	2	Ceftazidime	<=	0.25	0.06	0.5	1
45	2	Ertapenem	<=	0.015	0.004	0.016	1
45	2	Imipenem	<=	0.12	0.06	0.25	**1**
45	2	Meropenem	<=	0.03	0.008	0.06	1
56	1	Ampicillin	=	2	2	8	1
56	1	Cefotaxime	<=	0.25	0.03	0.125	1
56	1	Ceftazidime	<=	0.5	0.06	0.5	1
56	1	Chloramphenicol	<=	8	2	8	1
56	1	Ciprofloxacin	<=	0.015	0.004	0.016	1
56	1	Colistin	<=	1	0.25	2	1
56	1	Gentamicin	<=	0.5	0.25	1	1
56	1	Meropenem	<=	0.03	0.008	0.06	1
56	1	Nalidixic acid	<=	4	1	4	1
56	1	Sulfamethoxazole	=	16	8	32	1
56	1	Tetracycline	<=	2	0.5	2	1
56	1	Tigecycline	<=	0.25	0.03	0.25	1
56	1	Trimethoprim	=	0.5	0.5	2	1
56	2	Cefepime	<=	0.06	0.016	0.125	1
56	2	Cefotaxime	<=	0.25	0.03	0.125	1
56	2	Cefoxitin	=	2	2	8	1
56	2	Ceftazidime	<=	0.25	0.06	0.5	1
56	2	Ertapenem	<=	0.015	0.004	0.016	1
56	2	Imipenem	<=	0.12	0.06	0.25	1
56	2	Meropenem	<=	0.03	0.008	0.06	1

Lab no.	Panel	Antimicrobial	Operator	Value	Low limit	High limit	Mark
59	1	Ampicillin	=	4	2	8	1
59	1	Cefotaxime	<=	0.25	0.03	0.125	1
59	1	Ceftazidime	<=	0.5	0.06	0.5	1
59	1	Chloramphenicol	<=	8	2	8	1
59	1	Ciprofloxacin	<=	0.015	0.004	0.016	1
59	1	Colistin	<=	1	0.25	2	1
59	1	Gentamicin	<=	0.5	0.25	1	1
59	1	Meropenem	<=	0.03	0.008	0.06	1
59	1	Nalidixic acid	<=	4	1	4	1
59	1	Sulfamethoxazole	=	32	8	32	1
59	1	Tetracycline	<=	2	0.5	2	1
59	1	Tigecycline	<=	0.25	0.03	0.25	1
59	1	Trimethoprim	=	0.5	0.5	2	1
59	2	Cefepime	=		0.016	0.125	
59	2	Cefotaxime	=		0.03	0.125	
59	2	Cefoxitin	=		2	8	
59	2	Ceftazidime	=		0.06	0.5	
59	2	Ertapenem	=		0.004	0.016	
59	2	Imipenem	=		0.06	0.25	
59	2	Meropenem	=		0.008	0.06	
60	1	Ampicillin	=	4	2	8	1
60	1	Cefotaxime	<=	0.25	0.03	0.125	1
60	1	Ceftazidime	<=	0.5	0.06	0.5	1
60	1	Chloramphenicol	<=	8	2	8	1
60	1	Ciprofloxacin	<=	0.015	0.004	0.016	1
60	1	Colistin	<=	1	0.25	2	1
60	1	Gentamicin	<=	0.5	0.25	1	1
60	1	Meropenem	<=	0.03	0.008	0.06	1
60	1	Nalidixic acid	<=	4	1	4	1
60	1	Sulfamethoxazole	=	16	8	32	1
60	1	Tetracycline	<=	2	0.5	2	1
60	1	Tigecycline	<=	0.25	0.03	0.25	1
60	1	Trimethoprim	=	0.5	0.5	2	1
60	2	Cefepime	<=	0.06	0.016	0.125	1
60	2	Cefotaxime	<=	0.25	0.03	0.125	1
60	2	Cefoxitin	=	4	2	8	1
60	2	Ceftazidime	<=	0.25	0.06	0.5	1
60	2	Ertapenem	<=	0.016	0.004	0.016	1
60	2	Imipenem	=	0.25	0.06	0.25	1
60	2	Meropenem	<=	0.03	0.008	0.06	1

Test results from the reference strain *E. coli* ATCC 25922 obtained by microbroth dilution, Salmonella trial

Lab no.	Panel	Antimicrobial	Operator	Value	Low limit	High limit	Mark
2	1	Ampicillin	=	4	2	8	1
2	1	Cefotaxime	<=	0.25	0.03	0.125	1
2	1	Ceftazidime	<=	0.5	0.06	0.5	1
2	1	Chloramphenicol	<=	8	2	8	1
2	1	Ciprofloxacin	<=	0.015	0.004	0.016	1
2	1	Colistin	<=	1	0.25	2	1
2	1	Gentamicin	<=	0.5	0.25	1	1
2	1	Meropenem	<=	0.03	0.008	0.06	1
2	1	Nalidixic acid	<=	4	1	4	1
2	1	Sulfamethoxazole	=	16	8	32	1
2	1	Tetracycline	<=	2	0.5	2	1
2	1	Tigecycline	<=	0.25	0.03	0.25	1
2	2	Cefepime	<=	0.06	0.016	0.125	1
2	2	Cefotaxime	<=	0.25	0.03	0.125	1
2	2	Cefoxitin	=	2	2	8	1
2	2	Ceftazidime	<=	0.25	0.06	0.5	1
2	2	Ertapenem	<=	0.015	0.004	0.016	1
2	2	Imipenem	<=	0.12	0.06	0.25	1
2	2	Meropenem	<=	0.03	0.008	0.06	1
2	2	Trimethoprim	=	0.5	0.5	2	1
4	1	Ampicillin	=	4	2	8	1
4	1	Cefotaxime	<=	0.25	0.03	0.125	1
4	1	Ceftazidime	<=	0.5	0.06	0.5	1
4	1	Chloramphenicol	<=	8	2	8	1
4	1	Ciprofloxacin	<=	0.015	0.004	0.016	1
4	1	Colistin	<=	1	0.25	2	1
4	1	Gentamicin	<=	0.5	0.25	1	1
4	1	Meropenem	<=	0.03	0.008	0.06	1
4	1	Nalidixic acid	<=	4	1	4	1
4	1	Sulfamethoxazole	=	16	8	32	1
4	1	Tetracycline	<=	2	0.5	2	1
4	1	Tigecycline	<=	0.25	0.03	0.25	1
4	1	Trimethoprim	=	1	0.5	2	1
4	2	Cefepime	<=	0.06	0.016	0.125	1
4	2	Cefotaxime	<=	0.25	0.03	0.125	1
4	2	Cefoxitin	=	4	2	8	1
4	2	Ceftazidime	<=	0.25	0.06	0.5	1
4	2	Ertapenem	<=	0.015	0.004	0.016	1
4	2	Imipenem	<=	0.12	0.06	0.25	1
4	2	Meropenem	<=	0.03	0.008	0.06	1
6	1	Ampicillin	=	8	2	8	1
6	1	Cefotaxime	<=	0.25	0.03	0.125	1
6	1	Ceftazidime	<=	0.5	0.06	0.5	1
6	1	Chloramphenicol	<=	8	2	8	1
6	1	Ciprofloxacin	<=	0.015	0.004	0.016	1
6	1	Colistin	<=	1	0.25	2	1
6	1	Gentamicin	=	1	0.25	1	1
6	1	Meropenem	<=	0.03	0.008	0.06	1
6	1	Nalidixic acid	<=	4	1	4	1
6	1	Sulfamethoxazole	=	32	8	32	1
6	1	Tetracycline	<=	2	0.5	2	1
6	1	Tigecycline	<=	0.25	0.03	0.25	1
6	1	Trimethoprim	=	1	0.5	2	1
6	2	Cefepime	<=	0.06	0.016	0.125	1
6	2	Cefotaxime	<=	0.25	0.03	0.125	1
6	2	Cefoxitin	=	8	2	8	1
6	2	Ceftazidime	<=	0.25	0.06	0.5	1
6	2	Ertapenem	<=	0.015	0.004	0.016	1
6	2	Imipenem	<=	0.12	0.06	0.25	1
6	2	Meropenem	<=	0.03	0.008	0.06	1
9	1	Ampicillin	=	8	2	8	1
9	1	Cefotaxime	<=	0.25	0.03	0.125	1
9	1	Ceftazidime	<=	0.5	0.06	0.5	1
9	1	Chloramphenicol	<=	8	2	8	1
9	1	Ciprofloxacin	<=	0.015	0.004	0.016	1
9	1	Colistin	<=	1	0.25	2	1
9	1	Gentamicin	<=	0.5	0.25	1	1
9	1	Meropenem	<=	0.03	0.008	0.06	1
9	1	Nalidixic acid	<=	4	1	4	1
9	1	Sulfamethoxazole	=	16	8	32	1
9	1	Tetracycline	<=	2	0.5	2	1
9	1	Tigecycline	<=	0.25	0.03	0.25	1
9	1	Trimethoprim	=	0.5	0.5	2	1
9	2	Cefepime	<=	0.06	0.016	0.125	1
9	2	Cefotaxime	<=	0.25	0.03	0.125	1
9	2	Cefoxitin	=	2	2	8	1
9	2	Ceftazidime	<=	0.25	0.06	0.5	1
9	2	Ertapenem	<=	0.015	0.004	0.016	1
9	2	Imipenem	<=	0.12	0.06	0.25	1
9	2	Meropenem	<=	0.03	0.008	0.06	1

