Interim Summary Report

EURL-*Salmonella* Proficiency Test Serotyping 2022

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1. Introduction

This interim summary report describes the overall results on the serotyping part of the Proficiency Test (PT) on typing of *Salmonella*, organised by the European Union Reference Laboratory for *Salmonella* (EURL-*Salmonella*, Bilthoven, the Netherlands) in November 2022. Results regarding the part on Cluster Analysis will be reported separately.
A total of 34 laboratories participated in the PT 2022. These included 27 National Reference Laboratories for *Salmonella* (NRLs-*Salmonella)* in the 27 EU Member States and 7 NRLs from third countries (EU candidate or potential EU candidate Member States, members of the European Free Trade Association (EFTA), and the United Kingdom).
The main objective of this PT was to evaluate the performance of the NRLs for serotyping of *Salmonella*.

2. Materials and Methods

2.1. *Salmonella* strains for serotyping

A total of 20 *Salmonella* strains (coded S1 - S20) had to be serotyped by the participants. As agreed at the 27th EURL-*Salmonella* Workshop (Mooijman, 2022), a less common strain (S21) was additionally included. Testing this strain was optional and results were not included in the evaluation.
The *Salmonella* strains used for the PT on serotyping originated from the National *Salmonella* Centre collection in the Netherlands. The strains were verified by the Centre before distribution. The complete antigenic formulas of the 21 serovars, in accordance with the most recent White-Kauffmann-Le Minor scheme (Grimont and Weill, 2007) plus published supplements no. 47 (Guibourdenche et al., 2010) and no. 48 (Issenhuth-Jeanjean et al., 2014) are shown in Table 1. However, participants were asked to report only the results as detected and on which the identification of serovar names was based. Eleven strains (Table 1) represented serovars included in the EURL-*Salmonella* serotyping PTs for the first time.

2.2 Laboratory codes

Each participant was randomly assigned a laboratory code 1 - 34.

Table 1. Antigenic formulas of the 21 Salmonella *strains according to the White-Kauffmann-LeMinor scheme used in the EURL-*Salmonella *PT Serotyping 2022*

Strain code	O-antigens	H-antigens (phase 1)	H-antigens (phase 2)	Serovar
S1[a)]	6,7	k	e,n,x	Singapore
S2[b)]	1,4,[5],12	i	-	1,4,[5],12:i:-
S3[a)]	4,12	z_{10}	1,6	Tudu
S4	1,4,[5],12	f,g,s	[1,2]	Agona
S5	1,9,12	g,m	-	Enteritidis
S6[a)]	6,7	l,z_{13}	e,n,x	Kenya
S7	1,13,23	m,t	-	Kintambo
S8 [a) c)]	4,[5],12	i	e,n,x	Farsta
S9	6,8	z_{10}	e,n,x	Hadar
S10 [a)]	16	b	1,2	Hull
S11 [a)]	11	d	[e,n,x]	Chandans
S12	6,7,14	r	1,2	Virchow
S13 [a)]	1,4,[5],12	g,m,s	[1,2]	Hato
S14	1,9,12	e,h	1,5	Eastbourne
S15 [a)]	3,10	z_{35}	z_6	Cairina
S16 [a)]	1,6,14,25	a	1,5	Garba
S17 [a)]	1,13,23	d	1,5	Mishmarhaemek
S18	1,4,[5],12	i	1,2	Typhimurium
S19 [a)]	28	c	1,5	Hermannswerder
S20	6,7,14	r	1,5	Infantis
S21[d)]	47	k	z_{35}	47:k:z_{35} (IIIb)

[a)] Represented in an EURL-*Salmonella* PT Serotyping for the first time.
[b)] Monophasic variant of Typhimurium based on genomic sequences.
[c)] In accordance with Supplement no. 48 to the White-Kauffmann-LeMinor scheme.
[d)] *Salmonella enterica* subspecies *diarizonae* (optional strain).

2.3 Transport

The parcels containing the strains for typing were sent by the EURL-*Salmonella* on 7 November 2022. All samples were packed and transported as Biological Substance Category B (UN 3373) and transported by a door-to-door courier service.

2.4 Evaluation of the serotyping results

The evaluation of the serotyping results is described in Table 2.

