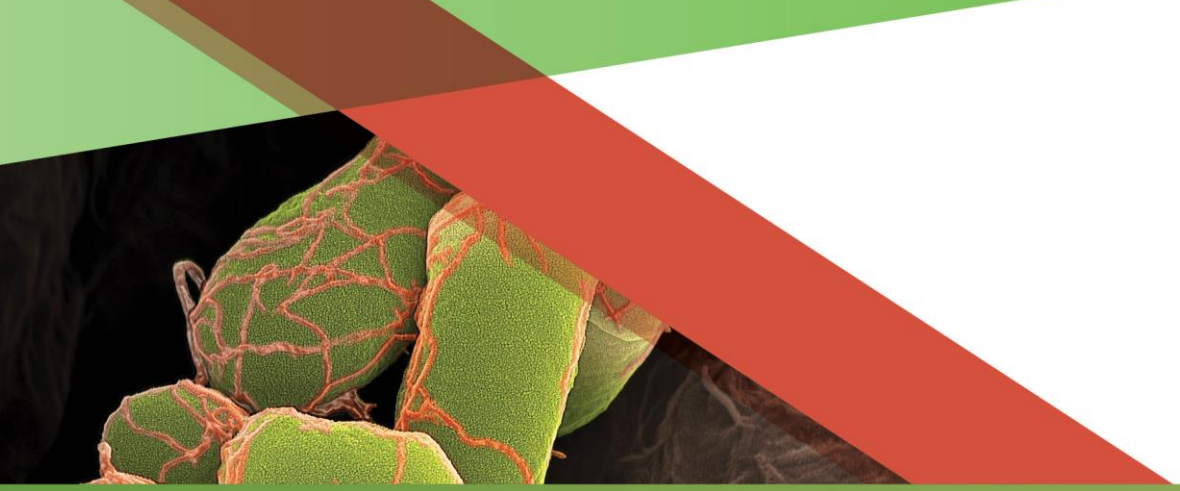

SURVEILLANCE REPORT

Shiga toxin/verocytotoxin-producing *Escherichia* coli (STEC/VTEC) infection

Annual Epidemiological Report for 2017

Key facts

- In 2017, 6 457 confirmed cases of infections with Shiga toxin/verocytotoxin-producing *Escherichia coli* (STEC/VTEC) were reported in the EU/EEA.
- The EU/EEA notification rate was 1.8 cases per 100 000 population.
- The highest rate of confirmed cases was observed in 0–4-year-old children (8.9 cases per 100 000 population).
- The EU/EEA notification rate has been stable from 2013–2017.
- The highest notification rates were reported in Denmark, Ireland, Norway and Sweden.

Methods

This report is based on data for 2017 retrieved from The European Surveillance System (TESSy) on 11 September 2018. TESSy is a system for the collection, analysis and dissemination of data on communicable diseases. For a detailed description of methods used to produce this report, refer to the *Methods* chapter [1].

An overview of the national surveillance systems is available online [2].

A subset of the data used for this report is available through ECDC's online *Surveillance atlas of infectious diseases* [3].

In 2017, 30 EU/EEA countries reported data on STEC/VTEC infections. Fifteen used the latest case definition (EU 2012), eight reported in accordance with the previous case definition (EU 2008) and seven reported using other definitions or did not specify which case definition they used.

The notification of STEC/VTEC infections is mandatory in most EU/EEA countries except for five Member States where notification is either voluntary (France, Luxembourg and Spain) or based on another type of system (Italy and the United Kingdom). The surveillance systems for STEC/VTEC infections have national coverage in all EU/EEA countries except for three: France, Italy and Spain. The majority of EU/EEA countries (25 of 30) have a passive surveillance system and in 21 of them, cases were reported by both laboratories and physicians and/or hospitals. Five countries have only laboratory-based reporting. In France, STEC/VTEC surveillance is based on paediatric haemolytic-uraemic syndrome (HUS) surveillance and in Italy it is primarily based on the national registry of HUS [2]. Twenty-nine EU/EEA countries reported case-based data and one reported aggregated data.

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Stockholm, April 2019

In addition to case-based surveillance, ECDC coordinates molecular typing for the surveillance of STEC/VTEC through isolate-based pulsed field gel electrophoresis (PFGE) data collection. A typing-based multi-country cluster of STEC/VTEC is defined as at least two countries reporting at least one isolate each with matching XbaI pulsotypes, with reports a maximum of eight weeks apart.