Lab no.	Panel	Antimicrobial	Operator	Value	Low limit	High limit	Mark
11	1	Ampicillin	=	4	2	8	1
11	1	Cefotaxime	<=	0.25	0.03	0.125	1
11	1	Ceftazidime	<=	0.5	0.06	0.5	1
11	1	Chloramphenicol	<=	8	2	8	1
11	1	Ciprofloxacin	<=	0.015	0.004	0.016	1
11	1	Colistin	<=	1	0.25	2	1
11	1	Gentamicin	<=	0.5	0.25	1	1
11	1	Meropenem	<=	0.03	0.008	0.06	1
11	1	Nalidixic acid	<=	4	1	4	1
11	1	Sulfamethoxazole	=	32	8	32	1
11	1	Tetracycline	<=	2	0.5	2	1
11	1	Tigecycline	<=	0.25	0.03	0.25	1
11	1	Trimethoprim	=	0.5	0.5	2	1
11	2	Cefepime	<=	0.06	0.016	0.125	1
11	2	Cefotaxime	<=	0.25	0.03	0.125	1
11	2	Cefoxitin	=	2	2	8	1
11	2	Ceftazidime	<=	0.5	0.06	0.5	1
11	2	Ertapenem	<=	0.015	0.004	0.016	1
11	2	Imipenem	<=	0.12	0.06	0.25	1
11	2	Meropenem	<=	0.03	0.008	0.06	1
12	1	Ampicillin	=	4	2	8	1
12	1	Cefotaxime	<=	0.25	0.03	0.125	1
12	1	Ceftazidime	<=	0.5	0.06	0.5	1
12	1	Chloramphenicol	<=	8	2	8	1
12	1	Ciprofloxacin	<=	0.015	0.004	0.016	1
12	1	Colistin	<=	1	0.25	2	1
12	1	Gentamicin	<=	0.5	0.25	1	1
12	1	Meropenem	<=	0.03	0.008	0.06	1
12	1	Nalidixic acid	<=	4	1	4	1
12	1	Sulfamethoxazole	=	32	8	32	1
12	1	Tetracycline	<=	2	0.5	2	1
12	1	Tigecycline	<=	0.25	0.03	0.25	1
12	1	Trimethoprim	=	1	0.5	2	1
12	2	Cefepime	<=	0.06	0.016	0.125	1
12	2	Cefotaxime	<=	0.25	0.03	0.125	1
12	2	Cefoxitin	=	4	2	8	1
12	2	Ceftazidime	<=	0.25	0.06	0.5	1
12	2	Ertapenem	<=	0.015	0.004	0.016	1
12	2	Imipenem	<=	0.12	0.06	0.25	1
12	2	Meropenem	<=	0.03	0.008	0.06	1
16	1	Ampicillin	=	4	2	8	1
16	1	Cefotaxime	<=	0.25	0.03	0.125	1
16	1	Ceftazidime	<=	0.5	0.06	0.5	1
16	1	Chloramphenicol	<=	8	2	8	1
16	1	Ciprofloxacin	<=	0.015	0.004	0.016	1
16	1	Colistin	<=	1	0.25	2	1
16	1	Gentamicin	<=	0.5	0.25	1	1
16	1	Meropenem	<=	0.03	0.008	0.06	1
16	1	Nalidixic acid	<=	4	1	4	1
16	1	Sulfamethoxazole	<=	8	8	32	1
16	1	Tetracycline	<=	2	0.5	2	1
16	1	Tigecycline	<=	0.25	0.03	0.25	1
16	1	Trimethoprim	=	0.5	0.5	2	1
16	2	Cefepime	=	0.12	0.016	0.125	1
16	2	Cefotaxime	<=	0.25	0.03	0.125	1
16	2	Cefoxitin	=	4	2	8	1
16	2	Ceftazidime	<=	0.25	0.06	0.5	1
16	2	Ertapenem	<=	0.015	0.004	0.016	1
16	2	Imipenem	=	0.25	0.06	0.25	1
16	2	Meropenem	<=	0.03	0.008	0.06	1
17	1	Ampicillin	=	8	2	8	1
17	1	Cefotaxime	<=	0.25	0.03	0.125	1
17	1	Ceftazidime	<=	0.5	0.06	0.5	1
17	1	Chloramphenicol	<=	8	2	8	1
17	1	Ciprofloxacin	<=	0.015	0.004	0.016	1
17	1	Colistin	<=	1	0.25	2	1
17	1	Gentamicin	<=	0.5	0.25	1	1
17	1	Meropenem	<=	0.03	0.008	0.06	1
17	1	Nalidixic acid	<=	4	1	4	1
17	1	Sulfamethoxazole	<=	8	8	32	1
17	1	Tetracycline	<=	2	0.5	2	1
17	1	Tigecycline	<=	0.25	0.03	0.25	1
17	1	Trimethoprim	=	0.5	0.5	2	1
17	2	Cefepime	<=	0.06	0.016	0.125	1
17	2	Cefotaxime	<=	0.25	0.03	0.125	1
17	2	Cefoxitin	=	2	2	8	1
17	2	Ceftazidime	=	0.5	0.06	0.5	1
17	2	Ertapenem	<=	0.015	0.004	0.016	1
17	2	Imipenem	=	0.25	0.06	0.25	1
17	2	Meropenem	<=	0.03	0.008	0.06	1

Lab no.	Panel	Antimicrobial	Operator	Value	Low limit	High limit	Mark
18	1	Ampicillin	=	4	2	8	1
18	1	Cefotaxime	<=	0.25	0.03	0.125	1
18	1	Ceftazidime	<=	0.5	0.06	0.5	1
18	1	Chloramphenicol	<=	8	2	8	1
18	1	Ciprofloxacin	<=	0.015	0.004	0.016	1
18	1	Colistin	<=	1	0.25	2	1
18	1	Gentamicin	<=	0.5	0.25	1	1
18	1	Meropenem	<=	0.03	0.008	0.06	1
18	1	Nalidixic acid	<=	4	1	4	1
18	1	Sulfamethoxazole	=	16	8	32	1
18	1	Tetracycline	<=	2	0.5	2	1
18	1	Tigecycline	<=	0.25	0.03	0.25	1
18	1	Trimethoprim	=	1	0.5	2	1
18	2	Cefepime	<=	0.06	0.016	0.125	1
18	2	Cefotaxime	<=	0.25	0.03	0.125	1
18	2	Cefoxitin	=	4	2	8	1
18	2	Ceftazidime	=	0.5	0.06	0.5	1
18	2	Ertapenem	<=	0.015	0.004	0.016	1
18	2	Imipenem	<=	0.12	0.06	0.25	1
18	2	Meropenem	<=	0.03	0.008	0.06	1
19	1	Ampicillin	=	4	2	8	1
19	1	Cefotaxime	<=	0.25	0.03	0.125	1
19	1	Ceftazidime	<=	0.5	0.06	0.5	1
19	1	Chloramphenicol	<=	8	2	8	1
19	1	Ciprofloxacin	<=	0.015	0.004	0.016	1
19	1	Colistin	<=	1	0.25	2	1
19	1	Gentamicin	<=	0.5	0.25	1	1
19	1	Meropenem	<=	0.03	0.008	0.06	1
19	1	Nalidixic acid	<=	4	1	4	1
19	1	Sulfamethoxazole	=	16	8	32	1
19	1	Tetracycline	<=	2	0.5	2	1
19	1	Tigecycline	<=	0.25	0.03	0.25	1
19	1	Trimethoprim	=	0.5	0.5	2	1
19	2	Cefepime	<=	0.06	0.016	0.125	1
19	2	Cefotaxime	<=	0.25	0.03	0.125	1
19	2	Cefoxitin	=	4	2	8	1
19	2	Ceftazidime	<=	0.25	0.06	0.5	1
19	2	Ertapenem	<=	0.015	0.004	0.016	1
19	2	Imipenem	<=	0.12	0.06	0.25	1
19	2	Meropenem	<=	0.03	0.008	0.06	1
20	1	Ampicillin	=	4	2	8	1
20	1	Cefotaxime	<=	0.25	0.03	0.125	1
20	1	Ceftazidime	<=	0.5	0.06	0.5	1
20	1	Chloramphenicol	<=	8	2	8	1
20	1	Ciprofloxacin	<=	0.015	0.004	0.016	1
20	1	Colistin	<=	1	0.25	2	1
20	1	Gentamicin	<=	0.5	0.25	1	1
20	1	Meropenem	<=	0.03	0.008	0.06	1
20	1	Nalidixic acid	<=	4	1	4	1
20	1	Sulfamethoxazole	<=	8	8	32	1
20	1	Tetracycline	<=	2	0.5	2	1
20	1	Tigecycline	<=	0.25	0.03	0.25	1
20	1	Trimethoprim	=	0.5	0.5	2	1
20	2	Cefepime	<=	0.06	0.016	0.125	1
20	2	Cefotaxime	<=	0.25	0.03	0.125	1
20	2	Cefoxitin	=	2	2	8	1
20	2	Ceftazidime	<=	0.25	0.06	0.5	1
20	2	Ertapenem	<=	0.015	0.004	0.016	1
20	2	Imipenem	<=	0.12	0.06	0.25	1
20	2	Meropenem	<=	0.03	0.008	0.06	1
21	1	Ampicillin	=	4	2	8	1
21	1	Cefotaxime	<=	0.25	0.03	0.125	1
21	1	Ceftazidime	<=	0.5	0.06	0.5	1
21	1	Chloramphenicol	<=	8	2	8	1
21	1	Ciprofloxacin	<=	0.015	0.004	0.016	1
21	1	Colistin	<=	1	0.25	2	1
21	1	Gentamicin	<=	0.5	0.25	1	1
21	1	Meropenem	<=	0.03	0.008	0.06	1
21	1	Nalidixic acid	<=	4	1	4	1
21	1	Sulfamethoxazole	=	16	8	32	1
21	1	Tetracycline	<=	2	0.5	2	1
21	1	Tigecycline	<=	0.25	0.03	0.25	1
21	1	Trimethoprim	=	0.5	0.5	2	1
21	2	Cefepime	<=	0.06	0.016	0.125	1
21	2	Cefotaxime	<=	0.25	0.03	0.125	1
21	2	Cefoxitin	=	4	2	8	1
21	2	Ceftazidime	<=	0.25	0.06	0.5	1
21	2	Ertapenem	<=	0.015	0.004	0.016	1
21	2	Imipenem	=	0.25	0.06	0.25	1
21	2	Meropenem	<=	0.03	0.008	0.06	1

Lab no.	Panel	Antimicrobial	Operator	Value	Low limit	High limit	Mark
22	1	Ampicillin	=	2	2	8	1
22	1	Cefotaxime	<=	0.25	0.03	0.125	1
22	1	Ceftazidime	<=	0.5	0.06	0.5	1
22	1	Chloramphenicol	<=	8	2	8	1
22	1	Ciprofloxacin	<=	0.015	0.004	0.016	1
22	1	Colistin	<=	1	0.25	2	1
22	1	Gentamicin	<=	0.5	0.25	1	1
22	1	Meropenem	<=	0.03	0.008	0.06	1
22	1	Nalidixic acid	<=	4	1	4	1
22	1	Sulfamethoxazole	=	16	8	32	1
22	1	Tetracycline	<=	2	0.5	2	1
22	1	Tigecycline	<=	0.25	0.03	0.25	1
22	1	Trimethoprim	=	0.5	0.5	2	1
22	2	Cefepime	<=	0.06	0.016	0.125	1
22	2	Cefotaxime	<=	0.25	0.03	0.125	1
22	2	Cefoxitin	=	2	2	8	1
22	2	Ceftazidime	<=	0.25	0.06	0.5	1
22	2	Ertapenem	<=	0.015	0.004	0.016	1
22	2	Imipenem	<=	0.12	0.06	0.25	1
22	2	Meropenem	<=	0.03	0.008	0.06	1
23	1	Ampicillin	=	2	2	8	1
23	1	Cefotaxime	<=	0.25	0.03	0.125	1
23	1	Ceftazidime	<=	0.5	0.06	0.5	1
23	1	Chloramphenicol	<=	8	2	8	1
23	1	Ciprofloxacin	<=	0.015	0.004	0.016	1
23	1	Colistin	<=	1	0.25	2	1
23	1	Gentamicin	<=	0.5	0.25	1	1
23	1	Meropenem	<=	0.03	0.008	0.06	1
23	1	Nalidixic acid	<=	4	1	4	1
23	1	Sulfamethoxazole	=	16	8	32	1
23	1	Tetracycline	<=	2	0.5	2	1
23	1	Tigecycline	<=	0.25	0.03	0.25	1
23	1	Trimethoprim	=	0.5	0.5	2	1
23	2	Cefepime	<=	0.06	0.016	0.125	1
23	2	Cefotaxime	<=	0.25	0.03	0.125	1
23	2	Cefoxitin	=	2	2	8	1
23	2	Ceftazidime	<=	0.25	0.06	0.5	1
23	2	Ertapenem	<=	0.015	0.004	0.016	1
23	2	Imipenem	<=	0.12	0.06	0.25	1
23	2	Meropenem	<=	0.03	0.008	0.06	1
25	1	Ampicillin	=	4	2	8	1
25	1	Cefotaxime	<=	0.25	0.03	0.125	1
25	1	Ceftazidime	<=	0.5	0.06	0.5	1
25	1	Chloramphenicol	<=	8	2	8	1
25	1	Ciprofloxacin	<=	0.015	0.004	0.016	1
25	1	Colistin	<=	1	0.25	2	1
25	1	Gentamicin	<=	0.5	0.25	1	1
25	1	Meropenem	<=	0.03	0.008	0.06	1
25	1	Nalidixic acid	<=	4	1	4	1
25	1	Sulfamethoxazole	<=	8	8	32	1
25	1	Tetracycline	<=	2	0.5	2	1
25	1	Tigecycline	<=	0.25	0.03	0.25	1
25	1	Trimethoprim	=	0.5	0.5	2	1
25	2	Cefepime	<=	0.06	0.016	0.125	1
25	2	Cefotaxime	<=	0.25	0.03	0.125	1
25	2	Cefoxitin	=	2	2	8	1
25	2	Ceftazidime	<=	0.25	0.06	0.5	1
25	2	Ertapenem	<=	0.015	0.004	0.016	1
25	2	Imipenem	=	0.5	0.06	0.25	**0**
25	2	Meropenem	<=	0.03	0.008	0.06	1
26	1	Ampicillin	=	2	2	8	1
26	1	Cefotaxime	<=	0.25	0.03	0.125	1
26	1	Ceftazidime	<=	0.5	0.06	0.5	1
26	1	Chloramphenicol	<=	8	2	8	1
26	1	Ciprofloxacin	<=	0.015	0.004	0.016	1
26	1	Colistin	<=	1	0.25	2	1
26	1	Gentamicin	=	1	0.25	1	1
26	1	Meropenem	<=	0.03	0.008	0.06	1
26	1	Nalidixic acid	<=	4	1	4	1
26	1	Sulfamethoxazole	=	16	8	32	1
26	1	Tetracycline	<=	2	0.5	2	1
26	1	Tigecycline	<=	0.25	0.03	0.25	1
26	1	Trimethoprim	=	0.5	0.5	2	1
26	2	Cefepime	=		0.016	0.125	
26	2	Cefotaxime	=		0.03	0.125	
26	2	Cefoxitin	=		2	8	
26	2	Ceftazidime	=		0.06	0.5	
26	2	Ertapenem	=		0.004	0.016	
26	2	Imipenem	=		0.06	0.25	
26	2	Meropenem	=		0.008	0.06	

