EUROPEAN MEDICINES AGENCY
SCIENCE MEDICINES HEALTH

Sales of veterinary antimicrobial agents in 31 European countries in 2019 and 2020

Trends from 2010 to 2020

Eleventh ESVAC report

An agency of the European Union

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Mission statement

The mission of the European Medicines Agency is to foster scientific excellence in the evaluation and supervision of medicines, for the benefit of public and animal health.

Legal role

The European Medicines Agency (hereinafter 'the Agency' or EMA) is the European Union (EU) body responsible for coordinating the existing scientific resources put at its disposal by Member States for the evaluation, supervision and pharmacovigilance of medicinal products.

The Agency provides the Member States and the institutions of the EU and the European Economic Area (EEA) countries with the best possible scientific advice on any questions relating to the evaluation of the quality, safety and efficacy of medicinal products for human or veterinary use referred to it in accordance with the provisions of EU legislation relating to medicinal products.

The founding legislation of the Agency is Regulation (EC) No 726/2004 of the European Parliament and the Council of 31 March 2004 laying down Community procedures for the authorisation and supervision of medicinal products for human and veterinary use and establishing a European Medicines Agency[1].

Principal activities

Working with the Member States and the European Commission as partners in a European medicines network, the Agency:

- provides independent, science-based recommendations on the quality, safety and efficacy of medicines, and on more general issues relevant to public and animal health that involve medicines;
- applies efficient and transparent evaluation procedures to help bring new medicines to the market by means of a single, EU-wide marketing authorisation granted by the European Commission;
- implements measures for continuously supervising the quality, safety and efficacy of authorised medicines to ensure that their benefits outweigh their risks;
- provides scientific advice and incentives to stimulate the development and improve the availability of innovative new medicines;
- recommends safe limits for residues of veterinary medicines used in food-producing animals to support the establishment of maximum residue limits by the European Commission;
- involves representatives of patients, healthcare professionals and other stakeholders in its work to facilitate dialogue on issues of common interest;
- publishes impartial and comprehensible information about medicines and their use;
- develops best practice for medicine evaluation and supervision in Europe and contributes alongside the Member States and the European Commission to the harmonisation of regulatory standards at the international level.

Guiding principles

- We are strongly committed to public and animal health.
- We make independent recommendations based on scientific evidence, using state-of-the-art knowledge and expertise in our field.
- We support research and innovation to stimulate the development of better medicines.
- We value the contribution of our partners and stakeholders to our work.
- We ensure continual improvement of our processes and procedures, in accordance with recognised quality standards.
- We adhere to high standards of professional and personal integrity.
- We communicate in an open, transparent manner with all of our partners, stakeholders and colleagues.
- We promote the well-being, motivation and ongoing professional development of every member of the Agency.

[1] OJ L 136, 30.4.2004, p. 1

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About the European Medicines Agency

The European Medicines Agency (EMA) is a decentralised body of the EU, located in Amsterdam. Its main responsibility is the protection and promotion of public and animal health through the evaluation and supervision of medicines for human and veterinary use.

The Agency is responsible for the scientific evaluation of applications for European marketing authorisations for both human and veterinary medicines (centralised procedure). Under the centralised procedure, companies submit a single marketing authorisation application to the Agency. Once granted by the European Commission (EC), a centralised marketing authorisation is valid in all EU Member States and, after implementation at national level, in the EEA-EFTA states (Iceland, Liechtenstein and Norway).

The Agency, with the help of its Committee for Medicinal Products for Veterinary Use (CVMP), and its Antimicrobials Working Party (AWP), has produced a strong body of scientific advice[2] in relation to the use of antimicrobials and the risk of antimicrobial resistance (AMR), with the intention of promoting the continued availability of effective antimicrobials for use in animals while, at the same time, acting to minimise risks to animals or humans arising from their use.

The European Surveillance of Veterinary Antimicrobial Consumption (ESVAC) project was launched by the Agency in September 2009, following a request from the EC to develop a harmonised approach to the collection and reporting of data on the use of antimicrobial agents in animals from the Member States.

About the report

The eleventh ESVAC report presents data on the sales of veterinary antimicrobial agents from 31 European countries in 2019 and 2020, provided at package level in accordance with a data reporting protocol and data collection form updated in March 2021[3]. In addition, it includes a chapter describing changes in consumption of veterinary antimicrobials for the years 2010-2020 (Chapter 2.8).

Information on country-specific changes in sales over the years is published separately on the EMA website[4].

The report emphasises certain classes or subclasses of antimicrobials included in Category B of the categorisation made by the EMA Antimicrobial Advice Ad Hoc Expert Group (AMEG) in 2019 (see selection criteria in Annex 6). The AMEG categories take account of the World Health Organization (WHO) categorisation of antimicrobials[5], the need for the respective antimicrobials in veterinary medicine and the probability of transfer of antimicrobial resistance from animals to humans. The AMEG classification is published on the EMA website[6].

Category B of the AMEG categorisation includes those veterinary antimicrobials from which the risk to public health is estimated to be higher than from other classes of antimicrobials; fluoroquinolones, other quinolones, 3rd- and 4th-generation cephalosporins and polymyxins are included in this category. Macrolides are included in Category C of the AMEG categorisation[7].

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[2] Available from the European Medicines Agency website (www.ema.europa.eu) via Home > Veterinary regulatory > Overview > Antimicrobial resistance

[3] Available from the European Medicines Agency website (www.ema.europa.eu) via Home > Veterinary regulatory > Overview > Antimicrobial resistance > European Surveillance of Veterinary Antimicrobial Consumption (ESVAC) > Sales data reporting form and protocol

[4] Available from the European Medicines Agency website (www.ema.europa.eu) via Home > Veterinary regulatory > Overview > Antimicrobial resistance > European Surveillance of Veterinary Antimicrobial Consumption (ESVAC) > Trends by country

[5] WHO Critically Important Antimicrobials for Human Medicine. 6th revision (https://www.who.int/publications/i/item/9789241515528)

[6] EMA/AMEG 2019. Categorisation of antibiotics in the European Union. Answer to the request from the European Commission for updating the scientific advice on the impact on public health and animal health of the use of antibiotics in animals (https://www.ema.europa.eu/en/documents/report/categorisation-antibiotics-european-union-answer-request-european-commission-updating-scientific_en.pdf)

[7] Although macrolides are not included in Category B, the CVMP has made recommendations indicating that, among other things, their responsible use should be strongly promoted, and that, while acknowledging that macrolides are a first-line treatment against a number of animal diseases, there is a need to avoid unnecessary use.

In 2021, the European Centre for Disease Prevention and Control (ECDC), the European Food Safety Authority (EFSA) and EMA published the third joint report on the integrated analysis of the consumption of antimicrobial agents and occurrence of AMR in bacteria from humans and food-producing animals (JIACRA III report)[8]. During the time frame covered in this report (2016–2018), when assessed per kg biomass, overall antimicrobial consumption was, for the first time, lower in food-producing animals than in humans. Whilst recognising the complexity of evaluating the association between the sales of antimicrobials and occurrence of AMR in animals and humans, the findings of the report suggest that further interventions to reduce antimicrobial consumption will have a beneficial impact on the occurrence of AMR, which underlines the need to promote prudent use of antimicrobial agents and infection control and prevention in both humans and food-producing animals.

ECDC, EFSA and EMA have also jointly established a list of harmonised outcome indicators[9] to assist EU Member States in assessing their progress in reducing the use of antimicrobials and occurrence of AMR in both humans and food-producing animals. For food-producing animals, the proposed indicators for antimicrobial consumption are: overall sales of veterinary antimicrobials; sales of 3rd- and 4th-generation cephalosporins; sales of quinolones (specifying the proportion of fluoroquinolones); and sales of polymyxins, measured in mg/PCU.

This eleventh ESVAC report places the emphasis on food-producing animals.

The data and information included in this report have been reviewed and approved by the ESVAC National Contact Points or their alternates.

Advice on how to read this report:

It is generally agreed that it usually takes at least three to four years to establish a valid baseline for the data on sales of veterinary antimicrobial agents. Consequently, for each country, data from the first few years of collection should be interpreted with due caution.

It should be emphasised that the data presented in this report should not be used as a sole basis for setting management priorities; additional data on the production of animals by country and animal demography, available veterinary medicinal products and other factors should also be considered.

It should be underlined that data presented in this report should not be used for direct comparison between countries, as more detailed information and analysis would be needed.

The report presents data for the years 2019 and 2020, with a focus on the most recent data (2020). Sales data for 2019 are displayed in the changes over time section (Section 2.8**) and changes in the overall sales between 2019 and 2020 are addressed in the discussion (**Section 3**). Data for 2019 are available in the ESVAC interactive database. Those figures and tables that cannot be directly extracted from the online application can be found in** Annex 2 **of this report.**

[8] Available on the EMA website (www.ema.europa.eu) via: Home > Veterinary regulatory > Overview > Antimicrobial resistance > Analysis of consumption and resistance (JIACRA): https://www.ema.europa.eu/en/documents/report/ema/ecdc/efsa-third-joint-report-integrated-analysis-consumption-antimicrobial-agents-occurrence_en.pdf

[9] Available on the EMA website (www.ema.europa.eu) via Home > Veterinary regulatory > Overview > Antimicrobial resistance > Analysis of consumption and resistance (JIACRA) > Outcome indicators (https://www.ema.europa.eu/en/documents/report/ecdc-efsa-ema-joint-scientific-opinion-list-outcome-indicators-regards-surveillance-antimicrobial_en.pdf)

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Summary

A total of 31 European countries — 30 EU/EEA countries (at the time of calendar years covered in this report) and Switzerland — submitted antimicrobial veterinary medicinal products (VMPs) sales or prescription (two countries) data to the European Medicines Agency for 2019 and 2020.

A population correction unit (PCU) is applied as a proxy for the size of the food-producing animal population (including all horses). The main indicator used in the current report to express the sales of antimicrobial VMPs is milligrams of active substance sold per population correction unit — mg/PCU.

Following the update to the ESVAC protocol in March 2021 and the subsequent update of conversion factors, historical updates of conversion factors were made to all previously reported data. Countries submitted 2020 data in compliance with the updated ESVAC protocol, including the rules for reporting the qualitative and quantitative composition of antimicrobial VMPs (variable strength). The vast majority of the countries also aligned their 2019 data to the requirements in the new protocol. The report presents data for the years 2019 and 2020, with a focus on the most recent data (2020). Sales data for 2019 are displayed in the changes over time section (Section 2.8) and changes in the overall sales between 2019 and 2020 are addressed in the discussion (Section 3). Data for 2019 are available in the ESVAC interactive database. Those figures and tables that cannot be directly extracted from the online application can be found in Annex 2 of this report.

Focusing on the most recent data, in the sales for 2020, expressed as mg/PCU, a large difference was observed between the countries with the highest and lowest sales (range from 2.3 mg/PCU to 393.9 mg/PCU and median value of 51.9 mg/PCU). The aggregated value for all 31 countries which reported data in 2020 was 89.0 mg/PCU.

Of the overall sales of antimicrobials in the 31 countries in 2020, the largest amounts, as a proportion of total mg/PCU, were accounted for by penicillins (31.1%), tetracyclines (26.7%) and sulfonamides (9.9%); 2019 and 2020 are the first years in which the proportion of sales accounted for by penicillins is higher than that for tetracyclines. Overall, in 2020 these three classes accounted for 67.7% of total sales in the 31 countries.

The sales patterns of the various antimicrobial classes, expressed as mg/PCU, varied substantially between the 31 countries. In 2020, notable variations between countries were observed with regard to the quantities sold for antimicrobial classes included in the EMA AMEG Category B, i.e. 3rd- and 4th-generation cephalosporins, fluoroquinolones, other quinolones and polymyxins, with sales for each class ranging from <0.01 to 0.7 mg/PCU, <0.01 to 12.9 mg/PCU, 0 to 1.1 mg/PCU and 0 to 15.9 mg/PCU, respectively (Table 5). For these classes, the proportion of aggregated sales (mg/PCU) for food-producing animals in the 31 countries accounted for 0.2%, 2.6%, 0.2% and 2.8% of total sales, respectively (Figure 4). These classes are also considered as critically important antimicrobials (CIAs) with highest priority for human medicine by WHO, which also includes macrolides (and ketolides) in this priority grouping. Macrolides accounted for 8.8% of the total sales of antimicrobials for food-producing animals in the 31 countries in 2020.

When aggregated for the 31 countries, the proportion of sales (mg/PCU) of product forms suitable for group treatment accounted for 86.9% of the total sales: premixes accounted for 22.5%; oral powders for 7.4%; and oral solutions for 57.0% (Figure 8). Sales of product forms suited for group treatment as a proportion of total sales varied substantially between countries, ranging from 1.3% to 96.1% (Figure 7). Of the product forms intended for treatment of individual animals (13.1% of total sales across all countries), 12.0% of the sales were accounted for by injectable products, 0.7% by intramammary products and 0.4% by oral pastes, boluses and intrauterine products (Figure 8).

In 2020, across the 31 countries, sales of antimicrobial VMPs suitable for group treatment (oral powder, oral solution and premix) that contained one antimicrobial active substance accounted for 85.7% of the total sales, while VMPs containing two or more antimicrobial active substances accounted for 14.3% (Figure 20).

For the 25 countries which provided sales data for all years between 2011 and 2020, an overall decline in sales (mg/PCU) of 43.2% was observed, with a noticeable decrease in sales identified for some of the highest-selling countries. Overall sales fell from 161.4 mg/PCU in 2011 to 91.6 mg/PCU in 2020 in these countries (Figure 23). During this reference period, sales (in mg/PCU) decreased by more than 5% (declines in sales of between 11.7% and 60.4%) in 19 of the 25 countries, while in four countries sales increased by more than 5% (increases in sales of between 8.6% and 79.3%).

The total sales of the AMEG Category B antimicrobials in these 25 countries showed a decreasing trend, which contributed to the overall decrease in sales. Specifically, between 2011 and 2020, sales of 3rd- and 4th-generation cephalosporins decreased by 32.8% (from 0.24 mg/PCU to 0.16 mg/PCU), polymyxins decreased by 76.5% (from 10.98 mg/PCU to 2.58 mg/PCU), fluoroquinolones decreased by 12.8% (from 2.53 mg/PCU to 2.21 mg/PCU) and sales of other quinolones decreased by 85.4% (from 1.07 mg/PCU to 0.16 mg/PCU).

Variations between the 31 countries in reported sales (mg/PCU) and in sales patterns are likely to be partly due to differences in the occurrence of bacterial diseases, in the composition of the animal population and in the production systems. Furthermore, there are considerable variations in terms of prescription guidelines, treatments and daily doses used for the various antimicrobial agents and pharmaceutical forms. Since these factors can only partly explain the differences in the sales observed between the 31 countries, other factors must also be considered. Some countries have changed their national data-collection systems over the years (e.g. Slovenia in 2013, Spain in 2014 and 2017, Romania in 2015 and Italy in 2020), have identified under-reporting (e.g. Bulgaria in 2014, Spain in 2014, Croatia in 2018 and Portugal in 2019) or double reporting (e.g. Bulgaria in 2020) for some of the years, which may also have an impact on the data. Overall, this emphasises that the data presented in this report should not be used for direct comparison between countries without considering, among other things, the above-mentioned differences, and that changes observed over time for certain countries should be interpreted with due caution.

Introduction

Terms of reference from the European Commission

In 2008, the Council of the European Union adopted the Council Conclusions on Antimicrobial Resistance (AMR)[10], calling upon the European Commission (EC) and the Member States to strengthen surveillance systems and improve data quality on antimicrobial resistance and the consumption of antimicrobial agents within both the human and veterinary sectors. In response to the Council Conclusions, the EC requested the Agency to take the lead in the collection of data on sales of veterinary antimicrobial agents in the Member States. To guarantee an integrated approach, EMA was requested to consult ECDC, EFSA and the EU Reference Laboratory for Antimicrobial Resistance (EURL-AR).

The European Surveillance of Veterinary Antimicrobial Consumption (ESVAC) project was launched in September 2009, following a request from the EC to develop an approach for the harmonised collection and reporting of data on the use of antimicrobial agents in animals in the Member States (SANCO/E2/KDS/rz D(2008) 520915). Through the EC terms of reference, EMA was requested, among other activities:

- to identify the existing data/surveillance systems established for collection of data on the sales and use of antibacterial drugs in the Member States;
- to develop a harmonised approach for the collection and reporting of data based on national sales figures, combined with estimations of usage in at least the major groups of species;
- to collect the data from Member States and manage the database;
- to draft and publish a summary annual report presenting the data from Member States.

Regarding data collection:

- comparability with the sale/use of antimicrobials in humans should be ensured.

About ESVAC activity

Through the ESVAC activity, data are collected on sales of antimicrobial VMPs at package level from the EU Member States, EEA countries, United Kingdom and Switzerland. Furthermore, in 2016, ESVAC established defined daily doses for animals (DDDvet) and defined course doses for animals (DCDvet) (EMA/224954/2016[11]). To prepare for the collection of data by animal species, in 2018, ESVAC published guidance on the collection of harmonised and standardised data from Member States on the use of antimicrobials by species[12].

In March 2021, EMA and the main National Contact Points revised the data reporting protocol and data collection form to improve data quality, including updated ESVAC conversion factors and rules for reporting the qualitative and quantitative composition of antimicrobial VMPs (variable strength).

[10] http://www.consilium.europa.eu/ueDocs/cms_Data/docs/pressData/en/lsa/101035.pdf

[11] Available on the EMA website (www.ema.europa.eu) via: Home > Veterinary regulatory > Antimicrobial resistance > European Surveillance of Veterinary Antimicrobial Consumption > Units of measurement

[12] Available on the EMA website (www.ema.europa.eu) via Home > Veterinary regulatory > Antimicrobial resistance > European Surveillance of Veterinary Antimicrobial Consumption (ESVAC) > Reporting data by animal species: https://www.ema.europa.eu/en/documents/scientific-guideline/guidance-collection-provision-national-data-antimicrobial-use-animal-species/categories_en.pdf

Article 57 of Regulation (EU) 2019/6 on VMPs[13] requests mandatory reporting of data on antimicrobial medicinal products used in animals. It states that the Agency shall cooperate with Member States and with other Union agencies to analyse data on antimicrobial sales and use and shall publish an annual report. Following this legal requirement, in April 2021, the Commission Delegated Regulation (EU) 2021/578 of 29 January 2021 was published[14]. It describes the requirements for the collection of data on the volume of sales and on the use of antimicrobial medicinal products in animals, including the lists of the respective Anatomical Therapeutic Chemical (ATC) and Anatomical Therapeutic Chemical classification system for veterinary medicines (ATCvet) codes for which data on the volume of sales shall or may be collected and reported to the Agency. Obligations of the Member States and the Agency are also described, as are methods for the collection and reporting of the data, and deadlines for data reporting and publishing the annual report. The organisation of the ESVAC project is illustrated in Figure 1.

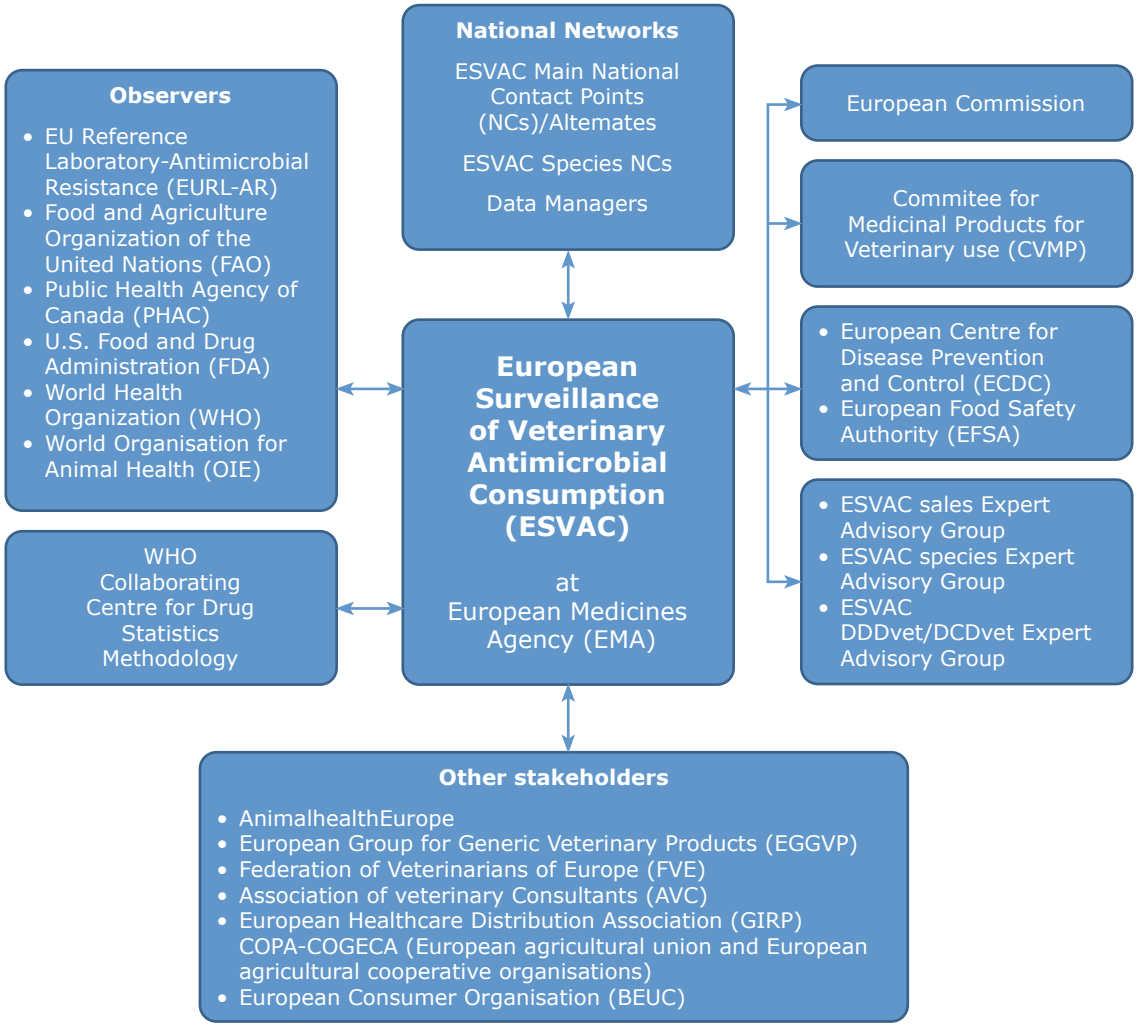
The ESVAC network, composed of main National Contact Points and alternates nominated by the national competent authorities in the participating countries, is responsible for sales data collection. The country and affiliation of the ESVAC main National Contact Points and alternates can be found in Annex 9 of this report. The tasks of the ESVAC main National Contact Points are: to provide sales data to the ESVAC team at the EMA in response to annual data calls; to revise the data in terms of quality and validity, following requests from the ESVAC team; to validate the animal population data used to calculate the PCU; and to provide comments on the annual ESVAC report.

The ESVAC sales data activity is supported by an Expert Advisory Group (EAG), which is comprised of representatives of the ESVAC main National Contact Points and alternates network. There are also observers from EC, ECDC and EFSA. The task of the ESVAC sales EAG is to provide technical advice on surveillance of overall sales data of antimicrobial VMPs, including collection, analysis and reporting of data, and preparation of the annual reports. A list of the ESVAC EAG members and observers can be found in Annex 10 of this report.

[13] Journal of the European Union, 2019. 'Regulation (EU) 2019/6 of the European Parliament and of the Council of 11 December 2018 on veterinary medicinal products and repealing Directive 2001/82/EC', https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32019R0006&from=EN

[14] Official Journal of the European Union, 2021. 'Commission Delegated Regulation (EU) 2021/578 of 29 January 2021 supplementing Regulation (EU) 2019/6 of the European Parliament and of the Council with regard to requirements for the collection of data on the volume of sales and on the use of antimicrobial medicinal products in animals', https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32021R0578&from=EN

Figure 1. Organisation of the ESVAC Network and Stakeholders



ESVAC deliverables also include publication of the core graphs and tables of the ESVAC sales reports available on the EMA website through the ESVAC BI web-based application (Oracle Business Intelligence Enterprise Edition)[15].

