22 May 2023

28th EURL-*Salmonella* Workshop

EU MONITORING OF *SALMONELLA* AND OF SALMONELLOSIS FOODBORNE OUTBREAKS, IN 2021

Frank Boelaert

EUROPEAN FOOD SAFETY AUTHORITY

GENERAL OBSERVATIONS ON EUOHZ 2021

Zoonotic diseases and foodborne outbreaks on the rise, but still below pre-pandemic levels

… exceptions are: ***yersiniosis***, ***tularaemia***, **STEC** *infections,* ***listeriosis*** *and* ***foodborne listeriosis outbreaks***

EFSA and ECDC (European Food Safety Authority and European Centre for Disease Prevention and Control), 2022. The European Union One Health 2021 Zoonoses Report. EFSA Journal 2022;20(12):7666, 273 pp.

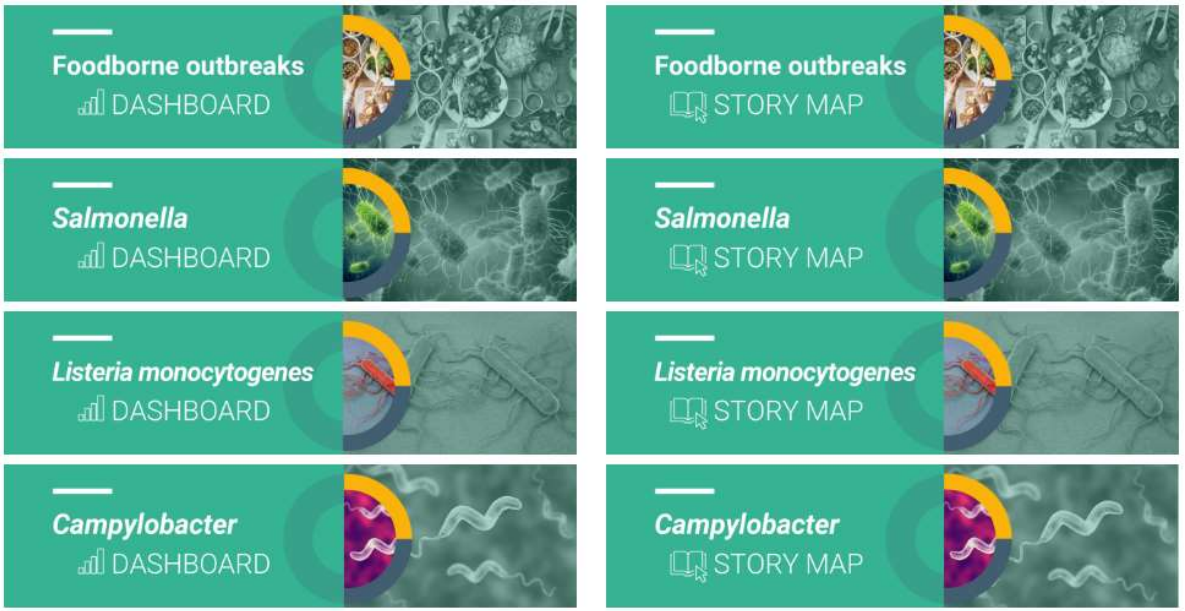
SPECIFICS FOR THE EUOHZ 2021

- Second year of the **COVID-19 pandemic**
- **Withdrawal of United Kingdom (UK)** from the EU since 2020
  - last reporting of UK to ECDC : 2019 data
  - reporting of UK to EFSA
    - last reporting of UK : 2020 data
    - Northern Ireland reported 2021 data that were assigned to the MSs group

GB	**United Kingdom**	**Great Britain, Northern Ireland, Channel Islands and Isle of Man**
XI	**United Kingdom (Northern Ireland)**	**Code to be used if United Kingdom (in respect of Northern Ireland) needs to be identified**
XU	**United Kingdom (excluding Northern Ireland)**	**Code to be used if United Kingdom (excluding Northern Ireland) needs to be identified.**

SPECIFICS FOR THE EUOHZ 2021 (2)

Interactive communication tools :



All links are here

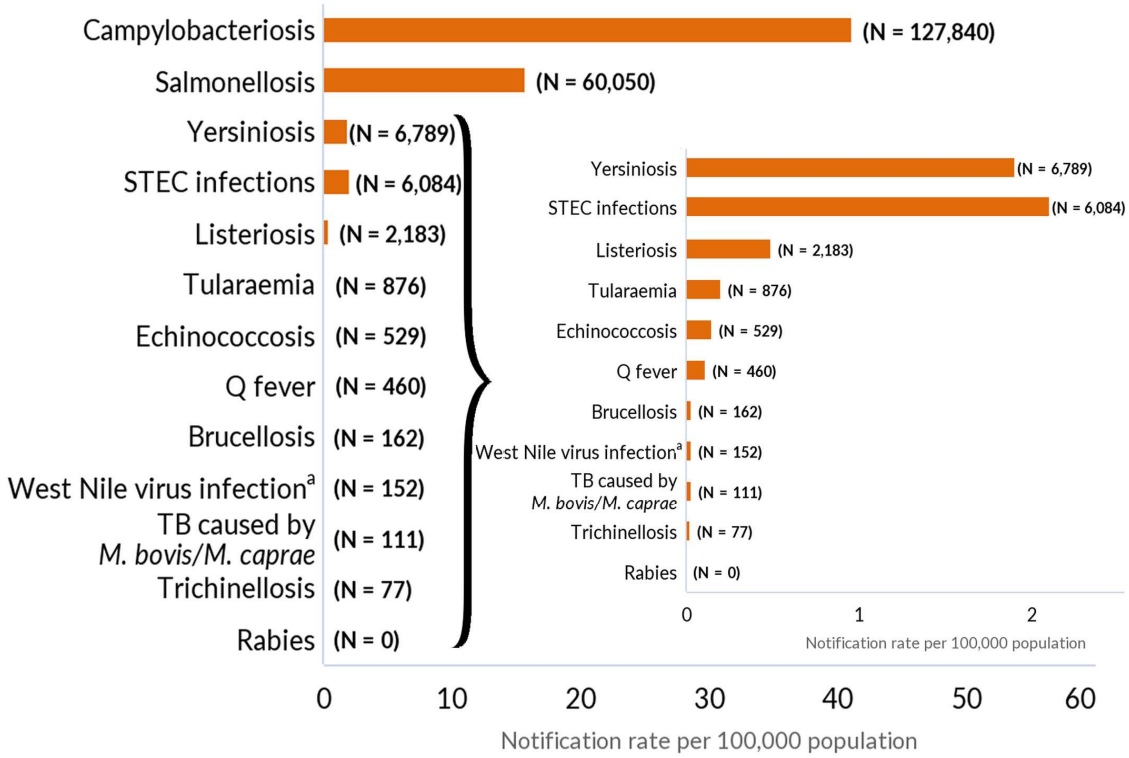
REPORTED NUMBERS AND NOTIFICATON RATES OF CONFIRMED HUMAN ZOONOSES IN THE EU, 2021

EU trends 2017-2021 period ?

