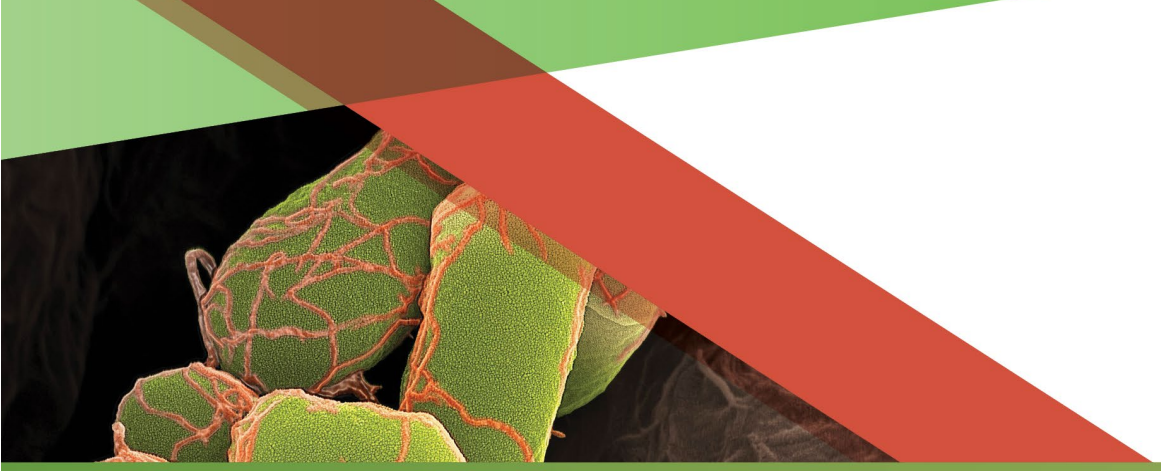


SURVEILLANCE REPORT

Shiga toxin-producing *Escherichia coli* (STEC) infection

Annual Epidemiological Report for 2019

Key facts

- For 2019, 29 EU/EEA countries reported 8 313 confirmed cases of Shiga toxin-producing *Escherichia coli* (STEC) infection.
- The overall notification rate was 2.2 cases per 100 000 population.
- After a stable period, the notification rate increased in 2018–2019.
- The highest notification rates were reported in Denmark, Iceland, Ireland, Malta, and Norway.
- The highest rate of confirmed cases was observed in 0–4-year-old children (10.3 cases per 100 000 population).

Methods

This report is based on data for 2019 retrieved from The European Surveillance System (TESSy) on 5 October 2020. 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, please 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].

This surveillance report is based on STEC surveillance data collected by the European Food- and Waterborne Diseases and Zoonoses Network (FWD-Net). In 2019, 29 EU/EEA countries reported data on STEC infections. The notification of STEC infections is mandatory in most EU/EEA countries, except for six Member States where notification is either voluntary (Belgium, France, Luxembourg, and Spain), or based on another type of system (Italy and the United Kingdom). Four EU/EEA Member States used the latest case definition (EU 2018), 13 used the previous case definition from 2012, seven reported in accordance with the one from 2008 and six reported using other definitions or did not specify which case definition they used. The surveillance systems for STEC infections have national coverage in all EU/EEA countries except for three: France, Italy, and Spain. No estimate for population coverage was provided, therefore no notification rates could be calculated for these three countries. The majority of EU/EEA countries (25 out of 30) have a passive surveillance system. In 21 of these 25 countries, cases were reported by both laboratories and physicians and/or hospitals. Five countries have only laboratory-based reporting. In France, STEC surveillance is based on paediatric haemolytic-uraemic syndrome (HUS) surveillance, and in Italy it is primarily based on the national registry for HUS [2]. Twenty-nine EU/EEA countries reported case-based data, and one country (Bulgaria) reported aggregated data.

In addition to case-based surveillance, ECDC coordinates centralised analysis of whole genome sequencing (WGS) data when needed to support multi-country outbreak investigations. It is still possible to submit pulsed-field gel electrophoresis (PFGE) data to TESSy, but this is only analysed on ad-hoc basis.