[15] ESVAC interactive database accessible via ESVAC activity web page: https://www.ema.europa.eu/en/veterinary-regulatory/overview/antimicrobial-resistance/european-surveillance-veterinary-antimicrobial-consumption-esvac#interactive-esvac-database-section

1. Technical notes

1.1. Antimicrobial substances included in the sales data sets

To obtain harmonised data on sales of antimicrobial VMPs from the ESVAC participating countries, the ESVAC protocol[16] defined which antimicrobial substances are to be included in the sales data sets by using ATCvet[17] (Table 1). Of note is the fact that all the antimicrobials included in the sales data sets contain substances with an antibacterial activity. All pharmaceutical forms, including premixes used to produce medicated feed, are included except for dermatological preparations (ATCvet group QD) and preparations for sensory organs (ATCvet group QS). The contribution of these pharmaceutical forms, in tonnes of active substance, to the total quantity of veterinary antimicrobials sold is considered to be minimal, and the overall sales data is expected to be negligible. The use of antimicrobial growth promoters is prohibited in the ESVAC participating countries, and therefore they are not part of the data collection. Ionophore coccidiostat feed additives and veterinary medicines containing zinc oxide[18] are also not included in the data material. Other active substances which are not classified as antibiotics, e.g. antiprotozoals (with no antibacterial effect), antivirals, antifungals and anti-inflammatory substances, fall outside of the scope of the ESVAC protocol.

To harmonise the reporting of sales of VMPs with the data on sales of antimicrobial agents used in human medicine, the substances are presented according to the classes/subclasses defined by the ATCvet hierarchical system, using WHO international non-proprietary names (INN) where available. If INNs have not been assigned, the ATCvet system applies either USAN (United States Adopted Names) or BAN (British Approved Names).

Table 1. Groups and ATCvet codes of antimicrobial substances used in veterinary medicine, as included in ESVAC database

Groups of antimicrobial substances	ATCvet codes
Antimicrobial substances for intestinal use	QA07AA, QA07AB
Antimicrobial substances for intrauterine use	QG01AA, QG01AE, QG01BA, QG01BE, QG51AA, QG51AG
Antimicrobial substances for systemic use	QJ01
Antimicrobial substances for intramammary use	QJ51
Antimicrobial substances used as antiparasitic agents	QP51AG

1.2. Variables reported for each antimicrobial VMP presentation

Detailed information on the variables to be reported for each antimicrobial VMP presentation is given in Annex 3 of this report, as well as in the data reporting protocol and data collection form published on the Agency's website[19]. To standardise the information and facilitate data management, the ESVAC analysis applies product forms which are a combination of pharmaceutical form and route of administration and which are selected from a standardised list: boluses, injectable products, intramammary products for lactating cow treatment, intramammary products for dry cow treatment, intrauterine products, oral solutions (includes powders for administration in drinking water), oral pastes, oral powders (powder to be administered with feed), premixes (premix for medicated feed) and tablets (including capsules). It should be noted that when the product information contains instructions such as 'powder for solution' or 'powder for administration in drinking water', the form should be reported as an oral solution. Premixes are VMPs intended for incorporation into medicated feed which are usually produced by feed mills.

1.3. Collection and calculation of sales data

For each calendar year, the ESVAC participating countries provide details of the number of packages sold within their territory for each VMP presentation — determined by differences in characteristics including the name of the VMP, the pharmaceutical form, the strength of the antimicrobial active substance(s) and the pack size. Data are directly uploaded

[16] Available on the EMA website (www.ema.europa.eu): https://www.ema.europa.eu/en/documents/other/european-surveillance-veterinary-antimicrobial-consumption-esvac-web-based-sales-animal-population_en.pdf

[17] www.whocc.no/atcvet/

[18] On 26 June 2017, the European Commission issued a decision to request the Member States to withdraw, within five years of the above date, existing marketing authorisations of veterinary medicinal products containing zinc oxide to be administered orally to food-producing animals. (C(2017) 4529 final)

[19] Available on the EMA website (www.ema.europa.eu) via: Home > Regulatory > Veterinary medicines > Overview > Antimicrobial resistance > European Surveillance of Veterinary Antimicrobial Consumption > Sales data collection form and protocol.

to the ESVAC database by the countries, using the ESVAC web-based application. The quantity of antimicrobial active substance in tonnes sold for each VMP presentation is calculated by multiplying the number of packages sold by the strength of the antimicrobial active substance per unit of package, as declared in the corresponding product information. For fixed-combination VMPs, the quantity of each antimicrobial active substance sold is calculated separately. For each VMP presentation, the tonnes sold are automatically calculated in a standardised and harmonised manner by the ESVAC web-based application tool. This entails the application of standard conversion factors to convert international units (IU) into mg when the strength is reported in IU (Table A11) and of derivative conversion factors to calculate the mass of antimicrobial active moiety in mg when the strength is reported as the derivative/compound strength (Table A12). These conversion factors were updated in 2021 and the updates are included in the new version of the sales data reporting form and protocol.

1.4. Denominator: population correction unit (PCU)

The quantities of antimicrobial active substances sold in the different countries are normalised by the animal population that could potentially be treated with antimicrobials in each country. The population correction unit, referred to as PCU, has been established as a denominator for the sales data and only includes food-producing animals. Further details on the data sources and the methodology used for the calculation of the PCU are comprehensively described in Appendix 2 of the Agency's report 'Trends in the sales of veterinary antimicrobial agents in nine European countries: 2005-2009' (EMA/238630/2011)[20]. Animal categories included in the calculation of the PCU and the weights used to calculate the PCU are described in Annex 4 of this report. It must be emphasised that the PCU is purely a surrogate for the animal population that could potentially be treated.

1.4.1. Calculation of PCU

The PCU for each animal category is calculated by multiplying numbers of livestock animals (dairy cows, sheep, sows and horses) and slaughtered animals (broilers, cattle, goats, pigs, rabbits, sheep, and turkeys) by their theoretical weight at the likely time of treatment. However, due to the incompleteness of the data on numbers of live goats data held by Eurostat, this category was not included when the PCU methodology was established for the first ESVAC report[20]. For countries with a relatively high number of goats compared to other food-producing animals, this results in an underestimation of the PCU. For farmed fish, Eurostat data are given only as live weight at slaughter rather than weight of slaughtered farmed fish; thus, for farmed fish, biomass live weight slaughtered is used to calculate the total PCU. In the case of animals moved across EU single market borders by intra-community importation or exportation for fattening or slaughter (cattle, goats, pigs, sheep and poultry), the PCU is calculated by multiplying the number of animals by a standardised weight.

The PCU of the animals exported for fattening or slaughter to another Member State is added to the PCU of livestock and to the PCU of slaughtered animals in the country of origin because typically young animals are treated more frequently than other age classes. Thus, the PCU for animals imported for fattening or slaughter from another Member State is subtracted from the total PCU of livestock and slaughtered animals of the importing country in order to avoid double counting (counting in both the exporting and the importing country).

The PCU is calculated for each species, weight class or production type, as follows:

PCU domestic

- Number of animals slaughtered × estimated weight at treatment
- Number of livestock animals × estimated weight at treatment

PCU export

- Number of animals transported to another country for fattening or slaughter × estimated weight at treatment

PCU import

- Number of animals transported from another country for fattening or slaughter × estimated weight at treatment

[20] Available on the EMA website (www.ema.europa.eu) via: Home > Veterinary regulatory > Overview > Antimicrobial resistance > European Surveillance of Veterinary Antimicrobial Consumption > https://www.ema.europa.eu/en/documents/report/trends-sales-veterinary-antimicrobial-agents-nine-european-countries_en.pdf

Total PCU is calculated as follows: PCU = total $PCU_{Domestic}$ + total PCU_{Export} – total PCU_{Import}

The total PCU by country is calculated according to the data above.

1 PCU = 1 kg of animal biomass.

1.4.2. Animal species and categories included in the PCU: selection of data sources

Eurostat, the Statistical Office of the EU, holds data on numbers of food-producing animals slaughtered, as well as numbers of livestock animals. The Eurostat database[21] was therefore selected as the source for these data. If data were not available via Eurostat (e.g. for rabbits, horses or fish), national statistics were applied. In addition, national statistics on animal categories are applied for non-EU countries — Iceland, Norway and Switzerland — as data for these countries are not available from Eurostat. As data on dog and cat population are not available for all participating countries, these species are not included in the PCU. Therefore, since tablets are typically approved only for companion animals, they are excluded from the data sets prior to the normalisation of sales by PCU.

The Eurostat data on the numbers of cattle, pigs, poultry, sheep and goats moved across borders within the single market for fattening or slaughter might not be complete as intra-community exports and imports are only reported above a certain quantity. Therefore, data are obtained from TRACES (the Trade Control and Expert System run by EC DG SANTE) as these are based on health certificates, which are obligatory for all animals crossing any border.

In cases where the deviation between the Eurostat data and/or TRACES data and national statistics was greater than 5%, countries could use national statistics to calculate the PCU.

1.5. Correction of historical data

Occasionally during data validation processes, inconsistencies in previously submitted datasets are identified. There may be several reasons for this, e.g. new official statistics regarding animal population data becoming available or identification of a specific inaccuracy for a VMP presentation. In such cases, data are corrected.

Note that subsequent to the correction of historical data, the updated values are published in the ESVAC interactive database as soon as they have been validated and approved by the participating country.

Data in printed reports or pdf-versions thereof are not updated when changes to data are implemented in the interactive database, therefore minor discrepancies between values in the reports and the interactive database may occur.

1.5.1. Sales data

Following the update of the sales data reporting form and protocol, which included the update of several ESVAC conversion factors, historical updates were implemented for the years 2010–2018 in all countries' sales datasets. Additionally, Germany completed the information for some VMPs for 2015 (2nd active substance was missing), Croatia and Poland updated the numbers of packs sold in 2018 for several VMPs and the United Kingdom corrected the strengths of several VMPs for the years 2010–2018. This led to revisions of the sales data, which are included in the ESVAC database and in the results of this report.

1.5.2. Animal population data

Updates were made to the animal population data, compared to the values used for the ESVAC 2018 report[22]. For Croatia, the biomass figures for farmed fish produced and the number of living horses and slaughtered turkeys were updated for 2014 to 2018. For Greece, the number of living horses was revised for 2015 to 2017. For Malta, the numbers of slaughtered turkeys, slaughtered rabbits, living horses and several categories of cattle, pig and caprinae populations were revised for 2017 and 2018. Tonnes of biomass of farmed fish produced in Lithuania in 2016–2018 were added to the PCU. Although changes were observed in the mg/PCU values following the updates, they were not extensive.

[21] https://ec.europa.eu/eurostat/data/database

[22] Sales of veterinary antimicrobial agents in 31 European countries in 2018 (https://www.ema.europa.eu/en/documents/report/sales-veterinary-antimicrobial-agents-31-european-countries-2018-trends-2010-2018-tenth-esvac-report_en.pdf)

1.6. Data quality check and validation of the sales and animal population data

The countries participating in ESVAC upload their sales data directly using a web-based submission tool designed for data collection: the ESVAC web-based application. To ensure the consistency of the variables submitted, automated warning and error messages are displayed instantaneously when any of the figures uploaded do not meet standardisation requirements. When data are uploaded, various reports, which can also be used for validation, can be created using the ESVAC BI web-based application. Each country is responsible for the quality of the sales data it delivers to ESVAC. The ESVAC secretariat assists with data validation, including the identification of outliers, mainly by comparison with available data from previous years and with official product information available in the registers of nationally authorised medicinal products. Possible errors are cross-checked and addressed with National Contact Points or ESVAC Data Managers, if applicable, until final agreement is reached.

Development of suitable quality control measures, including assessment of data coverage and accuracy, are defined and set up by each country individually, taking into account the distinctive aspects of each country's data collection.

Reference data for the animal population data used to calculate the denominator (PCU) gathered by the Agency from the Eurostat and TRACES databases are made available to the countries through the ESVAC web-based application. The data are subsequently validated by the ESVAC participating countries and completed or updated with national statistics, where necessary. To enable validation of the data by the National Contact Points and Data Managers, the outputs from the PCU calculations are displayed in the ESVAC BI reports, allowing for comparison with values per animal category and the overall PCU approved for previous years. Possible outliers are cross-checked and addressed with each National Contact Point or Data Manager, until final agreement is reached.

1.7. Analysis and reporting of the data

Throughout the report, there is a special focus on the analysis of those antimicrobials that either belong to the high-selling classes or are among those considered of the highest importance in the AMEG categorisation (AMEG Category B) or included in the WHO list of highest priority CIAs (see Annex 6). Following the list of harmonised outcome indicators[23] developed to assist Member States in assessing their progress in reducing the use of antimicrobials and the occurrence of antimicrobial resistance in both humans and food-producing animals, jointly established by ECDC, EFSA and EMA, the emphasis with respect to food-producing animals is on overall sales (mg/PCU) of antimicrobials (primary indicator) and sales of 3rd- and 4th-generation cephalosporins, quinolones (specifying the proportion of fluoroquinolones) and polymyxins for veterinary use (secondary indicators).

Based on the assumption that tablets are almost solely used for companion animals, VMP presentations reported in this product form are excluded from the analysis in mg/PCU for food-producing animals. All other product forms (including boluses) are considered as sold for use in food-producing animals, which include horses[24]. Injectable antimicrobial VMPs are also used in companion animals. As injectable presentations are frequently marketed for both food-producing and companion animals and their use in companion animals is minor in terms of quantity of active substance, such sales are included in the statistics for food-producing animals.

Of note is that some of the sales allocated to food-producing animals could be for non-food-producing animals such as companion animals, fur animals, exotic birds and racing pigeons. In the current report, the term 'group treatment' is used for VMPs administered orally via feed or water, i.e. product forms premixes, oral solutions and oral powders, while 'individual treatment' refers to boluses, injectable products, intramammary products, intrauterine products and oral pastes; intramammary products for lactating cows and for dry cow treatment are aggregated.

The main indicator applied in this report to express the consumption of veterinary antimicrobials is mg of active substance normalised by the population correction unit (mg/PCU):

$$\frac{\text{Quantity sold in tonnes} \times 10^9}{\text{PCU in kg}}$$

[23] Available on the EMA website (www.ema.europa.eu) via Home > Veterinary regulatory > Overview > Antimicrobial resistance > Analysis of consumption and resistance (JIACRA) > Outcome indicators (https://www.ema.europa.eu/en/documents/report/ecdc-efsa-ema-joint-scientific-opinion-list-outcome-indicators-regards-surveillance-antimicrobial_en.pdf)

[24] Regulation (EC) No 854/2004 establishes that horses are considered to be food-producing animals. Typically, statistics on living horses cover both food-producing and non-food-producing horses. This implies that the use of medicines authorised for horses not intended for slaughter is also included in the surveillance.

The data are presented according to the classes or subclasses defined in the ATCvet hierarchical system. The class 'Others' can include the following sub-classes: Imidazole derivatives (metronidazole), Nitrofuran derivatives (nifurpirinol, furazolidone) and Other antibacterials (bacitracin, fosfomycin, furaltadone, natamycin, nitroxoline, novobiocin, rifaximin, spectinomycin). Of note, metronidazole, nifurpirinol, furazolidone and furaltadone are included in Table 2 (prohibited substances) of the Annex to Commission Regulation (EU) No 37/2010 and are prohibited for use in food-producing animals (see Table A27).

For fixed-combination VMPs, sales of each active substance are reported according to the ATCvet class or subclass name for each single substance in question. Maps of the spatial distribution of consumption of the various veterinary antimicrobial agents (Figures 9, 11, 13, 15 and 17) were created using Adobe Illustrator CC 2021.

It should be noted that data presented in this report are calculated using the exact sales figures for each product (five decimals), while in the tables and graphs the numbers are aggregated and rounded. Therefore, the total sales figures in tables, for example, may differ slightly from the more detailed data presented in this report.

All data presented in this report reflect the datasets available in the ESVAC database on 4 October 2021. Any updates made to the data at a later stage are not included in the data analyses.

Data on sales, including tablets used for treatment of companion animals, are available in the ESVAC interactive database.

1.8. Summary of data sources/types included, by country

Information concerning the number of years of data collection, the legal basis for the data collection at national level, systems for distribution of antimicrobial VMPs, sources from which sales data were obtained, type of data and the data included are shown, by country, in Table 2.

Table 2. Summary of information on number of years of data collection, legal basis for data collection at national level, national data providers, sources for ESVAC data and characteristics of data, by country, in 2020

Country	Number of years of data collection	Legal basis	National data provider to ESVAC	Sources for ESVAC data (approx. number)	Sales data, prescription data or purchase data[1]	Sales between wholesalers and/or MAHs[2] excluded (Yes/No)	Products sold on special licence included[3] (Yes/No)
Austria	>5 years	Mandatory to report	Austrian Agency for Health and Food Safety	MAHs (n=9) Wholesalers (n=9)	Sales to pharmacies	Yes	No
Belgium	>5 years	Mandatory to report	Federal Agency for Medicines and Health Products	Wholesalers (n=21) Feed mills (n=45)	Sales to veterinarians and pharmacies; sales by feed mills to farmers	Yes	No
Bulgaria	>5 years	Not mandatory	Bulgarian Food Safety Agency	Wholesalers (n=38)	Sales to veterinarians, farmers and pharmacies	Yes	No
Croatia	>5 years	Mandatory to report	Ministry of Agriculture, Veterinary Directorate	Wholesalers (n=16)	Sales to pharmacies and veterinarians	Yes	No
Cyprus	>5 years	Mandatory to report	Ministry of Agriculture, Rural Development and Environment – Veterinary Services	Wholesalers (n=25) Feed mills (n=28)	Sales by wholesalers to veterinarians and pharmacies; sales by feed mills to farmers	Yes	Yes (33.3%)
Czechia	>5 years	Mandatory to report	Institute for State Control of Veterinary Biologicals and Medicines	Wholesalers (n=101) Feed mills (n=42)	Sales by wholesalers to veterinarians and pharmacies; sales by feed mills to farmers	Yes	Yes (0.1%)
Denmark	>5 years	Mandatory to report	Danish Veterinary and Food Administration	VetStat (n=1) obtaining data from pharmacies (n=551) Feed mills (n=1)	Prescriptions data from pharmacies and feed mills	Yes	Yes (1.8%)
Estonia	>5 years	Mandatory to report	State Agency of Medicines	Wholesalers (n=8)	Sales to veterinarians and pharmacies	Yes	Yes (1%)
Finland	>5 years	Mandatory to report	Finnish Medicines Agency	Wholesalers (n=3) Importers of medicated feed (n=1)	Sales to pharmacies and veterinarians	Yes	Yes (5.7%)
France	>5 years	Mandatory to report	National Agency for Veterinary Medicinal Products (Anses-ANMV)	MAHs (n=55)	Sales to wholesalers and feed mills	Yes	No
Germany	>5 years	Mandatory to report	Federal Office of Consumer Protection and Food Safety	MAHs (n=28) Wholesalers (n=14) PSURs[4] data for premixes	Sales to veterinarians	Yes	No
Greece	>5 years	Mandatory to report	Greek National Organisation for Medicines	MAHs (n=68)[5]	Sales to pharmacies and veterinarians	Yes	No

Country	Number of years of data collection	Legal basis	National data provider to ESVAC	Sources for ESVAC data (approx. number)	Sales data, prescription data or purchase data[1]	Sales between wholesalers and/or MAHs[2] excluded (Yes/No)	Products sold on special licence included[3] (Yes/No)
Hungary	>5 years	Not mandatory	National Food Chain Safety Office Directorate of Veterinary Medicinal Products	Wholesalers (n=32)	Sales to pharmacies, veterinarians, feed mills, farmers, retailers and animal clinics	Yes	No
Iceland	>5 years	Mandatory to report	Icelandic Medicines Agency	Wholesalers (n=2)	Sales to veterinarians and pharmacies	Yes	Yes (11.1%)
Ireland	>5 years	Mandatory to report	Health Products Regulatory Authority	MAHs (n=59)	Sales to wholesalers, pharmacies, veterinarians and licensed merchants	Yes	No[6]
Italy	>5 years	Mandatory to report	Italian Ministry of Health	Italian Drug Traceability System (n=1) obtaining data from pharmacies (n=19,304) and wholesalers (n=245) MAHs (n=16)	Dispensed e-prescription to veterinarians, farmers and companion animal owners; Sales of premixes from MAHs to wholesalers	Yes	Yes (<0.01%)
Latvia	>5 years	Mandatory to report	Food and Veterinary Service	Wholesalers (n=18)	Sales to pharmacies, veterinarians, veterinary clinics and farmers	Yes	No
Lithuania	>5 years	Mandatory to report	State Food and Veterinary Service	Wholesalers (n=46)	Sales to pharmacies, veterinarians and farmers	Yes	No
Luxembourg	>5 years	Mandatory to report	Ministry of Health	Wholesalers (n=2)	Sales to pharmacies and veterinarians	Yes	No
Malta	4 years	Not mandatory	Ministry for Agriculture, Fisheries and Animal Rights	Wholesalers (n=19) Medicated feed mill (n=1) Medicated feed traders (n=3)	Sales to pharmacies veterinarians and farmers	Yes	No
Netherlands	>5 years	Not mandatory	Federation of the Dutch Veterinary Pharmaceutical Industry (FIDIN)	MAHs (n=17)	Sales to wholesalers and veterinarians	Yes	Yes (<1%)
Norway	>5 years	Mandatory to report	Norwegian Veterinary Institute	Wholesalers (n=5) Feed mills (n=1)	Sales by wholesalers to pharmacies and veterinarians; sales by feed mills to fish farmers (only as medicated feed)	Yes	Yes (6.9%)
Poland	>5 years	Mandatory to report	Ministry of Agriculture and Rural Development	Wholesalers (n=124)	Sales to veterinarians	Yes	No

Country	Number of years of data collection	Legal basis	National data provider to ESVAC	Sources for ESVAC data (approx. number)	Sales data, prescription data or purchase data[1]	Sales between wholesalers and/or MAHs[2] excluded (Yes/No)	Products sold on special licence included[3] (Yes/No)
Portugal	>5 years	Mandatory to report	Directorate-General for Food and Veterinary Matters	Wholesalers (n=83)	Sales to retailers and veterinarians	Yes	No
Romania	>5 years	Mandatory to report	Institute for Control of Biological Products and Veterinary Medicines	MAHs (n=84)[7]	Sales to wholesalers	Yes	No
Slovakia	>5 years	Mandatory to report	Institute for State Control of Veterinary Biologicals and Medicaments	Wholesalers (n=58)	Sales to pharmacies, military forces, State Veterinary and Food Administration, veterinarians, farmers and feed mills	Yes	No
Slovenia	>5 years	Mandatory to report	Administration of the Republic of Slovenia for Food Safety, Veterinary Sector and Plant Protection (AFSVSPP)	Wholesalers (n=10)	Sales to pharmacies, feed mills and veterinarians	Yes	Yes (0.1%)
Spain	>5 years	Not mandatory	Spanish Agency for Medicines and Health Products	Retailers (n=805) Feed mills (n=18) Pharmacies (n=2,825)[8]	Sales to veterinarians, farmers and pet owners	Yes	No
Sweden	>5 years	Mandatory to report	National Veterinary Institute and Swedish Board of Agriculture	The Swedish eHealth Agency (n=1) obtaining data from pharmacies (n>1,400)	Dispensed veterinary prescriptions and requisitions[9]	Yes	Yes (10.2%)
Switzerland	>5 years	Mandatory to report	Federal Food Safety and Veterinary Office	MAHs (n=16)	Sales to veterinarians, pharmacies and medicated feed mills	No[10]	No
United Kingdom	>5 years	Mandatory to report	Veterinary Medicines Directorate	MAHs (n=65)	Sales to wholesalers, veterinarians, feed mills and veterinary pharmacies	Yes	No

[1] Purchase/import data from e.g. pharmaceutical industry and/or from wholesalers in other countries.
[2] MAHs = marketing authorisation holders.
[3] Antimicrobial VMPs available through special licence/marketing authorisation or through parallel trade. The type of authorisation procedure used might differ among Member States. The % refers to such sales as a proportion of the total sales reported for that year.
[4] PSURs = periodic safety update reports.
[5] Negligible sales from a few MAHs with a very small market share, and which do not have local representatives in Greece, are not included in the dataset.
[6] VMPs authorised under special licence by the Department of Agriculture, Food and the Marine were not included in this analysis. The contribution from these sources to the overall figure is likely to be very small.
[7] For 2015–2020, data were collected from MAHs, while for 2014 the data were obtained from MAHs and wholesalers and include MAHs' sales to wholesalers and wholesalers' sales to pharmacies and veterinarians.
[8] Since 2017, data have been collected from retailers and pharmacies, but data from feed mills were used to verify the sales of medicated feed.
[9] Data represent veterinary prescriptions and requisitions dispensed by pharmacies for use in their own practice.
[10] No data provided by wholesalers or feed mills.

