RIVM report 330604001/2006

Eleventh CRL-*Salmonella* interlaboratory comparison study (2006) 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 E/330604/06/CS by the Community Reference Laboratory for *Salmonella*.

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Abstract

Eleventh CRL-*Salmonella* interlaboratory comparison study (2006) on typing of *Salmonella* spp.

The eleventh 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) in March 2006. 26 National Reference Laboratories for *Salmonella* (NRLs-*Salmonella*), including Norway, and 31 Enter-Net Laboratories (ENLs), three of which also NRLs, participated in the study. In total, 20 strains of the species *Salmonella enterica* subspecies *enterica* were selected for serotyping. 10 Strains of *Salmonella* Enteritidis (SE) and 10 strains of *Salmonella* Typhimurium (STM) were selected for phage typing. In general, no problems were encountered with the typing of the O-antigens. 98 % of the NRLs and 98 % of the ENLs were able to correctly type the O-antigens. A few laboratories had problems typing the H-antigens. The H-antigens were typed correctly by 94 % of the NRLs and by 94 % of the ENLs. 93 % of the NRLs and 93 % of the ENLs indicated correct serovar names for the 20 serotyping strains. The phage typing results of the majority of the NRLs were found to be good. The seven NRLs phage typed 94 % of the *Salmonella* Enteritidis strains correct and 99 % of the *Salmonella* Typhimurium strains. 18 ENLs participated in the phagetyping. The *Salmonella* Enteritidis strains were correctly phage typed by 84 % of the ENLs and *Salmonella* Typhimurium by 89 % of the ENLs.

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

Rapport in het kort

Elfde CRL-*Salmonella* ringonderzoek (2006) voor de typering van *Salmonella* spp.

Het elfde ringonderzoek voor de typering van *Salmonella* werd in maart 2006 georganiseerd door het Communautair Referentie Laboratorium voor *Salmonella* (CRL-Salmonella, Bilthoven, Nederland) in samenwerking met de Health Protection Agency (HPA, Londen, Verenigd Koninkrijk). 26 Nationale Referentie Laboratoria voor *Salmonella* (NRLs-*Salmonella*) inclusief Noorwegen en 31 Enter-Net Laboratoria (ENLs), waarvan 3 ook NRL, namen deel aan de studie. 20 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. In het algemeen werden geen problemen gevonden met de typering van de O-antigenen. 98 % procent van de NRLs en 98 % van de ENLs typeerden de O-antigenen correct. Slechts enkele laboratoria hadden problemen met het typeren van de H-antigenen. De H-antigenen werden correct getypeerd door 94 % van de NRLs en door 94 % van de ENLs. 93 % procent van de NRLs en 93 % van de ENLs gaven de 20 serotyperingsstammen de goede serovar naam. De meeste NRLs vonden goede resultaten met de faagtypering. De zeven NRLs faagtypeerden 94 % van de *Salmonella* Enteritidis stammen correct en 99 % van de *Salmonella* Typhimurium stammen. De achttien ENLs hebben 84 % van de *Salmonella* Enteritidis en 89 % van de *Salmonella* Typhimurium stammen goed gefaagtypeerd

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

Contents

Summary

In 2006 the eleventh 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, London, United Kindom). The main objective of the study was to evaluate whether examination of samples by the National Reference Laboratories (NRLs-*Salmonella*) as well as by the EnterNet Laboratories (ENLs) was carried out uniformly and whether comparable results were obtained.
25 NRLs-*Salmonella* of the Member States of the European Union participated, as well as NRL-Norway. Furthermore, 31 EnterNet laboratories participated, 3 of them are also NRLs. All 26 NRLs and 28 ENLs performed serotyping. 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. No, or very few problems were encountered with the typing of the O-antigens. Some problems existed with the H-antigens, although the group of laboratories facing these problems seem to diminish. 98 % of the NRLs and 98 % of the ENLs were able to correctly type the O-antigens. The H-antigens were typed correctly by 94 % of the NRLs and by 94 % of the ENLs. 93 % of the NRLs and 93 % of the ENLs indicated correct serovar names for the 20 serotyping strains. Seven of the participating NRLs-*Salmonella* and eighteen of the ENLs also performed phage typing. The HPA selected 20 strains for phage typing, 10 were of the serovar *Salmonella* Enteritidis (SE) and 10 of the serovar *Salmonella* Typhimurium (STM). The phage typing results of the majority of the laboratories were good. The seven NRLs phage typed 94 % of the *Salmonella* Enteritidis strains correct and 99 % of the *Salmonella* Typhimurium strains. The *Salmonella* Enteritidis strains were correctly phage typed by 84 % of the ENLs and *Salmonella* Typhimurium by 89 % of the ENLs.

List of abbreviations

BGA	Brilliant Green Agar
CLSI	Clinical and Laboratory Standards Insitute
CRL-*Salmonella*	Community Reference Laboratory – *Salmonella*
ENL	EnterNet Laboratory
EU	European Union
HPA	Health Protection Agency
LEP	Laboratory of Enteric Pathogens
NRL-*Salmonella*	National Reference Laboratory – *Salmonella*
Nt	Not typable
PT	Phage Type
RIVM	National Institute for Public Health and the Environment
RDNC	Reacts with phages but does not confirm to a recognized pattern
SD	Standard Deviation
SE	*Salmonella* Enteritidis
STM	*Salmonella* Typhimurium
TSI	Triple Sugar Iron agar
UK	United Kingdom
XLT	Xylose Lysine Tergitol

1 Introduction

This report describes the 11th 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 Regulation (EC) no 882/2004 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 organisation of the typing studies started in 1995. The history of the studies through the years 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	Korver et al., 2005 (RIVM report 330300006)
X	VII	2005	spp. *enterica* 20	SE 10 STM 10	YES	Korver et al. 2006 (RIVM report 330300009
XI	VII	2006	spp. *Enterica* 20	SE 10 STM 10		This report

26 NRLs-*Salmonella* and 31 EnterNet Laboratories (ENLs) participated in this tenth study, 3 of these ENLs are also NRLs and their results are shown with the other NRL results. 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 NRLs and 26 ENLs performed serotyping of the strains.
Seven of the NRLs-*Salmonella* and 18 ENLs performed phage typing on 10 *Salmonella* Enteritidis and 10 *Salmonella* Typhimurium strains. However one ENL sent in their results very late and therefore their results are not included in this report. The selection of the strains and interpretation of the results of the phagetyping was performed in close cooperation with the Health Protection Agency, London, UK.

2 Participants

Country	Institute/City	National Reference Laboratory for *Salmonella* (NRL) or EnterNet Laboratory (ENL)	
Australia	University of Melbourne Department of Microbiology and Immunology Parkville		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 Section Bacteriologie Brussels		ENL
Canada	Canadian Science Centre for Human and Animal Health – National Microbiology Laboratory Winnipeg		ENL
Cyprus	Laboratory for the Control of Foods of Animal Origin (LCFAO) Nicosia	NRL	
Cyprus	Nicosia General Hospital Microbiology Department Nicosia		ENL
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 Institute for Food and Veterinary Research (DFVF) 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

Country	Institute/City	National Reference Laboratory for *Salmonella* (NRL) or EnterNet Laboratory (ENL)	
France	Agence française de sécurité sanitaire des aliments (AFSSA), Laboratoire d'études et de recherches avicoles et porcines (LERAP), Ploufragan	NRL	
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 and Kapodistrian University of Athens Department of Microbiology, Medical School Athens		ENL
Hungary	National Food Investigation Institute of Hungary Department Food Microbiology Budapest	NRL	
Hungary	Johan Bela National Centre for Epidemiology, Department of Phage Typhing and Molecular Epidemiology (phagetyping) Budapest		ENL
Hungary	NCE, Department of Bacteriology II (serotyping) Budapest		ENL
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 Legnaro	NRL	
Italy	Istituto Superiore di Sanita Lab. of Medical Bacteriology & Mycology Rome		ENL
Japan	National Institute of Infectious Diseases Department of Bacteriology Tokyo		ENL
Latvia	State Veterinary Medicine Diagnostic Centre (SVMDC) Riga	NRL	

Country	Institute/City	National Reference Laboratory for *Salmonella* (NRL) or EnterNet Laboratory (ENL)	
Lithuania	National Veterinary Laboratory Vilnius	NRL	
Luxembourg	Laboratoire de Médecine Vétérinaire de l'Etat Animal Zoonosis Luxembourg	NRL	
Luxembourg	Laboratoire National de Santé Luxembourg		ENL
Malta	St. Luke's Hospital Malta		ENL
The Netherlands	National Institute for Public Health and the Environment (RIVM) Bilthoven	NRL	ENL
New Zealand	ESR Kenepura Science Centre Communicable Disease Group 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	State Veterinary Institute Microbiological Department Pulawy	NRL	
Portugal	Laboratório Nacional de Veterinária Lisbon	NRL	
Portugal	Instituto Nacional de Saude Lisbon		ENL
Romania	INCDMI "Cantacuzino" Molecular Epidemiology Laboratory Bucharest		ENL
Scotland (UK)	Scottish Salmonella Reference Laboratory Department of Bacteriology Glasgow		ENL
Slovak Republic	State Veterinary and Food Institute Reference laboratory for Salmonella Bratislava	NRL	
Slovak Republic	Slovak Medical University Department of Microbiology (phagetyping) Bratislava		ENL
Slovak Republic	The Authority of Public Health of Slovak Republic (serotyping) Bratislava		ENL

Country	Institute/City	National Reference Laboratory for *Salmonella* (NRL) or EnterNet Laboratory (ENL)	
Slovenia	National Veterinary Institute Veterinary Faculty Ljubljana	NRL	
Slovenia	Institute of Public Health Celje Department of Microbiology Celje		ENL
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	
Sweden	Swedish Institute of Infectious Disease Control Department of Bacteriology Solna		ENL
Switzerland	Stv. Leiter Inst. Med. Mikrobiol. Zentrum fur Labormedizin Luzern		ENL
United Kingdom	Veterinary Laboratories Agency Weybridge Department of Bacterial Diseases New Haw, Addlestone	NRL	
United Kingdom	Healty Protection Agency London		ENL

3 Materials and Methods

3.1 *Salmonella* strains for serotyping

20 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
S1	*S.* Montevideo	6, 7, 14	g, m, [p], s : [1, 2, 7]
S2	*S.* Heidelberg	1, 4, [5], 12	r : 1, 2
S3	*S.* Rissen	6, 7, 14	f, g : -
S4	*S.* Indiana	1, 4, 12	z : 1, 7
S5	*S.* Stanleyville	1, 4, [5], 12, 27	z4, z23 : [1, 2]
S6	*S.* Yoruba	16	c : l, w
S7	*S.* Infantis	6, 7, 14	r : 1, 5
S8	*S.* Kentucky	8, 20	i : z6
S9	S. Newport	6, 8, 20	e, h : 1, 2 : [z67]
S10	*S.* Virchow	6, 7, 14	r : 1, 2
S11	*S.* Senftenberg	1, 3, 19	g, [s], t : -
S12	*S.* Hadar	6, 8	z10 : e, n, x
S13	*S.* Typhimurium	1, 4, [5], 12	i : 1, 2
S14	*S.* Blockley	6, 8	k : 1, 5
S15	*S.* Enteritidis	1, 9, 12	g, m : -
S16	*S.* Braenderup	6, 7, 14	e, h : e, n, z15
S17	*S.* Wernigerode	9, 46	f, g : -
S18	*S.* Oranienburg	6, 7, 14	m, t : [z57]
S19	*S.* Tennessee	6, 7, 14	z29 : [1, 2, 7]
S20	*S.* Brandenburg	4, [5], 12	l, v : e, n, z15

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 3 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 reactions at Routine Test Dilution															
QA number	**Phage type**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**
E1	2	ol	-	cl	scl	cl	scl	cl	ol	ol	ol	scl	cl	-	cl	-	-
E2	3	ol	-	-	-	-	+	-	ol	-	ol	-	-	-	cl	-	-
E3	14b	-	-	-	-	-	scl	-	-	±	-	-	-	-	-	-	-
E4	21	cl	scl	-	scl	-	scl	-	ol	ol	ol	-	-	-	cl	-	-
E5	5a	-	scl	±	scl	ol	scl	±	-	ol	-	-	ol	-	-	-	-
E6	34	-	-	-	-	-	-	-	ol	-	ol	-	-	-	-	-	-
E7	1	ol	scl	cl	scl	cl	scl	cl	scl	scl	ol	cl	cl	cl	cl	-	-
E8	6a	-	scl	-	scl	-	scl	-	-	ol	-	-	-	-	-	-	-
E9	4	-	scl	cl	scl	cl	scl	cl	scl	ol	ol	cl	cl	cl	-	-	-
E10	1b	ol	scl	cl	scl	cl	scl	cl	scl	ol	ol	cl	cl	cl	cl	scl	cl

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

		Phages at Routine Test Dilution																	
QA number	**Phage type**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**
M11	160	-	-	-	-	-	-	-	-	-	ol	-	scl	-	-	-	scl	scl	ol
M12	193	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
M13	12	-	-	-	-	-	-	-	-	-	-	scl	cl	-	-	-	-	-	-
M14	36	ol	ol	ol	ol	ol	ol	ol	ol	ol	ol	ol	ol	ol	ol	ol	ol	scl	ol
M15	8	-	-	-	-	-	-	-	scl	scl	scl	-	-	-	-	scl	-	-	-
M16	104	-	-	-	-	-	-	-	-	-	-	++	scl	-	-	-	-	++	-
M17	136	-	-	-	ol	ol	ol	-	-	-	ol	ol	ol	-	ol	ol	-	-	ol
M18	U302	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
M19	U310	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
M20	40	cl	ol	cl	ol	cl	scl	cl	-	ol	cl	-	cl	cl	cl	cl	cl	scl	cl

		Phages at Routine Test Dilution												Additional phages					
QA number	**Phage type**	**20**	**21**	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**32**	**35**	**1**	**2**	**3**	**10**	**10 var**	**18**
M11	160	scl	-	ol	-	-	-	-	-	-	-	scl	-	±	±	±	ol	ol	-
M12	193	-	-	-	-	-	-	-	-	-	-	-	-	+++	+++	+++	++	-	-
M13	12	-	-	-	-	-	-	-	-	-	-	-	-	++	++	++	ol	ol	-
M14	36	ol	ol	ol	ol	ol	ol	ol	ol	ol	ol	ol	ol	+	++	++	ol	ol	ol
M15	8	scl	-	ol	scl	-	-	++	-	-	cl	scl	-	±	±	±	ol	ol	-
M16	104	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ol	ol	-
M17	136	+	-	-	-	-	scl	-	-	-	-	-	-	-	-	-	ol	scl	-
M18	U302	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ol	ol	-
M19	U310	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	±	ol	-
M20	40	cl	ol	ol	cl	cl	scl	cl	cl	-	cl	cl	ol	-	±	±	ol	ol	ol

3.3 Laboratory codes

The NRLs were assigned a laboratory code 1-27 by CRL-*Salmonella*, which differed from the previous typing studies. From these 27 NRLs one laboratory did not participate and therefore laboratory code 10 was not used. The alphabetical laboratory codes (A t/m Z and AA and AB) for the ENLs were given by HPA, London, UK.

3.4 Transport

All samples were packed and transported as diagnostic specimens and transported by door-to-door courier service. The parcels containing strains for serotyping for the NRLs were sent by CRL-*Salmonella* in week 9, 2006. The parcels containing strains for phage typing for the NRLs were sent by HPA, London, UK in week 9 and 10, 2006. The ENLs received all their parcels from HPA.

3.5 Guidelines for evaluation of serotyping results

The evaluation of the various serotyping results as mentioned in this report are described in Table 5.

Table 5 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 containing the strains for serotyping damaged at arrival?

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 (strains for serotyping)?

21 NRLs received their package in the same week as it was sent (week 9 of 2006) the other five NRLs (laboratory codes 1, 3, 15, 23 and 25) received their package in week 10. The average transport time for the NRLs was 2.8 days. The shipment of the parcels to the EnterNet Laboratories was organised by HPA, London, UK.

Question 3: Was your parcel containing the strains for phage typing damaged at arrival?

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

Question 4: What was the date of receipt at the laboratory (strains for phage typing)?

Five NRLs (laboratory codes 3, 11, 16, 22 and 23) received their parcels in week 9 (2006). Two NRLs (laboratory codes 9 and 20) received their parcels in week 10 (2006). The shipment of the parcels to the NRLs and ENLs was organised by HPA, London, UK.

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

The NRLs as well as the ENLs used a variety of media from various manufacturers for the subculturing of the *Salmonella* strains. This varied from non-selective nutrient agar to selective media like XLD.

4.2 Questions regarding serotyping

Question 6: What was the frequency of serotyping at your laboratory in 2004 ?
Question 7: How many strains did your laboratory serotype in 2004 ?

Table 6 Frequency and number of strains serotyped in 2004

Laboratory code NRLs	Typing frequency	Number of strains serotyped in 2004	Laboratory code ENL	Typing frequency	Number 2004
1	Daily	686	**B**	Thrice a week	1177
2	Monthly	16	**C**	Daily	2980
3	Daily	2050	**D**	Daily	5665
4	Daily	3500	**E**	Monthly	100
5	Twice a week	2300	**F**	Daily	2500
6	Twice a week	599	**G**	Daily	1606
7	Weekly	188	**H**	Twice a week	90
8	Thrice a week	144	**I**	Daily	6629
9	Daily	6171	**J**	Daily	2304
11	Daily	10342	**K**	Monthly	120
12	Once a week	5000	**L**	Thrice a week	1250
13	Daily	261	**M**	Daily	1230
14	Daily	870	**N**	Once a week	40
15	Daily	543	**O**	Daily	550
16	Daily	8152	**P**	Daily	8372
17	Thrice a week	320	**Q**	Daily	2236
18	Daily	1200	**R**	Daily	5581
19	Daily	1429	**T**	Daily	250
20	Daily	2178	**U**	Daily	1485
21	Twice a week	169	**V**	Daily	7945
22	Daily	5195	**W**	Daily	2600
23	Daily	5000	**X**	Daily	850
24	Daily	460	**Y**	Daily	851
25	Twice a week	335	**AA**	Daily	241
26	Twice a week	107	**AB**	Daily	1180
27	Daily	1040			

Question 8: How many of these typings considered a rough strain?
Three NRLs (laboratory codes 2, 8 and 26) did not report the amount of rough strains. Zero rough strains were reported by seven NRLs (laboratory codes 1, 6, 13, 17, 19, 21 and 27). Eight NRLs (laboratory codes 3, 7, 14, 15, 16, 20, 24 and 25) reported between 1 – 10 rough strains, six NRLs (laboratory codes 4, 5, 9, 11, 12 and 18) reported 20 – 100 rough strains and two NRLs (laboratory codes 22 and 23) reported > 200 rough strains. In percentages 0 – 5 % of all strains serotyped were rough strains in 2004.

Question 9: What kind of sera do you use (commercially available or prepared in own laboratory) ?

Table 7 Number of laboratories using serotyping sera from one or more manufacturers and/or in-house prepared sera

Number of manufacturers	Number of NRLs (n=26)	Number of ENLs (n=25)
From 1 manufacturer	**4**	**8**
From 2 manufacturers	**12**	**3**
From 3 manufacturers	**7**	**5**
From 4 manufacturers	**2**	**2**
From 5 manufacturers or more	**1**	**2**
Preparation in own laboratory	**-**	**5**

Table 8 Number of laboratories using sera from the following manufacturers

Name manufacturer	Number of NRLs (n=26)	Number of ENLs (n=25)
Biorad	9	7
Biotrading	-	1
Dade Behring	4	2
Denka Seiken	2	4
Difco	4	2
Eurobio	1	1
Immunolab	1	-
Imuna	-	2
IMVS (Adelaide)	-	1
INCDI "Cantacuzino"	-	1
Institut Pasteur	-	1
Institute Immunology Zagreb	-	1
Murex - Abbott	2	-
Prolab	4	2
Reagensia AB	2	3
Remel	1	2
Sevac	-	1
Sevapharma	-	1
Sifin	10	8
SMI	1	-
Statens Serum Institute	21	14
Own laboratory	**-**	**5**

Question 10: Were the strains in the collaborative study typed in your own laboratory?
One NRL-*Salmonella* (laboratory code 17) sent some strains to another laboratory for serotyping. All other laboratories tested all strains in their own laboratory.

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 eighteen ENLs performed phage typing of *S.* Typhimurium and/or *S.* Enteritidis strains. For routine purposes four NRLs and 15 ENLs also phage typed other strains like, *S.* Agona, *S.* Bovismorbificans, *S.* Hadar, *S.* Infantis, *S.* Newport, *S.* Oranienburg, *S.* Panama, *S.* Paratyphi B, *S.* Typhi, *S.* Virchow.

Question 12: How many strains did your laboratory phage type in 2004 ?