Lab no.	Panel	Antimicrobial	Operator	Value	Low limit	High limit	Mark
29	1	Ampicillin	=	8	2	8	1
29	1	Cefotaxime	<=	0.25	0.03	0.125	1
29	1	Ceftazidime	<=	0.5	0.06	0.5	1
29	1	Chloramphenicol	=	8	2	8	1
29	1	Ciprofloxacin	<=	0.015	0.004	0.016	1
29	1	Colistin	<=	1	0.25	2	1
29	1	Gentamicin	<=	0.5	0.25	1	1
29	1	Meropenem	<=	0.03	0.008	0.06	1
29	1	Nalidixic acid	<=	4	1	4	1
29	1	Sulfamethoxazole	=	32	8	32	1
29	1	Tetracycline	<=	2	0.5	2	1
29	1	Tigecycline	<=	0.25	0.03	0.25	1
29	1	Trimethoprim	=	0.5	0.5	2	1
29	2	Cefepime	<=	0.06	0.016	0.125	1
29	2	Cefotaxime	<=	0.25	0.03	0.125	1
29	2	Cefoxitin	=	4	2	8	1
29	2	Ceftazidime	<=	0.25	0.06	0.5	1
29	2	Ertapenem	<=	0.015	0.004	0.016	1
29	2	Imipenem	<=	0.12	0.06	0.25	1
29	2	Meropenem	<=	0.03	0.008	0.06	1
30	1	Ampicillin	=	2	2	8	1
30	1	Cefotaxime	<=	0.25	0.03	0.125	1
30	1	Ceftazidime	<=	0.5	0.06	0.5	1
30	1	Chloramphenicol	<=	8	2	8	1
30	1	Ciprofloxacin	<=	0.015	0.004	0.016	1
30	1	Colistin	<=	1	0.25	2	1
30	1	Gentamicin	<=	0.5	0.25	1	1
30	1	Meropenem	<=	0.03	0.008	0.06	1
30	1	Nalidixic acid	<=	4	1	4	1
30	1	Sulfamethoxazole	=	16	8	32	1
30	1	Tetracycline	<=	2	0.5	2	1
30	1	Tigecycline	<=	0.25	0.03	0.25	1
30	1	Trimethoprim	=	0.5	0.5	2	1
30	2	Cefepime	<=	0.06	0.016	0.125	1
30	2	Cefotaxime	<=	0.25	0.03	0.125	1
30	2	Cefoxitin	=	2	2	8	1
30	2	Ceftazidime	=	0.5	0.06	0.5	1
30	2	Ertapenem	<=	0.015	0.004	0.016	1
30	2	Imipenem	<=	0.12	0.06	0.25	1
30	2	Meropenem	<=	0.03	0.008	0.06	1
33	1	Ampicillin	=	4	2	8	1
33	1	Cefotaxime	<=	0.25	0.03	0.125	1
33	1	Ceftazidime	<=	0.5	0.06	0.5	1
33	1	Chloramphenicol	<=	8	2	8	1
33	1	Ciprofloxacin	<=	0.015	0.004	0.016	1
33	1	Colistin	<=	1	0.25	2	1
33	1	Gentamicin	<=	0.5	0.25	1	1
33	1	Meropenem	<=	0.03	0.008	0.06	1
33	1	Nalidixic acid	<=	4	1	4	1
33	1	Sulfamethoxazole	=	16	8	32	1
33	1	Tetracycline	<=	2	0.5	2	1
33	1	Tigecycline	<=	0.25	0.03	0.25	1
33	1	Trimethoprim	=	0.5	0.5	2	1
33	2	Cefepime	<=	0.06	0.016	0.125	1
33	2	Cefotaxime	<=	0.25	0.03	0.125	1
33	2	Cefoxitin	=	8	2	8	1
33	2	Ceftazidime	<=	0.25	0.06	0.5	1
33	2	Ertapenem	<=	0.015	0.004	0.016	1
33	2	Imipenem	<=	0.12	0.06	0.25	1
33	2	Meropenem	<=	0.03	0.008	0.06	1
34	1	Ampicillin	=	2	2	8	1
34	1	Cefotaxime	<=	0.25	0.03	0.125	1
34	1	Ceftazidime	<=	0.5	0.06	0.5	1
34	1	Chloramphenicol	<=	8	2	8	1
34	1	Ciprofloxacin	<=	0.015	0.004	0.016	1
34	1	Colistin	<=	1	0.25	2	1
34	1	Gentamicin	<=	0.5	0.25	1	1
34	1	Meropenem	<=	0.03	0.008	0.06	1
34	1	Nalidixic acid	<=	4	1	4	1
34	1	Sulfamethoxazole	=	16	8	32	1
34	1	Tetracycline	<=	2	0.5	2	1
34	1	Tigecycline	<=	0.25	0.03	0.25	1
34	1	Trimethoprim	=	0.5	0.5	2	1
34	2	Cefepime	<=	0.06	0.016	0.125	1
34	2	Cefotaxime	<=	0.25	0.03	0.125	1
34	2	Cefoxitin	=	2	2	8	1
34	2	Ceftazidime	<=	0.25	0.06	0.5	1
34	2	Ertapenem	<=	0.015	0.004	0.016	1
34	2	Imipenem	<=	0.12	0.06	0.25	1
34	2	Meropenem	<=	0.03	0.008	0.06	1

Lab no.	Panel	Antimicrobial	Operator	Value	Low limit	High limit	Mark
36	1	Ampicillin	=	4	2	8	1
36	1	Cefotaxime	<=	0.25	0.03	0.125	1
36	1	Ceftazidime	<=	0.5	0.06	0.5	1
36	1	Chloramphenicol	<=	8	2	8	1
36	1	Ciprofloxacin	<=	0.015	0.004	0.016	1
36	1	Colistin	<=	1	0.25	2	1
36	1	Gentamicin	<=	0.5	0.25	1	1
36	1	Meropenem	<=	0.03	0.008	0.06	1
36	1	Nalidixic acid	<=	4	1	4	1
36	1	Sulfamethoxazole	<=	8	8	32	1
36	1	Tetracycline	<=	2	0.5	2	1
36	1	Tigecycline	<=	0.25	0.03	0.25	1
36	1	Trimethoprim	=	0.5	0.5	2	1
36	2	Cefepime	<=	0.06	0.016	0.125	1
36	2	Cefotaxime	<=	0.25	0.03	0.125	1
36	2	Cefoxitin	=	4	2	8	1
36	2	Ceftazidime	=	0.5	0.06	0.5	1
36	2	Ertapenem	<=	0.015	0.004	0.016	1
36	2	Imipenem	<=	0.12	0.06	0.25	1
36	2	Meropenem	<=	0.03	0.008	0.06	1
37	1	Ampicillin	=	4	2	8	1
37	1	Cefotaxime	<=	0.25	0.03	0.125	1
37	1	Ceftazidime	<=	0.5	0.06	0.5	1
37	1	Chloramphenicol	<=	8	2	8	1
37	1	Ciprofloxacin	<=	0.015	0.004	0.016	1
37	1	Colistin	<=	1	0.25	2	1
37	1	Gentamicin	=	1	0.25	1	1
37	1	Meropenem	<=	0.03	0.008	0.06	1
37	1	Nalidixic acid	<=	4	1	4	1
37	1	Sulfamethoxazole	=	16	8	32	1
37	1	Tetracycline	<=	2	0.5	2	1
37	1	Tigecycline	<=	0.25	0.03	0.25	1
37	1	Trimethoprim	=	1	0.5	2	1
37	2	Cefepime	=		0.016	0.125	
37	2	Cefotaxime	=		0.03	0.125	
37	2	Cefoxitin	=		2	8	
37	2	Ceftazidime	=		0.06	0.5	
37	2	Ertapenem	=		0.004	0.016	
37	2	Imipenem	=		0.06	0.25	
37	2	Meropenem	=		0.008	0.06	
38	1	Ampicillin	=	8	2	8	1
38	1	Cefotaxime	<=	0.25	0.03	0.125	1
38	1	Ceftazidime	<=	0.5	0.06	0.5	1
38	1	Chloramphenicol	<=	8	2	8	1
38	1	Ciprofloxacin	<=	0.015	0.004	0.016	1
38	1	Colistin	<=	1	0.25	2	1
38	1	Gentamicin	<=	0.5	0.25	1	1
38	1	Meropenem	<=	0.03	0.008	0.06	1
38	1	Nalidixic acid	<=	4	1	4	1
38	1	Sulfamethoxazole	=	16	8	32	1
38	1	Tetracycline	<=	2	0.5	2	1
38	1	Tigecycline	<=	0.25	0.03	0.25	1
38	1	Trimethoprim	=	1	0.5	2	1
38	2	Cefepime	<=	0.06	0.016	0.125	1
38	2	Cefotaxime	<=	0.25	0.03	0.125	1
38	2	Cefoxitin	=	2	2	8	1
38	2	Ceftazidime	<=	0.25	0.06	0.5	1
38	2	Ertapenem	<=	0.015	0.004	0.016	1
38	2	Imipenem	=	0.25	0.06	0.25	1
38	2	Meropenem	<=	0.03	0.008	0.06	1
39	1	Ampicillin	=	4	2	8	1
39	1	Cefotaxime	<=	0.25	0.03	0.125	1
39	1	Ceftazidime	<=	0.5	0.06	0.5	1
39	1	Chloramphenicol	<=	8	2	8	1
39	1	Ciprofloxacin	<=	0.015	0.004	0.016	1
39	1	Colistin	<=	1	0.25	2	1
39	1	Gentamicin	=	1	0.25	1	1
39	1	Meropenem	<=	0.03	0.008	0.06	1
39	1	Nalidixic acid	<=	4	1	4	1
39	1	Sulfamethoxazole	=	32	8	32	1
39	1	Tetracycline	<=	2	0.5	2	1
39	1	Tigecycline	<=	0.25	0.03	0.25	1
39	1	Trimethoprim	=	0.5	0.5	2	1
39	2	Cefepime	<=	0.06	0.016	0.125	1
39	2	Cefotaxime	<=	0.25	0.03	0.125	1
39	2	Cefoxitin	=	4	2	8	1
39	2	Ceftazidime	=	0.5	0.06	0.5	1
39	2	Ertapenem	<=	0.015	0.004	0.016	1
39	2	Imipenem	=	0.25	0.06	0.25	1
39	2	Meropenem	<=	0.03	0.008	0.06	1

