

Community Reference Laboratory, Antimicrobial Resistance

External Quality Assurance System
Salmonella & Campylobacter, 2006



May. 3-4, 2007
National Food Institute,
Copenhagen, Denmark

External Quality Assurance System Objectives / Goals

- To have laboratories evaluate their performance of antimicrobial susceptibility testing (AST)
- To assess the quality of AST in European laboratories
- To identify barriers for AST
- To improve quality of AST surveillance data

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The System

- AST of eight *Salmonella*, *Campylobacter*, *E.coli*, *Staphylococcus* and *Enterococcus* strains
- Supply labs with original ref. strain ATCC 25922, ATCC 25923, ATCC 29213 and ATCC 29212
- Results and comments submitted through a secured web-based data entry program, using individual passwords
- Instant anonymous individual evaluation reports with suggestions for corrective actions
- Yearly over-all evaluation reports on the web

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EQAS Entry page

Community Reference Laboratory Antibiotic Resistance

Salmonella Strain

User: GDA Strain: CRL S.1,1

Verify **User** and **Strain** before filling in the form.

	Read value	Interpretation code
Amoxicillin cl., AUG	<input type="text"/>	AUG <input type="text"/>
Amoxi/ampicil. AMX/AMP	<input type="text"/>	AMX/AMP <input type="text"/>
Cefotaxime, CTX	<input type="text"/>	CTX <input type="text"/>
Cefpodoxime, POD	<input type="text"/>	POD <input type="text"/>
Ceftazidime, CAZ	<input type="text"/>	CAZ <input type="text"/>
Ceftiofur, XNL	<input type="text"/>	XNL <input type="text"/>
Chloramphenicol, CHL	<input type="text"/>	CHL <input type="text"/>
Cip/enroflox. CIP/ENRO	<input type="text"/>	CIP/ENRO <input type="text"/>
Florphenicol, FFN	<input type="text"/>	FFN <input type="text"/>
Gentamicin, GEN	<input type="text"/>	GEN <input type="text"/>
Nalidixic acid, NAL	<input type="text"/>	NAL <input type="text"/>
Streptomycin, STR	<input type="text"/>	STR <input type="text"/>
Sulphonamides, SMX	<input type="text"/>	SMX <input type="text"/>

Read value should be Zonediameter, MIC or Rosco values according to the used method as stated on the first input page. Please put in numbers only without units. You may use one of the operators <= or > before the number. If decimals are needed use period as decimal separator (for example 0.5 but *not* 0,5). This input is not routinely evaluated but should be filled in to provide the background for the chosen interpretation codes in the next

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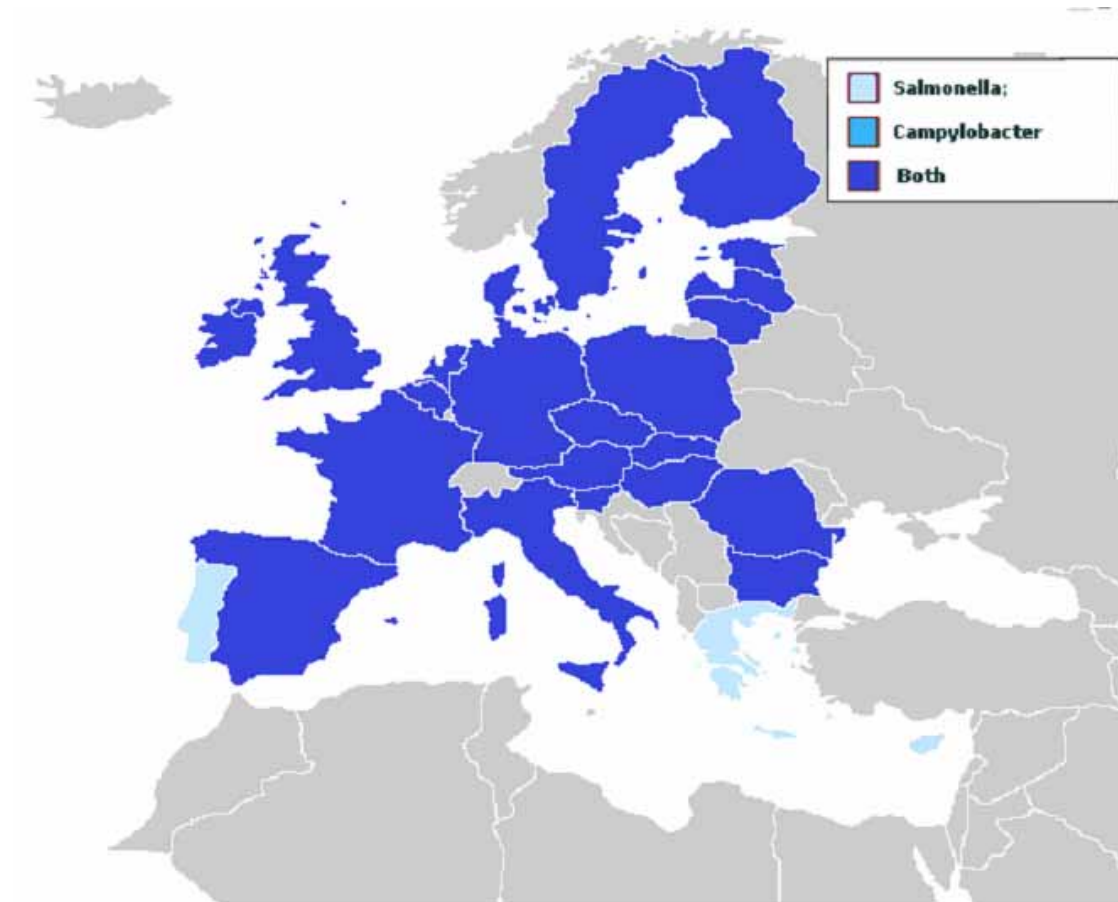
Example of deviation report

ARBAO - II  **Adm. Resume of Deviations**

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User	Method	Strain	Antibiotic	Obtained	Expected	Importance
	1. Strains	CRL S.1,2	Cipro-/enrofloxacin, CIP/ENRO	S	R	Very major
		CRL S.1,3	Cipro-/enrofloxacin, CIP/ENRO	S	R	Very major
			Streptomycin, STR	R	S	Major
		CRL S.1,6	Amoxicillin cl, AUG	I	S	Minor
			TMP+SMX, SXT	S	R	Very major
		CRL S.1,7	Amoxicillin cl, AUG	I	S	Minor
		CRL S.1,8	Chloramphenicol, CHL	I	S	Minor
			Streptomycin, STR	R	I	Minor
	2. Refstr.	ATCC 25922	Gentamicin, GEN	4	,25-1	

External Quality Assurance System Participation in the 2006 trial



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Panel / Ranges: *Salmonella* / MIC

