RIVM report 330300006/2005

Ninth CRL-*Salmonella* interlaboratory comparison study (2004) on typing of *Salmonella* spp.

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This investigation has been performed by order and for the account of the European Commission, Legislation Vétérinaire et Zootechnique and the RIVM within the framework of RIVM project V/330300/03/CS by the Community Reference Laboratory for *Salmonella*.

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Abstract

Ninth CRL-*Salmonella* interlaboratory comparison study (2004) on typing of *Salmonella* spp.

The ninth interlaboratory comparison study on the typing of *Salmonella* was organised by the Community Reference Laboratory for *Salmonella* (CRL-*Salmonella*, Bilthoven, the Netherlands) in collaboration with the Health Protection Agency (HPA, London, United Kingdom) and the Central Institute for Animal Disease Control (CIDC, Lelystad, the Netherlands) in spring 2004. Twenty-five National Reference Laboratories for *Salmonella* (NRLs-*Salmonella*) including Norway and Candidate Country Romania and eighteen Enter-Net Laboratories (ENLs) participated in the study. In total, 20 strains of the species *Salmonella enterica* subspecies *enterica* were selected for serotyping. Ten strains of *Salmonella* Enteritidis (SE) and 10 strains of *Salmonella* Typhimurium (STM) were selected for phage typing. Ten strains of *Salmonella* spp. were selected for antimicrobial susceptibility testing. In general, no problems were encountered with the typing of the O-antigens. Some laboratories had problems with typing of the H-antigens. Many problems occurred with the distinction between *S.* Banana and *S.* California. Ninety-eight percent of all participating laboratories were able to correctly type the O-antigens. The H-antigens were typed correctly by 90 % of the NRLs and by 96 % of the ENLs. Ninety percent of the NRLs and 95 % of the ENLs indicated correct serovar names for the 20 serotyping strains. The phage typing of some of the *Salmonella* Enteritidis strains caused problems for the NRLs as well as for the ENLs. Most laboratories performed the antimicrobial susceptibility testing towards a panel of fourteen antibiotics. Some problems occurred with the interpretation of the results obtained with antibiotics amoxicillin-clavanulate and trimethoprim/sulphamethoxazole. This study demonstrated that less deviating results were produced by Minimal Inhibition Concentration determinations than by disc diffusion.

Keywords: CRL-*Salmonella*, *Salmonella* spp., serotyping, phage typing, antimicrobial susceptibility.

Rapport in het kort

Negende CRL-*Salmonella* ringonderzoek (2004) voor de typering van *Salmonella* spp.

Het negende ringonderzoek voor de typering van *Salmonella* werd in de lente van 2004 georganiseerd door het Communautair Referentie Laboratorium voor *Salmonella* (CRL-Salmonella, Bilthoven, Nederland) in samenwerking met Health Protection Agency (HPA, Londen, Verenigd Koninkrijk) en het Centraal Instituut voor Dierziekte Controle (CIDC, Lelystad, Nederland). Vijfentwintig Nationale Referentie Laboratoria voor *Salmonella* (NRLs-*Salmonella*) inclusief Noorwegen en Kandidaat lidstaat Roemenië en 18 Enter-Net Laboratoria (ENLs) namen deel aan de studie. Twintig stammen van species *Salmonella enterica* subspecies *enterica* werden geselecteerd voor de serotypering. Tien stammen van *Salmonella* Enteritidis (SE) en 10 stammen van *Salmonella* Typhimurium (STM) werden geselecteerd voor faagtypering. Tien stammen van *Salmonella* spp. werden geselecteerd voor antimicrobiële gevoeligheidsbepalingen. In het algemeen werden geen problemen gevonden met de typering van de O-antigenen. Enkele laboratoria hadden problemen met het typeren van de H-antigenen. Veel problemen traden op met de onderscheiding tussen *S*. Banana en *S*. California. Achtennegentig procent van alle deelnemende laboratoria typeerden de O-antigenen correct. De H-antigenen werden correct getypeerd door 90 % van de NRLs en door 96 % van de ENLs. Negentig procent van de NRLs en 95 % van de ENLs gaven de 20 serotyperingsstammen de goede serovar naam. De faagtypering van enkele van de *Salmonella* Enteritidis stammen zorgden voor problemen voor zowel de NRLs als de ENLs. De meeste laboratoria testten de antimicrobiële gevoeligheids bepalingen tegen een panel van veertien antibiotica. Sommige problemen deden zich voor met de interpretatie van de resultaten verkregen met de antibiotica amoxicillin-clavanulaat en trimethoprim/sulphamethoxazole. Deze studie toonde aan dat minder afwijkende resultaten werden verkregen met de Minimal Inhibition Concentration methode dan met de disk-diffusie-test.

Trefwoorden: CRL-*Salmonella*, *Salmonella* spp., serotypering, faagtypering, antimicrobiële gevoeligheid.

Contents

Summary

In 2004 the ninth interlaboratory comparison study on typing of *Salmonella* was organised by the EU Community Reference Laboratory for *Salmonella* (CRL-*Salmonella*, Bilthoven, the Netherlands) in collaboration with the Health Protection Agency (HPA, Colindale) in London and the Central Institute for Animal Disease Control (CIDC) – Department of Bacteriology and TSEs (Lelystad, the Netherlands). Laboratories that were interested were able to perform phage typing and antimicrobial susceptibility testing as well. The main goal of this collaborative study was to evaluate the results reported by the National Reference Laboratories (NRLs-*Salmonella*) and among the EnterNet Laboratories (ENLs).
Twenty-three NRLs-*Salmonella* of the Member States of the European Union participated, as well as NRL-Norway and NRL-Romania. This was the first typing study in which the new member states could participate.
Seven of the participating NRLs-*Salmonella* also performed phage typing. Eighteen ENLs participated in the study of which 13 laboratories performed phage typing. Three of the NRLs-*Salmonella* are also ENLs. All three of these laboratories performed phage typing.
A total of 20 strains of the species *Salmonella enterica* subspecies *enterica* were selected for serotyping by the CRL-*Salmonella*. The strains had to be typed with the method routinely used in each laboratory. The laboratories were allowed to send strains for serotyping to another specialised laboratory in their country. Most problems were encountered when typing the H-antigens especially with the presence or absence of antigen H:g in strain representing *S*. Banana. Ninety-eight percent of all participating laboratories were able to correctly type the O-antigens. The H-antigens were typed correctly by 90 % of the NRLs and by 96 % of the ENLs. Ninety percent of the NRLs and 95 % of the ENLs indicated correct serovar names for the 20 serotyping strains.
The HPA selected 20 strains for phage typing, 10 were of the serovar *Salmonella* Enteritidis (SE) and 10 of the serovar *Salmonella* Typhimurium (STM). None of the NRLs and only one EnterNet Laboratory (out of 13) typed all SE strains correctly. All seven NRLs and eight ENLs typed all STM strains correctly.
In this report the results of antimicrobial susceptibility testing (AST) are also included. Twenty-four NRLs-*Salmonella* and 15 EnterNet Laboratories performed susceptibility testing. Ten strains of various *Salmonella* serovars had to be tested with a panel of fourteen antibiotics. Three different kinds of tests were used in this study, namely, minimal inhibition concentration (MIC) determinations with broth dilution tests, Etest and the disc diffusion test. The laboratories that determined MIC's or performed the Etest also categorised the results as susceptible, intermediate and resistant. The laboratories that used the disc diffusion method recorded inhibition zone diameters in mm and the notations susceptible, intermediate and resistant. In this report deviations are recorded as minor and major errors. Most problems occurred with the interpretation of the results obtained with the antibiotic amoxicillin-clavalunate and trimethoprim/sulphamethoxazole. This study demonstrated that based on the AST strains distributed and antibiotics tested, less deviating results were produced by MIC

determinations than by disc diffusion. If a quality limit of 90% accuracy would have been used, all laboratories that determined MICs would have been approved, while six laboratories using disc diffusion would not have complied.

List of abbreviations

AMC	Amoxicillin+clavanulate
AMP	Ampicillin
AST	Antimicrobial Susceptibility Testing
BGA	Brilliant Green Agar
CEF	Cefotaxime
CHL	Chloramphenicol
CIDC	Central Institute for Animal Disease Control
CIP	Ciprofloxacin
CRL-*Salmonella*	Community Reference Laboratory – *Salmonella*
ENL	EnterNet Laboratory
ESBL	Extended Spectrum Beta-Lactamases
EU	European Union
FLO	Florfenicol
GEN	Gentamicin
HPA	Health Protection Agency
I	Intermediate
KAN	Kanamycin
LEP	Laboratory of Enteric Pathogens
MIC	Minimal Inhibition Concentration
NAL	Nalidixic acid
NEO	Neomycin
NRL-*Salmonella*	National Reference Laboratory – *Salmonella*
Nt	not typable
PT	Phage Type
R	Resistant
RIVM	National Institute for Public Health and the Environment
S	Susceptible
SD	Standard Deviation
SE	*Salmonella* Enteritidis
STM	*Salmonella* Typhimurium
STR	Streptomycin
SXT	Sulfamethoxazole + Trimethoprim
TMP	Trimethoprim
TSI	Triple Sugar Iron agar
XLT	Xylose Lysine Tergitol

1. Introduction

This report describes the 9th interlaboratory comparison study on the typing of *Salmonella* strains. The study was organised by the Community Reference Laboratory for *Salmonella* (CRL-*Salmonella*, Bilthoven, the Netherlands). According to the Council Directive 2003/99/EC and the Commission Decision 2004/564/EC it is one of the tasks of the CRL-*Salmonella* to organise interlaboratory comparison studies for the National Reference Laboratories for *Salmonella* (NRLs-*Salmonella*). The main objective is that the examination of samples in the Member States will be carried out uniformly and comparable results will be obtained. The history of the various typing studies starting in 1995 is shown in Table 1.

Table 1 History of interlaboratory comparison studies on typing of Salmonella *spp*

Study NRLs	Study ENLs	Year	Type and number of serotyping strains of *Salmonella* spp	Number and type of phage typing strains	Antibiotic resistance testing	Reference
I		1995	spp. *enterica* 18 spp. *salamae* 1 spp. *houtenae* 1			Voogt et al., 1996 (RIVM report 284500004)
II		1996/ 1997	spp. *enterica* 20			Voogt et al., 1997 (RIVM report 284500008)
III		1998	spp. *enterica* 20	SE 4 STM 5		Voogt et al., 1998 (RIVM report 284500010)
IV	I	1999	spp. *enterica* 16	SE 10 STM 10		Raes et al., 2000 (RIVM report 284500013)
V	II	2000	spp. *enterica* 18 spp. *salamae* 1 spp. *houtenae* 1	SE 10 STM 10	YES	Raes et al., 2001 (RIVM report 284500016)
VI	III	2001	spp. *enterica* 19 spp. *arizonae* 1	SE 10 STM 10	YES	Korver et al., 2002 (RIVM report 284500020)
VII	IV	2002	spp. *enterica* 20	SE 10 STM 10		Korver et al., 2002 (RIVM report 284500022)
VIII	V	2003	spp. *enterica* 20	SE 10 STM 10	YES	Korver et al., 2003 (RIVM report 330300002)
IX	VI	2004	spp. *enterica* 20	SE 10 STM 10	YES	This report

Twenty-five NRLs-*Salmonella* (three of them are also EnterNet Laboratory) and eighteen EnterNet Laboratories participated in this ninth study. The main objective of this study was to compare the results of typing of *Salmonella* spp. among the NRLs-*Salmonella* and among the ENLs. All participants performed serotyping of the strains.
Seven of the NRLs-*Salmonella* and 13 ENLs performed phage typing on 10 *Salmonella* Enteritidis and 10 *Salmonella* Typhimurium strains. The selection of these strains and interpretation of the results of the phagetyping was performed in close cooperation with the Health Protection Agency, London, UK.
With the help of the Central Institute for Animal Disease Control (CIDC, Department of Bacteriology and TSEs, Lelystad, the Netherlands) ten strains of various *Salmonella* serotypes and one control strain were selected for antimicrobial susceptibility testing. These eleven strains were tested by the participants with a panel of fourteen antibiotics. Twenty-four NRLs and fifteen ENLs participated with either the Minimal Inhibition Concentration method, Etest or disc diffusion test.

2. Participants

Country	Institute/City	National Reference Laboratory for *Salmonella* (NRL) or EnterNet Laboratory (ENL)	
Austria	Institut für Medizinische Mikrobiologie und Hygiene, Graz	NRL	ENL
Belgium	Veterinary and Agrochemical Research Center (VAR) Brussels	NRL	
Belgium	Institute Scientifique de Santé Publique – Louis Pasteur Brussels		ENL
Canada	National Laboratory for Enteric Pathogens Canadian Science Centre for Human and Animal Health - Winnipeg		ENL
Cyprus	Laboratory for the Control of Foods of Animal Origin (LCFAO) Nicosia	NRL	
Czech Republic	National Reference Laboratory for Salmonellosis, State Veterinary Institute Prague	NRL	
Czech Republic	National Reference Laboratory for Salmonella National Institute of Public Health Prague		ENL
Denmark	Danish Veterinary Laboratory Copenhagen	NRL	
Denmark	Statens Serum Institut Department of Gastrointestinal Infections Copenhagen		ENL
Estonia	Estonian Veterinary and Food Laboratory Diagnostic Department, Bacteriology Laboratory Tartu	NRL	
Finland	National Veterinary and Food Research Institute Kuopio Department Kuopio	NRL	
Finland	National Public Health Institute (KTL) Laboratory of Enteric Pathogens, Helsinki		ENL
France	Agence française de sécurité sanitaire des aliments (AFSSA), Laboratoire d'études et de recherches avicoles et porcines (LERAP), Ploufragan	NRL	

Country	Institute/City	National Reference Laboratory for *Salmonella* (NRL) or EnterNet Laboratory (ENL)	
France	Unité Biodiversité des Bacteries Institute Pasteur Paris		ENL
Germany	Federal Institute for Risk Assessment (BFR) National Veterinary Salmonella Reference Lab. Berlin	NRL	
Germany	Robert-Koch Institut Bereich Wernigerode Harz		ENL
Greece	Veterinary Laboratory of Halkis Halkis	NRL	
Greece	National School of Public Health, Department of Public & Administrative Health (Serotyping) and Department of Microbiology, Medical School, University of Athens (Phage typing) Athens		ENL
Hungary	National Food Inestigation Institute of Hungary Department Food Microbiology Budapest	NRL	
Ireland	Department of Agriculture and Food Central Veterinary Research Laboratory Dublin	NRL	
Ireland	National Salmonella Reference Laboratory University College Hospital Galway		ENL
Italy	Istituto Zooprofilattico Sperimentale delle Venezie Centro Nazionale di Referenza per le Salmonellosi - Legnaro	NRL	
Italy	Istituto Superiore di Sanita Lab. of Medical Bacteriology & Mycology Rome		ENL
Latvia	State Veterinary Medicine Diagnostic Centre (SVMDC) Riga	NRL	
Luxembourg	Laboratoire de Médecine Vétérinaire de l'Etat Animal Zoonosis Luxembourg	NRL	
Luxembourg	Laboratoire National de Santé Luxembourg		ENL

Country	Institute/City	National Reference Laboratory for *Salmonella* (NRL) or EnterNet Laboratory (ENL)	
The Netherlands	National Institute for Public Health and the Environment (RIVM) Bilthoven	NRL	ENL
New Zealand	Communicable Disease Group ESR Kenepuru Science Centre Porirua		ENL
Northern Ireland (UK)	Department of Agriculture for Northern Ireland Veterinary Sciences Division, Bact. Department Belfast	NRL	
Norway	National Institute of Public Health Oslo	NRL	ENL
Poland	National Veterinary Research Institute Microbiological Department Pulawy	NRL	
Portugal	Laboratório Nacional de Investigaçã Veterinária Lisbon	NRL	
Portugal	Instituto Nacional de Saude Lisbon		ENL
Romania	Hygiene and Veterinary Public Health Institute Bucharest	NRL	
Scotland (UK)	Scottish Salmonella Reference Laboratory Department of Bacteriology Glasgow		ENL
Slovenia	National Veterinary Institute Veterinary Faculty Ljubljana	NRL	
Spain	Laboratorio de Sanidad Y Produccion Animal de Algete Madrid	NRL	
Spain	Laboratorio de Enterobacterias, CNM Instituto de Salud Carlos III Madrid		ENL
Sweden	National Veterinary Institute Department of Bacteriology Uppsala	NRL	

Country	Institute/City	National Reference Laboratory for *Salmonella* (NRL) or EnterNet Laboratory (ENL)	
Sweden	Swedish Institute of Infectious Disease Control Department of Bacteriology Solna		ENL
Switzerland	University of Berne Institute of Veterinary Bacteriology Bern		ENL
United Kingdom	Veterinary Laboratories Agency Weybridge Department of Bacterial Diseases New Haw, Addlestone	NRL	
United Kingdom	Laboratory of Enteric Pathogens Health Protection Agency (HPA) London		ENL

3. Materials and Methods

3.1 *Salmonella* strains for serotyping

Twenty strains for serotyping were sent to the participants. The *Salmonella* strains used for the interlaboratory comparison study on serotyping originated from the collection of the National *Salmonella* Centre in the Netherlands. The strains were typed once again by this Centre before mailing. The complete antigenic formula according to the most recent Kauffmann-White scheme (Popoff, 2001) of the 20 serovars are shown in Table 2.

Table 2 *Antigenic formulas of the 20* Salmonella *strains according to the Kauffmann-White scheme determined by CRL*-Salmonella

No	Serovar	O antigens	H antigens	Origin of strains
S1	*S*. Banana	1, 4, [5], 12	m, t : [1, 5]	Soy
S2	*S*. Paratyphi B var.Java	1, 4, [5], 12	b : 1, 2	Human
S3	*S*. Chester	1, 4, [5], 12	e, h : e, n, x	Swine
S4	*S*. Albany	8, 20	z_4, z_{24} : -	Human
S5	*S*. Blockley	6, 8	k : 1, 5	Human
S6	*S*. Enteritidis	1, 9, 12	g, m : -	Human
S7	*S*. Putten	13, 23	d : l, w	Animal feed
S8	*S*. Kivu	6, 7	d : 1, 6	Human
S9	*S*. Fresno	9, 46	z_{38} : -	Unknown
S10	*S*. Durban	9, 12	a : e, n, z_{15}	Human
S11	*S*. Weltevreden	3, 10 [15]	r : z_6	Spices
S12	*S*. Amsterdam	3, 10 [15][15, 34]	g, m, s : -	Human
S13	*S*. Indiana	1, 4, 12	z : 1, 7	Chicken
S14	*S*. Livingstone	6, 7, 14	d : l, w	Human
S15	*S*. Typhimurium	1, 4, [5], 12	i : 1, 2	Human
S16	*S*. Alachua	35	z_4, z_{23} : -	Fish flour
S17	*S*. Liverpool	1, 3, 19	d : e, n, z_{15}	Chicken
S18	*S*. Virchow	6, 7, 14	r : 1, 2	Human
S19	*S*. Infantis	6, 7, 14	r : 1, 5	Human
S20	*S*. Hadar	6, 8	z_{10} : e, n, x	Human

3.2 *Salmonella* strains for phage typing

The strains of *Salmonella* for the comparison study on phage typing were from the collection of the Salmonella Reference Unit of the Health Protection Agency (HPA), Laboratory of Enteric Pathogens (LEP), National *Salmonella* Reference Laboratory for England and Wales, London, UK. Ten strains of *Salmonella* Enteritidis and 10 strains of *Salmonella* Typhimurium were selected.
The explanation of the various notations in Tables 3 and 4 and the Tables in Annex 4 are as follows:

- = no reaction
± = 5-20 plaques
+ = 21-40 plaques
++ = 41-80 plaques
+++ = 81-100 plaques
scl = semi-confluent lysis
cl = confluent clear lysis
ol = confluent opaque lysis
<< = merging plaques towards semi-confluent lysis

Table 3 Phage reactions of the Salmonella *Enteritidis strains, determined by HPA*

		Phages at Routine Test Dilution															
QA No.	**Phage type**	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
E1	**1b**	**ol**	**scl**	**ol**	**scl**	**ol**	**scl**	**ol**	**scl**	**ol**	**ol**	**ol**	**ol**	**ol**	**ol**	**scl**	**ol**
E2	**1**	**ol**	**scl**	**cl**	**scl**	**cl**	**scl**	**cl**	**ol**	**ol**	**ol**	**cl**	**cl**	**cl**	**cl**	**-**	**-**
E3	**14b**	**-**	**-**	**-**	**-**	**-**	**scl**	**-**	**-**	**±**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
E4	**12**	**-**	**scl**	**++**	**scl**	**scl**	**-**	**cl**	**-**	**ol**	**-**	**cl**	**+++**	**cl**		**-**	**-**
E5	**2**	**ol**	**-**	**cl**	**scl**	**cl**	**scl**	**cl**	**ol**	**ol**	**ol**	**scl**	**cl**	**-**	**cl**	**-**	**-**
E6	**3**	**ol**	**-**	**-**	**-**	**-**	**+**	**-**	**ol**	**-**	**ol**	**-**	**-**	**-**	**cl**	**-**	**-**
E7	**21**	**cl**	**scl**	**-**	**scl**	**-**	**scl**	**-**	**ol**	**ol**	**ol**	**-**	**-**	**-**	**cl**	**-**	**-**
E8	**9b**	**-**	**-**	**cl**	**-**	**cl**	**-**	**-**	**-**	**-**	**-**	**-**	**cl**	**-**	**scl**	**-**	**-**
E9	**24**	**-**	**+**	**-**	**+**	**-**	**-**	**-**	**+**	**scl**	**+**	**-**	**cl**	**-**	**-**	**-**	**-**
E10	**4**	**-**	**scl**	**cl**	**scl**	**cl**	**scl**	**cl**	**scl**	**ol**	**ol**	**cl**	**cl**	**cl**	**-**	**-**	**-**

Table 4 Phage reactions of the Salmonella *Typhimurium strains, determined by HPA*

		Phages at Routine Test Dilution																
QA No.	Phage type	1	2	3	4	5	6	7	8	10	11	12	13	14	15	16	17	18	19
M11	41	cl	scl	cl	ol	cl	scl	cl	-	cl	ol	-	-	cl	cl	cl	cl	scl	ol
M12	1	cl	cl	cl	ol	cl	cl	cl	-	cl	cl	ol	ol	cl	cl	cl	cl	cl	cl
M13	104	-	-	-	-	-	-	-	-	-	-	++	scl	-	-	-	-	+++	-
M14	22	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
M15	9	-	-	-	-	-	-	-	cl	cl	ol	ol	ol	-	-	scl	-	-	-
M16	120	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	cl	-
M17	208	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
M18	18	-	-	-	-	-	-	-	-	-	ol	-	-	-	ol	-	cl	scl	scl
M19	136	-	-	-	ol	ol	ol	-	-	-	ol	ol	ol	-	ol	ol	-	-	ol
M20	193	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

		Phages at Routine Test Dilution												Additional phages					
QA No.	Phage type	20	21	22	23	24	25	26	27	28	29	32	35	1	2	3	10	10 var	18
M11	41	cl	ol	ol	cl	cl	cl	cl	cl	-	cl	cl	ol						
M12	1	ol	ol	cl	cl	cl	cl	cl	cl	-	cl	cl	cl						
M13	104	-	-	-	-	-	-	-	-	-	-	-	±	-	-	-	ol		-
M14	22	-	±	cl	-	-	-	-	-	-	-	-	-						
M15	9	scl	-	ol	scl	-	±	++	-	-	cl	cl	-						
M16	120	-	-	-	-	-	-	-	-	-	-	-	-	++	++	++	ol		-
M17	208	-	-	-	-	-	-	-	-	-	-	-	-	±	±	±	ol		ol
M18	18	scl	-	-	-	-	-	-	±	±	-	scl	++						
M19	136	+	-	-	-	-	scl	-	-	-	-	-	-						
M20	193	-	-	-	-	-	-	-	-	-	-	-	-	++ +	++ +	++ +	ol		-

3.3 Strains and antibiotics for antimicrobial susceptibility testing (AST)

The *Salmonella* strains used for the antimicrobial susceptibility testing originated from the collection of the Central Institute for Animal Disease Control (CIDC), Department of Bacteriology and TSEs (Lelystad, the Netherlands). The ten strains are numbered from AST-1 to AST-10.

These strains were tested for their susceptibility by broth microdilution method using Sensititre plates produced by Trek Diagnostic systems in the United Kingdom in duplicate. *E. coli* ATCC 25922 was used as control strain. The MIC values determined for the prescribed panel of antibiotics and the categories (resistant, intermediate and susceptible) based on NCCLS breakpoints, are shown in Table 5.

Table 5 MIC results of AST-strains with the prescribed panel of antibiotics, determined by CIDC

	Antibiotics					
	AMC	**AMP**	**CEF**	**CHL**	**CIP**	**FLO**
Strains						
AST 1	0.5/0.25 - 1/0.5	≤ 0.5 - 1	≤ 0.12	8	0.25	4
AST 2	0.5/0.25	≤ 0.5	≤ 0.12	128 - > 128	≤ 0.06	4
AST 3	0.5/0.25 - 1/0.5	≤0 0.5 - 1	≤ 0.12	8	0.5	4 – 8
AST 4	2/1 - 4/2	> 64	> 16	8	≤ 0.06	4
AST 5	4/2 - 8/4	> 64	≤ 0.12 -0.25	8	8	4
AST 6	2/1 - 4/2	> 64	≤ 0.12 -0.25	128	≤ 0.06	**16**
AST 7	0.75/0.38 - 1/0.5	≤ 0.5 - 1	≤ 0.12	8	≤ 0.06	4
AST 8	1.5/0.75 - 4/2	> 64	≤ 0.12	32	1	**8 – 16**
AST 9	16/8 - >16/8	> 64	> 16	> 128	≤ 0.06	> 128
AST 10	0.5/0.25 - 1/0.5	≤ 0.5	≤ 0.12	≤ 4 - 8	≤ 0.06	4

Light grey cells = Resistant; dark grey cells = Intermediate; White cells = Susceptible

	Antibiotics						
	GEN	**KAN**	**NAL**	**NEO**	**STR**	**SXT**	**TMP**
Strains							
AST 1	0.5	4	> 128	≤ 1 – 2	> 64	≤ 0.25/4.75	≤ 0.5
AST 2	≤ 0.25 – 0.5	4	4	≤ 1	> 64	0.5/9.5	≤ 0.5
AST 3	0.5 – 4	> 16	> 128	128 - > 128	64	≤ 0.25/4.75	≤ 0.5
AST 4	2	16	4	4	8	≤ 0.25/4.75	≤ 0.5
AST 5	16 - 32	4	> 128	≤ 1	32	≤ 0.25/4.75	≤ 0.5
AST 6	≤ 0.25 – 2	> 16	4	> 128	> 64	> 32/608	> 64
AST 7	≤ 0.25	2	4	≤ 1	32	1/19	> 64
AST 8	> 32	> 16	> 128	32 - 64	> 64	2/38	2 – 4
AST 9	> 32	> 16	16	≤ 1	> 64	2/38	1 - 2
AST 10	32 - > 32	16	4	≤ 1	> 64	≤ 0.25/4.75	≤ 0.5

Light grey cells = Resistant; White cells = Susceptible

The participating laboratories were asked to use their standard method for susceptibility testing. The methods used varied between Minimal Inhibition Concentration (MIC) test, or breakpoint-MIC determination with a broth dilution test, MICs obtained with Etest or inhibition zone diameters obtained with the disc diffusion test. The Etest comprises a predefined gradient of antibiotic concentrations on a plastic strip which is used to determine the exact MIC.
The requested discs in the diffusion tests were: amoxicillin + clavanulate (30 µg), ampicillin (10 µg), cefotaxime (30 µg), chloramphenicol (30 µg), ciprofloxacin (5 µg), enrofloxacin (5 µg), florfenicol (30 µg), gentamicin (10 µg), kanamycin (30 µg), nalidixic acid (30 µg), neomycin (30 µg), streptomycin (10 µg), sulfamethoxazole + trimethoprim (25 µg), and trimethoprim (5 µg). Laboratories that did not have the discs with the required amount of antibiotics were asked to omit that antibiotic from their list. For the MIC determinations, the participants were asked to test the same antibiotics as required for the diffusion tests.
Those participants that used a quantitative method were asked to record the MIC values determined. Moreover, all participants were asked to categorise their results as susceptible (S), intermediate (I) and resistant (R) according to the breakpoints used in the NRLs and ENLs. The deviations from the categories determined by CIDC were classified as minor or major deviations. A R–I or a S–I deviation was called a minor deviation and a S-R deviation, a major deviation. R-S deviations are considered very major deviations. The NCCLS breakpoints for MIC according to NCCLS guideline M7-A6 and interpretive criteria for disc diffusion according to guideline M2-A8/M31-A2 are shown in Table 6.

Table 6 NCCLS breakpoints in µg/mL for MIC and in mm for disc diffusion

	MIC (M7-A6) (µg/ml)		Disc diffusion (M2-A8/M31-A2) (mm)	
Antibiotics	Susceptible	Resistant	Susceptible	Resistant
Amoxicillin + clavanulate	≤ 8/4	≥ 32/16	≥ 18	≤ 13
Ampicillin	≤ 8	≥ 32	≥ 17	≤ 13
Cefotaxime	≤ 8	≥ 64	≥ 23	≤ 14
Cefotaxime (ESBL)	-	≥ 2	-	≤ 27
Chloramphenicol	≤ 8	≥ 32	≥ 18	≤ 12
Ciprofloxacin	≤ 1	≥ 4	≥ 21	≤ 15
Enrofloxacin	≤ 0.25	≥ 2	≥ 23	≤ 16
Florfenicol*	≤ 8	≥ 32	-	-
Gentamicin	≤ 4	≥ 16	≥ 15	≤ 12
Kanamycin	≤ 16	≥ 64	≥ 18	≤ 13
Nalidixic Acid	≤ 16	≥ 32	≥ 19	≤ 13
Neomycin*	≤ 16	≥ 32	-	-
Streptomycin	≤ 8	≥ 32[#]	≥ 15	≤ 11
Trimethoprim + Sulphamethoxazole (1:19)	≤ 2 / 38	≥ 4 / 76	≥ 16	≤ 10
Trimethoprim	≤ 8	≥ 16	≥ 16	≤ 10

** No NCCLS breakpoint, MARAN 2003 breakpoints used; [#] Streptomycin breakpoints provided by Sensititre manufacturer.*

3.4 Laboratory codes

The NRLs were assigned a laboratory code (labcode) from one to twenty-five (1-25) by CRL-*Salmonella*, which differed from the previous typing studies. The alphabetical labcodes for the ENLs were given by HPA, London, UK.

3.5 Transport

All samples had to be packed and transported as dangerous goods. The parcels containing strains for serotyping and antimicrobial susceptibility testing for the NRLs were sent by CRL-*Salmonella* in week 9, 2004. The parcels containing strains for phage typing for the NRLs were sent by HPA, London, UK. The ENLs received all their parcels from HPA.

3.6 Guidelines for evaluation of serotyping results

The evaluation of the various serotyping results as mentioned in this report are described in Table 7.

Table 7 Evaluation of serotyping results

Results of serotyping	Evaluation
Auto agglutination or incomplete set of antisera (outside the range of antisera)	**nt = not typable**
Partly typable due to incomplete set of antisera or part of the formula (for the name of the serovar)	**+/- = partly correct**
Wrong serovar or mixed sera formula	**- = incorrect**

4. Questionnaire

A questionnaire was incorporated in the testreport of the interlaboratory comparison study. In this part of the report the questions and answers of this questionnaire are summarised.

4.1 General questions

Question 1: Was your parcel damaged at arrival (shipment of serotyping strains) ?

All packages were received in a perfect state and no damage occurred during transport.

Question 2: What was the date of receipt at the laboratory (shipment of serotyping strains) ?

All NRLs except for seven laboratories (labcode 1, 2, 3, 9, 18, 22 and 25) received their parcel within the same week as the samples were sent (week 9, 2004). The laboratories with labcode 1, 2, 3, 9 and 18 received the parcel in the beginning of the week following the shipment of the parcels (week 10, 2004). The NRLs with with labcodes 22 and 25 received the parcel after 14 and 16 days, respectively. The average transport time for the NRLs was 4.2 days. The shipment of the parcels to the EnterNet Laboratories was organised by HPA, London, UK.

Question 3: Was your parcel damaged at arrival (shipment of phagetyping strains) ?

All packages were received in good condition and no damage occurred during transport.

Question 4: What was the date of receipt at the laboratory (shipment of phagetyping strains ?

Seven NRLs (labcodes 3, 4, 6, 15, 19, 20 and 24) received their parcels in week 10 (2004). Five packages (labcodes A, C, D, H and P) were received by the ENLs in week 13, four (labcode WE, G, H and L) in week 14, one (labcode W) in week 16, one (labcode S) in week 18 and one (labcode V) in week 21. Laboratory with labcode B did not report the arrival of the parcel.

Question 5: What kind of medium did you use for subculturing the strains ?

A variety of media from various manufacturers were used for the subculturing of the *Salmonella* strains. Ten NRLs and six ENLs subcultured the strains on a nutrient agar, three

NRLs on blood agar, two NRLs and two ENLs on trypcase soy medium, two NRLs on Brolac and one NRL and two ENLs on XLD.

4.2 Questions regarding serotyping

Question 6: What was the frequency of serotyping at your laboratory in 2003 ?
Question 7: How many strains did your laboratory serotype in 2003 ?

Table 8 Frequency and number of strains serotyped in 2003

Labcode NRLs	Typing frequency	Number 2003	Labcode ENL	Typing frequency	Number 2003
1	Daily	8,717	A	Daily	13,603
2	Weekly	66	B	Daily	750
3	No information	1,602	C	Daily	2,200
4	Daily	3,900	D	Daily	6,750
5	Weekly	2,300	E	Daily	5,941
6	Daily	8,000	F	Thrice a week	1,300
7	Daily	1,200	G	Daily	1,197
8	Daily	1,163	H	Weekly	250
9	Twice a week	107	J	Daily	427
10	Thrice a week	259	L	Daily	8,372
11	Daily	208	M	Thrice a week	4,310
12	Weekly	900	P	Daily	2,307
13	Daily	734	Q	Daily	2,222
14	Weekly	814	R	Daily	1,314
15	Weekly	7,000	S	Daily	2,800
16	Daily	1,625	T	Daily	6,405
17	Weekly	No information	V	Weekly	200
18	Daily	300	W	Daily	1,075
19	Daily	6,074			
20	Daily	12,108			
21	Daily	409			
22	Thrice a week	290			
23	No information	1,700			
24	Daily	2,128			
25	Monthly	40			

Question 8: What kind of sera do you use (commercially available or prepared in own laboratory) ?

Table 9 Number of laboratories using serotyping sera from one or more manufacturers or in-house prepared sera

Number of manufacturers	Number of NRLs	Number of ENLs
From 1 manufacturer	6	7
From 2 manufacturers	7	1
From 3 manufacturers	9	3
From 4 manufacturers	2	2
From 5 manufacturers	1	2
Preparation in own laboratory	6	6
No information	--	3

Table 10 Number of laboratories using sera from the following manufacturers

Name manufacturer	Number of NRLs (n=25)	Number of ENLs (n=15)
Biorad (=Sanofi = Pasteur)	**7**	**6**
Biostat	**1**	**0**
Biotrading	**0**	**1**
Cantacuzino (Romania)	**1**	**0**
Dade Behring	**4**	**3**
Denka Seiken	**2**	**3**
Difco	**4**	**1**
Eurobio	**0**	**1**
Immunomed (Poland)	**1**	**0**
Imuna (Slovak Republic)	**0**	**1**
Imunoloski (Croatia)	**1**	**0**
Murex-Abbott	**5**	**2**
Prolab	**4**	**1**
Reagensia AB	**2**	**2**
Sevapharma (Czech Republic)	**1**	**1**
Sifin (Germany)	**9**	**4**
SSIC (Statens Serum Institute, Copenhagen)	**17**	**9**

Question 9: Is your laboratory the veterinary or human reference laboratory for typing *Salmonella* strains in your country ?

All twenty-five NRLs are the veterinary reference laboratory in their country, except for NRL-France. Three of these 24 laboratories are also reference laboratory for human isolates. All eighteen ENLs are the human reference laboratory for *Salmonella*. Four of these laboratories are also reference laboratory for veterinary isolates.

Question 10: Were the strains in the collaborative study typed in your own laboratory?

Four NRLs-*Salmonella* (labcodes 12, 14, 22 and 25) sent some strains to another laboratory for serotyping.

4.3 Questions regarding phage typing

Question 11: Does your laboratory perform phage typing of *Salmonella* Enteritidis, *S.* Typhimurium and/or of other strains ?

Seven NRLs and thirteen ENLs performed phage typing of *S.* Typhimurium and/or *S.* Enteritidis strains. For routine purposes four NRLs and seven ENLs also phage typed other strains like *S.* Agona, *S.* Bovismorbificans, *S.* Hadar, *S.* Heidelberg, *S.* Infantis, *S.* Oranienburg, *S.* Paratyphi A, *S.* Paratyphi B, *S.* Thompson, *S.* Typhi, *S.* Virchow.

Question 12: How many strains did your laboratory phage type in 2003 ?

Table 11 Number of phage typings and their relationship to the serotyping in 2003

Laboratory codes	Sero typing	Phage typing
3	1,602	1,828
4	3,900	No information
6	8,000	1,800
15	7,000	2,000
19	6,074	1,874
20	12,108	10,000
24	2,128	306
A	13,603	1,118
B	750	800
C	2,200	1,300
D	6,750	1,385
E	5,941	4,374
G	1,197	256
H	250	1,000
L	8,372	6,820
M	4,310	2,377
P	2,307	1,229
S	2,800	1,585
V	200	1,500
W	1,075	4,301

4.4 Questions regarding antimicrobial susceptibility testing

Question 13: What is/are the name(s) of your control strain(s) ?

Twenty-three NRLs (labcode 1-25 except for labcodes 6 and 17) and fifteen ENLs (labcode A, B, C, D, E, F, G, H, J, L, Q, R, S, V and W) used *E. coli* (ATCC 25922) as their control strain. Some laboratories used more than one control strain. *Pseudomonas aeruginosa* (ATCC 27853) was tested by NRLs with labcodes 1 and 19 and ENL with labcode W. Furthermore, laboratories 1, 2, 3, 6, 13, 19, B, E and W also used a variety of control strains like *E. coli* (ATCC 35218 and ATCC 10418), *S.aureus* (ATCC 25923 and ATCC 29213), *E. faecalis* (ATCC 29212) and *K. pneumoniae* (ATCC 13883 and ATCC 70603). Laboratory 17 did not mention whether they used control strains.

