Update on the annual reporting of STEC in the EU and on EFSA activities for molecular typing data collection for food and animal isolates

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13th Annual Workshop of the National Reference Laboratories for *E. coli* in the EU, Rome, 18-19 October 2018

efsa
European Food Safety Authority

OUTLINE

- **Annual reporting of STEC in the EU**
- **EFSA activities for molecular typing data collection for food and animal isolates**

MONITORING OF ZOONOSES AND FBO IN THE EU

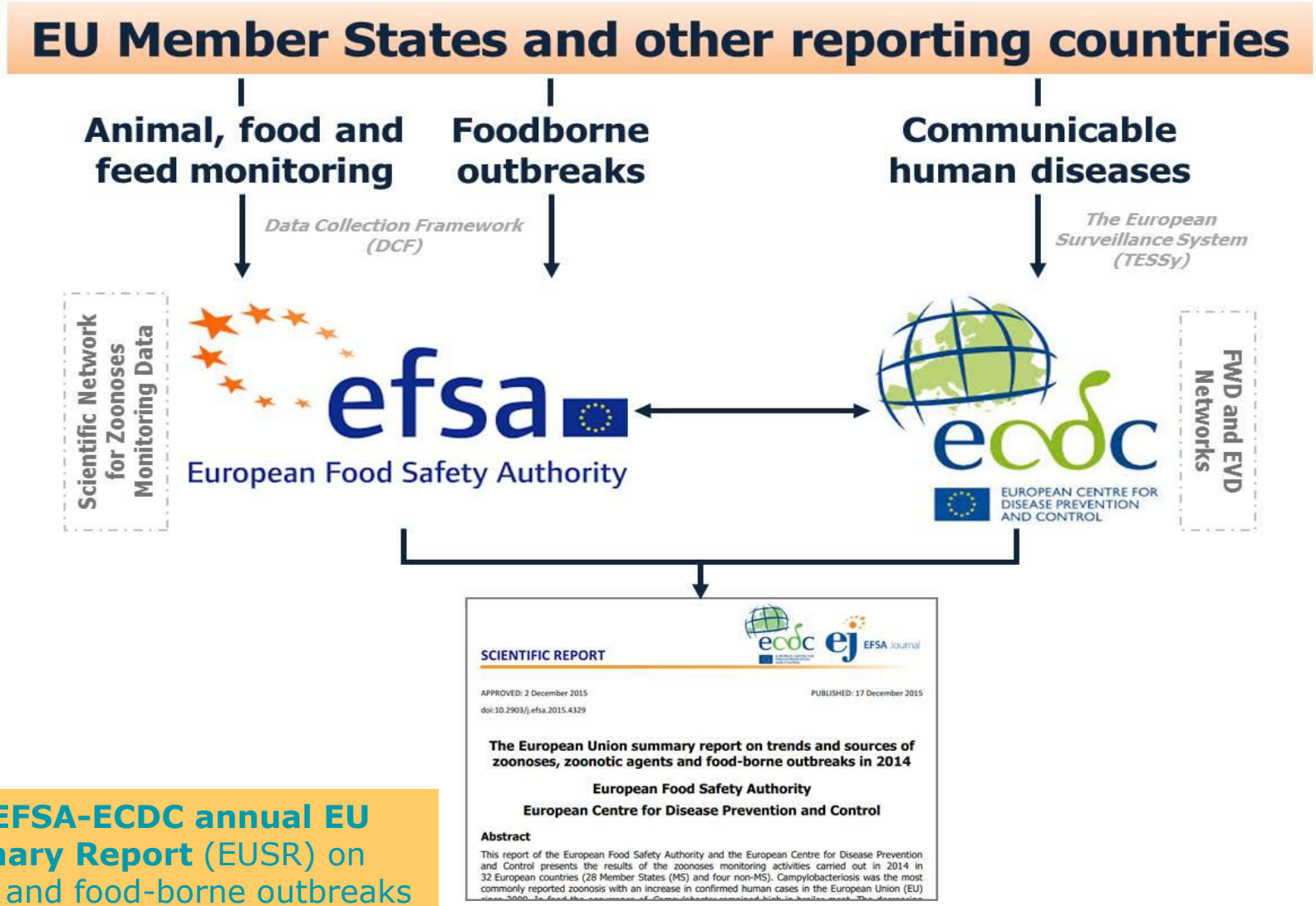
FOOD-ANIMAL DATA

- **Directive 2003/99/EC on the monitoring of zoonoses and zoonotic agents**
  - Publication of the annual EU Summary Report
  - MSs have an **obligation** to report data each year
  - Mandatory data collection for:
    - 8 zoonotic agents: *Salmonella* (+ AMR), *Campylobacter* (+ AMR), *L. monocytogenes, Brucella,* tuberculosis due to *Mycobacterium bovis,* VTEC*, Trichinella, Echinococcus*
    - foodborne outbreaks (FBOs) and susceptible animal populations

