



External Quality Assessment Exercise

2003



**European Antimicrobial Resistance Surveillance System
(EARSS)**

**in association with United Kingdom National External Quality
Assessment Scheme (UK NEQAS) for Microbiology**

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Introduction and Summary

Since the year 2000, EARSS has been organising external quality assessment (EQA) exercises of antibiotic susceptibility testing in collaboration with UK NEQAS (United Kingdom National External Quality Assessment Scheme) for Microbiology, Centre National de Référence des Antibiotiques (CRAB) and the members of the EQA committee. In this document the results of the EQA exercise in 2003 are presented. The goal of these EQA exercises are to assess the comparability of susceptibility test results, as collected according to the EARSS protocol across countries and guidelines, validating the comparison and pooling of antibiotic susceptibility data from a large number of laboratories from by now 28 countries.

Table 1 displays the characteristics of the 6 strains that were provided by the 'French Reference Center for Antibiotics-Institut Pasteur' and the Canisius Wilhelmina Hospital, Nijmegen, The Netherlands. The strains were characterised and tested by two reference laboratories in France and The Netherlands and by two laboratories in the United Kingdom appointed by UK-NEQAS. Each reference laboratory interpreted the results according to its own breakpoint criteria: CA-SFM, CRG/NCCLS, and BSAC. The reference laboratories agreed upon the designated interpretation (DI) as given in Table 1.

The strains were distributed to 737 laboratories participating in EARSS by UK-NEQAS and the laboratories were asked to report clinical susceptibility categorization (S, I, R). Results were analysed and considered 'concordant' if the reported categorisation agreed with the designated interpretation of the reference laboratories. In Table 2 the proportion of participating laboratories returning reports specified per country is shown. Similar as in the previous years, the overall response rate was very high (91%).

The usage of guidelines by number of laboratories per country is displayed in Table 3. The majority of laboratories used NCCLS guidelines; 72%. In addition, 9% of the laboratories used NCCLS in combination with their national guideline (>1, Table 3).

Of the laboratories that reported the method used for the detection of antimicrobial susceptibility (n=500), the majority used the Etest (86%) (Table 4a). Of the laboratories that reported their type of automated system (n=197), VITEK was most frequently used (59%) (Table 4b).

For the fully susceptible *S. aureus* (U2A166), the overall concordance was >95% for all antibiotics tested, except for ciprofloxacin (85%) (Table 5a/b). For the methicillin heteroresistant *S. aureus* (MRSA) (U2A1786), known from outbreaks, a relative low concordance for oxacillin (81%) and ceftioxin (78%) was reported, but the concordance for gentamicin, vancomycin, teicoplanin, penicillin and ciprofloxacin was $\geq 94\%$ (Table 6a/b).

One of the *S. pneumoniae* (U2A961) strains was erythromycin resistant, which was correctly detected by 94% of laboratories (Table 7a/b). The other *S. pneumoniae* (U2A1787) was intermediately resistant to penicillin, which was correctly detected by 77% of the laboratories (Table 8a/b). Twelve percent reported the strain as fully resistant. The designated interpretation for oxacillin susceptibility of *S. pneumoniae* U2A1787 was changed from intermediate (I) to intermediate and resistant (IR).

The ESBL production of the *E. coli* (U2A1789) strain was correctly identified by 94% of the laboratories (Table 9a/b). The *vanC* resistant enterococcus (U2A604) was correctly identified as *E. gallinarum*, by only 51% of laboratories, but more importantly 90% (I=58%/R=32%) of the laboratories found the reduced susceptibility to vancomycin and susceptibility to teicoplanin, which is typical for this type of resistance (Table 10a/b).

This fourth EARSS EQA exercise again showed that, overall, countries participating in EARSS are capable of delivering susceptibility data of good quality. However, 19% of laboratories missed detection of an MRSA that caused epidemics in Europe. This strain is difficult to detect since the resistance phenotype is heterogeneously expressed and maybe this property even contributes to its spread. Moreover, 11% of laboratories failed to detect penicillin non-susceptibility in *S. pneumoniae*. The results illustrate that there is room for improvement in European routine susceptibility testing.

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Table 1. Reference laboratory results: MICs, and susceptibility as determined by the reference laboratories (designated interpretation)

	MICs (mg/L)	Designated Interpretation
Specimen U2A 166 <i>S. aureus</i> (wild-type)		
Oxacillin	0.25-0.5	S
Methicillin	NT	S
Gentamicin	≤0.38	S
Erythromycin	0.19-0.5	S
Tetracycline	0.25-0.5	S
Rifampicin	<0.016	S
Vancomycin	1-2	S
Teicoplanin	0.25-1	S
Penicillin	0.016-0.064	S
Ciprofloxacin	0.75-1	S
Cefoxitin	1-1.5	S
Specimen U2A 1786 <i>S. aureus</i> (mec A positive)		
Oxacillin	2-4	R
Methicillin	NT	R
Gentamicin	0.12-0.5	S
Erythromycin	>128	R
Tetracycline	0.25-1	S
Rifampicin	≤0.016	S
Vancomycin	1-2	S
Teicoplanin	0.25-2	S
Penicillin	6-64	R
Ciprofloxacin	≥16	R
Cefoxitin	4-12	R
Specimen U2A 961 <i>S. pneumoniae</i>		
Oxacillin	0.064	S
Penicillin-G	≤0.016	S
Ceftriaxone	0.016	S
Cefotaxime	0.016	S
Ciprofloxacin	0.75-1	S
Erythromycin	8-16	R
Clindamycin	0.125-0.5	S

Table 1 (continued). Reference laboratory results: MICs, and susceptibility as determined by the reference laboratories (designated interpretation)