Question 14: What is the concentration of the AST inoculum in bacteria per ml ?

Table 12 Concentration of the inoculum of NRLs and ENLs using the disc diffusion method

Labcode	Inoculum	Labcode	Inoculum
1	1 – 2 x 10^8 cfu/ml	A	0.5 McFarland
2	0.5 McFarland	C	1 x 10^8 cfu/ml
3	0.5 McFarland	D	1 x 10^6 cfu/ml
6	0.5 McFarland	F	0.5 McFarland
8	1 x 10^8 cfu/ml	G	0.5 McFarland
9	0.5 McFarland	H	1.5 x 10^8 cfu/ml
10	0.5 McFarland	J	1 x 10^8 cfu/ml
11	1 x 10^8 cfu/ml	L	0.5 McFarland
12	No information	Q	0.5 McFarland
13	0.5 McFarland	S	1 x 10^8 cfu/ml
14	1 – 4 x 10^8 cfu/ml	V	0.5 McFarland
16	1.5 x 10^8 cfu/ml		
18	0.5 McFarland		
20	1 x 10^6 cfu/ml		
21	0.5 McFarland		
22	0.5 McFarland		
23	0.5 McFarland		
24	1 x 10^5 cfu/ml		
25	1 – 2 x 10^8 cfu/ml		

Table 13 Concentration of inoculum in bacteria per ml for NRLs and ENLs using MIC

NRLs	ENLs	Density
17 (Etest)	B, Q	**0.5 McFarland**
19	W	**1 x 10^5 cfu/ml**
4, 13	--	**1 – 5 x 10^5 cfu/ml**
7, 15	R	**5 x 10^5 cfu/ml**
--	E	**1 x 10^6 cfu/ml**
--	C (Etest)	**1 x 10^8 cfu/ml**

Question 15: For how many strains was the antimicrobial susceptibility tested in you lab in 2003 ?

Table 14 Number of strains tested for AST and method by NRLs and ENLs

Labcode NRL	Number	Method	Labcode ENL	Number	Method
1	1,718	Disc Diffusion	A	524	Disc Diffusion
2	665	Disc Diffusion	B	106	MIC
3	2,945	Disc Diffusion	C	2,200	Disc Diffusion / Etest
4	4,500	MIC	D	1,300	Disc Diffusion
6	3,800	Disc Diffusion	E	5,941	MIC
7	200	MIC	F	No information	Disc Diffusion
8	482	Disc Diffusion	G	1,197	Disc Diffusion
9	68	Disc Diffusion	H	800	Disc Diffusion
10	1,000	Disc Diffusion	J	2,751	Disc Diffusion
11	18	Disc Diffusion	L	2,566	Disc Diffusion
12	150	Disc Diffusion	Q	460	MIC / Etest
13	292 / 1,000	Disc Diffusion / MIC	R	1,143	MIC
14	153	Disc Diffusion	S	700	Disc Diffusion
15	2,500		V	300	Disc Diffusion
16	50	Disc Diffusion	W	2,995	MIC
17	80	Etest			
18	100	Disc Diffusion			
19	10,000	MIC			
20	12,108	Disc Diffusion			
21	20	Disc Diffusion			
22	189	Disc Diffusion			
23	1,700	Disc Diffusion			
24	2,512	Disc Diffusion			
25	15	Disc Diffusion			

MIC = Minimal Inhibition Concentration

Question 16: Which antibiotics did you use in this collaborative study ?

Table 15 Antibiotics and manufacturers tested by NRLs and ENLs

Lab	Company	AMC	AMP	CEF	CHL	CIP	ENR	FLO	GEN	KAN	NAL	NEO	STR	SXT	TMP
1	Bect.-Dick.	+	+	+	+	+	+	+	+	+	+	+	+	+	-
2	Bect.-Dick.	+	+	+	+	+	-	-	+	+	+	+	+	-	+
3	Bect.-Dick.	+	+	+	+	+	+	-	+	+	+	+	+	+	+
4	Trek	+	+	-	+	+	-	+	+	+	+	+	+	+	+
6	Oxoid	+	+	-	-	+	-	-	+	-	+	-	-	+	-
7	VetMIC	+	+	-	+	-	+	+	+	-	+	+	+	-	+
8	Oxoid	+	+	+	+	+	-	-	+	+	+	-	+	-	+
9	BBL	+	+	+	+	+	-	-	+	-	+	+	+	+	+
10	Oxoid	+	+	+	+	+	+	-	+	+	+	+	+	+	+
11	Various	+ (O)	+ (A)	-	+ (O)	+ (L)	+ (O)	-	-	+ (BB)	+ (A)	+ (O)	-	+ (O)	+ (A)
12	Biorad	+	+	+	+	-	+	+	-	+	+	-	+	+	+
13	Oxoid + VetMIC	+	+	+	+	+	+	+ (R)	+	-	+	+	+	+	+
14	Biorad	+	+	+	+	+	+ (B)	-	+	+	+		+	+	+
15	Trek	-	+	+	+	+	-	+	+	-	+	+	-	-	+
16	Biomerieux	+	+	+	+	+	-	-	+	-	+	+	+	+	+
17	AB Biodisk	+	+	-	+	-	-	-	-	-	-	-	+	+	-
18	Oxoid	+	+	-	+	+	+	-	+	+	+	-	+	+	+
19	Trek	+	+	-	+	+	-	+	+	-	+	+	+	+	+
20	Oxoid	+	+	+	+	+	-	-	+	+	+	-	+	-	+
21	Biomerieux	+	+	+	+	+	+	+	+	+	+	+	+	+	-
22	Bect.-Dick.	+	+	+	+	-	+	+	+	+	+	-	+	+	+
23	Oxoid	+	+	-	+	+	+	+ (M)	+	+	+	-	+	+	-
24	AB Biodisk	+	+	+	+	-	-	-	-	-	+	-	-	+	+
25	Oxoid	+	+	+	+	+	-	-	+	+	+	-	+	+	+
A	Biorad	+	+	+	+	+	-	+ (M)	+	+	+	-	+	+	+
B	??	+	+	+	+	+	-	-	+	+	+	-	+	+	+
C	Oxoid	-	+	+	+	+	-	-	+	-	+	-	+	-	+
D	Biorad	+	-	-	+	+	-	-	+	+	+	-	+	+	+
E	Various	- (B)	+ (B)	+ (H)	+ (C)	+ (B)	-	-	+ (RA)	+ (U)	+ (S)	-	+ (G)	+ (BE)	-
F	Biorad	+	+	+	+	+	-	-	+	+	+	-	+	+	+
G	Oxoid	-	+	+	+	+	-	-	+	+	+	-	+	-	+
H	Bect.-Dick.	-	+	+	+	+	-	-	+	+	+	-	+	+	+
J	Bect.-Dick.	+	+	+	+	+	-	-	+	+	+	-	+	+	+
L	Oxoid	-	+	+	+	+	-	-	+	+	+	-	+	+	-
Q	Biomerieux	+	+	+	+	+	-	-	+	+ (O)	+ (O)	-	+ (O)	+	-
R	Trek	+	+	-	+	+	-	+	+	-	+	+	+	-	+
S	Oxoid	+	+	-	+	+	-	-	+	-	+	-	+	+	+
V	Bect.-Dick.	+	+	+	+	+	-	-	+	+	+	-	+	+	+
W	Trek	+	+	-	+	+	-	-	+	+	+	-	+	+	

(A) = Abtek ; (B) = Bayer AG ; (BB) = BBL ; (BE) = Berlin ; (C) = Cephasaar ; (G) = Grunenthal ; (H) = Hoechst ; (L) = Liofilchem ; (M) = Mast ; (O) = Oxoid ; (R) = Rosco ; (RA) = Ratiopharm ; (S) = Sigma ; (U) = Ursapharm.

5. Results

5.1 Serotyping by the NRLs-*Salmonella*

5.1.1 Evaluation per laboratory

The evaluation of the detection of O- and H-antigens and identification of the strains per laboratory are shown in Figures 1, 2 and 3 and the percentages which were correct in Figure 4.
Fifteen laboratories (labcode 1, 3, 4, 6, 7, 9, 10, 13, 14, 15, 18, 20, 21, 23 and 25) typed all O-antigens correctly. Seven laboratories (labcode 3, 13, 15, 18, 19, 20 and 24) identified all H-antigens correctly and five laboratories (labcode 13, 15, 18, 20 and 24) identified all serovar names correctly.

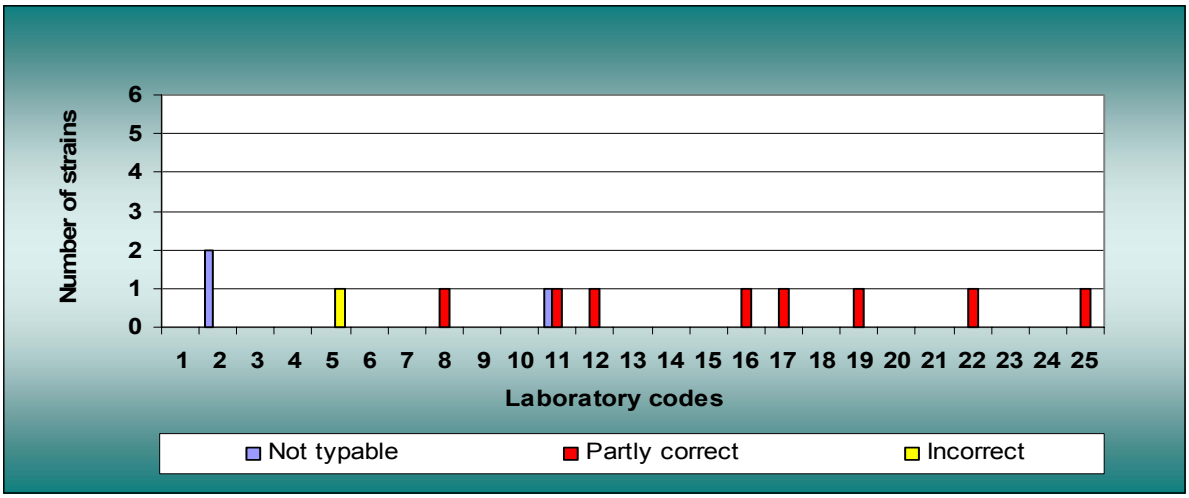


Figure 1 Evaluation of serotyping of O-antigens per NRL

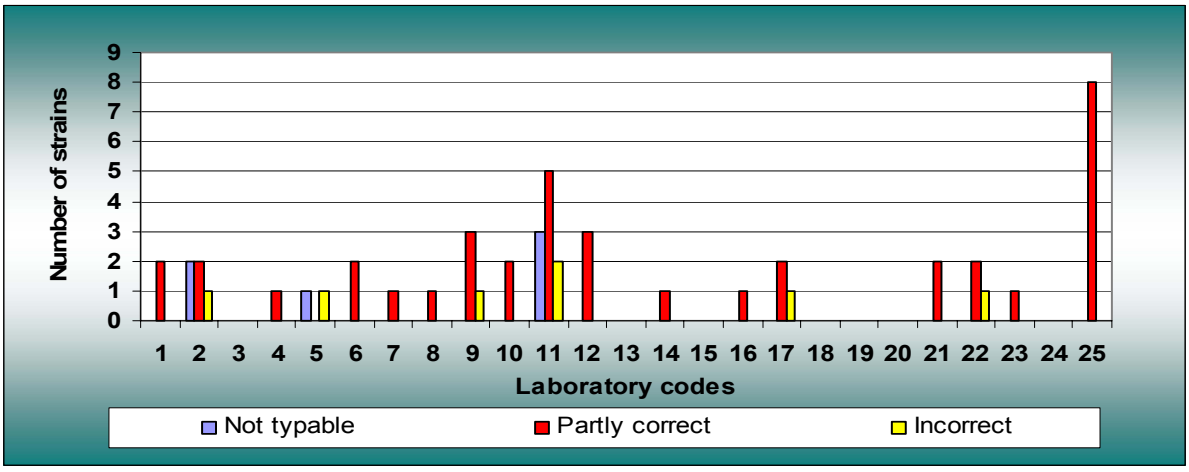


Figure 2 Evaluation of serotyping of H-antigens per NRL

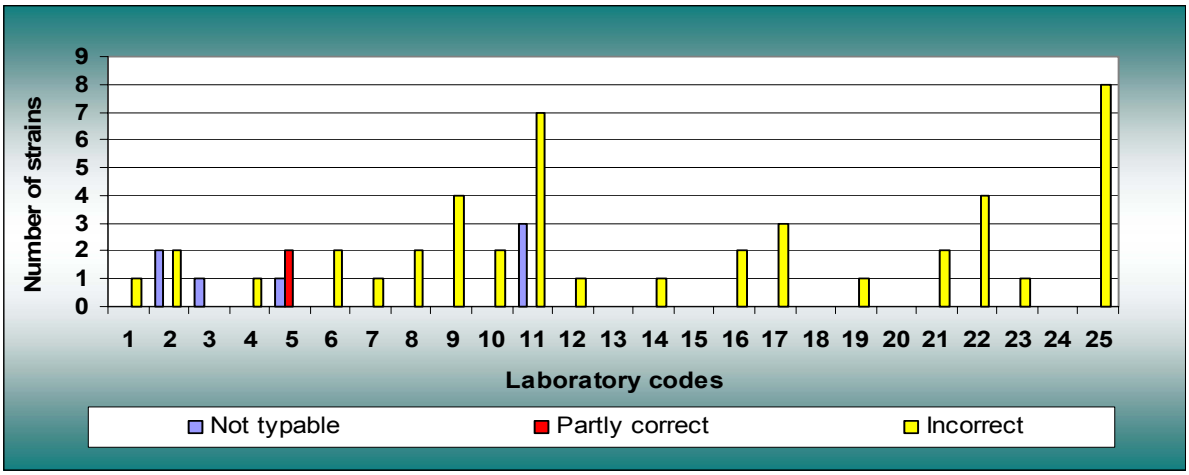


Figure 3 Evaluation of the correct serovar names per NRL

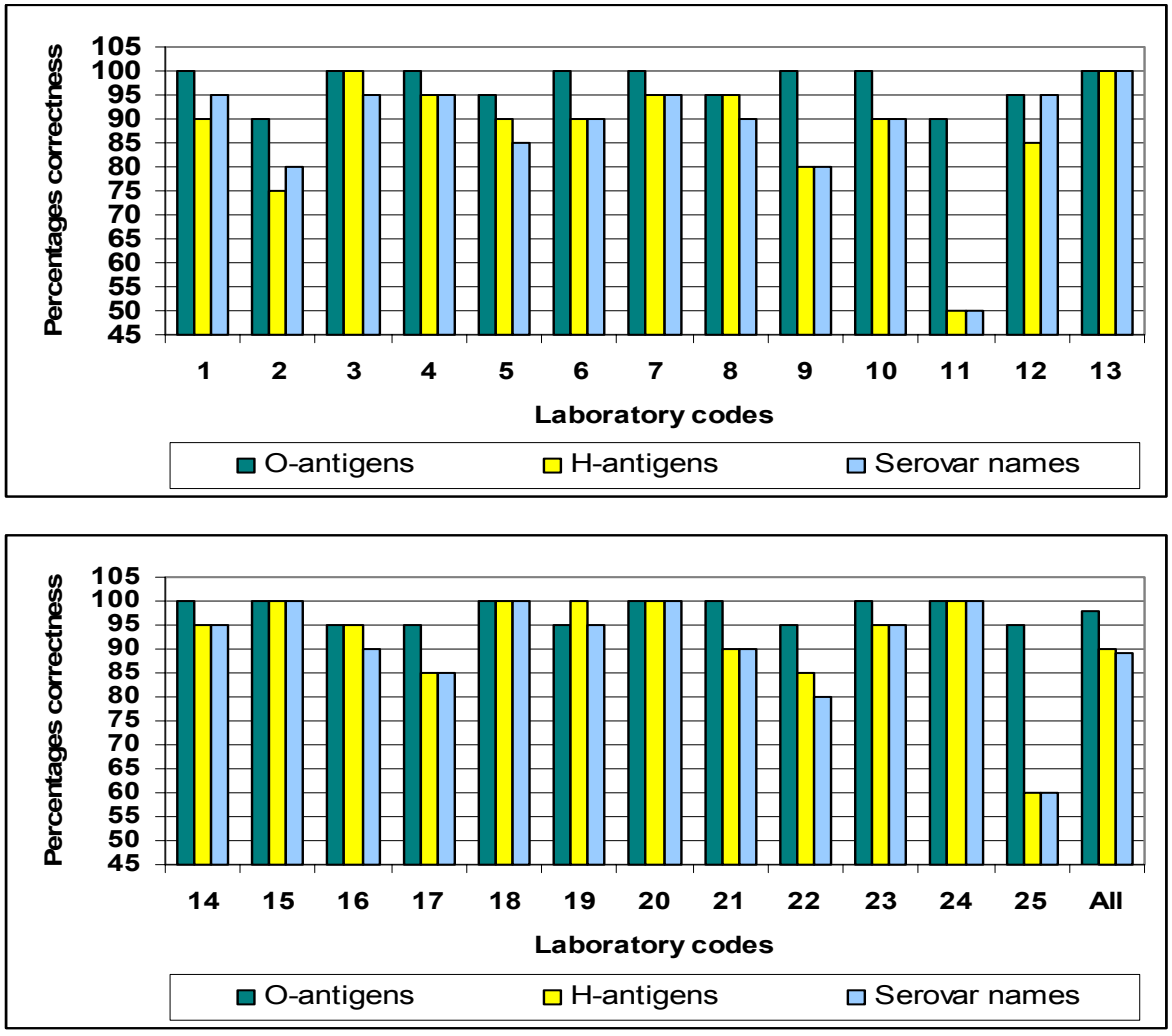


Figure 4 Achievements in percentages that were correct by NRLs

Nine-eight percent of the NRLs were able to correctly type the O-antigens. The H-antigens were typed correctly by 90 % and the serovar names by 89 % of the NRLs.

5.1.2 Evaluation per strain

The evaluation of the detection of O- and H-antigens and identification of the serovar names per strain are shown in Table 16. The O-antigens of 13 strains were typed correctly by all participants. The H-antigens were typed correctly for 4 strains by all participating laboratories. Problems arose with strains *S*. Banana (strain 1), *S*. Chester (strain 3), *S*. Albany (strain 4), *S*. Fresno (strain 9), *S*. Durban (strain 10) and *S*. Alachua (strain 16). A total correct identification by all participants was obtained for two strains (*S*. Paratyphi B and *S*. Typhimurium).

Table 16 Evaluation of the typing of strains by the NRLs

Strain		O antigen detected*				H antigen detected*				Name serovar*			
No.	Serotype	+	**nt**	+/-	-	+	**nt**	+/-	-	+	**nt**	+/-	-
1	*S*. Banana	24	0	1	0	12	0	12	1	11	1	0	13
2	*S*. Paratyphi B	25	0	0	0	25	0	0	0	25	0	0	0
3	*S*. Chester	25	0	0	0	19	0	6	0	20	0	0	5
4	*S*. Albany	25	0	0	0	21	1	3	0	22	1	0	2
5	*S*. Blockley	25	0	0	0	23	0	0	2	23	0	0	2
6	*S*. Enteritidis	25	0	0	0	23	0	2	0	23	0	0	2
7	*S*. Putten	23	1	1	0	23	1	1	0	23	1	0	1
8	*S*. Kivu	25	0	0	0	23	0	2	0	23	0	0	2
9	*S*. Fresno	24	0	1	0	21	1	0	3	21	1	1	2
10	*S*. Durban	22	0	2	1	21	0	3	1	20	0	0	5
11	*S*. Weltevreden	25	0	0	0	23	0	2	0	23	0	0	2
12	*S*. Amsterdam	25	0	0	0	24	0	1	0	24	0	0	1
13	*S*. Indiana	25	0	0	0	25	0	0	0	24	0	1	0
14	*S*. Livingstone	25	0	0	0	23	0	2	0	24	0	0	1
15	*S*. Typhimurium	25	0	0	0	25	0	0	0	25	0	0	0
16	*S*. Alachua	22	2	0	1	21	3	1	0	21	3	0	1
17	*S*. Liverpool	24	0	1	0	24	0	1	0	24	0	0	1
18	*S*. Virchow	25	0	0	0	23	0	2	0	23	0	0	2
19	*S*. Infantis	25	0	0	0	24	0	1	0	24	0	0	1
20	*S*. Hadar	24	0	1	0	25	0	0	0	24	0	0	1

+ = correct; nt = not typable ; +/- = partly correct ; - = incorrect
** = The figures indicate the number of laboratories finding the relevant results (total number of labs = 25)*

The typing of strain S-1 (*S*.Banana) and especially the typing of the H-antigens caused major problems. Only twelve of the 25 NRLs typed the H-antigens correctly. Therefore, CRL-*Salmonella* asked the NRLs to indicate which antisera were used for the serotyping of this strain. Furthermore, information about manufacturer, batchnumber and results were also requested. These data are summarised in Annex 3.
The characterisations that caused major problems in serotyping by the NRLs are shown in Table 17. The empty cells in the table indicate that strains were typed correctly by the laboratories mentioned.

Table 17 Identifications per strain that caused major problems in serotyping by NRLs

	Strain 1	Strain 3	Strain 4
Labcodes	*S*. Banana 1, 4, [5], 12 ; m, t : [1, 5]	*S*. Chester 1, 4, [5], 12 ; e, h : e, n, x	*S*. Albany 8, 20 ; z_4, z_{24} : -
Labcode 1	*S*. California 4, 12 ; g, m, t : -		*S*. Albany 8, 20 ; z_4, z_{23} : -
Labcode 2			*S*. Corvali 8, 20 ; z_4, z_{32} : z_6
Labcode 3	??? 4 ; m, t : -		
Labcode 4		*S*. Sandiego 4, 12 ; e, h : e, n, z_{15}	
Labcode 6	*S*. California 4, 12 ; g, m, t : -	*S*. Sandiego 4, 12 ; e, h : e, n, z_{15}	
Labcode 7, 8, 9 and 10	*S*. California 4, 12 ; g, m, t : -		
Labcode 11	*S*. Kaapstad 4, 12 ; e, h : 7		??? 8,20 ; ???
Labcode 12	S. Banana / S. Madras 4, 5 ; g, m, t	*S*. Chester 4, 5 ; E-4 : e, n, x	
Labcode 14			*S*. Corvallis 8, 20 ; z_4 , z_{23}
Labcode 16	*S*. Madras 4, 12 ; m, t : e, n, z_{15}		
Labcode 17	*S*. Hato 4, 12, 27 ; g, m, t : -		
Labcode 21	*S*. California 4, 12 ; g, m, t : -	*S*. Sandiego 4, 12 ; e, h : e, n, z_{15}	
Labcode 22	*S*. California 4, 12 ; g, m, t : -	*S*. Chartres 1, 4, 12 ; e, h : l, w	
Labcode 23	*S*. California 4, 12 ; g, m, t : -		
Labcode 25		*S*. Abortusequi 4, 12 ; -- : e, n, x	

Table 17 Identifications per strain that caused major problems in serotyping by NRL s (continued)

Labcodes	Strain 9 *S.* Fresno 9, 46 ; z_{38} : -	Strain 10 *S.* Durban 9, 12 ; a : e, n, z_{15}	Strain 16 S. Alachua 35 ; z_4, z_{23} : -
Labcode 2			**Not typable**
Labcode 5	**O 9, 46** **9, 46 ; HMD**		**???** **OMC ; ???**
Labcode 8		***S.* Doba** **9, 46 ; a : e, n, z_{15}**	
Labcode 9		***S.* Os** **9,12 ; a : 1, 6**	
Labcode 10			***S.* Westphalia** **35 ; z_4 , z_{24}**
Labcode 11	**???** **9, - ; ???**	***S.* Westafrica** **1, 9, 12 ; e, h : 7**	**???** **O A-S ; ???**
Labcode 16		***S.* Doba** **9, 46 ; a : e, n, z_{15}**	
Labcode 17	***S.* Fresno / *S.* Wuppertal** **9, 46 ; z_{38} or z_{41}**	***S.* Lomalinda** **9, 12 ; a : e, n, x**	
Labcode 22	**S. Ouakam** **9, 46 ; z29 : -**	***S.* Doba** **9, 46 ; a : e, n, z15**	

5.2 Serotyping by the ENLs

5.2.1 Evaluation per laboratory

The evaluation of the detection of O- and H-antigens and the correctness of the serovar names are shown in Figures 5, 6 and 7 and the percentages correctness in Figure 8.
Fourteen ENLs (A, B, C, D, E, F, G, M, P, Q, R, S, T, and V) typed all O-antigens correct. Four laboratories with labcodes H, J, L and W detected the O-antigens of one or more strains partly correct.

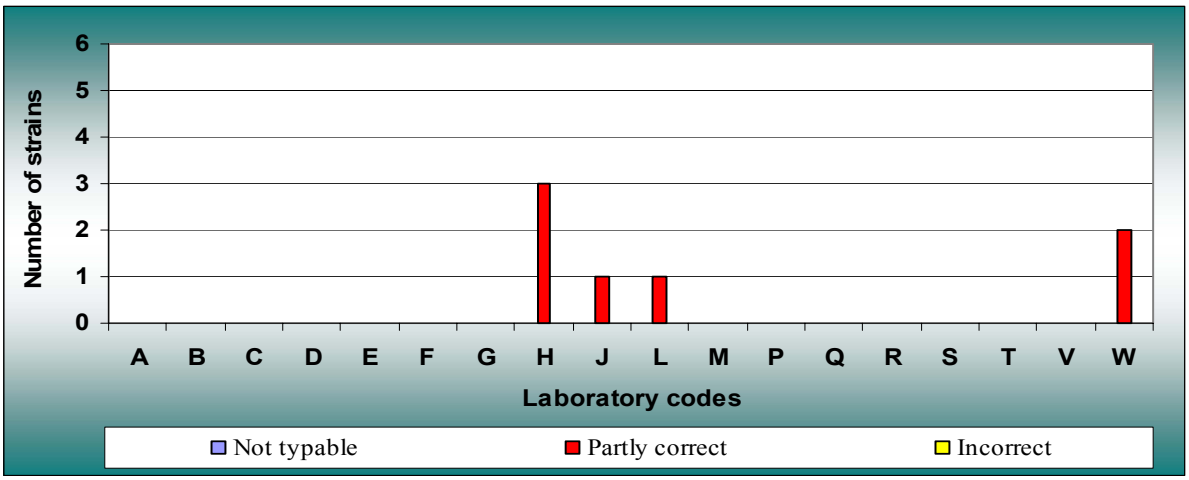


Figure 5 Evaluation of serotyping of O-antigens per ENL

Seven ENLs (labcodes A, B, D, G, L, Q and T) typed all H-antigens correctly. Eleven laboratories (labcodes C, E, F, H, J, M, P R, S, V and W) typed the H-antigens for one or two strains partly correct.

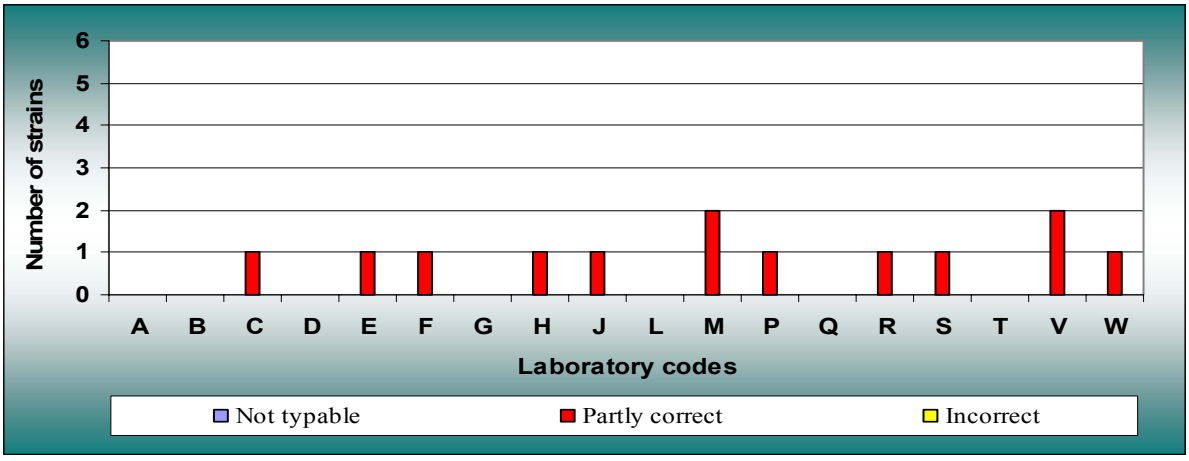


Figure 6 Evaluation of serotyping of H-antigens per ENL

Twelve laboratories namely C, E, F, H, J, L, M, P, R, S, V and W used an incorrect serovar name for one or more serovars

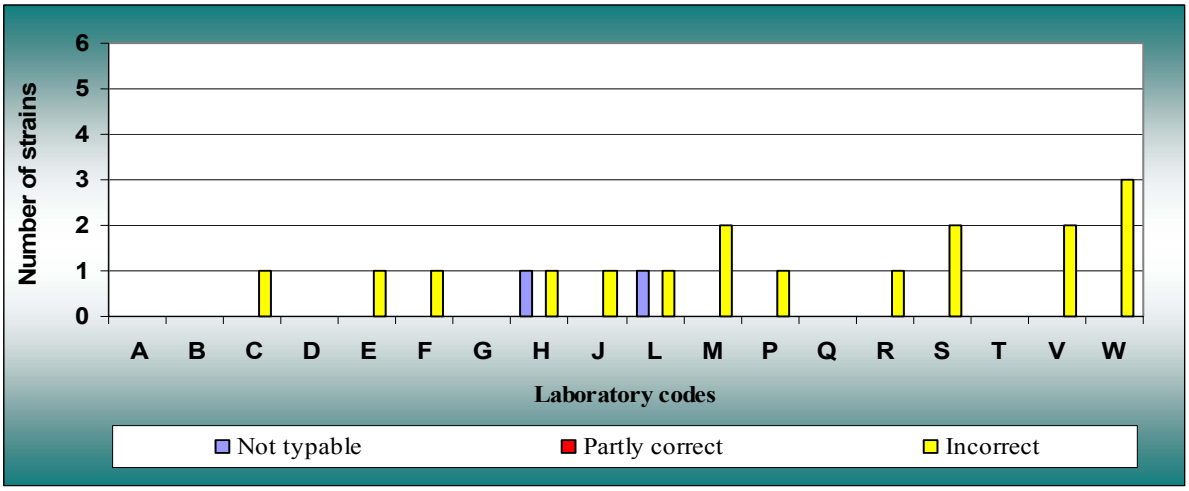


Figure 7 Evaluation of the correct serovar names per ENL

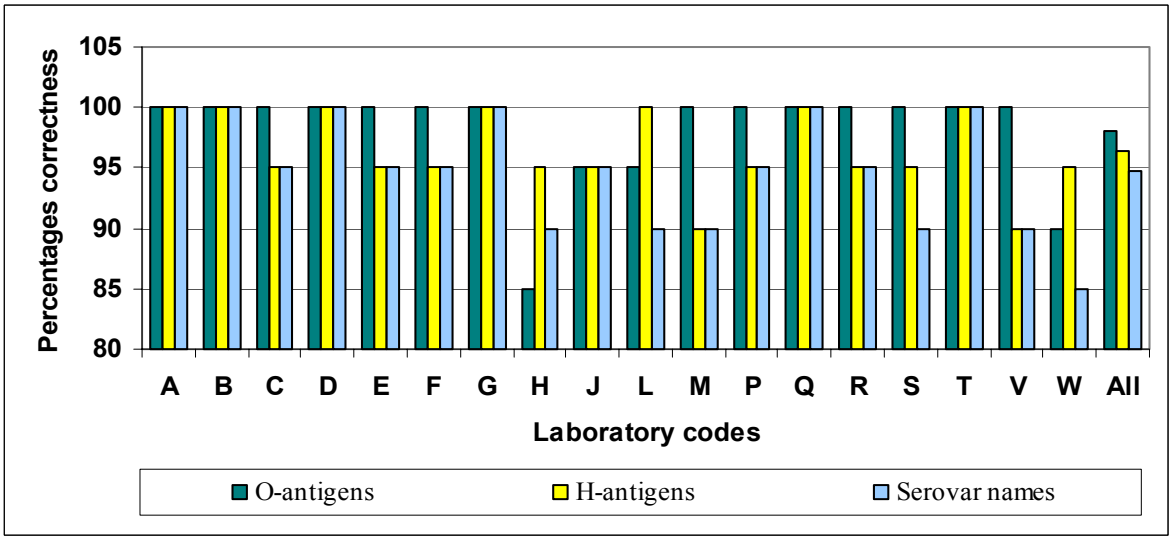


Figure 8 Achievements in percentages that were correct by ENLs

Nine-eight percent of the ENLs were able to correctly type the O-antigens. The H-antigens were typed correctly by 96 % and the serovar names by 95 % of the ENLs.

5.2.2 Evaluation per strain

Strains *S.* Paratyphi B (strain 2), *S.* Putten (strain 7), *S.* Kivu (strain 8), *S.* Weltevreden (strain 11), *S.* Indiana (strain 13), *S.* Livingstone (strain 14), *S.* Typhimurium (strain 15), *S.* Alachua (strain 16), *S.* Liverpool (strain 17), *S.* Virchow (strain 18) and *S.* Infantis (strain 19) were all typed correctly by all ENLs and are therefore not mentioned in Table 18.

Table 18 Evaluation of the typing of strains by the ENLs

Strain		O antigen detected*				H antigen detected*				Name serovar*			
No.	Serotype	+	nt	+/-	-	+	nt	+/-	-	+	nt	+/-	-
1	*S.* Banana	18	0	0	0	13	0	5	0	11	1	0	6
3	*S.* Chester	18	0	0	0	15	0	3	0	15	0	0	3
4	*S.* Albany	16	0	2	0	18	0	0	0	16	1	0	1
5	*S.* Blockley	18	0	0	0	17	0	1	0	17	0	0	1
6	*S.* Enteritidis	17	0	1	0	18	0	0	0	17	0	0	1
9	*S.* Fresno	15	0	3	0	17	0	1	0	15	0	0	3
10	*S.* Durban	18	0	0	0	17	0	1	0	18	0	0	0
12	*S.* Amsterdam	18	0	0	0	16	0	2	0	17	0	0	1
20	*S.* Hadar	17	0	1	0	18	0	0	0	17	0	0	1

+ = correct; nt = not typable ; +/- = partly correct ; - = incorrect
** = The figures indicate the number of laboratories finding the relevant results (total number of labs = 25)*

The characterisations that caused major problems (strains 1, 3 and 9) for some laboratories are shown in Table 19. The empty cells indicate that strains were typed correctly by the laboratories mentioned.

Table 19 Identifications per strain that caused major problems in serotyping by ENLs

	Strain 1	Strain 3	Strain 9
Labcodes	***S.*** **Banana** **1, 4, [5], 12 ; m, t : [1, 5]**	***S.*** **Chester** **1, 4, [5], 12 ; e, h : e, n, x**	***S.*** **Fresno** **9, 46 ; z_{38} : -**
Labcode C	***S.*** **California** **4, 12 ; g, m, t : -**		
Labcode E		***S.*** **Sandiego** **4, 12 ; e, h : e, n, z_{15}**	
Labcode F	***S.*** **California** **4, 12 ; g, m, t : -**		
Labcode H			***S.*** **Fresno** **12, 46 ; z_{38} : -**
Labcode J			***S.*** **Elomrane** **9, 12 ; z_{38} : -**
Labcode L	**???** **4, 12 ; m, t : -**		***S.*** **Elomrane** **9, 12 ; z_{38} : -**
Labcode M	***S.*** **California** **4, 12 ; g, m, t : -**		
Labcode P		***S.*** **Sandiego** **4, 12 ; e, h : e, n, z_{15}**	
Labcode S	***S.*** **Banana / *S.* California** **4, 12 ; m, t : -**	***S.*** **Sandiego** **4, 12 ; e, h : e, n, z_{15}**	
Labcode V	***S.*** **California** **4, 12 ; g, m, t : -**		***S.*** **Wuppertal** **9, 46 ; z_{41} : -**
Labcode W	***S.*** **California** **4, 12 ; g, m, t : -**		

Like in earlier collaborative studies there are still ENLs having problems with the detection of the antigen H:g, which should be absent in strain *S.* Banana.

5.3 Results phage typing

5.3.1 Results phage typing by the NRLs-*Salmonella*

The phage-typing results of the NRLs were evaluated per strain and per laboratory and are shown in Tables 20 and 21. Seven laboratories performed phage typing for *S.* Enteritidis. Four laboratories (labcode 4, 6, 20 and 24) assigned the correct phage type for nine of the *S.* Enteritidis (SE) strains. None of the laboratories had correct results for all ten strains. Seven strains of SE (PT 1b, 1, 14b, 2, 21, 9b and 4) were typed correctly by all laboratories. Six laboratories (labcode 3, 4, 6, 19, 20 and 24) performed *S.* Typhimurium (STM) phage typing and all the laboratories assigned the correct phage types to all ten strains (PT41, 1, 104, 22, 9, 120, 208, 18, 136 and 193). Separate notations per phage and per laboratory are given in Annex 4. The achievements in percentage correctness are presented in Figure 9.

