

SURVEILLANCE REPORT

Diphtheria

Annual Epidemiological Report for 2018

Key facts

- For 2018, 63 cases of diphtheria were reported to ECDC; 62 due to toxigenic *Corynebacterium diphtheriae* or *C. ulcerans* and one case with an unknown pathogen.
- The highest proportion of *C. ulcerans* cases was among adults 65 years and over, whereas *C. diphtheriae* cases were more common in younger age groups.
- Among the *C. diphtheriae* cases, 60% were reported as imported.
- High vaccination coverage is crucial to prevent diphtheria.

Methods

This report is based on data for 2018 retrieved from The European Surveillance System (TESSy) on 11 March 2020. TESSy is a system for the collection, analysis and dissemination of data on communicable diseases.

An overview of the national surveillance systems is available online [1].

A subset of the data used for this report is available through the interactive *Surveillance atlas of infectious diseases* [2].

In 2018, 30 EU/EEA Member States reported data on diphtheria and related toxigenic pathogens. Of these, eleven countries reported cases of *Corynebacterium diphtheriae* or *C. ulcerans*. One country did not report data.

The majority of Member States reported data on diphtheria according to the 2008 (n=9) or 2012 (n=12) EU case definition. Nine countries used an alternative or unspecified case definition. Irrespective of the case definition used, only cases caused by or with a clinical syndrome consistent with toxigenic strains are reported at EU level [3].

The majority of countries reported data from a comprehensive and compulsory case-based surveillance system [1].

Epidemiology

Sixty-two cases of laboratory-confirmed diphtheria and related toxigenic pathogens and one probable case of diphtheria were reported in 2018. (Table 1). Twenty-nine cases were reported as *C. diphtheriae*, 33 cases as *C. ulcerans* and for one case the pathogen was reported as unknown (Table 2). The overall notification rate was 0.01 per 100 000 population.

Diphtheria caused by *C. diphtheriae* was reported by nine countries (Table 2). Among these countries, Latvia reported the highest number of indigenous cases (n=4) followed by France (n=2).

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Diphtheria caused by *C. ulcerans* was reported by six countries. More than half of these cases were reported in Germany.

Between 2014 and 2018, 254 cases of diphtheria were reported in the EU/EEA, 139 of which were due to *C. diphtheriae*.

Table 1. Distribution of diphtheria cases and rates per 100 000 population by country, EU/EEA, 2014–2018

	2014	2015	2016	2017	2018
Country	Reported cases	Reported cases	Reported cases	Reported cases	Reported cases
Austria	2	0	2	0	0
Belgium	0	3	6	1	2
Bulgaria	0	0	0	0	0
Croatia	0	0	0	0	0
Cyprus	0	0	0	0	0
Czech Republic	0	0	0	0	0
Denmark	0	0	0	0	0
Estonia	0	0	0	0	0
Finland	0	1	0	0	0
France	6	14	8	7	9
Germany	8	14	11	10	26
Greece	0	0	0	0	0
Hungary	0	0	0	0	0
Iceland	0	0	0	0	0
Ireland	0	1	1	0	0
Italy	1	0	1	1	1
Latvia	13	10	6	3	4
Liechtenstein
Lithuania	0	0	0	0	0
Luxembourg	0	0	0	0	0
Malta	0	0	0	0	0
Netherlands	1	5	2	4	2
Norway	2	2	1	1	1
Poland	0	0	0	0	0
Portugal	0	0	0	0	0
Romania	0	0	0	0	0
Slovakia	0	0	0	0	1
Slovenia	0	0	0	0	0
Spain	1	1	1	0	1
Sweden	3	8	4	4	5
United Kingdom	1	6	6	8	11
EU/EEA	38	65	49	39	63

Table 2. Number of reported cases of diphtheria by country and species, EU/EEA, 2018

Country	<i>C. diphtheriae</i>	<i>C. ulcerans</i>	Unknown
Austria	0	0	0
Belgium	0	2	0
Bulgaria	0	0	0
Croatia	0	0	0
Cyprus	0	0	0
Czech Republic	0	0	0
Denmark	0	0	0
Estonia	0	0	0
Finland	0	0	0
France	4	5	0
Germany	7	19	0
Greece	0	0	0
Hungary	0	0	0
Iceland	0	0	0
Ireland	0	0	0
Italy	0	1	0
Latvia	4	0	0
Liechtenstein	.	.	.
Lithuania	0	0	0
Luxembourg	0	0	0
Malta	0	0	0
Netherlands	2	0	0
Norway	1	0	0
Poland	0	0	0
Portugal	0	0	0
Romania	0	0	0
Slovakia	1	0	0
Slovenia	0	0	0
Spain	1	0	0
Sweden	4	1	0
United Kingdom	5	5	1
EU/EEA	29	33	1

Source: country reports.