	MICs (mg/L)	Designated Interpretation
Specimen U2A 1787 <i>S. pneumoniae</i>		
Oxacillin	2	IR
Penicillin-G	0.25	I
Ceftriaxone	0.047-0.125	S
Cefotaxime	0.016-0.064	S
Ciprofloxacin	0.38-1	S
Erythromycin	0.064-0.125	S
Clindamycin	0.125-0.38	S
Specimen U2A 1789 <i>E. coli</i>		
Amoxicillin	NT	R
Ampicillin	>256	R
Gentamicin	1	S
Tobramycin	12-16	R
Ciprofloxacin	0.006-0.016	S
Cefotaxime	≥16	IR
Ceftriaxone	≥12	IR
Ceftazidime	>256	R
Piperacillin	>256	R
Piperacillin/Tazobactam	2	S
ESBL		positive
Specimen U2A 604 <i>E. gallinarium</i> (van C positive)		
Amoxicillin	NT	S
Ampicillin	0.5-2	S
Vancomycin	12	I
Gentamicin	6	S
Teicoplanin	0.5-1	S

Table 2. Proportion of participating laboratories returning reports specified per country

Country	Number of QA samples sent	Number of returning reports	Percentage returned reports
Austria (AT)	11	11	100%
Belgium (BE)	99	81	82%
Bulgaria (BU)	24	24	100%
Czech Republic (CZ)	44	44	100%
Denmark (DK)	5	5	100%
Estonia (EE)	10	9	90%
Germany (DE)	23	16	70%
Spain (ES)	40	35	88%
Finland (FI)	15	15	100%
France (FR)	22	20	91%
Greece (GR)	46	43	93%
Croatia (HR)	26	23	88%
Hungary (HU)	30	30	100%
Ireland (IE)	26	24	92%
Israel (IL)	5	5	100%
Iceland (IS)	2	2	100%
Italy (IT)	57	49	86%
Luxembourg (LU)	9	7	78%
Malta (MT)	1	1	100%
Netherlands (NL)	24	23	96%
Poland (PL)	69	68	99%
Portugal (PT)	23	22	96%
Romania (RO)	28	22	79%
Sweden (SE)	22	22	100%
Slovenia (SI)	11	11	100%
Slovakia (SK)	15	15	100%
United Kingdom (UK)	50	45	90%
Total	737	672	91%

Table 3. Adherence to national guidelines: number of laboratories per country **

	Country																												
Guideline*	AT	BE	BU	CZ	DE	DK	EE	ES	FI	FR	GR	HR	HU	IE	IL	IS	IT	LU	MT	NL	PL	PT	RO	SE	SI	SK	UK	Total	
BSAC				1										2													22	25	
CA-SFM		1								20													1						22
CRG																				5									5
CZECH				8																									8
DIN					8																								8
FIRE									2																				2
MENSURA								2			1																		3
NCCLS	11	72	21	5	4		9	29	9		40	23	29	14	5	2	48	6	1	14	52	18	17		11	11	9	460	
SRGA						3																	22						25
> 1		4		28	3			2	4								1	1		3	6	2	1				2		57
Other		3			1	2								7							1		2				11		27
Missing		19	3	2	7		1	7		2	5	3	1	3			8	2		2	10	3	7			4	6		95
Total	11	99	24	44	23	5	10	40	15	22	46	26	30	26	5	2	57	9	1	24	69	23	28	22	11	15	50	737	

* BSAC, the British Society for Antimicrobial Chemotherapy; CA-SFM, Comité de l'antibiogramme de la Société Française de Microbiologie; CRG, Commissie Richtlijnen Gevoeligheidsbepalingen; DIN, Deutsche Industrie Norm; FIRE, Finnish studygroup for Antimicrobial Resistance; MENSURA, Mesa Espanola de Normalizacion de la Susceptibilidad y Resistencia a los Antimicrobianos; NWGA, Norwegian Working Group on Antibiotics; NCCLS, National Committee for Clinical Laboratory Standards; SRGA, Swedish Reference Group for Antibiotics

** Due to the low number of laboratories (≤ 5) using CRG, FIRE and MENSURA guidelines, these were grouped among 'Other' in Table 5b-10b.

Table 4a. Methods used for the detection of antimicrobial susceptibility

	Country																											
Method	AT	BE	BU	CZ	DE	DK	EE	ES	FI	FR	GR	HR	HU	IE	IL	IS	IT	LU	MT	NL	PL	PT	RO	SE	SI	SK	UK	Total
Agar	2	1	2			1		1		1	2						1			1		2	3			2		19
Agar&Auto											1																	1
Agar&Broth			1	11				1																	1			14
Agar&Etest	1		1	1	1			2			3	1	2				1			3	4					1	1	22
Agar&Broth&Etest				4	1																1		1					7
Auto								1									3											4
Broth		2		12	3			4									1			1	2		1			1		27
Broth&Etest		1		6				3				1	1				3	1								2		18
Etest	8	55	5	4	9	4	8	10	13	15	17	21	25	17	4	1	14	4	1	13	47	13	7	21	10	2	35	383
Etest&Auto		1																										1
Other								1									2						1					4
Missing		39	15	6	9		2	17	2	6	23	3	2	9	1	1	32	4		6	15	8	15	1	1	6	14	237
Total	11	99	24	44	23	5	10	40	15	22	46	26	30	26	5	2	57	9	1	24	69	23	28	22	11	15	50	737

Table 4b. Type of automated system used by participating laboratories

Automated System	Country																											
	AT	BE	BU	CZ	DE	DK	EE	ES	FI	FR	GR	HR	HU	IE	IL	IS	IT	LU	MT	NL	PL	PT	RO	SE	SI	SK	UK	Total
ATB										1	1	1	1												1			5
Microscan/Walk-Away								14			1				1		4				1							21
MINI-API		1	6	1								1	1											2				12
Phoenix		2								1				1			5			1		1	2					13
Vitek	2	23	3	1	5	1		3		3	19		3	3	1		22	6	1	8		8					4	116
Wider								8			5						1											14
Other					1			3			5						4			1						2		16
Missing	9	73	15	42	17	4	10	12	15	17	15	24	25	22	3	2	21	3		14	69	13	24	22	10	13	46	540
Total	11	99	24	44	23	5	10	40	15	22	46	26	30	26	5	2	57	9	1	24	69	23	28	22	11	15	50	737

Table 5a. Detection of antimicrobial susceptibility in *S. aureus* U2A 166 by country