2. Results

2.1. Overall sales (tonnes) of antimicrobial VMPs for veterinary use

The overall national sales data cover sales of antimicrobial VMPs for use in food-producing animals, plus sales of tablets that are used almost solely in companion animals. Sales of tablets accounted for a minor proportion of the total sales of antimicrobial VMPs in 2020, except in Finland, Iceland, Luxembourg, Norway, Slovenia, Sweden and the United Kingdom, where they accounted for 10.2%, 9.5%, 5.8%, 7.5%, 7.3%, 7.3% and 5.1% of the total sales, respectively (Table 3). Overall, sales of tablets in the 31 countries represented 1.3% of the total sales in tonnes.

Table 3. Overall sales, in tonnes of active substance, split by tablets (used mainly in companion animals) and all other product forms (used mainly in food-producing animals), by country, in 2020

Country	Tablets		All other products forms		Total tonnes
	Tonnes	% of overall sales	Tonnes	% of overall sales	
Austria	0.6	1.4%	43.7	98.6%	44.3
Belgium	2.2	1.2%	180.4	98.8%	182.6
Bulgaria	0.1	0.1%	61.1	99.9%	61.2
Croatia	0.1	0.6%	22.6	99.4%	22.7
Cyprus	0.04	0.1%	48.3	99.9%	48.3
Czechia	1.1	2.8%	39.3	97.2%	40.5
Denmark	0.8	0.9%	88.7	99.1%	89.5
Estonia	0.2	2.6%	5.7	97.4%	5.9
Finland	0.9	10.2%	8.0	89.8%	8.9
France	16.5	4.0%	394.4	96.0%	410.9
Germany	10.8	1.5%	684.6	98.5%	695.4
Greece	0.5	0.4%	108.4	99.6%	108.8
Hungary	0.3	0.2%	136.1	99.8%	136.4
Iceland	0.1	9.5%	0.5	90.5%	0.6
Ireland	1.0	0.9%	102.9	99.1%	103.9
Italy	7.4	1.1%	689.3	98.9%	696.7
Latvia	0.1	2.0%	4.8	98.0%	4.9
Lithuania	0.1	1.4%	6.2	98.6%	6.3
Luxembourg	0.1	5.8%	1.6	94.2%	1.7
Malta	0.1	4.9%	1.7	95.1%	1.8
Netherlands	2.9	1.8%	156.4	98.2%	159.3
Norway	0.4	7.5%	4.7	92.5%	5.1
Poland	3.5	0.4%	853.2	99.6%	856.7
Portugal	1.2	0.7%	177.9	99.3%	179.1
Romania	4.2	2.3%	173.7	97.7%	177.9
Slovakia	0.3	2.6%	11.8	97.4%	12.2
Slovenia	0.5	7.3%	5.9	92.7%	6.3
Spain	1.7	0.1%	1,244.5	99.9%	1,246.2
Sweden	0.7	7.3%	8.7	92.7%	9.4
Switzerland	0.7	2.4%	27.7	97.6%	28.4
United Kingdom	11.6	5.1%	214.4	94.9%	226.0
Total 31 countries	**70.4**	**1.3%**	**5,507.4**	**98.7%**	**5,577.8**

2.2. Population-adjusted sales for food-producing animals by antimicrobial class

The sales of antimicrobial VMPs, expressed as mg sold per PCU, ranged from 2.3 mg/PCU to 393.9 mg/PCU across the 31 countries (Table 4). The sales patterns of the antimicrobial classes also varied substantially between the countries (Table 5).

Table 4. Sales, in tonnes of active substance, of antimicrobial VMPs marketed mainly for food-producing animals[1], PCU and sales in mg/PCU, by country, in 2020

Country	Sales (tonnes) for food-producing animals	PCU (1,000 tonnes)	mg/PCU
Austria	43.7	942.3	46.3
Belgium	180.4	1,745.3	103.4
Bulgaria	61.1	368.4	166.0
Croatia	22.6	328.9	68.6
Cyprus	48.3	122.6	393.9
Czechia	39.3	699.3	56.3
Denmark	88.7	2,384.7	37.2
Estonia	5.7	115.9	49.2
Finland	8.0	494.4	16.2
France	394.4	6,964.9	56.6
Germany	684.6	8,172.8	83.8
Greece	108.4	1,216.5	89.1
Hungary	136.1	801.0	169.9
Iceland	0.5	135.3	3.8
Ireland	102.9	2,189.8	47.0
Italy	689.3	3,790.4	181.8
Latvia	4.8	157.6	30.8
Lithuania	6.2	302.6	20.5
Luxembourg	1.6	54.4	29.0
Malta	1.7	14.7	116.1
Netherlands	156.4	3,114.9	50.2
Norway	4.7	2,030.8	2.3
Poland	853.2	4,541.7	187.9
Portugal	177.9	1,012.0	175.8
Romania	173.7	3,003.7	57.8
Slovakia	11.8	228.3	51.9
Slovenia	5.9	176.0	33.3
Spain	1,244.5	8,067.5	154.3
Sweden	8.7	786.0	11.1
Switzerland	27.7	806.1	34.3
United Kingdom	214.4	7,115.2	30.1
Total 31 countries	**5,507.4**	**61,884.2**	**89.00***

[1] Tablets are excluded as they are used almost solely in companion animals; injectable antimicrobial VMPs can also be used in companion animals; a few other products may solely be used in companion animals, but as their proportional use is minor, these are included in the sales for food-producing animals.

* Total mg/PCU for 31 countries represents aggregated sales (tonnes) for food-producing animals, including horses and farmed fish, normalised by the aggregated PCU (1,000 tonnes).

Table 5. Sales for food-producing animals, in mg/PCU, of the various antimicrobial classes in 31 European countries in 2020[1]

Country	Tetracyclines	Amphenicols	Penicillins	1st- and 2nd-gen. cephalosporins	3rd- and 4th-gen. cephalosporins	Sulfonamides	Trimethoprim	Macrolides	Lincosamides	Fluoroquinolones	Other quinolones	Aminoglycosides	Polymyxins	Pleuromutilins	Others*	Total mg/PCU
Austria	23.5	0.4	9.9	0.04	0.2	3.7	0.7	3.7	0.1	0.5	0	1.4	1.6	0.4	0.1	46.3
Belgium	20.5	1.9	42.5	0.3	0.1	16.6	3.3	7.5	2.7	0.3	0.5	1.6	1.6	0.3	3.7	103.4
Bulgaria	65.9	1.0	22.3	0.03	0.1	6.8	0.8	44.4	7.7	3.7	0	4.3	5.4	3.0	0.5	166.0
Croatia	24.8	1.5	23.1	0.04	0.2	5.4	1.1	4.0	0.1	2.1	0.3	2.5	2.7	0.6	0.2	68.6
Cyprus	132.0	1.2	79.4	0.02	0.4	56.8	11.3	18.9	51.1	2.2	0.4	5.1	15.9	18.3	0.7	393.9
Czechia	15.5	0.6	18.3	0.1	0.5	8.6	1.0	3.1	0.2	1.9	0	2.5	0.6	3.0	0.3	56.3
Denmark	6.0	0.8	12.0	0.02	<0.01	3.1	0.6	5.5	0.9	<0.01	0.2	3.9	<0.01	3.2	1.0	37.2
Estonia	13.5	0.4	13.4	0.1	0.7	4.2	0.8	1.6	0.3	1.1	0	3.7	0.3	8.6	0.5	49.2
Finland	3.7	0.2	8.4	<0.01	<0.01	2.8	0.6	0.4	0.05	0.1	0	0.1	0	<0.01	0	16.2
France	18.4	0.8	8.7	0.2	0.02	12.3	2.0	4.2	0.4	0.1	0.3	6.7	1.4	0.5	0.5	56.6
Germany	18.1	0.8	33.3	0.1	0.2	7.8	1.1	7.3	1.5	0.8	0	2.9	7.3	1.3	1.4	83.8
Greece	43.9	1.1	15.7	0.01	0.2	8.1	1.0	3.5	0.5	2.0	1.1	8.6	1.9	0.8	0.6	89.1
Hungary	57.4	2.5	51.6	0.1	0.5	7.0	1.5	8.9	2.2	11.6	0	3.3	7.5	14.6	1.2	169.9
Iceland	0.3	0	2.8	0	<0.01	0.1	0.01	0	0	<0.01	0	0.6	0	0	0	3.8
Ireland[2]	19.6	1.7	12.4	0.5	0.2	4.6	0.6	2.4	0.9	0.4	0	3.2			0.6	47.0
Italy	49.0	4.9	61.1	0.1	0.2	26.7	2.6	8.7	11.7	1.2	0.8	7.5	0.7	5.0	1.7	181.8
Latvia	7.0	0.2	6.6	0.3	0.5	1.3	0.3	6.2	0.2	1.5	0	4.1	0.8	1.5	0.2	30.8
Lithuania	2.6	0.4	6.3	0.1	0.1	4.1	0.9	2.3	0.2	1.3	0	0.5	<0.01	1.4	0.3	20.5
Luxembourg	11.4	1.0	6.6	0.1	0.5	2.9	0.6	0.6	0.6	0.8	0	3.0	0.4	0.03	0.4	29.0
Malta[3]	43.9	2.3	9.5	0.05	0.3	18.2	3.2	14.5	0.6	4.4		6.4	0.5	5.5	6.8	116.1
Netherlands	16.6	1.5	12.6	0.03	<0.01	8.3	1.5	7.6	0.05	0.05	0.8	0.6	0.5	0.1	0.02	50.2
Norway	0.1	0.1	1.4	0	<0.01	0.6	0.1	<0.01	<0.01	<0.01	0.1	0.1	0	0.02	<0.01	2.3
Poland	45.3	2.2	61.1	0.2	0.4	8.1	1.6	24.8	2.3	12.9	0	7.2	9.1	10.4	2.2	187.9
Portugal	60.4	4.4	38.9	0.04	0.4	7.2	1.4	20.0	6.0	7.3	0	5.0	11.7	12.7	0.4	175.8
Romania	15.4	2.4	13.7	<0.01	0.2	1.9	0.3	7.6	1.7	5.7	0.1	4.7	2.2	1.1	0.7	57.8
Slovakia	14.0	0.3	10.2	0.2	0.5	6.4	0.9	1.5	0.4	3.4	0.02	3.9	2.0	7.0	1.2	51.9
Slovenia	7.6	1.1	15.7	0.05	0.2	2.4	0.6	0.3	0.02	1.0	<0.01	3.6	0.1	0.7	0.02	33.3
Spain	34.7	6.4	52.7	0.1	0.4	12.1	2.1	11.0	15.4	3.7	0	10.9	0.4	2.8	1.5	154.3
Sweden[4]	0.8		6.8		<0.01	1.9	0.4	0.4	0.05		0.1	0.5			0.2	11.1
Switzerland[5]	8.4	0.7	11.0	0.1	0.1	8.3	0.7	1.3		0.2	0	3.1	0.2		0.1	34.3
United Kingdom	10.2	0.6	8.0	0.1	0.04	2.9	0.6	2.9	0.7	0.1	0	2.5	<0.01	1.0	0.6	30.1
Total sales[6] for 31 countries (mg/PCU)	**23.8**	**2.1**	**27.7**	**0.1**	**0.2**	**8.8**	**1.4**	**7.8**	**3.7**	**2.3**	**0.2**	**4.9**	**2.5**	**2.6**	**1.0**	**89.0**
Median[7] of 31 countries (mg/PCU)	**16.6**	**1.0**	**12.6**	**0.1**	**0.2**	**6.4**	**0.9**	**4.1**	**0.5**	**1.1**	**0.1**	**3.3**	**0.8**	**1.1**	**0.5**	**51.9**

* The class 'Others' includes the following sub-classes: Imidazole derivatives (metronidazole), Nitrofuran derivatives (furazolidone) and Other antibacterials (bacitracin, furaltadone, novobiocin, rifaximin and spectinomycin). Of note is that some of the sales could be for non-food-producing animals such as companion animals, fur animals, exotic birds and racing pigeons.

1 For the countries where the injectable 3rd- and 4th-generation cephalosporins are solely or almost solely marketed for dogs and cats, the data provide a considerable overestimate for food-producing animals.

2 Polymyxins and pleuromutilins are aggregated with 'Others' for reasons of commercial confidentiality.

3 For commercial confidentiality reasons, fluoroquinolones and other quinolones are aggregated.

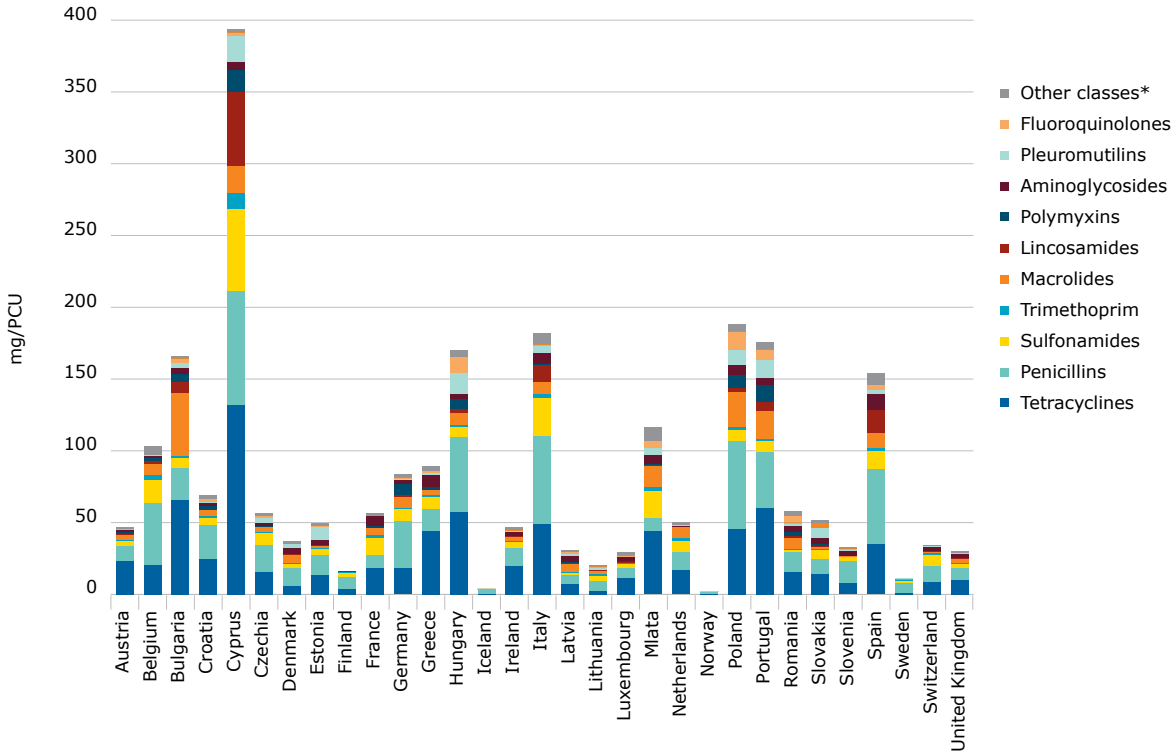
4 For commercial confidentiality reasons, amphenicols, polymyxins and pleuromutilins are aggregated with 'Others', 1st- and 2nd-generation cephalosporins are aggregated with 3rd- and 4th-generation cephalosporins and fluoroquinolones are aggregated with other quinolones.

5 For commercial confidentiality reasons, pleuromutilins are grouped with 'Others' and lincosamides are grouped with macrolides.

6 Total sales expressed in mg/PCU consist of total quantity of antimicrobial active substances sold (mg) divided by total PCU (kg) for 31 countries.

7 Median shows the 16th highest value out of 31 observed values for each antimicrobial class.

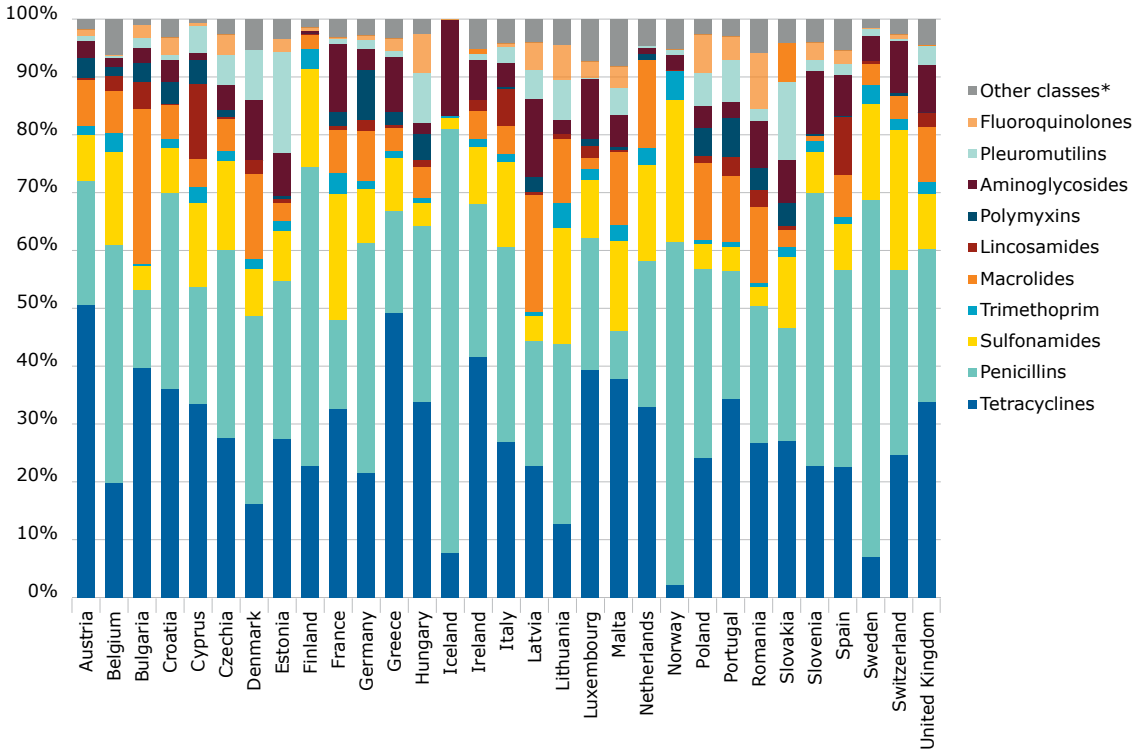
Figure 2. Sales for food-producing animals, in mg/PCU, of the various antimicrobial classes, for 31 European countries, in 2020[1]



* 'Other classes' includes amphenicols, cephalosporins, other quinolones and 'Others'.

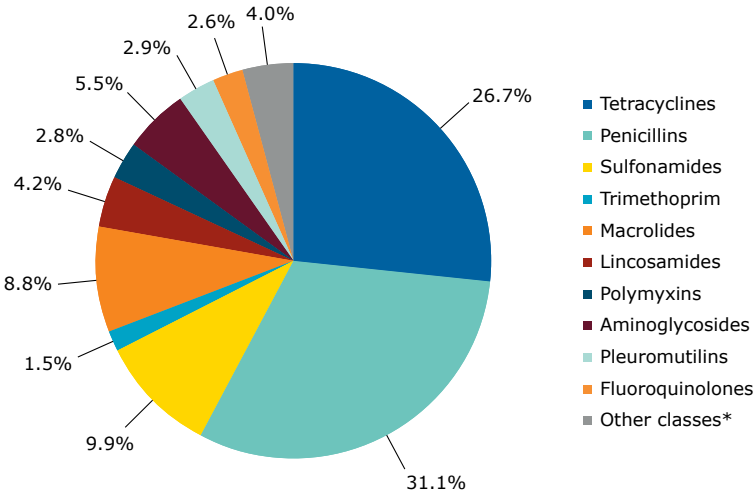
[1] Differences between countries can be partly explained by differences in animal demographics, occurrence of bacterial diseases, selection of antimicrobial agents, dosage regimes, types of data source, and veterinarians' prescribing habits.

Figure 3. Proportion of the total sales of the different antimicrobial classes, in mg/PCU, for 31 European countries, in 2020



* 'Other classes' includes amphenicols, cephalosporins, other quinolones and 'Others'.

Figure 4. Sales of antimicrobial active substances by antimicrobial class as percentages of the total sales for food-producing animals, in mg/PCU, aggregated by 31 European countries, in 2020



* 'Other classes' includes amphenicols, cephalosporins, other quinolones and 'Others'.

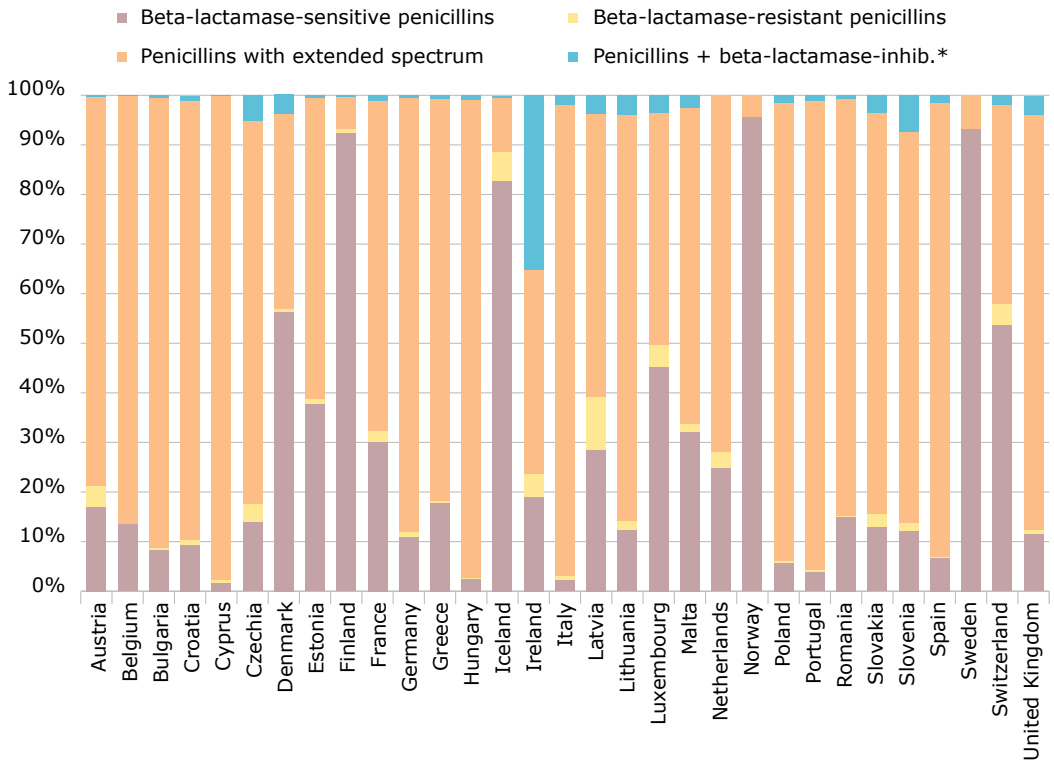
Sales of the different antimicrobial classes varied between countries (Figures 2 and 3). Differences between countries can partly be explained by differences in animal demographics, the selection of antimicrobial agents, dosage regimes, the type of data sources and veterinarians' prescribing habits.

Across all 31 countries, the sales of penicillins (31.1%), tetracyclines (26.7%) and sulfonamides (9.9%), in mg/PCU, accounted for 67.7% of the total sales in 2020 (Figure 4). Among the antimicrobial classes shown as 'Other classes' (Figure 4), of the overall sales in the 31 countries, 0.1% were accounted for by 1st- and 2nd-generation cephalosporins, 0.2% by 3rd- and 4th-generation cephalosporins, 2.3% by amphenicols and 0.2% by other quinolones.

The percentage of sales of penicillins attributed to the various subclasses differed substantially between the 31 countries (Figure 5). In the Nordic countries and Switzerland, where the proportion of sales of penicillin is typically high, beta-lactamase-sensitive penicillins[25] accounted for the majority of penicillins sold (range: 54% to 96% of total penicillins sold). For countries other than the Nordic countries and Switzerland, penicillins with an extended spectrum (mainly represented by amoxicillin) accounted for the major proportion of penicillin sales.

[25] Beta-lactamase-sensitive penicillins belong to ATCvet code QJ01CE. Procaine benzylpenicillin, penethamate hydriodide and phenoxymethylpenicillin accounted for the majority of sales of these penicillins.