Table 2. Evaluation of serotyping results

Results	Evaluation
Auto-agglutination or, Incomplete set of antisera (outside range of antisera)	Not typable
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

In 2007, the following criteria for 'good performance' in PTs on serotyping were defined (Mooijman, 2007).
Penalty points are given for the incorrect typing of strains, but a distinction is made between the five most important human health-related *Salmonella* serovars (as indicated in EU legislation, also sometimes referred to as 'top-5'), and all other strains:

- 4 penalty points: incorrect typing of *S.* Enteritidis, *S.* Typhimurium (including the monophasic variant), *S.* Hadar, *S.* Infantis or *S.* Virchow, or assigning the name of one of these five serovars to another strain.

- 1 penalty point: incorrect typing of all other *Salmonella* serovars.

The total number of penalty points is calculated for each NRL-*Salmonella*. The criterion for good performance is set at less than 4 penalty points.
All EU Member State NRLs not meeting the criterion of good performance (scoring four penalty points or more) have to participate in a follow-up study, in which 10 additional strains have to be serotyped.

3. Results

3.1 Serotyping results of the NRLs-*Salmonella*

3.1.1. General comments on this year's evaluation

As decided at the 27th EURL-*Salmonella* Workshop (online, 23 May 2022), Strain S21 was an additional strain to the study. Testing of this strain was optional and results were not included in the evaluation.

3.1.2. Serotyping results per laboratory

The evaluation of the type of errors for O- and H-antigens and for identification of the strains are shown in Figures 1, 2, and 3.
The percentages of correct results per laboratory are shown in Figure 4.
The O-antigens were typed completely correctly by 31 of the 34 participants (91%). This corresponds to nearly 100% of the total number of strains. The H-antigens were typed completely correctly by 27 of the 34 participants (79%), corresponding to 98% of the total number of strains. As a result, 25 participants (74%) reported all serovar names correctly, which corresponds to 98% of all strains evaluated.