Country	Species identification		Oxacillin (DI**=S)		Gentamicin (DI=S)		Erythromycin (DI=S)		Tetracycline (DI=S)		Rifampin (DI=S)	
	n*	correct	n	correct	n	correct	n	correct	n	correct	n	correct
AT	11	100%	11	100%	11	91%	11	91%	11	100%	11	100%
BE	80	100%	79	99%	75	99%	80	98%	69	100%	65	98%
BU	24	100%	24	100%	24	100%	24	100%	24	100%	24	100%
CZ	44	100%	44	100%	44	100%	44	100%	44	100%	42	100%
DE	16	100%	16	100%	16	100%	16	100%	16	100%	13	100%
DK	5	100%	3	100%	5	100%	5	100%	4	100%	5	100%
EE	9	100%	9	100%	8	100%	9	89%	8	88%	5	80%
ES	35	100%	35	97%	35	100%	35	97%	24	100%	34	100%
FI	14	100%	13	100%	5	100%	13	100%	10	100%	13	100%
FR	19	100%	19	100%	19	100%	19	100%	19	100%	19	100%
GR	43	95%	41	98%	42	98%	42	100%	39	100%	41	98%
HR	23	100%	22	100%	23	100%	23	96%	23	100%	23	100%
HU	30	100%	29	100%	30	100%	30	100%	29	97%	28	100%
IE	24	100%	18	100%	24	100%	24	100%	20	100%	23	100%
IL	5	100%	5	100%	5	100%	4	100%	4	100%	5	100%
IS	2	100%	2	100%	2	100%	2	100%	2	100%	2	100%
IT	48	100%	44	100%	47	98%	47	100%	42	100%	48	100%
LU	7	100%	7	100%	7	100%	7	100%	7	100%	7	100%
MT	1	100%	1	100%	1	100%	1	100%	1	100%	1	100%
NL	23	100%	21	100%	23	100%	23	100%	23	100%	22	100%
PL	68	100%	67	99%	68	100%	68	97%	68	100%	65	100%
PT	21	100%	22	100%	22	100%	22	100%	21	100%	21	95%
RO	22	91%	20	100%	22	100%	22	86%	21	90%	20	100%
SE	22	100%	22	100%	21	100%	20	100%	20	100%	22	100%
SI	11	100%	11	100%	11	100%	11	100%	11	100%	11	100%
SK	15	100%	15	100%	15	100%	15	100%	15	100%	14	100%
UK	45	98%	27	100%	45	100%	43	100%	43	100%	42	100%
Total	667	99%	627	99%	650	99%	660	98%	618	99%	626	99%

* Number of laboratories performing the test, ** DI= designated interpretation of the reference laboratories

Table 5a (continued). Detection of antimicrobial susceptibility in *S. aureus* U2A 166 by country

Country	Vancomycin (DI**=S)		Teicoplanin (DI=S)		Penicillin (DI=S)		Ciprofloxacin (DI=S)		Cefotaxim (DI=S)	
	n*	correct	n	correct	n	correct	n	correct	n	correct
AT	11	100%	11	100%	10	100%	11	91%	8	100%
BE	80	100%	63	100%	74	96%	75	89%	26	100%
BU	24	100%	24	100%	23	100%	24	100%	22	100%
CZ	44	100%	44	100%	44	100%	43	98%	43	100%
DE	15	100%	13	100%	16	94%	15	80%	8	100%
DK	5	100%	4	100%	5	100%	3	33%	5	100%
EE	9	100%	1	100%	9	89%	9	78%	3	100%
ES	35	100%	34	100%	32	94%	33	97%	8	100%
FI	14	100%	7	100%	10	90%	12	83%	4	100%
FR	19	100%	19	100%	19	100%	18	100%	15	100%
GR	42	100%	40	98%	41	93%	39	97%	24	96%
HR	23	100%	21	100%	23	91%	23	91%	18	100%
HU	30	100%	27	100%	30	97%	30	97%	24	100%
IE	24	100%	23	100%	24	100%	24	96%	12	100%
IL	5	100%	3	100%	4	100%	4	100%		
IS	2	100%			2	100%	2	50%		
IT	48	98%	47	100%	42	90%	40	95%	15	100%
LU	7	100%	7	100%	7	100%	7	100%	3	100%
MT	1	100%	1	100%	1	100%	1	100%		
NL	22	100%	22	100%	23	87%	22	100%	11	100%
PL	67	99%	64	100%	61	98%	67	76%	37	100%
PT	21	100%	21	100%	19	95%	22	91%	9	100%
RO	20	100%	18	94%	22	91%	22	59%	11	91%
SE	22	100%	20	100%	10	80%	21	10%	6	100%
SI	11	100%	11	100%	11	100%	11	91%	7	100%
SK	15	100%	15	100%	13	100%	15	100%	12	100%
UK	44	100%	38	100%	42	100%	42	50%	13	100%
Total	660	100%	598	100%	617	96%	635	85%	344	99%

* Number of laboratories performing the test, ** DI= designated interpretation of the reference laboratories

Table 5b. Detection of antimicrobial susceptibility in *S. aureus* U2A 166 by guideline used

Guideline	Species identification		Oxacillin (DI**=S)		Gentamicin (DI=S)		Erythromycin (DI=S)		Tetracycline (DI=S)		Rifampin (DI=S)	
	n*	correct	n	correct	n	correct	n	correct	n	correct	n	correct
BSAC	25	96%	15	100%	25	100%	24	100%	24	100%	23	100%
CA-SFM	21	100%	21	100%	21	100%	21	100%	21	100%	21	100%
CZECH	8	100%	8	100%	8	100%	8	100%	8	100%	8	100%
DIN	8	100%	8	100%	8	100%	8	100%	8	100%	7	100%
NCCLS	457	99%	444	100%	444	99%	452	98%	417	100%	424	99%
SRGA	25	100%	23	100%	24	100%	23	100%	23	100%	25	100%
> 1	56	100%	56	98%	55	100%	57	100%	55	100%	56	100%
Other	37	100%	22	100%	35	100%	37	100%	33	100%	34	100%
Total	637	99%	597	99%	620	99%	630	99%	589	100%	598	99%