↓ Q fever, *Brucella*

↑ tularaemia

= campylobacteriosis, salmonellosis, listeriosis, Shiga toxin-producing *E.coli*, trichinellosis, yersiniosis and West Nile virus



REPORTED HOSPITALISATIONS AND DEATHS DUE TO ZOONOSES IN CONFIRMED HUMAN CASES AND AMONG FOODBORNE OUTBREAK CASES IN THE EU, 2021

Disease	Surveillance data on human cases (source: ECDC)										Foodborne outbreaks (FBO) (source: EFSA)					
	Confirmed human cases	Hospitalisation					Deaths				Outbreaks	Cases	Hospitalisations and proportion of hospitalised cases		Deaths and case fatality	
		Status available		Reporting MSs[b]	Cases and proportion of hospitalised cases		Outcome available		Reporting MSs[b]	Deaths and case fatality						
	N	N	%	N	N	%	N	%	N	N	%	N	N	N	%	N	%
Campylobacteriosis	127,840	45,121	35.3	15	10,469	23.2	91,177	71.3	16	26	0.03	249	1,051	134	12.7	6	0.6
Salmonellosis	60,050	30,951	51.5	16	11,785	38.1	38,658	64.4	16	71	0.18	773	6,755	1,123	16.6	1	0.1
Yersiniosis	6,789	1,564	23.0	13	508	32.5	3,596	53.0	21	0	0	21	125	14	11.2	0	0
STEC infections	6,084	2,133	35.1	17	901	42.2	4,366	71.8	20	18	0.41	31	275	47	13.5	0	0
Listeriosis	2,183	956	43.8	16	923	96.5	1,427	65.4	14	196	13.7	23	104	48	46.2	12	11.5
Tularaemia	876	221	25.2	10	112	50.7	341	38.9	11	2	0.59	0	0	0	-	0	-
Echinococcosis	529	121	22.9	13	51	42.1	270	51.0	16	0	0	0	0	0	-	0	-
Q fever	460	NA	NA	NA	NA	NA	270	58.7	11	4	1.5	0	0	0	-	0	-
Brucellosis	162	60	37.0	10	36	60.0	59	36.4	11	0	0	1	2	2	100	0	-
West Nile virus infection[a]	152	83	54.6	6	70	84.3	152	100	8	11	7.2	NA	NA	NA	NA	NA	NA
Trichinellosis	77	26	33.8	6	10	38.5	28	36.4	6	0	0	1	2	0	100	0	-
Rabies	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Data on congenital toxoplasmosis are not shown since 2021 data are not available yet.
MSs: Member States.
NA: Not applicable as the information is not collected for this disease.
(a): Total number of locally acquired infections (probable and confirmed cases).
(b): Not all countries observed cases for all diseases.

SALMONELLA, EU, 2021

Human cases

Notification rate (per 100,000 population) 15.7

Trend (2017-2021) — Increasing / Decreasing / Stable

60,050 Cases of illness

43,720 Infections acquired in the EU

925 Infections acquired outside the EU

15,405 Unknown travel status or unknown country of infection

11,785 Hospitalisations

71 Deaths

Human cases in foodborne outbreaks

773 Foodborne outbreaks

143 Strong-evidence outbreaks

630 Weak-evidence outbreaks

6,755 Cases of illness

1,123 Hospitalisations

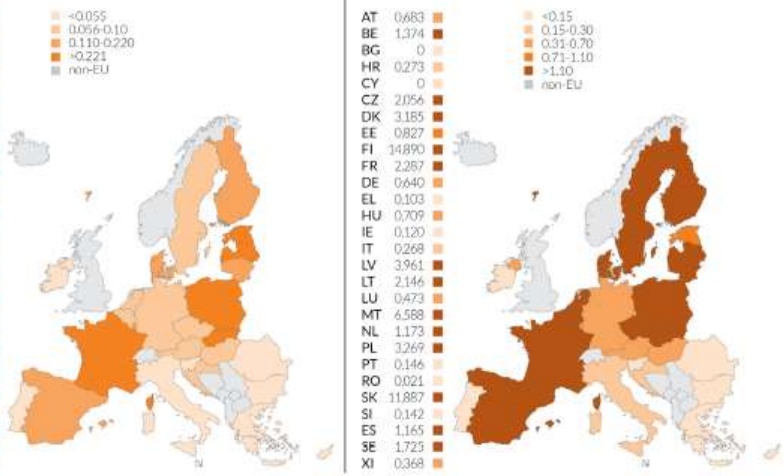
1 Death

Foodborne outbreaks

Food vehicles causing strong-evidence outbreaks

- Eggs and eggs products: 39 Outbreaks
- Mixed food: 24 Outbreaks
- Bakery products: 15 Outbreaks
- Pig meat and products thereof: 14 Outbreaks
- Vegetables and juices and other products thereof: 11 Outbreaks

N of outbreaks		N of outbreaks per 100,000 population*		N of outbreak cases per 100,000 population	
9	Austria	AT	0.101	AT	0.683
7	Belgium	BE	0.061	BE	1.374
0	Bulgaria	BG	0	BG	0
4	Croatia	HR	0.099	HR	0.273
0	Cyprus	CY	0	CY	0
7	Czechia	CZ	0.065	CZ	2.056
12	Denmark	DK	0.205	DK	3.185
5	Estonia	EE	0.376	EE	0.827
7	Finland	FI	0.126	FI	14.890
176	France	FR	0.260	FR	2.287
60	Germany	DE	0.072	DE	0.640
4	Greece	EL	0.037	EL	0.103
6	Hungary	HU	0.062	HU	0.709
1	Ireland	IE	0.020	IE	0.120
23	Italy	IT	0.039	IT	0.268
5	Latvia	LV	0.264	LV	3.961
4	Lithuania	LT	0.143	LT	2.146
1	Luxembourg	LU	0.158	LU	0.473
7	Malta	MT	1.356	MT	6.588
11	Netherlands	NL	0.063	NL	1.173
165	Poland	PL	0.436	PL	3.269
1	Portugal	PT	0.010	PT	0.146
1	Romania	RO	0.005	RO	0.021
154	Slovakia	SK	2.821	SK	11.887
1	Slovenia	SI	0.047	SI	0.142
93	Spain	ES	0.196	ES	1.165
8	Sweden	SE	0.077	SE	1.723
1	UK (N. Ireland)	XI	0.053	XI	0.368