HUMAN DATA

- **Decision 1082/2013/EU on serious cross-border threats to health**

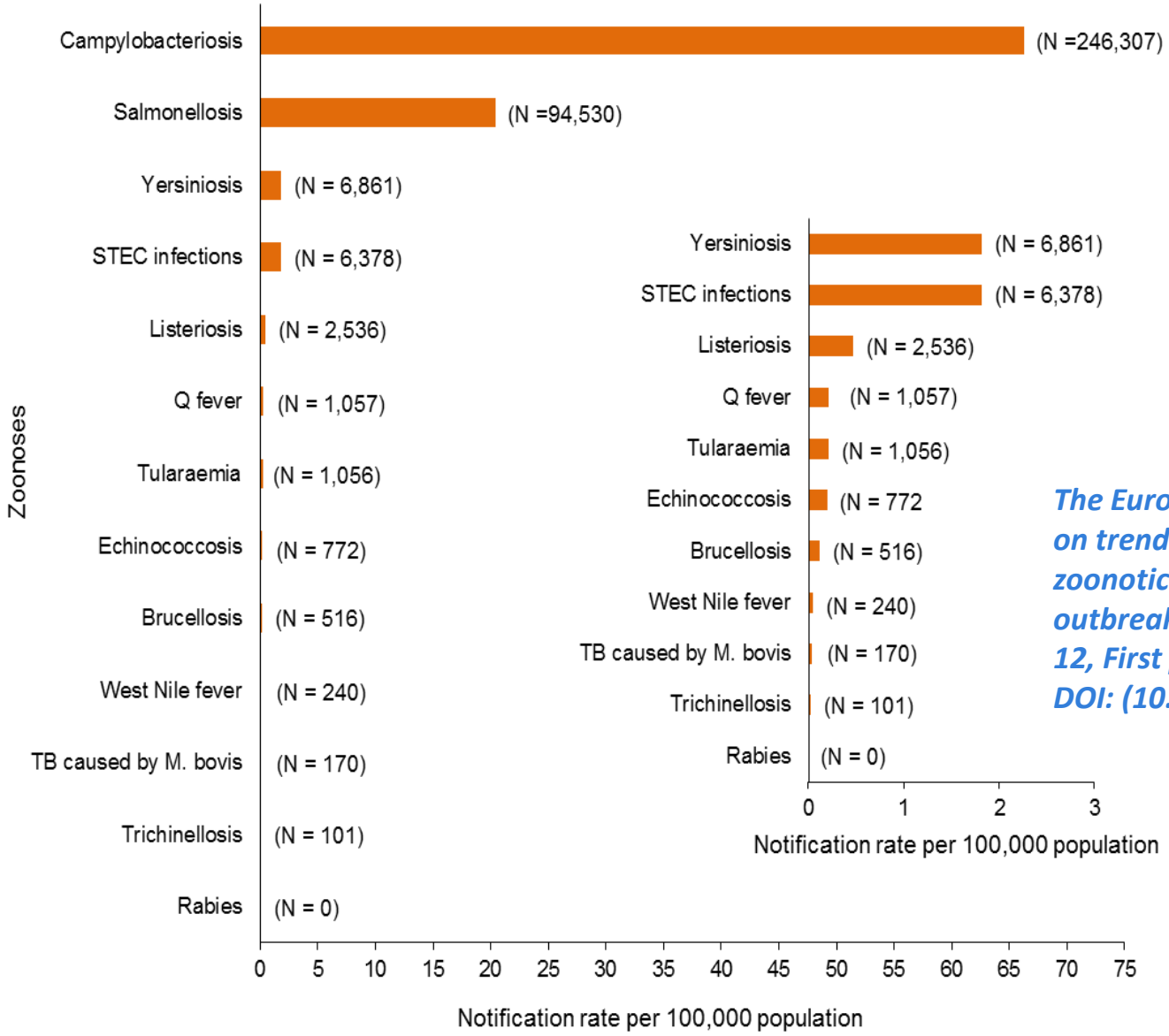
ZOONOSES DATA COLLECTION



Joint EFSA-ECDC annual EU Summary Report (EUSR) on zoonoses and food-borne outbreaks

[Available online: www.efsa.europa.eu/efsajournal]

HUMAN ZOONOSES CASES IN EU, 2016



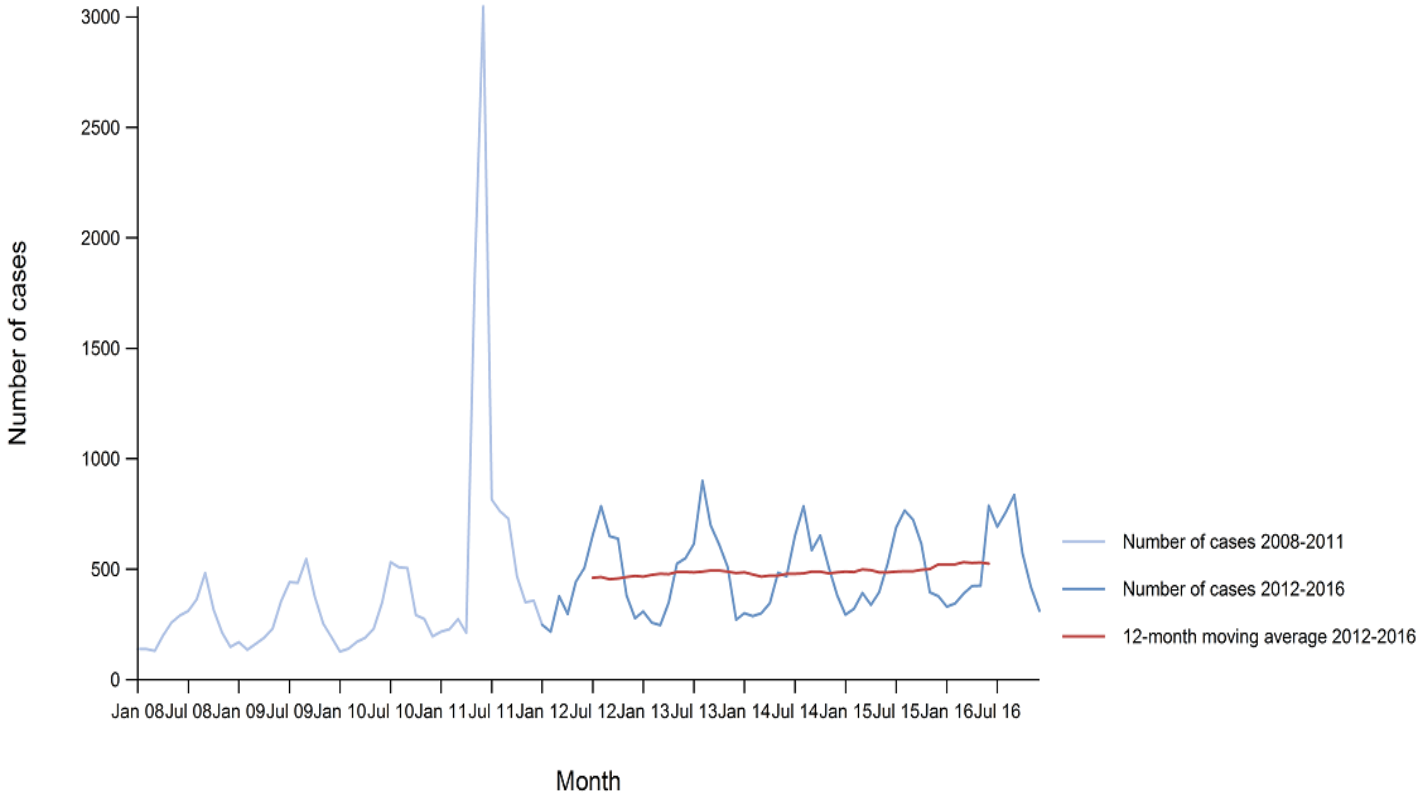
The European Union summary report on trends and sources of zoonoses, zoonotic agents and food-borne outbreaks in 2016, Volume: 15, Issue: 12, First published: 12 December 2017, DOI: (10.2903/j.efsa.2017.5077)