* Number of laboratories performing the test, ** DI= designated interpretation of the reference laboratories

Table 5b (continued). Detection of antimicrobial susceptibility in *S. aureus* U2A 166 by guideline used

Guideline	Vancomycin (DI**=S)		Teicoplanin (DI=S)		Penicillin (DI=S)		Ciprofloxacin (DI=S)		Cefotaxin (DI=S)	
	n*	correct	n	correct	n	correct	n	correct	n	correct
BSAC	25	100%	23	100%	23	100%	23	48%	8	100%
CA-SFM	21	100%	21	100%	20	100%	20	100%	15	100%
CZECH	8	100%	8	100%	8	100%	8	100%	8	100%
DIN	8	100%	7	100%	8	88%	8	75%	3	100%
NCCLS	451	100%	405	100%	426	96%	434	90%	227	100%
SRGA	25	100%	23	100%	13	85%	23	9%	9	100%
> 1	57	100%	55	100%	56	96%	54	93%	40	100%
Other	36	100%	26	96%	35	94%	35	83%	14	100%
Total	631	100%	568	100%	589	96%	605	85%	324	100%

* Number of laboratories performing the test, ** DI= designated interpretation of the reference laboratories

Table 6a. Detection of antimicrobial susceptibility in *S. aureus* U2A 1786 by country

Country	Species identification		Oxacillin (DI**=R)		Gentamicin (DI=S)		Erythromycin (DI=R)		Tetracycline (DI=S)		Rifampin (DI=S)	
	n*	correct	n	correct	n	correct	n	correct	n	correct	n	correct
AT	11	100%	10	50%	11	100%	11	82%	10	100%	11	100%
BE	79	100%	75	83%	75	97%	80	100%	69	100%	65	100%
BU	24	100%	24	88%	24	100%	24	100%	24	100%	24	100%
CZ	43	100%	43	100%	43	100%	43	100%	43	100%	44	100%
DE	16	100%	16	100%	16	94%	16	100%	16	100%	15	100%
DK	5	100%	3	100%	5	100%	5	100%	4	100%	5	100%
EE	9	100%	9	78%	8	100%	9	100%	8	100%	5	100%
ES	34	100%	34	79%	35	97%	35	100%	24	100%	34	97%
FI	14	100%	12	83%	5	100%	13	92%	9	100%	13	100%
FR	19	100%	19	100%	19	100%	19	100%	18	100%	19	100%
GR	42	98%	41	80%	41	93%	41	98%	37	100%	40	100%
HR	23	100%	22	91%	23	100%	23	100%	23	100%	23	100%
HU	30	100%	30	87%	30	100%	30	100%	29	93%	28	100%
IE	24	100%	18	83%	24	100%	24	100%	20	100%	23	100%
IL	5	100%	5	80%	5	100%	5	80%	4	100%	5	100%
IS	2	100%	2	100%	2	100%	2	100%	2	100%	2	100%
IT	49	100%	45	69%	48	90%	48	100%	44	95%	49	98%
LU	7	100%	7	100%	7	100%	7	100%	7	100%	7	100%
MT	1	100%	1	100%	1	100%	1	100%	1	100%	1	100%
NL	23	100%	22	86%	23	100%	23	100%	23	100%	22	100%
PL	68	100%	67	88%	67	100%	68	99%	68	100%	65	100%
PT	22	100%	22	64%	22	100%	22	100%	21	100%	21	100%
RO	22	95%	20	50%	22	100%	22	100%	21	90%	20	95%
SE	22	100%	22	91%	21	95%	20	95%	20	100%	22	100%
SI	11	100%	11	82%	11	100%	11	100%	11	100%	11	100%
SK	14	100%	14	57%	14	100%	14	100%	13	100%	13	100%
UK	45	100%	28	46%	45	100%	43	100%	44	100%	43	100%
Total	664	100%	622	81%	647	98%	659	99%	613	99%	630	100%

* Number of laboratories performing the test, ** DI= designated interpretation of the reference laboratories

Table 6a (continued). Detection of antimicrobial susceptibility in *S. aureus* U2A 1786 by country

Country	Vancomycin (DI**=S)		Teicoplanin (DI=S)		Penicillin (DI=R)		Ciprofloxacin (DI=R)		Cefotaxim (DI=R)	
	n*	correct	n	correct	n	correct	n	correct	n	correct
AT	11	100%	11	100%	10	80%	11	100%	5	60%
BE	79	97%	63	98%	76	100%	75	84%	24	83%
BU	24	100%	24	100%	23	100%	24	83%	23	91%
CZ	43	100%	43	100%	42	100%	43	100%	43	98%
DE	16	100%	15	100%	16	100%	15	93%	8	88%
DK	5	100%	3	100%	5	100%	4	100%	5	100%
EE	9	100%	1	100%	9	100%	9	100%	1	100%
ES	35	100%	34	100%	33	100%	33	76%	8	50%
FI	14	100%	6	100%	10	100%	12	92%	4	100%
FR	19	100%	19	100%	19	100%	19	100%	15	87%
GR	41	100%	39	97%	40	98%	37	97%	26	54%
HR	23	100%	21	100%	23	100%	23	100%	18	78%
HU	30	100%	27	100%	30	100%	29	100%	24	92%
IE	24	100%	23	100%	24	100%	24	100%	11	73%
IL	5	100%	3	100%	4	100%	4	100%		
IS	2	100%			2	100%	2	100%		
IT	49	98%	49	100%	44	100%	42	98%	16	50%
LU	7	100%	7	100%	7	100%	7	100%	3	33%
MT	1	100%	1	100%	1	100%	1	100%		
NL	22	100%	22	100%	23	100%	23	100%	11	64%
PL	68	99%	65	100%	61	97%	68	99%	36	86%
PT	22	100%	20	100%	19	100%	22	91%	7	71%
RO	20	95%	18	94%	22	82%	21	86%	11	45%
SE	22	100%	20	95%	14	100%	21	95%	6	100%
SI	11	100%	11	100%	11	100%	11	100%	7	86%
SK	14	100%	14	100%	12	100%	14	100%	10	70%
UK	44	100%	37	100%	42	98%	43	98%	13	54%
Total	660	99%	596	99%	622	98%	637	94%	335	78%