Suggested citation: European Centre for Disease Prevention and Control. Shiga toxin-producing Escherichia coli (STEC) infection. In: ECDC. Annual epidemiological report for 2019. Stockholm: ECDC; 2021.

Stockholm, May 2021

Epidemiology

For 2019, 8 313 confirmed cases of STEC infection were reported by 29 EU/EEA countries (Table 1). Twenty-six countries reported at least one confirmed case, and three countries reported no cases. The EU/EEA notification rate was 2.2 cases per 100 000 population, which is about the same level as in 2018, but higher than that for the previous four years.

The highest numbers of confirmed cases were reported by Germany and the United Kingdom, which together accounted for 42% of all reported cases in the EU/EEA. The highest country-specific notification rates were observed in Ireland, Denmark, Malta, Norway, and Iceland with 16.3, 10.7, 10.7, 9.6, and 7.6 cases per 100 000 population, respectively. A total of eleven southern and eastern EU/EEA countries reported ≤0.5 cases per 100 000 population (Table 1, Figure 1).

Thirty-five percent of 3 410 STEC cases were hospitalised (cases with known information on hospitalisation). Twelve of 5 099 cases with known outcome were reported to have died, resulting in a case fatality of 0.2%. The majority (79%) of 6 113 STEC cases with information on the country of infection were domestically acquired. Of 409 HUS cases, the highest proportion of patients was reported in the youngest age groups from 0–4 years (69%) to 5–14 years (18%).

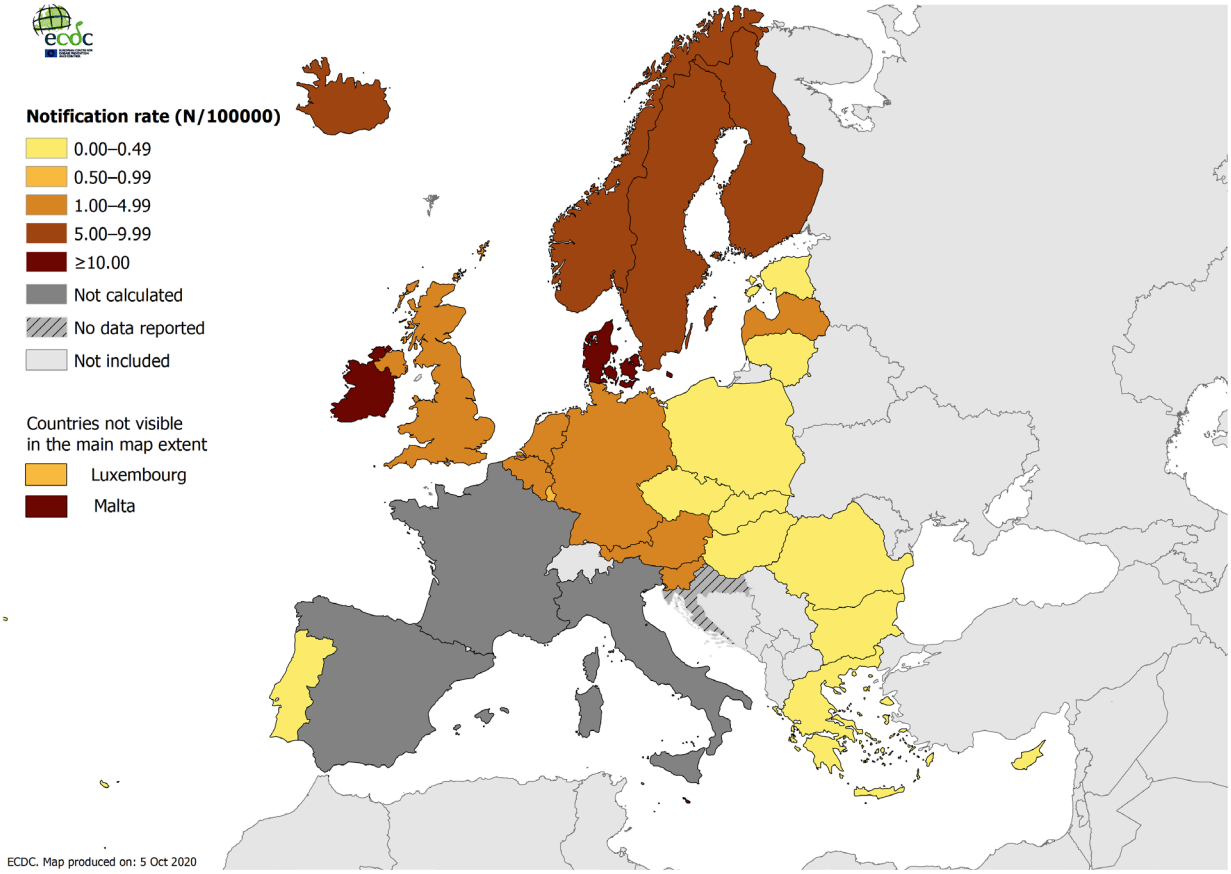
In 2019, the five most commonly reported serogroups were O157, O26, O146, O103, and O91. The most frequently reported virulence gene combinations (virulotypes) of the severe human cases (hospitalised, bloody diarrhoea and/or HUS cases) were stx1-/stx2+/eae+ and stx1+/stx2+/eae+. The most common stx gene subtypes were stx1a followed by stx2a.

