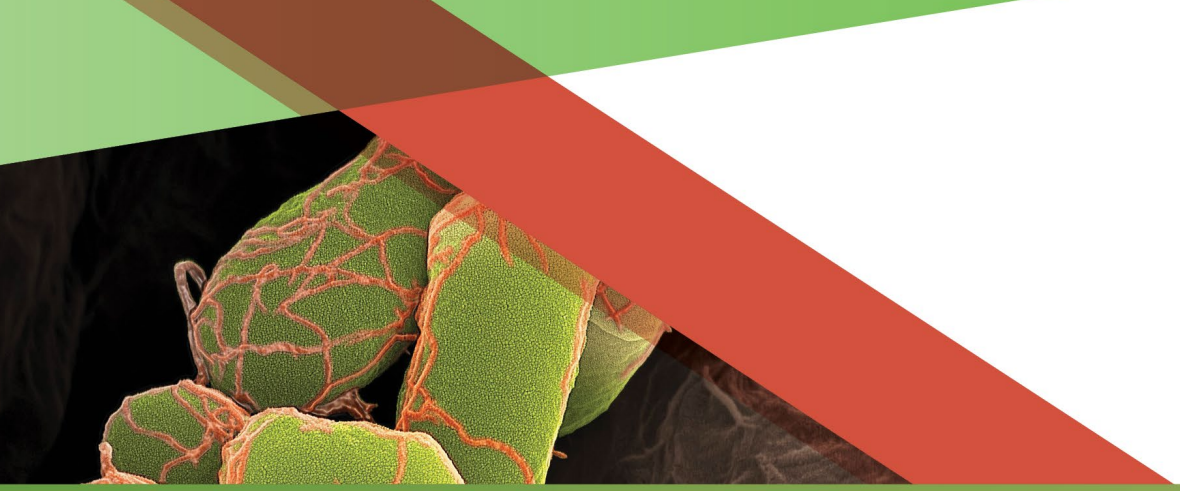

SURVEILLANCE REPORT

STEC infection

Annual Epidemiological Report for 2020

Key facts

- For 2020, 28 EU/EEA countries reported 4 824 confirmed cases of Shiga toxin -producing *Escherichia coli* (STEC) infection.
- The overall notification rate was 1.6 cases per 100 000 population. The highest notification rates were reported in Ireland, Malta, Denmark, and Norway.
- The EU/EEA notification rate decreased notably in 2020 compared with 2016-2019 due to the COVID-19 pandemic.
- The highest rate of confirmed cases was observed in 0–4-year-old children, with 8.6 cases per 100 000 population for males and 7.5 cases per 100 000 population for females.

Introduction

Shigatoxigenic *Escherichia coli* (STEC) are strains of the bacterium *Escherichia coli* that produce Shiga toxins. The main reservoir of STEC is grass-feeding animals, in particular cattle. STEC infection is regularly related to the consumption of undercooked beef contaminated due to poor processing methods during slaughter, or other contaminated food such as unpasteurised milk and dairy products, vegetables, and water. Direct contact with infected animals, for example in petting farms and zoos, is considered an important risk for STEC infection, especially in young children. STEC infection often causes gastroenteritis, enterocolitis, and bloody diarrhoea, and sometimes cause a severe complication called hemolytic-uremic syndrome (HUS), particularly in children.

Methods

This report is based on data for 2020 retrieved from The European Surveillance System (TESSy) on 5 November 2021. 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 in the 'Introduction to the Annual Epidemiological Report [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].

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Stockholm, September 2022

This surveillance report is based on STEC surveillance data collected by the European Food- and Waterborne Diseases and Zoonoses Network (FWD-Net). For 2020, data on STEC infections were reported by 29 EU/EEA Member States. The notification of STEC infections is mandatory in all EU/EEA countries except for five Member States in which notification is either voluntary (Belgium, France, Luxembourg, and Spain) or based on another type of system (Italy). Eight Member States used the latest case definition (EU 2018), 10 used the previous case definition from 2012, five reported in accordance with the one from 2008, and six reported using other unspecified definitions. The surveillance systems for STEC infections have national coverage in all EU/EEA countries except for three: France, Italy, and Spain. As no estimate for population coverage was provided, notification rates could not be calculated for these three countries. Six countries only have laboratory-based reporting. In France, STEC surveillance is based on paediatric haemolytic-uraemic syndrome (HUS) surveillance, and similarly in Italy, the surveillance is primarily based on the national registry for HUS [2]. For 2020, Spain did not receive data from all regions normally reporting and the case numbers are therefore lower than expected. All countries except Bulgaria reported case-based data. No data for 2020 were reported by the United Kingdom (UK) due to its withdrawal from the EU on 30 January 2020.