* Number of laboratories performing the test, ** DI= designated interpretation of the reference laboratories

Table 6b. Detection of antimicrobial susceptibility in *S. aureus* U2A 1786 by guideline used

Guideline	Species identification		Oxacillin (DI**=R)		Gentamicin (DI=S)		Erythromycin (DI=R)		Tetracycline (DI=S)		Rifampin (DI=S)	
	n*	correct	n	correct	n	correct	n	correct	n	correct	n	correct
BSAC	25	100%	15	47%	25	100%	24	100%	25	100%	24	100%
CA-SFM	21	100%	21	95%	21	100%	21	100%	20	100%	21	100%
CZECH	7	100%	7	100%	7	100%	7	100%	7	100%	8	100%
DIN	8	100%	8	100%	8	88%	8	100%	8	100%	8	100%
NCCLS	456	100%	440	80%	442	98%	452	99%	413	99%	424	100%
SRGA	25	100%	23	91%	24	96%	23	96%	23	100%	25	100%
>1	57	100%	55	91%	55	100%	57	98%	55	100%	57	100%
Other	35	100%	23	61%	35	100%	37	100%	33	100%	35	97%
Total	634	100%	592	81%	617	98%	629	99%	584	99%	602	100%

* Number of laboratories performing the test, ** DI= designated interpretation of the reference laboratories

Table 6b (continued). Detection of antimicrobial susceptibility in *S. aureus* U2A 1786 by guideline used

Guideline	Vancomycin (DI**=S)		Teicoplanin (DI=S)		Penicillin (DI=R)		Ciprofloxacin (DI=R)		Cefotaxin (DI=R)	
	n*	correct	n	correct	n	correct	n	correct	n	correct
BSAC	25	100%	22	100%	23	96%	23	100%	8	63%
CA-SFM	21	100%	21	100%	20	100%	21	100%	15	87%
CZECH	7	100%	7	100%	7	100%	7	100%	7	100%
DIN	8	100%	8	100%	8	100%	8	100%	3	100%
NCCLS	453	99%	406	100%	429	99%	434	94%	215	75%
SRGA	25	100%	23	96%	17	100%	24	96%	9	100%
>1	56	100%	54	100%	55	98%	55	96%	43	86%
Other	36	100%	25	96%	35	97%	35	91%	14	50%
Total	631	99%	566	99%	594	99%	607	94%	314	77%

* Number of laboratories performing the test, ** DI= designated interpretation of the reference laboratories

Table 7a. Detection of antimicrobial susceptibility in *S. pneumoniae* U2A 961 by country

Country	Species identification		Oxacillin (DI**=S)		Penicillin-G (DI=S)		Ceftriaxone (DI=S)		Cefotaxime (DI=S)		Ciprofloxacin (DI=S)		Erythromycin (DI=R)		Clindamycin (DI=S)	
	n*	correct	n	correct	n	correct	n	correct	n	correct	n	correct	n	correct	n	correct
AT	11	91%	8	88%	11	91%	6	100%	8	100%	10	80%	10	100%	11	91%
BE	81	99%	65	100%	74	99%	46	98%	49	100%	58	91%	79	96%	62	92%
BU	24	100%	19	100%	23	100%	20	100%	17	100%	20	100%	24	92%	24	100%
CZ	44	100%	11	100%	43	100%	15	100%	36	100%	44	100%	44	95%	44	98%
DE	16	94%	14	93%	14	93%	9	100%	11	100%	15	80%	15	100%	14	86%
DK	5	100%	5	100%	4	100%	3	100%	3	100%	3	0%	5	100%	4	100%
EE	9	100%	8	100%	9	100%	4	100%	4	100%	6	100%	9	89%	8	100%
ES	35	100%	24	96%	34	97%	3	100%	33	100%	23	96%	35	100%	32	100%
FI	15	93%	9	100%	14	100%	9	100%	3	100%	7	100%	14	93%	13	100%
FR	20	100%	14	100%	20	100%	5	100%	20	100%	14	71%	20	100%	16	94%
GR	43	91%	33	94%	39	97%	25	100%	28	96%	33	88%	40	88%	36	94%
HR	23	100%	19	100%	23	100%	23	100%	6	100%	12	100%	23	100%	23	100%
HU	30	100%	10	100%	30	100%	23	100%	20	100%	23	96%	29	100%	29	100%
IE	24	100%	21	100%	24	96%	7	100%	21	95%	19	79%	24	96%	18	100%
IL	5	100%	4	100%	5	100%	5	100%			2	100%	4	100%	2	100%
IS	2	100%	2	50%	1	100%	2	100%	2	100%	2	100%	2	100%	1	100%
IT	49	100%	21	90%	46	98%	37	100%	40	100%	28	89%	49	96%	33	85%
LU	7	100%	4	100%	7	100%	5	100%	7	100%	4	100%	7	100%	4	100%
MT	1	100%	1	100%	1	100%	1	100%	1	100%	1	100%	1	100%	1	100%
NL	23	100%	20	95%	23	100%	17	100%	11	100%	20	90%	23	87%	20	90%
PL	68	100%	56	98%	61	98%	21	100%	58	100%	24	83%	68	100%	68	97%
PT	22	95%	14	93%	21	95%	12	100%	17	100%	13	92%	21	90%	16	100%
RO	22	86%	20	75%	22	86%	18	72%	14	64%	19	84%	22	86%	16	88%
SE	22	100%	20	100%	21	100%	2	100%	20	100%	20	10%	22	100%	22	100%
SI	11	100%	9	100%	11	100%	2	100%	11	100%	8	100%	11	100%	11	100%
SK	15	100%	11	100%	14	93%	10	100%	10	100%	10	100%	15	93%	14	93%
UK	45	100%	40	100%	41	100%	18	100%	30	100%	34	53%	43	100%	29	93%
Total	672	98%	482	97%	636	98%	348	98%	480	99%	472	84%	659	96%	571	95%