Table 9 Number of phage typings in 2004

Laboratory codes	Number of strains phage typed in 2004
3	1220
9	-
11	2327
16	6697
20	387
22	2646
23	3100
A	523
B	676
C	1328
D	1251
E	700
F	3500
I	98
J	1034
K	1100
M	5809
P	5610
R	3995
S	3394
U	466
W	1400
X	645
Y	308

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. Laboratory 10 did not send in the results in and is therefore missing in the figures. 19 Laboratories (laboratory codes 1, 3, 4, 5, 6, 9, 11, 12, 13, 16, 17, 18, 19, 20, 22, 23, 24, 25 and 27) typed all O-antigens accurately. 13 laboratories (laboratory codes 1, 3, 11, 12, 13, 15, 16, 17, 20, 22, 23, 24 and 27) typed all H-antigens correctly and 12 laboratories (laboratory codes 1, 3, 11, 12, 13, 16, 17, 20, 22, 23, 24 and 27) identified all serovar names correctly.

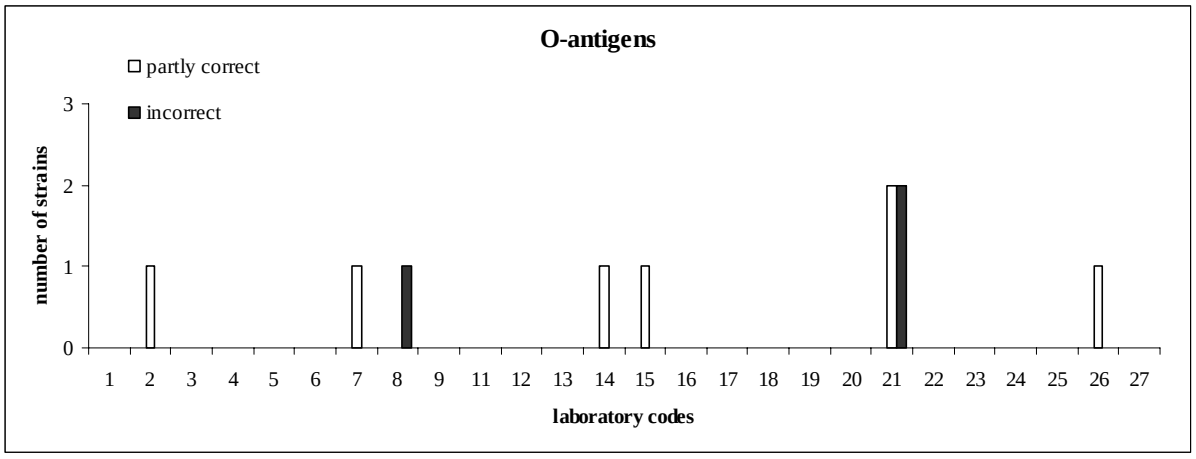

Figure 1 Evaluation of serotyping of O-antigens per NRL

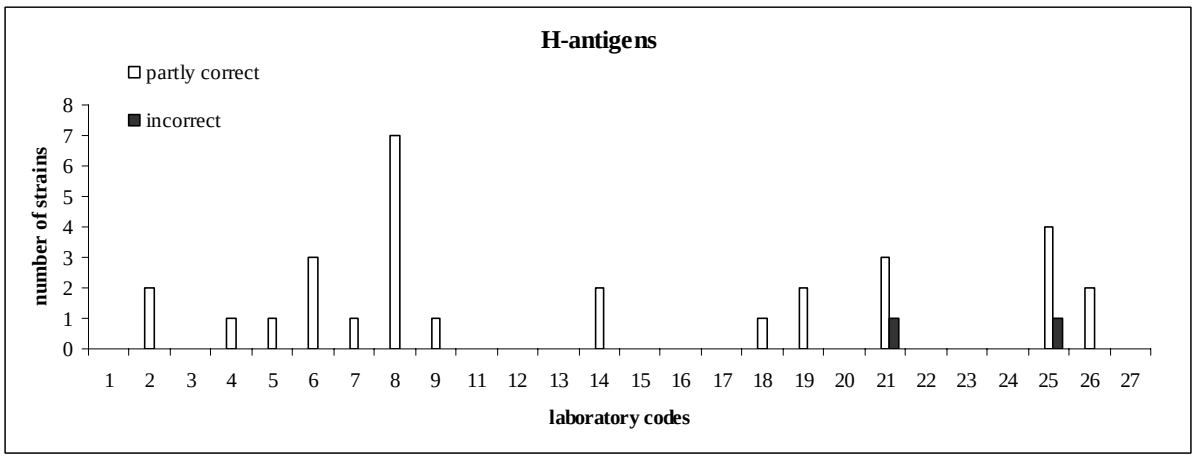

Figure 2 Evaluation of serotyping of H-antigens per NRL

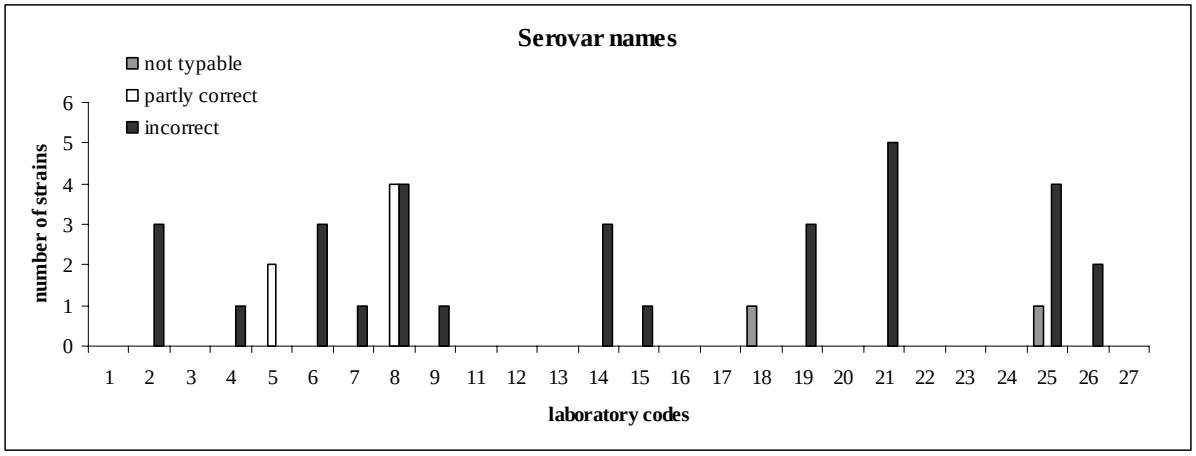

Figure 3 Evaluation of the correct serovar names per NRL

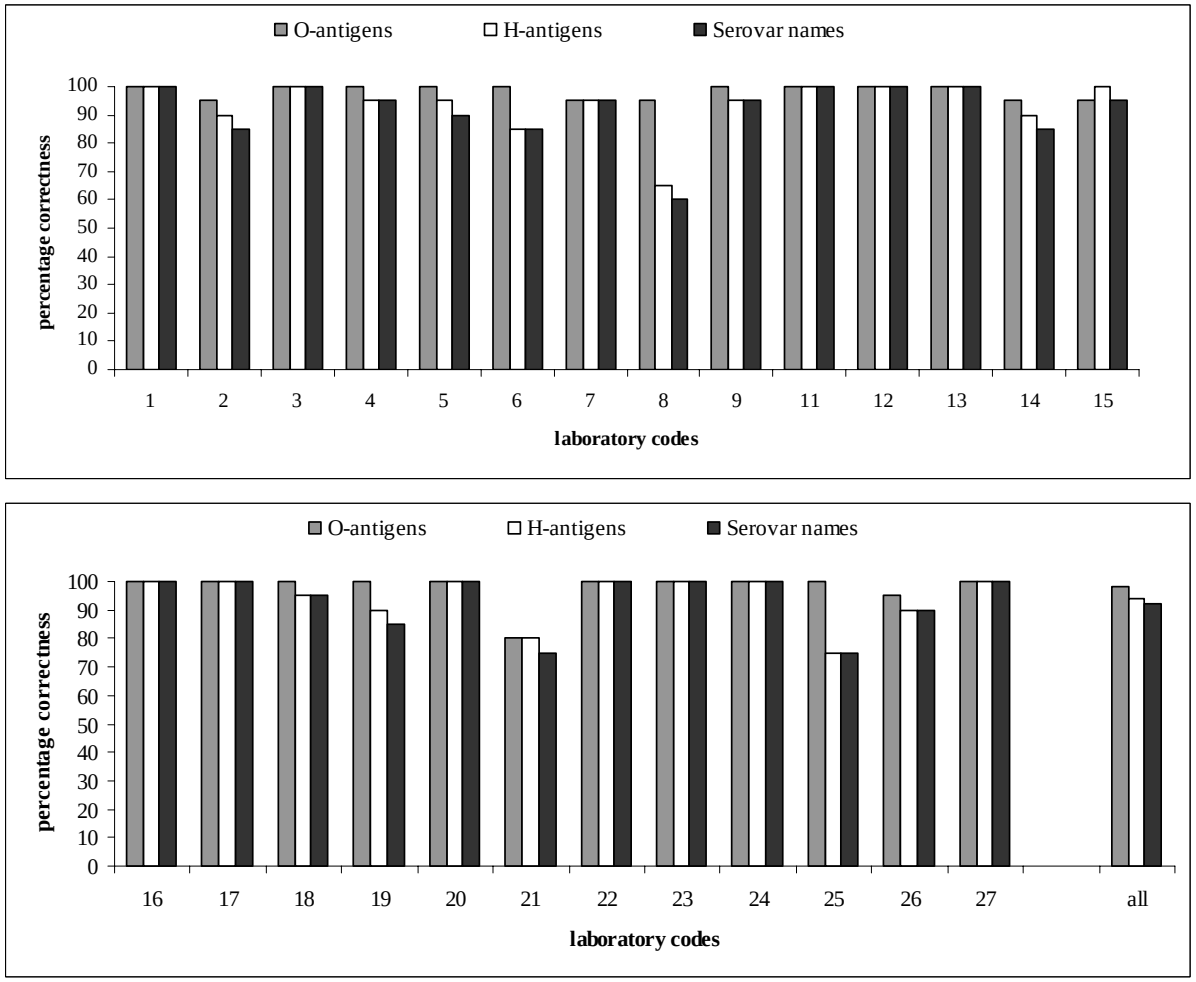

Figure 4 Achievements in percentages that were correct by the NRLs

98 % of all NRLs were able to type the O-antigens correctly. The H-antigens were typed correctly by 94 % and the serovar names by 93 % 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 10. The O-antigens of 14 strains were typed correctly by all participants. The H-antigens were typed correctly for 3 strains by all participating laboratories. A total correct identification by all participants was obtained for three strains *S.* Stanleyville (strain 5), *S.* Typhimurium (strain 13) and *S.* Tennessee (strain 19).

Table 10 Evaluation of the typing of strains by the NRLs

Strains		O-antigens detected				H-antigens detected				Name serovar			
		+	nt	+/-	-	+	nt	+/-	-	+	nt	+/-	-
S-1	Montevideo	25	0	0	1	24	0	2	0	23	0	0	3
S-2	Heidelberg	26	0	0	0	24	0	2	0	24	0	0	2
S-3	Rissen	26	0	0	0	25	0	1	0	25	0	0	1
S-4	Indiana	26	0	0	0	25	0	1	0	25	0	1	0
S-5	Stanleyville	26	0	0	0	26	0	0	0	26	0	0	0
S-6	Yoruba	25	0	0	1	20	0	5	1	20	2	2	2
S-7	Infantis	26	0	0	0	24	0	2	0	24	0	0	2
S-8	Kentucky	25	0	1	0	25	0	1	0	25	0	0	1
S-9	Newport	26	0	0	0	25	0	1	0	25	0	0	1
S-10	Virchow	26	0	0	0	25	0	1	0	25	0	0	1
S-11	Senftenberg	24	0	2	0	25	0	1	0	23	0	0	3
S-12	Hadar	26	0	0	0	24	0	2	0	24	0	1	1
S-13	Typhimurium	26	0	0	0	26	0	0	0	26	0	0	0
S-14	Blockley	26	0	0	0	24	0	2	0	24	0	0	2
S-15	Enteritidis	25	0	1	0	26	0	0	0	25	0	0	1
S-16	Braenderup	26	0	0	0	25	0	1	0	25	0	0	1
S-17	Wernigerode	24	0	1	1	25	0	1	0	24	0	0	2
S-18	Oranienburg	26	0	0	0	21	0	4	1	19	0	1	6
S-19	Tennessee	26	0	0	0	26	0	0	0	26	0	0	0
S-20	Brandenburg	24	0	2	0	23	0	3	0	23	0	1	2

+ = correct; nt = not typable ; +/- = partly correct ; - = incorrect
** = The figures indicate the number of laboratories finding the relevant results (total number of laboratories = 26)*

Most problems occurred with *S.* Yoruba (strain 6) and *S.* Oranienburg (strain 18). But also some NRLs had problems typing *S.* Montevideo (strain 1), *S.* Senftenberg (strain 11) and *S.* Brandenburg (strain 20). The characterisations of strains that caused problems in serotyping by the NRLs are shown in Table 11 and 12. The empty cells in the table indicate that strains were typed correctly by the laboratories mentioned.

Table 11 Identifications per strain that caused most problems in serotyping by NRLs

Laboratory code	Strain 6 ***S.* Yoruba** **16 : c : l, w**	Strain 18 ***S.* Oranienburg** **6, 7, 14 : m, t : [z57]**
2		*S.* Oakey 6, 7 : m, t : -
4		*S.* Oakey 6, 7 : m, t : z64
5	*S.* ??? 16 : c	*S.* ??? 6, 7 : m, t : -
8	*Salmonella* group I 16 : l, v	*S.* Oakey 6, 7 : m, t : z64
18	*S.* ??? 16 : c : -	
19		*S.* Oakey 6, 7 : m, t : z64
21	*S.* Menden 6, 7 : z10 : 1, 2	*S.* Oakey 6, 7 : m, t : z64
25	untypable 16 : c : 1, 2	*S.* Menden 6, 7 : z10 : 1, 2
26	*S.* Gafsa 16 : c : 1, 6	

Table 12 Identifications per strain that caused problems in serotyping by NRLs

Laboratory code	Strain 1	Strain 11	Strain 20
	***S.* Montevideo** **6, 7, 14 : g, m, [p], s : [1, 2, 7]**	***S.* Senftenberg** **1, 3, 19 : g, [s], t : -**	***S.* Brandenburg** **4, [5], 12 : l, v : e, n, z15**
2	*S.* Othmarschen 6, 7 : g, m, t		*S.* Kimuneza 4, 12, 27 : l, v : e, n, x
7		*S.* Amsterdam 3, 10 : g, m, s : -	
8	*S.* Emek 8, 20 : g, m, s		*Salmonella* group B 4 : l, v
14	*S.* Othmarschen 6, 7 : g, m, t : -		
15		*S.* Dessau 1, 3, 15, 19 : g, s, t : -	
19		*S.* Dessau 1, 3, 19 : g, s, t : -	

5.2 Serotyping by the ENLs

5.2.1 Evaluation per laboratory

The evaluation of the detection of O- and H-antigens and identification of the strains per laboratory are shown in Figures 5, 6 and 7 and the percentages which were correct in Figure 8.

Nine-teen laboratories (laboratory codes B, C, D, E, G, I, J, K, L, M, N, P, R, T, V, W, X, Y and AB) typed all O-antigens accurately. 17 Laboratories (laboratory codes C, D, E, G, I, J, L, M, O, P, Q, R, V, W, X, Y and AA) typed all H-antigens correctly and 14 laboratories (laboratory codes C, D, E, G, I, J, L, M, P, R, V, W, X and Y) identified all serovar names correctly.

