The European Union One Health 2022 Zoonoses Report

European Food Safety Authority
European Centre for Disease Prevention and Control

Abstract

This report by the European Food Safety Authority and the European Centre for Disease Prevention and Control presents the results of the zoonoses monitoring and surveillance activities carried out in 2022 in 27 Member States (MSs), the United Kingdom (Northern Ireland) and 11 non-MSs. Key statistics on zoonoses and zoonotic agents in humans, food, animals and feed are provided and interpreted historically. In 2022, the first and second most reported zoonoses in humans were campylobacteriosis and salmonellosis, respectively. The number of cases of campylobacteriosis and salmonellosis remained stable in comparison with 2021. Nineteen MSs and the United Kingdom (Northern Ireland) achieved all the established targets in poultry populations for the reduction of *Salmonella* prevalence for the relevant serovars. *Salmonella* samples from carcases of various animal species, and samples for *Campylobacter* quantification from broiler carcases, were more frequently positive when performed by the competent authorities than when own checks were conducted. Yersiniosis was the third most reported zoonosis in humans, followed by Shiga toxin-producing *Escherichia coli* (STEC) and *Listeria monocytogenes* infections. *L. monocytogenes* and West Nile virus infections were the most severe zoonotic diseases, with the most hospitalisations and highest case fatality rates. In 2022, reporting showed an increase of more than 600% compared with 2021 in locally acquired cases of human West Nile virus infection, which is a mosquito-borne disease. In the EU, the number of reported foodborne outbreaks and cases, hospitalisations and deaths was higher in 2022 than in 2021. The number of deaths from outbreaks was the highest ever reported in the EU in the last ten years, mainly caused by *L. monocytogenes* and to a lesser degree by *Salmonella*. *Salmonella* and in particular *S.* Enteritidis remained the most frequently reported causative agent for foodborne outbreaks. Norovirus (and other calicivirus) was the agent associated with the highest number of outbreak human cases. This report also provides updates on brucellosis, *Coxiella burnetii* (Q fever), echinococcosis, rabies, toxoplasmosis, trichinellosis, infection with *Mycobacterium tuberculosis* complex (focusing on *Mycobacterium bovis* and *Mycobacterium caprae*), and tularaemia.

Keywords: *Campylobacter*, foodborne outbreaks, *Listeria*, monitoring, parasites, *Salmonella*, West Nile, zoonoses

Requestor: European Commission
Question number: EFSA-Q-2021-00763
Correspondence: zoonoses@efsa.europa.eu

Declarations of interest: If you wish to access the declaration of interests of any expert contributing to an EFSA scientific assessment, please contactinterestmanagement@efsa.europa.eu.

Acknowledgements: EFSA and the ECDC wish to thank the members of the EFSA Scientific Network for Zoonoses Monitoring Data and of the ECDC Food and Waterborne Diseases and Zoonoses Network, the ECDC Emerging and Vector-borne Diseases Network and the ECDC Tuberculosis Network, who provided the data and reviewed the report; the members of the Scientific Network for Zoonoses Monitoring Data for their endorsement of this scientific report; the EFSA staff members (Frank Boelaert, Giusi Amore, Valentina Rizzi, Anca Stoicescu, Kateryna Chuzhakina, Maria Teresa Da Silva Felício, Sandra Luisa De Almeida Florentino Correia, Michaela Hempen, Winy Messens, Sotiria-Eleni Antoniou, Francesca Baldinelli, Alessandro Broglia, Lisa Kohnle and Lina Mur), the ECDC staff members (Taina Niskanen, Mohammed Afzal, Tamas Bakonyi and Veronica Cristea) and the EFSA and ECDC contractor: Istituto Superiore di Sanità (Gaia Scavia, Ilaria Altieri, Fabrizio Anniballi, Pierfrancesco Barbariol, Antonino Bella, Simone Cacciò, Adriano Casulli, Alessandra Ciervo, Elisabetta Delibato, Maria Grazia Dente, Michele Luca D'Errico, Aurora Garcia Fernandez, Maria Angeles Gomez Morales, Francesca Iacoponi, Federico Giannoni, Marco Lalle, Claudia Lucarelli, Cinzia Marianelli, Stefano Morabito, Marco Francesco Ortoffi, Flavia Riccardo, Elisabetta Suffredini, Rosangela Tozzoli, Eleonora Ventola, and Laura Villa); Istituto Zooprofilattico delle Venezie (Giorgia Angeloni, Lisa Barco, Grazia Manca, Aurora Boscolo, Katia Capello, Giulia Cento, Laura Ciot, Paola De Benedictis, Laura Gagliazzo, Annie Ishebabi, Elena Lazzaro, Monica Lorenzetto, Marzia Mancin, Claudio Mantovani, Angelo Sardella, Martina Simonato and Marica Toson); Istituto Zooprofilattico Sperimentale dell'Abruzzo e del Molise 'G. Caporale' (Paolo Calistri, Marta Cresci, Enrico De Albentiis, Giuliano Garofolo, Diana Palma, Fabrizio De Massis, Francesco Pomilio, Americo Bonanni, Susanna Tora, Alessio Di Lorenzo, Mauro Ferella, Andrea De Ruvo, Raffaella Lucchini and Annamaria Conte); Istituto Zooprofilattico Sperimentale della Lombardia ed Emilia Romagna 'B. Ubertini' (Maria Beatrice Boniotti, Nadia Vicari, Silvia Bellini, Gabriele Casadei); the French Agency for Food, Environmental and Occupational Health & Safety (Adrien Asséré, Christophe Cordevant, Aurélie Couesnon, Radu Blaga, Florence Cliquet, Corinne Danan, Nolwenn Dheilly, Luca Freddi, Gaëlle Gonzalez, Claire Ponsart, Dana Pottratz, Emmanuelle Robardet, Elodie Rousset and Isabelle Vallée) for the support provided to this scientific report.

Suggested citation: EFSA and ECDC (European Food Safety Authority and European Centre for Disease Prevention and Control), 2023. European Union One Health 2023 Zoonoses Report. EFSA Journal 21(12)

Map disclaimer: The designations employed and the presentation of material on the maps included in this report do not imply the expression of any opinion whatsoever on the part of the European Food Safety Authority and of the European Centre for Disease Prevention and Control concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries.

ISSN: 1831-4732

Introduction

Legal basis of European Union-coordinated zoonoses monitoring

The European Union (EU) system for the monitoring and collection of information on zoonoses is based on Zoonoses Directive 2003/99/EC[1], which obliges EU Member States (MSs) to collect relevant and, when applicable, comparable data on zoonoses, zoonotic agents, antimicrobial resistance and foodborne outbreaks. In addition, MSs shall assess the trends and sources of these agents, as well as outbreaks in their territory, submitting an annual report each year by the end of May to the European Commission (EC) covering the data collected. The EC should subsequently forward these reports to the European Food Safety Authority (EFSA). EFSA is assigned the tasks of examining these data and publishing the EU Annual Summary Reports. In 2004, the EC entrusted EFSA with setting up an electronic reporting system and database for monitoring zoonoses (EFSA Mandate No 2004-0178, prolonged by M-2015-0231[2]).

Data collection on human diseases from MSs is conducted in accordance with Decision 1082/2013/EU[3] on serious cross-border threats to health. In October 2013, this Decision replaced Decision 2119/98/EC on setting up a network for the epidemiological surveillance and control of communicable diseases in the EU. The case definitions to be followed when reporting data on infectious diseases to the European Centre for Disease Prevention and Control (ECDC) are described in Decision 2018/945/EU[4]. ECDC has provided data on zoonotic infections in humans and their analysis for the EU Summary Reports since 2005. Since 2008, data on human cases have been received via The European Surveillance System (TESSy), maintained by ECDC.

Reporting requirements

In accordance with List A, Annex I of Zoonoses Directive 2003/99/EC, data on animals, food and feed must be reported for the following eight zoonotic agents: *Salmonella*, *Campylobacter*, *Listeria monocytogenes*, Shiga toxin-producing *Escherichia coli* (STEC), *Mycobacterium bovis*, *Brucella*, *Trichinella* and *Echinococcus*. In addition, and based on the epidemiological situations in the MSs, data must be reported on the following agents and zoonoses (List B, Annex I of the Zoonoses Directive): (i) viral zoonoses: calicivirus, hepatitis A virus, influenza virus, rabies, viruses transmitted by arthropods; (ii) bacterial zoonoses: borreliosis and agents thereof, botulism and agents thereof, leptospirosis and agents thereof, psittacosis and agents thereof, tuberculosis due to agents other than *M. bovis*, vibriosis and agents thereof, yersiniosis and agents thereof; (iii) parasitic zoonoses: anisakiasis and agents thereof, cryptosporidiosis and agents thereof, cysticercosis and agents thereof, toxoplasmosis and agents thereof; and (iv) other zoonoses and zoonotic agents such as *Francisella* and *Sarcocystis*. Furthermore, MSs provided data on certain other microbiological contaminants in foods: histamine, staphylococcal enterotoxins and *Cronobacter sakazakii*, for which food safety criteria are set down in the EU legislation.

In accordance with Article 9 of the Directive, MSs shall assess the trends and sources of zoonoses, zoonotic agents and antimicrobial resistance in their territories and each MS shall send to the EC, every year by the end of May, a report on the trends in, and sources of, zoonoses, zoonotic agents and antimicrobial resistance. Reports, and any summaries of them, shall be made publicly available.

Terms of Reference

In accordance with Article 9 of Directive 2003/99/EC, EFSA shall examine the national reports and data submitted by the EU MSs regarding their zoonoses monitoring activities as described above, and publish an EU Summary Report on the trends and sources of zoonoses, zoonotic agents and antimicrobial resistance in the EU. Since 2019, the annual EU Summary Reports on zoonoses, zoonotic agents and foodborne outbreaks have been renamed the 'EU One Health Zoonoses Summary Report'

[1] Directive 2003/99/EC of the European Parliament and of the Council of 17 November 2003 on the monitoring of zoonoses and zoonotic agents, amending Council Decision 90/424/EEC and repealing Council Directive 92/117/EEC. OJ L 325, 12.12.2003 p. 31–40.

[2] See mandate M-2015-0231 in Open EFSA Questions: https://open.efsa.europa.eu/questions/EFSA-Q-2020-00787.

[3] Decision No. 1082/2013/EU of the European Parliament and of the Council of 22 October 2013 on serious cross-border threats to health and repealing Decision No 2119/98/EC. OJ L 293, 5.11.2013, p. 1–15.

[4] Commission Implementing Decision 2018/945/EU on the communicable diseases and related special health issues to be covered by epidemiological surveillance as well as relevant case definitions. OJ L 170, 6.7.2018, p. 1–74.

(EUOHZ), which is co-authored by EFSA and ECDC. The 2022 MSs data on antimicrobial resistance in zoonotic agents are published in a separate EU Summary Report.

Data sources and report production

Since 2020, support for production of the annual EUOHZ report has been provided by the ZOE (**Z**oonoses under a **O**ne health perspective in the **E**U) Consortium's Work Package 1. The Consortium is composed of the *Istituto Superiore di Sanità* (Rome, Italy), the *Istituto Zooprofilattico Sperimentale delle Venezie* (Padova, Italy), the *French Agency for Food, Environmental and Occupational Health & Safety* (ANSES) (Maisons-Alfort, France), the *Istituto Zooprofilattico Sperimentale dell'Abruzzo e del Molise* (Teramo, Italy), and the *Istituto Zooprofilattico Sperimentale della Lombardia e dell'Emilia Romagna* (Brescia, Italy), under the coordination of the *Istituto Zooprofilattico Sperimentale dell'Abruzzo e del Molise* (Teramo, Italy).

We gratefully acknowledge the efforts made by the MSs, the reporting non-MSs and the EC for the reporting of zoonoses and foodborne outbreak data and in the preparation of this report.

The MSs, other reporting countries, the EC, members of EFSA's Scientific Panels on Biological Hazards (BIOHAZ) and Animal Health and Welfare (AHAW), and the relevant European Union Reference Laboratories (EURLs) were consulted while preparing the EUOHZ 2022 report.

This report focuses on the most relevant information on zoonoses, foodborne outbreaks and food microbiological safety criteria for the EU in 2022. Where substantial differences with regard to the previous years were observed, they have been reported.

On 1 February 2020, the United Kingdom withdrew from the EU and became a third country[5]. Data collection for the 2020 to 2022 period was therefore affected, since the number of EU MSs went from 28 to 27. In descriptive tables, data from the United Kingdom were included in the EU statistics for 2019 and previous years, whereas the 2020 statistical data from the United Kingdom, when available for EFSA data, were assigned to the non-MS group. As of 2020, human data from the United Kingdom have not been collected by ECDC. With regard to trend analyses for human data, only countries having contributed data for all the years of the considered period were taken into account. For trend analyses of the estimated prevalence at EU level of *Salmonella* in poultry populations covered by National Control Programs, any data provided by the reporting MSs were taken into account in the model. The United Kingdom data were only included when available for 2019 and previous years.

Since 2021, the only United Kingdom data reported to EFSA were from Northern Ireland. In accordance with the Agreement on the withdrawal of the United Kingdom from the European Union, and in particular with the Protocol on Ireland/Northern Ireland, the European Union requirements on data sampling are also applicable to and in the United Kingdom with respect to Northern Ireland. Therefore, for the purpose of this report, and pursuant to Article 5(4) and Section 24 of Annex 2 of the Protocol on Ireland/Northern Ireland, which is an integral part of the Agreement on the withdrawal of the United Kingdom of Great Britain and Northern Ireland from the European Union and the European Atomic Energy Community, references to MSs should be read as including Northern Ireland, despite it being part of the United Kingdom. Hence, the European Union requirements on data sampling were also applicable to Northern Ireland (XI[6]) and data transmitted by the United Kingdom (Northern Ireland) have been assigned to the MSs group.

