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Twelfth CRL-*Salmonella* interlaboratory comparison study (2007) on typing of *Salmonella* spp.

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Abstract

Twelfth CRL-*Salmonella* interlaboratory comparison study (2007) on typing of *Salmonella* spp.

Good results were achieved by the National Reference Laboratories of the 25 European member states during the quality control on *Salmonella* typing in 2007. Six laboratories were found to require a follow-up.

The laboratories have been under obligation to participate in this quality test (the inter-laboratory comparison study for typing of *Salmonella*) since 1992. Each member state has appointed one laboratory, the National Reference Laboratory (NRL), which detects and types *Salmonella* from samples isolated from animals and/or food products. The performance of these laboratories is tested yearly using twenty *Salmonella* strains to which they have to assign the correct name.

EnterNet laboratories (ENLs) also participate in these studies; these laboratories examine mainly samples isolated from humans. The NRLs proved to be able to correctly name 95 percent of the strains, while the ENLs correctly named 91 percent of the strains.

Some NRLs and ENLs are also tested the phage typing of *Salmonella* on the basis of ten strains of each *Salmonella* types: *Salmonella* Enteritidis and *Salmonella* Typhimurium. The NRLs typed 98 per cent of the *S.* Enteritidis strains correctly and the ENLs 89 percent. The typing of *S.* Typhimurium strains proved to be more troublesome, with the NRLs typing 91 percent of the strains correctly and the ENLs 89 percent.

The Community Reference Laboratory for *Salmonella* (CRL-*Salmonella)* at the RIVM in the Netherlands organises this interlaboratory comparison study in cooperation with the Health Protection Agency (HPA) in London (UK).

Key words:
CRL-*Salmonella*, *Salmonella* spp., serotyping, phage typing

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Rapport in het kort

Twaalfde CRL-*Salmonella* ringonderzoek (2007) voor de typering van *Salmonella* spp.

De Nationale Referentie Laboratoria van de 25 Europese lidstaten scoorden dit jaar goed bij de kwaliteitscontrole op *Salmonella*. Sinds 1992 zijn deze laboratoria verplicht deel te nemen aan deze kwaliteitstoets, het zogeheten ringonderzoek voor de typering van *Salmonella*. Zes laboratoria hadden een herkansing nodig.

Elke lidstaat wijst één laboratorium aan, het Nationale Referentie Laboratorium (NRL), dat *Salmonella* afkomstig uit monsters van levensmiddelen of dieren aantoont en typeert. Jaarlijks wordt gecontroleerd of de laboratoria hun werk goed uitvoeren. De laboratoria krijgen hiertoe twintig stammen *Salmonella* opgestuurd waarvan zij de juiste naam moeten achterhalen.

Naast de NRL's doen de zogeheten Enter-Net laboratoria (ENL's) mee aan de ringonderzoeken. Zij analyseren vooral monsters afkomstig van mensen. De NRL's wisten 95 procent van de stammen de juiste naam te geven. De ENL's konden dit van 91 procent van de stammen.

Enkele NRL's en ENL's zijn bovendien op hun expertise getoetst om een subtypering van soorten *Salmonella* te maken. Ze kregen tien stammen voorgelegd van twee soorten, te weten *Salmonella* Enteritidis en *Salmonella* Typhimurium. De NRL's hebben 98 procent van de *S.* Enteritidis-stammen goed getypeerd, de ENL's 89 procent. Iets lastiger was de typering van de *S.* Typhimurium-stammen. De NRLs konden 91 procent van de stammen goed typeren; de ENL's 89 procent.

De organisatie van het ringonderzoek is in handen van het Communautair Referentie Laboratorium (CRL) voor *Salmonella* (CRL-*Salmonella*). De CRL-*Salmonella* is ondergebracht bij het RIVM. De organisatie van dit ringonderzoek wordt ondersteund door de Health Protection Agency (HPA) in Londen.

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

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Summary

In 2007 the twelfth 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, 29 EnterNet laboratories participated, 3 of them are also NRLs. All 26 NRLs and 25 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, following the Kauffman-White scheme. 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 seems to diminish. 98 % of the NRLs and 97 % of the ENLs were able to correctly type the O-antigens. The H-antigens were typed correctly by 96 % of the NRLs and by 92 % of the ENLs. 95 % of the NRLs and 91 % of the ENLs indicated correct serovar names for the 20 serotyping strains. At the CRL-*Salmonella* workshop in 2007 (Bilthoven) the CRL-*Salmonella* proposed a definition for good performance of the NRLs regarding the serotyping. Using this definition 19 NRLs achieved this level of good performance. The 6 NRLs which did not achieve the level of good performance received 10 extra strains for serotyping. All 6 NRLs achieved the level of good performance in this follow-up.
Eight of the participating NRLs-*Salmonella* and sixteen 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 eight NRLs phage typed 98 % of the *Salmonella* Enteritidis strains correctly and 91 % of the *Salmonella* Typhimurium strains. The ENLs correctly phage typed 89% of the *Salmonella* Enteritidis strains and 89% of the *Salmonella* Typhimurium strains.

List of abbreviations

BGA	Brilliant Green Agar
CRL-*Salmonella*	Community Reference Laboratory for *Salmonella*
ENL	EnterNet Laboratory
HPA	Health Protection Agency
LEP	Laboratory of Enteric Pathogens
NRLs-*Salmonella*	National Reference Laboratories for *Salmonella*
Nt	Not typable
RDNC	Reacts with phages but does not confirm to a recognized pattern
RIVM	National Institute for Public Health and the Environment
SE	*Salmonella* Enteritidis
STM	*Salmonella* Typhimurium
UK	United Kingdom
XLD	Xylose Lysine Desoxycholate

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1 Introduction

This report describes the twelfth 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*) of the European Union. 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.

26 NRLs-*Salmonella* and 30 EnterNet Laboratories (ENLs) participated in this twelfth study, 3 of these ENLs are also NRLs and their results are shown with the other NRL results. The main objectives of this study were to check the performance of the NRLs for typing of *Salmonella* spp. and to compare the results of typing of *Salmonella* spp. among the NRLs-*Salmonella* and among the ENLs. All NRLs and 25 ENLs performed serotyping of the strains. NRLs which did not achieve the level of good performance defined by the CRL-*Salmonella* have to participate in a follow-up study. This follow-up consist of serotyping of 10 extra strains.
Eight of the NRLs-*Salmonella* and 16 ENLs performed phage typing on 10 *Salmonella* Enteritidis and 10 *Salmonella* Typhimurium strains. The selection of the strains and interpretation of the results of the phage typing were performed in close cooperation with the Health Protection Agency, London, UK.

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	18x spp. *enterica* 1x spp. *salamae* 1x spp. *houtenae*			Voogt et al., 1996 (RIVM report 284500004)
II		1996/ 1997	20x spp. *enterica*			Voogt et al., 1997 (RIVM report 284500008)
III		1998	20x spp. *enterica*	4 x SE 5x STM		Voogt et al., 1998 (RIVM report 284500010)
IV	I	1999	16x spp. *enterica*	10x SE 10x STM		Raes et al., 2000 (RIVM report 284500013)
V	II	2000	18x spp. *enterica* 1x spp. *salamae* 1x spp. *houtenae*	10x SE 10x STM	YES	Raes et al., 2001 (RIVM report 284500016)
VI	III	2001	19x spp. *enterica* 1x spp. *arizonae*	10x SE 10x STM	YES	Korver et al., 2002 (RIVM report 284500020)
VII	IV	2002	20x spp. *enterica*	10x SE 10x STM		Korver et al., 2002 (RIVM report 284500022)
VIII	V	2003	20x spp. *enterica*	10x SE 10x STM	YES	Korver et al., 2003 (RIVM report 330300002)
IX	VI	2004	20x spp. *enterica*	10x SE 10x STM	YES	Korver et al., 2005 (RIVM report 330300006)
X	VII	2005	20x spp. *enterica*	10x SE 10x STM	YES	Korver et al. 2006 (RIVM report 330300009
XI	VII	2006	20x spp. *enterica*	10x SE 10x STM		Berk et al. 2006 (RIVM report 330604001)
XII	VIII	2007	20x spp. *enterica*	10x SE 10x STM		This report

2 Participants

Country	Institute/City		NRL or 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	National Food Institute, Department of Microbiology and Risk Assessment Copenhagen	NRL	
Denmark	Statens Serum Institut Department of Gastrointestinal Infections Copenhagen		ENL
Estonia	Estonian Veterinary and Food Laboratory Diagnostic Department, Bacteriology Laboratory Tartu	NRL	
Estonia	Health Protection Inspectorate Central Laboratory of Microbiology Tallinn		ENL
Finland	Finnish Food Safety Authority EVIRA Animal Disease and Food Safety Research Kuopio	NRL	
Finland	National Public Health Institute (KTL) Laboratory of Enteric Pathogens, Helsinki		ENL

Country	Institute/City	NRL or ENL	
France	Agence Française de Sécurité Sanitaire des Aliments (AFSSA), Laboratoire d'Etudes et de Recherches Avicoles et Porcines (LERAP), Ploufragan	NRL	
France	Unité Biodiversité des Bacteries Institut 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	Central Agricultural Office, Food and Feed Directorate, 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	National Diagnostic Centre (NDC) Riga	NRL	
Lithuania	National Veterinary Laboratory Vilnius	NRL	

Country	Institute/City	NRL or ENL	
Luxembourg	Laboratoire de Médecine Vétérinaire de l'Etat Animal Zoonosis Luxembourg	NRL	
Luxembourg	Laboratoire National de Santé, Division de Microbiologie 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)	Agri-Food and Biosciences Institute (AFBI) Veterinary Sciences Division, Bact. Department Belfast	NRL	
Norway	National Institute of Public Health Oslo	NRL	ENL
Poland	National Veterinary Institute Microbiological Department Pulawy	NRL	
Portugal	Laboratório Nacional de Veterinária Lisbon	NRL	
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
Slovenia	National Veterinary Institute Veterinary Faculty Ljubljana	NRL	
Slovenia	Institute of Public Health of the republic of Slovenia Ljubljana		ENL

Country	Institute/City	NRL or 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
United Kingdom	Veterinary Laboratories Agency Department of Bacterial Diseases Addlestone	NRL	

3 Materials and methods

3.1 *Salmonella* strains for serotyping

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

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

No.	Serovar	O-antigens	H-antigens
S1	*S.* Bredeney	1, 4, 12, 27	l, v : 1, 7
S2	*S.* Thompson	6, 7, 14	k : 1, 5
S3	*S.* Manchester	6, 8	l, v : 1, 7
S4	*S.* Infantis	6, 7, 14	r : 1, 5
S5	*S.* Anatum	3, 10, [15][15, 34]	e, h : 1, 6
S6	*S.* Hadar	6, 8	z_{10} : e, n, x
S7	*S.* Newport	6, 8, 20	e, h : 1, 2 : [z_{67}]
S8	*S.* Paratyphi B var. Java	1, 4, [5], 12	b : 1, 2
S9	*S.* Indiana	1, 4, 12	z : 1, 7
S10	*S.* Typhimurium	1, 4, [5], 12	i : 1, 2
S11	*S.* Virchow	6, 7, 14	r : 1, 2
S12	*S.* Yoruba	16	c : l, w
S13	*S.* Albany	8, 20	z_4, z_{24} : -
S14	*S.* Cannstatt	1, 3, 19	m, t : -
S15	*S.* Weltevreden	3, 10, [15]	r : z_6
S16	*S.* Bareilly	6, 7, 14	y : 1, 5
S17	*S.* Enteritidis	1, 9, 12	[f], g, m, [p] : [1, 7]
S18	*S.* Bracknell	13, 23	b : 1, 6
S19	*S.* Berta	1, 9, 12	[f], g, [t] : -
S20	*S.* Brandenburg	4, [5], 12	l, v : e, n, z_{15}

3.2 *Salmonella* strains for phage typing

The *Salmonella* strains for phage typing were obtained from the collection of the Salmonella Reference Unit of the Laboratory of Enteric Pathogens (LEP),Health Protection Agency (HPA), 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 5 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															
Phage type		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
E1	14b	-	-	-	-	-	SCL	-	-	±	-	-	-	-	-	-	-
E2	21	OL	SCL	-	SCL	-	SCL	-	OL	OL	OL	-	-	-	CL	-	+
E3	13	-	-	-	SCL	-	SCL	-	-	OL	-	-	-	-	-	-	-
E4	6	-	SCL	-	SCL	-	SCL	-	OL	OL	OL	-	-	-	-	-	-
E5	9b	-	-	CL	-	CL	-	-	-	-	-	-	CL	-	CL	-	-
E6	21c	OL	SCL	-	SCL	-	SCL	-	OL	OL	OL	-	-	-	CL	SCL	CL
E7	13a	-	-	-	SCL	-	SCL	-	OL	OL	OL	-	-	-	-	-	-
E8	8	-	-	SCL	SCL	CL	SCL	CL	OL	OL	OL	SCL	CL	-	-	-	-
E9	1b	OL	SCL	CL	SCL	CL	SCL	CL	OL	OL	OL	CL	CL	CL	CL	SCL	CL
E10	4	-	SCL	CL	SCL	CL	SCL	CL	OL	OL	OL	CL	CL	CL	-	-	-

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

		Phages reactions at Routine Test Dilution																	
Phage type		1	2	3	4	5	6	7	8	10	11	12	13	14	15	16	17	18	19
M11	U310	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
M12	41	CL	CL	CL	OL	CL	SCL	CL	-	CL	CL	-	-	CL	CL	CL	CL	CL	CL
M13	2	-	CL	CL	OL	CL	CL	-	-	CL	CL	CL	CL	CL	CL	CL	CL	-	CL
M14	36	OL	OL	OL	OL	OL	OL	OL	CL	OL	OL	OL	OL	OL	OL	OL	OL	CL	OL
M15	193	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
M16	208	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
M17	4	-	-	-	OL	CL	SCL	-	-	CL	CL	++	++	-	CL	CL	-	-	CL
M18	104	-	-	-	-	-	-	-	-	-	-	++	SCL	-	-	-	-	++	-
M19	9	-	-	-	-	-	-	-	CL	CL	CL	CL	CL	-	-	SCL	-	-	-
M20	110	-	-	-	-	-	-	-	-	-	-	-	CL	-	-	-	-	CL	-

		Phages at Routine Test Dilution												Additional phages					
Phage type		20	21	22	23	24	25	26	27	28	29	32	35	1	2	3	10	10 var	18
M11	U310	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	±	OL	-
M12	41	CL	OL	OL	CL	CL	SCL	CL	CL	-	CL	CL	OL	+	+	+	OL	OL	OL
M13	2	CL	CL	OL	CL	CL	SCL	CL	CL	-	CL	CL	OL	+	+	+	OL	OL	OL
M14	36	OL	OL	OL	OL	OL	SCL	OL	OL	OL	OL	OL	OL	+	++	+	OL	OL	OL
M15	193	-	-	-	-	-	-	-	-	-	-	-	-	+++	+++	+++	+	-	-
M16	208	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+++	+++	OL
M17	4	CL	±	OL	CL	-	++	++	CL	-	CL	CL	OL	++	++	++	OL	OL	±
M18	104	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	OL	OL	-
M19	9	CL	±	OL	CL	-	±	++	-	-	CL	CL	-	+	+	+	OL	OL	-
M20	110	-	-	-	-	-	-	-	±	-	-	-	-	+	+	+	OL	OL	-

3.3 Laboratory codes

The NRLs were assigned a laboratory code 1-26 by CRL-*Salmonella*, which differed from the previous typing studies. The alphabetical laboratory codes (A to Z and AA) for the ENLs were given by HPA, London, UK.

3.4 Protocol and test report

Four weeks before the start of the study both NRLs and ENLs received the protocol and a testreport via the e-mail. The protocol and testreport can be found in Annex 1 and Annex 2.

3.5 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 10, 2007. The parcels containing strains for phage typing for the NRLs were sent by HPA, London, UK in week 10, 2007. The ENLs received all their strains from HPA, after an additional subculture step of the strains for serotyping. HPA sent the parcels to the ENLs in week 12, 2007.

3.6 Guidelines for evaluation of serotyping results

The evaluation of the various serotyping results as mentioned in this report is 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**

At the CRL-*Salmonella* workshop in Bilthoven in May 2007, the CRL-*Salmonella* has made a proposal for the level of 'Good performance' which the NRLs need to achieve during an interlaboratory comparison stuy on serotyping. Penalty points are given for strains that are typed incorrectly. A distinction is made between the five most important *Salmonella* serotypes (as indicated in EU legislation) and all other strains:

- **4 penalty points:** Incorrect typing of *S.* Enteritidis, *S.* Typhimurium, *S.* Hadar, *S.* Infantis or *S.* Virchow **or** assigning the name of one of these 5 serotypes to another strain.
- **1 penalty point:** Incorrect typing of all other *Salmonella* serotypes.

For each NRL-*Salmonella* the total amount of penalty points is determined. The NRLs will reach the level of 'Good Performance' if they have less than 4 penalty points. A follow-up will occur for NRLs with 4 penalty points or more. The results of the ENLs will be discussed by the HPA, ENLs with pour performance will not participate in this follow-up.

3.7 Follow-up for serotyping

The follow-up for serotyping consisted of typing an extra set of 10 *Salmonella* strains. The strains for the follow-up are shown in Table 6. All NRLs with 4 penalty points or more had to participate in this follow-up. For this follow up an extended testreport was sent to the participants. In this testreport the NRLs had to indicate for each antisera-strain combination if agglutination was found or not (Annex 3).

Table 6 Antigenic formulas of the 10 *Salmonella* strains used in the follow up according to the Kauffmann-White scheme determined by the CRL-*Salmonella*

No.	Serovar	O-antigens	H-antigens
S1	*S.* Mbandaka	6, 7, 14	z_{10} : e, n, z_{15}
S2	*S.* Typhimurium	1, 4, [5], 12	i : 1, 2
S3	*S.* Infantis	6, 7, 14	r : 1, 5
S4	*S.* Enteritidis	1, 9, 12	[f], g, m, [p] : [1, 7]
S5	*S.* Colindale	6, 7	r : 1, 7
S6	*S.* Blockley	6, 8	k : 1, 5
S7	*S.* Virchow	6, 7, 14	r : 1, 2
S8	*S.* Paratyphi B var. Java	1, 4, [5], 12	b : 1, 2
S9	*S.* Hadar	6, 8	z_{10} : e, n, x
S10	*S.* Istanbul	8	z_{10} : e, n, x

4 Questionnaire

A questionnaire was incorporated in the test report of the interlaboratory comparison study (see Annex 2). 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)?
All NRLs received their package in the same week as it was sent (week 10 of 2006). The average transport time for the NRLs was 1.5 days. The shipment of the parcels to the EnterNet Laboratories was organised by HPA, London, UK. The parcels for the follow up of the serotyping were sent in week 26, 2007. One NRL received their package in week 27, 2007, all other NRLs participating in this follow up received their package in week 26, 2007.

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)?
All NRLs received their parcels in week 10. 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 or BGA.

4.2 Questions regarding serotyping

Question 6: What was the frequency of serotyping at your laboratory in 2006?
Question 7: How many strains did your laboratory serotype in 2006?

Table 7 Frequency and number of strains serotyped in 2006

Laboratory code NRLs	Typing frequency	Number of strains serotyped in 2006	Laboratory code ENL	Typing frequency	Number of strains serotyped in 2006
1	Daily	612	**A**	Daily	4186
2	Once a week	52	**B**	Once a week	103
3	Daily	2545	**C**	Daily	30003
4	Daily	1600	**D**	Thrice a week	114
5	Twice a week	2200	**E**	Daily	2638
6	Once a week	770	**F**	Monthly	50
7	Thrice a week	172	**I**	Daily	1080
8	Daily	885	**J**	Daily	552
9	Daily	6225	**K**	Daily	2600
10	Once a week	5000	**L**	Thrice a week	1558
11	Daily	1109	**M**	Daily	738
12	Daily	2513	**N**	Thrice a week	1000
13	Twice a week	205	**O**	Daily	940
14	Daily	597	**P**	Weekly	213
15	Daily	336	**Q**	Daily	430
16	Daily	8080	**S**	Weekly	172
17	Daily	5300	**T**	Daily	1129
18	Daily	10392	**U**	Daily	1194
19	Daily	1200	**V**	Daily	6311
20	Daily	997	**W**	Daily	7388
21	Twice a week	220	**X**	Daily	6851
22	Daily	5128	**Y**	Monthly	200
23	Daily	4800	**Z**	Daily	6593
24	Daily	600	**AA**	Daily	2584
25	Daily	3000			
26	Twice a week	130			

Question 8: How many of these typings considered a rough strain?

Four NRLs (laboratory codes 2, 10, 20 and 26) did not report the amount of rough strains. Zero rough strains were reported by six NRLs (laboratory codes 1, 6, 11, 13, 15, and 24). Five NRLs (laboratory codes 3, 7, 14, 21, 25) reported between 1 – 10 rough strains, eight NRLs (laboratory codes 4, 5, 9, 16, 17, 18, 19 and 22) reported 10 – 100 rough strains and two NRLs (laboratory codes 8 and 23) reported > 100 rough strains. In percentages 0 – 6 % of all strains serotyped were rough strains in 2006.
Two ENLs (laboratory codes A and U) dit not report the amount of rough strains. Eight ENLs (laboratory codes B, D, F, I, J, Q, S and T) reported zero rough strains. Eight ENLs (laboratory codes C, K, L, M, N, P, Y and AA) reported between 1 – 10 rough strains, four ENLs (laboratory codes E, O, W and Z) reported 10 – 100 rough strains and two ENLs (laboratory codes V and X) reported >100 rough strains. In percentages 0 – 3 % of all strains serotyped in 2006 were reported as rough.