* Number of laboratories performing the test, ** DI= designated interpretation of the reference laboratories

Table 7b. Detection of antimicrobial susceptibility in *S. pneumoniae* U2A 961 by guideline used

Guideline	Species identification		Oxacillin (DI**=S)		Penicillin-G (DI=S)		Ceftriaxone (DI=S)		Cefotaxime (DI=S)		Ciprofloxacin (DI=S)		Erythromycin (DI=R)		Clindamycin (DI=S)	
	n*	correct	n	correct	n	correct	n	correct	n	correct	n	correct	n	correct	n	correct
BSAC	25	100%	22	100%	23	100%	7	100%	20	100%	21	67%	25	100%	14	93%
CA-SFM	22	100%	16	100%	22	100%	6	100%	21	100%	15	73%	22	100%	17	94%
CZECH	8	100%	4	100%	8	100%	2	100%	8	100%	8	100%	8	88%	8	100%
DIN	7	100%	7	100%	7	100%	5	100%	5	100%	7	100%	7	100%	6	100%
NCCLS	458	99%	326	97%	434	97%	260	98%	314	99%	299	92%	449	95%	392	95%
SRGA	25	100%	23	100%	23	100%	3	100%	23	100%	22	9%	25	100%	25	100%
>1	57	100%	27	96%	55	98%	29	100%	42	100%	47	91%	57	98%	54	98%
Other	37	95%	33	94%	37	100%	18	89%	26	92%	31	65%	37	95%	27	85%
Total	639	99%	458	97%	609	98%	330	98%	459	99%	450	84%	630	96%	543	95%

* Number of laboratories performing the test, ** DI= designated interpretation of the reference laboratories

Table 8a. Detection of antimicrobial susceptibility in *S. pneumoniae* U2A 1787 by country

Country	Species identification		Oxacillin (DI**=IR)		Penicillin-G (DI=I)		Ceftriaxone (DI=S)		Cefotaxime (DI=S)		Ciprofloxacin (DI=S)		Erythromycin (DI=S)		Clindamycin (DI=S)	
	n*	correct	n	correct	n	correct	n	correct	n	correct	n	correct	n	correct	n	correct
AT	11	100%	5	80%	11	55%	7	86%	9	89%	10	90%	11	100%	11	100%
BE	80	100%	62	87%	78	86%	47	96%	49	98%	57	95%	79	96%	63	100%
BU	24	100%	16	100%	23	52%	14	93%	12	92%	20	100%	24	100%	24	100%
CZ	44	100%	10	90%	43	81%	12	100%	39	100%	43	100%	44	100%	43	100%
DE	15	100%	13	69%	15	73%	8	100%	12	100%	15	80%	15	93%	14	93%
DK	5	100%	5	80%	5	80%	3	100%	3	33%	3	0%	5	100%	4	100%
EE	9	100%	7	71%	9	44%	4	100%	4	100%	6	100%	8	100%	9	100%
ES	35	100%	20	95%	34	91%	3	100%	33	100%	24	96%	35	94%	33	100%
FI	14	100%	8	100%	14	93%	10	100%	3	100%	7	100%	14	100%	13	100%
FR	20	100%	11	91%	20	100%	5	100%	20	100%	12	83%	20	100%	16	100%
GR	43	95%	32	69%	38	50%	24	100%	26	92%	32	97%	39	97%	37	92%
HR	23	100%	19	95%	23	96%	23	100%	5	100%	12	100%	23	96%	23	100%
HU	30	100%	5	100%	30	100%	23	100%	20	100%	23	100%	29	100%	28	100%
IE	23	100%	20	90%	23	57%	6	100%	20	100%	18	83%	24	100%	18	94%
IL	5	100%	3	100%	5	80%	5	100%	5	100%	2	100%	5	100%	2	100%
IS	2	100%	2	50%	1	100%	2	100%	1	100%	2	100%	2	100%	1	100%
IT	48	100%	21	81%	46	78%	33	100%	39	97%	27	93%	49	94%	33	94%
LU	7	100%	3	100%	6	100%	5	100%	5	100%	5	100%	7	100%	5	100%
MT	1	100%	1	100%	1	100%	1	100%	1	100%	1	100%	1	100%	1	100%
NL	22	100%	20	65%	23	61%	16	100%	11	100%	20	90%	23	100%	20	100%
PL	68	100%	45	98%	67	93%	19	100%	60	98%	24	92%	68	99%	68	100%
PT	21	95%	15	73%	21	67%	12	100%	17	100%	13	100%	21	100%	16	100%
RO	21	90%	19	84%	19	37%	15	80%	14	71%	18	83%	21	90%	15	100%
SE	22	100%	18	100%	20	100%	3	67%	21	86%	20	10%	22	100%	22	100%
SI	11	100%	7	100%	11	100%	2	100%	11	100%	8	100%	11	100%	11	100%
SK	15	100%	11	100%	12	75%	7	100%	8	88%	9	100%	15	100%	15	100%
UK	45	100%	40	80%	42	43%	19	100%	28	96%	35	66%	43	100%	31	100%
Total	664	99%	438	86%	640	77%	328	98%	471	96%	466	88%	658	98%	576	99%

* Number of laboratories performing the test, ** DI= designated interpretation of the reference laboratories

Table 8b. Detection of antimicrobial susceptibility in *S. pneumoniae* U2A 1787 by guideline used

Guideline	Species identification		Oxacillin (DI**=IR)		Penicillin-G (DI=I)		Ceftriaxone (DI=S)		Cefotaxime (DI=S)		Ciprofloxacin (DI=S)		Erythromycin (DI=S)		Clindamycin (DI=S)	
	n*	correct	n	correct	n	correct	n	correct	n	correct	n	correct	n	correct	n	correct
BSAC	24	100%	21	76%	25	56%	7	100%	20	95%	22	73%	25	100%	15	100%
CA-SFM	22	100%	13	85%	22	95%	6	100%	21	100%	13	85%	22	100%	17	100%
CZECH	8	100%	4	75%	8	88%	2	100%	8	100%	8	100%	8	100%	8	100%
DIN	7	100%	7	71%	7	71%	4	100%	6	100%	7	86%	7	100%	6	100%
NCCLS	455	100%	292	87%	435	79%	243	98%	301	97%	297	95%	448	98%	395	99%
SRGA	25	100%	21	95%	23	96%	4	75%	24	79%	22	9%	25	100%	25	100%
>1	57	98%	26	85%	56	80%	28	100%	44	98%	45	93%	57	96%	55	98%
Other	37	97%	32	75%	35	40%	18	94%	25	100%	31	77%	37	97%	28	96%
Total	635	99%	416	86%	611	77%	312	97%	449	96%	445	88%	629	98%	549	99%

