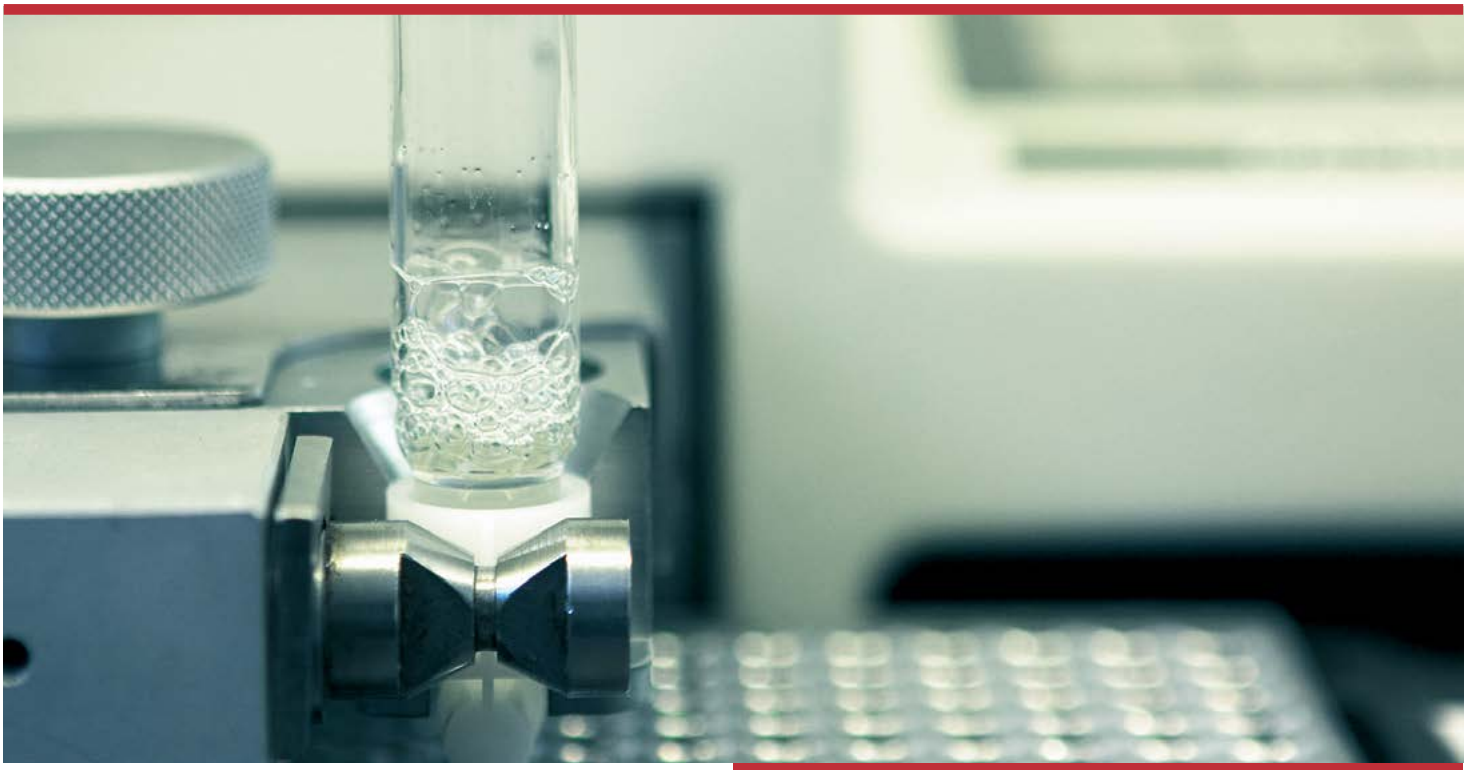
The 16th EURL-AR Proficiency Test - Enterococci, Staphylococci and *E. coli* 2014



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The 16TH EURL-AR Proficiency Test

Enterococci, Staphylococci and *Escherichia coli* - 2014

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1. Introduction

This report describes the results from the sixteenth proficiency test conducted by the National Food Institute as the EU Reference Laboratory for Antimicrobial Resistance (EURL-AR). This proficiency test focuses on antimicrobial susceptibility testing (AST) of enterococci, staphylococci and *Escherichia coli.* It is the eighth External Quality System Assurance System (EQAS) conducted for these microorganisms.

This 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 elaboration.

In 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). These results were then verified by the United States Food and Drug Administration (FDA), Centre for Veterinary Medicine. Finally, a fourth MIC determination was performed at DTU-FOOD after preparation of the agar stab culture for shipment to participants to confirm that the vials contained the correct strains with the expected MIC values.

2) Evaluation is based on interpretations of AST values determined by the participants. This is in agreement with the methods included in the EU Decision 652/2013 which are to be used for the testing of *E. coli* and Enterococci species and regarding the most recent recommendations from EFSA regarding the testing of *Staphylococcus aureus* by AST. The methods used should be reflecting those used to report AST data to the European Food Safety Authority (EFSA), and complies with “the main objective of this EQAS to assess and improve the comparability of surveillance and antimicrobial susceptibility data reported to EFSA by the different NRLs”, as stated in the protocol.

3) Given the new legislation referring only to the use of MIC methods, and the set-up of the newly built database, the reporting of Disk diffusion data was not allowed. Data reported that corresponded to interpretations based on inhibition zone diameters, instead of MIC testing were removed from the report analysis.

4) The EURL-AR network agreed on setting the accepted deviation level for laboratory performance 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. Since methods used for MIC determination have limitations, it is not considered a mistake to obtain a one-fold dilution difference in the MIC of a specific antimicrobial when testing the same strains. However, if the expected MIC is close to the breakpoint value for categorizing 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 will be categorized as susceptible and resistant, which will be evaluated as correct in one case and incorrect in the other if the evaluation is based on interpretation of MIC values. Since this report evaluates the interpretations of AST values, some participants may find their results classified as wrong even though the actual MIC they reported is only one-fold dilution different from the expected MIC. In these cases, the participants should be confident about the good quality of their performance of AST. In the organization of the EQAS we try to avoid these

situations by choosing test strains with MIC values distant from the breakpoints for resistance, which is not always feasible for all strains and all antimicrobials. Therefore, the EURL-AR network unanimously established in 2008 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 details case by case, these results may subsequently be subtracted from the evaluation report.

This report is approved in its final version by a technical advisory group composed by competent representatives from all NRLs who meet once a year at the EURL-AR workshop.

All conclusions presented in this report are publically available. However, participating laboratories are identified by codes and each code is known only by the corresponding laboratory. The full list of laboratory codes is confidential information 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 2014

A pre-notification to announce the EQAS 2014 on AST of enterococci, staphylococci and *E. coli* was sent by e-mail on the 5th May 2014 to the designated NRLs in the network (App. 1) and including eight additional laboratories (one from each of the following countries: Denmark, Iceland, Norway, Serbia, Spain, Switzerland, The Netherlands and Turkey). These were invited to take part in the EQAS 2014 on the basis of their participation in previous EQAS iterations and/or affiliation to the EU network. Finally, the participants in the EQAS represented all EU countries and Norway,

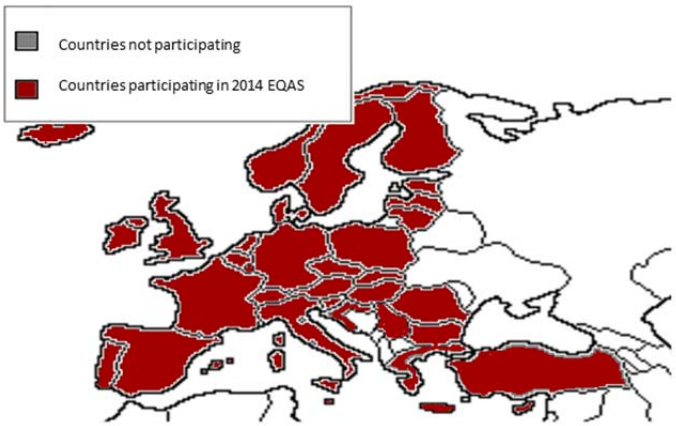

Figure 1 Participating countries in susceptibility testing of Enterococci, staphylococci and/or *E. coli*

Switzerland, Iceland, Turkey and Serbia (App. 2).

Two of the laboratories reporting data from Serbia and Turkey, have only reported data obtained by disk diffusion (DD) method for AST and therefore these laboratories have not further been included in the data analysis of AST for all pathogens but included when other data was reported. Additionally, one other laboratory (#29) reported DD partially for the *E. coli* trial and these data were not included in the analysis.

In total, this report includes AST results of enterococci strains submitted by 31 laboratories (29 included in analysis and two excluded due to submission of DD data), and AST results of staphylococci strains submitted by 31 laboratories (29 included in analysis and two excluded due to submission of DD data) and *E. coli* strains submitted by 37 laboratories (35 included in analysis and two excluded due to DD data for all AST and two additionally excluded for partial submission of DD results in the test for the second *E. coli* panel). The AST data included in the report represent all 28 MS in the EU and additionally includes data from laboratories in 3 non-EU countries (Norway, Switzerland and Iceland) (Figure 1).

2.2 Strains

Bacterial strains included in this EQAS (eight enterococci, eight staphylococci and eight *E. coli*) were selected among the DTU-Food strain collection on the basis of antimicrobial resistance profiles and MIC values. For quality assurance purposes, one strain per each bacterial species tested has been included in all EQAS iterations performed to date, which represents an internal control.

AST of the EQAS strains was performed at DTU-Food by MIC determination using the Sensititre panels from Trek Diagnostic Systems. The MIC values obtained (App. 3) were used as reference values for this EQAS trial after verification performed by the U.S. FDA. Results from the following antimicrobials were however not verified by FDA: ampicillin and teicoplanin for enterococci; meropenem, colistin, cefoxitin, meropenem, temocillin and ertapenem for *E. coli* and furthermore, chloramphenicol and ciprofloxacin for staphylococci. After comparison and verification of the MIC values obtained at DTU-Food and FDA, the strains were inoculated in agar as stab cultures, tested another time for AST and additionally for homogeneity at the DTU-FOOD laboratory, and dispatched to the participating laboratories.

Reference strains *E. faecalis* ATCC 29212, *S. aureus* ATCC 29213 and *E. coli* ATCC 25922 were provided to new participating laboratories with instructions to store and maintain them for quality assurance purposes and future EQAS trials.

2.3 Antimicrobials

The panels of antimicrobials recommended for AST in this trial are listed in Table 1.

The antimicrobials tested were changed in relation to previous trials by adjusting to the EU regulation EC652/2013 and in the case of Staphylococci to the most recent EFSA recommendations.

Guidelines for performing AST were set according to the Clinical and Laboratory Standards Institute (CLSI) document – M7-A9 (2012) “Methods for Dilution Antimicrobial Susceptibility Tests for Bacteria That Grow Aerobically; Approved Standard - Ninth Edition” and whenever commercial methods were used, the guidelines of the manufacturer should be followed.

MIC results were interpreted by using EUCAST epidemiological cut-off values (www.eucast.org), as included in the regulation referred above or as recommended by EFSA

Table 1. Panel of antimicrobials recommended for susceptibility testing of bacteria included in this EQAS 2014 component

Enterococci	Staphylococci	*Escherichia coli*	*Escherichia coli* 2nd panel
Ampicillin, AMP	Cefoxitin, FOX	Ampicillin, AMP	Cefepime, FEP
Chloramphenicol, CHL	Chloramphenicol, CHL	Azithromycin, AZI	Cefotaxime + clavulanic acid (F/C)
Ciprofloxacin, CIP	Ciprofloxacin, CIP	Cefotaxime, FOT	Cefotaxime, FOT
Daptomycin, DAP	Clindamycin, CLN	Ceftazidime, TAZ	Cefoxitin, FOX
Erythromycin, ERY	Erythromycin, ERY	Chloramphenicol, CHL	Ceftazidime, TAZ
Gentamicin, GEN	Gentamicin, GEN	Ciprofloxacin, CIP	Ceftazidime+ clavulanic acid (T/C)
Linezolid, LZD	Linezolid, LZD	Colistin, COL	Ertapenem, ETP
Quinupristin-dalfopristin (Synercid), SYN	Mupirocin, MUP	Gentamicin, GEN	Imipenem, IMI
Teicoplanin, TEI	Quinupristin-dalfopristin (Synercid), SYN	Meropenem, MERO	Meropenem, MERO
Tetracycline, TET	Sulfamethoxazole, SMX	Nalidixic acid, NAL	Temocillin, TRM
Tigecycline, TGC	Sulfamethoxazole+Trimethoprim, SXT	Sulfamethoxazole, SMX	
Vancomycin, VAN	Tetracycline, TET	Tetracycline, TET	
	Tiamulin, TIA	Tigecycline, TGC	
	Trimethoprim, TMP		
	Vancomycin, VAN		

and described in the protocol (App. 4). Results of ESBL detection were interpreted according to the recommendations by EFSA and as referred in the regulation, using MIC testing in the second panel of antimicrobials which should be tested every time a strain was found resistant to either cefotaxime, ceftazidime or meropenem in the first *E. coli* panel and interpreted according to the protocol indications, towards concluding on the strain's presumptive ESBL/AmpC or carbapenemase status.

2.4 Distribution

Protocols and all relevant information were uploaded on the EURL-AR website (http://www.eurl-ar.eu) thereby EQAS participants could access necessary information at any time. In June 2014, bacterial strains in agar stab cultures were dispatched in double pack containers (class UN 6.2) to the participating laboratories according to the International Air Transport Association (IATA) regulations as UN3373, biological substances category B.

2.5 Procedure

Participants were instructed to keep the agar stab cultures refrigerated until performance of AST according to the information posted on the EURL-AR website (App. 4b, 4c, 4d and 4e). In addition, instructions for interpretation of AST results were provided. For interpretation of MIC determination results, cut-off values were reported in the protocol (App. 4b: Tables 1, 2 and 3), results obtained with DD were as mentioned not acceptable in the EQAS round.

The EQAS test strains should have been categorized as resistant or susceptible.

The EURL-AR is aware that there are two different types of interpretative criteria of results, 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 still maintain the terms susceptible and resistant, even in cases where we are referring to wild-type and non-wild-type strains.

All participating laboratories were invited to enter the obtained results into an electronic record sheet at the new EURL-AR web-based database through a secured individual login and password.

A record sheet was provided with the protocol, including space for reporting the results (MIC values in µg/ml) obtained for the reference strains. These results were compared to the quality control ranges reported by CLSI in documents M31-A3 (2008) / M100-S23 (2013) (App. 5).

The database was finally closed and evaluations were made available to participants on the 17th September 2014.

After this date, the participants were invited to login again to retrieve a database-generated individual report which contained an evaluation of the submitted results including possible deviations from the expected interpretations. Finally, participants were encouraged to complete an evaluation form available at the EURL-AR database with the aim to improve future EQAS trials

3. Results

The participants were asked to report results, including MIC values together with the categorisation as resistant or susceptible. Only the categorisation was evaluated, whereas the MIC values were used as supplementary information.

As mentioned in the introduction, the EURL-AR network established that data should be examined and possibly subtracted from the general analysis if there are less than 75% correct results for a strain/antimicrobial combination in the ring trial. In this respect, we have noticed in the raw data analysis at database closing that seven antimicrobial/strain combinations were causing 25% or more deviations and these were further analysed in this report, and/or excluded from the analysis if this was justified. This was the case for ENT 8.7/ampicillin (50%), ST8.1/ciprofloxacin (52%), ST8.5/ciprofloxacin (52%) and ST 8.8/ Quinopristin-dalfopristin (SYN) (50%), EC 8.7 meropenem (47%) and EC8.7/imipenem (42%).

After these results were analyzed, the results for the enterococci and staphylococci combinations were deleted from the report. The cause for these deviations was that the expected values were just one step from the breakpoint. For this reason, these tests were not considered representative of the capacity of the laboratories for performing AST and were therefore not included in the report. However, in the case of the results of the combination EC 8.7/meropenem and imipenem, the results were included in the report given the importance of carbapenem detection. It was considered that the resistance detection in this strain containing an OXA-48 gene, which is a known carbapenem gene which is likely to emerge in *E. coli* in the MS and is important. Therefore, the laboratories would need to have the

capacity to be able to detect it. It is known that leads to reduced susceptibility to carbapenems which is at a rather low level and therefore it is challenging to detect this resistance using the current breakpoints and testing of meropenem alone as a first line of screening.

3.1 Methods

As mentioned previously all results should be reported using MIC methods as described in the regulation. Furthermore, the new database was designed only to receive data from MIC tests including values and interpretations as well as QC data from MIC relevant strains.

However, as referred before two of the participating laboratories (Serbian and Turkish participants) have uploaded data resulting from DD (observed by looking at the submitted values that must correspond to inhibition zone diameters and not MIC dilutions). Therefore the results of the Serbian and Turkish laboratories were excluded from the analysis of data included in this report, regarding AST data for all three pathogens. Additionally, one laboratory (Lab #29) performed DD for a part of the AST and these particular results were therefore not included in the report.

In the EQAS 2014, 29, 29 and 35 participants performed AST by MIC determination for enterococci, staphylococci and *E. coli*, respectively.

3.2 Deviations overall

The list of deviations is illustrated in Appendixes 8a, 8b and 8c. Figure 2 shows the overall deviation levels.

Table 2. Total number of antimicrobial susceptibility tests (AST) performed for each EQAS 2014 strain and percentage (%) of correct results

Strain*	No. AST	No correct	% correct	Strain*	No. AST	No correct	% correct	Strain*	No. AST	No correct	% correct
ENT-8.1	304	298	98,0%	ST-8.1	322	315	97,8%	EC 8.1	445	443	99,6%
ENT-8.2	304	296	97,4%	ST-8.2	352	346	98,3%	EC 8.2	672	668	99,4%
ENT-8.3	305	299	98,0%	ST-8.3	352	344	97,7%	EC 8.3	672	669	99,6%
ENT-8.4	306	301	98,4%	ST-8.4	349	342	98,0%	EC 8.4	671	669	99,7%
ENT-8.5	285	282	98,9%	ST-8.5	324	316	97,5%	EC 8.5	446	443	99,3%
ENT-8.6	285	284	99,6%	ST-8.6	354	344	97,2%	EC 8.6	446	444	99,6%
ENT-8.7	278	273	98,2%	ST-8.7	353	352	99,7%	EC 8.7	578	538	93,1%
ENT-8.8	272	271	99,6%	ST-8.8	333	328	98,5%	EC 8.8	446	443	99,3%

*ENT, enterococci; ST, staphylococci; EC, *Escherichia coli*.

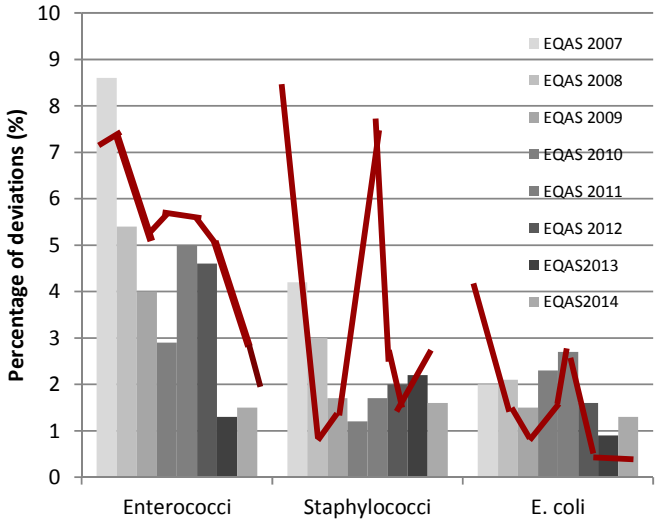

Figure 2 Overview of the percentages of deviations from expected results obtained in different EQAS iterations for the three bacterial species tested. The internal control strain is represented by a red line.

Overall, the percentage of results in agreement with the expected values ranged from a minimum of 93.1% (strain EC 8.7) to a maximum of 99.7% (strains ST 8.7 and EC 8.4), as shown in Table 2. The *E. coli* trial resulted in the highest percentage of correct results in general, which were at 98.7%, whereas enterococci and staphylococci showed 98.5% and 98.1% and of correct results respectively.

Detailed analyses of the results obtained for each species are reported in the following paragraphs.

3.2.1 Enterococci

Analysis of results from the Enterococci trial showed that one antimicrobial/strain combination had more than 25% deviations due to expected MIC being one dilution step from the breakpoint. This was the case of the

combination ampicillin and strain EURL ENT 8.7. For this combination, 26 laboratories uploaded results and exactly 50% of them (n=13) have responded either that the strain was falling into the category of susceptible or resistant. This strain had an expected result of "R" due to an expected MIC value of 8 mg/L which is just above the breakpoint. From the thirteen laboratories having a deviation, 11 had submitted a MIC value of 4 mg/L (one step below the expected value) or <= 4mg/L (this value was submitted only by one participant and might have been obtained with a different panel) and only two laboratories had obtained an MIC value at 2mg/L which is 2 steps below the expected value These results were subtracted from the calculations in this report as they do not reflect the capacity of the laboratories to perform AST.

Among, the strains sent in this EQAS, it was also noted that ENT 8.1, 8.2 and 8.3 showed heterogeneous colony morphology and further tests were performed at the EURL-AR showing that the MIC and ID of subcultures were equivalent. Furthermore, one of these strains (ENT 8.2) had a low MIC for vancomycin in one of the FDA verifications, but showed the expected MIC in a second testing at FDA performed on a subculture. Also one of the participant laboratories (Lab #1) obtained deviations for vancomycin and teicoplanin as they observed very low MIC for strains ENT 8.1 and 8.2 and an additional laboratory observed low MIC for vancomycin for ENT 8.2. This information indicates that there could have been a phenomenon of heteroresistance to vancomycin and teicoplanin present among strains ENT 8.1 and 8.2 and therefore the culture tested may have contained subpopulations of bacteria expressing the resistance gene contained unevenly. This has been observed in *E. faecium* before (Alam MR. *et al*, 2001). However, this did not cause further issues for the remaining participants and therefore the results were included in the analysis.

Thirty-one laboratories, representing 29 countries (24 MS and five non-EU countries) uploaded results for the Enterococci trial. From these, the two laboratories form Serbia and Turkey uploaded DD data for the AST tests which were excluded from the analysis, however, the results for the ID of Enterococci of these two laboratories were still included in the analysis. One of the participating laboratories uploaded data for only seven of the test strains (Lab #46). Additionally, they reported in the database comment field that they did not receive strain ENT 8.8. Had the laboratory communicated this to the EURL-AR in due time, the mistake could have been corrected and and the strain shipped. This could not be communicated to the EURL-AR in due time, as the laboratory's main activity is a clinical reference service and experiences a high volume of referral patient-isolates. Subsequently, there was a delay of testing the EQA strains, where the opportunity to alert the EURL-AR was too late for a replacement strain to be sent.

The Enterococci trial had in general very good results with 98.5% of the AST results interpreted correctly.

Results deviating from expected interpretation subdivided by strain showed that the percentage of deviations from expected results ranged from 0.4% (ENT 8.6 and ENT 8.8) to 2.6% (ENT 8.2) (Figure 3).

Analysis of the results according to the tested antimicrobials showed that the highest percentages of deviation from expected interpretations were obtained in testing susceptibility to tigecycline (6.0%) and quinopristin-dalfopristin (2.9%) (Figure 4). An overview of obtained and expected results is reported in Appendix 7a.

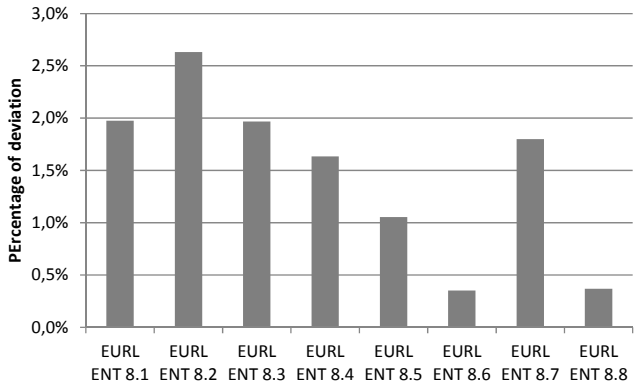

Figure 3. Enterococci trial: results deviating from the expected interpretation subdivided by tested strain

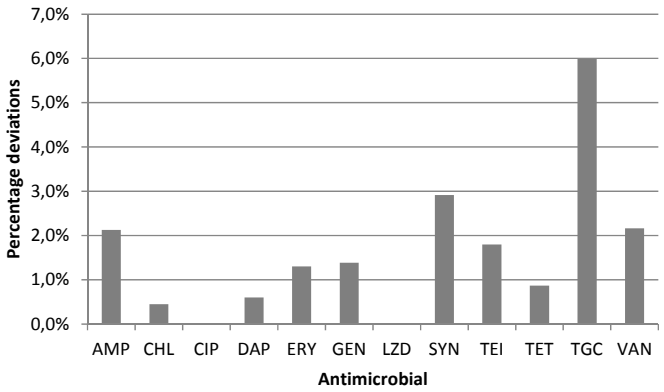

Figure 4. Enterococci trial: results deviating from the expected interpretation according to tested antimicrobials.

Enterococci identification (ID)

As a mandatory component of the proficiency test, the participants were requested to identify the Enterococci species. The exercise went very well and only six deviations were obtained in 248 tests performed. In reality, the deviations observed were not due to mistakes in the methods performed, but due to lack of data input as the default value was set on *E. faecalis*. In this way, one of the participant laboratories (Lab #54) reported all the strains as *E. faecalis* (assuming the "default" choice) and therefore had deviations in the five strains which were expected to be identified as *E. faecium*. For this laboratory the ID issues did not affect the analysis of the AST results, as these results were not included in this analysis as DD results were reported. One additional laboratory had one deviation due to lack of reporting on strain ENT 8.8 which they mentioned in the database comments that was not received from the EURL-AR and therefore no AST results were submitted for this strain either.

3.2.2 Staphylococci

Analysis of results from the Staphylococci trial showed that three antimicrobial/strain combinations had more than 25% deviations due to expected results being very close to the breakpoint. This was the case of the combinations: ciprofloxacin/ST 8.1, ciprofloxacin/ST 8.5 and quinopristin-dalfopristin (SYN)/ ST8.8.

Regarding the combination ciprofloxacin/ST

8.1, 27 laboratories uploaded results and 52% of them (n=14) responded that the strain fell into the category of susceptible. This strain had an expected result of “R” due to an expected MIC value of 2 mg/L which is just above the breakpoint. From the fourteen laboratories having a deviation, 13 had obtained a MIC value of 1 or <=1mg/L (one step below the expected value) and only one laboratories had obtained an MIC value at 0.5 mg/L which is 2 steps below the expected value.

For the combination ciprofloxacin/ST 8.5, again, 27 laboratories uploaded results and 52% of them (n=14) have responded strain was falling into the category of susceptible. Similarly to ST 8.1, this strain had an expected result of “R” due to an expected MIC value of 2 mg/L which is just above the breakpoint. All of the fourteen laboratories having a deviation, had obtained a MIC value of 1 (one step below the expected value).

Finally, regarding the combination quinopristin dalfopristin/ST 8.8, 20 laboratories uploaded results and 50% of them (n=10) responded that the strain fell into the category of susceptible. This strain had an expected interpretation set as of “S” due to an expected MIC value of 1 mg/L which is just below the breakpoint. From the ten laboratories having a deviation, nine had obtained a MIC value of >1 or 2mg/L (one step above the expected value) and only one laboratory had obtained an MIC value at 4 mg/L which is 2 steps above the expected value.

The results obtained in these three antimicrobial/strain combinations were subtracted from the calculations in this report as they did not reflect the capacity of the laboratories to perform AST.

Thirty-one laboratories, representing 29 countries (25 MS and four non-EU countries) uploaded results for the Staphylococci trial. From these, two laboratories (Serbia and Turkey) uploaded DD data for the AST tests which were excluded from the analysis. However, the results for the methicillin resistance of these two laboratories were still included in the analysis.