Human data collection for 2022

In the 2022 EUOHZ report, the analysis of data from human illnesses was prepared by the Food- and Waterborne Diseases and Zoonoses (FWD) domain (brucellosis, campylobacteriosis, congenital toxoplasmosis, echinococcosis, listeriosis, salmonellosis, Shiga toxin-producing *E. coli* infection, trichinellosis and yersiniosis), the Emerging and Vector-borne Diseases (EVD) domain (Q fever, rabies, tularaemia and West Nile virus (WNV) infection) and the tuberculosis (TB) domain (infection with *Mycobacterium tuberculosis* complex, focussing on *M. bovis* and *M. caprae*) at ECDC. TESSy is a software platform in which data on 56 diseases and special health issues are collected. Both aggregated and case-based data are reported to TESSy by the MSs and other European countries. Although aggregated

[5] Agreement on the withdrawal of the United Kingdom of Great Britain and Northern Ireland from the European Union and the European Atomic Energy Community. OJ L 29, 31.1.2020, p. 7 ('Withdrawal Agreement').

[6] For the collection of data, EFSA aligned with the guidelines of the Commission concerning customs registration that lays down abbreviations and terminology, and which are available at https://taxation-customs.ec.europa.eu/system/files/2020-11/use_of_gb_and_xi_codes_guidance.pdf

data did not include individual case-based information, both reporting formats were included, when possible, to calculate the number of cases and country-specific case notification rates. **The human data used in this report were extracted from TESSy as of 25 July 2023 for EVD, as of 24 July 2023 for FWD and as of 29 September 2023 for TB due to *M. bovis* and *M. caprae***. The denominators used for calculating notification rates were based on the human population data from Eurostat on 01 January 2023.

The reporting of data to TESSy is underpinned by specific standard definitions applicable to both cases and surveillance systems in place in the MSs and in other European countries[7], which are also used to summarise the data in this report. When interpreting statistics, data quality issues should be considered, as well as the differences between MS surveillance systems; comparisons between countries should therefore be undertaken with caution.

Data on human cases were received from the 27 MSs and from three non-MSs (Iceland, Liechtenstein and Norway). Switzerland reported its data on human cases directly to EFSA. In 2021, Liechtenstein resumed the reporting of human data for the first time since 2008; prior to this, they reported this data together with Switzerland.

Information provided in the EUOHZ 2022 report can be integrated into the interactive ECDC Surveillance Atlas of Infectious Diseases even if small discrepancies are present.

Data collection on food, animals, feed and foodborne outbreaks

For the year 2022, the 27 MSs and the United Kingdom (Northern Ireland) submitted data and national zoonoses reports on monitoring results in food, animals, feed and foodborne outbreaks. In addition, data and reports were submitted by four non-MSs which are also the four European Free Trade Association (EFTA) countries: Iceland, Norway, Switzerland and Liechtenstein[8]. For some food, animal and feed matrices, and for foodborne outbreaks, EFSA received data and reports from the following pre-accession countries: Albania, Bosnia and Herzegovina, Kosovo[9], Republic of North Macedonia, Montenegro and Serbia.

Data were submitted electronically to the EFSA zoonoses database, through EFSA's Data Collection Framework (DCF). MSs could also update their data from previous years.

The deadline for data submission was 31 May 2022. Two data validation procedures were carried out, from 1 June to 12 June 2023 and from 28 June to 7 July 2023, respectively. **Validated data on food, animals, feed and foodborne outbreaks used in the report were extracted from the EFSA zoonoses database on 21 July 2023**.

A detailed description of the terms used in the report is available in EFSA's manuals for reporting on zoonoses (EFSA, 2023c; EFSA, 2023d).

The national zoonoses reports submitted in accordance with Directive 2003/99/EC are published on the EFSA website together with the EU One Health Zoonoses Report. They are available online here.

To provide an overview of all the information reported by the MSs for the production of the EUOHZ 2022 report and to limit its volume, the following interactive communication tools were created: EFSA

[7] Definitions adopted by TESSy for surveillance systems and summarised in the EUOHZ 2022: **Legal character**; 'Compulsory' (Co): the surveillance system has a legal basis (at the national administrative level or other) under which reporting of cases of the disease(s) under surveillance is compulsory, 'Voluntary' (V): the surveillance system is based on a voluntary agreement (at the national level or other) by which reporting of cases of the disease(s) under surveillance is voluntary, 'Other' (O): any system that does not fall under one of the above descriptions, 'Unknown': not specified/unknown, **Comprehensiveness**; 'Comprehensive' (Cp): reporting is based on cases occurring within the whole population of the geographical area where the surveillance system is set up (national, regional, etc.), 'Sentinel' (Se): reporting is based on a selected group of physicians/hospitals/laboratories, or other institutions' notifications, and/or cases occurring within a selected population defined by age group, gender, exposure or other selection criteria, 'Other' (O): reporting is based on a part of the population or group of physicians (or other institutions) which is not specified, for example reporting from laboratories with no selection criteria, 'Unknown': not specified/unknown, **Active/Passive**; 'Active' (A): the surveillance system is based on the public health officials' initiative to contact the physicians, laboratory or hospital staff, or other relevant sources to report data, 'Passive' (P): the surveillance system relies on the physicians, laboratory or hospital staff, or other relevant sources to take the initiative to report data to the health department, 'Unknown': not specified/unknown, **National coverage**; Defined as covering the entire population of the country, or a part of it. May be unknown when not specified.

[8] Based on the customs union treaty of the Principality of Liechtenstein with Switzerland, Liechtenstein is part of the Swiss customs territory. Due to the strong connection between the veterinary authorities of Liechtenstein and Switzerland, and Liechtenstein's integration into the Swiss system in the veterinary field, in principal, all legislation, rules and data on contagious diseases are identical for both Switzerland and Liechtenstein. If not mentioned otherwise, the Swiss data also include the data from Liechtenstein.

[9] This designation is without prejudice to positions on status, and is in line with UNSCR 1244/1999 and the ICJ Opinion on the Kosovo declaration of independence.

story maps and dashboards for foodborne outbreaks (FBOs), *Campylobacter*, *Salmonella*, *Listeria monocytogenes*, Shiga toxin-producing *E. coli*, *Brucella*, and zoonotic tuberculosis (focussing on *Mycobacterium bovis* and *M. caprae*). The EFSA story maps provide general information on each zoonosis and its epidemiology, including information on characteristics of the zoonotic agent, how people and animals get infected, the occurrence of the pathogen in different sources, the disease it causes, and how to prevent infection. In addition, the story maps also illustrate the monitoring activities implemented in the EU and the role of EFSA with respect to these activities. The EFSA story maps include dynamic maps, images, text, and multimedia features. The EFSA dashboards on specific zoonoses are graphical user interfaces for searching and querying the large amount of data collected each year by EFSA from the MSs and other reporting countries based on Zoonoses Directive 2003/99/EC. The EFSA dashboards show summary statistics for the monitoring results for the pathogen with regard to major food and animal categories. In the EFSA dashboards, data and related statistics can be displayed interactively through charts, graphs, and maps using the online format. Moreover, the main statistics can also be viewed and downloaded in tabular format. Detailed information on the use and features of the dashboards can be found in the user guides that can be downloaded from the online tools. Links to the EFSA story maps and dashboards are available in the relevant sections of each chapter. Some discrepancies between the data and statistics reported in the present report and those shown in the storymaps and dashboards may occur. The reason for this is that the data underpinning the report were updated on 21 July 2023, whereas those visualised in the story maps and dashboards were updated on 1 December 2023.

Finalisation of the EUOHZ 2022 report

The draft EUOHZ 2022 report was sent to the MSs for consultation on 9 October 2023 and comments were collected by 24 October 2023. The utmost effort was made to incorporate comments within the available time frame. In general, data amended after the data validation period that ended on 21 July 2023 have not been considered in the summary calculations or other analyses, and footnotes to tables and figures have been added to account for these late data corrections. The report was finalised on 10 November 2023 and published online by EFSA and ECDC on 12 December 2023.

Data analysis and presentation

Data comparability and quality

Humans

For data on human infections, please note that the numbers presented in this report may differ from those found in the national zoonoses reports due to differences in the case definitions used at the EU and national levels or because of differing dates of data submission and extraction. The latter may also result in some divergence in the case numbers and notification rates presented in the different ECDC reports and the reports produced in previous years. Results are not directly comparable among the MSs or between different years. Data collection on human cases of foodborne diseases reported to ECDC through TESSy and to EFSA within the European Union Foodborne Reporting System (EU-FORS, see chapter on Foodborne Oubreaks, section 2) is separate and independent. Comparability between the two systems is limited by the different context and purposes of cases reporting and is also limited by the adoption of different case definitions.

Food, animals, feed and foodborne outbreaks

Comparability of data obtained by the EFSA DCF can vary depending on the levels of data quality and harmonisation. The types of data analysis suggested by EFSA for each zoonosis and matrix (food, animals, feed or foodborne outbreaks) strongly depended on this level of harmonisation and can either be a descriptive summary of submitted data, the following-up of trends (trend watching) or the (quantitative) analyses of trends. Data analyses were carried out in accordance with quality criteria described in Table 1: as adapted from Boelaert et al. (2016). Food, animals, feed and foodborne outbreak data can be classified into three categories depending on the zoonotic agent monitored and the design of the monitoring or surveillance carried out. It follows that the type of data analyses that can be implemented is conditioned by these three distinct categories.

Table 1: Categorisation of the data used in the EU One Health Zoonoses 2022 Summary Report (adapted from Boelaert et al. (2016))

Category	Type of analysis		Type/comparability between MSs	Examples
I	Descriptive summaries at the national level and EU level		Programmed harmonised monitoring or surveillance	National *Salmonella* control programmes in poultry; tuberculosis caused by *M. bovis* or *M. caprae*; *Brucella abortus*, *B. melitensis* and *B. suis* in bovine, caprine and ovine animal populations; *Trichinella* in pigs at the slaughterhouse
	EU trend watching (trend monitoring)		Comparable between MSs	
	Spatial and temporal trend analyses at the EU level		Results at the EU level are interpretable	
II	Descriptive summaries at national level and EU level		Monitoring or surveillance not fully harmonised	Foodborne outbreak data, official samplings related to process hygiene criteria for carcases at the slaughterhouse for *Salmonella* and *Campylobacter*, and to food safety criteria for *L. monocytogenes*, *Salmonella* and STEC in the context of Regulation (EC) No. 2073/2005, Rabies passive surveillance, West Nile virus
	EU trend watching (trend monitoring)		Not fully comparable between MSs	
	No EU trend analysis		Caution needed when interpreting results at the EU level	
III	Descriptive summaries at national level and EU level		Non-harmonised monitoring or surveillance data with no (harmonised) reporting requirements	*Campylobacter*, *Yersinia*, Q fever, *Francisella tularensis*, *Taenia* spp., *Toxoplasma* and other zoonoses
	No EU trend watching (trend monitoring)		Not comparable between MSs; extreme caution needed when interpreting results at the EU level	
	No EU trend analysis			

Rationale of the table of contents

Taking account of the zoonoses listing in Annex I of Directive 2003/99/EC, of the mandatory reporting of foodborne outbreaks and of the above-mentioned categorisation of food, animal and feed data (Table 1:), the following table of contents has been adopted for the 2022 EUOHZ report.

Zoonoses and zoonotic agents included in compulsory annual monitoring (Directive 2003/99/EC List A)

1. *Campylobacter*
2. *Salmonella*
3. *Listeria*
4. Shiga toxin-producing *Escherichia coli*
5. Infection with *Mycobacterium tuberculosis* complex, focussing on *M. bovis* and *M. caprae*
6. *Brucella*
7. *Trichinella*
8. *Echinococcus*

Foodborne and waterborne outbreaks (in accordance with Directive 2003/99/EC)

Zoonoses and zoonotic agents monitored depending on the epidemiological situation (Directive 2003/99/EC List B)

1. *Yersinia*
2. *Toxoplasma gondii*
3. Rabies
4. Q fever
5. West Nile virus
6. Tularaemia
7. Other zoonoses and zoonotic agents

Microbiological contaminants subject to food safety criteria (Regulation (EC) No 2073/2005)

Chapter sections

The 2022 EUOHZ Report presents a harmonised structure for each chapter:

- 'Key facts',
- 'Monitoring and surveillance' in the EU for the specific disease,
- 'Results', summarising the major findings of 2022 as regards trends and sources, starting with a table displaying summary statistics for the last 5 years (2018–2022) for human cases, food matrices and major animal species, and followed by specific sections describing the main results in humans, food and/or animals. References to statistics displayed in the EFSA dashboards are included in some sections of specific chapters, when available.
- A 'Discussion' section. For foodborne and waterborne outbreaks, the main findings are presented and discussed in a joint 'Results and discussion' section and key messages are summarised in the 'Conclusions' section.

For each chapter, overview tables present the data reported by each country. However, unless stated otherwise, the tables summarising MS-specific results and providing EU-level results for food, animals and feed, exclude data from industry own check programmes, hazard analysis and critical control point (HACCP) sampling, as well as data from suspect sampling, selective sampling, and outbreak or clinical investigations. Moreover, regional data reported by countries for food, animals and feed without statistics at the national level, were also excluded from these tables.