Antimicrobial \ Laboratories	#1	#2		Antimicrobial \ Laboratories	#25	#26	#27	#29	#33
Amoxicillin							2-4096		
Amoxicillin + Clavulanic acid	2/1-32/16	2/1-32/16					2-4096		
Ampicillin	1-32	1-32	0	Ampicillin	1-64	1-32		0.5-64	0.25 - 32
Ampicillin + Sulbactam				Cefotaxime				0.5-64	
Apramycin	4-32	4-64		Ceftazidime		4-64			
Cefoxitin				Ceftiofur			0.5-256		
Cefotaxime				Ceftiofur	2-16		0,016-512	0.25-32	0.06 - 2
Cefpodoxime	0,125-4			Ceftiofur	2-64		0,016-256	0.25-32	
Ceftazidime				Chloramphenicol		0,5-8	0,5-256		0,12-16
Ceftiofur	0,5-8	0,5-8		Ciprofloxacin					
Ceftriaxone			0	Ciprofloxacin		1-32			
Cefuroxime				Ciprofloxacin		2-64		0.12-16	
Cephalothin	4-32	2-64		Colistin	128	2-64	2-256	0.25-32	1 - 128
Chloramphenicol	2-64	2-64	0	Colistin	3-16		0,125-64	0.06-4	0.008 - 1
Ciprofloxacin	0,03-4	0,03-4	0	Florfenicol		4-32			
Colistin	4-16	4-64		Florfenicol		0,016-2	0,125-64		
Enrofloxacin				Gentamicin	128	2-64	2-32		4-32
Florfenicol	2-64	2-64		Gentamicin	5-32	1-32	0,5-256	0.25-32	0.5 - 64
Gentamicin	1-32	1-32		Nalidixic acid					
Imipenem				Neomycin					2-16
Kanamycin				Neomycin	128	8-128	2-256		1 - 128
Nalidixic acid	4-64	8-128	0	Streptomycin	128	2-32			
Neomycin	2-32	2-32		Streptomycin				0.5-64	
Oxolinic acid				Sulphonamides (sulfamethoxazol)		4-128			
Spectinomycin	16-256	4-128		Sulphonamides (sulfamethoxazol)		4-64	2-256	0.25-32	2 - 256
Streptomycin	4-64	4-64	0	Tetracycline	0.024	64-1024			16-2048
Sulphonamides (sulfamethoxazol)	64-1024	64-1024	0	Tetracycline				0.5-64	
Sulphonamides / trimethoprim			0	Trimethoprim	1-64	2-32	1-256	0.25-32	0.5 - 64
Tetracycline	2-32	2-32	0	Trimethoprim	1-64	4-32	0,125-64		0.25 - 32
Trimethoprim	4-32	4-32							

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EFSA suggested panel of antimicrobials marked in white
Marked in grey, participants using the suggested ranges



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Panel / Ranges: *Campylobacter* / MIC

Antimicrobial \ Laboratories	#1	#2	Antimicrobial \ Laboratories	#1	#24	#25	#27	#33
Amoxicillin			Amoxicillin	0,128	0,25-32	0,25-32		
Amoxicillin+Clav acid		1/0,5-1	Ampicillin				2-256	0,5-64
Ampicillin		1-12	Chloramphenicol	32	2-128	2-128		
Ceftazidim			Ciprofloxacin	0,128	0,12-16	0,12-16		
Chloramphenicol	2-32	2-3	Clostridium					
Ciprofloxacin	0,03-4	0,06-	Erythromycin		0,12-16			
Clindamycin			Gentamicin	0,128			0,125-64	0,03-4
Colistin		4-6	Nalidix acid		0,5-64	0,5-64	0,25-256	0,12-16
Doxycycline			Streptomycin	128	0,5-64	0,5-64		
Enrofloxacin			Sulphonamides (sulfamethoxazol)	0,128	0,25-32	0,25-32	0,5-256	0,25-8
Erythromycin	0,5-32	0,25-	Tetracycline	128	1-128	1-128	2-256	1-128
Gentamicin	0,125-16	0,25-	Trimethoprim		0,5-64	0,5-64		
Metronidazole								0,25-32
Nalidix acid	2-64	2-12						
Neomycin		1-6						
Oxytetracycline					1-128	1-128		
Spiramycin					8-512	8-512		
Streptomycin	2-16	1-6			0,25-32	0,25-32		
Sulphonamides (sulfamethoxazol)						0,5-64	1-256	
Sulphonamides / trimethoprim								
Tetracycline	0,25-16	0,25-						
Trimethoprim		0,5-0						

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EFSA suggested panel of antimicrobials marked in white
Marked in grey, participants using the suggested ranges



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Panel / disk content: *Salmonella*

Antimicrobial \ Laboratories	#	Antimicrobial \ Laboratories	#23	#28	#29	#30	#34
Amikacin							30
Amoxicillin				10	10	10	
Amoxicillin + Clavulanic acid				20/10	30	20/10	30
Ampicillin	1	Ampicillin	10	10		10	10
Apramycin		Cefotaxime					15
Aztreonam		Ceftazidime					
Carbenicillin		Ceftiofur		30		30	30
Cefoperazone		Chloramphenicol		30			30
Cefotaxime	3	Ciprofloxacin				30	
Cefoxitin		Colistin			30		
Cefquinome		Florfenicol	30	30		30	10
Ceftazidime		Gentamicin	5	5		5	1
Ceftiofur		Nalidixic acid	10				
Ceftriaxon		Neomycin			30	30	
Cefuroxime		Streptomycin					
Cephalexin		Sulphonamides (sulfamethoxazol)	30	30	30	30	30
Cephalothin		Tetracycline	30				10
Chloramphenicol	3	Trimethoprim			30		
Ciprofloxacin	4						
Colistin							
Crjepime							
Doxycycline							
Enrofloxacin							
Florfenicol							
Furazolidone							15
Gentamicin	1		10	10	10	10	10
Imipememe							
Kanamycin	3		30	30	30	30	
Nalidixic acid	3		30	30	30	30	30
Neomycin			30				10
Netilmicin							
Nitrofurantoin	30						
Orfloxacin							
Oxytetracycline							
Piperacillin							
Piperacillin + Tazobactam							
Spectinomycin							
Streptomycin	10						
Sulphonamide	300						
Sulphonamides+ Trimethoprim							
Tetracycline	30						
Ticarcillin							
Ticarcillin + Clavulanic acid							
Tobramycin							
Trimethoprim	5						

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External Quality Assurance System Panel / disc content: *Campylobacter*

The CR for Cat

Antibiotic	Antimicrobial Laboratories	34
Ampicillin		34
Chloramphenicol		34
Ciprofloxacin		34
Erythromycin		34
Gentamicin		34
Nalidix acid		34
Streptomycin		34
Sulphonamides (sulfamethoxazol)		34
Tetracycline		34
Streptomycin	10	10
Tetracycline	30	30
Trimethoprim		

disk diffusion available

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Conclusions: Antimicrobial Panels

- Many laboratories are using a large range of antimicrobials and many of them in the same classes
- It seems difficult for the laboratories doing MIC to use the ranges recommended by EFSA – probably due to the limitation of space in the commercially prepared MIC trays
- The monitoring programmes in Europe would benefit from the laboratories accepting to harmonise the list of used antimicrobials
- Lists of minimum requirements regarding antimicrobials will be developed which should be used for monitoring

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Breakpoints: *Salmonella* / MIC part I

Antimicrobial \ Laboratories		Ref value (CLSI)	#1, 4, 12, 17, 26,	#11, 25	#24, 35	#16, 27	#10			
Ampicillin / Amoxicillin	Sensitiv	≤8	≤8	≤4	-	≤4	≤8			
	Intermediate	16	16	-	-	-	16			
	Resistance	≥32	≥32	>4	>16	>16	>16			
Antimicrobial \ Laboratories		Ref value (CLSI)	#1	#10						
Amoxicillin + Clavulanic acid	Sensitiv	≤8	≤8	≤8						
	Intermediate	16	16	16						
	Resistance	≥32	≥32	>16						
Antimicrobial \ Laboratories		Ref value (CLSI)	#11, 25	#24	#12	#27	#10	#4		
Cefotaxime	Sensitiv	≤8	≤0.5	-	≤1	≤4	≤1	≤8		
	Intermediate	16-32	-	-	-	-	2	16		
	Resistance	≥64	≥0.5	≥0.5	≥2	>32	>2	≥32		
Antimicrobial \ Laboratories		Ref value (FOOD-DTU)	#1							
Cefpodoxime	Sensitiv	≤0,5	≤0.5							
	Intermediate	1	1							
	Resistance	≥2	≥2							
Antimicrobial \ Laboratories		Ref value (CLSI)	#25	#27	#10					
Ceftazidime	Sensitiv	≤8	≤2	≤4	≤1					
	Intermediate	16	-	-	-					
	Resistance	≥32	>2	>32	>8					
Antimicrobial \ Laboratories		Ref value (CLSI)	#1, 12, 17, 26	#11						
Ceftiofur	Sensitiv	≤2	≤2	≤2						
	Intermediate	4	4	-						
	Resistance	≥8	≥8	>2						
Antimicrobial \ Laboratories		Ref value (CLSI)	#1, 4, 12, 17, 26	#11, 25	#24, 35	#10,16				
Chloramphenicol	Sensitiv	≤8	≤8	≤16	-	≤8				
	Intermediate	16	16	-	-	16				
	Resistance	≥32	≥32	>16	>16	>16				
Antimicrobial \ Laboratories		Ref value (EUCAST)	#26, 35	#16, 27	#4, 12	#25	#24	#1, 11	#17	#10
Ciprofloxacin / Enrofloxacin	Sensitiv	<0,125	-	≤0.5	≤1	≤6	-	<0.125	≤0.25	≤1
	Intermediate	-	-	1	2	-	-	-	1	2
	Resistance	≥0,125	≥2	>1	≥4	>6	>6	≥0.125	≥2	>2