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

Table 8 Number of laboratories using sera from one or more manufacturers and/or in-house prepared sera

Number of manufacturers where sera are obtained	Number of NRLs (n=26)	Number of ENLs (n=24)
From 1 manufacturer	6	8
From 2 manufacturers	9	5
From 3 manufacturers	8	3
From 4 manufacturers	1	4
From 5 manufacturers or more	2	0
Preparation in own laboratory	3	4

Table 9 Number of laboratories using sera from different manufacturers

Name manufacturer	Number of NRLs (n=26)	Number of ENLs (n=24)
Biorad	9	8
Biomed	1	0
Biotrading	0	1
Dade Behring	3	1
Denka Seiken	2	3
Difco	3	0
Eurobio	0	1
Immunolab	1	0
Imuna	0	1
INCDI'Cantacuzino'	0	1
Institute Immunology Zagreb	1	1
Murex – Abbott	0	1
Mast Group Ltd	1	0
Prolab	5	2
Reagensia AB	3	2
Remel	2	2
Sifin	11	7
SMI	0	1
Statens Serum Institute	20	12
Own laboratory	3	4

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

One NRL-*Salmonella* (laboratory code 1) sent two 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?

Eight NRLs and sixteen ENLs performed phage typing of *S*. Typhimurium and *S*. Enteritidis strains. For routine purposes four NRLs and 10 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 2006?

Table 10 Number of phage typings in 2006

Laboratory codes	Number of strains phage typed in 2006
3	1083
9	280
10	1000
12	380
16	6350
18	2359
22	2124
23	2800
A	1147
E	1558
F	600
G	2543
H	406
I	328
K	1400
L	646
M	363
O	519
U	8000
V	3533
W	5304
Y	4000
Z	88
AA	1422

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. 18 Laboratories (laboratory codes 1, 6, 8, 9, 10, 12, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24 and 26) typed all O-antigens accurately. 14 laboratories (laboratory codes 1, 6, 9, 10, 12, 14, 15, 16, 17, 18, 19, 22, 23 and 24) typed all H-antigens correctly and the same 14 laboratories identified all serovar names correctly.

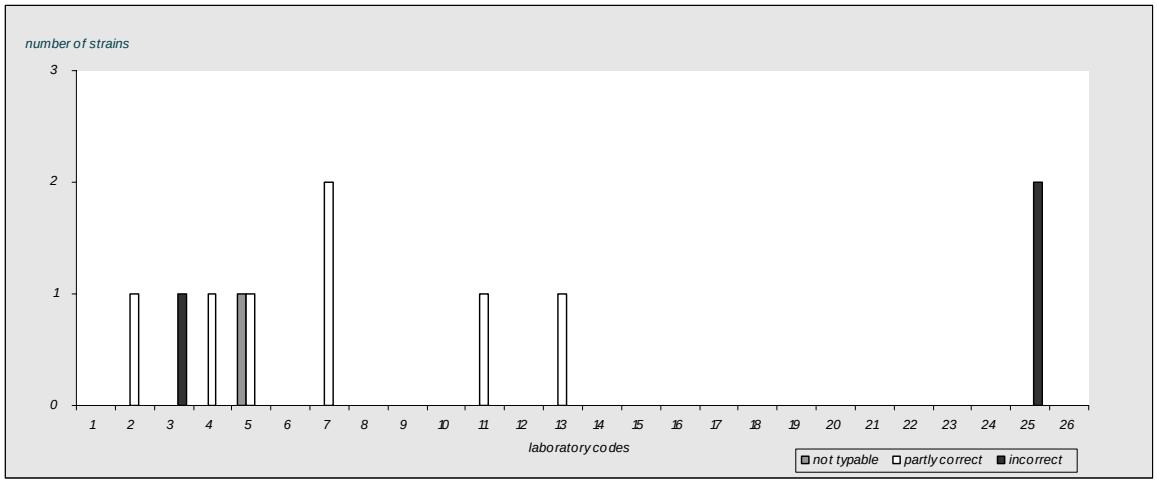


Figure 1 Evaluation of serotyping of O-antigens per NRL

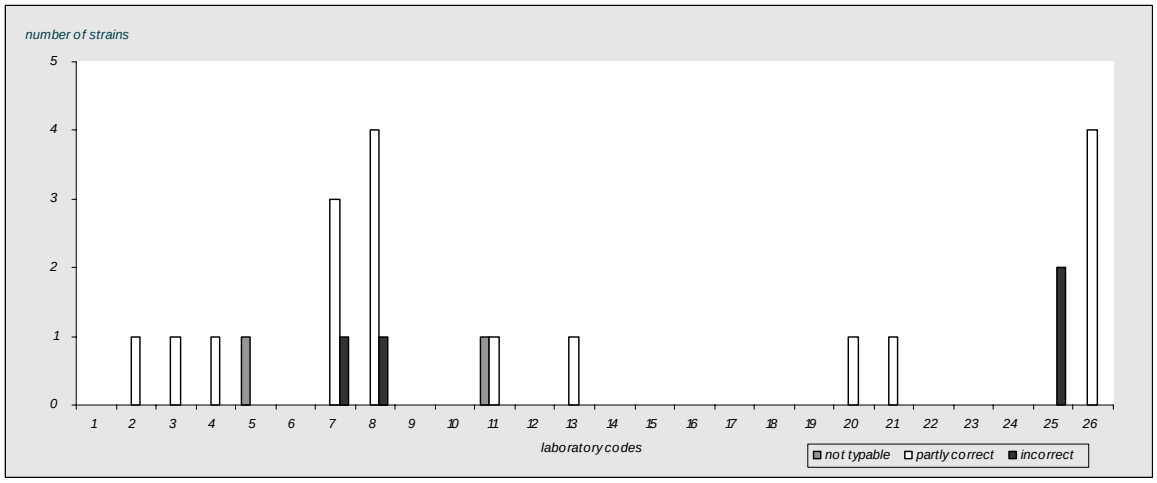


Figure 2 Evaluation of serotyping of H-antigens per NRL

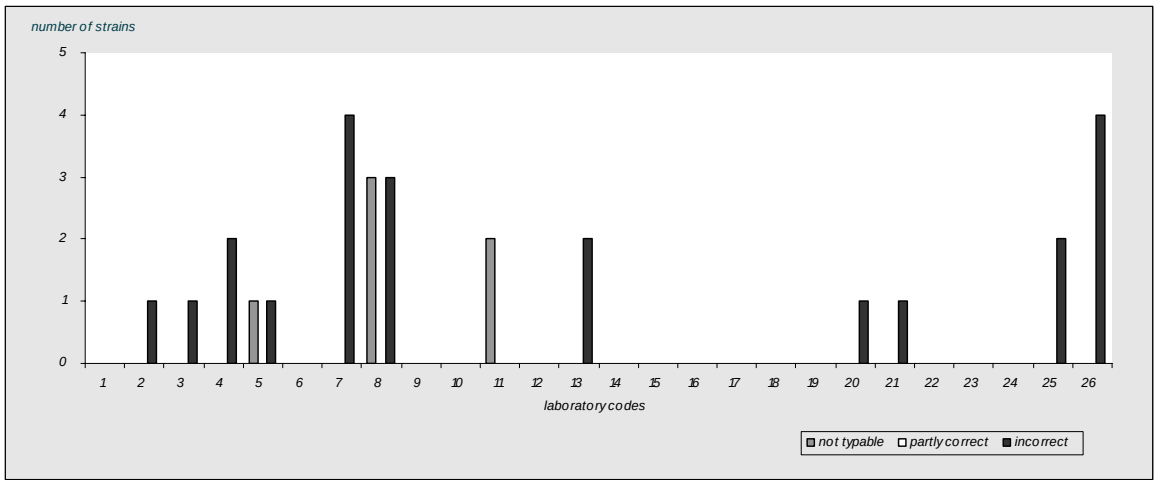


Figure 3 Evaluation of the correct serovar names per NRL

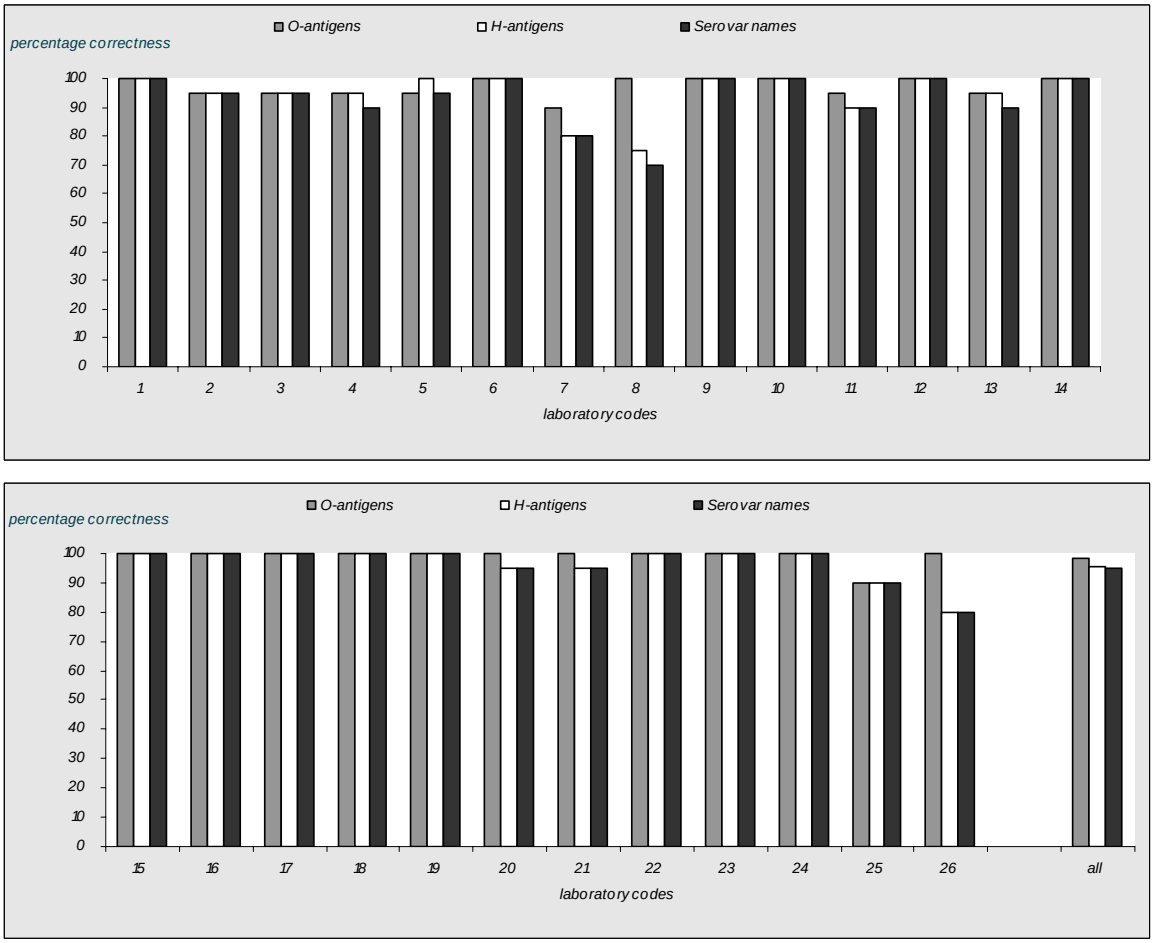


Figure 4 Achievements of the serotyping in percentages that were correct by the NRLs

98 % of all NRLs were able to type the O-antigens correctly. The H-antigens were typed correctly by 96 % and the serovar names by 95 % of the NRLs. The laboratory with labcode 25 probably switched the vials from strains 6 (*S.* Hadar) and 9 (*S.* Indiana). It is unlikely that there have been a mistake in serotyping since both O- and H-antigens are completely different for these two strains (6, 8 : z_{10} : e, n, x and 1, 4, 12 : z : 1, 7). Laboratory 5 could not type strain 8, since it was autoagglutinable. Also laboratory 11 could not type strain 8, since it was a rough strain. Laboratory 11 could also not type strain 2 because mistakes were made in both O- and H-antigens, therefore no serovar name could be assigned. Laboratory 8 could not assign a serovar name to both strains 2 and 3 because they could not determine the second phase of the H-antigens. This laboratory also indicated strain 9 as not typable, however both O- and H-antigens were typed correctly and a serovar name could have been given.

For each NRL the amount of penalty points were determined using the guidelines in section 3.5. Table 11 shows the amount of penalty points for each NRL, in the second column it is reported whether the level of good performance was achieved.

Table 11 Evaluation of serotyping results per NRL

Labcode	Penalty points	Good performance?	Labcode	Penalty points	Good performance?
1	0	Yes	14	0	Yes
2	4	No	15	0	Yes
3	1	Yes	16	0	Yes
4	2	Yes	17	0	Yes
5	1	Yes	18	0	Yes
6	0	Yes	19	0	Yes
7	4	No	20	1	Yes
8	6	No	21	1	Yes
9	0	Yes	22	0	Yes
10	0	Yes	23	0	Yes
11	2	Yes	24	0	Yes
12	0	Yes	25	8	No
13	5	No	26	4	No

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 12. The O-antigens of 13 strains were typed correctly by all participants. The H-antigens were typed correctly for 10 strains by all participating laboratories. A total correct identification by all participants was obtained for eight strains being:
S. Bredeney (strain 1), *S.* Infantis (strain 4), *S.* Anatum (strain 5), *S.* Typhimurium (strain 10), *S.* Virchow (strains 11), *S.* Albany (strain 13), *S.* Bracknell (strain 18) and *S.* Berta (strain 19).

Table 12 Evaluation of the typing of strains by the NLRs

Strains		O-antigens				H-antigens				Serovar names			
		+	nt	+/-	-	+	nt	+/-	-	+	nt	+/-	-
S1	*S.* Bredeney	26	0	0	0	26	0	0	0	26	0	0	0
S2	*S.* Thompson	24	0	2	0	23	0	3	0	20	2	0	4
S3	*S.* Manchester	26	0	0	0	24	0	2	0	23	1	0	2
S4	*S.* Infantis	26	0	0	0	26	0	0	0	26	0	0	0
S5	*S.* Anatum	26	0	0	0	26	0	0	0	26	0	0	0
S6	*S.* Hadar	24	0	1	1	25	0	0	1	24	0	0	2
S7	*S.* Newport	25	0	1	0	26	0	0	0	25	0	0	1
S8	*S.* Paratyphi B var. Java	26	0	0	0	21	1	2	2	21	1	0	4
S9	*S.* Indiana	25	0	0	1	25	0	0	1	24	1	0	1
S10	*S.* Typhimurium	26	0	0	0	26	0	0	0	26	0	0	0
S11	*S.* Virchow	26	0	0	0	26	0	0	0	26	0	0	0
S12	*S.* Yoruba	25	0	0	1	24	0	2	0	24	0	0	2
S13	*S.* Albany	26	0	0	0	26	0	0	0	26	0	0	0
S14	*S.* Cannstatt	26	0	0	0	24	0	2	0	24	0	0	2
S15	*S.* Weltevreden	26	0	0	0	25	0	1	0	25	0	0	1
S16	*S.* Bareilly	26	0	0	0	25	0	1	0	25	0	0	1
S17	*S.* Enteritidis	25	0	1	0	26	0	0	0	25	0	0	1
S18	*S.* Bracknell	26	0	0	0	26	0	0	0	26	0	0	0
S19	*S.* Berta	26	0	0	0	26	0	0	0	26	0	0	0
S20	*S.* Brandenburg	26	0	0	0	25	0	1	0	25	0	0	1

+ = 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.* Thompson (strain 2) and *S.* Paratyphi B var. Java (strain 8). But also some NRLs had problems typing *S.* Manchester (strain 3). The characterisations of strains that caused problems in serotyping by the NRLs are shown in Table 13. The empty cells in the table indicate that strains were typed correctly by the laboratories mentioned.
Results found per serotype and per laboratory are given in Annex 4

Table 13 Identifications per strain that caused most problems in serotyping by NRLs

Laboratory code	Strain 2	Strain 3	Strain 8
	S. Thompson **6, 7, 14 : k : 1, 5**	**S. Manchester** **6, 8 : l, v : 1, 7**	**S. Paratyphi B var. Java** **1, 4, [5], 12 : b : 1, 2**
4	S. Harburg 6, 14, 25 : k : 1, 5		
5			Autoagglutinating
7	S. Bareilly 6, 7 : y : 1, 5	S. Chincol 6, 8 : g, m, t : 1, 7	S. Gloucester i : l, w
8	not typable 6, 7 : 1, 5	not typable 8 : l, v	S. Hato II 4 : g, m, t : z39
11	not typable 6, 7, 14, 25 : i : 1, 5		not typable 4, 12 : -
13			S. Stanley 1, 4, [5], 12, 27 : d : 1, 2
20	S. Isangi 6, 7 : d : 1, 5		
26	S. Isangi 6, 7 : d : 1, 5	S. Edmonton 6, 8 : l, v : e, n, z15	S. Abony 4, 5, 2 : b : e, n, x

5.1.3 Follow-up

Six NRLs did not achieve the level of good performance (Table 11) and were therefore included in the follow up. These NRLs (labcodes 2, 7, 8, 13, 25 and 26) received 10 extra strains in week 26, 2007. The evaluation of the detection of O- and H-antigens and identification of the strains per laboratory are shown in Figure 5. All but one laboratories typed all 10 strains correctly. One laboratory typed the second phase of the H-antigens of 2 strains incorrectly and therefore assigned the wrong serovar name to these 2 strains.

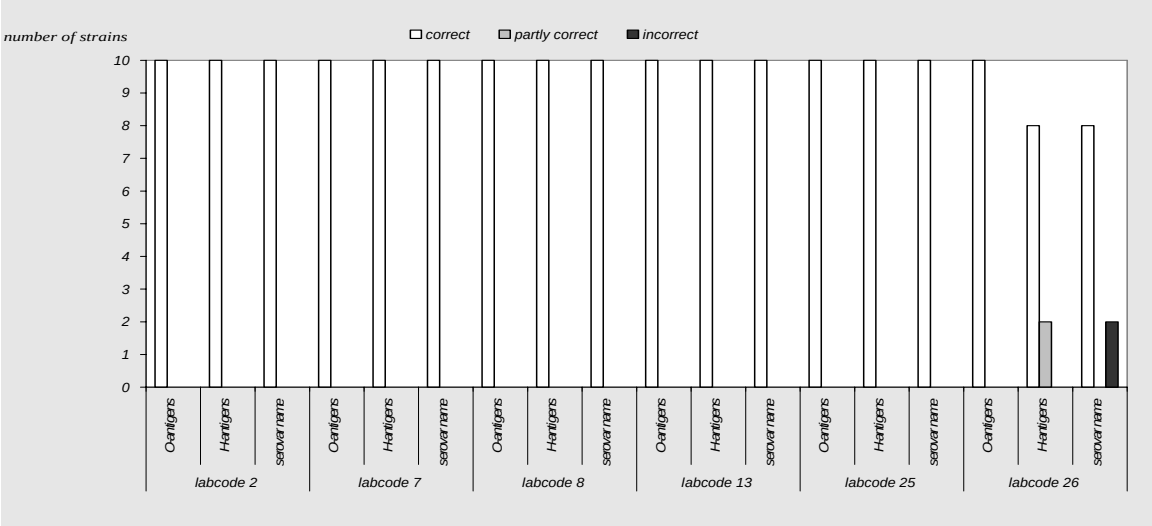


Figure 5 Evaluation of serotyping of O- and H-antigens and of the serovar names per NRL

Results found per serotype and per laboratory ar given in Table 14. For each NRL again the amount of penalty points were determined using the guidelines in section 3.5. Table 15 shows the amount of penalty points for each NRL, in the second column it is reported whether the level of good performance is achieved.

Table 14 Test results of serotyping per strains per NRL

	S1	S2	S3	S4	S5
CRL	**Mbandaka**	**Typhimurium**	**Infantis**	**Enteritidis**	**Colindale**
2	Mbandaka	Typhimurium	Infantis	Enteritidis	Colindale
7	Mbandaka	Typhimurium	Infantis	Enteritidis	Colindale
8	Mbandaka	Typhimurium	Infantis	Enteritidis	Colindale
13	Mbandaka	Typhimurium	Infantis	Enteritidis	Colindale
25	Mbandaka	Typhimurium	Infantis	Enteritidis	Colindale
26	Inganda	Typhimurium	Infantis	Enteritidis	Colindale

	S6	S7	S8	S9	S10
CRL	**Blockley**	**Virchow**	**Paratyphi B var. Java**	**Hadar**	**Istanbul**
2	Blockley	Virchow	Paratyphi B var. Java	Hadar	Istanbul
7	Blockley	Virchow	Paratyphi B var. Java	Hadar	Istanbul
8	Blockley	Virchow	Paratyphi B var. Java	Hadar	Istanbul
13	Blockley	Virchow	Paratyphi B var. Java	Hadar	Istanbul
25	Blockley	Virchow	Paratyphi B var. Java	Hadar	Istanbul
26	Blockley	Virchow	Paratyphi B var. Java	Hadar	Paris

Table 15 Evaluation of serotyping results per NRL for the follow up

Labcode	Penalty points	Good performance?
2	0	Yes
7	0	Yes
8	0	Yes
13	0	Yes
25	0	Yes
26	2	Yes

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 6, 7 and 8 and the percentages which were correct in Figure 9.
Thirteen laboratories (laboratory codes B, C, D, E, L, O, Q, S, T, U, W, X and Y) typed all O-antigens accurately. 11 Laboratories (laboratory codes E, L, O, P, Q, T, U, W, X, Z and AA) typed all H-antigens correctly and 8 laboratories (laboratory codes E, L, O, Q, Tu, U, W, X and Y) identified all serovar names correctly.