Data analyses

Statistical trend analyses for humans were carried out to evaluate the significance of temporal variations in the EU over the 2018-2022 period. Further details can be found in the individual chapters. The number of confirmed cases for the EU by month is presented as a trend figure for the 2013-2022 period. All countries that consistently reported cases – or reported zero cases over the whole reporting period – were included. The trend figure also shows a centred 12-month moving average over the last five years, illustrating the overall trend by smoothing seasonal and random variations. Moreover, the same trend analysis was carried out separately for each country (MS and non-MS countries). Analyses were carried out considering confirmed cases only, except for WNV infection, for which all locally acquired cases (i.e. probable and confirmed cases) were considered. Statistical methods for trend analysis were based on either the regression analysis or nonparametric test (Cox-Stuart test), where appropriate. The time trend was considered statistically significant with p value <0.01 ($p<0.05$ for non-parametric test).

The notification rates were calculated taking into account the coverage of the human population under surveillance (percentage of national coverage). For countries where surveillance did not cover the whole population, the estimated coverage – if provided – was used to calculate the country-specific rate. Cases and populations of those countries not providing information on national coverage or reporting incomplete data were excluded from the EU notification rate.

ESRI ArcMap 10.8.2 was used to map the data. Choropleth maps with graduated colours over five class scales of values using the natural breaks function proposed by the ArcGIS software, were produced to map the proportion of positive sampling units across the EU and other reporting countries. In the maps included in this report, EU MSs and the United Kingdom (Northern Ireland) were represented with a blue label, whereas all the non-EU MSs (including the EFTA countries: Iceland, Norway, Switzerland

and Liechtenstein; and the pre-accession countries: Albania, Bosnia and Herzegovina, Kosovo[10], Republic of North Macedonia, Montenegro, and Serbia) were represented with an orange label.

Statistical trend analysis of foodborne outbreaks was performed to evaluate the significance of temporal variations at the single MS level over the 2013–2022 period.

Summary data and the figures for food, animals, feed and foodborne outbreaks used to produce this report, as well as additional information on related projects and internet sources, are published on the EFSA Knowledge Junction on the Zenodo general-purpose open-access repository here. All country-specific data on food, animals, feed and foodborne outbreaks, updated through 30 November 2023, are also available at this URL.

Along with this report, EFSA has also published the following interactive communication tools:

- the EFSA story maps on *Campylobacter* (here), *Salmonella* (here), *Listeria monocytogenes* (here), Shiga toxin-producing *Escherichia coli* (here), *Mycobacterium tuberculosis* complex, focussing on *M. bovis* and *M. caprae* (here), *Brucella* (here), and foodborne outbreaks (here).
- the EFSA dashboards on *Campylobacter* (here), *Salmonella* (here), *Listeria monocytogenes* (here), Shiga toxin-producing *Escherichia coli* (here), zoonotic tuberculosis or tuberculosis due to *Mycobacterium tuberculosis* complex (here), *Brucella* (here), and foodborne outbreaks (here).

Data used in these communication tools were extracted from the EFSA zoonoses database on 1 December 2023.

Summary of human zoonoses data for 2022

The numbers of confirmed human cases of the zoonoses presented in this report are summarised in Table 2: . In 2022, campylobacteriosis was confirmed as the most commonly reported zoonosis (as it has been since 2005). It accounted for 61.3% of all the reported and confirmed human cases in 2022. After campylobacteriosis, salmonellosis, yersiniosis, STEC infections and listeriosis were the most frequently reported zoonoses. The severity of the diseases was descriptively analysed based on hospitalisations and the outcomes of reported cases. Based on severity data, listeriosis and West Nile virus infection were the two most severe diseases, with the highest case fatality and hospitalisation rates among reported cases. For these two diseases, almost all cases with available hospitalisation data were hospitalised (96.0% of confirmed cases for listeriosis and 86.9% of locally acquired probable and confirmed cases for West Nile virus infection, respectively). The highest number of deaths was associated with listeriosis (N = 286), followed by West Nile virus infection (N = 92) and salmonellosis (N = 81). Listeriosis and West Nile virus infection were also the zoonoses with the highest fatality rate, 18.1% and 8.3%, respectively.

With regard to foodborne outbreaks (FBOs), *Salmonella* accounted for the highest number of outbreaks and cases, followed by 'bacterial toxins, unspecified' and 'noroviruses and other caliciviruses' (statistics not displayed in Table 2:). The number of foodborne outbreaks increased by 43.9% in 2022 compared with 2021. Moreover, the number of human cases, hospitalisations and reported deaths associated with FBOs also increased by 49.4%, 11.5% and 106.5%, respectively.

[10] This designation is without prejudice to positions on status, and is in line with UNSCR 1244/1999 and the ICJ Opinion on the Kosovo declaration of independence.

Table 2: Reported hospitalisations and deaths due to zoonoses in confirmed human cases and among foodborne outbreak cases in the EU, 2022

Disease	Surveillance data on human cases (source: ECDC)											Foodborne outbreaks (source: EFSA)					
	Confirmed human cases	Hospitalisations					Deaths					Outbreaks	Cases	Hospitalisations and proportion of hospitalised cases		Deaths and case fatality	
		Status available		Reporting MSs[a]	Cases and proportion of hospitalised cases		Outcome available		Reporting MSs[a]	Deaths and case fatality							
	N	N	%	N	N	%	N	%	N	N	%	N	N	N	%	N	%
Campylobacteriosis	137,107	44,876	327	16	10,551	23.5	84,425	61.6	17	34	0.04	255	1,097	83	7.6	0	0
Salmonellosis	65,208	29,003	44.5	17	11,287	38.9	36,856	56.5	17	81	0.22	1,014	6,632	1,406	21.2	8	0.12
Yersiniosis	7,919	2,113	26.7	17	636	30.1	3,765	47.5	17	0	0	14	96	4	4.2	0	0
STEC infections	7,117	2,933	41.2	17	1,130	38.5	4,824	67.8	21	28	0.58	71	408	63	15.4	1	0.25
Listeriosis	2,738	1,386	50.6	19	1,330	96.0	1,578	57.6	21	286	18.1	35	296	242	81.8	28	9.5
West Nile virus infection[b]	1,111	366	32.9	8	318	86.9	1,111	100.0	11	92	8.3	NA	NA	NA	NA	NA	NA
Echinococcosis	722	277	38.4	15	128	46.2	405	56.1	15	1	0.25	0	0	0	-	0	-
Q fever	719	NA	NA	NA	NA	NA	445	61.9	14	4	0.90	0	0	0	-	0	-
Tularaemia	620	151	24.4	10	91	60.3	227	36.6	11	2	0.88	0	0	0	-	0	-
Brucellosis	198	79	39.9	10	55	69.6	81	40.9	10	0	0	0	0	0	-	0	-
Tuberculosis caused by *M. bovis, M. caprae*	130	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Trichinellosis[c]	41	11	26.8	5	7	63.6	11	26.8	5	0	0	7	68	10	14.7	0	0
Rabies	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

NA: Not applicable, as information is not collected for this disease.
Data on congenital toxoplasmosis are not shown, since 2022 data are not available yet.
(a): Not all countries provided case data for all diseases.
(b): For West Nile virus infection, the total number of locally acquired infection cases was used (includes probable and confirmed cases).
(c): The number of cases also includes two cases reported from Finland, by error.

Comparison of human zoonoses data for 2021 and 2022

In order to estimate the trends in human infections over the last two years, the 2022 data (number of cases and notification rates) were compared with those from 2021 (absolute and relative difference) (Table 3:). Relative differences in notification rates have been calculated using exact numbers.

For the zoonoses causing the highest number of cases (salmonellosis and campylobacteriosis), the notification rates were stable over the last two years. For all other zoonoses except trichinellosis (-51.9%) and tularaemia (-29.5%), there was an increase in the notification rates in 2022 compared to 2021. The rate of locally acquired West Nile virus infection increased markedly in 2022 as compared with 2021 (+631.8%) due to an epidemic outbreak mainly involving Italy and Greece. A smaller increase was seen for Q fever (+56.5%), brucellosis (+29.2%), yersiniosis (+16.3%), listeriosis (+15.9%), echinococcosis (+13.8%), tuberculosis caused by *M. bovis*, *M. caprae* (+13.2%), and STEC infection (+8.8%) rates.

Table 3: Number of confirmed human cases and notification rates (per 100,000 population) in 2022, including the absolute and relative (%) difference with regard to 2021, by zoonosis, EU

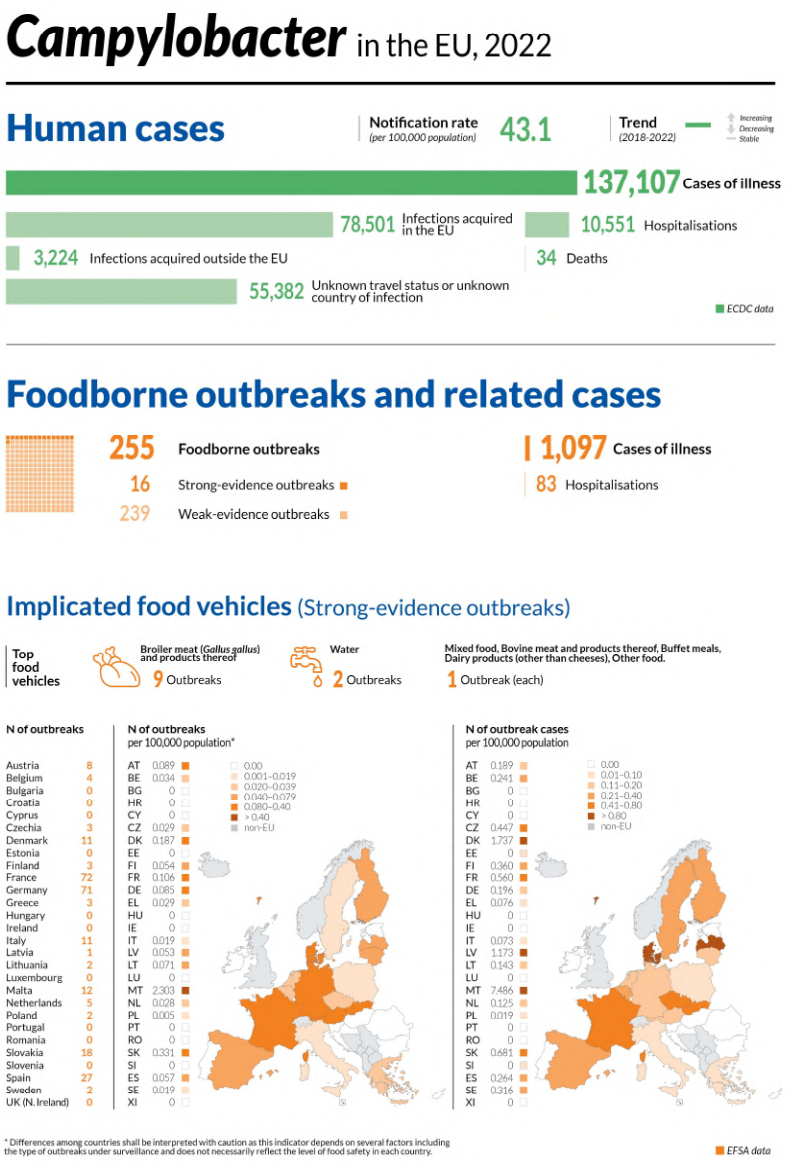
Zoonosis	Cases (N)		Notification Rates (Confirmed cases per 100,000 population)		
	2022	2021 Absolute difference	2022	2021	
				Absolute difference	Relative difference (%)
Campylobacteriosis	137,107	-210	43.1	<0.01	<0.01
Salmonellosis	65,208	5,039	15.3	<0.01	<0.01
Yersiniosis	7,919	910	2.2	+0.30	+16.3
STEC infections	7,117	711	2.1	+0.17	+8.8
Listeriosis	2,738	373	0.62	+0.08	+15.9
West Nile virus infection[a]	1,111	959	0.25	+0.22	+631.8
Echinococcosis	722	133	0.19	+0.02	+13.8
Q fever	719	259	0.17	+0.06	+56.5
Tularaemia	620	-261	0.14	-0.06	-29.5
Brucellosis	198	36	0.04	+0.01	+29.2
Tuberculosis caused by *M. bovis, M. caprae*	130	15	0.03	<0.01	+13.2
Trichinellosis[b]	41	-38	0.01	-0.01	-51.9
Rabies	0	0	0	0	-

(a): For West Nile virus infection, the total number of locally acquired infection cases was used (includes probable and confirmed cases).

(b): The number of cases or the number of confirmed cases per 100,000 population also includes two cases reported from Finland, by error.