Table 20 Results of Salmonella *Enteritidis phage typing by the NRLs*

		Phage type of each laboratory						
Strain	**PT**	**3**	**4**	**6**	15	**19**	**20**	**24**
E1	**1b**	**1b**	**1b**	**1b**	**1b**	**1b**	**1b**	**1b**
E2	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**
E3	**14b**	**14b**	**14b**	**14b**	**14b**	**14b**	**14b**	**14b**
E4	**12**	**17**	**12**	**1c**	**12**	**RDNC**	**RDNC**	**17**
E5	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**
E6	**3**	**22**	**3**	**3**	**22**	**3**	**3**	**3**
E7	**21**	**21**	**21**	**21**	**21**	**21**	**21**	**21**
E8	**9b**	**9b**	**9b**	**9b**	**9b**	**9b**	**9b**	**9b**
E9	**24**	**24**	**29**	**24**	**29a**	**29**	**24**	**24**
E10	**4**	**4**	**4**	**4**	**4**	**4**	**4**	**4**

PT = Phage type; RDNC = Strains reacting with the typing phages but not conform to any of the current recognised patterns; grey cells = deviating results

Table 21 Results of Salmonella *Typhimurium phage typing by the NRLs*

		Phage type of each laboratory						
Strain	**PT**	**3**	**4**	**6**	15	**19**	**20**	**24**
M11	**41**	**41**	**41**	**41**	**NT**	**41**	**41**	**41**
M12	**1**	**1**	**1**	**1**	**NT**	**1**	**1**	**1**
M13	**104**	**104**	**104L**	**104**	**NT**	**104**	**104L**	**104**
M14	**22**	**22**	**22**	**22**	**NT**	**22**	**22**	**22**
M15	**9**	**9**	**9**	**9**	**NT**	**9**	**9**	**9**
M16	**120**	**120**	**120**	**120**	**NT**	**120**	**120**	**120**
M17	**208**	**208**	**208**	**208**	**NT**	**208**	**208**	**208**
M18	**18**	**18**	**18**	**18**	**NT**	**18**	**18**	**18**
M19	**136**	**136**	**136**	**136**	**NT**	**136**	**136**	**136**
M20	**193**	**193**	**193**	**193**	**NT**	**193**	**193**	**193**

PT = Phage Type; NT = Not Tested

5.3.2 Results phage typing by the ENLs

The phage-typing results of the ENLs are summarised in Tables 22 and 23. Thirteen laboratories performed phage typing. One laboratory (labcode E) assigned all the *S.* Enteritidis strains the correct phage type and five laboratories (labcode H, L, P, V and W) had nine correctly identified phage types. Eight laboratories (labcode A, C, D, E, L, M, P and W) assigned all the *S.* Typhimurium strains the correct phage types. Three strains of SE (PT 1b, 14b and 2) and three strains of STM (PT 104, 9 and 136) were assigned correctly by all laboratories. The achievements in percentage correctness are presented in Figure 9.

Table 22 Results of Salmonella *Enteritidis phage typing by the ENLs*

		Phage type of each laboratory												
Strain	PT	A	B	C	D	E	G	H	L	M	P	S	V	W
E1	1b	1b	1b	1b	1b	1b	1b	1b	1b	1b	1b	1b	1b	1b
E2	1	1	1	1	1b	1	1	1	1	1	1	1	1	1
E3	14b	14b	14b	14b	14b	14b	14b	14b	14b	14b	14b	14b	14b	14b
E4	12	17	17	RD NC	7a	12	RD NC	12	RD NC	NST	12	12	12	12
E5	2	2	2	2	2	2	2	2	2	2	2	2	2	2
E6	3	3	3	3	21c	3	3	3	3	3	3	22 var	3	3
E7	21	32	21	21	32	21	21	1c	21	21	21	21c	21	21
E8	9b	9b	9b	9b	RD NC	9b	9b	9b	9b	9b	9b	9b	9b	9b
E9	24	24	24	24	24	24	29	29	24	29	29a	RD NC	29	24
E10	4	4	4	4	4b	4	4	4	4	4	4	4b	4	4a

PT = Phage type; RDNC = Strains reacting with the typing phages but not conform to any of the current recognised patterns; grey cells = deviating results

Table 23 Results of Salmonella *Typhimurium phage typing by the ENLs*

		Phage type of each laboratory												
Strain	PT	A	B	C	D	E	G	H	L	M	P	S	V	W
M11	41	41	41	41	41	41	41a	40	41	41	41	40	41a	41
M12	1	1	1	1	1	1	1	1	1	1	1	1	36	1
M13	104	104	104	104	104	104	104	104	104	104	104	104	104	104
M14	22	22	22	22	22	22	165	22	22	22	22	22	22	22
M15	9	9	9	9	9	9	9	9	9	9	9	9	9	9
M16	120	120	120	120	120	120	120	120	120	120	120	110	120	120
M17	208	208	208	208	208	208	U 302	208	208	208	208	***	208	208
M18	18	18	116	18	18	18	18	18	18	18	18	RD NC	18	18
M19	136	136	136	136	136	136	136	136	136	136	136	136	136	136
M20	193	193	193 a	193	193	193	193	193	193	193	193	193	193	193

**** = Untypable; PT = Phage type; grey cells = deviating results*

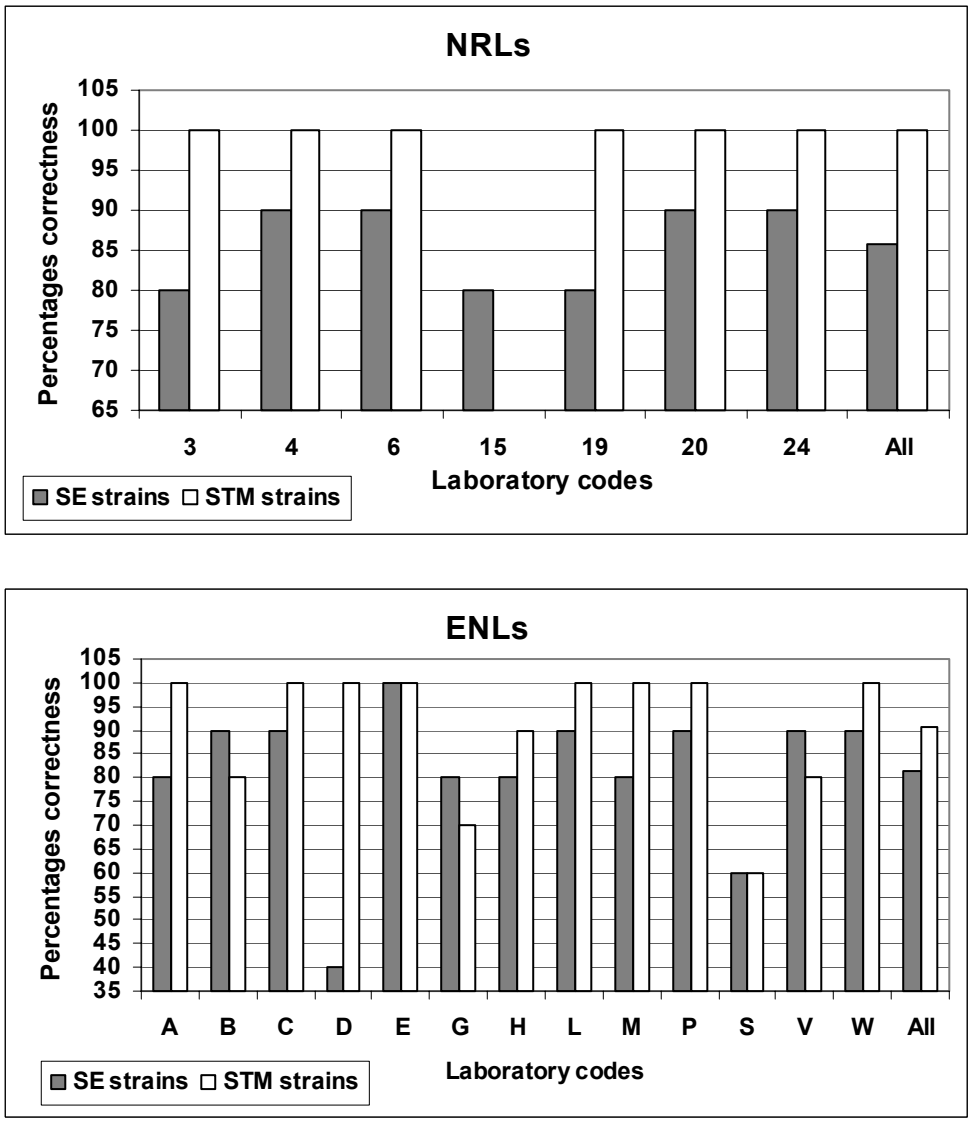


Figure 9 Achievements in percentages that were correct for NRLs and ENLs

5.4 Antimicrobial susceptibility testing

5.4.1 Results per antibiotic by NRLs and ENLs

Twenty-five NRLs and 15 ENLs tested the AST strains for susceptibility. The number of ENLs and NRLs that determined MICs with broth microdilution, Etest or disc diffusion, varied for each antibiotic and the results of all laboratories are shown in the tables of Annex 5. For those laboratories that determined MICs, the concentration is given in µg/ml. For the laboratories that used disc diffusion, the zone diameters are given in mm´s. In this Annex 5, for each AST strain the mean zone diameter, the standard deviation (SD) and 2SD level in mm´s are also given. If for a specific AST strain/antibiotic combination the zone diameter of a laboratory is within the 2SD range (mean ± 2SD ≈ 95% interval), the result is with 95% certainty not different from the results of the other laboratories. Optimally all results should vary around the mean within the 2SD ranges. If one laboratory systematically scores higher or lower than the mean or scores outside the 2SD ranges, it indicates as systematic difference in the method used.
In Annex 6 and 7, the number of errors is displayed for each AST strain.

Table 24 Serotypes and sources distributed for AST-strains

AST strains	Serotype	Source
AST-1	*S*. Hadar	Poultry
AST-2	*S*. Dublin	Cattle
AST-3	*S*. Blockley	Human
AST-4	*S*. Enteritidis	Human
AST-5	*S*. Kentucky	Human
AST-6	*S*. Livingstone	Pig
AST-7	*S*. Paratyphi B, var. Java	Poultry
AST-8	*S*. Enteritidis	Human
AST-9	*S*. Typhimurium	Human
AST-10	*S*. Muenchen	Poultry

Amoxicillin/clavanulate
All strains were susceptible to this combination except strain 9; this strain is inhibitor resistant (*AmpC*-type). However, strains 4, 5, 6 and 8 demonstrated slightly elevated reference MICs, indicative of reduced susceptibility.
Amoxicillin-clavanulate is a tricky antibiotic in susceptibility tests. The reason is that its effect on ß-lactamase producing strains (e.g. *Tem*1-positive) is based on the action of clavanulate on the ß-lactamase. This action is in fact a competition between clavanulate and the ß-lactamase for the receptor. In the test systems used the concentration of clavanulate is limited, therefore even for strains producing ß-lactamases, susceptible to clavanulate, the

MICs are often 2 - 4 dilution step higher than those for non ß-lactamase producing strains. Moreover, clavanulate is highly instable and warrants optimal handling to prevent a reduction in activity in the tests used.
The results of the ß-lactamase negative strains and the resistant strain 9 are quite satisfactory. The NRL with labcode 24 produced three minor deviations for these strains including the ATCC control strain, although according to NCCLS criteria, the strains should have been classified susceptible. On strain 9, only one minor deviation was made by NRL with labcode 12. The majority of the deviations were made on strain 5, and to a lesser extend on strains 4, 6 and 8.
Based on the results it can be concluded that the usage of amoxicillin/clavanulate in surveillance programmes will lead to an overestimation of the prevalence of inhibitor resistant strains. Because this is an indication of AmpC positiveness, it is a very relevant finding and the inclusion of this combination in surveillance programmes needs to be re-evaluated.
The zone diameters of NRL 25 were systematically smaller than the mean and the zone diameters of NRLs with labcodes 12 and 24 were systematically larger than the mean, indicating systematic differences.

Ampicillin/amoxicillin
Because of 100% cross-resistance, both ampicillin and amoxicillin can be used. For the 10 AST strains, no deviations were produced. Two minor deviations were produced on the ATCC strain 25922 by NRLs 22 and 24, although the result of NRL 24 was within the NCCLS criteria.
The zone diameters of NRL 25, ENLs H and V were systematically smaller than the mean and the zone diameter of NRLs 6, 11, 12 and 24 and ENL with labcode C were systematically larger than the mean, indicating systematic differences. For NRL with labcode 12 all results were outside the 2SD range. This laboratory also produced a zone diameter larger than the NCCLS criteria for the ATCC strain 25922.

Cefotaxime
For cefotaxime, NCCLS describes two sets of breakpoints, one as clinical breakpoint, the second as indicator of ESBLs being present. AST 4 and 9 were resistant, both strains were ESBL-positive, all other strains were susceptible. Only on strain AST 9, minor errors were made by 10 NRLs using disc diffusion. NRL with labcode 1 classified strain 9 susceptible, although based on NCCLS criteria this laboratory should have classified it intermediate. This was probably an administrative error.
Using the breakpoint for ESBL-detection the laboratories that determined MICs made no errors, while the laboratories that determined zone diameters made 13 errors (zone ≤ 27 mm).
The zone diameters of NRLs with labcodes 1 and 25 and ENL H were systematically smaller than the mean and the zone diameter of NRLs 12 and 24 were systematically larger than the mean, indicating systematic differences. For NRL with labcode 12 most results were outside the 2SD range.

The NRL with labcode 25 produced a zone diameter smaller, and NRLs 12, 24 and ENL C produced zone diameters larger than the NCCLS criteria for the ATCC strain 25922.
The 95% interval of the zone diameters (mean ± 2SD) was quite large (app. 16 mm). This indicates that, for whatever reason, cefotaxime causes more variation in the test results than e.g. ampicillin.

Chloramphenicol
For chloramphenicol 6 AST strains were susceptible, three strains highly resistant and one strain (AST 8) demonstrated borderline susceptibility (MIC 32 µg/ml). This MIC was repeatedly determined by the CIDC. The susceptible and highly resistant strains caused no problems at all. As could be expected, for strain AST-8, 15 minor errors and 15 major errors were made.
MIC determination seemed to be more reliable than disc diffusion. Obviously, the interpretive criteria for disc diffusion prescribed by NCCLS are not accurate for strains with borderline susceptibility
The zone diameters of NRL 9, 25 and ENL H were systematically smaller than the mean and the zone diameter of NRLs 11, 12 and 24 and ENLs D, J and L were systematically larger than the mean, indicating systematic differences. For NRL with labcode 12 most results were outside the 2SD range. The NRLs with labcodes 12 and 16 and ENL C produced a zone diameter larger than the NCCLS criteria for the ATCC strain 25922.

Ciprofloxacin
For ciprofloxacin strains 2, 4, 6, 7, 9 and 10 were susceptible, strains 1, 3 and 8 demonstrated reduced susceptibility and strain 5 was highly resistant. The susceptible strains caused little problems; only one accidental error was made by NRL 11 for AST 9. AST 5 caused little problems as well, only NRL 11 and ENL L made a minor error by classifying the strain as intermediate.
As was expected most deviations could be observed for the strains that demonstrate decreased susceptibility. ENL with labcode C classified these strains three times as intermediate, obviously not using NCCLS criteria. This was also done by NRL 4 for strains AST 3 and 8. Almost all MICs of ENL E were higher than those determined by the CIDC, resulting in a minor error on strain 8. The ENL with labcode B classified strain AST 8 as resistant.
Also by laboratories using disc diffusion for the decreased susceptible strains 6 minor and 4 major errors were made.
The zone diameters of NRL with labcode 25 were systematically smaller than the mean and the zone diameters of NRL 11 and ENLs D, J and L were systematically larger than the mean, indicating systematic differences. For NRL 25 most results were outside the 2SD range, which explains one major and two minor errors made by this laboratory. This NRL produced a zone diameter smaller than the NCCLS criteria for the ATCC strain 25922.

Enrofloxacin

The CIDC only determined reference MICs for ciprofloxacin and not for enrofloxacin. Because of the close relation between the two fluoroquinolones, it can be expected that the reference MICs were similar as those for ciprofloxacin. However, because of the slightly lower potency of enrofloxacin compared to ciprofloxacin, all MICs for enrofloxacin will be one or two dilution steps higher. Because the NCCLS breakpoints are lower than those for ciprofloxacin, it can be expected that the strains with decreased susceptibility are classified as intermediate or resistant. Because of the differences in potency and the difference in breakpoints used, ciprofloxacin cannot be used as reference for enrofloxacin. Therefore, it is not possible to count the numbers of deviations made.

Again all susceptible and the highly resistant AST 5, caused no problems. Variable results were recorded for strains 1, 3 and 8. The laboratories that determined MICs classified the strains as R or I. However, according to NCCLS, NRL 7 should have classified strains 1 and 3 as intermediate. The laboratories that used disc diffusion also showed variation in the results of strains 1, 3 and 8.

The zone diameters NRL 12 were systematically larger than the mean, indicating systematic differences; most results of NRL 12 were outside the 2SD range. The results with enrofloxacin are not incorporated in the calculation of the results obtained by NRLs and ENLs for all strains and all antibiotics.

Florfenicol

For florfenicol, NCCLS gives no breakpoints and interpretive criteria for *Enterobacteriaceae.* Therefore, the MIC breakpoints for chloramphenicol are used to classify the AST strains. Strains 1-5, 7 and 10 were classified susceptible, strain 9 resistant and strains 6 and 8 intermediate. Based on the chloramphenicol criteria used, six minor errors were made on AST 6. Because the CIDC determined a MIC range for AST 8 on the borderline between S and I, both S and I were considered as correct results. Only one minor error was made by NRL 7.

The zone diameters of NRL 23 were systematically smaller than the mean and the zone diameter of NRL 12 were systematically larger than the mean, indicating systematic differences. For NRL with labcode 12 most results were outside the 2SD range. This NRL produced a zone diameter larger than the NCCLS criteria for the ATCC strain 25922.

Gentamicin

Strains AST 1-4, 6 and 7 are susceptible and AST 8-10 highly resistant to gentamicin. Strain AST 5 is also classified resistant but demonstrates a borderline MIC. For the susceptible strains, only ENL E and NRLs 13 and 25 made minor errors. Obviously, ENL E did not use NCCLS breakpoints. For the highly resistant AST 8-10 no deviating results were produced. For borderline strain AST 5, seven minor deviations were recorded, mainly by laboratories using disc diffusion.

The zone diameters of NRL 25 were systematically smaller than the mean indicating systematic differences and for this NRL all results were outside the 2SD range. This NRL also produced a zone diameter smaller than the NCCLS criteria for the ATCC strain 25922.

Kanamycin

CIDC determined MICs for kanamycin with broth microdilution. The highest concentration in the wells was 16 µg/ml, therefore strains with MICs ≥ 16 µg/ml were considered resistant. The NCCLS R breakpoint is ≥ 64, which means that CIDC did not accurately determine the resistance level of these strains. AST 9 may have had borderline susceptibility.

Strains AST 3, 6 and 8 are resistant, and AST 1, 2, 5 and 7 very susceptible and strains 4 and 10 reduced susceptible.

Except for NRL 25, no deviating results were produced on the very susceptible and highly resistant strains.

On borderline susceptible strain AST 4, 11 minor errors and 1 major error was made. The ENL with labcode E classified AST 4 intermediate, which based on NCCLS criteria, should have been susceptible. On borderline resistant strain AST 9, nine minor errors and seven very major errors were made, the latter all except one (ENL W), by laboratories using disc diffusion.

The level of the NCCLS breakpoints and the interpretive criteria derived from these breakpoints seems not entirely adequate for resistance surveillance purposes of *Salmonella*. Breakpoint MICs for the related aminoglycoside gentamicin could be more appropriate for *Salmonella* and could lead to less variation in the results from different laboratories.

The zone diameters of NRL 25 were systematically smaller than the mean and the zone diameter of NRL 12 were systematically larger than the mean, indicating systematic differences. For NRL 12 one and for NRL 25 most results were outside the 2SD range. NRL 25 produced a zone diameter smaller than the NCCLS criteria for the ATCC strain 25922.

Nalidixic acid

AST strains 2, 4, 6, 7 and 10 were susceptible, AST 9 borderline susceptible and AST 1, 3, 5 and 8 highly resistant. As could be expected the majority of the deviating results were produced for AST 9. One very major error (probably an accidental error) was made by NRL with labcode 9 on strain AST 3. Several laboratories produced minor deviating results for AST 7 and one for AST 10. The slightly elevated MIC of AST 9 was confirmed by the other laboratories determining MICs. NRL 19 classified AST 9 intermediate while using NCCLS criteria it should have been classified susceptible. ENL E made a major error on AST 9. Most laboratories using disc diffusion produced minor (n = 15) or major (n = 11) errors on AST 9. Obviously, the interpretive criteria provided by NCCLS are not accurate for borderline susceptibility.

The zone diameters of NRL 2 were systematically smaller than the mean and the zone diameter of NRLs 11 and 12 were systematically larger than the mean, indicating systematic differences. For NRL 12 most results were outside the 2SD range and this NRL 12 produced a zone diameter larger than the NCCLS criteria for the ATCC strain 25922.

Neomycin
AST strains 1, 2, 4, 5, 7, 9 and 10 were susceptible and AST strains 3, 6 and 8 were resistant to neomycin. Only a limited number of minor errors were made on AST 4 and 8. These deviating results were partly caused by variation in criteria used. AST 4 is less susceptible than the other strains and AST 8 is less resistant, which will have affected the deviations produced.
Because of the limited number of laboratories that determined the susceptibility for neomycin, a proper quantitative analysis is not possible.

Streptomycin
Unlike last year when 8 out of 10 AST strains were susceptible to streptomycin, this year all but one (AST 4) were resistant. On the AST strains with MICs ≥ 64 μg/ml, no deviating results were produced. On the two strains with MIC 32 μg/ml, 11 minor errors were made, partly due to difference in criteria used. Like last year, the susceptible strain AST 4 caused a lot of variety in the results. The deviations based on MIC determinations were partly due to differences in breakpoints. The mean zone diameter for AST 4 (13.7 ± 1.8 mm) indicates that disc diffusion is very inaccurate. Even for susceptible strains, only very small zones of inhibition were recorded.
Streptomycin is included in antibiotics panels for *Salmonella* resistance surveillance, because it is a marker for the *Salmonella* Genomic Island 1 (SG1), present in DT104. Both the results of 2003 and 2004 indicate that using the R breakpoint ≥ 32 μg/ml would only incidentally lead to deviating results. Using ≤ 11 mm as criterium for resistance in disc diffusion is also quite adequate. The I-criteria, both for MIC determinations and for disc diffusion should be omitted.
Because all but one AST strain was resistant resulting in 6 mm zone diameter for a majority of the cases, a correct quantitative analysis is not possible. Therefore, the results with streptomycin are not used for the calculation of the results obtained by NRLs and ENLs for all strains and all antibiotics.

Sulphamethoxazole + trimethoprim
Bacteria are resistant to this combination if they are resistant to both trimethoprim and sulphamethoxazole. This was only the case for AST 6. AST 2, 5, 8, 9 and 10 were resistant to sulphamethoxazole only, and AST 7 was resistant to trimethoprim only. For sulphonamides and trimethoprim it is very difficult to determine endpoints adequately because the growth media may contain thymine/thymidine, that antagonise the activity of these drugs. Endpoints should be determined at 80% growth inhibition. This is difficult to standardise. In broth microdilution, this means the endpoint should be determined at the well or tube with any growth reduction compared to the positive control. In diffusion tests, the endpoint should be determined at the point of reduced growth. For surveillance pruposis, it is advisable to test both trimethoprim and sulphamethoxazole and not the combination of these drugs.
No deviating results were produced on the resistant AST 6 and susceptible strains 1 - 5 and 10, except two minor errors on AST 5. ASTs 7 (only trimethoprim resistant) was classified

resistant (major error) by most participating laboratories, except NRL 4, 17 (minor error), 12, 22 and ENL V. Strains AST 8 and 9 (only sulpha resistant) were classified resistant or intermediate by many laboratories. For these strains, correct results were provided by NRLs 4, 17, 6, 11, 16 and ENLs W, and V.
The zone diameters of NRL with labcode 3 were systematically smaller than the mean and the zone diameter of NRLs 12, 22 and ENL N were systematically larger than the mean, indicating systematic differences. For NRL 12 some results were outside the 2SD range.
NRLs 12, 22 and 24 and ENL E (MIC) produced a zone diameter larger than the NCCLS criteria for the ATCC strain 25922.

Trimethoprim
Trimethoprim as single drug caused less deviating results than in combination with sulphamethoxazole. Only AST 6 and 7 were resistant. Seven minor and one major error were made on AST 8 and 2 minor errors on AST 9.
The zone diameters of NRL 3 were systematically smaller than the mean and the zone diameter of NRL 24 and ENL C were systematically larger than the mean, indicating systematic differences. For NRL 24 most results were outside the 2SD range. This NRL and ENL C produced a zone diameter larger than the NCCLS criteria for the ATCC strain 25922.

5.4.2 Results MIC testing by NRLs

The quality of the categorisation results by the NRLs based on MIC determinations was good. Only 2 or 3 minor and a maximum of 4 major errors per laboratory. Most of the major errors were made on amoxicillin/clavanulate and sulphamethoxazole, two very problematic antibiotic combinations to test adequately. The level of the MICs, which is very dependent on method and dilution range used, was very similar for most antibiotics.

Table 25 Totals, minor and major errors and percentages based on MIC testing by NRLs for all strains and all antibiotics except streptomycin and enrofloxacin

Lab code	Total tests per lab	Minor error	Major error
4	110	2 (1.8%)	0
7	80	2 (2.5%)	4 (5%)
13	80	2 (2.5%)	4 (5%)
15	90	2 (2.2%)	0
17	50	2 (4%)	2 (4%)
19	90	3 (3.3%)	0
For all NRLs	500	13 (2.6%)	10 (2%)

5.4.3 Results MIC testing by ENLs

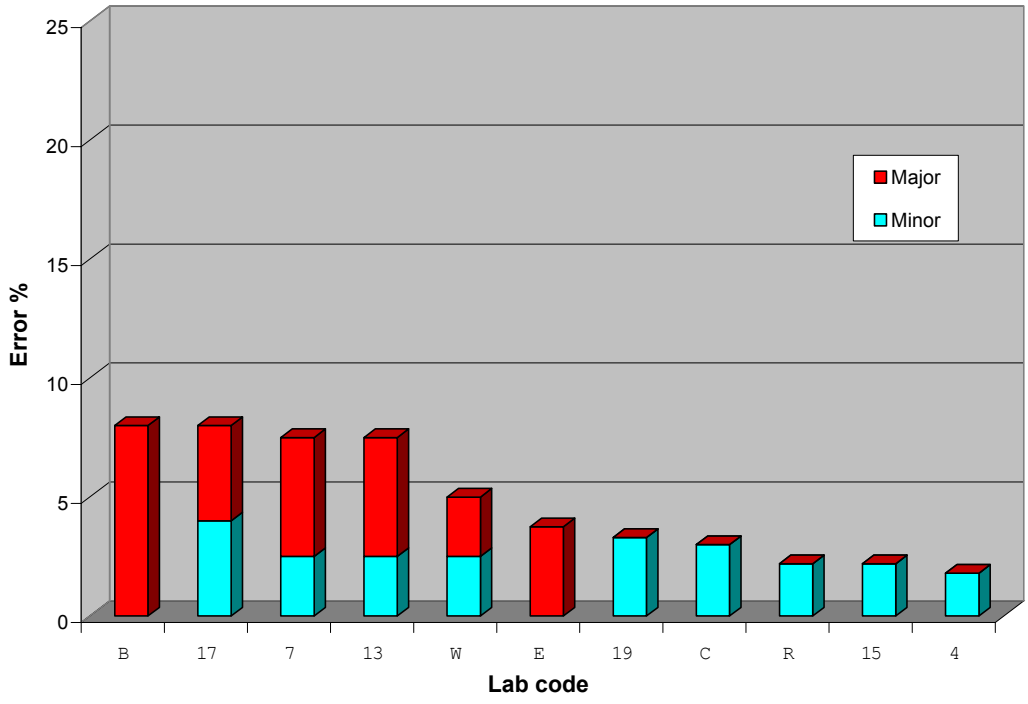
The quality of the categorisation results of the ENLs based on MICs was good. The percentage of minor errors varied from 0 – 8.75%, the percentage of major errors varied from 0 – 8%. The majority of the errors were made on trimethoprim/sulphamethoxazole.

Table 26 *Totals, minor and major errors and percentages of results of MIC testing by ENLs for all strains and all antibiotics except streptomycin and enrofloxacin*

Lab code	Total tests per lab	Minor error	Major error
B	100	0	8 (8%)
C*	5	3	0
E	80	7 (8.8%)	3 (3.8%)
R	90	2 (2.2%)	0
W	80	2 (2.5)	2 (2.5)
For all ENLs	355	14 (3.9)	13 (3.7%)

**5 AST strains tested based on Nal susceptibility*

Figure 10 *Percentages of minor and major errors made by NRLs and ENLs that determined MICs (except streptomycin and enrofloxacin)*



5.4.4 Results disc diffusion tests by NRLs

As was observed in 2003 the number of minor errors in the results of the NRLs that used the disc diffusion test is larger than those obtained with MIC-determinations. The interpretive criteria used to discriminate between S, I and R are derived from breakpoint MICs by regression analysis. The predictive value of these criteria varies from antibiotic to antibiotic and from bacterial species to bacterial species. Keeping that in mind, the results are of high quality. The majority of the errors were made with amoxicillin/clavanulate and with trimethoprim/sulphamethoxazole and on strains with 'borderline' susceptibility: strain AST 9 for cefotaxime, strain AST 8 for chloramphenicol, strain AST 4 for kanamycin, and strain AST 9 for nalidixic acid. For these strains the NCCLS criteria are not adequate.
The percentage of minor errors varied from 0 – 14%, the percentage of major errors varied from 0 – 5%.

Table 27 Totals, minor and major errors and percentages of results of disc diffusion testing by NRLs for all strains and all antibiotics except streptomycin and enrofloxacin

Lab code	Total tests per lab	Minor error	Major error
1	110	5 (4.5%)	5 (4.5%)
2	90	7 (7.8%	2 (2.2%)
3	110	8 (7.3%)	3 (2.7%)
6	50	0	1 (2%)
8	90	4 (4.4%)	0
9	100	5 (5%)	5 (5%)
10	110	6 (5.4%)	4 (3.6%)
11	70	5 (7.1%	2 (2.8%)
12	90	4 (4.4%)	2 (2.2%)
13	110	3 (2.7%)	4 (3.6%)
14	100	5 (5%)	3 (3%)
16	100	4 (4%)	3 (3%)
18	90	3 (3.3%)	5 (5.6%)
20	90	5 (5.6%)	3 (3.3%)
21	110	8 (7.3%)	3 (2.7%)
22	100	7 (7%)	2 (2%)
23	90	6 (6.7%)	2 (2.2%)
24	70	6 (8.5%)	4 (5.7%)
25	100	14 (14%)	5 (5%)
For all NRLs	1780	100 (5.9%)	58 (3.3%)

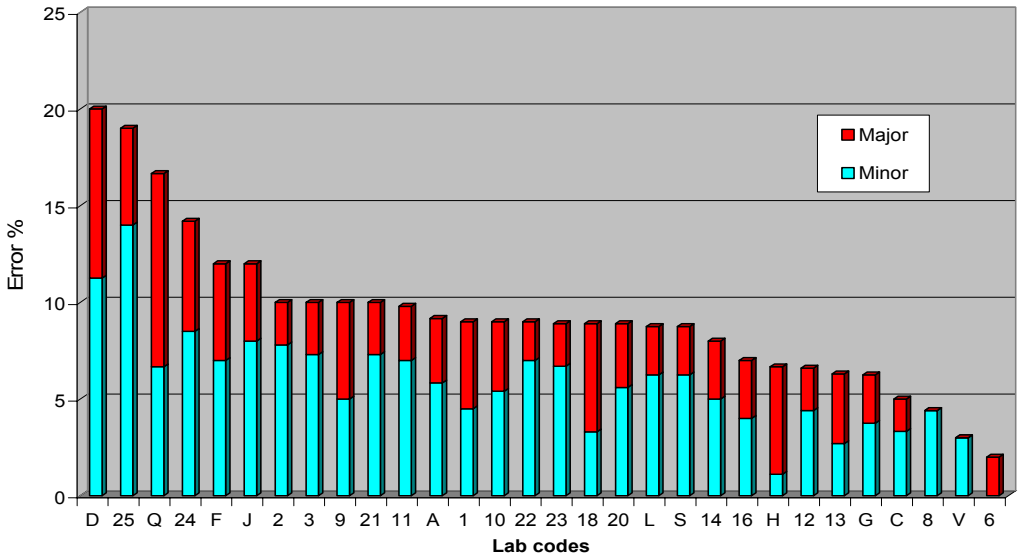
5.4.5 Results disc diffusion tests by ENLs

For the ENLs, the percentage of minor errors varied from 1 – 9%, the percentage of major errors varied from 1 – 7%.

Table 28 *Totals, minor and major errors and percentages of results of disc diffusion testing by ENLs for all strains and all antibiotics except streptomycin and enrofloxacin*

Lab code	Total tests per lab	Minor error	Major error
A	120	7 (5.8%)	4 (3.3%)
C	60	2 (3.3%)	1 (1.7%)
D	80	9 (11.3%)	7 (8.8%)
F	100	7 (7%)	5 (5%)
G	80	3 (3.8%)	2 (2.5%)
H	90	1 (1.1%)	5 (5.6%)
J	100	8 (8%)	4 (4%)
L	80	5 (6.3%)	2 (2.5%)
Q	30	2 (6.7%)	3 (10%)
S	80	5 (6.3%)	2 (2.5)
V	100	3 (3%)	0
For all ENLs	920	52 (5.6%)	35 (3.8%)

Figure 11 *Percentages of minor and major errors made by NRLs and ENLs that determined zone diameters (except streptomycin and enrofloxacin)*



6. Discussion

Serotyping

As in previous studies the serotyping of the O-antigens was performed correctly by most of the NRLs and ENLs. The detection of the H-antigens is still the most frequent occurring problem. Fourteen of the 25 NRLs and seven of the 18 ENLs had problems in serotyping of the H-antigens of strain S-1 (*S*. Banana). CRL-*Salmonella* decided to ask all NRLs for specific information about the antisera like manufacturer, batchnumber and their results with strain S-1. From the reactions of the NRLs it may be concluded that the problems were attributed to unfamiliarity with the separate parts of polyvalent antisera, non-specific reactions of monovalent antisera (i.e. g-antisera) and the discriminating capacity of mixed antisera (i.e. H: g,m antiserum versus H: g,p antiserum). Some NRLs used a polyvalent H:G serum but this antiserum is not always discriminative between g, m and m,t (or g,m,t strains). For the separation of *S*. Banana and *S*. California it is necessary to use a H:g,p antiserum that can discriminate between H:g,m and H:m,t strains. Not all manufacturers provide this information on their information leaflets. A strain which possesses the H:g factor (like *S*. California) is agglutinated by sera H:g,m and H:g,p which is not the case with strain *S*. Banana. Strain S-1, belonging to *S*. Banana but serotyped by many laboratories as *S*. California is under investigation. This investigation will be carried out together with other reference laboratories.

Another strain in this study causing problems is strain S-3, which belongs to *S*. Chester. Three NRLs and three ENLs typed this strain as *S*. Sandiego, meaning they were facing problems in the detection of H-antigens e, n, z15 (for *S*. Sandiego) instead of e,n,x (for *S*. Chester). The guidelines for the preparation of *Salmonella* antisera give a solution for the problems occurring with the typing failures of *S.* Chester. In certain cases *S*.Chester possesses antigen z17 which is also present in *S*. Sandiego. Some *S.* Chester strains do not have this antigen z17. So it is important to know whether certain antisera have the capacity of discriminating strains possessing antigen z17 or not. This information is not always given.

The O-antigens of strain S-10 (*S*. Durban) are typed by some laboratories as 9, 46 instead of 9, 12. This explains the typing of strain S-10 as *S*. Doba.

As mentioned in earlier reports the NRLs and ENLs should require from their manufacturers/suppliers certain specific information about the antisera used.

Ninety-eight percent of all participating laboratories were able to correctly type the O-antigens. The H-antigens were typed correctly by 90 % of the NRLs and by 96 % of the ENLs. Eight-nine percent of the NRLs and 95 % of the ENLs indicated correct serovar names. These findings are well acceptable in the typing of *Salmonella* strains. The NRLs scored less than the ENLs in this study and they also scored less than in the study of 2003 (correctness of 99 % for the O-antigens, 96 % for the H-antigens and 95 % for the serovar names). This can partly be explained by the fact that in the study of 2004 eight NRLs participated for the first time.

Phage typing

The strains of *S.* Enteritidis and *S.* Typhimurium for this study were from the collection of the National *Salmonella* Reference Laboratory of England and Wales. Selection was based on their occurrence in incidents and outbreaks in the European Union during 2003. The majority of problems encountered with the 2004 phage-typing study were mainly the result of misinterpretation of the phage patterns obtained.

The *S.* Enteritidis strains that gave most problems, were SE PT12 where five NRLs and seven ENLs had incorrect results and *S.* Enteritidis PT24 with three NRLs and six ENLs misidentifying this type. Strain *S.* Enteritidis PT12 has a tendency to be unstable and requires ideal typing conditions. Phage type 24 also requires typing under the standard conditions with the typing phages maintained at the routine test dilutions, otherwise variable results will occur.

The results for *S.* Typhimurium phage typing were good with all the participating NRLs and eight of the ENLs identifying all the strains correctly. The strain that gave most difficulty in its identification was STM PT41 isolated from a wild bird. However of the four laboratories who identified this phage type incorrectly three had misinterpreted their reading. All of the laboratories correctly identified STM PT136. This strain appeared in 2003 associated with travel to the Maldives.

On the whole the results were good with the majority of laboratories achieving at least 90% correct results for *S.* Enteritidis and *S.* Typhimurium. However, in 2003 the NRLs typed 93 % and the ENLs 89 % of the *S.* Enteritidis strains and respectively 97 % and 90 % of the *S.* Typhimurium strains correctly

Antimicrobial susceptibility testing

In this study the susceptibility of 10 AST strains was tested to a panel of fourteen antibiotics. Laboratories were free to choose their method, the determination of MICs by dilution methods or Etest or zone diameters by disc diffusion. Therefore the results in this report are classified according to these methods. The results of the Etest are included with those obtained with dilution methods.