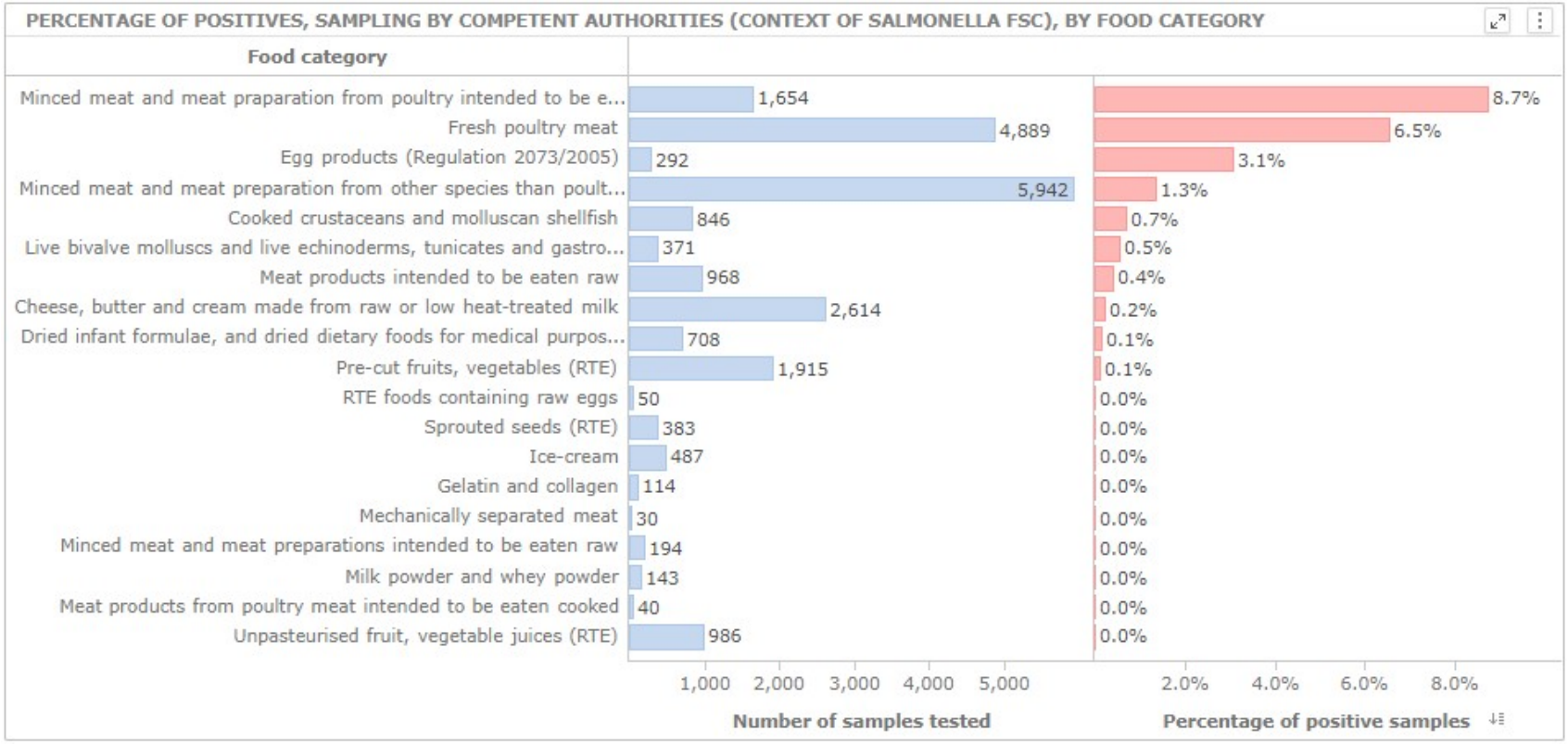


* Differences among countries shall be interpreted with caution as this indicator depends on several factors including the type of outbreaks under surveillance and does not necessarily reflect the level of food safety in each country.

ECDC data EFSA data

SALMONELLA, REGULATION (EU) NO 2073/2005, FSC, DISTRIBUTION STAGE, SINGLE OFFICIAL SAMPLES, EU, 2021

Number of countries	Number of samples tested	Percentage of positive samples
14	22,626	2.53%



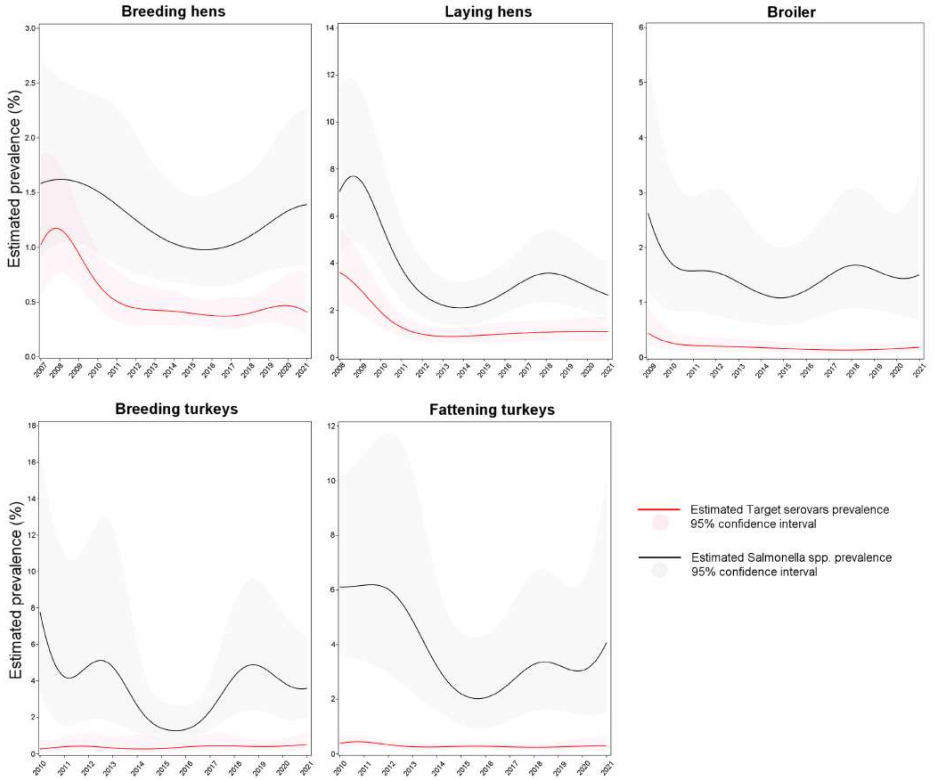
SALMONELLA, REGULATION (EU) NO 2019/627, PHC, DISTRIBUTION STAGE, SINGLE OFFICIAL SAMPLES, EU, 2021

Considering data on *Salmonella* from carcases of different species, irrespective of the sampler, the prevalence values found for neck skin samples from **broilers** (4.2%) and **turkeys** (3.7%) were much higher than those reported for carcase surfaces of ruminants (cattle (0.3%), sheep (0.6%) and goats (1.6%)) and horses. Pigs: 1.4%.

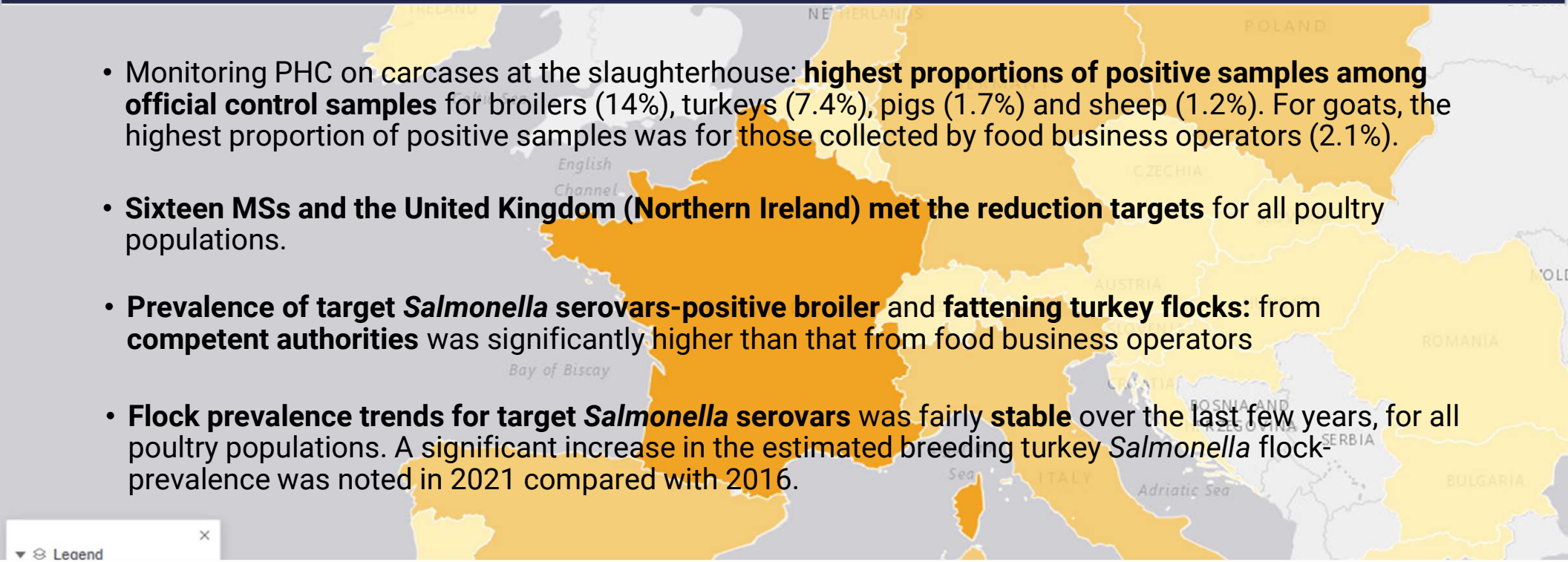
Table 12: Comparisons of proportions (%) of *Salmonella*-positive single samples from pig carcases after dressing, but before chilling, by sampler and reporting MS, EU, 2021