Table 1. Distribution of confirmed STEC infection cases and rates per 100 000 population by country and year, EU/EEA, 2015–2019

Country	2015		2016		2017		2018		2019		
	Number	Rate	Number	Rate	Number	Rate	Number	Rate	Number	Rate	ASR
Austria	107	1.2	177	2.0	250	2.8	305	3.5	284	3.2	3.3
Belgium	100	0.9	119	1.1	123	1.1	112	1.0	131	1.1	1.1
Bulgaria	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0.0
Croatia	0	0.0	9	0.2	7	0.2	10	0.2	.	.	.
Cyprus	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0.0
Czechia	26	0.2	28	0.3	37	0.3	26	0.2	34	0.3	0.3
Denmark	201	3.6	210	3.7	263	4.6	493	8.5	621	10.7	10.6
Estonia	8	0.6	5	0.4	3	0.2	7	0.5	6	0.5	0.4
Finland	74	1.4	139	2.5	123	2.2	210	3.8	311	5.6	5.7
France	262	-	302	-	260	-	259	-	335	-	-
Germany	1 616	2.0	1 843	2.2	2 065	2.5	2 226	2.7	1 907	2.3	2.4
Greece	1	0.0	2	0.0	3	0.0	1	0.0	5	0.0	0.1
Hungary	15	0.2	12	0.1	12	0.1	14	0.1	23	0.2	0.2
Iceland	1	0.3	3	0.9	3	0.9	3	0.9	27	7.6	6.7
Ireland	598	12.8	737	15.6	795	16.6	966	20.0	798	16.3	15.4
Italy	59	-	78	-	92	-	73	-	59	-	-
Latvia	4	0.2	1	0.1	1	0.1	3	0.2	48	2.5	2.5
Liechtenstein	.	.	.	.	.	.	.	.	.	.	.
Lithuania	3	0.1	4	0.1	0	0.0	0	0.0	0	0.0	0.0
Luxembourg	4	0.7	4	0.7	1	0.2	3	0.5	4	0.7	0.6
Malta	4	0.9	4	0.9	9	2.0	41	8.6	53	10.7	10.4
Netherlands	858	5.1	665	3.9	392	2.3	488	2.8	459	2.7	2.6
Norway	221	4.3	239	4.6	381	7.2	494	9.3	511	9.6	9.5
Poland	0	0.0	4	0.0	4	0.0	6	0.0	14	0.0	0.0
Portugal	0	0.0	0	0.0	1	0.0	2	0.0	1	0.0	0.0
Romania	0	0.0	29	0.1	11	0.1	20	0.1	36	0.2	-
Slovakia	1	0.0	2	0.0	3	0.1	12	0.2	3	0.1	0.1
Slovenia	23	1.1	26	1.3	33	1.6	32	1.5	31	1.5	1.6
Spain	86	-	69	-	86	-	126	-	269	-	-
Sweden	551	5.7	638	6.5	504	5.0	892	8.8	756	7.4	7.4
United Kingdom	1 328	2.0	1 367	2.1	993	1.5	1 840	2.8	1 587	2.4	2.4
EU-EEA	**6 151**	**1.7**	**6 716**	**1.8**	**6 455**	**1.8**	**8 664**	**2.4**	**8 313**	**2.2**	**2.2**