The overall numbers of deviating results was larger than in 2003. The reason is that more AST strains with ‘borderline’ susceptibility were included. On these strains it can be expected to find a variety in results. Moreover, amoxicillin/clavanulate and trimethoprim/sulphamethoxazole proved to be very problematic in this respect. Amoxicillin-clavanulate is a tricky antibiotic in susceptibility tests because its effect on ß-lactamase positive strains (e.g. *Tem*1-positive) is based on the action of clavanulate on the ß-lactamase. This action is in fact a competition between clavanulate and the ß-lactamase for the receptor. In the test systems used the concentration of clavanulate is limited, therefore even for strains producing ß-lactamases, susceptible to clavanulate, the MICs are often 2 - 4 dilution step higher than those for non ß-lactamase producing strains. Moreover, clavanulate is highly instable and warrants optimal handling to prevent a reduction in activity in the tests used.

Bacteria that are resistant to trimethoprim/sulphamethoxazole are resistant to both trimethoprim and sulphamethoxazole. This was only the case for one AST strain. Five AST strains were resistant to sulphamethoxazole only, and one AST strain was resistant to trimethoprim only. For sulphonamides and trimethoprim it is very difficult to determine endpoints adequately because the growth media may contain thymine/thymidine, that antagonise the activity of these drugs. Endpoints should be determined at 80% growth inhibition. This is difficult to standardise. In broth microdilution, this means the endpoint should be determined at the well or tube with any growth reduction compared to the positive control. In diffusion tests, the endpoint should be determined at the point of reduced growth. Obviously, the two antibiotics in the combination interact on the bacteria, which make it more difficult to determine the susceptibility correctly. For surveillance purposes, it is advisable to test both trimethoprim and sulphamethoxazole and not the combination of these drugs.

The laboratories that used disc diffusion made more errors. Because the disc diffusion method is derived from the reference agar dilution method with a certain level of confidence, a larger number of errors are inevitable using disc diffusion.

Streptomycin showed a wide variability in results on the susceptible AST strain. Because no NCCLS interpretive criteria exist, the results were excluded from the summary tables. Similar as in 2003 it can be concluded that only high level resistance can be determined accurately by MIC-determination using breakpoint ≥ 32 or interpretive criterium ≤ 11 mm. Any attempt to classify strains more susceptible will inevitable lead to misinterpretations.

The results of this study shows that as reference values only MICs of the identical antibiotics can be used. E.g., Ciprofloxacin cannot reliably be used as reference for enrofloxacin; neither can neomycin be used as reference for kanamycin.

A quantitative analysis of the MICs was not possible because of the variability in concentration ranges, and methods (breakpoint-MICs and Etest) used. For the disc diffusion results a quantitative method of analysis clearly demonstrated systematic differences between laboratories.

Some laboratories determined zone diameters that were systematically smaller or larger than the mean values. If that is the case for more antibiotics, it indicated that the specific laboratory has a systematic difference in the test method compared to the other laboratories. Assuming that all laboratories use the Kirby Bauer method, an adjustment of the test conditions should be considered.

The majority of the NRLs and ENLs regularly use *E. coli* (ATCC 25922) as their control strain. In this study the results of this strain were included and deviating results were reported.

The figures in this study demonstrate that based on the AST strains distributed and antibiotics tested, less deviating results were produced by MIC determinations than by disc diffusion.

If a quality limit of 90% accuracy would have been used, all laboratories that determined MICs would have been approved; six laboratories using disc diffusion would not have complied.

7. Conclusions

Serotyping

In general, problems with the typing of the O-antigens were of minor importance except for the detection of the O-antigens of strain *S.* Durban.

The problem of the antisera to detect the correct H-antigens could be resolved by the introduction of a certain quality assurance of the ordered antisera. For this, these antisera could, for instance, be tested with the *Salmonella* strains from the CRL Interlaboratory comparison study (especially for O:6, H:x, H:z15 and H:g antigens).

In case of the typing of *S.* Banana versus *S.* California each laboratory should require information from their suppliers. This information should contain the name of the antiserum, the lotnumber, the identity of the immunising strain, the titre of the immunizing strain, the names of the absorption strain (s), the positive and negative controls and the dilution of the antiserum for the slide agglutination.

Strains that caused problems in serotyping might again be incorporated in the next interlaboratory comparison study.

Phage typing

Overall the phage typing results were good. The laboratories who have been using the *S.* Enteritidis and *S.* Typhimurium phage-typing schemes for a number of years had few problems. The predominate types occurring in Europe were identified by most of the participating laboratories. It is essential that all laboratories adhere to the standardised methods and continue to use identical phage preparations. This will enable results to be compared and outbreaks that spread over national boundaries to be investigated.

Antimicrobial susceptibility testing

The quality of susceptibility testing of NRLs and ENLs in the EU is good. Errors were mainly made on a number of strains with borderline susceptibility and on two antibiotics that proved to be very problematic in this respect.

Based on the results of this interlaboratory comparison study the value of the inclusion of streptomycin, amoxicillin/clavanulate and trimethoprim/sulphamethoxazole in monitoring programs is questionable, or the methods should be validated first.

If a quality limit of 90% accuracy would have been used, all laboratories that determined MICs would have been approved and six laboratories using disc diffusion would not have complied.

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Annex 1 Protocol

PROTOCOL OF THE NINTH COLLABORATIVE STUDY (IX, 2004) ON SERO- AND PHAGE TYPING OF SALMONELLA STRAINS AND TESTING OF ANTIMICROBIAL SUSCEPTIBILITY ORGANISED BY CRL-SALMONELLA

Introduction

The Community Reference Laboratory (CRL) - *Salmonella* organises the ninth collaborative typing study of *Salmonella* strains amongst the National Reference Laboratories for *Salmonella* (NRLs-*Salmonella*) and EnterNet laboratories (ENLs).

The main objective of this typing study is to compare the test results of sero- and phage typing and antimicrobial susceptibility testing of the participating laboratories with the results obtained by the CRL-*Salmonella*.

For the NRLs-*Salmonella* the performance of the study will take place in week 10 (starting on 1 March 2003) or one week earlier or later. For the ENLs the study will be performed a few weeks later.

All data will be reported in the study report, send to the CRL-*Salmonella* and will be used for analysis. **The data on phage typing will be send to CRL-*Salmonella* and to Linda Ward, Health Protection Agency (HPA), London, UK.**

Transportation of the *Salmonella* strains to the NRLs, - and ENLs-*Salmonella*.

CRL-*Salmonella* will mail the parcels with the strains for serotyping and antimicrobial susceptibility testing from Schiphol Airport (The Netherlands) to the airport of destination. The participants have to collect the parcels at their airport. To be able to collect the parcel from the airport you need the airway bill number. This number and other important information will be mentioned in an e-mail which will be send to you one week (= week 8) before mailing the parcels. The transport costs from the airport of destination to the laboratory can not be paid by the CRL-*Salmonella*, so this will be at the expense of the participant. The shipment of the strains for phage typing to the NRLs and the shipment of all strains to the ENLs will be arranged by Linda Ward, HPA, London, UK.

Serotyping

In this study a total number of 20 *Salmonella* strains (numbered S-1 till S-20), supplied by the CRL-*Salmonella*, are serotyped. The method routinely performed in your laboratory will be used in this study. Each laboratory is allowed to send strains for serotyping to another reference laboratory in their country.
The results will be evaluated by the CRL-*Salmonella*. Definite conclusions can only be based on agglutination with mono-specific antisera. Otherwise it is better to identify the strains by giving the antigenic formula as far as detected. The evaluation of the serotyping results will be performed according to Table 1.

Table 1: Guidelines for evaluation

Results	Evaluation	Abbreviation
Autoagglutination or Incomplete set of antisera (outside range of antisera)	Not typable	NT
Partly typable due to incomplete set of antisera or Part of the formula (for the name of the serovar) or No name serovar	Partly correct	+/-
Wrong serovar or mixed sera formula	Incorrect	-

Phagetyping
The laboratories will receive a parcel containing 20 *Salmonella* cultures (supplied by HPA, London) for phage typing:

- 10 strains of *S*. Enteritidis numbered E1-E10
- 10 strains of *S*. Typhimurium numbered M11-M20

The evaluation of the phage typing results will be done in collaboration with Linda Ward, HPA, London, UK.

Antimicrobial susceptibility testing

The laboratories will receive 10 strains (different from the ones used for sero- and phage typing) for antimicrobial susceptibility testing. These strains are numbered from AST-1 till AST-10 and are to be tested according to **NCCLS guidelines** with one of the following methods: Minimal Inhibition Concentration (MIC) or disc diffusion method.

The strains should be tested against the following antibiotics:

1. Amoxicillin + clavulanate (30 µg)
2. Ampicillin (10 µg),
3. Cefotaxime (30 µg),
4. Chloramphenicol (30 µg),
5. Ciprofloxacin (5 µg) or Enrofloxacin (5 µg)
6. Florfenicol (30 µg),
7. Gentamicin (10 µg),
8. Kanamycin (30 µg) or neomycin (30 µg),
9. Nalidixic Acid (30 µg),
10. Streptomycin (10 µg),
11. Sulfamethoxazole + Trimethoprim (23,75 + 1,25 µg),
12. Trimethoprim (5 µg).

The numbers between brackets are the concentratiopns of antibiotics in the discs. The same antibiotics may be tested with the MIC if this method is your method of choice. If you do not have discs with the specified amount please omit this antibiotic from your list.

If you have questions or remarks about the collaborative study please contact:

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Timetable of the ninth collaborative study (2004) on sero- and phage typing and antimicrobial susceptibility testing.

Week	Date	Topic
5	26-30 January	Mailing of the protocol and test report 2004 (to NRLs and ENLs)
8	16-20 February	The airway bill number and other important information will be mentioned in an e-mail which will be send to you in this week (only NRLs)
9	23-27 February	Mailing the strains to the participants (NRLs) After arrival at the laboratory the strains need to be subcultured and stored until the performance of the typing. If the parcel has not arrived at the airport on 28 February, please do contact the CRL immediately.
10	1-5 March	Starting with the identification of the strains.
12	15-19 March	Completion of the test report. Sending of the complete report to the CRL by e-mail. The original test report will be send to the CRL by mail. Send the results of the phage typing also to HPA, London (o*nly printed versions of the test report will be accepted).* **Deadline for NRLs: End of March 2004** **Deadline for ENLs: End of April 2004**
13	22-26 March and onwards	A printed version of the individual results will be send to all NRLs and ENLs by CRL. Checking of the results on this printed version will be done by the NRLs and ENLs. NRLs and ENLs will inform CRL whether their results are correct. If CRL does not receive a reaction within one week after receipt of the printed version the CRL will consider the results as correct.

N.B. For the ENLs the data in the time table may be one or two weeks later.

Annex 2. Testreport

TEST REPORT

COLLABORATIVE TYPING STUDY OF *SALMONELLA* STRAINS AND ANTIMICROBIAL SUSCEPTIBILITY TESTING 2004

NINTH FOR THE NATIONAL REFERENCE LABORATORIES AND SIXTH FOR THE ENTERNET LABORATORIES

Laboratory code	
Name contact person	
Name of laboratory	
Name department and/or institute	
Address	
Country	
Is your laboratory accredited or certified for the serotyping, phagetyping or resistance testing. If yes, according to which system ? If no, are you planning to be accredited or certified in the near future.	

Please write your remarks and comments on page 9 of the test report !!

GENERAL QUESTIONS

Shipment of serotyping strains	
Was your parcel damaged at arrival ?	❑ NO ❑ YES
Date of receipt at your laboratory	…… - …… - 2004

Shipment of phagetyping strains	
Was your parcel damaged at arrival ?	❑ NO ❑ YES
Date of receipt at your laboratory	…… - …… - 2004

Subculturing

Medium used for subculturing the strains	Name…….. Manufacturer……..

QUESTIONS SEROTYPING

What was the frequency of serotyping of *Salmonella* at your laboratory in 2003 ?	❑ Daily ❑ Once a week ❑ Twice a week ❑ Thrice a week ❑ Weekly ❑ Monthly
How many *Salmonella* strains did your laboratory serotype in 2003 ?	Number of strains:……..
What kind of sera do you use ?	❑ Prepared in own laboratory ❑ Commercial sera Manufacturer(s): …… …….
Is your laboratory the veterinary or human reference laboratory for typing *Salmonella* strains in your country ?	❑ YES, Veterinary ❑ YES, Human ❑ YES, Both ❑ NO, the name and address of the reference laboratory is:…… …… ……
The strains in this collaborative study were serotyped by:	❑ Own laboratory, Strain……... ❑ Other laboratory, namely…… …… …… Strains:…… …… …… ……

TEST RESULTS SEROTYPING

Labcode	……
Starting date of serotyping	…… - …… - 2004
Finishing date of serotyping	…… - …… - 2004

Strain no.	O-antigens detected	H-antigens detected	Serovar
S-1			
S-2			
S-3			
S-4			
S-5			
S-6			
S-7			
S-8			
S-9			
S-10			
S-11			
S-12			
S-13			
S-14			
S-15			
S-16			
S-17			
S-18			
S-19			
S-20			

QUESTIONS PHAGE TYPING

Does your laboratory perform phage typing of the following strains ?	❑ *Salmonella* Typhimurium ❑ *Salmonella* Enteritidis ❑ Other(s)…… ……
Which typing system is used for:	❑ *Salmonella* Typhimurium ……. ❑ *Salmonella* Enteritidis …….
How many strains did your laboratory phage type in 2003 ?	Number of strains……...

TEST RESULTS PHAGETYPING

Labcode	……
Starting date of typing	…… - …… - 2004
Finishing date of typing	…… - …… - 2004

		Phages reactions at Routine Test Dilution (*S.*Enteritidis)															
QA number	Phage type	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
E1																	
E2																	
E3																	
E4																	
E5																	
E6																	
E7																	
E8																	
E9																	
E10																	

TEST RESULTS PHAGETYPING

Labcode	……
Starting date of phagetyping	…… - …… - 2004
Finishing date of phagetyping	…… - …… - 2004

		Phages at Routine Test Dilution (*S.* Typhimurium)																
QA number	Phage type	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**
M11																			
M12																			
M13																			
M14																			
M15																			
M16																			
M17																			
M18																			
M19																			
M20																			

		Phages at Routine Test Dilution (*S.* Typhimurium)												Additional phages				
QA number	Phage type	**20**	**21**	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**32**	**35**		**1**	**2**	**3**	**10**	**18**
M11																			
M12																			
M13																			
M14																			
M15																			
M16																			
M17																			
M18																			
M19																			
M20																			

O*: O pooled
(<)CL: clear lysis
(<)OL: opaque lysis
SCL: semi confluent lysis
<< : Merging plaques towards semi-confluent lysis

QUESTIONS ANTIMICROBIAL SUSCEPTIBILITY TESTING (AST)

Do you use a standard method for susceptibility testing, eg NCCLS)	Disc:
	MIC:
Which control strain(s) do you use ?	Disc:
	MIC:
What is the concentration of the inoculum in bacteria per ml ?	Disc:
	MIC:
How many strains were tested for susceptibility in your lab in 2003 ?	

Which antibiotics did you use in this collaborative study ?

Antibiotic	Abbreviation	Disc load (µg)	Manufacturer	Breakpoints/ interpretive criteria used (R/I/S)	Range used in MIC determination
Amox/clavulanate	**AMC**				
Ampicillin	**AMP**				
Cefotaxime	**CEF**				
Chloramphenicol	**CHL**				
Ciprofloxacin	**CIP**				
Enrofloxacin	**ENR**				
Florfenicol	**FLO**				
Gentamicin	**GEN**				
Kanamycin	**KAN**				
Nalidixic Acid	**NAL**				
Neomycin	**NEO**				
Streptomycin	**STR**				
Sulfamethoxazole + Trimethoprim	**SXT**				
Trimethoprim	**TMP**				

RESULTS ANTIMICROBIAL SUSCEPTIBILITY TESTING (AST)

Labcode	……
Starting date of AST	…… - …… - 2004
Finishing date of AST	…… - …… - 2004

Please fill in the diameter of the inhibition zones in mm if your method is disc diffusion and the MIC-value if your method of choice is the Minimal Inhibition Concentration and include your interpretation according to your criteria between brackets (R, I, or S)

Antibiotic	AST-1	AST-2	AST-3	AST-4	AST-5	AST-6	AST-7	AST-8	AST-9	AST-10	ATCC 25922
AMC											
AMP											
CEF											
CHL											
CIP											
ENR											
FLO											
GEN											
KAN											
NAL											
NEO											
STR											
SXT											
TMP											

REMARKS AND COMMENTS

Name of person(s)carring out the typing	
Date and signature	

Name of person in charge	
Date and signature	

Annex 3. Serotyping reactions of NRLs for strain S-1

Labcode	Serovar	Antiserum	Manufacturer	Batch	Result
1	*S*. California	m, t	Home-made	Not reported	+
		g, m, s	Home-made	Not reported	+
		g, p, u	Home-made	Not reported	+
		m	Sifin	Not reported	+
		t	Sifin	Not reported	+
2	*S*. Banana	m	Sifin	450302	Not reported
		t	Sifin	1110700	Not reported
3	???	HMB	SSI	649C	+
		g	SSI	691D	-
		m	SSI	692F	+
		g, m	SSI	731B	+
		f	SSI	693D	-
		g, f	SSI	732A	-
		s	SSI	695C	-
		t	SSI	696D	+
		HG	Sifin	620503	-
4	*S*. Banana	g-pool	Home-made	Not reported	Not reported
		All kind of monofactor sera	Home-made	Not reported	Not reported
5	*S*. Banana	HMB	Biorad	1K0020	+
		HG	Biorad	2E0021	+
		m	Biorad	2G0022	+
		t	Dade Behring	223233	+
		g, p	Biorad	2D0019	-
6	*S*. California	g, p	Prolab	687	Not reported
		g, m	Prolab	740	±
		t	Prolab	616	+
		m	Prolab	703	+
		g, m	Sifin	10701202	Not reported
		m	Sifin	1291103	Not reported
7	*S*. California	g, p	Reagensia AB	7/99	Not reported
		p	Reagensia AB	Not reported	Not reported
		m	Reagensia AB	Not reported	Not reported
		f	Reagensia AB	Not reported	Not reported
		q	Reagensia AB	Not reported	Not reported
		s	Reagensia AB	Not reported	Not reported
		t	Reagensia AB	Not reported	Not reported
		u	Reagensia AB	Not reported	Not reported

Labcode	Serovar	Antiserum	Manufacturer	Batch	Result
8	*S*. California	Rapid 3-H (d, E, G, k)	Biostat	H398610	+
		G	Biostat	H606210	+
		m	Prolab	496	+
		t	Prolab	616	+
		Rapid 1-H (b, d, E, r)	Biostat	H484110	-
		Rapid 2-H (b, E, k, l)	Biostat	H415810	-
		s	Prolab	725	-
		f	Prolab	625	-
9	*S*. California	Not reported	Not reported	Not reported	Not reported
10	*S*. California	HG	Denka-Seiken	86-206A	+
		g, p	Imuna	Not reported	+
		f, g	Imuna	Not reported	+
		m	Biorad	2G0022	+
		p	Biorad	3A0019	-
		t	Denka-Seiken	38-307A	+
		f	Denka-Seiken	38-307A	-
11	*S*. Kaapstad	Not reported	Not reported	Not reported	Not reported
12	*S*. Banana or	HMB	Biorad	1K0020	+
	S. Madras	G	Biorad	2E0021	+
		g, m	Biorad	2M2022	+
		g, p	Biorad	1C0018	-
		m	Biorad	2G0022	+
		p	Biorad	1M0018	-
13	*S*. Banana	g, p	Reagensia AB	7/99	+
		g, p	SSI	732 A-1	-
		p	Reagensia AB	24/88	-
		m	Reagensia AB	26/99	+
		t	Reagensia AB	13/00	+
		s	Reagensia AB	24/90	-
		z15	Reagensia AB	6/91	-
		H5	Reagensia AB	14/90	-
14	*S*. Banana	G	Sifin	690502	+
		m	Sifin	450302	+
		t	Prolab	616	+
15	*S*. Banana	G	Home-made	Not reported	+
		g	Home-made	Not reported	-
		m	Home-made	Not reported	+
		t	Home-made	Not reported	+

Labcode	Serovar	Antiserum	Manufacturer	Batch	Result
16	*S*. Madras	HMB	Biorad	2F0021	+
		G	Biorad	2E0021	+
		m	Biorad	3K2023	+
		p	Biorad	9F016	-
		g, p	Biorad	9H017	-
		f	SSI	691D	-
		s	SSI	695C	-
		t	SSI	696D	+
		u	SSI	697C	-
		q	SSI	694B	-
		E	Biorad	2D0014	+
		z15	SSI	706F	+
17	*S*. Hato	HMB	Biorad	K0020	Not reported
		H-G	Biorad	E0021	Not reported
		H-m	Dade Behring	223835	Not reported
		H-t	Dade Behring	223233	Not reported
		H-g, p	Dade Behring	224227	Not reported
18	*S*. Banana	HMG	SSI	861B-1	Not reported
		f, g	Immunolab	505	Not reported
		g, p	Immunolab	975	Not reported
		m	Immunolab	837	Not reported
		t	Immunolab	881	Not reported
19	*S*. Banana	G	SSI	842A	+
		g, p	SSI	732A	-
		m	SSI	692F	+
		t	SSI	696D	+
20	*S*. Banana	g, m	Home-made	Not reported	±
		m	Home-made	Not reported	+
		t	Home-made	Not reported	+
21	*S*. California	G	Difco	147474	+
		EN	Difco	30147	-
		f	Difco	147369	-
		m	Difco	111372	+
		s	Difco	165807	-
		t	Difco	150785	+
22	*S*. California	Not reported	Not reported	Not reported	Not reported

Labcode	Serovar	Antiserum	Manufacturer	Batch	Result
23	*S*. California	f, g	Murex	“old”	+
		f, g	Murex	P057511	-
		f	SSI	691D	-
		g, s, t	Murex	P125610	+
		g, m	Murex	H579510	+
		g, p	Murex	H606310	-
		g, p	Murex	P084110	-
		m	SSI	692F1	+
		m	Prolab	496	+
		m	Mast	139692	+
		t	Prolab	616	+
		g, m	Sanofi	2B0021	+
		g, p	Sanofi	2D0019	-
		g, p	Prolab	687	-
		p	SSI	693E1	-
		s	Prolab	564	-
24	*S*. Banana	HMB	Home-made	Not reported	+
		f, g	Home-made	Not reported	-
		g, m	Home-made	Not reported	-
		g, m, s	Home-made	Not reported	+
		g, p	Home-made	Not reported	+
		g, p, u	Home-made	Not reported	-
		g, q	Home-made	Not reported	-
		g, s, t	Home-made	Not reported	-
		m, t	Home-made	Not reported	+
		s	Home-made	Not reported	-
		p	Home-made	Not reported	-
		m	Home-made	Not reported	+
		t	Home-made	Not reported	+
25	*S*. Banana	m, t	Home-made	Not reported	+
		m	Home-made	Not reported	+
		t	Home-made	Not reported	+

Annex 4. Test results of phage typing per strain

Strain E 1

		Phages reactions at Routine Test Dilution (*S.*Enteritidis)															
Lab code	Phage type	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
HPA	**1b**	**ol**	**scl**	**ol**	**scl**	**ol**	**scl**	**ol**	**scl**	**ol**	**ol**	**ol**	**ol**	**ol**	**ol**	**scl**	**ol**
3	**1b**	**ol**	**++ +**	**cl**	**++ +**	**< cl**	**scl**	**scl**	**< ol**	**ol**	**ol**	**scl**	**cl**	**< cl**	**< cl**	**ol**	**< ol**
4	**1b**	**ol**	**++**	**cl**	**scl**	**cl**	**±**	**cl**	**< ol**	**+**	**< ol**	**cl**	**cl**	**cl**	**cl**	**± LL**	**< cl**
6	**1b**	**ol**	**cl**	**cl**	**ol**	**cl**	**scl**	**cl**	**ol**	**ol**	**scl**	**scl**	**cl**	**cl**	**cl**	**scl**	**ol**
15	**1b**	**ol**	**scl**	**cl**	**scl**	**cl**	**scl**	**cl**	**ol**	**cl**	**ol**	**cl**	**cl**	**cl**	**cl**	**cl**	**cl**
19	**1b**	**ol**	**scl**	**cl**	**++**	**cl**	**++**	**< cl**	**< ol**	**sol**	**< ol**	**< cl**	**cl**	**< cl**	**cl**	**scl**	**< cl**
20	**1b**	**<ol**	**++ +ns**	**cl**	**++ +ns**	**cl**	**scl**	**cl**	**<ol**	**<ol**	**<ol**	**<cl**	**cl**	**cl**	**cl**	**+I< <ss**	**<ol**
24	**1b**	**ol**	**++**	**cl**	**< ol**	**cl**	**++ +**	**scl**	**ol**	**< ol**	**±± ±**	**cl**	**cl**	**cl**	**cl**	**ol**	**ol**
A	**1b**	**scl**	**++ +**	**cl**	**++ +**	**cl**	**++**	**scl**	**scl**	**++**	**scl**	**scl**	**cl**	**cl**	**scl**	**scl**	**scl**
B	**1b**	**ol**	**scl**	**cl**	**scl**	**cl**	**scl**	**scl**	**scl**	**scl**	**scl**	**cl**	**cl**	**cl**	**cl**	**ol**	**ol**
C	**1b**	**< cl**	**< cl**	**ol**	**< cl**	**ol**	**++ +**	**scl**	**< cl**	**ol**	**scl**	**scl**	**ol**	**ol**	**scl**	**scl**	**< cl**
D	**1b**	**cl**	**cl**	**cl**	**cl**	**cl**	**cl**	**cl**	**cl**		**cl**	**cl**	**cl**	**cl**	**cl**	**cl**	**cl**
E	**1b**	**++ +n**	**++ n+ +s**	**ol**	**++ n**	**ol**	**++ +n**	**ol**	**++ +n**	**++ s+ +n**	**scl**	**scl**	**ol**	**ol**	**ol**	**ol**	**scl**
G	**1b**	**ol**	**scl**	**cl**	**scl**	**cl**	**< cl**	**cl**	**< ol**	**ol**	**scl**	**scl**	**cl**	**cl**	**cl**	**scl**	**ol**
H	**1b**	**ol**	**scl**	**cl**	**< ol**	**cl**	**++ +**	**scl**	**ol**	**ol**	**ol**	**scl**	**cl**	**scl**	**cl**	**scl**	**scl**
L	**1b**	**cl**	**scl**	**cl**	**++ + scl**	**scl**	**++ +<s cl**	**cl**	**++ +**	**scl**	**ol**	**cl**	**cl**	**cl**	**cl**	**< cl**	**< cl**
M	**1b**	**ol**	**cl**	**cl**	**ol**	**cl**	**scl**	**cl**	**ol**	**ol**	**ol**	**cl**	**cl**	**cl**	**cl**	**scl**	**scl**
P	**1b**	**ol**	**scl**	**cl**	**< ol**	**cl**	**scl**	**cl**	**ol**	**< ol**	**ol**	**cl**	**cl**	**cl**	**cl**	**cl**	**cl**
S	**1b**	**< cl**	**scl**	**cl**	**< cl**	**cl**	**ol**	**cl**	**ol**	**scl**	**ol**	**cl**	**cl**	**cl**	**cl**	**< cl**	**cl**
V	**1b**	**ol**	**++ +**	**cl**	**ol**	**cl**	**ol**	**scl**	**ol**	**< ol**	**ol**	**cl**	**cl**	**cl**	**cl**	**scl**	**cl**
W	**1b**	**ol**	**scl**	**cl**	**ol**	**cl**	**< ol**	**scl**	**ol**	**ol**	**< ol**	**scl**	**cl**	**cl**	**scl**	**scl**	**cl**

Strain E 2

		Phages reactions at Routine Test Dilution (*S.*Enteritidis)															
Lab code	Phage type	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
HPA	**1**	**ol**	**scl**	**cl**	**scl**	**cl**	**scl**	**cl**	**ol**	**ol**	**ol**	**cl**	**cl**	**cl**	**cl**	**-**	**-**
3	**1**	**ol**	**++ +**	**cl**	**++**	**cl**	**++ +**	**scl**	**< ol**	**ol**	**ol**	**scl**	**cl**	**< cl**	**< cl**	**-**	**±**
4	**1**	**ol**	**++**	**cl**	**< ol**	**cl**	**+**	**cl**	**ol**	**±±**	**ol**	**cl**	**cl**	**cl**	**cl**	**-**	**±**
6	**1**	**ol**	**cl**	**cl**	**ol**	**cl**	**scl**	**cl**	**ol**	**ol**	**cl**	**cl**	**cl**	**cl**	**cl**	**-**	**-**
15	**1**	**ol**	**scl**	**cl**	**scl**	**cl**	**scl**	**cl**	**ol**	**ol**	**ol**	**cl**	**cl**	**cl**	**cl**	**-**	**-**
19	**1**	**ol**	**scl**	**cl**	**++ +**	**cl**	**+**	**scl**	**< ol**	**sol**	**sol**	**< cl**	**cl**	**< cl**	**cl**	**-**	**-**
20	**1**	**ol**	**++ +ns**	**cl**	**sol**	**cl**	**scl**	**cl**	**ol**	**ol**	**ol**	**cl**	**cl**	**cl**	**cl**	**-**	**-**
24	**1**	**ol**	**++**	**cl**	**< ol**	**cl**	**++ +**	**cl**	**ol**	**< ol**	**scl**	**cl**	**scl**	**cl**	**cl**	**+**	**±±**
A	**1**	**ol**	**++ +**	**cl**	**++ +**	**cl**	**++**	**cl**	**scl**	**++**	**scl**	**scl**	**cl**	**cl**	**scl**	**++ ***	**++ ***
B	**1**	**ol**	**scl**	**cl**	**scl**	**cl**	**scl**	**scl**	**scl**	**scl**	**scl**	**cl**	**cl**	**cl**	**cl**	**-**	**-**
C	**1**	**ol**	**scl**	**cl**	**scl**	**cl**	**++ +**	**scl**	**ol**	**ol**	**ol**	**cl**	**cl**	**cl**	**cl**	**++**	**++ +u**
D	**1b**	**cl**	**cl**	**cl**	**cl**	**cl**	**cl**	**cl**	**RT D**		**cl**	**cl**	**cl**	**cl**	**cl**	**cl**	**cl**
E	**1**	**scl**	**++s ++ n**	**< cl**	**++ n**	**ol**	**++ +n**	**ol**	**ol**	**++ n+ +s**	**++ +n**	**scl**	**< cl**	**< cl**	**< cl**	**-**	**-**
G	**1**	**ol**	**scl**	**cl**	**< cl**	**cl**	**scl**	**cl**	**cl**	**cl**	**< ol**	**< cl**	**cl**	**cl**	**< cl**	**-**	**-**
H	**1**	**cl**	**scl**	**cl**	**< ol**	**cl**	**++ +**	**scl**	**ol**	**ol**	**scl**	**scl**	**scl**	**cl**	**cl**	**-**	**-**
L	**1**	**ol**	**scl**	**ol**	**++ + scl**	**cl**	**< scl**	**cl**	**< scl**	**scl**	**ol**	**cl**	**cl**	**cl**	**cl**	**-**	**-**
M	**1**	**ol**	**cl**	**cl**	**ol**	**cl**	**scl**	**cl**	**ol**	**ol**	**ol**	**cl**	**cl**	**cl**	**cl**	**-**	**-**
P	**1**	**ol**	**scl**	**cl**	**< ol**	**cl**	**scl**	**cl**	**ol**	**< ol**	**ol**	**cl**	**cl**	**cl**	**cl**	**-**	**-**
S	**1**	**ol**	**scl**	**cl**	**scl**	**cl**	**ol**	**cl**	**ol**	**< cl**	**ol**	**cl**	**cl**	**cl**	**cl**	**-**	**-**
V	**1**	**ol**	**++ +**	**cl**	**ol**	**cl**	**ol**	**cl**	**ol**	**< ol**	**ol**	**cl**	**cl**	**cl**	**cl**	**-**	**-**
W	**1**	**ol**	**scl**	**cl**	**ol**	**cl**	**< ol**	**< cl**	**ol**	**ol**	**< ol**	**< cl**	**cl**	**cl**	**scl**	**-**	**-**

Strain E 3

		Phages reactions at Routine Test Dilution (*S.*Enteritidis)															
Lab code	Phage type	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
HPA	**14b**	**-**	**-**	**-**	**-**	**-**	**scl**	**-**	**-**	**±**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
3	**14b**	-	-	-	-	-	++ +	-	-	±	-	-	-	-	-	-	-
4	**14b**	-	-	-	- 2	-	+	-	-	-	-	-	-	-	-	-	-
6	**14b**	-	-	-	±s	-	scl	-	-	±n	-	-	-	-	-	-	-
15	**14b**	-	-	-	±	-	scl	-	-	±	-	-	-	-	-	-	-
19	**14b**	1	-	-	2	-	++	-	-	3	-	-	-	-	-	-	-
20	**14b**	-	-	-	-	-	sol	-	-	+s m	-		-	-	-	-	-
24	**14b**	-	-	-	-	-	++ +	-	-	±	-	-	-	-	-	-	-
A	**14b**	-	-	-	-	-	++	-	-	-	-	-	-	-	-	-	-
B	**14b**	-	-	-	-	-	++ +	-	-	+	-	-	-	-	-	-	-
C	**14b**	-	-	-	±	-	++ +	-	-	+	-	-	-	-	-	-	++ +u
D	**14b**	-	-	-	-	-	++	-	-		-	-	-	-	-	-	-
E	**14b**	-	-	-	-	-	++ +n	-	-	-	-	-	-	-	-	-	-
G	**14b**	-	-	-	-	-	scl	-	-	-	-	-	-	-	-	-	-
H	**14b**	-	-	-	-	-	++ +	-	-	-	-	-	-	=	-	=	-
L	**14b**	-	-	-	±s	-	++ <s cl	-	-	++	-	-	-	-	-	-	-
M	**14b**	-	-	-	-	-	scl	-	-	-	-	-	-	-	-	-	-
P	**14b**	-	-	-	-	-	scl	-	-	-	-	-	-	-	-	-	-
S	**14b**	-	-	-	-	-	cl	-	1-5	-	-	-	-	-	-	-	-
V	**14b**	-	-	-	-	-	ol	-	-	-	-	-	-	-	-	-	-
W	**14b**	-	-	-	±S	-	< ol	-	-	±S	-	-	-	-	-	-	-

Strain E 4

		Phages reactions at Routine Test Dilution (*S.*Enteritidis)															
Lab code	Phage type	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
HPA	**12**	**-**	**scl**	**++**	**scl**	**scl**	**-**	**cl**	**-**	**ol**	**-**	**cl**	**+++**	**cl**		**-**	**-**
3	**17**	**±±±µ**	**+++**	**+L**	**±**	**scl**	**-**	**scl**	**-**	**ol**	**-**	**scl**	**++**	**<cl**	**++µ**	**-**	**-**
4	**12**	**-**	**±±s**	**±**	**scl**	**ol-4**	**-**	**cl**	**+m**	**±±**	**+m**	**cl**	**++m**	**cl**	**±±m**	**-**	**-**
6	**1c**	**ol**	**cl**	**cl**	**ol**	**cl**	**±s**	**cl**	**ol**	**ol**	**scl**	**scl**	**cl**	**cl**	**cl**	**-**	**-**
15	**12**	**-**	**scl**	**+**	**scl**	**+**	**-**	**cl**	**-**	**ol**	**-**	**cl**	**+**	**cl**	**-**	**-**	**-**
19	**RDNC**																
20	**RDNC**	**++m**	**++ns**	**<ol**	**++ns**	**<ol**	**-**	**cl**	**-**	**ol**	**+++m**	**cl.**	**scl**	**cl**	**sol**	**-**	**-**
24	**17**	**++**	**++**	**++/ol**	**<ol**	**++/ol**	**-**	**scl**	**-**	**<ol**	**-**	**scl**	**++**	**cl**	**scl**	**-**	**-**
A	**17**	**+++**	**+++**	**+++**	**+++**	**scl**	**-**	**scl**	**-**	**+**	**++***	**scl**	**+/scl**	**cl**	**+++**	**-**	**-**
B	**17**	**++**	**scl**	**++**	**scl**	**cl**	**-**	**cl**	**-**	**ol**	**-**	**cl**	**+++**	**cl**	**+++**	**-**	**-**
C	**RDNC**	**scl**	**scl**	**cl**	**ol**	**cl**	**-**	**<cl**	**scl**	**ol**	**scl**	**scl**	**cl**	**cl**	**scl**	**-**	**-**
D	**7a**	**-**	**++++**	**2p**	**+++**	**3p**	**-**	**RTD**	**-**		**-**	**RTD**	**-**	**RTD**	**-**	**-**	**-**
E	**12**	**-**	**++s**	**++l**	**++n**	**scl**	**-**	**<cl**	**-**	**++n+s**	**-**	**scl**	**++n+s**	**scl**	**-**	**-**	**-**
G	**RDNC**	**-**	**scl**	**cl**	**scl**	**cl**	**-**	**cl**	**-**	**<ol**	**-**	**scl**	**cl**	**cl**	**-**	**-**	**-**
H	**12**	**-**	**scl**	**ol**	**scl**	**-**	**scl**	**-**	**ol**	**+**	**scl**	**ol**	**cl**	**-**	**-**	**-**	**-**
L	**RDNC**	**cl**	**scl**	**++L**	**scl**	**cl**	**-**	**cl**	**±**	**ol**	**cl**	**cl**	**<cl**	**cl**	**scl**	**-**	**-**
M	**NST**	**ol**	**cl**	**cl**	**ol**	**cl**	**-**	**cl**	**ol**	**ol**	**ol**	**cl**	**cl**	**cl**	**cl**	**-**	**-**
P	**12**	**-**	**+++**	**cl**	**scl**	**cl**	**-**	**cl**	**-**	**scl**	**-**	**cl**	**cl**	**cl**	**-**	**-**	**-**
S	**12**	**-**	**<<**	**1-5**	**<<**	**ol**	**-**	**cl**	**-**	**scl**	**-**	**cl**	**1-5**	**cl**	**-**	**-**	**-**
V	**12**	**-**	**++**	**-/+++**	**ol**	**+/ol**	**-**	**<<scl**	**-**	**<ol**	**-**	**scl**	**++M**	**cl**	**-**	**-**	**-**
W	**12**	**±u**	**scl**	**+L**	**ol**	**++L**	**-**	**scl**	**±u**	**ol**	**±S**	**scl**	**++S**	**cl**	**-**	**-**	**-**