Figure 5. Distribution of sales, in mg/PCU, of penicillins by subclass for food-producing animals, in 31 European countries, in 2020



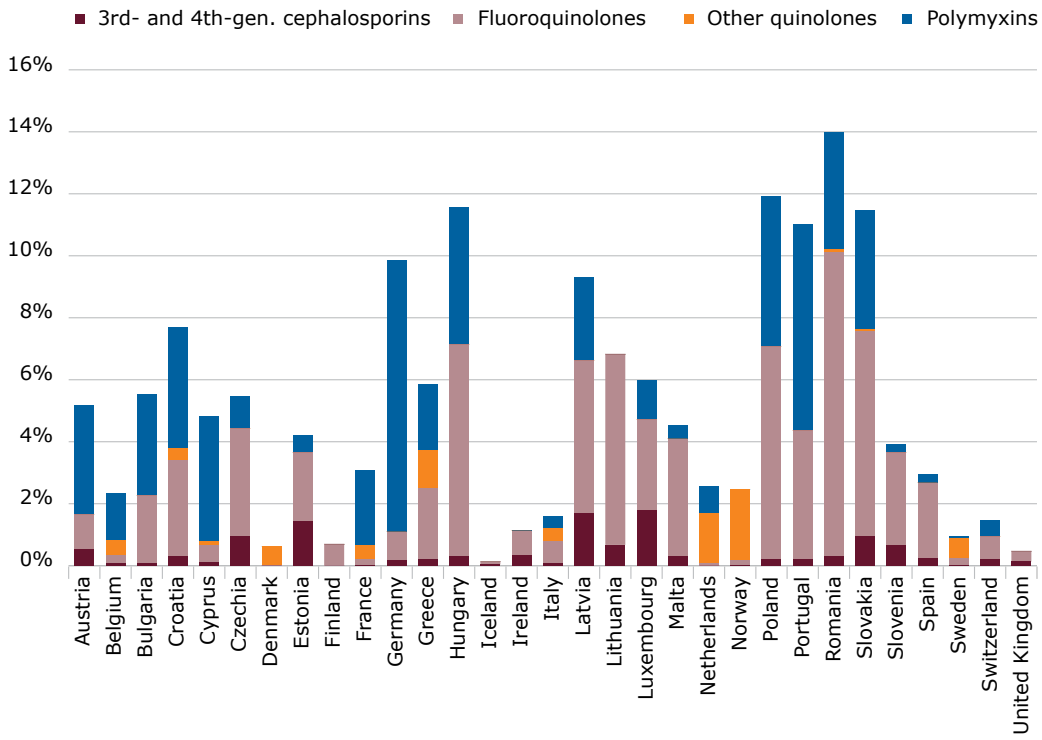
* In the ATCvet system, these are classified as combinations of penicillins that include beta-lactamase inhibitors. In 2020, all penicillins included in this group are aminopenicillins (amoxicillin, ampicillin and metampicillin).

The substances included in each of the categories in the above figure are detailed in Annex 5, Table A15. 'Penicillins plus beta-lactamase inhibitors' refers to penicillins combined with clavulanic acid.

In 2020, the proportion of sales of antimicrobials included in the AMEG Category B and classified as highest priority critically important antimicrobials (HP CIAs) by WHO (see Annex 6, Table A16), i.e. 3rd- and 4th-generation cephalosporins, fluoroquinolones, other quinolones and polymyxins, varied substantially between the 31 countries, ranging from <0.01% to 1.8%, 0.01% to 9.8%, 0% to 2.3% and 0% to 8.8%, respectively (Figure 6). The changes in total sales, in mg/PCU, of these classes/subclasses in the 31 European countries are shown in Tables 9 to 11 and Figure 31.

Overall, in the 31 countries, the sales (mg/PCU) of 3rd- and 4th-generation cephalosporins, fluoroquinolones, other quinolones and polymyxins accounted for 0.2%, 2.6%, 0.2% and 2.8%, respectively, of the total sales of antimicrobial VMPs in 2020 (Figure 4).

Figure 6. Proportion of the total sales of 3rd- and 4th-generation cephalosporins, fluoroquinolones, other quinolones and polymyxins for food-producing animals, in mg/PCU, for 31 European countries, in 2020[1,2,3]



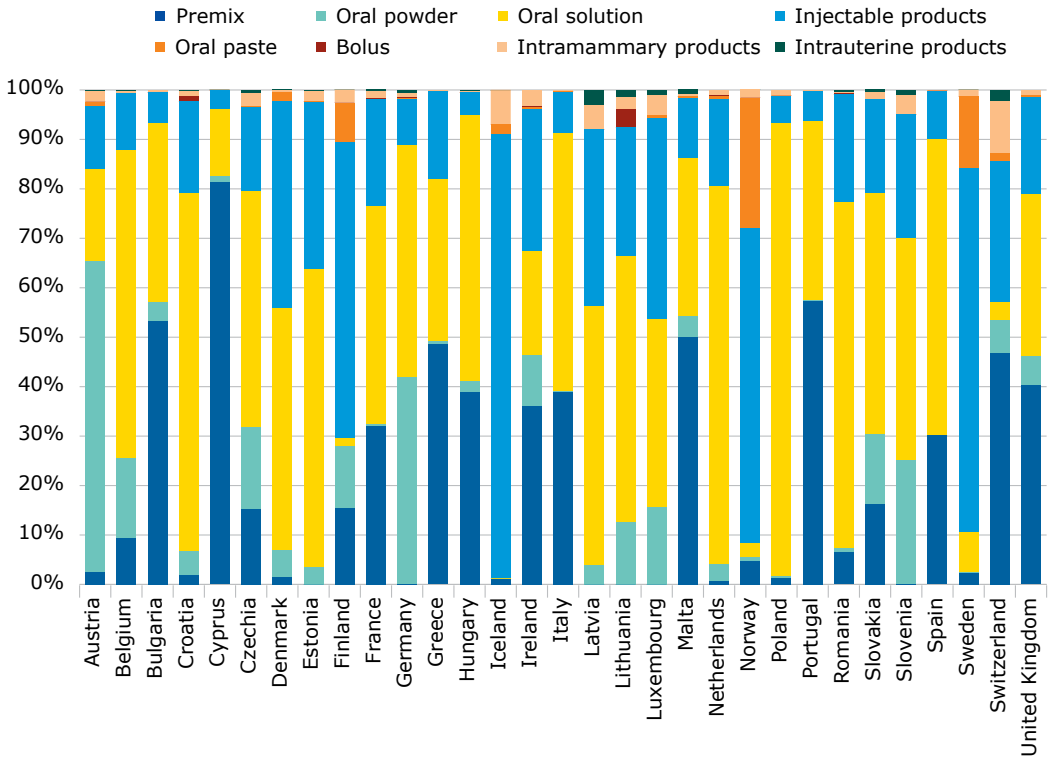
[1] Variations between the countries should be interpreted with great care due to the large differences in dosing between these classes/ subclasses of antimicrobials.
[2] No sales of other quinolones were reported for Austria, Bulgaria, Czechia, Estonia, Finland, Germany, Hungary, Iceland, Ireland, Latvia, Lithuania, Luxembourg, Malta, Poland, Portugal, Spain, Switzerland and the United Kingdom.
[3] No sales of polymyxins in Finland, Iceland and Norway.

Throughout this report, there is a special focus on certain antimicrobials that are either included in the AMEG Category B and/or are among the WHO HP CIAs. The emphasis is placed on the list of harmonised outcome indicators developed by EMA/EFSA/ECDC at the request of the EC. The aim of establishing such indicators is to assist EU Member States in assessing their progress in reducing the use of antimicrobials and antimicrobial resistance in both humans and food-producing animals.

2.3. Population-adjusted sales for food-producing animals by product form

The sales of antimicrobial VMPs for food-producing animals, stratified into product forms, by country, are shown in Figure 7. Tablets are not included in the data as they are used almost solely in companion animals.

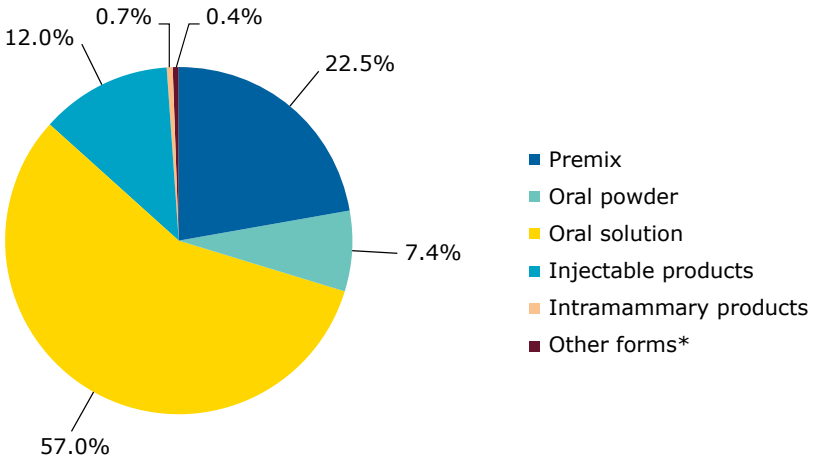
Figure 7. Distribution of sales of antimicrobial VMPs for food-producing animals, in mg of active substance per population correction unit (mg/PCU), by product form, in 31 European countries, in 2020



The proportions accounted for by premixes and oral powders vary considerably between the countries, which may be attributed to whether or not the farmers in the country administer medicated feed prepared by a feed mill from premixes, or whether group treatment is carried out by the application of oral powder as, for example, top dressing on the feed at the farm. It may also be influenced by the distribution of animal species, as group medication is used mainly in poultry and pigs, and less, for example, in sheep or goats. The products available as well as national policies for in-feed medication can also influence the sales patterns in terms of pharmaceutical form and route of administration.

As shown in Figure 8, aggregated by the 31 countries, sales (mg/PCU) of premixes accounted for 22.5% of the overall sales, 7.4% of sales were of oral powders and 57% were of oral solutions — i.e. 86.9% of sales were of VMPs used for group treatment; 12.0% of sales were of injectable products, 0.7% were of intramammary products and 0.4% were of oral pastes, boluses and intrauterine products.

Figure 8. Distribution of sales, in mg/PCU, of the various product forms of antimicrobial VMPs for food-producing animals, aggregated by the 31 European countries, in 2020



* 'Other forms' includes oral pastes, boluses and intrauterine products.

Oral powders that can be administered both via feed and oral solution are reported in ESVAC as oral powders. Although a small proportion of oral powders and oral solutions are suitable for treatment of single animals or a very limited number of animals, the overall sales figures for these product forms provide a reasonable estimate of sales for group treatment, including groups in one pen/farm[26].

Additional graphs showing the distribution of sales for the highest-selling antimicrobial classes and the HP CIAs by product form, aggregated by the 31 European countries, can be found in Annex 1, Tables A4-A7.

[26]Recently, a thorough analysis of the provisions concerning oral administration of veterinary medicinal products, as detailed in Regulation (EU) 2019/6, and of the preparation and administration of medicated feed, as detailed in Regulation (EU) 2019/4 was carried out (https://www.ema.europa.eu/en/documents/regulatory-procedural-guideline/advice-implementing-measures-under-article-106-6-regulation-eu-2019/6-veterinary-medicinal-products-scientific-problem-analysis-recommendations-ensure-safe-efficient_en.pdf). One of the recommendations was that oral powders, granules or similar pharmaceutical forms administered to terrestrial animals via solid feed, including VMPs administered via top-dressing, should be restricted to use in individual animals only. Therefore, the classification of group treatment included in the ESVAC analysis could be adjusted in the future, once these recommendations are fully implemented by the Member States.

2.4. Distribution of sales for food-producing animals – overall and by antimicrobial class and product form

2.4.1. Distribution of overall sales of antimicrobial VMPs for food-producing animals

Figure 9. Spatial distribution of overall sales of all antimicrobials for food-producing animals, in mg/PCU, for 31 countries, in 2020 – see also Figure 7.

2.4.2. Distribution of sales of 3rd- and 4th-generation cephalosporins

Figure 10. Spatial distribution of sales of 3rd- and 4th-generation cephalosporins for veterinary use, in mg/PCU, by country, in 2020

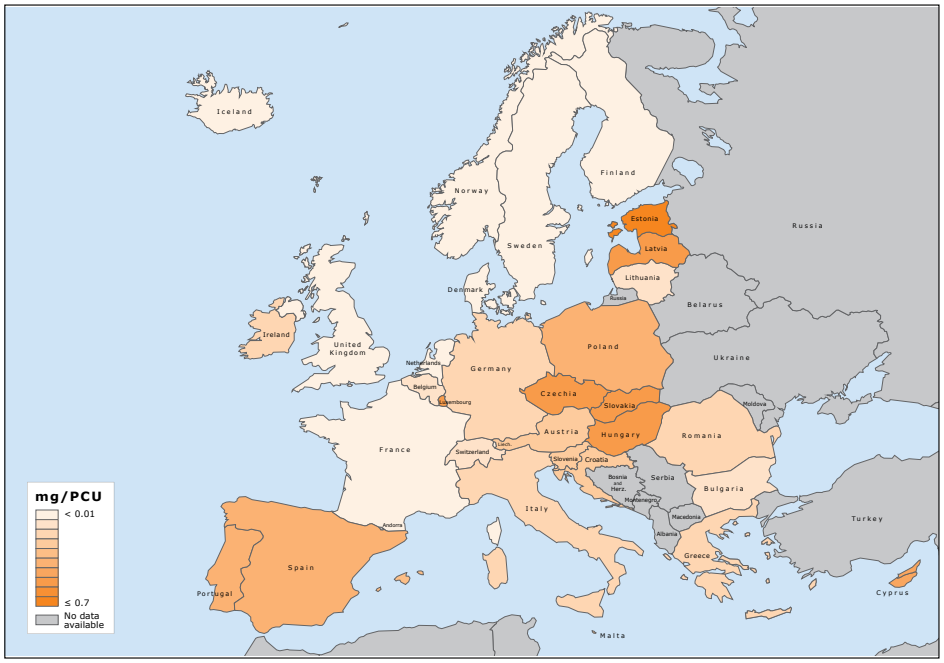
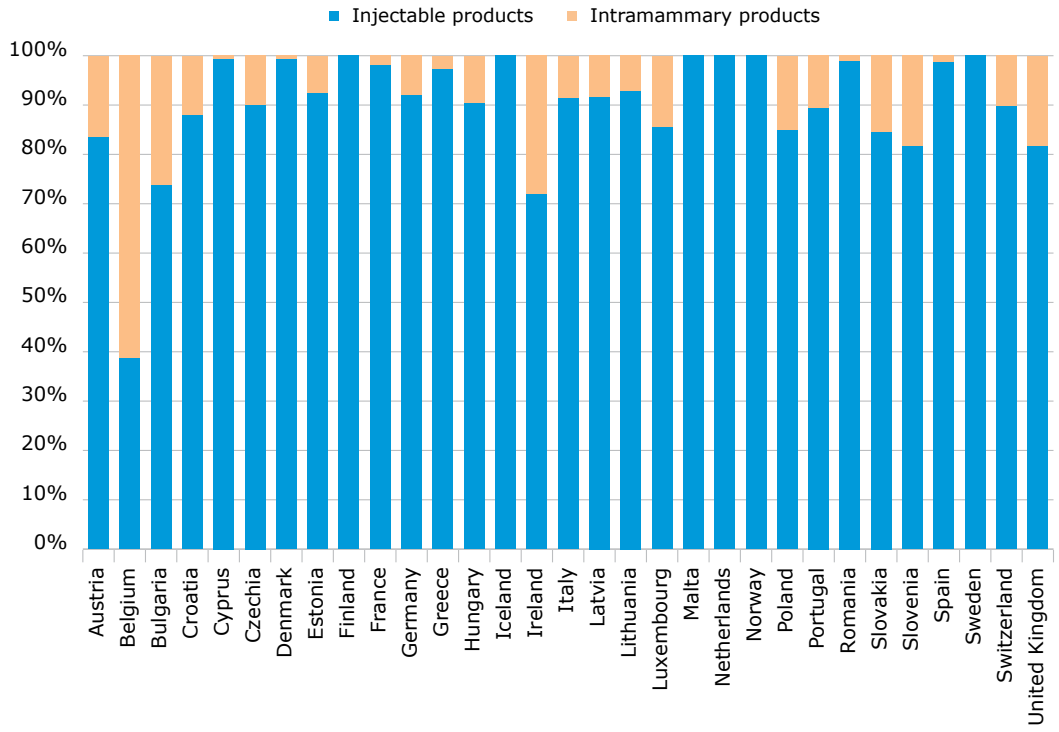


Figure 11. Distribution of sales of 3rd- and 4th-generation cephalosporins for veterinary use by product form, in mg/PCU, by country, in 2020[1,2,3]

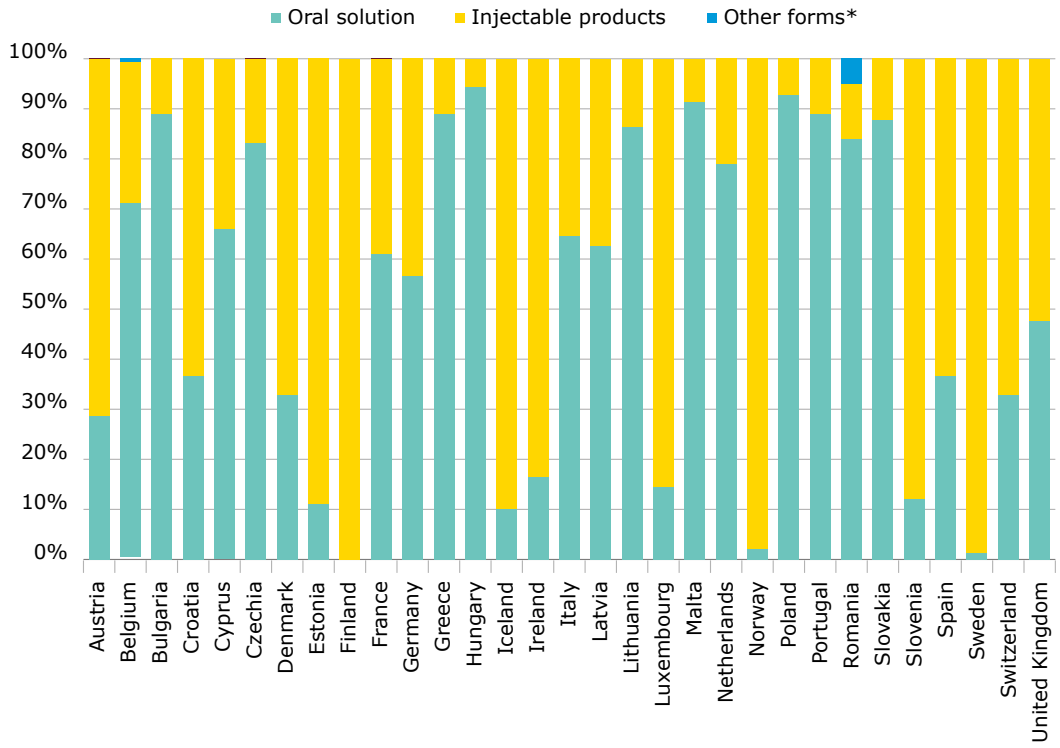


[1] Sales <1 kg in Finland, Iceland, Netherlands and Norway.
[2] No sales of intramammary products reported for Finland, Iceland, Malta, Netherlands, Norway and Sweden.
[3] For countries where the injectable 3rd- and 4th-generation cephalosporins are solely or almost solely marketed for dogs and cats, the data provide a considerable overestimate for food-producing animals.

2.4.3. Distribution of sales of fluoroquinolones

Figure 12. Spatial distribution of sales of fluoroquinolones for veterinary use, in mg/PCU, by country, in 2020

Figure 13. Distribution of sales of fluoroquinolones for veterinary use by product form, in mg/PCU, by country, in 2020[1]



* 'Other forms' includes negligible quantities sold as boluses, oral powders, premixes and/or intrauterine products in some countries.

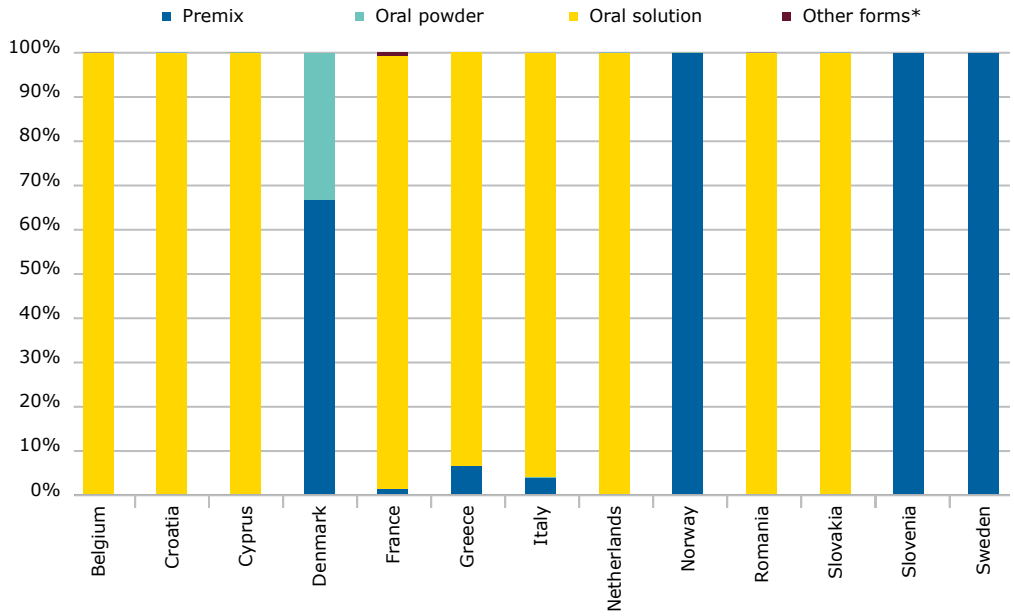
[1] In Iceland, sales of fluoroquinolones were <1 kg.

2.4.4. Distribution of sales of other quinolones

Figure 14. Spatial distribution of sales of other quinolones for veterinary use, in mg/PCU, by country, in 2020[1]

[1] No sales reported in Austria, Bulgaria, Czechia, Estonia, Finland, Germany, Hungary, Iceland, Ireland, Latvia, Lithuania, Luxembourg, Malta, Poland, Portugal, Spain, Switzerland and the United Kingdom.

Figure 15. Distribution of sales of other quinolones for veterinary use by product form, in mg/PCU, by country, in 2020[1,2]



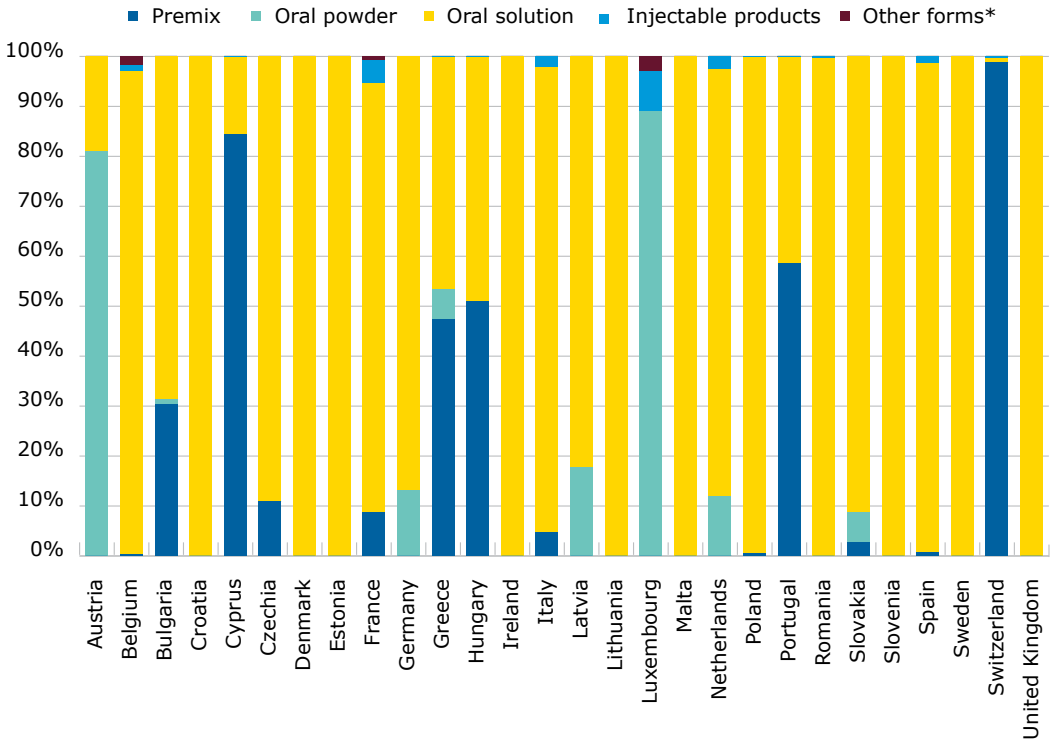
* 'Other forms' includes negligible quantities sold as injectable products, boluses and/or oral pastes in some countries.
[1] No sales of other quinolones in Austria, Bulgaria, Czechia, Estonia, Finland, Germany, Hungary, Iceland, Ireland, Latvia, Lithuania, Luxembourg, Malta, Poland, Portugal, Spain, Switzerland and the United Kingdom.
[2] In Slovenia, sales of other quinolones were <1 kg.

