

Interim Summary Report

EURL-*Salmonella* Proficiency Test Serotyping 2023

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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 2023. Results regarding the part on Cluster Analysis will be reported separately.

A total of 32 laboratories participated in the PT 2023. These included 27 National Reference Laboratories for *Salmonella* (NRLs-*Salmonella*) in the 27 EU Member States and 5 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 in serotyping *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 28th EURL-*Salmonella* Workshop (Mooijman, 2023), 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. Two strains (S5: Neukoelln and S13: Fillmore) 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 - 32.

Table 1. Antigenic formulas of the 21 *Salmonella* strains according to the White-Kauffmann-LeMinor scheme used in the EURL-*Salmonella* PT Serotyping 2023

| Strain code | O-antigens | H-antigens (phase 1) | H-antigens (phase 2) | Serovar |
|-------------------|------------|----------------------|----------------------|----------------|
| S1 | 6,8 | z10 | e,n,x | Hadar |
| S2 | 6,7,14 | z10 | e,n,z15 | Mbandaka |
| S3 | 6,8 | z10 | e,n,z15 | Glostrup |
| S4 | 6,7,14 | r | 1,2 | Virchow |
| S5 ^{a)} | 6,7 | l,z13,[z28] | e,n,z15 | Neukoelln |
| S6 | 1,9,12 | g,m | - | Enteritidis |
| S7 | 6,7 | r | 1,7 | Colindale |
| S8 | 3,{10}{15} | l,v | 1,6 | London |
| S9 | 6,7,14 | r | 1,5 | Infantis |
| S10 | 3,10 | z35 | z6 | Cairina |
| S11 | 1,4,[5],12 | f,g | [1,2] | Derby |
| S12 | 1,4,[5],12 | e,h | e,n,x | Chester |
| S13 ^{a)} | 6,8 | e,h | e,n,x | Fillmore |
| S14 | 13,23 | d | l,w | Putten |
| S15 | 1,3,19 | g,[s],t | - | Senftenberg |
| S16 | 1,4,[5],12 | i | 1,2 | Typhimurium |
| S17 | 9,12 | l,v | 1,7 | Kapemba |
| S18 | 1,9,12[VI] | g,p | - | Dublin |
| S19 ^{b)} | 1,4,[5],12 | i | - | 1,4,[5],12:i:- |
| S20 | 28 | i | 1,5 | Cotham |
| S21 ^{c)} | 41 | z | 1,5 | II 41:z:1,5 |

^{a)} Represented in an EURL-*Salmonella* PT Serotyping for the first time.

^{b)} Monophasic variant of *S. Typhimurium* based on genomic sequences. Phenotypic result: 4,5:i:-.

^{c)} *Salmonella enterica* subspecies *salamae* (optional strain).

2.3 Transport

The parcels containing the strains for typing were sent by the EURL-*Salmonella* on 6 November 2023. 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 deviating serotyping results is described in Table 2.

Table 2. Evaluation of deviating 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 28th EURL-*Salmonella* Workshop (online, 22 May 2023), 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 the 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 completely typed correctly by 28 of the 32 participants (88%). This corresponds to 99% of the total number of strains. The H-antigens were completely typed correctly by 29 of the 32 participants (91%), corresponding to 99% of the total number of strains. As a result, 26 participants (81%) reported all serovar names correctly, which corresponds to 98% of all strains evaluated.