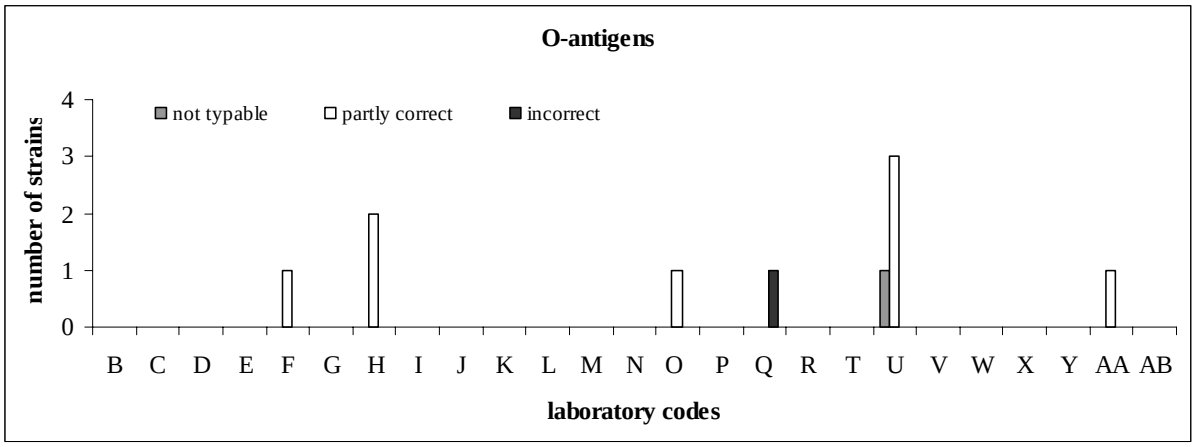

Figure 5 Evaluation of serotyping of O-antigens per ENL

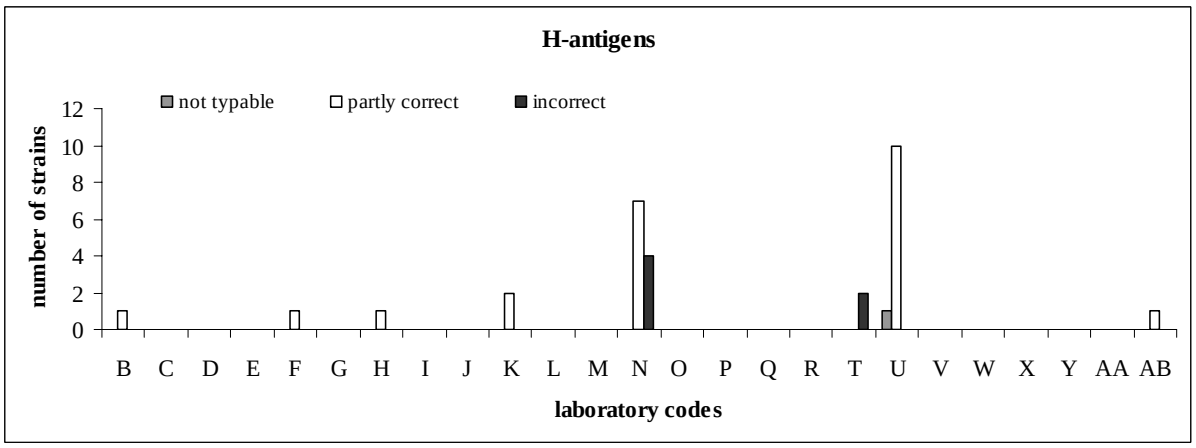

Figure 6 Evaluation of serotyping of H-antigens per ENL

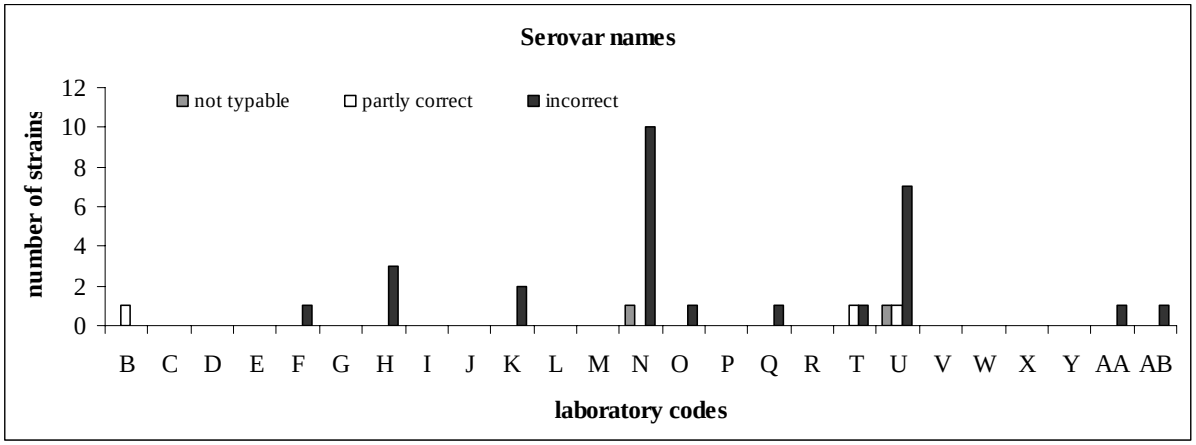

Figure 7 Evaluation of the correct serovar names per ENL

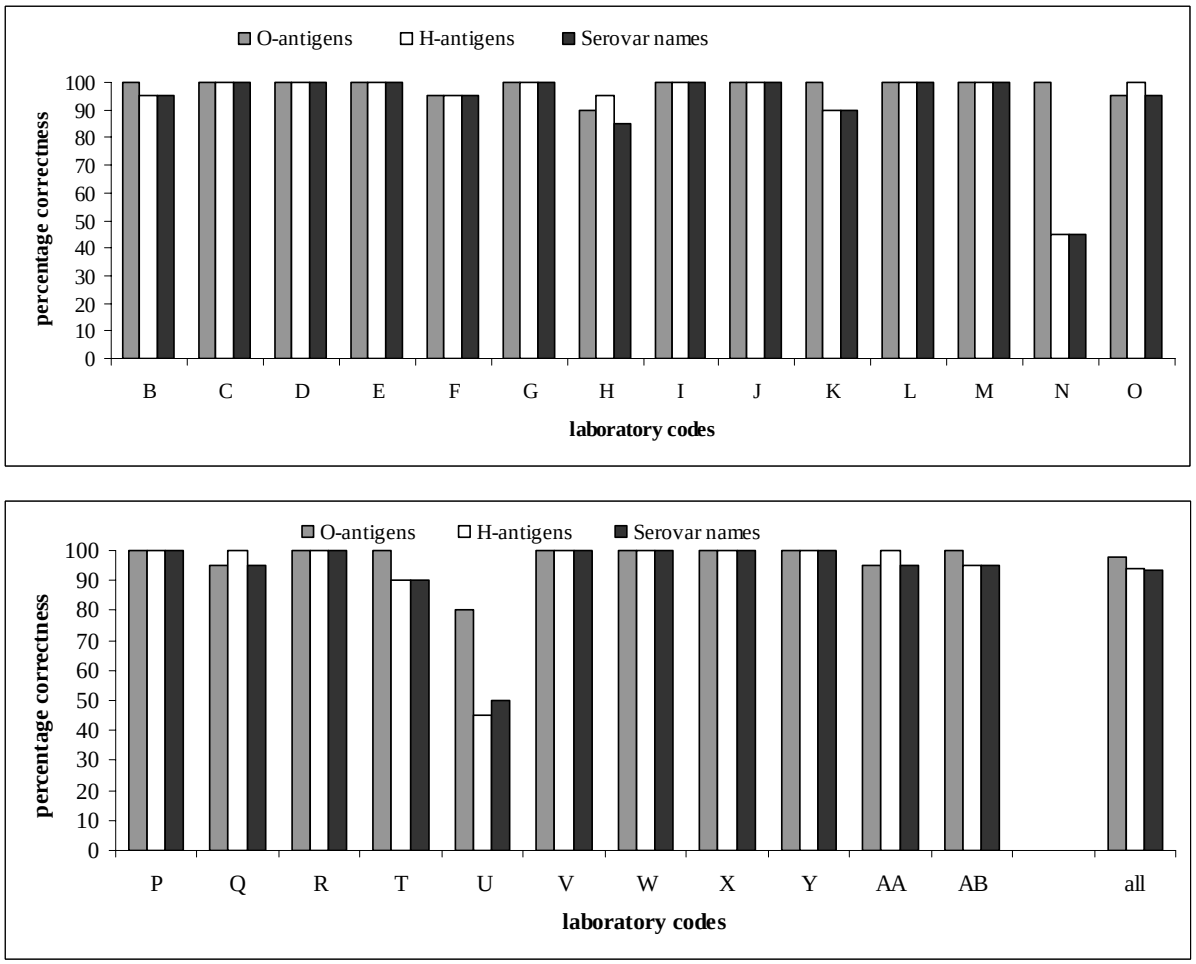

Figure 8 Achievements in percentages that were correct by the ENLs

98 % of the ENLs were able to correctly type the O-antigens. The H-antigens were typed correctly by 94 % and the serovar names by 93 % of the ENLs.

5.2.2 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 13. 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. A total correct identification by all participants was obtained for three strains *S.* Infantis (strain 7), *S.* Typhimurium (strain 13) and *S.* Tennessee (strain 19).

Table 13 Evaluation of the typing of strains by the ENLs

Strains		O-antigens detected				H-antigens detected				Name serovar			
		+	nt	+/-	-	+	nt	+/-	-	+	nt	+/-	-
S-1	Montevideo	25	0	0	0	24	0	0	1	24	0	0	1
S-2	Heidelberg	24	0	1	0	25	0	0	0	24	0	0	1
S-3	Rissen	25	0	0	0	24	0	1	0	24	0	0	1
S-4	Indiana	25	0	0	0	22	0	3	0	22	0	0	3
S-5	Stanleyville	25	0	0	0	24	0	0	1	24	0	0	1
S-6	Yoruba	23	1	0	1	22	1	1	1	21	1	1	2
S-7	Infantis	25	0	0	0	25	0	0	0	25	0	0	0
S-8	Kentucky	23	0	2	0	24	0	1	0	23	0	0	2
S-9	Newport	23	0	2	0	24	0	1	0	22	0	0	3
S-10	Virchow	25	0	0	0	24	0	0	1	24	0	0	1
S-11	Senftenberg	24	0	1	0	23	0	2	0	23	0	0	2
S-12	Hadar	25	0	0	0	23	0	2	0	23	1	0	1
S-13	Typhimurium	25	0	0	0	25	0	0	0	25	0	0	0
S-14	Blockley	25	0	0	0	23	0	2	0	23	0	0	2
S-15	Enteritidis	25	0	0	0	24	0	1	0	24	0	0	1
S-16	Braenderup	25	0	0	0	24	0	1	0	24	0	0	1
S-17	Wernigerode	24	0	1	0	23	0	2	0	23	0	0	2
S-18	Oranienburg	25	0	0	0	20	0	3	2	20	0	0	5
S-19	Tennessee	25	0	0	0	25	0	0	0	25	0	0	0
S-20	Brandenburg	24	0	1	0	23	0	2	0	23	0	0	2

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

Like for the NRLs, most problems occurred with *S.* Yoruba (strain 6) and *S.* Oranienburg (strain 18). But also some ENLs had problems typing *S.* Indiana (strain 4) and *S.* Newport (strain 9). The characterisations of strains that caused problems in serotyping by the ENLs are shown in Table 14 and 15. The empty cells in the table indicate that strains were typed correctly by the laboratories mentioned.

Table 14 Identifications per strain that caused most problems in serotyping by ENLs

Laboratory code	Strain 6 ***S.* Yoruba** **16 : c : l, w**	Strain 18 ***S.* Oranienburg** **6, 7, 14 : m, t : [z57]**
B	*Salmonella* group I 16 : c	
H		*S.* Oakey 6, 7 : m, t : z64
K		*S.* Oakey 6, 7 : m, t : z64
N		*S.* Argentina 6, 7 : z36
Q	*S.* Alexanderpolder 8 : c : l, w	
T	*Salmonella* group I 16	*S.* Bulovka 6, 7 : z44
U	Untypable nt : nt	
AB		*S.* Oakey 6, 7 : m, t : z64

Table 15 Identifications per strain that caused problems in serotyping by ENLs

Laboratory code	Strain 4 ***S.* Indiana** **1, 4, 12 : z : 1, 7**	Strain 9 ***S.* Newport** **6, 8, 20 : e, h : 1, 2 : [z67]**
H		*S.* Bardo 8 : e, h : 1, 2
K	*S.* Remo 1, 4, 12 : r : 1, 7	
N	*S.* Shubra 4, 12 : z : 2	
U	*S.* Kaapstad 4, 12 : e, h : 1, 7	*S.* Tshiongwe 6, 8 : e, h : e, n, z15
AA		*S.* Bardo 8 : e, h : 1, 2

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 by laboratory and are shown in Tables 16 and 17. Seven laboratories performed phage typing for both *Salmonella* Enteritidis and *Salmonella* Typhimurium. Three laboratories (laboratory codes 16, 22 and 23) assigned the correct phage type for all ten of the *S.* Enteritidis (SE) strains (PT 2, 3, 14b, 21, 5a, 34, 1, 6a, 4 and 1b) and two laboratories (laboratory codes 3 and 20) had only one incorrect result and the laboratory with laboratory code 11 reported strain E3 as RDNC, since the readings were not typical. The laboratory with laboratory code 9 had two incorrect results for *S.* Enteritidis. Six laboratories (laboratory code 3, 9, 11, 16, 22 and 23) correctly phage typed all ten strains of *S.* Typhimurium. The laboratory with laboratory code 20 assigned correct phage types to nine of the strains but incorrectly identified strain M13 (PT12). Separate notations per phage and per laboratory are given in Annex 3. The achievements in percentage correctness are presented in Figure 9.

Table 16 Results of Salmonella *Enteritidis phage typing by the NRLs*

		Phage type found per NRL						
Strain	**PT**	**3**	**9**	**11**	**16**	**20**	**22**	**23**
E1	**2**	2	2	2	2	2	2	2
E2	**3**	3	3	3	3	3	3	3
E3	**14b**	14b	14b	RDNC	14b	14b	14b	14b
E4	**21**	21c	21	21	21	21	21	21
E5	**5a**	5a	6b	5a	5a	5a	5a	5a
E6	**34**	34	34	34	34	19	34	34
E7	**1**	1	1a	1	1	1	1	1
E8	**6a**	6a	6a	6a	6a	6a	6a	6a
E9	**4**	4	4a	4	4	4	4	4
E10	**1b**	1b	1b	1b	1b	1b	1b	1b

PT = Phage type; RDNC = Reacts with phages but does not confirm to a recognized pattern; grey cells = deviating results

Table 17 Results of Salmonella *Typhimurium phage typing by the NRLs*

		Phage type found per NRL						
Strain	**PT**	**3**	**9**	**11**	**16**	**20**	**22**	**23**
M11	**160**	160	160	160	160	160	160	160
M12	**193**	193	193	193	193	193	193	193
M13	**12**	12	12	12	12	107	12	12
M14	**36**	36	36	36	36	36	36	36
M15	**8**	8	8	8	8	8	8	8
M16	**104**	104	104	104	104	104	104	104
M17	**136**	136	136	136	136	136	136	136
M18	**U302**	U302	U302	U302	U302	U302	U302	U302
M19	**U310**	U310	U310	U310	U310	U310	U310	U310
M20	**40**	40	40	40	40	40	40	40

PT = Phage Type, grey cells = deviating results

Figure 9 Achievements in percentages that were correct for the NRLs

Overall 93 % of the *Salmonella* Enteritidis strains were typed correctly and 99 % of the *Salmonella* Typhimurium strains.

5.3.2 Results phage typing by the ENLs

The phage typing results of the ENLs were evaluated per strain and by laboratory and are shown in Tables 18 and 19. 16 Laboratories performed phage typing for both *Salmonella* Enteritidis and *Salmonella* Typhimurium, one laboratory (laboratory code I) performed phage typing for *Salmonella* Typhimurium only and one laboratory did not send in their results. Four laboratories (laboratory code B, C, J and R) assigned the correct phage type for all 10 *S.* Enteritidis (SE) strains. Five laboratories (laboratory code D, K, M, P and X) had only one incorrect result and five laboratories had two incorrect results (laboratory code E, F, S, W and Y). The laboratory with laboratory code U had four incorrect results and the laboratory with laboratory code A had six incorrect results. 10 Laboratories (laboratory code B, D, F, J, M, P, R, S, W and Y) correctly phage typed all 10 strains of *S.* Typhimurium (PT 160, 193, 12, 36, 8, 104, 136, U302, U310 and 40). The laboratories with laboratory code E and K assigned correct phage types to nine of the strains. The laboratory with laboratory code C also assigned correct phage types to nine of the strains but also reported one strain as untypable because they were missing one of the additional phages. Two laboratories had two incorrect results (laboratory code I and X). The laboratory with laboratory code A assigned correct phage types to seven of the strains, they typed one strain incorrectly and reported two strains as RDNC. The laboratory with laboratory code U assigned correct phage types to five of the strains, typed two strains incorrectly and reported three strains as untypable because they did not have the additional phages. Separate notations per phage and per laboratory are given in Annex 3. The achievements in percentage correctness are presented in Figure 10.

Table 18 Results of Salmonella *Enteritidis phage typing by the ENLs*

		Phage type found per ENL															
Strain	**PT**	**A**	**B**	**C**	**D**	**E**	**F**	**J**	**K**	**M**	**P**	**R**	**S**	**U**	**W**	**X**	**Y**
E1	**2**	2	2	2	2	43	2	2	2	2	2	2	2	2	2	2	2
E2	**3**	21c	3	3	3	3	3	3	3	3	3	3	3	3	21	22	21
E3	**14b**	14b	14b	14b	14b	14b	14b	14b	14b	14b	14b	14b	14b	14b	14b	14b	14b
E4	**21**	21c	21	21	21	21	21c	21	21	21	21c	21	21	21c	21c	21	21c
E5	**5a**	6b	5a	5a	5c	10	5a	5a	5a	38	5a	5a	6b	5a	5a	5a	5a
E6	**34**	25	34	34	34	34	3	34	25	34	34	34	34	34b	34	34	34
E7	**1**	1b	1	1	1	1	1	1	1	1	1	1	1a	1c	1	1	1
E8	**6a**	6a	6a	6a	6a	6a	6a	6a	6a	6a	6a	6a	6a	6a	6a	6a	6a
E9	**4**	4a	4	4	4	4	4	4	4a	4	4	4	4	4b	4	4	4
E10	**1b**	1b	1b	1b	1b	1b	1b	1b	1b	1b	1b	1b	1b	1b	1b	1b	1b

PT = Phage type; grey cells = deviating results

Table 19 Results of Salmonella *Typhimurium phage typing by the ENLs*

		Phage type per ENL								
Strain	**PT**	**A**	**B**	**C**	**D**	**E**	**F**	**I**	**J**	**K**
M11	**160**	RDNC	160	160	160	160	160	160	160	160
M12	**193**	193	193	193	193	193	193	193	193	193
M13	**12**	104L	12	12a	12	12	12	104L	12	12
M14	**36**	36	36	36	36	36	36	36	36	36
M15	**8**	8	8	8	8	8	8	8	8	8
M16	**104**	104	104	104	104	104	104	104	104	104
M17	**136**	RDNC	136	136	136	136	136	136	136	136
M18	**U302**	U302	U302	U302	U302	U302	U302	U302	U302	U302
M19	**U310**	U310	U310	untyp	U310	U310	U310	U310	U310	110B
M20	**40**	40	40	40	40	1	40	104	40	40

		Phage type found per ENL							
Strain	**PT**	**M**	**P**	**R**	**S**	**U**	**W**	**X**	**Y**
M11	**160**	160	160	160	160	87	160	160	160
M12	**193**	193	193	193	193	untyp	193	194	193
M13	**12**	12	12	12	12	12	12	109	12
M14	**36**	36	36	36	36	36	36	36	36
M15	**8**	8	8	8	8	8	8	8	8
M16	**104**	104	104	104	104	120	104	104	104
M17	**136**	136	136	136	136	136	136	136	136
M18	**U302**	U302	U302	U302	U302	untyp	U302	U302	U302
M19	**U310**	U310	U310	U310	U310	untyp	U310	U310	U310
M20	**40**	40	40	40	40	40	40	40	40

PT = Phage type; RDNC = Reacts with phages but does not confirm to a recognized pattern; untyp = untypable; grey cells = deviating results

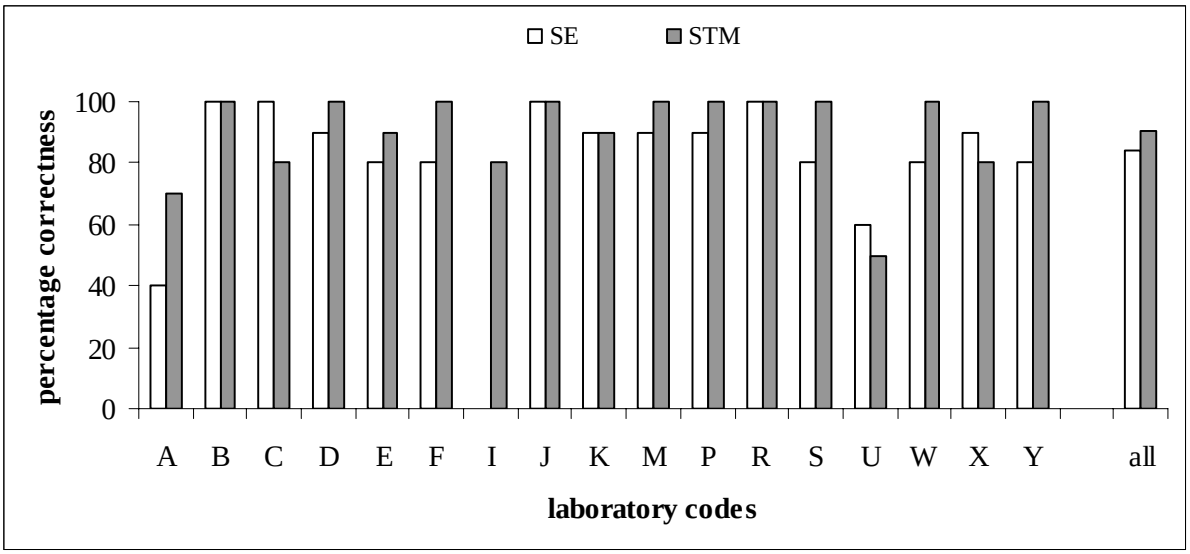

Figure 10 Achievements in percentages that were correct for the ENLs

Overall 84 % of the *Salmonella* Enteritidis strains were typed correctly and 92 % of the *Salmonella* Typhimurium strains.

6 Discussion

Serotyping

Like in the previous typing studies, the serotyping of the O-antigens did not cause much problems. 98 % of the NRLs and 98 % of the ENLs typed the O-antigens correctly. The problems that existed were mainly caused by the detection of the H-antigens. The H-antigens were typed correctly by 94 % of both NRLs and ENLs. Correct serovar names were assigned to the strains by 93 % of both NRLs and ENLs.

Two strains caused the major problems for both the NRLs and ENLs, being *Salmonella* Yoruba and *Salmonella* Oranienburg.
73 % of the NRLs and 80 % of the ENLs correctly typed *S.* Oranienburg. In previous studies *S.* Oranienburg was also a strain which caused a lot of problems. Five NRLs and 3 ENLs typed this strain as *S.* Oakey (6, 7 : m, t : z_{64}), which has a small difference in the second phase of the H-antigens with *S.* Oranienburg (6, 7, 14 : m, t : [z_{57}]). In the study of 2002 59 % of the NRLs and 80 % of the ENLs typed this strain correctly and in 2005 65 % of the NRLs and 93 % of the ENLs. Althoug this strain is still causing problems the percentage of NRLs that typed this strain correctly is increasing (59 % - 65 % - 73 %). For the ENLs this increase is not visible but the percentage correctness was already higher than for the NRLs (80 % - 93 % - 80 %).
The other strain causing problems is *S.* Yoruba. 77 % of the NRLs and 84 % of the ENLs typed this strain correctly. The strain was previously used in the study of 2002. In this study 82 % of the NRLs and 84 % of the ENLs typed this strain correctly. No improvement is seen in this study compared to the study of 2002. However in the study of 2002 only 17 NRLs and 14 ENLs participated whereas in this study 26 NRLs and 25 ENLs participated.

The performance of the participating NRLs in this study was comparible to the study of last year (2005). In the 2005 study, the NRLs typed 99 % of the O-antigens correctly (98 % in 2006), 97 % of the H-antigens (94 % in 2006) and 94 % assigned the correct serovar names (93 % in 2006). The ENLs however scored lower in this study compared to the typing study of 2005. In the study of 2005, the ENLs typed 100 % of the O-antigens correctly, 99 % of the H-antigens and 99 % assigned the correct serovar names to the strains. The difference in this study compared to the study of 2005 is that 14 ENLs participated in the study of 2005 and 25 ENLs in the study of 2006. Meaning that 11 ENLs participated for the first time in this serotyping study. It could be that some of these 11 ENLs have less experience in the serotyping than the other ENLs and NRLs which participated in this kind of studies before. The new ENLs typed 96 % of the O-antigens correctly, 87 % of the H-antigens and 86 % assigned the correct serovar names to the strains, in comparison with 100 %, 99 % and 98 % correctness of the ENLs that participated previously. In previous studies the ENLs scored better than the NRLs and in the report of the study of 2005 (Korver *et al*., 2006) it was noted

that the differences were becoming smaller. In this study the NRLs scored even better than the ENLs, although this was most likely caused by the fact that 11 ENLs were participating for the first time.