The general analysis of results from the Staphylococci trial showed that 98.1% of the results had correct interpretations.

The analysis of results deviating from expected interpretation subdivided by strain showed that the percentage of deviations from expected results ranged from 0.3% to 2.8% (Figure 5). For the staphylococci the strains showing higher number of deviations (2.8%) disagreeing with the expected results was strain ST 8.6 (Figure 5). The lowest percentage of disagreement with the expected results was 0.3 % for strain ST 8.7 (Figure 5).

Analysis of the results sorted according to the tested antimicrobials showed that the highest percentages of deviation from expected interpretations were obtained in testing susceptibility to sulfamethoxazole (5.2%) and quinupristin-dalfopristin (4.9%) (Figure 6).

An overview of obtained and expected results is reported in Appendix 7b.

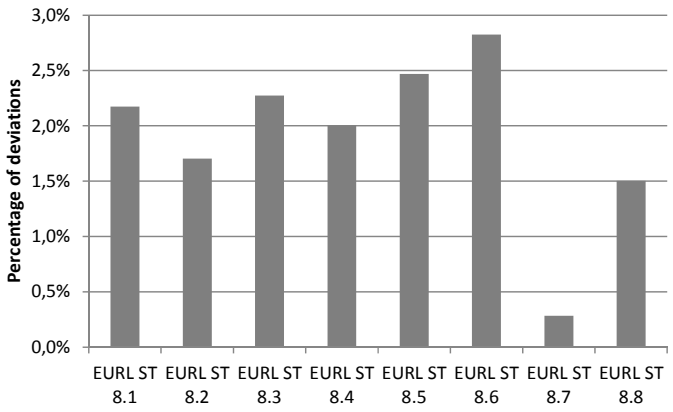

Figure 5. Staphylococci trial: results deviating from the expected interpretation subdivided by tested strain.

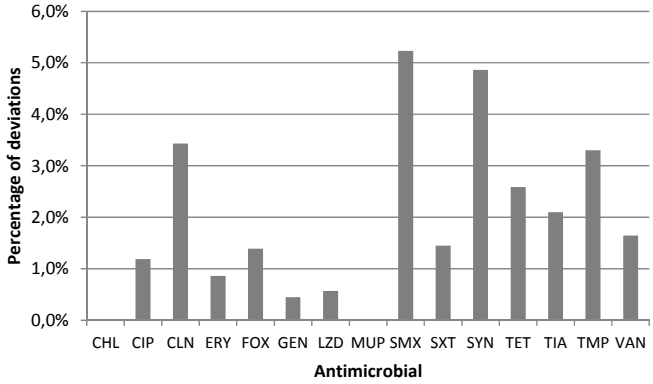

Figure 6. Staphylococci trial: results deviating from the expected interpretation according to tested antimicrobials.

Methicillin-resistant *S. aureus*

In this EQAS trial, staphylococci strains ST 8.4, 8.5 and 8.8 were methicillin-resistant, all of these harbouring the *mecA* gene. Among 31 participants testing staphylococci strains for methicillin resistance, one (#57) did not report results concerning methicillin resistance and had therefore set the result into the default option “Negative”, being unable to detect the three positive strains.

One additional participant (Lab #39) failed in detecting methicillin resistance in strain ST 8.5 and found strain ST8.1 as false positive for methicillin resistance.

All remaining results were correct, including those reported by Lab #54 which had not included in the AST analysis due to reporting of DD data.

3.2.3 Escherichia coli

The initial data check of results from the *E. coli* trial showed that two antimicrobial/strain combinations had more than 25% deviations. In both cases the antimicrobials that were difficult to assign to the right interpretation were related to the same strain EC 8.7. This strain contains an OXA-48 gene conferring reduced susceptibility to carbapenems, without causing detectable cephalosporin resistance. Therefore, among the 31 laboratories uploading results for this strain, 17 (54.8%) of them considered this

strain as susceptible in the first panel. This strain was therefore only tested in the second panel by 20 participants from which again seven of them (35%) did not detect the meropenem resistance in the second panel either. Furthermore, this same strain was tested for imipenem by 19 laboratories performing AST on the second panel, and 8 of these (42.1%) did not detect the imipenem resistance. These issues might not reveal real problems in the AST methodology, as the strain's expected MIC for both meropenem and imipenem was just above the breakpoint (0.12 and 0.25mg/L, respectively) and most laboratories having this mistake had results just one step below the expected. There were, however, two laboratories were the interpretation was correct as "R", even though the strain was tested at 0.12 mg/L and otherwise the mistakes observed were mostly caused by testing one dilution below the expected value (with few exceptions), indicating the resistance mechanisms is present but causing low level of susceptibility. Only in two cases the result was two or more steps below, which might indicate a possible loss of plasmid or issues in the MIC testing.

Analysis of results from the *E. coli* trial showed that 98.7% of the results were interpreted correctly. Figure 2 shows the total percentage of deviations assigned to AST in this trial in relation to the previous trials.

Analysis of results deviating from expected interpretation subdivided by strain showed that percentage of deviations from all expected results ranged from 0.3% to 6.9% (Figure 7). The highest percentage (6.9%) of disagreement with expected results was obtained for EC 8.7 (Figure 7) and this is mainly due to the issues related to the detection of the reduction in susceptibility of carbapenems. Out of the 37 laboratories participating in the *E. coli* trial, two were not included in the analysis due to the DD results submitted and therefore 35 were further analysed. An overview of obtained and expected results is reported in Appendix 7c.

Analysis of the results according to the tested antimicrobials showed that the highest percentages of deviation from expected interpretations were obtained in testing susceptibility to imipenem (8.5%) and meropenem (6.7%), essentially due to the deviations related to strain EC 8.7 (Figure 8). No deviations were observed for colistin, gentamicin and trimethoprim susceptibility testing (Figure 8).

An overview of obtained and expected results is reported in Appendix 7c.

Beta-lactamase-producing *E. coli*

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 production requires the testing of the second *E. coli* susceptibility testing panel. Which includes both cefotaxime (FOT) and ceftazidime (TAZ) alone and in combination with a β-lactamase inhibitor (clavulanic acid), as well as additional cephalosporins and carbapenems and temocillin which can be used to interpret the phenotype and do a presumptive diagnosis of the type of genes that might be present in the strains. In this sense, one of the main concepts would be synergy which is defined as a ≥ 3 twofold concentration decrease in an MIC for either cephalosporin agent tested in combination with clavulanic acid vs. its MIC when tested alone (CLSI M100 Table 2A; Enterobacteriaceae). The presence of synergy indicates ESBL production. Resistance to cefepime gives further indication of ESBL production.

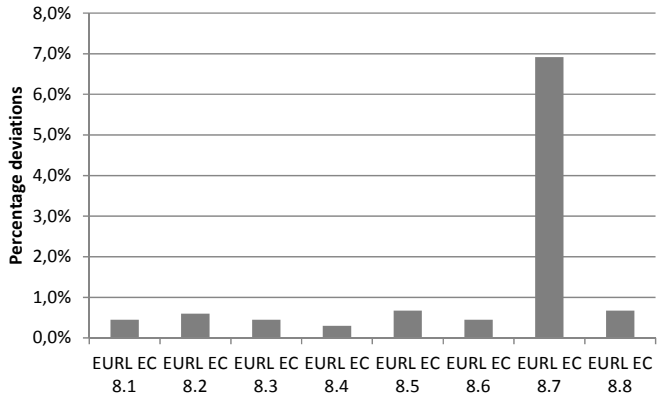

Figure 7 *E. coli* trial: results deviating from the expected interpretation subdivided by tested strain and antimicrobial susceptibility test method used

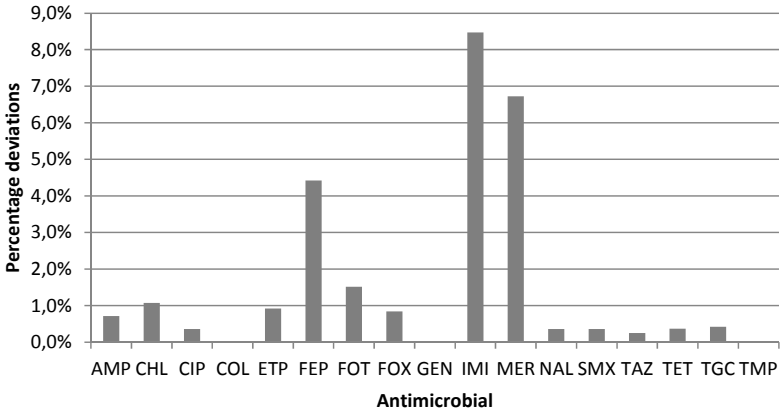

Figure 8. *E. coli* trial: results deviating from the expected interpretation according to tested antimicrobials.

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

Detection of AmpC-type beta-lactamase producing bacteria can be performed by testing the isolates for susceptibility to cefoxitin (FOX). Resistance to FOX could indicate the presence of an AmpC-type beta-lactamase, that may be verified by PCR and sequencing.

The classification of the phenotypic results should be based on the most recent EFSA recommendations (EFSA 2012), indicating as:

- Presumptive ESBL: strains with positive synergy test, susceptible to cefoxitin and resistant to cefepime
- Presumptive ESBL+pAmpC: -strains with positive or negative synergy test, resistant to cefoxitin and resistant to cefepime
- Presumptive pAmpC phenotype: - strains with resistance to cefoxitin and

negative synergy test and susceptible to cefepime

- Presumptive carbapenemase phenotype: -strain resistant to meropenem
- Unusual phenotype: any other combinations

In this EQAS, 36 laboratories have uploaded results at least for the strains harbouring resistance genes to the cephalosporins tested. One additional laboratory (Lab #54) considered all the strains as "Not resistant" probably because no test was performed, and had therefore deviations for all four positive strains.

Deviations from expected results were obtained as follows:

Three participants (Lab #34, #37 and #54) did not identify EC 8.3 as an ESBL producing strain but they classified it respectively as: "presumptive pAmpC". "presumptive ESBL+pAmpC" and "Not resistant".

Regarding the AmpC strains, strain EC 8.4 was misclassified as "presumptive ESBL+pAmpC" by four laboratories (Lab #16, #57, #58 and #59) or as "Not resistant" by Lab #54.

Most of these labs seemed to have misclassified the phenotype, whereas lab #16 and #58 found resistance to cefepime in addition to the AmpC phenotype.

Strain EC 8.2 harbouring a KPC-2 carbapenemase was quite resistant and its deviating results were split between "Unusual phenotype" chosen by nine laboratories (Labs #1, #2, #6, #18, #20, #36, #38, #41 and #58) due to the FOX resistance observed. Additionally, two labs (Lab #2, and #57) classified it as "presumptive pAmpC" and four laboratories (Labs #22, #23, #39 and #40) classified it as "presumptive ESBL+ pAmpC".

Regarding the carbapenemase producing (OXA-48) EC 8.7, the strain was correctly classified by 16 laboratories and misclassified by 21 laboratories which considered it as a Not resistant (n=18) since they did not detect the meropenem reduced susceptibility or as unusual type (three labs) by classifying it at not fitting in the classifications recommended in the EFSA guidelines and the EQAS protocol for this ring trial (please refer to protocol, App.4b).

Additionally, the participant laboratories #39, #57 and #58 had additional deviations (respectively three, two and one deviations) in the interpretations of the phenotypes by considering some of the strains that were expected not to have any of these resistances as "Unusual phenotype", "ESBL" or "carbapenemase" suspects.

3.3 Deviations by participating laboratory

Figures 9, 10 and 11 illustrate the percentage of deviations for each participant laboratory.

One out of 29 participants obtained a percentage of deviations from expected results higher than 5% for enterococci (Figure 9), four out of 29 participants had above 5% deviation in the staphylococci trial (Figure 10) and one out of 35 participants had above 5% deviation in the *E. coli* trial (Figure 11). These results will be the focus of the next sections.

3.3.1 Enterococci

Participant #58 obtained the largest number of deviations (16.3%) and was considered as an outlier in this ring trial. Fifteen deviations were obtained among the results reported from this laboratory. Deviations were obtained for all the strains in the test and for several antimicrobial drugs and having in common that all deviations were caused by reporting MIC's much higher than the expected and therefore interpretation

as resistant of strains that were expected to be susceptible.

For further information please consult the overview in the Appendixes (App. 8a).

In summary, 28 of the 29 participants in the enterococci trial achieved the acceptance level by having less than 5% of results deviating from the expected values (Figure 9). The one participant who did not meet the acceptance level, (Lab #58), was considered an outlier (Figure 9). Two additional participants were not included in the analysis of the AST data due to submission of DD results.

3.3.2 Staphylococci

Analysis of laboratory performance of AST showed that four out of 29 participants obtained a percentage of deviations from expected results higher than 5.0% (Figure 10).

Participant #58 was considered outlier due to the percentages of deviations obtained. This participant had 11.3% deviations corresponding to twelve deviations. These deviations were regarding the testing of several of the test strains against a number of antimicrobials including: cefoxitin, clindamycin, erythromycin sulfamethoxazole, tetracycline, tiamulin, trimethoprim . As also for the enterococci all deviations were caused by reporting higher MIC results than expected.

Participant #39 obtained 8.7% due to four deviations from expected results. These deviations are regarding the testing of only one strain ST 8.2 against 4 antimicrobials (ciprofloxacin, erythromycin, tetracycline and trimethoprim) and for all the deviations, higher MIC results than expected were obtained.

The third participant having deviation percent higher than the 5% threshold was laboratory #46. The results of this laboratory affected the testing of most of the strains and eight deviations were distributed among the results for several antimicrobials. Most deviating results were one step below or above the expected value, however, in one case a much higher MIC was obtained for tetracycline and in another case the interpretations was different from the expected but the MIC value was equal to the expected value.

The fourth participant having a level of deviation above 5% for staphylococci was laboratory #17 which had 5.5% deviations caused by six deviations in total. The deviations were found in different test strains and for different antimicrobials and all of them were due to MIC

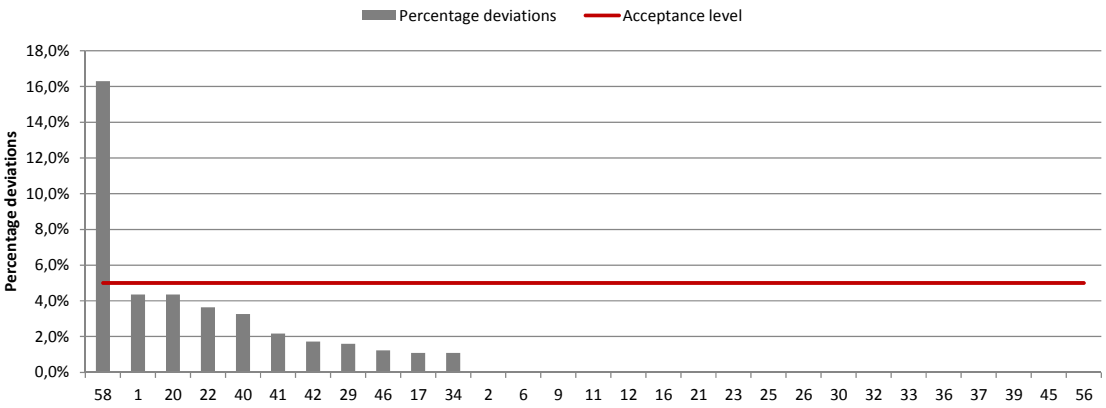

Figure 9. Percentage of deviations from expected results obtained by each laboratory in the enterococci trial. The laboratories were ranked by decreasing percentage of deviations from expected results in antimicrobial susceptibility testing.

values determined that were higher than expected by one (in four cases) or two steps (in two cases), and causing the interpretation to be resistant instead of sensitive as expected.

In summary, 25 of 29 participants in the staphylococci trial achieved the acceptance level by having less than 5% of results deviating from the expected values and four had deviation levels above , one of the latter was considered an outlier (Figure 10).

Two additional participants were not included in the analysis of the AST data due to submission of DD results.

Deviations from expected results obtained by each participant in the staphylococci trial are reported in Appendix 8b.

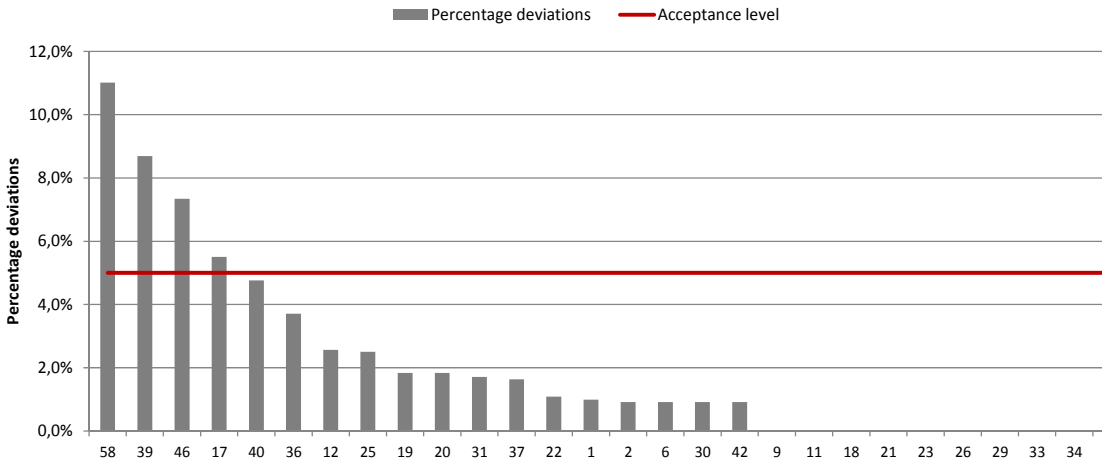

Figure 10 Percentage of deviations from expected results obtained by each laboratory in the Staphylococci trial. The laboratories were ranked by decreasing percentage of deviations from expected results in antimicrobial susceptibility testing

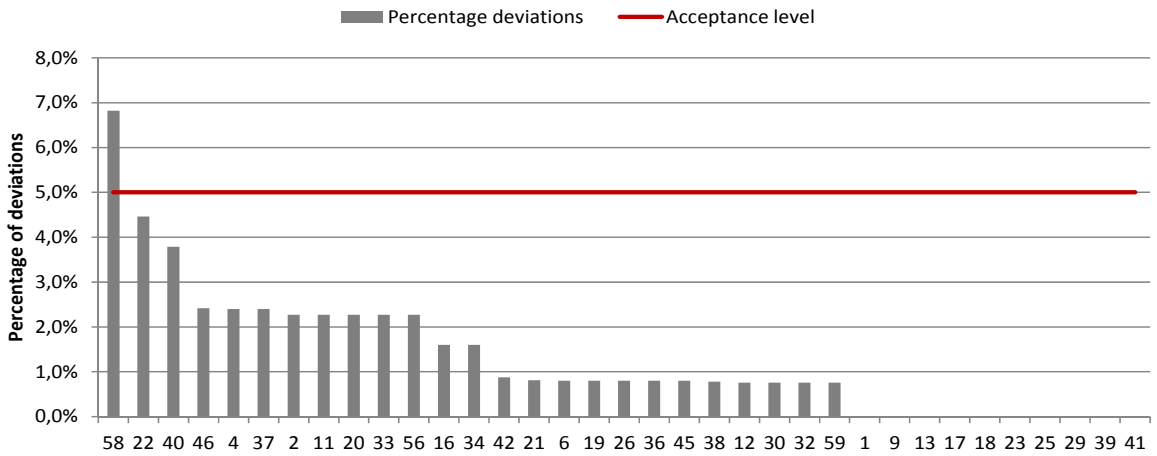

Figure 11. Percentage of deviations from expected results obtained by each laboratory in the *Escherichia coli* trial. The laboratories were ranked by decreasing percentage of deviations from expected results in antimicrobial susceptibility testing

3.3.3 *Escherichia coli*

Analysis of laboratory performance of AST showed that one out of 35 participants obtained a percentage of deviations from expected results higher than 5% (Figure 12).

Table 3. Antimicrobial susceptibility testing of *Enterococcus faecalis* ATCC 29212 by MIC determination: deviations from expected values.

Antimicrobial	Proportion outside of range	Below QC range	Above QC range
Ampicillin	0/27 (0%)	-	-
Chloramphenicol	0/26 (0%)	-	-
Ciprofloxacin	0/22 (0%)	-	-
Daptomycin	0/20 (0%)	-	-
Erythromycin	0/28 (0%)	-	-
Gentamicin	1/28 (4%)	<=0.8	-
Linezolid	0/28 (0%)	-	-
Quinu-dalfo-pristin	0/18 (0%)	-	-
Teicoplanin	0/21 (0%)	-	-
Tetracycline	0/28 (0%)	-	-
Tigecycline	0/20 (0%)	-	-
Vancomycin	0/28 (0%)	-	-

Table 4. Antimicrobial susceptibility testing of *Staphylococcus aureus* ATCC 29213 by MIC determination: deviations from expected values.

Antimicrobial	Proportion outside of range	Below QC range	Above QC range
Cefoxitin	1/25 (4%)	1 step	-
Chloramphenicol	0/26 (0%)	-	-
Ciprofloxacin	0/27 (0%)	-	-
Clindamycin	0/25 (0%)	-	-
Erythromycin	0/28 (0%)	-	-
Gentamicin	0/27 (0%)	-	-
Linezolid	0/21 (0%)	-	-
Mupirocin	No range		
Quinu-dalfo-pristin	0/20 (0%)	-	-
Sulfisoxazole	1/18 (6%)	2 steps	-
Sulfametoxazol + Trimethoprim	0/5 (0%)	-	-
Tetracycline	0/28 (0%)	-	-
Tiamulin	No range		
Trimethoprim	0/25 (0%)	-	-
Vancomycin	0/22 (0%)	-	-

Participant #58 obtained nine deviations from the expected results accounting for a total deviation of 6.8%. These deviations are regarding the testing of five of the eight strains against different antimicrobials.

34 of 35 participants in the *E. coli* trial achieved the acceptance level by having less than 5% of results deviating from the expected values

3.4 Deviations from expected results for the reference strains

The results for antimicrobial susceptibility testing of the reference strains have been evaluated according to the CLSI-established quality control (QC) ranges (App. 5).

3.4.1 Enterococcus faecalis ATCC 29212

28 participants performed AST of *E. faecalis* ATCC 29212 by MIC determination. One only result was found outside of range due to insertion of an unexpected value by participant Lab# 20. In summary, out of 294 tests performed 293 were correct (Table 3).

3.4.2 Staphylococcus aureus ATCC 29213

Twenty-eight participants performed AST of *S. aureus* ATCC 29213 by MIC determination (Table 4) and one additional laboratory #23 did perform MIC testing but did not upload data for this reference strain. In this EQAS, four deviations were obtained, two of them were due to insertion of unexpected values (probable disk diffusion data) for both cefoxitin and vancomycin by Lab #29 and were disregarded from this analysis. One deviation for cefoxitin was obtained by Lab #46 which tested the QC strain one step below the QC range because an E-test was used. Lab #46 does not undertake MICs of cefoxitin as standard and the use of E-tests results in lower MICs and another deviation was obtained by Lab #37 by testing sulfamethoxazole 2 steps below the QC range. In summary, out of 297 tests submitted, 293

Table 5. Antimicrobial susceptibility testing of *Escherichia coli* ATCC 25922 by MIC: deviations from expected values.

Antimicrobial	Panel	Proportion outside of range	Below QC range	Above QC range
Ampicillin	1	1/34 (3%)		2 steps
Azithromycin	1	No range		
Cefotaxime	1	1/33 (3%)		1 step
Ceftazidime	1	0/34 (0%)		
Chloramphenicol	1	0/33 (0%)		
Ciprofloxacin	1	1/34 (3%)		0,016*
Colistin	1	0/34 (0%)		
Gentamicin	1	0/34 (0%)		
Meropenem	1	0/32 (0%)		
Nalidixic acid	1	0/33 (0%)		
Sulfamethoxazole	1	1/31 (3%)		1 step
Tetracycline	1	0/33 (0%)		
Tigecycline	1	2/30 (7%)	0,025*	1 step
Trimethoprim	1	0/33 (0%)		
Cefepime	2	0/23 (0%)		
Cefotaxime	2	0/23 (0%)		
CTX/clav acid	2	No range		
Cefoxitin	2	2/23 (9%)	1 step 2 steps	
Ceftazidime	2	0/23 (0%)		
CAZ/ clav acid	2	No range		
Ertapenem	2	0/23 (0%)		
Imipenem	2	0/23 (0%)		
Meropenem	2	0/23 (0%)		
Temocillin	2	No range		

- Result obtained could be have been right but the value uploaded was mistyped

were correct.

3.4.3 *Escherichia coli* ATCC 25922

Thirty-four participants performed AST of *E. coli* ATCC 25922 by MIC determination and one participant (Lab #23) performed MIC determination but did not upload reference strain data even though this is a compulsory part of the EQAS. Six deviations were detected, to different antimicrobials and obtained by different participant laboratories which all had one deviation each (Labs #4, #18, #19, #39, #45 and #46. In summary, out of 428 tests performed in the first panel, 422 were correct. For the second panel of antimicrobials only 23 laboratories tested this QC strain and out of 161 tests, 159 were correct and two deviations were observed for cefoxitin (Labs #41 and #36 which got the results respectively one step and two steps below the QC range).

For further information please consult App 6a, 6b and 6c.

4. Discussion

4.1 General overview

In general, the results were comparable to recent years and the overall deviations levels for AST in the three trials were very similar, ranging from 1.3% to 1.6%. For *E.coli* and enterococci the level of deviations in AST had slightly increased in this year's trial in relation to the past year, whereas the staphylococci deviation level had slightly decreased. (Figure 2). The results observed with the internal control strain, denoted a slight improvement of the results for all three bacterial species and the deviation levels for these strains ranged from 0.4% to 2.5% (Figure 2).

It is important to consider that the number of EQAS participants changes from year to year, which implies that comparisons among different EQAS iterations are difficult to interpret. Furthermore, results from five laboratories from EU–affiliated countries non-MS were included in this report.

The network has now implemented the EU regulation and therefore the AST methodology has been harmonized among NRLs for testing *E. coli* and enterococci. This shows by having most laboratories uploading data for all antimicrobials in the panels. However, not all results are uploaded, denoting possibly that not all laboratories are yet able to deliver data for all antimicrobials. However, as staphylococci are not included in the regulation there are some discrepancies in the tests performed in relation to the EFSA recommended antimicrobials, between participants.

4.2 Enterococci

The percentages of deviations observed from 0.4% to 2.6% among the different test strains (Figure 3). These percentages of deviation were rather similar to those obtained in the 2013 trial.

One participants submitted more than 5% results deviating from the expected interpretation and was considered outlier due to 16.3% deviations (Figure 9). In comparison, last year three labs had deviation levels above 5%. The participant has been contacted by the EURL-AR to identify possible causes of this unsatisfactory performance and to improve the quality of results. The overall level of deviation was only slightly increased from the level in the 2013 iteration, probably affected by the deviation level in the one outlying laboratory.

The number of participants performing AST with 100% agreement with the expected results was 18 (62%), which is a higher level than last year.

AST of the quality control strain *E. faecalis* ATCC 29212 was very good for the 28 participants that tested this strain by MIC determination (Table 3). In summary, out of 294 tests performed overall, 293 (99.7%) were within range.

Regarding the identification of the enterococci strains, the exercise went very well and only six deviations were obtained in 248 tests performed. As these deviations observed were due to lack of data input, there is no major concern on the identification methods as it corresponds to only one participant not delivering these data and accepting the default choice.

4.3 Staphylococci

The deviation percentages observed among the results for the different test strains ranged from 0.3% to 2.8% among the different test strains (Figure 5). The number of participants performing AST with 100% agreement with the expected results was higher than in the past year and consisted of 11 participants (38%).

Identification of methicillin-resistant strains was

in general satisfactory, which demonstrated that laboratories within the EURL-AR network correctly identify MRSA. Among 31 participants testing staphylococci strains for methicillin resistance, one (#57) did not report results concerning methicillin resistance and had therefore set the result into the default option "Negative", being unable to detect the three positive strains.