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Breakpoints: *Salmonella* / MIC part II

Antimicrobial \ Laboratories		Ref value (EUCAST)	#1, 12, 17, 26	#11, 25	#24, 35	#16				
Florfenicol	Sensitiv	≤8	≤8	≤16	-	≤8				
	Intermediate	16	16	-	-	16				
	Resistance	≥32	≥32	>16	>16	>16				
Antimicrobial \ Laboratories		Ref value (EUCAST)	#4, 12, 17, 26	#16, 27	#25	#24	#1	#11	#35	#10
Gentamicin	Sensitiv	≤2	≤4	≤2	≤2	-	≤2	≤4	-	≤4
	Intermediate	4	8	4	-	-	4	-	-	8
	Resistance	≥8	≥16	>4	>2	>2	≥8	>4	>8	>8
Antimicrobial \ Laboratories		Ref value (CLSI)	#1, 4, 12, 17, 26	#10, 11, 25	#24, 35	#16				
Nalidixic acid	Sensitiv	≤16	≤16	≤16	-	≤8				
	Intermediate	-	-	-	-	16				
	Resistance	≥32	≥32	>16	>16	>16				
Antimicrobial \ Laboratories		Ref value (FOOD-DTU)	#1, 12, 17, 26	#10, 16	#11	#35	#4			
Streptomycin	Sensitiv	≤8	≤8	≤8	≤32	-	≤4			
	Intermediate	16	16	16	-	-	-			
	Resistance	≥32	≥32	>16	≥32	>16	≥16			
Antimicrobial \ Laboratories		Ref value	#1, 4, 12, 17, 26	#11, 25	#24					
Sulphonamides	Sensitiv	≤256	≤256	≤256	-					
	Intermediate	-	-	-	-					
	Resistance	≥512	≥512	>256	>32					
Antimicrobial \ Laboratories		Ref value (CLSI)	#10	#4						
Sulphonamides + Trimethoprim	Sensitiv	≤2/38	≤2	≤2						
	Intermediate	-	-	-						
	Resistance	≥4/76	≥2	≥4						
Antimicrobial \ Laboratories		Ref value (CLSI)	#1, 4, 12, 17, 26	#11, 25	#24, 35	#10, 16				
Tetracycline	Sensitiv	≤4	≤4	≤8	-	≤4				
	Intermediate	8	8	-	-	8				
	Resistance	≥16	≥16	>8	>8	>8				
Antimicrobial \ Laboratories		Ref value (CLSI)	#1, 4, 12, 17, 26	#11, 25	#16, 27	#24	#10			
Trimethoprim	Sensitiv	≤8	≤8	≤2	≤4	-	≤8			
	Intermediate	-	-	-	8	-	-			
	Resistance	≥16	≥16	>2	>8	>2	>8			

External Quality Assurance System

Breakpoints: *Salmonella* / Disk diffusion part I

Antimicrobial \ Laboratories		#2, 5, 6, 18, 20, 22, 23, 28, 30	#14, 15	#13	#29	#19		
Ampicillin / Amoxicillin	Sensitiv	≥17	≥21	≥19	≥18	≥20		
	Intermediate	-	-	-	-	-		
	Resistance	≤13	<14	<14	≤12	16		
Antimicrobial \ Laboratories		#5, 6, 18, 20, 22, 23, 28, 30	#13, 14, 15	#29	#19	#35		
Amoxicillin + Clavulanic acid	Sensitiv	≥18	≥21	≥19	18	-		
	Intermediate	-	-	-	-	-		
	Resistance	≤13	<14	<12	13	<14		
Antimicrobial \ Laboratories		#2, 5, 18, 20, 22, 28, 30	#13, 14, 15	#29	#19	#35		
Cefotaxime	Sensitiv	≥23	≥21	≥22	28	-		
	Intermediate	-	-	-	-	-		
	Resistance	≤14	<15	≤16	27	<5		
Antimicrobial \ Laboratories		#20, 30	#19					
Cefpodoxime	Sensitiv	≥21	19					
	Intermediate	-	18					
	Resistance	<17	17					
Antimicrobial \ Laboratories		#5, 20, 28, 30	#13, 14, 15	#19	#29	#35		
Ceftazidime	Sensitiv	≥18	≥21	22	≥22	-		
	Intermediate	-	-	-	-	-		
	Resistance	≤14	≤15	14	≤16	<15		
Antimicrobial \ Laboratories		#20, 22	#14, 15	#18	#29	#19	#30	
Ceftiofur	Sensitiv	≥21	≥21	≥23	≥22	≥21	20	
	Intermediate	-	-	-	-	-	-	
	Resistance	≤17	<18	≤14	≤16	17	16	
Antimicrobial \ Laboratories		#2, 5, 6, 18, 20, 22, 23, 28	#14, 15	#19, 30	#29	#13		
Chloramphenicol	Sensitiv	≥18	≥23	18	≥19	≥23		
	Intermediate	-	-	-	-	-		
	Resistance	≤12	<19	12	≤11	19		
Antimicrobial \ Laboratories		#2, 5, 6, 18, 20	#13, 15	#19, 30	#28, 29	#14		
Ciprofloxacin / Enrofloxacin	Sensitiv	≥21	≥22	21	≥24	≥25		
	Intermediate	-	-	-	-	-		
	Resistance	≤15	<17	15	≤15	<22		

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Breakpoints: *Salmonella* / Disk diffusion part II

Antimicrobial \ Laboratories		#18, 20	#29	#23	#22	#14	#19	#15	#30
Florfenicol	Sensitiv	≥19	≥19	≥18	≥20	≥22	19	≥19	≥20
	Intermediate	-	-	-	-	-	-	-	-
	Resistance	≤14	≤11	≤12	≤16	<19	14	<14	16
Antimicrobial \ Laboratories		#2, 5, 6, 18, 20, 22, 23, 28	#13, 14, 15	#19, 30	#29				
Gentamicin	Sensitiv	≥15	≥18	15	≥16				
	Intermediate	-	-	-	-				
	Resistance	≤12	<16	12	≤11				
Antimicrobial \ Laboratories		#2, 5, 6, 18, 20, 22, 23, 28	#13, 14, 15	#19, 30	#24				
Nalidixic acid	Sensitiv	≥19	≥20	19	≥24				
	Intermediate	-	-	-	-				
	Resistance	≤13	<15	13	≤15				
Antimicrobial \ Laboratories		#2, 6, 18, 20, 22, 23, 28	#13, 15	#19, 30	#29				
Streptomycin	Sensitiv	≥15	≥15	15	≥16				
	Intermediate	-	-	-	-				
	Resistance	≤11	<13	11	≤11				
Antimicrobial \ Laboratories		#2, 6, 18, 20, 22, 23, 28	#13, 14, 15	#19, 30	#29	#35			
Sulphonamides	Sensitiv	≥17	≥17	17	≥18	-			
	Intermediate	-	-	-	-	-			
	Resistance	≤12	<12	12	≤11	<13			
Antimicrobial \ Laboratories		#5, 6, 20, 22, 28	#13, 14	#19, 30	#23	#18	#29		
Sulphonamides + Trimethoprim	Sensitiv	≥16	≥16	16	≥17	≥16	≥17		
	Intermediate	-	-	-	-	-	-		
	Resistance	≤10	<10	10	≤10	≤10	≤9		
Antimicrobial \ Laboratories		#2, 5, 18, 20, 22, 23, 28	#13, 14, 15	#19, 30	#29				
Tetracycline	Sensitiv	≥19	≥19	19	≥20				
	Intermediate	-	-	-	-				
	Resistance	≤14	<17	14	≤13				
Antimicrobial \ Laboratories		#2, 6, 18, 20, 22, 23, 28	#13, 14, 15	#19, 30	#29	#35			
Trimethoprim	Sensitiv	≥16	≥16	16	≥17	-			
	Intermediate	-	-	-	-	-			
	Resistance	≤10	<12	10	≤9	<11			