Epidemiology

For 2017, 6 647 cases of STEC/VTEC infections were reported by 30 EU/EEA countries (Table 1). Of these cases, 6 457 (97%) were confirmed. Twenty-seven countries reported at least one confirmed case and three countries reported no cases. The EU/EEA notification rate was 1.8 cases per 100 000 population, the same level as in the previous four years.

The highest number of confirmed cases was reported by Germany and the United Kingdom, both of which accounted for 47.4% of all reported cases in EU/EEA. As in the previous years, the highest country-specific notification rates were observed in Ireland, Norway, Sweden and Denmark, with 16.6, 7.2, 5.0 and 4.6 cases per 100 000 population respectively. Ten southern and eastern EU/EEA countries reported ≤0.1 cases per 100 000 population (Figure 1).

On average, 37.5% of STEC/VTEC cases with known information were hospitalised. Twenty cases died, resulting in a case fatality of 0.5%.

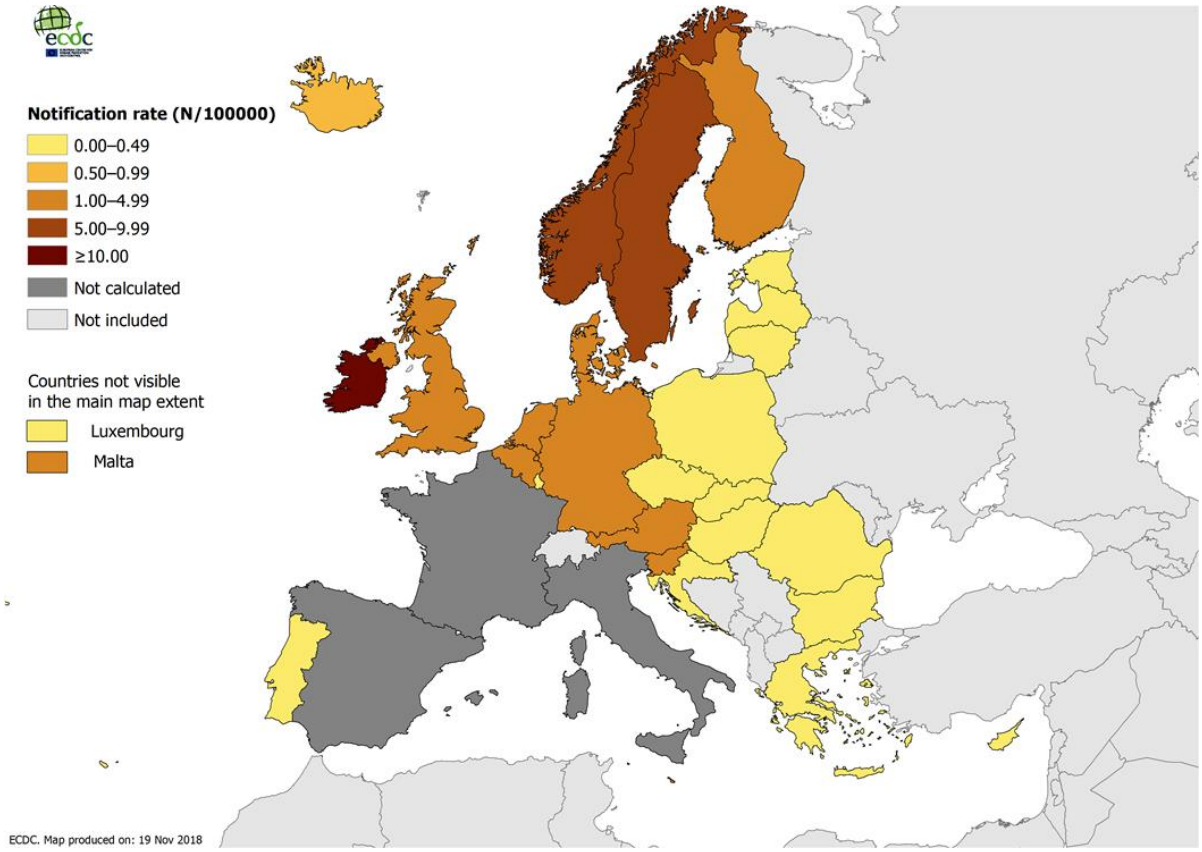
The majority (83.5%) of STEC/VTEC cases with information regarding the country of infection were domestically acquired.