Phage typing

10 Strains of *S.* Enteritidis and 10 strains of *S.* Typhimurium were selected for this study by the Salmonella Reference Laboratory of the Health Protection Agency in London. Most problems with the phage typing were due to the misinterpretation of the phage patterns, which could have resulted from the inexperience of some laboratories. As more countries have joined the European Union more laboratories are taking part in the study. 17 ENLs perfomed phage typing in this study, whereas in the study of 2005 only 10 ENLs participated. Many of the new laboratories will be less experienced at phage typing.
Five *S.* Enteritidis and nine *S.* Typhimurium strains were typed correctly by all seven NRLs. The remaining five *S.* Enteritidis and one *S.* Typhimurium strains were incorrectly identified only once. Three *S.* Enteritidis and two *S.* Typhimurium strains were typed correctly by all 17 ENLs.

The *S.* Enteritidis strains causing most problems was PT 21. Six of the 17 ENLs typed this strains as PT 21c by misinterpreting the phage pattern. PT 21c always gives a CL reading with phage 16. The readings obtained with phage 16 for this strain may be due to the phage titre being incorrect. *S.* Enteritidis PT 5a, which caused problems in the 2005 study, was incorrectly identified by one NRL and five ENLs in this study. The NRL and two of the ENLs gave an identification of PT6b although they had the correct phage pattern. The other three ENLs had identified this strain as PT 5c, PT 10 and PT 38 and this may have been due to an incorrect phage titre.

The *S.* Typhimurium strain causing most problems were PT 12. This resulted from misinterpretation of the phage patterns. *S.* Typhimurium PT U310 was incorrectly identified by three of the ENLs. Two of these laboratories recorded it as untypable as they did not have all the additional phages. Both these laboratories also were unable to type *S.* Typhimurium PT U302 and one was unable to type *S.* Typhimurium PT 193.

Overall the results for the NRLs were good with 93% correct phage types for *S.* Enteritidis and 99% for *S.* Typhimurium. The overall results for the ENLs were 84% correct phage types for *S.* Enteritidis and 92% for *S.* Typhimurium.
The results for both NRLs and ENLs are comparable to the study of 2005. In that study the NRLs correctly typed 97% of both *S.* Enteritidis and *S.* Typhimurium strains and 83% of the *S.* Enteritidis strains and 91% of the *S.* Typhimurium strains were correctly typed by the ENLs.

7 Conclusions

Serotyping

- O-antigens were typed correctly by 98 % of the NRLs and 98 % of the ENLs
- H-antigens were typed correctly by 94 % of both NRLs and ENLs.
- Serovar names were assigned correctly by 93 % of both NRLs and ENLs
- Performance of ENLs was slightly lower than last year, probably due to the participation of 11 new (less experienced) ENLs
- *S.* Oranienburg and *S.* Yoruba were the strains causing most problems.

Phage typing

- The performance of the NRLs was good, with the *S.* Enteritidis strains typed correctly by 93 % of the NRLs and the *S.* Typhimurium strains by 99 %.
- *S.* Enteridis strains were typed correctly by 84 % of the ENLs.
- *S.* Typhimurium strains were typed correctly by 92 % of the ENLs.
- Two *S.* Enteritidis strains were typed correctly by all participating NRLs and ENLs.
- Two *S.* Typhimurium strains were typed correctly by all participating NRLs and ENLs.

References

Korver H, Raes M, Maas HME, Ward LR, Wannet WJB and Henken AM, 2002.
Test results of *Salmonella* typing by the NRLs-*Salmonella* in the Member States of the EU and the EnterNet Laboratories. Collaborative study VI (2001) on typing of *Salmonella* [RIVM, Bilthoven], RIVM report 284500020.

Korver H, Maas HME, Ward LR, Wannet WJB and Henken AM, 2002.
Test results of *Salmonella* typing by the NRLs-*Salmonella* in the Member States of the EU and the EnterNet Laboratories. Collaborative study VII (2002) on typing of *Salmonella* [RIVM, Bilthoven], RIVM report 284500022.

Korver H, Maas HME, Mooijman KA, Ward LR, Mevius DJ, Wannet WJB and Henken AM, 2003. Test results of *Salmonella* typing by the NRLs-*Salmonella* in the Member States of the EU and the EnterNet Laboratories. Collaborative study VIII (2003) on typing of *Salmonella* [RIVM, Bilthoven], RIVM report 330300002.

Korver H, Maas HME, Ward LR, Mevius DJ, Wannet WJB and Mooijman KA, 2005.
Ninth CRL-*Salmonella* interlaboratory comparison study (2004) on typing of *Salmonella* spp. [RIVM, Bilthoven], RIVM report 330300006.

Korver H, Maas HME, Ward LR, Mevius DJ and Mooijman KA, 2006.
Tenth CRL-*Salmonella* interlaboratory comparison study (2005) on typing of *Salmonella* spp. [RIVM, Bilthoven], RIVM report 330300009.

Popoff MY and Le Minor L, 1997.
Guidelines for the preparation of *Salmonella* antisera, WHO Collaborating Centre for Reference and Research on *Salmonella*. Institut Pasteur, Paris.

Popoff MY, 2001.
Antigenic formulas of the *Salmonella* serovars (8^{th} edition). WHO Collaborating Centre for Reference and Research on *Salmonella*. Institut Pasteur, Paris.

Raes M, Ward LR, Maas HME, Leeuwen WJ van and Henken AM, 2000.
Test results of *Salmonella* sero- and phage typing by the National Reference Laboratories and the EnterNet Laboratories in the Member States of the European Union. Collaborative study IV on sero- and phage typing [RIVM, Bilthoven], RIVM report 284500013.

Raes M, Ward LR, Maas HME, Wannet WJB and Henken AM, 2001.
Test results of *Salmonella* sero-, phage and antibiotic resistance pattern typing by the National Reference Laboratories for *Salmonella* and the EnterNet Laboratories in the Member States of the European Union. Collaborative study V on sero-, phage and antibiotic resistance pattern typing [RIVM, Bilthoven], RIVM report 284500016.

Regulation (EC) No 882/2004 of the European parliament and of the counsil of 29 April 2004 on official controls performed to ensure the verification of compliance with feed and food law, animal health and animal welfare rules.

Voogt N, Maas HME, Leeuwen WJ van and Henken AM, 1996.
A collaborative study on serotyping of *Salmonella* amongst the National Reference Laboratories for *Salmonella* [RIVM, Bilthoven], RIVM report 284500004.

Voogt N, Maas HME, Leeuwen WJ van and Henken AM, 1997.
Test results of *Salmonella* serotyping in the Member States of the European Union. A collaborative study amongst the National Reference Laboratories for *Salmonella* [RIVM, Bilthoven], RIVM report 284500008.

Voogt N, Maas HME, Leeuwen WJ van and Henken AM, 1999.
Test results of *Salmonella* serotyping in the Member States of the European Union. Collaborative study III amongst the National Reference Laboratories for *Salmonella* [RIVM, Bilthoven], RIVM report 284500010.

Annex 1 Protocol

PROTOCOL OF THE ELEVENTH INTERLABORATORY COMPARISON STUDY (XI, 2006) ON SEROTYPING AND PHAGE TYPING OF *SALMONELLA* STRAINS ORGANISED BY CRL-*SALMONELLA*

Introduction

The Community Reference Laboratory (CRL) - *Salmonella* organises the eleventh interlaboratory comparison study on the typing 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 test the performance of the participating laboratories for serotyping and phagetyping of *Salmonella* spp. In contradiction with the former studies antimicrobial resistance testing is no longer included in this study.

For the NRLs-*Salmonella* the performance of the study will take place in week 10 (starting on 6 March 2005) 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 testreport, send to the CRL-*Salmonella* and will be used for analysis. The data on phage typing will be sent to CRL-*Salmonella* and to Elizabeth de Pinna, Health Protection Agency (HPA), London, UK.

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

CRL-*Salmonella* will mail to the NRLs the parcels as diagnostic specimens with a door-to-door courier to your laboratory, so you do not need to pick up the strains at the airport as was the case in previous typing studies. The shipment of the strains for phage typing to the NRLs and the shipment of all strains to the ENLs will be arranged by Elizabeth de Pinna, HPA, London, UK.

Serotyping

A total number of 20 *Salmonella* strains (numbered S-1 till S-20), supplied by the CRL-*Salmonella*, have to be serotyped. The method routinely performed in your laboratory can be used in this study. Each laboratory is allowed to send strains for serotyping to another reference laboratory in their country, if this is part of the normal routine procedure.

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 Elizabeth de Pinna, HPA, London, UK.

If you have questions or remarks about the interlaboratory comparison study, please contact:

Kirsten Mooijman (head CRL-*Salmonella*)
P.O. Box 1
3720 BA Bilthoven
tel. number: +31-30-2743537
fax. number: +31-30-2744434
e-mail: Kirsten.mooijman@rivm.nl

If you have questions or remarks on the phage typing please contact:

Elizabeth de Pinna
Public Health Laboratory Service, Laboratory of Enteric Pathogens
61 Colindale Avenue, London NW9 5HT
tel. number: + 44-20-8327 6136
fax number: + 44-20-8905 9929
e-mail: Elizabeth.DePinna@HPA.org.uk

Timetable of the eleventh interlaboratory comparison study (2006) on serotyping and phage typing of *Salmonella* spp.

Week	Date	Topic
6	6-10 February	Mailing of the protocol and test report 2006 (to NRLs and ENLs)
9	27 February-3 March	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 your lab on 4 March, please do contact the CRL immediately.
10	6-10 March	Starting with the identification of the strains.
12	20-24 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	27-31 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

INTERLABORATORY COMPARISON STUDY ON TYPING OF *SALMONELLA* STRAINS 2006

ELEVENTH STUDY FOR THE NATIONAL REFERENCE LABORATORIES AND EIGHTH FOR THE ENTERNET LABORATORIES

Laboratory code	
Name contact person	
Name of laboratory	
Name department and/or institute	
Address	
Country	
Is your laboratory accredited/certified and according to which system?	Serotyping: Yes/No System:……. Phagetyping: Yes/No System:…….
If you are not yet accredited/certified are you planning to do so in the near future?	Yes/No System:…….

Please write your remarks and comments on page 7 of the test report!!

GENERAL QUESTIONS

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

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

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

QUESTIONS SEROTYPING

What was the frequency of serotyping of *Salmonella* at your laboratory in 2005?	❑ Daily ❑ Once a week ❑ Twice a week ❑ Thrice a week ❑ Weekly ❑ Monthly
How many *Salmonella* strains did your laboratory serotype in 2005?	Number of strains:……..
How many of these typings considered a rough strain?	Number of rough strains:……
What kind of sera do you use?	❑ Prepared in own laboratory ❑ Commercial sera Manufacturer(s): …… …… …… ……
The strains in this collaborative study were serotyped by:	❑ Own laboratory, Strain……... ❑ Other laboratory, namely…… …… …… Strains:…… …… …… ……

TEST RESULTS SEROTYPING

Laboratory code	
Starting date of serotyping	
Finishing date of serotyping	

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 2005?	Number of strains……...

TEST RESULTS PHAGETYPING

Laboratory code	……
Starting date of typing	
Finishing date of typing	

		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

Laboratory code	
Starting date of phagetyping	
Finishing date of phagetyping	

		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**	**10 var**	**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

REMARKS AND COMMENTS

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

Name of person in charge	
Date and signature	

Annex 3. Test results of phagetyping 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	**2**	**ol**	**-**	**cl**	**scl**	**cl**	**scl**	**cl**	**ol**	**ol**	**ol**	**scl**	**cl**	**-**	**cl**	**-**	**-**
3	**2**	**ol**	**-**	**scl**	**+++**	**scl**	**+**	**scl**	**+++**	**<ol**	**ol**	**+**	**scl**	**-**	**scl**	**-**	**-**
9	**2**	**ol**	**-**	**cl**	**scl**	**<cl**	**scl**	**cl**	**ol**	**<ol**	**ol**	**<cl**	**cl**	**-**	**cl**	**-**	**-**
11	**2**	**cl**	**-**	**cl**	**scl**	**cl**	**+**	**5**	**cl**	**scl**	**cl**	**+**	**cl**	**-**	**cl**	**-**	**-**
16	**2**	**ol**	**-**	**cl**	**<scl**	**cl**	**sol**	**<ol**	**ol**	**ol·**	**ol**	**<ol**	**cl**	**-**	**cl**	**-**	**-**
20	**2**	**ol**	**-**	**cl**	**+++**	**cl**	**+++**	**±±±**	**ol**	**+++**	**<ol**	**±±±**	**cl**	**-**	**cl**	**-**	**-**
22	**2**	**ol**	**-**	**cl**	**<scl**	**cl**	**±**	**<cl**	**ol**	**scl**	**ol**	**cl**	**cl**	**-**	**<cl**	**-**	**-**
23	**2**	**ol**	**-**	**<cl**	**sol**	**<cl**	**++**	**++**	**ol**	**<ol**	**<ol**	**scl**	**<cl**	**-**	**<cl**	**-**	**-**
A	**2**	**ol**	**-**	**<cl**	**scl**	**<cl**	**ol**	**scl**	**ol**	**scl**	**ol**	**scl**	**<cl**	**-**	**cl**	**-**	**-**
B	**2**	**ol**	**-**	**cl**	**scl**	**cl**	**scl**	**cl**	**ol**	**scl**	**ol**	**scl**	**cl**	**-**	**cl**	**-**	**-**
C	**2**	**ol**	**-**	**<cl**	**<cl**	**<cl**	**scl**	**cl**	**ol**	**scl**	**ol**	**scl**	**cl**	**-**	**cl**	**-**	**-**
D	**2**	**ol**	**-**	**cl**	**++**	**<cl**	**++**	**scl**	**ol**	**scl**	**ol**	**scl**	**cl**	**-**	**scl**	**-**	**-**
E	**43**	**ol**	**±**	**scl**	**ol**	**cl**	**ol**	**+**	**ol**	**ol**	**ol**	**scl**	**cl**	**-**	**cl**	**-**	**-**
F	**2**	**ol**	**-**	**cl**	**<ol**	**cl**	**ol**	**<cl**	**scl**	**<ol**	**<ol**	**++**	**cl**	**-**	**cl**	**-**	**-**
J	**2**	**ol**	**-**	**cl**	**scl**	**cl**	**scl**	**cl**	**ol**	**<ol**	**ol**	**<cl**	**cl**	**-**	**cl**	**-**	**-**
K	**2**	**ol**	**-**	**cl**	**+++**	**scl**	**ol**	**scl**	**+++**	**++**	**<ol**	**<ol**	**scl**	**-**	**cl**	**-**	**-**
M	**2**	**ol**	**-**	**cl**	**<ol**	**cl**	**<ol**	**<cl**	**ol**	**<ol**	**ol**	**scl**	**cl**	**-**	**scl**	**-**	**-**
P	**2**	**ol**	**-**	**cl**	**++**	**cl**	**±**	**<cl**	**cl**	**<scl**	**cl**	**<cl**	**cl**	**-**	**cl**	**-**	**-**
R	**2**	**scl**	**-**	**<cl**	**++**	**<cl**	**++**	**scl**	**ol**	**+**	**scl**	**++l**	**<cl**	**-**	**<cl**	**-**	**-**
S	**2**	**ol**	**-**	**cl**	**scl**	**<cl**	**scl**	**cl**	**ol**	**<ol**	**ol**	**<cl**	**cl**	**-**	**cl**	**-**	**-**
U	**2**	**ol**	**-**	**<cl**	**+++**	**cl**	**scl**	**++**	**ol**	**ol**	**ol**	**+**	**cl**	**-**	**scl**	**-**	**-**
W	**2**	**scl**	**-**	**<cl**	**+++**	**<cl**	**scl**	**+**	**<scl**	**ol**	**scl**	**scl**	**ol**	**-**	**cl**	**-**	**-**
X	**2**	**ol**	**-**	**cl**	**+++**	**<cl**	**+++**	**cl**	**ol**	**<ol**	**ol**	**<cl**	**cl**	**-**	**cl**	**-**	**-**
Y	**2**	**ol**	**-**	**ol**	**+++**	**ol**	**+++**	**++**	**ol**	**<ol**	**ol**	**+++**	**cl**	**-**	**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	**3**	**ol**	**-**	**-**	**-**	**-**	**+**	**-**	**ol**	**-**	**ol**	**-**	**-**	**-**	**cl**	**-**	**-**
3	**3**	**ol**	**-**	**-**	**-**	**-**	**-**	**-**	**<ol**	**-**	**cl**	**-**	**-**	**-**	**cl**	**-**	**-**
9	**3**	**ol**	**-**	**-**	**-**	**-**	**-**	**-**	**ol**	**-**	**ol**	**-**	**-**	**-**	**cl**	**-**	**-**
11	**3**	**cl**	**-**	**-**	**-**	**-**	**+**	**-**	**ol**	**-**	**cl**	**-**	**-**	**-**	**cl**	**-**	**-**
16	**3**	**ol**	**-**	**-**	**-**	**-**	**++**	**-**	**ol**	**-**	**ol**	**-**	**-**	**-**	**cl**	**-**	**-**
20	**3**	**ol**	**-**	**-**	**-**	**-**	**++**	**-**	**ol**	**-**	**ol**	**-**	**-**	**-**	**cl**	**-**	**-**
22	**3**	**ol**	**-**	**3**	**-**	**-**	**±**	**-**	**<ol**	**-**	**<ol**	**-**	**-**	**-**	**<cl**	**-**	**-**
23	**3**	**scl**	**±**	**-**	**-**	**-**	**++**	**-**	**<ol**	**±**	**<ol**	**-**	**-**	**-**	**<cl**	**2**	**±**
A	**21C**	**ol**	**scl**	**-**	**ol**	**-**	**ol**	**-**	**ol**	**scl**	**ol**	**-**	**-**	**-**	**cl**	**scl**	**<cl**
B	**3**	**ol**	**-**	**-**	**-**	**-**	**-**	**-**	**ol**	**-**	**ol**	**-**	**-**	**-**	**cl**	**-**	**-**
C	**3**	**ol**	**-**	**-**	**-**	**-**	**++**	**-**	**cl**	**-**	**ol**	**-**	**-**	**-**	**cl**	**-**	**-**
D	**3**	**ol**	**-**	**-**	**-**	**-**	**-**	**-**	**ol**	**-**	**ol**	**-**	**-**	**-**	**scl**	**+++**	**+++**
E	**3**	**ol**	**-**	**-**	**-**	**-**	**-**	**-**	**ol**	**-**	**ol**	**-**	**-**	**-**	**cl**	**-**	**-**
F	**3**	**ol**	**±**	**-**	**-**	**-**	**+++**	**-**	**scl**	**-**	**ol**	**-**	**-**	**-**	**cl**	**-**	**-**
J	**3**	**ol**	**-**	**-**	**-**	**-**	**±**	**-**	**ol**	**-**	**ol**	**-**	**-**	**-**	**cl**	**-**	**-**
K	**3**	**ol**	**-**	**-**	**-**	**-**	**++**	**-**	**ol**	**-**	**+++**	**-**	**-**	**-**	**cl**	**-**	**-**
M	**3**	**ol**	**-**	**-**	**-**	**-**	**-**	**-**	**<ol**	**-**	**ol**	**-**	**-**	**-**	**scl**	**-**	**-**
P	**3**	**ol**	**-**	**-**	**-**	**-**	**1**	**-**	**ol**	**-**	**ol**	**-**	**-**	**-**	**cl**	**-**	**-**
R	**3**	**scl**	**-**	**-**	**-**	**-**	**-**	**-**	**scl**	**-**	**scl**	**-**	**-**	**-**	**<cl**	**-**	**-**
S	**3**	**ol**	**-**	**-**	**-**	**-**	**-**	**-**	**ol**	**-**	**ol**	**-**	**-**	**-**	**cl**	**-**	**-**
U	**3**	**ol**	**-**	**-**	**-**	**-**	**-**	**-**	**ol**	**-**	**ol**	**-**	**-**	**-**	**cl**	**-**	**+**
W	**21**	**scl**	**+++**	**-**	**+++**	**-scl**	**+++**	**-**	**scl**	**+++**	**scl**	**-**	**-**	**-**	**cl**	**-**	**-**
X	**22**	**ol**	**-**	**-**	**+++**	**-**	**+++**	**-**	**ol**	**<ol**	**ol**	**-**	**-**	**-**	**cl**	**-**	**-**
Y	**21**	**ol**	**+++**	**-**	**+++**	**-**	**+++**	**-**	**ol**	**<ol**	**ol**	**-**	**-**	**-**	**cl**	**-**	**-**