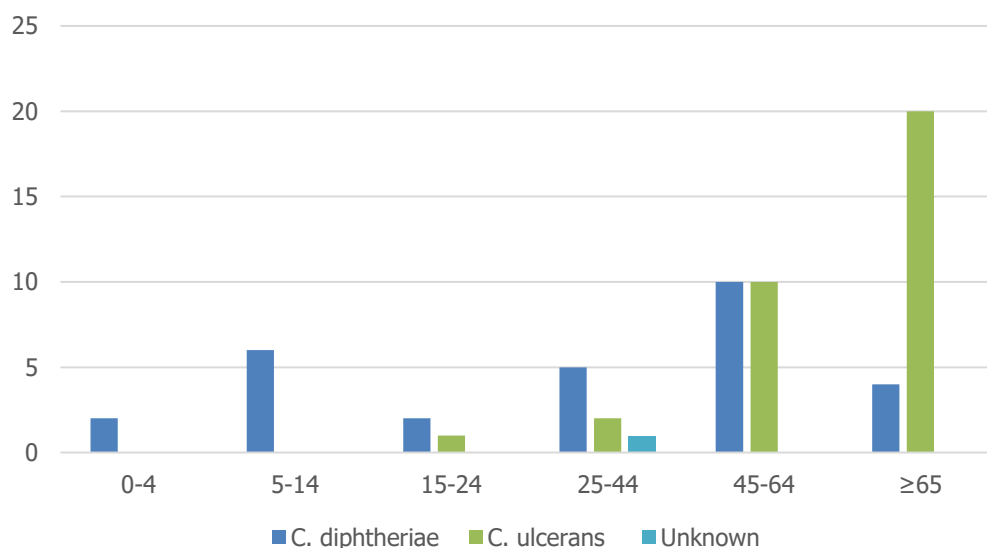
∴ no data reported.

Age and gender distribution

In 2018, cases were reported among all age groups, with a preponderance among those aged 45–64 years (32%) and 65 years or older (38%). Forty-six (73%) of the 63 cases were reported in males.

Of the 29 *C. diphtheriae* cases, eight (28%) were below 15 years, two (7%) were reported in teenagers and young adults from 15–24 years and 19 (65%) were reported in adults 25 years and over. Twenty-five (86%) of the 29 cases with known gender were reported in males.

Of the 33 *C. ulcerans* cases with known age, 30 (91%) were reported in adults over 46 years of age and 21 (64%) of the cases with known gender were reported in males.

Figure 1. Age distribution of diphtheria cases by species, EU/EEA, 2018

Seasonality

The low number of cases reported does not allow for analysis of seasonal variation. As in previous years, cases in 2018 were reported throughout the year, peaking during the last quarter.

Clinical presentation, biotype and outcome

Twenty-five *C. diphtheriae* cases were reported with known clinical presentation. Two of them were reported as classical respiratory diphtheria: one from Latvia and one from Spain. Two cases were reported as respiratory infection with no membrane: one from Latvia and one from the UK.

Eighteen confirmed *C. diphtheriae* cases were reported with cutaneous infections from Germany (7), Sweden (4), the UK (3), the Netherlands (2), Latvia (1), and Norway (1). Fifteen of the 18 cases were reported as imported cases. One case from Latvia, one case from Slovakia, and one case from the UK were reported with a clinical presentation described as 'other'.

Of the reported *C. ulcerans* cases, 25 had cutaneous infection. They were reported from Germany (18), the UK (4), Belgium (2), and Sweden (1). One case from Italy and one case from the UK were reported as classical respiratory diphtheria, one case from Germany was reported as respiratory infection with no membrane and for five cases the clinical presentation was reported as 'unknown'.

Six *C. diphtheriae* cases were due to biotype Var gravis and 5 *C. diphtheriae* cases due to biotype Var mitis. For 12 *C. diphtheriae* cases the biotype was unknown and it was not available for 6 *C. diphtheriae* cases.

Information on eventual outcome was available for only 58 cases. One death was reported due to *C. diphtheriae* biotype Var gravis in a 87-year-old man in Latvia.