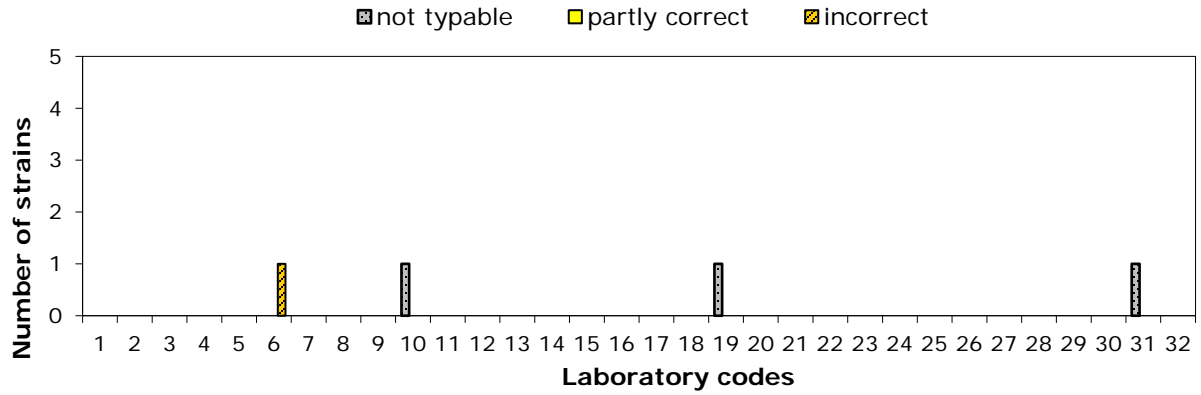


Figure 1. Evaluation of the type of errors for O-antigens, per participant

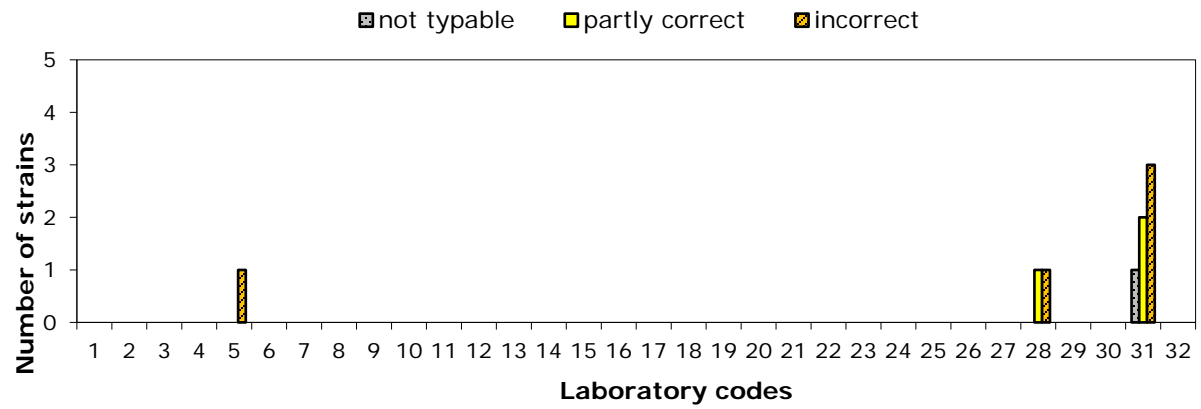


Figure 2. Evaluation of the type of errors for H-antigens, per participant

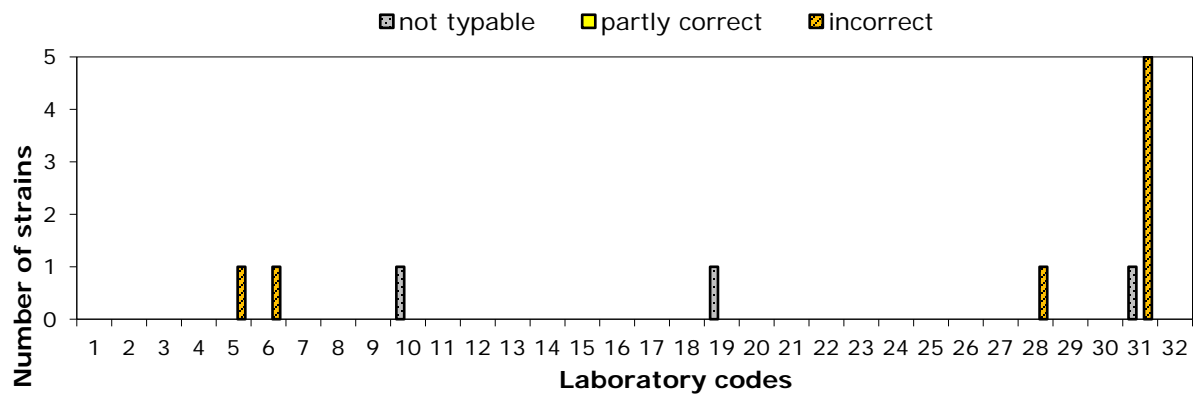


Figure 3. Evaluation of the type of errors in the identification of the serovar names, per participant

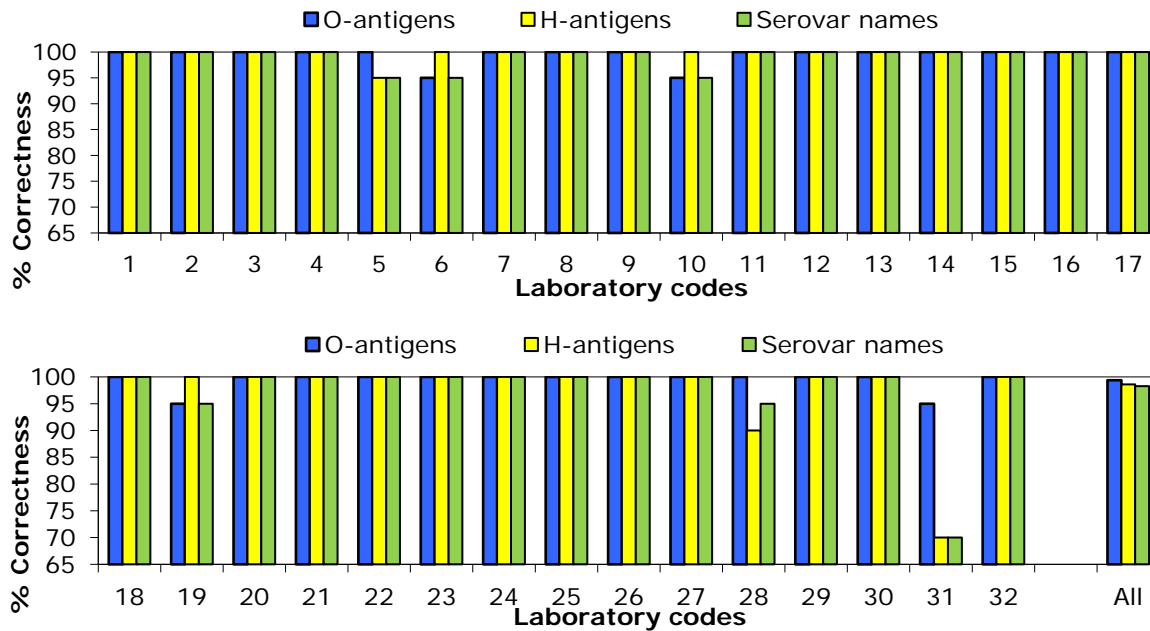


Figure 4. Percentages of correct serotyping results, per participant

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 participants' performance in the PT Serotyping 2023 was very good.

One participant (Lab 31) did not meet the level of good performance at the first stage of the study and a follow-up study for this non-EU MS laboratory 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 | 17 | 0 | yes |
| 2 | 0 | yes | 18 | 0 | yes |
| 3 | 0 | yes | 19 | 0 | yes |
| 4 | 0 | yes | 20 | 0 | yes |
| 5 | 1 | yes | 21 | 0 | yes |
| 6 | 1 | yes | 22 | 0 | yes |
| 7 | 0 | yes | 23 | 0 | yes |
| 8 | 0 | yes | 24 | 0 | yes |
| 9 | 0 | yes | 25 | 0 | yes |
| 10 | 0 | yes | 26 | 0 | yes |
| 11 | 0 | yes | 27 | 0 | yes |
| 12 | 0 | yes | 28 | 1 | yes |
| 13 | 0 | yes | 29 | 0 | yes |
| 14 | 0 | yes | 30 | 0 | yes |
| 15 | 0 | yes | 31 | 5 | NO |
| 16 | 0 | yes | 32 | 0 | yes |