Table 1. Distribution of confirmed cases of Shiga toxin/verocytotoxin-producing *Escherichia coli* (STEC/VTEC) infection by country and year, EU/EEA, 2013–2017

Country	2013		2014		2015		2016		2017			
	Number	Rate	Number	Rate	Number	Rate	Number	Rate	Confirmed cases	Rate	ASR	Reported cases
Austria	130	1.5	131	1.5	107	1.2	177	2.0	250	2.8	-	250
Belgium	117	-	85	-	100	0.9	34	0.3	123	1.1	-	123
Bulgaria	1	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0
Croatia	0	0.0	4	0.1	0	0.0	9	0.2	7	0.2	-	7
Cyprus	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0
Czech Republic	17	0.2	29	0.3	26	0.2	28	0.3	37	0.3	-	37
Denmark	191	3.4	226	4.0	201	3.6	210	3.7	263	4.6	-	344
Estonia	8	0.6	6	0.5	8	0.6	5	0.4	3	0.2	-	3
Finland	98	1.8	64	1.2	74	1.4	139	2.5	123	2.2	-	124
France	218	-	221	-	262	-	302	-	260	-	-	303
Germany	1 639	2.0	1 663	2.1	1 616	2.0	1 843	2.2	2 065	2.5	-	2 098
Greece	2	0.0	1	0.0	1	0.0	2	0.0	3	0.0	-	3
Hungary	13	0.1	18	0.2	15	0.2	12	0.1	12	0.1	-	12
Iceland	3	0.9	3	0.9	1	0.3	3	0.9	3	0.9	-	3
Ireland	564	12.2	572	12.3	598	12.8	737	15.6	795	16.6	-	804
Italy	64	-	68	-	59	-	78	-	94	-	-	111
Latvia	0	0.0	0	0.0	4	0.2	1	0.1	1	0.1	-	1
Liechtenstein	.	.	.	.	.	.	.	.	.	.	.	.
Lithuania	6	0.2	1	0.0	3	0.1	4	0.1	0	0.0	0	0
Luxembourg	10	1.9	3	0.5	4	0.7	4	0.7	1	0.2	-	1
Malta	2	0.5	5	1.2	4	0.9	4	0.9	9	2.0	-	9
Netherlands	1 184	7.1	919	5.5	858	5.1	665	3.9	392	2.3	-	392
Norway	103	2.0	151	3.0	221	4.3	239	4.6	381	7.2	-	381
Poland	5	0.0	5	0.0	0	0.0	4	0.0	4	0.0	-	6
Portugal	-	-	-	-	0	0.0	0	0.0	1	0.0	-	2
Romania	6	0.0	2	0.0	0	0.0	29	0.1	11	0.1	-	11
Slovakia	7	0.1	2	0.0	1	0.0	2	0.0	3	0.1	-	3
Slovenia	17	0.8	29	1.4	23	1.1	26	1.3	33	1.6	-	33
Spain	28	-	50	-	86	-	69	-	86	-	-	89
Sweden	551	5.8	472	4.9	551	5.7	638	6.5	504	5.0	-	504
United Kingdom	1 164	1.8	1 324	2.1	1 328	2.0	1 367	2.1	993	1.5	-	993
EU/EEA	**6 148**	**1.8**	**6 054**	**1.8**	**6 151**	**1.7**	**6 631**	**1.8**	**6 457**	**1.8**	**-**	**6 647**

Source: Country reports.
ASR: age-standardised rate
.: no data reported
-: no rate calculated.

Figure 1. Distribution of confirmed cases of Shiga toxin/verocytotoxin-producing *Escherichia coli* (STEC/VTEC) infection per 100 000 population by country, EU/EEA, 2017