HUMAN ZOONOSES CASES IN EU, 2016

Disease	Number of confirmed[a] human cases	Hospitalisation				Deaths			
		Status available (%)	Number of reporting MSs[b]	Reported hospitalised cases	Proportion hospitalised (%)	Outcome available (%)	Number of reporting MSs[b]	Reported deaths	Case fatality (%)
Campylobacteriosis	246,307	27.4	17	19,265	28.5	72.6	16	62	0.03
Salmonellosis	94,530	33.5	14	12,182	38.4	55.2	16	128	0.25
Yersiniosis	6,861	24.1	14	521	31.5	63.5	15	5	0.11
STEC infections	6,378	42.6	18	940	34.6	58.9	20	10	0.27
Listeriosis	2,536	38.8	18	962	97.7	60.1	20	247	16.2
Q-fever	1,057	NA[c]	NA	NA	NA	54.3	15	3	0.30
Tularaemia	1,056	12.3	11	130	54.6	15.8	12	0	0.0
Echinococcosis	772	26.2	14	119	58.9	25.4	13	1	0.51
Brucellosis	516	39.7	12	146	71.2	26.0	12	1	0.75
West Nile fever[a]	240	65.1	7	147	93.6	99.2	9	28	11.7
Trichinellosis	101	45.5	7	30	65.2	50.5	8	0	0.0
Rabies	0	NA[c]	NA	NA	NA	0.0	0	0	0.0

MS: Member State; STEC: Shiga toxin-producing *Escherichia coli*.
(a): Exception: West Nile fever in which the total number of cases was included.
(b): Not all countries observed cases for all diseases.
(c): NA: Not applicable as information is not collected for this disease.

CONFIRMED CASES OF HUMAN STEC INFECTIONS, EU, 2008-2016



Increasing trend in the period 2008-2016.
Over the last five-year-period from 2012 to 2016, the trend was stable, but higher level than before 2011.

SEROGROUPS IN CONFIRMED HUMAN STEC INFECTIONS IN EU, 2016

The 20 most frequent serogroups reported in confirmed cases of human STEC infections

The proportion of the second most common serogroup O26 increased in 2016 compared with 2015 and 2014.

Serogroup O157 and O26 were followed by serogroups O103, O146, O91, O145 and O128.

One new serogroup (O63) entered into and one serogroup (O78) was dropped from the "top 20 list" in 2016.

The proportion of non-typable STEC strains declined in 2016 compared with 2015 to the same level than in 2014 representing 8.3% of the reported cases with known serogroup.

Serogroup	2016			2015			2014		
	Cases	MSs	%	Cases	MSs	%	Cases	MSs	%
O157	1,553	22	38.6	1,510	21	42.1	1,692	23	47.0
O26	671	19	16.7	537	16	15.0	444	16	12.3
NT[1]	335	12	8.3	397	10	11.1	265	9	7.4
O103	218	18	5.4	172	14	4.8	192	12	5.3
O146	159	11	4.0	74	10	2.1	82	9	2.3
O91	150	11	3.7	114	12	3.2	105	11	2.9
O145	121	12	3.0	95	12	2.6	105	11	2.9
O128	65	13	1.6	49	12	1.4	47	11	1.3
O113	60	11	1.5	25	7	0.7	31	10	0.9
O111	57	14	1.4	42	11	1.2	54	11	1.5
O80	42	8	1.0	24	4	0.7	15	3	0.4
O55	34	10	0.8	28	8	0.8	37	11	1.0
O117	29	7	0.7	23	7	0.6	21	8	0.6
O5	29	7	0.7	21	6	0.6	16	7	0.4
O-rough[2]	26	4	0.6	44	8	1.2	54	7	1.5
O182	25	6	0.6	24	5	0.7	13	5	0.4
O8	25	10	0.6	20	9	0.6	15	7	0.4
O121	24	5	0.6	17	4	0.5	31	6	0.9
O63	24	4	0.6	8	4	0.2	24	6	0.7
O27	22	3	0.5	16	4	0.4	9	3	0.2
O76	21	7	0.5	31	9	0.9	21	7	0.6
O177	16	6	0.4	23	5	0.6	14	8	0.4
Other	313	-	7.8	296	-	**8.2**	314	-	8.7
Total	**4,019**	**24**	100.0	**3,590**	**21**	**100.0**	**3,601**	**24**	**100.0**

STATISTICS ON STEC DATA IN EU, 2012-2016

	2016	2015	2014	2013	2012	Data source
Humans						
Total number of confirmed cases	6,378	5,929	5,900	6,042	5,680	ECDC
Total number of confirmed cases/ 100,000 population (notification rates)	1.82	1.68	1.75	1.80	1.70	ECDC
Number of reporting MS	28	28	27	27	27	ECDC
Infection acquired in the EU	3,994	3,991	3,959	3,916	3,678	ECDC
Infection acquired outside the EU	342	532	474	485	543	ECDC
Unknown travel status or unknown country of infection	2,042	1,406	1,467	1,641	1,459	ECDC
Total number of food-borne outbreaks (including waterborne outbreaks)	42	69	67	74	41	EFSA
Number of outbreak-related cases	735	674	957	633	NA	EFSA
Food						
Meat and meat products						
Number of sampled units	9,242	10,385	8,576	11,024	11,876	EFSA
Number of reporting MS	18	16	16	19	18	EFSA
Milk and milk products						
Number of sampled units	4,119	4,518	6,811	4,933	4,606	EFSA
Number of reporting MS	12	11	12	13	12	EFSA
Fruits and vegetables (and juices)						
Number of sampled units	1,543	2,052	2,054	3,250	2,025	EFSA
Number of reporting MS	11	13	13	13	12	EFSA
Animals						
Bovine animals						
Number of sampled herds	62	49	1,178	1,307	1,664	EFSA
Number of reporting MS	2	2	5	4	4	EFSA
Small ruminants						
Number of sampled herds	208	109	44	11	58	EFSA
Number of reporting MS	8	7	7	7	6	EFSA

STEC IN FOOD : ANALYTICAL METHODS USED, 2012-2016

Year	2012	2013	2014	2015	2016
No of samples tested for STEC	25,547	25,008	21,599	20,886	18,975
Analytical method	**Proportion (%) of food samples tested by each method:**				
ISO 16654:2001 - NMKL-164:2005 -DIN 10167:2004-3	13.6	14.1	6.4	8.8	7.0
ISO TS 13136:2012	31.1	34.4	41.5	82.8	91.5
Other PCR-based methods	8.5	17.8	13.5	2.3	0.3
ELISA-based method including ELFA	0	<0.1	<0.1	0	0
Other microbiological tests	33.2	20.6	24.5	0.9	0.1
Not specified	13.6	13.1	14.1	5.2	1.2

The top five serogroups most commonly reported in foods were: O26 (0.1% of 17,364 samples tested and 5.1% of the positive specimens), O157 (0.07% of 17,364 samples tested and 3.2% of the positive specimens), O103 (0.02% of 17,364 samples tested), O111 (0.01%) and O145 (0.01%) (Table 17).