3.1.3. Serotyping results per strain

Annex A displays the final naming results reported per strain (S1 – S20) and per laboratory (1-32). A completely correct identification was obtained for 11 *Salmonella* serovars: Hadar (S1), Virchow (S4), Enteritidis (S6), London (S8), Infantis (S9), Chester (S12), Fillmore (S13), Senftenberg (15), Typhimurium (S16), Kapemba (S17), and 1,4,[5],12:i:- (S19). Annex A also shows the reported serovar names for strain 1,4,[5],12:i:- (S19). Eighteen participants used a PCR method to confirm this strain to be monophasic Typhimurium.

Annex B includes all details on the strains that caused problems in serotyping. The problems were all individual strain/participant cases, except for serovar Cotham (S20, 28:i:1,5). Three laboratories had difficulties assigning the full correct serovar name to this strain, mainly due to problems with completing the designation of the O-antigens.

Annex C describes details on the additional and optional strain S21. All but one participants tried to serotype strain S21, a *Salmonella enterica* subsp. *salamae* (II). The completely correct serovar name (41:z:1,5) was reported by 24 participants.

3.2 Optional part on MLVA within the PT Serotyping

Optionally, also MLVA could have been performed on any applicable strain within the serotyping part of the PT. Applied schemes and allelic profiles were to be submitted in the electronic result form for serotyping. The EURL-*Salmonella* PT Typing Protocol indicated that results would be evaluated by a comparison among the MLVA participants. However, since only one participant (Laboratory 26) submitted MLVA data (on strains S6, S16 and S19), evaluation of these data was not possible.

List of abbreviations

| | |
|-------------------------|---|
| EFTA | European Free Trade Association |
| EU | European Union |
| EURL- <i>Salmonella</i> | European Union Reference Laboratory for <i>Salmonella</i> |
| MLVA | Multiple-Locus Variable number of tandem repeat Analysis |
| NRLs- <i>Salmonella</i> | National Reference Laboratories for <i>Salmonella</i> |
| REF | Reference |
| RIVM | National Institute for Public Health and the Environment |

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Annex A. Serotyping results per strain (S1 – S20) and laboratory (1 - 32)