2.4.5. Distribution of sales of polymyxins

Figure 16. Spatial distribution of sales of polymyxins for veterinary use, in mg/PCU, by country, in 2020[1]

[1] No sales in Finland, Iceland and Norway.

Figure 17. Distribution of sales of polymyxins for veterinary use by product form, in mg/PCU, by country, in 2020[1]



* 'Other forms' includes negligible quantities sold as boluses, oral pastes and/or intramammary products in some countries.
[1] No sales in Finland, Iceland and Norway.

2.5. Distribution of the PCU by species and country

The value of the denominator (PCU) for the various species and countries is shown in Table 6. The EU countries included in the ESVAC 2020 data cover almost 100% of the food-producing animal population in the EU measured as PCU.

Distribution of the various food-producing animals by country, expressed by PCU, is shown in Table 6 and Figures 18 and 19.

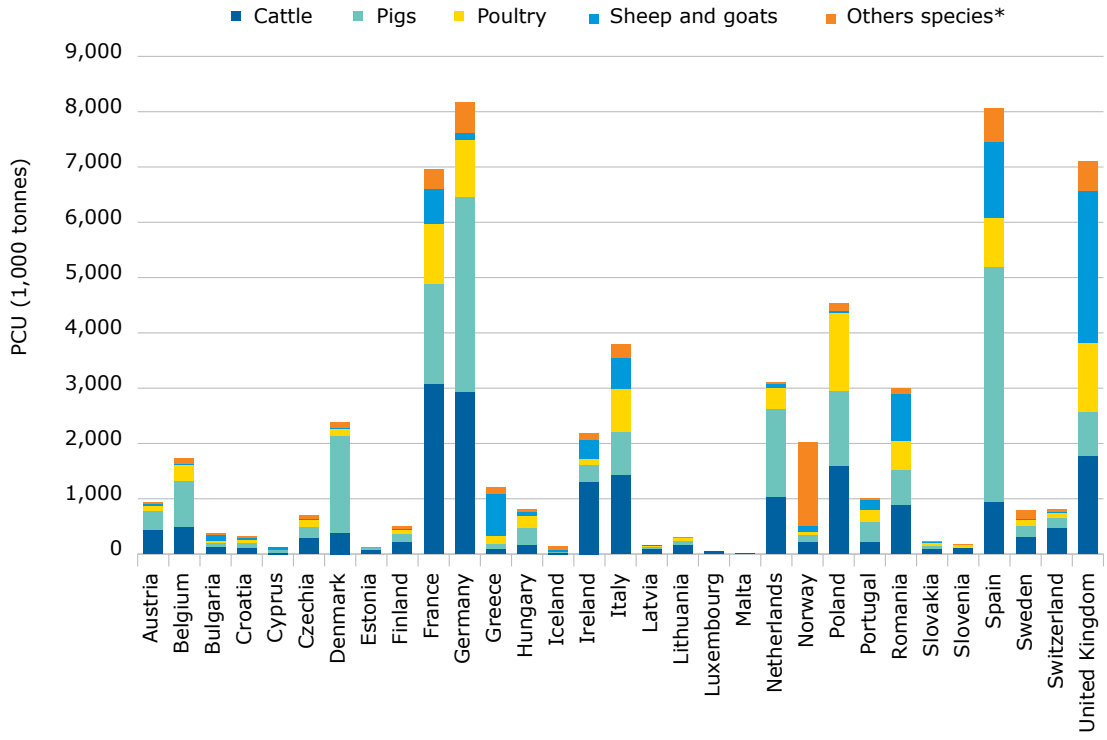
Overall, pigs, cattle, poultry and sheep along with goats accounted for 32%, 31%, 15% and 13%, respectively, of the PCU in the 31 countries.

Table 6. Estimated PCU (in 1,000 tonnes) of the population of food-producing animals[1,2], by country, in 2020

Country	Cattle	Pigs	Poultry	Sheep and goats	Fish	Rabbits	Horses	Total
Austria	422	357	89	36	0	0	38	942
Belgium	484	832	285	19	0	4	122	1,745
Bulgaria	114	76	42	100	14	<0.01	23	368
Croatia	103	92	49	52	21	0.01	11	329
Cyprus	20	45	13	43	0	0.1	2	123
Czechia	288	199	131	16	20	7	39	699
Denmark	380	1,754	123	12	46	0	70	2,385
Estonia	59	43	2	5	1	0	5	116
Finland	207	146	85	12	15	0	30	494
France	3,065	1,811	1,087	644	46	39	272	6,965
Germany	2,922	3,534	1,022	132	19	23	520	8,173
Greece	77	103	144	759	129	2	2	1,217
Hungary	152	315	211	82	9	8	24	801
Iceland	19	6	6	41	41	0	23	135
Ireland	1,304	294	111	344	38	0	100	2,190
Italy	1,424	782	766	571	59	30	157	3,790
Latvia	88	36	23	8	0	0.04	3	158
Lithuania	157	71	57	11	2	0.04	6	303
Luxembourg	42	10	0.1	1	0	0	2	54
Malta	4	5	2	1	0	0.1	2	15
Netherlands	1,021	1,597	382	72	6	0.5	36	3,115
Norway	213	120	69	92	1,486	0	50	2,031
Poland	1,583	1,370	1,409	21	40	2	116	4,542
Portugal	212	359	229	178	13	6	15	1,012
Romania	886	618	534	850	7	<0.01	108	3,004
Slovakia	83	60	52	26	2	<0.01	6	228
Slovenia	94	18	43	9	2	<0.01	10	176
Spain	935	4,253	888	1,372	310	57	252	8,068
Sweden	295	201	114	25	10	0	142	786
Switzerland	463	188	78	31	0	1	45	806
United Kingdom	1,768	795	1,251	2,744	218	0	339	7,115
Total 31 countries	**18,888**	**20,087**	**9,299**	**8,307**	**2,552**	**179**	**2,571**	**61,884**

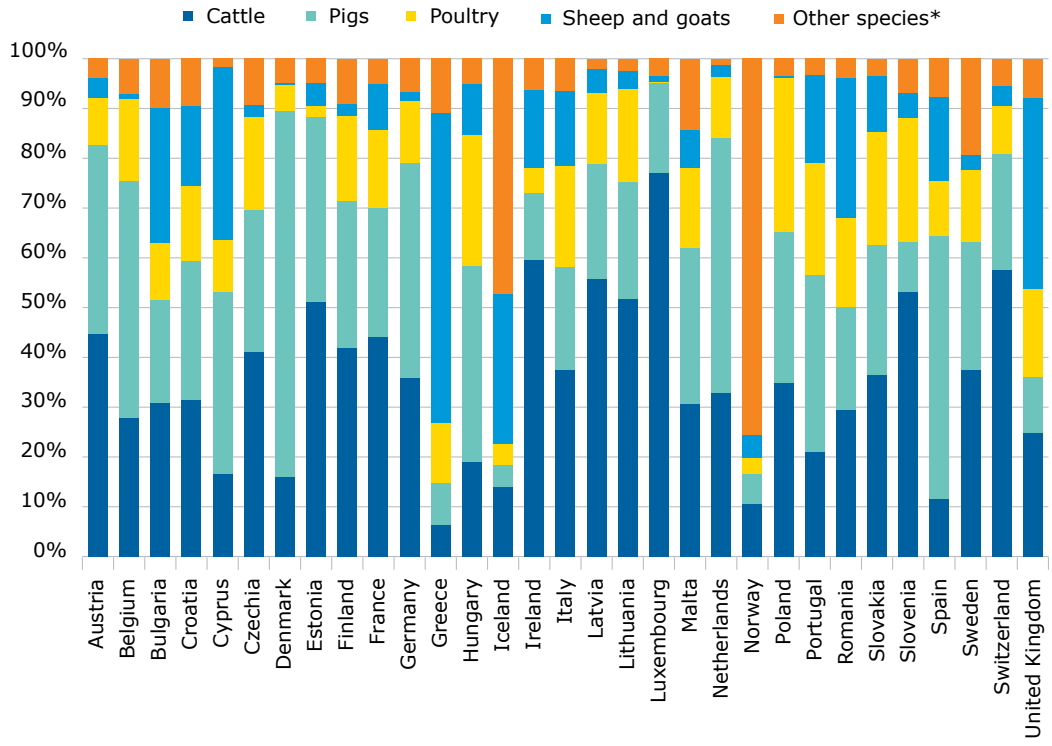
[1] See Annex 4 for details regarding animal species and categories included in the calculation of the PCU.
[2] When PCU is given as zero it indicates insignificant or no production of animals of specific species.

Figure 18. The denominator (PCU) and its distribution by the food-producing animal species (1 PCU = 1 kg), by country, in 2020



* 'Other species' includes horses and, for some countries, farmed fish and/or rabbits.

Figure 19. Distribution of the denominator (PCU) in weight by the food-producing animal species, by country, in 2020



* 'Other species' includes horses and, for some countries, farmed fish and/or rabbits.

In 2020, of the 31 countries, 12 had net exports of animals for slaughter or fattening to other Member States which accounted for ≥5% of the total denominator (PCU), whilst 13 countries had a net import accounting for ≥5% of the total denominator.

Table 7. Domestic PCU, net export and net import PCU (in 1,000 tonnes) of animals for fattening or slaughter to or from other Member States and total PCU (net balance) in 2020

Country	PCU - domestic	PCU - export	Proportion, export	PCU - import	Proportion, import	Total PCU
Austria	1,016	11	1%	85	9%	942
Belgium	1,759	195	11%	208	12%	1,745
Bulgaria	372	0.1	0.02%	4	1%	368
Croatia	337	32	10%	40	12%	329
Cyprus	123	0.02	0.02%	0.1	0.1%	123
Czechia	628	80	11%	8	1%	699
Denmark	1,975	409	17%	<0.01	<0.01%	2,385
Estonia	105	12	10%	1	0.5%	116
Finland	494	1	0.1%	<0.01	<0.01%	494
France	6,666	342	5%	43	1%	6,965
Germany	8,252	388	5%	468	6%	8,173
Greece	1,226	0.04	<0.01%	10	1%	1,217
Hungary	823	59	7%	81	10%	801
Iceland	135	0	0%	0.02	0.02%	135
Ireland	2,140	64	3%	15	1%	2,190
Italy	4,036	3	0.1%	249	7%	3,790
Latvia	148	18	11%	8	5%	158
Lithuania	300	18	6%	15	5%	303
Luxembourg	46	13	24%	4	8%	54
Malta	15	0.01	0.04%	0.04	0.3%	15
Netherlands	3,120	393	13%	398	13%	3,115
Norway	2,031	0	0%	0	0%	2,031
Poland	4,786	11	0.2%	255	6%	4,542
Portugal	1,053	38	4%	79	8%	1,012
Romania	3,008	40	1%	45	1%	3,004
Slovakia	187	66	29%	24	11%	228
Slovenia	167	16	9%	8	4%	176
Spain	8,189	98	1%	220	3%	8,068
Sweden	786	0.01	<0.01%	<0.01	<0.01%	786
Switzerland	806	1	0.1%	1	0.2%	806
United Kingdom	7,150	9	0.1%	44	1%	7,115

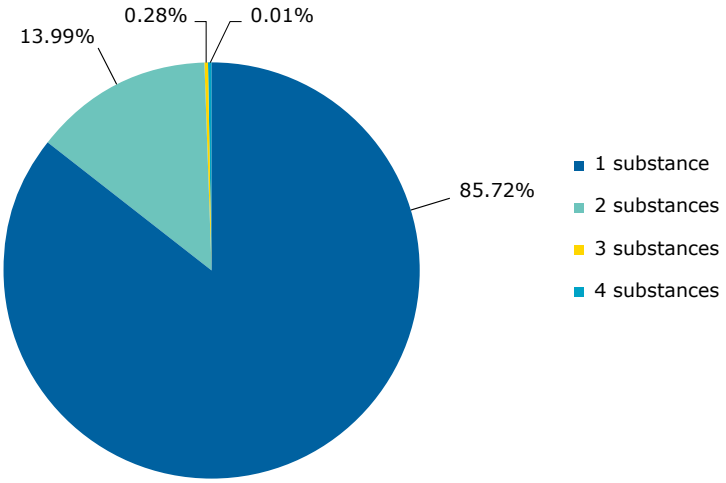
2.6. Distribution of single- and multiple-active substance VMPs

Of the 9,657 VMP presentations (tablets excluded) for which sales were reported, 84.2% (n=8,133) contained only one active substance, 13.6% (n=1,314) contained two active substances and 2% (n=197) contained three active substances (Annex 1, Table A7). In addition, 0.1% (n=13) of the product presentations contained four active substances. Sales of VMPs with three active substances were accounted for almost exclusively by products for individual treatment (injections, intramammary and intrauterine products).

For all 31 countries, 86.9% of the VMP presentations were for group treatment[27], i.e. premixes, oral powders and oral solutions (Figure 8). Of these, 87.5% contained one antimicrobial active substance, 11.4% contained two antimicrobial active substances and 1% contained three antimicrobial active substances (Annex 1, Table A8).

Across the 31 countries, of the total sales of premixes, oral powders and oral solutions, in tonnes of antimicrobial active substance, 85.72%, 13.99% and 0.28% were accounted for by VMPs containing one, two and three antimicrobial active substances, respectively (Figure 20).

Figure 20. Percentage of sales for veterinary use, in tonnes of antimicrobial active substance, of premixes, oral powders and oral solutions containing 1, 2, 3 and 4 antimicrobial active substances, in 2020



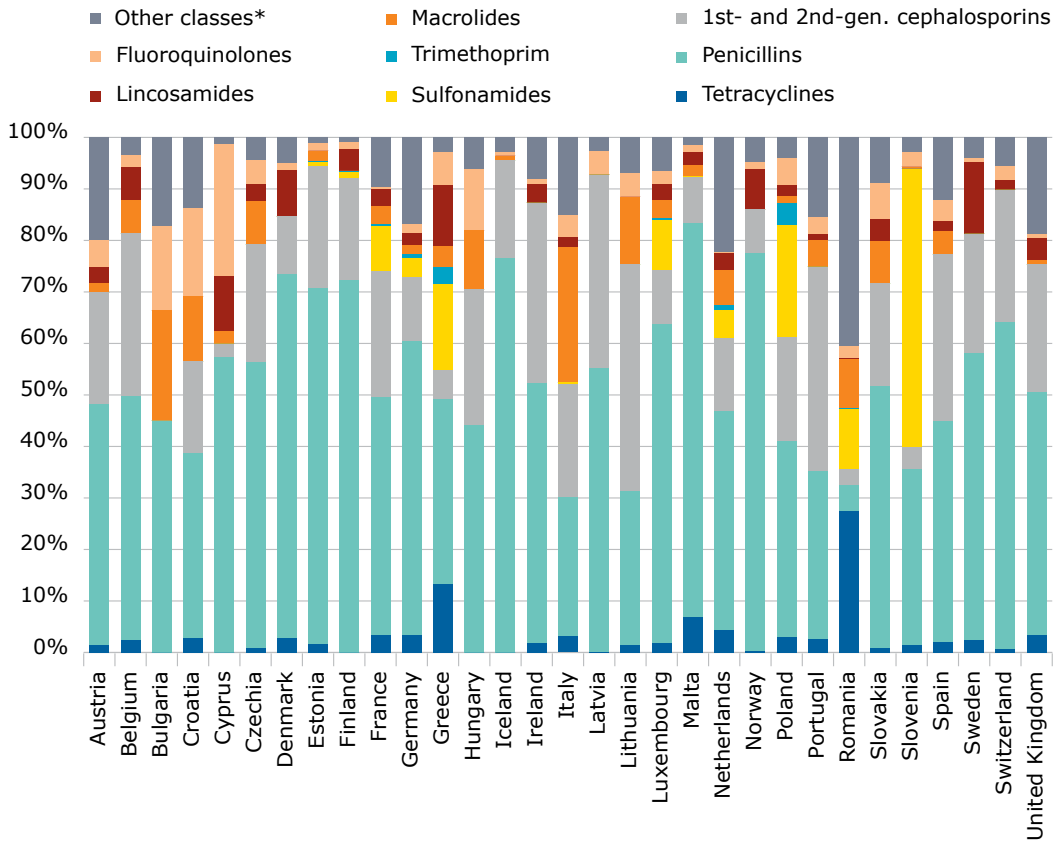
2.7. Sales of tablets by antimicrobial class for companion animals

Tablets are excluded from the dataset used to report sales for food-producing animals in mg/PCU based on the assumption that tablets are used almost solely for companion animals. Figure 21 shows the distribution of sales of tablets, in tonnes of active substance, by antimicrobial class and country, for 2020. The sales patterns for tablets varied substantially between countries, but in general the highest-selling tablets contained penicillins (mainly in combination with a beta-lactamase inhibitor, see Figure 22).

Data presented in Figure 21 covers sales of tablets containing antimicrobials marketed for veterinary use and should be interpreted as such. In the current report, all injectable veterinary antimicrobial products are included in the sales data for food-producing animals, but some of the injectable products are also used in companion animals and a few are only marketed for companion animals. Similarly, some tablet formulations could also be authorised for use in food-producing or fur animals (e.g. foxes, nutria and mink), so their use is not necessarily exclusively for companion animals.

[27] Please see section 2.3 for further details.

Figure 21. Distribution of sales of tablets, in tonnes of active substance, by antimicrobial class (reported according to the ATCvet hierarchical system), by country, in 2020[1,2]

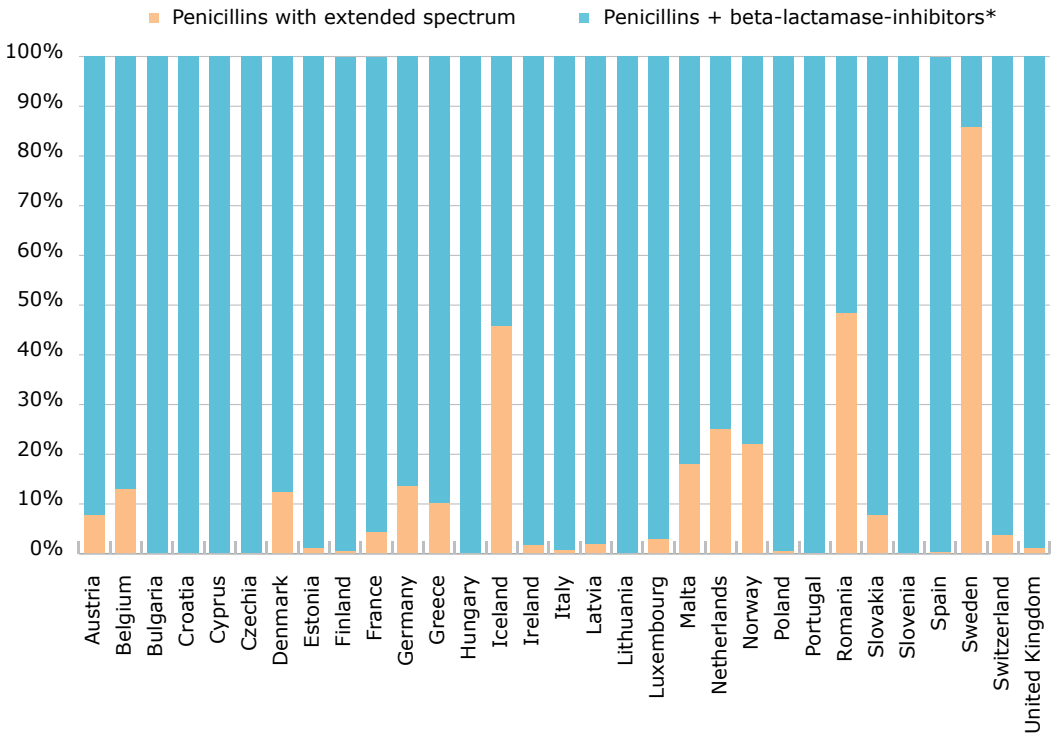


*'Other classes' includes small quantities of aminoglycosides, amphenicols, pleuromutilins and 'Others'.
[1] Some tablet formulations are authorised for use in food-producing, fur and companion animals.
[2] In Romania, 29% (0.7 tonnes) of tablets sold were indicated for food-producing or non-food-producing birds.

Aggregated by the 31 countries, penicillins (43.9%), 1st- and 2nd-generation cephalosporins (20.7%), 'others' (13.3%), macrolides (5.6%) and sulfonamides (5.1%) were the highest-selling antimicrobial classes of tablets.

The sales (in tonnes of active substance) of penicillin tablets varied significantly in terms of distribution by penicillin subclasses in the 31 countries (Figure 22). Combinations of penicillins with beta-lactamase inhibitors ranged from 14% to 100% (in six countries) of the total sales of penicillin tablets (sales of clavulanic acid are not included in the data submitted).

Figure 22. Distribution of sales (by quantity of active substance) of tablets containing penicillins by subclass, by country, in 2020[1,2]



* In the ATCvet system, classified as combinations of penicillins which include penicillins + beta-lactamase inhibitors.
[1] Some tablet formulations are authorised for use in food-producing, fur and companion animals.
[2] No sales of penicillins with extended spectrum in Bulgaria, Croatia, Cyprus, Hungary, Lithuania and Slovenia.

2.8. Changes over time

This chapter presents the changes over time for all participating countries for the highest-selling classes (tetracyclines, penicillins and sulfonamides) and the antimicrobials belonging to AMEG Category B, i.e. 3rd- and 4th-generation cephalosporins, fluoroquinolones, other quinolones and polymyxins. In addition, changes over time are presented for macrolides, which are also authorised for use in food-producing animals and are classified by WHO as the HP CIAs for human medicine (Table A16).

