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to ensuring that Europe's food is safe



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

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8° Annual Workshop of the National Reference Laboratories for *E. coli* in the EU
Rome, Italy, 10-11 October 2013

- **EFSA and the Biological Monitoring (BIOMO) unit**
- **EU-wide data collection on zoonotic pathogens**
 - Data on VTEC
 - Food-borne outbreaks due to pathogenic *E. coli*
- **Molecular typing data collection for food and animal isolates**

10 years of EU food safety system

- Europeans enjoy **one of the highest levels of food safety** in the world
- **Continued commitment, co-operation and innovation** of EU institutions and its independent agencies
- For 10 years, **EFSA** has underpinned the EU's decisions on **food and feed safety, animal health & welfare, nutrition and plant health**



Scientific advice from farm to fork

Plant Health



Plant Protection



Genetically modified organisms



Animal feed



Animal health and welfare



Biological food chain hazards



Food chain contaminants



Food additives
Flavourings and
Processing aids



Dietary,
nutritional and
novel food



Food packaging

Working together, working for Europe

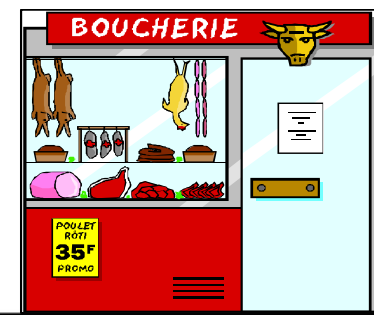
- 30 national food safety agencies
- 300 research institutes
- Over 1500 experts



- EU Agencies
- Third country organisations

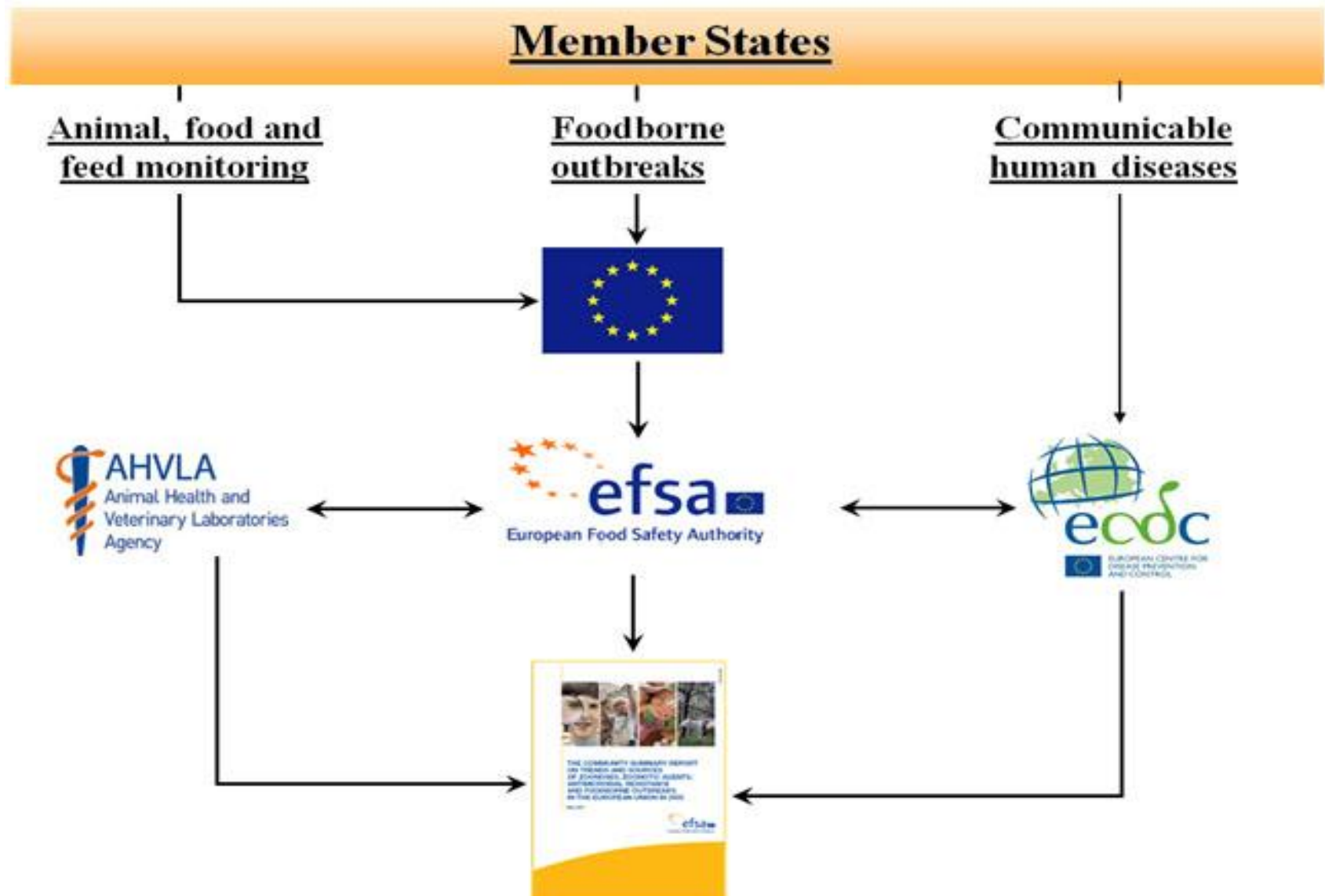
Activities currently focused on three areas:

- **Annual data collection and reporting on zoonoses, AMR and food-borne outbreaks in EU**
- **Survey design and analyses of EU-wide baseline surveys** on zoonotic agents in animals and food
- **Meat inspection mandate** – define epidemiological criteria for adaptations of current meat inspection methodology