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**	-	-	-	-	-	++	-	-	+	-	-	-	-	-	-	-
9	**14b**	-	-	-	-	-	scl	-	-	-	-	-	-	-	-	-	-
11	**rdnc**	-	-	-	±	-	+	-	±	±	±	-	-	-	-	-	-
16	**14b**	-	-	-	-	-	sol	-	-	-	-	-	-	-	-	-	-
20	**14b**	-	-	-	±	-	+++	-	-	±	-	-	-	-	-	-	-
22	**14b**	-	-	-	2	-	±	-	-	-	-	-	-	-	-	-	-
23	**14b**	-	-	-	-	-	++	-	-	-	-	-	-	-	-	-	-
A	**14b**	-	-	-	-	-	scl	-	-	-	-	-	-	-	-	-	-
B	**14b**	-	-	-	-	-	scl	-	-	-	-	-	-	-	-	-	-
C	**14b**	-	-	-	1-5	-	scl	-	-	-	-	-	-	-	-	-	-
D	**14b**	-	-	-	-	-	++	-	+	+	+	-	-	-	-	-	-
E	**14b**	-	-	-	-	-	ol	-	-	-	-	-	-	-	-	-	-
F	**14b**	-	-	-	±	-	ol	-	-	±	-	-	-	-	-	-	-
J	**14b**	-	-	-	-	-	scl	-	-	±	-	-	-	-	-	-	-
K	**14b**	-	-	-	-	-	scl	-	-	-	-	-	-	-	-	-	-
M	**14b**	-	-	-	±	-	<ol	-	-	1	-	-	-	-	-	-	-
P	**14b**	-	-	-	-	1	<<scl	-	-	4	-	-	4	-	-	-	-
R	**14b**	-	-	-	-	-	++	-	-	1	-	-	-	-	-	-	-
S	**14b**	-	-	-	-	-	ol	-	-	-	-	-	-	-	-	-	-
U	**14b**	-	-	-	-	-	<scl	-	-	±	-	-	-	-	-	-	-
W	**14b**	-	-	-	-	-	scl	-	-	±	-	-	-	-	-	-	-
X	**14b**	-	-	-	-	-	ol	-	-	-	-	-	-	-	-	-	-
Y	**14b**	-	-	-	-	-	+++	-	-	-	-	-	-	-	-	-	-

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	**21**	**cl**	**scl**	**-**	**scl**	**-**	**scl**	**-**	**ol**	**ol**	**ol**	**-**	**-**	**-**	**cl**	**-**	**-**
3	**21c**	**ol**	**+++**	**-**	**+++**	**-**	**+**	**-**	**<ol**	**+++**	**<ol**	**-**	**-**	**-**	**cl**	**<<scl**	**scl**
9	**21**	**ol**	**scl**	**-**	**<ol**	**-**	**scl**	**-**	**ol**	**<ol**	**ol**	**-**	**-**	**-**	**cl**	**-**	**+**
11	**21**	**cl**	**+**	**-**	**±**	**-**	**+**	**-**	**cl**	**++**	**cl**	**-**	**-**	**-**	**cl**	**-**	**-**
16	**21**	**ol**	**scl**	**-**	**<sol**	**-**	**sol**	**-**	**ol**	**ol**	**ol**	**-**	**-**	**-**	**cl**	**±**	**±**
20	**21**	**ol**	**±±±**	**1**	**+++**	**-**	**scl**	**-**	**ol**	**scl**	**ol**	**-**	**-**	**-**	**cl**	**±±**	**++**
22	**21**	**ol**	**±±**	**-**	**<scl**	**-**	**±**	**-**	**ol**	**<scl**	**ol**	**-**	**-**	**-**	**cl**	**3**	**±**
23	**21**	**ol**	**scl**	**-**	**sol**	**-**	**++**	**-**	**ol**	**<ol**	**ol**	**-**	**-**	**-**	**cl**	**-**	**-**
A	**21c**	**ol**	**scl**	**-**	**ol**	**-**	**ol**	**-**	**ol**	**scl**	**ol**	**-**	**-**	**-**	**cl**	**<cl**	**<cl**
B	**21**	**ol**	**scl**	**-**	**scl**	**-**	**scl**	**-**	**ol**	**scl**	**ol**	**-**	**-**	**-**	**cl**	**-**	**-**
C	**21**	**ol**	**+++**	**-**	**scl**	**-**	**scl**	**-**	**ol**	**scl**	**ol**	**-**	**-**	**-**	**cl**	**-**	**1-5**
D	**21**	**ol**	**++**	**-**	**+**	**-**	**++**	**-**	**ol**	**scl**	**ol**	**-**	**-**	**-**	**scl**	**+++**	**+++**
E	**21**	**ol**	**+**	**-**	**ol**	**-**	**ol**	**-**	**ol**	**ol**	**ol**	**-**	**-**	**-**	**cl**	**-**	**-**
F	**21c**	**ol**	**ol**	**-**	**scl**	**±**	**ol**	**-**	**<cl**	**<ol**	**ol**	**-**	**-**	**-**	**cl**	**+**	**<ol**
J	**21**	**ol**	**scl**	**-**	**<ol**	**-**	**scl**	**-**	**ol**	**ol**	**ol**	**-**	**-**	**-**	**cl**	**+**	**+**
K	**21**	**ol**	**+++**	**-**	**++**	**-**	**scl**	**-**	**ol**	**++**	**ol**	**-**	**-**	**-**	**cl**	**-**	**-**
M	**21**	**ol**	**<<scl**	**-**	**<ol**	**-**	**<ol**	**-**	**ol**	**<ol**	**ol**	**-**	**-**	**-**	**scl**	**+**	**+**
P	**21c**	**ol**	**+++**	**-**	**++**	**-**	**<scl**	**-**	**ol**	**+++**	**ol**	**-**	**-**	**-**	**cl**	**±±**	**±±**
R	**21**	**scl**	**++**	**-**	**++**	**-**	**+++**	**-**	**ol**	**++**	**ol**	**-**	**-**	**-**	**<cl**	**+**	**-**
S	**21**	**ol**	**scl**	**-**	**<ol**	**-**	**scl**	**-**	**ol**	**<ol**	**ol**	**-**	**-**	**-**	**cl**	**+**	**+**
U	**21c**	**ol**	**+**	**-**	**+**	**-**	**scl**	**-**	**<ol**	**ol**	**ol**	**-**	**-**	**-**	**<cl**	**++**	**scl**
W	**21c**	**scl**	**+++**	**-**	**++**	**-**	**scl**	**-**	**scl**	**+++**	**scl**	**-**	**-**	**-**	**cl**	**++**	**++**
X	**21**	**ol**	**scl**	**-**	**<ol**	**-**	**+++**	**-**	**ol**	**<ol**	**ol**	**-**	**-**	**-**	**cl**	**-**	**-**
Y	**21c**	**ol**	**+++**	**-**	**+++**	**-**	**+++**	**-**	**ol**	**<ol**	**ol**	**-**	**-**	**-**	**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	**5a**	**-**	**scl**	**±**	**scl**	**ol**	**scl**	**±**	**-**	**ol**	**-**	**-**	**ol**	**-**	**-**	**-**	**-**
3	**5a**	**-**	**scl**	**-**	**+++**	**ol**	**±**	**-**	**-**	**<ol**	**-**	**-**	**cl**	**-**	**-**	**-**	**-**
9	**6b**	**-**	**scl**	**-**	**scl**	**++**	**scl**	**-**	**-**	**ol**	**-**	**-**	**scl**	**-**	**-**	**-**	**-**
11	**5a**	**-**	**±±**	**-**	**±±**	**ol**	**+**	**-**	**-**	**ol**	**-**	**-**	**ol**	**-**	**-**	**-**	**-**
16	**5a**	**-**	**scl**	**+**	**<scl**	**<cl**	**sol**	**±**	**-**	**<ol**	**-**	**±**	**cl**	**-**	**-**	**-**	**-**
20	**5a**	**-**	**±±±**	**-**	**+++**	**cl**	**+++**	**-**	**-**	**scl**	**-**	**-**	**cl**	**-**	**-**	**-**	**-**
22	**5a**	**-**	**±±**	**2**	**scl**	**scl**	**±**	**1**	**-**	**<scl**	**-**	**±**	**cl**	**±**	**-**	**-**	**-**
23	**5a**	**-**	**scl**	**-**	**<ol**	**<ol**	**++**	**-**	**-**	**<ol**	**-**	**-**	**<ol**	**-**	**-**	**-**	**-**
A	**6b**	**-**	**scl**	**-**	**scl**	**<<**	**scl**	**-**	**-**	**scl**	**-**	**ol**	**-**	**-**	**-**	**-**	**-**
B	**5a**	**-**	**scl**	**-**	**scl**	**scl**	**scl**	**+**	**-**	**scl**	**-**	**-**	**ol**	**-**	**-**	**-**	**-**
C	**5a**	**-**	**scl**	**-**	**<cl**	**ol**	**scl**	**-**	**-**	**<cl**	**-**	**-**	**ol**	**1-5**	**1-5**	**-**	**-**
D	**5c**	**-**	**+++**	**+**	**++**	**<cl**	**++**	**+**	**++**	**scl**	**++**	**++**	**cl**	**++**	**-**	**-**	**-**
E	**10**	**-**	**-**	**-**	**ol**	**ol**	**ol**	**-**	**-**	**ol**	**-**	**+**	**cl**	**-**	**-**	**-**	**-**
F	**5a**	**-**	**ol**	**-**	**scl**	**<cl**	**<ol**	**-**	**-**	**ol**	**-**	**-**	**cl**	**-**	**-**	**-**	**-**
J	**5a**	**-**	**scl**	**-**	**scl**	**cl**	**scl**	**-**	**-**	**ol**	**-**	**-**	**cl**	**-**	**-**	**-**	**-**
K	**5a**	**-**	**+++**	**-**	**++**	**cl**	**scl**	**-**	**-**	**+++**	**-**	**-**	**cl**	**-**	**-**	**-**	**-**
M	**38**	**-**	**scl**	**±**	**ol**	**cl**	**<ol**	**<<scl**	**-**	**ol**	**-**	**±**	**cl**	**-**	**-**	**-**	**-**
P	**5a**	**-**	**+++**	**+**	**±±±**	**cl**	**<<scl**	**±±±**	**-**	**+++**	**-**	**-**	**cl**	**-**	**-**	**-**	**-**
R	**5a**	**-**	**<scl**	**+**	**++**	**ol**	**+++**	**-**	**-**	**++**	**-**	**-**	**<cl**	**-**	**-**	**-**	**-**
S	**6b**	**-**	**scl**	**-**	**scl**	**+++**	**scl**	**-**	**-**	**ol**	**-**	**-**	**+++**	**-**	**-**	**-**	**-**
U	**5a**	**-**	**+**	**-**	**scl**	**scl**	**scl**	**-**	**-**	**ol**	**-**	**-**	**scl**	**-**	**-**	**-**	**-**
W	**5a**	**-**	**+++**	**-**	**+++**	**cl**	**scl**	**-**	**-**	**<ol**	**-**	**-**	**<cl**	**-**	**-**	**-**	**-**
X	**5a**	**-**	**scl**	**-**	**<ol**	**cl**	**<ol**	**-**	**-**	**<ol**	**-**	**-**	**cl**	**-**	**-**	**-**	**-**
Y	**5a**	**-**	**+++**	**-**	**+++**	**cl**	**+++**	**-**	**-**	**<ol**	**-**	**-**	**cl**	**-**	**-**	**-**	**-**

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	**34**	-	-	-	-	-	-	-	ol	-	ol	-	-	-	-	-	-
3	**34**	-	-	-	-	-	-	-	<ol	-	<ol	-	-	-	-	-	-
9	**34**	-	-	-	-	-	-	-	ol	-	ol	-	-	-	-	-	-
11	**34**	-	-	-	-	-	-	-	cl	-	cl	-	-	-	-	-	-
16	**34**	-	-	-	-	-	-	-	ol	-	ol	-	-	-	-	-	-
20	**19**	4	-	-	-	-	++	-	ol	-	ol	-	-	-	±	-	-
22	**34**	1	-	-	-	-	-	-	ol	-	ol	-	-	-	-	-	-
23	**34**	-	-	-	-	-	-	-	ol	-	ol	-	-	-	-	-	-
A	**25**	-	-	-	-	-	-	-	scl	-	<cl	-	-	-	-	-	-
B	**34**	+	-	-	-	-	-	-	ol	-	ol	-	-	-	-	-	-
C	**34**	-	-	-	-	-	-	-	<cl	-	ol	-	-	-	1-5	-	-
D	**34**	-	-	-	-	-	-	-	ol	-	ol	-	-	-	-	-	-
E	**34**	-	-	-	-	-	-	-	ol	-	ol	-	-	-	-	-	-
F	**3**	+	-	-	-	-	-	-	<cl	-	<ol	-	-	-	scl	-	-
J	**34**	-	-	-	-	-	-	-	ol	-	ol	-	-	-	-	-	-
K	**25**	-	-	-	-	-	-	-	+	-	ol	-	-	-	-	-	-
M	**34**	-	-	-	-	-	-	-	ol	-	ol	-	-	-	-	-	-
P	**34**	4	-	-	-	-	-	-	ol	-	ol	-	-	-	3	-	-
R	**34**	-	-	-	-	-	-	-	ol	-	scl	-	-	-	-	-	-
S	**34**	-	-	-	-	-	-	-	ol	-	ol	-	-	-	-	-	-
U	**34b**	-	-	-	-	-	-	-	ol	-	ol	-	-	-	-	-	scl
W	**34**	±	-	-	-	-	-	-	scl	-	scl	-	-	-	±	-	-
X	**34**	-	-	-	-	-	-	-	ol	-	ol	-	-	-	-	-	-
Y	**34**	3	-	-	-	-	-	-	ol	-	ol	-	-	-	-	-	-

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	**1**	**ol**	**scl**	**cl**	**scl**	**cl**	**scl**	**cl**	**scl**	**scl**	**ol**	**cl**	**cl**	**cl**	**cl**	**-**	**-**
3	**1**	**ol**	**+++**	**cl**	**+++**	**<cl**	**++**	**cl**	**<ol**	**ol**	**<ol**	**<cl**	**cl**	**<cl**	**<cl**	**-**	**-**
9	**1a**	**ol**	**scl**	**cl**	**<ol**	**cl**	**scl**	**cl**	**ol**	**ol**	**ol**	**cl**	**cl**	**cl**	**+++**	**-**	**-**
11	**1**	**cl**	**<ol**	**cl**	**scl**	**cl**	**+**	**scl**	**ol**	**scl**	**ol**	**scl**	**cl**	**scl**	**cl**	**-**	**-**
16	**1**	**ol**	**scl**	**cl**	**sol**	**cl**	**sol**	**cl**	**ol**	**ol**	**ol**	**cl**	**cl**	**cl**	**cl**	**-**	**-**
20	**1**	**ol**	**+++**	**cl**	**<ol**	**cl**	**scl**	**cl**	**ol**	**<ol**	**ol**	**cl**	**cl**	**cl**	**cl**	**±±**	**±±**
22	**1**	**ol**	**±±**	**cl**	**scl**	**cl**	**±**	**cl**	**<ol**	**scl**	**ol**	**cl**	**cl**	**cl**	**<cl**	**-**	**-**
23	**1**	**ol**	**scl**	**<cl**	**<ol**	**<cl**	**++**	**<cl**	**<ol**	**<ol**	**<ol**	**cl**	**<cl**	**cl**	**<cl**	**-**	**-**
A	**1b**	**ol**	**<cl**	**scl**	**scl**	**<cl**	**scl**	**<cl**	**ol**	**scl**	**ol**	**<cl**	**<cl**	**<cl**	**<cl**	**scl**	**ol**
B	**1**	**ol**	**scl**	**cl**	**scl**	**cl**	**scl**	**cl**	**ol**	**scl**	**ol**	**cl**	**cl**	**cl**	**cl**	**-**	**-**
C	**1**	**ol**	**scl**	**cl**	**<cl**	**cl**	**scl**	**cl**	**ol**	**<cl**	**ol**	**cl**	**cl**	**cl**	**cl**	**-**	**-**
D	**1**	**ol**	**scl**	**ol**	**+++**	**ol**	**++**	**ol**	**ol**	**scl**	**ol**	**ol**	**ol**	**ol**	**ol**	**+++**	**+++**
E	**1**	**ol**	**+**	**cl**	**ol**	**cl**	**ol**	**cl**	**ol**	**ol**	**ol**	**cl**	**cl**	**cl**	**cl**	**-**	**-**
F	**1**	**ol**	**<ol**	**cl**	**±**	**cl**	**ol**	**cl**	**<ol**	**<ol**	**ol**	**<cl**	**cl**	**cl**	**cl**	**-**	**-**
J	**1**	**ol**	**scl**	**cl**	**scl**	**cl**	**scl**	**cl**	**ol**	**<ol**	**ol**	**cl**	**cl**	**cl**	**cl**	**-**	**-**
K	**1**	**cl**	**cl**	**scl**	**<ol**	**scl**	**ol**	**scl**	**+++**	**+++**	**+++**	**scl**	**scl**	**scl**	**cl**	**-**	**-**
M	**1**	**ol**	**scl**	**cl**	**ol**	**cl**	**<ol**	**cl**	**ol**	**ol**	**ol**	**cl**	**cl**	**cl**	**scl**	**-**	**-**
P	**1**	**ol**	**+++**	**cl**	**+++**	**cl**	**±**	**cl**	**ol**	**scl**	**ol**	**cl**	**cl**	**cl**	**cl**	**-**	**-**
R	**1**	**scl**	**+++**	**<cl**	**+++**	**<cl**	**+++**	**<cl**	**ol**	**++**	**scl**	**ol**	**<cl**	**scl**	**<cl**	**-**	**-**
S	**1a**	**ol**	**scl**	**cl**	**<ol**	**cl**	**ol**	**cl**	**ol**	**ol**	**ol**	**cl**	**cl**	**cl**	**+++**	**-**	**-**
U	**1c**	**ol**	**++**	**cl**	**++**	**cl**	**scl**	**cl**	**ol**	**scl**	**ol**	**cl**	**cl**	**<cl**	**<cl**	**-**	**++**
W	**1**	**scl**	**+++**	**scl**	**+++**	**scl**	**scl**	**scl**	**<scl**	**ol**	**scl**	**scl**	**scl**	**scl**	**cl**	**-**	**-**
X	**1**	**ol**	**scl**	**cl**	**<ol**	**cl**	**+++**	**cl**	**ol**	**ol**	**ol**	**cl**	**cl**	**cl**	**cl**	**-**	**-**
Y	**1**	**ol**	**+++**	**cl**	**+++**	**cl**	**+++**	**cl**	**ol**	**<ol**	**ol**	**cl**	**cl**	**cl**	**cl**	**-**	**+**

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	**6a**	**-**	**scl**	**-**	**scl**	**-**	**scl**	**-**	**-**	**ol**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
3	**6a**	**-**	**scl**	**-**	**+++**	**-**	**+**	**-**	**-**	**<ol**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
9	**6a**	**-**	**scl**	**-**	**scl**	**-**	**scl**	**-**	**-**	**<ol**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
11	**6a**	**-**	**scl**	**-**	**scl**	**-**	**+**	**-**	**-**	**scl**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
16	**6a**	**-**	**scl**	**-**	**<sol**	**-**	**sol**	**-**	**-**	**<ol**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
20	**6a**	**-**	**+++**	**-**	**+++**	**-**	**scl**	**-**	**-**	**<ol**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
22	**6a**	**-**	**<scl**	**-**	**scl**	**-**	**±**	**-**	**-**	**scl**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
23	**6a**	**-**	**scl**	**-**	**sol**	**-**	**+++**	**-**	**-**	**scl**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
A	**6a**	**-**	**scl**	**-**	**scl**	**-**	**<cl**	**-**	**-**	**scl**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
B	**6a**	**-**	**cl**	**-**	**scl**	**-**	**scl**	**-**	**-**	**scl**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
C	**6a**	**-**	**scl**	**-**	**<cl**	**-**	**scl**	**-**	**-**	**scl**	**-**	**-**	**-**	**-**	**1-5**	**-**	**-**
D	**6a**	**-**	**scl**	**-**	**+++**	**-**	**++**	**-**	**-**	**scl**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
E	**6a**	**-**	**+**	**-**	**ol**	**-**	**ol**	**-**	**-**	**ol**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
F	**6a**	**-**	**<cl**	**-**	**<ol**	**-**	**cl**	**-**	**-**	**ol**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
J	**6a**	**-**	**scl**	**-**	**scl**	**-**	**scl**	**-**	**-**	**<ol**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
K	**6a**	**-**	**scl**	**-**	**scl**	**-**	**cl**	**-**	**-**	**<ol**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
M	**6a**	**-**	**<<scl**	**-**	**<<ol**	**-**	**<ol**	**-**	**-**	**<ol**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
P	**6a**	**-**	**cl**	**-**	**scl**	**-**	**<<scl**	**-**	**-**	**scl**	**-**	**-**	**-**	**-**	**1**	**-**	**-**
R	**6a**	**-**	**+++**	**-**	**++**	**-**	**+++**	**-**	**-**	**+++**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
S	**6a**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
U	**6a**	**-**	**scl**	**-**	**+**	**-**	**scl**	**-**	**-**	**scl**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
W	**6a**	**-**	**scl**	**-**	**<scl**	**-**	**scl**	**-**	**-**	**<ol**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
X	**6a**	**-**	**scl**	**-**	**+++**	**-**	**+++**	**-**	**-**	**<ol**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Y	**6a**	**-**	**scl**	**-**	**<ol**	**-**	**+++**	**-**	**-**	**ol**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