Zoonoses and zoonotic agents included in compulsory annual monitoring (Directive 2003/99/EC List A)

1. *Campylobacter*



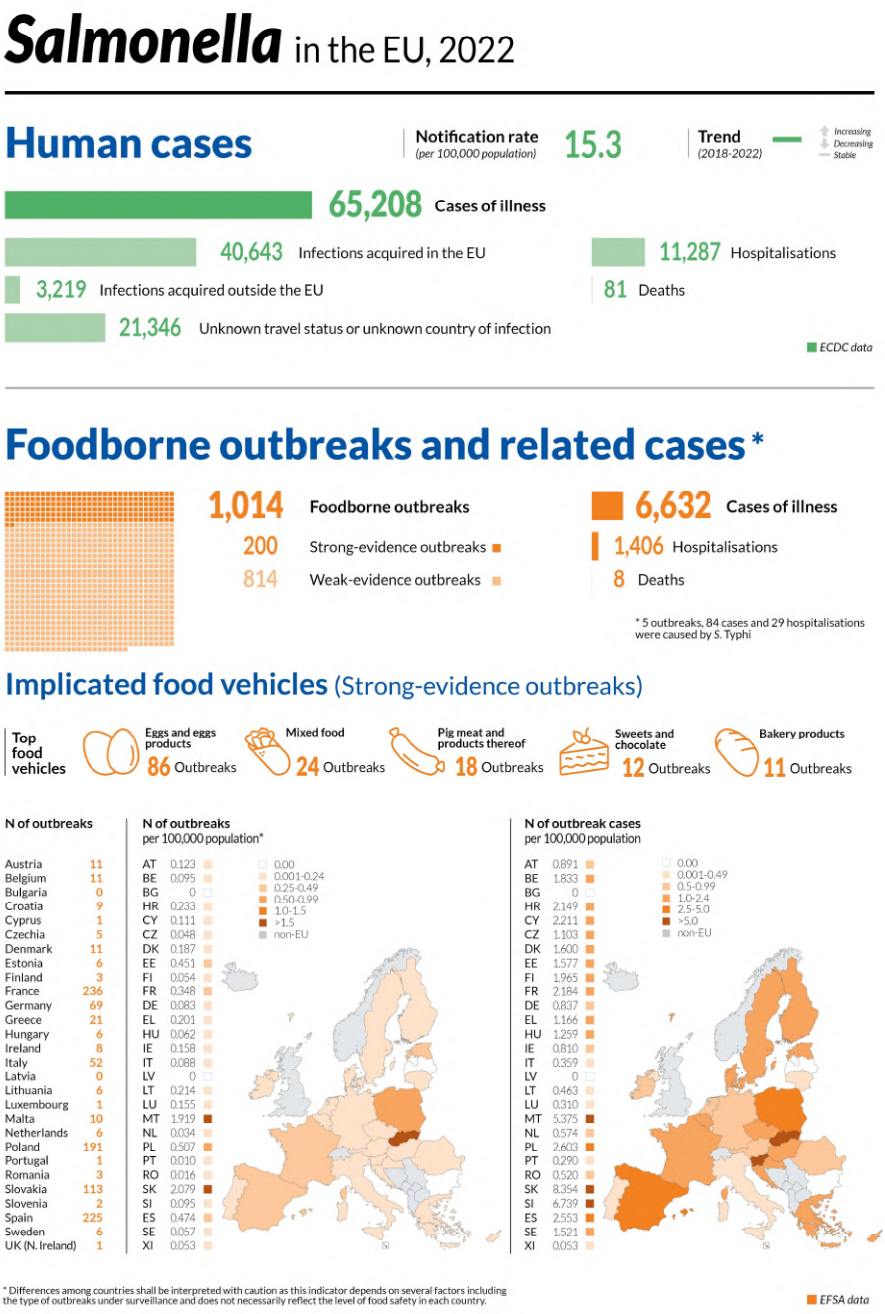
1.1. Key facts

- Campylobacteriosis was the most commonly reported foodborne gastrointestinal infection in humans in the EU.
- In 2022, there were 137,107 confirmed cases of human campylobacteriosis, corresponding to an EU notification rate of 43.1 cases per 100,000 population. The notification rate was stable compared with 2021.

- The overall trend for *Campylobacter* infections showed no significant increase or decrease over the 2018–2022 period.
- Twenty-four MSs and the United Kingdom (Northern Ireland) reported data for 2022 in the context of the *Campylobacter* process hygiene criterion (PHC), set out in Regulation (EC) No 2073/2005[11]. Sixteen MSs and the United Kingdom (Northern Ireland) reported 7,905 test results from official controls, with 38.3% *Campylobacter*-positive samples and 19.4% exceeding the limit of 1,000 CFU/g. Twenty MSs reported 58,372 test results from the monitoring of food business operators, with 39% positive samples and 17.5% exceeding the limit of 1,000 CFU/g. Twelve MSs reported results from both samplers, showing that the number of samples exceeding the limit was significantly higher in official samples (22.1%) than in own checks (9%).
- In 2022, 0.11% of 2,774 'ready-to-eat' food sampling units reported by 11 MSs were positive for *Campylobacter*, with positive units originating from 'minced meat from other poultry species intended to be eaten raw' and from oysters. Of 25,601 'non-ready-to-eat' sampling units reported by 16 MSs, 11.1% were positive, with the highest level of contamination (11.6%) in 'meat and meat products'. *Campylobacter* was isolated from all fresh meat categories, with meat from broilers and turkeys showing the highest percentages of contamination, 12% and 11.2%, respectively.
- *Campylobacter* spp. was detected by 14 MSs and the United Kingdom (Northern Ireland) and three non-MSs in more than 40 different animal categories in 2022. About 40% of units tested in the EU were from broilers (N= 9,035) and the proportion of positives was 18.1%. The proportion of positive sampling units for turkeys, cats and dogs, bovine animals, small ruminants and pigs were 71.9% 12.5%, 6.4%, 2.2% and 1.8%, respectively.

11 Commission Regulation (EC) No 2073/2005 of 15 November 2005 on microbiological criteria for foodstuffs OJ L 338, 22.12.2005, p. 1–26.

2. *Salmonella*



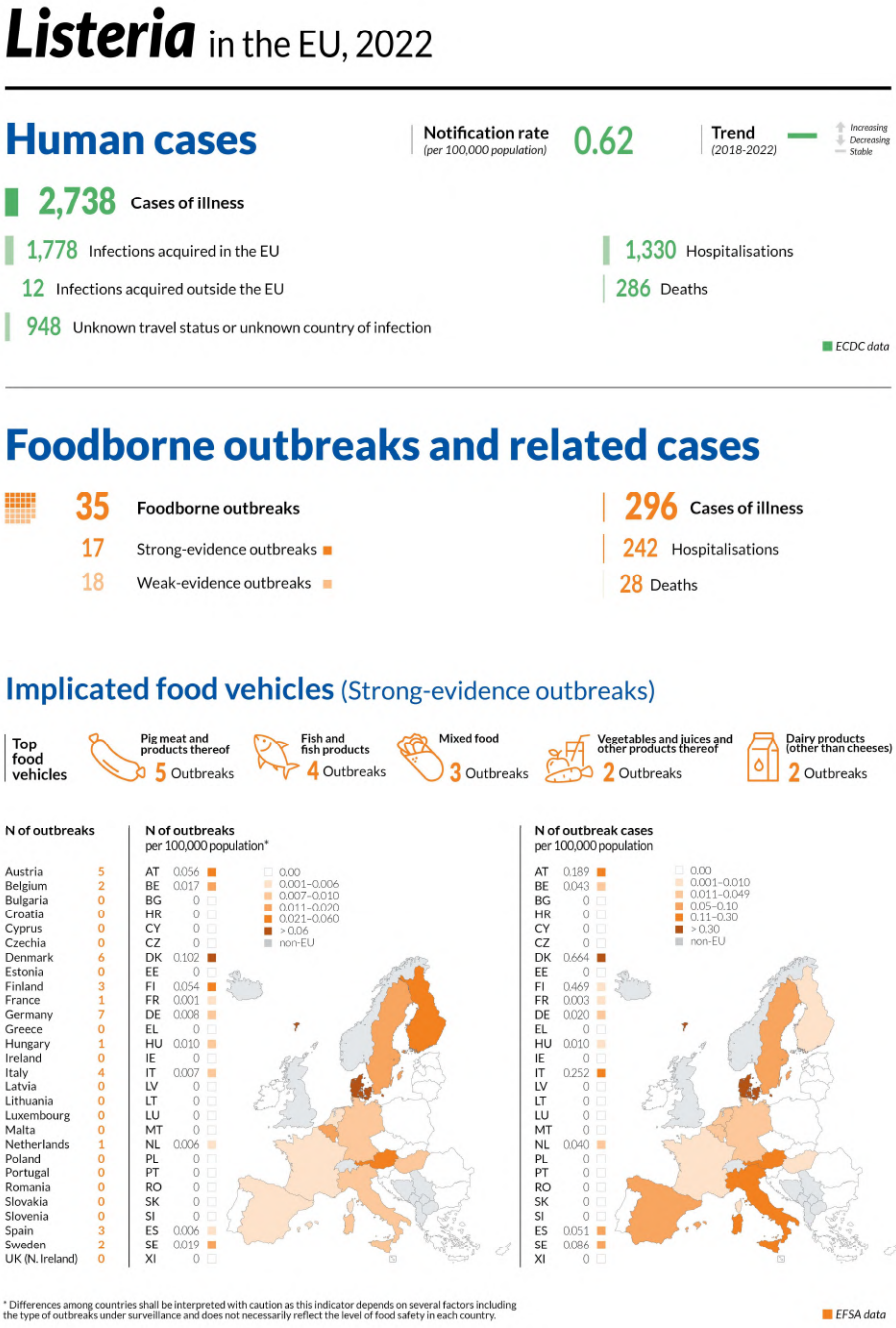
2.1. Key facts

- Salmonellosis was the second most commonly reported foodborne gastrointestinal infection in humans in the EU and was a major cause of foodborne outbreaks in EU MSs and non-MS countries.

- In 2022, there were 65,208 confirmed cases of human salmonellosis, corresponding to an EU notification rate of 15.3 cases per 100,000 population. The notification rate was stable compared with the rate in 2021.
- The overall trend for *Salmonella* infections did not show any significant increase or decrease in the 2018–2022 period.
- The proportion of hospitalised cases was 38.9%, which was slightly higher than in 2021, with an EU case fatality rate of 0.22%, which was similar to 2021.
- The top five EU-acquired *Salmonella* serovars involved in human infections were distributed as follows: *S*. Enteritidis (67.3%), *S*. Typhimurium (13.1%), monophasic *S*. Typhimurium (1,4,[5],12:i:-) (4.3%), *S.* Infantis (2.3%), and *S*. Derby (0.89%).
- In 2022, 0.16% of 99,341 'ready-to-eat' food sampling units reported by 25 MSs were positive for *Salmonella*, with the highest levels of contamination found in 'meat and meat products from broilers' (1.4%; N=584) and 'spices and herbs' (1.1%; N=1,309). Of 521,917 'non-ready-to-eat' sampling units reported by 28 MSs, 2.1% were positive, with the highest levels of contamination found in 'meat and meat products from broilers' (5.1%; N=99,022) and 'meat and meat products from turkeys' (3.3%; N=13,867).
- Sampling to verify compliance with process hygiene criteria on carcases at the slaughterhouse in the context of Regulation (EC) No 2073/2005[12] for MSs found the highest proportions of *Salmonella*-positive samples among those collected by the competent authorities for turkeys (14%), broilers (11.8%), pigs (2.7%), cattle (0.96%), and sheep (0.75%).
- Nineteen MSs and the United Kingdom (Northern Ireland) reporting on *Salmonella* control programmes met all reduction targets for poultry populations, which is an improvement compared with the previous years. The number of MSs that did not meet the reduction targets was four for breeding *Gallus gallus*, four for laying hens and one for fattening turkeys, whereas for broilers and breeding turkeys, all MSs reached the reduction targets.
- For broilers and fattening turkeys, the EU-level flock prevalence reported by food business operators was significantly lower than that reported by competent authorities.
- There were no significant variations in the estimated EU flock prevalence for poultry populations over the years, neither for *Salmonella* spp. nor for target *Salmonella* serovars. The only exception was for breeding turkeys, for which a significant increase in the estimated *Salmonella* spp. flock prevalence was noted in 2022 compared with 2016, when it reached the lowest value seen during the entire study period (2010-2022).
- *S*. Enteritidis was the most commonly reported serovar in laying hens and the second most commonly reported one in broilers. *S.* Infantis was by far the main serovar isolated from broilers, and ranked among the top four serovars for all the food-animal sources considered. The most common serovars from pig sources included the monophasic variant of *S.* Typhimurium and *S.* Typhimurium. The latter serovar was the most commonly reported one from bovine animals, together with *S*. Dublin.

[12] Commission Regulation (EC) No 2073/2005 of 15 November 2005 on microbiological criteria for foodstuffs.

3. *Listeria monocytogenes*



3.1. Key facts

- In 2022, 27 MSs reported 2,738 confirmed invasive human cases of *Listeria monocytogenes*. These cases resulted in 1,330 hospitalisations and 286 deaths in the EU. Listeriosis was the fifth most commonly reported zoonosis in humans in the EU and one of the most serious foodborne diseases under EU surveillance.

- The EU notification rate was 0.62 cases per 100,000 population, which was an increase of 15.9% compared with 2021 (0.53 cases per 100,000 population) and the highest rate and number of cases reported since 2007.
- The overall trend for listeriosis did not show any significant increase or decrease, in the 2018–2022 period.
- The overall EU case fatality rate was high (18.1%), higher than 2021 and 2020 (13.7% and 13.0%, respectively).
- 26 MSs reported a total of 312,849 sampling units from different 'ready-to-eat' food categories, from the distribution or manufacturing stages.
- At distribution, the proportions of positive results for single sample enumeration tests for *L. monocytogenes* carried out by the competent authorities as part of verification of *L. monocytogenes* Food Safety Criteria listed in Regulation (EC) No 2073/2005[13] remained rare (<0.1%) to very low (0.1% to 1.0%) in 9 out of 10 focussed 'ready-to-eat' food categories. The highest proportion at distribution was observed for 'fish' (2.3%).
- In the same context, at manufacturing, the proportions of single samples positive for *L. monocytogenes* based on the detection test were higher compared with those at the distribution level, for all categories of 'ready-to-eat' food except for 'milk', for which no *Listeria* was detected regardless of the stage. The highest proportions at manufacturing were observed for 'fish' (2.6%), 'fishery products' (2.5%) and 'products of meat origin other than fermented sausages' (2.5%).
- The occurrence of *L. monocytogenes* gives an indication of the reasonably foreseeable contamination rate in these 'ready-to-eat' food categories. Results varied according to the 'ready-to-eat' food category, the sampling stage, the number of tested sampling units and the number of reporting countries. In the framework of objective sampling, all samplers and sampling units included, overall occurrences remained generally rare (<0.1%) to low (1% to 10%) in these categories. The overall highest values (from 2% to 7%) were observed for 'fish and fishery products', 'meat products from bovines or pigs', 'fruits and vegetables', and 'cheeses from sheep milk'.
- At primary production, the percentage of positive units was very low in pigs (0.35%) and low in cattle (1.2%), which was the most sampled animal species in the EU. The low number of MSs reporting data reflects the absence of minimum legal requirements for harmonised sampling and reporting at primary production.