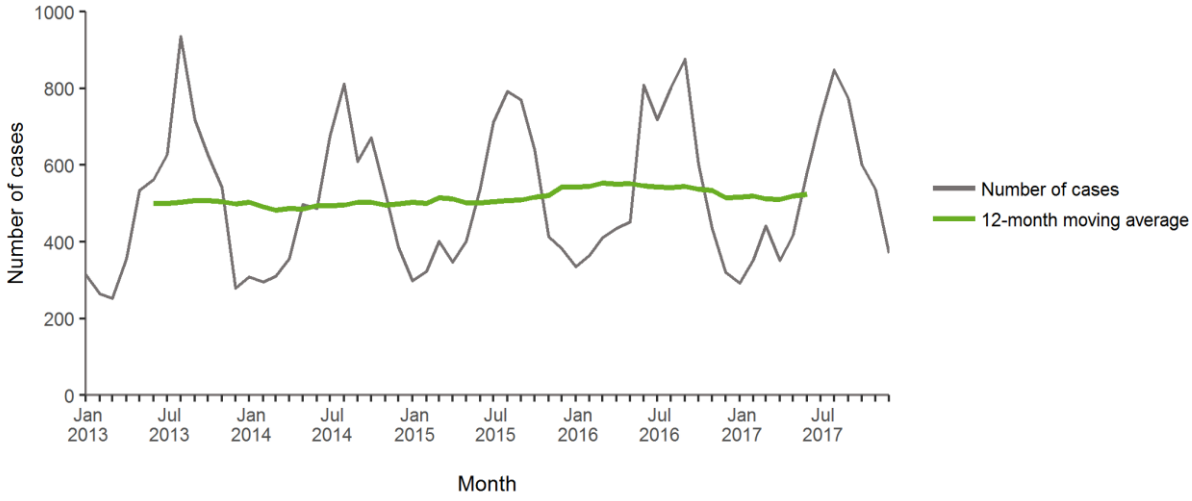


Source: Country reports from Austria, Belgium, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, Germany, Greece, Hungary, Iceland, Ireland, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Sweden and the United Kingdom.

The number of reported confirmed STEC/VTEC cases remained stable at the EU/EEA level between 2013–2017 (Figure 2).

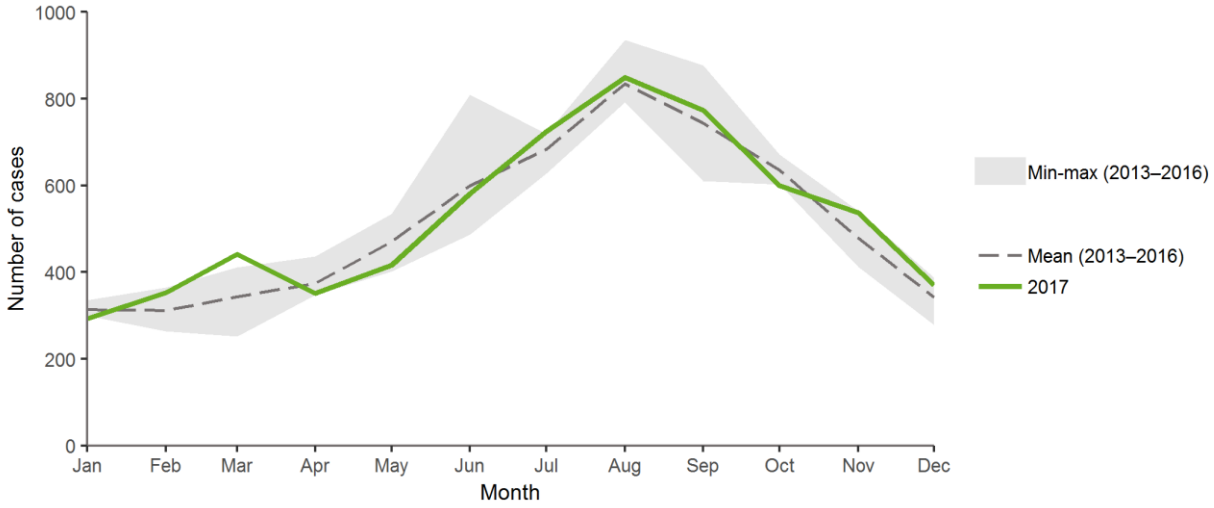
A clear seasonal trend in the number of confirmed STEC/VTEC cases was observed in the EU/EEA between 2013–2017, with more cases reported during the summer months from June–September (Figure 3).

Figure 2. Distribution of confirmed cases of Shiga toxin/verocytotoxin -producing *Escherichia coli* (STEC/VTEC) -infection by month, EU/EEA, 2012–2017



Source: Country reports from Austria, Cyprus, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Romania, Slovakia, Slovenia, Spain, Sweden and the United Kingdom.