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	**4**	**-**	**scl**	**cl**	**scl**	**cl**	**scl**	**cl**	**scl**	**ol**	**ol**	**cl**	**cl**	**cl**	**-**	**-**	**-**
3	**4**	**-**	**scl**	**<cl**	**+++**	**cl**	**±**	**cl**	**+++**	**<ol**	**<ol**	**cl**	**cl**	**<cl**	**-**	**-**	**-**
9	**4**	**-**	**scl**	**cl**	**scl**	**cl**	**scl**	**cl**	**ol**	**<ol**	**ol**	**cl**	**cl**	**cl**	**-**	**-**	**-**
11	**4**	**-**	**scl**	**cl**	**scl**	**cl**	**+**	**scl**	**cl**	**ol**	**cl**	**cl**	**cl**	**cl**	**-**	**-**	**-**
16	**4**	**-**	**scl**	**cl**	**<scl**	**cl**	**sol**	**cl**	**ol**	**ol**	**ol**	**cl**	**cl**	**cl**	**-**	**-**	**-**
20	**4**	**-**	**+++**	**cl**	**ol**	**cl**	**+++**	**cl**	**ol**	**ol**	**<ol**	**cl**	**cl**	**cl**	**-**	**-**	**-**
22	**4**	**-**	**scl**	**cl**	**scl**	**cl**	**±**	**cl**	**ol**	**<ol**	**ol**	**cl**	**cl**	**cl**	**-**	**-**	**-**
23	**4**	**-**	**<cl**	**<cl**	**sol**	**<cl**	**++**	**<cl**	**ol**	**<ol**	**ol**	**cl**	**cl**	**cl**	**-**	**-**	**-**
A	**4a**	**-**	**<cl**	**<cl**	**scl**	**cl**	**scl**	**cl**	**scl**	**scl**	**scl**	**cl**	**cl**	**cl**	**<<**	**-**	**-**
B	**4**	**-**	**cl**	**cl**	**ol**	**cl**	**scl**	**cl**	**ol**	**ol**	**ol**	**cl**	**cl**	**cl**	**-**	**-**	**-**
C	**4**	**-**	**<cl**	**cl**	**ol**	**cl**	**scl**	**cl**	**ol**	**<cl**	**ol**	**cl**	**cl**	**cl**	**-**	**-**	**-**
D	**4**	**-**	**scl**	**cl**	**scl**	**cl**	**++**	**cl**	**ol**	**ol**	**ol**	**cl**	**cl**	**cl**	**-**	**-**	**-**
E	**4**	**-**	**+**	**scl**	**ol**	**cl**	**ol**	**scl**	**ol**	**ol**	**ol**	**cl**	**cl**	**cl**	**-**	**-**	**-**
F	**4**	**-**	**<cl**	**cl**	**<cl**	**cl**	**<cl**	**cl**	**scl**	**ol**	**<cl**	**cl**	**cl**	**cl**	**±**	**-**	**-**
J	**4**	**-**	**scl**	**cl**	**<ol**	**cl**	**scl**	**cl**	**ol**	**<ol**	**ol**	**cl**	**cl**	**cl**	**-**	**-**	**-**
K	**4a**	**-**	**cl**	**scl**	**scl**	**scl**	**ol**	**scl**	**+**	**<ol**	**++**	**scl**	**scl**	**scl**	**-**	**-**	**-**
M	**4**	**-**	**<cl**	**cl**	**ol**	**cl**	**<ol**	**cl**	**<ol**	**ol**	**ol**	**cl**	**cl**	**<cl**	**-**	**-**	**-**
P	**4**	**1**	**scl**	**cl**	**<scl**	**cl**	**±**	**cl**	**ol**	**ol**	**ol**	**cl**	**cl**	**cl**	**2**	**-**	**-**
R	**4**	**-**	**<scl**	**ol**	**+++**	**<cl**	**+++**	**ol**	**ol**	**++**	**scl**	**ol**	**<cl**	**<cl**	**-**	**-**	**-**
S	**4**	**-**	**scl**	**cl**	**<ol**	**cl**	**scl**	**cl**	**ol**	**<ol**	**ol**	**cl**	**cl**	**cl**	**-**	**-**	**-**
U	**4b**	**-**	**cl**	**scl**	**ol**	**<cl**	**+**	**cl**	**scl**	**ol**	**ol**	**cl**	**cl**	**cl**	**-**	**-**	**+++**
W	**4**	**4**	**+++**	**scl**	**+++**	**cl**	**scl**	**scl**	**<scl**	**<ol**	**scl**	**scl**	**scl**	**scl**	**4**	**-**	**-**
X	**4**	**-**	**scl**	**cl**	**<ol**	**cl**	**+++**	**cl**	**ol**	**<ol**	**ol**	**cl**	**cl**	**cl**	**-**	**-**	**-**
Y	**4**	**-**	**scl**	**cl**	**+++**	**cl**	**scl**	**cl**	**ol**	**<ol**	**ol**	**cl**	**cl**	**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	**1b**	**ol**	**scl**	**cl**	**scl**	**cl**	**scl**	**cl**	**scl**	**ol**	**ol**	**cl**	**cl**	**cl**	**cl**	**scl**	**cl**
3	**1b**	**ol**	**scl**	**cl**	**+++**	**cl**	**±**	**cl**	**+++**	**<ol**	**<ol**	**<<scl**	**cl**	**scl**	**scl**	**<<ol**	**<<ol**
9	**1b**	**ol**	**scl**	**cl**	**<ol**	**cl**	**scl**	**cl**	**ol**	**<ol**	**ol**	**cl**	**cl**	**cl**	**cl**	**ol**	**ol**
11	**1b**	**+++**	**++**	**cl**	**scl**	**cl**	**+**	**scl**	**ol**	**scl**	**scl**	**scl**	**cl**	**cl**	**cl**	**cl**	**cl**
16	**1b**	**ol**	**scl**	**cl**	**sol**	**cl**	**sol**	**cl**	**<ol**	**<ol**	**ol**	**cl**	**cl**	**cl**	**cl**	**sol**	**sol**
20	**1b**	**ol**	**+++**	**cl**	**+++**	**cl**	**+++**	**cl**	**scl**	**scl**	**+++**	**cl**	**cl**	**cl**	**cl**	**+++**	**scl**
22	**1b**	**<ol**	**scl**	**cl**	**<scl**	**cl**	**±**	**cl**	**++**	**scl**	**scl**	**cl**	**cl**	**cl**	**cl**	**+**	**<cl**
23	**1b**	**ol**	**<cl**	**<ol**	**<ol**	**ol**	**++**	**cl**	**ol**	**<ol**	**<ol**	**cl**	**cl**	**cl**	**cl**	**<cl**	**cl**
A	**1b**	**ol**	**scl**	**<cl**	**scl**	**<cl**	**scl**	**<cl**	**scl**	**scl**	**ol**	**scl**	**<cl**	**<cl**	**<cl**	**scl**	**<cl**
B	**1b**	**ol**	**cl**	**ol**	**scl**	**cl**	**scl**	**cl**	**ol**	**ol**	**ol**	**cl**	**cl**	**cl**	**cl**	**cl**	**scl**
C	**1b**	**ol**	**scl**	**cl**	**<cl**	**cl**	**scl**	**cl**	**<cl**	**scl**	**<cl**	**cl**	**ol**	**ol**	**cl**	**<cl**	**<cl**
D	**1b**	**scl**	**+++**	**cl**	**+**	**cl**	**++**	**cl**	**ol**	**+++**	**scl**	**cl**	**cl**	**cl**	**scl**	**scl**	**scl**
E	**1b**	**ol**	**++**	**cl**	**ol**	**cl**	**ol**	**scl**	**ol**	**ol**	**ol**	**cl**	**cl**	**cl**	**cl**	**scl**	**cl**
F	**1b**	**ol**	**<ol**	**cl**	**++**	**cl**	**ol**	**++**	**<ol**	**<ol**	**cl**	**<cl**	**cl**	**cl**	**cl**	**<cl**	**cl**
J	**1b**	**ol**	**scl**	**cl**	**scl**	**cl**	**scl**	**cl**	**ol**	**ol**	**ol**	**cl**	**cl**	**cl**	**cl**	**cl**	**cl**
K	**1b**	**+++**	**cl**	**scl**	**+++**	**scl**	**ol**	**scl**	**ol**	**+++**	**+++**	**scl**	**scl**	**scl**	**cl**	**ol**	**scl**
M	**1b**	**ol**	**<<scl**	**cl**	**<ol**	**cl**	**<ol**	**cl**	**ol**	**<ol**	**ol**	**<cl**	**cl**	**<cl**	**scl**	**scl**	**scl**
P	**1b**	**ol**	**+++**	**cl**	**+++**	**cl**	**<scl**	**cl**	**<cl**	**scl**	**<cl**	**cl**	**cl**	**cl**	**cl**	**<cl**	**<cl**
R	**1b**	**scl**	**+++**	**<cl**	**++**	**<cl**	**+++**	**ol**	**+++**	**++**	**++**	**scl**	**<cl**	**scl**	**<cl**	**ol**	**ol**
S	**1b**	**ol**	**scl**	**cl**	**<ol**	**cl**	**scl**	**cl**	**ol**	**<ol**	**+++**	**cl**	**cl**	**cl**	**cl**	**ol**	**ol**
U	**1b**	**ol**	**+**	**cl**	**+**	**cl**	**+**	**cl**	**scl**	**+**	**ol**	**cl**	**cl**	**<cl**	**cl**	**<cl**	**cl**
W	**1b**	**scl**	**+++**	**scl**	**+++**	**scl**	**scl**	**ol**	**++**	**<ol**	**+++**	**cl**	**cl**	**cl**	**cl**	**ol**	**ol**
X	**1b**	**ol**	**scl**	**cl**	**<ol**	**cl**	**+++**	**cl**	**ol**	**<ol**	**ol**	**cl**	**cl**	**cl**	**cl**	**ol**	**ol**
Y	**1b**	**ol**	**+++**	**cl**	**<ol**	**cl**	**+++**	**cl**	**ol**	**<ol**	**scl**	**cl**	**cl**	**cl**	**cl**	**+++**	**cl**

Strain M-11

		Phages at Routine Test Dilution (*S.*Typhimurium)																	
Lab code	**Phage type**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**
HPA	**160**	-	-	-	-	-	-	-	-	-	ol	-	scl	-	-	-	scl	scl	ol
3	**160**	-	-	-	-	-	-	-	-	-	<ol	-	<ol	-	-	-	scl	scl	<<scl
9	**160**	-	-	-	-	-	-	-	-	-	ol	-	<ol	-	-	-	<scl	scl	ol
11	**160**	-	-	-	-	-	-	-	-	-	±	ol	-	±	-	-	scl	±±	±
16	**160**	-	-	-	-	-	-	-	-	-	ol	-	<ol	-	-	-	3	scl	+ <<
20	**160**	-	-	-	-	-	-	-	-	-	ol	-	scl	-	-	-	+++	scl	+++
22	**160**	-	-	-	-	-	-	-	-	-	ol	-	++	-	-	-	±	+	2
23	**160**	-	-	-	-	-	-	-	-	-	ol	-	scl	-	2	-	ol	scl	++
A	**rdnc**	scl	-	-	-	-	-	-	-	-	ol	-	scl	-	-	-	<scl	scl	scl
B	**160**	-	-	-	-	-	-	-	-	-	ol	-	scl	-	-	-	scl	cl	scl
C	**160**	-	-	-	-	-	-	-	-	-	ol	-	<cl	-	-	-	+	<cl	+
D	**160**	-	-	-	-	-	-	-	-	-	+++	-	scl	-	-	-	++	scl	+++
E	**160**	-	-	-	-	-	-	-	-	-	cl	-	ol	-	-	-	+	+++	+
F	**160**	-	-	-	-	-	-	-	-	-	ol	-	+++	-	-	-	<cl	scl	<scl
I	**160**	-	-	-	-	-	-	-	-	-	cl	-	+++	-	-	-	+++	+++	2
J	**160**	-	-	-	-	-	-	-	-	-	ol	-	cl	-	-	-	ol	cl	<scl
K	**160**	-	-	-	-	-	-	-	-	-	ol	-	scl	-	-	-	scl	scl	ol
M	**160**	-	-	-	-	-	-	-	-	-	ol	-	cl	-	-	-	ol	cl	ol
P	**160**	-	-	±	-	±	-	-	2	-	ol	-	scl	-	±	±	<cl	scl	scl
R	**160**	-	-	-	-	-	-	-	-	-	ol	-	scl	-	-	-	scl	<cl	ol
S	**160**	-	-	-	-	-	-	-	-	-	ol	-	<ol	-	-	-	+++	scl	+++
U	**87**	-	-	-	-	-	-	-	-	-	cl	-	cl	-	+	-	<cl	cl	<cl
W	**160**	-	-	-	-	-	-	-	-	-	scl	-	+++	-	-	-	±	+++	+++
X	**160**	-	-	-	-	-	-	-	-	-	ol	-	ol	-	-	-	scl	+++	ol
Y	**160**	-	-	-	-	-	-	-	-	-	ol	-	<ol	-	-	-	++	+++	+++

Strain M-11 (continue)

		Phages at Routine Test Dilution (*S.*Typhimurium)												Additional phages					
Lab code	Phage type	20	21	22	23	24	25	26	27	28	29	32	35	1	2	3	10	10va	18
HPA	160	scl	-	ol	-	-	-	-	-	-	-	scl	-	±	±	±	ol	ol	-
3	160	+++	-	scl	-	-	-	-	-	-	-	scl	-						
9	160	scl	-	scl	-	-	-	-	-	-	-	<scl	-						
11	160	±±	-	ol	-	-	-	-	-	-	-	±	-	+	+	+	ol	ol	-
16	160	<cl	-	ol·	-	-	-	-	-	-	-	<cl	-	±	+	+	ol	ol·	-
20	160	scl	2	cl	-	-	-	-	-	-	-	scl	-	3	±	±	ol	ol	-
22	160	+	1	<ol	-	-	-	-	-	-	-	±	-						
23	160	<ol	-	<ol	-	-	-	-	-	-	++	++	-	+	+++	++	ol	ol	-
A	rdnc	scl	-	<cl	-	-	-	-	-	-	-	++	-						
B	160	scl	-	cl	-	-	-	-	-	-	-	scl	-	-	+	-	ol	ol	-
C	160	scl	1-5	cl<	-	-	-	-	-	-	-	scl	-						
D	160	+++	-	scl	-	-	-	-	-	-	-	scl	-	-	++	+	scl	scl	-
E	160	scl	-	cl	-	-	-	-	-	-	-	scl	-	±	+++	++	ol	<ol	-
F	160	<scl	-	<cl	-	-	-	-	-	-	-	<scl	-						
I	160	++	-	+++	-	2	-	-	-	-	-	++	-	-	-	-	cl	cl	-
J	160	ol	-	cl	-	-	-	-	-	-	-	<cl	-						
K	160	scl	-	ol	-	-	-	-	-	-	-	+++	-	-	-	-	ol	ol	-
M	160	ol	-	ol	-	-	-	-	-	-	-	ol	-						
P	160	cl	2	cl	±	-	3	-	-	-	-	<cl	-	± s	± s	± s	ol	ol	-
R	160	ol	-	scl	-	-	-	-	-	-	-	+++	-						
S	160	scl	-	scl	-	-	-	-	-	-	-	++	-	±	++	-	ol	ol	-
U	87	cl	-	cl	-	-	-	-	-	-	-	cl	-						
W	160	+++	±	scl	-	-	-	-	-	-	-	+++	-	±	±	±	ol	scl	-
X	160	scl	-	scl	-	-	-	-	-	-	-	scl	-						
Y	160	+++	-	scl	-	-	-	-	-	-	-	scl	-	±	++	++	ol	<ol	ol

Strain M-12

		Phages at Routine Test Dilution (*S.*Typhimurium)																	
Lab code	**Phage type**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**
HPA	**193**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3	**193**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
9	**193**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11	**193**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
16	**193**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
20	**193**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
22	**193**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
23	**193**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
A	**193**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
B	**193**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C	**193**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
D	**193**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
E	**193**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F	**193**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
I	**193**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
J	**193**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
K	**193**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
M	**193**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
P	**193**	-	-	-	-	-	-	-	-	-	-	-	-	-	±	-	-	**2**	-
R	**193**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
S	**193**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
U	**untyp**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W	**193**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
X	**194**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Y	**193**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Strain M-12 (continue)

		Phages at Routine Test Dilution (*S.*Typhimurium)												Additional phages					
Lab code	Phage type	20	21	22	23	24	25	26	27	28	29	32	35	1	2	3	10	10va	18
HPA	193	-	-	-	-	-	-	-	-	-	-	-	-	+++	+++	+++	++	-	-
3	193	-	-	-	-	-	-	-	-	-	-	-	-	-	scl	+++	-	-	-
9	193	-	-	-	-	-	-	-	-	-	-	-	-	scl	scl	scl	-	-	-
11	193	-	-	-	-	-	-	-	-	-	-	-	-	+	+	±±	-	-	-
16	193	-	-	-	-	-	-	-	-	-	-	-	-	++	+++	+++	-	-	-
20	193	-	-	-	-	-	-	-	-	-	-	-	-	±±	±±	±±±	±±	±±	-
22	193	-	-	-	-	-	-	-	-	-	-	-	-	+	±±	±±	ol	ol	-
23	193	-	-	-	-	-	-	-	-	-	-	-	-	scl	scl	scl	<ol	scl	-
A	193	-	-	-	-	-	-	-	-	-	-	-	-	scl	scl	scl	-	-	-
B	193	-	-	-	-	-	-	-	-	-	-	-	-	++	++	++	-	-	-
C	193	-	-	-	-	-	-	-	-	-	-	-	-	<cl	<cl	<cl	+		-
D	193	-	-	-	-	-	-	-	-	-	-	-	-	+	++	++	-	-	-
E	193	-	-	-	-	-	-	-	-	-	-	-	-	+++	+++	+++	-	-	-
F	193	-	-	-	-	-	-	-	-	-	-	-	-	+++	++	+++	<ol	<ol	-
I	193	-	-	-	-	-	-	-	-	-	-	-	-	+	+	+	cl	cl	-
J	193	-	-	-	-	-	-	-	-	-	-	-	-	scl	<cl	scl	ol	ol	-
K	193	-	-	-	-	-	-	-	-	-	-	-	-	+	++	++	ol	ol	-
M	193	-	-	-	-	-	-	-	-	-	-	-	-	scl	scl	scl	ol	ol	-
P	193	-	-	-	-	-	-	-	-	-	-	-	-	+++	+++	+++	scl	scl	-
R	193	-	-	-	-	-	-	-	-	-	-	-	-	++	+++	+++	-	-	-
S	193	-	-	-	-	-	-	-	-	-	-	-	-	++	scl	+++	-	-	-
U	untyp	-	-	-	-	-	-	-	-	-	-	-	-						
W	193	-	-	-	-	-	-	-	-	-	-	-	-	+++	+++	+++	ol	-	-
X	194	-	-	-	-	-	-	-	-	-	-	-	-	-	scl	-	-	-	-
Y	193	-	-	-	-	-	-	-	-	-	-	-	-	+++	+++	+++	-		-

Strain M-13

		Phages at Routine Test Dilution (*S*.Typhimurium)																	
Lab code	**Phage type**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**
HPA	**12**	-	-	-	-	-	-	-	-	-	-	scl	cl	-	-	-	-	-	-
3	**12**	-	-	-	-	-	-	-	-	-	-	scl	scl	-	-	-	-	-	-
9	**12**	-	-	-	-	-	-	-	-	-	-	cl	cl	-	-	-	-	-	-
11	**12**	-	-	-	-	-	-	-	-	-	-	scl	scl	-	-	-	-	-	-
16	**12**	-	-	-	-	-	-	-	-	-	-	++	scl	-	-	-	-	-	-
20	**107**	-	-	-	-	-	-	-	-	-	-	scl	scl	-	-	-	2	-	-
22	**12**	-	-	-	-	-	-	-	-	-	-	±	<cl	-	-	-	-	-	-
23	**12**	-	-	-	-	-	-	-	-	-	-	++	scl	-	-	-	-	-	-
A	**104L**	-	-	-	-	-	-	-	-	-	-	++	<<	-	-	-	-	+	-
B	**12**	-	-	-	-	-	-	-	-	-	-	scl	scl	-	-	-	-	-	-
C	**12a**	-	-	-	-	-	-	-	-	-	-	cl<	cl<	-	-	-	-	-	-
D	**12**	-	-	-	-	-	-	-	-	-	-	++	+++	-	-	-	-	-	-
E	**12**	-	-	-	-	-	-	-	-	-	-	scl	scl	-	-	-	-	-	-
F	**12**	-	-	-	-	-	-	-	-	-	-	++	scl	-	-	-	-	-	-
I	**104L**	-	-	-	-	-	-	-	-	-	-	+	++	-	-	-	-	-	-
J	**12**	-	-	-	-	-	-	-	-	-	-	scl	<cl	-	-	-	-	-	-
K	**12**	-	-	-	-	-	-	-	-	-	-	scl	scl	-	-	-	-	-	-
M	**12**	-	-	-	-	-	-	-	-	-	-	cl·	cl	-	-	-	-	-	-
P	**12**	-	-	-	-	-	-	-	-	-	-	<scl	scl	-	-	-	-	-	-
R	**12**	-	-	-	-	-	-	-	-	-	-	scl	scl	-	-	-	-	-	-
S	**12**	-	-	-	-	-	-	-	-	-	-	+	++	-	-	-	-	-	-
U	**12**	-	-	-	-	-	-	-	-	-	-	scl	cl	-	-	-	-	-	-
W	**12**	-	-	-	-	-	-	-	-	-	-	scl	scl	-	-	-	-	-	-
X	**109**	-	-	-	-	-	-	-	-	-	-	cl	cl	-	-	-	-	-	-
Y	**12**	-	-	-	-	-	-	-	-	-	-	<scl	+++	-	-	-	-	-	-