Country	Competent authority (CA)			Food business operator (FBOp)			p-value[b]	Interpretation
	N tested samples	N (%) positive samples	CI_{95}	N tested samples	N (%) positive samples	CI_{95}		
Austria	–	–	–	4,056	2 (0.05)	[0.01; 0.18]	–	–
Belgium	955	59 (6.2)	[4.7; 7.9]	4,108	62 (1.5)	[1.2; 1.9]	< 0.001	CA > FBOp
Bulgaria	5,049	0	[0; 0.07][a]	305	0	[0; 1.2][a]	NS	
Croatia	1,630	4 (0.24)	[0.07; 0.63]	–	–	–	–	–
Cyprus	2	0	[–]	–	–	–	–	–
Czechia	4,508	35 (0.78)	[0.54; 1.1]	–	–	–	–	–
Denmark	–	–	–	10,773	80 (0.74)	[0.59; 0.92]	–	–
Estonia	357	6 (1.7)	[0.62; 3.6]	1,581	12 (0.76)	[0.39; 1.3]	0.096	CA > FBOp
France	–	–	–	13,662	628 (4.6)	[4.3; 5.0]	–	–
Germany	200	4 (2.0)	[0.55; 5.0]	24,885	156 (0.63)	[0.53; 0.73]	0.039	CA > FBOp
Hungary	3,045	44 (1.4)	[1.1; 1.9]	–	–	–	–	–
Ireland	391	19 (4.9)	[3.0; 7.5]	2,064	25 (1.2)	[0.78; 1.8]	< 0.001	CA > FBOp
Italy	5,147	174 (3.4)	[2.9; 3.9]	11,494	107 (0.93)	[0.76; 1.1]	< 0.001	CA > FBOp
Latvia	–	–	–	579	3 (0.52)	[0.11; 1.5]	–	–
Luxembourg	–	–	–	345	2 (0.58)	[0.07; 2.1]	–	–
Malta	–	–	–	120	13 (10.8)	[5.9; 17.8]	–	–
Netherlands	–	–	–	5,635	120 (2.1)	[1.8; 2.5]	–	–
Poland	273	0	[0; 1.3][a]	5,576	3 (0.05)	[0.01; 0.16]	NS	
Portugal	–	–	–	8,222	66 (0.8)	[0.62; 1.0]	–	–
Romania	2,540	0	[0; 0.14][a]	2,881	0	[0; 0.13][a]	NS	
Slovakia	–	–	–	3,209	0	[0; 0.12][a]	–	–
Slovenia	–	–	–	970	13 (1.3)	[0.72; 2.3]	–	–
Spain	705	82 (11.6)	[9.4; 14.2]	2,805	109 (3.9)	[3.2; 4.7]	< 0.001	CA > FBOp
EU Total (27 + XI)	24,802	427 (1.7)	[1.6; 1.9]	103,270	1401 (1.4)	[1.3; 1.4]	< 0.001	CA > FBOp
EU Total (27 + XI) providing CA and FBOp data	15,617	344 (2.2)	[2.0; 2.4]	55,699	474 (0.85)	[0.78; 0.93]	< 0.001	CA > FBOp

POULTRY MONITORING DATA ACCORDING TO THE SNCP



SALMONELLA, EU, 2021



- Monitoring PHC on carcases at the slaughterhouse: **highest proportions of positive samples among official control samples** for broilers (14%), turkeys (7.4%), pigs (1.7%) and sheep (1.2%). For goats, the highest proportion of positive samples was for those collected by food business operators (2.1%).
- **Sixteen MSs and the United Kingdom (Northern Ireland) met the reduction targets** for all poultry populations.
- **Prevalence of target *Salmonella* serovars-positive broiler** and **fattening turkey flocks:** from **competent authorities** was significantly higher than that from food business operators
- **Flock prevalence trends for target *Salmonella* serovars** was fairly **stable** over the last few years, for all poultry populations. A significant increase in the estimated breeding turkey *Salmonella* flock-prevalence was noted in 2021 compared with 2016.

SALMONELLA SEROVARS, EU, 2021

Table 29: Distribution of reported confirmed cases of human salmonellosis in the EU, 2019–2021, for the 20 most frequent *Salmonella* serovars in 2021

Serovar	2021		
	Cases	MSs	%
Enteritidis	27,734	24	54.6
Typhimurium	5,781	24	11.4
Monophasic Typhimurium 1.4.[5] 0.12:i:-	4,495	14	8.8
Infantis	1,019	24	2.0
Derby	474	17	0.93
Coeln	463	15	0.91
Braenderup	373	15	0.73
Napoli	352	12	0.69
Chester	316	12	0.62
Newport	311	20	0.61
Montevideo	219	11	0.43

Table 32: Distribution of the top 20 *Salmonella* serovars by food–animal source (laying hens, broilers, turkeys, pigs and bovines), EU, 2021

Poultry population

Laying hens

Serovar	N (%) positive samples	N MSs
Enteritidis	425 (35.5)	22
Kentucky	124 (10.3)	5
Typhimurium	113 (9.4)	15
Enterica, subspecies enterica	97 (8.1)	3
Infantis	85 (7.1)	12
Braenderup	24 (2.0)	8
Mbandaka	20 (1.7)	8
Anatum	19 (1.6)	5
Corvallis	17 (1.4)	6
Montevideo	16 (1.3)	6
Ohio	16 (1.3)	4
Thompson	15 (1.2)	6
Newport	13 (1.1)	5
Senftenberg	13 (1.1)	6
Livingstone	11 (0.92)	5
Mikawasima	11 (0.92)	2
Agona	10 (0.83)	4
Hadar	10 (0.83)	3
Mkamba	10 (0.83)	1
Monophasic Typhimurium	9 (0.75)	1
Other	140 (11.7)	26
Total	**1,198**	

Broilers

Serovar	N (%) positive samples	N MSs
Infantis	6,468 (45.1)	23
Enteritidis	1,147 (8.0)	21
Livingstone	998 (7.0)	7
Mbandaka	838 (5.8)	10
Java	439 (3.1)	5
Enterica, subspecies enterica	436 (3.0)	4
Thompson	374 (2.6)	7
Typhimurium	330 (2.3)	17
Montevideo	301 (2.1)	5
Group O:7	281 (2.0)	3
Senftenberg	273 (1.9)	8
Newport	171 (1.2)	15
Agona	170 (1.2)	13
Kedougou	156 (1.1)	7
enterica	150 (1.0)	3
Virchow	99 (0.69)	5
Kentucky	96 (0.67)	9
Mkamba	92 (0.64)	1
Napoli	81 (0.56)	2
Monophasic Typhimurium	81 (0.56)	2
Other	1,367 (9.5)	27
Total	**14,348**	