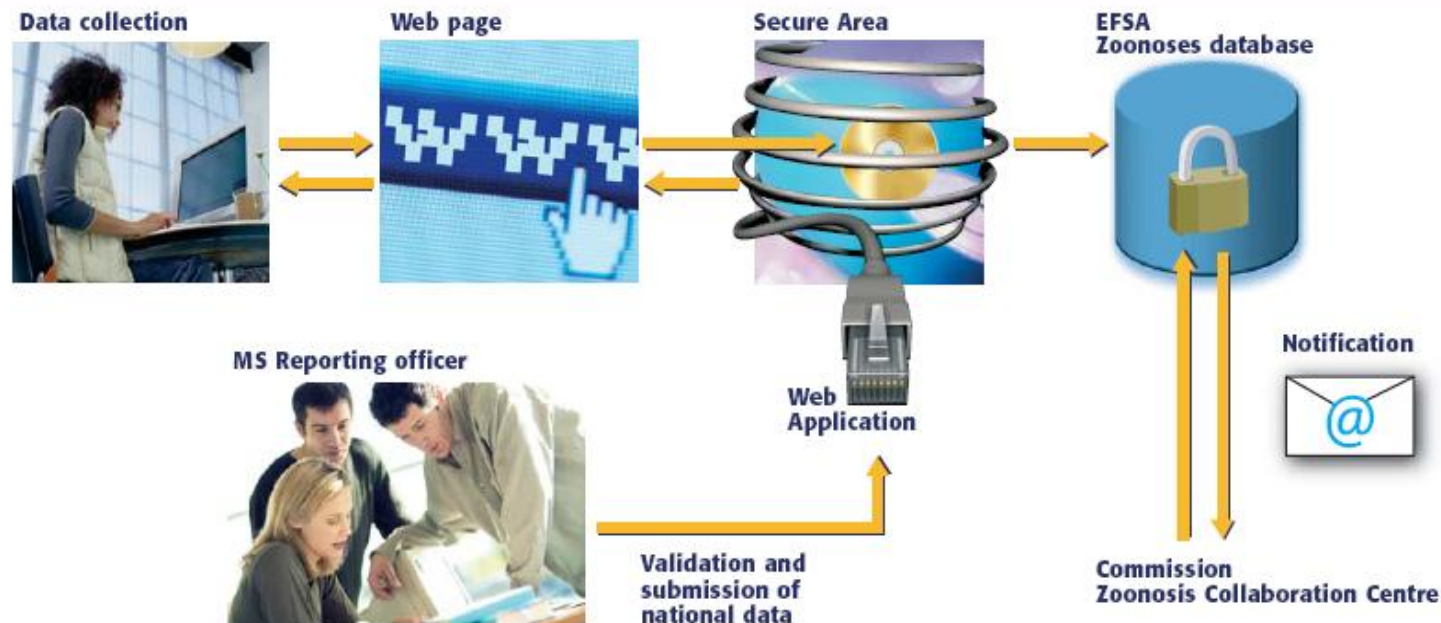
- Annual data collection based on Directive 2003/99/EC
- Member States are obliged to submit data on 8 zoonoses and food-borne outbreaks:
 - *Salmonella* and *Campylobacter* (+ antimicrobial resistance)
 - *Listeria monocytogenes*, *Brucella*, tuberculosis due to *Mycobacterium bovis*, **verotoxigenic *Escherichia coli***.
 - *Trichinella*, *Echinococcus*
- Data on other zoonoses based on the epidemiological situation in the Member State
 - Currently 7 additional zoonoses covered (e.g. rabies, Q fever)
 - 3 microbiological contaminants
- EFSA is assigned the task of analysing the data and publishing the two EU Summary Reports

EUSR: reporting scheme in EU



The EFSA web application, Data Collection Framework and reporting manuals provide the format of the reporting (standardised tables, categorisations of food and animals, definitions)

WEB-BASED DATA COLLECTION & REPORTING



- EFSA collects and analyses data on zoonoses and zoonotic agents and food-borne outbreaks and publishes an annual EU Summary Report, in collaboration with the European Centre for Disease Prevention and Control (ECDC)
- ECDC provides for and analyses the data on human zoonoses cases

SCIENTIFIC REPORT OF EFSA AND ECDC

The European Union Summary Report on Trends and Sources of Zoonoses, Zoonotic Agents and Food-borne Outbreaks in 2011¹

European Food Safety Authority^{2,3}

European Centre for Disease Prevention and Control^{2,3}

European Food Safety Authority (EFSA), Parma, Italy

European Centre for Disease Prevention and Control (ECDC), Stockholm, Sweden

ABSTRACT

The European Food Safety Authority and the European Centre for Disease Prevention and Control analysed the information submitted by 27 European Union Member States on the occurrence of zoonoses and food-borne outbreaks in 2011. *Campylobacteriosis* was the most commonly reported zoonosis with 220,209 confirmed human cases. The occurrence of *Campylobacter* continued to be high in broiler meat at EU level. The decreasing trend in confirmed salmonellosis cases in humans continued with a total of 95,548 cases in 2011. Most Member States met their *Salmonella* reduction targets for poultry, and *Salmonella* is declining in these populations. In foodstuffs, *Salmonella* was most often detected in meat and products thereof. The number of confirmed human listeriosis cases decreased to 1,476. *Listeria* was seldom detected above the legal safety limit from ready-to-eat foods. A total of 9,485 confirmed verotoxinogenic *Escherichia coli* (VTEC) infections were reported. This represents an increase of 159.4 % compared with 2010 as a result of the large STEC/VTEC outbreak that occurred in 2011 in the EU, primarily in Germany. VTEC was also reported from food and animals. The number of human yersiniosis cases increased to 7,017 cases. *Yersinia enterocolitica* was isolated also from pig meat and pigs; 132 cases of *Mycobacterium bovis* and 330 cases of brucellosis in humans were also reported. The prevalence of bovine tuberculosis in cattle increased, and the prevalence of brucellosis decreased in cattle and sheep and goat populations. Trichinellosis and echinococcosis caused 268 and 781 human cases, respectively and these parasites were mainly detected in wildlife. The numbers of alveolar and of cystic echinococcosis respectively increased and decreased in the last five years. One imported human case of rabies was reported. The number of rabies cases in animals continued to decrease. Most of the 5,648 reported food-borne outbreaks were caused by *Salmonella*, bacterial toxins, *Campylobacter* and viruses, and the main food sources were eggs, mixed foods and fish and fishery products.

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KEY WORDS

Zoonoses, surveillance, monitoring, *Salmonella*, *Campylobacter*, *Listeria*, rabies, parasites, food-borne outbreaks, food-borne diseases

¹ On request of EFSA, Question No EFSA-Q-2012-00428, approved on 28 February 2013.