One additional participant (Lab #39) failed in detecting methicillin resistance in strain ST 8.5 and found strain ST8.1 as false positive for methicillin resistance.

All remaining results were correct, including those reported by Lab #54 for which submitted AST results were not included in the analysis due to reporting of DD data.

AST of the quality control strain *S. aureus* ATCC 29213 in MIC determination resulted in 99% correct tests (Table 4). Overall, this performance was quite satisfactory.

4.4 Escherichia coli

The percentages of results deviating from the expected interpretations varied from 0.3% to 6.9% among the different test strains, with seven of the strains showing deviation percentages between 0.3% and 0.7% and only the test strain EC 8.7 with high deviation percent due to the difficulties observed in detection of the reduced susceptibility to carbapenems in the AST (for meropenem in both panels and imipenem on panel 2) (Figure 7). For further detail in the deviations observed please consult Appendix 8c.

One participant submitted more than 5% results deviating from the expected interpretation, which is lower than last year when two participants performed outside the acceptance level (Figure 11). The Laboratory obtaining highest deviation levels at 6.8% was laboratory #58. This laboratory had in total nine deviations in several antimicrobials and strains and the reasons behind the mistakes could be related to several causes including testing of strains and obtaining MIC's above the expected for most strains (except for strain EC 8.7 which had results below the expected for carbapenems) and one due to mistake in the interpretation of the correct value for chloramphenicol and strain EC 8.6.

The number of participants performing AST with 100% agreement with the expected results was 10 (29%). This is a lower percentage than the past trial and is mainly due to the fact that 12 laboratories had one deviation mostly due to the meropenem testing results for strain EC 8.7.

Detection of beta-lactamases of the ESBL and AmpC-type and especially carbapenemases should be further improved especially concerning the detection of carbapenemases and classification of the profiles found, especially mixed profiles as it is included in the EFSA classification included in the EC regulation (EU Decision 2013/652/EC) Therefore we consider there is some need for improvements for correct performance and interpretation of ESBL and AmpC confirmatory tests as well as detection of carbapenemases.

AST of the quality control strain *E. coli* ATCC 25922 resulted in 99% correct tests for both the first panel and the second (Table 5). Overall, this performance was quite satisfactory.

5. Conclusions

Despite the changes introduced with the new MIC panels to be tested in 2014, the number of laboratories not performing AST above the acceptation level (i.e. > 5% deviating results) was relatively low and consistent with the results obtained in previous EQAS trials. One out of 29 participants obtained a percentage of deviations from expected results higher than

5% for enterococci (Figure 9), four out of 29 participants had above 5% deviation in the staphylococci trial (Figure 10) and one out of 35 participants had above 5% deviation in the *E. coli* trial (Figure 11). One participant laboratory showed high levels of deviation above 5% for all organisms (Lab #58) and was considered an outlier for both enterococci and Staphylococci AST results.

Since one of the tasks of the EURL-AR is to give specific recommendations targeting individual difficulties in performing acceptable AST, laboratories outside the acceptable level have been contacted to assess individually the causes of inadequate AST performance and provide guideline to improve the methods used. These individual contacts should be taken as an opportunity to perform troubleshooting and self-evaluation and to discuss with the EURL-AR on how improve the AST results in the future.

The enterococci ID module did not reveal any methodological issues, but as one participant did not upload this parameter, the EURL-AR will follow up on the laboratory capacity of performing the ID.

One participant did not provide data on methicillin resistance and one false negative and one false positive results were reported in this trial by another laboratory, therefore the EURL-AR will follow up on any needs regarding the implementation of the correct detection and confirmation methods in these laboratories.

Major focus will be given next year on the correctly identification of *E. coli* producing beta-lactamases of the ESBL, AmpC and especially the carbapenemase phenotypes. This is a priority area within the EURL-AR activities, especially when the implementation of the selective isolation methods in 2015 becomes a reality and a large number of suspect isolates need to undergo phenotypic screening and if necessary selected for confirmatory testing. We strongly encourage participants having difficuties in identifying these strains to perform a re-test of the test strains as a training exercise, and to contact the EURL-AR in case any discussion is needed.

Finally, the EURL-AR welcomes any suggestions for improvement in future EQAS trials and invites the entire network to contribute with ideas for material to be disseminated in newsletters, alert for training needs on specific focus areas which may be of interest of the network and improve the knowledge and skills of the laboratories involved in AST monitoring.

6. References

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M00-06-001/01.12.2011

Appendix 1. Pre notification EURL-AR EQAS 2014

EQAS 2014 FOR *E. COLI*, STAPHYLOCOCCI AND ENTEROCOCCI

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 *E. coli* isolates, eight staphylococci and eight enterococci isolates. Additionally, quality control (QC) strains *E. coli* ATCC 25922 (CCM 3954), *E. faecalis* ATCC 29212 (CCM 4224) and *S. aureus* ATCC 29213 (CCM 4223) (for MIC) will be distributed to new participants.

This EQAS is specifically for NRL's on antimicrobial resistance. Therefore, laboratories designated to be NRL-AR do not need to sign up to participate but are automatically regarded as participants. Participation is free of charge for all designated NRL-AR's.

TO AVOID DELAY IN SHIPPING THE ISOLATES TO YOUR LABORATORY

The content of the parcel is "UN3373, Biological Substance Category B": Eight *E. coli*, eight staphylococci, eight enterococci 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 *June* 2014. The protocol for this proficiency test will be available for download from the website (www.eurl-ar.eu).

Submission of results: Results must be submitted to the National Food Institute **no later than *September, 5th, 2014*** via the password-protected website.
Upon reaching the deadline, each participating laboratory is kindly asked to enter the password-protected website 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. 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 EURL-AR EQAS that we will have is on antimicrobial susceptibility testing of *Salmonella* and *Campylobacter* which will be carried out in *October, 2014*
Please contact me if you have comments or questions regarding the EQAS.

Sincerely,

Lina Cavaco- EURL-AR

EU Community Reference Laboratory, Antimicrobial Resistance, Kemitorvet, Building 204, DK-2800 Kgs. Lyngby, Denmark
Ph: + 45 3588 6269, Fax: + 45 3588 6341, e-mail: licav@food.dtu.dk

Appendix 2- List of participants

Institute	Country	*E coli*	Ent	Staph
Austrian Agency for Health and Food Safety	Austria	x	x	x
Institute of Public Health	Belgium	x		
Nacional Diagnostic and Research Veterinary Institute	Bulgaria	x	x	x
Croatian Veterinary Institut	Croatia	x	x	x
Veterinary Services	Cyprus	x	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	
Estonian Veterinary and Food Laboratory	Estonia	x	x	x
Finnish Food Safety Authority EVIRA	Finland	x	x	x
Agence nationale de sécurité sanitaire ANSES- Maisons-Alfort	France	x		
Agence nationale de sécurité sanitaire ANSES - Fougères	France	x	x	
Federal Institute for Risk Assessment	Germany	x	x	x
Veterinary Laboratory of Chalkis	Greece	x		x
Central Agricultural Office Veterinary Diagnostic Directorate	Hungary	x		x
University of Iceland	Iceland	x	x	
Central Veterinary Research Laboratory	Ireland	x	x	x
Istituto Zooprofilattico Sperimentale delle Regioni Lazio e Toscana	Italy	x	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		
Public Health Laboratory	Malta	x	x	x
Food and Consumer Product Safety Authority (VWA)	Netherlands	x	x	x
Central Veterinary Institute of Wageningen UR	Netherlands	x	x	x
Veterinærinstituttet	Norway	x	x	x
National Veterinary Research Institute	Poland	x	x	x
Laboratorio National de Investigacáo Veterinaria	Portugal	x	x	x
Institute for Hygiene and Veterinary Public Health	Romania	x	x	x
Institute for Diagnosis and Animal Health	Romania	x	x	x
State Veterinary and Food Institute (SVFI)	Slovakia	x	x	x
Institute of Veterinary Medicine of Serbia	Serbia	x	x	x
National Veterinary Institute	Slovenia	x	x	x
Laboratorio Central de Sanidad, Animal de Santa Fe	Spain			x
Laboratorio Central de Sanidad, Animal de Algete	Spain	x	x	
VISAVET Health Surveillance Center, Complutense University	Spain	x	x	x
Agencia Espanola de Seguridad Alimentria y Nutricion	Spain	x		
National Veterinary Institute, SVA	Sweden	x	x	x
Vetsuisse faculty Bern, Institute of veterinary bacteriology	Switzerland	x	x	x
National Food Reference Laboratory	Turkey	x	x	x
Public Health England - Colindale	UK	x	x	x
The Veterinary Laboratory Agency	UK	x	x	x

NRL's	
non- NRL enrolled for EQAS	
not EU-member state	

Appendix 3a- Expected results for the enterococci trial (MIC- values and interpretations)

Strain nr	Species	AMP	CHL	CIP	DAP	ERY	GEN	LZD	SYN	TEI	TGC	TET	VAN
EURL ENT 8.1	*E. faecium*	4	8	0,5	0,5	1	<=8	2	4	64	0,06	64	>128
EURL ENT 8.2	*E. faecium*	4	8	0,5	1	>128	<=8	2	8	64	0,06	64	>128
EURL ENT 8.3	*E. faecium*	2	8	2	4	<=1	16	2	4	<=0,5	0,06	<=1	<=1
EURL ENT 8.4	*E. faecium*	>32	8	64	4	>32	>1024	2	2	<=0,25	0,03	<=1	2
EURL ENT 8.5	*E. faecalis*	1	128	1	2	>128	1024	1	16	<=0,5	0,125	128	1
EURL ENT 8.6	*E. faecalis*	1	8	1	2	>128	>1024	1	16	<=0,5	0,125	64	1
EURL ENT 8.7	*E. faecium*	8	8	1	2	2	16	2	4	<=0,5	0,125	64	<=1
EURL ENT 8.8	*E. faecalis*	1	128	1	2	>128	16	2	8	<=0,5	0,125	128	2

MIC interpretations

Strain nr	Species	**AMP**	**CHL**	**CIP**	**DAP**	**ERY**	**GEN**	**LZD**	**SYN**	**TEI**	**TGC**	**TET**	**VAN**
EURL ENT 8.1	*E. faecium*	S	S	S	S	S	S	S	S	R	S	R	R
EURL ENT 8.2	*E. faecium*	S	S	S	S	R	S	S	R	R	S	R	R
EURL ENT 8.3	*E. faecium*	S	S	S	S	S	S	S	S	S	S	S	S
EURL ENT 8.4	*E. faecium*	R	S	R	S	R	R	S	S	S	S	S	S
EURL ENT 8.5	*E. faecalis*	S	R	S	S	R	R	S	NA	S	S	R	S
EURL ENT 8.6	*E. faecalis*	S	S	S	S	R	R	S	NA	S	S	R	S
EURL ENT 8.7	*E. faecium*	R	S	S	S	S	S	S	S	S	S	R	S
EURL ENT 8.8	*E. faecalis*	S	R	S	S	R	S	S	NA	S	S	R	S

Resistant

NA Not applicable

Abbreviations: DAP- daptomycin, TIG- tigecycline, TEI- teicoplanin, AMP-ampicillin, CHL-chloramphenicol, CIP- ciprofloxacin, ERY- erythromycin, GEN- gentamicin, LZD- linezolid, SYN- quinupristin-dalfopristin, TET- tetracycline, VAN- vancomycin

Appendix 3b- Expected results for the staphylococci trial (MIC- values and interpretations)

Strain nr	Species	CHL	CIP	CLN	ERY	FOX	LZD	MUP	GEN	SYN	SMX	SXT	TET	TIA	TMP	VAN	methicillin R
EURL ST 8.1	*S. aureus*	8	2	0,125	0,5	4	2	0,25	0,5	<=0,5	<=32	0,5	64	1	>32	<=1	neg
EURL ST 8.2	*S. aureus*	8	0,25	0,06	0,5	2	2	0,125	0,5	<=0,5	<=32	<=0,25	<=0,5	1	1	<=1	neg
EURL ST 8.3	*S. aureus*	<=4	<=0,125	1	<=0,25	2	2	0,125	0,5	1	<=32	<=0,25	32	16	2	<=1	neg
EURL ST 8.4	*S. aureus*	8	8	8	<=0,25	8	1	0,06	<=0,25	2	<=32	0,5	128	>32	>32	<=1	pos
EURL ST 8.5	*S. aureus*	8	2	0,06	<=0,25	8	2	0,125	>16	<=0,5	512	<=0,25	32	1	1	<=1	pos
EURL ST 8.6	*S. aureus*	8	0,5	0,125	0,5	4	2	0,125	0,5	<=0,5	128	<=0,25	1	2	2	<=1	neg
EURL ST 8.7	*S. aureus*	8	>16	0,06	0,25	4	2	0,25	0,5	<=0,5	<=32	<=0,25	<=0,5	1	2	<=1	neg
EURL ST 8.8	*S. aureus*	8	0,5	0,5	0,5	8	2	<=0,06	0,5	1	<=32	<=0,25	1	>32	1	<=1	pos

MIC interpretations

Strain nr	Species	CHL	CIP	CLN	ERY	FOX	LZD	MUP	GEN	SYN	SMX	SXT	TET	TIA	TMP	VAN	methicillin R
EURL ST 8.1	*S. aureus*	S	R	S	S	S	S	S	S	S	S	S	R	S	R	S	neg
EURL ST 8.2	*S. aureus*	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	neg
EURL ST 8.3	*S. aureus*	S	S	R	S	S	S	S	S	S	S	S	R	R	S	S	neg
EURL ST 8.4	*S. aureus*	S	R	R	S	R	S	S	S	R	S	S	R	R	R	S	pos
EURL ST 8.5	*S. aureus*	S	R	**S**	S	R	S	S	R	S	R	S	R	S	S	S	pos
EURL ST 8.6	*S. aureus*	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	neg
EURL ST 8.7	*S. aureus*	S	R	S	S	S	S	S	S	S	S	S	S	S	S	S	neg
EURL ST 8.8	*S. aureus*	S	S	R	S	R	S	S	S	S	S	S	S	R	S	S	pos

Resistant

NA Not applicable

Abbreviations:, CHL-chloramphenicol, CIP- ciprofloxacin, CLN- Clindamycin, ERY- erythromycin, FOX- cefoxitin, LZD- linezolid, MUP- mupirocin, GEN- gentamicin, SYN- quinupristin-dalfopristin,, SMX- sulphametoxazole, SXT- sulphametoxazole + trimethroprim, TET- tetracycline, TIA- tiamulin, TMP- trimethoprim, VAN- vancomycin

Appendix 3c- Expected results for the E. coli trial (MIC- values and interpretations)

Panel 1

Strain nr	Species	AMP	AZI	CHL	CIP	COL	FOT	GEN	MER	NAL	SMX	TAZ	TET	TMP	TGC
EURL EC 8.1	*E. coli*	2	8	<=8	0,25	<=1	<=0,25	<=0,5	<=0,03	128	<=8	<=0,5	<=2	<=0,25	<=0,25
EURL EC 8.2	*E. coli*	>64	8	>128	>8	<=1	>4	>32	4	>128	32	>8	>64	<=0,25	<=0,25
EURL EC 8.3	*E. coli*	>64	8	<=8	<=0,015	<=1	>4	0,5	0,03	2	16	2	<=2	<=0,25	<=0,25
EURL EC 8.4	*E. coli*	>64	8	4	<=0,015	<=1	8	1	<=0,03	<=4	<=8	8	<=2	<=0,25	<=0,25
EURL EC 8.5	*E. coli*	2	8	4	<=0,015	<=1	<=0,25	0,5	<=0,03	1	<=8	<=0,5	<=2	<=0,25	<=0,25
EURL EC 8.6	*E. coli*	>64	8	>128	8	<=1	<=0,25	1	<=0,03	>128	>1024	<=0,5	<=2	>32	<=0,25
EURL EC 8.7	*E. coli*	>64	>64	128	<=0,015	<=1	<=0,25	>32	0,25	<=4	>1024	<=0,5	>64	>32	<=0,25
EURL EC 8.8	*E. coli*	>64	8	8	<=0,015	<=1	<=0,25	1	<=0,03	2	>1024	<=0,5	64	>32	<=0,25

MIC interpretations

Strain nr	Species	AMP	AZI	CHL	CIP	COL	FOT	GEN	MER	NAL	SMX	TAZ	TET	TMP	TGC
EURL EC 8.1	*E. coli*	S	NA	S	R	S	S	S	S	R	S	S	S	S	S
EURL EC 8.2	*E. coli*	R	NA	R	R	S	R	R	R	R	S	R	R	S	S
EURL EC 8.3	*E. coli*	R	NA	S	S	S	R	S	S	S	S	R	S	S	S
EURL EC 8.4	*E. coli*	R	NA	S	S	S	R	S	S	S	S	R	S	S	S
EURL EC 8.5	*E. coli*	S	NA	S	S	S	S	S	S	S	S	S	S	S	S
EURL EC 8.6	*E. coli*	R	NA	R	R	S	S	S	S	R	R	S	S	R	S
EURL EC 8.7	*E. coli*	R	NA	R	S	S	S	R	R	S	R	S	R	R	S
EURL EC 8.8	*E. coli*	R	NA	S	S	S	S	S	S	S	R	S	R	R	S

Panel 2

Strain nr	Species	ETP	FEP	FOT	FOT/CLA	FOX	IMI	MERO	TAZ	TAZ/CLA	TRM	ESBL conclusion
EURL EC 8.1	*E. coli*	NT	NT	<=0,25	NT	0,75	0,19	<=0,03	<=0,5	NT	NT	not resistant
EURL EC 8.2	*E. coli*	>2	16	32	32/4	>64	2	4	16	8,0/4,0	32	CARBA KPC-2
EURL EC 8.3	*E. coli*	<=0,015	32	64	0,06/4	4	<=0,12	<=0,03	2	0,12/4	<=4	ESBL
EURL EC 8.4	*E. coli*	0,06	**0,12**	4	8,0/4,0	64	0,25	<=0,03	8	8,0/4,0	4	pAmpC
EURL EC 8.5	*E. coli*	NT	NT	<=0,25	NT	2	0,12	<=0,03	<=0,5	NT	NT	not resistant
EURL EC 8.6	*E. coli*	NT	NT	<=0,25	NT	4	0,19	<=0,03	<=0,5	NT	NT	not resistant
EURL EC 8.7	*E. coli*	0,25	0,12	<=0,25	0,12/4	4	1	0,25	<=0,25	0,12/4	128	CARBA Oxa 48 but not ESBL
EURL EC 8.8	*E. coli*	NT	NT	<=0,25	NT	4	0,19	<=0,03	<=0,5	NT	NT	not resistant

MIC interpretations

Strain nr	Species	ETP	FEP	FOT	FOT/CLA	FOX	IMI	MERO	TAZ	TAZ/CLA	TRM
EURL EC 8.1	*E. coli*	NT	NT	S	NT	S	S	S	S	NT	NT
EURL EC 8.2	*E. coli*	R	R	R	NO SYN	R	R	R	R	NO SYN	NA
EURL EC 8.3	*E. coli*	S	R	R	SYN	S	S	S	R	SYN	NA
EURL EC 8.4	*E. coli*	S	S	R	NO SYN	R	S	S	R	NO SYN	NA
EURL EC 8.5	*E. coli*	NT	NT	S	NT	S	S	S	S	NT	NT
EURL EC 8.6	*E. coli*	NT	NT	S	NT	S	S	S	S	NT	NT
EURL EC 8.7	*E. coli*	R	S	S	NO SYN	S	R	R	S	NO SYN	NA
EURL EC 8.8	*E. coli*	NT	NT	S	NT	S	S	S	S	NT	NT

	Resistant
NA or NT	Not applicable or not testet

Abbreviations: AMP- ampicillin, AZI- Azithromycicn, , CHL-chloramphenicol, CIP- ciprofloxacin, COL- colistin, ETP- ertapenem, FEP- cefepime, FOT- cefotaxime, FOT/cla- cefotaxime/clav acid, GEN- gentamicin, IMI- imipenem, MER- meropenem, , NAL- nalidixic acid, SMX- sulphametoxazole, TAZ- ceftazidime, TAZ/CLA- Ceftazidime/clav acid, TET- tetracycline, TMP- trimethoprim, TGC- tigecycline, TRM- temocillin.

National Food Institute

M00-06-001/01.12.2011

EURL-AR External Quality Assurance System (EQAS) 2014:

-*Escherichia coli*, staphylococci and enterococci

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

Lyngby, 16th June 2014

Dear «Name»

Please find enclosed the bacterial strains for the EURL-AR EQAS 2014. Upon arrival to your laboratory, the strains should be stored dark and at 4°C for stabs, and dark and cool for freeze-dried strains.

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

- Protocol for *E. coli*, staphylococci and enterococci
- Instructions for Opening and Reviving Lyophilised Cultures
- Subculture and Maintenance of Quality Control Strains

We ask you to examine the eight *E. coli, enterococci and S. aureus* strains that we send to you by performing antimicrobial susceptibility testing and the eight *S.aureus* . In the protocol you can find detailed description of the procedures to follow. Additionally, you can find a description of the procedure to enter your results into the interactive web database. For accessing the database, you need this username and password:

Your username: «Username»

Your password: «Password»

Please keep this document
Your username and password will not appear in other documents

Results should be entered in the database no later than 5th **September 2014.** Please acknowledge receipt of this parcel immediately upon arrival (to licav@food.dtu.dk) and do not hesitate to contact me for further information.

Yours sincerely,

Lina Cavaco

Technical University of Denmark
National Food Institute

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www.food.dtu.dk

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PROTOCOL

For antimicrobial susceptibility testing of *Escherichia coli*, enterococci and staphylococci

1 INTRODUCTION

The organisation and implementation of an External Quality Assurance System (EQAS) on antimicrobial susceptibility testing (AST) of *E. coli*, enterococci and staphylococci is among the tasks of the EU Reference Laboratory for Antimicrobial Resistance (EURL-AR). The EC/Ent/Staph EQAS 2014 will include AST of eight *E. coli*, eight enterococci and eight staphylococci strains and AST of reference strains *E. coli* ATCC 25922 (CCM 3954), *E. faecalis* ATCC 29212 (CCM 4224), and *S. aureus* ATCC 29213 (CCM 4223).

The above-mentioned reference strains are included in the parcel only for new participants of the EQAS who did not receive them previously. The 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 reference strains will not be included in the years to come. Therefore, please take proper care of these strains. Handle and maintain them as suggested in the manual 'Subculture and Maintenance of QC Strains' available on the EURL-AR website (see www.eurl-ar.eu).

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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*, enterococci and staphylococci. Further objectives are to evaluate and improve the comparability of surveillance data on antimicrobial susceptibility of *E. coli*, enterococci and staphylococci reported to EFSA by different laboratories.

3 OUTLINE OF THE EC/ENT/STAPH EQAS 2014

3.1 Shipping, receipt and storage of strains

In June 2014, the National Reference Laboratories for Antimicrobial Resistance (NRL-AR) will receive a parcel containing eight *E. coli*, eight enterococci and eight staphylococci 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 carbapenamase producing strains and methicillin resistant *Staphylococcus aureus* (MRSA) will be included in the selected material. The reference strains are shipped lyophilised, while the test strains are stab cultures. On arrival, the stab cultures must be subcultured, and all cultures should be adequately stored until testing. A suggested procedure for reconstitution of the lyophilised reference strains is presented below.

3.2 Suggested procedure for reconstitution of the lyophilised reference strains

Please refer to the document 'Instructions for opening and reviving lyophilised cultures' reported on the EURL-AR-website (see www.eurl-ar.eu).

3.3 Antimicrobial susceptibility testing

The strains should be tested for susceptibility to the antimicrobials listed in Tables 1, 2, 3 and 4, using the method implemented in your laboratory for performing monitoring for EFSA and applying the interpretative criteria listed below.

Participants should perform minimum inhibitory concentration (MIC) determination using the methods stated in the EC regulation EC 652/2013. For staphylococci MIC methods should be used as well, according to the EFSA recommendations and the antimicrobials to test are those stated under the EFSA technical specifications (see Table 3). For interpretation of the results, use the cut-off values listed in Tables 1, 2, 3 and 4 in this document. These values (except where indicated) represent the current epidemiological cut-off values developed by EUCAST (www.eucast.org), and

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allow categorisation of bacterial isolates into two categories: Resistant or susceptible. A categorisation as intermediate is not accepted**.**

Participants will not be allowed to use disk diffusion as the current regulation and recommendations only focus on MIC testing.

3.3.1 *E. coli*

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

Antimicrobials for *E. coli*	MIC (µg/mL) **R is >**
Ampicillin, AMP	8
Azithromycin, AZI	Not available*
Cefotaxime, FOT	0.25
Ceftazidime, TAZ	0.5
Chloramphenicol, CHL	16
Ciprofloxacin, CIP	0.06
Colistin, COL	2
Gentamicin, GEN	2
Meropenem, MERO	0.125
Nalidixic acid, NAL	16
Sulfamethoxazole, SMX	64
Tetracycline, TET	8
Tigecycline, TGC	1
Trimethoprim, TMP	2

*For the antimicrobials for which there is no interpretative criteria available, we request the participants upload the MIC value obtained, and do not select an interpretation.

Plasmid-mediated quinolone resistance

When performing antimicrobial susceptibility testing of *E. coli*, the interpretative criteria listed in Table 1 for results obtained by MIC-determination should be able to detect plasmid mediated quinolone resistant test strains.

Beta-lactam resistance

Confirmatory tests for ESBL production are mandatory on all strains resistant to cefotaxime (CTX), ceftazidime (CAZ) or meropenem and should be performed by testing the second panel of antimicrobials (Table 2 in this document corresponding to Table 4 in EC regulation 652/2013).

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

Antimicrobials for *E. coli*	MIC (µg/mL) **R is >**
Cefepime, FEP	0.125
Cefotaxime + clavulanic acid (F/C)	Not applicable
Cefotaxime, FOT	0.25
Cefoxitin, FOX	8
Ceftazidime, TAZ	0.5
Ceftazidime+ clavulanic acid (T/C)	Not applicable
Ertapenem, ETP	0.06
Imipenem, IMI	0.5
Meropenem, MERO	0.125
Temocillin, TRM	Not available*

*For the antimicrobials for which there is no interpretative criteria available, we request the participants upload the MIC value obtained, and do not select an interpretation.

Confirmatory test for ESBL production requires use of both cefotaxime (CTX) and ceftazidime (CAZ) alone and in combination with a β-lactamase inhibitor (clavulanic acid). Synergy is defined either as i) a ≥ 3 twofold concentration decrease in an MIC for either antimicrobial agent tested in combination with clavulanic acid vs. its MIC when tested alone (MIC CTX : CTX/CL or CAZ : CAZ/CL ratio ≥ 8) (CLSI M100 Table 2A; Enterobacteriaceae). The presence of synergy indicates ESBL production. Resistance to cefepime gives further indication of ESBL production, but is not essential.

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, that may be verified by PCR and sequencing.

The classification of the phenotypic results should be based on the most recent EFSA recommendations (EFSA 2012), indicating the strains as:

- Presumptive ESBL: strains with positive synergy test, susceptible to cefoxitin and resistant to cefepime
- Presumptive ESBL+pAmpC: -strains with positive or negative synergy test, resistant to cefoxitin and resistant to cefepime
- Presumptive pAmpC phenotype: -strains with negative synergy test
- Presumptive carbapenemase phenotype: -strain resistant to meropenem
- Unusual phenotype: any other combinations

(However we recommend that strains which show synergy with clavulanic acid for at least one of the third generation cephalosporins cefotaxime or ceftazidime should be considered ESBL, independently of the cefepime result)

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3.3.2 Enterococci

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

Antimicrobials for enterococci	MIC (µg/mL) **R is >** *E. faecium*	MIC (µg/mL) **R is >** *E. faecalis*
Ampicillin, AMP	4	4
Chloramphenicol, CHL	32	32
Ciprofloxacin, CIP	4	4
Daptomycin, DAP	4	4
Erythromycin, ERY	4	4
Gentamicin, GEN	32	32
Linezolid, LZD	4	4
Quinupristin-dalfopristin (Synercid), SYN	4*	Not applicable
Teicoplanin, TEI	2	2
Tetracycline, TET	4	4
Tigecycline, TGC	0.25	0.25
Vancomycin, VAN	4	4

*DANMAP 2009 (www.danmap.org)

Identification of the *Enterococcus* spp.