Lab no.	Panel	Antimicrobial	Operator	Value	Low limit	High limit	Mark
40	1	Ampicillin	=	2	2	8	1
40	1	Cefotaxime	=	0.12	0.03	0.125	1
40	1	Ceftazidime	=	0.5	0.06	0.5	1
40	1	Chloramphenicol	=	8	2	8	1
40	1	Ciprofloxacin	=	0.015	0.004	0.016	1
40	1	Colistin	=	1	0.25	2	1
40	1	Gentamicin	=	0.5	0.25	1	1
40	1	Meropenem	=	0.03	0.008	0.06	1
40	1	Nalidixic acid	=	4	1	4	1
40	1	Sulfamethoxazole	=	16	8	32	1
40	1	Tetracycline	=	2	0.5	2	1
40	1	Tigecycline	=	0.25	0.03	0.25	1
40	1	Trimethoprim	=	0.5	0.5	2	1
40	2	Cefepime	=	0.12	0.016	0.125	1
40	2	Cefotaxime	=	0.12	0.03	0.125	1
40	2	Cefoxitin	=	4	2	8	1
40	2	Ceftazidime	=	0.5	0.06	0.5	1
40	2	Ertapenem	=	0.015	0.004	0.016	1
40	2	Imipenem	=	0.25	0.06	0.25	1
40	2	Meropenem	=	0.03	0.008	0.06	1
41	1	Ampicillin	=	2	2	8	1
41	1	Cefotaxime	<=	0.25	0.03	0.125	1
41	1	Ceftazidime	<=	0.5	0.06	0.5	1
41	1	Chloramphenicol	<=	8	2	8	1
41	1	Ciprofloxacin	<=	0.015	0.004	0.016	1
41	1	Colistin	<=	1	0.25	2	1
41	1	Gentamicin	=	1	0.25	1	1
41	1	Meropenem	<=	0.03	0.008	0.06	1
41	1	Nalidixic acid	<=	4	1	4	1
41	1	Sulfamethoxazole	=	16	8	32	1
41	1	Tetracycline	<=	2	0.5	2	1
41	1	Tigecycline	<=	0.25	0.03	0.25	1
41	1	Trimethoprim	<=	0.5	0.5	2	1
41	2	Cefepime	<=	0.06	0.016	0.125	1
41	2	Cefotaxime	<=	0.25	0.03	0.125	1
41	2	Cefoxitin	=	2	2	8	1
41	2	Ceftazidime	<=	0.5	0.06	0.5	1
41	2	Ertapenem	<=	0.015	0.004	0.016	1
41	2	Imipenem	<=	0.12	0.06	0.25	1
41	2	Meropenem	<=	0.03	0.008	0.06	1
45	1	Ampicillin	=	4	2	8	1
45	1	Cefotaxime	<=	0.25	0.03	0.125	1
45	1	Ceftazidime	<=	0.5	0.06	0.5	1
45	1	Chloramphenicol	<=	8	2	8	1
45	1	Ciprofloxacin	<=	0.015	0.004	0.016	1
45	1	Colistin	<=	1	0.25	2	1
45	1	Gentamicin	<=	0.5	0.25	1	1
45	1	Meropenem	<=	0.03	0.008	0.06	1
45	1	Nalidixic acid	<=	4	1	4	1
45	1	Sulfamethoxazole	=	16	8	32	1
45	1	Tetracycline	=	2	0.5	2	1
45	1	Tigecycline	<=	0.25	0.03	0.25	1
45	1	Trimethoprim	=	0.5	0.5	2	1
45	2	Cefepime	<=	0.06	0.016	0.125	1
45	2	Cefotaxime	<=	0.25	0.03	0.125	1
45	2	Cefoxitin	=	4	2	8	1
45	2	Ceftazidime	<=	0.25	0.06	0.5	1
45	2	Ertapenem	<=	0.015	0.004	0.016	1
45	2	Imipenem	<=	0.12	0.06	0.25	1
45	2	Meropenem	<=	0.03	0.008	0.06	1
56	1	Ampicillin	=	2	2	8	1
56	1	Cefotaxime	<=	0.25	0.03	0.125	1
56	1	Ceftazidime	<=	0.5	0.06	0.5	1
56	1	Chloramphenicol	<=	8	2	8	1
56	1	Ciprofloxacin	<=	0.015	0.004	0.016	1
56	1	Colistin	<=	1	0.25	2	1
56	1	Gentamicin	<=	0.5	0.25	1	1
56	1	Meropenem	<=	0.03	0.008	0.06	1
56	1	Nalidixic acid	<=	4	1	4	1
56	1	Sulfamethoxazole	=	16	8	32	1
56	1	Tetracycline	<=	2	0.5	2	1
56	1	Tigecycline	<=	0.25	0.03	0.25	1
56	1	Trimethoprim	=	0.5	0.5	2	1
56	2	Cefepime	<=	0.06	0.016	0.125	1
56	2	Cefotaxime	<=	0.25	0.03	0.125	1
56	2	Cefoxitin	=	2	2	8	1
56	2	Ceftazidime	<=	0.25	0.06	0.5	1
56	2	Ertapenem	<=	0.015	0.004	0.016	1
56	2	Imipenem	<=	0.12	0.06	0.25	1
56	2	Meropenem	<=	0.03	0.008	0.06	1

Lab no.	Panel	Antimicrobial	Operator	Value	Low limit	High limit	Mark
59	1	Ampicillin	=	4	2	8	1
59	1	Cefotaxime	<=	0.25	0.03	0.125	1
59	1	Ceftazidime	<=	0.5	0.06	0.5	1
59	1	Chloramphenicol	<=	8	2	8	1
59	1	Ciprofloxacin	<=	0.015	0.004	0.016	1
59	1	Colistin	<=	1	0.25	2	1
59	1	Gentamicin	<=	0.5	0.25	1	1
59	1	Meropenem	<=	0.03	0.008	0.06	1
59	1	Nalidixic acid	<=	4	1	4	1
59	1	Sulfamethoxazole	=	32	8	32	1
59	1	Tetracycline	<=	2	0.5	2	1
59	1	Tigecycline	<=	0.25	0.03	0.25	1
59	1	Trimethoprim	=	0.5	0.5	2	1
59	2	Cefepime	=		0.016	0.125	
59	2	Cefotaxime	=		0.03	0.125	
59	2	Cefoxitin	=		2	8	
59	2	Ceftazidime	=		0.06	0.5	
59	2	Ertapenem	=		0.004	0.016	
59	2	Imipenem	=		0.06	0.25	
59	2	Meropenem	=		0.008	0.06	
60	1	Ampicillin	=	4	2	8	1
60	1	Cefotaxime	<=	0.25	0.03	0.125	1
60	1	Ceftazidime	<=	0.5	0.06	0.5	1
60	1	Chloramphenicol	<=	8	2	8	1
60	1	Ciprofloxacin	<=	0.015	0.004	0.016	1
60	1	Colistin	<=	1	0.25	2	1
60	1	Gentamicin	<=	0.5	0.25	1	1
60	1	Meropenem	<=	0.03	0.008	0.06	1
60	1	Nalidixic acid	<=	4	1	4	1
60	1	Sulfamethoxazole	=	16	8	32	1
60	1	Tetracycline	<=	2	0.5	2	1
60	1	Tigecycline	<=	0.25	0.03	0.25	1
60	1	Trimethoprim	=	0.5	0.5	2	1
60	2	Cefepime	<=	0.06	0.016	0.125	1
60	2	Cefotaxime	<=	0.25	0.03	0.125	1
60	2	Cefoxitin	=	4	2	8	1
60	2	Ceftazidime	<=	0.25	0.06	0.5	1
60	2	Ertapenem	<=	0.016	0.004	0.016	1
60	2	Imipenem	=	0.25	0.06	0.25	1
60	2	Meropenem	<=	0.03	0.008	0.06	1

Test results from the reference strain *C. jejuni* ATCC 33560

Lab no.	Antimicrobial	Operator	Value	Low limit	High limit	Mark	Method	36-37ºC/48h	42ºC/24h
2	Ciprofloxacin	=	0.25	0.06	0.25	1	MIC	X	
2	Erythromycin	=	2	0.5	2	1	MIC	X	
2	Gentamicin	=	0.5	0.5	2	1	MIC	X	
2	Nalidixic acid	=	8	4	16	1	MIC	X	
2	Tetracycline	=	2	0.25	2	1	MIC	X	
4	Ciprofloxacin			0.06	0.25				
4	Erythromycin			0.5	2				
4	Gentamicin			0.5	2				
4	Nalidixic acid			4	16				
4	Tetracycline			0.25	2				
6	Ciprofloxacin			0.06	0.25				
6	Erythromycin			0.5	2				
6	Gentamicin			0.5	2				
6	Nalidixic acid			4	16				
6	Tetracycline			0.25	2				
11	Ciprofloxacin	<=	0.12	0.06	0.25	1	MIC	X	
11	Erythromycin	=	2	0.5	2	1	MIC	X	
11	Gentamicin	=	1	0.5	2	1	MIC	X	
11	Nalidixic acid	=	8	4	16	1	MIC	X	
11	Tetracycline	<=	0.5	0.25	2	1	MIC	X	
12	Ciprofloxacin	=	0.25	0.06	0.25	1	MIC	X	
12	Erythromycin	<=	1	0.5	2	1	MIC	X	
12	Gentamicin	=	2	0.5	2	1	MIC	X	
12	Nalidixic acid	=	8	4	16	1	MIC	X	
12	Tetracycline	=	2	0.25	2	1	MIC	X	
14	Ciprofloxacin	<=	0.12	0.03	0.125	1	MIC		X
14	Erythromycin	<=	1	0.25	2	1	MIC		X
14	Gentamicin	<=	0.5	0.25	2	1	MIC		X
14	Nalidixic acid	=	4	4	16	1	MIC		X
14	Tetracycline	<=	0.5	0.25	1	1	MIC		X
17	Ciprofloxacin	=	0.25	0.06	0.25	1	MIC	X	
17	Erythromycin	<=	1	0.5	2	1	MIC	X	
17	Gentamicin	=	1	0.5	2	1	MIC	X	
17	Nalidixic acid	=	8	4	16	1	MIC	X	
17	Tetracycline	=	1	0.25	2	1	MIC	X	
18	Ciprofloxacin	<=	0.12	0.03	0.125	1	MIC		X
18	Erythromycin	<=	1	0.25	2	1	MIC		X
18	Gentamicin	=	1	0.25	2	1	MIC		X
18	Nalidixic acid	=	4	4	16	1	MIC		X
18	Tetracycline	=	1	0.25	1	1	MIC		X
19	Ciprofloxacin	<=	0.12	0.03	0.125	1	MIC		X
19	Erythromycin	<=	1	0.25	2	1	MIC		X
19	Gentamicin	=	1	0.25	2	1	MIC		X
19	Nalidixic acid	=	8	4	16	1	MIC		X
19	Tetracycline	<=	0.5	0.25	1	1	MIC		X
20	Ciprofloxacin	<=	0.12	0.06	0.25	1	MIC	X	
20	Erythromycin	<=	1	0.5	2	1	MIC	X	
20	Gentamicin	=	1	0.5	2	1	MIC	X	
20	Nalidixic acid	=	8	4	16	1	MIC	X	
20	Tetracycline	=	1	0.25	2	1	MIC	X	
21	Ciprofloxacin	<=	0.12	0.03	0.125	1	MIC		X
21	Erythromycin	<=	1	0.25	2	1	MIC		X
21	Gentamicin	=	0.5	0.25	2	1	MIC		X
21	Nalidixic acid	=	4	4	16	1	MIC		X
21	Tetracycline	<=	0.5	0.25	1	1	MIC		X