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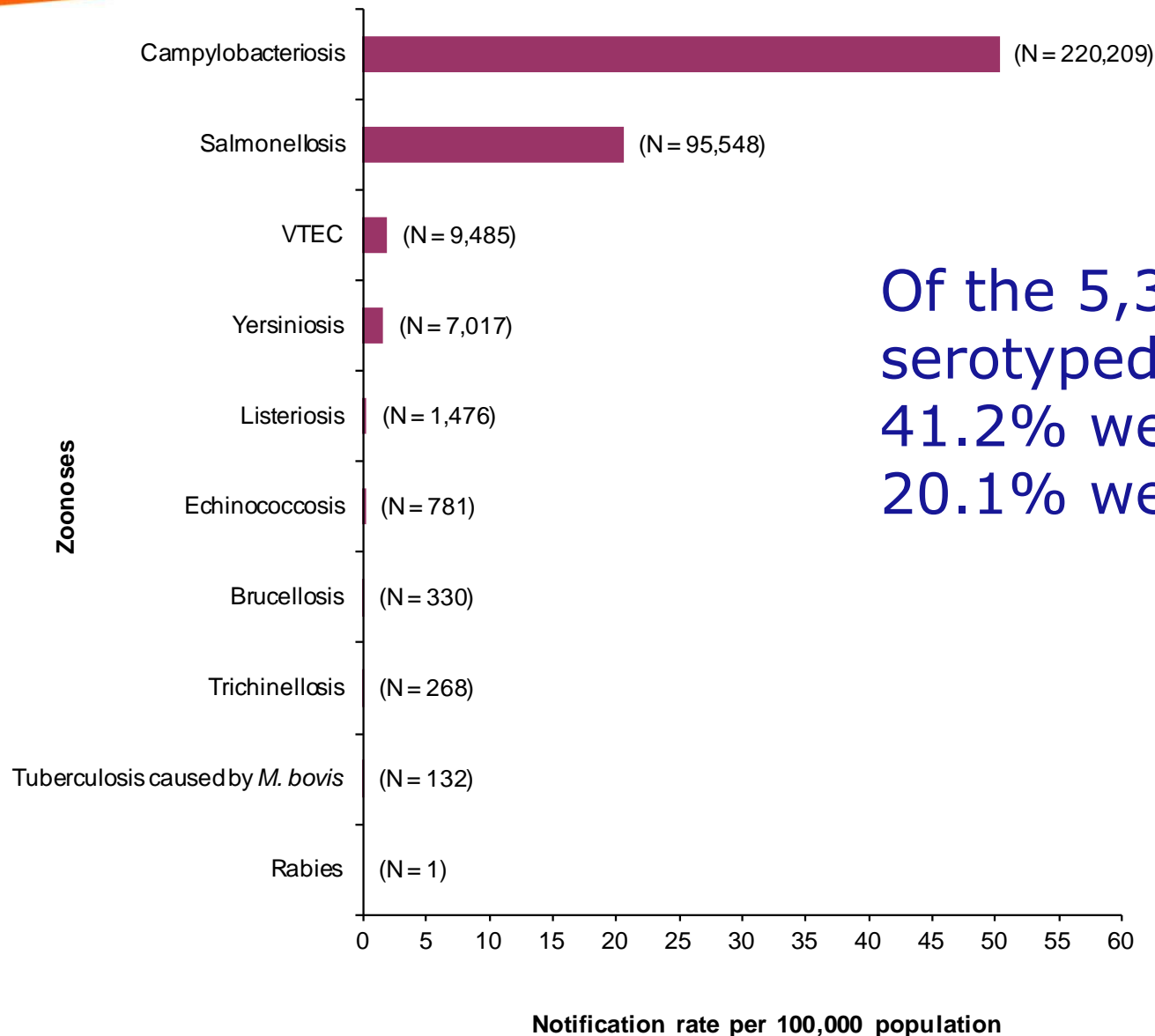
³ Acknowledgement: EFSA and ECDC wish to thank the members of the Task Force on Zoonoses Data Collection and the Food and Waterborne Diseases and Zoonoses Network who provided the data and reviewed the report. Also the contributions of the following for their support provided to this scientific output are gratefully acknowledged: EFSA staff members Pia Mikell, Frank Boelaert, Valentina Rizzi, Marius Georgiadis, Elena Mazzolini, Gianni Amore, Francesca Rizzo, Kenneth Malligan; ECDC staff members Therese Westrell, Taina Niskanen, Angela Lahuerta Marin, Joana Gomes Dias and Johanna Takkinen; and reviewer Ilain Imberechts.

Suggested citation: EFSA, (European Food Safety Authority), ECDC (European Centre for Disease Prevention and Control), 2013. The European Union Summary Report on Trends and Sources of Zoonoses, Zoonotic Agents and Food-borne Outbreaks in 2011; EFSA Journal 2013;11(4):3129, 250 pp. doi:10.2903/j.efsa.2013.3129.

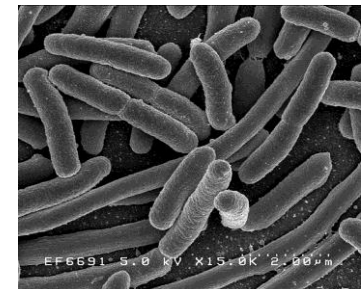
Available online: www.efsa.europa.eu/en/journal

- EFSA and the Biological Monitoring (BIOMO) unit
- **EU-wide data collection on zoonotic pathogens**
 - Data on VTEC
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Human zoonoses cases and notification rates, EU, 2011



Of the 5,301 cases serotyped (for antigen O), 41.2% were O157 and 20.1% were O104



- 22 MSs reported data on VTEC in food
- 13 MSs reported data on VTEC in animals
- Different investigations are not necessarily directly comparable owing to differences in sampling strategies and the analytical methods applied
 - The most widely used analytical method, ISO 16654/2001, aims to detect only VTEC O157,
 - Fewer investigations have been conducted with analytical methods aiming at detecting all VTEC or selected non-O157 serotypes of VTEC

Eight MSs reported data on VTEC in **fresh bovine meat** (from investigations with 25 or more samples); out of 4,347 units tested:

- 1.4% VTEC-positive and
- 0.3% VTEC O157-positive

In fresh meat from other animals species:

- No positive results in samples from fresh sheep meat (two MSs), fresh pig meat (one MS) and fresh turkey meat (one MS).
- Only one VTEC O157-positive sample (out of 34 tested; 2.9%) in fresh poultry meat.

VTEC in food

Country	Description	Sample unit	Sample weight	N	VTEC		VTEC O157		Other VTEC serogroups
					N pos	% pos	N pos	% pos	
Belgium	Carcase at slaughterhouse, carcass swab	Batch	600 cm ²	427	18	4.2	3	0.7	O26 (4) ¹ , O103 (3), O111 (5), O103 and O111 (1), O145 (2)
	Fresh at processing	Batch	25 g	294	1	0.3	1	0.3	
Czech Republic	Carcass at slaughterhouse, carcass swab	Batch	100 cm ²	1,159	4	0.3	3	0.3	
Germany	Carcass at slaughterhouse, domestic production, carcass sponge	Single	400 cm ²	261	6	2.3	0	0	
	Fresh at retail, domestic production	Single	25 g	492	9	1.8	0	0	
	Minced meat at retail, domestic production	Single	25 g	479	18	3.8	0	0	
Hungary	Fresh at processing	Single	25 g	98		0	0	0	
	Fresh at retail	Single	25 g	61		0	0	0	
Ireland	Carcass at processing	Single	25 g	291	3	1.0	1	0.3	
Netherlands	Fresh at retail	Single	25 g	702	2	0.3	2	0.3	
Poland	Fresh at processing	Single	25 g	38	1	2.6	1	2.6	
Spain	Fresh at retail	Single	25 g	45	0	0	0	0	
Total (8 MSs)				4,347	62	1.4	11	0.3	

Five MSs reported data on VTEC in **milk and dairy products** (raw cows' milk, cheeses, butter, cream) from investigations with at least 25 samples.

➤ Most of the positive samples were from raw cow's milk.

Country	Description	Sample unit	Sample weight	N	VTEC		VTEC O157		
					N pos	% pos	N pos	% pos	
Raw cows' milk									
Belgium	Intended for direct human consumption, at farm	Batch	25 g	39	1	2.6	1	2.6	
Germany	Intended for direct human consumption, at processing, domestic	Single	25 g	94	1	1.1	0	0	
	Intended for direct human consumption, at retail, domestic		25 g	57	3	5.3	0	0	
	Intended for manufacture of pasteurised/UHT products, at processing, domestic	Single	25 g	79	3	3.8	0	0	
Hungary	Intended for direct human consumption, at farm	Single	25 g	102	0	0	0	0	
Slovenia		Single	25 g	128	0	0	0	0	

Eight MSs reported data on VTEC in **seeds, sprouts and vegetables** in 2011 from investigations with at least 25 samples (probably prompted by the STEC/VTEC O104 outbreaks in Germany and France).