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

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3.3.3 Staphylococci

Eight staphylococci strains will be sent to be tested both in the AST component of the EQAS 2014.

Table 4: Antimicrobials recommended for AST of *Staphylococcus aureus* and interpretative criteria according to EFSA technical specifications (EFSA 2012)

Antimicrobials for *S. aureus*	MIC (µg/mL) **R is >**
Cefoxitin, FOX	4
Chloramphenicol, CHL	16
Ciprofloxacin, CIP	1
Clindamycin, CLN	0.25
Erythromycin, ERY	1
Gentamicin, GEN	2
Linezolid, LZD	4
Mupirocin, MUP	1
Quinupristin-dalfopristin (Synercid), SYN	1
Sulfamethoxazole, SMX	128
Sulfamethoxazole+Trimethoprim, SXT	0.5
Tetracycline, TET	1
Tiamulin, TIA	2
Trimethoprim, TMP	2
Vancomycin, VAN	2

*CLSI M100 Table 2C

Identification of *MRSA*

Confirmation of *mec*A and/or *mecC* presence is mandatory in this EQAS. For this purpose, you are recommended to use the PCR method protocol recommended by the EURL-AR (www.eurl-ar.eu/233-protocols.htm) and upload the result as 'positive' or 'negative'. According to CLSI recommendations (M100, Table 2C), all MRSA should be regarded as resistant to all β-lactam antibiotics.

4 REPORTING OF RESULTS AND EVALUATION

4.1 AST of *E. coli*, enterococci and staphylococci

Please write your results in the test forms, and enter your results into the interactive web database. In addition, we kindly ask you to report in the database the tested MIC range for the staphylococci tests, (for this organism, only, as it is not covered by the EC regulation on MIC testing). Finally, if **you did not use the cut-off values recommended in the protocol for interpretation of AST results**, please report the breakpoints used in the database.

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4.2 General recommendations for data upload

We recommend reading carefully the description reported in paragraph 5 before entering your results in the web database. **Results must be submitted no later than September 5th 2014.** After the deadline when all participants have uploaded results, you will be able to login to the database once again, and 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'.

If you experience difficulties in entering your results, please contact us directly.

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:

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National Food Institute
Technical University of Denmark
Kemitorvet, Building 204, DK-2800 Lyngby

Denmark

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Fax: +45 3588 6341

E-mail: suska@food.dtu.dk

5 HOW TO ENTER RESULTS IN THE INTERACTIVE DATABASE

Please read carefully this paragraph before entering the web page.
Remember that you need by your side the completed test forms and the breakpoint values you used.

Enter the EURL-AR EQAS 2014 start web page (http://eurl-ar.food.dtu.dk), write your username and password in lower-cases and press enter. Your username and password are indicated in the letter following your strains. Do not hesitate to contact us if you experience problems with the login.

You can browse back and forth by using the Home or back keys, but please remember to save your inputs before.

5.1 AST of *E. coli*, enterococci and staphylococci

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Click on either "*E. coli*", "enterococci" or "staphylococci" for input of test results based on the results you are going to upload.

Click on "Start of Data Entry - Methods and Breakpoints"

In the next page, you can navigate among fields with the Tab-key and the mouse.

Complete the fields related to the method used for antimicrobial susceptibility testing and the brand of MIC trays, etc.

Click on "save" and then go back using the tab "home" and enter another test page to upload results

In the data entry pages, enter the obtained values and the interpretation (R, resistant or S, susceptible) for each *E. coli*, enterococcus and staphylococcus strain.

For *E. coli* strains, remember to report also the results for the ESBL detection tests.
For *S. aureus* strains, remember to report also the results for presence/absence of methicillin resistance.

If you did not test for susceptibility to a given antimicrobial, please leave the field empty.

Click on "save" and then go back using the tab "home" and enter another test page to upload results.

When uploading data on the reference strains, please enter MIC values in µg/ml. Remember to use the operator keys to show symbols like "equal to", etc.

Click on "save".

Review the input pages by browsing through the pages and make corrections if necessary. Remember to save a page if you make corrections. If you press home a page without saving changes, you will see an error screen. In this case, click on "save" to save your results, browse back to the page and then continue.

Please complete the evaluation form.

Before approving your input, please be sure that you have filled in all the relevant fields because YOU CAN ONLY APPROVE ONCE! The approval blocks your data entry in the interactive database.

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TEST FORMS

Antimicrobial susceptibility testing of *Escherichia coli*, enterococci and staphylococci

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

Comments:

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TEST FORMS METHODS - Enterococci

Which method did you use for antimicrobial susceptibility testing of enterococci in this EQAS:

☐ MIC – Microtitre
☐ MIC – Agar dilution
Brand**:**

How many *Enterococcus* spp. isolates does your laboratory annually isolate:

How many *Enterococcus* spp. isolates does your laboratory annually test for antimicrobial susceptibility by a MIC method:

Comments or additional information:

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TEST FORMS METHODS - Staphylococci

Which method did you use for antimicrobial susceptibility testing of staphylococci in this EQAS:

☐ MIC – Microtitre
☐ MIC – Agar dilution

Brand:

How many *Staphylococcus* spp. isolates does your laboratory annually isolate:

How many *Staphylococcus* spp. isolates does your laboratory annually test for antimicrobial susceptibility by a MIC method:

Comments or additional information:

Antimicrobial	General info The relevant information in the two columns below should be reported			
	Test-range for MIC (µg/mL)	Resistant (µg/mL)	Intermediate (µg/mL)	Susceptible (µg/mL)
Cefoxitin, FOX		≤		≥
Chloramphenicol, CHL		≤		≥
Ciprofloxacin, CIP		≤		≥
Clindamycin, CLN		≤		≥
Erythromycin, ERY		≤		≥
Gentamicin, GEN		≤		≥
Linezolid, LZD		≤		≥
Mupirocin, MUP		≤		≥
Penicillin, PEN		≤		≥
Quin.-Dalf. (Synercid), SYN		≤		≥
Sulphonamides, SMX		≤		≥
Tetracycline, TET		≤		≥
Trimethoprim, TMP		≤		≥
Vancomycin, VAN		≤		≥

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TEST FORMS METHODS – *E. coli*

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

☐ MIC – Microtitre
☐ MIC – Agar dilution

Brand**:**
Incubation conditions: °C/ h

How many *E. coli* isolates does your laboratory annually isolate:

How many *E. coli* isolates does your laboratory annually test for antimicrobial susceptibility by a MIC method:

Comments or additional information:

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TEST FORMS- Enterococci

Strain	Antimicrobial	Results and interpretation		
		≤ >	MIC-value (µg/ml)	S / R
Enterococci EURL ENT. 8.X ☐ *E. faecium* ☐ *E. faecalis*	Ampicillin AMP			
	Chloramphenicol, CHL			
	Ciprofloxacin, CIP			
	Daptomycin, DAP			
	Erythromycin, ERY			
	Gentamicin, GEN			
	Linezolid, LZD			
	Quin.-Dalf. (Synercid), SYN			
	Teicoplanin, TEI			
	Tetracycline, TET			
	Tigecycline, TGC			
	Vancomycin, VAN			

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TEST FORM

Antimicrobial susceptibility testing of reference strain *Enterococcus faecalis* ATCC 29212

Antimicrobial	MIC-value (µg/ml)
Ampicillin, AMP	
Chloramphenicol, CHL	
Ciprofloxacin, CIP	
Daptomycin, DAP	
Erythromycin, ERY	
Gentamicin, GEN	
Linezolid, LZD	
Quinupristin-Dalfopristin (Synercid), SYN	
Teicoplanin, TEI	
Tetracycline, TET	
Tigecycline, TIG	
Vancomycin, VAN	

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TEST FORMS -Staphylococci

Strain	Antimicrobial	Results and interpretation		
		≤ >	MIC-value (µg/ml)	S / R
S. aureus EURL ST 8.X	Cefoxitin, FOX			
	Chloramphenicol, CHL			
	Ciprofloxacin, CIP			
	Clindamycin, CLN			
	Erythromycin, ERY			
	Gentamicin, GEN			
	Linezolid, LZD			
	Mupirocin, MUP			
	Quino-dalfopristin (Synercid), SYN			
	Sulfamethoxazole, SMX			
	Sulfamethoxazole+Trimethoprim, SXT			
	Tetracycline, TET			
	Tiamulin, TIA			
	Trimethoprim, TMP			
	Vancomycin, VAN			

Methicillin resistance (MRSA)	☐ Positive ☐ Negative

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TEST FORM

Antimicrobial susceptibility testing of reference strain *S. aureus* ATCC 29213 (MIC)

Antimicrobial	MIC-value (µg/ml)
Cefoxitin, FOX	
Chloramphenicol, CHL	
Ciprofloxacin, CIP	
Clindamycin, CLN	
Erythromycin, ERY	
Gentamicin, GEN	
Linezolid, LZD	
Mupirocin, MUP	
Quino-dalfo (Synercid), SYN	
Sulfamethoxazole, SMX	
Sulfamethoxazole+Trimethroprim, SXT	
Tetracycline, TET	
Tiamulin, TIA	
Trimethoprim, TMP	
Vancomycin, VAN	

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TEST FORM

Strain	Antimicrobial	Results and interpretation		
		≤ >	MIC-value (µg/ml)	S / R
E. coli EURL EC 8.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) should be included for testing in the second panel confirmatory tests for ESBL or carbapenemase production. See further description of confirmatory tests in the protocol section '*3.1.1E. coli*'.

Strain	Antimicrobial	Results and interpretation		
		≤ >	MIC-value (µg/ml)	S / R
E. coli EURL EC 8.X	Cefepime, FEP			
	Cefotaxime + clavulanic acid (F/C)			
	Cefotaxime, FOT			
	Cefoxitin, FOX			
	Ceftazidime, TAZ			
	Ceftazidime+ clavulanic acid (T/C)			
	Ertapenem, ETP			
	Imipenem, IMI			
	Meropenem, MERO			
	Temocillin, TRM			

☐ Presumptive ESBL
☐ Presumptive ESBL+ pAmpC
☐ Presumptive pAmpC
☐ Presumptive carbapenemase
☐ Unusual phenotype
☐ Not resistant

Comments (include optional genotype or other results):

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TEST FORM

Antimicrobial susceptibility testing of reference strain *E. coli* ATCC 25922

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

*The antimicrobial which is mentioned in the CLSI M100 performance standard as representative for the sulfonamides concerning acceptable limits for quality control strains (CLSI M100, Table 3)

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INSTRUCTIONS FOR OPENING AND REVIVING LYOPHILISED CULTURES

Manual from Czech Collection of Microorganisms (CCM)
Masaryk University
Tvrdého 14
602 00 BRNO
Czech Republic

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
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

Please note that:

- Cultures should be grown on media and under conditions as recommended in the CCM catalogue
- 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!

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SUBCULTURE AND MAINTENANCE OF QUALITY CONTROL STRAINS

1.1 Purpose

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

1.2 References

M100-S21, January 2011 (Performance Standards for Antimicrobial Susceptibility Testing)

M7-A8, January 2009 (Methods for Dilution Antimicrobial Susceptibility Test for Bacteria That Grow Aerobically; Approved Standard)

1.3 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

1.4 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 (only after 30 day 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
- Periodically perform colony counts to check the inoculum preparation procedure

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- 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

1.5 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.

1.6 Frequency of Testing

Weekly vs. daily testing

Weekly testing is possible if the lab can demonstrate satisfactory performance with daily testing as follows:

- Documentation showing reference strain results from 30 consecutive test days were within the acceptable range.
- For each antimicrobial/organism combination, no more than 3 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

The problem is considered resolved only after the reference strain is tested for 5 consecutive days and each drug/organism result is within specification on each day.

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

Repeat the 30 days validation before resuming weekly testing.

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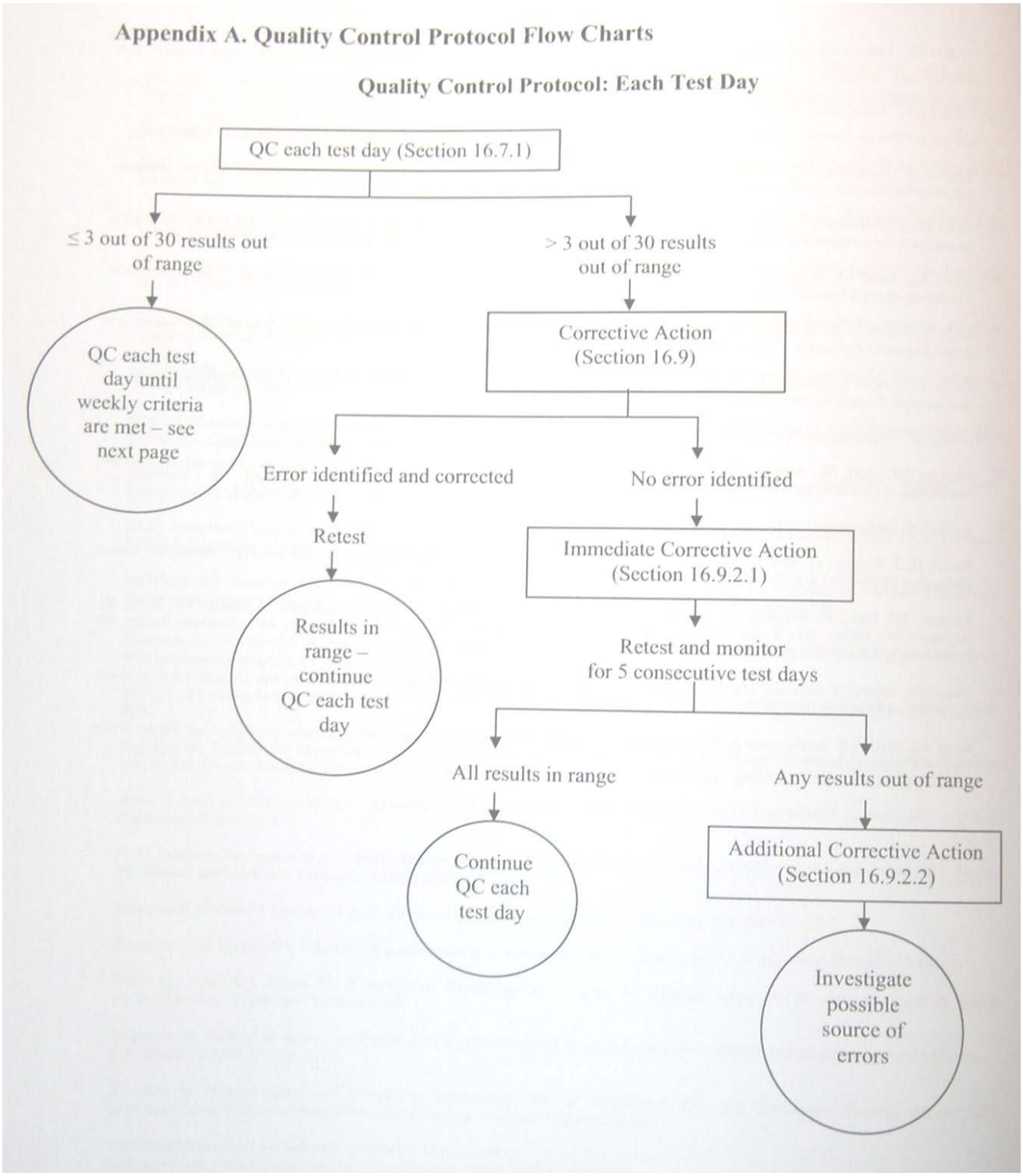
European Union Reference Laboratory Antimicrobial Resistance

DAILY MIC QC CHART



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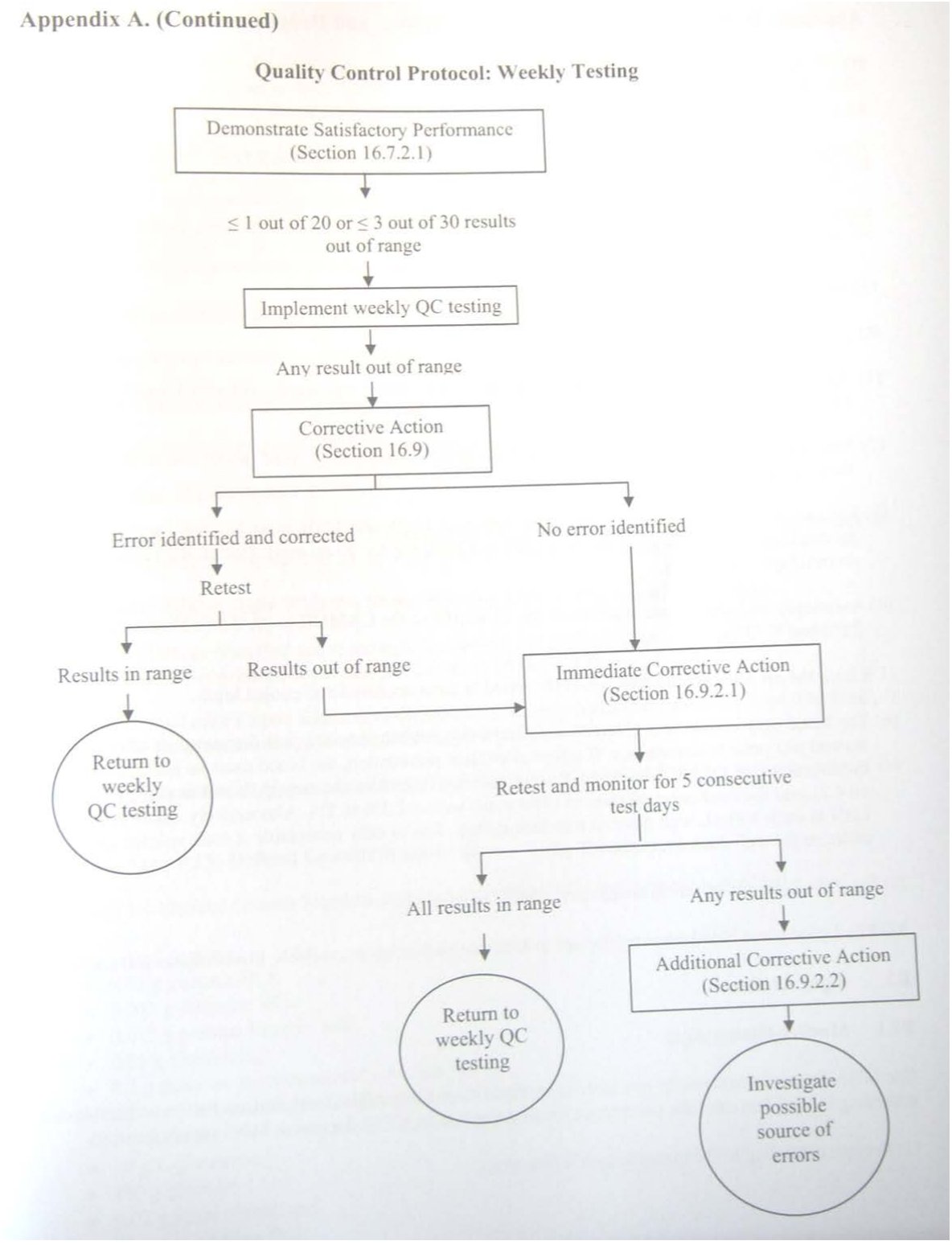
WEEKLY MIC QC CHART



Reference: CLSI M7-A8, page 45

Appendix 5- Quality control ranges for ATCC QC strains

Escherichia coli ATCC 25922

Panel	Antimicrobial		Min.	Max
1	Ampicillin	AMP	2	8
	Azithromycin	AZI		
	Cefotaxime	FOT	0.03	0.12
	Ceftazidime	TAZ	0.06	0.5
	Chloramphenicol	CHL	2	8
	Ciprofloxacin	CIP	0.004	0.015
	Colistin	COL	0.25	2
	Gentamicin	GEN	0.25	1
	Meropenem	MER	0.008	0.06
	Nalidixic acid	NAL	1	4
	Sulfamethoxazole	SMX	8	32
	Tetracycline	TET	0.5	2
	Tigecycline	TGC	0.03	0.25
	Trimethoprim	TMP	0.5	2
2	Cefepime	FEP	0.015	0.12
	Cefotaxime/clavulanic acid	F/C		
	Cefotaxime	FOT	0.03	0.12
	Cefoxitin	FOX	2	8
	Ceftazidime	TAZ	0.06	0.5
	Ceftazidime/clavulanic acid	T/C		
	Ertapenem	ETP	0.004	0.015
	Imipenem	IMI	0.06	0.25
	Meropenem	MER	0.008	0.06
	Temocillin	TRM		

Enterococcus faecalis ATCC 29212

Antimicrobial		min	max
Daptomycin	DAP	1	4
Linezolid	LZD	1	4
Chloramphenicol	CHL	4	16
Ciprofloxacin	CIP	0.25	2
Gentamicin	GEN	4	16
Erythromycin	ERY	1	4
Teicoplanin	TEI	0.25	1
Tetracycline	TET	8	32
Tigecycline	TGC	0.03	0.12
Vancomycin	VAN	1	4
Ampicillin	AMP	0.5	2
Quinopristin_Dalfo	SYN	2	8

Staphylococcus aureus ATCC 29213

Antimicrobial		min	max
Cefoxitin	FOX	1	4
Chloramphenicol	CHL	2	16
Ciprofloxacin	CIP	0.12	0.5
Clindamycin	CLN	0.06	0.25
Erythromycin	ERY	0.25	1
Gentamicin	GEN	0.12	1
Linezolid	LZD	1	4
Mupirocin	MUP		
Quinopristin_Dalfo	SYN	0.25	1
Sulfamethoxazole	SMX	32	128
Sulfamethoxazole-Thrimethoprim	SXT	0	0.5
Tetracycline	TET	0.12	1
Tiamulin	TIA		
Trimethoprim	TMP	1	4
Vancomycin	VAN	0.5	2

Appendix 6a- Test results from reference strain *Enterococcus faecalis* ATCC 29212

LAB	ANTIBIOTIC	ANTIBIOTIC_ABR	OPERATOR	READVALUE	MINVALUE	MAXVALUE	SCORE
1	Ampicillin	AMP	=	1	0.5	2	1
1	Chloramphenicol	CHL	=	8	4	16	1
1	Ciprofloxacin	CIP	=	1	0.25	2	1
1	Daptomycin	DAP	=	4	1	4	1
1	Erythromycin	ERY	=	2	1	4	1
1	Gentamicin	GEN	<=	8	4	16	1
1	Linezolid	LZD	=	2	1	4	1
1	Quinopristin_Dalfo	SYN	=	8	2	8	1
1	Teicoplanin	TEI	<=	0.5	0.25	1	1
1	Tetracycline	TET	=	16	8	32	1
1	Tigecycline	TGC	=	0.12	0.03	0.12	1
1	Vancomycin	VAN	=	4	1	4	1
2	Ampicillin	AMP	=	1	0.5	2	1
2	Chloramphenicol	CHL	=	8	4	16	1
2	Ciprofloxacin	CIP	=	0.5	0.25	2	1
2	Daptomycin	DAP	=	2	1	4	1
2	Erythromycin	ERY	=	2	1	4	1
2	Gentamicin	GEN	<=	4	4	16	1
2	Linezolid	LZD	=	2	1	4	1
2	Teicoplanin	TEI	<=	0.25	0.25	1	1
2	Tetracycline	TET	=	16	8	32	1
2	Tigecycline	TGC	=	0.12	0.03	0.12	1
2	Vancomycin	VAN	=	2	1	4	1
6	Ampicillin	AMP	=	1	0.5	2	1
6	Chloramphenicol	CHL	=	8	4	16	1
6	Ciprofloxacin	CIP	=	1	0.25	2	1
6	Daptomycin	DAP	=	2	1	4	1
6	Erythromycin	ERY	<=	1	1	4	1
6	Gentamicin	GEN	<=	8	4	16	1
6	Linezolid	LZD	=	2	1	4	1
6	Quinopristin_Dalfo	SYN	=	8	2	8	1
6	Teicoplanin	TEI	<=	0.5	0.25	1	1
6	Tetracycline	TET	=	16	8	32	1
6	Tigecycline	TGC	=	0.12	0.03	0.12	1
6	Vancomycin	VAN	=	4	1	4	1
9	Ampicillin	AMP	=	1	0.5	2	1
9	Chloramphenicol	CHL	=	8	4	16	1
9	Ciprofloxacin	CIP	=	0.5	0.25	2	1
9	Daptomycin	DAP	=	2	1	4	1

LAB	ANTIBIOTIC	ANTIBIOTIC_ABR	OPERATOR	READVALUE	MINVALUE	MAXVALUE	SCORE
9	Erythromycin	ERY	=	2	1	4	1
9	Gentamicin	GEN	<=	8	4	16	1
9	Linezolid	LZD	=	2	1	4	1
9	Quinopristin_Dalfo	SYN	=	8	2	8	1
9	Teicoplanin	TEI	<=	0.5	0.25	1	1
9	Tetracycline	TET	=	16	8	32	1
9	Tigecycline	TGC	=	0.06	0.03	0.12	1
9	Vancomycin	VAN	=	2	1	4	1
11	Ampicillin	AMP	<=	0,5	0.5	2	1
11	Chloramphenicol	CHL	=	8	4	16	1
11	Ciprofloxacin	CIP	=	1	0.25	2	1
11	Daptomycin	DAP	=	1	1	4	1
11	Erythromycin	ERY	=	2	1	4	1
11	Gentamicin	GEN	<=	8	4	16	1
11	Linezolid	LZD	=	1	1	4	1
11	Quinopristin_Dalfo	SYN	=	8	2	8	1
11	Teicoplanin	TEI	<=	0.5	0.25	1	1
11	Tetracycline	TET	=	16	8	32	1
11	Tigecycline	TGC	=	0.06	0.03	0.12	1
11	Vancomycin	VAN	<=	1	1	4	1
12	Ampicillin	AMP	=	0.5	0.5	2	1
12	Chloramphenicol	CHL	=	4	4	16	1
12	Erythromycin	ERY	=	2	1	4	1
12	Gentamicin	GEN	=	4	4	16	1
12	Linezolid	LZD	=	1	1	4	1
12	Tetracycline	TET	=	16	8	32	1
12	Vancomycin	VAN	<=	1	1	4	1
16	Ampicillin	AMP	=	1	0.5	2	1
16	Chloramphenicol	CHL	=	8	4	16	1
16	Daptomycin	DAP	=	4	1	4	1
16	Erythromycin	ERY	=	2	1	4	1
16	Gentamicin	GEN	=	16	4	16	1
16	Linezolid	LZD	=	2	1	4	1
16	Quinopristin_Dalfo	SYN	=	8	2	8	1
16	Teicoplanin	TEI	<=	0.5	0.25	1	1
16	Tetracycline	TET	=	32	8	32	1
16	Tigecycline	TGC	=	0.12	0.03	0.12	1
16	Vancomycin	VAN	=	1	1	4	1
17	Ampicillin	AMP	=	1	0.5	2	1
17	Chloramphenicol	CHL	=	8	4	16	1
17	Ciprofloxacin	CIP	=	0.5	0.25	2	1
17	Daptomycin	DAP	=	2	1	4	1