External Quality Assurance System Breakpoints: *Campylobacter* / MIC

Antimicrobial \ Laboratories	Ref value (CLSI)	#24, 35	#20	#2	#25	#4	#1							
Chloramphenicol	Sensitiv	≤16	-	≤8	-	≤16	≤8	≤16						
	Intermediate	-	-	-	-	16	-							
	Resistance	≥32	>16	>16	≥32	>16	≥32	≥32						
Antimicrobial \ Laboratories	Ref value (CLSI)	#1, 4	#14, 15	#2, 21	#25, 34	#20	#17	#19	#24	#11	#35	#12	#10	
Ciprofloxacin / Enrofloxacin	Sensitiv	≤1	≤1	<1	-	≤1	≤1	≤2	-	-	-	-	≤1	≤1
	Intermediate	2	2	1	-	-	-	-	-	-	-	-	-	2
	Resistance	≥4	≥4	≥5	≥4	≥1	≥4	≥4	≥2	>1	≥5	>2	≥5	>2
Antimicrobial \ Laboratories	Ref value (CLSI)	#2, 19	#11, 35	#15	#20	#17	#21	#24	#14	#1	#34	#12	#10	#4
Erythromycin	Sensitiv	≤8	-	-	<1	≤8	≤4	-	-	≤1	≤8	≤4	≤8	≤5
	Intermediate	16	-	-	4	-	-	-	-	-	16	-	16	-
	Resistance	≥32	>8	>8	≥4	>32	>8	≥32	>4	>4	≥32	≥4	≥16	>16
Antimicrobial \ Laboratories	Ref value (CLSI)	#1, 17	#2, 21	#15	#20	#4	#24	#14	#11	#35	#12			
Gentamicin	Sensitiv	≤8	≤8	-	<2	≤2	≤4	-	≤2	-	≤4			
	Intermediate	-	-	-	4	-	8	-	4	-	-			
	Resistance	≥16	≥16	>16	≥4	>4	≥16	>1	>4	>4	>8	≥8		
Antimicrobial \ Laboratories	Ref value (CLSI)	#4, 12, 17, 19	#11, 24, 35	#4	#20	#21	#2	#14	#1	#15				
Nalidixic acid	Sensitiv	≤32	≤16	-	≤8	-	-	≤8	≤32	<8				
	Intermediate	-	-	-	16	-	-	16	-	16				
	Resistance	≥64	≥32	>16	≥32	>16	≥64	≥32	>16	≥64	≥16			
Antimicrobial \ Laboratories	Ref value (FOOD-DTU)	#19, 20	#15	#2	#24	#14	#1	#35	#4					
Streptomycin	Sensitiv	≤8	≤4	≤4	-	-	≤8	≤8	-	≤4				
	Intermediate	-	-	8	-	-	16	-	-	8				
	Resistance	≥16	≥16	>8	≥16	>2	>16	≥16	>16	≥16				
Antimicrobial \ Laboratories	Ref value (CLSI)	#2, 21	#1, 4	#10, 15	#19, 20	#25	#24	#14	#11	#34	#35	#12	#17	
Tetracycline	Sensitiv	≤4	-	≤4	≤4	≤4	≤2	-	≤4	-	≤2	-	≤2	≤8
	Intermediate	8	-	8	8	-	-	8	-	-	-	-	-	-
	Resistance	≥16	≥16	≥16	>8	≥16	>2	≥5	>8	>2	≥2	>8	≥4	≥16

External Quality Assurance System

Breakpoints: *Campylobacter* / Disk diffusion

Antimicrobial \ Laboratories		#22	#29	#23	#26	#28	
Chloramphenicol	Sensitiv	≥20	≥19	≥18	>17	≥23	
	Intermediate	-					
	Resistance	≤20	≤11	≤12	<13	<19	
Antimicrobial \ Laboratories		#22	#29	#23	#26	#28	#30
Ciprofloxacin / Enrofloxacin	Sensitiv	≥20	≥24	≥21	>20	≥25	27
	Intermediate	-	-	-	-	-	-
	Resistance	≤20	≤15	≤15	<16	<22	16
Antimicrobial \ Laboratories		#22	#29	#23	#26	#28	#30
Erythromycin	Sensitiv	≥20	≥23	≥23	>22	≥22	>20
	Intermediate	-	-		-	-	-
	Resistance	≤20	≤16	≤13	<14	<17	20
Antimicrobial \ Laboratories		#22	#29	#26			
Gentamicin	Sensitiv	≥20	≥15	>14			
	Intermediate	-	-	-			
	Resistance	≤20	≤12	<13			
Antimicrobial \ Laboratories		#22	#29	#23	#28	#30	
Nalidixic acid	Sensitiv	≥20	≥24	≥19	≥20	>6	
	Intermediate	-	-		-	-	
	Resistance	≤20	≤15	≤13	<15	6	
Antimicrobial \ Laboratories		#22	#29				
Streptomycin	Sensitiv	≥20	≥15				
	Intermediate	-	-				
	Resistance	≤20	≤12				
Antimicrobial \ Laboratories		#22	#29	#23	#26	#28	#30
Tetracycline	Sensitiv	≥20	≥20	≥19	>18	≥19	>29
	Intermediate	-	-		-	-	-
	Resistance	≤20	≤13	≤14	<15	<17	17

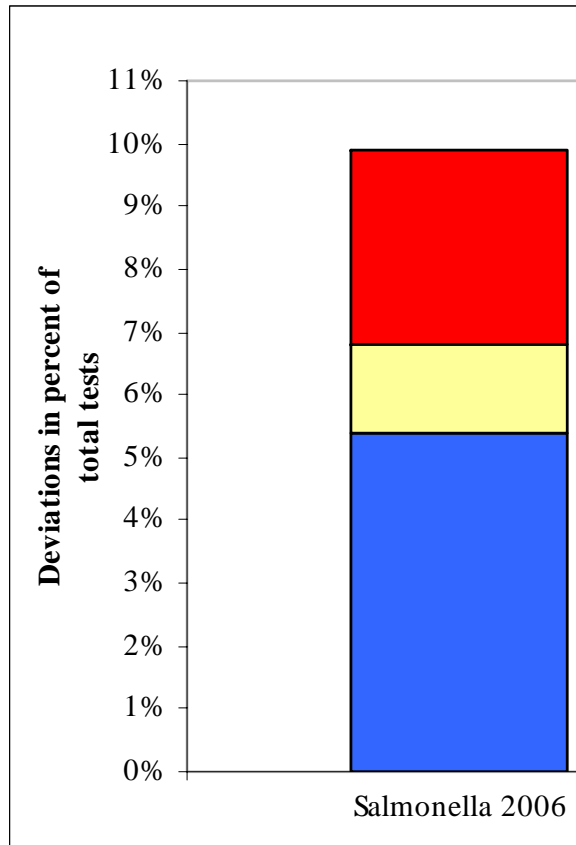
According to
CLSI M45-A:
erythromycin and
ciprofloxacin
R = 6mm