- No positive samples in vegetables, spices and herbs.
- Two VTEC-positive investigations in sprouted seeds.

Country	Description	Sample unit	Sample weight	N	VTEC		VTEC O157	
					N pos	% pos	N pos	% pos
Seeds and sprouts								
Belgium	Seeds, sprouted, ready-to-eat, at retail	Batch	150 g	31	0	0	0	0
Finland	Seeds, dried , at retail	Batch	50 g	33	0	0	0	0
Germany	Seeds, sprouted, at processing, domestic	Single	25 g	61	0	0	0	0
	Seeds, sprouted, at retail, domestic	Single	25 g	278	2	0.7	0	0
Netherlands	Seeds, sprouted, ready-to-eat, at retail	Single	25 g	83	3	3.6	0	0

Nine MSs provided data on VTEC in **cattle** for the year 2011 from investigations with 25 or more samples (Table VT11).

- In all reported investigations VTEC was detected from the animals tested.
- Four MSs provided data on serogroups different from O157 and/ or virulence genes.

VTEC in animals

Cattle

Country	Description	Sample unit	Sample weight	N	VTEC		VTEC O157		VTEC serogroups
					N pos	% pos	N pos	% pos	
Austria	Adult cattle over 2 years at slaughterhouse, domestic, recto-anal swab	Animal	-	82	34	41.5	3	3.7	O91 <i>eae</i> negative, <i>vtx1</i> negative, <i>vtx2</i> positive (2) ¹ , O91 <i>eae</i> negative, <i>vtx1</i> positive, <i>vtx2</i> positive (2), O103 <i>eae</i> positive, <i>vtx1</i> positive, <i>vtx2</i> negative (1), O145 <i>eae</i> positive, <i>vtx1</i> positive, <i>vtx2</i> negative (1), O145 <i>eae</i> positive, <i>vtx1</i> negative, <i>vtx2</i> positive (1)
	Young cattle (1-2 years) at slaughterhouse, domestic, recto-anal swab	Animal	-	40	13	32.5	2	5.0	
Belgium	At farm	Animal	-	545	10	1.8	0	0	<i>vtx1/eae</i> positive (4), <i>vtx1</i> positive (2), <i>vtx1/vtx2/eae</i> positive (1), <i>vtx2</i> positive (2), <i>vtx2/eae</i> positive (1), <i>vtx2/STa</i> (1).
Denmark	At slaughterhouse, faeces	Animal	-	237	4	1.7	4	1.7	
Estonia	At slaughterhouse, EFSA monitoring specifications, hide	Animal		244	8	3.3	8	3.3	VTEC O157:H7 <i>eae</i> positive, <i>vtx1</i> and <i>vtx2</i> positive (4); VTEC O157:H7 <i>eae</i> positive, <i>vtx1</i> negative <i>vtx2</i> positive (4); VTEC O157:H7 <i>eae</i> positive, <i>vtx1</i> negative, <i>vtx2</i> negative (0)
Finland	At slaughterhouse, faeces	Animal	10 g	1,501	5	0.3	5	0.3	
Germany	At farm, domestic, faeces	Herd	-	703	120	17.1	0	0	
	Meat production animals, young cattle (1-2 years), at farm, domestic, faeces	Herd	25 g	878	162	18.4	0	0	
	Calves (under 1 year) at farm, domestic, faeces	Herd	-	229	8	3.5	0	0	
Italy	At slaughterhouse, domestic	Animal	-	139	29	20.9	0	0	
Netherlands	At farm, faeces	Herd	25 g	807	40	5.0	40	5.0	
Spain	Young cattle (1-2 years) at slaughterhouse, faeces	Slaughter batch	-	204	43	21.1	0	0	<i>vtx1</i> positive (16); <i>vtx2</i> positive (21); <i>vtx1</i> and <i>vtx2</i> positive (7)
	Young cattle (1-2 years) at slaughterhouse, EFSA monitoring specifications, hide	Slaughter batch	-	198	22	11.1	22	11.1	<i>vtx2</i> positive (12); <i>vtx1</i> and <i>vtx2</i> positive (10)
Total (9 MSs)				5,807	498	8.6	84	1.4	

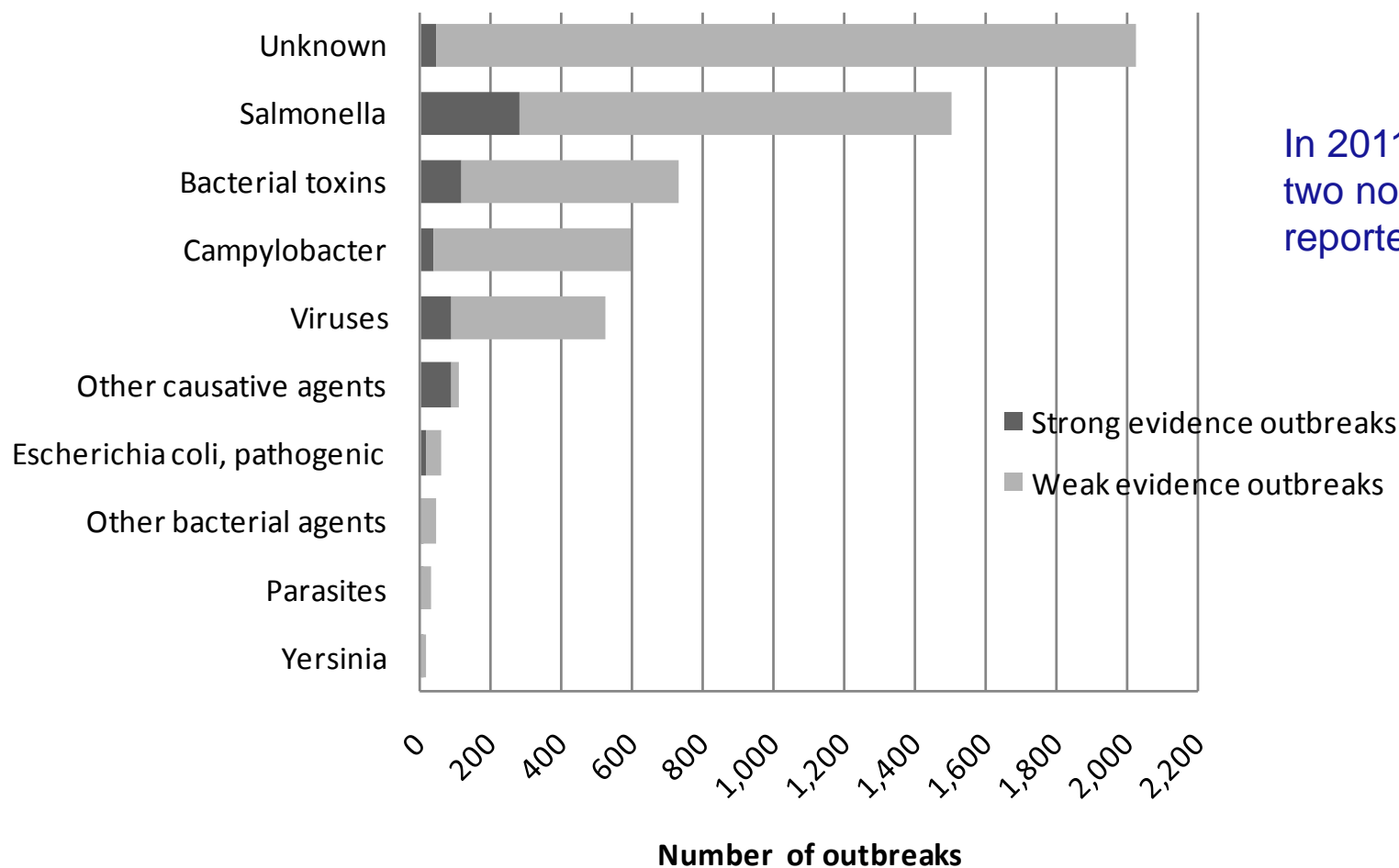
Three MSs reported data on VTEC from **animal species other than cattle.**