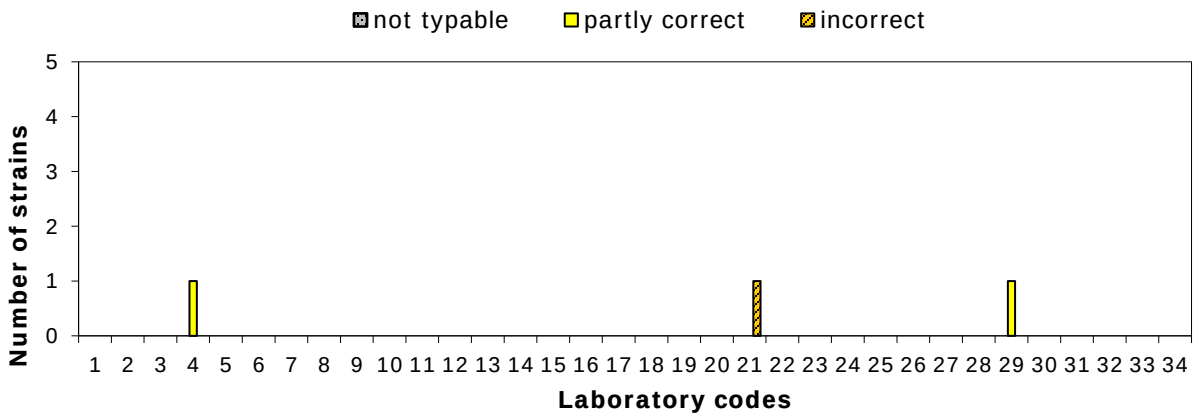

Figure 1. Evaluation of the type of errors for O-antigens, per participant

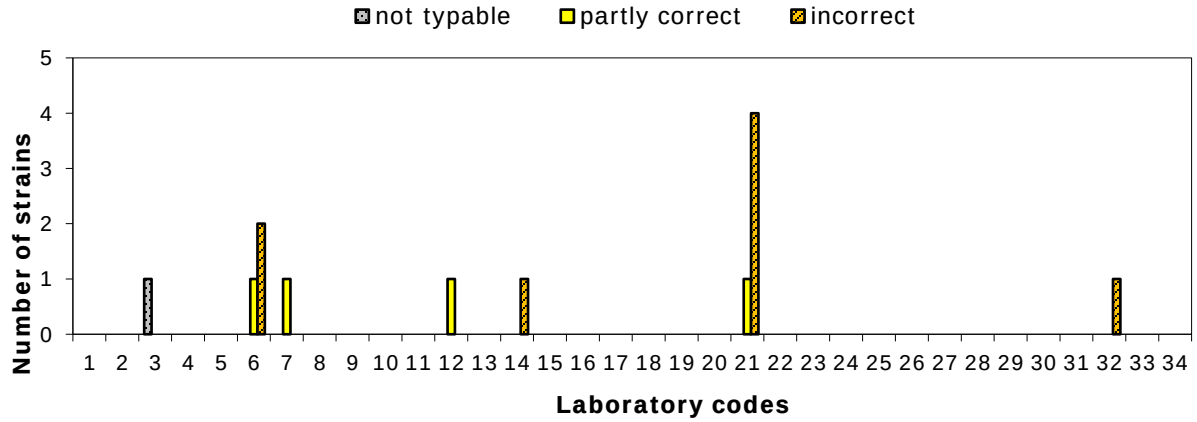

Figure 2. Evaluation of the type of errors for H-antigens, per participant

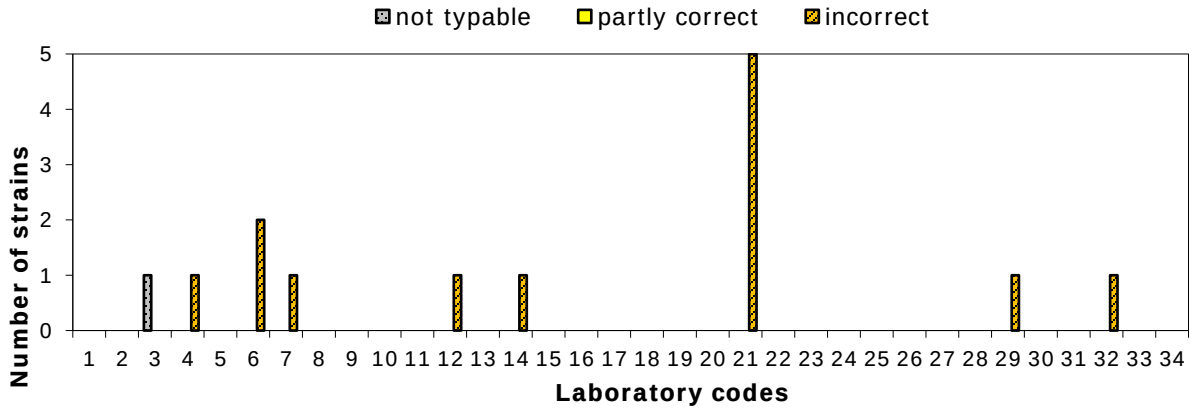

Figure 3. Evaluation of the type of errors in the identification of the serovar names, per participant