External Quality Assurance System

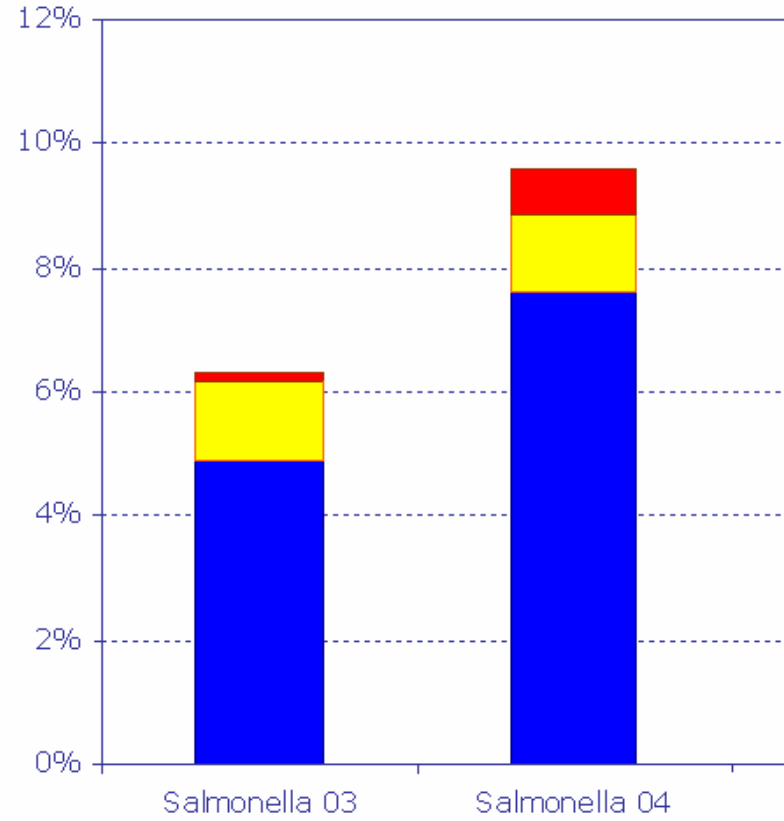
Conclusions: Breakpoints

- Huge differences of used breakpoints between laboratories and antimicrobials
- The laboratories are using breakpoints according to multiple systems
- A clear need to harmonise the breakpoints
- Using different breakpoints makes it very difficult to compare susceptibility data in Europe.

External Quality Deviations b



Deviations b



■ minor ■ major



External Quality Assurance System Strain by Species

Year Species Strain	2006			
	<i>Salmonella</i>		<i>Campylobacter</i>	
	AST in total	% correct	AST in total	% correct
1.1	303	89.8	132	87.9
1.2	356	79.5	132	90.9
1.3	368	85.3	112	98.2
1.4	368	92.4	121	92.6
1.5	358	93.9	137	96.4
1.6	371	93.8	132	95.5
1.7	344	96.5	135	92.3
1.8	355	90.4	132	99.2

External Quality Assurance System Antibiotic by Species

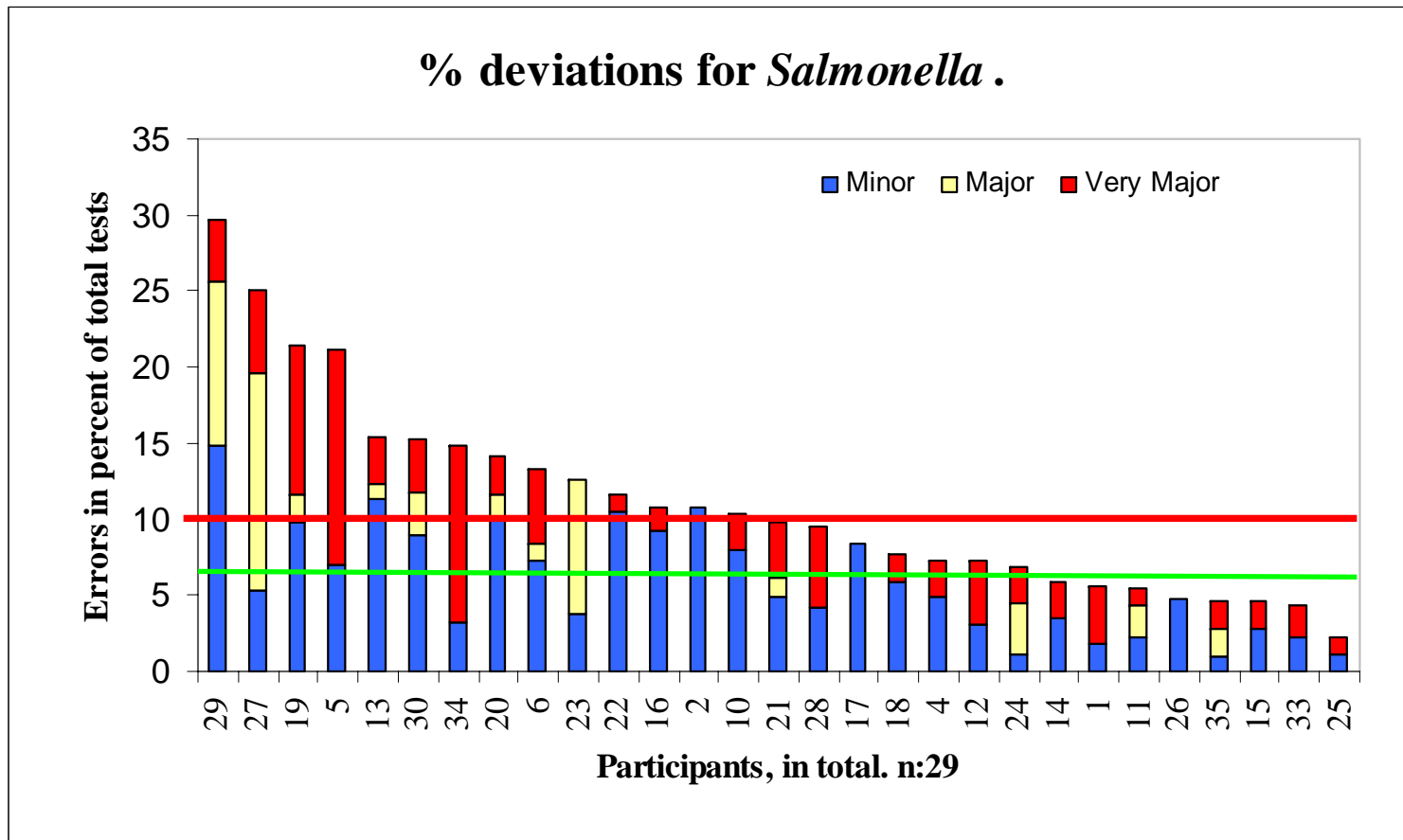
Year Species Antimicrobials	2006	
	<i>Salmonella</i> % correct	<i>Campylobacter</i> % correct
Amoxicillin / Ampicillin	98.4	-
Amoxicillin + Clavulanic acid	70.0	-
Cefotaxime	93.6	-
Cefpodoxime	87.5	-
Ceftazidime	92.0	-
Ceftiofur	92.3	-
Chloramphenicol	86.1	97.0
Ciprofloxacin / Enrofloxacin	79.8	95.3
Erythromycin	-	91.9
Florphenicol	89.5	-
Gentamicin	90.9	99.4
Nalidixic acid	94.9	96.8
Streptomycin	76.1	87.4
Sulfonamides	96.4	-
Trimethoprim + Sulfonamides	96.3	-
Tetracycline	89.4	90.1
Trimethoprim	100.0	-