➤ Positive samples were reported from sheep and pigs.

Country	Description	Sample unit	N	VTEC		VTEC O157		VTEC serogroups
				N pos	% pos	N pos	% pos	
Austria	Sheep at farm, domestic, Recto-anal swab	Animal	116	79	68.1	0	0	O91 eae negative, vtx1 positive, vtx2 positive (2) ¹ , O103 eae positive, vtx1 positive, vtx2 negative (1)
Netherlands	Goats at farm	Animal	214	0	0	0	0	
	Sheep at farm	Animal	564	0	0	0	0	
	Sheep at slaughterhouse, wool	Animal	374	51	13.6	51	13.6	
Germany	Pigs at farm	Herd	146	13	8.9	0	0	

- EFSA
- EFSA's Biological Monitoring (BIOMO) unit
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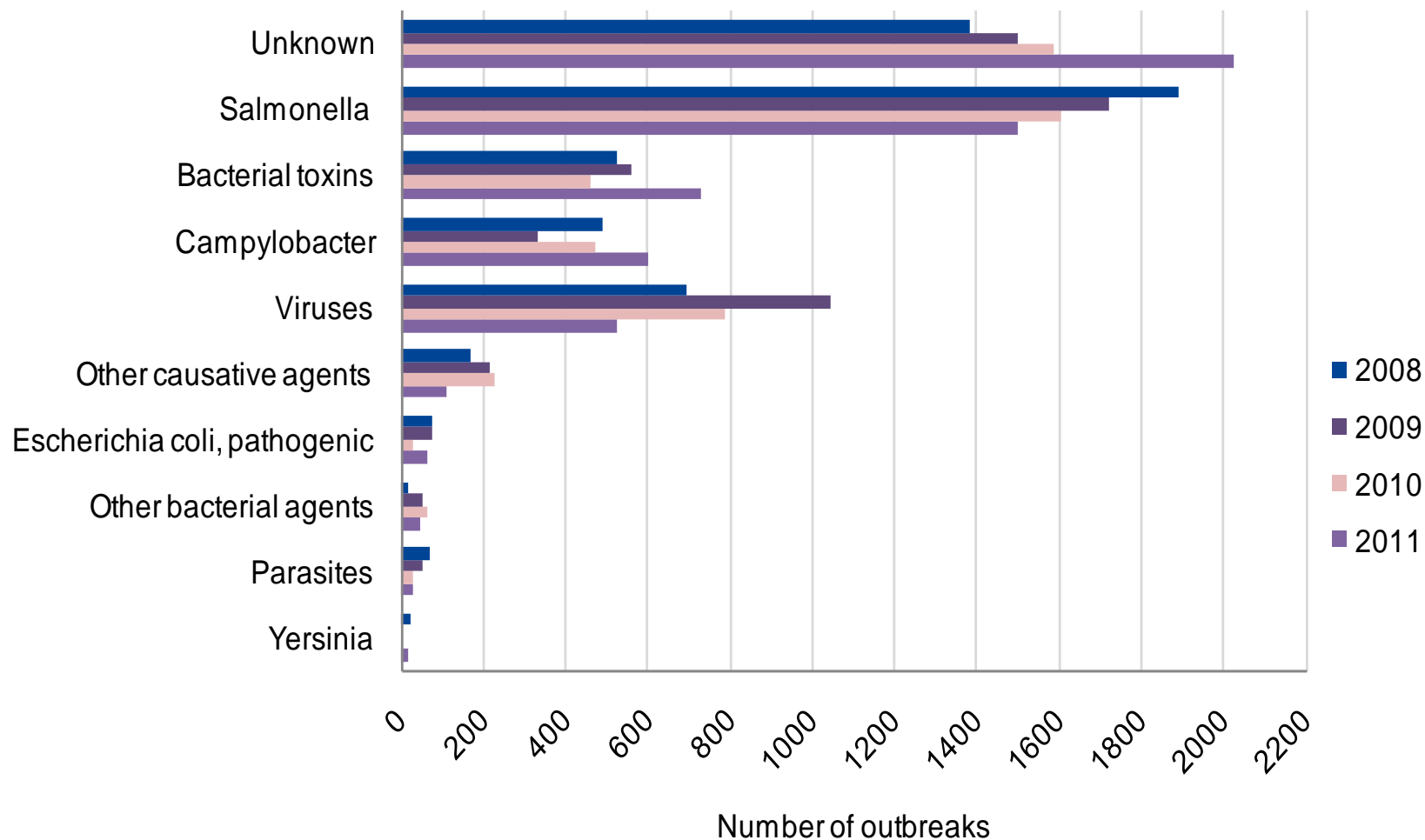
Food-borne outbreaks (FBOs) in EU, 2011