Strain M-13 (continue)

		Phages at Routine Test Dilution (*S.*Typhimurium)												Additional phages					
Lab code	Phage type	20	21	22	23	24	25	26	27	28	29	32	35	1	2	3	10	10va	18
HPA	12	-	-	-	-	-	-	-	-	-	-	-	-	++	++	++	ol	ol	-
3	12	-	-	-	-	-	-	-	-	-	-	-	-						
9	12	-	-	-	-	-	-	-	-	-	-	-	-						
11	12	-	-	-	-	-	-	-	-	-	-	-	-	±	±	±	ol	ol	-
16	12	-	-	-	-	-	-	-	-	-	-	-	-	++	++	++	ol	ol·	-
20	107	-	-	scl	-	-	-	-	-	-	-	-	-	±±	+	±±	ol	ol	-
22	12	-	-	-	-	-	-	-	-	-	-	-	-						
23	12	-	-	-	-	-	-	-	-	-	-	-	-	±	±	±	<ol	<ol	-
A	104L	-	-	-	-	-	-	-	-	-	-	-	-						
B	12	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+	ol	ol	-
C	12a	-	-	-	-	-	-	-	-	-	-	-	-						
D	12	-	-	-	-	-	-	-	-	-	-	-	-	+	++	+	scl	scl	-
E	12	-	-	-	-	-	-	-	-	-	-	-	-	+++	+++	+++	ol	<ol	-
F	12	-	-	-	-	-	-	-	-	-	-	-	-	±	+	+	ol	<ol	-
I	104L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	cl	cl	-
J	12	-	-	-	-	-	-	-	-	-	-	-	-						
K	12	-	-	-	-	-	-	-	-	-	-	-	-	+	+	+	ol	ol	-
M	12	-	-	-	-	-	-	-	-	-	-	-	-	++	scl	scl	ol	ol	-
P	12	-	-	-	-	-	-	-	-	-	-	-	-	±	±	±	ol	ol	-
R	12	-	-	-	-	-	-	-	-	-	-	-	-						
S	12	-	-	-	-	-	-	-	-	-	-	-	-	+	+++	+	ol	ol	-
U	12	-	-	-	-	-	-	-	-	-	-	-	-						
W	12	-	-	-	-	-	-	-	-	-	-	-	-	±	±	+	ol	scl	-
X	109	-	-	-	-	-	-	-	-	-	-	-	-						
Y	12	-	-	-	-	-	-	-	-	-	-	-	-	+++	+++	+++	ol	ol	-

Strain M-14

		Phages at Routine Test Dilution (*S*.Typhimurium)																	
Lab code	**Phage type**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**
HPA	**36**	**ol**	**ol**	**ol**	**ol**	**ol**	**ol**	**ol**	**ol**	**ol**	**ol**	**ol**	**ol**	**ol**	**ol**	**ol**	**ol**	**scl**	**ol**
3	**36**	**scl**	**<<scl**	**scl**	**cl**	**scl**	**scl**	**scl**	**scl**	**scl**	**cl**	**scl**	**scl**	**scl**	**cl**	**cl**	**cl**	**scl**	**scl**
9	**36**	**<scl**	**cl**	**scl**	**cl**	**cl**	**cl**	**cl**	**cl**	**cl**	**cl**	**<cl**	**cl**	**cl**	**cl**	**cl**	**cl**	**cl**	**cl**
11	**36**	**cl**	**scl**	**scl**	**scl**	**cl**	**cl**	**cl**	**cl**	**scl**	**cl**	**cl**	**scl**	**cl**	**cl**	**cl**	**cl**	**scl**	**scl**
16	**36**	**cl**	**+<<**	**scl**	**cl**	**cl**	**cl**	**cl**	**cl**	**cl**	**cl**	**<cl**	**cl**	**cl**	**cl**	**cl**	**5**	**<cl**	**<cl**
20	**36**	**cl**	**ol**	**cl**	**ol**	**scl**	**cl**	**cl**	**cl**	**cl**	**scl**	**cl**	**cl**	**ol**	**cl**	**cl**	**scl**	**cl**	**cl**
22	**36**	**scl**	**<cl**	**<cl**	**ol**	**<<cl**	**cl**	**cl**	**cl**	**<cl**	**cl**	**scl**	**cl**	**cl**	**cl**	**cl**	**scl**	**scl**	**scl**
23	**36**	**<cl**	**<cl**	**<cl**	**ol**	**<cl**	**<cl**	**<cl**	**cl**	**<cl**	**<cl**	**<cl**	**<cl**	**<cl**	**<cl**	**<cl**	**<cl**	**<cl**	**<cl**
A	**36**	**ol**	**<cl**	**<cl**	**<cl**	**<cl**	**cl**	**cl**	**cl**	**cl**	**<cl**	**<cl**	**<cl**	**<cl**	**<cl**	**ol**	**<cl**	**<cl**	**cl**
B	**36**	**cl**	**scl**	**cl**	**ol**	**cl**	**cl**	**cl**	**cl**	**cl**	**cl**	**scl**	**cl**	**cl**	**cl**	**cl**	**cl**	**cl**	**cl**
C	**36**	**<cl**	**1-5**	**<cl**	**<cl**	**<cl**	**<cl**	**scl**	**cl**	**cl**	**cl**	**<cl**	**<cl**	**<cl**	**cl**	**cl**	**cl**	**<cl**	**scl**
D	**36**	**++**	**scl**	**scl**	**scl**	**scl**	**+++**	**scl**	**scl**	**+++**	**+++**	**scl**	**scl**	**ol**	**ol**	**ol**	**++**	**scl**	**scl**
E	**36**	**scl**	**++**	**scl**	**cl**	**cl**	**cl**	**cl**	**cl**	**scl**	**cl**	**cl**	**cl**	**cl**	**cl**	**cl**	**scl**	**cl**	**scl**
F	**36**	**scl**	**<cl**	**<cl**	**ol**	**scl**	**<cl**	**<cl**	**<cl**	**<cl**	**cl**	**scl**	**<cl**	**cl**	**cl**	**cl**	**<cl**	**<cl**	**<cl**
I	**36**	**cl**	**+++**	**+++**	**+++**	**+++**	**cl**	**+++**	**cl**	**cl**	**cl**	**+++**	**+++**	**+++**	**cl**	**+++**	**+++**	**+++**	**+++**
J	**36**	**cl**	**cl**	**cl**	**cl**	**cl**	**cl**	**cl**	**cl**	**cl**	**cl**	**cl**	**cl**	**cl**	**cl**	**cl**	**cl**	**cl**	**cl**
K	**36**	**scl**	**scl**	**scl**	**ol**	**scl**	**scl**	**scl**	**scl**	**scl**	**scl**	**scl**	**scl**	**scl**	**scl**	**scl**	**scl**	**scl**	**scl**
M	**36**	**cl**	**ol**	**cl**	**ol**	**cl**	**cl**	**cl**	**cl**	**cl**	**cl**	**cl**	**cl**	**cl**	**cl**	**cl**	**cl**	**cl**	**cl**
P	**36**	**cl**	**<cl**	**cl**	**ol**	**<cl**	**cl**	**cl**	**cl**	**cl**	**cl**	**<cl**	**<cl**	**cl**	**cl**	**cl**	**cl**	**cl**	**cl**
R	**36**	**++**	**++**	**ol**	**scl**	**scl**	**ol**	**ol**	**scl**	**ol**	**ol**	**scl**	**ol**	**ol**	**ol**	**ol**	**ol**	**<cl**	**ol**
S	**36**	**<scl**	**cl**	**scl**	**cl**	**cl**	**cl**	**cl**	**cl**	**cl**	**cl**	**<cl**	**cl**	**cl**	**cl**	**cl**	**cl**	**cl**	**cl**
U	**36**	**cl**	**cl**	**cl**	**cl**	**cl**	**cl**	**cl**	**scl**	**cl**	**cl**	**<cl**	**cl**	**cl**	**cl**	**cl**	**cl**	**cl**	**cl**
W	**36**	**+**	**scl**	**+**	**scl**	**scl**	**scl**	**scl**	**scl**	**scl**	**scl**	**scl**	**scl**	**scl**	**scl**	**scl**	**+**	**scl**	**scl**
X	**36**	**cl**	**scl**	**scl**	**cl**	**cl**	**cl**	**cl**	**cl**	**cl**	**cl**	**scl**	**cl**	**scl**	**cl**	**cl**	**cl**	**scl**	**cl**
Y	**36**	**cl**	**cl**	**cl**	**cl**	**cl**	**cl**	**cl**	**cl**	**cl**	**cl**	**cl**	**cl**	**cl**	**cl**	**cl**	**cl**	**cl**	**cl**

Strain M-14 (continue)

		Phages at Routine Test Dilution (*S.*Typhimurium)												Additional phages					
Lab code	Phage type	20	21	22	23	24	25	26	27	28	29	32	35	1	2	3	10	10va	18
HPA	36	ol	ol	ol	ol	ol	ol	ol	ol	ol	ol	ol	ol	+	++	++	ol	ol	ol
3	36	scl	scl	scl	scl	scl	scl	cl	cl	cl	scl	scl	ol						
9	36	cl	cl	cl	cl	cl	cl	scl	cl	ol	cl	cl	ol						
11	36	scl	scl	ol	scl	scl	scl	cl	cl	cl	cl	scl	ol	+	+	+	ol	ol	ol
16	36	<cl	<cl	cl	<cl	cl	<cl	cl	cl	cl	cl	cl	ol	+	+	+	ol	ol	cl
20	36	scl	ol	ol	cl	cl	scl	ol	ol	ol	ol	scl	ol	±	+	+	ol	ol	ol
22	36	<cl	cl	cl	<cl	scl	<scl	cl	cl	cl	cl	scl	ol						
23	36	<cl	<cl	<cl	<cl	<cl	scl	cl	cl	<cl	<cl	<cl	<cl	+	++	++	ol	ol	<cl
A	36	cl	cl	cl	cl	cl	<cl	scl	<cl	<cl	cl	cl	<cl						
B	36	scl	cl	cl	scl	cl	scl	scl	cl	cl	cl	scl	ol	-	+	+	ol	ol	ol
C	36	scl	cl	cl	cl	cl	scl	cl	cl	cl<	cl	cl<	ol						
D	36	scl	scl	scl	scl	scl	scl	scl	ol	ol	scl	scl	ol	++	+++	++	scl	scl	scl
E	36	scl	scl	scl	scl	scl	cl	scl	cl	cl	cl	scl	cl	+++	+++	+++	ol	<ol	-
F	36	<cl	<cl	cl	cl	cl	scl	cl	<cl	ol	cl	<cl	ol						
I	36	+++	+++	+++	+++	cl	+++	+++	+++	++	cl	+++	cl	-	1	-	cl	cl	cl
J	36	cl	cl	cl	cl	cl	cl	cl	cl	ol	cl	cl	ol						
K	36	scl	scl	scl	ol	scl	scl	scl	scl	scl	scl	scl	ol	scl	scl	scl	ol	ol	scl
M	36	cl	cl	ol	cl	cl	cl	cl	cl	ol	cl	cl	ol						
P	36	<cl	cl	cl	cl	cl	<cl	cl	cl	cl	cl	<cl	cl	++	++	++	ol	ol	cl
R	36	ol	ol	scl	scl	ol	ol	scl	ol	ol	ol	scl	ol						
S	36	cl	cl	cl	cl	cl	cl	scl	cl	ol	cl	cl	ol	+	scl	++	ol	ol	scl
U	36	<cl	cl	cl	cl	cl	cl	<cl	cl	(cl)	cl	cl	(cl)						
W	36	scl	scl	scl	scl	scl	scl	scl	scl	scl	scl	scl	scl	±	+	+	ol	scl	scl
X	36	cl	cl	cl	cl	cl	cl	scl	cl	cl	cl	cl	cl						
Y	36	scl	cl	cl	cl	cl	cl	cl	cl	cl	cl	cl	ol	+++	+++	+++	ol	cl	ol

Strain M-15

		Phages at Routine Test Dilution (*S*.Typhimurium)																	
Lab code	**Phage type**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**
HPA	**8**	-	-	-	-	-	-	-	scl	scl	scl	-	-	-	-	scl	-	-	-
3	**8**	-	-	-	-	-	-	-	+++	scl	+++	-	-	-	-	+++	-	-	-
9	**8**	-	-	-	-	-	-	-	cl	scl	++	-	-	-	-	+++	-	-	-
11	**8**	-	-	-	-	-	-	-	++	++	++	-	-	-	-	+	-	-	-
16	**8**	-	-	-	-	-	-	-	scl	scl	<sol	-	-	-	-	cl·	-	-	-
20	**8**	-	-	-	-	-	-	-	scl	scl	+++	-	-	-	-	+++	-	-	-
22	**8**	-	-	-	-	-	-	-	scl	<scl	+	-	-	-	-	±	-	-	-
23	**8**	-	-	-	-	-	-	-	scl	scl	+++	-	-	-	-	+++	-	-	-
A	**8**	-	-	-	-	-	-	-	<cl	scl	++	-	-	-	-	+++	-	-	-
B	**8**	-	-	-	-	-	-	-	scl	scl	scl	-	-	-	-	scl	-	-	-
C	**8**	-	-	-	-	-	-	-	<cl	<cl	<cl	-	-	-	-	+	-	-	-
D	**8**	-	-	-	-	-	-	-	+++	+++	+	-	-	-	-	+++	-	-	-
E	**8**	-	-	-	-	-	-	-	scl	scl	scl-	-	-	-	-	scl	-	-	-
F	**8**	-	-	-	-	-	-	-	+++	<scl	++	-	-	-	-	+++	-	-	-
I	**8**	-	-	-	-	-	-	-	+++	+++	+++	-	-	-	-	2	-	-	-
J	**8**	-	-	-	-	-	-	-	cl	cl	<ol	-	-	-	-	scl	-	-	-
K	**8**	-	-	-	-	-	-	-	scl	scl	+++	-	±	-	-	+++	-	-	-
M	**8**	-	-	-	-	-	-	-	cl	cl	ol	-	-	-	-	scl	-	-	-
P	**8**	-	-	-	-	-	-	-	scl	scl	++	-	-	-	-	+++	-	-	-
R	**8**	-	-	-	-	-	-	-	+++	scl	++	-	-	-	-	+++	-	-	-
S	**8**	-	-	-	-	-	-	-	cl	scl	++	-	-	-	-	+++	-	-	-
U	**8**	-	-	-	-	-	-	-	scl	scl	+	-	-	-	-	scl	-	-	-
W	**8**	-	-	-	-	-	-	-	+++	+++	++	±	5	-	-	+++	-	-	-
X	**8**	-	-	-	-	-	-	-	+++	scl	++	-	-	-	-	scl	-	-	-
Y	**8**	-	-	-	-	-	-	-	<cl	cl	+++	-	-	-	-	+++	-	-	-

Strain M-15 (continue)

		Phages at Routine Test Dilution (*S.*Typhimurium)												Additional phages					
Lab code	Phage type	20	21	22	23	24	25	26	27	28	29	32	35	1	2	3	10	10va	18
HPA	8	scl	-	ol	scl	-	-	++	-	-	cl	scl	-	±	±	±	ol	ol	-
3	8	+++	-	scl	+	-	±	±	-	-	scl	scl	-						
9	8	scl	-	scl	scl	-	±	±	-	-	cl	cl	-						
11	8	scl	-	cl	scl	-	-	±	-	-	cl	+	-	+	+	+	ol	ol	-
16	8	scl	-	<ol	++<<	-	-	±	-	-	cl	<cl	-	++	++	++	<ol	<ol	-
20	8	scl	-	scl	scl	-	±	±	-	-	cl	scl	-	-	-	-	ol	ol	-
22	8	+	-	++	++	-	-	1	±	-	-	scl	±						
23	8	+++	-	<ol	scl	-	-	-	-	-	scl	++	-	±	+	±	<ol	<ol	-
A	8	scl	-	<scl	scl	-	-	-	-	-	<cl	scl	-						
B	8	scl	-	cl	scl	-	-	-	-	-	ol	scl	-	-	+	+	ol	ol	-
C	8	scl	-	<cl	<cl	-	1-5	scl	-	-	<cl	<cl	-						
D	8	+++	-	+++	+++	-	-	+++	-	-	scl	scl	-	+	+	+	scl	scl	-
E	8	scl	-	ol	scl	-	-	+	-	-	cl	scl	-	+++	+	+++	ol	<ol	-
F	8	++	±	<scl	scl	-	±	±	-	-	çl	+++	-						
I	8	+++	-	+++	+++	-	++	-	-	-	+++	++	-	-	-	-	cl	cl	-
J	8	<cl	-	<cl	cl	-	3	±	-	-	cl	<cl	-						
K	8	scl	-	scl	scl	-	-	+	-	-	cl	+++	-	-	-	-	ol	ol	-
M	8	cl	-	ol	cl	-	±	±	-	-	cl	scl	-						
P	8	<scl	5	<cl	cl	-	2	2	-	-	cl	scl	-	-	4	-	ol	ol	-
R	8	scl	2	+++	+++	-	-	-	-	-	ol	+++	-						
S	8	scl	-	scl	scl	-	±	±	-	-	cl	cl	-	-	++	-	ol	ol	-
U	8	scl	-	<cl	cl	-	±	±	-	-	cl	<cl	-						
W	8	+++	5	scl	+++	2	5	+	-	-	cl	+++	-	-	-	-	ol	scl	-
X	8	scl	-	scl	cl	-	-	-	-	-	cl	scl	-						
Y	8	+++	-	+++	+++	-	-	-	-	-	cl	scl	-	-	-	-	ol	-	ol

Strain M-16

		Phages at Routine Test Dilution (*S*.Typhimurium)																	
Lab code	**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**	-	-	-	-	-	-	-	-	-	-	scl	scl	-	-	-	-	±±	-
9	**104L**	-	-	-	-	-	-	-	-	-	-	++	++	-	-	-	-	+	-
11	**104**	-	-	-	-	-	-	-	-	-	-	scl	scl	-	-	-	-	+	-
16	**104L**	-	-	-	-	-	-	-	-	-	-	+<<	sol	-	-	-	-	++	-
20	**104**	-	-	-	-	-	-	-	-	-	-	+++	scl	-	-	-	-	+++	-
22	**104L**	-	-	-	-	-	-	-	-	-	-	±	scl	-	-	-	-	±	-
23	**104**	-	-	-	-	-	-	-	-	-	-	++	+++	-	-	-	-	+++	-
A	**104L**	-	-	-	-	-	-	-	-	-	-	<<	<<	-	-	-	-	+	-
B	**104**	-	-	-	-	-	-	-	-	-	-	scl	ol	-	-	-	-	++	-
C	**104**	-	-	-	-	-	-	-	-	-	-	scl	scl	-	-	-	-	scl	-
D	**104L**	-	-	-	-	-	-	-	-	-	-	++	+++	-	-	-	-	+++	-
E	**104**	-	-	-	-	-	-	-	-	-	-	scl	scl	-	-	-	-	++	-
F	**104L**	-	-	-	-	-	-	-	-	-	-	++	+++	-	-	-	-	+	-
I	**104**	-	-	-	-	-	-	-	-	-	-	+++	+++	-	-	-	-	+++	-
J	**104**	-	-	-	-	-	-	-	±	-	-	scl	<cl	-	-	-	-	<cl	
K	**104L**	-	-	-	-	-	-	-	-	-	-	scl	scl	-	-	-	-	++	-
M	**104**	-	-	-	-	-	-	-	-	-	-	cl	cl	-	-	-	-	cl	-
P	**104L**	-	-	-	-	-	-	-	-	-	-	<scl	scl	-	-	-	-	+++	-
R	**104**	-	-	-	-	-	-	-	-	-	-	scl	scl	-	-	-	-	+++	-
S	**104L**	-	-	-	-	-	-	-	-	-	-	++	+++	-	-	-	-	++	-
U	**120**	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	scl	±
W	**104**	-	-	-	-	-	-	-	-	-	-	scl	scl	-	-	-	-	++	-
X	**104**	-	-	-	-	-	-	-	-	-	-	cl	cl	-	-	-	-	+++	-
Y	**104**	-	-	-	-	-	-	-	-	-	-	cl	scl	-	-	-	-	+++	-