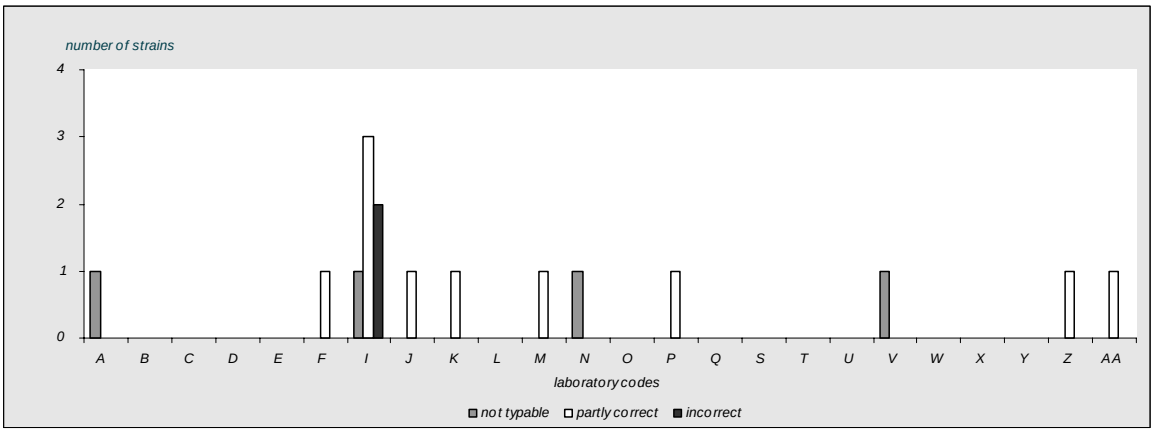


Figure 6 Evaluation of serotyping of O-antigens per ENL

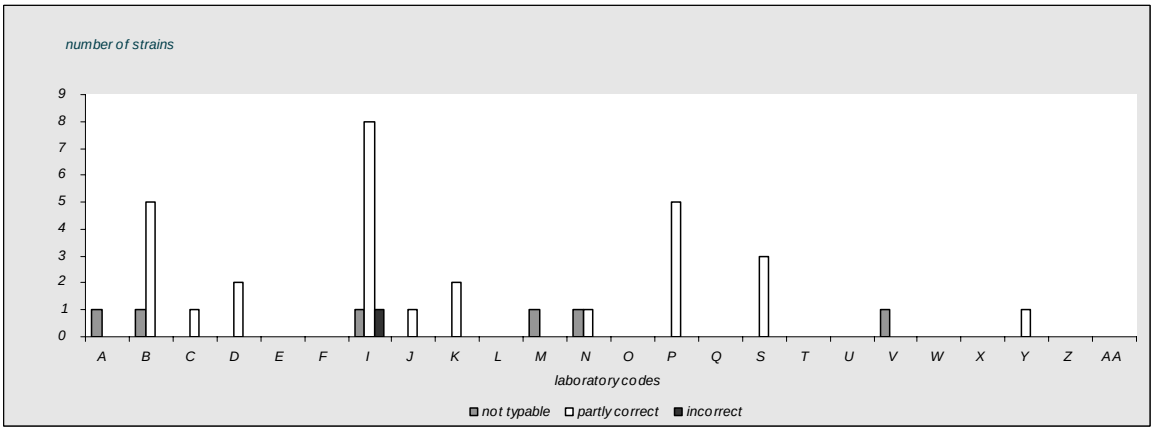


Figure 7 Evaluation of serotyping of H-antigens per ENL

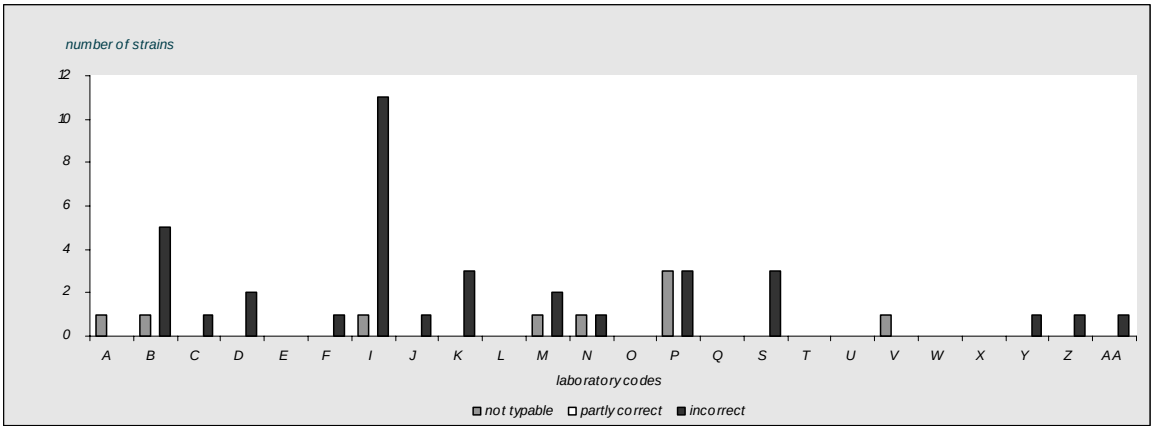
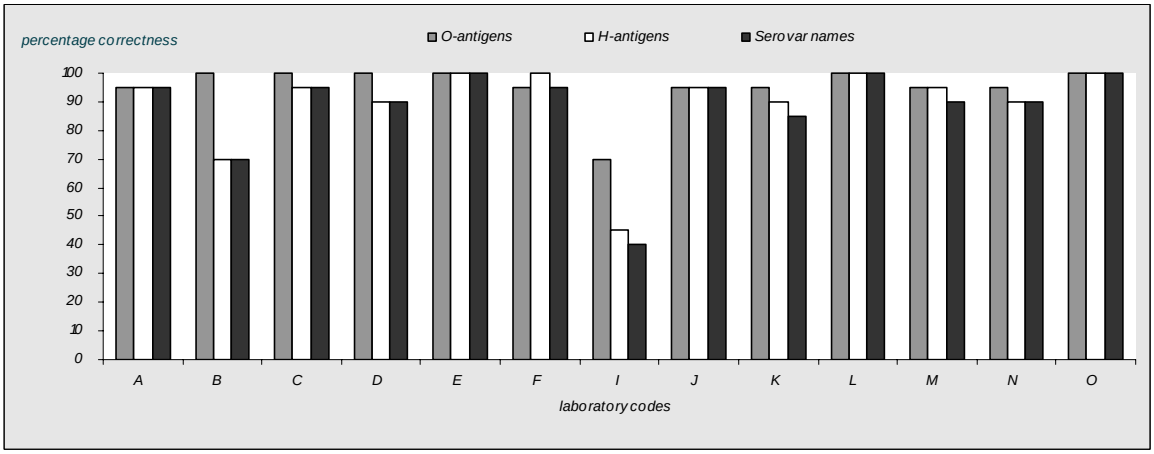


Figure 8 Evaluation of the correct serovar names per ENL



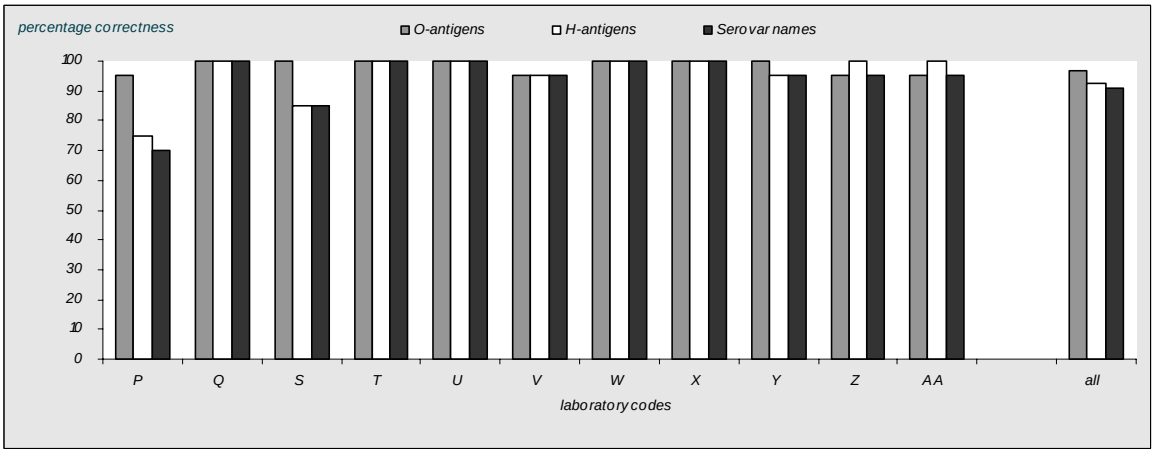


Figure 8 Achievements of the serotyping in percentages that were correct by the ENLs

97 % of the ENLs were able to correctly type the O-antigens. The H-antigens were typed correctly by 92 % and the serovar names by 91 % of the ENLs.

Four laboratories (labcode A, M, N and V) could not type strain 8, since it was autoagglutinable or rough. Laboratory B could not type strain 2 because they could not completely type the H-antigens. Laboratory I could not type strain 12, since they did not have the necessary antigens. Laboratory P indicated 3 strains as not typable (strain 9, 11 and 12), for all these strains the second phase of the

H-antigens was not determined.

For each ENL the amount of penalty points were determined using the guidelines in section 3.5. Table 16 shows the amount of penalty points for each ENL, in the second column it is reported whether the level of good performance was achieved.

Table 16 Evaluation of serotyping results per ENL

Labcode	Penalty points	Good performance?	Labcode	Penalty points	Good performance?
A	0	Yes	O	0	Yes
B	9	No	P	9	No
C	4	No	Q	0	Yes
D	2	Yes	S	3	Yes
E	0	Yes	T	0	Yes
F	1	Yes	U	0	Yes
I	17	No	V	0	Yes
J	1	Yes	W	0	Yes
K	3	Yes	X	0	Yes
L	0	Yes	Y	1	Yes
M	2	Yes	Z	1	Yes
N	1	Yes	AA	1	Yes

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 17. The O-antigens of 11 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 two strains S. Enteritidis (strain 17) and S. Berta (strain 19).

Table 17 Evaluation of the typing of the strains by the ENLs

	Strains	O-antigens				H-antigens				Name serovar			
		+	nt	+/-	-	+	nt	+/-	-	+	nt	+/-	-
S1	*S.* Bredeney	23	0	1	0	23	0	1	0	23	0	0	1
S2	*S.* Thompson	22	0	2	0	19	0	5	0	17	1	0	6
S3	*S.* Manchester	23	0	0	1	24	0	0	0	23	0	0	1
S4	*S.* Infantis	24	0	0	0	22	0	2	0	22	1	0	1
S5	*S.* Anatum	24	0	0	0	21	0	3	0	21	0	0	3
S6	*S.* Hadar	23	0	1	0	23	0	1	0	22	0	0	2
S7	*S.* Newport	23	0	1	0	23	0	1	0	23	0	0	1
S8	*S.* Paratyphi B var. Java	20	3	1	0	16	3	6	0	14	4	0	6
S9	*S.* Indiana	24	0	0	0	23	0	1	0	23	1	0	0
S10	*S.* Typhimurium	24	0	0	0	23	0	0	1	23	0	0	1
S11	*S.* Virchow	24	0	0	0	23	0	1	0	23	1	0	0
S12	*S.* Yoruba	23	0	0	1	23	0	1	0	23	1	0	0
S13	*S.* Albany	24	0	0	0	23	0	1	0	23	0	0	1
S14	*S.* Cannstatt	23	0	0	1	22	0	2	0	21	0	0	3
S15	*S.* Weltevreden	24	0	0	0	22	0	2	0	22	0	0	2
S16	*S.* Bareilly	24	0	0	0	23	0	1	0	23	0	0	1
S17	*S.* Enteritidis	24	0	0	0	24	0	0	0	24	0	0	0
S18	*S.* Bracknell	20	0	4	0	23	0	1	0	20	0	0	4
S19	*S.* Berta	24	0	0	0	24	0	0	0	24	0	0	0
S20	*S.* Brandenburg	24	0	0	0	23	0	1	0	23	0	0	1

+ = correct; nt = not typable ; +/- = partly correct ; - = incorrect

The figures indicate the number of laboratories finding the relevant results (total number of labs = 24)

Like for the NRLs, most problems occurred with S. Thompson (strain 2) and S. Paratyphi B var. Java (strain 8). But also some ENLs had problems typing S. Bracknell (strain 18), S. Anatum (strain 5) and S. Canstatt (strain 14). The characterisations of strains that caused problems in serotyping by the ENLs are shown in Table 18. The empty cells in the table indicate that strains were typed correctly by the laboratories mentioned.

Table 18 Identifications per strains that caused most problems in serotyping by ENLs

Laboratory code	Strain 2	Strain 8
	S. Thompson **6, 7, 14 : k : 1, 5**	**S. Paratyphi B var. Java** **1, 4, [5], 12 : b : 1, 2**
A		autoagglutination
B	*S.* ?? 6, 7 : ? : 5	
D		*S.* Uppsala 4 : b : 1, 7
I	*S.* Norwich 6, 7 : e, h : 1, 6	*S.* Braenderup 6, 7, 14 : e, h : e, n, z15
J		*S.* Uppsala 1, 4, 12, 27 : b : 1, 7
K	*S.* Irumu 6, 7 : l, v : 1, 5	*S.* Coeln 4, 12 : : 1, 2
M	*S.* Harburg 6, 14 : k : 5	not typable 4, 12 : nt
N	*S.* Lomita 6, 7 : e, h : 1, 5	rough strain
P		*S.* Derby 1, 4, 12 : f, g : 1, 2
S	*S.* Poitiers 6, 7 : z : 1, 5	
V		*S.* spp I rough strain
Y		*S.* Kisangi 1, 4, 12 : a : 1, 2
AA	*S.* Harburg 6, 14 : k : 1, 5	

Table 18 (continued) Identification per strains that caused problems in serotyping by ENLs

Laboratory code	Strain 5	Strain 14	Strain 18
	S. Anatum **3, 10, [15][15, 34] : e, h : 1, 6**	**S. Canstatt** **1, 3, 19 : m, t : -**	**S. Bracknell** **13, 23 : b : 1, 6**
B	*S.* Newlands 3, 15 : e, h : e, n, x	*S.* Kouka 3, 19 : g, m, t	
F			*S.* Oudwijk 13, 22 : b : 1, 6
I	*S.* London 3, 10 [15] : l, v : 1, 6	*S.* Southbank 3, 10, [15][15, 34] : m, t -	*S.* Poona 1, 13, 22 : z : 1, 6
K			*S.* Oudwijk 13, 22 : b : 1, 6
P		*S.* Kouka 1, 3, 19 : g, m, t	*S.* Oudwijk 13, 22 : b : 1, 5
S	*S.* Velje (var. Goerlitz) 3, 10, 15 : 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 19 and 20. Eight laboratories performed phage typing for both *Salmonella* Enteritidis and *Salmonella* Typhimurium. Six laboratories (laboratory codes 9, 12, 16, 18, 22 and 23) assigned the correct phage type for all ten of the *S*. Enteritidis (SE) strains (PT 14b, 21, 13, 6, 9b, 21c, 13a, 8, 1b and 4) and two laboratories (laboratory codes 3 and 10) had only one incorrect result each. Five laboratories (laboratory codes 3, 12, 16, 18 and 22) correctly phage typed all ten strains of *S*. Typhimurium. The laboratories with laboratory codes 9 and 23 assigned correct phage types to nine of the strains but incorrectly identified strain M16 (PT208). The laboratory with labcode 10 assigned correct phage types to five of the strains. Separate notations per phage and per laboratory are given in Annex 5. The achievements in percentage correctness are presented in Figure 10.

Table 19 Results of *Salmonella* Enteritidis phage typing by the NRLs

		Phage type found per NRL							
Labcodes		**3**	**9**	**10**	**12**	**16**	**18**	**22**	**23**
Strain	**PT**								
E1	**14b**	14b	14b	14b	14b	14b	14b	14b	14b
E2	**21**	21	21	21	21	21	21	21	21
E3	**13**	13	13	13	13	13	13	13	13
E4	**6**	6	6	6	6	6	6	6	6
E5	**9b**	9b	9b	9b	9b	9b	9b	9b	9b
E6	**21c**	21c	21c	21c	21c	21c	21c	21c	21c
E7	**13a**	13a	13a	13a	13a	13a	13a	13a	13a
E8	**8**	34	8	28	8	8	8	8	8
E9	**1b**	1b	1b	1b	1b	1b	1b	1b	1b
E10	**4**	4	4	4	4	4	4	4	4

PT = Phage type; grey cells = deviating results

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

		Phage type found per NRL							
Labcodes		**3**	**9**	**10**	**12**	**16**	**18**	**22**	**23**
Strain	**PT**								
M11	**U310**	U310	U310	U302	U310	U310	U310	U310	U310
M12	**41**	41	41	41	41	41	41	41	41
M13	**2**	2	2	46	2	2	2	2	2
M14	**36**	36	36	36	36	36	36	36	36
M15	**193**	193	193	195	193	193	193	193	193
M16	**208**	208	U302	U302	208	208	208	208	U302
M17	**4**	4	4	4	4	4	4	4	4
M18	**104**	104	104	104b	104	104	104	104	104
M19	**9**	9	9	9	9	9	9	9	9
M20	**110**	110	110	110	110	110	110	110	110

PT = Phage Type, grey cells = deviating results

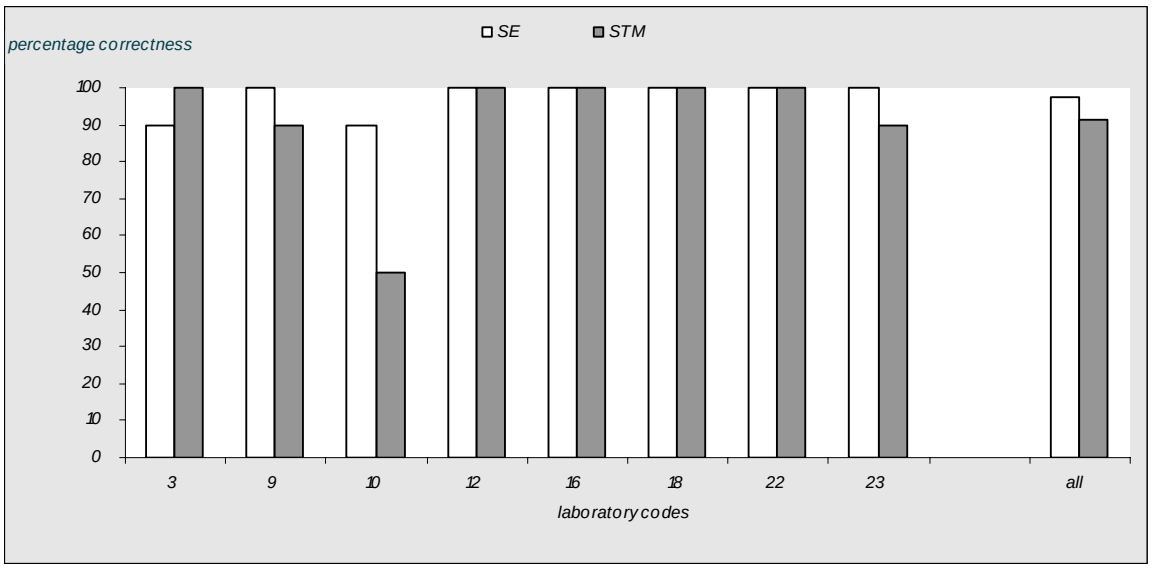


Figure 10 Achievements of the phage typing in percentages that were correct for the NRLs

Overall 98 % of the *Salmonella* Enteritidis strains were phage typed correctly and 91 % 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 21 and 22. Fifteen laboratories performed phage typing for both *S.* Enteritidis and *S.* Typhimurium, one laboratory (laboratory code Z) performed phage typing for *Salmonella* Enteritidis only. Six laboratories (laboratory codes F, G, I, K, L and V) assigned the correct phage type for all 10 *S.* Enteritidis (SE) strains. Eight laboratories (laboratory codes A, E, M, O, U, W, Y and AA) had only one incorrect result. One laboratories had four incorrect results (laboratory code H) and one laboratory (Laboratory code Z) had five incorrect results. Six Laboratories (laboratory codes G, K, L, M, V and W) correctly phage typed all 10 strains of *S.* Typhimurium (PTU310, 41, 2, 36, 193, 208, 4, 104, 9 and 110). The laboratories with laboratory codes F and I assigned correct phage types to nine of the strains. Seven laboratories had two incorrect results (laboratory codes A, E, H, O, U, Y and AA). Separate notations per phage and per laboratory are given in Annex 4. The achievements in percentage correctness are presented in Figure 11.
Overall 89 % of the *Salmonella* Enteritidis strains were phage typed correctly and 89 % of the *Salmonella* Typhimurium strains.