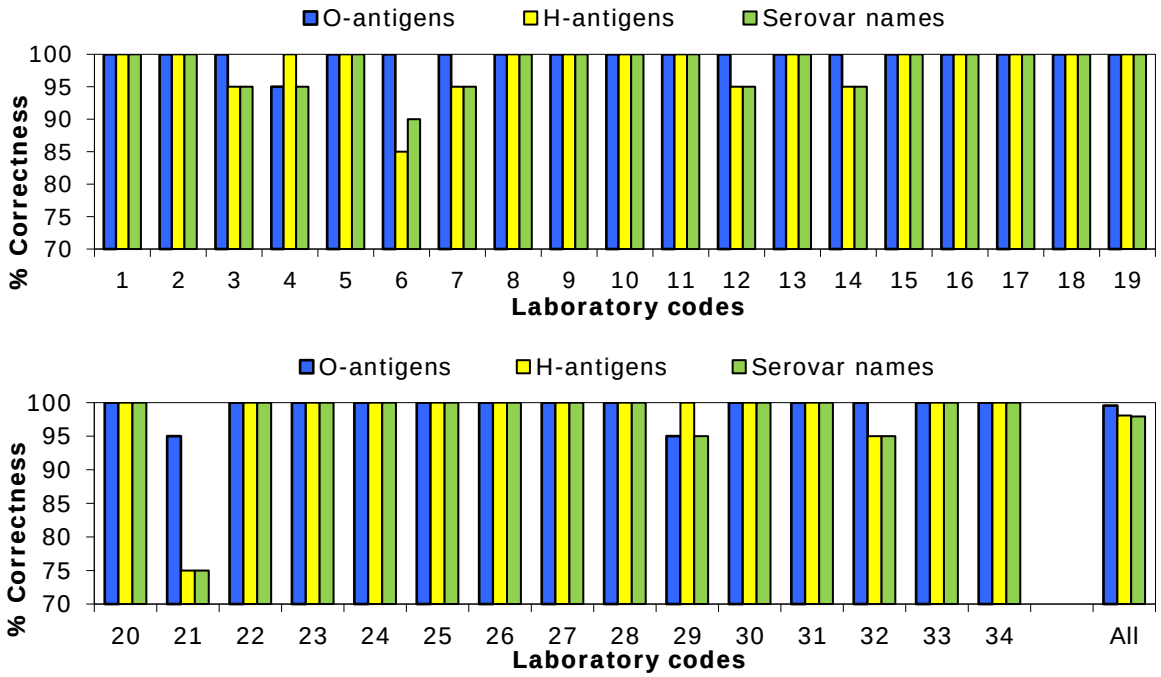

Figure 4. Percentages of correct serotyping results, per participant

The number of penalty points was determined for each NRL using the guidelines described in section 2.4. Table 3 shows the number of penalty points for each NRL and indicates whether the level of good performance was achieved (yes or no).
Overall, the performance of the participants in the PT Serotyping 2022 was very good. Two EU Member State NRLs (Lab 14 and Lab 21) did not meet the level of good performance at the first stage of the study and a follow-up study for these laboratories will be organised.

Table 3. Evaluation of serotyping results per NRL

Lab code	Penalty points	Good performance	Lab code	Penalty points	Good performance
1	0	yes	18	0	yes
2	0	yes	19	0	yes
3	0	yes	20	0	yes
4	1	yes	21	5	**NO**
5	0	yes	22	0	yes
6	2	yes	23	0	yes
7	1	yes	24	0	yes
8	0	yes	25	0	yes
9	0	yes	26	0	yes
10	0	yes	27	0	yes
11	0	yes	28	0	yes
12	1	yes	29	1	yes
13	0	yes	30	0	yes
14	4	**NO**	31	0	yes
15	0	yes	32	1	yes
16	0	yes	33	0	yes
17	0	yes	34	0	yes

3.1.3. Serotyping results per strain

Final naming results reported per strain (S1 – S20) and per laboratory (1 - 34) are given in Annex A.
A completely correct identification was obtained for ten *Salmonella* serovars: Singapore (S1), Agona (S4), Enteritidis (S5), Kenya (S6), Hadar (S9), Hull (S10), Virchow (S12), Hato (S13), Mishmarhaemek (S17), and Infantis (S20).
The reported serovar names for strain 1,4,[5],12:i:- (S2) are also shown in Annex A. Fourteen participants used a PCR method to confirm this strain to be monophasic Typhimurium.
Strain S8 was characterised with antigenic formula 4,5,12:i:e,n,x, and in accordance with Supplement 2008-2010 (no. 48) to the White-Kauffmann-LeMinor scheme this new variant of the previously described serovar Farsta (4,12:i:e,n,x) is now recognised with the updated antigenic formula: 4,[5],12:i:e,n,x (Issenhuth-Jeanjean et al., 2014).
Most problems occurred with the serovar Kintambo (S7). Four laboratories had difficulties assigning the correct serovar name to this strain, due to problems with completing the designation of the O-antigens. Details on all strains that caused problems in serotyping are shown in Annex B.

Details on the additional and optional strain S21 are given in Annex C. All but five participants tried to serotype strain S21, a *Salmonella enterica* subsp. *diarizonae* (IIIb). A few laboratories did not have access to all required antisera to finalise this (47:k:z_{35}).