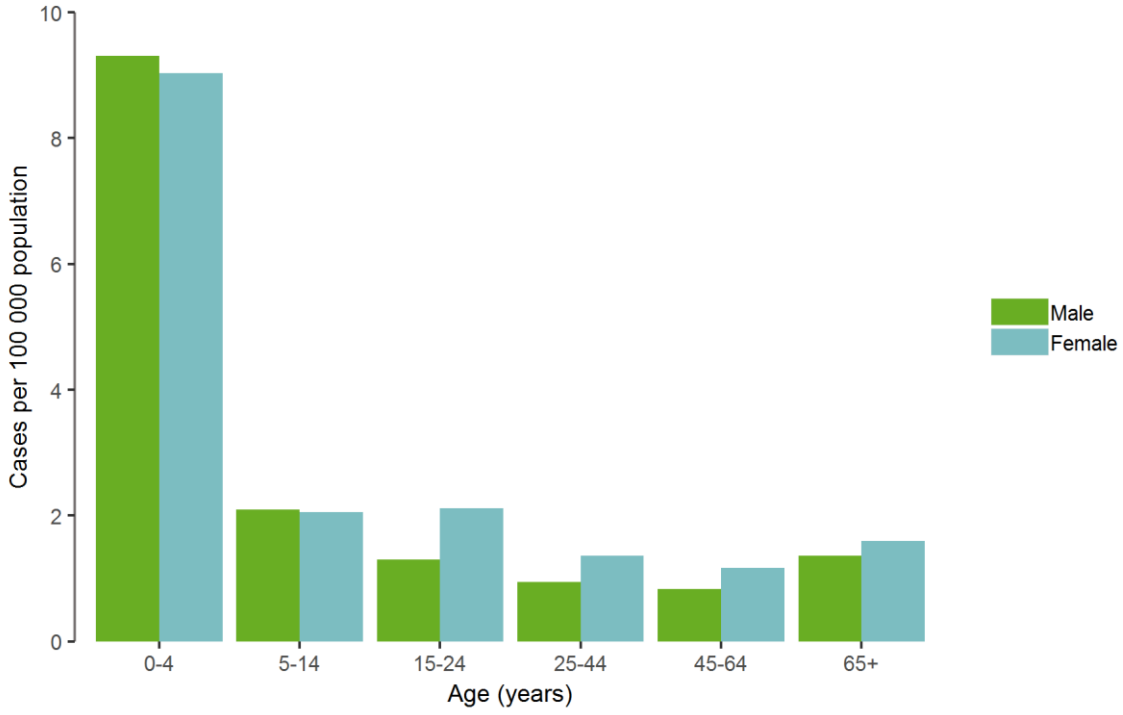
Figure 3. Distribution of confirmed cases of Shiga toxin/verocytotoxin-producing *Escherichia coli* (STEC/VTEC) infection by month, EU/EEA, 2017 and 2013–2016



Source: Country reports from Austria, Cyprus, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Romania, Slovakia, Slovenia, Spain, Sweden and the United Kingdom.

Of 6 073 confirmed cases with known gender in 2017, 55% were female. The male-to-female ratio was 0.8:1. The highest rate of confirmed cases was reported in the age group 0–4 years (8.9 cases per 100 000 population). The notification rate in the age-group 0–4 years was 4–9 times higher than the rates in the older age groups.

Figure 4. Distribution of confirmed cases of Shiga toxin/verocytotoxin-producing *Escherichia coli* (STEC/VTEC) -infection per 100 000 population by age and gender, EU/EEA, 2017



Outbreaks and other threats

In 2017, three countries submitted STEC/VTEC molecular typing data to ECDC.

The United Kingdom reported a cluster of STEC O157 phage type (PT) 54 cases in December 2016. Eighteen domestic cases in the 25-SNP (single-nucleotide polymorphism) cluster and three additional PT54 cases with the same virulence profile were identified by WGS. Cases were reported from Ireland and the UK (England, Northern

Ireland and Scotland). The majority of cases were females over the age of 60. Cases were distributed over time (index case in December 2015). Certain isolates had an unusual genotypic drug resistance profile not typically found in strains of UK origin. In the UK-England, four cases were hospitalised and two cases of HUS were reported. Descriptive epidemiology indicated that the majority of cases ate out in the week before onset. Further WGS-based analysis of 20 isolates from seven countries revealed a multi-country cluster within 5 SNP of one isolate from Denmark, four from Ireland and three from the UK. Investigations were reopened when three new cases in this cluster were identified in the UK-Scotland and one new case in the UK-England in May 2018.