Strain E 5

		Phages reactions at Routine Test Dilution (*S.*Enteritidis)															
Lab code	Phage type	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
HPA	**2**	**ol**	**-**	**cl**	**scl**	**cl**	**scl**	**cl**	**ol**	**ol**	**ol**	**scl**	**cl**	**-**	**cl**	**-**	**-**
3	**2**	**ol**	**-**	**scl**	**++**	**++**	**scl**	**±**	**ol**	**ol**	**ol**	**±**	**scl**	**-**	**< cl**	**-**	**-**
4	**2**	**ol**	**-**	**cl**	**scl**	**cl**	**+**	**< cl**	**ol**	**< scl**	**ol**	**cl**	**cl**	**-**	**scl**	**-**	**-**
6	**2**	**ol**	**-**	**cl**	**ol**	**cl**	**scl**	**cl**	**ol**	**cl**	**cl**	**scl**	**cl**	**-**	**cl**	**-**	**-**
15	**2**	**ol**	**-**	**cl**	**scl**	**cl**	**scl**	**scl**	**ol**	**ol**	**ol**	**scl**	**cl**	**-**	**cl**	**-**	**-**
19	**2**	**ol**	**-**	**cl**	**++ +**	**cl**	**+**	**+**	**ol**	**sol**	**< ol**	**+**	**cl**	**-**	**< cl**	**-**	**-**
20	**2**	**ol**	**-**	**cl**	**++ +ns**	**cl**	**sol**	**scl**	**<ol**	**ol**	**ol**	**scl**	**cl**	**-**	**cl**	**-**	**-**
24	**2**	**ol**	**-**	**cl**	**< ol**	**cl**	**++ +**	**++ /ol**	**ol**	**< ol**	**scl**	**scl**	**cl**	**-**	**cl**	**-**	**-**
A	**2**	**ol**	**-**	**cl**	**+**	**cl**	**++**	**scl**	**ol**	**+**	**ol**	**scl**	**cl**	**-**	**cl**	**-**	**-**
B	**2**	**ol**	**-**	**cl**	**++ +**	**cl**	**++ +**	**scl**	**cl**	**ol**	**ol**	**scl**	**cl**	**-**	**cl**	**-**	**-**
C	**2**	**ol**	**-**	**cl**	**scl**	**cl**	**++ +**	**ol**	**ol**	**scl**	**ol**	**ol**	**cl**	**-**	**cl**	**-**	**-**
D	**2**	**cl**	**-**	**cl**	**cl**	**cl**	**cl**	**cl**	**cl**		**cl**	**cl**	**cl**	**-**	**cl**	**-**	**-**
E	**2**	**scl**	**-**	**< cl**	**++ n+ +s**	**< cl**	**++ +n**	**scl**	**scl**	**++ n+ s**	**scl**	**scl**	**< cl**	**-**	**< cl**	**-**	**-**
G	**2**	**ol**	**-**	**cl**	**++ +**	**cl**	**++ +**	**cl**	**ol**	**< ol**	**ol**	**++ +**	**cl**	**-**	**cl**	**-**	**-**
H	**2**	**cl**	**-**	**cl**	**ol**	**cl**	**++ +**	**scl**	**ol**	**ol**	**ol**	**scl**	**cl**	**-**	**cl**	**-**	**-**
L	**2**	**cl**	**-**	**< cl**	**scl**	**cl**	**<< scl**	**+L <cl**	**cl**	**ol**	**cl**	**+L <cl**	**cl**	**-**	**cl**	**-**	**-**
M	**2**	**ol**	**-**	**cl**	**ol**	**cl**	**scl**	**cl**	**ol**	**ol**	**ol**	**cl**	**cl**	**-**	**cl**	**-**	**-**
P	**2**	**ol**	**-**	**cl**	**ol**	**cl**	**scl**	**< cl**	**ol**	**< ol**	**ol**	**< cl**	**cl**	**-**	**cl**	**-**	**-**
S	**2**	**cl**	**-**	**< cl**	**scl**	**cl**	**< cl**	**< cl**	**ol**	**< cl**	**ol**	**scl**	**cl**	**-**	**cl**	**-**	**-**
V	**2**	**ol**	**-**	**scl**	**ol**	**cl**	**ol**	**+**	**ol**	**< ol**	**ol**	**++**	**cl**	**-**	**cl**	**-**	**-**
W	**2**	**ol**	**-**	**cl**	**ol**	**cl**	**< ol**	**scl**	**ol**	**ol**	**ol**	**ol**	**cl**	**-**	**scl**	**-**	**-**

Strain E 6

		Phages reactions at Routine Test Dilution (*S.*Enteritidis)															
Lab code	Phage type	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
HPA	**3**	**ol**	**-**	**-**	**-**	**-**	+	**-**	**ol**	**-**	**ol**	**-**	**-**	**-**	**cl**	**-**	**-**
3	**22**	**ol**	±	**-**	±	**-**	++ +	**-**	**ol**	< **ol**	**ol**	**-**	**-**	**-**	**cl**	**-**	±
4	**3**	**ol**	**-**	**-**	**-**	**-**	**-**	**-**	**ol**	**-**	**ol**	**-**	**-**	**-**	**cl**	**-**	**-**
6	**3**	**ol**	**-**	**-**	**-**	**-**	++	**-**	**ol**	**-**	**ol**	**-**	**-**	**-**	**cl**	**-**	**-**
15	**22**	**ol**	**-**	**-**	**scl**	**-**	**3**	**-**	**scl**	**ol**	**ol**	**-**	**-**	**-**	**cl**	**-**	**-**
19	**3**	**ol**	**-**	**-**	**-**	**-**	**-**	**-**	**ol**	**-**	< **ol**	**-**	**-**	**-**	**cl**	**-**	**-**
20	**3**	**ol**	**-**	**-**	**-**	**-**	**-**	**-**	**ol**	**-**	**ol**	**-**	**-**	**-**	**cl**	**-**	**-**
24	**3**	**ol**	**-**	**-**	**-**	**-**	++	**-**	**ol**	**-**	**ol**	**-**	**-**	**-**	**cl**	**-**	**-**
A	**3**	**ol**	**-**	**-**	**-**	**-**	**-**	**-**	**ol**	**-**	**scl**	**-**	**-**	**-**	**scl**	++ *	++ *
B	**3**	**ol**	**-**	**-**	**-**	**-**	+	**-**	**ol**	**-**	**ol**	**-**	**-**	**-**	**cl**	**-**	**-**
C	**3**	**ol**	**-**	**-**	**-**	**-**	**+s**	**-**	**ol**	**-**	**ol**	**-**	**-**	**-**	< **cl**	**-**	**-**
D	**21c**	**cl**	++	**-**	+	**-**	++ +	**-**	**cl**		**RT D**	**-**	**-**	**-**	++ +	++ +	**cl**
E	**3**	**scl**	**-**	**-**	**-**	**-**	**-**	**-**	**ol**	**-**	**scl**	**-**	**-**	**-**	**scl**	**-**	**-**
G	**3**	**ol**	**-**	**-**	**-**	**-**	**-**	**-**	**ol**	**-**	**ol**	**-**	**-**	**-**	**cl**	**-**	++
H	**3**	**cl**	**-**	**-**	**-**	**-**	+	**-**	**cl**	**-**	**scl**	**-**	**-**	**-**	**cl**	**-**	**-**
L	**3**	**ol**	++ <ol	**-**	±	**-**	**+s**	**-**	**scl**	**+s**	**ol**	**-**	**-**	**-**	**cl**	**-**	**-**
M	**3**	**ol**	+m	**-**	**-**	**-**	++ m	**-**	**ol**	**-**	**ol**	**-**	**-**	**-**	**cl**	**-**	**-**
P	**3**	**ol**	**-**	**-**	**-**	**-**	±	**-**	**ol**	**-**	**ol**	**-**	**-**	**-**	**cl**	**-**	**-**
S	**22 var**	< **cl**	**-**	**-**	**-**	**-**	<<	**-**	**ol**	< **cl**	**ol**	**-**	**-**	**-**	**cl**	**-**	**-**
V	**3**	**ol**	**-**	**-**	**-**	**-**	**-**	**-**	**ol**	**-**	**ol**	**-**	**-**	**-**	**cl**	**-**	**-**
W	**3**	**ol**	**-**	**-**	**-**	**-**	**±u**	**-**	**ol**	**-**	**ol**	**-**	**-**	**-**	**scl**	**-**	**-**

Strain E 7

		Phages reactions at Routine Test Dilution (*S.*Enteritidis)															
Lab code	Phage type	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
HPA	**21**	**cl**	**scl**	**-**	**scl**	**-**	**scl**	**-**	**ol**	**ol**	**ol**	**-**	**-**	**-**	**cl**	**-**	**-**
3	**21**	**ol**	**+++**	-	±	-	**+++**	-	**ol**	**< ol**	**ol**	-	-	-	**cl**	+	++
4	**21**	**ol**	+	-	**scl**	-	±	-	**ol**	+	**ol**	-	-	-	**cl**	**- 2**	±
6	**21**	**ol**	**scl**	**-**	**ol**	±±	**scl**	**-**	**ol**	**ol**	**ol**	**-**	±	**-**	**cl**	**-**	**-**
15	**21**	**ol**	**scl**	**-**	**scl**	**-**	**scl**	**-**	**ol**	**ol**	**ol**	**-**	**-**	**-**	**cl**	**-**	**-**
19	**21**	**ol**	**< cl**	**-**	**+++**	**-**	+	**-**	**< ol**	**sol**	**< ol**	**-**	**-**	**-**	**< cl**	**-**	**-**
20	**21**	**ol**	**++ ns**	-	**sol**	-	**sol**	-	**ol**	**ol**	**ol**	-	-	-	**cl**	**3s**	**±s**
24	**21**	**ol**	++	-	**< ol**	-	**+++**	-	**ol**	**< ol**	**ol**	-	-	-	**ol**	+	+
A	**32**	**ol**	**+++**	**+++**	+	**+++**	**+++**	+	**ol**	+	**ol**	-	**+++**	+	**scl**	**+++**	**+++**
B	**21**	**ol**	**scl**	-	**scl**	-	**+++**	-	**scl**	**ol**	**ol**	-	-	-	**sc**	-	-
C	**21**	**ol**	**scl**	-	**scl**	-	**+++**	-	**ol**	**ol**	**ol**	-	-	-	**< cl**	+	++
D	**32**	**cl**	**cl**	**+++**	**+++**	**cl**	**cl**	++	**cl**		**cl**	**2p**	**cl**	-	**cl**	**cl**	**cl**
E	**21**	**scl**	**++s ++ n**	-	**++ n**	-	**++ +n**	-	**ol**	**++ s+ +n**	**ol**	-	-	-	**scl**	**+s**	**4s**
G	**21**	**ol**	**+++**	-	**+++**	-	**+++**	-	**ol**	**scl**	**scl**	-	-	-	**cl**	±	++
H	**1c**	**cl**	**scl**	**< ol**	**+++**	**+++**	**+++**	±	**cl**	**ol**	**scl**	±	**+++**	++	**cl**	-	**< ol**
L	**21**	**cl**	**+++**	+	**+++**	+	**< scl**	±	**<cl**	**ol**	**cl**	±	++	++	**cl**	±	±
M	**21**	**ol**	**cl**	-	**ol**	-	**scl**	-	**ol**	**ol**	**ol**	-	-	-	**cl**	-	-
P	**21**	**ol**	**scl**	-	**< ol**	-	**scl**	-	**ol**	**< ol**	**ol**	-	**-®**	**-®**	**cl**	+	±
S	**21c**	**cl**	**scl**	-	**scl**	-	**< cl**	-	**ol**	**scl**	**cl**	-	-	-	**cl**	**scl**	**< cl**
V	**21**	**òl**	**+++**	-	**ol**	-	**ol**	-	**ol**	**< ol**	**ol**	-	-	-	**cl**	-	-
W	**21**	**ol**	**scl**	**-**	**ol**	**-**	**< ol**	**-**	**ol**	**ol**	**ol**	**-**	**-**	**-**	**< cl**	**±S**	**±S**

Strain E 8

		Phages reactions at Routine Test Dilution (*S.*Enteritidis)															
Lab code	Phage type	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
HPA	**9b**	**-**	**-**	**cl**	**-**	**cl**	**-**	**-**	**-**	**-**	**-**	**-**	**cl**	**-**	**scl**	**-**	**-**
3	**9b**	-	-	**cl**	-	**< cl**	-	-	-	-	-	-	**cl**	-	**scl**	-	-
4	**9b**	-	-	**cl**	-	**cl**	-	**- 2s**	-	-	-	**± s**	**cl**	-	**scl**	-	-
6	**9b**	-	-	**cl**	-	**cl**	-	-	-	-	-	-	**cl**	-	**scl**	-	-
15	**9b**	-	-	**cl**	-	**cl**	-	-	-	-	-	-	**cl**	-	**cl**	-	-
19	**9b**	-	-	**cl**	-	**cl**	-	**1**	**2**	-	**1**	-	**cl**	**1**	**++ +**	-	-
20	**9b**	-	-	**cl**	-	**cl**	-	-	-	-	-	-	**cl**	-	**scl**	-	-
24	**9b**	-	-	**scl**	-	**scl**	-	+	-	-	-	±	**scl**	-	**scl**	-	-
A	**9b**	-	-	**scl**	-	**ol**	-	+*	-	-	-	-	**ol**	-	**++ +**	-	-
B	**9b**	-	-	**cl**	-	**cl**	-	-	-	-	-	-	**cl**	-	**scl**	-	-
C	**9b**	-	-	**cl**	-	**cl**	-	-	-	-	-	-	**cl**	-	**++ +**	-	-
D	**RDNC**	-	+	**cl**	-	**cl**	-	++	-		-	++	**cl**	-	**2p**	-	-
E	**9b**	-	-	**< cl**	-	**< cl**	-	-	-	-	-	-	**< cl**	-	**< scl**	-	-
G	**9b**	-	-	**cl**	-	**cl**	-	-	-	-	-	-	**cl**	-	**ol**	-	-
H	**9b**	-	-	**cl**	-	**scl**	-	-	-	-	-	-	**scl**	-	**cl**	-	-
L	**9b**	-	-	**cl**	-	**cl**	-	-	-	-	-	-	**cl**	-	**++ + ol**	-	-
M	**9b**	-	-	**cl**	-	**cl**	-	-	-	-	-	-	**cl**	-	**scl**	-	-
P	**9b**	-	-	**cl**	-	**cl**	-	-	-	-	-	-	**cl**	-	**< cl**	-	-
S	**9b**	-	-	**cl**	-	**cl**	-	±	-	-	-	-	**cl**	-	**<<**	-	-
V	**9b**	-	-	**cl**	-	**cl**	-	-	-	-	-	-	**cl**	-	**++ +M**	-	-
W	9b	-	-	**cl**	-	**cl**	-	**±S**	-	-	-	**±S**	**cl**	-	**++ +u**	-	-

Strain E 9

		Phages reactions at Routine Test Dilution (*S.*Enteritidis)															
Lab code	Phage type	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
HPA	**24**	-	+	-	+	-	-	-	+	**scl**	+	-	**cl**	-	-	-	-
3	**24**	-	±	-	±	-	±	-	±	++	±	-	**cl**	-	-	-	-
4	**29**	-	- **2**	-	±	-	-	-	±	- **3**	-	- **1L**	**cl**	-	-	-	-
6	**24**	-	±±	-	++	±	±	-	±±	**scl**	±±	-	**cl**	-	-	-	-
15	**29a**	-	…	-	+	-	±	-	±	+	…	-	**scl**	…	-	-	-
19	**29**	-	±	-	±	-	**2**	-	-	±	-	-	**cl**	-	-	-	-
20	**24**	-	±s	-	+s	-	±n	-	±n	**ol.**	±ns	-	**cl**	-	-	-	-
24	**24**	-	-	-	±	-	±	-	+	++	++	-	**cl**	-	-	-	-
A	**24**	-	+	-	-	-	+	-	++	+	+	-	**cl**	-	-	-	-
B	**24**	-	+	-	++	-	++	-	+	**ol**	++	-	**scl**	-	-	-	-
C	**24**	-	++ +	-	++	-	-	-	++	++ +	±	-	**cl**	-	-	-	-
D	**24**	-	+	-	++ +	**3p**	**1p**	-	**4p**		++	**1p**	**cl**	-	-	-	-
E	**24**	-	++ s	-	+s + m	-	+n +s	-	**3l+ s**	++ n+ s	+l	-	< cl	-	-	-	-
G	**29**	-	-	-	-	-	-	-	-	-	-	-	**cl**	-	-	-	-
H	**29**	-	-	-	-	=	-	-	±	-	-	-	**cl**	-	-	-	=
L	**24**	-	+s	-	±s	-	+s	-	**8l**	++ + scl	**ol**	-	**cl**	**2l**	**2s**	-	-
M	**29**	-	++	-	+	-	-	-	+	+	**scl**	-	**cl**	-	-	-	-
P	**29a**	-	-	-	+	-	-	-	+	-	±	-	**cl**	-	-	-	-
S	**RDNC**	-	-	-	-	**1-5L**	+	-	-	+	< cl	-	**cl**	-	-	-	-
V	**29**	-	-	-	-	+L	-	-	-	-	-	-	**cl**	-	-	-	-
W	**24**	-	++ S	-	< ol	-	-	**3p**	**±u**	< ol	**1p**	-	**cl**	-	-	-	-

Strain E 10

		Phages reactions at Routine Test Dilution (*S.*Enteritidis)															
Lab code	Phage type	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
HPA	**4**	**-**	**scl**	**cl**	**scl**	**cl**	**scl**	**cl**	**scl**	**ol**	**ol**	**cl**	**cl**	**cl**	**-**	**-**	**-**
3	**4**	-	±	scl	±	< cl	scl	scl	ol	ol	ol	scl	cl	< cl	-	-	-
4	**4**	-	scl	cl	ol	cl	±	cl	ol	scl	ol	cl	cl	cl	-	-	-
6	**4**	-	cl	cl	ol	cl	scl	cl	ol	ol	ol	cl	cl	cl	-	-	-
15	**4**	-	scl	cl	scl	cl	scl	cl	ol	ol	ol	cl	cl	cl	-	-	-
19	**4**	-	scl	scl	++ +	cl	+	scl	< ol	< ol	< ol	scl	cl	< cl	-	-	-
20	**4**	-	scl	<cl	sol	cl	sol	cl	ol	ol	ol	cl	cl	cl	-	-	-
24	**4**	-	++ +	scl	< ol	cl	++ +	cl	ol	ol	++ +	scl	cl	cl	-	-	-
A	**4**	-	scl	scl	scl	cl	++	cl	scl	scl	scl	scl	cl	cl	-	-	-
B	**4**	-	scl	cl	scl	cl	++ +	cl	scl	ol	ol	cl	cl	cl	-	-	-
C	**4**	-	< cl	cl	ol	cl	++ +	cl	ol	ol	ol	cl	cl	cl	-	-	-
D	**4b**	-	cl	cl	cl	cl	cl	cl	cl		cl	cl	cl	cl	-	-	cl
E	**4**	-	++ +n	ol	++ n	< cl	++ +n	< cl	ol	++ s+ +s	ol	scl	< cl	scl	-	-	-
G	**4**	-	scl	cl	++ +	cl	++ +	cl	ol	< ol	cl	< cl	cl	cl	-	-	-
H	**4**	-	cl	scl	scl	scl	++ +	scl	ol	ol	ol	scl	scl	scl	-	-	-
L	**4**	-	scl	++ + <cl	scl	cl	< scl	cl	< cl	scl	ol	cl	cl	cl	1l	-	1l
M	**4**	-	cl	cl	ol	cl	scl	cl	ol	ol	ol	cl	cl	cl	-	-	-
P	**4**	-	scl	cl	< ol	cl	scl	cl	ol	< ol	ol	cl	cl	cl	-	-	-
S	**4b**	-	scl	cl	< cl	cl	< cl	cl	ol	< cl	ol	cl	cl	cl	-	-	<<
V	**4**	-	++ +	< cl	ol	cl	ol	cl	ol	< ol	ol	cl	cl	cl	-	-	-
W	**4a**	-	< cl	< cl	ol	cl	< ol	< cl	++ +u	ol	< ol	< cl	cl	cl	-	-	-

Strain M 11 (A)

		Phages at Routine Test Dilution (*S.*Typhimurium)																	
Labcode	Phage type	1	2	3	4	5	6	7	8	10	11	12	13	14	15	16	17	18	19
HPA	**41**	cl	scl	cl	ol	cl	scl	cl	-	cl	ol	-	-	cl	cl	cl	cl	scl	ol
3	**41**	scl	<< scl	scl	scl	scl	++ +	scl	-	scl	scl	-	-	cl	cl	< cl	scl	+	++ L
4	**41**	cl	< cl	< cl	scl	scl	cl	cl	- 1	< cl	cl	-	-	cl	cl	cl	< cl	scl	< cl
6	**41**	scl	scl	cl	scl	cl	cl	cl	-	cl	cl	-	±	cl	cl	cl	cl	cl	scl
19	**41**	< cl	++ +	< cl	ol	+	< cl	< cl	2	< cl	< cl	-	-	cl	cl	cl	< cl	< cl	< cl
20	**41**	<c l	+I << ss	<c l	<o l	<c l	sol	cl	-	<c l	cl	-	-	cl	cl	cl	+I << ss	<c l	scl
24	**41**	cl	scl	cl	ol	++	cl	cl	±	cl	cl	-	-	cl	cl	cl	±±	cl	scl
A	**41**	cl	scl	cl	scl	scl	scl	scl	+	scl	+	-	+	cl	cl	cl	scl	cl	scl
B	**41**	cl	cl	cl	cl	cl	cl	cl	-	cl	cl	-	-	cl	cl	cl	cl	scl	scl
C	**41**	< cl	++ +	< cl	ol	scl	cl	scl	-	cl	cl	-	6-	cl	cl	cl	cl	scl	scl
D	**41**	RT D	RT D	++ +	++ +	++ +	RT D	cl	-	++ +	RT D	-	-	RT D	RT D	RT D	RT D	++ +	RT D
E	**41**	scl	scl	ol	< cl	scl	scl	< cl	-	< cl	< cl	-	-	ol	< cl	< cl	< cl	scl	scl
G	**41a**	cl	< cl	cl	cl	cl	< cl	cl	-	cl	cl	-	-	cl	cl	cl	< cl	< cl	cl
H	**40**	cl	scl	cl	scl	cl	scl	cl	-	cl	cl	-	±	cl	cl	cl	scl	++ +	scl
L	**41**	< cl	scl	< cl	ol	scl	cl	cl	3n	cl	cl	-	±n	cl	cl	cl	cl	cl	scl
M	**41**	cl	++ L/ scl	cl	ol	cl	scl	cl	-	cl	cl	-	+	ol	ol	cl	cl	scl	scl
P	**41**	cl	< cl	cl	cl	cl	cl	cl	-	< cl	cl	-	-	cl	cl	cl	cl	cl	cl
S	**40**	< cl	scl	< cl	ol	< cl	scl	scl	-	cl	cl	-	< cl	cl	< cl	cl	< cl	cl	scl
V	**41a**	cl	+	cl	cl	cl	ol	cl	-	++ +	cl	-	-	cl	cl	cl	++	++ +	++ +
W	**41**	< cl	ol	scl	< ol	cl	cl	cl	-	cl	cl	-	-	cl	cl	cl	< cl	scl	< cl

Strain M 11 (B)

		Phages at Routine Test Dilution (*S.*Typhimurium)												Additional phages					
Labcode	Phage type	20	21	22	23	24	25	26	27	28	29	32	35	1	2	3	10	10 var	18
HPA	**41**	cl	ol	ol	cl	cl	cl	cl	cl	-	cl	cl	ol						
3	**41**	+L	+L	scl	scl	++ +	++ +	scl	scl	±	scl	++ +	cl						
4	**41**	< cl	cl	ol	cl	< cl	scl	cl	cl	- 1	cl	< cl	ol						
6	**41**	scl	cl	cl	scl	cl	scl	cl	cl	3 L	cl	scl	ol	+	±±	±±	ol		ol
19	**41**	scl	< cl	< cl	< cl	cl	+ +	ol	ol	-	cl	scl	ol	+	++	±	ol	< ol	cl
20	**41**	<c l	scl	<c l	scl	cl	scl	<c l	cl	± n	cl	<c l	< ol	±s	+ ns	±s	< ol	< ol	cl
24	**41**	±± ±	ol	ol	cl	cl	+ +	scl	scl	±	cl	±± ±	ol	-	+ +	+	ol	ol	cl
A	**41**	scl	cl	scl	scl	cl	scl	scl	scl	+	cl	cl	sc l	+	+ +	+	scl		cl
B	**41**	scl	cl	cl	scl	scl	scl	cl	cl	-	cl	scl	cl						
C	**41**	scl	< cl	scl	cl	< cl	scl	++ +	cl	±	cl	scl	ol	-	++ +	±	ol		ol
D	**41**	++ +	RT D	++ +	RT D	++ +	++ +	++ +	RT D	-	cl	++ +	R T D						
E	**41**	scl	ol	scl	< cl	< cl	scl	ol	ol	-	< cl	scl	ol						
G	**41a**	cl	cl	cl	cl	cl	scl	cl	cl	++	cl	< cl	cl						
H	**40**	scl	scl	scl	scl	scl	++	cl	scl	±	cl	++ +	sc l	-	+	+	ol	ol	cl
L	**41**	< scl	< scl	scl	< cl	cl	< cl	scl	cl	6 L	cl	< cl	ol	±	+	+	ol		cl
M	**41**	scl	ol	ol	++ L/ scl	cl	++ L/ scl	scl	cl	-	cl	++ L/ scl	ol	+	+	+	ol		ol
P	**41**	cl	cl	cl	< cl	cl	< cl	cl	cl	3	cl	< cl	ol						
S	**40**	< cl	< cl	< cl	cl	scl	scl	< cl	< cl	-	cl	< cl	ol						
V	**41a**	scl	scl	cl	cl	cl	++ +	cl	cl	+	cl	++ +	cl						
W	**41**	cl	ol	ol	< cl	< cl	scl	< cl	cl	2P	cl	scl	ol						

Strain M 12 (A)

		Phages at Routine Test Dilution (*S.*Typhimurium)																	
Labcode	Phage type	1	2	3	4	5	6	7	8	10	11	12	13	14	15	16	17	18	19
HPA	**1**	**cl**	**cl**	**cl**	**ol**	**cl**	**cl**	**cl**	**-**	**cl**	**cl**	**ol**	**ol**	**cl**	**cl**	**cl**	**cl**	**cl**	**cl**
3	**1**	**scl**	**scl**	**scl**	**scl**	**scl**	**scl**	**scl**	**-**	**scl**	**scl**	**scl**	**scl**	**< cl**	**< cl**	**cl**	**< cl**	**++ +**	**<< scl**
4	**1**	**cl**	**cl**	**cl**	**ol**	**cl**	**cl**	**cl**	**-**	**< cl**	**cl**	**cl**	**< cl**	**cl**	**cl**	**cl**	**< cl**	**< cl**	**cl**
6	**1**	**scl**	**scl**	**cl**	**scl**	**cl**	**ol**	**cl**	**-**	**cl**	**cl**	**cl**	**cl**	**cl**	**cl**	**cl**	**cl**	**cl**	**cl**
19	**1**	**< cl**	**< cl**	**< cl**	**ol**	**scl**	**cl**	**cl**	**3**	**< cl**	**< cl**	**< cl**	**cl**	**cl**	**cl**	**cl**	**cl**	**< cl**	**< cl**
20	**1**	**cl**	**scl**	**<c l**	**cl**	**<c l**	**cl**	**cl**	**-**	**<c l**	**cl**	**<c l**	**cl**	**cl**	**cl**	**cl**	**++ n**	**<c l**	**<c l**
24	**1**	**cl**	**scl**	**cl**	**ol**	**±± ±**	**cl**	**cl**	**±**	**scl**	**scl**	**scl**	**scl**	**cl**	**cl**	**cl**	**±±**	**cl**	**scl**
A	**1**	**scl**	**scl**	**scl**	**scl**	**scl**	**++ +**	**scl**	**+**	**scl**	**scl**	**scl**	**cl**	**cl**	**cl**	**cl**	**scl**	**scl**	**scl**
B	**1**	**cl**	**cl**	**cl**	**scl**	**cl**	**cl**	**cl**	**-**	**cl**	**cl**	**cl**	**cl**	**cl**	**cl**	**cl**	**cl**	**++ +**	**scl**
C	**1**	**< cl**	**++ +**	**< cl**	**ol**	**< cl**	**cl**	**scl**	**-**	**cl**	**cl**	**cl**	**cl**	**cl**	**cl**	**cl**	**cl**	**< cl**	**cl**
D	**1**	**cl**	**cl**	**RT D**	**RT D**	**RT D**	**RT D**	**RT D**	**-**	**++**	**RT D**	**RT D**	**RT D**	**RT D**	**RT D**	**RT D**	**RT D**	**++ +**	**RT D**
E	**1**	**scl**	**ol**	**< cl**	**< cl**	**< cl**	**< cl**	**< cl**	**-**	**< cl**	**< cl**	**scl**	**< cl**	**ol**	**< cl**	**< cl**	**< cl**	**scl**	**scl**
G	**1**	**cl**	**< cl**	**cl**	**cl**	**cl**	**cl**	**cl**	**-**	**cl**	**cl**	**cl**	**cl**	**cl**	**cl**	**cl**	**cl**	**cl**	**cl**
H	**1**	**cl**	**scl**	**cl**	**scl**	**cl**	**cl**	**cl**	**-**	**scl**	**cl**	**scl**	**scl**	**cl**	**cl**	**cl**	**cl**	**scl**	**cl**
L	**1**	**< cl**	**< cl**	**< cl**	**ol**	**scl**	**cl**	**cl**	**2s**	**cl**	**cl**	**cl**	**cl**	**cl**	**cl**	**cl**	**cl**	**cl**	**cl**
M	**1**	**scl**	**++ L/ scl**	**cl**	**ol**	**cl**	**ol**	**cl**	**-**	**cl**	**cl**	**cl**	**cl**	**ol**	**cl**	**cl**	**ol**	**scl**	**ol**
P	**1**	**cl**	**cl**	**cl**	**cl**	**cl**	**cl**	**cl**	**-**	**cl**	**cl**	**cl**	**cl**	**cl**	**cl**	**cl**	**cl**	**cl**	**cl**
S	**1**	**< cl**	**< cl**	**< cl**	**ol**	**cl**	**cl**	**scl**	**1-5**	**cl**	**cl**	**cl**	**cl**	**cl**	**< cl**	**cl**	**< cl**	**< cl**	**< cl**
V	**36**	**cl**	**++**	**cl**	**cl**	**cl**	**cl**	**cl**	**++**	**++ +**	**cl**	**cl**	**cl**	**cl**	**cl**	**cl**	**scl**	**scl**	**cl**
W	**1**	**< cl**	**cl**	**scl**	**< ol**	**cl**	**cl**	**cl**	**-**	**cl**	**cl**	**scl**	**cl**	**cl**	**cl**	**cl**	**scl**	**scl**	**< cl**

Strain M 12 (B)

		Phages at Routine Test Dilution (*S.*Typhimurium)												Additional phages					
Labcode	Phage type	20	21	22	23	24	25	26	27	28	29	32	35	1	2	3	10	10 var	18
HPA	**1**	**ol**	**ol**	**cl**	**cl**	**cl**	**cl**	**cl**	**cl**	**-**	**cl**	**cl**	**cl**						
3	**1**	**+ L**	**+ L**	**< cl**	**scl**	**scl**	**scl**	**scl**	**cl**	**±**	**scl**	**scl**	**cl**						
4	**1**	**< cl**	**cl**	**ol**	**cl**	**cl**	**< cl**	**cl**	**cl**	**- 1**	**cl**	**< cl**	**ol**						
6	**1**	**cl**	**cl**	**cl**	**cl**	**cl**	**cl**	**cl**	**cl**	**3 L**	**cl**	**cl**	**ol**	**+**	**+**	**±±**	**ol**		**ol**
19	**1**	**scl**	**cl**	**< cl**	**cl**	**cl**	**scl**	**cl**	**< ol**	**-**	**cl**	**scl**	**ol**	**1**	**±**	**2**	**ol**	**< ol**	**cl**
20	**1**	**<cl**	**<cl**	**cl**	**<cl**	**cl**	**scl**	**<cl**	**cl**	**3I**	**cl**	**<cl**	**<cl**	**+s**	**++ ns**	**++ ns**	**ol**	**ol.**	**cl**
24	**1**	**scl**	**ol**	**ol**	**cl**	**cl**	**±± ±**	**ol**	**ol**	**+**	**ol**	**++ +**	**ol**	**-**	**+**	**+**	**ol**	**ol**	**ol**
A	**1**	**scl**	**scl**	**scl**	**scl**	**cl**	**scl**	**scl**	**cl**	**+**	**cl**	**scl**	**scl**	**+**	**++ +**	**++**	**scl**		**ol**
B	**1**	**++**	**cl**	**cl**	**++ +**	**scl**	**++**	**cl**	**cl**	**+**	**cl**	**scl**	**cl**						
C	**1**	**cl**	**scl**	**scl**	**cl**	**scl**	**scl**	**++ +**	**cl**	**-**	**cl**	**cl**	**ol**	**-**	**++ +**	**±**	**ol**		**ol**
D	**1**	**++ +**	**RT D**	**RT D**	**RT D**	**RT D**	**RT D**	**++ +**	**RT D**	**-**	**RT D**	**++ +**	**RT D**						
E	**1**	**scl**	**ol**	**scl**	**< cl**	**< cl**	**scl**	**scl**	**scl**	**+1**	**< cl**	**< cl**	**ol**						
G	**1**	**< cl**	**cl**	**cl**	**cl**	**< cl**	**< cl**	**cl**	**cl**	**cl**	**cl**	**cl**	**cl**						
H	**1**	**++ +**	**scl**	**scl**	**scl**	**cl**	**scl**	**cl**	**cl**	**±**	**cl**	**++ +**	**cl**	**-**	**+**	**+**	**ol**	**ol**	**cl**
L	**1**	**cl**	**< cl**	**< cl**	**< cl**	**cl**	**cl**	**scl**	**cl**	**7 L**	**cl**	**< cl**	**ol**	**±**	**+**	**±**	**ol**		**cl**
M	**1**	**scl**	**ol**	**ol**	**scl**	**cl**	**scl**	**ol**	**ol**	**-**	**ol**	**scl**	**ol**	**-**	**-**	**-**	**ol**		**ol**
P	**1**	**< cl**	**cl**	**cl**	**< cl**	**cl**	**cl**	**cl**	**cl**	**2**	**cl**	**cl**	**ol**						
S	**1**	**< cl**	**cl**	**cl**	**cl**	**< cl**	**< cl**	**< cl**	**cl**	**-**	**cl**	**< cl**	**ol**						
V	**36**	**cl**	**cl**	**cl**	**cl**	**cl**	**cl**	**cl**	**cl**	**++**	**cl**	**scl**	**cl**						
W	**1**	**< cl**	**< ol**	**ol**	**< cl**	**< cl**	**scl**	**< cl**	**cl**	**3P**	**cl**	**scl**	**ol**						

Strain M 13 (A)

		Phages at Routine Test Dilution (*S.*Typhimurium)																	
Labcode	Phage type	1	2	3	4	5	6	7	8	10	11	12	13	14	15	16	17	18	19
HPA	**104**	-	-	-	-	-	-	-	-	-	-	++	scl	-	-	-	-	+++	-
3	**104**	-	-	-	-	-	-	-	-	-	-	+L	<< scl	-	-	-	-	±	-
4	**104L**	-	-	-	-	-	-	-	-	-	-	± L L	- 4L L	-	-	-	-	± s	-
6	**104**	-	-	-	-	-	-	-	-	-	-	±L <<	±L <<	-	-	-	-	-	-
19	**104**	-	-	-	-	-	-	-	-	-	-	++	scl	-	-	-	-	++	-
20	**104L**	-	-	-	-	-	-	-	-	-	-	±n	++ n< <s s	-	-	-	-	++ ns	-
24	**104**	-	-	-	-	-	-	-	±	-	-	±± ±	++ +	-	-	-	-	±± ±	-
A	**104L**	-	-	-	-	-	-	-	-	-	-	+	++ +	-	-	-	-	++ +	-
B	**104**	-	-	-	-	-	-	-	-	-	-	cl	cl	-	-	-	-	scl	-
C	**104L**	-	-	-	-	-	-	-	-	-	-	++	++ +	-	-	-	-	++ +	-
D	**104L**	-	-	-	-	-	-	-	-	-	-	+v	+v	-	-	-	-	++	-
E	**104L**	-	-	-	-	-	-	-	-	-	-	++ l	scl	-	-	-	-	+s	-
G	**104**	-	-	-	-	-	-	-	-	-	-	scl	scl	-	-	-	-	++ +	-
H	**104H**	-	-	-	-	-	-	-	-	-	-	scl	scl	-	-	-	-	++	-
L	**104L**	-	-	-	-	-	-	-	-	-	-	< scl	scl	-	-	-	-	< scl	-
M	**104**	-	-	-	-	-	-	-	-	-	-	++ L/ scl	scl	-	-	-	-	++	-
P	**104 L**	-	-	-	-	-	-	-	-	-	-	+	±	-	-	-	-	+	-
S	**104**	-	-	-	-	-	-	-	1-5	-	-	< cl	< cl	-	-	-	-	scl	-
V	**104**	-	-	-	-	-	-	-	-	-	-	scl	scl	-	-	-	-	++	-
W	**104**	-	-	-	-	-	-	-	2P	-	-	scl	< cl	-	-	-	-	scl	-

Strain M 13 (B)

		Phages at Routine Test Dilution (*S.*Typhimurium)												Additional phages					
Labcode	Phage type	20	21	22	23	24	25	26	27	28	29	32	35	1	2	3	10	10 var	18
HPA	**104**	-	-	-	-	-	-	-	-	-	-	-	±	-	-	-	ol		-
3	**104**	-	-	-	-	-	-	-	-	-	-	-	-						
4	**104L**	-	-	-	-	-	-	-	-	-	-	-	-						
6	**104**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		ol
19	**104**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ol	< ol	-
20	**104L**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ol	ol	-
24	**104**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ol	ol	-
A	**104 L**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	scl		-
B	**104**	-	-	-	-	-	-	-	-	-	-	-	-						
C	**104 L**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ol		-
D	**104 L**	-	-	-	-	-	-	-	-	-	-	-	-		-	-	cl		-
E	**104 L**	-	-	-	-	-	-	-	-	-	-	-	-						
G	**104**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ol		-
H	**104 H**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ol	ol	ol
L	**104 L**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ol		-
M	**104**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ol		-
P	**104 L**	-	-	-	-	-	-	-	-	-	-	-	-						
S	**104**	-	-	-	-	-	-	-	-	-	-	-	-						
V	**104**	-	-	-	-	-	-	-	-	-	-	-	-						
W	**104**	-	-	-	-	-	-	-	-	-	-	-	-						