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 it is only analysed on an ad hoc basis.

Epidemiology

For 2020, 4 824 confirmed cases of STEC infection were reported by 29 EU/EEA countries (Table 1). Twenty-five countries reported at least one confirmed case, and four countries reported no cases. The EU/EEA notification rate was 1.6 cases per 100 000 population, which was a decrease compared with the previous four years.

The highest numbers of confirmed cases were reported by Germany and Ireland, which together accounted for 44% of all reported cases in the EU/EEA. The highest country-specific notification rates were observed in Ireland, Malta, Denmark, and Norway, with 14.8, 8.4, 7.6, and 6.2 cases per 100 000 population respectively. A total of 13 southern and eastern EU/EEA countries reported ≤0.3 cases per 100 000 population (Table 1, Figure 1).

Thirty-nine percent of 1 957 STEC cases with known information were hospitalised. Fourteen of 3 313 cases with known outcome were reported to have died, resulting in a case fatality of 0.4%. Most of the deceased cases were aged over 65 years (64%), one third of them having HUS. Of a total of 324 HUS cases, the majority of cases were in the youngest age groups from 0-4 years (73%) to 5–14 years (18%), with a case fatality of 2.0%.

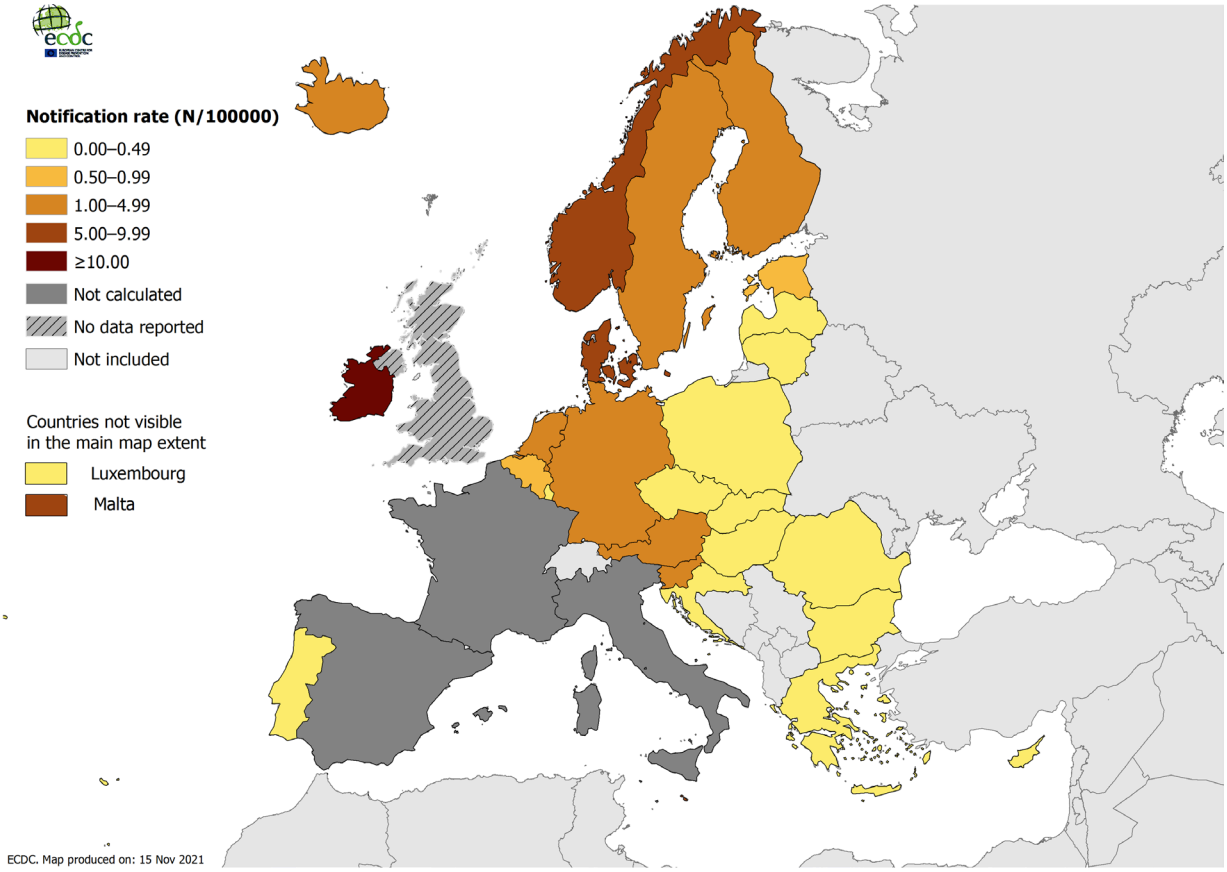
In 2020, the five most commonly reported serogroups were O26, O157, O103, O145, and O146. The most frequently reported virulence gene combinations (virulotypes) of the severe human cases (hospitalised cases, bloody diarrhoea and/or HUS cases) were stx1-/stx2+/eae+ and stx1+/stx2+/eae+. The most commonly reported *stx* gene subtypes in severe cases were *stx*1a, followed by *stx2a*.