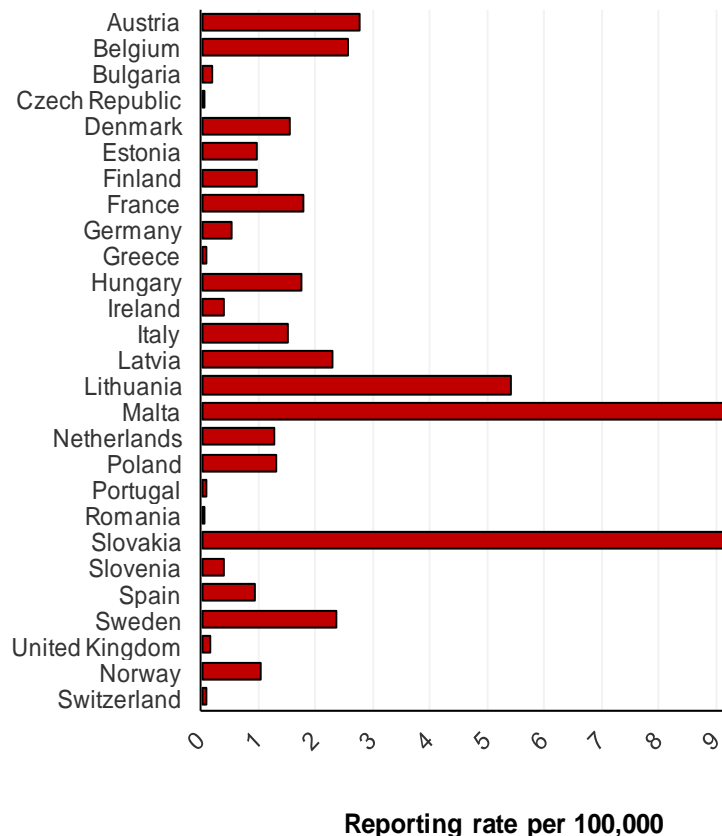


In 2011, 25 MSs and two non-MSs reported data

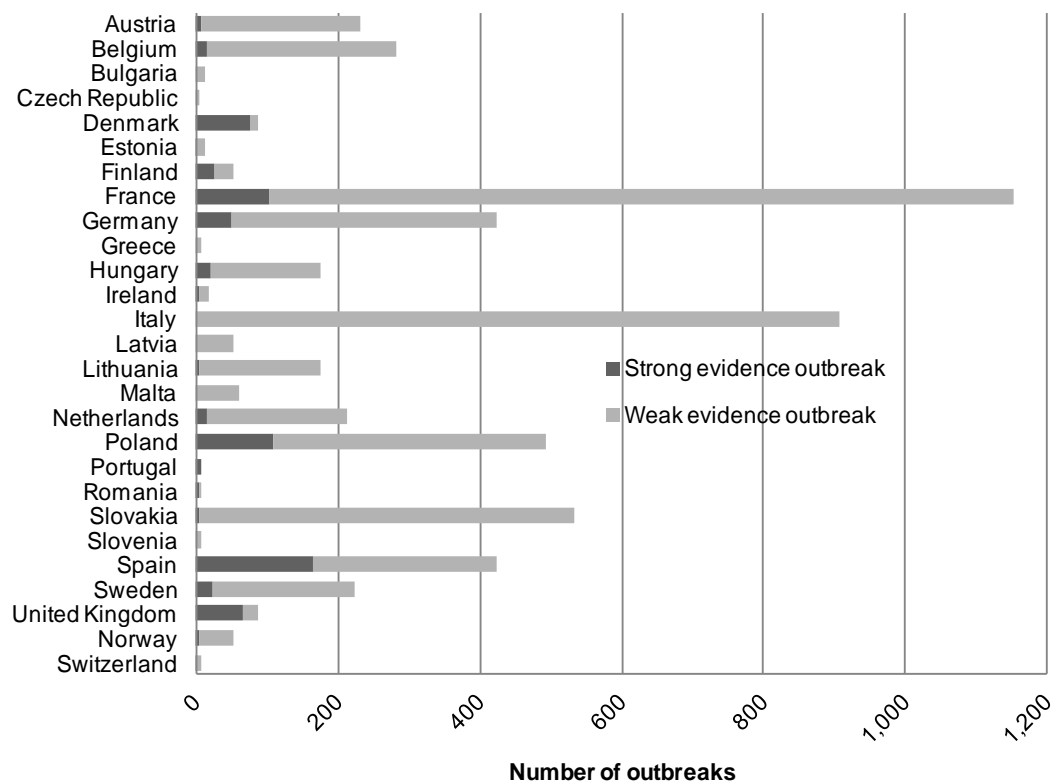
Overall, 5,648 FBOs causing:
69,553 human cases - 7,125 hospitalisations - 93 deaths

Trends in food-borne outbreaks, EU, 2008-2011





Reporting rate per 100,000



Number of outbreaks

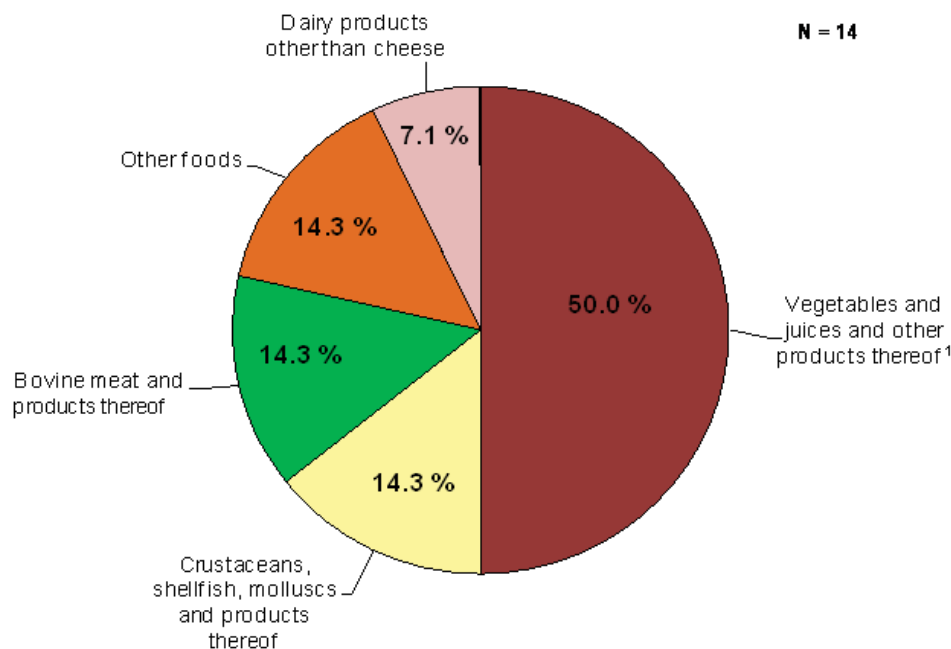
Twelve MSs reported **60 outbreaks** caused by human pathogenic *Escherichia coli*

Country	Total outbreaks		Strong evidence outbreaks				Weak evidence outbreaks			
	N	Reporting rate per 100,000	N	Human cases			N	Human cases		
				Cases	Hospitalised	Deaths		Cases	Hospitalised	Deaths
Austria	3	0.04	-	-	-	-	3	8	3	0
Belgium	3	0.03	-	-	-	-	3	8	6	0
Denmark	4	0.07	2	113	20	0	2	64	1	0
France	13	0.02	1	15	15	0	12	43	7	0
Germany	14	0.01	1	3,793	2,353	53	13	33	6	0
Hungary	1	0.01	-	-	-	-	1	2	0	0
Ireland	5	0.11	-	-	-	-	5	15	1	0
Netherlands	2	0.01	2	14	8	0	-	-	-	-
Romania	1	<0.01	1	13	13	0	-	-	-	-
Spain	3	<0.01	1	14	0	0	2	21	1	0
Sweden	3	0.03	-	-	-	-	3	24	2	0
United Kingdom	8	0.01	6	288	86	1	2	8	2	0
EU Total	60	0.01	14	4,250	2,495	54	46	226	29	0

This represents 1.1 % of the total number of reported food-borne outbreaks in the EU and an increase of 93.5 % compared with 2010 (31 outbreaks)

14 *E. coli* outbreaks (23.3 %) were supported by strong evidence.