In 2016, an increasing trend of reporting for non-O157 STEC serogroups was observed in food, in particular O26, in parallel with the decreasing trend in the reporting of STEC O157. This result confirms the findings for 2015.

STEC IN FOOD: MONITORING DATA (REG. 2073/2005) IN EU, 2016

Overall, STEC was reported in **2.5%** of the 18,975 food samples tested.

Highest proportion of positive samples in:
- Meat from sheep and goats
- Milk and dairy products

The food safety criterion prescribes that sprouted seeds monitoring results must be compliant with "absence in 25 grams", of Shiga toxin producing *E. coli* (STEC) O157, O26, O111, O103, O145 and O104:H4, at retail (Reg. (EC) 209/2013).

STEC sprouted seeds monitoring results at retail, EU, 2013-2016

Sprouted seeds	Number of reporting MS	Sample units tested	Sample units positive (%)
2013	6	444	0 (0.0)
2014	6	481	0 (0.0)
2015	7	576	1 (0.2)
2016	8	344	1 (0.3)

STEC IN FOOD

*Proportion of positive samples for any STEC and STEC belonging to the '**top-5**' serogroups in **food categories** in reporting Member States and reporting non-Member States, 2016*

Food category[b]	Samples tested by ISO 13136	Samples positive for											
		Any STEC		O157		O26		O145		O103		O111	
	n	n	%	n	%	n	%	n	%	n	%	n	%
Bovine meat	4,852	98	2.02	6	0.12	4	0.08	1	0.02	0	0.00	0	0.00
Ovine and goat meat	413	62	15.01	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Other ruminants meat[c]	48	8	16.67	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Pig meat	938	24	2.56	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Other meat[d]	2,263	63	2.78	3	0.13	2	0.09	0	0.00	1	0.04	2	0.09
Mixed meat	100	8	8.00	0	0.00	4	4.00	0	0.00	0	0.00	0	0.00
Milk and dairy products[e]	2,399	34	1.42	3	0.13	7	0.29	0	0.00	2	0.08	0	0.00
Raw milk[f]	1,188	21	1.77	0	0.00	2	0.17	0	0.00	1	0.08	0	0.00
Fruit and vegetable	1,359	9	0.66	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Seeds[g]	433	1	0.23	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Other food	3,371	42	1.25	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Total	**17,364**	**370**	**2.13**	**12**	**0.07**	**19**	**0.11**	**1**	**0.01**	**4**	**0.02**	**2**	**0.01**

STEC IN FOOD

*Frequency distribution of **non-O157 STEC** serogroups in **food categories** in reporting Member States, 2016*

Food category[b]	STEC isolates with serogroup reported	STEC serogroups													
		% of total STEC isolates with serogroup reported in the specific food category													
	n	O26	O103	O145	O111	O146	O91	O76	O113	O5	O174	O87	O116	O6	Other serogroups (list)
Bovine meat	30	13.3	0.0	3.3	0.0	0.0	3.3	3.3	20.0	0.0	3.3	0.0	0.0	0.0	53.3 (O100, O108, O130, O139, O153, O171, O177, O182, O22, O39, O79, O8)
Ovine and goat meat	23	0.0	0.0	0.0	0.0	21.7	4.3	4.3	8.7	0.0	0.0	8.7	0.0	13.0	39.1 (O108, O14, O15, O168, O176, O38, O65)
Other ruminants meat[c]	7	0.0	0.0	0.0	0.0	57.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	14.3	28.6 (O153, O8)
Pig meat	6	0.0	0.0	0.0	0.0	16.7	16.7	0.0	0.0	0.0	16.7	0.0	0.0	0.0	50.0 (O119, O68, O8)
Other meat[d]	23	8.7	4.3	0.0	8.7	4.3	0.0	4.3	4.3	0.0	0.0	0.0	0.0	0.0	65.2 (O100, O101, O112, O121, O168, O188, O21, O23, O27, O38, O7, O77, O8)
Mixed meat	4	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Milk and dairy products[e]	13	53.8	15.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	30.8 (O15, O177, O38, O8)
Raw milk[f]	7	28.6	14.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	14.3	0.0	42.9 (O150, O179, O22)
Fruit and vegetable	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Seeds	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other food	31	0.0	0.0	0.0	0.0	12.9	3.2	0.0	0.0	3.2	3.2	0.0	0.0	3.2	74.2 (O100, O130, O166, O168, O181, O21, O27, O39, O55, O8, O81)
Total	**144**	**13.2**	**2.8**	**0.7**	**1.4**	**10.4**	**2.8**	**2.1**	**6.3**	**0.7**	**2.1**	**1.4**	**0.7**	**3.5**	**52.1**

STEC IN ANIMALS

Overall, STEC was reported in **12.7%** of the 2,496 animal samples tested.

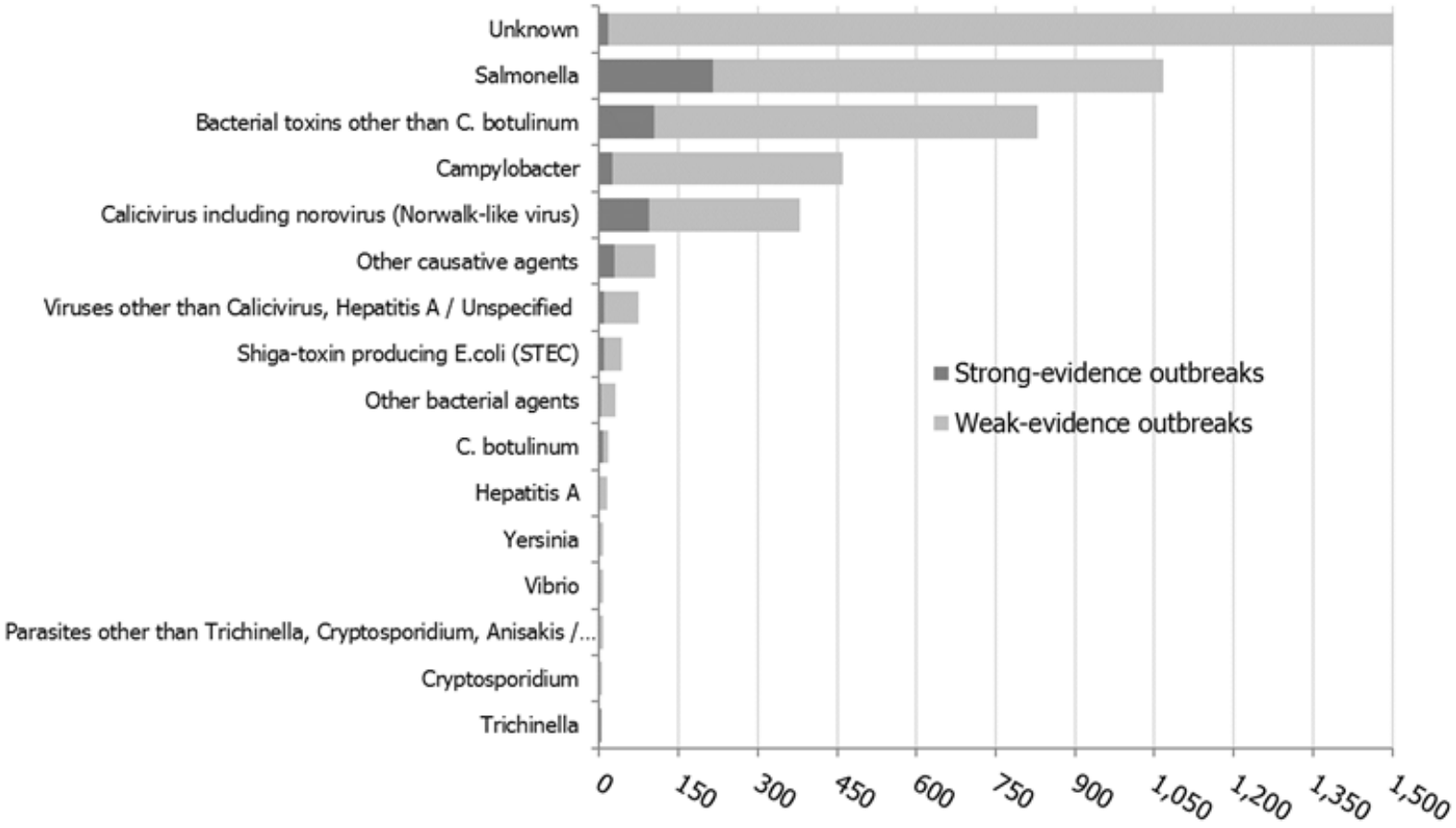
Highest proportion of positive samples in sheep and goats.