[13] Commission Regulation (EC) No 2073/2005 of 15 November 2005 on microbiological criteria for foodstuffs

4. Shiga toxin-producing *Escherichia coli* (STEC)

Shiga toxin-producing *Escherichia coli* (STEC) in the EU, 2022

Human cases

Notification rate (per 100,000 population) 2.1

Trend (2018-2022) — Increasing, Decreasing, Stable

7,117 Cases of illness

- 5,011 Infections acquired in the EU
- 525 Infections acquired outside the EU
- 1,581 Unknown travel status or unknown country of infection
- 1,130 Hospitalisations
- 28 Deaths

ECDC data

Foodborne outbreaks and related cases

71 Foodborne outbreaks

- 1 Strong-evidence outbreak
- 70 Weak-evidence outbreaks

408 Cases of illness

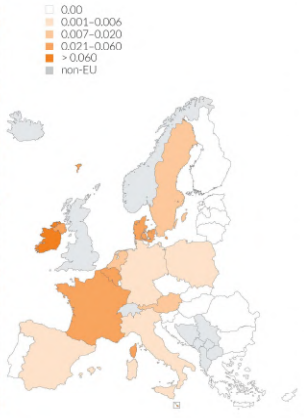
- 63 Hospitalisations
- 1 Death

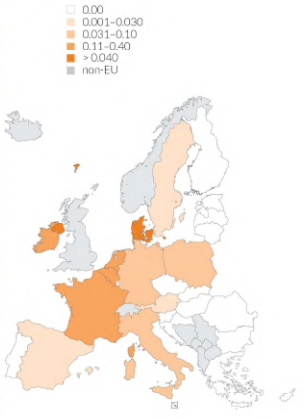
Implicated food vehicles (Strong-evidence outbreaks)

Top food vehicles

Bovine meat and products thereof
1 Outbreak

N of outbreaks		N of outbreaks per 100,000 population*		N of outbreak cases per 100,000 population	
Austria	1	AT	0.011	AT	0.022
Belgium	5	BE	0.043	BE	0.129
Bulgaria	0	BG	0	BG	0
Croatia	0	HR	0	HR	0
Cyprus	0	CY	0	CY	0
Czechia	0	CZ	0	CZ	0
Denmark	3	DK	0.051	DK	0.460
Estonia	0	EE	0	EE	0
Finland	0	FI	0	FI	0
France	37	FR	0.055	FR	0.236
Germany	3	DE	0.004	DE	0.036
Greece	0	EL	0	EL	0
Hungary	0	HU	0	HU	0
Ireland	8	IE	0.158	IE	0.336
Italy	3	IT	0.005	IT	0.085
Latvia	0	LV	0	LV	0
Lithuania	0	LT	0	LT	0
Luxembourg	0	LU	0	LU	0
Malta	1	MT	0.192	MT	0.576
Netherlands	3	NL	0.017	NL	0.279
Poland	2	PL	0.005	PL	0.072
Portugal	0	PT	0	PT	0
Romania	0	RO	0	RO	0
Slovakia	0	SK	0	SK	0
Slovenia	0	SI	0	SI	0
Spain	3	ES	0.006	ES	0.017
Sweden	1	SE	0.010	SE	0.019
UK (N. Ireland)	1	XI	0.053	XI	0.946





* Differences among countries shall be interpreted with caution as this indicator depends on several factors including the type of outbreaks under surveillance and does not necessarily reflect the level of food safety in each country.

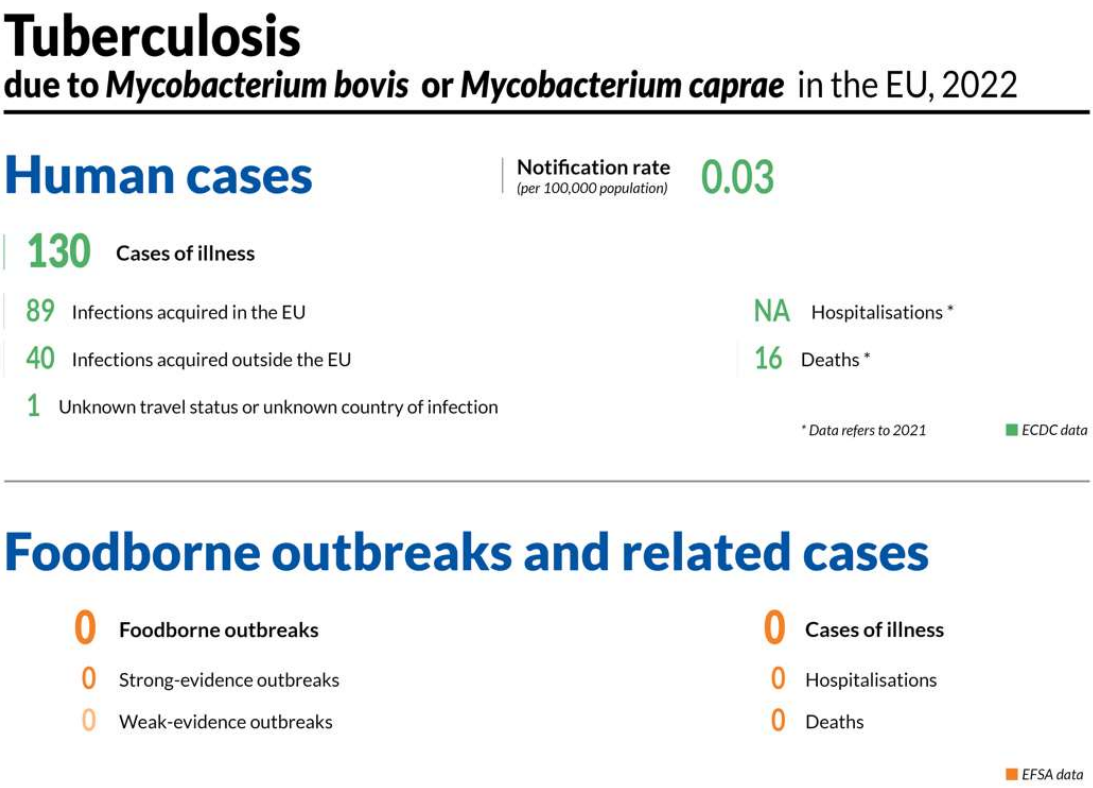
EFSA data

4.1. Key facts

- STEC infections were the fourth most reported gastrointestinal foodborne illnesses in humans in the EU.
- In 2022, there were 7,117 confirmed cases of human STEC infections, corresponding to an EU notification rate of 2.1 cases per 100,000 population. This was an increase of 8.8% compared with 2021 (1.9 cases per 100,000 population).
- The overall trend for STEC infections did not show any significant increase or decrease in the 2018–2022 period.
- Nine MSs tested 472 official control samples of 'sprouted seeds' in the context of Regulation (EC) No 2073/2005[14] taken at retail and processing plants, with no positive results.
- In 2022, 1.1% of 8,556 'ready-to-eat' food sampling units reported by 15 MSs were positive for STEC, with positive sampling units originating from 'milk and milk products' (1.7% positives), 'meat and meat products' (1.0%) and 'fruits, vegetables and juices' (0.14%). Of the 10,259 'non-ready-to-eat' sampling units reported by 18 MSs, 2.5% were positive, with the highest level of contamination (3.3%) in 'meat and meat products'. Overall, STEC were isolated from 347 sampling units, with 'fresh meat from sheep' and 'other fresh meat' showing the highest percentages of STEC-positive sampling units of 6.1% and 7.6%, respectively.
- In 2022, STEC were detected by four MSs in five different animal categories. Most of the units tested in the EU (N=1,916) were from 'goats and sheep' (N=1,300) and the proportion of positives was 1.3%. The proportions of positive sampling units from 'cattle', 'pigs', 'other ruminants' and 'other animals' were 41.5%, 0%, 6.7% and 0.81%, respectively.

[14] Commission Regulation (EC) No 2073/2005 of 15 November 2005 on microbiological criteria for foodstuffs

5. Infection with *Mycobacterium tuberculosis* complex (focusing on *Mycobacterium bovis* and *Mycobacterium caprae*)

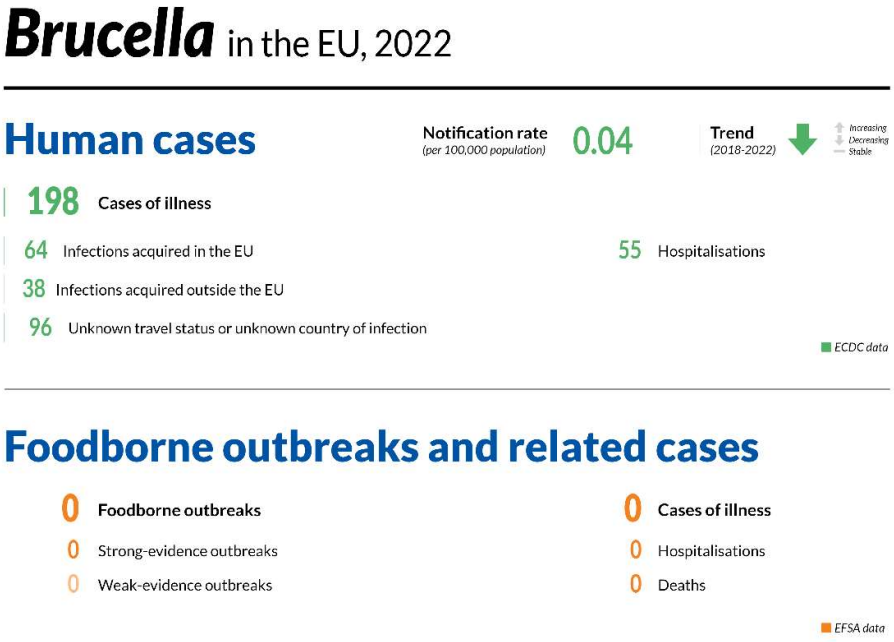


5.1. Key facts

- In 2022, there were 130 confirmed cases of human tuberculosis due to *Mycobacterium bovis* or *Mycobacterium caprae*, corresponding to an EU notification rate of 0.03 cases per 100,000 population. This resulted in a notification increase of 13.2% compared with 2021.
- Cases of human tuberculosis due to *M. bovis* or *M. caprae* in the EU progressively increased in both 2022 and 2021 following the drop observed in 2020, the first COVID-19 pandemic year. In 2022, the number of human cases among the 27 MSs exceeded the number of cases reported in 2019.
- In 2022, the *M. bovis* and *M. caprae* case notification rate was 0.03 cases per 100,000 among EU MSs with disease-free status and 0.04 per 100,000 in EU MSs with non-disease-free status for the bovine population.
- The majority of *M. bovis* and *M. caprae* cases in humans (68.5%) were of EU origin (native cases and/or cases originating from other MSs).
- In bovines, in 2022, the overall prevalence of tuberculosis (0.61%) due to *M. bovis* or *M. caprae* increased slightly compared with the previous year (0.54%), and the number of infected cattle herds in the EU increased from 9,384 to 9,845 herds.
- Similar to previous years, the distribution of positive herds was heterogeneous and spatially clustered, with a national herd-level prevalence ranging from <0.01% (Belgium, Poland) to 12.2% (the United Kingdom (Northern Ireland)).
- Seventeen MSs had disease-free status during 2022. Ten MSs and the United Kingdom (Northern Ireland) have an approved eradication programme, of which three MSs had disease-free status zones.
- Overall, 149 cattle herds (0.015%) proved infected with the *Mycobacterium tuberculosis* complex in disease-free status zones, confirming that infection occurs rarely in these zones.

- In the zones under an eradication programme within 10 MSs and the United Kingdom (Northern Ireland), 8,696 cattle herds (1.5% of total herds) were positive for the *M. tuberculosis* complex in 2022. The United Kingdom (Northern Ireland) (12.2%), Ireland (4.6%) and Spain (2.5% in zones under an eradication programme) were the only countries that reported a prevalence higher than 1%. No positive herds were reported by Malta or Cyprus.
- In the last 10 years (2013–2022), the annual number of positive cattle herds in under eradication programme zones has decreased by 46.3%. This decrease is mainly attributable to the withdrawal of the United Kingdom from the EU in 2020.