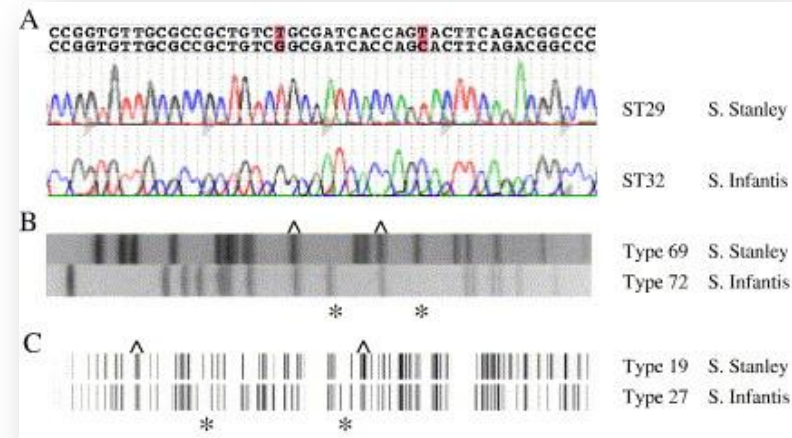
Vegetables and juices and other products thereof were involved in 7 outbreaks (50.0 %).



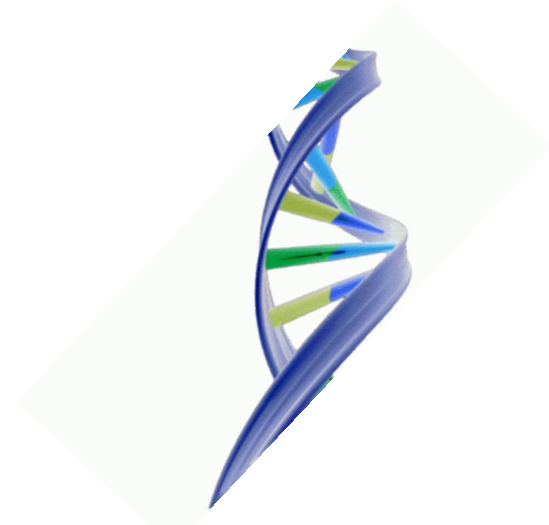
Note:

- These 7 FBOs linked to consumption of vegetables causes 98.6 % of human cases, 99.3 % of hospitalisations and all deaths reported in strong evidence pathogenic *E. coli* outbreaks.
- Four of these 7 outbreaks were associated with the consumption of imported fenugreek sprouts or seeds (i.e. the German outbreak and the related outbreaks in Denmark, France and in the Netherlands).

- EFSA and the Biological Monitoring (BIOMO) unit
- EU-wide data collection on zoonotic pathogens
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- Conclusions from the EFSA 10th Anniversary Conference: **The creation of a centralised microbial Whole Genome Sequencing (WGS) database is needed** to predict the outcome of pathogen-host interactions.
- At the Advisory Forum meeting (December 2012): **Denmark and Ireland** indicated that EFSA should take an active role on the field of WGS.



Molecular typing data collection at EU level

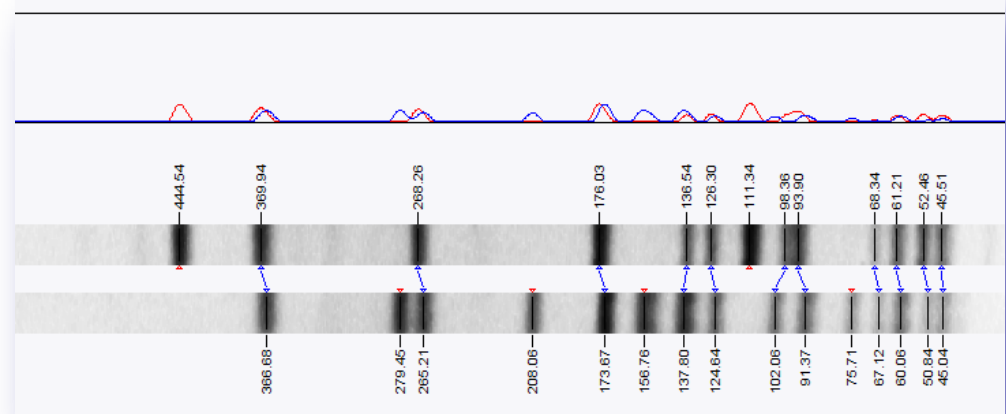
Setting the scene

- The Standing Committee on Food Chain and Animal Health (representing all EU Member States) approved in December 2012 a

Vision paper on the development of databases for molecular testing of food-borne pathogens in view of outbreak preparedness

- The paper was prepared by the EU Commission in consultation with ECDC, EFSA and the EU Reference laboratories (EURLs).

- The purpose is to encourage collection of molecular typing data to allow integration of data on isolates from human cases, food and animals.