| Lab: | S1 | S2 | S3 | S4 | S5 | S6 | S7 | S8 | S9 | S10 | S11 |
|----------|-------|----------|-----------|---------|------------|-------------|----------------|--------|----------|---------|-------|
| REF | Hadar | Mbandaka | Glostrup | Virchow | Neukoelln | Enteritidis | Colindale | London | Infantis | Cairina | Derby |
| 1 | Hadar | Mbandaka | Glostrup | Virchow | Neukoelln | Enteritidis | Colindale | London | Infantis | Cairina | Derby |
| 2 | Hadar | Mbandaka | Glostrup | Virchow | Neukoelln | Enteritidis | Colindale | London | Infantis | Cairina | Derby |
| 3 | Hadar | Mbandaka | Glostrup | Virchow | Neukoelln | Enteritidis | Colindale | London | Infantis | Cairina | Derby |
| 4 | Hadar | Mbandaka | Glostrup | Virchow | Neukoelln | Enteritidis | Colindale | London | Infantis | Cairina | Derby |
| 5 | Hadar | Mbandaka | Glostrup | Virchow | Neukoelln | Enteritidis | Colindale | London | Infantis | Sinchew | Derby |
| 6 | Hadar | Mbandaka | Glostrup | Virchow | Neukoelln | Enteritidis | Elisabethville | London | Infantis | Cairina | Derby |
| 7 | Hadar | Mbandaka | Glostrup | Virchow | Neukoelln | Enteritidis | Colindale | London | Infantis | Cairina | Derby |
| 8 | Hadar | Mbandaka | Glostrup | Virchow | Neukoelln | Enteritidis | Colindale | London | Infantis | Cairina | Derby |
| 9 | Hadar | Mbandaka | Glostrup | Virchow | Neukoelln | Enteritidis | Colindale | London | Infantis | Cairina | Derby |
| 10 | Hadar | Mbandaka | Glostrup | Virchow | Neukoelln | Enteritidis | Colindale | London | Infantis | Cairina | Derby |
| 11 | Hadar | Mbandaka | Glostrup | Virchow | Neukoelln | Enteritidis | Colindale | London | Infantis | Cairina | Derby |
| 12 | Hadar | Mbandaka | Glostrup | Virchow | Neukoelln | Enteritidis | Colindale | London | Infantis | Cairina | Derby |
| 13 | Hadar | Mbandaka | Glostrup | Virchow | Neukoelln | Enteritidis | Colindale | London | Infantis | Cairina | Derby |
| 14 | Hadar | Mbandaka | Glostrup | Virchow | Neukoelln | Enteritidis | Colindale | London | Infantis | Cairina | Derby |
| 15 | Hadar | Mbandaka | Glostrup | Virchow | Neukoelln | Enteritidis | Colindale | London | Infantis | Cairina | Derby |
| 16 | Hadar | Mbandaka | Glostrup | Virchow | Neukoelln | Enteritidis | Colindale | London | Infantis | Cairina | Derby |
| 17 | Hadar | Mbandaka | Glostrup | Virchow | Neukoelln | Enteritidis | Colindale | London | Infantis | Cairina | Derby |
| 18 | Hadar | Mbandaka | Glostrup | Virchow | Neukoelln | Enteritidis | Colindale | London | Infantis | Cairina | Derby |
| 19 | Hadar | Mbandaka | Glostrup | Virchow | Neukoelln | Enteritidis | Colindale | London | Infantis | Cairina | Derby |
| 20 | Hadar | Mbandaka | Glostrup | Virchow | Neukoelln | Enteritidis | Colindale | London | Infantis | Cairina | Derby |
| 21 | Hadar | Mbandaka | Glostrup | Virchow | Neukoelln | Enteritidis | Colindale | London | Infantis | Cairina | Derby |
| 22 | Hadar | Mbandaka | Glostrup | Virchow | Neukoelln | Enteritidis | Colindale | London | Infantis | Cairina | Derby |
| 23 | Hadar | Mbandaka | Glostrup | Virchow | Neukoelln | Enteritidis | Colindale | London | Infantis | Cairina | Derby |
| 24 | Hadar | Mbandaka | Glostrup | Virchow | Neukoelln | Enteritidis | Colindale | London | Infantis | Cairina | Derby |
| 25 | Hadar | Mbandaka | Glostrup | Virchow | Neukoelln | Enteritidis | Colindale | London | Infantis | Cairina | Derby |
| 26 | Hadar | Mbandaka | Glostrup | Virchow | Neukoelln | Enteritidis | Colindale | London | Infantis | Cairina | Derby |
| 27 | Hadar | Mbandaka | Glostrup | Virchow | Neukoelln | Enteritidis | Colindale | London | Infantis | Cairina | Derby |
| 28 | Hadar | Mbandaka | Glostrup | Virchow | Neukoelln | Enteritidis | Colindale | London | Infantis | Cairina | Derby |
| 29 | Hadar | Mbandaka | Glostrup | Virchow | Neukoelln | Enteritidis | Colindale | London | Infantis | Cairina | Derby |
| 30 | Hadar | Mbandaka | Glostrup | Virchow | Neukoelln | Enteritidis | Colindale | London | Infantis | Cairina | Derby |
| 31 | Hadar | Djudu | Tshiongwe | Virchow | Braenderup | Enteritidis | Colindale | London | Infantis | Cairina | Essen |
| 32 | Hadar | Mbandaka | Glostrup | Virchow | Neukoelln | Enteritidis | Colindale | London | Infantis | Cairina | Derby |
| X | 0 | 1 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 1 |