*Frequency distribution of **non-O157 STEC** serogroups in **animals** in reporting Member States, 2016*

Animal category	STEC isolates with serogroup reported	STEC serogroups (g)											
		% of total STEC isolates with serogroup reported in the specific animal category											
	n	O26	O103	O145	O111	O146	O91	O76	O113	O5	O87	O6	Other serogroups (list)
Cattle	2	50.0	50.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Goat and sheep	180	2.2	0.6	0.0	0.0	21.7	0.6	17.2	6.7	5.0	1.1	3.3	41.7	(O1, O104, O112, O12, O128, O134, O141, O148, O15, O153, O166, O175, O176, O178, O182, O21, O38, O43, O65, O77, O92)
Other ruminants[(b)]	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Pigs[(c)]	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Other animals[(d)]	8	25.0	25.0	25.0	25.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total	**190**	**3.7**	**2.1**	**1.1**	**1.1**	**20.5**	**0.5**	**16.3**	**6.3**	**4.7**	**1.1**	**3.2**	**39.5**	

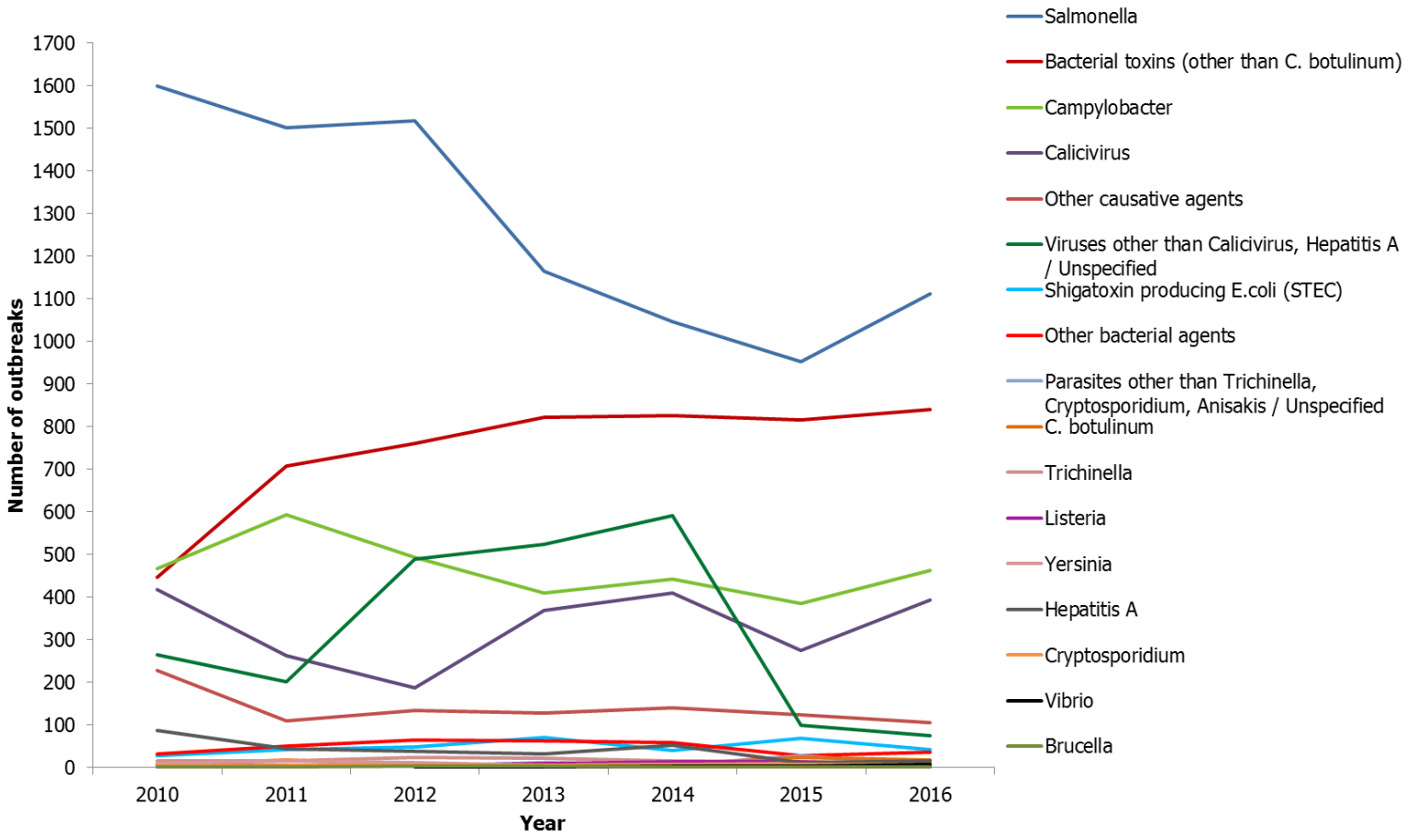
FOODBORNE OUTBREAKS IN EU, 2016

Distribution of strong-evidence and weak-evidence food-borne and waterborne outbreaks, per causative agent, EU, 2016