Lab no.	Antimicrobial	Operator	Value	Low limit	High limit	Mark	Method	36-37ºC/48h	42ºC/24h
23	Ciprofloxacin	=	0.12	0.03	0.125	1	MIC		X
23	Erythromycin	<=	1	0.25	2	1	MIC		X
23	Gentamicin	=	1	0.25	2	1	MIC		X
23	Nalidixic acid	=	4	4	16	1	MIC		X
23	Tetracycline	=	1	0.25	1	1	MIC		X
25	Ciprofloxacin	=	0.25	0.06	0.25	1	MIC	X	
25	Erythromycin	=	2	0.5	2	1	MIC	X	
25	Gentamicin	=	0.5	0.5	2	1	MIC	X	
25	Nalidixic acid	=	8	4	16	1	MIC	X	
25	Tetracycline	=	2	0.25	2	1	MIC	X	
26	Ciprofloxacin	<=	0.12	0.06	0.25	1	MIC	X	
26	Erythromycin	<=	1	0.5	2	1	MIC	X	
26	Gentamicin	=	1	0.5	2	1	MIC	X	
26	Nalidixic acid	=	4	4	16	1	MIC	X	
26	Tetracycline	<=	0.5	0.25	2	1	MIC	X	
30	Ciprofloxacin	<=	0.12	0.03	0.125	1	MIC		X
30	Erythromycin	<=	1	0.25	2	1	MIC		X
30	Gentamicin	=	1	0.25	2	1	MIC		X
30	Nalidixic acid	=	8	4	16	1	MIC		X
30	Tetracycline	=	1	0.25	1	1	MIC		X
32	Ciprofloxacin	<=	0.12	0.06	0.25	1	MIC	X	
32	Erythromycin	<=	1	0.5	2	1	MIC	X	
32	Gentamicin	=	0.5	0.5	2	1	MIC	X	
32	Nalidixic acid	=	4	4	16	1	MIC	X	
32	Tetracycline	<=	0.5	0.25	2	1	MIC	X	
33	Ciprofloxacin	<=	0.12	0.06	0.25	1	MIC	X	
33	Erythromycin	<=	1	0.5	2	1	MIC	X	
33	Gentamicin	=	1	0.5	2	1	MIC	X	
33	Nalidixic acid	=	8	4	16	1	MIC	X	
33	Tetracycline	<=	0.5	0.25	2	1	MIC	X	
34	Ciprofloxacin	=	0.25	0.06	0.25	1	MIC	X	
34	Erythromycin	<=	1	0.5	2	1	MIC	X	
34	Gentamicin	=	1	0.5	2	1	MIC	X	
34	Nalidixic acid	=	8	4	16	1	MIC	X	
34	Tetracycline	=	4	0.25	2	**0**	MIC	X	
36	Ciprofloxacin	<=	0.12	0.03	0.125	1	MIC		X
36	Erythromycin	<=	1	0.25	2	1	MIC		X
36	Gentamicin	=	2	0.25	2	1	MIC		X
36	Nalidixic acid	=	8	4	16	1	MIC		X
36	Tetracycline	=	1	0.25	1	1	MIC		X
37	Ciprofloxacin	=	0.25	0.06	0.25	1	MIC	X	
37	Erythromycin	<=	1	0.5	2	1	MIC	X	
37	Gentamicin	=	2	0.5	2	1	MIC	X	
37	Nalidixic acid	=	8	4	16	1	MIC	X	
37	Tetracycline	=	1	0.25	2	1	MIC	X	
39	Ciprofloxacin	<=	0.12	0.06	0.25	1	MIC	X	
39	Erythromycin	<=	1	0.5	2	1	MIC	X	
39	Gentamicin	=	0.5	0.5	2	1	MIC	X	
39	Nalidixic acid	=	4	4	16	1	MIC	X	
39	Tetracycline	=	1	0.25	2	1	MIC	X	
40	Ciprofloxacin	=	0.125	0.03	0.125	1	MIC		X
40	Erythromycin	=	1	0.25	2	1	MIC		X
40	Gentamicin	=	0.5	0.25	2	1	MIC		X
40	Nalidixic acid	=	8	4	16	1	MIC		X
40	Tetracycline	=	0.5	0.25	1	1	MIC		X

Lab no.	Antimicrobial	Operator	Value	Low limit	High limit	Mark	Method	36-37ºC/48h	42ºC/24h
41	Ciprofloxacin	<=	0.12	0.03	0.125	1	MIC		X
41	Erythromycin	<=	1	0.25	2	1	MIC		X
41	Gentamicin	=	1	0.25	2	1	MIC		X
41	Nalidixic acid	=	8	4	16	1	MIC		X
41	Tetracycline	=	1	0.25	1	1	MIC		X
45	Ciprofloxacin	<=	0.12	0.06	0.25	1	MIC	X	
45	Erythromycin	<=	1	0.5	2	1	MIC	X	
45	Gentamicin	=	0.5	0.5	2	1	MIC	X	
45	Nalidixic acid	=	4	4	16	1	MIC	X	
45	Tetracycline	=	1	0.25	2	1	MIC	X	
56	Ciprofloxacin	<=	0.12	0.03	0.125	1	MIC		X
56	Erythromycin	<=	1	0.25	2	1	MIC		X
56	Gentamicin	=	0.25	0.25	2	1	MIC		X
56	Nalidixic acid	=	4	4	16	1	MIC		X
56	Tetracycline	<=	0.5	0.25	1	1	MIC		X
59	Ciprofloxacin	<=	0.12	0.06	0.25	1	MIC	X	
59	Erythromycin	<=	1	0.5	2	1	MIC	X	
59	Gentamicin	=	1	0.5	2	1	MIC	X	
59	Nalidixic acid	=	8	4	16	1	MIC	X	
59	Tetracycline	<=	0.5	0.25	2	1	MIC	X	
60	Ciprofloxacin			0.06	0.25				
60	Erythromycin			0.5	2				
60	Gentamicin			0.5	2				
60	Nalidixic acid			4	16				
60	Tetracycline			0.25	2				

MIC: Broth microdilution

Escherichia coli - expected and obtained interpretation

Antimicrobial	Strain	Panel	Expected	% R	% S	No. correct	No. incorrect
Ampicillin AMP	EURL EC-15.1	Panel 1	R	100	0	29	0
	EURL EC-15.2	Panel 1	S	3.3	96.7	29	1
	EURL EC-15.3	Panel 1	R	100	0	30	0
	EURL EC-15.4	Panel 1	R	100	0	30	0
	EURL EC-15.5	Panel 1	S	0	100	30	0
	EURL EC-15.6	Panel 1	R	100	0	30	0
	EURL EC-15.7	Panel 1	R	100	0	30	0
	EURL EC-15.8	Panel 1	R	100	0	30	0
Azithromycin AZI	EURL EC-15.1	Panel 1	R	100	0	29	0
	EURL EC-15.2	Panel 1	S	0	100	30	0
	EURL EC-15.3	Panel 1	S	0	100	30	0
	EURL EC-15.4	Panel 1	R	96.7	3.3	29	1
	EURL EC-15.5	Panel 1	S	0	100	30	0
	EURL EC-15.6	Panel 1	S	0	100	30	0
	EURL EC-15.7	Panel 1	S	0	100	30	0
	EURL EC-15.8	Panel 1	R	100	0	30	0
Cefepime FEP	EURL EC-15.1	Panel 2	R	100	0	29	0
	EURL EC-15.2	Panel 2	R	100	0	20	0
	EURL EC-15.3	Panel 2	R	100	0	30	0
	EURL EC-15.4	Panel 2	R	100	0	30	0
	EURL EC-15.5	Panel 2	S	0	100	5	0
	EURL EC-15.6	Panel 2	R	100	0	30	0
	EURL EC-15.7	Panel 2	R	100	0	30	0
	EURL EC-15.8	Panel 2	S	0	100	6	0
Cefotaxime FOT	EURL EC-15.1	Panel 1	R	100	0	29	0
	EURL EC-15.2*	Panel 1*	R*	70*	30*	21*	9*
	EURL EC-15.3	Panel 1	R	100	0	30	0
	EURL EC-15.4	Panel 1	R	100	0	30	0
	EURL EC-15.5	Panel 1	S	0	100	30	0
	EURL EC-15.6	Panel 1	R	100	0	30	0
	EURL EC-15.7	Panel 1	R	100	0	30	0
	EURL EC-15.8	Panel 1	S	0	100	30	0
	EURL EC-15.1	Panel 2	R	100	0	29	0
	EURL EC-15.2	Panel 2	R	100	0	20	0
	EURL EC-15.3	Panel 2	R	100	0	30	0
	EURL EC-15.4	Panel 2	R	100	0	30	0
	EURL EC-15.5	Panel 2	S	0	100	5	0
	EURL EC-15.6	Panel 2	R	100	0	30	0
	EURL EC-15.7	Panel 2	R	100	0	30	0
	EURL EC-15.8	Panel 2	S	0	100	6	0
Cefotaxime/Clavulanic acid	EURL EC-15.1*	Panel 2*	S*	40.9*	59.1*	13*	9*
	EURL EC-15.2	Panel 2	S	18.8	81.2	13	3
	EURL EC-15.3	Panel 2	S	4.2	95.8	23	1
	EURL EC-15.4	Panel 2	S	0	100	24	0
	EURL EC-15.5	Panel 2	S	0	100	4	0
	EURL EC-15.6	Panel 2	R	100	0	24	0
	EURL EC-15.7	Panel 2	R	100	0	24	0
	EURL EC-15.8	Panel 2	S	0	100	4	0
Cefoxitin FOX	EURL EC-15.1	Panel 2	R	100	0	29	0
	EURL EC-15.2	Panel 2	R	100	0	20	0
	EURL EC-15.3	Panel 2	S	0	100	30	0
	EURL EC-15.4	Panel 2	S	0	100	30	0
	EURL EC-15.5	Panel 2	S	0	100	5	0
	EURL EC-15.6	Panel 2	R	100	0	30	0
	EURL EC-15.7	Panel 2	R	100	0	30	0
	EURL EC-15.8	Panel 2	S	0	100	6	0