* Number of laboratories performing the test, ** DI= designated interpretation of the reference laboratories

Table 9a. Detection of antimicrobial susceptibility in *E. coli* U2A 1789 by country

Country	Species identification		Ampicillin (DI**=R)		Gentamicin (DI=S)		Tobramycin (DI=R)		Ciprofloxacin (DI=S)		Cefotaxime (DI=IR)	
	n*	correct	n	correct	n	correct	n	correct	n	correct	n	correct
AT	11	100%	10	100%	11	100%	10	50%	11	100%	9	89%
BE	80	100%	72	93%	71	97%	39	59%	77	99%	55	89%
BU	24	100%	24	100%	24	100%	20	95%	24	100%	20	90%
CZ	44	100%	44	100%	44	98%	40	98%	44	100%	44	98%
DE	16	100%	14	100%	15	100%	12	83%	16	100%	14	79%
DK	5	100%	5	100%	5	100%	3	67%	5	100%	3	100%
EE	9	100%	8	100%	9	100%	5	100%	9	89%	4	100%
ES	35	100%	26	92%	35	100%	33	79%	35	100%	33	91%
FI	14	100%	11	100%	3	100%	14	71%	12	100%	9	100%
FR	19	100%	5	100%	19	100%	18	78%	19	100%	19	95%
GR	43	100%	41	95%	42	100%	42	69%	41	100%	35	80%
HR	23	100%	19	100%	23	100%	12	100%	23	100%	9	100%
HU	30	100%	29	93%	30	97%	29	76%	30	100%	26	96%
IE	24	100%	24	100%	24	100%	17	88%	24	100%	21	95%
IL	5	100%	5	100%	5	100%	4	75%	5	100%	2	100%
IS	2	100%	2	100%	2	100%	2	100%	2	100%	2	100%
IT	49	100%	45	91%	49	100%	41	61%	49	100%	37	92%
LU	7	100%	7	100%	7	100%	6	67%	7	100%	6	100%
MT	1	100%	1	100%	1	100%	1	100%	1	100%	1	100%
NL	23	100%	13	92%	21	95%	23	65%	23	100%	14	100%
PL	68	99%	65	100%	67	100%	65	88%	68	100%	55	96%
PT	22	100%	20	100%	22	100%	20	90%	22	100%	22	77%
RO	22	95%	20	85%	22	95%	16	75%	22	91%	17	88%
SE	22	100%	21	100%	20	100%	19	89%	22	100%	22	100%
SI	11	100%	10	100%	11	100%	11	91%	11	100%	11	100%
SK	15	93%	15	100%	15	100%	14	86%	15	100%	14	100%
UK	45	98%	29	100%	45	98%	36	94%	45	100%	33	76%
Total	669	99%	585	97%	642	99%	552	80%	662	99%	537	91%

* Number of laboratories performing the test, ** DI= designated interpretation of the reference laboratories

Table 9a (continued). Detection of antimicrobial susceptibility in *E. coli* U2A 1789 by country

Country	Ceftriaxone (DI**=IR)		Ceftazidime (DI=R)		Piperacillin (DI=R)		Pip-Taz (DI=S)		ESBL (DI=positive)	
	n*	correct	n	correct	n	correct	n	correct	n	correct
AT	5	80%	11	91%	6	100%	8	75%	10	90%
BE	32	84%	78	86%	45	91%	73	52%	78	92%
BU	21	90%	24	96%	21	100%	20	85%	24	96%
CZ	5	100%	44	98%	38	100%	17	59%	44	95%
DE	4	100%	15	100%	15	100%	13	77%	14	100%
DK	4	100%	5	100%	3	100%	4	75%	4	100%
EE	5	100%	8	88%	2	100%	7	100%	9	100%
ES	3	100%	35	91%	24	96%	27	96%	35	91%
FI	10	100%	13	100%			14	93%	13	100%
FR	3	100%	19	74%	17	71%	18	44%	19	95%
GR	27	81%	42	88%	35	94%	37	84%	39	87%
HR	22	100%	23	100%	22	100%	17	82%	22	95%
HU	23	96%	30	93%	14	100%	23	87%	30	93%
IE	5	100%	23	100%	7	86%	22	68%	22	100%
IL	5	100%	5	100%	4	100%	5	100%	5	100%
IS	1	100%	2	100%	2	100%			2	100%
IT	29	69%	48	85%	44	86%	43	84%	43	93%
LU	2	100%	6	100%	5	100%	5	0%	7	100%
MT	1	100%	1	100%			1	0%	1	100%
NL	14	86%	23	96%	17	88%	14	50%	23	96%
PL	26	100%	68	90%	42	95%	66	100%	66	100%
PT	8	63%	22	77%	15	73%	21	67%	19	89%
RO	16	100%	20	80%	10	90%	14	79%	20	95%
SE	3	100%	22	100%	7	100%	19	47%	17	94%
SI	3	100%	11	100%	11	100%	5	100%	11	100%
SK	8	88%	15	100%	14	100%	14	93%	15	100%
UK	14	93%	45	93%	10	80%	36	72%	32	84%
Total	299	90%	658	91%	430	93%	543	76%	624	94%

* Number of laboratories performing the test, ** DI= designated interpretation of the reference laboratories

Table 9b. Detection of antimicrobial susceptibility in *E. coli* U2A 1789 by guideline used