| S12 | S13 | S14 | S15 | S16 | S17 | S18 | S19 | S20 | Lab: |
|---------|----------|--------|-------------|-------------|---------|--------|-------------------------------------|-----------------|------|
| Chester | Fillmore | Putten | Senftenberg | Typhimurium | Kapemba | Dublin | 1,4,[5],12:i:- | Cotham | REF |
| Chester | Fillmore | Putten | Senftenberg | Typhimurium | Kapemba | Dublin | 4,5:i:- | Cotham | 1 |
| Chester | Fillmore | Putten | Senftenberg | Typhimurium | Kapemba | Dublin | 4:i:- | Cotham | 2 |
| Chester | Fillmore | Putten | Senftenberg | Typhimurium | Kapemba | Dublin | 4,5,12:i:- | Cotham | 3 |
| Chester | Fillmore | Putten | Senftenberg | Typhimurium | Kapemba | Dublin | Typhimurium, monophasic (4,5,12:i:- | Cotham | 4 |
| Chester | Fillmore | Putten | Senftenberg | Typhimurium | Kapemba | Dublin | Monophasic Typhimurium | Cotham | 5 |
| Chester | Fillmore | Putten | Senftenberg | Typhimurium | Kapemba | Dublin | 4,5,12:i:- | Cotham | 6 |
| Chester | Fillmore | Putten | Senftenberg | Typhimurium | Kapemba | Dublin | 4,5,12:i:- | Cotham | 7 |
| Chester | Fillmore | Putten | Senftenberg | Typhimurium | Kapemba | Dublin | 4,5,12:i:- | Cotham | 8 |
| Chester | Fillmore | Putten | Senftenberg | Typhimurium | Kapemba | Dublin | 4:i:- | Cotham | 9 |
| Chester | Fillmore | Putten | Senftenberg | Typhimurium | Kapemba | Dublin | 4,5,12:i:- | -:i:1,5 | 10 |
| Chester | Fillmore | Putten | Senftenberg | Typhimurium | Kapemba | Dublin | 4,5,12:i:- | Cotham | 11 |
| Chester | Fillmore | Putten | Senftenberg | Typhimurium | Kapemba | Dublin | 4,5,12:i:- (mST) | Cotham | 12 |
| Chester | Fillmore | Putten | Senftenberg | Typhimurium | Kapemba | Dublin | 4,5,12:i:- | Cotham | 13 |
| Chester | Fillmore | Putten | Senftenberg | Typhimurium | Kapemba | Dublin | 4,5,12:i:- | Cotham | 14 |
| Chester | Fillmore | Putten | Senftenberg | Typhimurium | Kapemba | Dublin | Monophasic variant (4,5,12:i:-) | Cotham | 15 |
| Chester | Fillmore | Putten | Senftenberg | Typhimurium | Kapemba | Dublin | 1 4:i:- | Cotham | 16 |
| Chester | Fillmore | Putten | Senftenberg | Typhimurium | Kapemba | Dublin | 4,5,12:i:- | Cotham | 17 |
| Chester | Fillmore | Putten | Senftenberg | Typhimurium | Kapemba | Dublin | 4,5,12:i:- | Cotham | 18 |
| Chester | Fillmore | Putten | Senftenberg | Typhimurium | Kapemba | Dublin | Typhimurium monophasic Variant | rough : i : 1,5 | 19 |
| Chester | Fillmore | Putten | Senftenberg | Typhimurium | Kapemba | Dublin | 4,5,12:i:- | Cotham | 20 |
| Chester | Fillmore | Putten | Senftenberg | Typhimurium | Kapemba | Dublin | 4,5,12:i:- | Cotham | 21 |
| Chester | Fillmore | Putten | Senftenberg | Typhimurium | Kapemba | Dublin | 4,5,12:i:- | Cotham | 22 |