List of abbreviations

EFTA	European Free Trade Association
EU	European Union
EURL-*Salmonella*	European Union Reference Laboratory for *Salmonella*
NRLs-*Salmonella*	National Reference Laboratories for *Salmonella*
REF	Reference
RIVM	National Institute for Public Health and the Environment

References

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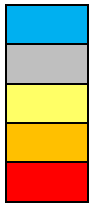
Annex A. Serotyping results per strain and laboratory

Lab:	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10
REF	Singapore	1,4,[5],12:i:-	Tudu	Agona	Enteritidis	Kenya	Kintambo	Farsta	Hadar	Hull
1	Singapore	4:i:-	Tudu	Agona	Enteritidis	Kenya	Kintambo	Farsta	Hadar	Hull
2	Singapore	I 4:i:-	Tudu	Agona	Enteritidis	Kenya	Kintambo	Farsta	Hadar	Hull
3	Singapore	4,12:i:-	Tudu	Agona	Enteritidis	Kenya	Kintambo	Farsta	Hadar	Hull
4	Singapore	4,12:i:-	Tudu	Agona	Enteritidis	Kenya	Kintambo	Farsta	Hadar	Hull
5	Singapore	1,4,5,12:i:-	Tudu	Agona	Enteritidis	Kenya	Kintambo	Farsta	Hadar	Hull
6	Singapore	Typhimurium monofaza	Tudu	Agona	Enteritidis	Kenya	enterica II	Farsta	Hadar	Hull
7	Singapore	4,12:i:-	Tudu	Agona	Enteritidis	Kenya	Agbeni	Farsta	Hadar	Hull
8	Singapore	1,4,12:i:-	Tudu	Agona	Enteritidis	Kenya	Kintambo	Farsta	Hadar	Hull
9	Singapore	4,12:i:-	Tudu	Agona	Enteritidis	Kenya	Kintambo	Farsta	Hadar	Hull
10	Singapore	monophasic Typhimurium	Tudu	Agona	Enteritidis	Kenya	Kintambo	Farsta	Hadar	Hull
11	Singapore	4,12:i:- (mST)	Tudu	Agona	Enteritidis	Kenya	Kintambo	Farsta	Hadar	Hull
12	Singapore	4,5,12:i:-	Tudu	Agona	Enteritidis	Kenya	Agbeni	Farsta	Hadar	Hull
13	Singapore	monophasic Typhimurium	Tudu	Agona	Enteritidis	Kenya	Kintambo	Farsta	Hadar	Hull
14	Singapore	Tumodi	Tudu	Agona	Enteritidis	Kenya	Kintambo	Farsta	Hadar	Hull