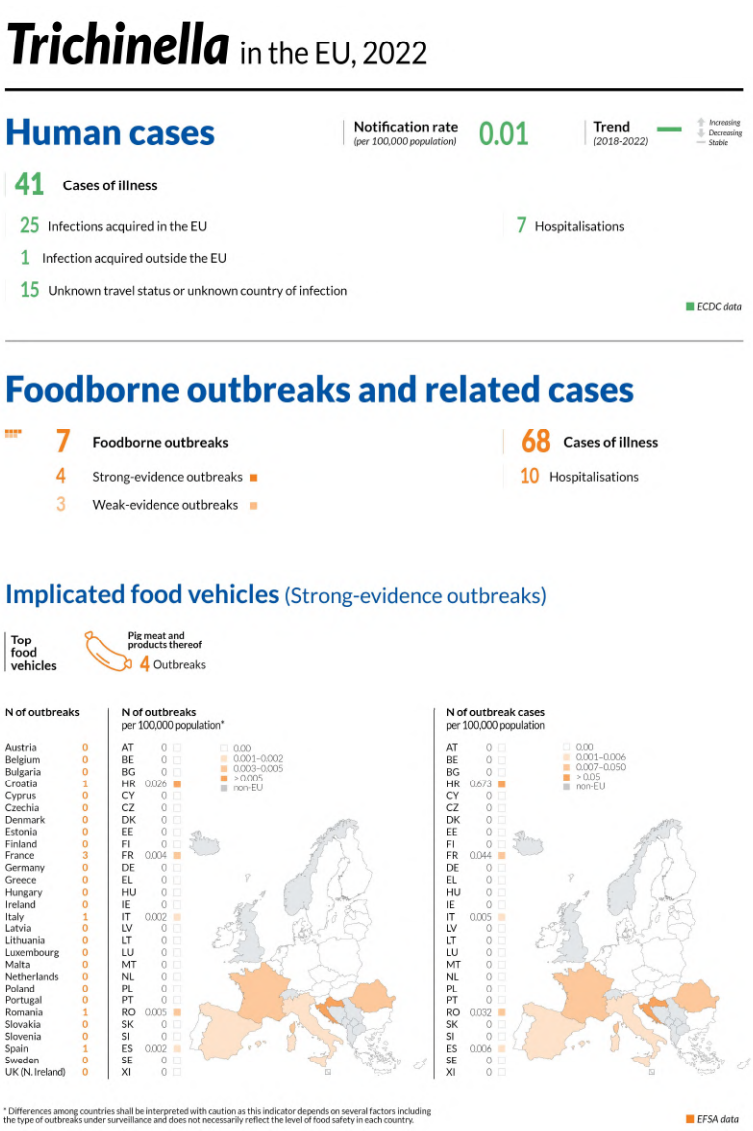
6. *Brucella*



6.1. Key facts

- In 2022, there were 198 confirmed cases of human brucellosis, corresponding to an EU notification rate of 0.04 cases per 100,000 population. This was an increase of 29.2% compared with 2021 (0.03 cases per 100,000 population).
- The overall trend for *Brucella* infections showed a significantly decreasing trend in 2018–2022.
- Four Member States (Germany, Greece, Italy and Portugal) had significantly decreasing 5-year trends from 2018 to 2022.
- *Brucella melitensis* was reported as the aetiological agent in 84 (94.4%) out of 89 human cases of brucellosis with information reported on the *Brucella* species.
- In total, 22 Member States and the United Kingdom (Northern Ireland) were disease-free for brucellosis in cattle, while five MSs (Bulgaria, Greece, Hungary, Italy, and Portugal) were non-disease-free (under an eradication programme). Overall, in the disease-free status zones of the EU, there were 13 positive herds in 2022, demonstrating a rare occurrence (prevalence < 0.001%). In the zones under an eradication programme, bovine brucellosis remained very low, with 411 positive herds (0.39%). The number of positive herds ranged between 603 (in 2020) and 411 (in 2022) during 2018–2022.
- In total, 20 Member States and the United Kingdom (Northern Ireland) were disease-free for brucellosis in sheep and goats, while seven Member States (Bulgaria, Croatia, overseas French regions, Greece, Italy, Malta and Portugal) were non-disease-free. Overall, in the disease-free status zones of the EU, there were only two infected herds in 2022, demonstrating a rare occurrence (< 0.01%). In zones under an eradication programme, brucellosis in sheep and goats remained very low, with 234 flocks reported to be infected (0.15%), which represents a decrease from 620 in 2018.
- Brucellosis is still an animal health concern with public health relevance in southern European countries that are not disease-free for brucellosis.

7. *Trichinella*



The number of cases and the notification rate include two cases reported erroneously by Finland.

7.1. Key facts

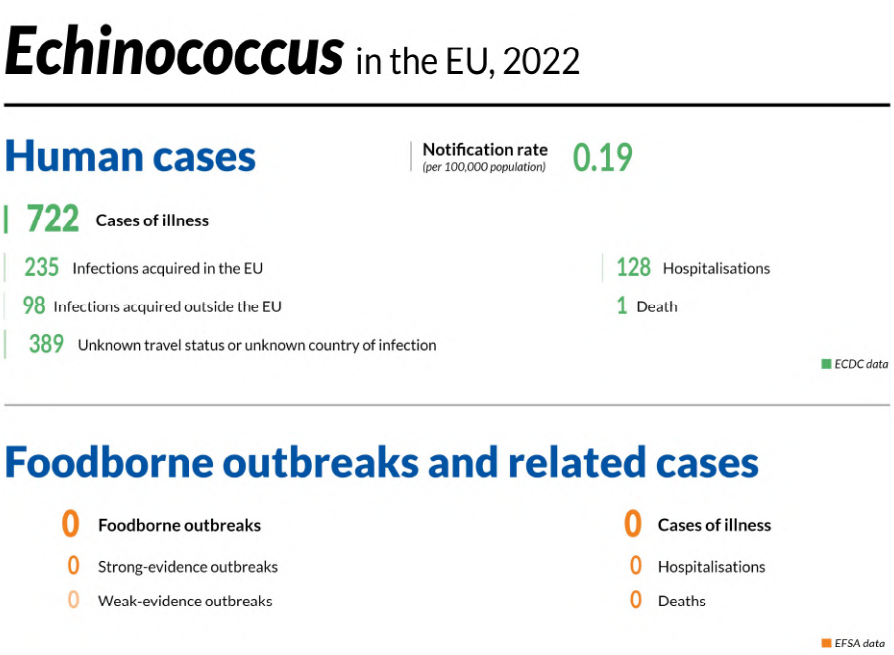
- In 2022, there were 41 confirmed cases of human trichinellosis, corresponding to an EU notification rate of 0.01 cases per 100,000 population[15] and a decrease of 51.9% compared with 2021 (0.02 cases per 100,000 population).
- The overall trend for trichinellosis did not show any significant increase or decrease in 2018–2022.
- In 2022, no infections with *Trichinella* were reported in tested fattening pigs (33.7 million) or breeding pigs (0.47 million) raised under controlled housing conditions, recognised by the competent authorities, confirming that farming conditions are a key factor in preventing infection with this zoonosis.

[15] The number of cases and the number of confirmed cases*100,000 include two cases reported erroneously by Finland.

- In other domestic pigs, 0.00004% (71 out of 175 million) were positive for *Trichinella*. Romania accounted for most of the positive pigs (59), followed by Croatia (eight[16]), Spain (two), Bulgaria (one), and Poland (one).
- No *Trichinella* infections were detected in domestic solipeds in the EU in 2022, as during 2018–2021.
- In 2022, the proportions of *Trichinella*-positive hunted wild boar and foxes (indicator animals) were 0.08% and 0.95%, respectively, compared with 0.07% and 1.6% in 2021, respectively.

[16] Croatia reported only positive results.

8. *Echinococcus*



8.1. Key facts

- In 2022, there were 722 confirmed cases of human echinococcosis, corresponding to an EU notification rate of 0.19 per 100,000 population and an increase of 13.8% compared with 2021 (0.17 per 100,000 population).
- The overall rate and number of reported echinococcosis cases reached similar levels to the 2018–2019 period, before the COVID-19 pandemic.
- In 2022*, Echinococcus granulosus sensu lato,* causing cystic echinococcosis, accounted for 62.4% of human cases reported with species information, while *Echinococcus multilocularis* causing alveolar echinococcosis accounted for 37.6% of cases.
- In 2022, *E. multilocularis* was detected by eight Member States (MSs) and one non-MS in six different animal categories. Most units that tested positive in the EU were from foxes (6,710), and the proportion of positives was 12.5%. Czechia, Germany, Poland and Slovenia reported the largest proportions of infected foxes among those tested, accounting for 20.5%, 21.6%, 39.4% and 22.7% of positive findings, respectively.
- In 2022, *Echinococcus granulosus sensu lato* was detected by 10 MSs and two non-MSs in 13 different animal categories. Most of the units tested in the EU were from sheep and goats (12,337,176), cattle (7,185,526) and pigs (58,254,973), and the proportion of positives was 0.81%, 0.32% and < 0.01%, respectively. Italy and Spain accounted for the majority of sheep and goats (50.7% and 41.9%), cattle (21.9% and 68.2%) and pigs (6.4% and 91.7%) that tested positive, respectively.
- Data from Finland, Ireland, Malta, the United Kingdom (Northern Ireland) and mainland Norway confirmed the free status of these countries for *E. multilocularis* in 2022 in accordance with Commission Delegated Regulation (EU) 2018/772.

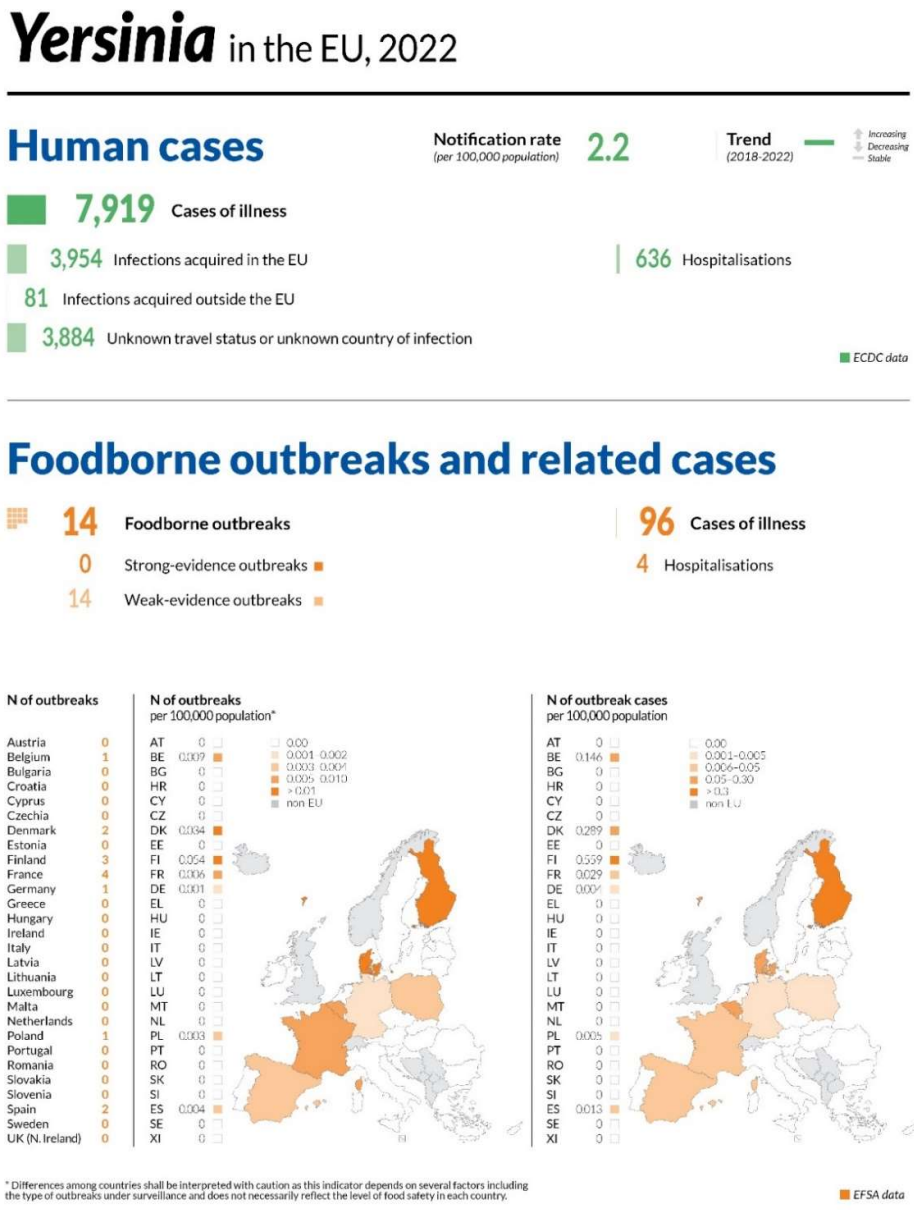
Foodborne outbreaks (according to Directive 2003/99/EC)