Antimicrobial	Strain	Panel	Expected	% R	% S	No. correct	No. incorrect
Ceftazidime TAZ	EURL EC-15.1	Panel 1	R	100	0	29	0
	EURL EC-15.2	Panel 1	S	0	100	30	0
	EURL EC-15.3	Panel 1	R	100	0	30	0
	EURL EC-15.4	Panel 1	R	100	0	30	0
	EURL EC-15.5	Panel 1	S	0	100	30	0
	EURL EC-15.6	Panel 1	R	100	0	30	0
	EURL EC-15.7	Panel 1	R	100	0	30	0
	EURL EC-15.8	Panel 1	S	0	100	30	0
	EURL EC-15.1	Panel 2	R	100	0	29	0
	EURL EC-15.2	Panel 2	S	0	100	20	0
	EURL EC-15.3	Panel 2	R	100	0	30	0
	EURL EC-15.4	Panel 2	R	100	0	30	0
	EURL EC-15.5	Panel 2	S	0	100	5	0
	EURL EC-15.6	Panel 2	R	100	0	30	0
	EURL EC-15.7	Panel 2	R	100	0	30	0
	EURL EC-15.8	Panel 2	S	0	100	6	0
Ceftazidime/clavulanic acid	EURL EC-15.1	Panel 2	S	4.3	95.7	22	1
	EURL EC-15.2	Panel 2	S	0	100	17	0
	EURL EC-15.3	Panel 2	S	0	100	24	0
	EURL EC-15.4	Panel 2	S	0	100	24	0
	EURL EC-15.5	Panel 2	S	0	100	3	0
	EURL EC-15.6	Panel 2	R	100	0	24	0
	EURL EC-15.7	Panel 2	R	100	0	26	0
	EURL EC-15.8	Panel 2	S	0	100	4	0
Chloramphenicol CHL	EURL EC-15.1	Panel 1	R	100	0	29	0
	EURL EC-15.2*	Panel 1*	S*	43.3*	56.7*	17*	13*
	EURL EC-15.3	Panel 1	S	0	100	30	0
	EURL EC-15.4	Panel 1	R	100	0	30	0
	EURL EC-15.5	Panel 1	S	0	100	30	0
	EURL EC-15.6	Panel 1	R	100	0	30	0
	EURL EC-15.7	Panel 1	S	0	100	30	0
	EURL EC-15.8	Panel 1	R	100	0	30	0
Ciprofloxacin CIP	EURL EC-15.1	Panel 1	R	100	0	29	0
	EURL EC-15.2	Panel 1	R	100	0	30	0
	EURL EC-15.3	Panel 1	S	0	100	30	0
	EURL EC-15.4	Panel 1	R	83.3	16.7	25	5
	EURL EC-15.5	Panel 1	S	0	100	30	0
	EURL EC-15.6	Panel 1	R	100	0	30	0
	EURL EC-15.7	Panel 1	R	100	0	30	0
	EURL EC-15.8	Panel 1	R	100	0	30	0
Colistin COL	EURL EC-15.1	Panel 1	S	0	100	29	0
	EURL EC-15.2	Panel 1	S	0	100	30	0
	EURL EC-15.3	Panel 1	S	0	100	30	0
	EURL EC-15.4	Panel 1	S	0	100	30	0
	EURL EC-15.5	Panel 1	S	0	100	30	0
	EURL EC-15.6	Panel 1	S	0	100	30	0
	EURL EC-15.7	Panel 1	S	0	100	30	0
	EURL EC-15.8	Panel 1	R	96.7	3.3	29	1
Ertapenem ETP	EURL EC-15.1	Panel 2	R	100	0	29	0
	EURL EC-15.2	Panel 2	S	0	100	20	0
	EURL EC-15.3	Panel 2	S	0	100	30	0
	EURL EC-15.4	Panel 2	S	0	100	30	0
	EURL EC-15.5	Panel 2	S	0	100	5	0
	EURL EC-15.6	Panel 2	S	20	80	24	0
	EURL EC-15.7	Panel 2	R	100	0	30	0
	EURL EC-15.8	Panel 2	S	0	100	6	0

Antimicrobial	Strain	Panel	Expected	% R	% S	No. correct	No. incorrect
Gentamicin GEN	EURL EC-15.1	Panel 1	R	100	0	29	0
	EURL EC-15.2	Panel 1	S	0	100	30	0
	EURL EC-15.3	Panel 1	S	0	100	30	0
	EURL EC-15.4	Panel 1	S	0	100	30	0
	EURL EC-15.5	Panel 1	S	0	100	30	0
	EURL EC-15.6	Panel 1	S	0	100	30	0
	EURL EC-15.7	Panel 1	S	0	100	30	0
	EURL EC-15.8	Panel 1	R	100	0	30	0
Imipenem IMI	EURL EC-15.1	Panel 2	S	10.3	89.7	26	3
	EURL EC-15.2	Panel 2	S	0	100	20	0
	EURL EC-15.3	Panel 2	S	0	100	30	0
	EURL EC-15.4	Panel 2	S	0	100	30	0
	EURL EC-15.5	Panel 2	S	0	100	5	0
	EURL EC-15.6	Panel 2	S	0	100	30	6
	EURL EC-15.7	Panel 2	R	100	0	30	0
	EURL EC-15.8	Panel 2	S	16.7	83.3	5	1
Meropenem MER	EURL EC-15.1	Panel 1	R	93.1	6.9	27	2
	EURL EC-15.2	Panel 1	S	0	100	30	0
	EURL EC-15.3	Panel 1	S	0	100	30	0
	EURL EC-15.4	Panel 1	S	0	100	30	0
	EURL EC-15.5	Panel 1	S	0	100	30	0
	EURL EC-15.6	Panel 1	S	0	100	30	0
	EURL EC-15.7	Panel 1	R	100	0	30	0
	EURL EC-15.8	Panel 1	S	0	100	30	0
	EURL EC-15.1	Panel 2	R	96.6	3.4	28	1
	EURL EC-15.2	Panel 2	S	0	100	20	0
	EURL EC-15.3	Panel 2	S	0	100	30	0
	EURL EC-15.4	Panel 2	S	0	100	30	0
	EURL EC-15.5	Panel 2	S	0	100	5	0
	EURL EC-15.6	Panel 2	S	0	100	30	0
	EURL EC-15.7	Panel 2	R	100	0	30	0
	EURL EC-15.8	Panel 2	S	0	100	6	0
Nalidixic acid NAL	EURL EC-15.1	Panel 1	R	100	0	29	0
	EURL EC-15.2	Panel 1	R	100	0	30	0
	EURL EC-15.3	Panel 1	S	0	100	30	0
	EURL EC-15.4	Panel 1	S	0	100	30	0
	EURL EC-15.6	Panel 1	S	0	100	30	0
	EURL EC-15.7	Panel 1	R	100	0	30	0
	EURL EC-15.7	Panel 1	R	100	0	30	0
	EURL EC-15.8	Panel 1	R	100	0	30	0

Antimicrobial	Strain	Panel	Expected	% R	% S	No. correct	No. incorrect
Sulfamethoxazole SMX	EURL EC-15.1	Panel 1	R	100	0	29	0
	EURL EC-15.2	Panel 1	S	6.7	93.3	28	2
	EURL EC-15.3	Panel 1	S	6.7	93.3	28	2
	EURL EC-15.4	Panel 1	R	100	0	30	0
	EURL EC-15.5	Panel 1	S	0	100	30	0
	EURL EC-15.6	Panel 1	S	3.3	96.7	29	0
	EURL EC-15.7*	Panel 1*	S*	60*	40*	12*	18*
	EURL EC-15.8	Panel 1	R	100	0	29	0
Temocillin TRM	EURL EC-15.1	Panel 2	S	3.4	96.6	28	1
	EURL EC-15.2	Panel 2	S	0	100	20	0
	EURL EC-15.3	Panel 2	S	0	100	30	0
	EURL EC-15.4	Panel 2	S	0	100	30	0
	EURL EC-15.5	Panel 2	S	0	100	5	0
	EURL EC-15.6	Panel 2	S	0	100	30	0
	EURL EC-15.7	Panel 2	R	78.6	21.4	22	6
	EURL EC-15.8	Panel 2	S	0	100	6	0
Tetracycline TET	EURL EC-15.1	Panel 1	R	100	0	29	0
	EURL EC-15.2	Panel 1	S	0	100	30	0
	EURL EC-15.3	Panel 1	S	0	100	30	0
	EURL EC-15.4	Panel 1	R	100	0	30	0
	EURL EC-15.5	Panel 1	S	0	100	30	0
	EURL EC-15.6	Panel 1	R	100	0	30	1
	EURL EC-15.7	Panel 1	R	100	0	30	0
	EURL EC-15.8	Panel 1	R	100	0	30	0
Tigecycline TGC	EURL EC-15.1	Panel 1	S	0	100	29	0
	EURL EC-15.2	Panel 1	S	0	100	30	0
	EURL EC-15.3	Panel 1	S	0	100	30	0
	EURL EC-15.4	Panel 1	S	0	100	30	0
	EURL EC-15.5	Panel 1	S	0	100	30	0
	EURL EC-15.6	Panel 1	S	3.3	96.7	29	0
	EURL EC-15.7	Panel 1	S	0	100	30	0
	EURL EC-15.8	Panel 1	S	0	100	30	0
Trimethoprim TMP	EURL EC-15.1	Panel 1	R	100	0	29	0
	EURL EC-15.2	Panel 1	S	0	100	30	0
	EURL EC-15.3	Panel 1	S	0	100	30	0
	EURL EC-15.4	Panel 1	R	100	0	30	0
	EURL EC-15.5	Panel 1	S	0	100	29	0
	EURL EC-15.6	Panel 1	R	100	0	30	1
	EURL EC-15.7	Panel 1	R	100	0	30	0
	EURL EC-15.8	Panel 1	R	100	0	30	0

*Strain/antimicrobial-combination excluded from the evaluation

Salmonella - expected and obtained interpretation

Antimicrobial	Strain	Panel	Expected	% R	% S	No. correct	No. incorrect
Ampicillin AMP	EURL S-15.1	Panel 1	S	0	100	30	0
	EURL S-15.2	Panel 1	R	100	0	30	0
	EURL S-15.3	Panel 1	R	100	0	30	0
	EURL S-15.4	Panel 1	R	100	0	30	0
	EURL S-15.5	Panel 1	S	3.3	96.7	29	1
	EURL S-15.6	Panel 1	R	96.7	3.3	29	1
	EURL S-15.7	Panel 1	R	100	0	30	0
	EURL S-15.8	Panel 1	R	100	0	30	0
Azithromycin AZI	EURL S-15.1	Panel 1	S	0	100	29	0
	EURL S-15.2	Panel 1	R	100	0	29	0
	EURL S-15.3	Panel 1	S	0	100	29	0
	EURL S-15.4	Panel 1	S	0	100	29	0
	EURL S-15.5	Panel 1	S	3.4	96.6	28	1
	EURL S-15.6	Panel 1	R	96.7	3.3	29	1
	EURL S-15.7	Panel 1	R	100	0	29	0
	EURL S-15.8	Panel 1	S	0	100	29	0
Cefepime FEP	EURL S-15.1	Panel 2	S	0	100	3	0
	EURL S-15.2	Panel 2	R	100	0	28	0
	EURL S-15.3	Panel 2	R	92.9	7.1	26	2
	EURL S-15.4	Panel 2	R	100	0	28	0
	EURL S-15.5	Panel 2	S	57.1	42.9	3	4
	EURL S-15.6	Panel 2	R	100	0	27	0
	EURL S-15.7	Panel 2	R	100	0	28	0
	EURL S-15.8	Panel 2	R	96.4	3.6	27	1
Cefotaxime FOT	EURL S-15.1	Panel 1	S	0	100	30	0
	EURL S-15.2	Panel 1	R	100	0	30	0
	EURL S-15.3	Panel 1	R	100	0	30	0
	EURL S-15.4	Panel 1	R	100	0	30	0
	EURL S-15.5	Panel 1	S	6.7	93.3	28	2
	EURL S-15.6	Panel 1	R	96.7	3.3	29	1
	EURL S-15.7	Panel 1	R	100	0	30	0
	EURL S-15.8	Panel 1	R	100	0	30	0
	EURL S-15.1	Panel 2	S	0	100	3	0
	EURL S-15.2	Panel 2	R	100	0	30	0
	EURL S-15.3	Panel 2	R	100	0	30	0
	EURL S-15.4	Panel 2	R	100	0	30	0
	EURL S-15.5	Panel 2	S	28.6	71.4	5	2
	EURL S-15.6	Panel 2	R	100	0	29	0
	EURL S-15.7	Panel 2	R	100	0	30	0
	EURL S-15.8	Panel 2	R	100	0	30	0
Cefoxitin FOX	EURL S-15.1	Panel 2	S	0	100	3	0
	EURL S-15.2	Panel 2	S	0	100	30	0
	EURL S-15.3	Panel 2	R	100	0	30	0
	EURL S-15.4	Panel 2	S	0	100	30	0
	EURL S-15.5	Panel 2	R	71.4	28.6	5	2
	EURL S-15.6	Panel 2	S	0	100	29	0
	EURL S-15.7	Panel 2	R	100	0	29	0
	EURL S-15.8	Panel 2	S	0	100	30	0