Turkeys

Serovar	N (%) positive samples	N MSs
Anatum	785 (29.8)	7
Agona	620 (23.5)	9
Infantis	189 (7.2)	9
Newport	94 (3.6)	9
Senftenberg	90 (3.4)	4
Enterica, subspecies enterica	81 (3.1)	1
Typhimurium	71 (2.7)	9
Derby	61 (2.3)	6
Bredeney	55 (2.1)	5
Saintpaul	55 (2.1)	4
Hadar	52 (2.0)	4
Lagos	40 (1.5)	1
Monophasic Typhimurium	40 (1.5)	2
Kedougou	38 (1.4)	3
Enteritidis	37 (1.4)	11
Coeln	32 (1.2)	5
Napoli	27 (1.0)	3
Kentucky	24 (0.91)	7
Thompson	18 (0.68)	1
Haifa	15 (0.57)	1
Other	215 (8.2)	19
Total	**2,639**	

SALMONELLA SEROVARS, EU, 2021

Pigs and cattle (bovine animals)

Pigs

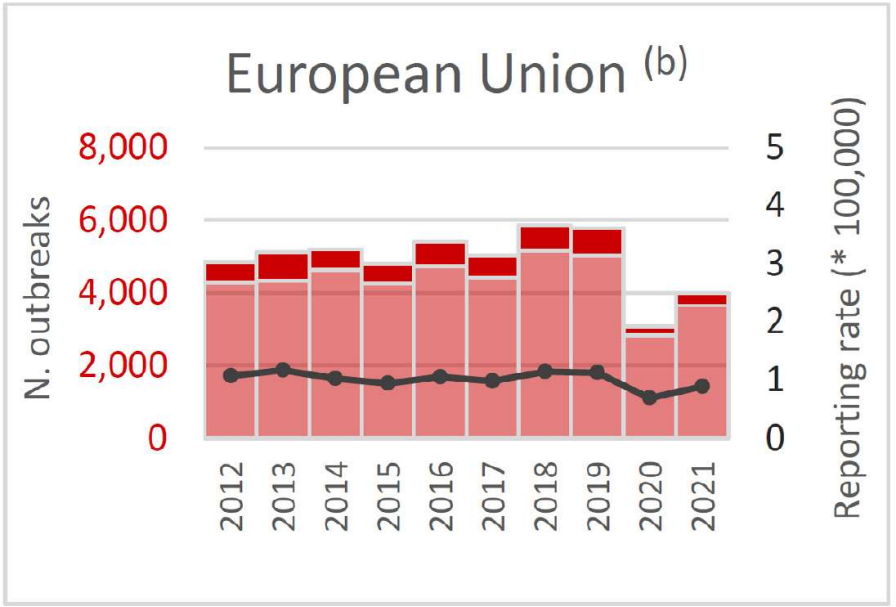
Serovar	N (%) positive samples	N MSs
Monophasic Typhimurium	440 (28.2)	16
Derby	347 (22.3)	21
Typhimurium	239 (15.3)	19
Rissen	103 (6.6)	8
enterica	81 (5.2)	3
Brandenburg	44 (2.8)	8
Infantis	39 (2.5)	10
Group B	24 (1.5)	4
Group O:4	22 (1.4)	1
Enterica, subspecies enterica	19 (1.2)	4
London	19 (1.2)	7
4,12:a:-	14 (0.9)	1
Goldcoast	12 (0.77)	3
Afula	10 (0.64)	1
Enteritidis	10 (0.64)	5
Livingstone	10 (0.64)	3
Agona	9 (0.58)	2
Bovismorbificans	6 (0.38)	2
Choleraesuis	6 (0.38)	2
Choleraesuis var. Kunzendorf	6 (0.38)	1
Other	99 (6.3)	26
Total	**1,559**	

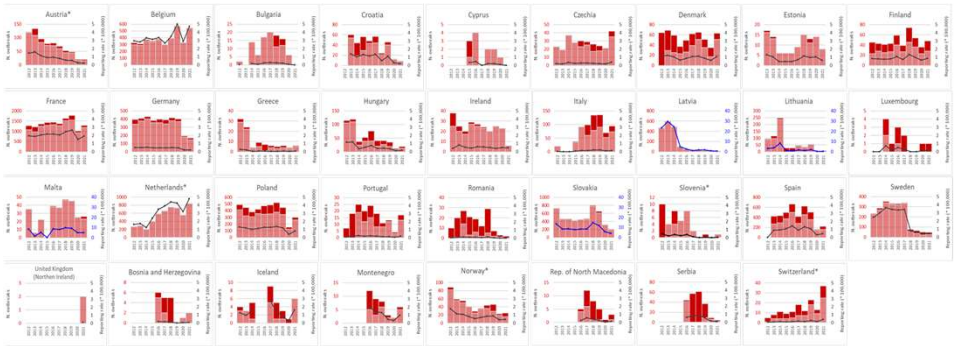
Bovines

Serovar	N (%) positive samples	N MSs
Dublin	281 (31.5)	9
Typhimurium	265 (29.7)	15
Monophasic Typhimurium	80 (9.0)	7
Havana	57 (6.4)	2
enterica	28 (3.1)	3
Group B	19 (2.1)	3
Derby	18 (2.0)	8
Enteritidis	18 (2.0)	6
Infantis	14 (1.6)	7
Altona	9 (1.0)	1
Agona	6 (0.67)	2
Group C	6 (0.67)	1
Montevideo	6 (0.67)	1
Group C1	5 (0.56)	1
Mbandaka	5 (0.56)	2
Kentucky	4 (0.45)	2
Muenster	4 (0.45)	1
Newport	4 (0.45)	2
Give	3 (0.34)	1
Rissen	3 (0.34)	3
Other	56 (6.3)	21
Total	**891**	

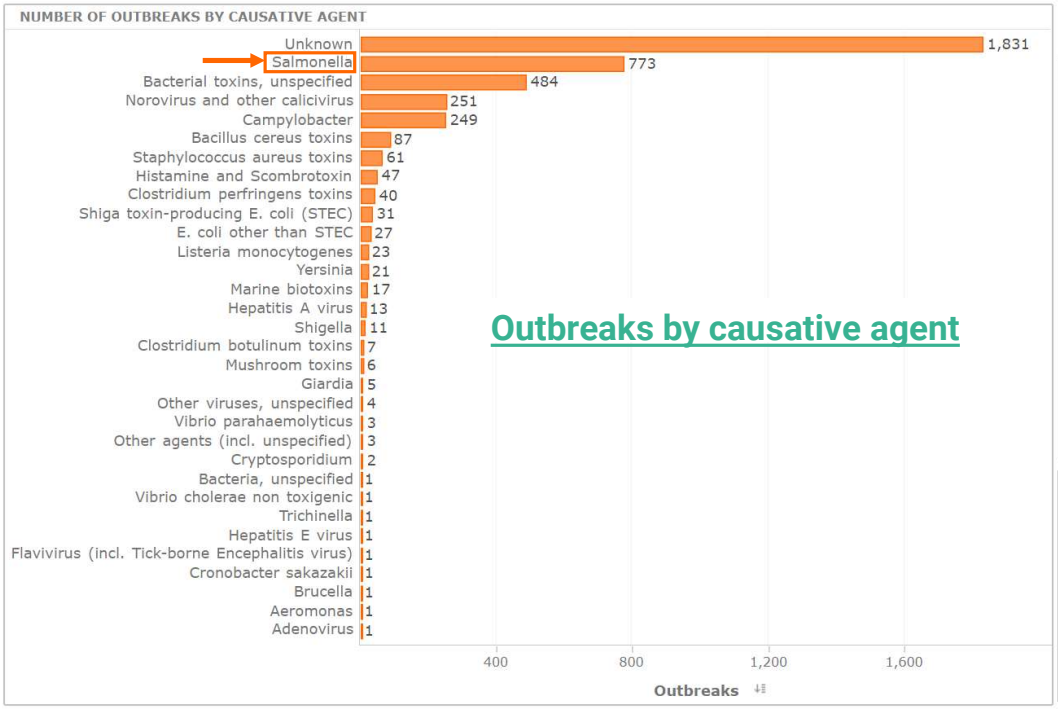
FOODBORNE OUTBREAKS IN EU, OVERVIEW, 2021 (EUOHZ REPORT)