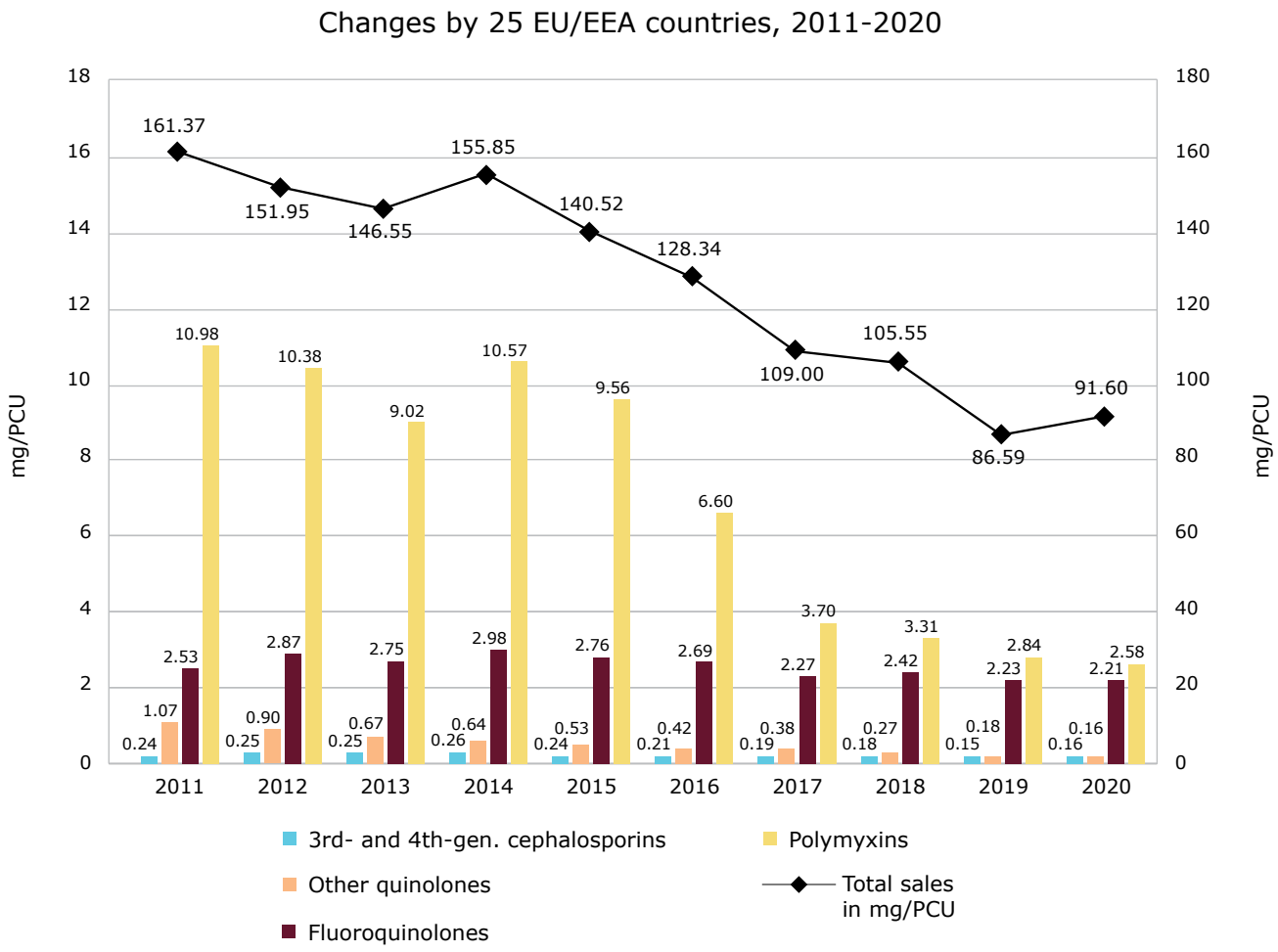
2.8.1. Changes in sales (mg/PCU) from 2011 to 2020, aggregated by 25 countries

For the 25 countries that reported sales data to ESVAC for every year from 2011 to 2020, an overall decrease in sales of 43.2% (mg/PCU) was observed (Figure 23).

For the period 2011 to 2020, 19 out of the 25 countries had a drop in sales (mg/PCU) of more than 5%. Over the same period, in 4 out of the 25 countries, sales increased by more than 5% (Table 8).

During the period 2011-2020, sales (mg/PCU) of 3rd- and 4th-generation cephalosporins decreased by 32.8%, sales of polymyxins decreased by 76.5%, sales of fluoroquinolones decreased by 12.8% and sales of other quinolones decreased by 85.4%.

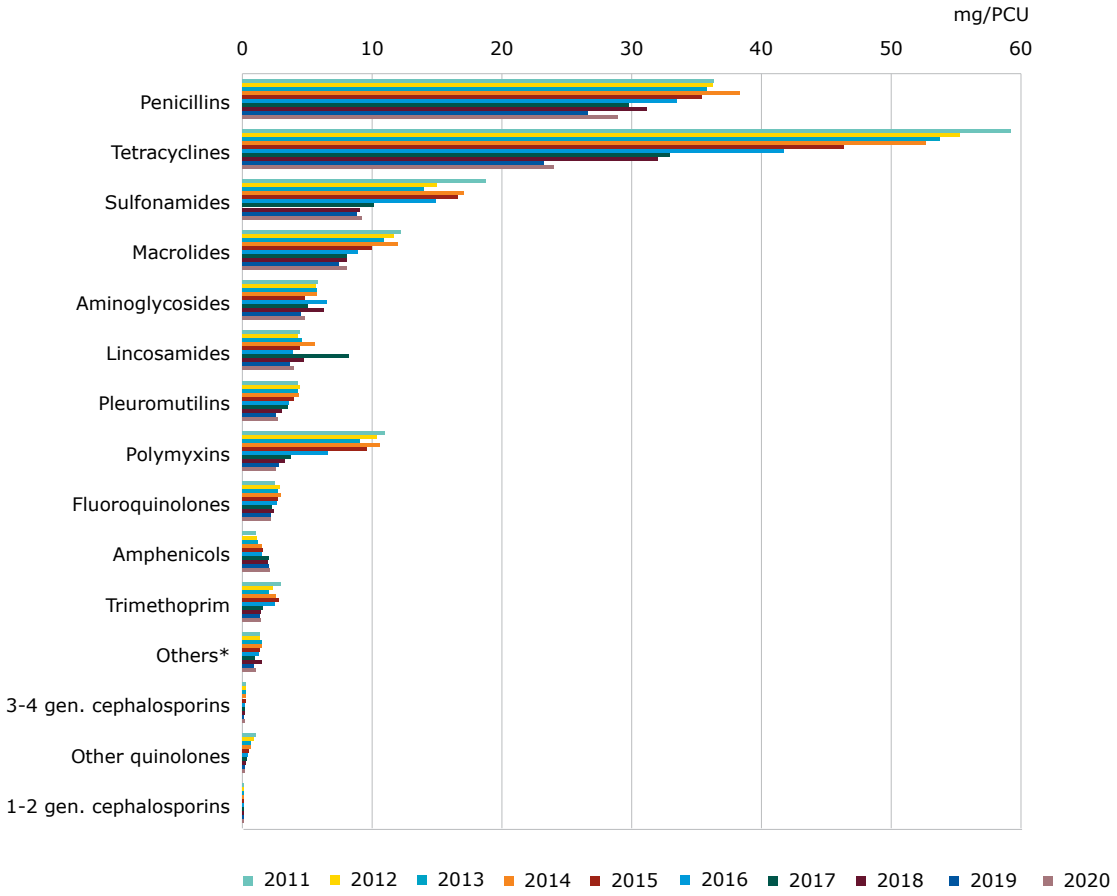
Figure 23. Changes in aggregated overall sales, sales of fluoroquinolones, other quinolones, 3rd- and 4th-generation cephalosporins and polymyxins, in mg/PCU, for 25 EU/EEA countries[1], from 2011 to 2020 (note the difference in the scales of the y-axes)



[1] Austria, Belgium, Bulgaria, Cyprus, Czechia, Denmark, Estonia, Finland, France, Germany, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden and the United Kingdom.

For those 25 countries delivering data in every year from 2011 to 2020, a decrease in sales of all antimicrobial classes has been observed, with the exception of amphenicols (Figure 24). During the period 2011 to 2020, the decline in the three highest-selling antimicrobial classes — tetracyclines, penicillins and sulfonamides — was 59.5%, 20.3% and 51.0%, respectively.

Figure 24. Changes in aggregated sales (mg/PCU) by antimicrobial class in 25 EU/EEA countries[1], from 2011 to 2020

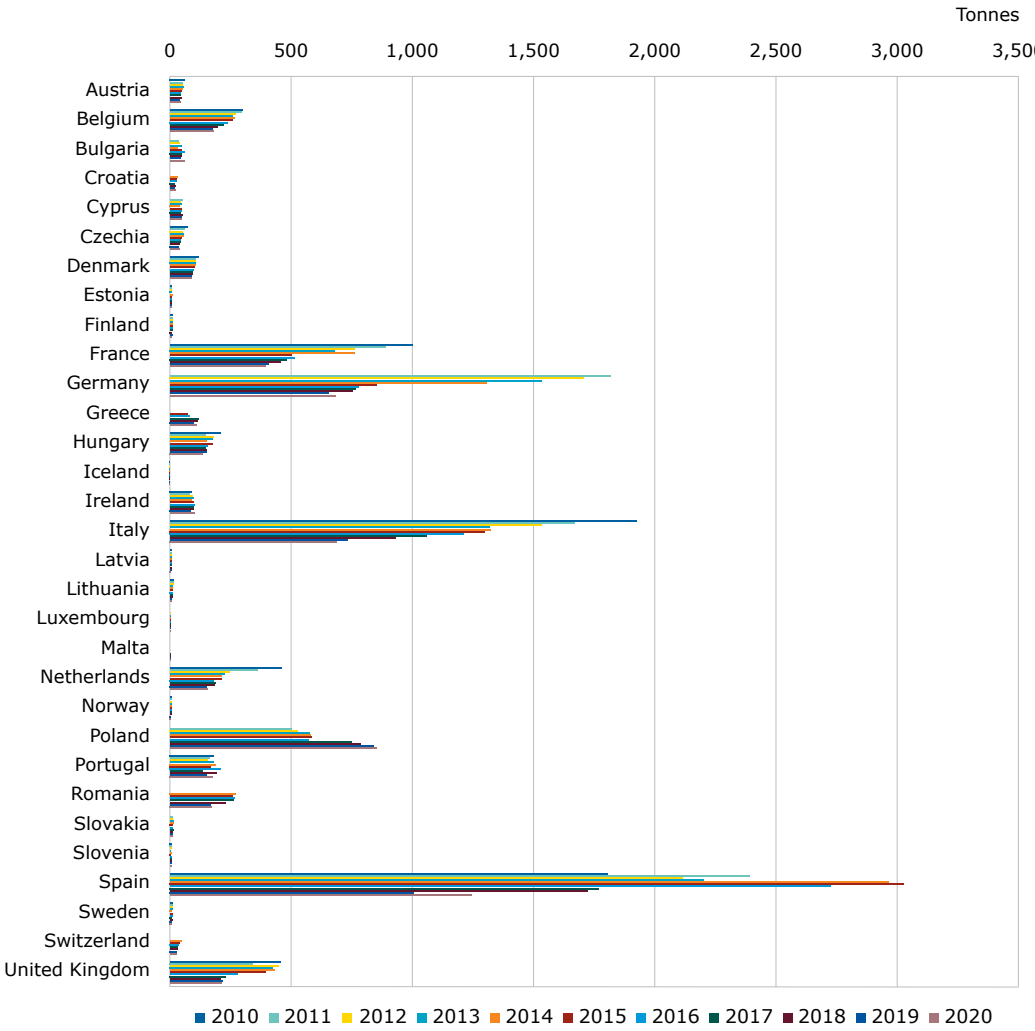


[1] Austria, Belgium, Bulgaria, Cyprus, Czechia, Denmark, Estonia, Finland, France, Germany, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden and the United Kingdom.

* The class 'Others' includes the following sub-classes: Imidazole derivatives (metronidazole), Nitrofuran derivatives (furazolidone) and Other antibacterials (bacitracin, furaltadone, natamycin, nitroxoline, novobiocin, rifaximin, spectinomycin). Of note is that some of the sales could be for non-food-producing animals such as companion animals, fur animals, exotic birds and racing pigeons.

2.8.2. Changes in sales of active substances in tonnes, by country

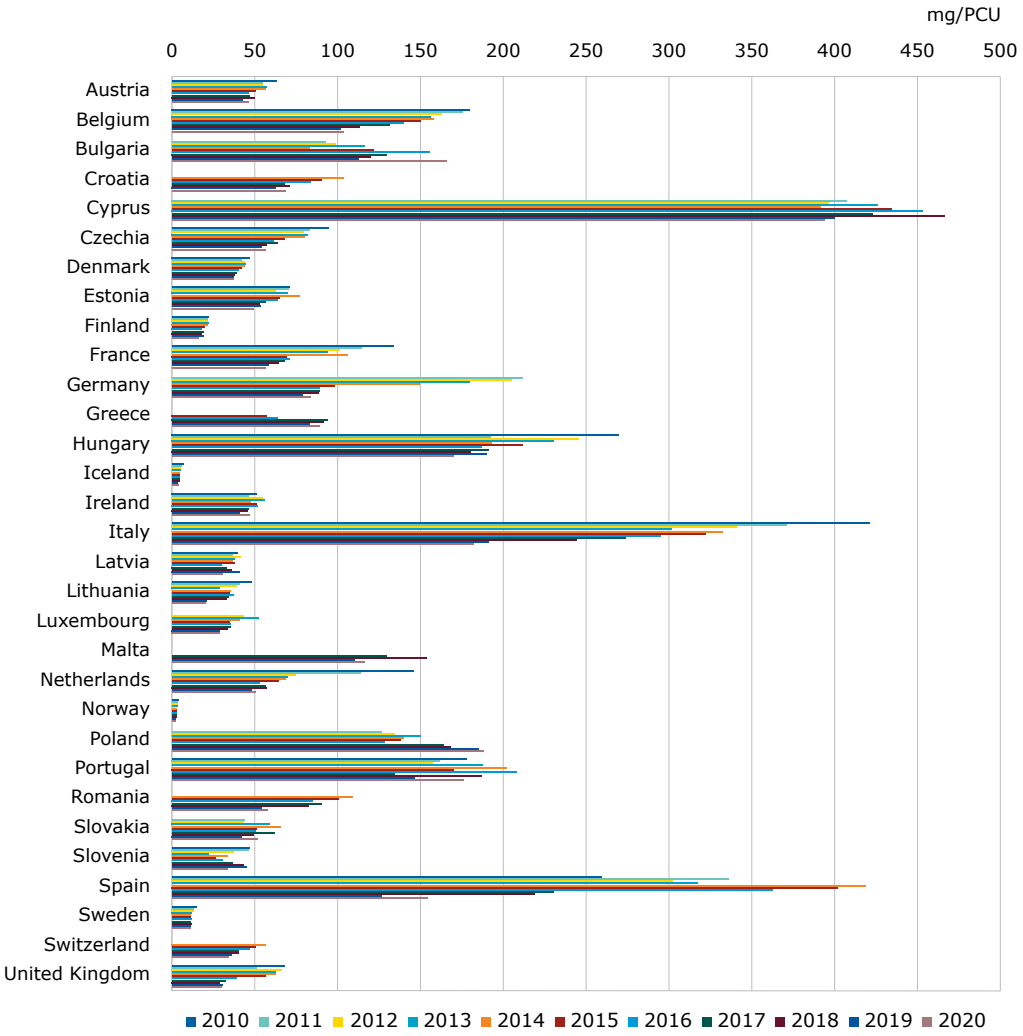
Figure 25. Sales of antimicrobial active substances for food-producing animals, in tonnes, by country, from 2010 to 2020[1-13]



[1] Corrections to sales data as published in the ESVAC 2019 and 2020 report are described in Chapter 1.5. These include the historical corrections to conversion factors in 2010–2018.
[2] Strengths reported as active moiety for the great majority of the antimicrobial VMPs from 2019 onwards.
[3] For Bulgaria, under-reporting was identified in the 2011, 2012, 2014 and 2015 data, as several wholesalers failed to report data. For 2020, data are overestimated as double reporting of sales could not be excluded.
[4] For Croatia, double reporting was observed for sales of several VMPs between 2014 and 2017 and under-reporting was identified in the 2018 sales data.
[5] For Czechia, strength reported as the active moiety for most VMPs for 2011–2012; for 2013–2018, strength reported as on the labels of the VMPs.
[6] For Italy, sales data represent sales from MAHs to wholesalers and feed mills for 2010–2019. For 2020, they represent sales of premixes from MAHs to wholesalers, and for all other pharmaceutical forms, dispensed e-prescriptions obtained from wholesalers and pharmacies to veterinarians, farmers and companion animal owners.
[7] For the Netherlands, strength reported as the active moiety for some VMPs for 2011–2012; for 2013–2018, strength reported as on the labels of the VMPs.
[8] For Portugal, under-reporting has been identified for 2010–2014, 2017 and 2019.
[9] For Romania, 2014 data were updated, as wholesalers initially failed to deliver all sales data.
[10] For Slovakia, for 2011 and 2012, the data only represent antimicrobial VMPs imported by wholesalers; from 2013, the data represent all sales from wholesalers to end-users (veterinarians, pharmacies, producers of medicated feed and farmers) of VMPs obtained by import and from national manufacturers.
[11] For Spain, under-reporting has been identified for 2010 to 2013 (underestimates) and sales data providers for 2017–2020 were changed from MAHs to retailers.
[12] For Sweden, there was no reporting of sales for use in farmed fish in 2012 and under-reporting in 2017.
[13] For the United Kingdom, sales of certain tetracycline-containing VMPs were high in late 2010. These VMPs were probably used in 2011 and thus their use has been underestimated for 2011.

2.8.3. Changes in overall sales in mg/PCU, by country

Figure 26. Total sales of antimicrobial VMPs for food-producing animals, including horses and farmed fish, in mg/PCU, by country, from 2010 to 2020[1-13]



[1] Corrections to sales data as published in the ESVAC 2019 and 2020 report are described in Chapter 1.5. These include the historical corrections to conversion factors in 2010–2018.
[2] Strengths reported as active moiety for the great majority of the antimicrobial VMPs from 2019 onwards.
[3] For Bulgaria, under-reporting was identified in the 2011, 2012, 2014 and 2015 data, as several wholesalers failed to report data. For 2020, data are overestimated as double reporting of sales could not be excluded.
[4] For Croatia, double reporting was observed for sales of several VMPs between 2014 and 2017 and under-reporting was identified in the 2018 sales data.
[5] For Czechia, strength reported as the active moiety for most VMPs for 2011–2012; for 2013–2018, strength reported as on the labels of the VMPs.
[6] For Italy, sales data represent sales from MAHs to wholesalers and feed mills for 2010–2019. For 2020, they represent sales of pre-mixes from MAHs to wholesalers, and for all other pharmaceutical forms, dispensed e-prescriptions obtained from wholesalers and pharmacies to veterinarians, farmers and companion animal owners.
[7] For the Netherlands, strength reported as the active moiety for some VMPs for 2011–2012; for 2013-2018, strength reported as on the labels of the VMPs.
[8] For Portugal, under-reporting has been identified for 2010–2014, 2017 and 2019.
[9] For Romania, 2014 data were updated, as wholesalers initially failed to deliver all sales data.
[10] For Slovakia, for 2011 and 2012, the data only represent antimicrobial VMPs imported by wholesalers; from 2013, the data represent all sales from wholesalers to end-users (veterinarians, pharmacies, producers of medicated feed and farmers) of VMPs obtained by import and from national manufacturers.
[11] For Spain, under-reporting has been identified for 2010 to 2013 (underestimates) and sales data providers for 2017–2020 were changed from MAHs to retailers.
[12] For Sweden, there was no reporting of sales for use in farmed fish in 2012 and under-reporting in 2017.
[13] For the United Kingdom, sales of certain tetracycline-containing VMPs were high in late 2010. These VMPs were probably used in 2011 and thus their use has been underestimated for 2011.

For 20 out of the 25 countries that reported data for all years from 2011 to 2020, sales (mg/PCU) in 2020 were lower than sales in 2011 (range -3.3% to -60.4%) (Table 8). For five countries, sales (mg/PCU) in 2020 were higher than sales in 2011 (range 1.4% to 79.3%).

Table 8. Annual sales of antimicrobial VMPs for food-producing animals, including horses and farmed fish, in mg/PCU, by country[1,2], from 2010 to 2020

Country	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Trends 2010-2020
Austria	62.9	54.4	54.8	57.2	56.3	50.7	46.1	46.7	50.2	42.6	46.3	
Belgium	179.9	175.1	162.9	156.4	158.1	149.9	139.9	131.1	113.0	101.9	103.4	
Bulgaria[3]		92.6	98.9	116.1	82.9	121.8	155.2	129.8	119.6	112.7	166.0	
Croatia[4]					103.5	90.5	83.6	68.0	70.8	62.8	68.6	
Cyprus		407.5	396.4	425.7	391.3	434.1	453.3	423.0	466.5	399.7	393.9	
Czechia[5]	94.3	83.0	79.8	82.2	79.8	68.0	61.2	63.5	57.0	53.8	56.3	
Denmark	47.1	42.1	43.7	44.5	43.8	41.8	40.4	38.9	37.8	37.1	37.2	
Estonia	70.8	70.5	62.7	70.1	76.8	64.9	63.7	56.3	52.9	53.5	49.2	
Finland	22.0	21.3	21.3	21.8	21.8	19.9	18.1	18.9	18.2	19.1	16.2	
France	133.6	114.3	101.1	93.9	105.8	69.4	71.2	68.0	64.2	58.3	56.6	
Germany		211.5	204.8	179.7	149.3	98.2	89.2	89.1	88.4	78.6	83.8	
Greece						57.4	63.6	94.2	91.2	83.2	89.1	
Hungary	269.9	192.5	245.7	230.6	193.0	211.4	187.0	190.9	180.5	189.7	169.9	
Iceland	6.8	6.0	5.4	4.9	4.8	4.7	4.5	4.4	4.8	3.5	3.8	
Ireland	51.4	46.4	54.8	55.7	47.5	50.8	52.0	46.5	45.9	40.8	47.0	
Italy[6]	421.1	371.0	340.9	301.5	332.3	321.9	294.7	273.7	244.0	191.1	181.8	
Latvia	39.4	36.7	41.5	37.6	36.6	37.6	29.9	33.2	35.9	41.1	30.8	

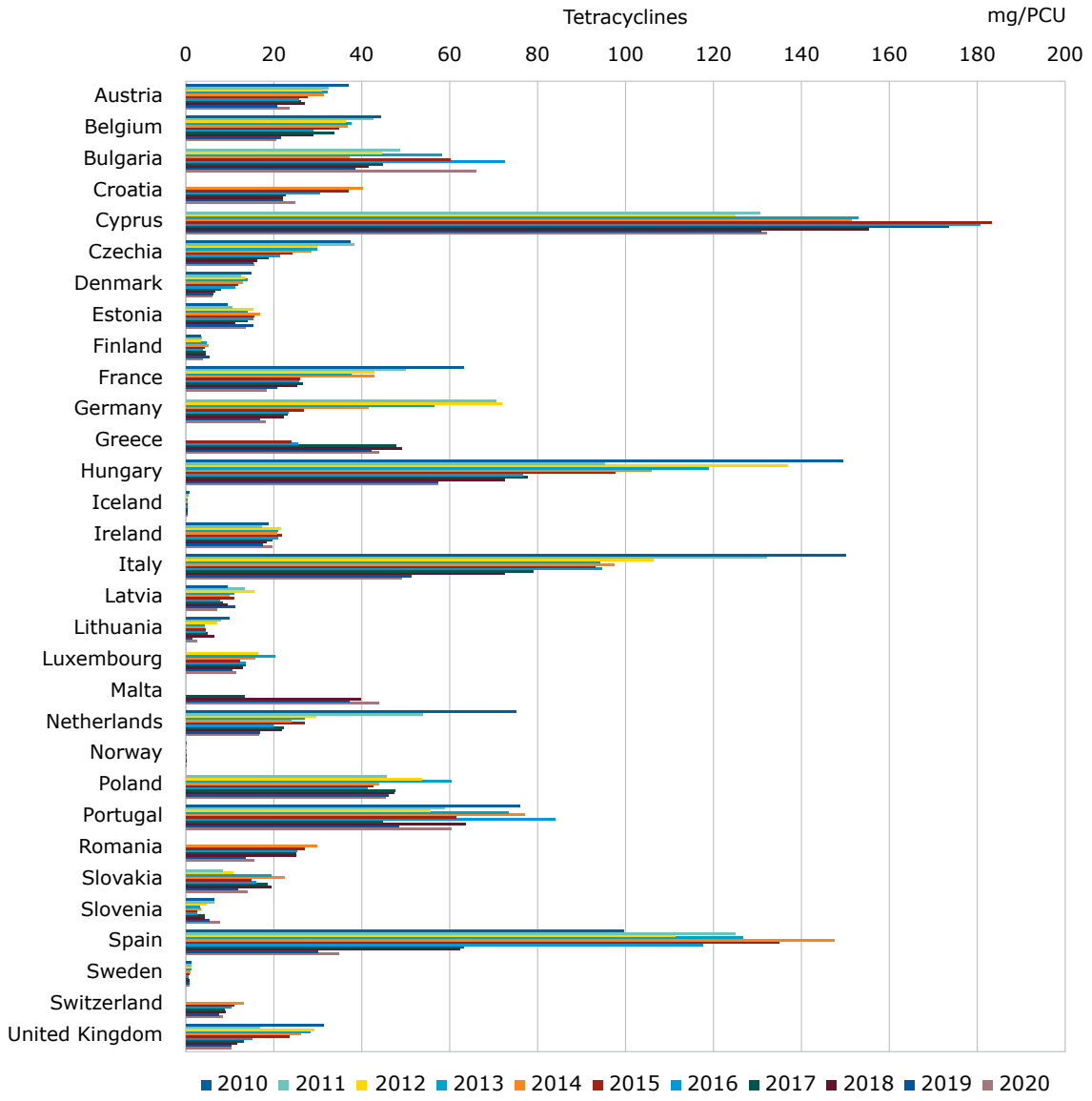
Country	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Trends 2010-2020
Lithuania	48.2	41.1	39.1	29.0	35.5	35.0	37.4	34.2	32.7	20.8	20.5	48.2 20.5
Luxembourg			43.2	52.1	40.6	34.5	35.4	35.1	33.6	29.0	29.0	52.1 29.0
Malta								129.3	153.4	110.3	116.1	153.4 110.3
Netherlands[7]	146.0	113.7	74.8	69.9	68.4	64.4	52.7	56.2	57.4	48.2	50.2	146.0 48.2
Norway	3.9	3.5	3.7	3.5	3.0	2.8	2.8	3.0	2.9	2.3	2.3	3.9 2.3
Poland		126.3	134.1	150.3	139.5	137.9	128.4	163.9	168.3	185.2	187.9	187.9 126.3
Portugal[8]	178.0	161.8	157.2	187.2	201.7	170.3	208.0	134.2	186.6	146.6	175.8	208.0 134.2
Romania[9]					109.0	100.5	85.2	90.1	82.7	53.9	57.8	109.0 53.9
Slovakia[10]		43.6	43.3	59.2	65.6	50.8	50.3	61.8	49.2	42.3	51.9	65.6 42.3
Slovenia	46.8	46.0	36.9	22.3	33.3	26.3	30.3	36.6	43.2	44.9	33.3	46.8 22.3
Spain[11]	259.5	335.8	302.3	317.0	418.8	402.0	362.4	230.3	219.0	126.7	154.3	418.8 126.7
Sweden[12]	14.7	13.1	13.0	12.2	11.1	11.4	11.7	11.3	12.1	11.1	11.1	14.7 11.1
Switzerland					56.8	50.6	46.6	40.1	40.2	35.7	34.3	56.8 34.3
United Kingdom[13]	67.8	51.0	66.2	62.5	62.3	56.5	39.0	32.1	29.0	30.5	30.1	67.8 29.0