Germany reported an outbreak of STEC O103:H2 with nine cases of gastroenteritis in a group of 25 persons who participated in a ski camp in Austria in February 2017. The students and teachers shared meals in a hotel. Active case finding revealed further cases among German school groups staying at the same hotel in February. The group ate most of the meals together, either in the hotel or a restaurant. During the outbreak investigation, Austrian authorities detected that raw cow milk delivered by a dairy farm had been offered at the hotel for breakfast in January and February 2017. Nine isolates from human stool samples and two isolates from cattle fecal samples yielded the same STEC strain with an almost identical PFGE pattern and WGS profile. Microbiological and epidemiological evidence identified raw cow milk as the vehicle of the outbreak. As a result of this outbreak investigation, the Austrian authorities enforced Austrian law to provide only pasteurised milk in hotels [4].

Discussion

In 2017, STEC/VTEC was the fourth most commonly reported zoonosis in the EU [5]. In 2013–2017, the overall trend of reported cases remained stable, but at a markedly higher level than at the beginning of the STEC/VTEC surveillance in 2007 and higher than before a large outbreak in 2011 [6]. Part of the increase may be explained by improved clinical awareness of STEC/VTEC infection following the 2011 outbreak. Other contributing factors could be the increasing number of laboratories that were testing for serogroups other than O157 and shift in diagnostic methods from culture to culture-independent methods, with PCR more commonly used. Serogroup O157 was the most commonly reported, but the proportion continued to decrease, while the proportion of non-O157 STEC/VTEC serogroups increased in 2017 [5]. The top six non-O157 serogroups were O26, O103, O91, O145, O146 and O111, which have steadily increased in the EU since 2007 (both in human and food samples). Non-O157 accounted for a higher proportion of HUS cases than reported for serogroup O157, emphasising an emerging risk of severe infections [3,5–7] and the potential for large outbreaks [6,9].

Surveillance of STEC/VTEC infections is mandatory and covers the whole population in most EU/EEA countries. However, surveillance only covers cases of HUS in two countries, which mainly affects small children and is characterised by acute kidney failure requiring hospital care. In 2017, the average proportion of hospitalised STEC/VTEC cases was relatively high (38%) and had increased compared with previous years. The highest proportions of hospitalised cases were reported in the countries only reporting HUS cases and having the lowest numbers of cases/notification rates, indicating that their surveillance systems focus only on the most severe cases. The age group most affected by STEC/VTEC were infants and children up to 4 years of age, who accounted for almost one-third of all confirmed cases in 2017. This was also seen in the HUS cases, where two-thirds of the cases were reported in patients 0–4 years old [5].

Most human STEC/VTEC cases are sporadic. The latest systematic review found undercooked ground beef or other meat to be a significant risk factor for acquiring sporadic STEC infection and indicated that infections from contaminated meat are most often caused by serogroup O157 [8]. The recent outbreak of serotype O103:H2 highlights a risk of infection associated with raw milk [4,10]. In 2017, 48 STEC outbreaks were reported to the European Food Safety Authority (EFSA) involving 260 cases in 11 countries and accounting for 0.9% of all food- and waterborne outbreaks at the EU level. These outbreaks were relatively small (mean number of cases: 5.4/outbreak) [5]. Nine of the 37 foodborne outbreaks were reported with known food vehicle. Four outbreaks were caused by bovine meat and products thereof (STEC O157), one by meat and meat products (STEC unspecified), three by milk (STEC O157 and STEC unspecified) and one by cheese (STEC O111). In Ireland, where the highest country-specific notification rate in the EU was reported, STEC represented the most frequently reported causative agent of outbreaks and was identified in 50% of outbreaks in 2017, including 11 waterborne outbreaks [5].

Public health implications

STEC/VTEC infection is mainly acquired through consuming contaminated food and contact with animals and/or their faeces. Good hygiene practices in premises dealing with animals and food processing can decrease the risk of infections. The STEC/VTEC serogroups most frequently found in food samples are those most commonly reported in human infections, highlighting the importance of contaminated food as a source of human infections. Raw meat and unpasteurised milk and dairy products are well known potential sources of STEC/VTEC infections. Even though they are rarely reported, these products have been implicated in multi-country outbreaks, emphasising a potential risk associated with food trade. Adequate cooking of food, particularly beef, and the use of pasteurised milk may reduce the risk of foodborne STEC/VTEC infections.

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