Table 21 Results of *Salmonella* Enteritidis phage typing by the ENLs

		Phage type found per ENL							
Labcodes		**A**	**E**	**F**	**G**	**H**	**I**	**K**	**L**
Strain	**PT**								
E1	**14b**	14b	14b	14b	14b	14b	14b	14b	14b
E2	**21**	3	21	21	21	21	21	21	21
E3	**13**	13	13	13	13	13	13	13	13
E4	**6**	6	6	6	6	6	6	6	6
E5	**9b**	9b	9b	9b	9b	RDNC	9b	9b	9b
E6	**21c**	21c	21c	21c	21c	21c	21c	21c	21c
E7	**13a**	13a	13a	13a	13a	22	13a	13a	13a
E8	**8**	8	28	8	8	28	8	8	8
E9	**1b**	1b	1b	1b	1b	5a	1b	1b	1b
E10	**4**	4	4	4	4	4	4	4	4

		Phage type found per ENL							
Labcodes		**M**	**O**	**U**	**V**	**W**	**Y**	**Z**	**AA**
Strain	**PT**								
E1	**14b**	14b	14b	14b	14b	14b	14b	14b	14b
E2	**21**	22	21	21	21	21	21	21c	22
E3	**13**	13	13	13	13	13	13	10	13
E4	**6**	6	6	6	6	6	6	6	6
E5	**9b**	9b	9b	9b	9b	9b	9b	9b	9b
E6	**21c**	21c	32	21c	21c	32	32	32	21c
E7	**13a**	13a	13a	28	13a	13a	13a	RDNC	13a
E8	**8**	8	8	8	8	8	8	2	8
E9	**1b**	1b	1b	1b	1b	1b	1b	1b	1b
E10	**4**	4	4	4	4	4	4	4	4

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

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

		Phage type found per ENL							
Labcodes		**A**	**E**	**F**	**G**	**H**	**I**	**K**	**L**
Strain	**PT**								
M11	**U310**	U310	U310	U310	U310	U310	U310	U310	U310
M12	**41**	RDNC	41	41	41	41	41	41	41
M13	**2**	2	2	2	2	2	2	2	2
M14	**36**	36	36	36	36	36	36	36	36
M15	**193**	193	194	193	193	193	193	193	193
M16	**208**	208	U302	U302	208	U302	U302	208	208
M17	**4**	141	4	4	4	52a	4	4	4
M18	**104**	104	104	104	104	104	104	104	104
M19	**9**	9	9	9	9	9	9	9	9
M20	**110**	110	110	110	110	110	110	110	110

		Phage type found per ENL						
Labcodes		**M**	**O**	**U**	**V**	**W**	**Y**	**AA**
Strain	**PT**							
M11	**U310**	U310	U302	U310	U310	U310	U310	U310
M12	**41**	41	41	41	41	41	41	41
M13	**2**	2	2	2	2	2	46	135
M14	**36**	36	36	36	36	36	36	36
M15	**193**	193	194	193	193	193	193	193
M16	**208**	208	208	U302	208	208	U302	U302
M17	**4**	4	4	135	4	4	4	4
M18	**104**	104	104	104	104	104	104	104
M19	**9**	9	9	9	9	9	9	9
M20	**110**	110	110	110	110	110	110	110

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

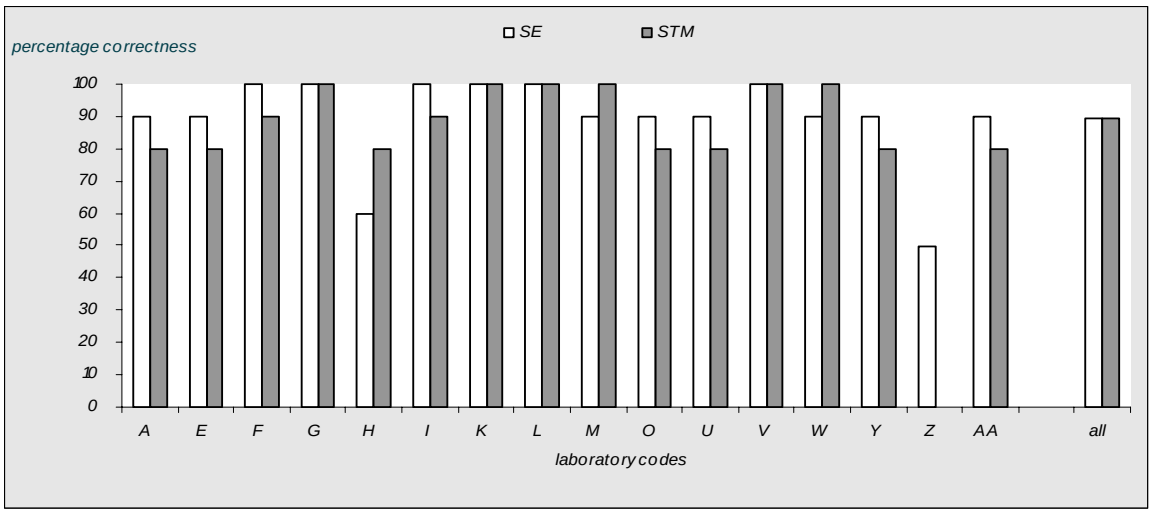


Figure 11 Achievements of the phage typing in percentages that were correct for the ENLs

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 97 % 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 96 % of the NRLs and by 92 % of the ENLs. Correct serovar names were assigned to the strains by 95 % of the NRLs and 91 % of the ENLs.

Two strains caused the major problems for both the NRLs and ENLs, being *Salmonella* Thompson and *Salmonella* Paratyphi B variation Java. 81 % of the NRLs and 65 % of the ENLs correctly typed *S.* Thompson. This was the first time that *S.* Thompson was used in a study organized by the CRL-*Salmonella* so no comparison could be made to other studies. All but one laboratory which did not type *S.* Thompson correct had problems with the H-antigens, specifically with H-k. The other strain causing problems is *S.* Paratyphi B variation Java. Seventy-seven percent of the NRLs and 54 % of the ENLs typed this strain correctly. *S.* Paratyphi B variation Java was previously used in the studies of 2002, 2004 and 2005. In 2002 two strains of *S.* Paratyphi B var. Java were used and they were typed correctly by 80 % of both NRLs and ENLs. In 2004 and 2005 all NRLs and ENLs typed *S.* Paratyphi B var. Java correctly. The lower performance this year is probably due to the fact that some laboratories have experienced problems with the culturing of this strain. Also some laboratories indicated that the strain was autoagglutinable.

The performance of the participating NRLs in this study was slighty better than the performances in the study of last year (2006). In the 2006 study, the NRLs typed 98 % of the O-antigens correctly (98 % in 2007), 94 % of the H-antigens (96 % in 2007) and 93 % assigned the correct serovar names (95 % in 2007). The ENLs, however scored slightly lower in this study compared to the typing study of 2006. In the study of 2006, the ENLs typed 98 % of the O-antigens correctly (97 % in 2007), 94 % of the H-antigens (92 % in 2007) and 93 % assigned the correct serovar names to the strains (91 % in 2007). 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. Most likely this is caused by the fact that some ENLs participated for the first or second time. Six NRLs and four ENLs did not achieve the level of good performance. The 6 NRLs received extra strains to improve their serotyping. Five of these 6 NRLs typed all of the 10 extra strains correctly. One NRL typed 8 of the 10 strains correctly, for both strains the mistake was made in the second phase of the H-antigens. All six NRLs achieved the level of good performance in this follow up.

Phage typing
Ten strains of *S.* Enteritidis and ten strains of *S.* Typhimurium were selected for this study by the *Salmonella* Reference Unit of the Health Protection Agency in London. Nine *S.* Enteritidis and six

S. Typhimurium strains were typed correctly by all eight NRLs. One NRL participated for the first time in the *S.* Typhimurium phage typing and designated five incorrect phage types to the different *S.* Typhimurium strains. This was probably due to misinterpretation of the phage patterns, due to their inexperience. Three *S.* Enteritidis and four *S.* Typhimurium strains were typed correctly by 16 and 15 ENLs, respectively.

As in the study of 2006 the *S.* Enteritidis strain causing most problems was PT 21. In this study only one ENL typed PT21 as PT21c, while six ENLs made this mistake in the study of 2006. Two ENLs typed this strain as PT22 and one ENL as PT3. The incorrect results for PT21 were probably due to incorrect dilution of some of the phages. The results of PT3 and PT22 were due to a too low phage reading, or none with some phages, suggesting the titre of the phage was low. The result of PT21c again was probably due to incorrect dilution of the phage but in this case the titre of two phages may have been too high.
Two other strains causing some problems were PT21c and PT8. Four of the 16 ENLs typed PT 21c as PT32, this may have been caused by the inoculum size of the culture when the phage typing was performed. *S.* Enteritidis requires a heavy inoculum. If the inoculum is too light, false positive reactions can be seen with some phages.
Three ENLs and two NRLs did not assign the correct phagetype to strain E-8 (PT8). One ENL typed this strain as PT2, while the other 2 ENLs and one NRL typed this strain as PT28. The other NRL typed this strain as PT34.These results could be due to the incorrect dilution of some of the phages. The result of PT2 was due to two phages that should have been negative showing a phage reaction. The titre of these phages could have been too high. One laboratory had a result of PT28 caused by low readings with three of the phages. This may have been due to incorrect dilution of the phages. Another result of PT28 was caused by misinterpretation of correct phage readings.

The *S.* Typhimurium strain causing most problems was PT208. Three NRLs and 7 ENLs typed this strain as U302. PT208 gives a reading with additional phage 18, but U302 does not. The readings obtained with additional phage 18 may be due to the phage titre being incorrect.

Overall the results for the NRLs were good with 98 % correct phage types for *S.* Enteritidis and 91 % for *S.* Typhimurium. The overall results for the ENLs were 89 % correct phage types for *S.* Enteritidis and 89 % for *S.* Typhimurium. In this study the results for phage typing of *S.* Enteritidis is better than in previous studies for both NRLs and ENLs (93 % and 84 % in 2006). The results for *S.* Typhimurium for the ENLs are slightly lower than the results from the study of 2006 (92 %). For the NRLs the results for *S.* Typhimurium are lower than in 2006 (99 %), but this is due to one NRL participating for the first time in the *S.* Typhimurium phage typing study.

7 Conclusions

Serotyping

- O-antigens were typed correctly by 98 % of the NRLs and 97 % of the ENLs
- H-antigens were typed correctly by 96 % of the NRLs and 92 % of the ENLs.
- Serovar names were assigned correctly by 95 % of the NRLs and 91 % of the ENLs
- *S.* Thompson and *S.* Paratyphi B variation Java were the strains causing most problems.
- Performance is comparable to that of last year for both NRLs and ENLs.
- Six NRLs and 4 ENLs did not achieve the level of good performance
- Follow up: Five of the six NRLs typed all 10 extra strains correctly, one NRL typed 8 of the 10 strains correctly.
- In the follow up all NRLs achieved the level of good performance

Phage typing

- The performance of the NRLs was good, with 98% of the *S.* Enteritidis strains and 91% of the *S.* Typhimurium strains typed correctly.
- 89% of the *S.* Enteridis strains were typed correctly by the ENLs.
- 89% of the *S.* Typhimurium strains were typed correctly by the ENLs.
- Three *S.* Enteritidis strains and three *S.* Typhimurium strains were typed correctly by all participating NRLs and ENLs.
- *S.* Typhimurium strain M16 (PT 208) caused the most problem this year. All the laboratories that incorrectly phage typed it either had no phage reading or a very low reaction with additional phage 18. This suggests that the titre of some batches of this phage has dropped and it needs to be replaced.

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Annex 1 Protocol

PROTOCOL OF THE TWELFTH INTERLABORATORY COMPARISON STUDY (XII, 2007) 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 11 (starting on 12 March 2007) 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 don't 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:

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3720 BA Bilthoven
tel. number: +31-30-2744284
fax. number: +31-30-2744434
e-mail: petra.berk@rivm

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

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Timetable of the eleventh interlaboratory comparison study (2007) on serotyping and phage typing of *Salmonella* spp.

Week	Date	Topic
7	12-16 February	Mailing of the protocol and test report 2007 (to NRLs and ENLs)
10	5-9 March	Mailing of the parcels to the participants (NRLs) as diagnostic specimens by door-to-door courier service. After arrival at the laboratory the strains need to be subcultured and stored until the performance of the typing. **If you did not receive the parcel at 9 March, do contact the CRL immediately.**.
11	12-16 March	Starting with the identification of the strains.
13	26-30 March	Send the completed test report by email to CRL-*Salmonella*. If the test report is e-mailed to the CRL it is not longer necessary to sent the original test report as well, unless it is not legible (to be indicated by CRL-*Salmonella*). Send the results of the phage typing <u>also</u> to HPA, London **Deadline for NRLs: 30 March 2007** **Deadline for ENLs: 16 April 2007**
14	2-6 April and onwards	Data input at CRL-*Salmonella* and sending these data by CRL to NRLs (and later ENLs) by email for checking. Checking the results by the participants (NRLs & ENLs) and they will inform CRL whether their results are correct. If CRL does not receive a reaction within one week after receipt of this email the CRL will consider the results as correct.

Annex 2. Testreport

TEST REPORT

INTERLABORATORY COMPARISON STUDY ON TYPING OF *SALMONELLA* STRAINS 2007

TWELFTH STUDY FOR THE NATIONAL REFERENCE LABORATORIES AND NINTH 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!!

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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 2006?	☐ Daily ☐ Once a week ☐ Twice a week ☐ Thrice a week ☐ Weekly ☐ Monthly
How many *Salmonella* strains did your laboratory serotype in 2006?	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:…… …… …… ……

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TEST RESULTS SEROTYPING

Labcode	
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 2006?	Number of strains……...

TEST RESULTS PHAGETYPING

Labcode	……
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																	

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TEST RESULTS PHAGETYPING

Labcode	
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	

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Annex 3. Testreport follow-up

TEST REPORT

FOLLOW-UP INTERLABORATORY COMPARISON STUDY ON TYPING OF *SALMONELLA* STRAINS 2007

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……..

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QUESTIONS SEROTYPING	
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:…… …… …… ……

REMARKS CONCERNING THE TABLES ON THE FOLLOWING PAGES

Two extra tables are added to this testreport, to give the CRL-*Salmonella* more information about the antisera used. The table on page 4 concerns reactions obtained with O-antisera and the table on page 5 with H-antisera. On the bottom of the table there is space left to fill in other antisera than mentioned in the table.
Please mention the manufacturer of the antisera used in the collumn next to the antisera. For every combination of strain and antisera you indicate if there was agglutination (+) or not (-). If the cell remains empty this indicates that the agglutionation was not determined for the specific combination of antisera and strain.

		Strains									
O-antisera	**Manufacturer**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Group B											
1, 4, 12, 27											
1, 4, 5, 12											
4, 5, 12											
4, 5, 27											
4, 5											
4											
5											
Group C											
7, 8											
6, 7, 8											
6, 7											
6_1, 6_2, 7											
6, 8											
8, 20											
6_1											
6											
7											
8											
Group D											
9											
9, 12											
1, 9, 12											
12											
9, 46											
9, (46)											
46											
Group E											
1, 3, 10, 15, 19, 34											
3, 10, 15, 19, 34											
(3), (15), 34											
3, 10, 15											
3, 10											
3, 15											
10											
15											
1, 3, 19											
19											

		Strains									
H-antisera	**Manufacturer**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
b											
d											
E (complex)											
e, h											
e, n											
e, n, x											
e, n, z_{15}											
h											
x											
x (z_{16})											
z_{15}											
G (complex)											
g, p											
g, m											
f											
m											
s											
q											
t											
q, s, t, p, u											
i											
k											
L (complex)											
l, v											
l, w											
v											
w											
r											
y											
z											
z_{10}											
1 (complex)											
2											
5											
6											
7											

TEST RESULTS SEROTYPING

Labcode	
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			

REMARKS AND COMMENTS

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

Name of person in charge	
Date and signature	

rivm

Annex 4. Test results of serotyping per strain for all NRLs and ENLs

Labcode	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10
CRL	**Bredeney**	**Thompson**	**Manchester**	**Infantis**	**Anatum**	**Hadar**	**Newport**	**Paratyphi B var Java**	**Indiana**	**Typhimurium**
1	Bredeney	Thompson	Manchester	Infantis	Anatum	Hadar	Newport	Paratyphi B var Java	Indiana	Typhimurium
2	Bredeney	Thompson	Manchester	Infantis	Anatum	Hadar	Newport	Paratyphi B var Java	Indiana	Typhimurium
3	Bredeney	Thompson	Manchester	Infantis	Anatum	Hadar	Newport	Paratyphi B var Java	Indiana	Typhimurium
4	Bredeney	Harburg	Manchester	Infantis	Anatum	Hadar	Newport	Paratyphi B var Java	Indiana	Typhimurium
5	Bredeney	Thompson	Manchester	Infantis	Anatum	Hadar	Larochelle	not typable	Indiana	Typhimurium
6	Bredeney	Thompson	Manchester	Infantis	Anatum	Hadar	Newport	Paratyphi B var Java	Indiana	Typhimurium
7	Bredeney	Bareilly	Chincol	Infantis	Anatum	Hadar	Newport	Gloucester	Indiana	Typhimurium
8	Bredeney	not typable	untypable	Infantis	Anatum	Hadar	Newport	Hato	not typable	Typhimurium
9	Bredeney	Thompson	Manchester	Infantis	Anatum	Hadar	Newport	Paratyphi B var Java	Indiana	Typhimurium
10	Bredeney	Thompson	Manchester	Infantis	Anatum	Hadar	Newport	Paratyphi B var Java	Indiana	Typhimurium
11	Bredeney	not typable	Manchester	Infantis	Anatum	Hadar	Newport	not typable	Indiana	Typhimurium
12	Bredeney	Thompson	Manchester	Infantis	Anatum	Hadar	Newport	Paratyphi B var Java	Indiana	Typhimurium
13	Bredeney	Thompson	Manchester	Infantis	Anatum	Djugu	Newport	Stanley	Indiana	Typhimurium
14	Bredeney	Thompson	Manchester	Infantis	Anatum	Hadar	Newport	Paratyphi B var Java	Indiana	Typhimurium
15	Bredeney	Thompson	Manchester	Infantis	Anatum	Hadar	Newport	Paratyphi B var Java	Indiana	Typhimurium
16	Bredeney	Thompson	Manchester	Infantis	Anatum	Hadar	Newport	Paratyphi B var Java	Indiana	Typhimurium
17	Bredeney	Thompson	Manchester	Infantis	Anatum	Hadar	Newport	Paratyphi B var Java	Indiana	Typhimurium
18	Bredeney	Thompson	Manchester	Infantis	Anatum	Hadar	Newport	Paratyphi B var Java	Indiana	Typhimurium
19	Bredeney	Thompson	Manchester	Infantis	Anatum	Hadar	Newport	Paratyphi B var Java	Indiana	Typhimurium
20	Bredeney	Isangi	Manchester	Infantis	Anatum	Hadar	Newport	Paratyphi B var Java	Indiana	Typhimurium
21	Bredeney	Thompson	Manchester	Infantis	Anatum	Hadar	Newport	Paratyphi B var Java	Indiana	Typhimurium
22	Bredeney	Thompson	Manchester	Infantis	Anatum	Hadar	Newport	Paratyphi B var Java	Indiana	Typhimurium
23	Bredeney	Thompson	Manchester	Infantis	Anatum	Hadar	Newport	Paratyphi B var Java	Indiana	Typhimurium
24	Bredeney	Thompson	Manchester	Infantis	Anatum	Hadar	Newport	Paratyphi B var Java	Indiana	Typhimurium
25	Bredeney	Thompson	Manchester	Infantis	Anatum	Indiana	Newport	Paratyphi B var Java	Hadar	Typhimurium
26	Bredeney	Isangi	Edmonton	Infantis	Anatum	Hadar	Newport	Abony	Indiana	Typhimurium