Table 1. Distribution of confirmed STEC infection cases and rates per 100 000 population by country and year, EU/EEA, 2016–2020

Country	2016		2017		2018		2019		2020		
	Number	Rate	Number	Rate	Number	Rate	Number	Rate	Number	Rate	ASR
Austria	177	2.0	250	2.8	305	3.5	284	3.2	288	3.2	3.3
Belgium	119	1.1	123	1.1	112	1.0	131	1.1	84	0.7	0.7
Bulgaria	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0.0
Croatia	9	0.2	7	0.2	10	0.2	22	0.5	8	0.2	0.2
Cyprus	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0.0
Czechia	28	0.3	37	0.3	26	0.2	33	0.3	32	0.3	0.3
Denmark	210	3.7	263	4.6	493	8.5	623	10.7	445	7.6	7.4
Estonia	5	0.4	3	0.2	7	0.5	6	0.5	10	0.8	0.8
Finland	139	2.5	123	2.2	210	3.8	311	5.6	175	3.2	3.2
France	302	-	260	-	259	-	335	-	262	-	-
Germany	1 843	2.2	2 065	2.5	2 226	2.7	1 907	2.3	1 409	1.7	1.7
Greece	2	0.0	3	0.0	1	0.0	5	0.0	3	0.0	0.0
Hungary	12	0.1	12	0.1	14	0.1	23	0.2	8	0.1	0.1
Iceland	3	0.9	3	0.9	3	0.9	27	7.6	4	1.1	1.1
Ireland	737	15.6	795	16.6	966	20.0	798	16.3	734	14.8	14.1
Italy	78	-	92	-	73	-	62	-	45	-	-
Latvia	1	0.1	1	0.1	3	0.2	48	2.5	2	0.1	0.1
Liechtenstein	.	.	.	.	.	.	.	.	.	.	.
Lithuania	4	0.1	0	0.0	0	0.0	0	0.0	0	0.0	0.0
Luxembourg	4	0.7	1	0.2	3	0.5	4	0.7	0	0.0	0.0
Malta	4	0.9	9	2.0	41	8.6	53	10.7	43	8.4	8.0
The Netherlands	665	3.9	392	2.3	488	2.8	459	2.7	323	1.9	1.8
Norway	239	4.6	381	7.2	494	9.3	511	9.6	331	6.2	6.1
Poland	4	0.0	4	0.0	6	0.0	14	0.0	3	0.0	0.0
Portugal	0	0.0	1	0.0	2	0.0	1	0.0	5	0.0	0.0
Romania	29	0.1	11	0.1	20	0.1	36	0.2	14	0.1	0.1
Slovakia	2	0.0	3	0.1	12	0.2	3	0.1	1	0.0	0.0
Slovenia	26	1.3	33	1.6	32	1.5	31	1.5	30	1.4	1.5
Spain	69	-	86	-	126	-	269	-	74	-	-
Sweden	638	6.5	504	5.0	892	8.8	756	7.4	491	4.8	4.7
The United Kingdom	1 367	2.1	993	1.5	1 840	2.8	1 587	2.4	-	-	-
EU-EEA	**6 716**	**1.8**	**6 455**	**1.8**	**8 664**	**2.4**	**8 339**	**2.2**	**4 824**	**1.6**	**1.6**