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

Figure 1. Distribution of confirmed STEC infection cases per 100 000 population by country, EU/EEA, 2019

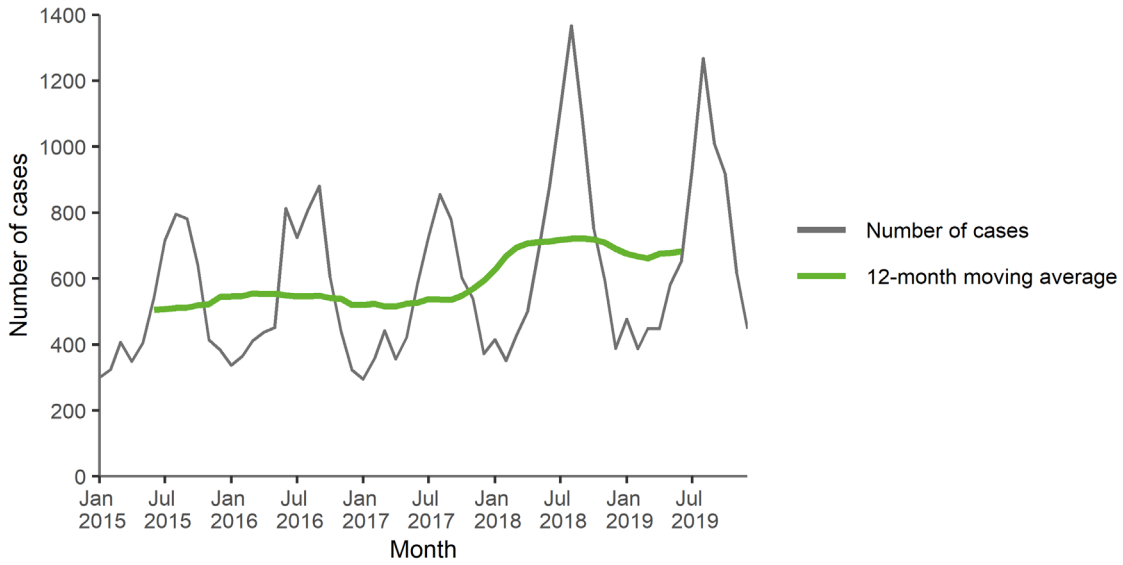


Source: Country reports from Austria, Belgium, Bulgaria, Cyprus, Czechia, Denmark, Estonia, Finland, Germany, Greece, Hungary, Iceland, Ireland, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Sweden, and the United Kingdom

Between 2015 and 2017, the number of reported confirmed STEC cases remained stable at the EU/EEA level, but this increased in 2018–2019 (Figure 2).