15	Singapore	4,12:i:-	Tudu	Agona	Enteritidis	Kenya	Kintambo	Farsta	Hadar	Hull
16	Singapore	4,12:i:-	Tudu	Agona	Enteritidis	Kenya	Kintambo	Farsta	Hadar	Hull
17	Singapore	Monophasic Typhimurium 4:i:-	Tudu	Agona	Enteritidis	Kenya	Kintambo	Farsta	Hadar	Hull
18	Singapore	4,5,12:i:-	Tudu	Agona	Enteritidis	Kenya	Kintambo	Farsta	Hadar	Hull
19	Singapore	Sub I 4,12:i:-	Tudu	Agona	Enteritidis	Kenya	Kintambo	Farsta	Hadar	Hull
20	Singapore	4,12:i:-	Tudu	Agona	Enteritidis	Kenya	Kintambo	Farsta	Hadar	Hull
21	Singapore	Monophasic Salmonella Typhimurium	Lexington	Agona	Enteritidis	Kenya	Agbeni	Chester	Hadar	Hall
22	Singapore	4,5,12:i:-	Tudu	Agona	Enteritidis	Kenya	Kintambo	Farsta	Hadar	Hull
23	Singapore	4,12:i: -	Tudu	Agona	Enteritidis	Kenya	Kintambo	Fasta	Hadar	Hull
24	Singapore	4:i:-	Tudu	Agona	Enteritidis	Kenya	Kintambo	4,5:i:e,n,x	Hadar	Hull
25	Singapore	4:i:- (monophasic Typhimurium)	Tudu	Agona	Enteritidis	Kenya	Kintambo	Farsta	Hadar	Hull
26	Singapore	4,12:i:-	Tudu	Agona	Enteritidis	Kenya	Kintambo	Farsta	Hadar	Hull
27	Singapore	4,12:i:-	Tudu	Agona	Enteritidis	Kenya	Kintambo	Farsta	Hadar	Hull
28	Singapore	4,12:i:-	Tudu	Agona	Enteritidis	Kenya	Kintambo	Farsta	Hadar	Hull
29	Singapore	4,12:i:-	Tudu	Agona	Enteritidis	Kenya	Kintambo	Farsta	Hadar	Hull
30	Singapore	Typhimurium, monophasic (4,12:i:-)	Tudu	Agona	Enteritidis	Kenya	Kintambo	Farsta	Hadar	Hull
31	Singapore	4,12:i:-	Tudu	Agona	Enteritidis	Kenya	Kintambo	Farsta	Hadar	Hull
32	Singapore	4,12:i:-	Tudu	Agona	Enteritidis	Kenya	Kintambo	Farsta	Hadar	Hull
33	Singapore	4,5:i:-	Tudu	Agona	Enteritidis	Kenya	Kintambo	Farsta	Hadar	Hull
34	Singapore	4,[5],12:i:- (monophasic Typhimurium)	Tudu	Agona	Enteritidis	Kenya	Kimtambo	Farsta	Hadar	Hull
X	0	1	1	0	0	0	4	1	0	0