Strain M 14 (A)

		Phages at Routine Test Dilution (*S.*Typhimurium)																	
Labcode	Phage type	1	2	3	4	5	6	7	8	10	11	12	13	14	15	16	17	18	19
HPA	**22**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3	**22**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4	**22**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6	**22**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
19	**22**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
20	**22**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
24	**22**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
A	**22**	-	-	-	-	-	-	-	-	-	-	-	+*	-	-	-	-	-	-
B	**22**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C	**22**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
D	**22**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
E	**22**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
G	**165**	-	-	-	-	-	-	-	-	++ +u	±	±	-	-	-	-	-	-	-
H	**22**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
L	**22**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
M	**22**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
P	**22**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
S	**22**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
V	**22**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W	**22**	-	-	-	-	-	-	-	-	-	-	-	2 P	-	-	-	-	-	-

Strain M 14 (B)

		Phages at Routine Test Dilution (*S.*Typhimurium)												Additional phages					
Labcode	Phage type	20	21	22	23	24	25	26	27	28	29	32	35	1	2	3	10	10 var	18
HPA	**22**	-	±	cl	-	-	-	-	-	-	-	-	-						
3	**22**	-	-	< ol	-	-	-	-	-	-	-	-	-						
4	**22**	-	-	ol	-	-	-	-	-	-	-	-	-						
6	**22**	-	-	ol	-	-	-	-	-	-	-	-	-	-	-	-	-		-
19	**22**	-	-	< ol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
20	**22**	-	-	<o l	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
24	**22**	-	-	ol	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
A	**22**	-	+	scl	-	-	-	-	-	-	-	-	-	-	-	-	-		-
B	**22**	-	+	scl	-	-	-	-	-	-	-	-	-						
C	**22**	-	-	scl	-	-	-	-	-	-	-	-	-	-	-	-	-		-
D	**22**	-	1p	++ +	-	-	-	-	-	-	-	-	-						
E	**22**	-	1l	scl	-	-	-	-	-	-	-	-	-						
G	**165**	+	-	cl	-	-	-	-	-	-	-	-	-						
H	**22**	-	-	cl	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
L	**22**	-	-	< cl	-	-	-	-	-	-	-	-	-	-	-	-	1l		-
M	**22**	-	-2	ol	-	-	-	-	-	-	-	-	-	-	-	-	-		-
P	**22**	-	-	ol	-	-	-	-	-	-	-	-	-						
S	**22**	-	-	ol	-	-	-	-	-	-	-	-	-						
V	**22**	-	-	cl	-	-	-	-	-	-	-	-	-						
W	**22**	-	-	1P	ol	-	-	-	-	-	-	-	-						

Strain M 15 (A)

		Phages at Routine Test Dilution (*S.*Typhimurium)																	
Labcode	**Phage type**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**
HPA	**9**	-	-	-	-	-	-	-	cl	cl	ol	ol	ol	-	-	scl	-	-	-
3	**9**	-	-	-	-	-	-	-	+++	scl	scl	scl	scl	-	-	scl	-	-	-
4	**9**	-	-	-	-	-	-	-	< cl	cl	ol	< cl	< cl	-	-	+	-	-	-
6	**9**	-	-	-	-	-	-	-	cl	cl	cl	cl	cl	-	-	scl	-	-	-
19	**9**	-	-	-	-	-	-	-	< cl	scl	sol	scl	< cl	-	-	scl	-	-	-
20	**9**	-	-	-	-	-	-	-	<cl	<cl	<ol	<cl	<cl	-	-	<cl	1n	-	-
24	**9**	-	-	-	-	-	-	-	cl	scl	ol	scl	scl	-	-	+++	-	-	-
A	**9**	-	-	-	-	-	-	-	cl	scl	+	scl	cl	-	-	scl	-	-	-
B	**9**	-	-	-	-	-	-	-	scl	scl	+++	scl	scl	-	-	+++	-	-	-
C	**9**	-	-	-	-	-	-	-	scl	cl	scl	scl	cl	-	-	scl	-	-	-
D	**9**	-	-	-	-	-	-	-	+++	+++	+++	+++	-	-	-	+	-	-	-
E	**9**	-	-	-	-	-	-	-	scl	< cl	< cl	< cl	< cl	-	-	scl	-	-	-
G	**9**	-	-	-	-	-	-	-	cl	< cl	scl	< cl	cl	-	-	scl	-	-	-
H	**9**	-	-	-	-	-	-	-	scl	scl	scl	scl	scl	-	-	scl	-	-	-
L	**9**	-	-	-	-	-	-	-	cl	cl	< cl	ol	ol	-	-	< cl	-	-	-
M	**9**	-	-	-	-	-	-	-	scl	scl	ol	ol	ol	-	-	scl	-	-	-
P	**9**	-	-	-	-	-	-	-	cl	scl	< cl	cl	cl	-	-	< cl	-	-	-
S	**9**	-	-	-	-	-	-	-	cl	cl	ol	cl	< cl	-	-	scl	-	-	-
V	**9**	-	-	-	-	-	-	-	cl	+++	scl	cl	cl	-	-	scl	-	-	-
W	**9**	-	-	-	-	-	-	-	cl	cl	ol	< cl	cl	-	-	< cl	-	-	-

Strain M 15 (B)

		Phages at Routine Test Dilution (*S.*Typhimurium)												Additional phages					
Labcode	Phage type	20	21	22	23	24	25	26	27	28	29	32	35	1	2	3	10	10 var	18
HPA	**9**	scl	-	ol	scl	-	±	++	-	-	cl	cl	-						
3	**9**	+L	-	scl	scl	-	-	+	-	-	scl	scl	-						
4	**9**	scl	-	ol	< cl	-	- 1	+< scl	-	-	< cl	scl	-						
6	**9**	scl	2n	cl	cl	-	±	+L	-	-	ol	cl	-	+	+	+	ol		-
19	**9**	scl	-	so l	scl	-	-	++ +	-	-	cl	++ +	-	±	+	±	ol	< ol	-
20	**9**	<c l	-	cl	<c l	-	1n	± n	-	-	cl	<c l	-	+ ns	+ ns	+ ns	ol.	ol.	-
24	**9**	scl	-	ol	scl	-	-	±	-	-	cl	++	-	-	++	+	ol	ol	-
A	**9**	scl	+	scl	scl	-	+	+	-	-	cl	cl	-	+	++	++	ol		-
B	**9**	++ +	-	scl	scl	-	-	++	-	-	cl	scl	-						
C	**9**	scl	-	scl	cl	-	-	-	-	-	cl	scl	-	-	++	+	ol		-
D	**9**	++	1p	++ +	RT D	-	-	-	-	-	cl	++ +	-						
E	**9**	scl	3n	scl	scl	-	+n	+n	-	-	ol	scl	-						
G	**9**	scl	-	< cl	cl	-	-	-	-	-	cl	scl	-						
H	**9**	scl	-	scl	scl	-	-	±	-	-	cl	scl	-	±	+	+	ol	ol	-
L	**9**	cl	4n	< cl	< cl	-	2 N	3 N	-	-	cl	< cl	-	±	+	+	ol		-
M	**9**	scl	-	ol	scl	-	-	-4	-	-	cl	scl	-	+	+	+	ol		-
P	**9**	cl	-	cl	scl	-	-	±	-	-	cl	< cl	-						
S	**9**	< cl	-	< cl	< cl	-	-	-	-	-	cl	scl	-						
V	**9**	cl	-	cl	cl	-	-	+	-	-	cl	scl	-						
W	**9**	< cl	-	ol	scl	-	-	4P	-	-	cl	scl	-						

Strain M 16 (A)

		Phages at Routine Test Dilution (*S.*Typhimurium)																	
Labcode	Phage type	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**
HPA	**120**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**cl**	-
3	**120**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	++ +	-
4	**120**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	< **cl**	-
6	**120**	-	-	-	-	-	-	-	**±n**	-	-	-	-	-	-	-	-	**ol**	-
19	**120**	-	-	-	-	-	-	-	±	-	-	-	-	-	-	-	-	< **cl**	-
20	**120**	-	-	-	-	-	-	-	**3s**	-	-	-	-	-	-	-	-	**<c l**	-
24	**120**	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	**cl**	-
A	**120**	-	-	-	-	-	-	-	++	-	-	-	++ *	-	-	-	-	**cl**	-
B	**120**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**scl**	-
C	**120**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**cl**	-
D	**120**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	++ +	-
E	**120**	-	-	-	-	-	-	-	**+n**	-	-	-	-	-	-	-	-	**scl**	-
G	**120**	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	**cl**	-
H	**120**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**cl**	-
L	**120**	-	-	-	-	-	-	-	**±s**	-	-	-	**±s**	-	-	-	-	**cl**	-
M	**120**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**ol**	-
P	**120**	-	-	-	-	-	-	-	**3**	-	-	-	-	-	-	-	-	**cl**	-
S	**110**	-	-	-	-	-	-	-	-	-	-	-	**scl**	-	-	-	-	< **cl**	-
V	**120**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**cl**	-
W	**120**	-	-	-	-	-	-	-	+ **S**	-	-	-	-	-	-	-	-	**scl**	-

Strain M 16 (B)

		Phages at Routine Test Dilution (*S.*Typhimurium)												Additional phages					
Labcode	Phage type	20	21	22	23	24	25	26	27	28	29	32	35	1	2	3	10	10 var	18
HPA	**120**	-	-	-	-	-	-	-	-	-	-	-	-	++	++	++	**ol**		-
3	**120**	-	-	-	-	-	-	-	-	-	-	-	-						
4	**120**	-	-	-	-	-	-	-	-	-	-	-	-						
6	**120**	-	-	-	-	-	-	-	-	-	-	-	-	+	+	+	**ol**		-
19	**120**	-	-	-	-	-	-	-	-	-	-	-	-	+	+	+	**ol**	**< ol**	-
20	**120**	-	-	-	-	-	-	-	-	-	-	-	-	**+s**	**+s**	**+s**	**ol**	**sol**	-
24	**120**	-	-	-	-	-	-	-	-	-	-	-	-	-	++	++	**ol**	**ol**	-
A	**120**	-	-	-	-	-	-	-	-	-	-	-	-	+	++	++	**scl**		-
B	**120**	-	-	-	-	-	-	-	-	-	-	-	-						
C	**120**	-	-	-	-	-	-	-	-	-	-	-	-	-	++	-	**ol**		-
D	**120**	-	-	-	-	-	-	-	-	-	-	-	-		+		**cl**		-
E	**120**	-	-	-	-	-	-	-	-	-	-	-	-						
G	**120**	-	-	-	-	-	-	-	-	-	-	-	-	+	+	+	**ol**		-
H	**120**	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+	**ol**	**ol**	-
L	**120**	-	-	-	-	-	-	-	-	-	-	-	-	±	+	+	**ol**		-
M	**120**	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+	**ol**		-
P	**120**	-	-	-	-	-	-	-	-	-	-	-	-						
S	**110**	-	-	-	-	-	-	-	-	-	-	-	-						
V	**120**	-	-	-	-	-	-	-	-	-	-	-	-						
W	**120**	-	-	-	-	-	-	-	-	-	-	-	-	**< scl**	**scl**	**scl**	**ol**		-

Strain M 17 (A)

		Phages at Routine Test Dilution (*S.*Typhimurium)																	
Labcode	Phage type	1	2	3	4	5	6	7	8	10	11	12	13	14	15	16	17	18	19
HPA	**208**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3	**208**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4	**208**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6	**208**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
19	**208**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
20	**208**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
24	**208**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
A	**208**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
B	**208**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C	**208**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
D	**208**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
E	**208**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
G	**U 302**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
H	**208**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
L	**208**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
M	**208**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
P	**208**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
S	***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
V	**208**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W	**208**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

*** *Untypable*

Strain M 17 (B)

		Phages at Routine Test Dilution (*S.*Typhimurium)												Additional phages					
Labcode	Phage type	20	21	22	23	24	25	26	27	28	29	32	35	1	2	3	10	10 var	18
HPA	**208**	-	-	-	-	-	-	-	-	-	-	-	-	±	±	±	ol		ol
3	**208**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ol	< ol	< ol
4	**208**	-	-	-	-	-	-	-	-	-	-	-	-	-	- 3	-	< ol	scl	scl
6	**208**	-	-	-	-	-	-	-	-	-	-	-	-	±	+	+	ol		ol
19	**208**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	< ol	sol	±
20	**208**	-	-	-	-	-	-	-	-	-	-	-	-	±s	+s	+s	sol	sol	sol
24	**208**	-	-	-	-	-	-	-	-	-	-	-	-	-	±	-	ol	ol	++ +
A	**208**	-	-	-	-	-	-	-	-	-	-	-	-	-	++	-	scl		scl
B	**208**	-	-	-	-	-	-	-	-	-	-	-	-	ol	-	-	-		ol
C	**208**	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	scl		scl
D	**208**	-	-	-	-	-	-	-	-	-	-	-	-		-	-	cl		R T D
E	**208**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ol		scl
G	**U 302**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ol		-
H	**208**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ol	ol	ol
L	**208**	-	-	-	-	-	-	-	-	-	-	-	-	2s	3s	1s	ol		< ol
M	**208**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ol		ol
P	**208**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	< ol		< ol
S	***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			-
V	**208**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	< ol		ol
W	**208**	-	-	-	-	-	-	-	-	-	-	-	-	+S	++ S	++ S	ol		ol

*** = *Untypable*

Strain M 18 (A)

		Phages at Routine Test Dilution (*S.*Typhimurium)																	
Labcode	Phage type	1	2	3	4	5	6	7	8	10	11	12	13	14	15	16	17	18	19
HPA	**18**	-	-	-	-	-	-	-	-	-	ol	-	-	-	ol	-	cl	scl	scl
3	**18**	-	-	-	-	-	-	-	-	-	scl	-	-	-	scl	-	+++	++	±
4	**18**	-	-	-	-	-	-	-	-	-	< ol	-	-	-	scl	-	+	±±	- 4
6	**18**	-	-	-	-	-	-	-	-	-	ol	2n	-	-	ol	-	ol	cl	±n
19	**18**	-	-	-	-	-	-	-	-	-	< ol	-	-	-	so l	-	so l	++ L	ol/ +
20	**18**	-	-	-	-	-	-	-	-	-	<o l	-	-	-	scl	-	++ s	scl	++ s
24	**18**	-	-	-	-	-	-	-	±	-	ol	-	-	-	++	-	±±	scl	±±
A	**18**	-	-	-	-	-	-	-	-	-	++	-	-	-	+++	-	+++	scl	++
B	**116**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	scl	-	-
C	**18**	-	-	-	-	-	-	-	-	-	ol	-	-	-	+++	-	scl	scl	++
D	**18**	-	-	-	-	-	-	-	-	-	RT D	-	-	-	+++	-	RT D	RT D	+++
E	**18**	-	-	-	-	-	-	-	-	-	++ s+ ++ m	-	-	-	++ +n	-	scl	scl	++ n+ +s
G	**18**	-	-	-	-	-	-	-	-	-	+++	-	-	-	scl	-	++	scl	+++
H	**18**	-	-	-	-	-	-	-	-	-	cl	-	-	-	cl	-	cl	+++	+++
L	**18**	-	-	-	-	-	-	-	1s	-	cl	-	-	-	+++ scl	-	cl	+++ scl	+ N
M	**18**	-	-	-	-	-	-	-	-	-	ol	-	-	-	ol	-	ol	scl	scl
P	**18**	-	-	-	-	-	-	-	-	-	ol	-	-	-	ol	-	ol	cl	++
S	**RDNC**	-	-	-	-	-	-	-	±L	-	ol	-	-	-	1-5	-	scl	< cl	1-5
V	**18**	-	-	-	-	-	-	-	-	-	cl	-	-	-	cl	-	+++	+++	+++
W	**18**	-	-	-	-	-	-	-	-	-	< ol	-	-	-	ol	-	< ol	< scl	++ L

Strain M 18 (B)

		Phages at Routine Test Dilution (*S.*Typhimurium)												Additional phages					
Labcode	Phage type	20	21	22	23	24	25	26	27	28	29	32	35	1	2	3	10	10 var	18
HPA	**18**	**scl**	**-**	**-**	**-**	**-**	**-**	**-**	**±**	**±**	**-**	**scl**	**++**						
3	**18**	+	-	-	-	-	-	-	±	-	-	+	+						
4	**18**	+	-	-	-	-	-	-	-	-	-	+	- 2 L						
6	**18**	**scl**	**-**	**-**	**-**	**-**	**-**	**±**	**±**	**-**	**-**	**cl**	**4 L**	**±**	**+**	**+**	**ol**		**-**
19	**18**	**sol**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**ol/ ++**	**-**	**±**	**±**	**±**	**< ol**	**sol**	**-**
20	**18**	**sol**	**-**	**-**	**-**	**-**	**-**	**-**	**+s**	**3s**	**-**	**sol**	**±s**	**±n s**	**+n s**	**+n s**	**ol**	**ol.**	**-**
24	**18**	++	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	++	±	**-**	±±	±±	**ol**	**ol**	±
A	**18**	++ +	**-**	**-**	**-**	**-**	**-**	**-**	+	+	**-**	**scl**	+	+	++	++	**scl**		+
B	**116**	-	-	-	-	-	-	-	-	-	-	+	-						
C	**18**	++ +	**-**	**-**	**-**	**-**	**-**	**-**	+	**-**	**-**	++ +	±	**-**	++	±	**ol**		**-**
D	**18**	++ +	**-**	**-**	**-**	**-**	**-**	**-**	-	**-**	**-**	++	+						
E	**18**	**scl**	**-**	**-**	**-**	**-**	**-**	**-**	-	**2n**	**-**	**scl**	**2n**						
G	**18**	++ +	**-**	**-**	**-**	**-**	**-**	**-**	+	**-**	**-**	+ +	+ +						
H	**18**	++ +	**-**	**-**	**-**	**-**	**-**	**-**	+	±	**-**	**scl**	±	**-**	+	+	**ol**	**ol**	**-**
L	**18**	++ +s cl	**-**	**-**	**-**	**-**	**-**	**1n**	**3n**	**-**	**-**	**< scl**	±	++	++	++	**ol**		**-**
M	**18**	**scl**	**-**	**-**	**-**	**-**	**-**	**-**	**-2**	**-**	**-**	**scl**	+ L	+	+	+	**ol**		**-**
P	**18**	**< ol**	**-**	**-**	**-**	**-**	**-**	**-**	++	**-**	**-**	**< cl**	+						
S	**RDNC**	**scl**	**-**	**-**	**-**	**-**	**-**	**-**	-	**-**	**-**	**< cl**	**-**						
V	**18**	**scl**	**-**	**-**	**-**	**-**	**-**	**-**	++	**-**	**-**	++ +	++ +						
W	**18**	< ol	-	-	-	-	-	-	+ + L	1L	-	< ol	2L						

Strain M 19 (A)

		Phages at Routine Test Dilution (*S.*Typhimurium)																	
Labcode	Phage type	1	2	3	4	5	6	7	8	10	11	12	13	14	15	16	17	18	19
HPA	**136**	-	-	-	ol	ol	ol	-	-	-	ol	ol	ol	-	ol	ol	-	-	ol
3	**136**	-	-	-	scl	scl	scl	-	-	-	scl	scl	scl	-	cl	cl	-	-	++ +
4	**136**	-	-	-	ol	cl	cl	-	-	-	cl	cl	< cl	-	cl	cl	-	-	< cl
6	**136**	-	-	-	2 L	cl	cl	-	-	-	ol	ol	ol	-	ol	ol	-	-	cl
19	**136**	-	-	-	ol	< cl	cl	-	-	-	cl	< cl	cl	-	cl	cl	-	-	< cl
20	**136**	-	-	-	<o l	ol	ol	-	-	-	ol	<o l	ol	-	ol	ol	-	-	<o l
24	**136**	-	-	-	ol	± ±	cl	-	-	-	cl	scl	scl	-	cl	cl	-	-	scl
A	**136**	-	-	-	scl	scl	scl	-	-	-	scl	scl	cl	-	cl	cl	-	-	scl
B	**136**	-	-	-	cl	cl	cl	-	-	-	cl	cl	cl	-	cl	cl	-	-	scl
C	**136**	-	-	-	ol	scl	cl	-	-	-	cl	scl	cl	-	cl	cl	-	-	scl
D	**136**	-	-	-	++ +	++ +	RT D	-	-	-	RT D	++	++ +	-	RT D	RT D	-	-	RT D
E	**136**	-	-	-	< cl	< cl	< cl	-	-	-	< cl	< cl	< cl	-	< cl	< cl	-	-	scl
G	**136**	-	-	-	cl	cl	cl	-	-	-	ol	ol	ol	-	cl	cl	-	-	cl
H	**136**	-	-	-	scl	cl	cl	-	-	-	cl	scl	scl	-	cl	cl	-	-	scl
L	**136**	-	-	-	ol	< cl	cl	-	-	-	cl	cl	cl	-	cl	cl	-	-	< cl
M	**136**	-	-	-	ol	cl	cl	-	-	-	cl	cl	cl	-	cl	cl	-	-	cl
P	**136**	-	-	-	cl	cl	cl	-	-	-	cl	cl	cl	-	cl	cl	-	-	< cl
S	**136**	-	-	-	ol	cl	cl	-	-	-	cl	cl	cl	-	< cl	cl	-	-	scl
V	**136**	-	-	-	cl	cl	cl	-	-	-	cl	cl	cl	-	cl	cl	-	-	scl
W	**136**	-	-	-	< ol	< cl	cl	-	-	-	cl	< cl	cl	-	cl	cl	-	-	< cl

Strain M 19 (B)

		Phages at Routine Test Dilution (*S.*Typhimurium)												Additional phages					
Labcode	Phage type	20	21	22	23	24	25	26	27	28	29	32	35	1	2	3	10	10 var	18
HPA	**136**	+	-	-	-	-	scl	-	-	-	-	-	-						
3	**136**	-	-	-	-	-	++ +	-	-	-	-	-	-						
4	**136**	- 1	-	-	-	-	< cl	-	-	-	-	-	-						
6	**136**	+L	-	-	-	-	scl	-	-	-	-	-	-	±	±	±	ol		-
19	**136**	+	-	-	-	-	< cl	-	-	-	-	-	-	1	1	1	< cl	scl	-
20	**136**	+ n	-	-	-	-	scl	-	-	-	-	-	-	-	-	-	sol	sol	-
24	**136**	±	-	-	-	-	++ ±	-	-	-	-	-	-	-	±	±	ol	ol	-
A	**136**	++	-	-	-	-	scl	-	-	-	-	-	-	+	++	+	scl		-
B	**136**	-	-	-	-	-	scl	-	-	-	-	-	-						
C	**136**	++ +	-	-	-	-	scl	-	-	-	-	-	-	-	-	-	scl		-
D	**136**	2p	-	-	-	-	RT D	-	-	-	-	-	-						
E	**136**	+n	-	-	-	-	ol	-	-	-	-	-	-						
G	**136**	++ +	-	-	-	-	< cl	-	-	-	-	-	-						
H	**136**	++	-	-	-	-	++ +	-	-	-	-	-	-	-	-	-	scl	scl	-
L	**136**	+ +l	-	-	-	-	< cl	-	-	-	-	-	-	-	3s	-	ol		-
M	**136**	+ L	-	-	-	-	scl	-	-	-	-	-	-	-	-	-	ol		-
P	**136**	+	-	-	-	-	< cl	-	-	-	-	-	-						
S	**136**	1-5	-	-	-	-	< cl	-	-	-	-	-	-						
V	**136**	++	-	-	-	-	scl	-	-	-	-	-	-						
W	**136**	+ L	-	-	-	-	scl	-	-	-	-	-	-						

Strain M 20 (A)

		Phages at Routine Test Dilution (*S.* Typhimurium)																	
Labcode	Phage type	1	2	3	4	5	6	7	8	10	11	12	13	14	15	16	17	18	19
HPA	**193**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3	**193**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4	**193**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6	**193**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
19	**193**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
20	**193**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
24	**193**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
A	**193**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
B	**193a**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C	**193**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
D	**193**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
E	**193**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
G	**193**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
H	**193**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
L	**193**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
M	**193**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
P	**193**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
S	**193**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
V	**193**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W	**193**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Strain M 20 (B)

		Phages at Routine Test Dilution (*S.*Typhimurium)												Additional phages					
Labcode	Phage type	20	21	22	23	24	25	26	27	28	29	32	35	1	2	3	10	10	18
HPA	**193**	-	-	-	-	-	-	-	-	-	-	-	-	++ +	++ +	++ +	**ol**		-
3	**193**	-	-	-	-	-	-	-	-	-	-	-	-	±	+	+	-	-	-
4	**193**	-	-	-	-	-	-	-	-	-	-	-	-	+	++	**scl**	**< ol**	**sc l**	-
6	**193**	-	-	-	-	-	-	-	-	-	-	-	-	**scl**	**scl**	**scl**	-		-
19	**193**	-	-	-	-	-	-	-	-	-	-	-	-	++	++	++	**ol/ ++ +**	**ol/ +**	-
20	**193**	-	-	-	-	-	-	-	-	-	-	-	-	**+s**	**++ s**	**++ s**	**< ol**	-	-
24	**193**	-	-	-	-	-	-	-	-	-	-	-	-	±	++ ±	++ ±	**ol**	**ol**	-
A	**193**	-	-	-	-	-	-	-	-	-	-	-	-	+	++	++	**scl**		-
B	**193a**	-	-	-	-	-	-	-	-	-	-	-	-	**scl**	**scl**	**scl**	-		**ol**
C	**193**	-	-	-	-	-	-	-	-	-	-	-	-	-	**++ +**	++	++		-
D	**193**	-	-	-	-	-	-	-	-	-	-	-	-		+	+	++		-
E	**193**	-	-	-	-	-	-	-	-	-	-	-	-	**++ ++ +s**	**++ +n**	**++ +s c**	-		-
G	**193**	-	-	-	-	-	-	-	-	-	-	-	-	**++ +**	**++ +**	**++ +**	-		-
H	**193**	-	-	-	-	-	-	-	-	-	-	-	-	++	**++ +**	++	**ol**	**< ol**	-
L	**193**	-	-	-	-	-	-	-	-	-	-	-	-	**++ +**	**++ +**	**++ +**	**ol**		-
M	**193**	-	-	-	-	-	-	-	-	-	-	-	-	++	**++ +**	**++ +**	**ol**		-
P	**193**	-	-	-	-	-	-	-	-	-	-	-	-	**<+ ++**	**scl**	**<+ ++**	**++ +**		-
S	**193**	-	-	-	-	-	-	-	-	-	-	-	-	**scl**	<<	**scl**			-
V	**193**	-	-	-	-	-	-	-	-	-	-	-	-	**++ +**	**++ +**	**++ +**	-		-
W	**193**	-	-	-	-	-	-	-	-	-	-	-	-	**< scl**	**sc l**	**< cl**	**ol**		-

Annex 5. Results antimicrobial susceptibility testing per antibiotic

AMOXICILLIN + CLAVANULATE

Lab code	Method	AST 1	AST 2	AST 3	AST 4	AST 5	AST 6	AST 7	AST 8	AST 9	AST 10	ATCC 25922
CRL	MIC	0.5/ 0.25-1/0.5	0.5/ 0.25	0.5/ 0.25-1/0.5	2/1-4/2	4/2-8/4	2/1-8/4	0.75/ 0.38 – 1/0.5	1.5/ 0.75 – 4/2	16/8->16/8	0.5/ 0.25 – 1/0.5	2/1 – 8/4
4	MIC	≤ 2/1	≤ 2/1	≤ 2/1	4/2	16/8	8/4	≤ 2/1	8/4	32/16	≤ 2/1	≤ 2/1
7	MIC	≤ 2/1	≤ 2/1	≤ 2/1	16/8	64/32	32/16	≤ 2/1	16/8	>64/32	≤ 2/1	8/4
13	MIC	≤ 2/1	≤ 2/1	≤ 2/1	32/ 16	>64/32	>64/32	≤ 2/1	32/ 16	>64/32	≤ 2/1	8/4
19	MIC	≤ 2	≤ 2	≤ 2	8	16	8	≤ 2	8	>32	≤ 2	--
B	MIC	1	2	1	4	32	32	1	32	32	1	4
R	MIC	≤ 2/1	≤ 2/1	≤ 2/1	8/4	16/8	8/4	≤ 2/1	8/4	>32/16	≤ 2/1	--
W	MIC	≤1/ 0.5	≤1/ 0.5	≤1/ 0.5	8/4	16/8	4/2	≤1/ 0.5	4/2	>32/16	≤1/ 0.5	--
17	Etest	1	1	1	12	32	16	1	24	>256	1	6
	Disc load in µg											18 – 24
1	30	25	27	25	22	13	16	24	20	6	23	22
2	30	25	26	25	20	16	19	26	22	10	27	22
3	30	25	27	28	25	17	21	27	23	11	26	22
6	30	27	29	30	23	15	21	29	22	7	30	21.3
8	30	26	29	27	25	15	20	28	22	8	29	20
9	30	25	27	26	21	13	19	26	21	8	26	18
10	30	26	27	26	24	15	18	27	22	6	25	20
12	30	33	35	33	30	24	25	33	27	18	34	30
13	30	28	28	30	24	18	22	26	23	10	30	23
14	30	27	29	28	24	17	21	28	23	11	27	23
16	30	27	29	26	25	16	20	27	21	8	26	22
18	30	26	27	26	23	17	20	28	22	9	28	--
20	30	27	27	27	15	9	13	28	17	6	27	19
21	30	25	25	22	20	17	17	25	21	6	26	20
22	30	24	29	27	22	13	19	24	19	6	28	20
23	30	26	26	25	22	17	21	25	23	10	21	21
24	30	31	33	32	28	17	22	33	24	9	32	25
25	30	21	22	22	19	14	16	22	18	7	22	18
A	30	27	30	32	21	15.1	20.3	29	20	7	27	--
D	30	30	29	27	22	14	20	29	21	6	29	--
F	30	28	28	28	17	11	18	27	17	6	28	22
J	30	28	31	29	26	15	20	29	23	6	30	--
S	30	28	28	27	24	15	21	26	21	8	28	22
V	30	25	27	24	25	16	20	24	19	8	23	21
Mean		26.7	28.1	27.2	22.8	15.4	19.6	27.1	21.3	8.2	27.2	21.6
SD		2.4	2.6	2.8	3.3	2.8	2.4	2.6	2.3	2.7	3.0	2.7
2SD		4.9	5.2	5.7	6.6	5.6	4.8	5.2	4.5	5.4	6.1	5.4

Light grey cells = resistant; dark grey cells = intermediate; white cells = susceptible

AMPICILLIN

Lab code	Method	AST 1	AST 2	AST 3	AST 4	AST 5	AST 6	AST 7	AST 8	AST 9	AST 10	ATCC 25922
CRL	MIC	≤ 0.5-1	≤ 0.5	≤ 0.5-1	> 64	> 64	> 64	≤ 0.5-1	> 64	> 64	≤ 0.5	2-8
4	MIC	≤ 1	≤ 1	≤ 1	> 32	> 32	> 32	≤ 1	> 32	> 32	≤ 1	2
7	MIC	2	1	1	>32	>32	>32	2	>32	>32	1	4
13	MIC	2	2	2	> 32	> 32	> 32	1	> 32	> 32	2	4
15	MIC	1	1	1	>64	>64	>64	1	>64	>64	≤0.5	8
19	MIC	≤ 1	≤ 1	2	>32	>32	>32	≤ 1	>32	>32	≤ 1	--
B	MIC	2	2	2	> 64	> 64	> 64	1	> 64	> 64	2	4
E	MIC	2	1	2	16	16	16	2	16	16	2	8
R	MIC	≤ 1	≤ 1	≤ 1	>32	>32	>32	≤ 1	>32	>32	2	--
W	MIC	≤1	≤1	≤1	> 32	> 32	> 32	≤1	> 32	> 32	≤1	--
17	Etest	1.5	0.75	1.5	>256	>256	>256	1.5	>256	>256	1.5	6
	Disc load in ug											16 – 22
1	10	22	23	22	6	6	6	20	6	6	22	18
2	10	24	24	24	6	6	6	24	6	6	24	18
3	10	23	23	26	6	6	6	26	6	6	24	20
6	10	27	30	27	8	8	8	26	13	8	27	19.1
8	10	22	26	24	6	6	6	25	6	6	22	20
9	10	23	24	22	6	6	6	24	6	6	26	18
10	10	24	26	23	6	6	6	24	6	6	25	18
11	10	28	28	28	6	6	6	28	6	6	28	22
12	10	31	34	30	6	6	6	30	6	6	32	26
13	10	28	26	25	6	6	6	28	6	6	25	20
14	10	25	26	25	6	6	6	25	6	6	25	17
16	10	23	25	22	7	7	7	23	7	7	22	19
18	10	25	25	24	6	6	6	25	6	6	24	18
20	10	24	27	25	6	6	6	26	6	6	25	19
21	10	23	25	22	6	6	6	23	6	6	22	19
22	10	24	27	22	6	6	6	23	6	6	22	16
23	10	23	24	23	7	8	7	23	8	7	24	18
24	10	29	29	29	6	6	6	29	6	6	30	18
25	10	21	21	21	6	6	6	21	6	6	22	17
A	10	26	29	28	7	7	7	27	7	7	26	--
C	10	28	27	28	6	6	6	30	6	6	28	19
F	10	24	26	24	6	6	6	24	6	6	26	21
G	10	24	26	23	6	6	6	24	6	6	23	19
H	10	23	20	22	6	6	6	22	6	6	22	--
J	10	25	27	25	6	6	6	25	6	6	25	--
L	10	26	27.9	27.1	6	6	6	25.9	6	6	26.1	--
S	10	24	24	24	6	6	6	24	6	6	23	20
V	10	20	23	20	6	6	6	21	6	6	20	18
Mean		24.6	25.8	24.5	6.2	6.2	6.2	24.9	6.4	6.2	24.6	19.0
SD		2.5	2.8	2.6	0.5	0.6	0.5	2.6	1.4	0.5	2.7	2.0
2SD		5.0	5.7	5.2	1.0	1.1	1.0	5.2	2.7	1.0	5.4	4.0

Light grey cells = resistant; dark grey cells = intermediate; white cells = susceptible

CEFOTAXIME

Lab code	Method	AST 1	AST 2	AST 3	AST 4	AST 5	AST 6	AST 7	AST 8	AST 9	AST 10	ATCC 25922
CRL	MIC	≤ 0.12	≤ 0.12	≤ 0.12	> 16	≤ 0.12-0.25	≤ 0.12-0.25	≤ 0.12	≤ 0.12	> 16	≤ 0.12	0.03-0.125
15	MIC	≤ 0.125	≤ 0.125	≤ 0.125	> 16	≤ 0.125	≤ 0.125	≤ 0.125	≤ 0.125	> 16	≤ 0.125	≤ 0.125
B	MIC	≤ 0.25	≤ 0.25	≤ 0.25	> 32	≤ 0.25	≤ 0.25	≤ 0.25	≤ 0.25	32	≤ 0.25	≤ 0.25
E	MIC	1	1	1	16	1	1	1	1	16	1	< 1
	Disc load in µg											29 – 35
1	30	26	30	26	10	28	28	28	30	17	28	30
2	30	28	30	29	10	30	29	28	30	12	29	32
3	30	30	33	33	13	34	34	31	33	17	34	35
8	30	31	33	30	10	31	29	32	29	15	32	30
9	30	30	31	29	10	30	28	30	32	13	28	29
10	30	28	31	30	6	30	30	30	32	12	30	30
12	30	40	44	40	10	40	40	38	38	17	38	40
13	30	32	35	34	12	32	30	30	32	14	32	30
14	30	32	39	34	9	30	30	31	32	13	25	31
16	30	30	35	31	12	30	28	30	31	17	31	32
20	30	32	34	34	10	34	31	32	33	17	33	32
21	30	27	30	30	10	30	28	28	30	15	30	30
22	30	33	38	34	12	33	32	32	34	18	32	32
24	30	40	44	41	17	41	39	43	42	18	41	42
25	30	26	27	25	6	26	23	23	26	12	25	27
A	30	34	36	34	9.3	32	35	33	33	10.6	31	--
C	30	37	40	38	13	36	38	37	38	14	36	40
F	30	>30	>30	>30	10	>30	>30	>30	>30	16	>30	33
G	30	30	32	31	8	30	31	32	31	14	32	33
H	30	28	30	28	6	26	28	30	30	13	28	--
J	30	31	36	33	11	36	36	36	36	17	36	--
L	30	35.2	36.4	34.4	12.2	35.7	32.9	34.7	36.6	15.1	33.7	--
V	30	28	34	29	10	30	27	30	30	14	31	31
Mean		31.3	34.5	32.2	10.3	32.0	31.2	31.8	32.7	15.0	31.6	32.6
SD		4.0	4.6	4.1	2.6	4.0	4.3	4.2	3.6	2.1	4.0	4.1
2SD		8.0	9.2	8.2	5.2	8.0	8.5	8.4	7.3	4.1	8.0	8.2

Light grey cells = resistant; dark grey cells = intermediate; white cells = susceptible