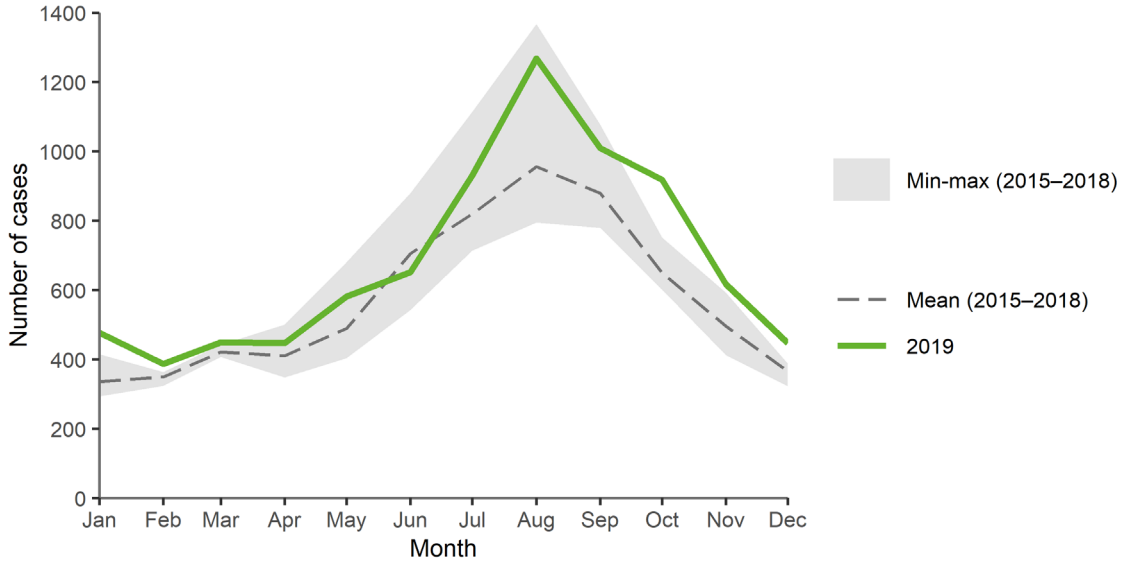
A clear seasonal trend in the number of confirmed STEC cases was observed in the EU/EEA between 2015 and 2019, with more cases reported during the summer months during the period June–September (Figure 3).

Figure 2. Distribution of confirmed STEC infection cases by month, EU/EEA, 2015–2019



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

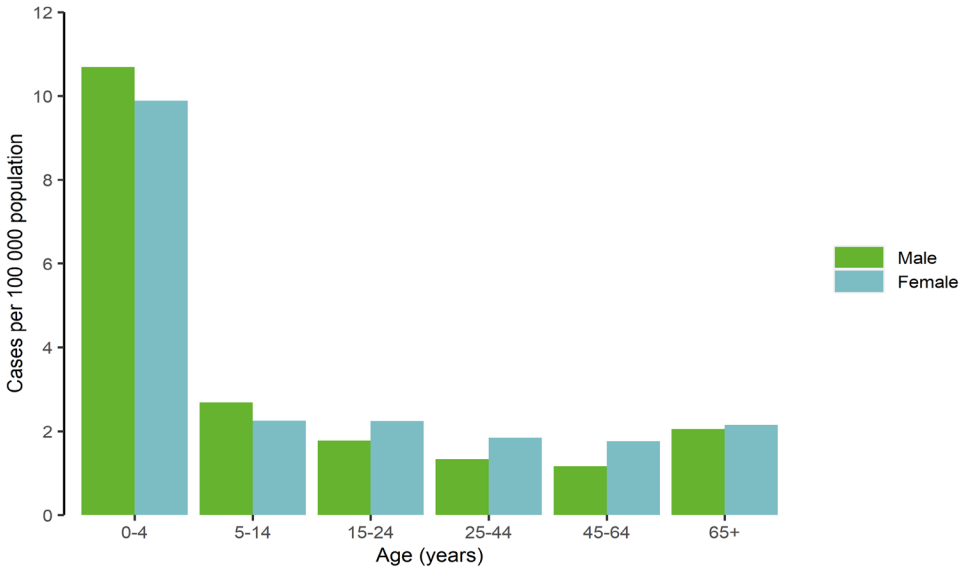
Figure 3. Distribution of confirmed STEC infection cases by month, EU/EEA, 2019 and 2015–2018



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

Among the 8 305 confirmed STEC cases for which gender was reported, 46% were males and 54% were females, with a male-to-female ratio of 0.9:1. The highest notification rate per 100 000 population was observed in the age group 0–4-years (10.7 for males and 9.9 for females). This age group accounted for 2 115 (26%) of the cases for which information on age was available. The notification rate decreased with age and was lowest (1.2) in the age group of 45–64-year-old males. For females, the lowest notification rate (1.8) was in the age groups 25–44 years and 45–64-years (Figure 4).

Figure 4. Distribution of confirmed STEC infection cases per 100 000 population, by age and gender, EU/EEA, 2019



Outbreaks and other threats

In 2019, ten urgent inquiries regarding STEC infection were launched through ECDC's Epidemic Intelligence Information System for Food- and Waterborne Diseases (EPIS-FWD). No multi-country outbreaks were detected/investigated.