Sources: 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, 2020

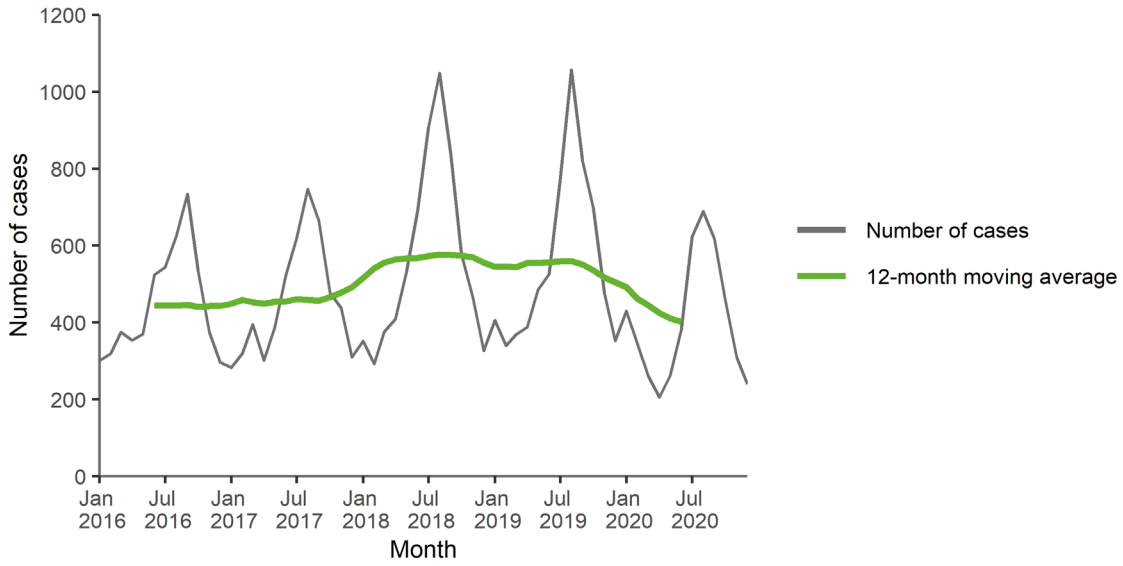


Sources: Country reports from Austria, Belgium, Bulgaria, Croatia, Cyprus, Czechia, Denmark, Estonia, Finland, Germany, Greece, Hungary, Iceland, Ireland, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia and Sweden.

The EU/EEA trend for confirmed STEC cases decreased in 2020 after an increase in 2016-2019 (Figure 2).

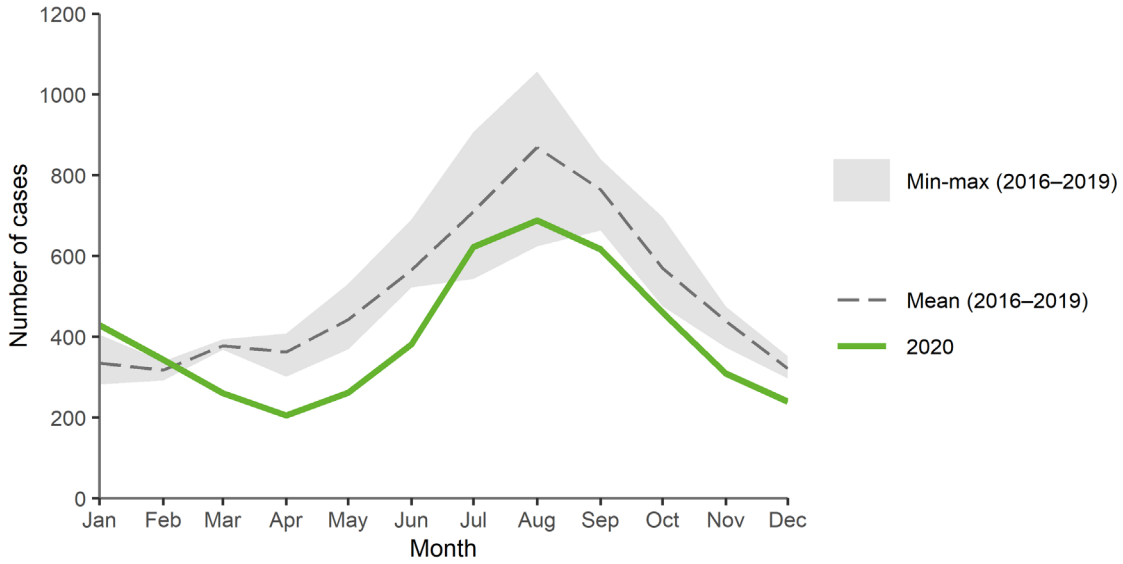
A clear seasonal trend in the number of confirmed STEC cases was observed between 2016 and 2020, with more cases reported during the months from June to September. In 2020, the number of reported cases was lower than the average compared to the same month in 2016-2019 in all months except January (Figure 3).