- In 2021, **27 MSs** and **United Kingdom (Northern Ireland)** reported a total of 4,005 FBOs (355 strong-evidence FBOs), 32,543 cases of illness, 2,495 hospitalisations and 31 deaths
- Among MSs, no foodborne outbreaks were detected in 2021 in Bulgaria and Cyprus
- **Seven non-MSs** (Bosnia and Herzegovina, Iceland, Montenegro, Norway, Republic of North Macedonia, Serbia, Switzerland) reported 83 outbreaks, 1,270 cases of illness, 65 hospitalisations and 2 deaths



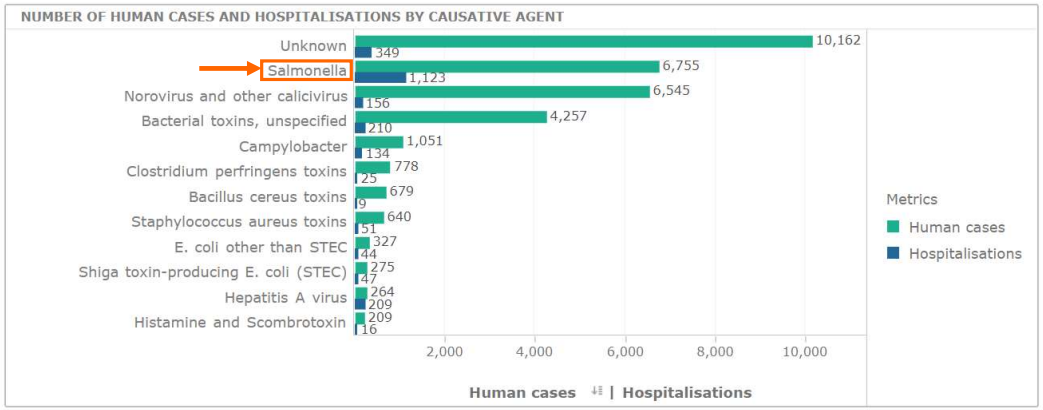


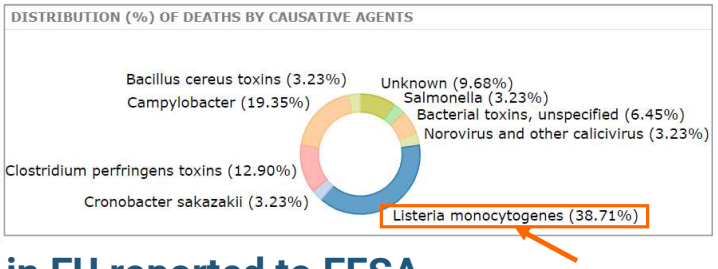
OVERVIEW OF CAUSATIVE AGENTS IN EU, 2021