CHLORAMPHENICOL

Lab code	Method	AST 1	AST 2	AST 3	AST 4	AST 5	AST 6	AST 7	AST 8	AST 9	AST 10	ATCC 25922
CRL	MIC	8	128->128	8	8	8	128	8	32	> 128	≤ 4-8	2-8
4	MIC	≤ 2	> 64	≤ 2	4	4	> 64	4	32	> 64	≤ 2	≤ 2
7	MIC	4	>128	4	4	4	64	4	16	>128	4	--
13	MIC	2	>128	4	4	8	64	4	32	>128	4	4
15	MIC	8	>128	8	8	8	128	8	32	>128	8	≤4
19	MIC	8	>64	8	4	8	>64	4	32	>64	4	--
B	MIC	4	> 32	4	4	4	> 32	4	32	> 32	4	4
E	MIC	8	32	8	4	8	32	4	32	32	8	4
R	MIC	4	>64	4	4	8	64	4	16	>64	4	--
W	MIC	≤ 2	> 32	4	4	8	> 32	4	8	> 32	4	--
17	Etest	3	>256	2	2	4	>256	2	8	>256	3	3
	Disc load in ug											21 – 27
1	30	26	10	25	30	25	6	24	18	6	26	23
2	30	23	6	25	28	24	6	24	16	6	25	24
3	30	27	6	26	30	25	8	27	20	6	26	26
8	30	23	6	23	29	26	7	23	16	6	27	22
9	30	22	6	23	25	23	6	23	19	6	22	22
10	30	25	6	25	27	25	6	25	17	6	27	25
11	30	32	6	30	34	31	9	30	23	6	30	27
12	30	32	6	30	35	33	6	33	28	6	32	30
13	30	26	6	28	28	26	9	26	15	6	26	24
14	30	23	6	23	25	24	7	23	14	6	25	22
16	30	27	7	26	29	26	8	26	20	7	28	28
18	30	26	6	24	27	24	8	26	19	6	27	26
20	30	25	6	26	27	27	8	27	19	6	28	26
21	30	24	6	25	25	27	6	24	17	6	24	22
22	30	24	6	22	28	22	6	24	19	6	24	23
23	30	25	7	26	27	25	8	25	18	8	26	25
24	30	29	6	30	30	29	8	28	13	6	30	26
25	30	23	6	21	24	25	10	20	14	6	24	22
A	30	24	7	25	26	26	7.2	25	18.1	7	25	--
C	30	27	6	28	30	26	6	29	16	6	27	29
D	30	30	6	28	30	30	6	28	16	6	28	--
F	30	24	6	25	28	25	6	24	18	6	28	27
G	30	25	6	25	29	26	6	26	17	6	25	26
H	30	23	6	20	26	20	6	20	16	6	21	--
J	30	29	6	30	36	28	9	28	17	6	31	--
L	30	29.9	6	30.5	33.1	29.2	6	28.5	20	6	27.4	--
Q	30	25	6	27	27	26	8	26	19	6	27	--
S	30	25	6	26	28	27	9	22	17	6	26	25
V	30	28	6	24	34	22	6	15	13	6	25	25
Mean		25.9	6.2	25.7	28.8	25.9	7.1	25.2	17.7	6.1	26.5	25.0
SD		2.7	0.8	2.8	3.1	2.7	1.3	3.4	3.0	0.4	2.4	2.3
2SD		5.5	1.6	5.5	6.2	5.5	2.5	6.9	6.0	0.9	4.9	4.6

Light grey cells = resistant; dark grey cells = intermediate; white cells = susceptible

CIPROFLOXACIN

Lab code	Method	AST 1	AST 2	AST 3	AST 4	AST 5	AST 6	AST 7	AST 8	AST 9	AST 10	ATCC 25922
CRL	MIC	0.25	≤ 0.06	0.5	≤ 0.06	8	≤ 0.06	≤ 0.06	1	≤ 0.06	≤ 0.06	0.004 - 0.016
4	MIC	0.25	≤ 0.03	0.5	≤ 0.03	> 4	≤ 0.03	≤ 0.03	1	0.06	≤ 0.03	≤ 0.03
15	MIC	0.25	≤0.06	0.25	≤0.06	8	≤0.06	≤0.06	1	≤0.06	≤0.06	≤0.06
19	MIC	0.5	≤0.03	0.5	≤0.03	> 4	≤0.03	≤0.03	1	0.06	≤0.03	--
B	MIC	0.5	≤ 0.032	0.5	0.063	> 4	≤ 0.032	≤ 0.032	4	0.063	0.125	≤ 0.032
E	MIC	0.5	0.06	0.5	0.06	16	0.06	0.06	2	0.13	0.06	<0.06
R	MIC	0.25	≤ 0.03	0.25	≤ 0.03	4	≤ 0.03	≤ 0.03	0.5	≤ 0.03	≤ 0.03	--
W	MIC	0.12	≤ 0.015	0.25	≤ 0.015	> 4	0.03	≤ 0.015	0.25	≤ 0.015	≤ 0.015	--
C	Etest	0.125	--	0.19	--	8	--	--	0.5	0.023	--	0.006
	Disc load in µg											30 - 40
1	5	27	31	23	35	9	33	30	19	32	30	30
2	5	23	30	22	30	11	30	29	19	25	31	32
3	5	24	32	24	33	11	33	32	23	35	32	34
8	5	28	35	27	36	13	35	33	24	38	34	31
9	5	28	32	25	30	13	30	29	22	28	29	30
10	5	25	31	27	32	12	35	30	25	36	35	35
11	5	32	37	33	37	17	39	36	27	14	39	38
13	5	26	34	26	34	13	32	34	22	32	32	30
14	5	25	34	26	34	13	31	33	22	29	34	34
16	5	26	35	25	34	13	36	32	22	39	34	37
18	5	27	33	26	31	10	32	34	23	30	34	35
20	5	27	36	27	32	14	35	33	23	35	34	34
21	5	24	31	25	36	12	29	30	21	33	33	30
23	5	27	31	24	30	13	30	29	21	36	34	32
25	5	19	26	18	27	9	24	23	15	22	24	23
A	5	24	33	25	33	10.3	31	32	19.8	28	30	--
C	5	--	38	--	36	--	36	36	--	--	34	38
D	5	29	34	26	35	11	37	34	25	38	38	--
F	5	25	>30	24	>30	6	>30	>30	20	>30	>30	32
G	5	25	32	31	32	12	33	33	22	29	33	33
H	5	24	30	23	32	9	32	30	21	30	30	--
J	5	28	36	29	36	10	36	33	25	36	36	--
L	5	32.8	36.3	29.2	34	15.5	40.8	36.1	28.3	42.6	40.6	--
S	5	28	38	27	37	12	35	36	23	32	36	35
V	5	26	37	24	43	10	32	32	21	33	31	35
Mean		26.2	33.4	25.7	33.7	11.6	33.2	32.0	22.2	31.9	33.2	32.9
SD		2.9	3.0	3.0	3.2	2.3	3.6	3.0	2.8	6.1	3.5	3.5
2SD		5.7	5.9	6.1	6.4	4.7	7.1	6.0	5.6	12.3	7.0	6.9

Light grey cells = resistant; dark grey cells = intermediate; white cells = susceptible

ENROFLOXACIN

Lab code	Method	AST 1	AST 2	AST 3	AST 4	AST 5	AST 6	AST 7	AST 8	AST 9	AST 10	ATCC 25922
CRL*	MIC	0.25	≤ 0.06	0.5	≤ 0.06	8	≤ 0.06	≤ 0.06	1	≤ 0.06	≤ 0.06	0.008 -0.03
7	MIC	1	0.06	1	0.12	> 4	0.06	0.12	2	0.25	0.12	≤0.03
13	MIC	1	0.12	1	0.12	> 4	0.12	0.12	2	0.12	0.12	≤0.03
	Disc load in µg											32 - 40
1	5	21	28	20	30	6	28	27	18	25	27	30
3	5	17	31	20	31	8	29	27	15	26	28	33
10	5	21	30	22	30	6	30	30	18	30	30	32
12	5	27	34	27	41	6	38	35	21	38	36	40
14	5	22	30	22	30	8	31	30	17	28	30	32
18	5	19	30	18	27	7	29	30	18	28	31	33
21	5	21	28	22	30	6	28	27	19	27	32	33
22	5	20	30	22	30	6	30	28	19	27	28	32
23	5	19	29	20	29	6	26	29	18	27	30	34
Mean		20.8	30.0	21.4	30.9	6.6	29.9	29.2	18.1	28.4	30.2	33.2
SD		2.8	1.8	2.5	4.0	0.9	3.4	2.5	1.6	3.8	2.7	2.8
2SD		5.5	3.6	5.0	7.9	1.8	6.7	5.1	3.2	7.7	5.4	5.5

Light grey cells = resistant; dark grey cells = intermediate; white cells = susceptible

***** Ciprofloxacin MICs displayed*

FLORFENICOL

Lab code	Method	AST 1	AST 2	AST 3	AST 4	AST 5	AST 6	AST 7	AST 8	AST 9	AST 10	ATCC 25922
CRL	MIC	4	4	4-8	4	4	16	4	8-16	> 128	4	2-8
4	MIC	≤ 2	≤ 2	≤ 2	4	4	16	≤ 2	8	>64	4	≤ 2
7	MIC	≤ 4	≤ 4	≤ 4	≤ 4	≤ 4	16	≤ 4	16	>32	≤ 4	≤ 4
13	MIC	≤ 4	≤ 4	≤ 4	≤ 4	≤ 4	16	≤ 4	8	>32	≤ 4	≤ 4
15	MIC	4	4	4	4	4	16	4	8	>128	4	4
19	MIC	4	≤ 2	4	4	4	16	4	8	>64	4	--
R	MIC	≤ 2	4	4	4	4	16	4	8	>64	4	--
	Disc load in µg											22 – 28
1	30	24	26	25	30	24	15	24	22	6	25	25
12	30	30	30	30	38	33	22	31	26	6	31	30
13	30	26	30	26	30	26	21	28	20	9	26	26
21	30	23	25	26	30	27	17	24	20	6	26	24
22	30	22	26	24	26	21	10	23	19	6	24	20
23	30	23	22	22	25	25	15	22	19	6	23	--
A	30	24	25	25	26	24	14.2	24	20	7	23	--
Mean		24.6	26.3	25.4	29.3	25.7	16.3	25.1	20.9	6.6	25.4	25.0
SD		2.7	2.9	2.4	4.4	3.7	4.1	3.2	2.5	1.1	2.8	3.6
2SD		5.4	5.7	4.9	8.8	7.5	8.3	6.4	5.0	2.3	5.5	7.2

Light grey cells = resistant; dark grey cells = intermediate; white cells = susceptible

GENTAMICIN

Lab code	Method	AST 1	AST 2	AST 3	AST 4	AST 5	AST 6	AST 7	AST 8	AST 9	AST 10	ATCC 25922
CRL	MIC	0.5	≤0.25 -0.5	0.5-4	2	16-32	≤0.25 -2	≤ 0.25	> 32	> 32	32- >32	0.25-1
4	MIC	≤ 1	≤ 1	≤ 1	2	16	≤ 1	≤ 1	>32	>32	32	≤ 1
7	MIC	4	1	2	4	32	4	≤0.05	>64	>64	32	2
13	MIC	1	1	1	4	16	8	1	> 64	> 64	32	≤0.5
15	MIC	0.5	0.5	0.5	4	16	1	0.5	>32	>32	>32	0.5
19	MIC	≤ 1	≤ 1	≤ 1	4	16	≤ 1	≤ 1	>32	>32	32	--
B	MIC	1	1	1	4	16	2	0.5	>32	>32	>32	1
E	MIC	2	0.5	2	4	8	1	0.5	8	8	8	< 0.5
R	MIC	≤ 1	≤ 1	≤ 1	2	16	≤ 1	≤ 1	>32	>32	16	--
W	MIC	0.5	0.5	1	2	8	1	≤0.25	> 16	> 16	> 16	--
	Disc load in µg											19 – 26
1	10	21	27	23	15	11	23	23	6	6	9	23
2	10	18	22	20	16	14	18	20	6	6	11	21
3	10	18	22	21	15	14	23	23	6	6	12	24
6	10	19	23	20	17	11	20	23	8	9	11	20.4
8	10	18	20	18	15	11	18	20	6	6	9	19
9	10	19	21	20	16	13	18	20	6	6	11	20
10	10	18	21	20	15	10	19	21	6	6	6	20
13	10	22	24	24	19	12	20	25	6	6	10	21
14	10	18	20	19	15	10	18	21	6	6	9	20
16	10	21	25	21	20	12	21	24	7	7	9	24
18	10	21	23	21	18	13	20	23	6	6	11	22
20	10	20	23	20	16	13	21	21	6	6	7	21
21	10	21	23	22	16	10	20	21	6	6	9	21
22	10	23	26	25	17	12	23	25	6	6	6	23
23	10	19	21	19	19	10	22	21	7	8	7	20
25	10	15	17	15	13	6	14	15	6	6	7	15
A	10	19	22	20	15.3	8.7	20	21	7	7	7	--
C	10	22	26	23	19	11	24	25	6	6	6	26
D	10	22	24	21	16	10	22	24	6	6	6	--
F	10	22	29	24	18	10	23	24	6	6	11	24
G	10	19	22	19	16	12	19	22	6	6	9	20
H	10	20	21	20	18	6	18	20	6	6	6	--
J	10	23	27	23	17	12	23	25	6	6	6	--
L	10	19	22.2	19.1	17.1	12.9	19.7	22.4	6	6	10	--
S	10	20	24	22	17	11	22	24	6	6	7	22
V	10	25	28	24	31	11	23	25	6	11	8	26
Mean		20.1	23.2	20.9	17.2	11.0	20.5	22.2	6.2	6.5	8.5	21.5
SD		2.1	2.8	2.2	3.3	2.0	2.3	2.3	0.5	1.2	2.0	2.5
2SD		4.3	5.5	4.5	6.5	4.0	4.7	4.6	1.0	2.3	4.0	5.0

Light grey cells = resistant; dark grey cells = intermediate; white cells = susceptible

KANAMYCIN

Lab code	Method	AST 1	AST 2	AST 3	AST 4	AST 5	AST 6	AST 7	AST 8	AST 9	AST 10	ATCC 25922
CRL	MIC	4	4	> 16	16	4	> 16	2	> 16	> 16	16	1-4
4	MIC	≤ 4	≤ 4	> 64	8	≤ 4	> 64	≤ 4	> 64	64	8	≤ 4
B	MIC	4	4	> 32	16	4	> 32	2	> 32	> 32	16	2
E	MIC	4	2	32	16	4	32	2	32	32	4	2
W	MIC	≤ 8	≤ 8	> 64	16	≤ 8	> 64	≤ 8	> 64	16	≤ 8	--
	Disc load in µg											17 – 25
1	30	21	24	6	20	22	6	23	6	17	18	23
2	30	18	22	6	16	20	6	21	6	13	19	21
3	30	20	23	6	16	21	6	23	6	16	18	24
8	30	20	23	6	18	20	6	22	6	18	20	21
10	30	19	21	6	15	20	6	22	6	16	19	23
11	30	21	26	6	20	22	6	24	8	16	18	22
12	30	25	28	6	21	24	6	28	6	20	22	24
14	30	19	22	6	16	19	6	22	6	16	19	20
18	30	21	24	6	19	22	6	24	7	18	22	22
20	30	22	25	6	18	23	6	24	7	19	19	23
21	30	22	25	6	17	22	6	23	6	17	20	20
22	30	22	26	6	16	22	6	24	6	14	20	22
23	30	20	22	8	19	19	7	21	6	15	19	20
25	30	15	17	6	13	16	6	16	6	13	15	16
A	30	20	22	7	15	19	7	21	7	12.8	18	--
D	30	22	24	6	16	21	6	24	6	15	17	--
F	30	23	28	6	18	24	6	25	6	20	23	23
G	30	21	24	6	17	20	6	23	6	11	19	20
H	30	21	21	6	18	18	6	22	6	6	18	--
J	30	21	26	6	20	22	6	24	6	17	20	--
L	30	21.9	25	6	19.6	21.8	6	24.1	6	19.3	21	--
Q	30	21	22	6	17	20	6	22	6	6	20	--
V	30	22	26	6	23	22	6	25	6	19	19	24
Mean		20.8	23.7	6.1	17.7	20.9	6.1	22.9	6.2	15.5	19.3	21.6
SD		1.9	2.5	0.5	2.3	1.9	0.3	2.2	0.5	3.9	1.7	2.1
2SD		3.9	5.0	0.9	4.6	3.8	0.6	4.4	1.0	7.8	3.5	4.1

Light grey cells = resistant; dark grey cells = intermediate; white cells = susceptible

NALIDIXIC ACID

Lab code	Method	AST 1	AST 2	AST 3	AST 4	AST 5	AST 6	AST 7	AST 8	AST 9	AST 10	ATCC 25922
CRL	MIC	>128	4	>128	4	>128	4	4	>128	16	4	1-4
4	MIC	>128	≤ 4	>128	≤ 4	>128	≤ 4	≤ 4	>128	8	≤ 4	≤ 4
7	MIC	>128	4	>128	4	>128	4	4	>128	16	8	4
13	MIC	>128	4	>128	8	>128	4	4	>128	16	4	4
15	MIC	>128	4	>128	4	>128	4	4	>128	16	4	≤2
19	MIC	>128	≤ 8	>128	≤ 8	>128	≤ 8	≤ 8	>128	16	≤ 8	--
B	MIC	> 64	2	> 64	2	> 64	2	2	> 64	8	2	1
E	MIC	32	8	32	8	32	8	8	32	32	8	4
R	MIC	>128	≤ 8	>128	≤ 8	>128	≤ 8	≤ 8	>128	16	≤ 8	--
W	MIC	> 32	2	> 32	8	> 32	4	4	> 32	8	4	--
	Disc load in µg											22 - 28
1	30	6	24	6	27	6	23	21	6	16	23	24
2	30	6	25	6	26	6	23	17	6	13	25	27
3	30	6	22	6	27	6	22	20	6	16	21	23
6	30	7	23	8	24	8	23	22	13	15	24	26.8
8	30	6	25	6	26	6	23	20	6	15	23	26
9	30	6	25	20	25	6	22	19	6	16	24	26
10	30	6	24	6	25	6	22	20	6	13	21	26
11	30	6	29	6	30	6	27	24	6	18	25	28
12	30	6	32	6	34	6	33	29	6	25	32	33
13	30	6	26	6	26	6	23	20	6	13	24	26
14	30	6	26	6	28	6	23	21	6	15	24	27
16	30	7	26	7	30	7	26	24	7	18	24	25
18	30	6	24	6	27	6	22	18	6	13	24	26
20	30	6	27	6	26	6	26	24	6	16	27	27
21	30	6	25	6	25	6	23	20	6	14	25	24
22	30	6	26	6	26	6	24	20	6	18	26	26
23	30	7	22	7	24	7	21	17	7	15	21	24
24	30	6	27	6	28	6	28	26	6	13	28	29
25	30	6	21	6	22	6	19	19	6	12	20	22
A	30	7	25	7	23	7	24	20	7	14	24	--
C	30	6	26	6	26	6	28	24	6	14	25	29
D	30	6	22	6	26	6	21	17	6	13	18	--
F	30	6	26	6	26	6	25	19	6	19	26	25
G	30	6	24	6	25	6	23	20	6	13	23	25
H	30	6	21	6	25	6	23	20	6	13	22	--
J	30	6	26	6	29	6	26	25	6	16	26	--
L	30	6	28.2	6	26.9	6	25.9	24.9	6	15.5	26.8	--
Q	30	6	25	6	25	6	22	16	6	12	25	--
S	30	6	23	6	25	6	25	19	6	13	21	25
V	30	6	22	6	26	6	21	19	6	20	21	23
Mean		6.1	24.9	6.6	26.3	6.2	23.9	20.8	6.3	15.2	24.0	26.0
SD		0.3	2.4	2.6	2.3	0.5	2.8	3.0	1.3	2.8	2.7	2.3
2SD		0.7	4.8	5.1	4.6	0.9	5.5	6.1	2.6	5.6	5.5	4.7

Light grey cells = resistant; dark grey cells = intermediate; white cells = susceptible

NEOMYCIN

Lab code	Method	AST 1	AST 2	AST 3	AST 4	AST 5	AST 6	AST 7	AST 8	AST 9	AST 10	ATCC 25922
CRL	MIC	≤ 1-2	≤ 1	128->128	4	≤ 1	>128	≤ 1	32-64	≤ 1	≤ 1	≤ 1-2
4	MIC	≤ 2	≤ 2	> 32	≤ 2	≤ 2	> 32	≤ 2	32	≤ 2	≤ 2	≤ 2
7	MIC	4	≤ 2	>16	4	≤ 2	>16	≤ 2	>16	4	≤ 2	≤ 2
13	MIC	≤ 2	≤ 2	> 16	4	≤ 2	> 16	≤ 2	> 16	≤ 2	≤ 2	≤ 2
15	MIC	2	≤ 1	>128	4	≤ 1	128	≤ 1	64	2	≤ 1	2
19	MIC	≤ 2	≤ 2	>32	8	≤ 2	>32	≤ 2	16	≤ 2	≤ 2	--
R	MIC	≤ 2	≤ 2	>32	4	≤ 2	>32	≤ 2	16	≤ 2	≤ 2	--
	Disc load in µg											NA
1	30	20	23	6	15	19	6	23	13	22	22	22
3	30	20	21	9	22	22	9	19	12	22	21	24
9	30	18	18	7	16	18	9	17	12	17	17	17
10	30	17	19	8	15	18	6	18	12	18	18	17
13	30	20	24	12	18	20	8	23	15	21	22	19
16	30	22	24	9	21	22	10	22	14	22	21	22
21	30	18	19	10	15	17	6	18	13	16	17	16
A	30	18.5	21.9	7	16.5	18.4	7	20.9	12.2	20	20.3	--
Mean		19.2	21.2	8.5	17.3	19.3	7.6	20.1	12.9	19.8	19.8	19.6
SD		1.6	2.4	1.9	2.8	1.9	1.6	2.4	1.1	2.4	2.1	3.1
2SD		3.2	4.7	3.9	5.6	3.8	3.2	4.8	2.2	4.9	4.3	6.2

Light grey cells = resistant; dark grey cells = intermediate; white cells = susceptible

STREPTOMYCIN

Lab code	Method	AST 1	AST 2	AST 3	AST 4	AST 5	AST 6	AST 7	AST 8	AST 9	AST 10	ATCC 25922
CRL	MIC	> 64	> 64	64	8	32	> 64	32	> 64	> 64	> 64	4-8
4	MIC	64	64	64	8	64	> 64	32	> 64	> 64	> 64	≤4
7	MIC	128	128	128	8	64	256	64	>256	>256	>256	8
13	MIC	128	64	64	8	32	256	32	> 256	> 256	128	4
19	MIC	64	>64	>64	16	64	>64	32	>64	>64	>64	--
B	MIC	> 64	> 64	64	8	64	> 64	32	> 64	> 64	> 64	8
E	MIC	64	64	64	8	16	64	32	64	64	64	8
R	MIC	64	64	32	16	32	>64	16	>64	>64	64	--
W	MIC	64	64	64	≤ 32	≤ 32	> 64	≤ 32	> 64	> 64	64	--
17	Etest	48	64	96	12	32	>256	32	>256	>256	96	4
	Disc load in µg											12 - 20
1	10	6	6	6	11	9	6	11	6	6	6	18
2	10	9	10	8	14	10	6	10	6	6	9	16
3	10	10	11	10	18	11	6	12	6	6	10	17
8	10	8	7	6	12	10	6	9	6	6	8	16
9	10	10	8	9	14	12	6	8	6	6	6	16
10	10	6	6	6	10	9	6	6	6	6	6	15
12	10	10	6	6	17	10	6	9	6	6	6	19
13	10	9	8	8	15	10	6	9	6	6	6	15
14	10	8	9	6	12	10	6	10	6	6	6	16
16	10	9	8	9	16	11	7	11	7	7	9	15
18	10	7	8	7	11	10	6	10	6	6	9	15
20	10	8	7	7	13	10	6	8	6	6	7	17
21	10	10	6	10	15	11	6	10	6	6	6	15
22	10	6	6	6	14	6	6	6	6	6	6	16
23	10	9	7	7	13	7	6	7	8	8	6	16
25	10	7	8	6	12	8	6	9	6	6	6	12
A	10	7	7	7	12.8	8.6	7	8.2	7	7	7	--
C	10	6	6	6	14	9	6	10	6	6	6	20
D	10	7	8	8	15	10	6	11	6	6	6	--
F	10	6	6	10	14	10	6	10	6	6	6	14
G	10	9	6	6	12	10	6	9	6	6	6	15
H	10	6	6	10	15	6	6	6	6	6	6	--
J	10	6	10	6	13	10	6	10	6	6	6	--
L	10	9.2	10.8	6	14.2	11.9	6	12.6	6	6	11	--
Q	10	9	10	8	14	11	6	12	6	6	10	--
S	10	6	6	6	14	8	6	7	6	6	6	17
V	10	7	9	6	15	9	6	10	6	6	8	14
Mean		7.8	7.6	7.3	13.7	9.5	6.1	9.3	6.1	6.1	7.0	15.9
SD		1.5	1.7	1.5	1.8	1.5	0.3	1.8	0.5	0.5	1.6	1.8
2SD		3.0	3.3	3.0	3.6	3.1	0.5	3.6	0.9	0.9	3.2	3.5

Light grey cells = resistant; dark grey cells = intermediate; white cells = susceptible

SULFAMETHOXAZOLE + TRIMETHOPRIM

Lab code	Method	AST 1	AST 2	AST 3	AST 4	AST 5	AST 6	AST 7	AST 8	AST 9	AST 10	ATCC 25922
CRL	MIC	≤0.25 / 4.75	0.5/ 9.5	≤0.25 /4.75	≤0.25 /4.75	≤0.25 /4.75	>32/6 08	1/19	2/38	2/38	≤0.25 /4.75	≤0.5/ 9.5
4	MIC	≤ 1/19	≤ 1/19	≤ 1/19	≤ 1/19	≤ 1/19	>8/ 152	≤ 1/19	≤ 1/19	≤ 1/19	≤ 1/19	≤ 1/19
B	MIC	≤ 0.063 /1.19	0.25/ 4.75	≤ 0.063 /1.19	0.125 /2.38	0.5/ 9.5	>8/ 152	8/152	8/152	4/76	0.25/ 4.75	0.5/ 9.5
E	MIC	4	4	4	4	4	128	128	32	32	4	4
W	MIC	≤0.12 /2.37	≤0.12 /2.37	≤0.12 /2.37	0.25/ 4.75	0.25/ 4.75	>4/76	>4/76	0.5/ 9.5	0.5/ 9.5	≤0.12 /2.37	--
17	Etest	0.032	0.125	0.047	0.064	0.094	>32	3	1.5	0.75	0.064	0.094
	Disc load in µg											23 - 29
1	25	27	23	29	30	20	6	6	15	13	25	24
3	25	23	17	25	26	18	8	6	10	11	22	26
6	25	26	21	28	27	26	9	9	15	14	27	26.9
9	25	27	23	29	28	23	6	6	10	12	25	25
10	25	25	23	27	24	22	6	6	6	10	25	26
11	25	31	28	30	32	23	6	6	17	15	29	28
12	25	36	28	34	39	26	6	16	6	11	32	31
13	25	32	24	32	30	22	6	6	7	10	28	28
14	25	28	21	30	27	22	6	6	6	6	27	26
16	25	28	26	30	33	25	7	7	16	17	28	28
18	25	29	21	29	28	24	6	6	6	9	27	27
21	25	27	16	27	28	21	6	6	6	6	26	26
22	25	32	30	35	36	24	6	18	15	14	32	30
23	25	28	20	28	28	22	7	8	11	12	25	28
24	25	35	33	36	38	31	6	16	16	15	34	30
25	25	25	21	24	25	22	6	6	12	12	22	23
A	25	32	26	31	32	26	7	7	10.0	10.6	28	--
D	25	27	17	27	25	15	6	6	6	6	26	--
F	25	26	17	28	29	15	6	6	6	10	27	26
H	25	26	18	26	26	20	6	6	6	6	24	--
J	25	30	26	32	32	27	6	8	7	13	30	--
L	25	29.6	27.6	32.7	30.5	24.6	6	6	12.1	13.9	29.1	--
S	25	28	23	29	28	26	6	8	12	11	26	27
V	25	27	22	25	31	18	6	16	12	19	21	24
Mean		28.5	23.0	29.3	29.7	22.6	6.3	8.2	10.2	11.6	26.9	26.8
SD		3.2	4.5	3.1	3.9	3.8	0.8	3.9	4.0	3.5	3.2	2.2
2SD		6.3	8.9	6.3	7.9	7.5	1.5	7.8	8.1	7.0	6.4	4.4

Light grey cells = resistant; dark grey cells = intermediate; white cells = susceptible

TRIMETHOPRIM

Lab code	Method	AST 1	AST 2	AST 3	AST 4	AST 5	AST 6	AST 7	AST 8	AST 9	AST 10	ATCC 25922
CRL	MIC	≤ 0.5	≤ 0.5	≤ 0.5	≤ 0.5	≤ 0.5	> 64	> 64	2-4	1-2	≤ 0.5	0.5-2
4	MIC	≤ 4	≤ 4	≤ 4	≤ 4	≤ 4	>32	>32	≤ 4	≤ 4	≤ 4	≤ 4
7	MIC	0.5	1	0.5	0.5	≤0.25	>32	>32	2	2	0.5	2
13	MIC	≤ 0.25	≤ 0.25	≤ 0.25	≤ 0.25	≤ 0.25	>32	>32	2	1	≤ 0.25	1
15	MIC	≤0.5	≤0.5	≤0.5	≤0.5	≤0.5	>64	>64	2	2	≤0.5	1
19	MIC	≤ 4	≤ 4	≤ 4	≤ 4	≤ 4	>32	>32	≤ 4	≤ 4	≤ 4	--
B	MIC	≤ 0.25	≤ 0.25	≤ 0.25	0.5	≤ 0.25	> 32	> 32	4	2	≤ 0.25	0.5
R	MIC	≤ 4	≤ 4	≤ 4	≤ 4	≤ 4	>32	>32	≤ 4	≤ 4	≤ 4	--
	Disc load in µg											21 - 28
2	5	25	25	28	27	26	6	6	14	16	26	25
3	5	17	18	26	29	25	6	6	14	16	21	23
8	5	27	28	28	30	28	6	6	18	19	27	25
9	5	26	24	29	28	27	6	6	17	18	26	28
10	5	25	25	28	26	26	6	6	14	16	27	25
11	5	29	30	28	30	30	6	6	22	20	29	23
12	5	32	24	34	36	24	6	6	20	25	32	28
13	5	32	22	32	26	28	6	6	16	17	30	25
14	5	28	28	30	28	29	6	6	17	18	30	25
16	5	27	30	27	34	30	7	7	22	22	28	24
18	5	27	25	29	28	27	6	6	15	16	28	25
20	5	29	29	31	30	31	6	6	19	21	30	27
22	5	30	33	32	36	31	6	6	20	24	32	25
24	5	35	38	38	40	37	6	6	27	23	36	29
25	5	26	24	26	26	26	6	6	17	17	24	22
A	5	31	30	33	21	31	7	7	19	22	30	--
C	5	32	34	34	34	32	6	6	25	23	32	30
D	5	30	26	28	30	24	6	6	13	14	30	--
F	5	26	25	27	27	26	6	6	10	14	28	22
G	5	27	27	27	27	28	6	6	15	17	29	25
H	5	26	22	26	26	26	6	6	16	18	26	--
J	5	28	29	30	31	30	6	6	20	19	31	--
S	5	28	28	28	30	29	6	6	21	19	27	22
V	5	24	25	24	26	24	6	6	15	23	21	22
Mean		27.8	27.0	29.3	29.4	28.1	6.1	6.1	17.8	19.0	28.3	25.0
SD		3.6	4.3	3.2	4.2	3.1	0.3	0.3	3.9	3.2	3.4	2.4
2SD		7.1	8.6	6.4	8.3	6.1	0.6	0.6	7.9	6.4	6.8	4.8

Light grey cells = resistant; dark grey cells = intermediate; white cells = susceptible

Annex 6. Results antimicrobial susceptibility testing per strain with MIC test

STRAIN AST - 1

Lab code	AMC (S)	AMP (S)	CEF (S)	CHL (S)	CIP (S)	ENR (S)*	FLO (S)	GEN (S)	KAN (S)	NAL (R)	NEO (S)	STR (R)	SXT (S)	TMP (S)
4	S	S	--	S	S	--	S	S	S	R	S	R	S	S
7	S	S	--	S	--	R	S	S	--	R	S	R	--	S
13	S	S	--	S	--	I	S	S	--	R	S	R	--	S
15	--	S	S	S	S	--	S	S	--	R	S	--	--	S
17 (Etest)	S	S	--	S	--	--	--	--	--	--	--	R	S	--
19	S	S	--	S	S	--	S	S	--	R	S	R	--	S
B	S	S	S	S	S	--	--	S	S	R	--	R	S	S
C (Etest)	--	--	--	--	I	--	--	--	--	--	--	--	--	--
E	--	S	S	S	S	--	--	I	S	R	--	R	S	--
R	S	S	--	S	S	--	S	S	--	R	S	R	--	S
W	S	S	--	S	S	--	--	S	S	R	--	R	S	--
Total	8	10	3	10	8	2	6	9	4	9	6	9	5	7
Number S	8	10	3	10	7	0	6	8	4	0	6	0	5	7
Number I	0	0	0	0	1	1	0	1	0	0	0	0	0	0
Number R	0	0	0	0	0	1	0	0	0	9	0	9	0	0
Minor error					1			1						
Major error														

S = Susceptible; I = Intermediate; R = Resistant

** Ciprofloxacin was tested as reference. Numbers of deviating results not counted*

STRAIN AST - 2

Lab code	AMC (S)	AMP (S)	CEF (S)	CHL (R)	CIP (S)	ENR (S)*	FLO (S)	GEN (S)	KAN (S)	NAL (S)	NEO (S)	STR (R)	SXT (S)	TMP (S)
4	S	S	--	R	S	--	S	S	S	S	S	R	S	S
7	S	S	--	R	--	S	S	S	--	S	S	R	--	S
13	S	S	--	R	--	S	S	S	--	S	S	R	--	S
15	--	S	S	R	S	--	S	S	--	S	S	--	--	S
17 (Etest)	S	S	--	R	--	--	--	--	--	--	--	R	S	--
19	S	S	--	R	S	--	S	S	--	S	S	R	--	S
B	S	S	S	R	S	--	--	S	S	S	--	R	S	S
E	--	S	S	R	S	--	--	S	S	S	--	R	S	--
R	S	S	--	R	S	--	S	S	--	S	S	R	--	S
W	S	S	--	R	S	--	--	S	S	S	--	R	S	--
Total	8	10	3	10	7	2	6	9	4	9	6	9	5	7
Number S	8	10	3	0	7	2	6	9	4	9	6	0	5	7
Number I	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number R	0	0	0	10	0	0	0	0	0	0	0	9	0	0
Minor error														
Major error														

S = Susceptible; I = Intermediate; R = Resistant

** Ciprofloxacin was tested as reference. Numbers of deviating results not counted*

STRAIN AST - 3

Lab code	AMC (S)	AMP (S)	CEF (S)	CHL (S)	CIP (S)	ENR (S)	FLO (S)	GEN (S)	KAN (R)	NAL (R)	NEO (R)	STR (R)	SXT (S)	TMP (S)
4	S	S	--	S	I	--	S	S	R	R	R	R	S	S
7	S	S	--	S	--	R	S	S	--	R	R	R	--	S
13	S	S	--	S	--	I	S	S	--	R	R	R	--	S
15	--	S	S	S	S	--	S	S	--	R	R	--	--	S
17 (Etest)	S	S	--	S	--	--	--	--	--	--	--	R	S	--
19	S	S	--	S	S	--	S	S	--	R	R	R	--	S
B	S	S	S	S	S	--	--	S	R	R	--	R	S	S
C (Etest)	--	--	--	--	I	--	--	--	--	--	--	--	--	--
E	--	S	S	S	S	--	--	I	R	R	--	R	S	--
R	S	S	--	S	S	--	S	S	--	R	R	R	--	S
W	S	S	--	S	S	--	--	S	R	R	--	R	S	--
Total	8	10	3	10	8	2	6	9	4	9	6	9	5	7
Number S	8	10	3	10	6	0	6	8	0	0	0	0	5	7
Number I	0	0	0	0	2	1	0	1	0	0	0	0	0	0
Number R	0	0	0	0	0	1	0	0	4	9	6	9	0	0
Minor error					2			1						
Major error														

S = Susceptible; I = Intermediate; R = Resistant

** Ciprofloxacin was tested as reference. Numbers of deviating results not counted*

STRAIN AST - 4

Lab code	AMC (S)	AMP (R)	CEF (R)	CHL (S)	CIP (S)	ENR (S)*	FLO (S)	GEN (S)	KAN (S)	NAL (S)	NEO (S)	STR (S)#	SXT (S)	TMP (S)
4	S	R	--	S	S	--	S	S	S	S	S	S	S	S
7	R	R	--	S	--	S	S	S	--	S	S	S	--	S
13	R	R	--	S	--	S	S	S	--	S	S	S	--	S
15	--	R	R	S	S	--	S	S	--	S	S	--	--	S
17 (Etest)	I	R	--	S	--	--	--	--	--	--	--	I	S	--
19	S	R	--	S	S	--	S	S	--	S	I	I	--	S
B	S	R	R	S	S	--	--	S	S	S	--	S	S	S
E	--	R	R	S	S	--	--	I	I	S	--	S	S	--
R	S	R	--	S	S	--	S	S	--	S	S	I	--	S
W	S	R	--	S	S	--	--	S	S	S	--	S	S	--
Total	8	10	3	10	7	2	6	9	4	9	6	9	5	7
Number S	5	0	0	10	7	2	6	8	3	9	5	6	5	7
Number I	1	0	0	0	0	0	0	1	1	0	1	3	0	0
Number R	2	10	3	0	0	0	0	0	0	0	0	0	0	0
Minor error	1							1	1		1			
Major error	2													