Total n. FBOs: 4,786 (strong-evidence: 525; weak-evidence: 4,261)

FOODBORNE OUTBREAKS BY CAUSATIVE AGENT, 2010-2016



Number of food-borne and water-borne outbreaks reported by causative agent in the EU Member States from 2010 to 2016

FOODBORNE OUTBREAKS BY CAUSATIVE AGENT/COUNTRY, 2016

FOODBORNE OUTBREAKS DUE TO STEC, 2016

42 FBOs due to pathogenic *E. coli* were reported by 7 MSs (BE, FI, DE, IE, RO, SE, UK) 735 cases – 125 hospitalisations – 3 deaths

- 33 weak evidence
- 9 strong evidence
  - **Food vehicle**: Bovine meat, Cheese, Vegetables and juices and other products thereof, Other or mixed red meat and products thereof, Buffet meal, Milk
  - **Type**: All general outbreaks but 1 (household)
  - **Contributory factors**: Unprocessed contaminated ingredient (in 4) and Cross-contamination (in 3)
  - **Serogroup**: VTEC O157, *E. coli* , VTEC, VTEC non-O157

In addition, 2 EFTA countries reported 2 strong-evidence outbreaks (NO and CH)

FOODBORNE OUTBREAKS DUE TO STEC, 2016

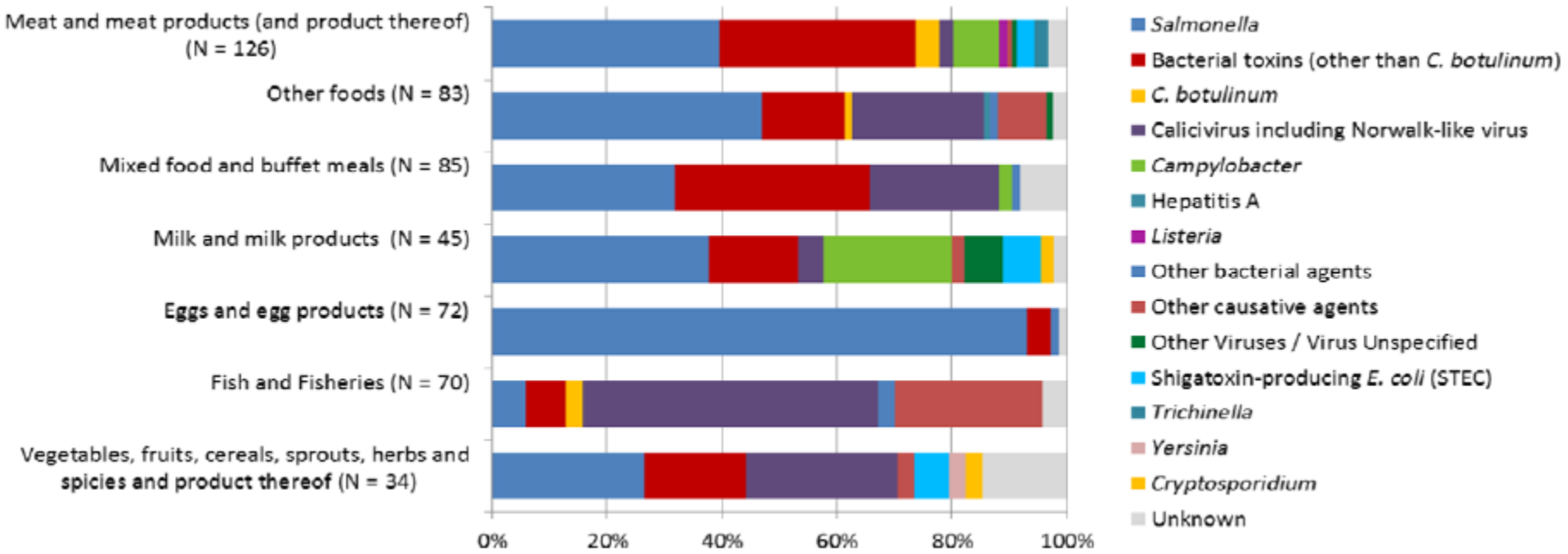
Top-5 combinations (agent/food vehicle) causing the **highest number of deaths**, in strong-evidence food-borne outbreaks (including waterborne outbreaks), reporting Member States and reporting non-Member States, 2016

High impact in term of fatality cases.

Causative agent	Food vehicle	2016							2010–2016		
		Rank	Number of outbreaks	Cases			Outbreak reporting rate per 100,000	Reporting Member State	Rank	Number of deaths (mean)	Outbreak reporting rate per 100,000 (mean)
				Number	Hospitalised	Deaths					
Salmonella	Eggs and egg products	1	67	1,099	222	4	0.014	17	3	0.8	0.022
Shiga toxin-producing *E. coli* (STEC)	Vegetables and juices and their other products	2	2	407	63	2	< 0.001	2	1	9.0	< 0.001
Salmonella	Mixed food	3	23	266	123	1	0.005	12	3	0.8	0.005
Salmonella	Cheese	3	14	97	27	1	0.003	3	17	0.2	0.002
Shiga toxin-producing *E. coli* (STEC)	Cheese	3	2	29	18	1	< 0.001	3	na	na	na
Listeria	Meat and meat products	3	1	11	10	1	< 0.001	1	na	na	na

FOODBORNE OUTBREAKS DUE TO STEC, 2016

Frequency distribution of causative agents associated with strong-evidence food-borne outbreaks (excluding waterborne outbreaks), by food vehicle, reporting Member States, 2016



OUTLINE

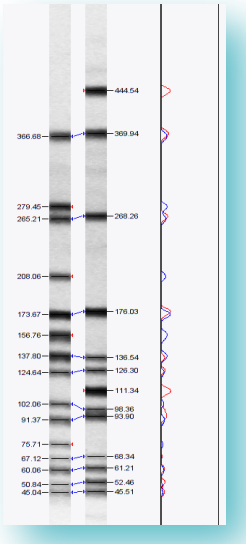
- Annual reporting of STEC in the EU
- **EFSA activities for molecular typing data collection for food and animal isolates**

COMMISSION'S MANDATE (18/1/2013)