S11 Chandans	S12 Virchow	S13 Hato	S14 Eastbourne	S15 Cairina	S16 Garba	S17 Mishmarhaemek	S18 Typhimurium	S19 Hermannswerder	S20 Infantis	Lab: REF
Chandas	Virchow	Hato	Eastbourne	Cairina	Garba	Mishmarhaemek	Typhimurium	Hermannswerder	Infantis	1
Chandans	Virchow	Hato	Eastbourne	Cairina	Garba	Mishmarhaemek	Typhimurium	Hermannswerder	Infantis	2
Chandans	Virchow	Hato	Eastbourne	3,10:-:z6	Garba	Mishmarhaemek	Typhimurium	Hermannswerder	Infantis	3
Chandans	Virchow	Hato	Waedenswil	Cairina	Garba	Mishmarhaemek	Typhimurium	Hermannswerder	Infantis	4
Chandans	Virchow	Hato	Eastbourne	Cairina	Garba	Mishmarhaemek	Typhimurium	Hermannswerder	Infantis	5
Chandans	Virchov	Hato	Eastbourne	enterica II	Garba	Mishmarhaemek	Typhimurium	Hermannswerder	Infantis	6
Chandans	Virchow	Hato	Eastbourne	Cairina	Garba	Mishmarhaemek	Typhimurium	Hermannswerder	Infantis	7
Chandans	Virchow	Hato	Eastbourne	Cairina	Garba	Mishmarhaemek	Typhimurium	Hermannswerder	Infantis	8
Chandans	Virchow	Hato	Eastbourne	Cairina	Garba	Mishmarhaemek	Typhimurium	Hermannswerder	Infantis	9
Chandans	Virchow	Hato	Eastbourne	Cairina	Garba	Mishmarhaemek	Typhimurium	Hermannswerder	Infantis	10
Chandans	Virchow	Hato	Eastbourne	Cairina	Garba	Mishmarhaemek	Typhimurium	Hermannswerder	Infantis	11
Chandans	Virchow	Hato	Eastbourne	Cairina	Garba	Mishmarhaemek	Typhimurium	Hermannswerder	Infantis	12
Chandans	Virchow	Hato	Eastbourne	Cairina	Garba	Mishmarhaemek	Typhimurium	Hermannswerder	Infantis	13
Chandans	Virchow	Hato	Eastbourne	Cairina	Garba	Mishmarhaemek	Typhimurium	Hermannswerder	Infantis	14
Chandans	Virchow	Hato	Eastbourne	Cairina	Garba	Mishmarhaemek	Typhimurium	Hermannswerder	Infantis	15
Chandans	Virchow	Hato	Eastbourne	Cairina	Garba	Mishmarhaemek	Typhimurium	Hermannswerder	Infantis	16
Chandans	Virchow	Hato	Eastbourne	Cairina	Garba	Mishmarhaemek	Typhimurium	Hermannswerder	Infantis	17
Chandans	Virchow	Hato	Eastbourne	Cairina	Garba	Mishmarhaemek	Typhimurium	Hermannswerder	Infantis	18
Chandans	Virchow	Hato	Eastbourne	Cairina	Garba	Mishmarhaemek	Typhimurium	Hermannswerder	Infantis	19
Chandans	Virchow	Hato	Eastbourne	Cairina	Garba	Mishmarhaemek	Typhimurium	Hermannswerder	Infantis	20
Findorff	Virchow	Hato	Eastbourne	Cairina	Garba	Mishmarhaemek	Typhimurium	Vanier	Infantis	21
Chandans	Virchow	Hato	Eastbourne	Cairina	Garba	Mishmarhaemek	Typhimurium	Hermannswerder	Infantis	22
Chandans	Virchow	Hato	Eastbourne	Cairina	Garba	Mishmarhaemek	Typhimurium	Hermannswerder	Infantis	23
Chandans	Virchow	Hato	Eastbourne	Cairina	Garba	Mishmarhaemek	Typhimurium	Hermannswerder	Infantis	24
Chandans	Virchow	Hato	Eastbourne	Cairina	Garba	Mishmarhaemek	Typhimurium	Hermannswerder	Infantis	25
Chandans	Virchow	Hato	Eastbourne	Cairina	Garba	Mishmarhaemek	Typhimurium	Hermannswerder	Infantis	26
Chandans	Vichow	Hato	Eastbourne	Cairina	Garba	Mishmarhaemek	Typhimurium	Hermannswerder	Infantis	27
Chandans	Virchow	Hato	Eastbourne	Cairina	Garba	Mishmarhaemek	Typhimurium	Hermannswerder	Infantis	28
Chandans	Virchow	Hato	Eastbourne	Cairina	Sanjuan	Mishmarhaemek	Typhimurium	Hermannswerder	Infantis	29
Chandans	Virchow	Hato	Eastbourne	Cairina	Garba	Mishmarhaemek	Typhimurium	Hermannswerder	Infantis	30
Chandans	Virchow	Hato	Eastbourne	Cairina	Garba	Mishmarhaemek	Typhimurium	Hermannswerder	Infantis	31
Chandans	Virchow	Hato	Eastbourne	Cairina	Garba	Mishmarhaemek	4,5,12:i:-	Hermannswerder	Infantis	32
Chandans	Virchow	Hato	Eastbourne	Cairina	Garba	Mishmarhaemek	Typhimurium	Hermannswerder	Infantis	33
Chandans	Virchow	Hato	Eastbourne	Cairina	Garba	Mishmarhaemek	Typhimurium	Hermannswerder	Infantis	34
1	0	0	1	1	1	0	1	1	0	**X**