| Chester | Fillmore | Putten | Senftenberg | Typhimurium | Kapemba | Dublin | 4,5,12:i:- | Cotham | 23 |
| Chester | Fillmore | Putten | Senftenberg | Typhimurium | Kapemba | Dublin | 4,5 : i : - | Cotham | 24 |
| Chester | Fillmore | Putten | Senftenberg | Typhimurium | Kapemba | Dublin | 1,4,5,12:i:- | Cotham | 25 |
| Chester | Fillmore | Putten | Senftenberg | Typhimurium | Kapemba | Dublin | monophasic Typhimurium | Cotham | 26 |
| Chester | Fillmore | Putten | Senftenberg | Typhimurium | Kapemba | Dublin | 4,5,12:i:- | Cotham | 27 |
| Chester | Fillmore | Putten | Senftenberg | Typhimurium | Kapemba | Dublin | 4,5,12:i:- | Cotham | 28 |
| Chester | Fillmore | Putten | Senftenberg | Typhimurium | Kapemba | Dublin | 1,4,[5],12:i:- | Cotham | 29 |
| Chester | Fillmore | Putten | Senftenberg | Typhimurium | Kapemba | Dublin | 4,5,12:i:- | Cotham | 30 |
| Chester | Fillmore | Handen | Senftenberg | Typhimurium | Kapemba | Dublin | Typhimurium monofaza | - | 31 |
| Chester | Fillmore | Putten | Senftenberg | Typhimurium | Kapemba | Dublin | Monophasic Salmonella typhimurium | Cotham | 32 |
| 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 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 | 6,7,14 | z10 | e,n,z15 | Mbandaka | REF |
| S-2 | 6,7 | z29 | e,n,z15 | Mbandaka | 28 |
| S-2 | 6,7 | z10 | e,n,x | Djudu | 31 |
| S-3 | 6,8 | z10 | e,n,z15 | Glostrup | REF |
| S-3 | 6,8 | e,h | e,n,z15 | Tshiongwe | 31 |
| S-5 | 6,7 | l,z13,[z28] | e,n,z15 | Neukoelln | REF |
| S-5 | 6,7 | e,h | e,n,z15 | Braenderup | 31 |
| S-6 | 1,9,12 | g,m | - | Enteritidis | REF |
| S-6 | 9,12 | g,m | - | Enteritidis | 14 |
| S-6 | 9,12 | g,m | - | Enteritidis | 26 |
| S-7 | 6,7 | r | 1,7 | Colindale | REF |
| S-7 | 15 | r | 7 | Elisabethville | 6 |
| S-10 | 3,10 | z35 | z6 | Cairina | REF |
| S-10 | 3,10 | l,v | z35 | Sinchew | 5 |
| S-11 | 1,4,[5],12 | f,g | [1,2] | Derby | REF |
| S-11 | 1,4,5,12 | f,g | - | Derby | 25 |
| S-11 | 4,12 | g,f | - | Derby | 30 |
| S-11 | 4,12 | g,m | - | Essen | 31 |
| S-13 | 6,8 | e,h | e,n,x | Fillmore | REF |
| S-13 | 6,8 | e,h | e,nx | Fillmore | 26 |
| S-14 | 13,23 | d | l,w | Putten | REF |
| S-14 | 13,23 | d | 1,2 | Handen | 31 |
| S-16 | 1,4,[5],12 | i | 1,2 | Typhimurium | REF |
| S-16 | 4,5,15 | i | 1,12 | Typhimurium | 28 |
| S-17 | 9,12 | l,v | 1,7 | Kapemba | REF |
| S-17 | 9,12 | l,v | 1,7 | Kapemba | 18 |
| S-17 | 9,12 | l,v | 1,7 | Kampemba | 28 |
| S-18 | 1,9,12[Vi] | g,p | - | Dublin | REF |
| S-18 | 9,12 | g,p,u | - | Rostock | 28 |
| S-20 | 28 | i | 1,5 | Cotham | REF |
| S-20 | - | i | 1,5 | -: i: 1,5 | 10 |
| S-20 | 28 | i | 1,5 | Cothan | 17 |
| S-20 | - | i | 1,5 | rough : i : 1,5 | 19 |
| S-20 | - | - | - | - | 31 |