Discussion

In 2019, STEC was the third most commonly reported zoonosis in the EU/EEA after campylobacteriosis and salmonellosis. A large increase in confirmed cases was observed in 2018–2019 compared to the stable trend in the previous six years from 2012 to 2017. A contributing factor may be the shift from culture to culture-independent diagnostic methods, with PCR more commonly used to diagnose cases [4]. In most EU/EEA countries, surveillance of STEC infections is mandatory and covers the whole population. However, almost one-third of the countries report less than five cases annually, indicating significant under-reporting of STEC cases in some countries. In two countries (France and Italy), surveillance only covers cases of HUS, which mainly affects small children and is characterised by acute kidney failure requiring hospital care.

The age groups most affected by STEC infection were infants and children up to four years of age, who accounted for more than one-quarter of all confirmed cases in 2019. An even larger proportion of children was seen among the HUS cases, where two-thirds of the cases were reported in 0–4-year-olds. However, the majority of deaths were reported in the age groups >25 years. Half of the deaths reported were with HUS [4]. As in previous years, serogroup O157 was the most commonly reported serogroup in 2019. The proportion of non-O157 serogroups has been increasing over the years as more laboratories are testing for serogroups other than O157. Serogroup O26 was a more common cause of HUS than serogroup O157, as it has been since 2016 [4]. A high proportion of HUS cases due to non-O157 serogroups points to an emerging risk of severe infections [5,6].

Although the recent pathogenicity assessment of STEC affirms that serogroup is not a marker of pathogenicity, it still has some importance as an epidemiological marker, and it is still useful to observe the circulation of the different STEC types in food and human cases of disease [7]. Analysis of the virulence gene combinations (*stx* and *eae*), particularly the subtyping of the *stx* genes, allows STEC virulotypes to be identified which have a higher frequency of association with severe disease in humans (hospitalised, bloody diarrhoea and HUS cases). Since 2012 there has been a steady increase in the reporting of *stx* and *eae* virulence genes to TESSy. The majority (>90%) of the severe human cases were reported with information on *stx* gene subtypes. However, this level of characterisation is unfortunately still far from comprehensive for food and animal isolates, making it difficult to assess the risk of STEC circulating in vehicles of infections.

Ruminants are the main natural reservoir of STEC. Undercooked ground beef or other meats were found to be a significant risk factor for acquiring sporadic foodborne STEC infection, most often caused by serogroup O157 [8]. In recent analyses, beef and fresh produce (fruit and vegetables) were found to be the most important sources of STEC infections in Europe, each estimated with 30% of illnesses [9]. Reported outbreaks highlight a risk of STEC infections associated with raw milk and cheese made from unpasteurised milk [4,6]. In 2019, STEC was the third most frequent bacterial agent detected in food- and waterborne outbreaks in EU reported to the European Food Safety Authority (EFSA) annual zoonoses data collection. STEC outbreaks involved 273 human cases in 42 outbreaks across 11 Member States. This accounted for 0.8% of all food- and waterborne outbreaks and for 5.6% of the reported domestic STEC cases at EU level. Food as a vehicle was reported in four foodborne outbreaks with strong-evidence: two outbreaks were caused by red bovine meat, one by raw milk and one by untreated water during camping. All 17 food-borne outbreaks were reported with known serogroup data and the majority of STEC isolates from food belonged to the top-20 STEC serogroups reported in human infections in EU [4].

Public health implications

STEC infection is mainly acquired through consumption of contaminated food or water and contact with animals and/or their faeces. Good hygiene practices in food processing and good handling practices at premises dealing with animals, along with guidance on hand hygiene for visitors to open/pet farms can decrease the risk of infection and further outbreaks. Adequate cooking of food at home, particularly beef, and the use of pasteurised milk may also reduce the risk of foodborne STEC infections. The STEC serogroups most frequently found in food samples are those most commonly reported in human infections, highlighting the role of contaminated food as a source of human infections. Raw meat, unpasteurised milk and dairy products and raw produce are well known potential sources of STEC infections and outbreaks.

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