[1] Updates to sales data or PCU data as published in the ESVAC 2019 and 2020 report are described in Chapter 1.5.
[2] Strengths reported as active moiety for the great majority of the antimicrobial VMPs from 2019 onwards.
[3] For Bulgaria, under-reporting was identified in the 2011, 2012, 2014 and 2015 data, as several wholesalers failed to report data. For 2020, data are overestimated as double reporting of sales could not be excluded.
[4] For Croatia, double reporting was observed for sales of several VMPs between 2014 and 2017 and under-reporting was identified in the 2018 data.
[5] For Czechia, strength reported as the active moiety for most VMPs for 2011-2012; for 2013-2018, strength reported as on the VMPs' labels.
[6] For Italy, sales data represent sales from MAH to wholesalers and feed mills for 2010-2019. For 2020 they represent sales of premixes from MAHs to wholesalers and dispensed e-prescription of all other pharmaceutical forms obtained from wholesalers, pharmacies and others to veterinarians, farmers and companion animal owners.
[7] For the Netherlands, strength reported as the active moiety for some VMPs for 2011–2012; for 2013-2018, strength reported as on the labels of the VMPs.
[8] For Portugal, underreporting has been identified for 2010-2014, 2017 and 2019.
[9] For Romania, 2014 data were updated, as wholesalers initially failed to deliver all sales data.
[10] For Slovakia, for 2011 and 2012, the data only represent antimicrobial VMPs imported by wholesalers; from 2013, data represent all sales from wholesalers to end-users (veterinarians, pharmacies, producers of medicated feed and farmers) of VMPs obtained by import and from national manufacturers.
[11] For Spain, under-reporting has been identified for 2010 to 2013 (underestimates) and sales data providers for 2017-2020 were changed from MAHs to retailers.
[12] For Sweden, there was no reporting of sales for use in farmed fish in 2012 and underreporting in 2017.
[13] For the United Kingdom, sales of certain tetracycline-containing VMPs were high in late 2010. These VMPs were probably used in 2011 and their use has thus been underestimated for 2011.

2.8.4. Changes in sales by antimicrobial class in mg/PCU, by country

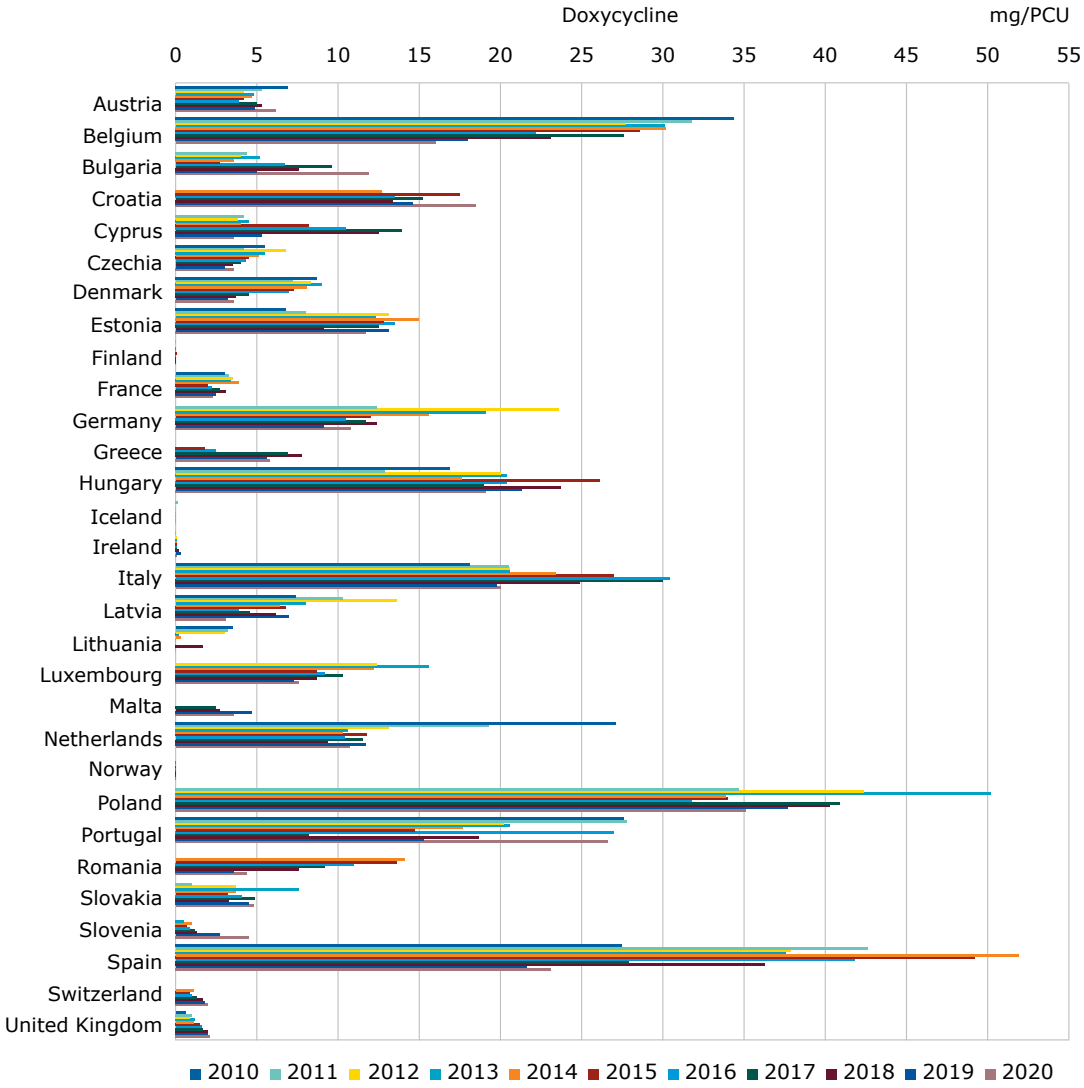
Sales of tetracyclines, a class of antimicrobials with a high volume of sales for veterinary use, are shown in Figure 27. Sales of doxycycline are presented separately (Figure 28) because the dosing of doxycycline for the treatment of animals is lower than for other tetracyclines. Therefore, an increase in sales of doxycycline could be associated with a reduction in total sales of tetracyclines.

Figure 27. Changes in sales of tetracyclines for food-producing animals, in mg/PCU, by country, from 2010 to 2020[1]



[1] Sales in Iceland and Norway <1 mg/PCU for all years; sales in Sweden <1 mg/PCU from 2014 to 2020.

Figure 28. Changes in sales of doxycycline for food-producing animals, in mg/PCU, by country, from 2010 to 2020[1,2]



[1] No sales in Iceland since 2012 and sales in 2011 <1 mg/PCU; in Finland, Ireland and Norway no sales were reported for some of the years or sales were very low (≤0.4 mg/PCU).
[2] For reasons of commercial confidentiality, sales of doxycycline in Sweden (≤0.1 mg/PCU for all years) are not included in this graph.

Figure 29. Changes in sales of penicillins for food-producing animals, in mg/PCU, by country, from 2010 to 2020

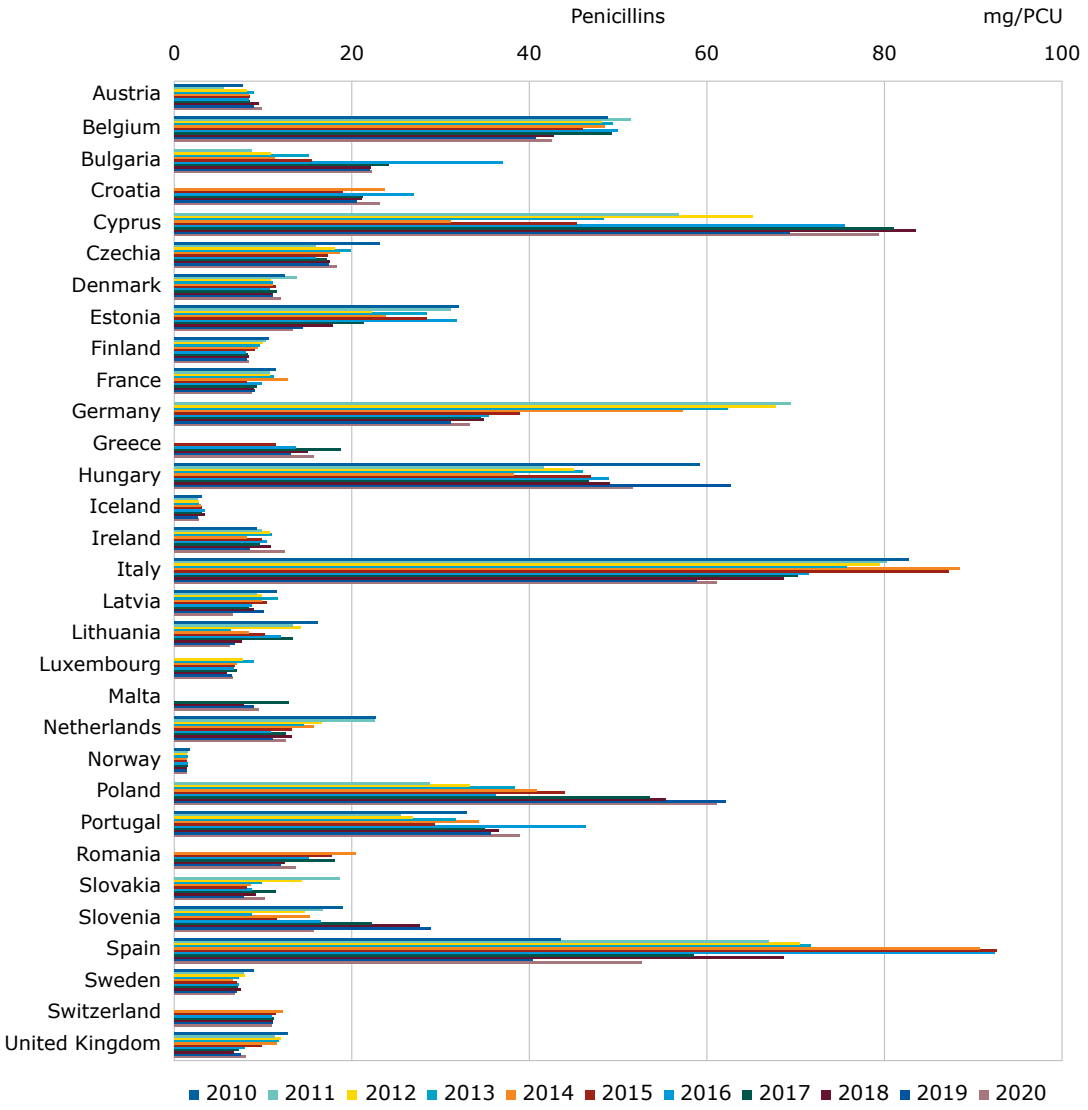
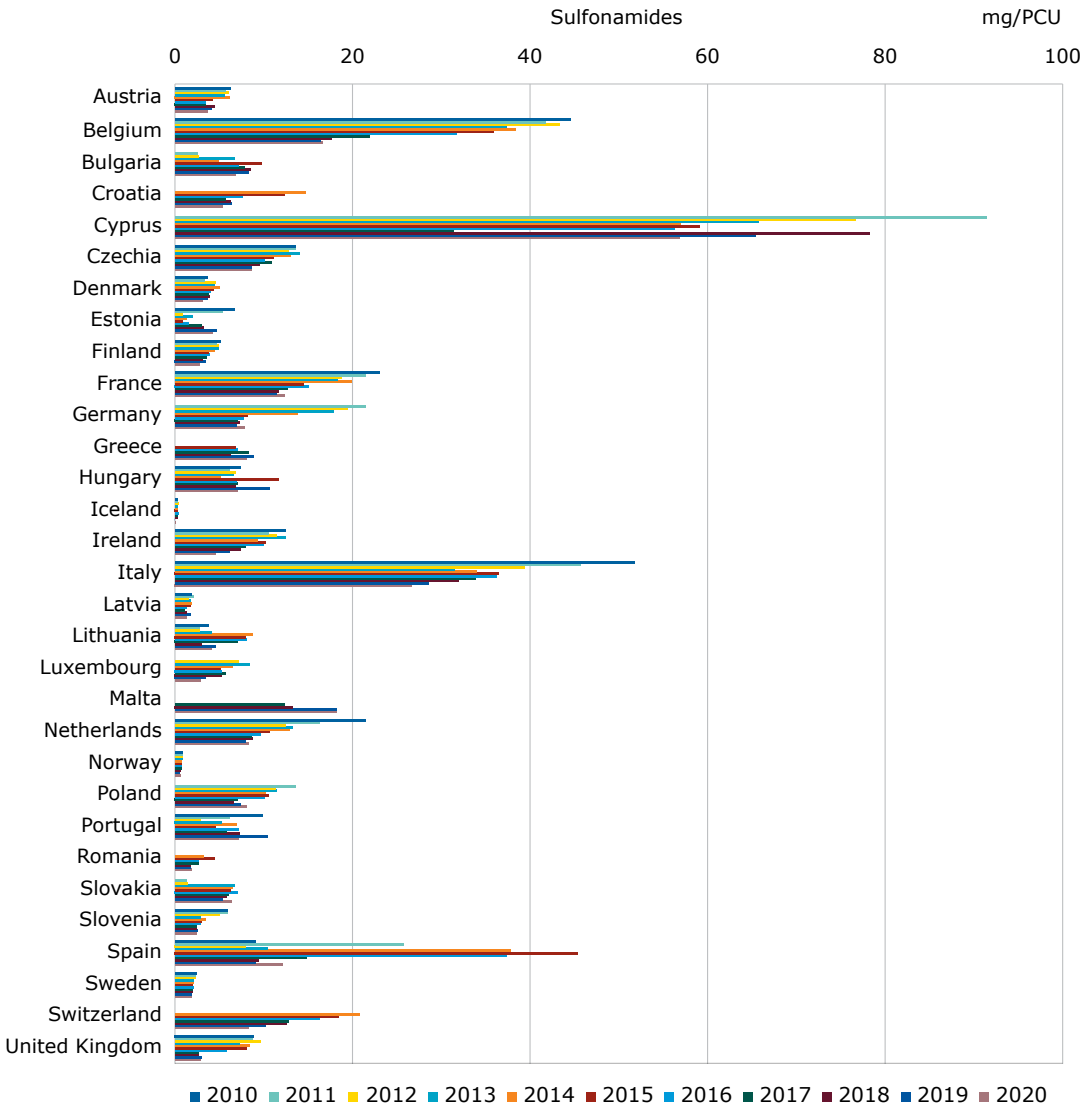


Figure 30. Changes in sales of sulfonamides for food-producing animals, in mg/PCU, by country, from 2010 to 2020[1]



[1] Negligible sales in Iceland and Norway (<1 mg/PCU) for all years.

Tables 9 to 11 and Figures 31 and 32 highlight HP CIAs for humans, as defined by WHO, and antimicrobial classes belonging to AMEG Category B. More details on the antimicrobial classes identified as HP CIAs by WHO and placed in AMEG Category B are provided in Annex 6, Table A26.

Table 9. Changes in sales of 3rd- and 4th-generation cephalosporins for food-producing animals, in mg/PCU, by country, from 2010 to 2020[1,2]. Note that the scale differs between countries.

Country	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Trends 2010-2020
Austria	0.3	0.3	0.3	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.2	
Belgium	0.5	0.5	0.5	0.5	0.5	0.4	0.3	0.1	0.1	0.1	0.1	
Bulgaria		0.05	0.03	0.1	0.1	0.2	0.1	0.1	0.1	0.1	0.1	
Croatia					0.1	0.2	0.2	0.2	0.3	0.3	0.2	
Cyprus		0.2	0.5	0.5	0.8	0.3	0.7	0.4	0.4	0.4	0.4	
Czechia	0.4	0.3	0.3	0.4	0.4	0.4	0.4	0.5	0.5	0.5	0.5	
Denmark	0.05	0.03	0.03	0.02	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	
Estonia	0.4	0.5	0.6	0.7	0.6	0.6	0.7	0.8	0.9	0.8	0.7	
Finland	<0.01	0.02	0.03	0.02	0.02	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	
France	0.3	0.3	0.3	0.3	0.3	0.2	0.1	0.02	0.02	0.02	0.02	
Germany		0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.2	0.2	0.2	
Greece						0.1	0.1	0.1	0.1	0.1	0.2	
Hungary	0.3	0.1	0.3	0.3	0.2	0.4	0.4	0.5	0.5	0.5	0.5	
Iceland	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	
Ireland	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.1	0.2	
Italy	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.2	0.2	

Country	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Trends 2010-2020
Latvia	0.2	0.2	0.4	0.4	0.4	0.4	0.3	0.3	0.4	0.7	0.5	
Lithuania	0.02	0.04	0.1	0.2	0.2	0.1	0.1	0.2	0.3	0.2	0.1	
Luxembourg			0.7	0.7	0.6	0.6	0.7	0.6	0.6	0.6	0.5	
Malta								0.3	0.2	0.3	0.3	
Netherlands	0.2	0.2	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	
Norway	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	
Poland		0.1	0.1	0.2	0.2	0.1	0.2	0.2	0.3	0.4	0.4	
Portugal	0.3	0.3	0.3	0.4	0.4	0.5	0.5	0.6	0.4	0.3	0.4	
Romania					0.05	0.04	0.1	0.2	0.2	0.1	0.2	
Slovakia		0.7	0.5	0.4	0.5	0.3	0.4	0.4	0.4	0.4	0.5	
Slovenia	0.1	0.1	0.2	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2	
Spain	0.7	0.3	0.3	0.3	0.3	0.3	0.3	0.2	0.4	0.3	0.4	
Switzerland					0.2	0.2	0.2	0.2	0.2	0.1	0.1	
United Kingdom	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.03	0.04	

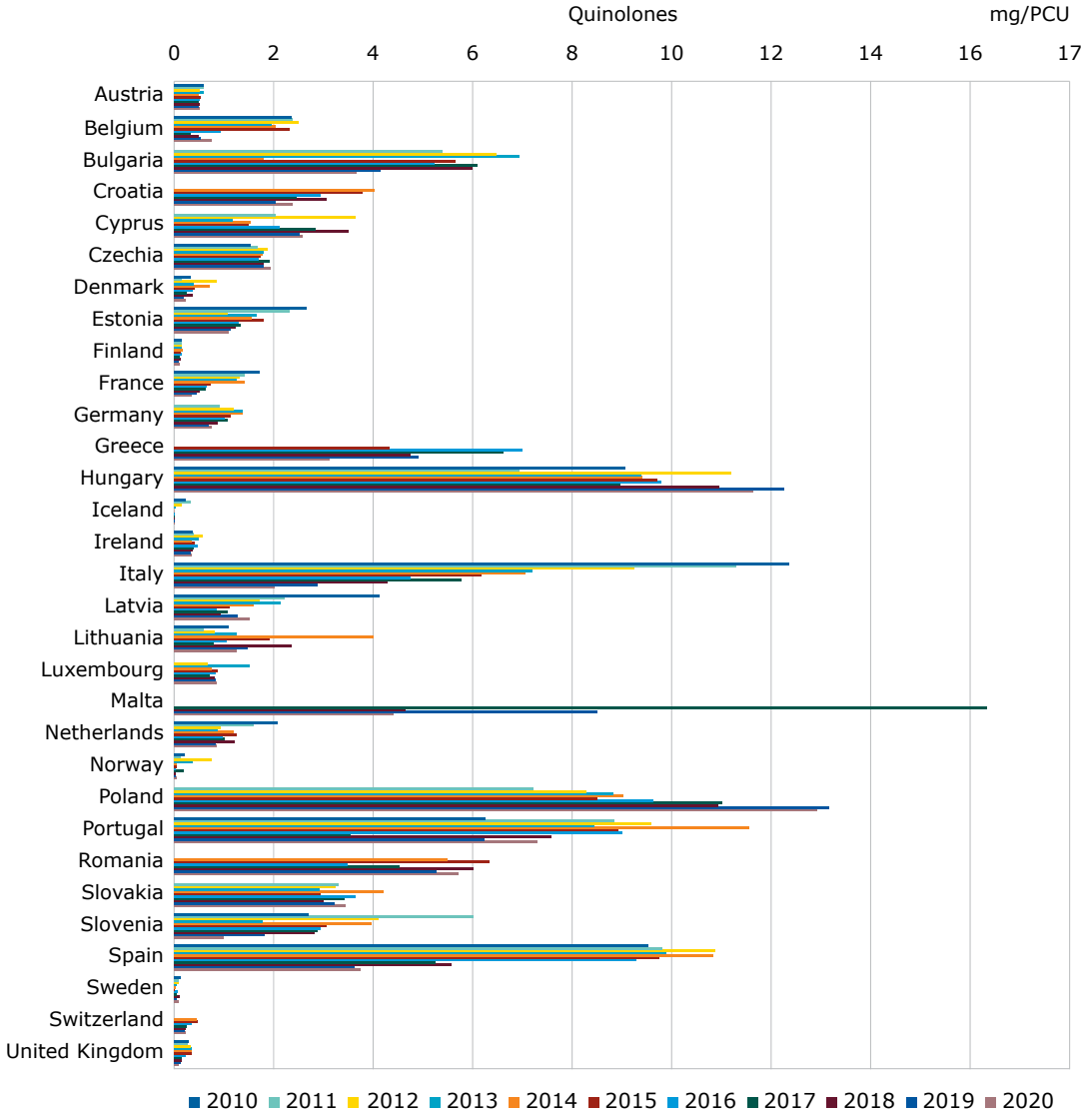
[1] For countries where injectable 3rd- and 4th-generation cephalosporins are solely or almost solely marketed for dogs and cats, the data provide a considerable overestimate for food-producing animals.
[2] For reasons of commercial confidentiality, sales of 3rd- and 4th-generation cephalosporins in Sweden (<0.01 mg/PCU since 2013) are not included in this table.

Table 10. Changes in sales of fluoroquinolones for food-producing animals, in mg/PCU, by country, from 2010 to 2020. Note that the scale differs between countries.