LAB	ANTIBIOTIC	ANTIBIOTIC_ABR	OPERATOR	READVALUE	MINVALUE	MAXVALUE	SCORE
17	Erythromycin	ERY	=	2	1	4	1
17	Gentamicin	GEN	<=	8	4	16	1
17	Linezolid	LZD	=	2	1	4	1
17	Quinopristin_Dalfo	SYN	=	8	2	8	1
17	Teicoplanin	TEI	<=	0.5	0.25	1	1
17	Tetracycline	TET	=	16	8	32	1
17	Tigecycline	TGC	=	0.06	0.03	0.12	1
17	Vancomycin	VAN	=	2	1	4	1
20	Ampicillin	AMP	=	1	0.5	2	1
20	Chloramphenicol	CHL	<=	4	4	16	1
20	Ciprofloxacin	CIP	=	1	0.25	2	1
20	Daptomycin	DAP	=	1	1	4	1
20	Erythromycin	ERY	<=	1	1	4	1
20	Gentamicin	GEN	<=	0.8	4	16	0
20	Linezolid	LZD	=	2	1	4	1
20	Quinopristin_Dalfo	SYN	=	8	2	8	1
20	Teicoplanin	TEI	<=	0.5	0.25	1	1
20	Tetracycline	TET	=	16	8	32	1
20	Tigecycline	TGC	=	0.12	0.03	0.12	1
20	Vancomycin	VAN	=	4	1	4	1
21	Chloramphenicol	CHL	=	4	4	16	1
21	Ciprofloxacin	CIP	=	0.5	0.25	2	1
21	Erythromycin	ERY	=	1	1	4	1
21	Gentamicin	GEN	=	8	4	16	1
21	Linezolid	LZD	=	1	1	4	1
21	Quinopristin_Dalfo	SYN	=	4	2	8	1
21	Tetracycline	TET	=	16	8	32	1
21	Vancomycin	VAN	=	1	1	4	1
22	Ampicillin	AMP	=	2	0.5	2	1
22	Chloramphenicol	CHL	=	4	4	16	1
22	Erythromycin	ERY	=	2	1	4	1
22	Gentamicin	GEN	=	8	4	16	1
22	Linezolid	LZD	=	2	1	4	1
22	Tetracycline	TET	=	16	8	32	1
22	Vancomycin	VAN	=	2	1	4	1
25	Ampicillin	AMP	=	1	0.5	2	1
25	Chloramphenicol	CHL	=	8	4	16	1
25	Ciprofloxacin	CIP	=	1	0.25	2	1
25	Daptomycin	DAP	=	2	1	4	1
25	Erythromycin	ERY	=	4	1	4	1
25	Gentamicin	GEN	=	16	4	16	1
25	Linezolid	LZD	=	2	1	4	1

LAB	ANTIBIOTIC	ANTIBIOTIC_ABR	OPERATOR	READVALUE	MINVALUE	MAXVALUE	SCORE
25	Quinopristin_Dalfo	SYN	=	8	2	8	1
25	Teicoplanin	TEI	<=	0.5	0.25	1	1
25	Tetracycline	TET	=	32	8	32	1
25	Tigecycline	TGC	=	0.12	0.03	0.12	1
25	Vancomycin	VAN	=	4	1	4	1
26	Ampicillin	AMP	=	1	0.5	2	1
26	Chloramphenicol	CHL	=	8	4	16	1
26	Ciprofloxacin	CIP	=	1	0.25	2	1
26	Daptomycin	DAP	=	4	1	4	1
26	Erythromycin	ERY	=	2	1	4	1
26	Gentamicin	GEN	<=	8	4	16	1
26	Linezolid	LZD	=	2	1	4	1
26	Teicoplanin	TEI	<=	0.5	0.25	1	1
26	Tetracycline	TET	=	16	8	32	1
26	Tigecycline	TGC	=	0.06	0.03	0.12	1
26	Vancomycin	VAN	=	4	1	4	1
29	Ampicillin	AMP	=	1	0.5	2	1
29	Chloramphenicol	CHL	=	4	4	16	1
29	Erythromycin	ERY	=	2	1	4	1
29	Gentamicin	GEN	=	4	4	16	1
29	Linezolid	LZD	=	1	1	4	1
29	Tetracycline	TET	=	32	8	32	1
29	Vancomycin	VAN	=	2	1	4	1
30	Ampicillin	AMP	=	1	0.5	2	1
30	Chloramphenicol	CHL	=	8	4	16	1
30	Ciprofloxacin	CIP	=	1	0.25	2	1
30	Daptomycin	DAP	=	2	1	4	1
30	Erythromycin	ERY	=	2	1	4	1
30	Gentamicin	GEN	=	8	4	16	1
30	Linezolid	LZD	=	2	1	4	1
30	Quinopristin_Dalfo	SYN	=	8	2	8	1
30	Teicoplanin	TEI	<=	0.5	0.25	1	1
30	Tetracycline	TET	=	16	8	32	1
30	Tigecycline	TGC	=	0.12	0.03	0.12	1
30	Vancomycin	VAN	=	2	1	4	1
32	Ampicillin	AMP	=	1	0.5	2	1
32	Chloramphenicol	CHL	=	8	4	16	1
32	Ciprofloxacin	CIP	=	1	0.25	2	1
32	Daptomycin	DAP	=	2	1	4	1
32	Erythromycin	ERY	=	2	1	4	1
32	Gentamicin	GEN	<=	8	4	16	1
32	Linezolid	LZD	=	2	1	4	1

LAB	ANTIBIOTIC	ANTIBIOTIC_ABR	OPERATOR	READVALUE	MINVALUE	MAXVALUE	SCORE
32	Quinopristin_Dalfo	SYN	=	4	2	8	1
32	Teicoplanin	TEI	<=	0.5	0.25	1	1
32	Tetracycline	TET	=	16	8	32	1
32	Tigecycline	TGC	=	0.06	0.03	0.12	1
32	Vancomycin	VAN	=	2	1	4	1
33	Ampicillin	AMP	=	1	0.5	2	1
33	Chloramphenicol	CHL	=	8	4	16	1
33	Erythromycin	ERY	=	2	1	4	1
33	Gentamicin	GEN	=	4	4	16	1
33	Linezolid	LZD	=	1	1	4	1
33	Tetracycline	TET	=	32	8	32	1
33	Vancomycin	VAN	=	2	1	4	1
34	Ampicillin	AMP	=	1	0.5	2	1
34	Chloramphenicol	CHL	=	8	4	16	1
34	Ciprofloxacin	CIP	=	1	0.25	2	1
34	Daptomycin	DAP	=	4	1	4	1
34	Erythromycin	ERY	=	4	1	4	1
34	Gentamicin	GEN	=	16	4	16	1
34	Linezolid	LZD	=	4	1	4	1
34	Quinopristin_Dalfo	SYN	=	8	2	8	1
34	Teicoplanin	TEI	<=	0.5	0.25	1	1
34	Tetracycline	TET	=	32	8	32	1
34	Tigecycline	TGC	=	0.12	0.03	0.12	1
34	Vancomycin	VAN	=	4	1	4	1
36	Ampicillin	AMP	=	1	0.5	2	1
36	Chloramphenicol	CHL	<=	4	4	16	1
36	Ciprofloxacin	CIP	=	1	0.25	2	1
36	Daptomycin	DAP	=	2	1	4	1
36	Erythromycin	ERY	=	2	1	4	1
36	Gentamicin	GEN	=	16	4	16	1
36	Linezolid	LZD	=	1	1	4	1
36	Quinopristin_Dalfo	SYN	=	4	2	8	1
36	Teicoplanin	TEI	<=	0.5	0.25	1	1
36	Tetracycline	TET	=	16	8	32	1
36	Tigecycline	TGC	=	0.06	0.03	0.12	1
36	Vancomycin	VAN	=	4	1	4	1
37	Ampicillin	AMP	=	1	0.5	2	1
37	Ciprofloxacin	CIP	=	0.5	0.25	2	1
37	Erythromycin	ERY	<=	1	1	4	1
37	Gentamicin	GEN	<=	8	4	16	1
37	Linezolid	LZD	=	2	1	4	1
37	Teicoplanin	TEI	<=	0.5	0.25	1	1

LAB	ANTIBIOTIC	ANTIBIOTIC_ABR	OPERATOR	READVALUE	MINVALUE	MAXVALUE	SCORE
37	Tetracycline	TET	=	16	8	32	1
37	Vancomycin	VAN	=	2	1	4	1
39	Ampicillin	AMP	=	1	0.5	2	1
39	Chloramphenicol	CHL	=	8	4	16	1
39	Erythromycin	ERY	=	2	1	4	1
39	Gentamicin	GEN	=	8	4	16	1
39	Linezolid	LZD	=	2	1	4	1
39	Tetracycline	TET	=	32	8	32	1
39	Vancomycin	VAN	=	4	1	4	1
40	Ampicillin	AMP	=	1	0.5	2	1
40	Chloramphenicol	CHL	=	8	4	16	1
40	Ciprofloxacin	CIP	=	1	0.25	2	1
40	Daptomycin	DAP	=	1	1	4	1
40	Erythromycin	ERY	=	4	1	4	1
40	Gentamicin	GEN	=	16	4	16	1
40	Linezolid	LZD	=	2	1	4	1
40	Teicoplanin	TEI	=	1	0.25	1	1
40	Tetracycline	TET	=	8	8	32	1
40	Tigecycline	TGC	=	0.06	0.03	0.12	1
40	Vancomycin	VAN	=	2	1	4	1
41	Ampicillin	AMP	=	1	0.5	2	1
41	Chloramphenicol	CHL	=	8	4	16	1
41	Ciprofloxacin	CIP	=	1	0.25	2	1
41	Daptomycin	DAP	=	2	1	4	1
41	Erythromycin	ERY	=	2	1	4	1
41	Gentamicin	GEN	<=	8	4	16	1
41	Linezolid	LZD	=	2	1	4	1
41	Quinopristin_Dalfo	SYN	=	4	2	8	1
41	Teicoplanin	TEI	<=	0.5	0.25	1	1
41	Tetracycline	TET	=	16	8	32	1
41	Tigecycline	TGC	=	0.06	0.03	0.12	1
41	Vancomycin	VAN	=	2	1	4	1
42	Ampicillin	AMP	<=	2	0.5	2	1
42	Chloramphenicol	CHL	=	8	4	16	1
42	Ciprofloxacin	CIP	=	1	0.25	2	1
42	Erythromycin	ERY	=	2	1	4	1
42	Gentamicin	GEN	<=	128	4	16	1
42	Linezolid	LZD	=	2	1	4	1
42	Tetracycline	TET	=	32	8	32	1
42	Vancomycin	VAN	=	2	1	4	1
45	Ampicillin	AMP	=	1	0.5	2	1
45	Chloramphenicol	CHL	=	8	4	16	1

LAB	ANTIBIOTIC	ANTIBIOTIC_ABR	OPERATOR	READVALUE	MINVALUE	MAXVALUE	SCORE
45	Ciprofloxacin	CIP	=	1	0.25	2	1
45	Daptomycin	DAP	=	2	1	4	1
45	Erythromycin	ERY	<=	1	1	4	1
45	Gentamicin	GEN	<=	8	4	16	1
45	Linezolid	LZD	=	2	1	4	1
45	Quinopristin_Dalfo	SYN	=	4	2	8	1
45	Teicoplanin	TEI	<=	0.5	0.25	1	1
45	Tetracycline	TET	=	32	8	32	1
45	Tigecycline	TGC	=	0.06	0.03	0.12	1
45	Vancomycin	VAN	=	4	1	4	1
46	Ampicillin	AMP	=	0.5	0.5	2	1
46	Ciprofloxacin	CIP	=	1	0.25	2	1
46	Daptomycin	DAP	=	2	1	4	1
46	Erythromycin	ERY	=	2	1	4	1
46	Gentamicin	GEN	=	8	4	16	1
46	Linezolid	LZD	=	2	1	4	1
46	Quinopristin_Dalfo	SYN	=	4	2	8	1
46	Teicoplanin	TEI	<=	0.5	0.25	1	1
46	Tetracycline	TET	>	8	8	32	1
46	Tigecycline	TGC	<=	0.25	0.03	0.12	1
46	Vancomycin	VAN	=	4	1	4	1
56	Ampicillin	AMP	=	1	0.5	2	1
56	Chloramphenicol	CHL	=	8	4	16	1
56	Ciprofloxacin	CIP	=	1	0.25	2	1
56	Daptomycin	DAP	=	1	1	4	1
56	Erythromycin	ERY	<=	1	1	4	1
56	Gentamicin	GEN	<=	8	4	16	1
56	Linezolid	LZD	=	2	1	4	1
56	Quinopristin_Dalfo	SYN	=	2	2	8	1
56	Teicoplanin	TEI	<=	0.5	0.25	1	1
56	Tetracycline	TET	=	16	8	32	1
56	Tigecycline	TGC	<=	0.03	0.03	0.12	1
56	Vancomycin	VAN	<=	1	1	4	1
58	Ampicillin	AMP	=	1	0.5	2	1
58	Chloramphenicol	CHL	<=	4	4	16	1
58	Ciprofloxacin	CIP	=	0.5	0.25	2	1
58	Daptomycin	DAP	=	2	1	4	1
58	Erythromycin	ERY	=	4	1	4	1
58	Gentamicin	GEN	<=	8	4	16	1
58	Linezolid	LZD	=	2	1	4	1
58	Quinopristin_Dalfo	SYN	=	8	2	8	1
58	Teicoplanin	TEI	<=	0.5	0.25	1	1

LAB	ANTIBIOTIC	ANTIBIOTIC_ABR	OPERATOR	READVALUE	MINVALUE	MAXVALUE	SCORE
58	Tetracycline	TET	=	16	8	32	1
58	Tigecycline	TGC	=	0.06	0.03	0.12	1
58	Vancomycin	VAN	=	2	1	4	1

Appendix 6b- Test results from reference strain *S. aureus* ATCC 29213

LAB	Antimicrobial	ABR	OPERATOR	READVALUE	MINVALUE	MAXVALUE	SCORE
1	Cefoxitin	FOX	=	2	1	4	1
1	Chloramphenicol	CHL	=	8	2	16	1
1	Ciprofloxacin	CIP	=	0.25	0.12	0.5	1
1	Erythromycin	ERY	=	0.5	0.25	1	1
1	Gentamicin	GEN	=	0.5	0.12	1	1
1	Linezolid	LZD	=	2	1	4	1
1	Quinopristin_Dalfo	SYN	<=	0.5	0.25	1	1
1	Sulfamethoxazole	SMX	=	64	32	128	1
1	Sulfa-Trimethoprim	SXT	<=	0.25	0	0.5	1
1	Tetracycline	TET	<=	0.5	0.12	1	1
1	Tiamulin	TIA	=	1			
1	Trimethoprim	TMP	=	2	1	4	1
1	Vancomycin	VAN	<=	1	0.5	2	1
2	Cefoxitin	FOX	=	2	1	4	1
2	Chloramphenicol	CHL	=	8	2	16	1
2	Ciprofloxacin	CIP	<=	0.25	0.12	0.5	1
2	Clindamycin	CLN	<=	0.12	0.06	0.25	1
2	Erythromycin	ERY	=	0.5	0.25	1	1
2	Gentamicin	GEN	<=	1	0.12	1	1
2	Linezolid	LZD	=	2	1	4	1
2	Mupirocin	MUP	<=	0.5			
2	Quinopristin_Dalfo	SYN	<=	0.5	0.25	1	1
2	Sulfamethoxazole	SMX	<=	64	32	128	1
2	Tetracycline	TET	<=	0.5	0.12	1	1
2	Tiamulin	TIA	<=	0.5			
2	Trimethoprim	TMP	<=	2	1	4	1
2	Vancomycin	VAN	<=	1	0.5	2	1
6	Cefoxitin	FOX	=	2	1	4	1
6	Chloramphenicol	CHL	=	8	2	16	1
6	Ciprofloxacin	CIP	<=	0.25	0.12	0.5	1
6	Clindamycin	CLN	<=	0.12	0.06	0.25	1
6	Erythromycin	ERY	=	0.5	0.25	1	1
6	Gentamicin	GEN	<=	1	0.12	1	1
6	Linezolid	LZD	=	2	1	4	1
6	Mupirocin	MUP	<=	0.5			
6	Quinopristin_Dalfo	SYN	<=	0.5	0.25	1	1
6	Tetracycline	TET	<=	0.5	0.12	1	1
6	Tiamulin	TIA	<=	0.5			
6	Trimethoprim	TMP	<=	2	1	4	1
6	Vancomycin	VAN	<=	1	0.5	2	1

LAB	Antimicrobial	ABR	OPERATOR	READVALUE	MINVALUE	MAXVALUE	SCORE
9	Cefoxitin	FOX	=	2	1	4	1
9	Chloramphenicol	CHL	<=	4	2	16	1
9	Ciprofloxacin	CIP	<=	0.25	0.12	0.5	1
9	Clindamycin	CLN	<=	0.12	0.06	0.25	1
9	Erythromycin	ERY	=	0.5	0.25	1	1
9	Gentamicin	GEN	<=	1	0.12	1	1
9	Linezolid	LZD	=	2	1	4	1
9	Quinopristin_Dalfo	SYN	<=	0.5	0.25	1	1
9	Sulfamethoxazole	SMX	=	64	32	128	1
9	Tetracycline	TET	<=	0.5	0.12	1	1
9	Tiamulin	TIA	=	0.5			
9	Trimethoprim	TMP	<=	2	1	4	1
9	Vancomycin	VAN	<=	1	0.5	2	1
11	Cefoxitin	FOX	=	2	1	4	1
11	Chloramphenicol	CHL	=	8	2	16	1
11	Ciprofloxacin	CIP	=	0.5	0.12	0.5	1
11	Clindamycin	CLN	<=	0.25	0.06	0.25	1
11	Erythromycin	ERY	=	0.5	0.25	1	1
11	Gentamicin	GEN	<=	0.5	0.12	1	1
11	Tetracycline	TET	=	1	0.12	1	1
11	Trimethoprim	TMP	=	1	1	4	1
12	Cefoxitin	FOX	=	4	1	4	1
12	Chloramphenicol	CHL	=	16	2	16	1
12	Ciprofloxacin	CIP	=	0.5	0.12	0.5	1
12	Clindamycin	CLN	<=	0.25	0.06	0.25	1
12	Erythromycin	ERY	=	1	0.25	1	1
12	Gentamicin	GEN	<=	0.5	0.12	1	1
12	Linezolid	LZD	=	2	1	4	1
12	Tetracycline	TET	<=	0.5	0.12	1	1
12	Trimethoprim	TMP	=	4	1	4	1
12	Vancomycin	VAN	<=	1	0.5	2	1
17	Cefoxitin	FOX	=	4	1	4	1
17	Chloramphenicol	CHL	=	16	2	16	1
17	Ciprofloxacin	CIP	=	0.5	0.12	0.5	1
17	Clindamycin	CLN	<=	0.12	0.06	0.25	1
17	Erythromycin	ERY	=	1	0.25	1	1
17	Gentamicin	GEN	<=	1	0.12	1	1
17	Linezolid	LZD	=	4	1	4	1
17	Mupirocin	MUP	<=	0.5			
17	Quinopristin_Dalfo	SYN	<=	0.5	0.25	1	1
17	Sulfamethoxazole	SMX	<=	64	32	128	1
17	Tetracycline	TET	=	1	0.12	1	1

LAB	Antimicrobial	ABR	OPERATOR	READVALUE	MINVALUE	MAXVALUE	SCORE
17	Tiamulin	TIA	=	1			
17	Trimethoprim	TMP	<=	2	1	4	1
17	Vancomycin	VAN	<=	1	0.5	2	1
18	Cefoxitin	FOX	=	4	1	4	1
18	Chloramphenicol	CHL	=	8	2	16	1
18	Ciprofloxacin	CIP	=	0.25	0.12	0.5	1
18	Clindamycin	CLN	<=	0.12	0.06	0.25	1
18	Erythromycin	ERY	=	0.25	0.25	1	1
18	Gentamicin	GEN	<=	1	0.12	1	1
18	Linezolid	LZD	=	1	1	4	1
18	Mupirocin	MUP	<=	0.5			
18	Quinopristin_Dalfo	SYN	<=	0.5	0.25	1	1
18	Sulfamethoxazole	SMX	=	64	32	128	1
18	Tetracycline	TET	<=	0.5	0.12	1	1
18	Tiamulin	TIA	=	0.5			
18	Trimethoprim	TMP	<=	2	1	4	1
18	Vancomycin	VAN	<=	1	0.5	2	1
19	Cefoxitin	FOX	=	4	1	4	1
19	Chloramphenicol	CHL	=	8	2	16	1
19	Ciprofloxacin	CIP	<=	0.25	0.12	0.5	1
19	Clindamycin	CLN	<=	0.12	0.06	0.25	1
19	Erythromycin	ERY	=	0.5	0.25	1	1
19	Gentamicin	GEN	<=	1	0.12	1	1
19	Linezolid	LZD	=	2	1	4	1
19	Mupirocin	MUP	<=	0.5			
19	Quinopristin_Dalfo	SYN	<=	0.5	0.25	1	1
19	Sulfamethoxazole	SMX	<=	64	32	128	1
19	Tetracycline	TET	<=	0.5	0.12	1	1
19	Tiamulin	TIA	<=	0.5			
19	Trimethoprim	TMP	<=	2	1	4	1
19	Vancomycin	VAN	<=	1	0.5	2	1
20	Cefoxitin	FOX	=	4	1	4	1
20	Chloramphenicol	CHL	=	16	2	16	1
20	Ciprofloxacin	CIP	=	0.5	0.12	0.5	1
20	Clindamycin	CLN	<=	0.12	0.06	0.25	1
20	Erythromycin	ERY	=	0.5	0.25	1	1
20	Gentamicin	GEN	<=	1	0.12	1	1
20	Linezolid	LZD	=	4	1	4	1
20	Mupirocin	MUP	<=	0.5			
20	Quinopristin_Dalfo	SYN	<=	0.5	0.25	1	1
20	Sulfamethoxazole	SMX	=	128	32	128	1
20	Tetracycline	TET	=	1	0.12	1	1

LAB	Antimicrobial	ABR	OPERATOR	READVALUE	MINVALUE	MAXVALUE	SCORE
20	Tiamulin	TIA	=	1			
20	Trimethoprim	TMP	<=	2	1	4	1
20	Vancomycin	VAN	<=	1	0.5	2	1
21	Cefoxitin	FOX	=	2	1	4	1
21	Chloramphenicol	CHL	=	8	2	16	1
21	Ciprofloxacin	CIP	=	0.25	0.12	0.5	1
21	Clindamycin	CLN	<=	0.12	0.06	0.25	1
21	Erythromycin	ERY	=	0.25	0.25	1	1
21	Gentamicin	GEN	<=	1	0.12	1	1
21	Linezolid	LZD	=	2	1	4	1
21	Quinopristin_Dalfo	SYN	<=	0.5	0.25	1	1
21	Sulfamethoxazole	SMX	<=	64	32	128	1
21	Tetracycline	TET	<=	0.5	0.12	1	1
21	Tiamulin	TIA	=	0.5			
21	Trimethoprim	TMP	<=	2	1	4	1
21	Vancomycin	VAN	<=	1	0.5	2	1
22	Cefoxitin	FOX	=	4	1	4	1
22	Chloramphenicol	CHL	=	16	2	16	1
22	Ciprofloxacin	CIP	=	0.5	0.12	0.5	1
22	Clindamycin	CLN	<=	0.12	0.06	0.25	1
22	Erythromycin	ERY	=	0.5	0.25	1	1
22	Gentamicin	GEN	<=	1	0.12	1	1
22	Linezolid	LZD	=	2	1	4	1
22	Quinopristin_Dalfo	SYN	<=	0.5	0.25	1	1
22	Sulfamethoxazole	SMX	<=	64	32	128	1
22	Tetracycline	TET	<=	0.5	0.12	1	1
22	Trimethoprim	TMP	<=	2	1	4	1
22	Vancomycin	VAN	<=	1	0.5	2	1
25	Clindamycin	CLN	=	0.12	0.06	0.25	1
25	Erythromycin	ERY	=	0.5	0.25	1	1
25	Sulfa-Trimethoprim	SXT	<=	0.12	0	0.5	1
25	Tetracycline	TET	=	0.5	0.12	1	1
26	Cefoxitin	FOX	=	2	1	4	1
26	Chloramphenicol	CHL	=	8	2	16	1
26	Ciprofloxacin	CIP	=	0.25	0.12	0.5	1
26	Clindamycin	CLN	<=	0.12	0.06	0.25	1
26	Erythromycin	ERY	=	0.5	0.25	1	1
26	Gentamicin	GEN	<=	0.25	0.12	1	1
26	Linezolid	LZD	=	2	1	4	1
26	Mupirocin	MUP	<=	0.5			
26	Quinopristin_Dalfo	SYN	<=	0.5	0.25	1	1
26	Sulfamethoxazole	SMX	=	64	32	128	1

LAB	Antimicrobial	ABR	OPERATOR	READVALUE	MINVALUE	MAXVALUE	SCORE
26	Sulfa-Trimethoprim	SXT	<=	0.25	0	0.5	1
26	Tetracycline	TET	<=	0.5	0.12	1	1
26	Tiamulin	TIA	=	0.5			
26	Trimethoprim	TMP	=	2	1	4	1
26	Vancomycin	VAN	<=	1	0.5	2	1
29	Cefoxitin	FOX	=	24	1	4	0
29	Chloramphenicol	CHL	=	4	2	16	1
29	Ciprofloxacin	CIP	=	0.5	0.12	0.5	1
29	Clindamycin	CLN	=	0.25	0.06	0.25	1
29	Erythromycin	ERY	=	1	0.25	1	1
29	Gentamicin	GEN	=	0.5	0.12	1	1
29	Tetracycline	TET	=	0.12	0.12	1	1
29	Trimethoprim	TMP	=	2	1	4	1
29	Vancomycin	VAN	=	20	0.5	2	0
30	Cefoxitin	FOX	=	4	1	4	1
30	Chloramphenicol	CHL	=	8	2	16	1
30	Ciprofloxacin	CIP	<=	0.25	0.12	0.5	1
30	Clindamycin	CLN	<=	0.12	0.06	0.25	1
30	Erythromycin	ERY	=	0.5	0.25	1	1
30	Gentamicin	GEN	<=	1	0.12	1	1
30	Linezolid	LZD	=	2	1	4	1
30	Mupirocin	MUP	<=	0.5			
30	Quinopristin_Dalfo	SYN	<=	0.5	0.25	1	1
30	Sulfamethoxazole	SMX	<=	64	32	128	1
30	Tetracycline	TET	<=	0.5	0.12	1	1
30	Tiamulin	TIA	<=	0.5			
30	Trimethoprim	TMP	<=	2	1	4	1
30	Vancomycin	VAN	<=	1	0.5	2	1
31	Cefoxitin	FOX	<=	4	1	4	1
31	Chloramphenicol	CHL	<=	16	2	16	1
31	Ciprofloxacin	CIP	<=	0.12	0.12	0.5	1
31	Clindamycin	CLN	<=	0.25	0.06	0.25	1
31	Erythromycin	ERY	<=	0.5	0.25	1	1
31	Gentamicin	GEN	<=	2	0.12	1	1
31	Linezolid	LZD	<=	1	1	4	1
31	Mupirocin	MUP	<=	1			
31	Quinopristin_Dalfo	SYN	<=	1	0.25	1	1
31	Sulfamethoxazole	SMX	<=	128	32	128	1
31	Sulfa-Trimethoprim	SXT	<=	0.5	0	0.5	1
31	Tetracycline	TET	<=	1	0.12	1	1
31	Tiamulin	TIA	<=	2			
31	Trimethoprim	TMP	<=	2	1	4	1