External Quality Assurance System

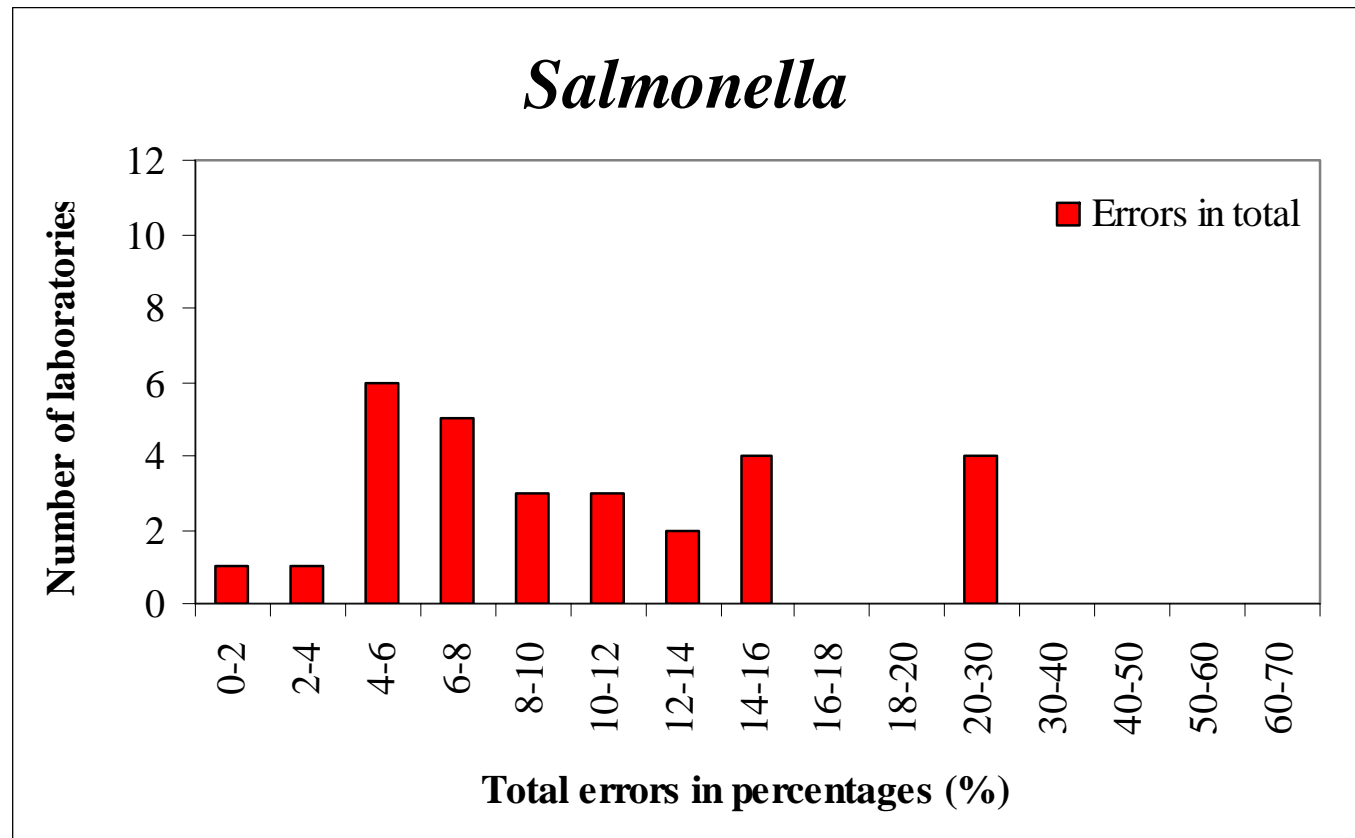
Detection of ESBL

Cephalosporines / strains	Strain #3 (CTX-M-9)			
	ESBL not detected		ESBL detected	
	Number, n:	Percentages, %	Number, n:	Percentages, %
CTX, CAZ, XNL	1	17%	5	83%
CTX, CAZ	4	50%	4	50%
CTX, XNL	2	33%	4	67%
CTX	1	33%	2	67%
XNL	0	0%	4	100%
CTX/CI:CTX	2	33%	4	67%
CAZ/CI:CAZ	0	0%	0	0%
Cephalosporines / strains	Strain #4 (CTX-M-14)			
	ESBL not detected		ESBL detected	
	Number, n:	Percentages, %	Number, n:	Percentages, %
CTX, CAZ, XNL	0	0%	6	100%
CTX, CAZ	2	25%	6	75%
CTX, XNL	0	0%	5	100%
CTX	0	0%	4	100%
XNL	0	0%	4	100%
CTX/CI:CTX	1	17%	5	83%
CAZ/CI:CAZ	2	33%	4	67%
Cephalosporines / strains	Strain #6 (CTX-M-1)			
	ESBL not detected		ESBL detected	
	Number, n:	Percentages, %	Number, n:	Percentages, %
CTX, CAZ, XNL	0	0%	6	100%
CTX, CAZ	0	0%	8	100%
CTX, XNL	0	0%	5	100%
CTX	0	0%	4	100%
XNL	0	0%	5	100%
CTX/CI:CTX	0	0%	6	100%
CAZ/CI:CAZ	0	0%	6	100%

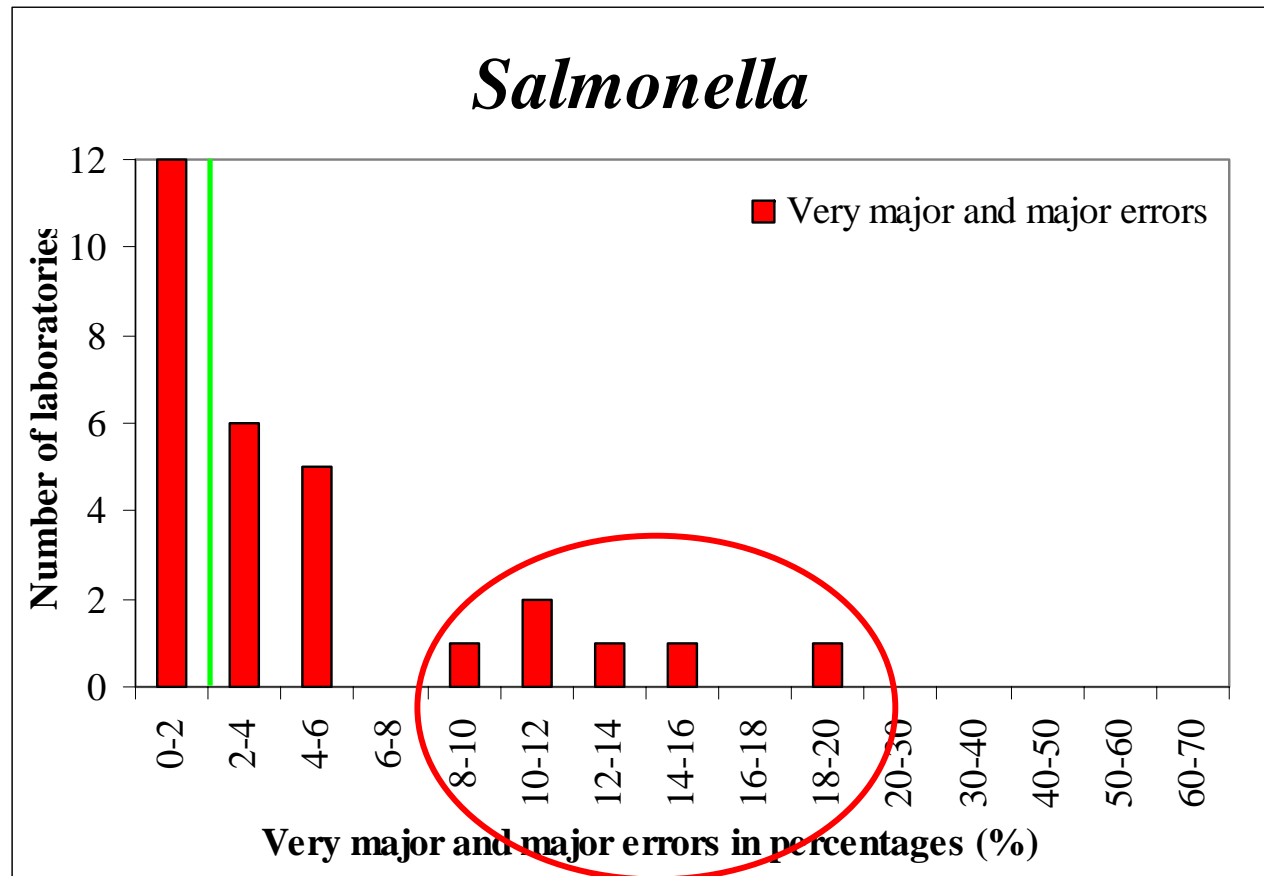
External Quality Assurance System Deviations in total for *Salmonella* per lab