Antimicrobial	Strain	Panel	Expected	% R	% S	No. correct	No. incorrect
Ceftazidime TAZ	EURL S-15.1	Panel 1	S	0	100	30	0
	EURL S-15.2	Panel 1	R	100	0	30	0
	EURL S-15.3	Panel 1	R	100	0	30	0
	EURL S-15.4	Panel 1	R	100	0	30	0
	EURL S-15.5	Panel 1	S	0	100	30	0
	EURL S-15.6*	Panel 1*	S*	40*	60*	30*	12*
	EURL S-15.7	Panel 1	R	100	0	30	0
	EURL S-15.8	Panel 1	S	0	100	30	0
	EURL S-15.1	Panel 2	S	0	100	3	0
	EURL S-15.2	Panel 2	R	100	0	30	0
	EURL S-15.3	Panel 2	R	100	0	30	0
	EURL S-15.4	Panel 2	R	96.7	3.3	29	1
	EURL S-15.5	Panel 2	S	0	100	7	0
	EURL S-15.6*	Panel 2*	S*	34.5*	65.5*	29*	10*
	EURL S-15.7	Panel 2	R	100	0	30	0
	EURL S-15.8	Panel 2	S	3.3	96.7	29	1
Chloramphenicol CHL	EURL S-15.1	Panel 1	S	0	100	30	0
	EURL S-15.2	Panel 1	R	100	0	30	0
	EURL S-15.3	Panel 1	R	100	0	30	0
	EURL S-15.4	Panel 1	S	0	100	30	0
	EURL S-15.5	Panel 1	S	3.3	96.7	29	1
	EURL S-15.6	Panel 1	R	93.3	6.7	28	2
	EURL S-15.7	Panel 1	R	100	0	30	0
	EURL S-15.8	Panel 1	S	0	100	30	0
Ciprofloxacin CIP	EURL S-15.1	Panel 1	S	0	100	30	0
	EURL S-15.2	Panel 1	R	100	0	30	0
	EURL S-15.3	Panel 1	S	0	100	30	0
	EURL S-15.4	Panel 1	R	100	0	30	0
	EURL S-15.5	Panel 1	S	0	100	30	0
	EURL S-15.6	Panel 1	S	0	100	30	0
	EURL S-15.7	Panel 1	R	100	0	30	0
	EURL S-15.8	Panel 1	S	0	100	30	0
Colistin COL	EURL S-15.1	Panel 1	S	0	100	30	0
	EURL S-15.2	Panel 1	S	0	100	30	0
	EURL S-15.3	Panel 1	S	0,0	100	30	0
	EURL S-15.4	Panel 1	S	0	100	30	0
	EURL S-15.5	Panel 1	R	80	20,0	24	6
	EURL S-15.6	Panel 1	S	3.3	96.7	29	1
	EURL S-15.7	Panel 1	S	3.3	96.7	29	1
	EURL S-15.8	Panel 1	S	0	100	30	0
Ertapenem ETP	EURL S-15.1	Panel 2	S	0	100	3	0
	EURL S-15.2	Panel 2	S	6.7	93.3	28	2
	EURL S-15.3	Panel 2	S	3.3	96.7	29	1
	EURL S-15.4	Panel 2	S	0	100	30	0
	EURL S-15.5	Panel 2	S	0	100	7	0
	EURL S-15.6	Panel 2	S	0	100	29	0
	EURL S-15.7	Panel 2	R	100	0	30	0
	EURL S-15.8	Panel 2	S	0	100	30	0
Gentamicin GEN	EURL S-15.1	Panel 1	S	0	100	30	0
	EURL S-15.2	Panel 1	R	100	0	30	0
	EURL S-15.3	Panel 1	S	0	100	30	0
	EURL S-15.4	Panel 1	S	0	100	30	0
	EURL S-15.5	Panel 1	R	96.7	3.3	29	1
	EURL S-15.6	Panel 1	S	3.3	96.7	29	1
	EURL S-15.7	Panel 1	S	0	100	30	0
	EURL S-15.8	Panel 1	S	0	100	30	0

Antimicrobial	Strain	Panel	Expected	% R	% S	No. correct	No. incorrect
Imipenem IMI	EURL S-15.1	Panel 2	S	0	100	3	0
	EURL S-15.2	Panel 2	S	0	100	30	0
	EURL S-15.3	Panel 2	S	0	100	30	0
	EURL S-15.4	Panel 2	S	0	100	30	0
	EURL S-15.5	Panel 2	S	0	100	7	0
	EURL S-15.6	Panel 2	S	0	100	29	0
	EURL S-15.7	Panel 2	R	96.7	3.3	29	1
	EURL S-15.8	Panel 2	S	0	100	30	0
Meropenem MER	EURL S-15.1	Panel 1	S	0	100	30	0
	EURL S-15.2	Panel 1	S	0	100	30	0
	EURL S-15.3	Panel 1	S	0	100	30	0
	EURL S-15.4	Panel 1	S	0	100	30	0
	EURL S-15.5	Panel 1	S	0	100	30	0
	EURL S-15.6	Panel 1	S	0	100	30	0
	EURL S-15.7	Panel 1	R	100	0	30	0
	EURL S-15.8	Panel 1	S	0	100	30	0
	EURL S-15.1	Panel 2	S	0	100	3	0
	EURL S-15.2	Panel 2	S	0	100	30	0
	EURL S-15.3	Panel 2	S	0	100	30	0
	EURL S-15.4	Panel 2	S	0	100	30	0
	EURL S-15.5	Panel 2	S	0	100	7	0
	EURL S-15.6	Panel 2	S	0	100	29	0
	EURL S-15.7	Panel 2	R	100	0	30	0
	EURL S-15.8	Panel 2	S	0	100	30	0
Nalidixic acid NAL	EURL S-15.1	Panel 1	S	0	100	30	0
	EURL S-15.2	Panel 1	R	100	0	30	0
	EURL S-15.3	Panel 1	S	0	100	30	0
	EURL S-15.4	Panel 1	R	100	0	30	0
	EURL S-15.5	Panel 1	S	0	100	30	0
	EURL S-15.6	Panel 1	S	0	100	30	0
	EURL S-15.7	Panel 1	R	100	0	30	0
	EURL S-15.8	Panel 1	R	100	0	30	0
Sulfamethoxazole SMX	EURL S-15.1	Panel 1	S	0	100	30	0
	EURL S-15.2	Panel 1	R	100	0	30	0
	EURL S-15.3	Panel 1	R	100	0	30	0
	EURL S-15.4	Panel 1	R	100	0	30	0
	EURL S-15.5	Panel 1	R	100	0	30	0
	EURL S-15.6	Panel 1	R	100	0	30	0
	EURL S-15.7	Panel 1	R	100	0	30	0
	EURL S-15.8	Panel 1	S	0	100	30	0
Temocillin TRM	EURL S-15.1	Panel 2	S	0	100	3	0
	EURL S-15.2	Panel 2	S	6.9	93.1	27	2
	EURL S-15.3	Panel 2	S	0	100	29	0
	EURL S-15.4	Panel 2	S	0	100	29	0
	EURL S-15.5	Panel 2	R	42.9	57.1	3	4
	EURL S-15.6	Panel 2	S	0	100	28	0
	EURL S-15.7	Panel 2	R	100	0	29	0
	EURL S-15.8	Panel 2	S	0	100	29	0
Tetracycline TET	EURL S-15.1	Panel 1	S	0	100	30	0
	EURL S-15.2	Panel 1	R	100	0	30	0
	EURL S-15.3	Panel 1	R	100	0	30	0
	EURL S-15.4	Panel 1	R	100	0	30	0
	EURL S-15.5	Panel 1	S	3.3	96.7	29	1
	EURL S-15.6	Panel 1	R	96.7	3.3	29	1
	EURL S-15.7	Panel 1	R	100	0,0	30	0
	EURL S-15.8	Panel 1	R	100	0	30	0

Antimicrobial	Strain	Panel	Expected	% R	% S	No. correct	No. incorrect
Tigecycline TGC	EURL S-15.1	Panel 1	S	0	100	30	0
	EURL S-15.2	Panel 1	S	13.3	86.7	26	4
	EURL S-15.3	Panel 1	S	3.3	96.7	29	1
	EURL S-15.4	Panel 1	S	0	100	30	0
	EURL S-15.5	Panel 1	S	0	100	30	0
	EURL S-15.6	Panel 1	S	3.3	96.7	29	1
	EURL S-15.7	Panel 1	S	0	100	30	0
	EURL S-15.8	Panel 1	S	0	100	30	0
Trimethoprim TMP	EURL S-15.1	Panel 1	S	0	100	30	0
	EURL S-15.2	Panel 1	R	96.7	3.3	29	1
	EURL S-15.3	Panel 1	S	0	100	30	0
	EURL S-15.4	Panel 1	R	96.6	3.4	28	1
	EURL S-15.5	Panel 1	S	3.3	96.7	29	1
	EURL S-15.6	Panel 1	R	96.7	3.3	29	1
	EURL S-15.7	Panel 1	R	96.7	3.3	29	1
	EURL S-15.8	Panel 1	S	0	100	30	0

*Strain/antimicrobial-combination excluded from the evaluation

Campylobacter - expected and obtained interpretation

Antimicrobial	Strain	Expected	% R	% S	No. correct	No. incorrect
Ciprofloxacin, CIP	EURL C-15.1	S	0	100	27	0
	EURL C-15.2	R	100	0	23	0
	EURL C-15.3	R	96.3	3.7	26	1
	EURL C-15.4	R	96.3	3.7	26	1
	EURL C-15.5	S	3.7	96.3	26	1
	EURL C-15.6	S	0	100	27	0
	EURL C-15.7	S	3.7	96.3	26	1
	EURL C-15.8	R	100	0	26	0
Erythromycin, ERY	EURL C-15.1	S	3.7	96.3	26	1
	EURL C-15.2	R	100	0	23	0
	EURL C-15.3	S	0	100	27	0
	EURL C-15.4	S	3.7	96.3	26	1
	EURL C-15.5	S	0	100	27	0
	EURL C-15.6	S	3.7	96.3	26	1
	EURL C-15.7	S	3.7	96.3	26	1
	EURL C-15.8	S	7.7	92.3	24	2
Gentamicin, GEN	EURL C-15.1	S	3.7	96.3	26	1
	EURL C-15.2	S	4.5	95.5	22	1
	EURL C-15.3	S	0	100	27	0
	EURL C-15.4	S	0	100	27	0
	EURL C-15.5	S	0	100	27	0
	EURL C-15.6	S	3.7	96.3	26	1
	EURL C-15.7	S	3.8	96.2	25	1
	EURL C-15.8	S	0	100	26	0
Nalidixic acid, NAL	EURL C-15.1	S	0	100	27	0
	EURL C-15.2	R	100	0	23	0
	EURL C-15.3	R	96.3	3.7	26	1
	EURL C-15.4	R	100	0	27	0
	EURL C-15.5	S	3.7	96.3	26	1
	EURL C-15.6	S	3.7	96.3	26	1
	EURL C-15.7	S	3.7	96.3	26	1
	EURL C-15.8	R	100	0	26	0
Streptomycin, STR	EURL C-15.1	S	3.7	96.3	26	1
	EURL C-15.2	S	4.3	95.7	22	1
	EURL C-15.3	S	0	100	27	0
	EURL C-15.4	S	3.7	96.3	26	1
	EURL C-15.5	R	96.3	3.7	26	1
	EURL C-15.6	S	3.7	96.3	26	1
	EURL C-15.7	R	100	0	26	0
	EURL C-15.8	R	96.2	3.8	25	1
Tetracycline, TET	EURL C-15.1	S	3.7	96.3	26	1
	EURL C-15.2	R	100	0	23	0
	EURL C-15.3	R	96.3	3.7	26	1
	EURL C-15.4	R	100	0	27	0
	EURL C-15.5	S	3.7	96.3	26	1
	EURL C-15.6	R	100	0	27	0
	EURL C-15.7	R	100	0	27	0
	EURL C-15.8	R	100	0	26	0