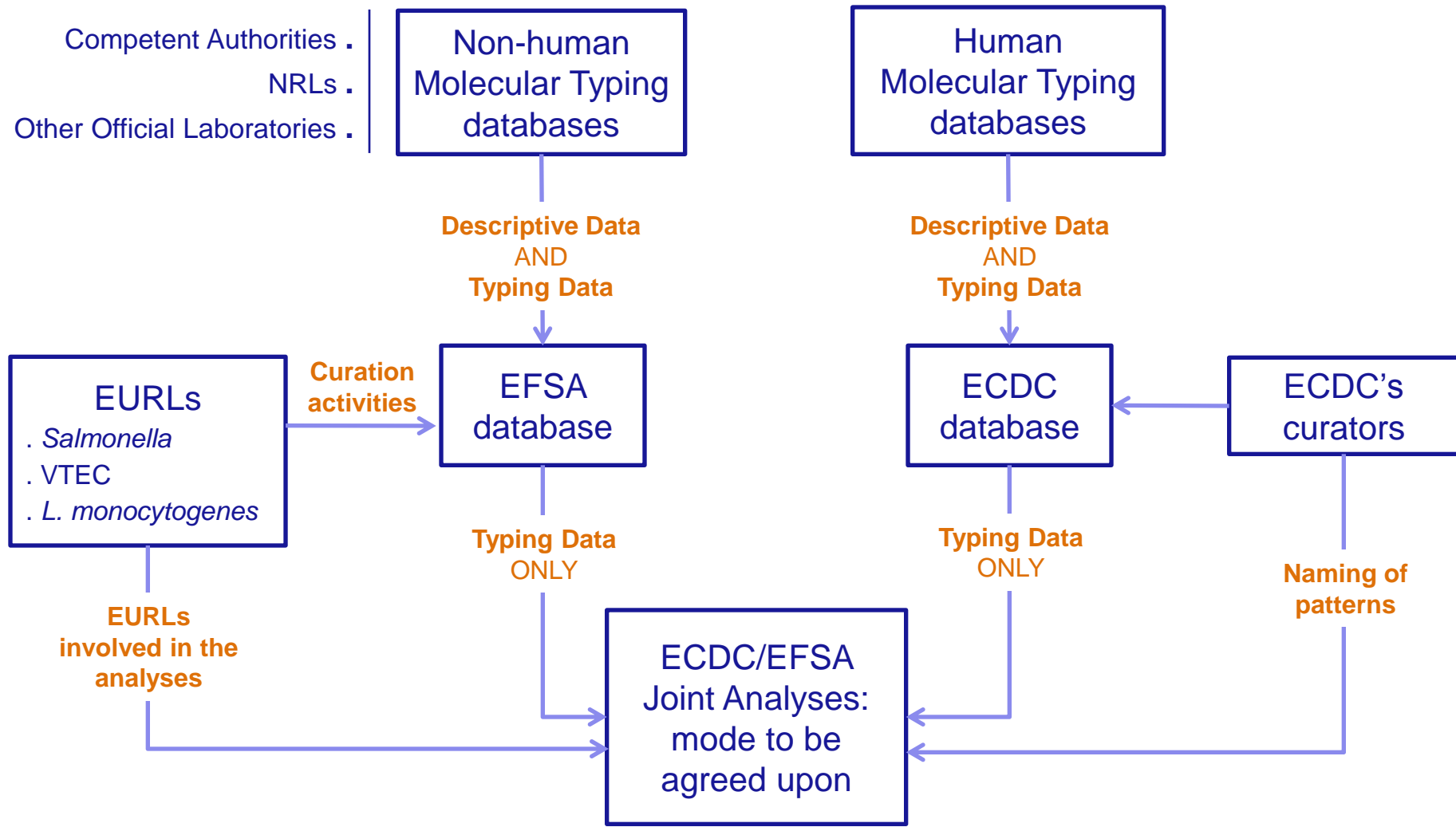


- Regular joint analyses of the data by ECDC, EFSA and EURLs – integration at the EU level
 - ECDC to collect molecular typing data from food-borne pathogens isolated from human cases
 - EFSA to collect similar data from food, feed and animal isolates, in close collaboration with relevant EURLs
- Ownership of the data
 - The reporting Member States
 - EU Commission if it has financed EURL's typing or other research projects
- The data collection to cover initially *Salmonella*, VTEC and *Listeria* with PFGE and MLVA (*S. Typhimurium*) methods
- Other methods and pathogens can be taken aboard later on

- To contribute to epidemiological investigations of (multi-country) food-borne outbreaks at EU/national level
 - Identify outbreaks in humans
 - Enable the comparison of isolates from human cases, food and animals at high discriminatory power level
 - Identify or give background information on possible food and animal sources of the outbreaks
- To provide data for source attribution analyses at the EU level, e.g. to those carried out by EFSA's BIOHAZ panel
 - Identify the most important food and animal sources of human infections in the EU
- To detect and perform epidemiological analyses of clonal diffusion between MSs

Molecular typing on food and animal isolates

General Schema



- EFSA has formally agreed to collaborate closely with ECDC and EURLs on molecular typing of food-borne pathogens.
- ECDC, EFSA and DG-SANCO are working on a SOP for joint assessment of food-borne outbreaks.
- EFSA received a mandate (BIOMO) from DG SANCO
 - to provide technical support on the collection of molecular typing data in food-borne pathogens (food and animal data), to be under pilot phase in 2014.

- EFSA's BIOMO Unit has set up a Working Group to define the structure of the data collection system for food and animal isolates and the integration with the human data – members from ECDC, EURLs, DG SANCO, MSs
 - EURL on *Salmonella*
 - EURL on VTEC
 - EURL on *L. monocytogenes*
 - National experts from NRLs of certain EU Member States
 - ECDC
 - European Commission (observer)
- 4 WG meetings
- Database to be under pilot phase in 2014





Molecular typing on food and animal isolates

Integration of surveillance at EU level

- Common nomenclature, data dictionaries, similar SOPs etc. to be agreed upon between EFSA, EURLs and ECDC – compatible data collection systems
- EFSA, EURLs and ECDC to regularly analyse the data together – frequency and model still to be defined
- Publication or communication of the data requires authorisation from the data owners (Member States)
- Alert situations: existing EU structures will be used (RASFF, EWRS, EPIS-FWD)
- EFSA and ECDC can use aggregated data (anonymised) in overview reports and scientific opinions
- Data from food and animal isolates often sensitive and may be subject to misinterpretation and misuse

Molecular typing on food and animal isolates

Proposal for the datasets from EFSA and ECDC

DESCRIPTIVE DATA (PARTLY SENSITIVE)					TYPING DATA (NOT SENSITIVE BY ITSELF)		
ID	Country	Animal/Food Type	Area in the country	Date of Sample	Serotype	PFGE_XbaI	AST_NAL
EFSA-001	BE	Smoked salmon	X	2012-06-01	STANLEY		S
EFSA-002	HU	Turkey	Y	2012-07-01	STANLEY		R

- **Descriptive Data:** data about an isolate in terms of sampling time and place, origin (food/ animal type, country of origin, producer) etc. - **partly sensitive data**
- **Typing Data:** the results of typing experiments performed on an isolate. e.g. serotype, PFGE pattern, antimicrobial susceptibility results, MLVA results – **non sensitive data**
- **Joint EFSA-ECDC analyses** to be carried out only with non-sensitive data

The **BIOHAZ** Panel is working on a **Self-task on:**
“Evaluation of **molecular typing methods** for major food-borne microbiological hazards and their use for **attribution modelling, outbreak investigation** and **scanning surveillance**”. Focus on food and feed-borne zoonotic bacteria (Deadline **December 2013**).

- It is important to link closely molecular surveillance initiatives instigated for pathogens identified in the human population and surveillance activities in food, feed and food-producing animals.
- In recent years EFSA has made increasing use of attribution modelling to enhance the scientific value of opinions.
- Harmonised approaches for
 - (i) selection of representative isolates of food-borne pathogens,
 - (ii) selection of subtyping methodologies, and
 - (iii) analysis and storage of large quantities of molecular typing data,.

Terms of reference (the “questions”)

- Review information on **current and prospective** (e.g. whole genome sequencing (WGS)) molecular identification and sub-typing methods for food-borne pathogens (e.g. ***Salmonella*, *Campylobacter*, VTEC and *Listeria***) in terms of:
 - (a) **discriminatory capability**,
 - (b) **reproducibility**, and
 - (c) **capability for international harmonisation**.
- Review the **appropriateness** of use of the different food-borne pathogen sub-typing methodologies (including data analysis methods) for outbreak investigation, attribution modelling and the potential for early identification of organisms with future epidemic potential.

- Evaluate the **requirements for the design of surveillance activities** for food-borne pathogens, in particular for the selection for a statistically representative group of isolates to be included in molecular typing investigations, and attribution modelling.
- Review the **requirements for harmonised data collection, management and analysis**, with the final aim to achieve full integration of efficient and effectively managed molecular typing databases for food-borne pathogens.

- In 2014, EFSA will organise a **Colloquium on "Whole Genome Sequencing (WGS) and other molecular typing techniques"**.

Whole Genome Sequencing

- **Universally applicable** method that gives all useful information in one single test: **defines the whole organism**
- Provides full characterisation of the strains.
- **Speed** (increasing) and **cost** (decreasing)

Thank you for your attention!

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 - <http://www.efsa.europa.eu/en/contact/askefsa.htm>
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 - www.efsa.europa.eu