Vaccination status

Eleven *C. diphtheriae* cases were reported to have been vaccinated with a known number of doses, having received one to six doses. Seventeen cases (7 *C. diphtheriae* cases and 10 *C. ulcerans* cases) were reported as vaccinated with an unknown number of doses.

Five cases were reported as unvaccinated. Twenty-nine additional cases had unknown vaccination status.

Importation status

In 2018, 17 cases were reported as imported, one additional case was reported as import-related. All imported cases were caused by *C. diphtheriae*. The probable country of origin was known for 14 cases. They were imported from Ghana (1), Guinea (1), India (1), Kenya (1), Sri Lanka (1), Mali (1), Myanmar (1), Philippines (2), Somalia (2), Thailand (2), and Tanzania (1).

Eleven confirmed *C. diphtheriae* cases were reported as indigenous: Latvia (4), France (2), Germany (1), Netherlands (1), Slovakia (1), Spain (1) and the UK (1).

There were no imported cases due to *C. ulcerans*. Twenty-seven indigenous confirmed *C. ulcerans* cases were reported by Germany (14), France (5), the UK (5), Belgium (1), Italy (1), Sweden (1).

Discussion

C. diphtheriae is transmitted via droplets during close contact. The bacterium produces a toxin that can cause severe complications. Systemic toxicity occurs in 8% of all diphtheria patients, which may lead to severe complications such as myocarditis, neuropathies, renal failure and even death. Other corynebacteria (*C. ulcerans* and very rarely *C. pseudotuberculosis*) may produce diphtheria toxin, although the toxigenic strains appear to belong to distinct species and have different routes of transmission [4].

This report includes cases due to *C. diphtheriae* and *C. ulcerans*. While most Member States had surveillance in place for *C. diphtheriae* (n=29), few countries reported cases to ECDC during the period 2014–2018. It is likely that countries with reported cases of all species causing diphtheria in consecutive years have a higher awareness of these pathogens [5].

Diphtheria case detection is strongly influenced by the availability of laboratory resources, expertise and surveillance systems [6,7]. This varies across Europe and few countries perform toxigenicity testing [6–8]. As a consequence, it is highly likely that there is under-ascertainment and under-reporting.

The majority of *C. diphtheriae* cases with known clinical presentation were reported as cutaneous and imported from endemic geographical areas. The increased number of susceptible travellers will probably have contributed to distribution [9]. European travellers may become infected and develop cutaneous diphtheria while travelling or working in endemic countries. ECDC data show that most cutaneous cases were unvaccinated or had an uncertain vaccination status. Unvaccinated travellers exposed to overcrowding and poor hygienic conditions are at risk for acquiring diphtheria and transmitting the infection upon their return. Therefore, the vaccination status of travellers to diphtheria-endemic areas should be checked and catch-up vaccinations should be offered at any opportunity, especially in adult migrants [10–13], in accordance with national recommendations.

Since reported diphtheria vaccination coverage is high in Europe, the threat of widespread outbreaks is low. As reported data show, sporadic cases may continue to occur in unvaccinated and partially vaccinated individuals, especially in travellers to and from endemic countries. The few cases reported in vaccinated adults and the elderly are most probably due to waning immunity [11,12].

Communication with the Member States experiencing diphtheria cases suggested that a significant effort was required for the clinical and public health management of cases of a disease which is rarely seen in Europe. Member States should consider close monitoring of their diphtheria antitoxin (DAT) stock and take appropriate and timely action to replace it [14]. This is particularly important given the increasing number of outbreaks due to *C. diphtheriae* in endemic geographical areas (Bangladesh, Indonesia, Venezuela and Yemen) among people facing humanitarian crises, most probably due to disrupted immunisation programmes.

Public health implications

Immunisation with the diphtheria toxoid vaccine is the only effective method of preventing the toxin-mediated disease. Achieving and sustaining high vaccination coverage in the population is critical to prevent toxigenic diphtheria from causing serious or fatal illness. In addition, special attention should be given to travellers, healthcare and social workers.

If cases occur, prompt clinical recognition, laboratory confirmation and treatment are essential, including rapid investigation and management of close contacts of cases. If there is a strong suspicion of toxigenic *C. diphtheria* disease, irrespective of clinical manifestation, early administration of DAT is essential for survival. Therefore the timely mobilisation of available stocks in individual countries should be ensured. This may require support from other countries if domestic DAT stocks are depleted.

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