Labcode	S11	S12	S13	S14	S15	S16	S17	S18	S19	S20
CRL	**Virchow**	**Yoruba**	**Albany**	**Cannstatt**	**Weltevreden**	**Bareilly**	**Enteritidis**	**Bracknell**	**Berta**	**Brandenburg**
1	Virchow	Yoruba	Albany	Cannstatt	Weltevreden	Bareilly	Enteritidis	Bracknell	Berta	Brandenburg
2	Virchow	Yoruba	Albany	Cannstatt	Weltevreden	Bareilly	Gateshead	Bracknell	Berta	Brandenburg
3	Virchow	Madiago	Albany	Cannstatt	Weltevreden	Bareilly	Enteritidis	Bracknell	Berta	Brandenburg
4	Virchow	Yoruba	Albany	Senftenberg	Weltevreden	Bareilly	Enteritidis	Bracknell	Berta	Brandenburg
5	Virchow	Yoruba	Albany	Cannstatt	Weltevreden	Bareilly	Enteritidis	Bracknell	Berta	Brandenburg
6	Virchow	Yoruba	Albany	Cannstatt	Weltevreden	Bareilly	Enteritidis	Bracknell	Berta	Brandenburg
7	Virchow	Yoruba	Albany	Cannstatt	Weltevreden	Bareilly	Enteritidis	Bracknell	Berta	Bredeney
8	Virchow	Shamba	Albany	Cannstatt	Elisabethville	Bareilly	Enteritidis	Bracknell	Berta	Brandenburg
9	Virchow	Yoruba	Albany	Cannstatt	Weltevreden	Bareilly	Enteritidis	Bracknell	Berta	Brandenburg
10	Virchow	Yoruba	Albany	Cannstatt	Weltevreden	Bareilly	Enteritidis	Bracknell	Berta	Brandenburg
11	Virchow	Yoruba	Albany	Cannstatt	Weltevreden	Bareilly	Enteritidis	Bracknell	Berta	Brandenburg
12	Virchow	Yoruba	Albany	Cannstatt	Weltevreden	Bareilly	Enteritidis	Bracknell	Berta	Brandenburg
13	Virchow	Yoruba	Albany	Cannstatt	Weltevreden	Bareilly	Enteritidis	Bracknell	Berta	Brandenburg
14	Virchow	Yoruba	Albany	Cannstatt	Weltevreden	Bareilly	Enteritidis	Bracknell	Berta	Brandenburg
15	Virchow	Yoruba	Albany	Cannstatt	Weltevreden	Bareilly	Enteritidis	Bracknell	Berta	Brandenburg
16	Virchow	Yoruba	Albany	Cannstatt	Weltevreden	Bareilly	Enteritidis	Bracknell	Berta	Brandenburg
17	Virchow	Yoruba	Albany	Cannstatt	Weltevreden	Bareilly	Enteritidis	Bracknell	Berta	Brandenburg
18	Virchow	Yoruba	Albany	Cannstatt	Weltevreden	Bareilly	Enteritidis	Bracknell	Berta	Brandenburg
19	Virchow	Yoruba	Albany	Cannstatt	Weltevreden	Bareilly	Enteritidis	Bracknell	Berta	Brandenburg
20	Virchow	Yoruba	Albany	Cannstatt	Weltevreden	Bareilly	Enteritidis	Bracknell	Berta	Brandenburg
21	Virchow	Yoruba	Albany	Kouka	Weltevreden	Bareilly	Enteritidis	Bracknell	Berta	Brandenburg
22	Virchow	Yoruba	Albany	Cannstatt	Weltevreden	Bareilly	Enteritidis	Bracknell	Berta	Brandenburg
23	Virchow	Yoruba	Albany	Cannstatt	Weltevreden	Bareilly	Enteritidis	Bracknell	Berta	Brandenburg
24	Virchow	Yoruba	Albany	Cannstatt	Weltevreden	Bareilly	Enteritidis	Bracknell	Berta	Brandenburg
25	Virchow	Yoruba	Albany	Cannstatt	Weltevreden	Bareilly	Enteritidis	Bracknell	Berta	Brandenburg
26	Virchow	Yoruba	Albany	Cannstatt	Weltevreden	Mikawasima	Enteritidis	Bracknell	Berta	Brandenburg

Labcode	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10
CRL	**Bredeney**	**Thompson**	**Manchester**	**Infantis**	**Anatum**	**Hadar**	**Newport**	**Paratyphi B var Java**	**Indiana**	**Typhimurium**
A	Bredeney	Thompson	Manchester	Infantis	Anatum	Hadar	Newport	not typable	Indiana	Typhimurium
B	Bredeney	-	Manchester	Infantis	Newlands	Narachino	Newport	Paratyphi B var Java	Indiana	Typhimurium
C	Bredeney	Thompson	Manchester	-	Anatum	Hadar	Newport	Paratyphi B var Java	Indiana	Typhimurium
D	Bredeney	Thompson	Manchester	Infantis	Anatum	Hadar	Newport	Uppsala	Indiana	Typhimurium
E	Bredeney	Thompson	Manchester	Infantis	Anatum	Hadar	Newport	Paratyphi B var Java	Indiana	Typhimurium
F	Bredeney	Thompson	Manchester	Infantis	Anatum	Hadar	Newport	Paratyphi B var Java	Indiana	Typhimurium
I	Koessen	Norwich	Bredeney	Larochelle	London	Hadar	Braenderup	Heidelberg	Indiana	Southampton
J	Bredeney	Thompson	Manchester	Infantis	Anatum	Hadar	Newport	Uppsala	Indiana	Typhimurium
K	Bredeney	Irumu	Manchester	Infantis	Anatum	Hadar	Newport	Coeln	Indiana	Typhimurium
L	Bredeney	Thompson	Manchester	Infantis	Anatum	Hadar	Newport	Paratyphi B var Java	Indiana	Typhimurium
M	Bredeney	Harburg	Manchester	Infantis	Anatum	Hadar	Newport	not typable	Indiana	Typhimurium
N	Bredeney	Lomita	Manchester	Infantis	Anatum	Hadar	Newport	not typable	Indiana	Typhimurium
O	Bredeney	Thompson	Manchester	Infantis	Anatum	Hadar	Newport	Paratyphi B var Java	Indiana	Typhimurium
P	Bredeney	Thompson	Manchester	Infantis	Anatum	Hadar	Newport	Derby	not typable	Typhimurium
Q	Bredeney	Thompson	Manchester	Infantis	Anatum	Hadar	Newport	Paratyphi B var Java	Indiana	Typhimurium
S	Bredeney	Poitiers	Manchester	Infantis	Velje	Hadar	Newport	Paratyphi B var Java	Indiana	Typhimurium
T	Bredeney	Thompson	Manchester	Infantis	Anatum	Hadar	Newport	Paratyphi B var Java	Indiana	Typhimurium
U	Bredeney	Thompson	Manchester	Infantis	Anatum	Hadar	Newport	Paratyphi B var Java	Indiana	Typhimurium
V	Bredeney	Thompson	Manchester	Infantis	Anatum	Hadar	Newport	not typable	Indiana	Typhimurium
W	Bredeney	Thompson	Manchester	Infantis	Anatum	Hadar	Newport	Paratyphi B var Java	Indiana	Typhimurium
X	Bredeney	Thompson	Manchester	Infantis	Anatum	Hadar	Newport	Paratyphi B var Java	Indiana	Typhimurium
Y	Bredeney	Thompson	Manchester	Infantis	Anatum	Hadar	Newport	Kisangani	Indiana	Typhimurium
Z	Bredeney	Thompson	Manchester	Infantis	Anatum	Istanbul	Newport	Paratyphi B var Java	Indiana	Typhimurium
AA	Bredeney	Harburg	Manchester	Infantis	Anatum	Hadar	Newport	Paratyphi B var Java	Indiana	Typhimurium

labcode	S11	S12	S13	S14	S15	S16	S17	S18	S19	S20
CRL	**Virchow**	**Yoruba**	**Albany**	**Cannstatt**	**Weltevreden**	**Bareilly**	**Enteritidis**	**Bracknell**	**Berta**	**Brandenburg**
A	Virchow	Yoruba	Albany	Cannstatt	Weltevreden	Bareilly	Enteritidis	Bracknell	Berta	Brandenburg
B	Virchow	Yoruba	Albany	Kouka	Weltevreden	Obogu	Enteritidis	Bracknell	Berta	Bissau
C	Virchow	Yoruba	Albany	Cannstatt	Weltevreden	Bareilly	Enteritidis	Bracknell	Berta	Brandenburg
D	Virchow	Yoruba	Albany	Cannstatt	Biafra	Bareilly	Enteritidis	Bracknell	Berta	Brandenburg
E	Virchow	Yoruba	Albany	Cannstatt	Weltevreden	Bareilly	Enteritidis	Bracknell	Berta	Brandenburg
F	Virchow	Yoruba	Albany	Cannstatt	Weltevreden	Bareilly	Enteritidis	Oudwijk	Berta	Brandenburg
I	Virchow	not typable	Albany	Southbank	Elisabethville	Bareilly	Enteritidis	Poona	Berta	Brandenburg
J	Virchow	Yoruba	Albany	Cannstatt	Weltevreden	Bareilly	Enteritidis	Bracknell	Berta	Brandenburg
K	Virchow	Yoruba	Albany	Cannstatt	Weltevreden	Bareilly	Enteritidis	Oudwijk	Berta	Brandenburg
L	Virchow	Yoruba	Albany	Cannstatt	Weltevreden	Bareilly	Enteritidis	Bracknell	Berta	Brandenburg
M	Virchow	Yoruba	Albany	Cannstatt	Weltevreden	Bareilly	Enteritidis	Bracknell	Berta	Brandenburg
N	Virchow	Yoruba	Albany	Cannstatt	Weltevreden	Bareilly	Enteritidis	Bracknell	Berta	Brandenburg
O	Virchow	Yoruba	Albany	Cannstatt	Weltevreden	Bareilly	Enteritidis	Bracknell	Berta	Brandenburg
P	not typable	not typable	Albany	Kouka	Weltevreden	Bareilly	Enteritidis	Oudwijk	Berta	Brandenburg
Q	Virchow	Yoruba	Albany	Cannstatt	Weltevreden	Bareilly	Enteritidis	Bracknell	Berta	Brandenburg
S	Virchow	Yoruba	Corvalis	Cannstatt	Weltevreden	Bareilly	Enteritidis	Bracknell	Berta	Brandenburg
T	Virchow	Yoruba	Albany	Cannstatt	Weltevreden	Bareilly	Enteritidis	Bracknell	Berta	Brandenburg
U	Virchow	Yoruba	Albany	Cannstatt	Weltevreden	Bareilly	Enteritidis	Bracknell	Berta	Brandenburg
V	Virchow	Yoruba	Albany	Cannstatt	Weltevreden	Bareilly	Enteritidis	Bracknell	Berta	Brandenburg
W	Virchow	Yoruba	Albany	Cannstatt	Weltevreden	Bareilly	Enteritidis	Bracknell	Berta	Brandenburg
X	Virchow	Yoruba	Albany	Cannstatt	Weltevreden	Bareilly	Enteritidis	Bracknell	Berta	Brandenburg
Y	Virchow	Yoruba	Albany	Cannstatt	Weltevreden	Bareilly	Enteritidis	Bracknell	Berta	Brandenburg
Z	Virchow	Yoruba	Albany	Cannstatt	Weltevreden	Bareilly	Enteritidis	Bracknell	Berta	Brandenburg
AA	Virchow	Yoruba	Albany	Cannstatt	Weltevreden	Bareilly	Enteritidis	Bracknell	Berta	Brandenburg

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Annex 5. 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	**14b**	-	-	-	-	-	**SCL**	-	-	±	-	-	-	-	-	-	-
3	14b	-	-	-	-	-	+	-	-	±	-	-	-	-	-	-	-
9	14b	-	-	-	-	-	SCL	-	-	±	-	-	-	-	-	-	-
10	14b	-	-	-	+	-	SCL	-	-	+	-	-	-	-	-	-	-
12	14b	-	-	-	±	-	++	-	-	±	-	-	-	-	-	-	-
16	14b	-	-	-	-	-	SCL	-	-	2	-	-	-	-	-	-	-
18	14b	-	-	-	+	-	SCL	-	-	+	-	-	-	-	-	-	-
22	14b	-	-	-	1	-	±	-	-	4	-	-	-	-	-	-	-
23	14b	-	-	-	-	-	+	-	-	+/-	-	-	-	-	-	-	-
A	14b	-	-	-	-	-	++	-	-	-	-	-	-	-	-	-	-
E	14b	-	-	-	-	-	SCL	-	-	-	-	-	-	-	-	-	-
F	14b	-	-	-	±	-	<OL	-	-	±	-	-	-	-	-	-	-
G	14b	-	-	-	-	-	SCL	-	-	-	-	-	-	-	-	-	-
H	14b	-	-	-	-	-	SCL	-	-	-	-	-	-	-	-	-	-
I	14b	-	-	-	±	-	SCL	-	-	±	-	-	-	-	-	-	-
K	14b	-	-	-	-	-	SCL	-	-	1	1	-	1	-	-	-	-
L	14b	-	-	-	-	-	SCL	-	-	-	-	-	++	-	-	-	-
M	14b	-	-	-	-	-	+++	-	-	-	-	-	-	-	-	-	-
O	14b	-	-	-	-	-	OL	-	-	+	-	-	-	-	-	-	-
U	14b	-	-	-	-	-	OL	-	-	2	-	-	-	-	-	-	-
V	14b	-	-	-	1	-	+++	-	-	1	-	-	-	-	-	-	-
W	14b	-	-	-	-	-	7	-	-	1	-	-	-	-	-	-	-
Y	14b	-	-	-	-	-	SCL	-	-	-	-	-	-	-	-	-	-
Z	14b	-	-	-	-	-	+++	-	1	-	-	-	-	-	-	-	-
AA	14b	-	-	-	1-5	-	+++	-	-	1-5	-	-	-	-	-	-	-

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	**21**	**OL**	**SCL**	**-**	**SCL**	**-**	**SCL**	**-**	**OL**	**OL**	**OL**	**-**	**-**	**-**	**CL**	**-**	**+**
3	21	OL	SCL	-	+++	-	±	-	OL	<OL	OL	-	-	-	CL	++	+++
9	21	SCL	SCL	-	OL	-	SCL	-	OL	OL	OL	-	-	-	SCL	-	-
10	21	OL	SCL	-	<OL	-	SCL	-	OL	<OL	OL	-	-	-	CL	-	+
12	21	OL	++	1	+++	-	±±	-	OL	+++	OL	-	-	-	CL	±±	±±
16	21	OL	SCL	-	SCL	-	SCL	-	OL	<OL	OL	-	-	-	CL	±	±
18	21	SCL	SCL	-	++	-	SCL	-	OL	SCL	OL	-	-	-	CL	+	+
22	21	OL	+	-	<<SCL	-	4	-	OL	<OL	OL	-	-	-	<CL	-	+
23	21	OL	SCL	-	+/-	-	+	-	OL	SCL	<OL	-	-	-	<CL	-	-
A	3	SCL	-	-	-	-	++	-	SCL	-	SCL	-	-	-	SCL	-	-
E	21	OL	SCL	-	SCL	-	SCL	-	OL	<OL	OL	-	-	-	CL	±	+
F	21	OL	+++	-	OL	-	<OL	-	OL	OL	OL	-	-	-	CL	-	-
G	21	OL	++	-	+	-	SCL	-	OL	++	OL	-	-	-	CL	±	±
H	21	<CL	SCL	-	SCL	-	SCL	-	SCL	OL	SCL	-	-	-	-	SCL	-
I	21	OL	+++	-	OL	-	SCL	-	OL	OL	OL	-	-	-	CL	-	±
K	21	OL	+++	-	++	-	SCL	2	+++	+++	SCL	-	-	-	CL	+	+++
L	21	OL	SCL	-	SCL	-	SCL	-	OL	SCL	OL	-	-	-	<CL	-	-
M	22	OL	-	-	<OL	-	++	-	OL	<OL	OL	-	-	-	CL	-	-
O	21	OL	SCL	-	<OL	-	SCL	-	OL	<OL	OL	-	-	-	SCL	-	-
U	21	OL	<SCL	-	<OL	-	OL	-	<OL	OL	OL	-	-	-	<CL	±	±
V	21	OL	<SCL	-	<SCL	-	+++	-	OL	++	SCL	-	-	-	<CL	+	+
W	21	OL	++	-	±	-	±	-	OL	+++	OL	-	-	-	CL	+	+
Y	21	SCL	+++	-	++	-	SCL	-	+	+	++	-	-	-	CL	-	+
Z	21c	CL	++	-	++	-	+++	-	CL	+++	CL	-	-	-	CL	CL.	CL.
AA	22	OL	-	-	+	-	+	-	OL	SCL	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	**13**	-	-	-	**SCL**	-	**SCL**	-	-	**OL**	-	-	-	-	-	-	-
3	13	-	-	-	**+++**	-	±	-	-	<OL	-	-	-	-	-	-	-
9	13	-	-	-	SCL	-	SCL	-	-	OL	-	-	-	-	-	-	-
10	13	-	-	-	SCL	-	SCL	-	-	<OL	-	-	-	-	-	-	-
12	13	-	-	-	+++	-	++	-	-	+++	-	-	-	-	-	-	-
16	13	-	-	-	<SCL	-	SCL	-	-	SCL	-	-	-	-	-	-	-
18	13	-	-	-	++	-	SCL	-	-	SCL	-	-	-	-	-	-	-
22	13	-	-	-	++	-	±	-	-	SCL	-	-	-	-	-	-	-
23	13	-	-	-	+	-	+	-	-	SCL	-	-	-	-	-	-	-
A	13	-	-	-	+++	-	SCL	-	-	++	-	-	-	-	-	-	-
E	13	-	-	-	<SCL	-	<SCL	-	-	<OL	-	-	-	-	-	-	-
F	13	-	-	-	OL	-	<OL	-	-	OL	-	-	-	-	-	-	-
G	13	-	-	-	++	-	SCL	-	-	+++	-	-	-	-	-	-	-
H	13	-	-	-	SCL	-	SCL	-	-	<SCL	-	-	-	-	-	-	-
I	13	-	-	-	+++	-	SCL	-	-	+++	-	-	-	-	-	-	-
K	13	-	-	-	++	-	SCL	-	-	+++	-	-	-	-	-	-	-
L	13	-	-	-	SCL	-	SCL	-	-	OL	-	-	-	-	-	-	-
M	13	-	-	-	<OL	-	+++	-	-	OL	-	-	-	-	-	-	-
O	13	-	-	-	SCL	-	SCL	-	-	<OL	-	-	-	-	-	-	-
U	13	-	-	-	<OL	-	OL	-	-	<OL	-	-	-	-	-	-	-
V	13	-	-	-	<SCL	-	+++	-	-	<SCL	-	-	-	-	-	-	-
W	13	-	-	-	+	-	3	-	-	+++	-	-	-	-	-	-	-
Y	13	-	-	-	+	-	CL	-	-	+	-	-	-	-	-	-	-
Z	10	-	-	-	++	-	++	-	-	+++	-	1	+++	-	-	-	-
AA	13	-	-	-	SCL	-	++	-	-	SCL	-	-	-	-	-	-	-

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	**6**	**-**	**SCL**	**-**	**SCL**	**-**	**SCL**	**-**	**OL**	**OL**	**OL**	**-**	**-**	**-**	**-**	**-**	**-**
3	6	-	SCL	-	+++	-	±	-	OL	<OL	OL	-	-	-	-	-	-
9	6	-	SCL	-	SCL	-	SCL	-	OL	OL	OL	-	-	-	-	-	-
10	6	-	SCL	-	SCL	-	SCL	-	OL	<OL	OL	-	-	-	-	-	-
12	6	1	+++	-	+++	-	++	-	CL	+++	+++	-	-	-	-	-	-
16	6	-	SCL	-	SCL	-	SCL	-	<OL	<OL	OL	-	-	-	-	-	-
18	6	-	SCL	-	SCL	-	SCL	-	OL	OL	OL	-	-	-	-	-	-
22	6	-	+	-	<SCL	-	±	-	<OL	<OL	<OL	-	-	-	-	-	-
23	6	-	SCL	-	+	-	+	-	OL	SCL	<OL	-	-	-	-	-	-
A	6	-	+++	-	+++	-	+++	-	+++	++	+++	-	-	-	-	-	-
E	6	-	SCL	-	SCL	-	SCL	-	OL	<OL	OL	-	-	-	-	-	-
F	6	-	+++	-	OL	-	OL	-	OL	OL	OL	-	-	-	-	-	-
G	6	-	++	-	++	-	SCL	-	SCL	++	SCL	-	-	-	-	-	-
H	6	-	<CL	-	SCL	-	SCL	-	SCL	SCL	<SCL	-	-	-	-	-	-
I	6	-	SCL	-	OL	-	SCL	-	OL	OL	OL	-	-	-	-	-	-
K	6	-	+++	-	+++	-	<SCL	-	++	+++	SCL	-	-	-	2-	-	-
L	6	-	CL	-	OL	-	SCL	-	OL	OL	OL	-	-	-	-	-	-
M	6	-	++	-	OL	-	+++	-	<OL	OL	OL	-	-	-	-	-	-
O	6	-	SCL	-	SCL	-	SCL	-	OL	<OL	OL	-	-	-	-	-	-
U	6	-	<SCL	-	<OL	-	<OL	-	<OL	<OL	<OL	-	-	-	-	-	-
V	6	-	<SCL	-	<SCL	-	+++	-	OL	<SCL	OL	-	-	-	-	-	-
W	6	-	+	-	±	-	7	-	OL	+++	OL	-	-	-	±	-	-
Y	6	-	SCL	-	+	-	CL	-	+	++	++	-	-	-	-	-	-
Z	6	-	+++	-	++	-	+++	-	CL	+++	CL.	-	-	-	-	-	-
AA	6	-	+	-	SCL	-	SCL	-	OL	<CL	OL	-	-	-	-	-	-