Outbreaks by causative agent

Cases & hospitalisations by causative agent

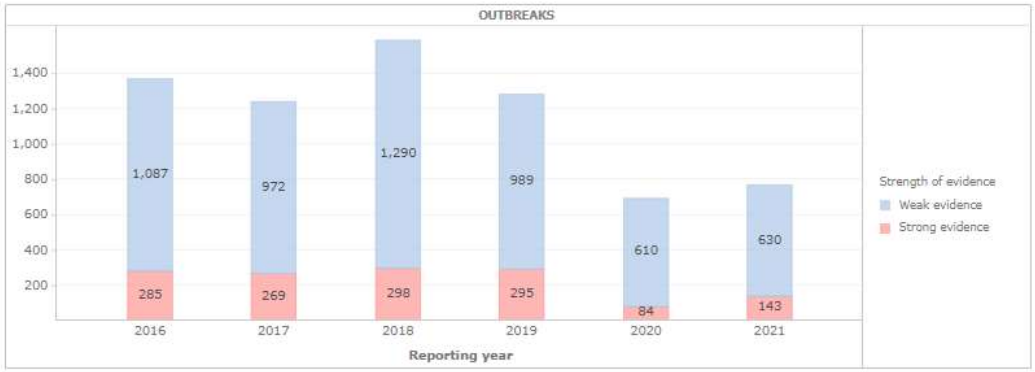


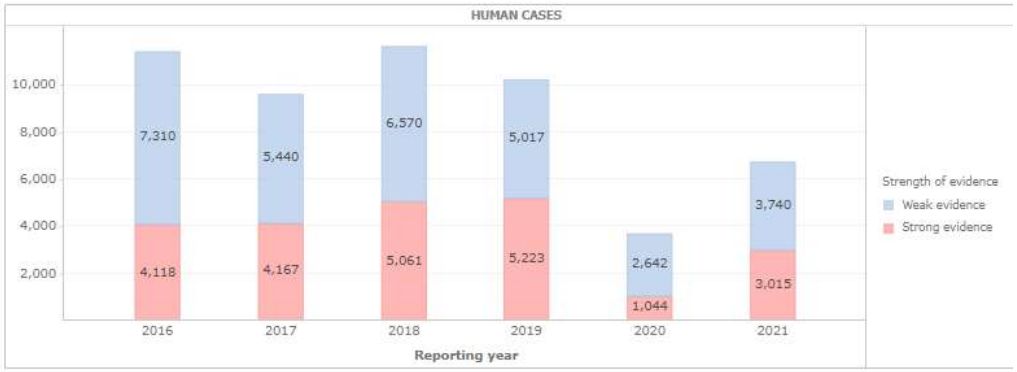


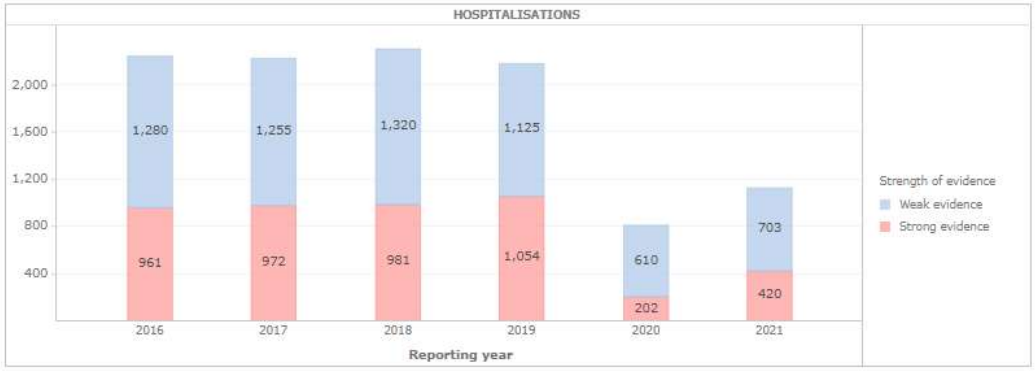
Deaths by causative agent

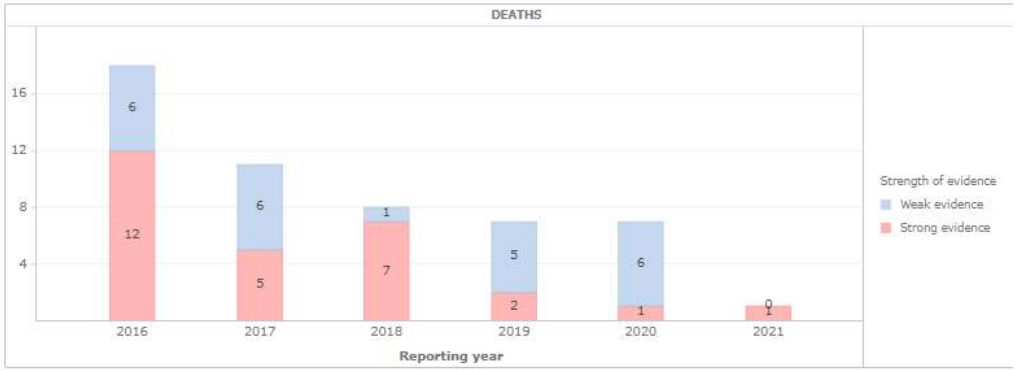
- **FBOs of unknown etiology: 45.7% of all outbreaks in EU reported to EFSA**
- **Bacteria** caused the highest number of outbreaks, human cases, hospitalisations and deaths
- Next to bacteria, the most frequently reported causative agents were **bacterial toxins** and **viruses**
- ***Cronobacter sakazakii*** & **non-toxigenic *Vibrio cholerae*** reported for the **first time** in 2021

OVERVIEW OF SALMONELLOSIS FBO, TIME TRENDS, EU

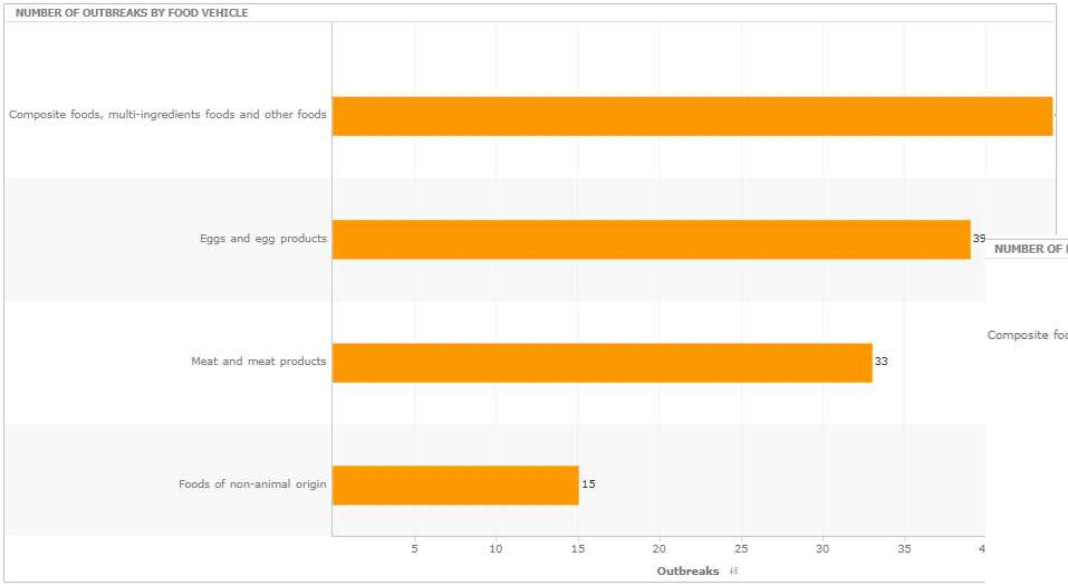






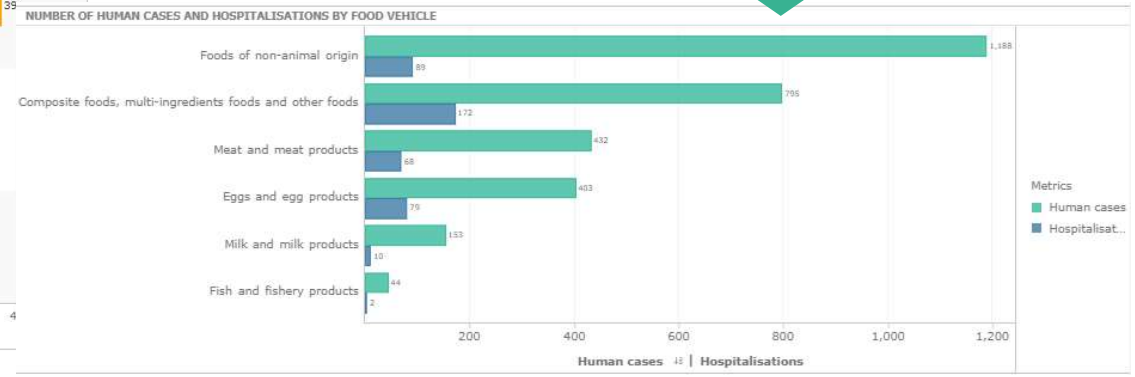


OVERVIEW OF SALMONELLOSIS FBO, STR-EV OUTBREAKS, EU, 2021

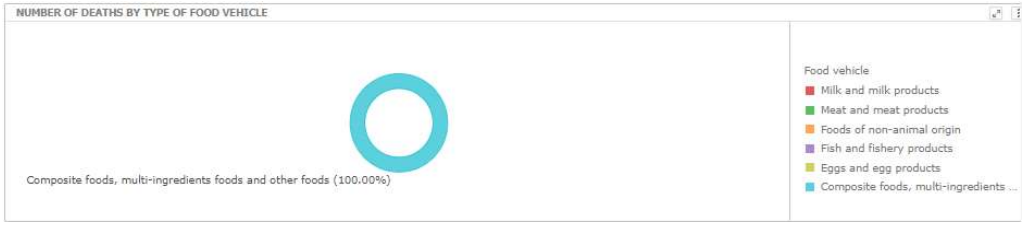


Outbreaks by food vehicle

Cases & hospitalisations by food vehicle



Deaths by food vehicle



MULTI-COUNTRY OUTBREAK OF *SALMONELLA* MBANDAKA ST413, POSSIBLY LINKED TO CONSUMPTION OF CHICKEN MEAT IN THE EU/EEA, ISRAEL AND THE UK *(30 NOVEMBER 2022)*

Cases' distribution

196 cases: 7 EU/EEA n=111; Israel n=4; UK n=81

September 2021 - November 2022

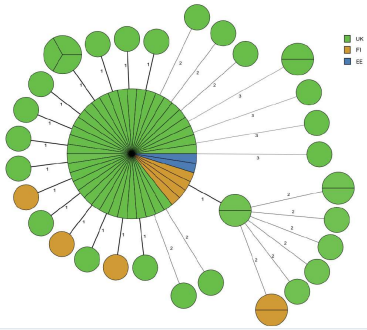
Exposure and interviews

Nineteen cases have been hospitalized and **one** case in the UK died. The cases are reported across all age groups and there is no difference by gender

UK: cases reported consumption of **RTE chicken products** and chicken meat.