Figure 2. Distribution of confirmed STEC infection cases by month, EU/EEA, 2016–2020



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

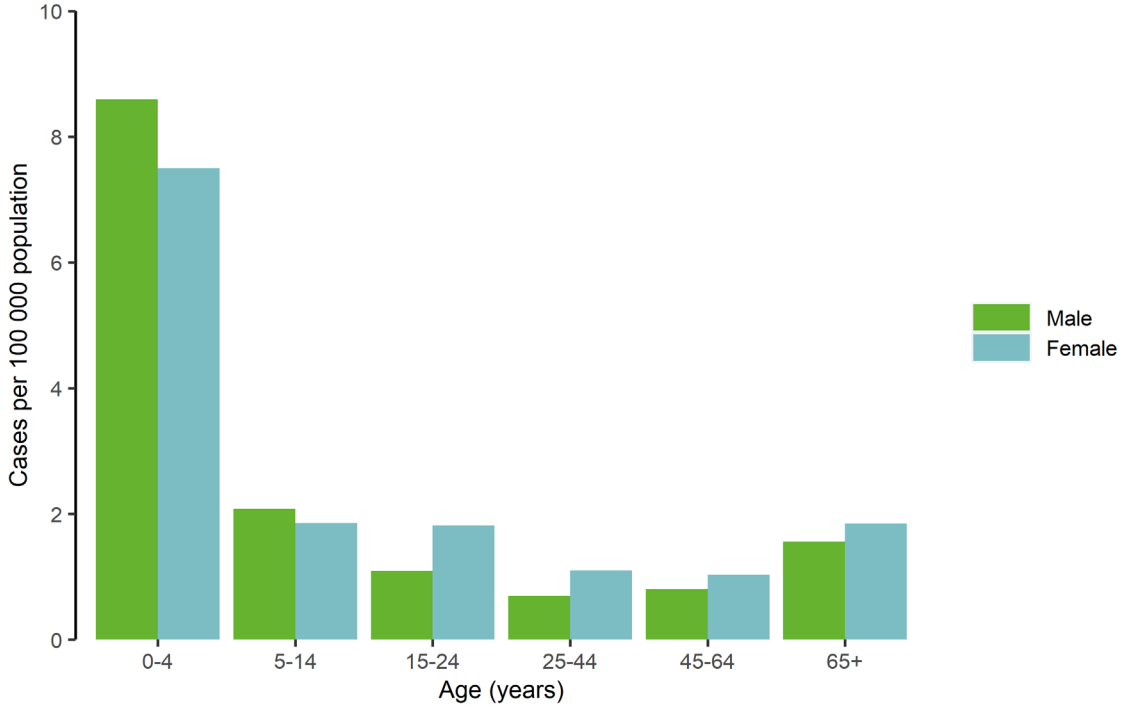
Figure 3. Distribution of confirmed STEC infection cases by month, EU/EEA, 2020 and 2016–2019



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

Among the 4 817 (99.9%) confirmed STEC cases for which sex was reported, 45% were males and 55% were females, with a male-to-female ratio of 0.8:1. The highest notification rate per 100 000 population was observed in the age group 0–4-years (8.6 for males and 7.5 for females). This age group accounted for 1 326 (28%) of the 4 819 cases for whom information on age was available. The notification rate decreased with age, and was lowest (0.7) in the age group of 25-44 -years for males. For females, the lowest notification rate (1.0) was in the age group of 45–64 years (Figure 4).