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	**9b**	-	-	**CL**	-	**CL**	-	-	-	-	-	-	**CL**	-	**CL**	-	-
3	9b	-	-	CL	-	CL	-	-	-	-	-	-	SCL	-	SCL	-	-
9	9b	-	-	CL	-	CL	-	-	-	-	-	-	CL	-	<SCL	-	-
10	9b	-	-	CL	-	CL	-	-	-	-	-	-	CL	-	SCL	-	-
12	9b	-	-	CL	-	CL	-	5	-	-	-	±	CL	-	CL	-	-
16	9b	-	-	CL	-	CL	-	-	-	-	-	-	CL	-	<CL	-	-
18	9b	-	-	CL	-	CL	-	-	-	-	-	-	CL	-	SCL	-	-
22	9b	-	-	CL	-	CL	-	±	-	-	-	±	CL	-	++	-	-
23	9b	-	-	CL	-	CL	-	-	-	-	-	-	CL	-	<CL	-	-
A	9b	-	-	CL	-	CL	-	-	-	-	-	-	CL	-	++	-	-
E	9b	-	-	CL	-	CL	-	-	-	-	-	-	CL	-	+++	-	-
F	9b	-	-	CL	-	CL	-	-	-	-	-	-	CL	-	OL	-	-
G	9b	-	-	CL	-	CL	-	-	-	-	-	-	CL	-	+++	-	-
H	RDNC	-	<CL	<<	-	CL	SCL	-	-	-	-	-	CL	SCL	-	-	-
I	9 b	-	-	CL	-	CL	-	-	-	-	-	-	CL	-	SCL	-	-
K	9b	-	-	SCL	-	CL	1	2	2	-	-	-	CL	-	+++	-	-
L	9b	-	-	CL	-	CL	-	-	-	-	-	-	CL	-	SCL	-	-
M	9b	-	-	CL	-	<CL	-	-	-	-		-	CL	-	+++	-	-
O	9b	-	-	CL	-	CL	-	-	-	-	-	-	CL	-	CL	-	-
U	9b	-	-	<CL	-	<CL	-	±	-	-	-	±	<CL	-	+++	-	-
V	9b	-	-	<CL	-	<CL	-	-	-	-	-	-	<CL	-	<CL	-	-
W	9b	-	-	CL	-	CL	-	-	-	-	-	4	CL	-	CL	-	-
Y	9b	-	-	SCL	-	SCL	-	-	-	-	-	-	SCL	-	CL	-	-
Z	9b	-	-	CL	-	CL	-	-	-	-	-	-	CL	-	+++	-	-
AA	9b	-	±	CL	-	CL	-	1-5	-	-	-	-	CL	-	<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	**21c**	**OL**	**SCL**	**-**	**SCL**	**-**	**SCL**	**-**	**OL**	**OL**	**OL**	**-**	**-**	**-**	**CL**	**SCL**	**CL**
3	21c	OL	SCL	-	+++	-	±	-	+++	<OL	OL	-	-	-	SCL	SCL	SCL
9	21c	OL	SCL	-	OL	-	SCL	-	OL	OL	OL	-	-	-	SCL	<CL	CL
10	21c	OL	SCL	-	SCL	-	SCL	-	OL	<OL	OL	-	-	-	CL	SCL	SCL
12	21c	CL	+++	-	OL	(+++?)	±±	-	SCL	+++	±±±	-	(+++?)	-	CL	SCL	SCL
16	21c	OL	SCL	-	SCL	-	SCL	-	<OL	<OL	<OL	-	-	-	CL	+ <<	SCL
18	21c	SCL	SCL	-	SCL	-	CL	-	CL	OL	SCL	-	-	-	CL	SCL	CL
22	21c	OL	+	-	<SCL	-	±	-	SCL	<OL	SCL	-	+++	-	CL	SCL	<CL
23	21c	<OL	+++	-	+	-	+	-	<CL	+++	++	-	-	-	<CL	++	<CL
A	21c	SCL	+++	-	+++	-	++	-	+++	++	+++	-	-	-	SCL	SCL	SCL
E	21c	CL	SCL	-	SCL	-	SCL	-	<OL	<OL	<OL	-	-	-	CL	CL	<CL
F	21c	OL	+++	-	OL	-	OL	-	OL	+	OL	-	OL	-	CL	SCL	CL
G	21c	OL	+++	-	++	-	SCL	-	+++	+++	+++	-	-	-	CL	<SCL	<SCL
H	21c	SCL	SCL	-	<<	-	<CL	-	<OL	SCL	<OL	-	-	-	CL	SCL	CL
I	21 c	OL	CL	-	CL	-	<CL	-	CL	CL	CL	-	-	-	CL	CL	CL
K	21c	SCL	+++	-	+++	+++	SCL	-	+	+++	+++	-	-	-	CL	SCL	SCL
L	21c	OL	CL	-	SCL	-	SCL	-	SCL	OL	OL	-	-	-	SCL	<CL	SCL
M	21c	OL	+	-	OL	-	+++	-	OL	OL	<OL	-	-	-	<CL	<SCL	<SCL
O	32	OL	SCL	CL	SCL	CL	SCL	-	OL	<OL	OL	-	OL	-	CL	CL	CL
U	21c	O	<SCL	-	<OL	+	OL	-	OL	<OL	OL	-	+	-	<CL	<SCL	<SCL
V	21c	OL	<SCL	-	<SCL	-	+++	-	SCL	<SCL	SCL	-	-	-	<SCL	SCL	SCL
W	32	OL	++	++	+	SCL	+	4	CL	<SCL	CL	-	SCL	-	CL	<CL	<CL
Y	32?	SCL	SCL	-	++	++	CL	-	+	++	++	-	SCL	-	CL	+/OL	CL
Z	32	CL.	+++	++	++	CL.	CL.	-	CL	+++	CL	-	CL	-	CL	CL	CL
AA	21c	<OL	++	-	<CL	-	SCL	-	OL	<CL	OL	-	-	-	CL	OL	CL

rivm

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	**13a**	-	-	-	**SCL**	-	**SCL**	-	**OL**	**OL**	**OL**	-	-	-	-	-	-
3	13a	-	-	-	+++	-	±	-	<OL	<OL	<OL	-	-	-	-	-	-
9	13a	-	-	-	SCL	-	SCL	-	OL	OL	OL	-	-	-	-	-	-
10	13a	-	-	-	SCL	-	SCL	-	OL	SCL	OL	-	-	-	-	-	-
12	13a	4	-	-	+++	-(?)	±±	-	OL	+++	+++	-	-(?)	-	1	-	-
16	13a	-	-	-	<SCL	-	SCL	-	SCL	SCL	<OL	-	-	-	-	-	-
18	13a	-	-	-	SCL	-	SCL	-	OL	OL	OL	-	-	-	-	-	-
22	13a	-	-	2	SCL	-	±	4	<OL	<OL	<OL	±	+++	-	-	-	-
23	13a	-	-	-	+	-	+	-	OL	SCL	<OL	-	-	-	-	-	-
A	13a	-	-	-	++	-	++	-	CL	+++	+++	-	-	-	-	-	-
E	13a	-	-	-	SCL	-	SCL	-	<OL	<OL	<OL	-	-	-	-	-	-
F	13a	-	-	-	OL	-	+	-	OL	OL	OL	-	-	-	-	-	-
G	13a	-	-	-	+++	-	SCL	-	SCL	++	SCL	-	-	-	-	-	-
H	22	SCL	-	-	<SCL	-	SCL	-	SCL	SCL	SCL	-	-	-	-	-	-
I	13a	-	-	-	SCL	-	SCL	-	OL	OL	OL	-	-	-	-	-	-
K	13a	-	-	-	+++	-	SCL	-	++	+++	+++	-	-	-	-	-	-
L	13a	-	-	-	OL	-	SCL	-	OL	SCL	OL	-	-	-	-	-	-
M	13a	-	-	-	OL	-	+++	-	OL	OL	OL	-	-	-	-	-	-
O	13a	-	-	-	SCL	-	SCL	-	OL	OL	OL	-	-	-	-	-	-
U	28	-	-	-	<OL	<SCL	<OL	±	<OL	<OL	<OL	±	<OL	-	-	-	-
V	13a	-	-	-	<SCL	-	+++	-	SCL	<SCL	SCL	-	-	-	-	-	-
W	13a	-	-	-	++	-	±	-	<CL	SCL	<CL	-	-	-	-	-	-
Y	13a	-	-	-	+++	-	OL	-	+	+++	++	-	-	-	-	-	-
Z	RDNC	+++	-	-	++	-	+++	-	CL	CL.	CL.	-	CL.	-	++	-	-
AA	13a	-	-	-	SCL	1-5	SCL	-	OL	<SCL	OL	-	-	-	-	-	-

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	**8**	**-**	**-**	**SCL**	**SCL**	**CL**	**SCL**	**CL**	**OL**	**OL**	**OL**	**SCL**	**CL**	**-**	**-**	**-**	**-**
3	34	-	-	-	-	-	-	-	<OL	-	OL	-	-	-	-	-	-
9	8	-	-	<CL	SCL	CL	SCL	<CL	OL	OL	OL	<CL	CL	-	-	-	-
10	28	-	-	+	SCL	SCL	SCL	2	OL	OL	OL	+	CL	-	-	-	-
12	8	1	-	±±±	+++	CL	±±	±±±	OL	+++	OL	±±±	CL	-	1	-	-
16	8	-	-	SCL	<SCL	CL	SCL	<CL	<OL	<OL	<OL	SCL	CL	-	-	-	-
18	8	-	-	SCL	SCL	SCL	SCL	SCL	OL	SCL	SCL	SCL	SCL	-	-	-	-
22	8	-	-	SCL	++	<CL	+	<CL	OL	<OL	OL	<CL	CL	-	-	-	-
23	8	-	-	+++	+	CL	+	+	<OL	SCL	<CL	++	CL	-	-	-	-
A	8	-	-	SCL	++	CL	++	SCL	SCL	++	SCL	SCL	CL	-	-	-	-
E	28	-	-	SCL	SCL	CL	SCL	<CL	OL	<OL	OL	+	CL	-	-	-	-
F	8	-	-	++	OL	CL	OL	++	OL	OL	OL	SCL	CL	-	-	-	-
G	8	-	-	SCL	++	CL	++	++	SCL	+++	CL	SCL	CL	-	-	-	-
H	28	-	-	-	SCL	<CL	SCL	SCL	-	SCL	-	SCL	<CL	<CL	<CL	SCL	<CL
I	8	-	-	SCL	<OL	SCL	SCL	+++	OL	OL	OL	+++	CL	-	-	-	-
K	8	-	-	++	+++	<CL	+++	++	++	+++	SCL	++	SCL	-	-	-	-
L	8	+	-	CL	SCL	CL	SCL	CL	OL	SCL	OL	SCL	CL	-	-	-	-
M	8	-	-	<CL	OL	+++	+++	+++	OL	+++	OL	+++	CL	-	-	-	-
O	8	-	-	SCL	SCL	CL	SCL	CL	OL	OL	OL	SCL	CL	-	-	-	-
U	8	-	-	SCL	<OL	CL	OL	<CL	OL	<OL	OL	SCL	CL	-	-	-	-
V	8	-	-	SCL	<SCL	<CL	<SCL	<SCL	SCL	<SCL	SCL	<SCL	<CL	-	-	-	-
W	8	-	-	++	++	CL	<<	+++	OL	+++	OL	+	CL	-	2	-	-
Y	8	-	-	+++	+++	SCL	SCL	SCL	+	++	SCL	<SCL	SCL	-	-	-	-
Z	2	CL.	-	+++	++	CL	CL.	++	CL.	+	CL	++	CL	-	++	-	-
AA	8	-	-	<CL	SCL	CL	+	<CL	OL	SCL	CL	<CL	CL	-	-	-	1-5

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	**1b**	**OL**	**SCL**	**CL**	**SCL**	**CL**	**SCL**	**CL**	**OL**	**OL**	**OL**	**CL**	**CL**	**CL**	**CL**	**SCL**	**CL**
3	1b	OL	SCL	SCL	+++	CL	±	SCL	<OL	<OL	OL	SCL	SCL	SCL	SCL	SCL	SCL
9	1b	OL	SCL	CL	OL	CL	SCL	CL	OL	OL	OL	CL	CL	CL	CL	++	CL
10	1b	OL	CL	CL	OL	CL	SCL	CL	OL	<OL	CL	CL	CL	CL	CL	SCL	SCL
12	1b	OL	+++	CL	+++	CL	++	CL	OL	+++	±±±	CL	CL	CL	CL	SCL	SCL
16	1b	OL	SCL	CL	SCL	CL	SCL	CL	<OL	<OL	<OL	<CL	CL	CL	CL	SCL	SCL
18	1b	OL	SCL	CL	SCL	CL	SCL	CL	OL	SCL	SCL	SCL	SCL	SCL	SCL	SCL	OL
22	1b	SCL	++	CL	SCL	CL	±	CL	SCL	<OL	SCL	CL	CL	CL	CL	SCL	<CL
23	1b	<OL	SCL	CL	+	CL	+	<CL	SCL	SCL	SCL	<CL	CL	CL	CL	<CL	<CL
A	1b	+++	+++	CL	++	CL	++	CL	++	++	+++	SCL	CL	CL	+++	+++	+++
E	1b	<CL	SCL	CL	SCL	CL	SCL	CL	<OL	<OL	<OL	<CL	CL	CL	CL	CL	<CL
F	1b	OL	+++	CL	OL	CL	OL	SCL	OL	OL	OL	CL	CL	CL	CL	CL	CL
G	1b	++	+	CL	++	CL	SCL	SCL	++	++	++	SCL	CL	CL	SCL	CL	CL
H	5a	-	<CL	-	SCL	<CL	SCL	SCL	-	SCL	-	SCL	-	-	-	-	-
I	1 b	OL	<CL	CL	OL	CL	<CL	CL	OL	OL	OL	CL	CL	CL	CL	OL	OL
K	1b	+++	+++	SCL	+++	<CL	+++	++	++	+++	+++	SCL	SCL	SCL	CL	<OL	<OL
L	1b	OL	CL	CL	SCL	CL	SCL	CL	OL	SCL	OL	CL	CL	CL	SCL	SCL	SCL
M	1b	OL	++	CL	OL	<CL	+++	<CL	OL	OL	OL	<CL	CL	CL	<CL	SCL	SCL
O	1b	OL	SCL	CL	<OL	CL	SCL	CL	OL	<OL	OL	CL	CL	CL	CL	SCL	OL
U	1b	OL	SCL	CL	<OL	CL	OL	CL	OL	OL	<OL	<CL	CL	<CL	SCL	SCL	SCL
V	1b	SCL	<SCL	OL	<SCL	OL	<SCL	<CL	SCL	<SCL	SCL	SCL	OL	SCL	<SCL	<CL	SCL
W	1b	OL	+++	CL	±	CL	<<	<CL	<CL	+++	<CL	CL	CL	CL	CL	<CL	<CL
Y	1b	OL	SCL	CL	<OL	CL	SCL	CL	OL	<OL	OL	CL	CL	CL	CL	OL	OL
Z	1b	CL	CL	CL	++	CL	CL	CL	CL	CL	CL	CL	CL	CL	CL	CL	CL
AA	1b	<CL	+	CL	+++	CL	++	CL	<CL	+++	<CL	<CL	CL	CL	CL	OL	OL

Strain E-10

		Phages reactions at Routine Test Dilution (*S.* Enteritidis)															
Lab code	**Phage type**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**
HPA	**4**	**-**	**SCL**	**CL**	**SCL**	**CL**	**SCL**	**CL**	**OL**	**OL**	**OL**	**CL**	**CL**	**CL**	**-**	**-**	**-**
3	4	-	SCL	SCL	+++	CL	±	SCL	OL	<OL	OL	SCL	CL	SCL	-	-	-
9	4	-	SCL	CL	SCL	CL	SCL	CL	OL	OL	OL	CL	CL	CL	-	-	-
10	4	-	CL	SCL	OL	CL	SCL	CL	OL	OL	OL	CL	CL	CL	-	-	-
12	4	-	+++	CL	OL	CL	±±	CL	OL	OL	SCL	CL	CL	CL	3	-	-
16	4	-	SCL	CL•	SCL	CL•	SCL	CL	OL	<OL	OL	<CL	CL	CL	-	-	-
18	4	-	SCL	CL	SCL	CL	SCL	SCL	SCL	SCL	SCL	SCL	CL	CL	-	-	-
22	4	-	++	CL	<OL	CL	±	CL	OL	OL	OL	CL	CL	CL	-	-	2
23	4	-	<CL	CL	+	CL	±	<CL	OL	<OL	<CL	CL	CL	CL	-	-	-
A	4	-	SCL	CL	+++	CL	++	CL	+++	++	SCL	CL	CL	CL	-	-	-
E	4	-	SCL	CL	SCL	CL	SCL	CL	OL	<OL	OL	CL	CL	CL	-	-	-
F	4	-	+++	SCL	OL	CL	OL	SCL	OL	OL	OL	CL	CL	CL	-	-	-
G	4	-	+++	CL	SCL	CL	CL	CL	CL	SCL	CL	CL	CL	CL	-	-	-
H	4	-	<CL	<SCL	SCL	CL	SCL	CL	SCL	<CL	SCL	CL	CL	CL	-	-	-
I	4	-	CL	SCL	<OL	CL	<CL	CL	OL	OL	OL	CL	CL	CL	-	-	-
K	4	-	+++	SCL	+++	<CL	SCL	SCL	++	+++	SCL	SCL	SCL	SCL	-	-	-
L	4	-	CL	CL	SCL	CL	SCL	CL	OL	SCL	OL	SCL	CL	CL	-	-	-
M	4	-	++	CL	OL	<CL	+++	CL	OL	OL	OL	CL	CL	CL	-	-	-
O	4	-	SCL	CL	SCL	CL	SCL	CL	OL	<OL	OL	CL	CL	CL	-	-	-
U	4	-	SCL	<CL	OL	CL	<OL	CL	<OL	OL	OL	<CL	CL	CL	-	-	-
V	4	-	SCL	<CL	<SCL	<CL	<SCL	SCL	SCL	<SCL	SCL	SCL	<CL	SCL	-	-	-
W	4	-	+++	CL	+++	CL	4	CL	OL	SCL	OL	CL	CL	CL	-	-	-
Y	4	-	SCL	CL	SCL	CL	SCL	CL	OL	<OL	OL	CL	CL	CL	-	-	-
Z	4	-	CL	CL	+++	CL	+++	CL	CL	CL	+++	CL	CL	CL	-	-	-
AA	4	-	+	CL	<CL	CL	+	CL	<CL	<CL	OL	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	**U310**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3	U310	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
9	U310	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
10	U302	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12	U310	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
16	U310	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
18	U310	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
22	U310	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
23	U310	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
A	U310	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
E	U310	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F	U310	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
G	U310	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
H	U310	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
I	U310	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
K	U310	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
L	U310	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
M	U310	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
O	U302	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
U	U310	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
V	U310	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W	U310	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Y	U310	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
AA	U310	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Strain M-11 (continued)

		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**	**10var2**	**18**
HPA	**U310**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	±	**OL**	-
3	U310	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	±	**+**	-
9	U310	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	±	OL	-
10	U302	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	±	+	-
12	U310	-	-	-	-	-	-	-	-	-	-	-	-	±	-	3	1	OL	-
16	U310	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	±	OL•	-
18	U310	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	OL	-
22	U310	-	-	-	-	-	-	-	-	-	-	-	-	2	-	2	1	SCL	-
23	U310	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	±	<OL	-
A	U310	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	SCL	-
E	U310	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	OL	-
F	U310	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<OL	-
G	U310	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	±	OL	-
H	U310	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	OL	-
I	U310	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	OL	-
K	U310	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	OL	+++	-
L	U310	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	OL	-
M	U310	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+	-	OL	-
O	U302	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	OL	OL	-
U	U310	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	±	OL	-
V	U310	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	OL	-
W	U310	-	-	-	-	-	-	-	-	-	-	-	-	2	-	1	<OL	OL	-
Y	U310	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	OL	-
AA	U310	-	-	-	-	-	-	-	-	-	-	-	-	-	-	±	1-5	<CL	-

rivm

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	**41**	**CL**	**CL**	**CL**	**OL**	**CL**	**SCL**	**CL**	**-**	**CL**	**CL**	**-**	**-**	**CL**	**CL**	**CL**	**CL**	**CL**	**CL**
3	41	SCL	<CL	SCL	CL	SCL	SCL	SCL	-	SCL	SCL	-	-	CL	CL	CL	SCL	+++	+++
9	41	CL	CL	CL	CL	CL	CL	CL	-	<CL	CL	-	-	CL	CL	CL	CL	SCL	CL
10	41	+++	++	+++	+++	+++	++	+++	-	+++	++	-	-	+++	+++	SCL	SCL	+++	++
12	41	CL	SCL	SCL	OL	+++	CL	CL	5	CL	CL	-	-	CL	CL	CL	SCL	CL	CL
16	41	<CL	<CL	SCL	<CL	<CL	SCL	CL	-	CL	CL	-	-	CL	CL	CL	CL	<CL	SCL
18	41	CL	CL	SCL	CL	CL	CL	CL	-	CL	CL	-	-	CL	CL	CL	CL	CL	CL
22	41	<SCL	SCL	SCL	OL	SCL	CL	SCL	-	<CL	CL	-	-	CL	CL	CL	SCL	<CL	<SCL
23	41	<CL	<CL	<CL	OL	CL	SCL	CL	-	<CL	CL	-	-	CL	CL	CL	<CL	++	<CL
A	RDNC	-	SCL	SCL	SCL	SCL	+	SCL	-	+++	+++	-	-	SCL	SCL	SCL	++	SCL	SCL
E	41	CL	<CL	CL	OL	<CL	CL	CL	-	<CL	CL	-	-	CL	CL	CL	CL	<CL	<CL
F	41	CL	+	CL	SCL	CL	OL	CL	-	SCL	CL	-	-	CL	CL	CL	SCL	SCL	SCL
G	41	CL	+	+	CL	CL	CL	CL	-	CL	CL	-	-	CL	CL	CL	CL	<SCL	CL
H	41	SCL	CL	OL	SCL	<CL	CL	CL	-	CL	<CL	-	-	CL	CL	CL	CL	<CL	SCL
I	41	SCL	SCL	CL	OL	SCL	+++	CL	-	CL	CL	-	-	CL	CL	CL	CL	SCL	CL
K	41	++	SCL	++	SCL	+++	+++	SCL	-	SCL	SCL	-	-	+++	SCL	<CL	+++	+++	SCL
L	41	SCL	SCL	SCL	<CL	SCL	SCL	<CL	-	SCL	CL	-	-	CL	CL	CL	SCL	CL	SCL
M	41	SCL	SCL	<CL	<SCL	SCL	SCL	SCL	-	SCL	<CL	-	-	CL	<CL	CL	CL	<CL	SCL
O	41	CL	CL	CL	CL	CL	CL	CL	-	CL	CL	-	-	CL	CL	CL	CL	SCL	CL
U	41	CL	OL	CL	OL	SCL	SCL	CL	-	SCL	CL	-	-	CL	CL	CL	CL	<CL	CL
V	41	SCL	SCL	SCL	CL	SCL	<CL	SCL	-	SCL	SCL	-	-	<CL	<CL	<CL	<CL	-	<CL
W	41	CL	SCL	CL	CL	+++	SCL	SCL	5	CL	CL	-	-	CL	CL	CL	<CL	<CL	SCL
Y	41	SCL	SCL	SCL	SCL	SCL	SCL	SCL	-	SCL	SCL	-	-	SCL	SCL	SCL	SCL	SCL	SCL
AA	41	<CL	<CL	<CL	SCL	<CL	<CL	SCL	1-5	<CL	CL	-	-	<CL	<CL	<CL	SCL	<CL	SCL