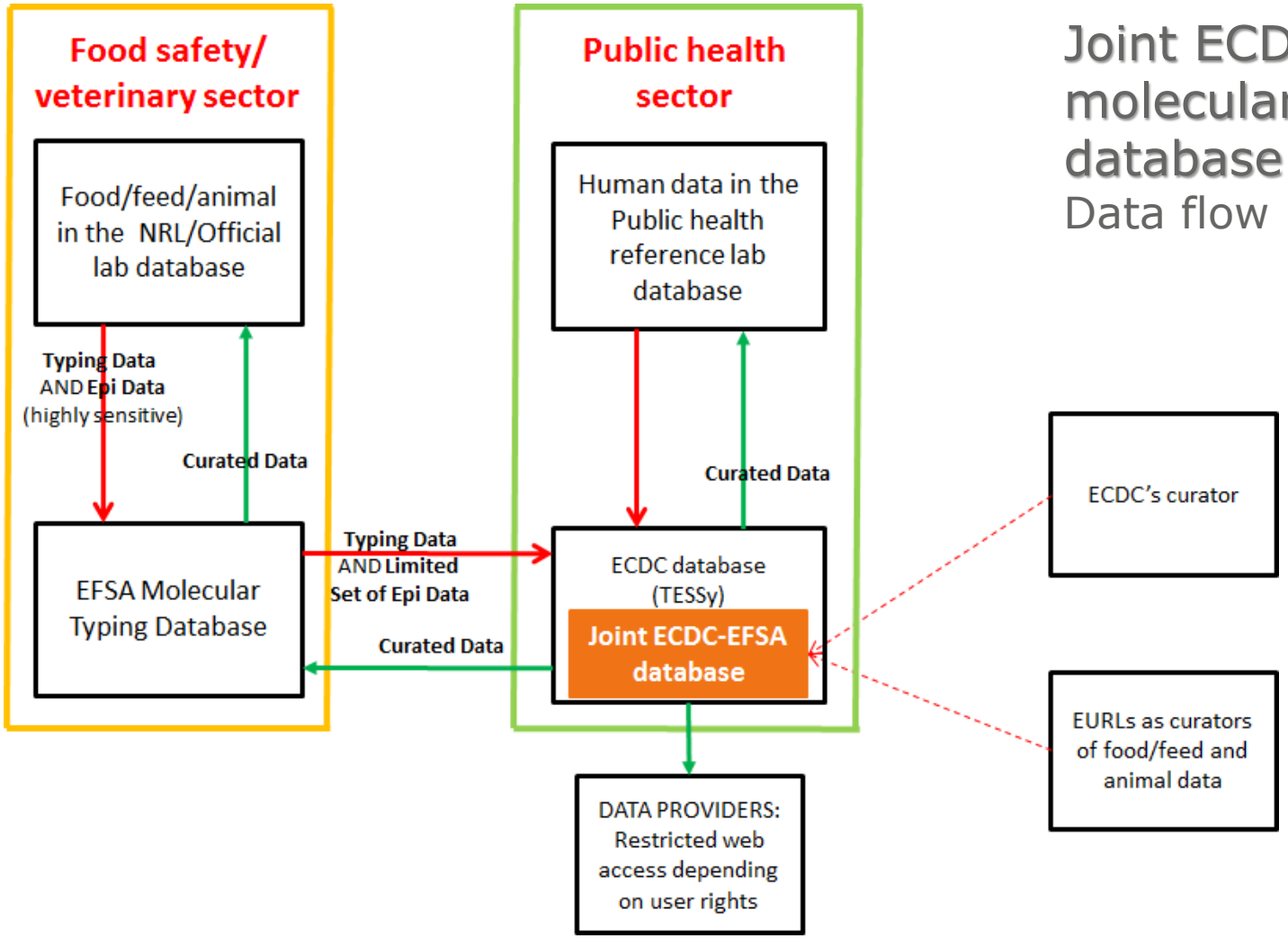
Following the STEC crisis in 2011, a '**Vision paper on the development of databases for molecular testing of food-borne pathogens in view of outbreak preparedness**' was prepared to encourage collection of molecular typing data to allow integration of data on isolates from human cases, food and animals.

Then, EC sent a request to EFSA and ECDC for assistance:

- to collect molecular typing data (**PFGE and MLVA**) on *Salmonella*, *L. monocytogenes* and VTEC isolates from food, feed, animals (EFSA) and humans (ECDC)
- to perform a joint data analyses of the data in the **joint EFSA-ECDC molecular typing database**.



MOLECULAR TYPING DATABASE



Joint ECDC-EFSA molecular typing database

Data flow

MOLECULAR TYPING DATABASE

To guarantee **data confidentiality** only a subset of the metadata stored in the EFSA database will be sent to ECDC for storage in the joint EFSA-ECDC database.

The **visibility of data** in joint EFSA-ECDC database depends on the **type of data** (sensitive or non-sensitive) and the **users**.

Data shared in the joint database:

Non-sensitive data:

Microbiological Data, limited to *Molecular Typing Data* and other typing data (*Salmonella* serotype, *Listeria* serotype and STEC serogroup). EFSA Isolate Id, date of sampling, date of receipt of isolate in the reference lab, type of sample (e.g. 'animal', 'food', 'feed', 'environment')

Sensitive data:

Country of sampling, laboratory identification code

COLLABORATION AGREEMENT

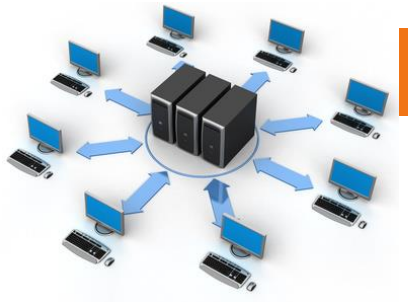
- Collaboration Agreement on the **management of data on molecular testing** of food, feed and animal isolates of selected food-borne pathogens and their use together with molecular typing data on isolates from human infections **for public health purposes**

- It covers issues with regards to **data ownership**, **availability**, **access**, **use**, **publication** and **confidentiality**

- The implementation of this agreement will be supervised by a **Steering Committee**

Appendix 1: Member State food/feed NRLs and other official control laboratories and institutes **agreement** on the collection of data on molecular testing in food, feed and animal isolates of food-borne infections

LABORATORIES PARTICIPATION



Criteria

- Voluntary submission of molecular typing data
- Source: isolates from food, feed, animal and food/feed processing environment
- Context: strains isolated and typed during outbreak investigation or during routine activities of the laboratory with the following prioritisation order:
  - Isolates from food that are traded (linked to RASFF notifications)
  - Isolates identified during multi-country outbreak investigations
  - Isolates identified during national outbreak investigations
- Time period of interest: available historical data and new data