remark (e.g., spelling error)
not typable (e.g., antisera not available, rough strain)
partly correct, in the naming: no penalty points
incorrect; in the naming: 1 penalty point
incorrect; in the naming: 4 penalty points

X = number of deviating laboratories (by penalty points) per strain.

Results for strain S21 are given in Annex C.

Annex B. Details per strain that caused problems in serotyping

Strain code	O-antigens	H-antigens		Serovar	Lab code
		(phase 1)	(phase 2)		
S-2	**1,4,[5],12**	**i**	**-**	**1,4,[5],12:i:-**	**REF**
S-2	1,4,12	i	z6	Tumodi	14
S-3	**4,12**	**z10**	**1,6**	**Tudu**	**REF**
S-3	3	z10	1,5	Lexington	21
S-7	**1,13,23**	**m,t**	**-**	**Kintambo**	**REF**
S-7	1,13,23	g,m,t	1,5	enterica II	6
S-7	13,23	g,m,t	-	Agbeni	7
S-7	13,23	g,m	-	Agbeni	12
S-7	13,23	g,m,t	-	Agbeni	21
S-7	13,23	m,t	-	Kimtambo	34
S-8	**4,[5],12**	**i**	**e,n,x**	**Farsta**	**REF**
S-8	4,5,12	e,h	e,n,x	Chester	21
S-8	4,5,12	i	e,n,x	Fasta	23
S-8	4,5	i	e,n,x	4,5:i:e,n,x	24
S-10	**16**	**b**	**1,2**	**Hull**	**REF**
S-10	16	b	1,2	Hall	21
S-11	**11**	**d**	**[e,n,x]**	**Chandans**	**REF**
S-11	11	d	e,n,x	Chandas	1
S-11	11	d	z6	Findorff	21
S-12	**6,7,14**	**r**	**1,2**	**Virchow**	**REF**
S-12	6,7	r	1,2	Virchov	6
S-12	6,7	r	1,2	Vichow	27
S-14	**1,9,12**	**e,h**	**1,5**	**Eastbourne**	**REF**
S-14	9,46	e,h	1,5	Waedenswil	4
S-15	**3,10**	**z35**	**z6**	**Cairina**	**REF**
S-15	3,10	-	z6	3,10:-:z6	3
S-15	3,10	z35	e,n,x,z15	enterica II	6
S-15	3,1	z35	z6	Cairina	13
S-16	**1,6,14,25**	**a**	**1,5**	**Garba**	**REF**
S-16	6,7,14	a	1,5	Sanjuan	29
S-18	**1,4,[5],12**	**i**	**1,2**	**Typhimurium**	**REF**
S-18	4,5,12	i	-	4,5,12:i:-	32
S-19	**28**	**c**	**1,5**	**Hermannswerder**	**REF**
S-19	28	z	1,5	Vanier	21

Reference strain
remark (e.g. spelling error)
not typable (e.g. antisera not available, rough strain)
partly correct; in the naming: no penalty points
incorrect; in the naming: 1 penalty point
incorrect; in the naming: 4 penalty points

Annex C. Details on serotyping results strain S21

Strain code	O-antigens	H-antigens		Serovar	Lab code
		(phase 1)	(phase 2)		
S-21	**47**	**k**	**z35**	**47:k:z35**	**REF**
S-21	47	k	z35	S. IIIb (Salmonella enterica subsp. diarizonae) 47:k:z35	1
S-21	47	k	z35	IIIb 47:k:z35	2
S-21	47	k	-	47:k:-	3
S-21	47	k	z35	47:k:z35	4
S-21	47	k	z35	Salmonella enterica subspecies diarizonae 47:k:z35 (IIIb)	5
S-21	-	-	-	-	6
S-21	47	k	-	enterica subsp diarizonae	7
S-21	47	k	z35	IIIb 47:k:z35	8
S-21	47	k	z35	47:5:z35	9
S-21		k	z35	S.enterica subsp. diarizonae IIIb	10
S-21	47	k	z35	47:k:z35 (IIIb)	11
S-21					12
S-21					13
S-21	47	k	z35	III b	14
S-21	47	k	z35	IIIb 47:k:z35	15
S-21					16
S-21	47	k	z35	IIIb:47:k:z35	17
S-21	47	k	z35	47:k:z35	18
S-21	47	k	z35	Sub IIIb 47:k:z35 (diarizonae)	19
S-21	47	k	z35	47:k:z35 (IIIb)	20
S-21	47	k	z35	Lyon III b	21
S-21	47	k	z35	IIIb 47:k:z35	22
S-21	47	k	z35	47:k:z35	23
S-21	OME+	k	z35	OME+:k:z35	24
S-21	-	-	-	-	25
S-21	47	k	z35	47:k:z35	26
S-21	47	k	z35	47:k:z35	27
S-21	47	k	z35	47:k:z35 (IIIb)	28
S-21	47	k	z35	47:z:z35 sg IIIb	29
S-21	47	k	z35	Salmonella enterica subsp. diarizonae serovar 47:k:z35	30
S-21	47	k	z35	47:k:z35 (IIIb)	31
S-21	47	k	z35	47:k:z35	32
S-21	47	k	z35	S.enterica subsp.diarizonae (Group O:X)	33
S-21	47	k	z35	IIIb	34