Figure 4. Distribution of confirmed STEC infection cases per 100 000 population, by age and sex, EU/EEA, 2020



Outbreaks and other threats

In 2020, 10 urgent inquiries on STEC infection were launched through ECDC's Epidemic Intelligence Information System for Food- and Waterborne Diseases (EPIS-FWD). One multi-country cluster in two countries with seven cases was detected between March and August.

Discussion

In 2020, STEC was the fourth most commonly reported foodborne zoonotic disease in the EU/EEA [3,4]. In the five-year period from 2015 to 2019, there was an increase in the overall trend of reported STEC cases. The contributing factors likely include changes in laboratory techniques, such as the increasing use of multiplexed molecular assays (PCR) and direct DNA extraction from specimens followed by isolation and further strain characterisation. In 2020, however, the reported cases of STEC infections decreased notably. The COVID-19 pandemic had a significant impact on the surveillance data for STEC infections in 2020. Factors mentioned by countries resulting in lower case numbers included people avoiding seeking medical care for mild symptoms due to the risk of exposure to COVID-19 in healthcare facilities, limited laboratory capacity due to the reallocation of resources to SARS-CoV-2, fewer restaurant visits, increased hand-washing, and less travel due to travel restrictions. The withdrawal of the UK from the EU resulted in a lower EU notification rate for STEC, related to a recurring high number of cases reported in the previous years by the UK relative to population size [4].

STEC was the third most frequent bacterial agent detected in food- and waterborne outbreaks in the EU reported to the European Food Safety Authority (EFSA) annual zoonoses data collection in 2020 [4]. STEC outbreaks involved 208 cases in 34 outbreaks in nine Member States. A food vehicle was reported in five strong-evidence foodborne outbreaks; 'meat and meat products', 'dairy products other than cheese' and 'cheeses made from cows' milk' caused one outbreak each, and two outbreaks were caused by 'tap water, including well water'. Information on the STEC serogroup was available for six outbreaks, with STEC O157, O145, and O26 identified in three, two, and one outbreaks respectively. The majority of STEC isolates from food belonged to the top 20 STEC serogroups reported in human infections in EU.

In 2020, the most frequently reported serogroup identified in human STEC cases was O26, followed by O157. This pattern arises from an increasing trend in the number of STEC O26 cases observed in the last five years, while those assigned to STEC O157 decreased during the same period. This inversion in relative frequency can be explained by the increasing number of laboratories that are testing for serogroups other than O157. There has been a shift in diagnostic methods, with PCR amplification of Stx-coding genes being more commonly used for the detection of STEC cases in several Member States instead of diagnosis based on the detection of the O157 antigen. On the other hand, STEC O26 was the most reported serogroup among HUS cases, as observed since 2016.

Most of the HUS cases caused by this serogroup were reported by three countries (France, Italy, and Ireland), two of which mainly base their surveillance of STEC infections on the detection of HUS cases. A high proportion of HUS cases due to non-O157 serogroups points towards an emerging risk of severe infections caused by serogroups other than O157 [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 identifying STEC virulotypes which have a higher frequency of association to severe disease in humans (hospitalised cases, bloody diarrhoea, and HUS cases). Since 2012, there has been a steady increase of reporting of *stx* and *eae* virulence genes to TESSy. The majority (>90%) of severe human cases were reported with information about *stx* gene subtypes. Unfortunately, this level of characterisation is still far from being comprehensive enough for food and animal isolates to allow risk assessment of STEC circulating in the vehicles of infections.

Ruminants are the main natural reservoir of STEC. Over the years, several STEC outbreaks among children have been reported in petting farms and zoos due to direct contact with STEC-positive animals [9]. 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 incriminated as the most important sources of STEC infections in Europe, each estimated to be associated with 30% of illnesses [10]. Reported outbreaks also highlight a risk of STEC infections associated with raw milk and cheese made from unpasteurised milk [4,6].

Public health implications

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

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