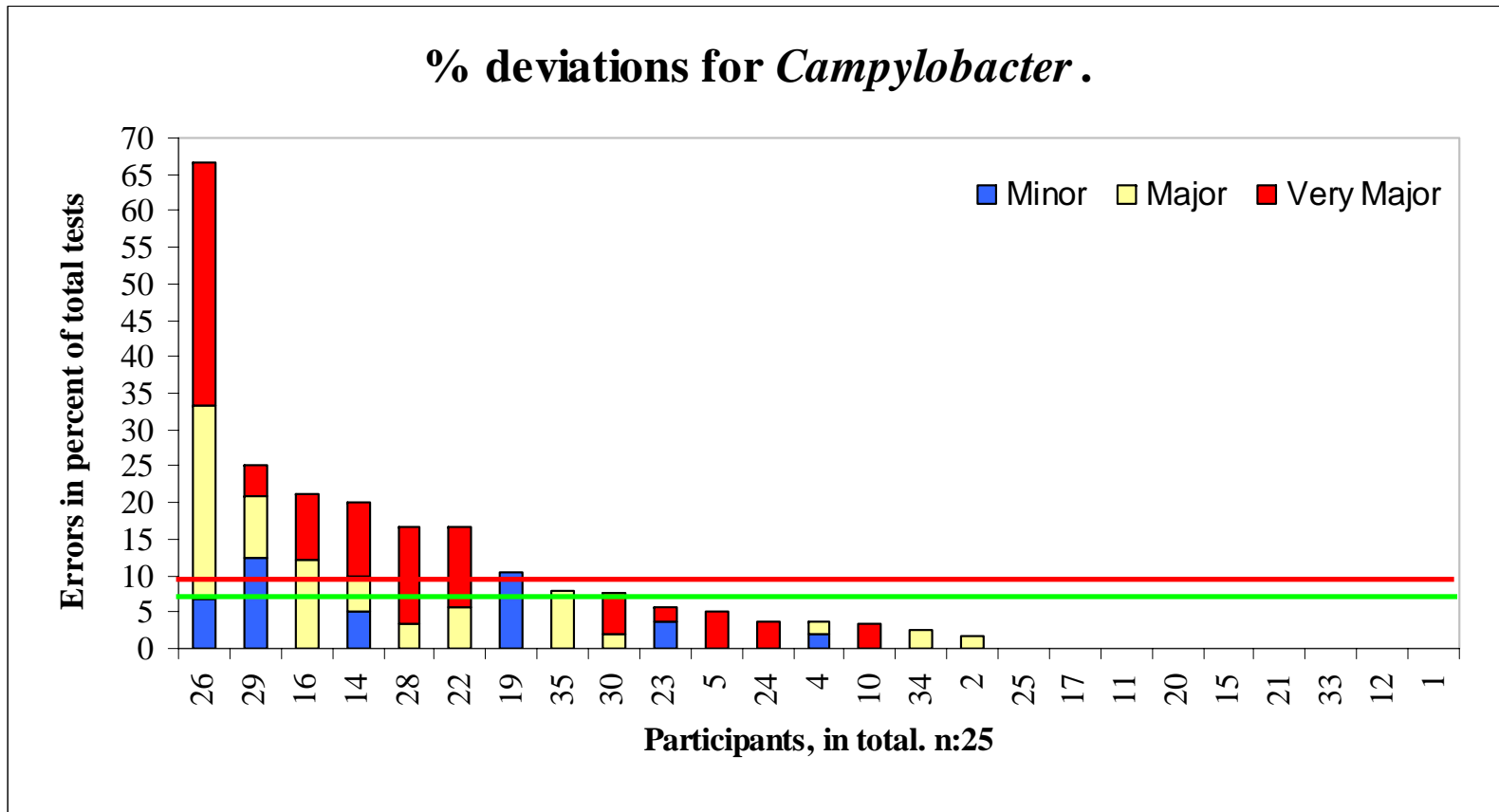
External Quality Assurance System Deviations in total for *Salmonella* in intervals



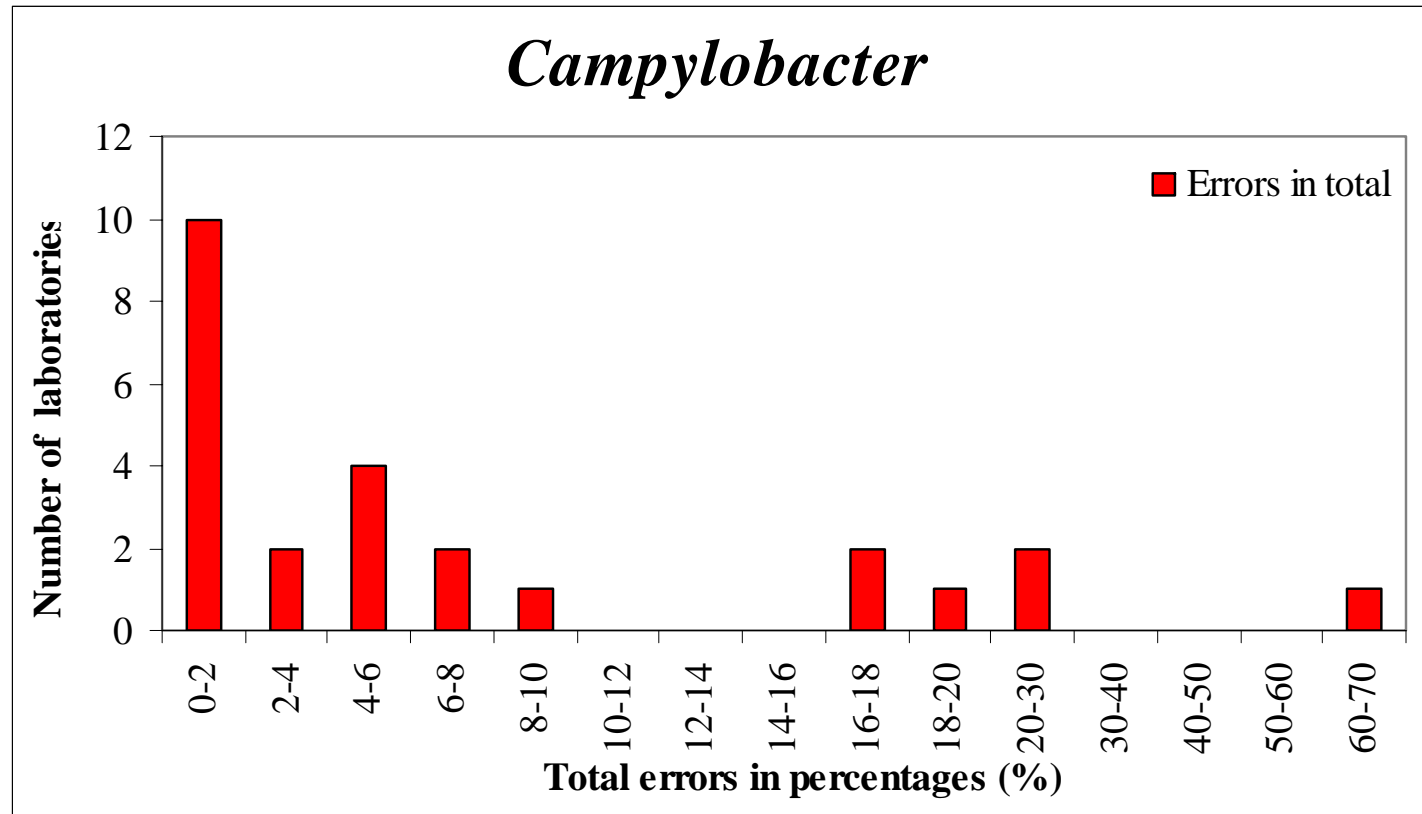
External Quality Assurance System Major deviations for *Salmonella* in intervals