FI: cases had eaten various chicken products. **A subset of 15 cases** had consumed or purchased certain ready-to-eat products of three brands.

Minimum Spanning Tree



EFSA and ECDC outbreak assessment

Chicken meat appears to be a common ingredient of the RTE products reported by cases in Finland and the UK.

This suggests that **contaminated chicken meat** used as an ingredient in RTE chicken products **can be the origin of infections**

Based on food exposure information, six RTE products from three brands seemed to have been consumed by 15 cases in Finland before the symptom onset.

The food safety authority in Finland linked the six RTE products to the Estonian Company A.

However, the link to the Estonian Company A is **not** followed by **the identification of batch numbers** and/or expiry dates of the six RTE products and by any microbiological evidence.

Official control performed at the Estonian Company A did not reveal **any *Salmonella* detection** from the sampled environment and food products.

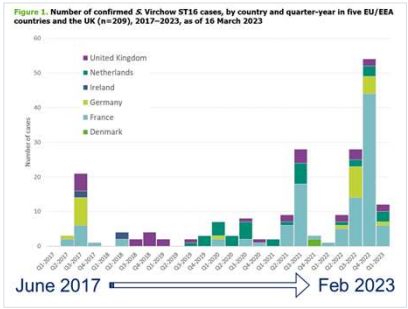
With exception of Finland, the Estonian Company A does not sell its products in the countries that have reported the number of human cases to ECDC, including UK that reported the second largest number of cases.

The role of the Estonian Company A as a source of infection could not be established.

New cases are likely to occur in the EU/EEA until the source has been identified and controlled.

MULTI-COUNTRY OUTBREAK OF *SALMONELLA* VIRCHOW ST16 INFECTIONS LINKED TO CONSUMPTION OF MEAT PRODUCTS CONTAINING CHICKEN MEAT *(30 MARCH 2023)*

Cases' distribution



210 cases: 5 EU/EEA n=177; USA n=1; UK n=32

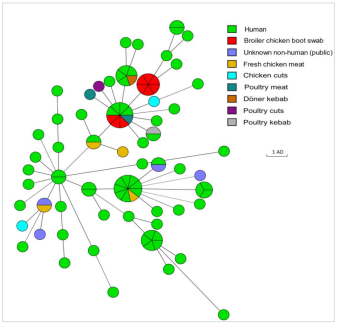
Exposure and interviews

FR: 79% reported consumption of kebab with chicken meat (24 cases interviewed)

DE: most recent case reported consumption of shawarma with chicken meat.

USA : the case reported purchase of eggs and chicken in Paris

WGS cluster analysis



EFSA and ECDC outbreak assessment

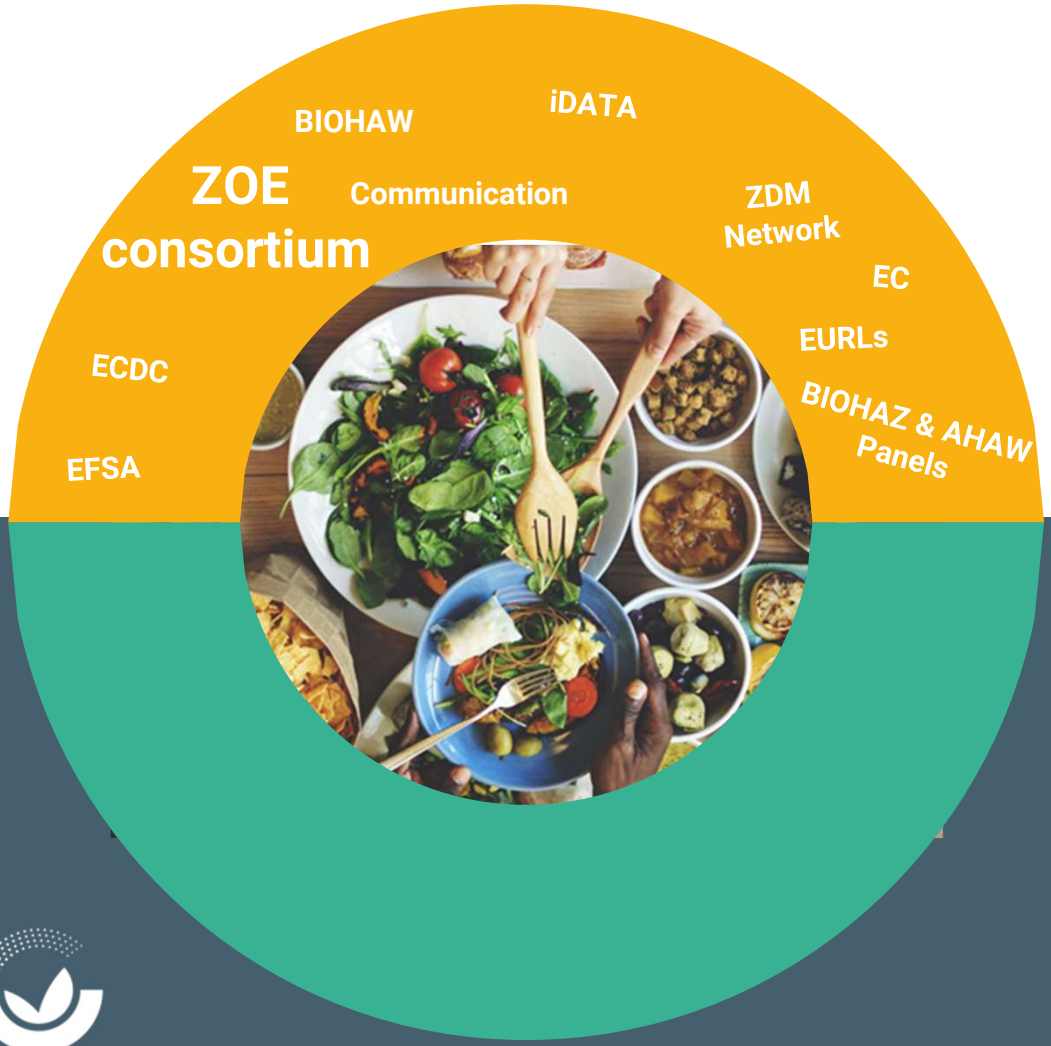
A persistent outbreak of Salmonella Virchow ST16 has been ongoing in at least **five EU/EEA countries**

Based on the available information from case interviews, traceback investigations, and the WGS cluster analysis, **kebab meat products containing contaminated chicken meat are the likely vehicles of infections**, with contaminated chicken meat alone being another possible vehicle of infection.

In the absence of the identification of the batch numbers and any microbiological evidence, **the source(s) of the infections and the point(s) of contamination of the consumed kebab products could not be established**.

The WGS cluster analysis revealed that most of the matching isolates belonged to broiler and broiler-related environments, **supporting the hypothesis of chicken meat as a vehicle of infections**, and highlighting the **circulation** of the clone in EU.

New infections are likely to occur in the EU/EEA until further investigations are performed by public health and food safety authorities to identify the source(s) of the and the possible point(s) of contamination along the chicken meat production chain, including the primary production upstream lines. This will allow appropriate **control measures to be implemented**.



Thank you for your attention