LAB	Antimicrobial	ABR	OPERATOR	READVALUE	MINVALUE	MAXVALUE	SCORE
31	Vancomycin	VAN	<=	1	0.5	2	1
33	Cefoxitin	FOX	=	4	1	4	1
33	Chloramphenicol	CHL	=	8	2	16	1
33	Ciprofloxacin	CIP	=	0.25	0.12	0.5	1
33	Clindamycin	CLN	<=	0.25	0.06	0.25	1
33	Erythromycin	ERY	<=	0.25	0.25	1	1
33	Gentamicin	GEN	<=	0.5	0.12	1	1
33	Tetracycline	TET	<=	0.5	0.12	1	1
33	Trimethoprim	TMP	=	2	1	4	1
34	Cefoxitin	FOX	=	4	1	4	1
34	Chloramphenicol	CHL	=	8	2	16	1
34	Ciprofloxacin	CIP	<=	0.25	0.12	0.5	1
34	Clindamycin	CLN	<=	0.12	0.06	0.25	1
34	Erythromycin	ERY	=	0.5	0.25	1	1
34	Gentamicin	GEN	<=	1	0.12	1	1
34	Linezolid	LZD	=	2	1	4	1
34	Mupirocin	MUP	<=	0.5			
34	Quinopristin_Dalfo	SYN	<=	0.5	0.25	1	1
34	Sulfamethoxazole	SMX	<=	64	32	128	1
34	Tetracycline	TET	<=	0.5	0.12	1	1
34	Tiamulin	TIA	=	1			
34	Trimethoprim	TMP	<=	2	1	4	1
34	Vancomycin	VAN	<=	1	0.5	2	1
36	Chloramphenicol	CHL	=	8	2	16	1
36	Ciprofloxacin	CIP	=	0.25	0.12	0.5	1
36	Clindamycin	CLN	<=	0.25	0.06	0.25	1
36	Erythromycin	ERY	=	0.5	0.25	1	1
36	Gentamicin	GEN	<=	0.5	0.12	1	1
36	Tetracycline	TET	<=	0.5	0.12	1	1
36	Trimethoprim	TMP	=	2	1	4	1
37	Cefoxitin	FOX	=	4	1	4	1
37	Chloramphenicol	CHL	=	8	2	16	1
37	Ciprofloxacin	CIP	=	0.25	0.12	0.5	1
37	Erythromycin	ERY	=	0.25	0.25	1	1
37	Gentamicin	GEN	=	0.25	0.12	1	1
37	Sulfamethoxazole	SMX	<=	8	32	128	0
37	Tetracycline	TET	<=	0.125	0.12	1	1
37	Trimethoprim	TMP	=	1	1	4	1
39	Chloramphenicol	CHL	=	8	2	16	1
39	Ciprofloxacin	CIP	=	0.5	0.12	0.5	1
39	Erythromycin	ERY	=	1	0.25	1	1
39	Gentamicin	GEN	=	1	0.12	1	1

LAB	Antimicrobial	ABR	OPERATOR	READVALUE	MINVALUE	MAXVALUE	SCORE
39	Tetracycline	TET	<=	0.5	0.12	1	1
39	Trimethoprim	TMP	=	2	1	4	1
40	Cefoxitin	FOX	=	4	1	4	1
40	Chloramphenicol	CHL	=	8	2	16	1
40	Ciprofloxacin	CIP	=	0.5	0.12	0.5	1
40	Clindamycin	CLN	=	0.25	0.06	0.25	1
40	Erythromycin	ERY	=	1	0.25	1	1
40	Gentamicin	GEN	=	1	0.12	1	1
40	Linezolid	LZD	=	1	1	4	1
40	Quinopristin_Dalfo	SYN	=	0.25	0.25	1	1
40	Sulfa-Trimethoprim	SXT	<=	0.5	0	0.5	1
40	Tetracycline	TET	=	1	0.12	1	1
40	Vancomycin	VAN	=	1	0.5	2	1
41	Cefoxitin	FOX	=	4	1	4	1
41	Chloramphenicol	CHL	=	8	2	16	1
41	Ciprofloxacin	CIP	<=	0.25	0.12	0.5	1
41	Clindamycin	CLN	=	0.25	0.06	0.25	1
41	Erythromycin	ERY	=	0.5	0.25	1	1
41	Gentamicin	GEN	<=	1	0.12	1	1
41	Linezolid	LZD	=	2	1	4	1
41	Mupirocin	MUP	=	1			
41	Quinopristin_Dalfo	SYN	=	1	0.25	1	1
41	Sulfamethoxazole	SMX	<=	64	32	128	1
41	Tetracycline	TET	<=	0.5	0.12	1	1
41	Tiamulin	TIA	=	1			
41	Trimethoprim	TMP	<=	2	1	4	1
41	Vancomycin	VAN	=	2	0.5	2	1
42	Cefoxitin	FOX	=	4	1	4	1
42	Chloramphenicol	CHL	=	8	2	16	1
42	Ciprofloxacin	CIP	<=	0.25	0.12	0.5	1
42	Clindamycin	CLN	<=	0.12	0.06	0.25	1
42	Erythromycin	ERY	=	0.5	0.25	1	1
42	Gentamicin	GEN	<=	1	0.12	1	1
42	Linezolid	LZD	=	2	1	4	1
42	Mupirocin	MUP	<=	0.5			
42	Quinopristin_Dalfo	SYN	<=	0.5	0.25	1	1
42	Sulfamethoxazole	SMX	<=	64	32	128	1
42	Tetracycline	TET	<=	0.5	0.12	1	1
42	Trimethoprim	TMP	<=	2	1	4	1
42	Vancomycin	VAN	<=	1	0.5	2	1
46	Cefoxitin	FOX	<=	0.5	1	4	0
46	Ciprofloxacin	CIP	<=	0.5	0.12	0.5	1

LAB	Antimicrobial	ABR	OPERATOR	READVALUE	MINVALUE	MAXVALUE	SCORE
46	Clindamycin	CLN	<=	0.25	0.06	0.25	1
46	Erythromycin	ERY	<=	0.25	0.25	1	1
46	Gentamicin	GEN	<=	0.5	0.12	1	1
46	Linezolid	LZD	=	1	1	4	1
46	Mupirocin	MUP	<=	1			
46	Quinopristin_Dalfo	SYN	<=	0.25	0,25	1	1
46	Tetracycline	TET	<=	0.5	0.12	1	1
46	Vancomycin	VAN	=	1	0.5	2	1
56	Cefoxitin	FOX	=	1	1	4	1
56	Chloramphenicol	CHL	=	8	2	16	1
56	Ciprofloxacin	CIP	<=	0.25	0.12	0.5	1
56	Clindamycin	CLN	<=	0.12	0.06	0.25	1
56	Erythromycin	ERY	=	0.5	0.25	1	1
56	Gentamicin	GEN	<=	1	0.12	1	1
56	Linezolid	LZD	=	2	1	4	1
56	Mupirocin	MUP	<=	0.5			
56	Quinopristin_Dalfo	SYN	<=	0.5	0.25	1	1
56	Sulfamethoxazole	SMX	<=	64	32	128	1
56	Tetracycline	TET	<=	0.5	0.12	1	1
56	Tiamulin	TIA	=	1			
56	Trimethoprim	TMP	<=	2	1	4	1
56	Vancomycin	VAN	<=	1	0.5	2	1
58	Cefoxitin	FOX	=	2	1	4	1
58	Chloramphenicol	CHL	=	8	2	16	1
58	Ciprofloxacin	CIP	<=	0.25	0.12	0.5	1
58	Clindamycin	CLN	<=	0.12	0.06	0.25	1
58	Erythromycin	ERY	=	0.5	0.25	1	1
58	Gentamicin	GEN	<=	1	0.12	1	1
58	Linezolid	LZD	=	2	1	4	1
58	Mupirocin	MUP	<=	0.5			
58	Quinopristin_Dalfo	SYN	<=	0.5	0.25	1	1
58	Sulfamethoxazole	SMX	<=	64	32	128	1
58	Tetracycline	TET	<=	0.5	0.12	1	1
58	Tiamulin	TIA	<=	0.5			
58	Trimethoprim	TMP	<=	2	1	4	1
58	Vancomycin	VAN	<=	1	0.5	2	1

Appendix 6c- Test results from reference strain *E. coli* ATCC 25922

PANEL	LAB	ANTIBIOTIC	ABR	OPERATOR	READVALUE	MINVALUE	MAXVALUE	SCORE
1	1	Ampicillin	AMP	=	2	2	8	1
1	1	Azithromycin	AZI	=	4			
1	1	Cefotaxime	FOT	<=	0.25	0.03	0.12	1
1	1	Ceftazidime	TAZ	<=	0.5	0.06	0.5	1
1	1	Chloramphenicol	CHL	<=	8	2	8	1
1	1	Ciprofloxacin	CIP	<=	0.015	0.004	0.015	1
1	1	Colistin	COL	<=	1	0.25	2	1
1	1	Gentamicin	GEN	<=	0.5	0.25	1	1
1	1	Meropenem	MER	<=	0.03	0.008	0.06	1
1	1	Nalidixic acid	NAL	<=	4	1	4	1
1	1	Sulfamethoxazole	SMX	=	16	8	32	1
1	1	Tetracycline	TET	<=	2	0.5	2	1
1	1	Tigecycline	TGC	<=	0.25	0.03	0.25	1
1	1	Trimethoprim	TMP	=	0.5	0.5	2	1
1	2	Ampicillin	AMP	=	8	2	8	1
1	2	Azithromycin	AZI	=	4			
1	2	Cefotaxime	FOT	<=	0.25	0.03	0.12	1
1	2	Ceftazidime	TAZ	<=	0.5	0.06	0.5	1
1	2	Chloramphenicol	CHL	<=	8	2	8	1
1	2	Ciprofloxacin	CIP	<=	0.015	0.004	0.015	1
1	2	Colistin	COL	<=	1	0.25	2	1
1	2	Gentamicin	GEN	<=	0.5	0.25	1	1
1	2	Meropenem	MER	<=	0.03	0.008	0.06	1
1	2	Nalidixic acid	NAL	<=	4	1	4	1
1	2	Sulfamethoxazole	SMX	=	16	8	32	1
1	2	Tetracycline	TET	<=	2	0.5	2	1
1	2	Tigecycline	TGC	<=	0.25	0.03	0.25	1
1	2	Trimethoprim	TMP	=	1	0.5	2	1
2	2	Cefepime	FEP	<=	0.06	0.015	0.12	1
2	2	Cefotaxime/clavulanic acid	F/C	<=	0.06			
2	2	Cefotaxime	FOT	<=	0.25	0.03	0.12	1
2	2	Cefoxitin	FOX	=	2	2	8	1
2	2	Ceftazidime	TAZ	<=	0.25	0.06	0.5	1
2	2	Ceftazidime/clavulanic acid	T/C	<=	0.12			
2	2	Ertapenem	ETP	<=	0.015	0.004	0.015	1
2	2	Imipenem	IMI	<=	0.12	0.06	0.25	1
2	2	Meropenem	MER	<=	0.03	0.008	0.06	1
2	2	Temocillin	TRM	=	8			
1	4	Ampicillin	AMP	=	4	2	8	1
1	4	Azithromycin	AZI	=	4			
1	4	Cefotaxime	FOT	=	0.25	0.03	0.12	0

PANEL	LAB	ANTIBIOTIC	ABR	OPERATOR	READVALUE	MINVALUE	MAXVALUE	SCORE
1	4	Ceftazidime	TAZ	=	0.5	0.06	0.5	1
1	4	Chloramphenicol	CHL	=	8	2	8	1
1	4	Ciprofloxacin	CIP	=	0.015	0.004	0.015	1
1	4	Colistin	COL	=	1	0.25	2	1
1	4	Gentamicin	GEN	=	0.5	0.25	1	1
1	4	Meropenem	MER	=	0.03	0.008	0.06	1
1	4	Nalidixic acid	NAL	=	4	1	4	1
1	4	Tetracycline	TET	=	2	0.5	2	1
1	4	Tigecycline	TGC	=	0.25	0.03	0.25	1
1	4	Trimethoprim	TMP	=	1	0.5	2	1
1	6	Ampicillin	AMP	=	2	2	8	1
1	6	Azithromycin	AZI	=	4			
1	6	Cefotaxime	FOT	<=	0.25	0.03	0.12	1
1	6	Ceftazidime	TAZ	<=	0.5	0.06	0.5	1
1	6	Chloramphenicol	CHL	<=	8	2	8	1
1	6	Ciprofloxacin	CIP	<=	0.015	0.004	0.015	1
1	6	Colistin	COL	<=	1	0.25	2	1
1	6	Gentamicin	GEN	<=	0.5	0.25	1	1
1	6	Meropenem	MER	<=	0.03	0.008	0.06	1
1	6	Nalidixic acid	NAL	<=	4	1	4	1
1	6	Tetracycline	TET	<=	2	0.5	2	1
1	6	Tigecycline	TGC	<=	0.25	0.03	0.25	1
1	6	Trimethoprim	TMP	=	0.5	0.5	2	1
2	6	Cefepime	FEP	<=	0.06	0.015	0.12	1
2	6	Cefotaxime/clavulanic acid	F/C	<=	0.06			
2	6	Cefotaxime	FOT	<=	0.25	0.03	0.12	1
2	6	Cefoxitin	FOX	=	2	2	8	1
2	6	Ceftazidime	TAZ	<=	0.25	0.06	0.5	1
2	6	Ceftazidime/clavulanic acid	T/C	<=	0.12			
2	6	Ertapenem	ETP	<=	0.015	0.004	0.015	1
2	6	Imipenem	IMI	=	0.12	0.06	0.25	1
2	6	Meropenem	MER	<=	0.03	0.008	0.06	1
2	6	Temocillin	TRM	=	4			
1	9	Ampicillin	AMP	=	4	2	8	1
1	9	Ceftazidime	TAZ	<=	0.5	0.06	0.5	1
1	9	Chloramphenicol	CHL	<=	8	2	8	1
1	9	Ciprofloxacin	CIP	<=	0.015	0.004	0.015	1
1	9	Colistin	COL	<=	1	0.25	2	1
1	9	Gentamicin	GEN	<=	0.5	0.25	1	1
1	9	Meropenem	MER	<=	0.03	0.008	0.06	1
1	9	Nalidixic acid	NAL	<=	4	1	4	1
1	9	Sulfamethoxazole	SMX	=	16	8	32	1

PANEL	LAB	ANTIBIOTIC	ABR	OPERATOR	READVALUE	MINVALUE	MAXVALUE	SCORE
1	9	Tetracycline	TET	<=	2	0.5	2	1
1	9	Tigecycline	TGC	<=	0.25	0.03	0.25	1
1	9	Trimethoprim	TMP	<=	2	0.5	2	1
2	9	Cefepime	FEP	<=	0.06	0.015	0.12	1
2	9	Cefotaxime/clavulanic acid	F/C	<=	0.06			
2	9	Cefotaxime	FOT	=	0.06	0.03	0.12	1
2	9	Cefoxitin	FOX	=	4	2	8	1
2	9	Ceftazidime	TAZ	<=	0.25	0.06	0.5	1
2	9	Ceftazidime/clavulanic acid	T/C	<=	0.12			
2	9	Ertapenem	ETP	<=	0.015	0.004	0.015	1
2	9	Imipenem	IMI	<=	0.12	0.06	0.25	1
2	9	Meropenem	MER	<=	0.03	0.008	0.06	1
1	11	Ampicillin	AMP	=	4	2	8	1
1	11	Azithromycin	AZI	=	4			
1	11	Cefotaxime	FOT	<=	0.25	0.03	0.12	1
1	11	Ceftazidime	TAZ	<=	0.5	0.06	0.5	1
1	11	Chloramphenicol	CHL	<=	8	2	8	1
1	11	Ciprofloxacin	CIP	<=	0.015	0.004	0.015	1
1	11	Colistin	COL	<=	1	0.25	2	1
1	11	Gentamicin	GEN	=	1	0.25	1	1
1	11	Meropenem	MER	<=	0.03	0.008	0.06	1
1	11	Nalidixic acid	NAL	<=	4	1	4	1
1	11	Sulfamethoxazole	SMX	=	32	8	32	1
1	11	Tetracycline	TET	<=	2	0.5	2	1
1	11	Tigecycline	TGC	<=	0.25	0.03	0.25	1
1	11	Trimethoprim	TMP	=	0.5	0.5	2	1
2	11	Cefepime	FEP	<=	0.06	0.015	0.12	1
2	11	Cefotaxime/clavulanic acid	F/C	<=	0.06			
2	11	Cefotaxime	FOT	<=	0.25	0.03	0.12	1
2	11	Cefoxitin	FOX	=	2	2	8	1
2	11	Ceftazidime	TAZ	<=	0.25	0.06	0.5	1
2	11	Ceftazidime/clavulanic acid	T/C	=	0.25			
2	11	Ertapenem	ETP	<=	0.015	0.004	0.015	1
2	11	Imipenem	IMI	<=	0.12	0.06	0.25	1
2	11	Meropenem	MER	<=	0.03	0.008	0.06	1
2	11	Temocillin	TRM	=	32			
1	12	Ampicillin	AMP	=	4	2	8	1
1	12	Azithromycin	AZI	=	4			
1	12	Cefotaxime	FOT	<=	0.25	0.03	0.12	1
1	12	Ceftazidime	TAZ	<=	0.5	0.06	0.5	1
1	12	Chloramphenicol	CHL	<=	8	2	8	1
1	12	Ciprofloxacin	CIP	<=	0.015	0.004	0.015	1

PANEL	LAB	ANTIBIOTIC	ABR	OPERATOR	READVALUE	MINVALUE	MAXVALUE	SCORE
1	12	Colistin	COL	<=	1	0.25	2	1
1	12	Gentamicin	GEN	<=	0.5	0.25	1	1
1	12	Meropenem	MER	<=	0.03	0.008	0.06	1
1	12	Nalidixic acid	NAL	<=	4	1	4	1
1	12	Sulfamethoxazole	SMX	<=	8	8	32	1
1	12	Tetracycline	TET	<=	2	0.5	2	1
1	12	Tigecycline	TGC	<=	0.25	0.03	0.25	1
1	12	Trimethoprim	TMP	=	1	0.5	2	1
2	12	Cefepime	FEP	<=	0.06	0.015	0.12	1
2	12	Cefotaxime/clavulanic acid	F/C	<=	0.06			
2	12	Cefotaxime	FOT	<=	0.25	0.03	0.12	1
2	12	Cefoxitin	FOX	=	4	2	8	1
2	12	Ceftazidime	TAZ	<=	0.25	0.06	0.5	1
2	12	Ceftazidime/clavulanic acid	T/C	<=	0.12			
2	12	Ertapenem	ETP	<=	0.015	0.004	0.015	1
2	12	Imipenem	IMI	<=	0.12	0.06	0.25	1
2	12	Meropenem	MER	<=	0.03	0.008	0.06	1
2	12	Temocillin	TRM	=	16			
1	13	Ampicillin	AMP	=	4	2	8	1
1	13	Azithromycin	AZI	=	4			
1	13	Cefotaxime	FOT	<=	0.25	0.03	0.12	1
1	13	Ceftazidime	TAZ	<=	0.5	0.06	0.5	1
1	13	Chloramphenicol	CHL	<=	8	2	8	1
1	13	Ciprofloxacin	CIP	<=	0.015	0.004	0.015	1
1	13	Colistin	COL	<=	1	0.25	2	1
1	13	Gentamicin	GEN	<=	0.5	0.25	1	1
1	13	Meropenem	MER	<=	0.03	0.008	0.06	1
1	13	Nalidixic acid	NAL	<=	4	1	4	1
1	13	Sulfamethoxazole	SMX	=	16	8	32	1
1	13	Tetracycline	TET	<=	2	0.5	2	1
1	13	Tigecycline	TGC	<=	0.25	0.03	0.25	1
1	13	Trimethoprim	TMP	=	0.5	0.5	2	1
2	13	Cefepime	FEP	<=	0.06	0.015	0.12	1
2	13	Cefotaxime/clavulanic acid	F/C	<=	0.06			
2	13	Cefotaxime	FOT	<=	0.25	0.03	0.12	1
2	13	Cefoxitin	FOX	=	2	2	8	1
2	13	Ceftazidime	TAZ	<=	0.25	0.06	0.5	1
2	13	Ceftazidime/clavulanic acid	T/C	=	0.25			
2	13	Ertapenem	ETP	<=	0.015	0.004	0.015	1
2	13	Imipenem	IMI	<=	0.12	0.06	0.25	1
2	13	Meropenem	MER	<=	0.03	0.008	0.06	1
2	13	Temocillin	TRM	=	16			

PANEL	LAB	ANTIBIOTIC	ABR	OPERATOR	READVALUE	MINVALUE	MAXVALUE	SCORE
1	16	Ampicillin	AMP	=	4	2	8	1
1	16	Cefotaxime	FOT	<=	0.25	0.03	0.12	1
1	16	Ceftazidime	TAZ	<=	0.5	0.06	0.5	1
1	16	Chloramphenicol	CHL	<=	8	2	8	1
1	16	Ciprofloxacin	CIP	<=	0.015	0.004	0.015	1
1	16	Colistin	COL	<=	1	0.25	2	1
1	16	Gentamicin	GEN	<=	0.5	0.25	1	1
1	16	Meropenem	MER	<=	0.03	0.008	0.06	1
1	16	Nalidixic acid	NAL	<=	4	1	4	1
1	16	Sulfamethoxazole	SMX	=	32	8	32	1
1	16	Tetracycline	TET	<=	2	0.5	2	1
1	16	Tigecycline	TGC	<=	0.25	0.03	0.25	1
1	16	Trimethoprim	TMP	=	0.5	0.5	2	1
2	16	Cefepime	FEP	<=	0.06	0.015	0.12	1
2	16	Cefotaxime/clavulanic acid	F/C	<=	0.06			
2	16	Cefotaxime	FOT	<=	0.25	0.03	0.12	1
2	16	Cefoxitin	FOX	=	4	2	8	1
2	16	Ceftazidime	TAZ	<=	0.25	0.06	0.5	1
2	16	Ceftazidime/clavulanic acid	T/C	=	0.25			
2	16	Ertapenem	ETP	<=	0.015	0.004	0.015	1
2	16	Imipenem	IMI	<=	0.12	0.06	0.25	1
2	16	Meropenem	MER	<=	0.03	0.008	0.06	1
2	16	Temocillin	TRM	=	16			
1	17	Ampicillin	AMP	=	2	2	8	1
1	17	Azithromycin	AZI	=	4			
1	17	Cefotaxime	FOT	<=	0.25	0.03	0.12	1
1	17	Ceftazidime	TAZ	<=	0.5	0.06	0.5	1
1	17	Chloramphenicol	CHL	<=	8	2	8	1
1	17	Ciprofloxacin	CIP	<=	0.015	0.004	0.015	1
1	17	Colistin	COL	<=	1	0.25	2	1
1	17	Gentamicin	GEN	<=	0.5	0.25	1	1
1	17	Meropenem	MER	<=	0.03	0.008	0.06	1
1	17	Nalidixic acid	NAL	<=	4	1	4	1
1	17	Sulfamethoxazole	SMX	=	32	8	32	1
1	17	Tetracycline	TET	<=	2	0.5	2	1
1	17	Tigecycline	TGC	<=	0.25	0.03	0.25	1
1	17	Trimethoprim	TMP	=	0.5	0.5	2	1
2	17	Cefepime	FEP	<=	0.06	0.015	0.12	1
2	17	Cefotaxime/clavulanic acid	F/C	<=	0.06			
2	17	Cefotaxime	FOT	<=	0.25	0.03	0.12	1
2	17	Cefoxitin	FOX	=	4	2	8	1
2	17	Ceftazidime	TAZ	<=	0.25	0.06	0.5	1

PANEL	LAB	ANTIBIOTIC	ABR	OPERATOR	READVALUE	MINVALUE	MAXVALUE	SCORE
2	17	Ceftazidime/clavulanic acid	T/C	<=	0.12			
2	17	Ertapenem	ETP	<=	0.015	0.004	0.015	1
2	17	Imipenem	IMI	=	0.25	0.06	0.25	1
2	17	Meropenem	MER	<=	0.03	0.008	0.06	1
2	17	Temocillin	TRM	=	16			
1	18	Ampicillin	AMP	=	2	2	8	1
1	18	Azithromycin	AZI	=	8			
1	18	Cefotaxime	FOT	<=	0.25	0.03	0.12	1
1	18	Ceftazidime	TAZ	<=	0.5	0.06	0.5	1
1	18	Chloramphenicol	CHL	<=	8	2	8	1
1	18	Ciprofloxacin	CIP	<=	0.015	0.004	0.015	1
1	18	Colistin	COL	<=	1	0.25	2	1
1	18	Gentamicin	GEN	<=	0.5	0.25	1	1
1	18	Meropenem	MER	<=	0.03	0.008	0.06	1
1	18	Nalidixic acid	NAL	<=	4	1	4	1
1	18	Sulfamethoxazole	SMX	=	32	8	32	1
1	18	Tetracycline	TET	<=	2	0.5	2	1
1	18	Tigecycline	TGC	<=	0.025	0.03	0.25	0
1	18	Trimethoprim	TMP	=	0.5	0.5	2	1
1	19	Ampicillin	AMP	=	4	2	8	1
1	19	Azithromycin	AZI	=	8			
1	19	Cefotaxime	FOT	<=	0.25	0.03	0.12	1
1	19	Ceftazidime	TAZ	<=	0.5	0.06	0.5	1
1	19	Chloramphenicol	CHL	<=	8	2	8	1
1	19	Ciprofloxacin	CIP	<=	0.015	0.004	0.015	1
1	19	Colistin	COL	<=	1	0.25	2	1
1	19	Gentamicin	GEN	<=	0.5	0.25	1	1
1	19	Meropenem	MER	<=	0.03	0.008	0.06	1
1	19	Nalidixic acid	NAL	<=	4	1	4	1
1	19	Sulfamethoxazole	SMX	=	32	8	32	1
1	19	Tetracycline	TET	<=	2	0.5	2	1
1	19	Tigecycline	TGC	=	0.5	0.03	0.25	0
1	19	Trimethoprim	TMP	=	0.5	0.5	2	1
1	20	Ampicillin	AMP	=	8	2	8	1
1	20	Azithromycin	AZI	=	8			
1	20	Cefotaxime	FOT	<=	0.25	0.03	0.12	1
1	20	Ceftazidime	TAZ	<=	0.5	0.06	0.5	1
1	20	Chloramphenicol	CHL	<=	8	2	8	1
1	20	Ciprofloxacin	CIP	<=	0.015	0.004	0.015	1
1	20	Colistin	COL	<=	1	0.25	2	1
1	20	Gentamicin	GEN	<=	0.5	0.25	1	1
1	20	Meropenem	MER	<=	0.03	0.008	0.06	1

PANEL	LAB	ANTIBIOTIC	ABR	OPERATOR	READVALUE	MINVALUE	MAXVALUE	SCORE
1	20	Nalidixic acid	NAL	<=	4	1	4	1
1	20	Sulfamethoxazole	SMX	=	32	8	32	1
1	20	Tetracycline	TET	<=	2	0.5	2	1
1	20	Tigecycline	TGC	<=	0.25	0.03	0.25	1
1	20	Trimethoprim	TMP	=	0.5	0.5	2	1
2	20	Cefepime	FEP	<=	0.06	0.015	0.12	1
2	20	Cefotaxime/clavulanic acid	F/C	<=	0.06			
2	20	Cefotaxime	FOT	<=	0.25	0.03	0.12	1
2	20	Cefoxitin	FOX	=	4	2	8	1
2	20	Ceftazidime	TAZ	=	0.5	0.06	0.5	1
2	20	Ceftazidime/clavulanic acid	T/C	<=	0.12			
2	20	Ertapenem	ETP	<=	0.015	0.004	0.015	1
2	20	Imipenem	IMI	=	0.25	0.06	0.25	1
2	20	Meropenem	MER	<=	0.03	0.008	0.06	1
2	20	Temocillin	TRM	=	32			
1	21	Ampicillin	AMP	=	4	2	8	1
1	21	Azithromycin	AZI	=	4			
1	21	Cefotaxime	FOT	<=	0.25	0.03	0.12	1
1	21	Ceftazidime	TAZ	<=	0.5	0.06	0.5	1
1	21	Chloramphenicol	CHL	<=	8	2	8	1
1	21	Ciprofloxacin	CIP	<=	0.015	0.004	0.015	1
1	21	Colistin	COL	<=	1	0.25	2	1
1	21	Gentamicin	GEN	<=	0.5	0.25	1	1
1	21	Meropenem	MER	=	0.06	0.008	0.06	1
1	21	Nalidixic acid	NAL	<=	4	1	4	1
1	21	Sulfamethoxazole	SMX	=	16	8	32	1
1	21	Tetracycline	TET	<=	2	0.5	2	1
1	21	Tigecycline	TGC	<=	0.25	0.03	0.25	1
1	21	Trimethoprim	TMP	=	0.5	0.5	2	1
2	21	Cefepime	FEP	<=	0.06	0.015	0.12	1
2	21	Cefotaxime/clavulanic acid	F/C	<=	0.06			
2	21	Cefotaxime	FOT	<=	0.25	0.03	0.12	1
2	21	Cefoxitin	FOX	=	2	2	8	1
2	21	Ceftazidime	TAZ	<=	0.25	0.06	0.5	1
2	21	Ceftazidime/clavulanic acid	T/C	<=	0.12			
2	21	Ertapenem	ETP	<=	0.015	0.004	0.015	1
2	21	Imipenem	IMI	<=	0.12	0.06	0.25	1
2	21	Meropenem	MER	<=	0.03	0.008	0.06	1
2	21	Temocillin	TRM	=	16			
1	22	Ampicillin	AMP	=	4	2	8	1
1	22	Cefotaxime	FOT	<=	0.06	0.03	0.12	1
1	22	Ceftazidime	TAZ	<=	0.25	0.06	0.5	1