Guideline	Species identification		Ampicillin (DI**=R)		Gentamicin (DI=S)		Tobramycin (DI=R)		Ciprofloxacin (DI=S)		Cefotaxime (DI=IR)	
	n*	correct	n	correct	n	correct	n	correct	n	correct	n	correct
BSAC	25	100%	14	100%	25	96%	20	95%	25	100%	20	85%
CA-SFM	21	100%	6	100%	21	100%	20	80%	21	100%	21	95%
CZECH	8	100%	8	100%	8	88%	8	100%	8	100%	8	100%
DIN	8	100%	7	100%	7	100%	6	67%	8	100%	6	83%
NCCLS	458	100%	419	96%	439	99%	372	77%	451	100%	351	91%
SRGA	25	100%	24	100%	23	100%	21	90%	25	100%	25	100%
>1	57	100%	53	98%	54	100%	51	88%	57	100%	53	89%
Other	37	95%	24	100%	35	100%	27	81%	37	97%	27	93%
Total	639	99%	555	97%	612	99%	525	80%	632	100%	511	91%

* Number of laboratories performing the test, ** DI= designated interpretation of the reference laboratories

Table 9b (continued). Detection of antimicrobial susceptibility in *E. coli* U2A 1789 by guideline used

Guideline	Ceftriaxone (DI**=IR)		Ceftazidime (DI=R)		Piperacillin (DI=R)		Pip-Taz (DI=S)		ESBL (DI=positive)	
	n*	correct	n	correct	n	correct	n	correct	n	correct
BSAC	6	83%	25	92%	8	88%	18	78%	18	83%
CA-SFM	3	100%	21	71%	19	74%	20	50%	21	95%
CZECH	1	100%	8	100%	8	100%	2	50%	8	100%
DIN	3	100%	7	100%	7	100%	5	60%	7	100%
NCCLS	235	89%	452	91%	305	93%	383	78%	438	94%
SRGA	5	100%	25	100%	9	100%	22	50%	20	95%
>1	12	92%	57	93%	39	97%	39	77%	54	96%
Other	18	94%	35	100%	18	94%	30	70%	30	93%
Total	283	89%	630	91%	413	93%	519	75%	596	94%

* Number of laboratories performing the test, ** DI= designated interpretation of the reference laboratories

Table 10a. Detection of antimicrobial susceptibility in *E. gallinarium* U2A604 by country

Country	Species identification		Ampicillin (DI**=S)		Amoxicillin (DI=S)		Vancomycin (DI=I)		Gentamicin (DI=S)		Teicoplanin (DI=S)	
	n*	correct	n	correct	n	correct	n	correct	n	correct	n	correct
AT	11	36%	9	100%	3	100%	10	50%	11	100%	11	100%
BE	81	53%	75	96%	12	92%	78	53%	72	97%	61	98%
BU	24	50%	24	100%	6	100%	24	92%	24	100%	24	96%
CZ	44	82%	42	100%	2	100%	43	53%	44	100%	43	100%
DE	16	81%	14	100%	3	100%	16	44%	16	100%	15	100%
DK	5	40%	5	100%	1	100%	5	20%	4	100%	3	100%
EE	9	0%	9	100%			9	56%	8	88%	2	100%
ES	35	49%	33	100%	2	100%	35	86%	35	97%	35	94%
FI	15	40%	14	100%			14	57%	11	91%	11	91%
FR	20	70%	11	100%	9	100%	19	63%	19	100%	19	100%
GR	42	52%	42	100%	6	100%	42	60%	41	95%	41	95%
HR	23	35%	19	100%	6	100%	23	70%	23	100%	21	95%
HU	29	62%	27	100%	7	100%	28	89%	28	100%	28	96%
IE	24	29%	24	100%	1	100%	24	58%	22	100%	24	100%
IL	5	20%	5	100%			5	80%	4	75%	4	100%
IS	2	50%	2	100%	1	100%	2	100%	2	100%	1	100%
IT	49	45%	48	100%	5	80%	49	43%	45	91%	49	96%
LU	7	29%	7	100%	1	100%	7	14%	7	86%	7	100%
MT	1	0%	1	100%			1	100%	1	100%	1	100%
NL	23	22%	10	100%	15	100%	22	41%	23	100%	21	100%
PL	68	85%	67	99%	5	100%	66	89%	68	97%	67	100%
PT	22	59%	20	100%	4	100%	20	65%	18	94%	20	100%
RO	22	5%	20	100%	10	80%	19	26%	21	81%	16	100%
SE	22	55%	20	100%	1	100%	21	0%	21	100%	20	100%
SI	11	73%	11	100%			11	100%	11	100%	11	100%
SK	15	13%	13	77%	2	100%	14	79%	15	87%	14	100%
UK	45	33%	32	100%	15	100%	44	14%	43	100%	40	93%
Total	670	51%	604	99%	117	97%	651	58%	637	97%	609	98%

* Number of laboratories performing the test, ** DI= designated interpretation of the reference laboratories

Table 10b. Detection of antimicrobial susceptibility in *E. gallinarium* U2A604 by guideline used

Guideline	Species identification		Ampicillin (DI**=S)		Amoxicillin (DI=S)		Vancomycin (DI=I)		Gentamicin (DI=S)		Teicoplanin (DI=S)	
	n*	correct	n	correct	n	correct	n	correct	n	correct	n	correct
BSAC	25	32%	16	100%	9	100%	25	12%	25	100%	24	96%
CA-SFM	22	64%	13	100%	9	100%	21	62%	21	95%	21	100%
CZECH	8	50%	8	100%			7	43%	8	100%	8	100%
DIN	8	88%	7	100%	1	100%	8	50%	8	100%	8	100%
NCCLS	457	51%	428	98%	72	97%	445	66%	434	96%	417	98%
SRGA	25	52%	23	100%	2	100%	24	4%	24	100%	23	100%
>1	57	77%	53	100%	5	100%	57	49%	56	96%	55	96%
Other	37	19%	29	100%	13	92%	36	31%	33	97%	25	92%
Total	639	51%	577	99%	111	97%	623	57%	609	96%	581	98%

* Number of laboratories performing the test, ** DI= designated interpretation of the reference laboratories