Strain M-12 (continued)

		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**	**10var 2**	**18**
HPA	**41**	**CL**	**OL**	**OL**	**CL**	**CL**	**SCL**	**CL**	**CL**	**-**	**CL**	**CL**	**OL**	**+**	**+**	**+**	**OL**	**OL**	**OL**
3	41	+++	+++	CL	+++	+++	SCL	SCL	SCL	-	CL	<<SCL	CL						
9	41	CL	CL	CL	CL	CL	CL	CL	CL	-	CL	CL	CL	++	++	+	OL	SCL	++
10	41	+++	SCL	++	+++	SCL	+++	SCL	++	-	+++	++	+++	+	+	+	++	+	+
12	41	SCL	SCL	OL	CL	CL	SCL	OL	SCL	±	CL	+++	OL	±	+	+	OL	OL	OL
16	41	CL	<CL	CL	<CL	CL	SCL	CL	CL	–	CL	<CL	CL	+++	+++	+++	OL	OL•	CL
18	41	CL	CL	CL	CL	CL	CL	CL	CL	-	CL	CL	CL	+	+	+	OL	OL	OL
22	41	SCL	CL	CL	SCL	SCL	+	CL	CL	-	<CL	±	OL	±	+	±	SCL	SCL	OL
23	41	<CL	OL	<OL	<CL	<CL	++	<CL	<CL	2	CL	SCL	OL	±	+	+	SCL	SCL	<OL
A	RDNC	+++	SCL	SCL	SCL	SCL	+++	SCL	SCL	-	CL	SCL	SCL	+	+	-	+++	SCL	SCL
E	41	<CL	CL	<CL	<CL	CL	SCL	<CL	CL	-	CL	<CL	OL						
F	41	CL	SCL	SCL	CL	SCL	SCL	SCL	CL	-	CL	SCL	CL	+++	+++	+++	OL	<OL	OL
G	41	CL	CL	SCL	<SCL	CL	+	SCL	CL	-	CL	<CL	CL	±	+	+	CL	CL	CL
H	41	<CL	<CL	<CL	<CL	CL	SCL	<CL	SCL	-	CL	SCL	OL						
I	41	SCL	CL	<CL	CL	CL	CL	SCL	SCL	-	CL	<CL	CL						
K	41	SCL	SCL	SCL	SCL	CL	+++	SCL	SCL	-	CL	+++	CL	±	+	+	OL	+++	SCL
L	41	SCL	SCL	SCL	SCL	<CL	SCL	SCL	CL	-	CL	SCL	OL	-	+	+	OL	OL	OL
M	41	SCL	SCL	<CL	CL	SCL	CL	SCL	CL	-	CL	SCL	OL	+	+++	+++	OL	OL	CL
O	41	CL	CL	CL	CL	CL	CL	CL	CL	-	CL	CL	OL						
U	41	<CL	OL	OL	CL	CL	SCL	CL	CL	±	CL	<CL	OL						
V	41	<CL	SCL	SCL	SCL	SCL	SCL	SCL	SCL	-	OL	SCL	OL						
W	41	<SCL	CL	CL	CL	CL	SCL	SCL	SCL	5	CL	SCL	OL	±	+	+	OL	OL	CL
Y	41	SCL	SCL	SCL	-	SCL	SCL	SCL	SCL	±	SCL	SCL	SCL	+	+	+	OL	OL	SCL
AA	41	SCL	<CL	<CL	CL	CL	SCL	SCL	<CL	-	<CL	<CL	<<						

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	**2**	**-**	**CL**	**CL**	**OL**	**CL**	**CL**	**-**	**-**	**CL**	**CL**	**CL**	**CL**	**CL**	**CL**	**CL**	**CL**	**-**	**CL**
3	2	-	CL	CL	CL	<CL	SCL	-	-	+++	SCL	<<SCL	SCL	CL	CL	CL	CL	-	SCL
9	2	-	CL	CL	CL	CL	CL	-	-	CL	CL	CL	CL	CL	CL	CL	CL	-	CL
10	46	-	++	SCL	SCL	SCL	SCL	-	-	+++	<SCL	+++	+++	CL	CL	SCL	SCL	-	+++
12	2	3	SCL	SCL	OL	+++	CL	±	-	CL	CL	CL	CL	OL	CL	CL	+++	-	CL
16	2	–	SCL	SCL	<CL	<CL	CL•	–	–	<CL	CL•	<CL	CL	CL	CL	CL	CL	–	SCL
18	2	-	SCL	CL	CL	CL	CL	-	-	CL	CL	CL	CL	CL	CL	CL	CL	-	CL
22	2	-	<CL	SCL	OL	SCL	CL	-	-	<CL	CL	<CL	CL	CL	CL	CL	SCL	-	SCL
23	2	-	<CL	<CL	OL	<CL	<CL	-	-	<CL	<CL	<CL	CL	CL	CL	CL	CL	-	<CL
A	2	+	SCL	SCL	SCL	SCL	+++	-	-	+++	+++	SCL	SCL	SCL	SCL	SCL	++	-	SCL
E	2	-	CL	CL	OL	<CL	CL	-	-	CL	CL	CL	CL	CL	CL	CL	CL	-	CL
F	2	-	+	CL	SCL	CL	CL	-	-	SCL	CL	CL	CL	CL	CL	CL	SCL	-	SCL
G	2	-	SCL	<SCL	<SCL	SCL	OL	-	-	<SCL	CL	CL	CL	CL	CL	CL	<SCL	-	CL
H	2	-	<CL	CL	OL	<CL	CL	-	-	CL	<CL	<CL	<CL	CL	CL	CL	CL	-	<CL
I	2	-	CL	CL	CL	CL	CL	-	-	CL	CL	CL	CL	CL	CL	CL	CL	-	CL
K	2	-	SCL	+	SCL	SCL	SCL	-	-	SCL	SCL	SCL	SCL	++	SCL	SCL	+++	-	SCL
L	2	-	SCL	SCL	OL	<CL	<CL	-	-	SCL	CL	SCL	SCL	CL	CL	CL	CL	-	CL
M	2	-	,CL	CL	OL	CL	CL	-	-	SCL	CL	CL	CL	CL	CL	CL	CL	-	SCL
O	2	-	CL	CL	CL	CL	CL	-	-	CL	CL	CL	CL	CL	CL	CL	CL	-	CL
U	2	-	<OL	CL	OL	SCL	<CL	-	-	SCL	CL	CL	CL	CL	CL	CL	CL	-	CL
V	2	-	SCL	OL	OL	OL	OL	-	-	OL	OL	OL	OL	OL	OL	OL	OL	-	OL
W	2	-	SCL	CL	OL	SCL	CL	-	-	CL	CL	CL	CL	CL	CL	CL	CL	-	<CL
Y	46	-	SCL	SCL	SCL	SCL	SCL	-	-	SCL	SCL	SCL	SCL	SCL	SCL	SCL	SCL	-	SCL
AA	135	-	,CL	CL	<CL	<CL	<CL	-	-	CL	CL	CL	CL	<CL	<CL	<CL	SCL	-	SCL

Strain M-13 (continued)

		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**	**10var 2**	**18**
HPA	**2**	**CL**	**CL**	**OL**	**CL**	**CL**	**SCL**	**CL**	**CL**	**-**	**CL**	**CL**	**OL**	**+**	**+**	**+**	**OL**	**OL**	**OL**
3	2	SCL	SCL	CL	CL	+++	<<SCL	SCL	SCL	-	CL	<<SCL	OL						
9	2	<CL	CL	<CL	<CL	<CL	CL	CL	CL	-	CL	CL	CL	-	-	-	OL	SCL	++
10	46	SCL	+++	+++	+++	SCL	SCL	SCL	+++	-	SCL	SCL	SCL	+	+	±	+++	++	+
12	2	+++	SCL	SCL	SCL	CL	SCL	OL	+++	4	OL	SCL	OL	5	+	±	OL	OL	OL
16	2	<CL	SCL	CL	<CL	CL	<CL	CL	CL	–	CL	<CL	CL	++	++	++	OL	OL	CL
18	2	CL	CL	CL	CL	CL	CL	CL	CL	1	CL	CL	CL	+	+	+	OL	OL	OL
22	2	<SCL	CL	<CL	SCL	SCL	SCL	CL	CL	-	CL	SCL	<CL	±	+	+	SCL	SCL	OL
23	2	<CL	<CL	<CL	<CL	CL	<CL	<CL	CL	-	OL	SCL	OL	±	±	±	OL	OL	CL
A	2	+++	SCL	SCL	SCL	SCL	+++	SCL	SCL	-	SCL	SCL	SCL	++	+++	++	+++	SCL	SCL
E	2	<CL	CL	CL	CL	CL	<CL	CL	CL	-	CL	<CL	OL						
F	2	CL	SCL	SCL	CL	SCL	SCL	SCL	CL	-	CL	SCL	OL	+++	+++	+++	OL	<OL	CL
G	2	CL	CL	<SCL	CL	CL	+	SCL	CL	-	OL	SCL	OL	±	±	±	CL	CL	CL
H	2	<CL	CL	<CL	CL	CL	SCL	<CL	<CL	-	CL	<CL	OL						
I	2	CL	CL	CL	CL	CL	CL	CL	CL	-	CL	CL	CL						
K	2	SCL	SCL	SCL	SCL	SCL	SCL	SCL	SCL	-	SCL	+++	SCL	+	+	++	OL	+++	SCL
L	2	SCL	SCL	SCL	SCL	CL	SCL	SCL	CL	-	CL	SCL	OL	-	+	+	OL	OL	OL
M	2	SCL	SCL	SCL	CL	CL	CL	SCL	CL	-	CL	<CL	OL	+	+++	+++	OL	OL	CL
O	2	CL	CL	CL	CL	CL	CL	CL	CL	+	CL	CL	CL						
U	2	<CL	OL	OL	CL	CL	CL	CL	CL	-	CL	<CL	OL						
V	2	OL	OL	SCL	SCL	OL	OL	SCL	OL	-	OL	SCL	OL						
W	2	<CL	CL	CL	CL	CL	<CL	CL	CL	5	CL	SCL	OL	4	+	+	OL	OL	CL
Y	46	SCL	SCL	SCL	SCL	SCL	SCL	SCL	SCL	+	SCL	SCL	SCL	+	+	+	OL	OL	SCL
AA	135	SCL	<CL	<CL	CL	CL	<CL	<CL	<CL	-	CL	<CL	SCL						

Strain M-14

Lab code	Phage type	Phages at Routine Test Dilution (*S.*Typhimurium)																	
		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**	**CL**	**OL**	**OL**	**OL**	**OL**	**OL**	**OL**	**OL**	**OL**	**CL**	**OL**
3	36	SCL	SCL	SCL	CL	SCL	SCL	SCL	SCL	+++	CL	<<SCL	SCL	CL	CL	CL	SCL	SCL	SCL
9	36	CL	CL	CL	CL	<CL	CL	CL	CL	CL	CL	CL	CL	CL	CL	CL	CL	CL	CL
10	36	SCL	<SCL	SCL	SCL	SCL	SCL	SCL	+++	+++	+++	+++	+++	CL	SCL	SCL	SCL	CL	SCL
12	36	CL	OL	SCL	OL	+++	CL	CL	CL	CL	CL	CL	CL	OL	OL	OL	SCL	OL	CL
16	36	SCL	CL	SCL	CL	CL	CL	CL	CL	CL	CL	<CL	CL	CL	CL	CL	CL	CL	<CL
18	36	SCL	CL	CL	CL	CL	CL	CL	CL	CL	CL	CL	CL	CL	CL	CL	CL	CL	CL
22	36	SCL	<CL	<CL	OL	<CL	CL	<CL	CL	CL	CL	SCL	CL	CL	CL	CL	<CL	CL	SCL
23	36	CL	CL	<CL	OL	CL	<CL	CL	SCL	CL	CL	SCL	<CL	CL	CL	CL	CL	<CL	CL
A	36	++	SCL	SCL	SCL	SCL	++	SCL	SCL	+++	+++	SCL	SCL	SCL	SCL	SCL	++	SCL	SCL
E	36	CL	CL	CL	OL	CL	CL	CL	CL	CL	CL	CL	CL	CL	CL	CL	CL	CL	CL
F	36	SCL	++	CL	CL	CL	CL	CL	CL	SCL	CL	SCL	SCL	CL	CL	CL	SCL	SCL	SCL
G	36	CL	SCL	SCL	CL	CL	CL	CL	CL	CL	CL	CL	CL	CL	CL	CL	CL	CL	CL
H	36	<CL	,CL	CL	OL	<CL	CL	CL	CL	CL	CL	<CL	CL	CL	CL	CL	CL	<CL	<CL
I	36	CL	CL	CL	CL	CL	CL	CL	CL	CL	CL	CL	CL	CL	CL	CL	CL	CL	CL
K	36	++	SCL	++	SCL	SCL	SCL	SCL	CL	SCL	SCL	SCL	SCL	++	SCL	SCL	++	<SCL	SCL
L	36	<CL	SCL	SCL	OL	CL	CL	CL	<CL	SCL	CL	SCL	SCL	CL	CL	CL	CL	CL	CL
M	36	CL	CL	CL	CL	CL	CL	CL	CL	SCL	CL	CL	CL	CL	CL	CL	CL	CL	CL
O	36	CL	CL	CL	CL	CL	CL	CL	CL	CL	CL	CL	CL	CL	CL	CL	CL	CL	CL
U	36	CL	<OL	CL	OL	SCL	<CL	CL	CL	<SCL	CL	<CL	<CL	CL	CL	CL	CL	CL	CL
V	36	SCL	SCL	SCL	OL	OL	OL	OL	SCL	SCL	OL	OL	OL	OL	OL	OL	OL	SCL	OL
W	36	CL	<CL	CL	OL	<CL	CL	CL	CL	CL	CL	SCL	<CL	CL	CL	CL	CL	CL	CL
Y	36	CL	SCL	CL	OL	SCL	CL	CL	SCL	SCL	SCL	SCL	SCL	SCL	SCL	SCL	SCL	SCL	SCL
AA	36	<CL	<CL	<CL	SCL	<CL	<CL	SCL	CL	CL	CL	CL	CL	<CL	<CL	CL	SCL	<CL	SCL

Strain M-14 (continued)

		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**	**SCL**	**OL**	**OL**	**OL**	**OL**	**OL**	**OL**	**+**	**++**	**+**	**OL**	**OL**	**OL**
3	36	SCL	SCL	CL	SCL	SCL	+++	SCL	SCL	SCL	CL	+++	OL						
9	36	CL	CL	CL	CL	CL	<CL	SCL	CL	CL	CL	CL	OL	++	++	++	OL	SCL	++
10	36	SCL	SCL	SCL	SCL	SCL	SCL	SCL	+++	SCL	SCL	SCL	SCL	+	+	±	+++	+	+
12	36	SCL	OL	OL	CL	CL	SCL	OL	OL	OL	CL	SCL	OL	+	±±	±±	OL	OL	OL
16	36	CL	<CL	CL	CL	CL	<CL	CL	CL	CL	CL	CL	CL	++	++	+++	OL	<OL	CL
18	36	CL	CL	CL	+L	CL	CL	CL	CL	OL	CL	CL	CL	+	+	+	OL	OL	OL
22	36	SCL	CL	CL	<CL	SCL	SCL	CL	CL	CL	<CL	SCL	OL	++	++	++	<OL	<OL	OL
23	36	<CL	CL	CL	CL	CL	++	<CL	<CL	OL	CL	<CL	OL	+	++	+	OL	OL	CL
A	36	+++	SCL	SCL	SCL	SCL	+++	SCL	SCL	SCL	SCL	SCL	SCL	+++	+++	++	SCL	SCL	SCL
E	36	CL	CL	CL	CL	CL	<CL	CL	CL	CL	CL	CL	OL						
F	36	CL	SCL	CL	CL	SCL	SCL	CL	CL	CL	CL	SCL	CL	+++	+++	+++	OL	<OL	CL
G	36	CL	CL	CL	CL	CL	CL	CL	CL	CL	CL	CL	CL	SCL	SCL	SCL	CL	CL	CL
H	36	<CL	<CL	CL	<CL	CL	SCL	<CL	<CL	<CL	CL	<CL	OL						
I	36	CL	CL	CL	CL	CL	CL	CL	CL	CL	CL	CL	CL						
K	36	<SCL	SCL	SCL	SCL	SCL	SCL	SCL	SCL	SCL	SCL	+++	SCL	+	++	+++	OL	+++	SCL
L	36	CL	SCL	<CL	SCL	CL	SCL	SCL	CL	SCL	CL	SCL	OL	-	+	+	OL	OL	OL
M	36	SCL	SCL	<CL	CL	CL	CL	SCL	CL	CL	CL	CL	OL	+++	+++	+++	OL	OL	CL
O	36	CL	CL	CL	CL	CL	CL	CL	CL	CL	CL	CL	OL						
U	36	<CL	OL	OL	CL	CL	SCL	CL	CL	OL	CL	<CL	OL						
V	36	OL	OL	SCL	OL	OL	OL	OL	OL	OL	OL	OL	OL						
W	36	<CL	CL	CL	CL	CL	<CL	CL	<CL	OL	CL	<CL	OL	++	++	+++	OL	OL	CL
Y	36	SCL	SCL	SCL	SCL	SCL	SCL	SCL	SCL	SCL	SCL	SCL	SCL	++	++	++	OL	OL	SCL
AA	36	SCL	<CL	<CL	CL	CL	<CL	SCL	CL	<CL	CL	<CL	<<						

rivm

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	**193**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3	193	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
9	193	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
10	195	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12	193	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
16	193	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
18	193	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
22	193	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
23	193	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
A	193	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
E	194	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F	193	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
G	193	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
H	193	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
I	193	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
K	193	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
L	193	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
M	193	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
O	194	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
U	193	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
V	193	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W	193	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Y	193	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
AA	193	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Strain M-15 (continued)

		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**	**10var2**	**18**
HPA	**193**	-	-	-	-	-	-	-	-	-	-	-	-	+++	+++	+++	+	-	-
3	193	-	-	-	-	-	-	-	-	-	-	-	-	+	+++	+++	-	-	-
9	193	-	-	-	-	-	-	-	-	-	-	-	-	<SCL	<SCL	+++	-	-	-
10	195	-	-	-	-	-	-	-	-	-	-	-	-	++	+	±	-	-	-
12	193	-	-	-	-	-	-	-	-	-	-	-	-	+++	+++	+++	+	±±±	-
16	193	-	-	-	-	-	-	-	-	-	-	-	-	+++	SCL	SCL	-	-	-
18	193	-	-	-	-	-	-	-	-	-	-	-	-	+	+	+	-	-	-
22	193	-	-	-	-	-	-	-	-	-	-	-	-	SCL	SCL	SCL	SCL	SCL	-
23	193	-	-	-	-	-	-	-	-	-	-	-	-	++	SCL	+++	-	-	-
A	193	-	-	-	-	-	-	-	-	-	-	-	-	+	++	+	-	-	-
E	194	-	-	-	-	-	-	-	-	-	-	-	-	±	SCL	±	<OL	-	-
F	193	-	-	-	-	-	-	-	-	-	-	-	-	+++	+++	+++	-	-	-
G	193	-	-	-	-	-	-	-	-	-	-	-	-	SCL	SCL	SCL	-	-	-
H	193	-	-	-	-	-	-	-	-	-	-	-	-	<<	<<	SCL	-	-	-
I	193	-	-	-	-	-	-	-	-	-	-	-	-	SCL	++	+++	SCL	SCL	-
K	193	-	-	-	-	-	-	-	-	-	-	-	-	+	++	+++	OL	-	-
L	193	-	-	-	-	-	-	-	-	-	-	-	-	++	+++	++	-	-	-
M	193	-	-	-	-	-	-	-	-	-	-	-	-	+++	<CL	SCL	-	-	-
O	194	-	-	-	-	-	-	-	-	-	-	-	-	-	SCL	-	OL	OL	-
U	193	-	-	-	-	-	-	-	-	-	-	-	-	++	<SCL	SCL	OL	<OL	-
V	193	-	-	-	-	-	-	-	-	-	-	-	-	<SCL	SCL	<SCL	-	-	-
W	193	-	-	-	-	-	-	-	-	-	-	-	-	+++	+++	+++	OL	OL	-
Y	193	-	-	-	-	-	-	-	-	-	-	-	-	++	++	++	<OL	<OL	-
AA	193	-	-	-	-	-	-	-	-	-	-	-	-	SCL	SCL	<CL	<OL	<CL	-

rivm

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	**208**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3	208	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
9	U302	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
10	U302	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12	208	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
16	208	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
18	208	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
22	208	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
23	U302	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
A	208	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
E	U302	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F	U302	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
G	208	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
H	U302	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
I	U302	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
K	208	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
L	208	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
M	208	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
O	208	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
U	U302	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
V	208	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
W	208	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Y	U302	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
AA	U302	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Strain M-16 (continued)