Official nomination

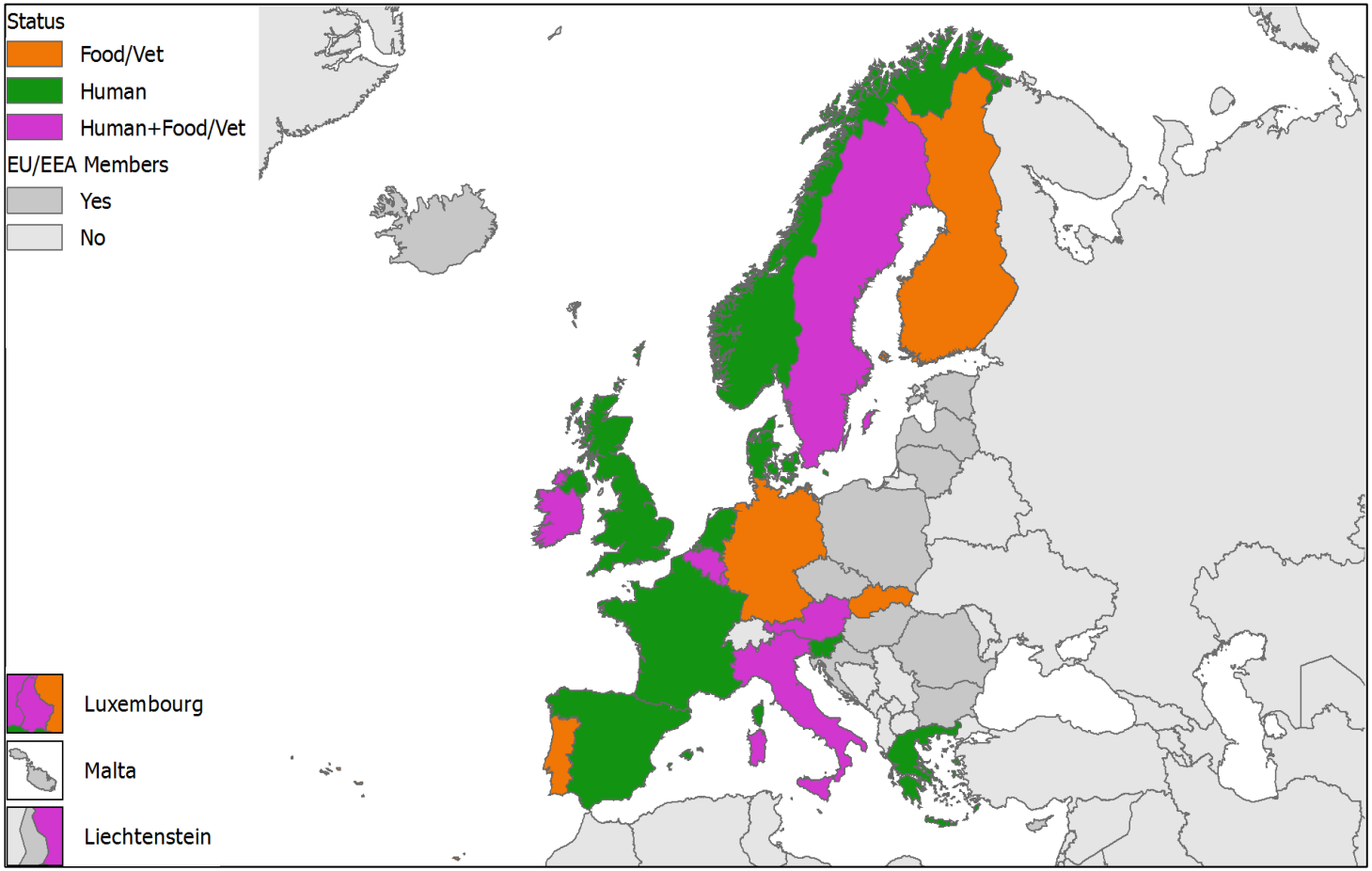
- The countries willing to participate in the data collection have to officially **nominate their representatives** for submitting molecular typing data to EFSA and communicate them to Commission, from a lab that:
  - is an **NRL or official control laboratory** for *Listeria monocytogens*, *Salmonella* or *E. coli*.
  - owns **BioNumerics (Applied Maths) version 7.1** or higher or is able to submit data through the **EFSA's Data Collection Framework** (DCF).
- The nominated users (or representative of their Institute) have to **sign the Appendix 1 of the Collaboration Agreement**

Status of engagement of laboratories

	Human side	Food/ veterinary side
Nominated users	All MSs	**12 MSs**: AT, BE, DK, DE, FI, IE, IT, LU, PT, SE, SK, UK (19 labs)
Signature of the Collaboration Agreement	**16 MSs**: AT, CZ, DK, EE, DE, EL, HU, LV, LT, MT, NO, RO, ES, SE, NL, SK	**10 MSs**: AT, BE, DE, FI, IE, IT, LU, PT, SE, SK (12 labs)
Transmission of data (upload in 2017, excluding WGS data)	**14 MSs**: AT, BE, DK, EL, ES, FR, IE, IT, LU, NL, NO, SE, SI, UK	**8 MSs (as of June 2018): BE, DE, FI, IE, IT, LU, SE, SK**
Total number of isolates uploaded (as of June 2018)	**45,083**	**837**

Status of engagement of laboratories

Status of engagement of laboratories



Human: submitting data. Food/veterinary: collaboration agreement signed.

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EUROPEAN UNION COLLABORATIVE PROJECTS BETWEEN EUROPEAN UNION OR NATIONAL REFERENCE LABORATORIES

The ECDC-EFSA molecular typing database for European Union public health protection

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http://euroreference.mag.anses.fr/en

Mandate on WGS

Due to the growing importance of WGS, the development of a WGS database is essential to ensure integrated analysis of molecular typing data from foodborne pathogens.

Important for the focus of the EC on improving crisis preparedness and management in the food and feed area in order to ultimately ensure a more effective and rapid containment of food and feed-related emergencies and crises in the future.

Collection of WGS data would support risk managers to quickly respond to challenges posed by threats.

Mandate on WGS

EFSA and ECDC are asked to provide technical support for the **implementation and management of a database on relevant WGS data from foodborne pathogens**.

In particular, to jointly evaluate the **possible solutions** for the **collection and the analysis of WGS** data for at least *L. monocytogenes*, *Salmonella*, *E. coli*

- ToR1: to analyse **outcome of ECDC and EFSA Surveys on WGS** capacity for foodborne pathogens in MSs (food and PH).
- ToR2: … to assess the **state of the art of pipelines** for collecting and analysing WGS data…
- ToR3: … to assess **needs/requirements** for analysis and comparability; interactions among databases; roles and responsibilities.
- ToR4: to prepare a **Technical report**: identification, comparison of potential solutions for a joint EFSA-ECDC

Deadline April 2019

Thanks for your attention!

EFSA is committed to:

Excellence, Independency, Responsiveness and Transparency

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Acknowledgements:
BIOCONTAM Unit
DATA Unit
ECDC
EC – SANTE G4
Zoonoses Monitoring Data Network
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