PANEL	LAB	ANTIBIOTIC	ABR	OPERATOR	READVALUE	MINVALUE	MAXVALUE	SCORE
1	22	Chloramphenicol	CHL	=	4	2	8	1
1	22	Ciprofloxacin	CIP	=	0.015	0.004	0.015	1
1	22	Colistin	COL	<=	2	0.25	2	1
1	22	Gentamicin	GEN	=	0.5	0.25	1	1
1	22	Nalidixic acid	NAL	<=	4	1	4	1
1	22	Sulfamethoxazole	SMX	=	32	8	32	1
1	22	Tetracycline	TET	=	2	0.5	2	1
1	22	Trimethoprim	TMP	<=	0.5	0.5	2	1
1	25	Ampicillin	AMP	=	4	2	8	1
1	25	Azithromycin	AZI	=	4			
1	25	Cefotaxime	FOT	<=	0.25	0.03	0.12	1
1	25	Ceftazidime	TAZ	<=	0.5	0.06	0.5	1
1	25	Chloramphenicol	CHL	<=	8	2	8	1
1	25	Ciprofloxacin	CIP	<=	0.015	0.004	0.015	1
1	25	Colistin	COL	<=	1	0.25	2	1
1	25	Gentamicin	GEN	<=	0.5	0.25	1	1
1	25	Meropenem	MER	<=	0.03	0.008	0.06	1
1	25	Nalidixic acid	NAL	<=	4	1	4	1
1	25	Sulfamethoxazole	SMX	<=	8	8	32	1
1	25	Tetracycline	TET	<=	2	0.5	2	1
1	25	Tigecycline	TGC	<=	0.25	0.03	0.25	1
1	25	Trimethoprim	TMP	=	0.5	0.5	2	1
2	25	Cefepime	FEP	<=	0.06	0.015	0.12	1
2	25	Cefotaxime/clavulanic acid	F/C	<=	0.06			
2	25	Cefotaxime	FOT	<=	0.25	0.03	0.12	1
2	25	Cefoxitin	FOX	=	2	2	8	1
2	25	Ceftazidime	TAZ	<=	0.25	0.06	0.5	1
2	25	Ceftazidime/clavulanic acid	T/C	=	0.25			
2	25	Ertapenem	ETP	<=	0.015	0.004	0.015	1
2	25	Imipenem	IMI	=	0.25	0.06	0.25	1
2	25	Meropenem	MER	<=	0.03	0.008	0.06	1
2	25	Temocillin	TRM	=	16			
1	26	Ampicillin	AMP	=	4	2	8	1
1	26	Azithromycin	AZI	=	4			
1	26	Cefotaxime	FOT	<=	0.25	0.03	0.12	1
1	26	Ceftazidime	TAZ	<=	0.5	0.06	0.5	1
1	26	Chloramphenicol	CHL	<=	8	2	8	1
1	26	Ciprofloxacin	CIP	<=	0.015	0.004	0.015	1
1	26	Colistin	COL	<=	1	0.25	2	1
1	26	Gentamicin	GEN	<=	0.5	0.25	1	1
1	26	Meropenem	MER	<=	0.03	0.008	0.06	1
1	26	Nalidixic acid	NAL	<=	4	1	4	1

PANEL	LAB	ANTIBIOTIC	ABR	OPERATOR	READVALUE	MINVALUE	MAXVALUE	SCORE
1	26	Sulfamethoxazole	SMX	=	16	8	32	1
1	26	Tetracycline	TET	<=	2	0.5	2	1
1	26	Tigecycline	TGC	<=	0.25	0.03	0.25	1
1	26	Trimethoprim	TMP	=	0.5	0.5	2	1
1	29	Ampicillin	AMP	=	8	2	8	1
1	29	Cefotaxime	FOT-	<=	0.25	0.03	0.12	1
1	29	Ceftazidime	TAZ	=	0.5	0.06	0.5	1
1	29	Chloramphenicol	CHL	=	8	2	8	1
1	29	Ciprofloxacin	CIP	=	0.015	0.004	0.015	1
1	29	Colistin	COL	=	1	0.25	2	1
1	29	Gentamicin	GEN	=	0.5	0.25	1	1
1	29	Meropenem	MER	=	0.03	0.008	0.06	1
1	29	Nalidixic acid	NAL	=	4	1	4	1
1	29	Sulfamethoxazole	SMX	=	16	8	32	1
1	29	Tetracycline	TET	=	2	0.5	2	1
1	29	Trimethoprim	TMP	=	0.5	0.5	2	1
1	30	Ampicillin	AMP	=	4	2	8	1
1	30	Azithromycin	AZI	=	8			
1	30	Cefotaxime	FOT	<=	0.25	0.03	0.12	1
1	30	Ceftazidime	TAZ	<=	0.5	0.06	0.5	1
1	30	Chloramphenicol	CHL	<=	8	2	8	1
1	30	Ciprofloxacin	CIP	<=	0.03	0.004	0.015	1
1	30	Colistin	COL	<=	1	0.25	2	1
1	30	Gentamicin	GEN	=	0.5	0.25	1	1
1	30	Meropenem	MER	<=	0.06	0.008	0.06	1
1	30	Nalidixic acid	NAL	<=	4	1	4	1
1	30	Sulfamethoxazole	SMX	=	16	8	32	1
1	30	Tetracycline	TET	<=	2	0.5	2	1
1	30	Tigecycline	TGC	<=	0.25	0.03	0.25	1
1	30	Trimethoprim	TMP	=	0.5	0.5	2	1
2	30	Cefepime	FEP	<=	0.06	0.015	0.12	1
2	30	Cefotaxime/clavulanic acid	F/C	<=	0.25			
2	30	Cefotaxime	FOT	<=	0.25	0.03	0.12	1
2	30	Cefoxitin	FOX	=	4	2	8	1
2	30	Ceftazidime	TAZ	<=	0.25	0.06	0.5	1
2	30	Ceftazidime/clavulanic acid	T/C	=	0.25			
2	30	Ertapenem	ETP	<=	0.015	0.004	0.015	1
2	30	Imipenem	IMI	<=	0.12	0.06	0.25	1
2	30	Meropenem	MER	<=	0.03	0.008	0.06	1
2	30	Temocillin	TRM	=	16			
1	32	Ampicillin	AMP	=	4	2	8	1
1	32	Azithromycin	AZI	=	8			

PANEL	LAB	ANTIBIOTIC	ABR	OPERATOR	READVALUE	MINVALUE	MAXVALUE	SCORE
1	32	Cefotaxime	FOT	<=	0.25	0.03	0.12	1
1	32	Ceftazidime	TAZ	<=	0.5	0.06	0.5	1
1	32	Chloramphenicol	CHL	<=	8	2	8	1
1	32	Ciprofloxacin	CIP	<=	0.015	0.004	0.015	1
1	32	Colistin	COL	<=	1	0.25	2	1
1	32	Gentamicin	GEN	=	1	0.25	1	1
1	32	Meropenem	MER	<=	0.03	0.008	0.06	1
1	32	Nalidixic acid	NAL	<=	4	1	4	1
1	32	Sulfamethoxazole	SMX	=	32	8	32	1
1	32	Tetracycline	TET	<=	2	0.5	2	1
1	32	Tigecycline	TGC	<=	0.25	0.03	0.25	1
1	32	Trimethoprim	TMP	=	0.5	0.5	2	1
2	32	Cefepime	FEP	<=	0.06	0.015	0.12	1
2	32	Cefotaxime/clavulanic acid	F/C	<=	0.06			
2	32	Cefotaxime	FOT	<=	0.25	0.03	0.12	1
2	32	Cefoxitin	FOX	=	2	2	8	1
2	32	Ceftazidime	TAZ	<=	0.25	0.06	0.5	1
2	32	Ceftazidime/clavulanic acid	T/C	<=	0.12			
2	32	Ertapenem	ETP	<=	0.015	0.004	0.015	1
2	32	Imipenem	IMI	<=	0.12	0.06	0.25	1
2	32	Meropenem	MER	<=	0.03	0.008	0.06	1
2	32	Temocillin	TRM	=	16			
1	33	Ampicillin	AMP	=	2	2	8	1
1	33	Azithromycin	AZI	=	4			
1	33	Cefotaxime	FOT	<=	0.25	0.03	0.12	1
1	33	Ceftazidime	TAZ	<=	0.5	0.06	0.5	1
1	33	Chloramphenicol	CHL	<=	8	2	8	1
1	33	Ciprofloxacin	CIP	<=	0.015	0.004	0.015	1
1	33	Colistin	COL	<=	1	0.25	2	1
1	33	Gentamicin	GEN	<=	0.5	0.25	1	1
1	33	Meropenem	MER	<=	0.03	0.008	0.06	1
1	33	Nalidixic acid	NAL	<=	4	1	4	1
1	33	Sulfamethoxazole	SMX	=	32	8	32	1
1	33	Tetracycline	TET	<=	2	0.5	2	1
1	33	Tigecycline	TGC	<=	0.25	0.03	0.25	1
1	33	Trimethoprim	TMP	=	0.5	0.5	2	1
2	33	Cefepime	FEP	<=	0.06	0.015	0.12	1
2	33	Cefotaxime/clavulanic acid	F/C	<=	0.06			
2	33	Cefotaxime	FOT	<=	0.25	0.03	0.12	1
2	33	Cefoxitin	FOX	=	2	2	8	1
2	33	Ceftazidime	TAZ	<=	0.25	0.06	0.5	1
2	33	Ceftazidime/clavulanic acid	T/C	<=	0.12			

PANEL	LAB	ANTIBIOTIC	ABR	OPERATOR	READVALUE	MINVALUE	MAXVALUE	SCORE
2	33	Ertapenem	ETP	<=	0.015	0.004	0.015	1
2	33	Imipenem	IMI	<=	0.12	0.06	0.25	1
2	33	Meropenem	MER	<=	0.03	0.008	0.06	1
2	33	Temocillin	TRM	=	1			
1	34	Ampicillin	AMP	=	4	2	8	1
1	34	Azithromycin	AZI	=	4			
1	34	Cefotaxime	FOT	<=	0.25	0.03	0.12	1
1	34	Ceftazidime	TAZ	<=	0.5	0.06	0.5	1
1	34	Chloramphenicol	CHL	<=	8	2	8	1
1	34	Ciprofloxacin	CIP	<=	0.015	0.004	0.015	1
1	34	Colistin	COL	<=	1	0.25	2	1
1	34	Gentamicin	GEN	<=	0.5	0.25	1	1
1	34	Meropenem	MER	<=	0.03	0.008	0.06	1
1	34	Nalidixic acid	NAL	<=	4	1	4	1
1	34	Sulfamethoxazole	SMX	=	16	8	32	1
1	34	Tetracycline	TET	<=	2	0.5	2	1
1	34	Tigecycline	TGC	<=	0.25	0.03	0.25	1
1	34	Trimethoprim	TMP	=	0.5	0.5	2	1
2	34	Cefepime	FEP	<=	0.06	0.015	0.12	1
2	34	Cefotaxime/clavulanic acid	F/C	<=	0.06			
2	34	Cefotaxime	FOT	<=	0.25	0.03	0.12	1
2	34	Cefoxitin	FOX	=	4	2	8	1
2	34	Ceftazidime	TAZ	<=	0.25	0.06	0.5	1
2	34	Ceftazidime/clavulanic acid	T/C	<=	0.12			
2	34	Ertapenem	ETP	<=	0.015	0.004	0.015	1
2	34	Imipenem	IMI	<=	0.12	0.06	0.25	1
2	34	Meropenem	MER	<=	0.03	0.008	0.06	1
2	34	Temocillin	TRM	=	16			
1	36	Ampicillin	AMP	=	4	2	8	1
1	36	Azithromycin	AZI	=	4			
1	36	Cefotaxime	FOT	<=	0.25	0.03	0.12	1
1	36	Ceftazidime	TAZ	<=	0.5	0.06	0.5	1
1	36	Chloramphenicol	CHL	<=	8	2	8	1
1	36	Ciprofloxacin	CIP	<=	0.015	0.004	0.015	1
1	36	Colistin	COL	<=	1	0.25	2	1
1	36	Gentamicin	GEN	<=	0.5	0.25	1	1
1	36	Meropenem	MER	<=	0.03	0.008	0.06	1
1	36	Nalidixic acid	NAL	<=	4	1	4	1
1	36	Sulfamethoxazole	SMX	=	16	8	32	1
1	36	Tetracycline	TET	<=	2	0.5	2	1
1	36	Tigecycline	TGC	<=	0.25	0.03	0.25	1
1	36	Trimethoprim	TMP	=	0.5	0.5	2	1

PANEL	LAB	ANTIBIOTIC	ABR	OPERATOR	READVALUE	MINVALUE	MAXVALUE	SCORE
2	36	Cefepime	FEP	<=	0.06	0.015	0.12	1
2	36	Cefotaxime/clavulanic acid	F/C	<=	0.06			
2	36	Cefotaxime	FOT	<=	0.25	0.03	0.12	1
2	36	Cefoxitin	FOX	<=	0.5	2	8	0
2	36	Ceftazidime	TAZ	<=	0.25	0.06	0.5	1
2	36	Ceftazidime/clavulanic acid	T/C	<=	0.12			
2	36	Ertapenem	ETP	<=	0.015	0.004	0.015	1
2	36	Imipenem	IMI	<=	0.12	0.06	0.25	1
2	36	Meropenem	MER	<=	0.03	0.008	0.06	1
2	36	Temocillin	TRM	>	8			
1	37	Ampicillin	AMP	=	4	2	8	1
1	37	Azithromycin	AZI	=	4			
1	37	Cefotaxime	FOT	<=	0.25	0.03	0.12	1
1	37	Ceftazidime	TAZ	<=	0.5	0.06	0.5	1
1	37	Chloramphenicol	CHL	<=	8	2	8	1
1	37	Ciprofloxacin	CIP	<=	0.015	0.004	0.015	1
1	37	Colistin	COL	<=	1	0.25	2	1
1	37	Gentamicin	GEN	<=	0.5	0.25	1	1
1	37	Meropenem	MER	<=	0.03	0.008	0.06	1
1	37	Nalidixic acid	NAL	<=	4	1	4	1
1	37	Sulfamethoxazole	SMX	=	32	8	32	1
1	37	Tetracycline	TET	<=	2	0.5	2	1
1	37	Tigecycline	TGC	=	0.25	0.03	0.25	1
1	37	Trimethoprim	TMP	=	0.5	0.5	2	1
1	38	Ampicillin	AMP	=	4	2	8	1
1	38	Azithromycin	AZI	=	8			
1	38	Cefotaxime	FOT	<=	0.25	0.03	0.12	1
1	38	Ceftazidime	TAZ	<=	0.5	0.06	0.5	1
1	38	Chloramphenicol	CHL	<=	8	2	8	1
1	38	Ciprofloxacin	CIP	<=	0.015	0.004	0.015	1
1	38	Colistin	COL	<=	1	0.25	2	1
1	38	Gentamicin	GEN	<=	0.5	0.25	1	1
1	38	Meropenem	MER	<=	0.03	0.008	0.06	1
1	38	Nalidixic acid	NAL	<=	4	1	4	1
1	38	Sulfamethoxazole	SMX	=	32	8	32	1
1	38	Tetracycline	TET	<=	2	0.5	2	1
1	38	Tigecycline	TGC	<=	0.25	0.03	0.25	1
1	38	Trimethoprim	TMP	=	0.5	0.5	2	1
2	38	Cefepime	FEP	<=	0.06	0.015	0.12	1
2	38	Cefotaxime/clavulanic acid	F/C	=	0.06			
2	38	Cefotaxime	FOT	<=	0.25	0.03	0.12	1
2	38	Cefoxitin	FOX	=	4	2	8	1

PANEL	LAB	ANTIBIOTIC	ABR	OPERATOR	READVALUE	MINVALUE	MAXVALUE	SCORE
2	38	Ceftazidime	TAZ	<=	0.25	0.06	0.5	1
2	38	Ceftazidime/clavulanic acid	T/C	<=	0.12			
2	38	Ertapenem	ETP	<=	0.015	0.004	0.015	1
2	38	Imipenem	IMI	<=	0.12	0.06	0.25	1
2	38	Meropenem	MER	<=	0.03	0.008	0.06	1
2	38	Temocillin	TRM	=	16			
1	39	Ampicillin	AMP	=	2	2	8	1
1	39	Cefotaxime	FOT	=	0.06	0.03	0.12	1
1	39	Ceftazidime	TAZ	=	0.5	0.06	0.5	1
1	39	Chloramphenicol	CHL	=	4	2	8	1
1	39	Ciprofloxacin	CIP	=	0.016	0.004	0.015	0
1	39	Colistin	COL	<=	0.5	0.25	2	1
1	39	Gentamicin	GEN	=	0.5	0.25	1	1
1	39	Nalidixic acid	NAL	=	2	1	4	1
1	39	Sulfamethoxazole	SMX	=	32	8	32	1
1	39	Tetracycline	TET	<=	1	0.5	2	1
1	39	Trimethoprim	TMP	=	0.5	0.5	2	1
1	40	Ampicillin	AMP	=	2	2	8	1
1	40	Cefotaxime	FOT	=	0.12	0.03	0.12	1
1	40	Ceftazidime	TAZ	=	0.5	0.06	0.5	1
1	40	Chloramphenicol	CHL	=	8	2	8	1
1	40	Ciprofloxacin	CIP	=	0.015	0.004	0.015	1
1	40	Colistin	COL	=	1	0.25	2	1
1	40	Gentamicin	GEN	=	1	0.25	1	1
1	40	Meropenem	MER	=	0.06	0.008	0.06	1
1	40	Nalidixic acid	NAL	=	4	1	4	1
1	40	Sulfamethoxazole	SMX	=	32	8	32	1
1	40	Tetracycline	TET	=	2	0.5	2	1
1	40	Tigecycline	TGC	=	0.25	0.03	0.25	1
1	40	Trimethoprim	TMP	=	0.5	0.5	2	1
2	40	Cefepime	FEP	=	0.12	0.015	0.12	1
2	40	Cefotaxime/clavulanic acid	F/C	=	0.12			
2	40	Cefotaxime	FOT	=	0.12	0.03	0.12	1
2	40	Cefoxitin	FOX	=	4	2	8	1
2	40	Ceftazidime	TAZ	=	0.5	0.06	0.5	1
2	40	Ceftazidime/clavulanic acid	T/C	=	0.5			
2	40	Ertapenem	ETP	=	0.015	0.004	0.015	1
2	40	Imipenem	IMI	=	0.25	0.06	0.25	1
2	40	Meropenem	MER	=	0.06	0.008	0.06	1
2	40	Temocillin	TRM	=	0.5			
1	41	Ampicillin	AMP	=	2	2	8	1
1	41	Azithromycin	AZI	=	4			

PANEL	LAB	ANTIBIOTIC	ABR	OPERATOR	READVALUE	MINVALUE	MAXVALUE	SCORE
1	41	Cefotaxime	FOT	<=	0.25	0.03	0.12	1
1	41	Ceftazidime	TAZ	<=	0.5	0.06	0.5	1
1	41	Chloramphenicol	CHL	<=	8	2	8	1
1	41	Ciprofloxacin	CIP	<=	0.015	0.004	0.015	1
1	41	Colistin	COL	<=	1	0.25	2	1
1	41	Gentamicin	GEN	<=	0.5	0.25	1	1
1	41	Meropenem	MER	<=	0.03	0.008	0.06	1
1	41	Nalidixic acid	NAL	<=	4	1	4	1
1	41	Sulfamethoxazole	SMX	<=	8	8	32	1
1	41	Tetracycline	TET	<=	2	0.5	2	1
1	41	Tigecycline	TGC	<=	0.25	0.03	0.25	1
1	41	Trimethoprim	TMP	=	0.5	0.5	2	1
2	41	Cefepime	FEP	<=	0.06	0.015	0.12	1
2	41	Cefotaxime/clavulanic acid	F/C	<=	0.06			
2	41	Cefotaxime	FOT	<=	0.25	0.03	0.12	1
2	41	Cefoxitin	FOX	=	1	2	8	0
2	41	Ceftazidime	TAZ	=	0.5	0.06	0.5	1
2	41	Ceftazidime/clavulanic acid	T/C	<=	0.12			
2	41	Ertapenem	ETP	<=	0.015	0.004	0.015	1
2	41	Imipenem	IMI	=	0.25	0.06	0.25	1
2	41	Meropenem	MER	<=	0.03	0.008	0.06	1
2	41	Temocillin	TRM	=	8			
1	42	Ampicillin	AMP	=	4	2	8	1
1	42	Cefotaxime	FOT	<=	0.25	0.03	0.12	1
1	42	Ceftazidime	TAZ	<=	0.5	0.06	0.5	1
1	42	Chloramphenicol	CHL	<=	8	2	8	1
1	42	Ciprofloxacin	CIP	<=	0.015	0.004	0.015	1
1	42	Colistin	COL	<=	1	0.25	2	1
1	42	Gentamicin	GEN	<=	0.5	0.25	1	1
1	42	Meropenem	MER	<=	1	0.008	0.06	1
1	42	Nalidixic acid	NAL	<=	4	1	4	1
1	42	Sulfamethoxazole	SMX	=	32	8	32	1
1	42	Tetracycline	TET	<=	2	0.5	2	1
1	42	Trimethoprim	TMP	=	0.5	0.5	2	1
1	45	Ampicillin	AMP	=	4	2	8	1
1	45	Azithromycin	AZI	=	4			
1	45	Cefotaxime	FOT	<=	0.25	0.03	0.12	1
1	45	Ceftazidime	TAZ	<=	0.5	0.06	0.5	1
1	45	Chloramphenicol	CHL	<=	8	2	8	1
1	45	Ciprofloxacin	CIP	<=	0.015	0.004	0.015	1
1	45	Colistin	COL	<=	1	0.25	2	1
1	45	Gentamicin	GEN	<=	0.5	0.25	1	1

PANEL	LAB	ANTIBIOTIC	ABR	OPERATOR	READVALUE	MINVALUE	MAXVALUE	SCORE
1	45	Meropenem	MER	<=	0.03	0.008	0.06	1
1	45	Nalidixic acid	NAL	<=	4	1	4	1
1	45	Sulfamethoxazole	SMX	=	64	8	32	0
1	45	Tetracycline	TET	<=	2	0.5	2	1
1	45	Tigecycline	TGC	<=	0.25	0.03	0.25	1
1	45	Trimethoprim	TMP	=	1	0.5	2	1
2	45	Cefepime	FEP	<=	0.06	0.015	0.12	1
2	45	Cefotaxime/clavulanic acid	F/C	<=	0.06			
2	45	Cefotaxime	FOT	<=	0.25	0.03	0.12	1
2	45	Cefoxitin	FOX	=	4	2	8	1
2	45	Ceftazidime	TAZ	<=	0.25	0.06	0.5	1
2	45	Ceftazidime/clavulanic acid	T/C	=	0.25			
2	45	Ertapenem	ETP	<=	0.015	0.004	0.015	1
2	45	Imipenem	IMI	<=	0.12	0.06	0.25	1
2	45	Meropenem	MER	<=	0.03	0.008	0.06	1
2	45	Temocillin	TRM	=	16			
1	46	Ampicillin	AMP	=	32	2	8	0
1	46	Cefotaxime	FOT	<=	0.125	0.03	0.12	1
1	46	Ceftacidime	TAZ	=	0.25	0.06	0.5	1
1	46	Ciprofloxacin	CIP	<=	0.125	0.004	0.015	1
1	46	Colistin	COL	<=	0.5	0.25	2	1
1	46	Gentamicin	GEN	=	0.5	0.25	1	1
1	46	Meropenem	MER	<=	0.06	0.008	0.06	1
1	46	Tigecycline	TGC	<=	0.25	0.03	0.25	1
2	46	Cefepime	FEP	<=	0.125	0.015	0.12	1
2	46	Cefotaxime/clavulanic acid	F/C	<=	0.06			
2	46	Cefotaxime	FOT	<=	0.125	0.03	0.12	1
2	46	Cefoxitin	FOX	=	4	2	8	1
2	46	Ceftazidime	TAZ	=	0.125	0.06	0.5	1
2	46	Ceftacidime/clavulanic acid	T/C	=	0.25			
2	46	Ertapenem	ETP	<=	0.125	0.004	0.015	1
2	46	Imipenem	IMI	=	0.25	0.06	0.25	1
2	46	Meropenem	MER	<=	0.06	0.008	0.06	1
2	46	Temocillin	TRM	=	8			
1	56	Ampicillin	AMP	=	4	2	8	1
1	56	Azithromycin	AZI	=	8			
1	56	Cefotaxime	FOT	<=	0.25	0.03	0.12	1
1	56	Ceftazidime	TAZ	<=	0.5	0.06	0.5	1
1	56	Chloramphenicol	CHL	<=	8	2	8	1
1	56	Ciprofloxacin	CIP	<=	0.015	0.004	0.015	1
1	56	Colistin	COL	<=	1	0.25	2	1
1	56	Gentamicin	GEN	<=	0.5	0.25	1	1

PANEL	LAB	ANTIBIOTIC	ABR	OPERATOR	READVALUE	MINVALUE	MAXVALUE	SCORE
1	56	Meropenem	MER	<=	0.03	0.008	0.06	1
1	56	Nalidixic acid	NAL	<=	4	1	4	1
1	56	Sulfamethoxazole	SMX	=	32	8	32	1
1	56	Tetracycline	TET	<=	2	0.5	2	1
1	56	Tigecycline	TGC	<=	0.25	0.03	0.25	1
1	56	Trimethoprim	TMP	=	0.5	0.5	2	1
2	56	Cefepime	FEP	<=	0.06	0.015	0.12	1
2	56	Cefotaxime/clavulanic acid	F/C	<=	0.06			
2	56	Cefotaxime	FOT	<=	0.25	0.03	0.12	1
2	56	Cefoxitin	FOX	=	2	2	8	1
2	56	Ceftazidime	TAZ	<=	0.25	0.06	0.5	1
2	56	Ceftazidime/clavulanic acid	T/C	<=	0.12			
2	56	Ertapenem	ETP	<=	0.015	0.004	0.015	1
2	56	Imipenem	IMI	<=	0.12	0.06	0.25	1
2	56	Meropenem	MER	<=	0.03	0.008	0.06	1
2	56	Temocillin	TRM	=	16			
1	58	Ampicillin	AMP	=	4	2	8	1
1	58	Azithromycin	AZI	=	4			
1	58	Cefotaxime	FOT	<=	0.25	0.03	0.12	1
1	58	Ceftazidime	TAZ	<=	0.5	0.06	0.5	1
1	58	Chloramphenicol	CHL	<=	8	2	8	1
1	58	Ciprofloxacin	CIP	<=	0.015	0.004	0.015	1
1	58	Colistin	COL	<=	1	0.25	2	1
1	58	Gentamicin	GEN	<=	0.5	0.25	1	1
1	58	Meropenem	MER	<=	0.03	0.008	0.06	1
1	58	Nalidixic acid	NAL	<=	4	1	4	1
1	58	Sulfamethoxazole	SMX	=	16	8	32	1
1	58	Tetracycline	TET	<=	2	0.5	2	1
1	58	Tigecycline	TGC	<=	0.25	0.03	0.25	1
1	58	Trimethoprim	TMP	=	0.5	0.5	2	1
2	58	Cefepime	FEP	<=	0.06	0.015	0.12	1
2	58	Cefotaxime/clavulanic acid	F/C	<=	0.06			
2	58	Cefotaxime	FOT	<=	0.25	0.03	0.12	1
2	58	Cefoxitin	FOX	=	2	2	8	1
2	58	Ceftazidime	TAZ	<=	0.25	0.06	0.5	1
2	58	Ceftazidime/clavulanic acid	T/C	<=	0.12			
2	58	Ertapenem	ETP	<=	0.015	0.004	0.015	1
2	58	Imipenem	IMI	<=	0.12	0.06	0.25	1
2	58	Meropenem	MER	<=	0.03	0.008	0.06	1
2	58	Temocillin	TRM	=	4			
1	59	Ampicillin	AMP	=	4	2	8	1
1	59	Azithromycin	AZI	=	4			