1. Key facts

- In 2022, 27 EU MSs and the United Kingdom (Northern Ireland) reported 5,763 foodborne outbreaks, 48,605 cases of illness, 2,783 hospitalisations and 64 deaths. A total of 108 foodborne outbreaks, 2,166 cases of illness, 186 hospitalisations and one death were reported by seven non-MSs.
- Foodborne outbreaks in the EU increased by 43.9% in 2022 compared with the previous year (4,005 in 2021). Human cases and hospitalisations also increased by 49.4% (32,543 cases in 2021) and 11.5% (2,495 hospitalisations in 2021), respectively. The number of deaths increased substantially by 106.5% compared with 2021 (31 deaths in 2021).
- In 2022, the foodborne outbreak reporting rate in the EU was 1.3 per 100,000 population. This represented an increase of 32.8% compared with the mean annual rate for the period 2018-2021 (0.97 outbreaks per 100.000 population). Similarly, the case reporting rate rose to 10.8 cases per 100,000 in 2022, an increase of 35.3% compared with the mean annual rate for the period 2018-2021 (8.0 cases per 100,000).
- The number of deaths observed in foodborne outbreaks in 2022 was one of the highest value ever reported to EFSA in the EU in the last ten years. Most deaths were caused by *Listeria monocytogenes* (N = 28; 43.8% of total deaths), confirming the severe health impact associated with *L. monocytogenes*, especially in vulnerable population groups such as the elderly. The highest case fatality ratio was observed for *Streptococcus equi* subsp. *zooepidemicus*, an emerging agent that in 2022 caused a single foodborne outbreak due to consumption of cheese made from unpasteurised milk, leading to 37 cases, of which five deaths.
- *Salmonella* was identified in most foodborne outbreaks in the EU (N = 1,014), making up 17.6% of total outbreaks. This pathogen was also associated with the highest number of hospitalisations (50.5% hospitalisations) and ranked second for the number of cases (13.6% of cases) and deaths (12.5% of deaths). *S.* Enteritidis was the predominant serovar (N = 395; 77.0% of all *Salmonella* outbreaks with serovar information available). *Salmonella* was also responsible for several multi-country outbreaks in 2022, including a major outbreak caused by monophasic *S.* Typhimurium, associated with the consumption of chocolate products. Five outbreaks (84 cases and 29 hospitalisations) were caused by *S.* Typhi.
- Norovirus (and other calicivirus) was the agent associated with the highest number of human cases, with an 11.6% increase (N = 7,305; 15.0% of outbreak-associated cases) compared with 2021. This causative agent caused 12 large outbreaks involving more than 100 cases in several MSs and was associated with a large mean outbreak size (22.0 cases).
- A total of 487 strong-evidence outbreaks were reported in 2022 (8.5% of all outbreaks). Among these, foodstuffs belonging to the group 'composite foods, multi-ingredient foods and other foods' were implicated in most outbreaks (29.4%) with an increase of 34.9% over 2021 (106 strong-evidence outbreaks in 2021), causing most cases (32.4% of all strong-evidence outbreak-related cases).
- In 2022, for the first time since the start of FBO data collection in the EU, most strong-evidence outbreaks and cases identified took place in the setting 'restaurants, pubs, street vendors, takeaway etc.' (147 outbreaks; 30.2% of all strong-evidence outbreaks). In particular, 'restaurant or cafe or pub or bar or hotel or catering service' were the most frequently reported places of exposure (134 strong-evidence outbreaks; 27.5%), a rise of 74.0% compared to 2021 (77 strong-evidence outbreaks).
- The number of strong-evidence outbreaks occurring on domestic premises also increased (145 outbreaks; 19.8% of all strong-evidence outbreaks) in 2022 in the EU, albeit to a lesser extent compared with 2021 (121 outbreaks; 34.0% of all strong-evidence outbreaks).
- 'School or kindergarten' were also places of exposure associated with a high number of cases (1,544 cases; 15.7% of all cases in strong-evidence outbreaks). These findings highlighted the importance of proper implementation of HACCP in public catering as well as the need to improve the awareness of both consumers and food business operators on correct procedures for handling and consuming food.

Zoonoses monitored according the epidemiological situation (Directive 2003/99 List B)

1. *Yersinia*



* Differences among countries shall be interpreted with caution as this indicator depends on several factors including the type of outbreaks under surveillance and does not necessarily reflect the level of food safety in each country.

1.1. Key facts

- Yersiniosis was the third most commonly reported foodborne gastrointestinal infection in humans in the EU.
- In 2022, there were 7,919 confirmed cases of human yersiniosis, corresponding to an EU notification rate of 2.2 cases per 100,000 population. This was an increase of 16.3% compared with 2021 (1.8 per 100,000 population).
- The overall trend for *Yersinia* infection did not show a statistically significant increase or decrease in the 2018–2022 period.
- In 2022, *Yersinia enterocolitica* was the species reported in the majority (98.7%) of human cases, while *Yersinia pseudotuberculosis* was notified in only 1.3% of human cases for which the information on *Yersinia* species was available.
- In 2022, none of 328 'ready-to-eat' food sampling units reported by four MSs were positive for *Yersinia*. Of 404 'non-ready-to-eat' sampling units reported by three MSs, 3.5% were positive, with the highest level of contamination (3.5%) in 'meat and meat products'. *Yersinia* was isolated from some fresh meat categories, with meat from pigs showing the highest percentage of *Yersinia*-positive sampling units, 7.8%.
- In 2022, *Yersinia* were detected by five MSs and one non-MSs in more than eight different animal categories, which overall include more than 30 animal species. The majority of the units tested in the EU (N = 15,764) were from cattle and the proportion of positives was 0.34% for *Yersinia enterocolitica* and 0.32% for *Yersinia pseudotuberculosis*. The proportions of positive sampling units from small ruminants, pigs and 'Pet animals' were 0.50%, 0.20%, and 0.10%, respectively for *Y. enterocolitica* and 0.29%, 0.00%, and 0.31%, respectively for *Y. pseudotuberculosis*.

2. *Toxoplasma gondii*

2.1. Key facts

- This chapter shows the human congenital toxoplasmosis data for 2021 due to two-year delayed reporting of data from France. As in previous years, France accounted the majority (78.0%) of reported cases of congenital toxoplasmosis in the EU due to its active screening of pregnant women.
- In 2021, there were 150 confirmed cases of human toxoplasmosis in the EU, corresponding to an EU notification rate of 5.6 cases per 100,000 live births and an increase of 10.0% compared with 2020 (5.1 cases per 100,000 live births).
- Reporting in 2020 and 2021 were partly impacted by the COVID-19 pandemic and the withdrawal of the United Kingdom from the EU.
- Overall, the number of human cases of congenital toxoplasmosis in the EU (without the United Kingdom) showed a decrease, although with periodic fluctuations, in the period 2017–2021, mainly mirroring the number of cases reported by a single MS (France).
- In total, 13 MSs and three non-MSs reported 2022 monitoring data on *Toxoplasma gondii* infections in animals and food. Most animals tested were sheep and goats, which also showed the highest overall prevalence of *T. gondii* infections in animals (29.0%), as reported by 12 MSs. Most samples with information provided on the sampling context were obtained from clinical investigations. It is impossible to accurately estimate the prevalence of *T. gondii* infections in animals due to different diagnostic methods, sampling schemes in MSs, and lack of information on the animals' ages and rearing conditions.

3. Rabies

3.1. Key facts

- In 2022, EU MSs reported no human lyssavirus infections, as in 2021 and in 2020. Human lyssavirus infections were reported in 2019 and 2018, over the past 5 years (2018-2022).
- Travel-associated human rabies cases occurred occasionally in Europe, as reported in recent years. In 2019, four cases were reported from EU countries, including three travel-related cases and one EU-acquired non-rabies lyssavirus infection caused by European bat lyssavirus 1, while in 2018, one travel-related case was reported from the UK.
- In animals excluding bats, a total of 71 cases of rabies of autochthonous origin were reported by four MSs: 36 cases in Poland (32 foxes, one badger, two dogs and one cat), 28 cases in Romania (15 cows, seven foxes and six dogs), four cases in Hungary (three foxes and one dog) and three cases in Slovakia (one fox, one badger and one dog). Hungary and Slovakia, countries that had not recorded any cases in five and seven years, respectively, reported cases in 2022. The total number of reported indigenous rabies cases in non-flying animals in the EU decreased in 2022 compared with 2021 (118 cases), but was higher than in 2020 (12 cases) and 2019 (5 cases).
- Surveillance data on lyssavirus in bats were reported by 16 EU MSs. Five MSs (France, Germany, the Netherlands, Poland and Spain) reported 26 positive results for lyssavirus, mainly European bat 1 lyssavirus. One non-MS country (Switzerland) reported a positive result in a bat for European bat 2 lyssavirus.
- A case of rabies was reported by France in an illegally imported dog infected with a rabies virus (RABV) strain.

4. Q fever

4.1. Key facts

- In 2022, there were 719 confirmed cases of human Q fever, corresponding to an EU notification rate of 0.17 cases per 100,000 population. This was an increase of 56.5% compared with 2021 (0.11 cases per 100,000 population).
- The overall trend for human *Coxiella burnetii* infections did not show any significant increase or decrease in the 2018–2022 period.
- In animals, cattle and small ruminants were mostly sampled during clinical investigations and passive monitoring of animals suspected to be infected with *C. burnetii*. However, in the absence of harmonised reporting data in animals in the EU, the data reported to EFSA cannot be used to analyse spatial representativeness and trends over the years for Q fever in the EU or to compare differences among reporting countries.
- In total, 18 MSs (17 in 2021) and five non-MSs (five in 2021) reported 2022 data for *C. burnetii* in animals. Among the animals tested using direct detection methods (N=2,973), the proportion of positive animals was 3.6% for sheep, 2.1% for goats and 2.7% for cattle. Among the herds tested using direct detection methods (N=7,935), the proportion of positive herds was 4.9% for sheep, 3.5% for goats and 7.7% for cattle. The proportion of seropositive animals was 11.4% for sheep, 17.9% for goats and 2.8% for cattle among the 7,697 animals tested in total. The proportion of seropositive herds was 97.7% for sheep and 30.1% for cattle among the 241 herds tested in total, whereas no serological tests were reported for goat herds.
- Among the other farmed, domestic or wild animals tested (N=396 animals, N=7 herds and N=6 reporting countries), positivity was reported only in Italy, in birds (13.8%; N=29), dogs (4.0%; N=25), water buffalos (1.8%; N=226) and pigs (N=1 herd).

5. West Nile virus

5.1. Key facts

- In 2022, there were 1,133 confirmed and probable cases of human West Nile virus (WNV) infection, corresponding to an EU notification rate of 0.26 cases per 100,000 population. This represented an increase of 631.8% in locally acquired cases, compared with 2021.
- During the past 5 years, two unusually intense transmission seasons were documented in 2018 and 2022, but the overall trend for human WNV infections showed no significant increase or decrease during the 2018–2022 period.
- In 2022, 431 birds and 166 equines tested positive for WNV, as reported to EFSA. This represent an increase of 195.2% and 245.8% respectively compared with 2021. WNV extended its geographical area, affecting birds and equines, and emerged during 2022 on the Atlantic coast in France. Its incidence increased in the North of Germany and in the South of Italy. In 2022, 364 outbreaks in animals were reported to ADIS by nine MSs, with the number of avian outbreaks (263) reported for 2022 being the highest since 2018. Italy, Germany, Spain, Austria and Hungary all reported outbreaks in birds to ADIS, with Italy and Germany reporting the highest numbers (76.1% and 19.4% respectively). .
- Nine MSs reported outbreaks in equids to ADIS, with the highest proportion in Italy, Germany, and Greece, accounting for 46.5%, 15.8%, and 8.9% of the total number of outbreaks respectively.

6. Tularaemia

6.1. Key facts

- In 2022, there were 620 confirmed cases of human tularaemia, corresponding to an EU notification rate of 0.14 cases per 100,000 population. This was a decrease of 29.5% compared with the rate in 2021 (0.20 per 100,000 population).
- The overall trend for human *Francisella tularensis* infections did not show any significant increase or decrease in the 2018–2022 period.
- In 2022, *F. tularensis* was detected by three MSs in five different animal categories. The majority of sampled animals in the EU (N=363) were hares with 9.9% positive samples. Other results from animals in the EU were reported from monkeys, dogs, squirrels, moles, rabbits, other rodents, and hares, with extremely small sample sizes, and a few samples were found to be positive.

7. Other zoonoses and zoonotic agents

In 2022, data on *Bacillus*, *Chlamydia*, *Clostridium*, *Cronobacter, Klebsiella*, non-pathogenic *Enterococcus*, non-pathogenic *Escherichia coli*, *Proteus*, *Staphylococcus*, *Streptococcus, Vibrio,* caliciviruses, flaviviruses other than West Nile virus, hepatitis virus, *Cysticercus*, *Leptospira* and *Sarcocystis* were reported to EFSA.

7.1. *Bacillus* spp.

Greece and Luxembourg submitted data on *Bacillus cereus* in various foods collected at hospitals or medical care facilities, schools or kindergartens, canteens or workplace catering establishments, retail, mobile food retailers, collective catering establishments (restaurant or cafe or pub or bar, or hotel or catering service) and manufacturing plants. Out of 3,415 single samples, only 95 (2.8%) were reported positive. The positive food categories were primarily 'other processed food products and prepared dishes', 'vegetable-based sauces', 'mushroom-cooked sauces' and 'ready-to-eat salads'.

Greece reported three *B. anthracis*-positive bovine animals, as well as two goats and one sheep also positive for *B. anthracis* (75%) out of a total of eight samples collected at the farm level during clinical investigations. Greece moreover reported data on *Bacillus* spp. from buffalos, sheep and wild boars, finding no positives out of 13 collected samples.

7.2. Caliciviruses (including norovirus)

Five MSs (Bulgaria, Croatia, France, Portugal and Romania) reported data on caliciviruses for a total of eight batches and 133 single samples. No positive samples were found.

7.3. *Chlamydia* spp.

Two MSs (Austria and Denmark) and one non-MS (Republic of North Macedonia) reported data on *Chlamydia* spp. in various animal species. Austria reported 95 (8.3%) positives out of 1,143 samples, Denmark reported 16 (25.4%) positives out of 63 samples and Republic of North Macedonia reported 35 (54.7%) positives out of 64 samples.

7.4. *Clostridium* spp.

Romania and one non-MS (Republic of North Macedonia) provided data on *Clostridium* spp. in foods for a total of 80 tested samples. No positive samples were detected.

Greece and one non-MS (Republic of North Macedonia) reported data on *Clostridium* spp. from various ruminant species for a total of 64 samples collected during clinical investigations. Greece detected 31 (56.4%) positives out of 55 animal samples, and Republic of North Macedonia detected 3 (33.3%) positives out of 9 samples.

7.5. Hepatitis virus

Three MSs (Bulgaria, France and Romania) provided data on hepatitis virus in pre-cut and non-pre-cut fruits and leaf vegetables collected at the primary production, manufacturing and distribution (wholesale and retail) levels. Five (5.6%) out of 90 tested samples were positive.

7.6. *Proteus* spp.

Greece tested for the presence of *Proteus* spp. 161 samples of milk collected from dairy cows, goats and sheep during clinical investigations, obtaining 22 (13.7%) positives.