| | |
|--|---|
| | 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 | 41 | z | 1,5 | II 41:z:1,5 | REF |
| S-21 | 41 | z | 1,5 | 41:z:1,5 | 1 |
| S-21 | - | z | e,n,x,z15 | -:z:e,n,x,z15 | 2 |
| S-21 | 41 | z | 1,5 | 41:z:1,5 | 3 |
| S-21 | 41 | z | 5 | Salmonella enterica subsp. salamae serovar 41:z:1,5 | 4 |
| S-21 | 41 | z | 1,5 | II 41:z:1,5 | 5 |
| S-21 | 41 | z | 5 | 41:z:1,5 (II) | 6 |
| S-21 | 41 | z | 1,5 | Salmonella enterica subsp. salamae 41: z: 1,5 | 7 |
| S-21 | 41 | z | 5 | 41:z:5 | 8 |
| S-21 | 41 | z | 1,5 | S. enterica subsp.salamae | 9 |
| S-21 | 41 | z | 1,5 | 41:z:1,5 | 10 |
| S-21 | 41 | z | 1,5 | 41:z:1,5 (II) S. enterica subsp. salamae | 11 |
| S-21 | 41 | z | 1,5 | 41:z:1,5 (II) | 12 |
| S-21 | 41 | z | 1,5 | salamae II | 13 |
| S-21 | 41 | z | 1,5 | 41:z:1,5 | 14 |
| S-21 | 6,7 | z | 1,5 | II 6,7:z:1,5 | 15 |
| S-21 | 41 | z | 1,5 | II 41:z:1,5 | 16 |
| S-21 | 41 | z | 1,5 | S. II 41:z:1,5 (S. enterica subsp. salamae) | 17 |
| S-21 | 41 | z | 1,5 | 41:z:1,5 (II) | 18 |
| S-21 | 41 | z | 1,5 | II 41 : z : 1,5 | 19 |
| S-21 | 41 | z | 1,5 | 41:z:1,5 sglI | 20 |
| S-21 | 41 | z | 1,5 | S. enterica subsp. salamae | 21 |
| S-21 | 41 | z | 1,5 | 41:z:1,5 | 22 |
| S-21 | 41 | z | 1,5 | 41:z:1,5 (II) | 23 |
| S-21 | ? | z | 5 | ? : z : 5 | 24 |
| S-21 | 41 | z | 1,5 | S. II (Salmonella enterica subsp. salamae) 41:z:1,5 | 25 |
| S-21 | 41 | - | 1,5 | 41 : - : 1,5 (II) | 26 |
| S-21 | 41 | z | 1,5 | 41:z:1,5 | 27 |
| S-21 | 6,7 | z | 1,5 | 6,7:z:1,5 | 28 |
| S-21 | | | | | 29 |
| S-21 | 41 | z | 1,5 | 41:z:1,5 | 30 |
| S-21 | 18 | z36 | - | enterica II | 31 |
| S-21 | 6,7 | z | 1,5 | Poitiers | 32 |

| | |
|--|--|
| | Reference strain |
| | remark, deviations in the results on optional strain S21 |
| | not typable (e.g. antisera not available, rough strain) |

NOTE: The Table reflects the raw data submitted by the participants. However, the electronic result form does not allow input in special fonts like 'italic' or 'subscript'.