S = Susceptible; I = Intermediate; R = Resistant

** Ciprofloxacin was tested as reference. Numbers of deviating results not counted*

 # Numbesr of deviating results for streptomycin not counted

STRAIN AST - 5

Lab code	AMC (S)	AMP (R)	CEF (S)	CHL (S)	CIP (R)	ENR (R)*	FLO (S)	GEN (R)	KAN (S)	NAL (R)	NEO (S)	STR (R)#	SXT (S)	TMP (S)
4	I	R	--	S	R	--	S	R	S	R	S	R	S	S
7	R	R	--	S	--	R	S	R	--	R	S	R	--	S
13	R	R	--	S	--	R	S	R	--	R	S	I	--	S
15	--	R	S	S	R	--	S	R	--	R	S	--	--	S
17 (Etest)	R	R	--	S	--	--	--	--	--	--	--	R	S	--
19	I	R	--	S	R	--	S	R	--	R	S	R	--	S
B	R	R	S	S	R	--	--	R	S	R	--	R	S	S
C (Etest)	--	--	--	--	R	--	--	--	--	--	--	--	--	--
E	--	R	S	S	R	--	--	R	S	R	--	I	S	--
R	I	R	--	S	R	--	S	R	--	R	S	R	--	S
W	I	R	--	S	R	--	--	I	S	R	--	S	S	--
Total	8	10	3	10	8	2	6	9	4	9	6	9	5	7
Number S	0	0	3	10	0	0	6	0	4	0	6	1	5	7
Number I	4	0	0	0	0	0	0	1	0	0	0	2	0	0
Number R	4	10	0	0	8	2	0	8	0	9	0	6	0	0
Minor error	4							1						
Major error	4													

S = Susceptible; I = Intermediate; R = Resistant

** Ciprofloxacin was tested as reference. Numbers of deviating results not counted*

 # Numbers of deviating results for streptomycin not counted

STRAIN AST - 6

Lab code	AMC (S)	AMP (R)	CEF (S)	CHL (R)	CIP (S)	ENR (S)*	FLO (I)	GEN (S)	KAN (R)	NAL (S)	NEO (R)	STR (R)	SXT (R)	TMP (R)
4	S	R	--	R	S	--	I	S	R	S	R	R	R	R
7	R	R	--	R	--	S	R	S	--	S	R	R	--	R
13	R	R	--	R	--	S	S	I	--	S	R	R	--	R
15	--	R	S	R	S	--	S	S	--	S	R	--	--	R
17 (Etest)	R	R	--	R	--	--	--	--	--	--	--	R	R	--
19	S	R	--	R	S	--	I	S	--	S	R	R	--	R
B	R	R	S	R	S	--	--	S	R	S	--	R	R	R
E	--	R	S	R	S	--	--	S	R	S	--	R	R	--
R	S	R	--	R	S	--	I	S	--	S	R	R	--	R
W	S	R	--	R	S	--	--	S	R	S	--	R	R	--
Total	8	10	3	10	7	2	6	9	4	9	6	9	5	7
Number S	4	0	3	0	7	2	2	8	0	9	0	0	0	0
Number I	0	0	0	0	0	0	3	1	0	0	0	0	0	0
Number R	4	10	0	10	0	0	1	0	4	0	6	9	5	7
Minor error							3	1						
Major error	4													

S = Susceptible; I = Intermediate; R = Resistant

** Ciprofloxacin was tested as reference. Numbers of deviating results not counted*

STRAIN AST - 7

Lab code	AMC (S)	AMP (S)	CEF (S)	CHL (S)	CIP (S)	ENR (S)*	FLO (S)	GEN (S)	KAN (S)	NAL (S)	NEO (S)	STR (R)#	SXT (S)	TMP (R)
4	S	S	--	S	S	--	S	S	S	S	S	R	S	R
7	S	S	--	S	--	S	S	S	--	S	S	R	--	R
13	S	S	--	S	--	S	S	S	--	S	S	I	--	R
15	--	S	S	S	S	--	S	S	--	S	S	--	--	R
17 (Etest)	S	S	--	S	--	--	--	--	--	--	--	R	I	--
19	S	S	--	S	S	--	S	S	--	S	S	R	--	R
B	S	S	S	S	S	--	--	S	S	S	--	R	R	R
E	--	S	S	S	S	--	--	S	S	S	--	I	R	--
R	S	S	--	S	S	--	S	S	--	S	S	I	--	R
W	S	S	--	S	S	--	--	S	S	S	--	S	R	--
Total	8	10	3	10	7	2	6	9	4	9	6	9	5	7
Number S	8	10	3	10	7	2	6	9	4	9	6	1	1	0
Number I	0	0	0	0	0	0	0	0	0	0	0	3	1	0
Number R	0	0	0	0	0	0	0	0	0	0	0	5	3	7
Minor error													1	
Major error													3	

S = Susceptible; I = Intermediate; R = Resistant

** Ciprofloxacin was tested as reference. Numbers of deviating results not counted*

 # Numbers of deviating results for streptomycin not counted

STRAIN AST - 8

Lab code	AMC (S)	AMP (R)	CEF (S)	CHL (R)	CIP (S)	ENR (S)*	FLO (I)	GEN (R)	KAN (R)	NAL (R)	NEO (R)	STR (R)	SXT (S)	TMP (S)
4	S	R	--	R	I	--	S	R	R	R	R	R	S	S
7	R	R	--	R	--	R	R	R	--	R	R	R	--	S
13	R	R	--	R	--	R	S	R	--	R	R	R	--	S
15	--	R	S	R	S	--	S	R	--	R	R	--	--	S
17 (Etest)	R	R	--	R	--	--	--	--	--	--	--	R	S	--
19	S	R	--	R	S	--	S	R	--	R	R	R	--	S
B	R	R	S	R	R	--	--	R	R	R	--	R	R	S
C (Etest)	--	--	--	--	I	--	--	--	--	--	--	--	--	--
E	--	R	S	R	I	--	--	R	R	R	--	R	I	--
R	S	R	--	I	S	--	S	R	--	R	R	R	--	S
W	S	R	--	S	S	--	--	R	R	R	--	R	S	--
Total	8	10	3	10	8	2	6	9	4	9	6	9	5	7
Number S	4	0	3	1	4	0	5	0	0	0	0	0	3	7
Number I	0	0	0	1	3	0	0	0	0	0	0	0	1	0
Number R	4	10	0	8	1	2	1	9	4	9	6	9	1	0
Minor error				1	3		6						1	
Major error	4			1	1								1	

S = Susceptible; I = Intermediate; R = Resistant

** Ciprofloxacin was tested as reference. Numbers of deviating results not counted*

STRAIN AST - 9

Lab code	AMC (R)	AMP (R)	CEF (R)	CHL (R)	CIP (S)	ENR (S)*	FLO (R)	GEN (R)	KAN (R)	NAL (S)	NEO (S)	STR (R)	SXT (S)	TMP (S)
4	R	R	--	R	S	--	R	R	R	S	S	R	S	S
7	R	R	--	R	--	S	R	R	--	S	S	R	--	S
13	R	R	--	R	--	S	R	R	--	S	S	R	--	S
15	--	R	R	R	S	--	R	R	--	S	S	--	--	S
17 (Etest)	R	R	--	R	--	--	--	--	--	--	--	R	S	--
19	R	R	--	R	S	--	R	R	--	I	S	R	--	S
B	R	R	R	R	S	--	--	R	R	S	--	R	R	S
C (Etest)	--	--	--	--	S	--	--	--	--	--	--	--	--	--
E	--	R	R	R	S	--	--	R	R	R	--	R	I	--
R	R	R	--	R	S	--	R	R	--	S	S	R	--	S
W	R	R	--	R	S	--	--	R	S	S	--	R	S	--
Total	8	10	3	10	8	2	6	9	4	9	6	9	5	7
Number S	0	0	0	0	8	2	0	0	1	7	6	0	3	7
Number I	0	0	0	0	0	0	0	0	0	1	0	0	1	0
Number R	8	10	3	10	0	0	6	9	3	1	0	9	1	0
Minor error										1			1	
Major error									1	1			1	

S = Susceptible; I = Intermediate; R = Resistant

** Ciprofloxacin was tested as reference. Numbers of deviating results not counted*

STRAIN AST – 10

Lab code	AMC (S)	AMP (S)	CEF (S)	CHL (S)	CIP (S)	ENR (S)*	FLO (S)	GEN (R)	KAN (S)	NAL (S)	NEO (S)	STR (R)	SXT (S)	TMP (S)
4	S	S	--	S	S	--	S	R	S	S	S	R	S	S
7	S	S	--	S	--	S	S	R	--	S	S	R	--	S
13	S	S	--	S	--	S	S	R	--	S	S	R	--	S
15	--	S	S	S	S	--	S	R	--	S	S	--	--	S
17 (Etest)	S	S	--	S	--	--	--	--	--	--	--	R	S	--
19	S	S	--	S	S	--	S	R	--	S	S	R	--	S
B	S	S	S	S	S	--	--	R	S	S	--	R	S	S
E	--	S	S	S	S	--	--	R	S	S	--	R	S	--
R	S	S	--	S	S	--	S	R	--	S	S	R	--	S
W	S	S	--	S	S	--	--	R	S	S	--	R	S	--
Total	8	10	3	10	7	2	6	9	4	9	6	9	5	7
Number S	8	10	3	10	7	2	6	0	4	9	6	0	5	7
Number I	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number R	0	0	0	0	0	0	0	9	0	0	0	9	0	0
Minor error														
Major error														

S = Susceptible; I = Intermediate; R = Resistant

** Ciprofloxacin was tested as reference. Numbers of deviating results not counted*

Annex 7. Results antimicrobial susceptibility testing per strain with disc diffusion test

STRAIN AST - 1

Lab code	AMC (S)	AMP (S)	CEF (S)	CHL (S)	CIP (S)	ENR (S)*	FLO (S)	GEN (S)	KAN (S)	NAL (R)	NEO (S)	STR (R)	SXT (S)	TMP (S)
1	S	S	S	S	S	S	S	S	S	R	S	R	S	--
2	S	S	S	S	S	--	--	S	S	R	--	R	--	S
3	S	S	S	S	S	R	--	S	S	R	S	R	S	S
6	S	S	--	--	--	--	--	S	--	R	--	--	S	--
8	S	S	S	S	S	--	--	S	S	R	--	R	--	S
9	S	S	S	S	S	--	--	S	--	R	S	R	S	S
10	S	S	S	S	S	S	--	S	S	R	S	R	S	S
11	--	S	--	S	S	--	--	--	S	R	--	--	S	S
12	S	S	S	S	--	S	S	--	S	R	--	R	S	S
13	S	S	S	S	S	--	S	S	--	R	S	R	S	S
14	S	S	S	S	S	S	--	S	S	R	--	R	S	S
16	S	S	S	S	S	--	--	S	--	R	S	R	S	S
18	S	S	--	S	S	I	--	S	S	R	--	R	S	S
20	S	S	S	S	S	--	--	S	S	R	--	R	--	S
21	S	S	S	S	S	S	S	S	S	R	S	R	S	--
22	S	S	S	S	--	S	S	S	S	R	--	R	S	S
23	S	S	--	S	S	I	S	S	S	R	--	R	S	--
24	S	S	S	S	--	--	--	--	--	R	--	R	S	S
25	S	S	S	S	I	--	--	S	I	R	--	R	S	S
A	S	S	S	S	S	--	S	S	S	R	S	R	S	S
C	--	S	S	S	--	--	--	S	--	R	--	R	--	S
D	S	--	--	S	S	--	--	S	S	R	--	R	S	S
F	S	S	S	S	S	--	--	S	S	R	--	R	S	S
G	--	S	S	S	S	--	--	S	S	R	--	R	--	S
H	--	S	S	S	S	--	--	S	S	R	--	R	S	S
J	S	S	S	S	I	--	--	S	S	R	--	R	S	S
L	--	S	S	S	S	--	--	S	S	R	--	R	S	--
Q	--	--	--	S	--	--	--	--	S	R	--	R	--	--
S	S	S	--	S	S	--	--	S	--	R	--	R	S	S
V	S	S	S	S	S	--	--	S	S	R	--	R	S	S
Total	24	28	23	29	24	9	7	26	23	30	8	28	24	24
Number S	24	28	23	29	22	6	7	26	22	0	8	0	24	24
Number I	0	0	0	0	2	2	0	0	1	0	0	0	0	0
Number R	0	0	0	0	0	1	0	0	0	30	0	28	0	0
Minor error					2				1					
Major error														

S = Susceptible; I = Intermediate; R = Resistant

** Ciprofloxacin was tested as reference. Numbers of deviating results not counted*

STRAIN AST - 2

Lab code	AMC (S)	AMP (S)	CEF (S)	CHL (R)	CIP (S)	ENR (S)*	FLO (S)	GEN (S)	KAN (S)	NAL (S)	NEO (S)	STR (R)	SXT (S)	TMP (S)
1	S	S	S	R	S	S	S	S	S	S	S	R	S	--
2	S	S	S	R	S	--	--	S	S	S	--	R	--	S
3	S	S	S	R	S	S	--	S	S	S	S	R	S	S
6	S	S	--	--	--	--	--	S	--	S	--	--	S	--
8	S	S	S	R	S	--	--	S	S	S	--	R	--	S
9	S	S	S	R	S	--	--	S	--	S	S	R	S	S
10	S	S	S	R	S	S	--	S	S	S	S	R	S	S
11	--	S	--	R	S	--	--	--	S	S	--	--	S	S
12	S	S	S	R	--	S	S	--	S	S	--	R	S	S
13	S	S	S	R	S	--	S	S	--	S	S	R	S	S
14	S	S	S	R	S	S	--	S	S	S	--	R	S	S
16	S	S	S	R	S	--	--	S	--	S	S	R	S	S
18	S	S	--	R	S	S	--	S	S	S	--	R	S	S
20	S	S	S	R	S	--	--	S	S	S	--	R	--	S
21	S	S	S	R	S	S	S	S	S	S	S	R	S	--
22	S	S	S	R	--	S	S	S	S	S	--	R	S	S
23	S	S	--	R	S	S	S	S	S	S	--	R	S	--
24	S	S	S	R	--	--	--	--	--	S	--	--	S	S
25	S	S	S	R	S	--	--	S	I	S	--	R	S	S
A	S	S	S	R	S	--	S	S	S	S	S	R	S	S
C	--	S	S	R	S	--	--	S	--	S	--	R	--	S
D	S	--	--	R	S	--	--	S	S	S	--	R	S	S
F	S	S	S	R	S	--	--	S	S	S	--	R	S	S
G	--	S	S	R	S	--	--	S	S	S	--	R	--	S
H	--	S	S	R	S	--	--	S	S	S	--	R	S	S
J	S	S	S	R	S	--	--	S	S	S	--	R	S	S
L	--	S	S	R	S	--	--	S	S	S	--	R	S	--
Q	--	--	--	R	--	--	--	--	S	S	--	R	--	--
S	S	S	--	R	S	--	--	S	--	S	--	R	S	S
V	S	S	S	R	S	--	--	S	S	S	--	R	S	S
Total	24	28	23	29	25	9	7	26	23	30	8	27	24	24
Number S	24	28	23	0	25	9	7	26	22	30	8	0	24	24
Number I	0	0	0	0	0	0	0	0	1	0	0	0	0	0
Number R	0	0	0	29	0	0	0	0	0	0	0	27	0	0
Minor error									1					
Major error														

S = Susceptible; I = Intermediate; R = Resistant

** Ciprofloxacin was tested as reference. Numbers of deviating results not counted*

STRAIN AST - 3

Lab code	AMC (S)	AMP (S)	CEF (S)	CHL (S)	CIP (S)	ENR (S)*	FLO (S)	GEN (S)	KAN (R)	NAL (R)	NEO (R)	STR (R)	SXT (S)	TMP (S)
1	S	S	S	S	S	S	S	S	R	R	R	R	S	--
2	S	S	S	S	S	--	--	S	R	R	--	R	--	S
3	S	S	S	S	S	I	--	S	R	R	R	R	S	S
6	S	S	--	--	--	--	--	S	--	R	--	--	S	--
8	S	S	S	S	S	--	--	S	R	R	--	R	--	S
9	S	S	S	S	S	--	--	S	--	S	R	R	S	S
10	S	S	S	S	S	S	--	S	R	R	R	R	S	S
11	--	S	--	S	S	--	--	--	R	R	--	--	S	S
12	S	S	S	S	--	S	S	--	R	R	--	R	S	S
13	S	S	S	S	S	--	S	S	--	R	R	R	S	S
14	S	S	S	S	S	S	--	S	R	R	--	R	S	S
16	S	S	S	S	S	--	--	S	--	R	R	R	S	S
18	S	S	--	S	S	I	--	S	R	R	--	R	S	S
20	S	S	S	S	S	--	--	S	R	R	--	R	--	S
21	S	S	S	S	S	S	S	S	R	R	R	R	S	--
22	S	S	S	S	--	S	S	S	R	R	--	R	S	S
23	S	S	--	S	S	I	S	S	R	R	--	R	S	--
24	I	S	S	S	--	--	--	--	--	R	--	--	S	S
25	S	S	S	S	I	--	--	S	R	R	--	R	S	S
A	S	S	S	S	S	--	S	S	R	R	R	R	S	S
C	--	S	S	S	--	--	--	S	--	R	--	R	--	S
D	S	--	--	S	S	--	--	S	R	R	--	R	S	S
F	S	S	S	S	S	--	--	S	R	R	--	R	S	S
G	--	S	S	S	S	--	--	S	R	R	--	R	--	S
H	--	S	S	S	S	--	--	S	R	R	--	R	S	S
J	S	S	S	S	I	--	--	S	R	R	--	R	S	S
L	--	S	S	S	S	--	--	S	R	R	--	R	S	--
Q	--	--	--	S	--	--	--	--	R	R	--	R	--	--
S	S	S	--	S	S	--	--	S	--	R	--	R	S	S
V	S	S	S	S	S	--	--	S	R	R	--	R	S	S
Total	24	28	23	29	24	9	7	26	23	30	8	27	24	24
Number S	23	28	23	29	22	6	7	26	0	1	0	0	24	24
Number I	1	0	0	0	2	3	0	0	0	0	0	0	0	0
Number R	0	0	0	0	0	0	0	0	23	29	8	27	0	0
Minor error	1				2									
Major error										1				

S = Susceptible; I = Intermediate; R = Resistant

** Ciprofloxacin was tested as reference. Numbers of deviating results not counted*

STRAIN AST - 4

Lab code	AMC (S)	AMP (R)	CEF (R)	CHL (S)	CIP (S)	ENR (S)*	FLO (S)	GEN (S)	KAN (S)	NAL (S)	NEO (S)	STR (S)#	SXT (S)	TMP (S)
1	S	R	R	S	S	S	S	S	S	S	S	S	S	--
2	S	R	R	S	S	--	--	S	I	S	--	I	--	S
3	S	R	R	S	S	S	--	S	I	S	S	S	S	S
6	S	R	--	--	--	--	--	S	--	S	--	--	S	--
8	S	R	R	S	S	--	--	S	S	S	--	I	--	S
9	S	R	R	S	S	--	--	S	--	S	I	I	S	S
10	S	R	R	S	S	S	--	S	I	S	I	R	S	S
11	--	R	--	S	S	--	--	--	S	S	--	--	S	S
12	S	R	R	S	--	S	S	--	S	S	--	S	S	S
13	S	R	R	S	S	--	S	S	--	S	S	S	S	S
14	S	R	R	S	S	S	--	S	I	S	--	I	S	S
16	S	R	R	S	S	--	--	S	--	S	S	S	S	S
18	S	R	--	S	S	S	--	S	S	S	--	R	S	S
20	I	R	R	S	S	--	--	S	S	S	--	I	--	S
21	S	R	R	S	S	S	S	S	I	S	S	I	S	--
22	S	R	R	S	--	S	S	S	I	S	--	I	S	S
23	S	R	--	S	S	S	S	S	S	S	--	I	S	--
24	I	R	R	S	--	--	--	--	--	S	--	--	S	S
25	S	R	R	S	S	--	--	I	R	S	--	I	S	S
A	S	R	R	S	S	--	S	S	I	S	I	I	S	S
C	--	R	R	S	S	--	--	S	--	S	--	I	--	S
D	R	--	--	S	S	--	--	S	I	S	--	S	S	S
F	I	R	R	S	S	--	--	S	S	S	--	I	S	S
G	--	R	R	S	S	--	--	S	I	S	--	I	--	S
H	--	R	R	S	S	--	--	S	S	S	--	S	S	S
J	S	R	R	S	S	--	--	S	S	S	--	I	S	S
L	--	R	R	S	S	--	--	S	S	S	--	I	S	--
Q	--	--	--	S	--	--	--	--	I	S	--	I	--	--
S	S	R	--	S	S	--	--	S	--	S	--	I	S	S
V	S	R	R	S	S	--	--	S	S	S	--	S	S	S
Total	24	28	23	29	25	9	7	26	23	30	8	27	24	24
Number S	20	0	0	29	25	9	7	25	12	30	5	8	24	24
Number I	3	0	0	0	0	0	0	1	10	0	3	17	0	0
Number R	1	28	23	0	0	0	0	0	1	0	0	2	0	0
Minor error	3							1	10		3			
Major error	1								1					

S = Susceptible; I = Intermediate; R = Resistant

** Ciprofloxacin was tested as reference. Numbers of deviating results not counted*

 # Numbers of deviating results for streptomycin not counted

STRAIN AST - 5

Lab code	AMC (S)	AMP (R)	CEF (S)	CHL (S)	CIP (R)	ENR (R)*	FLO (S)	GEN (R)	KAN (S)	NAL (R)	NEO (S)	STR (R)#	SXT (S)	TMP (S)
1	R	R	S	S	R	R	S	R	S	R	S	R	S	--
2	I	R	S	S	R	--	--	I	S	R	--	R	--	S
3	I	R	S	S	R	R	--	I	S	R	S	R	S	S
6	S	R	--	--	--	--	--	R	--	R	--	--	S	--
8	I	R	S	S	R	--	--	R	S	R	--	R	--	S
9	R	R	S	S	R	--	--	I	--	R	S	I	S	S
10	I	R	S	S	R	R	--	R	S	R	S	R	S	S
11	--	R	--	S	I	--	--	--	S	R	--	--	S	S
12	S	R	S	S	--	R	S	--	S	R	--	R	S	S
13	S	R	S	S	R	--	S	R	--	R	S	R	S	S
14	I	R	S	S	R	R	--	R	S	R	--	R	S	S
16	I	R	S	S	R	--	--	R	--	R	S	R	S	S
18	I	R	--	S	R	R	--	I	S	R	--	R	S	S
20	R	R	S	S	R	--	--	I	S	R	--	R	--	S
21	I	R	S	S	R	R	S	R	S	R	S	R	S	--
22	R	R	S	S	--	R	S	R	S	R	--	R	S	S
23	I	R	--	S	R	R	S	R	S	R	--	R	S	--
24	I	R	S	S	--	--	--	--	--	R	--	--	S	S
25	I	R	S	S	R	--	--	R	I	R	--	R	S	S
A	I	R	S	S	R	--	S	R	S	R	S	R	S	S
C	--	R	S	S	--	--	--	R	--	R	--	R	--	S
D	I	--	--	S	R	--	--	R	S	R	--	R	I	S
F	R	R	S	S	R	--	--	R	S	R	--	R	I	S
G	--	R	S	S	R	--	--	R	S	R	--	R	--	S
H	--	R	S	S	R	--	--	R	S	R	--	R	S	S
J	I	R	S	S	R	--	--	R	S	R	--	R	S	S
L	--	R	S	S	I	--	--	I	S	R	--	I	S	--
Q	--	--	--	S	--	--	--	--	S	R	--	I	--	--
S	I	R	--	S	R	--	--	R	--	R	--	R	S	S
V	I	R	S	S	R	--	--	R	S	R	--	R	S	S
Total	24	28	23	29	24	9	7	26	23	30	8	24	24	24
Number S	3	0	23	29	0	0	7	0	22	0	8	0	22	24
Number I	16	0	0	0	2	0	0	6	1	0	0	3	2	0
Number R	5	28	0	0	22	9	0	20	0	30	0	21	0	0
Minor error	16				2			6	1				2	
Major error	5													

S = Susceptible; I = Intermediate; R = Resistant

** Ciprofloxacin was tested as reference. Numbers of deviating results not counted*

 # Numbers of deviating results for streptomycin not counted

STRAIN AST - 6

Lab code	AMC (S)	AMP (R)	CEF (S)	CHL (R)	CIP (S)	ENR (S)*	FLO (I)	GEN (S)	KAN (R)	NAL (S)	NEO (R)	STR (R)	SXT (R)	TMP (R)
1	I	R	S	R	S	S	I	S	R	S	R	R	R	--
2	S	R	S	R	S	--	--	S	R	S	--	R	--	R
3	S	R	S	R	S	S	--	S	R	S	R	R	R	R
6	S	R	--	--	--	--	--	S	--	S	--	--	R	--
8	S	R	S	R	S	--	--	S	R	S	--	R	--	R
9	S	R	S	R	S	--	--	S	--	S	R	R	R	R
10	S	R	S	R	S	S	--	S	R	S	R	R	R	R
11	--	R	--	R	S	--	--	--	R	S	--	--	R	R
12	S	R	S	R	--	S	I	--	R	S	--	R	R	R
13	S	R	S	R	S	--	S	S	--	S	R	R	R	R
14	S	R	S	R	S	S	--	S	R	S	--	R	R	R
16	S	R	S	R	S	--	--	S	--	S	R	R	R	R
18	S	R	--	R	S	S	--	S	R	S	--	R	R	R
20	R	R	S	R	S	--	--	S	R	S	--	R	--	R
21	I	R	S	R	S	S	I	S	R	S	R	R	R	--
22	S	R	S	R	--	S	R	S	R	S	--	R	R	R
23	S	R	--	R	S	S	I	S	R	S	--	R	R	--
24	I	R	S	R	--	--	--	--	--	S	--	--	R	R
25	I	R	S	R	S	--	--	I	R	S	--	R	R	R
A	S	R	S	R	S	--	R	S	R	S	R	R	R	R
C	--	R	S	R	S	--	--	S	--	S	--	R	--	R
D	I	--	--	R	S	--	--	S	R	S	--	R	R	R
F	S	R	S	R	S	--	--	S	R	S	--	R	R	R
G	--	R	S	R	S	--	--	S	R	S	--	R	--	R
H	--	R	S	R	S	--	--	S	R	S	--	R	R	R
J	S	R	S	R	S	--	--	S	R	S	--	R	R	R
L	--	R	S	R	S	--	--	S	R	S	--	R	R	--
Q	--	--	--	R	--	--	--	--	R	S	--	R	--	--
S	S	R	--	R	S	--	--	S	--	S	--	R	R	R
V	S	R	S	R	S	--	--	S	R	S	--	R	R	R
Total	24	28	23	29	25	9	7	26	23	30	8	27	24	24
Number S	18	0	23	0	25	9	1	25	0	30	0	0	0	0
Number I	5	0	0	0	0	0	4	1	0	0	0	0	0	0
Number R	1	28	0	29	0	0	2	0	23	0	8	27	24	24
Minor error	5						3	1						
Major error	1													

S = Susceptible; I = Intermediate; R = Resistant

** Ciprofloxacin was tested as reference. Numbers of deviating results not counted*

STRAIN AST – 7

Lab code	AMC (S)	AMP (S)	CEF (S)	CHL (S)	CIP (S)	ENR (S)*	FLO (S)	GEN (S)	KAN (S)	NAL (S)	NEO (S)	STR (R)#	SXT (S)	TMP (R)
1	S	S	S	S	S	S	S	S	S	S	S	S	R	--
2	S	S	S	S	S	--	--	S	S	I	--	R	--	R
3	S	S	S	S	S	S	--	S	S	S	S	I	R	R
6	S	S	--	--	--	--	--	S	--	S	--	--	R	--
8	S	S	S	S	S	--	--	S	S	S	--	R	--	R
9	S	S	S	S	S	--	--	S	--	S	S	R	R	R
10	S	S	S	S	S	S	--	S	S	S	S	R	R	R
11	--	S	--	S	S	--	--	--	S	S	--	--	R	R
12	S	S	S	S	--	S	S	--	S	S	--	R	S	R
13	S	S	S	S	S	--	S	S	--	S	S	R	R	R
14	S	S	S	S	S	S	--	S	S	S	--	R	R	R
16	S	S	S	S	S	--	--	S	--	S	S	R	R	R
18	S	S	--	S	S	S	--	S	S	I	--	R	R	R
20	S	S	S	S	S	--	--	S	S	S	--	R	--	R
21	S	S	S	S	S	S	S	S	S	S	S	R	R	--
22	S	S	S	S	--	S	S	S	S	S	--	R	S	R
23	S	S	--	S	S	S	S	S	S	I	--	R	R	--
24	S	S	S	S	--	--	--	--	--	S	--	--	R	R
25	S	S	S	S	S	--	--	S	I	S	--	R	R	R
A	S	S	S	S	S	--	S	S	S	S	S	R	R	R
C	--	S	S	S	S	--	--	S	--	S	--	R	--	R
D	S	--	--	S	S	--	--	S	S	I	--	R	R	R
F	S	S	S	S	S	--	--	S	S	S	--	R	R	R
G	--	S	S	S	S	--	--	S	S	S	--	R	--	R
H	--	S	S	S	S	--	--	S	S	S	--	R	R	R
J	S	S	S	S	S	--	--	S	S	S	--	R	R	R
L	--	S	S	S	S	--	--	S	S	S	--	I	R	--
Q	--	--	--	S	--	--	--	--	S	I	--	I	--	--
S	S	S	--	S	S	--	--	S	--	S	--	R	R	R
V	S	S	S	S	S	--	--	S	S	S	--	R	S	R
Total	24	28	23	29	25	9	7	26	23	30	8	27	24	24
Number S	24	28	23	29	25	9	7	26	22	25	8	1	3	0
Number I	0	0	0	0	0	0	0	0	1	5	0	3	0	0
Number R	0	0	0	0	0	0	0	0	0	0	0	23	21	24
Minor error									1	5				
Major error													21	

S = Susceptible; I = Intermediate; R = Resistant

** Ciprofloxacin was tested as reference. Numbers of deviating results not counted*

 # Numbers of deviating results for streptomycin not counted

STRAIN AST - 8

Lab code	AMC (S)	AMP (R)	CEF (S)	CHL (R)	CIP (S)	ENR (S)*	FLO (I)	GEN (R)	KAN (R)	NAL (R)	NEO (R)	STR (R)	SXT (S)	TMP (S)
1	S	R	S	S	I	I	S	R	R	R	R	R	I	--
2	S	R	S	I	I	--	--	R	R	R	--	R	--	I
3	S	R	S	S	S	R	--	R	R	R	R	R	R	I
6	S	R	--	--	--	--	--	R	--	R	--	--	S	--
8	S	R	S	I	S	--	--	R	R	R	--	R	--	S
9	S	R	S	S	S	--	--	R	--	R	R	R	R	S
10	S	R	S	I	S	I	--	R	R	R	R	R	R	I
11	--	R	--	S	S	--	--	--	R	R	--	--	S	S
12	S	R	S	S	--	S	S	--	R	R	--	R	R	S
13	S	R	S	I	S	--	S	R	--	R	R	R	R	S
14	S	R	S	I	S	R	--	R	R	R	--	R	R	S
16	S	R	S	S	S	--	--	R	--	R	I	R	S	S
18	S	R	--	S	S	I	--	R	R	R	--	R	R	I
20	I	R	S	S	S	--	--	R	R	R	--	R	--	S
21	S	R	S	I	S	I	S	R	R	R	I	R	R	--
22	S	R	S	S	--	I	I	R	R	R	--	R	I	S
23	S	R	--	S	S	I	S	R	R	R	--	R	I	--
24	I	R	S	R	--	--	--	--	--	R	--	--	R	S
25	S	R	S	I	R	--	--	R	R	R	--	R	I	S
A	S	R	S	S	I	--	S	R	R	R	R	R	R	S
C	--	R	S	I	--	--	--	R	--	R	--	R	--	S
D	S	--	--	R	S	--	--	R	R	R	--	R	R	I
F	I	R	S	S	I	--	--	R	R	R	--	R	R	R
G	--	R	S	I	S	--	--	R	R	R	--	R	--	I
H	--	R	S	I	S	--	--	R	R	R	--	R	R	S
J	S	R	S	I	I	--	--	R	R	R	--	R	R	S
L	--	R	S	S	S	--	--	R	R	R	--	R	I	--
Q	--	--	--	S	--	--	--	--	R	R	--	R	--	--
S	S	R	--	I	S	--	--	R	--	R	--	R	I	I
V	S	R	S	I	S	--	--	R	R	R	--	R	I	S
Total	24	28	23	29	24	9	7	26	23	30	8	27	24	24
Number S	21	0	23	14	18	1	6	0	0	0	0	0	3	16
Number I	3	0	0	13	5	6	1	0	0	0	2	0	7	7
Number R	0	28	0	2	1	2	0	26	23	30	6	27	14	1
Minor error	3			13	5		0				2		7	7
Major error				14	1								14	1

S = Susceptible; I = Intermediate; R = Resistant

** Ciprofloxacin was tested as reference. Numbers of deviating results not counted*

STRAIN AST - 9

Lab code	AMC (R)	AMP (R)	CEF (R)	CHL (R)	CIP (S)	ENR (S)*	FLO (R)	GEN (R)	KAN (R)	NAL (S)	NEO (S)	STR (R)	SXT (S)	TMP (S)
1	R	R	S	R	S	S	R	R	I	I	S	R	I	--
2	R	R	R	R	S	--	--	R	R	R	--	R	--	S
3	R	R	I	R	S	S	--	R	I	I	S	R	I	S
6	R	R	--	--	--	--	--	R	--	S	--	--	S	--
8	R	R	I	R	S	--	--	R	S	I	--	R	--	S
9	R	R	R	R	S	--	--	R	--	I	S	R	I	S
10	R	R	R	R	S	S	--	R	I	R	S	R	R	S
11	--	R	--	R	I	--	--	--	I	I	--	--	I	S
12	I	R	I	R	--	S	R	--	S	S	--	R	I	S
13	R	R	R	R	S	--	R	R	--	R	S	R	R	S
14	R	R	R	R	S	S	--	R	I	I	--	R	R	S
16	R	R	I	R	S	--	--	R	--	I	S	R	S	S
18	R	R	--	R	S	S	--	R	S	R	--	R	R	S
20	R	R	I	R	S	--	--	R	S	I	--	R	--	S
21	R	R	I	R	S	S	R	R	I	I	S	R	R	--
22	R	R	I	R	--	S	R	R	I	I	--	R	I	S
23	R	R	--	R	S	S	R	R	I	I	--	R	I	--
24	R	R	R	R	--	--	--	--	--	R	--	--	R	S
25	R	R	R	R	S	--	--	R	R	R	--	R	I	S
A	R	R	R	R	S	--	R	R	R	I	S	R	I	S
C	--	R	R	R	--	--	--	R	--	I	--	R	--	S
D	R	--	--	R	S	--	--	R	I	R	--	R	R	I
F	R	R	I	R	S	--	--	R	S	S	--	R	R	I
G	--	R	R	R	S	--	--	R	R	R	--	R	--	S
H	--	R	R	R	S	--	--	R	R	R	--	R	R	S
J	R	R	I	R	I	--	--	R	R	I	--	R	R	S
L	--	R	I	R	S	--	--	R	S	I	--	R	I	--
Q	--	--	--	R	--	--	--	--	R	R	--	R	--	--
S	R	R	--	R	S	--	--	R	--	R	--	R	I	S
V	R	R	R	R	S	--	--	R	S	S	--	R	S	S
Total	24		23	29	24	9	7	26	23	30	8	27	24	24
Number S	0		1	0	22	9	0	0	7	4	8	0	3	22
Number I	1		10	0	2	0	0	0	9	15	0	0	11	2
Number R	23		12	29	0	0	7	26	7	11	0	27	10	0
Minor error	1		10		2				9	15			11	2
Major error			1						7	11			10	

S = Susceptible; I = Intermediate; R = Resistant

** Ciprofloxacin was tested as reference. Numbers of deviating results not counted*

STRAIN AST - 10

Lab code	AMC (S)	AMP (S)	CEF (S)	CHL (S)	CIP (S)	ENR (S)*	FLO (S)	GEN (R)	KAN (S)	NAL (S)	NEO (S)	STR (R)	SXT (S)	TMP (S)
1	S	S	S	S	S	S	S	R	S	S	S	R	S	--
2	S	S	S	S	S	--	--	R	S	S	--	R	--	S
3	S	S	S	S	S	S	--	R	S	S	S	R	S	S
6	S	S	--	--	--	--	--	R	--	S	--	--	S	--
8	S	S	S	S	S	--	--	R	S	S	--	R	--	S
9	S	S	S	S	S	--	--	R	--	S	S	R	S	S
10	S	S	S	S	S	S	--	R	S	S	S	R	S	S
11	--	S	--	S	S	--	--	--	S	S	--	--	S	S
12	S	S	S	S	--	S	S	--	S	S	--	R	S	S
13	S	S	S	S	S	--	S	R	--	S	S	R	S	S
14	S	S	S	S	S	S	--	R	S	S	--	R	S	S
16	S	S	S	S	S	--	--	R	--	S	S	R	S	S
18	S	S	--	S	S	S	--	R	S	S	--	R	S	S
20	S	S	S	S	S	--	--	R	S	S	--	R	--	S
21	S	S	S	S	S	S	S	R	S	S	S	R	S	--
22	S	S	S	S	--	S	S	R	S	S	--	R	S	S
23	S	S	--	S	S	S	S	R	S	S	--	R	S	--
24	I	S	S	S	--	--	--	--	--	S	--	--	S	S
25	S	S	S	S	S	--	--	R	I	S	--	R	S	S
A	S	S	S	S	S	--	S	R	S	S	S	R	S	S
C	--	S	S	S	S	--	--	R	--	S	--	R	--	S
D	S	--	--	S	S	--	--	R	S	I	--	R	S	S
F	S	S	S	S	S	--	--	R	S	S	--	R	S	S
G	--	S	S	S	S	--	--	R	S	S	--	R	--	S
H	--	S	S	S	S	--	--	R	S	S	--	R	S	S
J	S	S	S	S	S	--	--	R	S	S	--	R	S	S
L	--	S	S	S	S	--	--	R	S	S	--	R	S	--
Q	--	--	--	S	--	--	--	--	S	S	--	R	--	--
S	S	S	--	S	S	--	--	R	--	S	--	R	S	S
V	S	S	S	S	S	--	--	R	S	S	--	R	S	S
Total	24	28	23	29	25	9	7	26	23	30	8	27	24	24
Number S	23	28	23	29	25	9	7	0	22	29	8	0	24	24
Number I	1	0	0	0	0	0	0	0	1	1	0	0	0	0
Number R		0	0	0	0	0	0	26	0	0	0	27	0	0
Minor error	1								1	1				
Major error														

S = Susceptible; I = Intermediate; R = Resistant

** Ciprofloxacin was tested as reference. Numbers of deviating results not counted*