7.7. *Staphylococcus* spp. and staphylococcal enterotoxins

Five MSs (Croatia, Germany, Greece, Italy and Spain) provided data on *Staphylococcus* spp. (reported as *Staphylococcus*, *Staphylococcus* spp. unspecified, *S. aureus* or *S. intermedius*) in various food matrices (N = 7,494) and animals (N = 13,832). Overall, 8.3% of foods and 12.6% of animals

were reported positive. 'Other processed food products and prepared dishes', 'meat products – ready-to-eat', and 'cheeses soft and semi-soft' were the food categories with the highest numbers of positive results.

7.8. *Cysticercus* spp.

Eight MSs (Belgium, Finland, Luxembourg, Malta, Slovakia, Slovenia, Spain and Sweden) submitted data on *Cysticercus* spp. in various animal species. Belgium collected 758,282 bovine carcases from slaughterhouses and found 700 (0.09%) positive samples. None of the 2,127,700 carcases from bovine animals, pigs or farmed wild boars collected by Finland were positive. Luxembourg detected 63 (0.24%) positive bovine carcases out of 26,483 collected samples. None of the 62,922 bovine, pig, sheep or goat carcases collected by Malta were positive. Slovakia detected no positive bovine carcases out of 32,083, a single positive pig carcase out of 585,890 and 228 (4.8%) positive sheep carcases out of 4,782 samples collected at slaughterhouses. Slovenia provided results on 23 bovine carcases collected at slaughterhouses, detecting 1 (4.3%) positive sample. Spain provided data on *Cysticercus* spp. in various animal species: 89 (<0.01%) out of 2,586,042 bovine animals, 163,913 (2.49%) out of 6,586,572 sheep, 17,790 (2.04%) out of 871,084 goats, 2,630 (0.01%) out of 40,115,220 pigs, 20 (0.52%) out of 3,874 domestic solipeds, 76 (0.06%) of 129,614 hunted wild boars, 5 (<0.01%) out of 141,570 deer and 2 (0.02%) out of 8,378 mouflons were positive. Sweden detected no positive samples out of 412,090 bovine and 2,672,400 pig carcases collected at slaughterhouses.

7.9. *Leishmania*

Greece and one non-MS (Republic of North Macedonia) provided data on *Leishmania* collected on 6,241 blood samples from dogs, detecting 598 (9.6%) positive samples.

7.10. *Sarcocystis* spp.

Belgium reported data from 758,282 bovine animals collected at the slaughterhouse, finding 97 (0.01%) positive samples for *Sarcocystis* spp.

7.11. Other

Bulgaria provided data on non-pathogenic *Enterococcus* spp. collected from drinking water during quality control monitoring at production plants. None tested positive out of the 240 tested samples.

Five MSs (Bulgaria, Greece, Luxembourg, Malta, and Latvia) and two non-MSs (Iceland and Republic of North Macedonia) provided data on *Escherichia coli* and non-pathogenic *E. coli* in various food matrices and animals. Ten (0.75%) out of 1,340 food samples and 393 (77.8%) out of 505 animal samples tested positive.

Six MSs (Cyprus, Denmark, Italy, the Netherlands, Romania and Slovakia) and two non-MSs (Serbia and Switzerland) reported data to verify the presence of flaviviruses other than West Nile virus in various animal species. Cyprus detected 26 (21.3%) positives out of 122 domestic solipeds and 15 (3.2%) positives out of 472 birds. No positive samples were found by Denmark, which collected 91 samples from poultry. Italy tested 166 wild birds and five domestic solipeds with no positives. The Netherlands found a single positive out of 15,497 wild birds tested. Romania obtained 35 (66.0%) positives out of 53 poultry samples tested. Slovakia found no positives out of 52 horses tested. Among non-MSs, Serbia found 140 (8.0%) positives out of 1,740 bovine animals tested and Switzerland obtained no positives out of 18 domestic solipeds.

Greece reported data on *Klebsiella* spp. in milk collected from various ruminants (dairy cows, goats, sheep), obtaining 2 (1.2%) positives out of 163 tested samples.

Greece provided data on *Streptococcus* spp. in milk collected from cattle and small ruminants, obtaining 43 (22.9%) positives out of 188 tested samples.

The Netherlands tested 185 single samples and 327 batches of raw fish and crustaceans – shrimp, collected at border control posts to verify the presence of *Vibrio* spp. *Vibrio cholerae* was detected in 11 batches, and *V. parahaemolyticus* was detected 18 single samples and in 1 batch, for a total of 30 (5.9%) positives.

Two MSs (Bulgaria and Slovenia) provided data on *Leptospira* in various animal species. Bulgaria detected no positives out of 7,263 tested samples, and Slovenia detected 7 (7.3%) positives out of 96 tested samples.

Microbiological contaminants subject to food safety criteria (Regulation (EC) No 2073/200517)

This chapter summarises the 2022 information and data provided by reporting countries on microbiological contaminants in food for which food safety criteria (FSC) have been set down in EU legislation (Regulation (EC) No 2073/2005): histamine, staphylococcal enterotoxins and *Cronobacter sakazakii*. Requirements from the Official Controls Regulation (EU) 2017/625[18] (OCR) have been implemented for the first time. In contrast with previous legislation, competent authorities (CAs) must use methods complying with relevant internationally recognised rules or protocols, including those accepted by the European Committee for Standardization (CEN). This condition is met by the use of EN ISO methods, which are ISO methods recognised by CEN. Consequently, and unlike in previous legislation, CAs cannot use the alternative methods mentioned in Commission Regulation (EC) No 2073/2005 when they carry out official controls to verify the correct implementation of the provisions of this Regulation by food business operators (FBOs). The implementation of this change in legislative testing requirements may have impacted the results of 2022 official food control samples taken as part of Commission Regulation (EC) No 2073/2005, compared with the results of similar samples in 2021 and before, when OCR requirements were not yet implemented by EFSA in collecting zoonosis data. For this reason, the above-mentioned results should be interpreted with caution.

1. Histamine

1.1. Histamine data in the context of Regulation (EC) No 2073/2005

Histamine is a thermostable biogenic amine occurring naturally in the human body, and which is involved in key human physiological functions. However, its ingestion at high concentrations through food is associated with the onset of health disorders such as scombroid poisoning.

Regulation (EC) No 2073/2005 on microbiological criteria for foodstuffs defines FSC for histamine in food in three categories at the retail level: 'fishery products from fish species associated with a high amount of histidine' (food category 1.26), 'fishery products which have undergone enzyme maturation treatment in brine, manufactured from fish species associated with a high amount of histidine' (food category 1.27) and 'fish sauce produced by fermentation of fishery products' (food category 1.27a). Information was also obtained at manufacturing level, indicating the correct application of GMP (good manufacturing practices) and the proper maintenance of the cold chain, which is essential to avoid the development or increase of histamine in fish and fish products.

Histamine data were reported by 12 MSs (Bulgaria, Czechia, Denmark, Estonia, France, Germany, Italy, Luxembourg, Romania, Slovakia, Slovenia and Spain).

In official control samples (N = 6,061) for histamine in food category **1.26** at the *distribution level* (wholesale establishments, retail establishments, border control posts, catering and restaurants), 0.3% had a histamine content higher than 200 mg/kg, 0.2% a histamine content of between 100 and 200 mg/kg, 17.6% a histamine content above the limit of detection, but less than or equal to 100 mg/kg. Of the total number of samples, 52% were of EU origin (Denmark, Estonia, European Union, Italy, Latvia, Romania, Spain) and 18% of non-EU origin (Colombia, El Salvador, Ghana, Greenland, Maldives, Mauritius, Philippines, Seychelles, Thailand, Türkiye, United Kingdom, Vietnam, non-EU countries), while for 30%, no information was available. Of the total number of samples, 21% came from canned fish and 4% from raw fish, while for 75% no information was provided.

At the manufacturing level (processing plants), 609 official control sampling units were collected and the results were as follows: 0.7% had a histamine content higher than 200 mg/kg, and 3.8% a histamine content higher than the limit of detection, but less than or equal to 100 mg/kg. Of the total number of samples, 97% were of EU origin (Italy, Slovakia), while 3% were of non-EU origin. Of the total number of control samples, 8% came from canned fish and 24% from raw fish, while for 68% no information was reported.

[17] Commission Regulation (EC) No 2073/2005 of 15 November 2005 on microbiological criteria for foodstuffs

[18] Regulation (EU) 2017/625 of the European Parliament and of the Council of 15 March 2017 on official controls and other official activities performed to ensure the application of food and feed law, rules on animal health and welfare, plant health and plant protection products

For food category **1.27**, 1,227 and 11 official control samples were collected at the distribution and manufacturing levels, respectively. At the *distribution* level, 15.8% of samples had a histamine concentration less than or equal to 200 mg/kg, 0.2% a histamine content between 200 and 400 mg/kg and 0.7% a histamine content higher than 400 mg/kg. Of the total number of samples, 51% were of EU origin (Denmark, Italy Romania, EU countries) and 10% of non-EU origin, while for 39% no information was available. A total 25% of the control samples came from canned fish.

At the *manufacturing level*, all samples taken (N = 11) were negative and were of EU origin (Italy).

For food category **1.27a** *at the distribution level*, ten official control samples were reported: 80% of samples had a histamine content less than or equal to 400 mg/kg but above the limit of detection, and none had a histamine content above 400 mg/kg. Of the total number of control samples, 10% were of EU origin (Italy).

1.2. Other surveillance data for histamine

MSs also collected and analysed fishery products for surveillance purposes, outside the context of Regulation (EC) 2073/2005 on microbiological criteria for foodstuffs.

A total of 1,930 samples and 306 batches were collected as part of the Surveillance activity; data were reported by 11 MSs (Belgium, Croatia, Estonia, Germany, Greece, Italy, Latvia, Portugal, Romania, Slovakia and Spain) and two non-MSs (Serbia and Iceland).

A total of 809 single samples and 108 batches at the *distribution level*, and 1,121 sampling units and 198 batches at the *manufacturing level* were collected, respectively.

At the distribution level, 76%, 23% and 1% of the collected sampling units (N = 809) were classified in categories 1.26, 1.27 and 1.27a, respectively. Ten per cent of the samples falling into category 1.26 had a histamine content higher than 200 mg/kg and 20% of the samples in category 1.27a had a histamine concentration higher than 400 mg/kg.

A total 55%, 26%, 11% and 8% of sampling units were taken from retail, border control posts, wholesale and catering, respectively. Of the total number of sampling units, 46% were of EU origin (Estonia, Germany, Italy, Latvia, Spain, EU countries), and 26% of non-EU origin (Cape Verde, China, Ecuador, Mauritius, Morocco, Mozambique, Sri Lanka, Thailand), while for 28% no information was available.

All the batches (N = 108) taken at Border Control Posts were classified in categories 1.26. All batches were negative and were of non-EU origin (Ecuador, Morocco, Philippines, the United Kingdom, Thailand, Türkiye).

At the manufacturing level, all sampling units (N = 1,121) were taken at processing plants; 87% and 13% of the samples were classified in categories 1.26 and 1.27, respectively. Just 0.4% of the samples falling into category 1.26 had a histamine content higher than 200 mg/kg.

Of the total sampling units, 82% were of EU origin (Estonia, Italy, Latvia, Portugal, Romania, Sweden, EU countries) and 10.5% of non-EU origin (Iceland, non-EU countries), while for 7.5%, no information was available.

All the batches (N=198) taken at processing plants were classified in category 1.26 and were of EU origin (Greece). Of the total number of batches, 59% had a histamine content higher than the limit of detection, but less than or equal to 100 mg/kg.

2. Staphylococcal enterotoxins

2.1. Staphylococcal enterotoxins data in the context of Regulation (EC) No 2073/2005

Data on staphylococcal enterotoxins were reported by four MSs (Bulgaria, Italy, Slovakia and Spain). At the *distribution level*, a total of 2,294 official control samples were tested with seven (0.3%) positives, detected by Italy (N = 5) and Spain (N = 2). 'Cheeses made from cows' milk, unspecified' collected at the retail level and 'cheeses made from cows' milk - soft and semi-soft' collected at the wholesale level were the positive food categories. None of the total 870 official control samples collected by Italy, Slovakia and Romania at the *manufacturing level* were positive.

2.2. Other surveillance data for Staphylococcal enterotoxins

Ten MSs (Bulgaria, Cyprus, Czechia, Germany, Greece, Italy, Portugal, Romania, Slovakia and Spain) reported data on staphylococcal enterotoxins collected in contexts other than those stipulated in Regulation (EC) No 2073/2005. Twenty-seven (0.42%) out of 6,437 tested samples were positive. 'Other processed food products and prepared dishes' and 'cheeses made from cows' milk – soft and semi-soft', mainly collected at the distribution and manufacturing levels, were the food categories found positive for staphylococcal enterotoxins.

3. *Cronobacter sakazakii*

3.1. *Cronobacter sakazakii* data in the context of Regulation (EC) No 2073/2005

The results of 714 official control samples concerning *Cronobacter sakazakii* in 'infant formulae' and 'foodstuffs intended for special nutritional uses – dried dietary foods for special medical purposes intended for infants below six months' collected at the *distribution level* (retail and wholesale) were reported by five MSs (Cyprus, Hungary, Slovenia, Slovakia and Spain). Two positives (0.3%) were detected by Slovakia in dried infant formulae, out of 452 collected samples.

Estonia and Spain collected official control samples from food at processing plants, obtaining no positives out of 126 tested samples.

3.2. Other surveillance data for *Cronobacter sakazakii*

Eleven MSs reported data on *Cronobacter* spp. collected in contexts other than those stipulated in Regulation (EC) No 2073/2005. 'Infant formulae', 'foodstuffs intended for special nutritional uses' and 'dairy products, excluding cheeses' were collected at the retail, processing plant and wholesale levels or at hospital or medical care facilities for surveillance or monitoring purposes. A total of 600 single samples and 190 batches were collected. Ten single samples (1.7%) and three batches (1.6%) tested positive.