Strain M-16 (continue)

		Phages at Routine Test Dilution (*S.*Typhimurium)												Additional phages					
Lab code	**Phage type**	**20**	**21**	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**32**	**35**	**1**	**2**	**3**	**10**	**10va**	**18**
HPA	**104**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**ol**	**ol**	-
3	**104**	-	-	-	-	-	-	-	-	-	-	-	-						
9	**104L**	-	-	-	-	-	-	-	-	-	-	-	-						
11	**104**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**ol**	**ol**	-
16	**104L**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**ol**	**ol·**	-
20	**104**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**ol**	**ol**	-
22	**104L**	-	-	-	-	-	-	-	-	-	-	-	-						
23	**104**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**ol**	**ol**	-
A	**104L**	-	-	-	-	-	-	-	-	-	-	-	-						
B	**104**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**ol**	**ol**	-
C	**104**	-	-	-	-	-	-	-	-	-	-	-	-						
D	**104L**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**scl**	**scl**	-
E	**104**	-	-	-	-	-	-	-	-	-	±	-	-	-	-	-	**ol**	**<ol**	-
F	**104L**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**<ol**	**<ol**	-
I	**104**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**cl**	**cl**	-
J	**104**	-	-	-	-	-	-	-	-	-	-	-	±						
K	**104L**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**ol**	**ol**	-
M	**104**	-	-	-	-	-	-	-	-	-	-	-	-						
P	**104L**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**ol**	**ol**	-
R	**104**	-	-	-	-	-	-	-	-	-	-	-	-						
S	**104L**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**ol**	**ol**	-
U	**120**	-	-	-	-	-	-	-	-	-	-	-	-						
W	**104**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**ol**	**scl**	-
X	**104**	-	-	-	-	-	-	-	-	-	-	-	-						
Y	**104**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**ol**	**ol**	-

Strain M-17

		Phages at Routine Test Dilution (*S*.Typhimurium)																	
Lab code	**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**	-	-	-	ol	<ol	<ol	-	-	-	<cl	scl	cl	-	cl	cl	-	-	scl
9	**136**	-	-	-	ol	ol	ol	-	-	-	ol	<ol	ol	-	ol	ol	-	-	cl
11	**136**	-	-	-	scl	cl	cl	-	±	-	cl	cl	cl	-	cl	cl	-	-	scl
16	**136**	-	-	-	ol	cl	cl	-	-	-	cl	<cl	cl	-	cl	cl	-	-	<ol
20	**136**	-	-	-	ol	scl	cl	-	-	-	cl	cl	cl	-	cl	cl	-	-	cl
22	**136**	-	-	-	ol	cl	cl	-	-	-	cl	scl	cl	-	cl	cl	-	-	<scl
23	**136**	-	-	-	ol	<ol	cl	-	-	-	cl	<cl	<cl	-	cl	cl	-	-	<cl
A	**rdnc**	cl	scl	scl	<scl	<cl	<cl	<<	++	++	cl	scl	<cl	-	<cl	<cl	scl	<<	<cl
B	**136**	-	-	-	scl	cl	cl	-	-	-	cl	scl	cl	-	cl	cl	-	-	cl
C	**136**	-	-	-	ol	cl	cl<	-	-	-	cl	cl	cl	-	cl	cl	-	-	scl
D	**136**	-	-	-	scl	scl	scl	-	-	-	scl	scl	scl	-	ol	ol	-	-	scl
E	**136**	-	-	-	cl	cl	cl	-	-	-	cl	cl	cl	-	cl	cl	-	-	scl
F	**136**	-	-	-	ol	scl	<cl	-	-	-	cl	<cl	<cl	-	cl	cl	-	-	cl
I	**136**	-	-	-	+++	+++	+++	-	-	-	+++	+++	+++	-	+++	+++	-	-	+++
J	**136**	-	-	-	ol	cl	cl	-	-	-	cl	cl	cl	-	cl	cl	-	-	cl
K	**136**	-	-	-	scl	scl	scl	-	-	-	scl	scl	scl	-	scl	cl	-	-	scl
M	**136**	-	-	-	ol	cl	cl	-	-	-	cl	cl	cl	-	cl	cl	-	-	cl
P	**136**	-	-	-	cl	<cl	cl	-	-	-	cl	cl	cl	-	cl	cl	-	-	cl
R	**136**	-	-	-	scl	scl	<cl	-	-	-	ol	scl	scl	-	ol	ol	-	-	<cl
S	**136**	-	-	-	ol	ol	ol	-	-	-	ol	<ol	ol	-	ol	ol	-	-	cl
U	**136**	-	-	-	cl	cl	cl	-	-	-	cl	cl	cl	(<cl)	cl	cl	-	-	cl
W	**136**	-	-	-	scl	scl	cl	-	-	-	cl	cl	cl	-	cl	cl	-	-	scl
X	**136**	-	-	-	ol	ol	scl	-	-	-	ol	ol	ol	-	ol	ol	-	-	cl
Y	**136**	-	-	-	ol	ol	ol	-	-	-	cl	cl	cl	-	cl	cl	-	-	cl

Strain M-17 (continue)

		Phages at Routine Test Dilution (*S.*Typhimurium)												Additional phages					
Lab code	Phage type	20	21	22	23	24	25	26	27	28	29	32	35	1	2	3	10	10va	18
HPA	136	+	-	-	-	-	scl	-	-	-	-	-	-	-	-	-	ol	scl	-
3	136	±	-	-	-	-	scl	-	-	-	-	-	-						
9	136	+	-	-	-	-	<cl	-	-	-	-	-	-						
11	136	±	-	-	-	-	scl	-	-	-	-	-	-	-	-	-	ol	ol	-
16	136	+	-	-	-	-	<ol	-	-	-	-	-	-	±	3	±	ol	sol	-
20	136	+	-	-	-	-	scl	-	-	-	-	-	-	-	-	-	ol	ol	-
22	136	-3	-	-	-	-	<<scl	-	-	-	-	-	-						
23	136	+	-	-	-	-	scl	-	-	-	-	-	-	3	+	5	<ol	sol	-
A	rdnc	<<	++	-	-	-	scl	-	-	-	-	-	-						
B	136	-	-	-	-	-	scl	-	-	-	-	-	-	-	-	-	ol	ol	-
C	136	+	-	-	-	-	cl<	-	-	-	-	-	-						
D	136	++	-	-	-	-	scl	-	-	-	-	-	-	+	+	+	scl	scl	-
E	136	±	-	-	-	-	scl	-	-	-	-	-	-	-	-	-	ol	+	-
F	136	+	-	-	-	-	<scl	-	-	-	-	-	-						
I	136	+	-	-	-	-	+++	-	-	-	-	-	-	-	-	-	cl	cl	-
J	136	+<<	-	-	-	-	cl	-	-	-	-	-	-						
K	136	+++	-	-	-	scl	-	-	-	-	-	-	-	-	-	-	scl	scl	-
M	136	++	-	-	-	-	cl	-	-	-	-	-	-						
P	136	++	-	-	-	-	<cl	-	2	-	-	-	-	-	2	1	ol	ol	-
R	136	++	-	-	-	-	ol	-	-	-	-	-	-						
S	136	+	-	-	-	-	++	-	-	-	-	-	-	-	+	-	ol	ol	-
U	136	scl	-	-	-	-	cl	-	-	-	-	-	-						
W	136	±	-	-	-	-	scl	-	-	-	-	-	-	-	-	-	ol	+++	-
X	136	-	-	-	-	-	cl	-	-	-	-	-	-						
Y	136	++	-	-	-	-	cl	1	-	-	-	-	-	-	-	-	ol	ol	-

Strain M-18

		Phages at Routine Test Dilution (*S*.Typhimurium)																	
Lab code	**Phage type**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**
HPA	**U302**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3	**U302**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
9	**U302**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11	**U302**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
16	**U302**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
20	**U302**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
22	**U302**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
23	**U302**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
A	**U302**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
B	**U302**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C	**U302**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
D	**U302**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
E	**U302**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F	**U302**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
I	**U302**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
J	**U302**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
K	**U302**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
M	**U302**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
P	**U302**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
R	**U302**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
S	**U302**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
U	**untyp**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W	**U302**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
X	**U302**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Y	**U302**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Strain M-18 (continue)

		Phages at Routine Test Dilution (*S.*Typhimurium)												Additional phages					
Lab code	**Phage type**	**20**	**21**	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**32**	**35**	**1**	**2**	**3**	**10**	**10va**	**18**
HPA	**U302**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ol	ol	-
3	**U302**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ol	<ol	-
9	**U302**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ol	ol	-
11	**U302**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	±	+	-
16	**U302**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ol	ol·	-
20	**U302**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ol	ol	-
22	**U302**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ol	ol	-
23	**U302**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ol	ol	-
A	**U302**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ol	ol	-
B	**U302**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ol	ol	-
C	**U302**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ol		-
D	**U302**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	scl	scl	-
E	**U302**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ol	<ol	-
F	**U302**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<ol	<ol	-
I	**U302**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	cl	cl	-
J	**U302**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ol	ol	-
K	**U302**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ol	ol	-
M	**U302**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ol	ol	-
P	**U302**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ol	ol	-
R	**U302**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	scl	scl	-
S	**U302**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ol	ol	-
U	**untyp**	-	-	-	-	-	-	-	-	-	-	-	-						
W	**U302**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ol	scl	-
X	**U302**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ol	ol	-
Y	**U302**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ol	ol	-

Strain M-19

		Phages at Routine Test Dilution (*S*.Typhimurium)																	
Lab code	**Phage type**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**
HPA	**U310**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3	**U310**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
9	**U310**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11	**U310**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
16	**U310**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
20	**U310**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
22	**U310**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
23	**U310**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
A	**U310**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
B	**U310**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C	**untyp**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
D	**U310**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
E	**U310**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F	**U310**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
I	**U310**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
J	**U310**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
K	**110B**	-	-	-	-	-	-	-	-	-	-	-	+++	-	-	-	-	-	-
M	**U310**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
P	**U310**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
R	**U310**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
S	**U310**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
U	**untyp**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W	**U310**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
X	**U310**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Y	**U310**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Strain M-19 (continue)

		Phages at Routine Test Dilution (*S.*Typhimurium)												Additional phages					
Lab code	Phage type	20	21	22	23	24	25	26	27	28	29	32	35	1	2	3	10	10va	18
HPA	U310	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	±	ol	-
3	U310	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	<ol	-
9	U310	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	±	ol	-
11	U310	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	scl	-
16	U310	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	±	ol	-
20	U310	-	-	-	-	-	-	-	-	-	-	-	-	4	1	1	-	ol	-
22	U310	-	-	-	-	-	-	-	-	-	-	-	-	3	1	4	±	ol	-
23	U310	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	±	ol	-
A	U310	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ol	-
B	U310	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	ol	-
C	untyp	-	-	-	-	-	-	-	-	-	-	-	-	1-5	1-5	1-5	+		-
D	U310	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	scl	-
E	U310	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-
F	U310	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	<ol	-
I	U310	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	cl	-
J	U310	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	ol	-
K	110B	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ol	ol	-
M	U310	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	±	ol	-
P	U310	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	++	cl	-
R	U310	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	ol	-
S	U310	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ol	-
U	untyp	-	-	-	-	-	-	-	-	-	-	-	-						
W	U310	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+++	scl	-
X	U310	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ol	-
Y	U310	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	ol	-

Strain M-20

		Phages at Routine Test Dilution (*S*.Typhimurium)																	
Lab code	**Phage type**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**
HPA	**40**	**cl**	**ol**	**cl**	**ol**	**cl**	**scl**	**cl**	**-**	**ol**	**cl**	**-**	**cl**	**cl**	**cl**	**cl**	**cl**	**scl**	**cl**
3	**40**	**scl**	**<<scl**	**ascl**	**scl**	**scl**	**scl**	**scl**	**-**	**scl**	**scl**	**-**	**scl**	**+++**	**cl**	**cl**	**cl**	**+++**	**+++**
9	**40**	**scl**	**<cl**	**<cl**	**cl**	**cl**	**cl**	**cl**	**-**	**<scl**	**cl**	**-**	**cl**	**cl**	**cl**	**cl**	**cl**	**cl**	**cl**
11	**40**	**cl**	**scl**	**cl**	**ol**	**cl**	**ol**	**cl**	**-**	**scl**	**cl**	**-**	**cl**	**cl**	**cl**	**cl**	**cl**	**cl**	**scl**
16	**40**	**cl**	**±**	**<ol**	**<ol**	**<cl**	**scl**	**<cl**	**-**	**<cl**	**cl·**	**-**	**cl**	**cl**	**cl**	**cl**	**3**	**<cl**	**sol**
20	**40**	**cl**	**ol**	**cl**	**ol**	**scl**	**cl**	**cl**	**2**	**cl**	**scl**	**1**	**cl**	**cl**	**cl**	**cl**	**scl**	**cl**	**scl**
22	**40**	**scl**	**cl**	**<cl**	**ol**	**scl**	**<cl**	**cl**	**2**	**cl**	**cl**	**-**	**cl**	**cl**	**cl**	**cl**	**scl**	**scl**	**<scl**
23	**40**	**cl**	**cl**	**cl**	**ol**	**<cl**	**<ol**	**cl**	**3**	**cl**	**cl**	**-**	**cl**	**cl**	**cl**	**cl**	**cl**	**<cl**	**cl**
A	**40**	**cl**	**<cl**	**cl**	**<cl**	**<cl**	**<cl**	**cl**	**-**	**cl**	**<cl**	**-**	**cl**	**cl**	**cl**	**cl**	**cl**	**<cl**	**cl**
B	**40**	**scl**	**scl**	**cl**	**ol**	**cl**	**scl**	**cl**	**-**	**cl**	**cl**	**-**	**cl**	**cl**	**cl**	**cl**	**cl**	**cl**	**cl**
C	**40**	**cl**	**scl**	**<cl**	**<cl**	**<cl**	**+++**	**scl**	**1-5**	**cl**	**cl**	**-**	**cl**	**<cl**	**<cl**	**<cl**	**<cl**	**<cl**	**scl**
D	**40**	**+**	**scl**	**scl**	**scl**	**scl**	**+++**	**scl**	**-**	**scl**	**scl**	**-**	**cl**	**ol**	**cl**	**cl**	**scl**	**scl**	**scl**
E	**1**	**scl**	**+**	**scl**	**scl**	**cl**	**+**	**scl**	**+**	**scl**	**ol**	**-**	**cl**	**cl**	**cl**	**cl**	**+**	**scl**	**scl**
F	**40**	**scl**	**<cl**	**<cl**	**<ol**	**<scl**	**<cl**	**<cl**	**-**	**<cl**	**<cl**	**-**	**<cl**	**cl**	**cl**	**cl**	**<cl**	**<cl**	**<cl**
I	**104**	**cl**	**+++**	**+++**	**+++**	**+++**	**+++**	**cl**	**-**	**+++**	**+++**	**-**	**+++**	**+++**	**+++**	**+++**	**cl**	**+++**	**+++**
J	**40**	**cl**	**cl**	**cl**	**cl**	**cl**	**cl**	**cl**	**±**	**cl**	**cl**	**-**	**cl**	**cl**	**cl**	**cl**	**cl**	**<cl**	**cl**
K	**40**	**scl**	**scl**	**scl**	**ol**	**scl**	**scl**	**scl**	**-**	**scl**	**scl**	**-**	**scl**	**scl**	**scl**	**scl**	**scl**	**scl**	**scl**
M	**40**	**cl**	**ol**	**cl**	**ol**	**cl**	**scl**	**cl**	**±**	**cl**	**cl**	**-**	**cl**	**cl**	**cl**	**cl**	**cl**	**cl**	**cl**
P	**40**	**cl**	**<cl**	**cl**	**ol**	**<cl**	**cl**	**cl**	**±**	**cl**	**cl**	**1**	**cl**	**cl**	**cl**	**cl**	**cl**	**cl**	**cl**
R	**40**	**scl**	**++**	**<cl**	**++**	**scl**	**scl**	**<cl**	**-**	**<cl**	**<cl**	**-**	**<cl**	**<cl**	**<cl**	**<cl**	**<cl**	**scl**	**<cl**
S	**40**	**scl**	**<cl**	**<cl**	**cl**	**cl**	**cl**	**cl**	**-**	**<scl**	**cl**	**-**	**cl**	**cl**	**cl**	**cl**	**cl**	**cl**	**cl**
U	**40**	**<cl**	**cl**	**cl**	**cl**	**cl**	**cl**	**cl**	**-**	**<cl**	**cl**	**-**	**cl**	**cl**	**cl**	**cl**	**cl**	**cl**	**cl**
W	**40**	**++**	**scl**	**+++**	**scl**	**scl**	**+++**	**cl**	**8**	**cl**	**cl**	**-**	**cl**	**scl**	**cl**	**cl**	**scl**	**scl**	**scl**
X	**40**	**cl**	**scl**	**scl**	**cl**	**cl**	**cl**	**cl**	**-**	**cl**	**cl**	**-**	**cl**	**cl**	**cl**	**cl**	**cl**	**+++**	**cl**
Y	**40**	**cl**	**cl**	**cl**	**scl**	**cl**	**ol**	**cl**	**-**	**cl**	**cl**	**-**	**cl**	**cl**	**cl**	**cl**	**+++**	**cl**	**<cl**

Strain M-20 (continue)

		Phages at Routine Test Dilution (*S.*Typhimurium)												Additional phages					
Lab code	Phage type	20	21	22	23	24	25	26	27	28	29	32	35	1	2	3	10	10va	18
HPA	40	cl	ol	ol	cl	cl	scl	cl	cl	-	cl	cl	ol	-	±	±	ol	ol	ol
3	40	+++	+++	+++	scl	scl	scl	scl	scl	±	cl	scl	ol						
9	40	cl	cl	cl	cl	cl	cl	cl	cl	-	cl	cl	cl						
11	40	scl	scl	ol	scl	scl	scl	cl	cl	-	cl	scl	ol	+	+	+	ol	ol	ol
16	40	<cl	<ol	cl·	<cl	ol	<ol	<ol	ol	1	cl	cl	cl	±	±	±	ol	ol·	cl
20	40	scl	ol	ol	cl	cl	scl	cl	cl	5	cl	scl	ol	2	1	1	ol	ol	ol
22	40	scl	cl	<ol	<cl	<cl	<<scl	cl	cl	-	cl	scl	ol						
23	40	çl	ol	cl	cl	cl	<cl	cl	cl	-	cl	<cl	ol	+	++	+	ol	ol	cl
A	40	<cl	cl	<cl	<cl	cl	scl	<cl	<cl	-	cl	<cl	<cl						
B	40	scl	cl	cl	scl	cl	scl	scl	cl	-	cl	scl	ol	+	++	+	ol	ol	ol
C	40	scl	ol	<cl	cl	cl	scl	cl	cl	-	cl	<cl	ol						
D	40	scl	scl	scl	scl	ol	scl	ol	ol	+	scl	scl	ol	+	+	+	scl	ol	scl
E	1	scl	cl	cl	cl	scl	scl	scl	cl	±	cl	scl	cl	+	++	++	ol	<ol	cl
F	40	scl	cl	cl	<cl	cl	scl	<cl	<cl	±	cl	scl	ol						
I	104	+++	+++	+++	+++	cl	++	+++	+++	1	cl	++	+++	-	-	-	cl	cl	+++
J	40	cl	cl	cl	cl	cl	cl	cl	cl	3	cl	cl	ol						
K	40	scl	scl	scl	scl	scl	scl	scl	scl	-	scl	scl	ol	-	-	-	ol	ol	ol
M	40	cl	ol	ol	cl	cl	cl	cl	cl	-	cl	cl	ol						
P	40	cl	ol	ol	cl	cl	<cl	cl	cl	8	cl	scl	cl	±	±	-	ol	ol	cl
R	40	<cl	ol	scl	<cl	<cl	<cl	scl	ol	-	<cl	scl	ol						
S	40	cl	cl	cl	cl	cl	cl	cl	cl	-	cl	cl	cl	-	+	-	ol	ol	ol
U	40	cl	cl	cl	cl	cl	cl	<cl	cl	(cl)	cl	<cl	(cl)						
W	40	scl	cl	scl	scl	cl	scl	scl	ol	-	ol	scl	scl	-	±	±	ol	scl	scl
X	40	cl	cl	cl	cl	cl	cl	cl	cl	-	cl	cl	cl						
Y	40	+++	scl	scl	cl	scl	scl	+++	cl	-	cl	cl	ol	+	++	++	ol	ol	cl