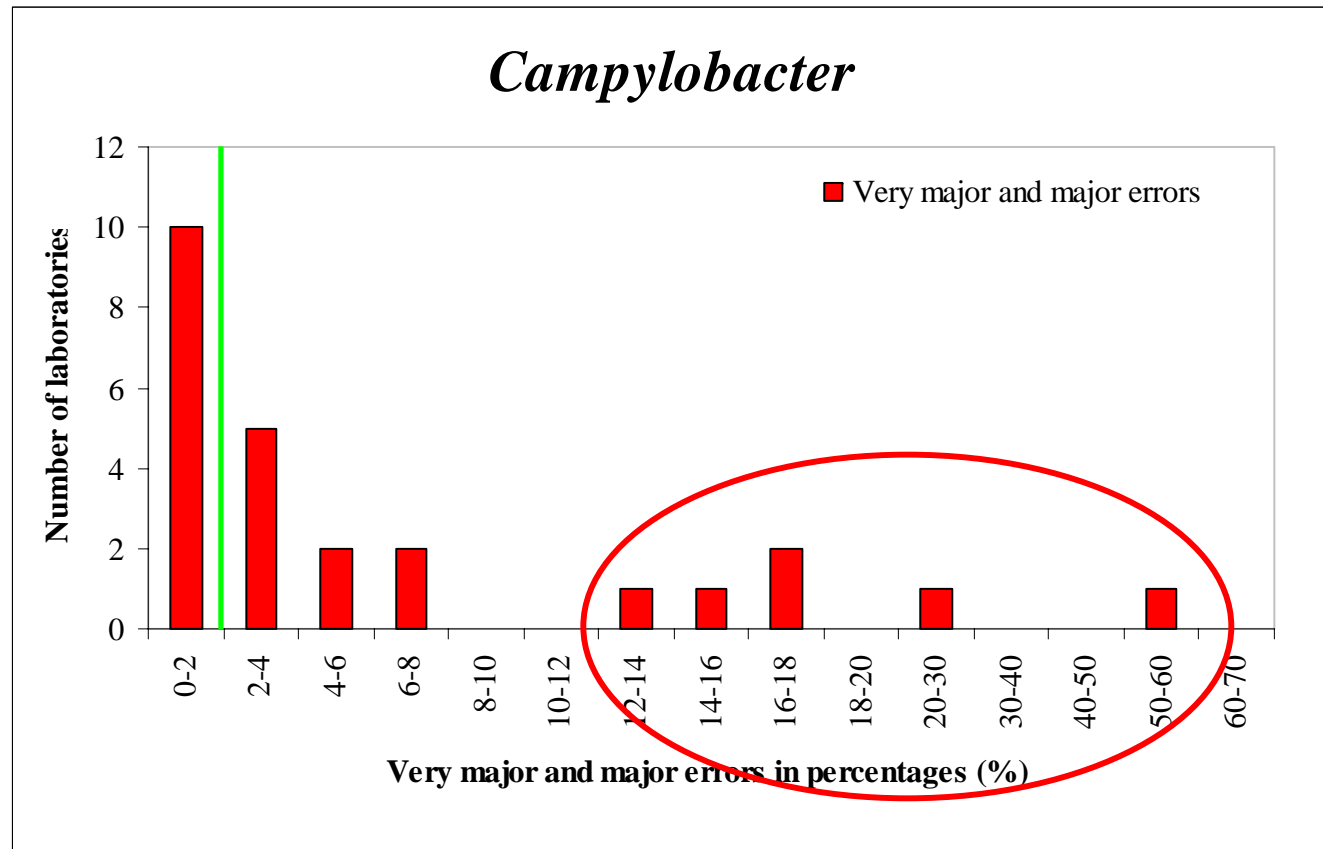
External Quality Assurance System Deviations in total for *Campylobacter* per lab



External Quality Assurance System Deviations in total for *Campylobacter* in intervals



External Quality Assurance System Major deviations for *Campylobacter* in intervals



Four of these laboratories uses disk diffusion.
All six will be contacted and requested to perform a re-test

External Quality Assurance System

Deviations by ATCC 25922 – disk diffusion

2006 Antimicrobials	Disk Diffusion ATCC25922		
	Prop. of labs outside QC range (%)	Range of obtained values in mm zones Below lower QC limit Above upper QC limit	
Ampicillin	0 / 9	(0.0)	
Amoxicillin	0 / 4	(0.0)	
Amoxicillin + Clavulanic acid	4 / 10	(40.0)	10 mm 5 mm
Cefpodoxime	0 / 3	(0.0)	
Ceftiofur	2 / 5	(40.0)	1 mm
Ceftazidime	1 / 8	(12.5)	
Cefotaxime	2 / 11	(18.2)	1 mm 8 mm
Chloramphenicol	1 / 13	(7.7)	1 mm
Ciprofloxacin	0 / 9	(0.0)	
Florphenicol	1 / 6	(16.7)	5 mm
Gentamicin	1 / 13	(7.7)	
Nalidixic acid	1 / 13	(7.7)	
Streptomycin	0 / 12	(0.0)	
Sulfonamides	3 / 8	(37.5)	9 mm 5 mm
Tetracycline	4 / 10	(40.0)	
Trimethoprim	0 / 10	(0.0)	
Trimethoprim + Sulfonamides	1 / 12	(8.3)	
Cefoxitin	0 / 4	(0.0)	
Imipenem	1 / 3	(33.3)	

External Quality Assurance System Deviations by ATCC 25922 – MIC

2006 Antimicrobials	MIC Determinations ATCC25922			
	Prop. of labs outside QC range (%)		Range of obtained values in MIC steps Below lower QC limit Above upper QC limit	
Ampicillin	0 / 8	(0.0)		
Amoxicillin	0 / 4	(0.0)		
Amoxicillin + Clavulanic acid	1 / 4	(25.0)	4 steps	
Cefpodoxime	0 / 1	(0.0)		
Ceftiofur	0 / 6	(0.0)		
Ceftazidime	0 / 3	(0.0)		
Cefotaxime	1 / 7	(14.3)		1 step
Chloramphenicol	0 / 12	(0.0)		
Ciprofloxacin	3 / 10	(30.0)	1 step	2 steps
Florphenicol	0 / 9	(0.0)		
Gentamicin	1 / 12	(8.3)		2 steps
Nalidixic acid	1 / 11	(9.1)		1 step
Streptomycin	0 / 9	(0.0)		
Sulfonamides	0 / 10	(0.0)		
Tetracycline	0 / 12	(0.0)		
Trimethoprim	1 / 10	(10.0)	1 step	
Trimethoprim + Sulfonamides	0 / 5	(0.0)		
Cefoxitin	0 / 2	(0.0)		
Imipenem	0 / 1	(0.0)		

External Quality Assurance System Deviations by ATCC 33560 – MIC

2006 Antimicrobials	MIC Determinations ATCC33560			
	Prop. of labs outside QC range (%)		Range of obtained values in MIC steps	
			Below lower QC limit	Above upper QC limit
Chloramphenicol	0 / 8	(0.0)		
Ciprofloxacin	4 / 14	(28.6)	1 step	2 steps
Erythromycin	5 / 13	(38.5)	1 step	1 step
Gentamicin	2 / 12	(16.7)	1 step	
Nalidixic acid	2 / 14	(14.3)	1 step	
Streptomycin	0 / 0	(0.0)		
Tetracycline	2 / 16	(12.5)	1 step	

External Quality Assurance System

Conclusions: Results

- Testing *Salmonella* are causing some problems
- Many of the problems are related to breakpoint issues
- Some antimicrobials and strains are more difficult to test than others
- It has been proven that detecting ESBL's should be addressed
- Fifteen of the laboratories perform unsatisfactory when testing *Salmonella*
- Eight laboratories had no errors when testing *Campylobacter*
- Six laboratories are offered a re-tests

External Quality Assurance System

Overall conclusions

- It is important to establish a consensus agreement regarding future antimicrobial panels, minimum ranges and breakpoints for the organisms in this programme
- Detecting ESBL should be addresses
- "Hands on training" for laboratories performing less good should be established

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Thank you!

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