Deviations - *E. coli*

Lab no.	Strain	Panel	Antimicrobial	Obtained MIC value	Expected MIC-value	Obtained interpretation	Expected interpretation
4	EURL EC-15.4	1	Ciprofloxacin CIP	0.06	0.12	S	R
4	EURL EC-15.7	2	Temocillin TRM	16	32	S	R
6	EURL EC-15.6	2	Ertapenem ETP	0,12	0,6	R	S
11	EURL EC-15.6	1	Sulfamethoxazole SMX	128	16	R	S
11	EURL EC-15.7	2	Temocillin TRM	32	32	S	R
12	EURL EC-15.1	2	Temocillin TRM	32	8	R	S
16	EURL EC-15.2	2	Cefotaxime/clavulanic acid F/C	0,5	0,25	R	S
17	EURL EC-15.6	2	Ertapenem ETP	0,12	0,06	R	S
19	EURL EC-15.1	2	Ceftazidime/clavulanic acid T/C	0,5	0,5	R	S
20	EURL EC-15.4	1	Ciprofloxacin CIP	0.06	0.12	S	R
20	EURL EC-15.7	2	Temocillin TRM	16	32	S	R
21	EURL EC-15.7	2	Temocillin TRM	32	32	S	R
22	EURL EC-15.1	1	Meropenem MERO	≤0.03	0,5	S	R
22	EURL EC-15.1	2	Meropenem MERO	0,06	0,25	S	R
23	EURL EC-15.2	1	Sulfamethoxazole SMX	128	≤8	R	S
23	EURL EC-15.7	2	Temocillin TRM	16	32	S	R
25	EURL EC-15.1	2	Imipenem IMI	1	0,5	R	S
25	EURL EC-15.2	1	Ampicillin AMP	16	8	R	S
25	EURL EC-15.6	2	Ertapenem ETP	0,25	0,06	R	S
26	EURL EC-15.1	1	Meropenem MERO	0.12	0.5	S	R
26	EURL EC-15.2	2	Cefotaxime/clavulanic acid F/C	0,5	0,25	R	S
26	EURL EC-15.4	1	Azithromycin AZI	16	64	S	R
26	EURL EC-15.7	2	Temocillin TRM	16	32	S	R
26	EURL EC-15.8	1	Colistin COL	2	8	S	R
33	EURL EC-15.1	2	Imipenem IMI	1	0,5	R	S
37	EURL EC-15.1	2	Imipenem IMI	0,5	0,5	R	S
37	EURL EC-15.3	2	Cefotaxime/clavulanic acid F/C	1	≤0.06	R	S
37	EURL EC-15.4	1	Ciprofloxacin CIP	0.06	0,12	S	R
38	EURL EC-15.6	2	Ertapenem ETP	0.12	0.06	R	S
39	EURL EC-15.2	1	Sulfamethoxazole SMX	>1024	≤8	R	S
39	EURL EC-15.3	1	Sulfamethoxazole SMX	128	≤8	R	S
39	EURL EC-15.6	2	Ertapenem ETP	0,12	0,06	R	S
39	EURL EC-15.8	2	Imipenem IMI	1	0,25	R	S
40	EURL EC-15.4	1	Ciprofloxacin CIP	0.25	0.25	S	R
41	EURL EC-15.3	1	Sulfamethoxazole SMX	>1024	≤8	R	S
45	EURL EC-15.4	1	Ciprofloxacin CIP	0.06	0.12	S	R
45	EURL EC-15.6	1	Tigecycline TGC	1	≤0.25	R	S
45	EURL EC-15.6	2	Ertapenem ETP	0.12	0.06	R	S
60	EURL EC-15.2	2	Cefotaxime/clavulanic acid F/C	0,5	0,25	R	S

Deviations - *Salmonella*

Lab no.	Strain	Panel	Antimicrobial	Obtained MIC value	Expected MIC-value	Obtained interpretation	Expected interpretation
4	EURL S-15.5	2	Temocillin	= 32	= 32	S	R
6	EURL S-15.2	2	Ertapenem	= 0.06	= 0.06	R	S
6	EURL S-15.2	2	Temocillin	= 16	= 16	R	S
6	EURL S-15.2	1	Tigecycline	= 1	= 1	R	S
6	EURL S-15.5	2	Cefepime	= 0.12	= 0.12	R	S
6	EURL S-15.5	1	Cefotaxime	= 0.5	= 0.5	R	S
6	EURL S-15.5	2	Cefotaxime	= 0.5	= 0.5	R	S
6	EURL S-15.7	1	Colistin	= 2	= 2	R	S
12	EURL S-15.2	2	Temocillin	= 16	= 16	R	S
12	EURL S-15.5	2	Cefepime	= 0.12	= 0.12	R	S
16	EURL S-15.2	1	Tigecycline	= 1	= 1	R	S
18	EURL S-15.5	1	Colistin	= 4	= 4	S	R
18	EURL S-15.6	1	Chloramphenicol	> 128	> 128	S	R
19	EURL S-15.2	2	Ertapenem	= 0.06	= 0.06	R	S
19	EURL S-15.5	1	Ampicillin	= 2	= 2	R	S
19	EURL S-15.5	1	Azithromycin	= 8	= 8	R	S
19	EURL S-15.5	2	Cefepime	= 0.12	= 0.12	R	S
19	EURL S-15.5	1	Cefotaxime	= 0.5	= 0.5	R	S
19	EURL S-15.5	2	Cefotaxime	= 0.5	= 0.5	R	S
19	EURL S-15.5	2	Cefoxitin	= 32	= 32	S	R
19	EURL S-15.5	1	Chloramphenicol	<= 8	<= 8	R	S
19	EURL S-15.5	1	Colistin	= 4	= 4	S	R
19	EURL S-15.5	1	Gentamicin	> 32	> 32	S	R
19	EURL S-15.5	2	Temocillin	= 32	= 32	S	R
19	EURL S-15.5	1	Tetracycline	<= 2	<= 2	R	S
19	EURL S-15.5	1	Trimethoprim	<= 0.25	<= 0.25	R	S
19	EURL S-15.6	1	Ampicillin	> 64	> 64	S	R
19	EURL S-15.6	1	Azithromycin	> 64	> 64	S	R
19	EURL S-15.6	1	Cefotaxime	> 4	> 4	S	R
19	EURL S-15.6	1	Chloramphenicol	> 128	> 128	S	R
19	EURL S-15.6	1	Colistin	<= 1	<= 1	R	S
19	EURL S-15.6	1	Gentamicin	<= 0.5	<= 0.5	R	S
19	EURL S-15.6	1	Tetracycline	> 64	> 64	S	R
19	EURL S-15.6	1	Trimethoprim	> 32	> 32	S	R
21	EURL S-15.3	2	Cefepime	= 0.5	= 0.5	S	R
22	EURL S-15.5	2	Cefoxitin	= 32	= 32	S	R
22	EURL S-15.5	2	Temocillin	= 32	= 32	S	R
25	EURL S-15.8	2	Ceftazidime	= 1	= 1	R	S
26	EURL S-15.5	1	Colistin	= 4	= 4	S	R
26	EURL S-15.7	2	Imipenem	= 4	= 4	S	R
34	EURL S-15.5	1	Colistin	= 4	= 4	S	R
36	EURL S-15.4	1	Trimethoprim	> 32	> 32	S	R
36	EURL S-15.5	2	Cefepime	= 0.12	= 0.12	R	S
36	EURL S-15.5	2	Temocillin	= 32	= 32	S	R
38	EURL S-15.4	2	Ceftazidime	= 8	= 8	S	R
38	EURL S-15.8	2	Cefepime	= 2	= 2	S	R
39	EURL S-15.2	1	Tigecycline	= 1	= 1	R	S
39	EURL S-15.7	1	Trimethoprim	> 32	> 32	S	R
45	EURL S-15.2	1	Tigecycline	= 1	= 1	R	S
45	EURL S-15.2	1	Trimethoprim	> 32	> 32	S	R
45	EURL S-15.3	2	Ertapenem	= 0.03	= 0.03	R	S
45	EURL S-15.3	1	Tigecycline	= 0.5	= 0.5	R	S
45	EURL S-15.5	1	Colistin	= 4	= 4	S	R
45	EURL S-15.6	1	Tigecycline	= 1	= 1	R	S
56	EURL S-15.3	2	Cefepime	= 0.5	= 0.5	S	R
59	EURL S-15.5	1	Colistin	= 4	= 4	S	R

Deviations - *Campylobacter*

Lab no.	Strain	Antimicrobial	Obtained MIC value	Expected MIC-value	Obtained interpretation	Expected interpretation
2	EURL C-15.8	Erythromycin ERY	8	8	R	S
4	EURL C-15.3	Ciprofloxacin CIP	<=0.12	16	S	R
4	EURL C-15.3	Nalidixic acid NAL	4	>64	S	R
4	EURL C-15.3	Tetracycline TET	<=0.5	64	S	R
4	EURL C-15.4	Erythromycin ERY	>128	1	R	S
4	EURL C-15.5	Ciprofloxacin CIP	16	0,12	R	S
4	EURL C-15.5	Nalidixic acid NAL	>64	4	R	S
4	EURL C-15.5	Streptomycin STR	2	16	S	R
4	EURL C-15.5	Tetracycline TET	>64	1	R	S
4	EURL C-15.8	Streptomycin STR	1	16	S	R
18	EURL C-15.1	Species identification			coli	jejuni
18	EURL C-15.4	Streptomycin STR	16	0,5	R	S
33	EURL C-15.8	Erythromycin ERY	16	8	R	S
39	EURL C-15.1	Erythromycin ERY	128	<=1	R	S
39	EURL C-15.1	Gentamicin GEN	>16	<=0.12	R	S
39	EURL C-15.1	Streptomycin STR	>16	0,5	R	S
39	EURL C-15.1	Tetracycline TET	4	<=0.5	R	S
39	EURL C-15.2	Gentamicin GEN	>16	0,25	R	S
39	EURL C-15.2	Streptomycin STR	>16	1	R	S
39	EURL C-15.4	Ciprofloxacin CIP	0,25	8	S	R
39	EURL C-15.6	Erythromycin ERY	128	<=1	R	S
39	EURL C-15.6	Gentamicin GEN	>16	<=0.12	R	S
39	EURL C-15.6	Nalidixic acid NAL	64	4	R	S
39	EURL C-15.6	Streptomycin STR	>16	0,5	R	S
39	EURL C-15.7	Ciprofloxacin CIP	2	<=0.12	R	S
39	EURL C-15.7	Erythromycin ERY	128	1	R	S
39	EURL C-15.7	Gentamicin GEN	>16	0,25	R	S
39	EURL C-15.7	Nalidixic acid NAL	>64	4	R	S

National Food Institute
Technical University of Denmark
Kemitorvet
2800 Lyngby

Tel: 35 88 77 00

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