PANEL	LAB	ANTIBIOTIC	ABR	OPERATOR	READVALUE	MINVALUE	MAXVALUE	SCORE
1	59	Cefotaxime	FOT	<=	0.25	0.03	0.12	1
1	59	Ceftazidime	TAZ	<=	0.5	0.06	0.5	1
1	59	Chloramphenicol	CHL	<=	8	2	8	1
1	59	Ciprofloxacin	CIP	<=	0.015	0.004	0.015	1
1	59	Colistin	COL	<=	1	0.25	2	1
1	59	Gentamicin	GEN	=	1	0.25	1	1
1	59	Meropenem	MER	<=	0.03	0.008	0.06	1
1	59	Nalidixic acid	NAL	<=	4	1	4	1
1	59	Sulfamethoxazole	SMX	=	16	8	32	1
1	59	Tetracycline	TET	<=	2	0.5	2	1
1	59	Tigecycline	TGC	<=	0.25	0.03	0.25	1
1	59	Trimethoprim	TMP	=	0.5	0.5	2	1

Appendix 7a- Summary of results Enterococci trial

	8.1		8.2		8.3		8.4		8.5		8.6		8.7		8.8	
	tested	correct	tested	correct	tested	correct	tested	correct	tested	correct	tested	correct	tested	correct	tested	correct
AMP	27	25	27	25	27	27	27	27	27	27	27	27	26	13	26	26
CHL	28	28	28	28	28	28	28	27	28	28	28	28	28	28	27	27
CIP	24	24	24	24	24	24	24	24	24	24	24	24	24	24	23	23
DAP	21	21	21	21	21	21	21	20	21	21	21	21	21	21	20	20
ERY	29	29	29	29	29	27	29	29	29	29	29	29	29	28	28	28
GEN	27	27	27	26	27	27	28	28	28	28	28	28	27	25	25	25
LZD	28	28	28	28	28	28	28	28	28	28	28	28	28	28	27	27
SYN	20	19	20	19	21	21	21	21					21	20		
TEI	21	20	21	20	21	20	21	21	21	21	21	21	21	21	20	20
TET	29	29	29	29	29	28	29	28	29	29	29	29	29	29	28	28
TGC	21	20	21	20	21	20	21	20	21	18	21	20	21	20	20	19
VAN	29	28	29	27	29	28	29	28	29	29	29	29	29	29	28	28
Grand Total	**304**	**298**	**304**	**296**	**305**	**299**	**306**	**301**	**285**	**282**	**285**	**284**	**304**	**286**	**272**	**271**

	8.1		8.2		8.3		8.4		8.5		8.6		8.7		8.8	
	dev	dev %	dev	dev %	dev	dev %	dev	dev %	dev	dev %	dev	dev %	dev	dev %	dev	dev %
AMP	2	7%	2	7%	0	0%	0	0%	0	0%	0	0%	13	50%	0	0%
CHL	0	0%	0	0%	0	0%	1	4%	0	0%	0	0%	0	0%	0	0%
CIP	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
DAP	0	0%	0	0%	0	0%	1	5%	0	0%	0	0%	0	0%	0	0%
ERY	0	0%	0	0%	2	7%	0	0%	0	0%	0	0%	1	3%	0	0%
GEN	0	0%	1	4%	0	0%	0	0%	0	0%	0	0%	2	7%	0	0%
LZD	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
SYN	1	5%	1	5%	0	0%	0	0%	0	NA	0	NA	1	5%	0	NA
TEI	1	5%	1	5%	1	5%	0	0%	0	0%	0	0%	0	0%	0	0%
TET	0	0%	0	0%	1	3%	1	3%	0	0%	0	0%	0	0%	0	0%
TGC	1	5%	1	5%	1	5%	1	5%	3	14%	1	5%	1	5%	1	5%
VAN	1	3%	2	7%	1	3%	1	3%	0	0%	0	0%	0	0%	0	0%

Combination ENT 8.7/ampicillin was subtracted from report as it caused more than 25% deviation.

Appendix 7b- Summary of results Staphylococci trial

Strain	**8.1**		**8.2**		**8.3**		**8.4**		**8.5**		**8.6**		**8.7**		**8.8**	
Antimicrobial	**tested**	**correct**	**tested**	**correct**	**tested**	**correct**	**tested**	**correct**	**tested**	**correct**	**tested**	**correct**	**tested**	**correct**	**tested**	**correct**
FOX	27	25	27	27	27	26	27	27	27	27	27	27	27	27	27	27
CHL	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28
CIP	27	13	28	27	28	28	28	28	27	13	28	28	28	28	28	27
CLN	25	24	26	26	24	21	26	26	26	25	26	26	26	26	25	23
ERY	29	28	29	28	29	29	29	29	29	29	29	29	29	29	29	29
GEN	27	27	28	28	28	28	28	27	28	28	28	28	28	28	28	28
LZD	22	22	22	22	22	22	22	22	22	22	22	21	22	22	22	22
MUP	18	18	17	17	18	18	18	18	18	18	17	17	18	18	18	18
SYN	20	20	21	21	21	19	19	15	21	21	21	20	21	21	20	10
SMX	22	21	22	22	22	22	21	20	20	17	22	18	21	21	22	22
SXT	9	9	8	8	9	9	8	7	8	8	9	9	9	9	9	9
TET	29	29	29	27	29	29	29	29	29	29	29	28	29	28	29	27
TIA	17	16	18	18	18	17	18	18	18	17	18	18	18	18	18	18
TMP	26	26	26	25	26	25	27	27	27	25	27	24	26	26	27	27
VAN	23	22	23	22	23	23	21	21	23	22	23	23	23	23	23	23
Total	**349**	**328**	**352**	**346**	**352**	**344**	**349**	**342**	**351**	**329**	**354**	**344**	**353**	**352**	**353**	**338**

Strain	**8.1**		**8.2**		**8.3**		**8.4**		**8.5**		**8.6**		**8.7**		**8.8**	
Antimicrobial	**dev**	**dev %**	**dev**	**dev %**	**dev**	**dev %**	**dev**	**dev %**	**dev**	**dev %**	**dev**	**dev %**	**dev**	**dev %**	**dev**	**dev %**
FOX	2	7%	0	0%	1	4%	0	0%	0	0%	0	0%	0	0%	0	0%
CHL	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
CIP	14	52%	1	4%	0	0%	0	0%	14	52%	0	0%	0	0%	1	4%
CLN	1	4%	0	0%	3	13%	0	0%	1	4%	0	0%	0	0%	2	8%
ERY	1	3%	1	3%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
GEN	0	0%	0	0%	0	0%	1	4%	0	0%	0	0%	0	0%	0	0%
LZD	0	0%	0	0%	0	0%	0	0%	0	0%	1	5%	0	0%	0	0%
MUP	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
SYN	0	0%	0	0%	2	10%	4	21%	0	0%	1	5%	0	0%	10	50%
SMX	1	5%	0	0%	0	0%	1	5%	3	15%	4	18%	0	0%	0	0%
SXT	0	0%	0	0%	0	0%	1	13%	0	0%	0	0%	0	0%	0	0%
TET	0	0%	2	7%	0	0%	0	0%	0	0%	1	3%	1	3%	2	7%
TIA	1	6%	0	0%	1	6%	0	0%	1	6%	0	0%	0	0%	0	0%
TMP	0	0%	1	4%	1	4%	0	0%	2	7%	3	11%	0	0%	0	0%
VAN	1	4%	1	4%	0	0%	0	0%	1	4%	0	0%	0	0%	0	0%

Combination ST 8.1/CIP ST 8.5/CIP and ST 8.8 /SYN were subtracted from report as they caused more than 25% deviation.

Appendix 7c- Summary of results *E. coli* trial

Strain	**8.1**		**8.2**		**8.3**		**8.4**		**8.5**		**8.6**		**8.7**		**8.8**	
Antimicrobial	**tested**	**correct**	**tested**	**correct**	**tested**	**correct**	**tested**	**correct**	**tested**	**correct**	**tested**	**correct**	**tested**	**correct**	**tested**	**correct**
AMP	35	34	35	35	35	35	35	35	35	34	35	35	35	35	35	35
CHL	35	35	35	34	35	35	35	35	35	35	35	34	35	35	35	34
CIP	35	34	35	35	35	35	35	35	35	35	35	35	35	35	35	35
COL	34	34	35	35	35	35	35	35	35	35	35	35	35	35	35	35
ETP			30	30	30	30	30	30					19	18		
FEP			32	32	32	32	31	29					18	15		
FOT	35	35	68	68	68	67	68	68	35	34	35	35	52	48	35	35
FOX			33	33	33	32	33	33					20	20		
GEN	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35
IMI			33	32	33	32	33	33					19	11		
MER	32	32	65	64	64	64	64	64	32	32	32	32	51	27	32	32
NAL	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	34
SMX	35	35	34	33	35	35	35	35	35	35	35	35	35	35	35	35
TAZ	35	35	68	68	68	68	68	68	35	34	35	35	55	55	35	35
TET	34	34	34	34	34	34	34	34	34	34	34	33	34	34	34	34
TGC	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	29
TMP	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35
Total	**445**	**443**	**672**	**668**	**672**	**669**	**671**	**669**	**446**	**443**	**446**	**444**	**578**	**538**	**446**	**443**

Strain	**8.1**		**8.2**		**8.3**		**8.4**		**8.5**		**8.6**		**8.7**		**8.8**	
Antimicrobial	**dev**	**dev %**	**dev**	**dev %**	**dev**	**dev %**	**dev**	**dev %**	**dev**	**dev %**	**dev**	**dev %**	**dev**	**dev %**	**dev**	**dev %**
AMP	1	3%	0	0%	0	0%	0	0%	1	3%	0	0%	0	0%	0	0%
CHL	0	0%	1	3%	0	0%	0	0%	0	0%	1	3%	0	0%	1	3%
CIP	1	3%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
COL	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
ETP	0	NA	0	0%	0	0%	0	0%	0	NA	0	NA	1	5%	0	NA
FEP	0	NA	0	0%	0	0%	2	6%	0	NA	0	NA	3	17%	0	NA
FOT	0	0%	0	0%	1	1%	0	0%	1	3%	0	0%	4	8%	0	0%
FOX	0	NA	0	0%	1	3%	0	0%	0	NA	0	NA	0	0%	0	NA
GEN	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
IMI	0	NA	1	3%	1	3%	0	0%	0	NA	0	NA	8	42%	0	NA
MER	0	0%	1	2%	0	0%	0	0%	0	0%	0	0%	24	47%	0	0%
NAL	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	1	3%
SMX	0	0%	1	3%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
TAZ	0	0%	0	0%	0	0%	0	0%	1	3%	0	0%	0	0%	0	0%
TET	0	0%	0	0%	0	0%	0	0%	0	0%	1	3%	0	0%	0	0%
TGC	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	1	3%
TMP	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%

Appendix 8a- Deviations of results Enterococci trial

Lab nr	strain	Antimicrobial	Obtained value	Obtained interpretation	Expected validation	Expected interpretation
1	EURL ENT 8.1	Teicoplanin	<=0.5	S	64	R
1	EURL ENT 8.1	Vancomycin	<=1	S	>128	R
1	EURL ENT 8.2	Teicoplanin	<=0.5	S	64	R
1	EURL ENT 8.2	Vancomycin	<=1	S	>128	R
1	EURL ENT 8.7	Ampicillin	4	S	8	R
2	EURL ENT 8.7	Ampicillin	4	S	8	R
11	EURL ENT 8.7	Ampicillin	2	S	8	R
17	EURL ENT 8.3	Erythromycin	<=1	R	<=1	S
17	EURL ENT 8.7	Ampicillin	4	S	8	R
20	EURL ENT 8.1	Quinopristin_Dalfo	8	R	4	S
20	EURL ENT 8.4	Daptomycin	8	R	4	S
20	EURL ENT 8.5	Tigecycline	0.5	R	0,125	S
20	EURL ENT 8.7	Gentamicin	64	R	16	S
22	EURL ENT 8.1	Ampicillin	8	R	4	S
22	EURL ENT 8.2	Ampicillin	8	R	4	S
26	EURL ENT 8.7	Ampicillin	4	S	8	R
29	EURL ENT 8.7	Ampicillin	4	S	8	R
29	EURL ENT 8.7	Erythromycin	64	R	2	S
32	EURL ENT 8.7	Ampicillin	<=4	S	8	R
34	EURL ENT 8.4	Chloramphenicol	16	R	8	S
40	EURL ENT 8.2	Gentamicin	1024	R	<=8	S
40	EURL ENT 8.2	Vancomycin	4	S	>128	R
40	EURL ENT 8.7	Ampicillin	2	S	8	R
40	EURL ENT 8.7	Gentamicin	64	R	16	S
41	EURL ENT 8.1	Ampicillin	8	R	4	S
41	EURL ENT 8.5	Tigecycline	0.5	R	0,125	S
42	EURL ENT 8.2	Ampicillin	8	R	4	S
42	EURL ENT 8.7	Ampicillin	4	S	8	R
45	EURL ENT 8.7	Ampicillin	4	S	8	R
46	EURL ENT 8.2	Quinopristin_Dalfo	4	S	8	R
46	EURL ENT 8.7	Ampicillin	4	S	8	R
56	EURL ENT 8.7	Ampicillin	4	S	8	R
58	EURL ENT 8.1	Tigecycline	>8	R	0,06	S
58	EURL ENT 8.2	Tigecycline	>8	R	0,06	S
58	EURL ENT 8.3	Erythromycin	>128	R	<=1	S
58	EURL ENT 8.3	Teicoplanin	16	R	<=0,5	S
58	EURL ENT 8.3	Tetracycline	64	R	<=1	S
58	EURL ENT 8.3	Tigecycline	>8	R	0,06	S
58	EURL ENT 8.3	Vancomycin	>128	R	<=1	S
58	EURL ENT 8.4	Tetracycline	16	R	<=1	S

Lab nr	strain	Antimicrobial	Obtained value	Obtained interpretation	Expected validation	Expected interpretation
58	EURL ENT 8.4	Tigecycline	>8	R	0,03	S
58	EURL ENT 8.4	Vancomycin	32	R	2	S
58	EURL ENT 8.5	Tigecycline	>8	R	0,125	S
58	EURL ENT 8.6	Tigecycline	>8	R	0,125	S
58	EURL ENT 8.7	Ampicillin	4	S	8	R
58	EURL ENT 8.7	Quinopristin_Dalfo	8	R	4	S
58	EURL ENT 8.7	Tigecycline	>8	R	0,125	S
58	EURL ENT 8.8	Tigecycline	>8	R	0,125	S

Combination ENT 8.7/ampicillin subtracted from report as it caused more than 25% deviation.

Appendix 8b- Deviations of results Staphylococci trial

Lab nr	strain	Antimicrobial	Obtained value	Obtained interpretation	Expected value	Expected interpretation
1	EURL ST 8.1	Ciprofloxacin	1	S	2	R
1	EURL ST 8.4	Quinopristin_Dalfo	1	S	2	R
1	EURL ST 8.5	Ciprofloxacin	1	S	2	R
2	EURL ST 8.1	Ciprofloxacin	1	S	2	R
2	EURL ST 8.4	Quinopristin_Dalfo	1	S	2	R
2	EURL ST 8.5	Ciprofloxacin	1	S	2	R
6	EURL ST 8.1	Ciprofloxacin	0.5	S	2	R
6	EURL ST 8.5	Ciprofloxacin	1	S	2	R
6	EURL ST 8.6	Sulfamethoxazole	128	R	128	S
12	EURL ST 8.1	Ciprofloxacin	1	S	2	R
12	EURL ST 8.3	Trimethoprim	4	R	2	S
12	EURL ST 8.5	Ciprofloxacin	1	S	2	R
12	EURL ST 8.6	Trimethoprim	4	R	2	S
17	EURL ST 8.1	Cefoxitin	8	R	4	S
17	EURL ST 8.3	Quinopristin_Dalfo	2	R	1	S
17	EURL ST 8.6	Tetracycline	2	R	1	S
17	EURL ST 8.6	Trimethoprim	8	R	2	S
17	EURL ST 8.7	Tetracycline	2	R	<=0,5	S
17	EURL ST 8.8	Quinopristin_Dalfo	4	R	1	S
17	EURL ST 8.8	Tetracycline	2	R	1	S
18	EURL ST 8.1	Ciprofloxacin	1	S	2	R
18	EURL ST 8.5	Ciprofloxacin	1	S	2	R
19	EURL ST 8.1	Ciprofloxacin	1	S	2	R
19	EURL ST 8.5	Ciprofloxacin	1	S	2	R
19	EURL ST 8.5	Sulfamethoxazole	128	S	512	R
19	EURL ST 8.6	Sulfamethoxazole	>512	R	128	S
20	EURL ST 8.6	Sulfamethoxazole	256	R	128	S
20	EURL ST 8.6	Trimethoprim	4	R	2	S
20	EURL ST 8.8	Quinopristin_Dalfo	2	R	1	S
21	EURL ST 8.1	Ciprofloxacin	1	S	2	R
21	EURL ST 8.5	Ciprofloxacin	1	S	2	R
21	EURL ST 8.8	Quinopristin_Dalfo	2	R	1	S
22	EURL ST 8.5	Trimethoprim	16	R	1	S
22	EURL ST 8.8	Quinopristin_Dalfo	2	R	1	S
23	EURL ST 8.1	Ciprofloxacin	1	S	2	R
23	EURL ST 8.5	Ciprofloxacin	1	S	2	R
25	EURL ST 8.3	Clindamycin	0.5	S	1	R
26	EURL ST 8.5	Ciprofloxacin	1	S	2	R
29	EURL ST 8.1	Ciprofloxacin	1	S	2	R
29	EURL ST 8.5	Ciprofloxacin	1	S	2	R

Lab nr	strain	Antimicrobial	Obtained value	Obtained interpretation	Expected value	Expected interpretation
30	EURL ST 8.5	Sulfamethoxazole	128	S	512	R
30	EURL ST 8.8	Quinopristin_Dalfo	2	R	1	S
31	EURL ST 8.3	Quinopristin_Dalfo	>1	R	1	S
31	EURL ST 8.3	Tiamulin	<=2	S	16	R
31	EURL ST 8.8	Quinopristin_Dalfo	>1	R	1	S
33	EURL ST 8.1	Ciprofloxacin	1	S	2	R
33	EURL ST 8.5	Ciprofloxacin	1	S	2	R
34	EURL ST 8.8	Quinopristin_Dalfo	2	R	1	S
36	EURL ST 8.3	Clindamycin	0.5	S	1	R
36	EURL ST 8.5	Ciprofloxacin	1	S	2	R
36	EURL ST 8.8	Clindamycin	<=0.25	S	0,5	R
37	EURL ST 8.1	Ciprofloxacin	1	S	2	R
37	EURL ST 8.5	Sulfamethoxazole	64	S	512	R
39	EURL ST 8.1	Ciprofloxacin	1	S	2	R
39	EURL ST 8.2	Ciprofloxacin	>4	R	0,25	S
39	EURL ST 8.2	Erythromycin	4	R	0,5	S
39	EURL ST 8.2	Tetracycline	>64	R	<=0,5	S
39	EURL ST 8.2	Trimethoprim	4	R	1	S
39	EURL ST 8.5	Ciprofloxacin	1	S	2	R
40	EURL ST 8.1	Ciprofloxacin	<1	S	2	R
40	EURL ST 8.1	Vancomycin	>32	R	1	S
40	EURL ST 8.4	Quinopristin_Dalfo	1	S	2	R
40	EURL ST 8.4	Sulfamethoxazole-Trimethoprim	1/19	R	0,5	S
40	EURL ST 8.8	Ciprofloxacin	>2	R	0,5	S
41	EURL ST 8.8	Quinopristin_Dalfo	2	R	1	S
42	EURL ST 8.5	Ciprofloxacin	1	S	2	R
42	EURL ST 8.6	Sulfamethoxazole	256	R	128	S
42	EURL ST 8.8	Quinopristin_Dalfo	2	R	1	S
46	EURL ST 8.2	Tetracycline	>8	R	<=0,5	S
46	EURL ST 8.2	Vancomycin	2	R	<=1	S
46	EURL ST 8.3	Clindamycin	0.5	S	1	R
46	EURL ST 8.4	Quinopristin_Dalfo	1	S	2	R
46	EURL ST 8.5	Vancomycin	1	R	<=1	S
46	EURL ST 8.6	Linezolid	2	R	2	S
46	EURL ST 8.6	Quinopristin_Dalfo	2	R	<=0,5	S
46	EURL ST 8.8	Clindamycin	0.25	S	0,5	R
56	EURL ST 8.1	Ciprofloxacin	1	S	2	R
56	EURL ST 8.8	Quinopristin_Dalfo	2	R	1	S
58	EURL ST 8.1	Cefoxitin	>16	R	4	S
58	EURL ST 8.1	Clindamycin	0.5	R	0,125	S
58	EURL ST 8.1	Erythromycin	0.5	R	0,5	S

Lab nr	strain	Antimicrobial	Obtained value	Obtained interpretation	Expected value	Expected interpretation
58	EURL ST 8.1	Sulfamethoxazole	>512	R	<=32	S
58	EURL ST 8.1	Tiamulin	4	R	1	S
58	EURL ST 8.3	Cefoxitin	>16	R	2	S
58	EURL ST 8.4	Gentamicin	>16	R	<=0,25	S
58	EURL ST 8.4	Sulfamethoxazole	>512	R	<=32	S
58	EURL ST 8.5	Clindamycin	>4	R	0,06	S
58	EURL ST 8.5	Tiamulin	4	R	1	S
58	EURL ST 8.5	Trimethoprim	>32	R	1	S
58	EURL ST 8.8	Tetracycline	2	R	1	S

Combination ST 8.1/CIP, ST8.5/CIP and ST 8.8/ SYN were subtracted from report as they caused more than 25% deviation.

Appendix 8c- Deviations of results *E. coli* trial

Lab nr	strain	Panel	Antimicrobial	Obtained value	Obtained interpretation	Expected value	Expected interpretation
2	EURL EC 8.7	1	Meropenem	0.12	S	0,25	R
2	EURL EC 8.7	2	Imipenem	0.5	S	1	R
2	EURL EC 8.7	2	Meropenem	0.12	S	0,25	R
4	EURL EC 8.1	1	Ampicillin	2	R	2	S
4	EURL EC 8.7	1	Meropenem	0.12	S	0,25	R
4	EURL EC 8.3	2	Cefotaxime	0.06	S	64	R
6	EURL EC 8.7	1	Meropenem	0.12	S	0,25	R
11	EURL EC 8.7	1	Cefotaxime	0.5	R	<=0,25	S
11	EURL EC 8.7	2	Cefotaxime	0.5	R	<=0,25	S
11	EURL EC 8.7	2	Ertapenem	0.025	S	0,25	R
12	EURL EC 8.7	2	Meropenem	0.12	S	0,25	R
16	EURL EC 8.7	1	Meropenem	0.12	S	0,25	R
16	EURL EC 8.4	2	Cefepime	0.25	R	0.12	S
19	EURL EC 8.7	1	Meropenem	0.12	S	0,25	R
20	EURL EC 8.7	1	Meropenem	0.12	S	0,25	R
20	EURL EC 8.7	2	Imipenem	0.25	S	1	R
20	EURL EC 8.7	2	Meropenem	0.125	S	0,25	R
21	EURL EC 8.7	1	Meropenem	0.12	S	0,25	R
22	EURL EC 8.2	2	Imipenem	<0.5	S	2	R
22	EURL EC 8.2	2	Meropenem	<1	S	4	R
22	EURL EC 8.3	2	Imipenem	1	R	<=0,12	S
22	EURL EC 8.7	2	Imipenem	<0.5	S	1	R
22	EURL EC 8.7	2	Meropenem	<1	S	0,25	R
26	EURL EC 8.7	1	Meropenem	<=0.03	S	0,25	R
30	EURL EC 8.7	2	Cefepime	0.25	R	0,12	S
32	EURL EC 8.7	2	Cefepime	<=0.5	R	0,12	S
33	EURL EC 8.7	1	Meropenem	0.12	S	0,25	R
33	EURL EC 8.7	2	Imipenem	0.5	S	1	R
33	EURL EC 8.7	2	Meropenem	0.06	S	0,25	R
34	EURL EC 8.6	1	Tetracycline	<=2	R	<=2	S
34	EURL EC 8.7	1	Meropenem	0.12	S	0,25	R
36	EURL EC 8.7	1	Meropenem	0.06	S	0,25	R
37	EURL EC 8.7	1	Meropenem	0.125	S	0,25	R
37	EURL EC 8.8	1	Tigecycline	2	R	<=0,25	S
37	EURL EC 8.3	2	Cefoxitin	>64	R	4	S
38	EURL EC 8.7	2	Imipenem	1	S	1	R
40	EURL EC 8.1	1	Ciprofloxacin	<0.015	S	0,25	R
40	EURL EC 8.2	1	Sulfamethoxazole	>1024	R	32	S
40	EURL EC 8.7	1	Cefotaxime	1	R	<=0,25	S
40	EURL EC 8.7	2	Cefepime	0.5	R	0,12	S

Lab nr	strain	Panel	Antimicrobial	Obtained value	Obtained interpretation	Expected value	Expected interpretation
40	EURL EC 8.7	2	Cefotaxime	2	R	<=0,25	S
42	EURL EC 8.7	1	Meropenem	<=1	S	0,25	R
45	EURL EC 8.7	1	Meropenem	0.12	S	0,25	R
46	EURL EC 8.2	1	Chloramphenicol	0.5	S	>128	R
46	EURL EC 8.7	1	Meropenem	0.25	S	0,25	R
46	EURL EC 8.8	1	Chloramphenicol	>32	R	8	S
56	EURL EC 8.7	1	Meropenem	0.12	S	0,25	R
56	EURL EC 8.7	2	Imipenem	0.5	S	1	R
56	EURL EC 8.7	2	Meropenem	0.12	S	0,25	R
58	EURL EC 8.5	1	Ampicillin	>64	R	2	S
58	EURL EC 8.5	1	Cefotaxime	>4	R	<=0,25	S
58	EURL EC 8.5	1	Ceftazidime	1	R	<=0,5	S
58	EURL EC 8.6	1	Chloramphenicol	>128	S	>128	R
58	EURL EC 8.7	1	Meropenem	0.12	S	0,25	R
58	EURL EC 8.8	1	Nalidixic acid	32	R	2	S
58	EURL EC 8.4	2	Cefepime	8	R	0.12	S
58	EURL EC 8.7	2	Imipenem	0.5	S	1	R
58	EURL EC 8.7	2	Meropenem	0.06	S	0,25	R
59	EURL EC 8.7	2	Imipenem	0.25	S	1	R

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