		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	**208**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+++	+++	**OL**
3	208	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	OL	+	+++
9	U302	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	OL	SCL	-
10	U302	-	-	-	-	-	-	-	-	-	-	-	-	-	-	±	-	-	-
12	208	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	OL	OL	+
16	208	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	SCL	SCL	SCL
18	208	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	OL	OL	OL
22	208	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	SCL	SCL	+
23	U302	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<OL	SCL	-
A	208	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	++	+++	+++
E	U302	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<OL	SCL	±
F	U302	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	OL	<OL	<OL
G	208	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	CL	CL	OL
H	U302	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<SCL	<SCL	-
I	U302	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	OL	OL	±
K	208	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	OL	+++	+
L	208	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	OL	OL	OL
M	208	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<OL	<OL	<SCL
O	208	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	OL	OL	OL
U	U302	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	OL	<OL	-
V	208	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	OL	OL	SCL
W	208	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	OL	OL	±
Y	U302	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	OL	OL	-
AA	U302	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<OL	<CL	1-5

rivm

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	**4**	-	-	-	**OL**	**CL**	**SCL**	-	-	**CL**	**CL**	++	++	-	**CL**	**CL**	-	-	**CL**
3	4	-	-	-	CL	SCL	SCL	-	-	SCL	SCL	+	++	-	CL	SCL	-	-	SCL
9	4	-	-	-	CL	<CL	SCL	-	-	CL	CL	++	++	-	CL	CL	-	-	CL
10	4	-	-	-	SCL	++	++	-	-	+++	++	±	±	-	+++	SCL	-	-	+
12	4	-	+	-	OL	±±	CL	-	-	CL	CL	SCL	SCL	++	CL	CL	±	-	SCL
16	4	-	-	-	<CL	<CL	<CL	-	-	<CL	OL	+	++	-	OL	CL	-	-	SCL
18	4	-	-	-	SCL	SCL	SCL	-	-	SCL	OL	SCL	SCL	-	SCL	SCL	-	-	+
22	4	-	±	-	OL	<SCL	CL	-	-	<CL	CL	SCL	<CL	+	CL	CL	4	-	±
23	4	-	-	-	<CL	SCL	SCL	-	-	<CL	<CL	±	+	-	CL	<CL	-	-	SCL
A	141	-	-	-	SCL	SCL	+	-	-	SCL	++	++	++	-	SCL	SCL	-	-	SCL
E	4	-	-	-	CL	SCL	<CL	-	-	CL	CL	++	<SCL	±	CL	CL	±	-	SCL
F	4	-	-	-	+++	SCL	OL	-	-	SCL	OL	++	+++	-	OL	CL	-	-	+++
G	4	-	-	-	CL	CL	CL	-	-	SCL	CL	±	+	-	CL	CL	-	-	SCL
H	52a	-	-	-	<CL	<<	SCL	-	-	CL	SCL	-	-	-	<CL	CL	-	-	SCL
I	4	-	-	-	OL	SCL	+++	-	-	<CL	+++	SCL	SCL	-	CL	CL	-	-	<CL
K	4	-	5	-	SCL	+++	+++	-	-	SCL	SCL	+++	+++	-	CL	CL	-	-	CL
L	4	-	-	-	SCL	SCL	<CL	-	-	SCL	<CL	+++	+++	-	CL	CL	-	-	SCL
M	4	-	-	-	SCL	SCL	SCL	-	-	<SCL	SCL	SCL	SCL	-	SCL	CL	-	-	SCL
O	4	-	-	-	CL	CL	CL	-	-	CL	+++	+++	CL	-	CL	SCL	SCL	-	CL
U	135	-	+	+	<OL	<SCL	SCL	-	-	+	<OL	<CL	<CL	<SCL	SCL	CL	SCL	-	<SCL
V	4	-	-	-	<CL	<CL	<CL	-	-	<CL	<CL	++	++	-	<CL	<CL	-	-	CL
W	4	-	-	-	OL	SCL	<CL	-	-	OL	OL	SCL	OL	-	OL	OL	-	-	OL
Y	4	-	-	±	CL	++	CL	-	-	SCL	SCL	++	+++	-	CL	CL	-	-	+++
AA	4	-	-	-	SCL	SCL	+++	-	-	<CL	<CL	SCL	SCL	-	SCL	<CL	-	-	SCL

Strain M-17 (continued)

		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	**4**	**CL**	**±**	**OL**	**CL**	**-**	**++**	**++**	**CL**	**-**	**CL**	**CL**	**OL**	**++**	**++**	**++**	**OL**	**OL**	**±**
3	4	SCL	-	CL	SCL	-	SCL	±	SCL	-	CL	<<SCL	OL						
9	4	CL	-	CL	CL	-	+++	+	<CL	-	CL	<CL	CL	-	++	-	OL	SCL	-
10	4	SCL	-	+++	+++	-	++	+	++	-	CL	SCL	SCL	±	±	±	+++	++	-
12	4	+	±	SCL	SCL	-	SCL	±	SCL	±	OL	SCL	OL	±±	±±	±±	OL	OL	++
16	4	CL	-	<CL	<CL	-	SCL	+<<	CL	3	CL	<CL	CL	++	++	+++<<	OL	<OL	±
18	4	+	-	SCL	+	-	SCL	+	SCL	-	SCL	CL	OL	-	-	-	OL	OL	-
22	4	SCL	+	<OL	SCL	-	+	SCL	CL	-	<CL	<<SCL	OL	+	+	+	<OL	<OL	<CL
23	4	SCL	-	<CL	<CL		+	2	SCL	3	CL	<CL	CL	+	+	+	OL	<OL	-
A	141	SCL	-	SCL	SCL	-	+++	++	SCL	+	SCL	SCL	SCL	+	+	+	SCL	SCL	-
E	4	<CL	±	<OL	SCL	-	SCL	-	CL	-	CL	<CL	OL						
F	4	SCL	-	SCL	CL	-	+++	++	CL	-	CL	SCL	CL	+++	+++	+++	OL	<OL	-
G	4	CL	-	SCL	CL	-	+	±	CL	-	CL	CL	CL	±	+	+	CL	CL	±
H	52a	<CL	-	<CL	<<	-	<<	-	SCL	-	CL	SCL	CL						
I	4	SCL	±	CL	CL	-	CL	-	+++	-	CL	CL	CL						
K	4	SCL	±	SCL	SCL	-	SCL	+	SCL	-	SCL	SCL	SCL	±	+	+	OL	+++	++
L	4	SCL	-	<CL	SCL	-	SCL	-	CL	-	CL	SCL	OL	+	++	+	OL	OL	+
M	4	SCL	-	SCL	CL	-	SCL	-	CL	-	SCL	SCL	OL	+	+++	++	OL	OL	<SCL
O	4	CL	+	CL	CL	-	SCL	-	CL	+	CL	SCL	CL						
U	135	<SCL	<SCL	<CL	<CL	++	<SCL	<SCL	CL	-	CL	<SCL	OL						
V	4	<CL	+	SCL	SCL	-	SCL	+	OL	-	OL	SCL	OL						
W	4	OL	-	OL	OL	-	SCL	2	<CL	4	OL	SCL	OL	++	++	++	OL	OL	-
Y	4	SCL	-	SCL	SCL	-	++	±	SCL	-	SCL	SCL	SCL	-	-	-	OL	OL	-
AA	4	SCL	-	SCL	<CL	-	SCL	1-5	CL	-	<CL	<CL	SCL						

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	**104**	-	-	-	-	-	-	-	-	-	-	++	**SCL**	-	-	-	-	++	-
3	104	-	-	-	-	-	-	-	-	-	-	+	SCL	-	-	-	-	±	-
9	104	-	-	-	-	-	-	-	-	-	-	++	+++	-	-	-	-	+	-
10	104b	-	-	-	-	-	-	-	-	-	-	-	-	±	-	-	-	++	-
12	104	-	-	-	-	-	-	-	5	-	-	SCL	SCL	-	-	-	-	+++	-
16	104	-	-	-	-	-	-	-	-	-	-	+	++<<	-	-	-	-	+	-
18	104	-	-	-	-	-	-	-	-	-	-	SCL	SCL	-	-	-	-	+	-
22	104	-	-	-	-	-	-	-	-	-	-	±	<CL	-	-	-	-	++	-
23	104	-	-	-	-	-	-	-	-	-	-	±	+	-	-	-	-	±	-
A	104	-	-	-	-	-	-	-	-	-	-	+++	+++	-	-	-	-	+++	-
E	104	-	-	-	-	-	-	-	-	-	-	<CL	CL	-	-	-	-	SCL	-
F	104	-	-	-	-	-	-	-	-	-	-	SCL	SCL	-	-	-	-	+++	-
G	104	-	-	-	-	-	-	-	-	-	-	+	<SCL	-	-	-	-	+	-
H	104	-	-	-	-	-	-	-	-	-	-	<<	SCL	-	-	-	-	<<	-
I	104	-	-	-	-	-	-	-	-	-	-	++	CL	-	-	-	-	++	-
K	104	-	-	-	-	-	-	-	-	-	-	SCL	SCL	-	-	-	-	++	2
L	104	-	-	-	-	-	-	-	-	-	-	SCL	SCL	-	-	-	-	+++	-
M	104	-	-	-	-	-	-	-	-	-	-	SCL	SCL	-	-	-	-	+++	-
O	104	-	-	-	-	-	-	-	-	-	-	CL	CL	-	-	-	-	SCL	-
U	104	-	-	-	-	-	-	-	-	-	-	<CL	CL	-	-	-	-	<CL	-
V	104	-	-	-	-	-	-	-	-	-	-	SCL	SCL	-	-	-	-	SCL	-
W	104	-	-	-	-	-	-	-	-	-	-	<SCL	CL	-	-	-	-	+++	-
Y	104	-	-	-	-	-	-	-	-	-	-	SCL	SCL	-	-	-	-	+	-
AA	104	-	-	-	-	-	-	-	-	-	-	SCL	<CL	-	-	-	-	+	-

Strain M-18 (continued)

		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	104	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	OL	SCL	-
10	104b	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+++	+	-
12	104	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	OL	OL	-
16	104	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	OL	OL	-
18	104	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	OL	OL	-
22	104	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<OL	<OL	1
23	104	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	OL	OL	-
A	104	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	SCL	SCL	-
E	104	-	-	-	-	-	-	-	-	-	-	-	-						
F	104	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	OL	<OL	-
G	104	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	CL	CL	-
H	104	-	-	-	-	-	-	-	-	-	-	-	-						
I	104	-	-	-	-	-	-	-	-	-	-	-	±						
K	104	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	OL	SCL	-
L	104	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	OL	OL	-
M	104	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	OL	OL	-
O	104	-	-	-	-	-	-	-	-	-	-	-	-						
U	104	-	-	-	-	-	-	-	-	-	-	-	-						
V	104	+	-	-	-	-	-	-	-	-	-	-	-						
W	104	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	OL	OL	-
Y	104	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	OL	OL	-
AA	104	-	-	-	-	-	-	-	-	-	-	-	-						

Strain M-19

Lab code	Phage type	Phages at Routine Test Dilution (*S.*Typhimurium)																	
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**
HPA	**9**	-	-	-	-	-	-	-	**CL**	**CL**	**CL**	**CL**	**CL**	-	-	**SCL**	-	-	-
3	9	-	-	-	-	-	-	-	SCL	SCL	+++	SCL	SCL	-	-	SCL	-	-	-
9	9	-	-	-	-	-	-	-	CL	CL	CL	CL	CL	-	-	CL	-	-	-
10	9	-	-	-	-	-	-	-	SCL	++	+	+	++	-	-	++	-	-	-
12	9	-	-	-	-	-	-	-	CL	SCL	OL	CL	CL	1	-	SCL	-	-	-
16	9	-	-	-	-	-	-	-	CL	<CL	<CL	<CL	CL	-	-	<CL	-	-	-
18	9	-	-	-	-	-	-	-	CL	SCL	SCL	CL	CL	-	-	SCL	-	-	-
22	9	-	-	-	-	-	-	-	CL	<CL	<OL	<CL	CL	-	-	±	-	-	-
23	9	-	-	-	-	-	-	-	CL	<CL	<CL	<CL	<CL	-	-	<CL	-	-	-
A	9	-	-	-	-	-	-	-	SCL	+++	++	SCL	SCL	-	-	SCL	-	-	-
E	9	-	-	-	-	-	-	-	CL	SCL	CL	SCL	CL	-	-	CL	-	-	-
F	9	-	-	-	-	-	-	-	CL	SCL	CL	CL	CL	-	-	SCL	-	-	-
G	9	-	-	-	-	-	-	-	CL	CL	CL	CL	CL	-	-	CL	-	-	-
H	9	-	-	-	-	-	-	-	CL	<CL	SCL	<CL	<CL	-	-	SCL	-	-	-
I	9	-	-	-	-	-	-	-	CL	+++	SCL	CL	CL	-	-	SCL	-	-	-
K	9	-	-	-	-	-	-	-	CL	SCL	OL	SCL	SCL	-	-	SCL	-	-	-
L	9	-	-	-	-	-	-	-	<CL	SCL	<CL	SCL	CL	-	-	SCL	-	-	-
M	9	-	-	-	-	-	-	-	CL	+++	<CL	CL	CL	-	-	SCL	-	-	-
O	9	-	-	-	-	-	-	-	CL	SCL	OL	CL	CL	-	-	SCL	-	-	-
U	9	-	-	-	-	-	-	-	CL	<SCL	<OL	CL	CL	-	-	<CL	-	-	-
V	9	-	-	-	-	-	-	-	SCL	SCL	SCL	SCL	SCL	-	-	+++	-	-	-
W	9	-	-	-	-	-	-	-	CL	CL	<CL	<CL	CL	-	-	SCL	-	-	-
Y	9	-	-	-	-	-	-	-	SCL	SCL	SCL	SCL	SCL	-	-	SCL	-	-	-
AA	9	-	-	-	-	-	-	-	CL	CL	CL	CL	CL	-	-	±	-	-	-

Strain M-19 (continued)

		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	**9**	**CL**	**±**	**OL**	**CL**	**-**	**±**	**++**	**-**	**-**	**CL**	**CL**	**-**	**+**	**+**	**+**	**OL**	**OL**	**-**
3	9	SCL	±	CL	SCL	-	±	±	-	-	CL	+++	-						
9	9	SCL	-	CL	CL	-	-	-	-	-	CL	SCL	-	++	++	+	OL	SCL	-
10	9	SCL	-	++	+++	-	±	+	-	-	CL	SCL	-	±	±	±	+++	++	-
12	9	++	1	OL	SCL	-	3	±	-	-	OL	SCL	-	±	+	±	OL	OL	-
16	9	CL	-	CL	<CL	-	2	+	-	-	CL	<CL	-	+	++	+++	OL	<OL	-
18	9	+	+	OL	+	-	-	+	-	-	SCL	CL	-	+	+	+	OL	OL	-
22	9	<<SCL	2	<OL	<SCL	-	-	+	-	-	<CL	±	-	+	±	+	<OL	<OL	±
23	9	SCL	±	<CL	<CL	-	-	2	-	-	CL	SCL	-	±	+	+	OL	<OL	-
A	9	SCL	+	SCL	SCL	-	-	++	-	-	SCL	SCL	-	++	+++	++	SCL	SCL	-
E	9	SCL	-	<CL	<CL	-	-	±	-	-	CL	<CL	-						
F	9	CL	-	CL	CL	-	-	-	-	-	OL	SCL	-	+++	+++	+++	OL	<OL	-
G	9	SCL	-	SCL	SCL	-	-	±	-	-	CL	SCL	-	+	+	+	CL	CL	-
H	9	SCL	-	<CL	<CL	-	-	+	-	-	CL	SCL	-						
I	9	SCL	-	CL	CL	-	++	±	-	-	CL	CL	-						
K	9	SCL	+	SCL	SCL	-	-	+	-	-	SCL	SCL	-	+	+	+	OL	SCL	-
L	9	SCL	-	CL	SCL	-	-		-	-	CL	SCL	-	-	+	-	OL	OL	-
M	9	+++	-	CL	<CL	-	-	-	-	-	<CL	SCL	-	++	+++	+++	OL	OL	-
O	9	CL	-	CL	CL	-	-	-	-	-	CL	CL	-						
U	9	<CL	-	OL	CL	-	+	+	-	-	CL	<CL	-						
V	9	SCL	1	SCL	SCL	-	1	1	-	-	OL	SCL	-						
W	9	SCL	11	CL	CL	-	-	±	-	-	CL	++	-	+	+	+	OL	OL	-
Y	9	SCL	±	SCL	SCL	-	+	-	-	-	SCL	SCL	-	+	+	+	OL	OL	-
AA	9	SCL	-	<CL	CL	-	-	1-5	-	-	<CL	<CL	-						

rivm

Strain M-20

Lab code	Phage type	Phages at Routine Test Dilution (*S.*Typhimurium)																	
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**
HPA	**110**	-	-	-	-	-	-	-	-	-	-	-	**CL**	-	-	-	-	**CL**	-
3	110	-	-	-	-	-	-	-	-	-	-	-	OL	-	-	-	-	SCL	-
9	110	-	-	-	-	-	-	-	-	-	-	-	CL	-	-	-	-	CL	-
10	110	-	-	-	-	-	-	-	-	-	-	-	+++	-	-	-	-	CL	-
12	110	-	-	-	-	-	-	-	±	-	-	-	CL	-	-	-	-	CL	-
16	110	-	-	-	-	-	-	-	-	-	-	-	<CL	-	-	-	-	<CL	-
18	110	-	-	-	-	-	-	-	-	-	-	-	CL	-	-	-	-	CL	-
22	110	-	-	-	-	-	-	-	-	-	-	-	<CL	-	-	-	-	CL	-
23	110	-	-	-	-	-	-	-	-	-	-	-	<CL	-	-	-	-	SCL	-
A	110	-	-	-	-	-	-	-	-	-	-	-	SCL	-	-	-	-	CL	-
E	110	-	-	-	-	-	-	-	-	-	-	±	CL	-	-	-	-	CL	-
F	110	-	-	-	-	-	-	-	-	-	-	-	CL	-	-	-	-	SCL	-
G	110	-	-	-	-	-	-	-	-	-	-	-	CL	-	-	-	-	CL	-
H	110	-	-	-	-	-	-	-	-	-	-	-	<CL	-	-	-	-	<CL	-
I	110	-	-	-	-	-	-	-	-	-	-	-	CL	-	-	-	-	CL	-
K	110	-	-	-	-	-	-	-	-	-	-	-	SCL	-	-	-	-	SCL	-
L	110	-	-	-	-	-	-	-	-	-	-	-	CL	-	-	-	-	CL	-
M	110	-	-	-	-	-	-	-	-	-	-	-	CL	-	-	-	-	CL	-
O	110	-	-	-	-	-	-	-	-	-	-	-	CL	-	-	-	-	SCL	-
U	110	-	-	-	-	-	-	-	-	-	-	-	CL	-	-	-	-	CL	-
V	110	-	-	-	-	-	-	-	-	-	-	-	<CL	-	-	-	-	SCL	-
W	110	-	-	-	-	-	-	-	6	-	-	-	CL	-	-	-	-	CL	-
Y	110	-	-	-	-	-	-	-	-	-	-	-	SCL	-	-	-	-	CL	-
AA	110	-	-	-	-	-	-	-	-	-	-	-	<CL	-	-	-	-	<CL	-

Strain M-20 (continued)

		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	**110**	-	-	-	-	-	-	-	±	-	-	-	-	+	+	+	**OL**	**OL**	-
3	110	-	-	-	-	-	-	-	-	-	-	-	-						
9	110	-	-	-	-	-	-	-	±	-	-	-	+	++	++	++	OL	SCL	-
10	110	-	-	-	-	-	-	-	-	-	-	-	-	+	±	±	+++	++	-
12	110	-	-	-	-	-	-	-	-	-	-	-	-	+	±±	±±	OL	OL	-
16	110	-	-	-	-	-	-	-	±	-	-	-	±	++	++	+++	OL	<OL	-
18	110	-	-	-	-	-	-	-	-	-	-	-	-	+	+	+	OL	OL	-
22	110	-	-	-	-	-	-	-	1	-	-	-	-	±	±	+	<OL	<OL	-
23	110	-	-	-	-	-	-	-	-	-	-	-	-	+	++	+	OL	OL	-
A	110	-	-	-	-	-	-	-	-	-	-	-	-	+	+	+	SCL	SCL	-
E	110	-	-	-	-	-	-	-	±	-	-	-	-						
F	110	-	-	-	-	-	-	-	-	-	-	-	-	+++	+++	+++	OL	<OL	-
G	110	-	-	-	-	-	-	-	-	-	-	-	±	±	+	+	CL	CL	-
H	110	-	-	-	-	-	-	-	±	-	-	-	+						
I	110	-	-	-	-	-	-	-	-	-	-	-	-						
K	110	-	-	-	-	-	-	-	4	-	-	-	-	+	++	+++	OL	SCL	-
L	110	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	OL	OL	-
M	110	-	-	-	-	-	-	-	-	-	-	-	-	+	+++	+++	OL	OL	-
O	110	-	-	-	-	-	-	-	-	-	-	-	-						
U	110	-	-	-	-	-	-	-	-	-	-	-	-						
V	110	-	-	-	-	-	-	-	-	-	-	-	1						
W	110	-	-	-	-	-	-	-	-	-	-	-	1	++	++	++	OL	OL	-
Y	110	-	-	-	-	-	-	-	±	-	-	-	±	+	+	+	OL	OL	-
AA	110	-	-	-	-	-	-	-	-	-	-	-	-						