Country	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Trends 2010-2020
Austria	0.6	0.6	0.5	0.6	0.5	0.5	0.5	0.5	0.5	0.5	0.5	
Belgium	0.7	0.8	0.9	1.0	1.1	1.0	0.6	0.2	0.2	0.2	0.3	
Bulgaria		5.0	6.1	6.8	1.8	5.3	4.9	5.6	6.0	4.1	3.7	
Croatia					3.4	3.1	2.5	1.8	2.2	2.0	2.1	
Cyprus		0.5	0.8	0.9	0.9	1.1	1.6	2.4	3.1	2.2	2.2	
Czechia	1.3	1.5	1.8	1.8	1.8	1.7	1.7	1.9	1.8	1.8	1.9	
Denmark	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	
Estonia	2.5	2.3	1.1	1.7	1.6	1.8	1.3	1.3	1.2	1.1	1.1	
Finland	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	
France	0.6	0.6	0.6	0.6	0.6	0.3	0.2	0.2	0.1	0.1	0.1	
Germany		0.9	1.2	1.4	1.4	1.1	1.0	1.1	0.9	0.7	0.8	
Greece						1.7	2.2	2.7	2.2	1.6	2.0	
Hungary	8.8	6.7	11.0	9.2	9.1	9.5	9.6	8.8	10.8	12.2	11.6	
Iceland	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	
Ireland	0.4	0.4	0.6	0.5	0.4	0.4	0.5	0.4	0.4	0.3	0.4	

Country	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Trends 2010-2020
Italy	1.7	2.2	2.5	2.3	3.1	2.9	2.3	3.0	2.3	1.8	1.2	
Latvia	4.1	2.2	1.7	2.1	1.6	1.1	0.8	1.1	0.9	1.3	1.5	
Lithuania	0.7	0.4	0.6	0.8	3.1	1.7	1.0	0.8	2.2	1.5	1.3	
Luxembourg			0.7	0.8	0.7	0.7	0.8	0.7	0.8	0.8	0.8	
Malta								15.2	4.6	8.4	4.4	
Netherlands	0.5	0.5	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.05	
Norway	0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	
Poland		7.1	8.2	8.8	9.0	8.5	9.6	11.0	10.9	13.2	12.9	
Portugal	5.6	8.4	9.4	8.2	11.4	8.8	8.9	3.5	7.6	6.2	7.3	
Romania					5.3	6.1	3.3	4.3	6.0	5.2	5.7	
Slovakia		3.0	3.2	2.8	4.2	2.9	3.6	3.4	3.0	3.2	3.4	
Slovenia	2.6	5.9	4.1	1.8	4.0	3.0	2.9	2.9	2.8	1.8	1.0	
Spain	8.8	9.2	10.2	9.3	9.9	9.0	8.5	4.9	5.6	3.6	3.7	
Sweden	0.1	0.1	0.1	0.04	0.03	0.02	0.02	0.02	0.03	0.02	0.02	
Switzerland					0.5	0.5	0.3	0.3	0.2	0.2	0.2	
United Kingdom	0.3	0.3	0.3	0.4	0.4	0.3	0.2	0.2	0.1	0.1	0.1	

Figure 31. Changes in aggregated sales of fluoroquinolones and other quinolones for food-producing animals, in mg/PCU, by country, from 2010 to 2020[1]



[1] In Austria, Denmark, Finland, Iceland, Ireland, Norway, Sweden, Switzerland and the United Kingdom combined sales of fluoroquinolones and other quinolones were <1 mg/PCU for all years; in Luxembourg, sales were <1 mg/PCU for 2011 and 2013–2020.

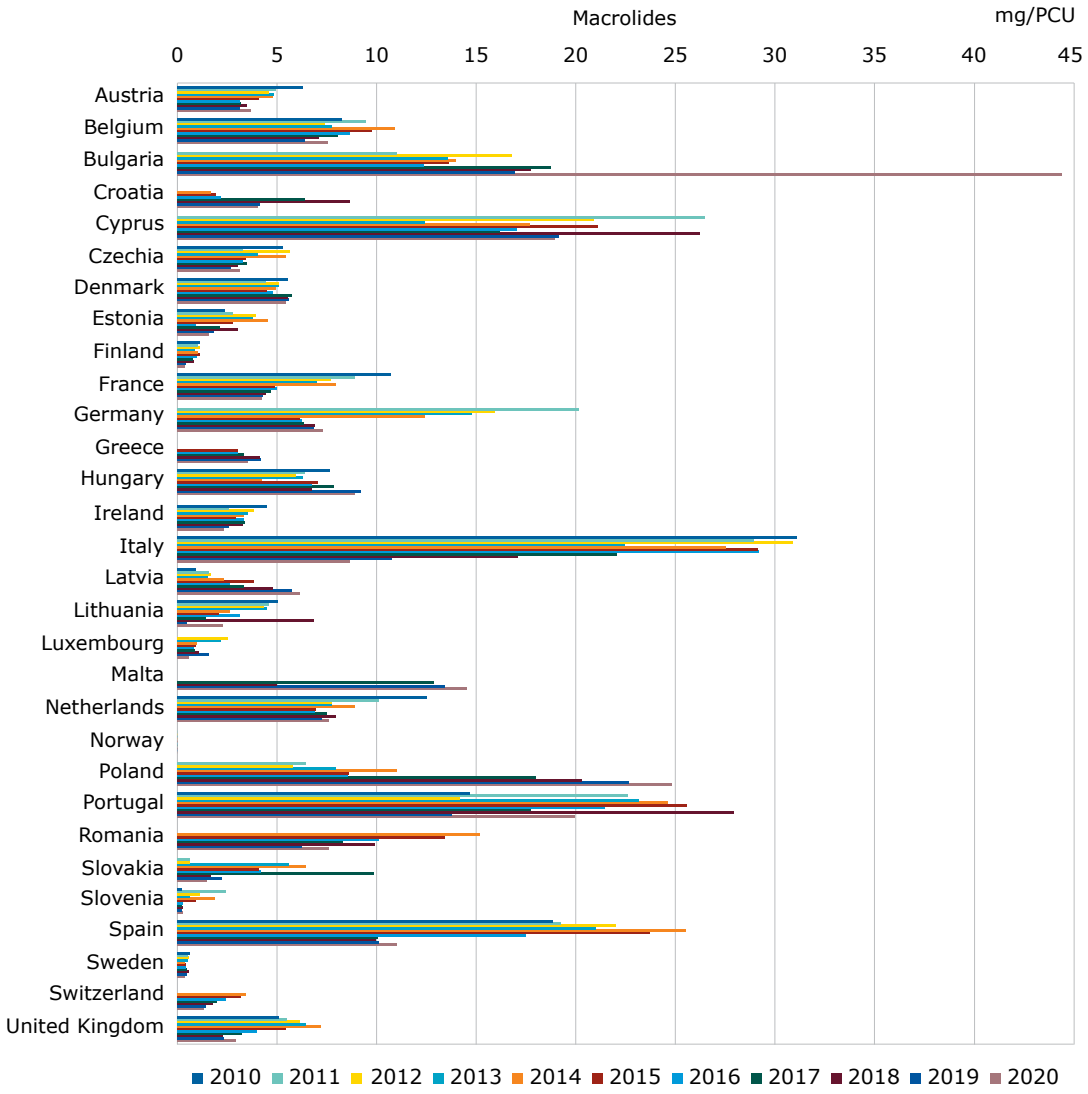
Table 11. Changes in sales of polymyxins for food-producing animals, in mg/PCU, by country, from 2010 to 2020[1,2]. Note that the scale differs between countries.

Country	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Trends 2010-2020
Austria	1.0	1.0	0.7	0.9	1.6	1.6	1.6	1.7	1.9	1.6	1.6	
Belgium	6.0	5.4	5.8	4.7	3.4	2.8	2.4	2.1	2.0	1.8	1.6	
Bulgaria		3.2	3.8	2.7	0.5	3.6	2.3	2.9	3.7	1.6	5.4	
Croatia					3.6	2.3	3.4	3.0	2.6	1.5	2.7	
Cyprus		8.2	8.1	8.4	11.1	12.4	11.1	10.4	12.8	14.0	15.9	
Czechia	0.9	0.6	0.9	1.1	1.0	1.0	0.8	0.6	0.7	0.6	0.6	
Denmark	0.3	0.2	0.2	0.2	0.4	0.5	0.5	0.2	<0.01	<0.01	<0.01	
Estonia	3.5	4.3	4.9	5.8	3.1	1.3	0.7	1.1	0.8	0.5	0.3	
France	8.6	7.7	6.7	5.9	7.0	4.0	2.8	2.2	1.8	1.4	1.4	
Germany		14.8	14.8	14.6	12.2	9.2	7.9	8.5	8.6	7.9	7.3	
Greece						3.4	1.0	1.3	1.6	1.5	1.9	
Hungary	6.9	8.9	7.8	10.0	7.1	9.6	12.2	14.9	10.1	9.3	7.5	
Italy	40.2	30.7	30.1	27.6	29.4	26.1	15.1	5.2	2.7	0.9	0.7	

Country	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Trends 2010-2020
Latvia	1.0	1.0	2.5	1.5	0.8	0.9	0.9	1.3	1.9	1.3	0.8	
Lithuania	1.7	1.4	1.3	0.1	0.1	0.6	1.0	0.7	0.2	0.7	<0.01	
Luxembourg			1.7	3.1	2.4	1.5	1.0	1.0	0.6	0.4	0.4	
Malta								4.9	1.9	0.1	0.5	
Netherlands	2.3	1.6	0.97	0.6	0.5	0.5	0.3	0.3	0.4	0.4	0.5	
Poland		4.1	4.0	4.4	5.0	5.9	5.6	7.4	7.4	10.6	9.1	
Portugal	15.1	7.9	18.6	19.0	17.6	14.6	13.5	10.9	12.6	8.5	11.7	
Romania					6.5	7.4	5.6	4.1	6.4	2.5	2.2	
Slovakia		1.2	2.1	1.1	1.5	1.1	1.2	1.7	1.4	1.3	2.0	
Slovenia	0.1	0.1	0.1	0.04	0.1	0.1	0.1	0.1	0.2	0.1	0.1	
Spain	33.0	33.5	29.4	21.5	36.1	34.9	22.0	4.4	3.3	0.9	0.4	
Switzerland					0.9	0.6	0.5	0.4	0.3	0.3	0.2	
United Kingdom	0.1	0.1	0.1	0.1	0.1	0.1	0.02	<0.01	<0.01	<0.01	<0.01	

[1] No sales of polymyxins in Finland, Iceland and Norway in any year.
[2] For reasons of commercial confidentiality, sales of polymyxins in Ireland and Sweden (≤0.1 mg/PCU for all years) are not included in this table.

Figure 32. Changes in sales of macrolides for food-producing animals, in mg/PCU, by country, from 2010 to 2020[1]



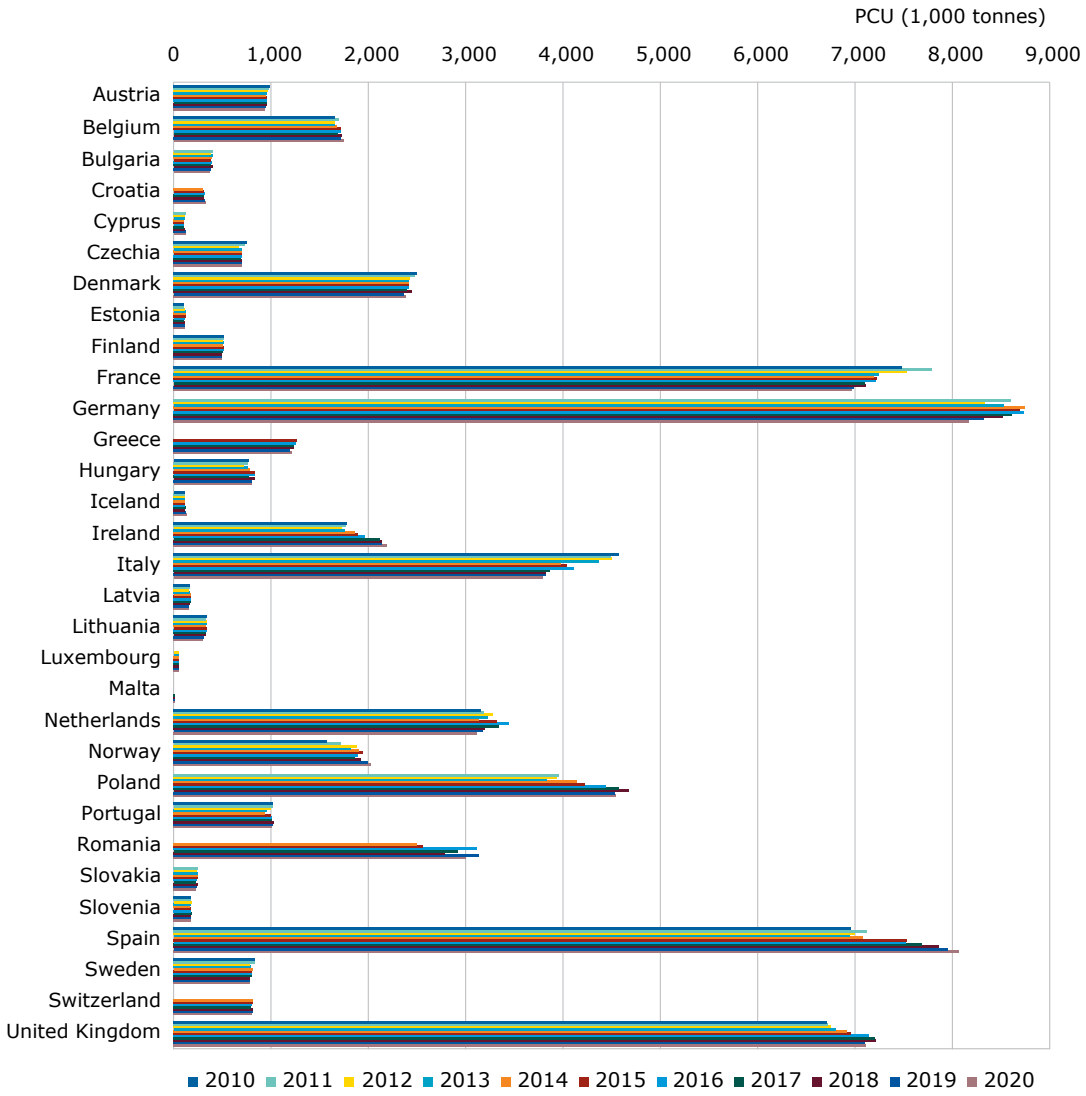
[1] No sales in Iceland; negligible sales (<1 mg/PCU) in Norway and Sweden for all years; negligible sales (<1 mg/PCU) in Finland for 2016–2020 and in Slovenia for 2015–2020.

2.8.5. Changes in the denominator (PCU) by country

From 2010 to 2020, the total PCU (estimated weight at treatment of livestock and slaughtered animals) was relatively stable for most countries (Figure 33).

For 5 of the 25 countries (Iceland, Ireland, Norway, Poland and Spain) that provided data for at least five years, an increase of more than 10% was observed for the PCU, while a decrease of more than 10% was seen in France, Italy and Lithuania.

Figure 33. Changes in the denominator (total PCU) for food-producing animals, in 1,000 tonnes, by country, from 2010 to 2020



3. Discussion

In the EU, the use of antimicrobials for growth promotion has been banned since 2006. Therefore, the data sets provided to ESVAC represent exclusively sales of antimicrobial agents sold as VMPs.

According to Directive 2001/82/EC of the European Parliament and of the Council of 6 November 2001 on the Community code relating to veterinary medicinal products[28], all VMPs, including veterinary antimicrobial agents, must be sold through distributors authorised by the competent authority in each country. This enables all participating countries to identify all distributors of antimicrobial VMPs in their country, allowing for 100% data-source coverage. Thus, it is reasonable to assume that the data presented in this report provide a good overview of the total sales of antimicrobial agents in the 31 reporting countries.

The discussion focusses on the trends towards the most recent data, i.e. the 2020 data. In 2020, all countries provided sales data except Denmark, which submitted prescription data; Sweden, which submitted prescription and requisition data; and Italy, which submitted prescription data (for all product forms with the exception of premixes).

It should also be noted that in all of the participating countries, antimicrobial agents have a prescription-only status.

The national sales data (numerator) cover all species considered to be food-producing animals according to EU legislation, which includes farmed fish and horses. Thus, the animal population that could potentially be treated with antimicrobial agents (denominator) includes all food-producing animals. However, as the use of antimicrobial agents varies considerably in the different animal species, interpretation of the data should take into account distribution of the PCU value between the species in the various countries. It should also be emphasised that the PCU represents a technical unit of measurement only and is not a real value for the animal population that could potentially be treated with antimicrobial agents.

Based on the cascade principle described in Article 11 of Directive 2001/82/EC[28] (and as of 28 January 2022 according to Articles 107, 112, 113 and 114 of Regulation (EU) 2019/6[29]), in Member States where there is no authorised VMP for treatment of companion or food-producing animals, the administration of other medicinal products may be permitted in exceptional circumstances. Sales of human medicinal products fall outside of the scope of the ESVAC protocol. In addition, when antimicrobial sales data are submitted to ESVAC, details regarding whether or not a VMP was used under the cascade are not included.

Dosing schedules for the various antimicrobial agents varies substantially between and within classes, as well as between animal species, sometimes by several orders of magnitude, as reflected by the DDDvet and DCDvet values published by EMA in 2016[30]. For example, the dose for a complete course of treatment (DCDvet) with an oral fluoroquinolone VMP may vary between 10 and 40 mg/kg, depending on whether cattle, pigs or poultry are treated, while for an oral tetracycline VMP the dose for a complete course of treatment may vary between 42 mg/kg and 353 mg/kg. This implies that a given amount of active substance of fluoroquinolone can be used to treat several times as many animals as the same amount of active substance of a tetracycline. Furthermore, within an antimicrobial class there may be different doses for different substances; for example, the dose for doxycycline is about one-quarter that for oxytetracycline. The daily dose can also vary between oral and parenteral forms. Another consideration is that the dosage may differ significantly between species; for fish, a typical tetracycline dosage for a complete treatment is 800 mg/kg, nearly six times higher than for terrestrial animals. Since the data in this report cover all food-producing animals together, it is not possible to take into account differences in dosing when reporting the data. Considering the above-mentioned factors, sales data do not reflect the real exposure of animals to antimicrobials or frequency of treatment. Since sales patterns and animal demographics vary substantially between countries, comparisons of sales data across the countries should be made with great care.

The proportion of sales of small packages of oral powders and oral solutions sufficient for treatment of only a single animal or a few animals is low compared to that of sales of those suitable for group treatment; oral solutions and oral powders are typically used for group treatment. Thus, the data presented in this report on sales of oral powder and oral solutions, as well as of premixes, are considered to be a reasonable estimate of sales of these forms for group

[28] OJ L 311, 28.11.2001, p. 1
[29] OJ L 4, 7.1.2019, p 43-167
[30] Available on the European Medicines Agency website (www.ema.europa.eu) via Home > Veterinary regulatory > Antimicrobial resistance (https://www.ema.europa.eu/en/veterinary-regulatory/overview/antimicrobial-resistance/european-surveillance-veterinary-antimicrobial-consumption/standardised-units-measurement-veterinary-antimicrobials)

treatment. This analysis approach could be adjusted in the future, following the CVMP recommendations for ensuring safe and efficient administration of oral VMPs via routes other than medicated feed[31].

Dermatological products (ATCvet group QD) and products for sensory organs (ATCvet group QS) were not included in the data collection. In 2020, these pharmaceutical forms/routes of administration accounted for, for example, only 0.2% of total sales, in tonnes, in Denmark, (L. Mie Jensen, unpublished data) and 0.9% in the United Kingdom (UK-VARSS 2020). As the annual contribution from these groups of antimicrobial agents, in tonnes of active substance, to the total amounts is thought to be minimal, the effect of this exclusion is considered negligible.

In the current report, data presented on sales of veterinary antimicrobial agents for companion animals represent only sales of tablets. Parenteral preparations of antimicrobial agents are used both in food-producing and companion animals. With the exception of some long-acting products, parenteral administration of antimicrobial agents in companion animals is generally limited to hospitalised animals or perioperative treatments. Data from Denmark for 2020 showed that approximately 1.4% of the injectable antimicrobial VMPs sold were used for dogs and cats (L. Mie Jensen, unpublished data). In this report sales of injectable antimicrobials are assumed to be for use in food-producing animals. Therefore, for countries where injectable 3rd- and 4th-generation cephalosporins are solely or almost solely marketed for dogs and cats, the data provide a considerable overestimate of use in food-producing animals.

For 2020, the data sets of 11 countries (Table 2) also included antimicrobial VMPs obtained on special licence/marketing authorisation or through parallel trade – i.e. obtained from another Member State and permitted to be used for specific animal species and indications, where there is no marketed/authorised VMP for the indication and species in question. The procedure for obtaining a special licence may differ among Member States. The majority of these countries have a low number of antimicrobial VMPs on the market (Annex 1, Table A7). The proportion of sales of antimicrobial VMPs on special licence ranged from 33.3% to <0.01% of the total sales.

Among the 25 countries that reported data for every year since 2011, the decrease in sales (mg/PCU) for some of the highest-selling countries has had a considerable impact on the overall aggregated sales, which have declined by 43.2% during this period (2011–2020).

Total sales of AMEG Category B antimicrobials in these 25 countries followed a downward trend, which also contributed to the overall decrease. Specifically, between 2011 and 2020 (Figure 23), sales of 3rd- and 4th-generation cephalosporins decreased by 32.8% (from 0.24 mg/PCU to 0.16 mg/PCU), those of polymyxins decreased by 76.5% (from 10.98 mg/PCU to 2.58 mg/PCU), those of fluoroquinolones decreased by 12.8% (from 2.53 mg/PCU to 2.21 mg/PCU) and sales of other quinolones decreased by 85.4% (from 1.07 mg/PCU to 0.16 mg/PCU).

For 20 out of the 25 countries that reported data for all years from 2011 to 2020, sales (mg/PCU) in 2020 were lower than sales in 2011 (range -3.3% to -60.4%) (Table 8). For five countries, sales (mg/PCU) in 2020 were higher than sales in 2011 (range 1.4% to 79.3%).

When looking at a more granular level at changes between 2019 and 2020, an apparent increase of 5.8% in overall sales (mg/PCU) for the 25 countries between 2019 (86.6 mg/PCU) and 2020 (91.6 mg/PCU) can be noted. This apparent increase should be interpreted with due caution. At this point, it is not possible to determine whether the observed increase results from data anomaly, market fluctuations or a combination of different factors. Examples of tentative explanations are the increase of sales in some countries due to over-purchasing of VMPs in 2020 due to the uncertainty surrounding the medicines market situation because of the COVID-19 pandemic and Brexit, and overestimation of sales due to double reporting. The decrease in other countries in 2019 could partly be due to under-reporting, shortages, changes in data-collection systems or decreases in sales for specific antimicrobial classes, such as tetracyclines. Data for the next few years are needed to properly analyse the differences observed between 2019 and 2020.

Variations in reported sales (mg/PCU) and in sales patterns between the 31 countries for 2020 are likely to be due, in part, to differences in the composition of the animal population, production systems and prescription practices in

[31] Recently, a thorough analysis of the provisions concerning oral administration of veterinary medicinal products, as detailed in Regulation (EU) 2019/6, and of the preparation and administration of medicated feed, as detailed in Regulation (EU) 2019/4 was carried out (https://www.ema.europa.eu/en/documents/regulatory-procedural-guideline/advice-implementing-measures-under-article-106-6-regulation-eu-2019/6-veterinary-medicinal-products-scientific-problem-analysis-recommendations-ensure-safe-efficient_en.pdf). One of the recommendations was that oral powders, granules or similar pharmaceutical forms administered to terrestrial animals via solid feed, including VMPs administered via top-dressing, should be restricted to use in individual animals only. Therefore, the classification of group treatment included in the ESVAC analysis could be adjusted in the future, once these recommendations are fully implemented by the Member States.

the different countries. Considerable variations exist in terms of daily doses used for the various antimicrobial agents and the various pharmaceutical forms, as well as in terms of duration of treatment, which may have an impact on the data. In addition, differences among countries in the selection of sales data providers may have an impact, although the effect of this is thought to be minor. These and other country-specific factors must be taken into account when evaluating results on a country-by-country basis.

The sales data (numerator) and the corrected populations of the main food-producing animals (denominator) cover the animal population that could potentially be treated with antimicrobial VMPs. However, the use of antimicrobial VMPs in the various animal species varies considerably: for example, their use in extensive production systems is generally relatively low. Therefore, interpretation of the data should take into account the distribution of the PCU value between the species in the various countries, as well as characteristics of production systems.

It is important to note that the results presented in this report may differ slightly from those presented in national reports (see references to national reports in Annex 9). Differences between this report and previous printed or pdf versions of the reports can also be observed subsequent to the revision of the sales data reporting form and protocol, which includes updates to the reference information for conversion factors applied for international units and derivatives. Thus, for a harmonised trend analysis between 2010 and 2020, the historical data (2010–2018) for all countries were updated, i.e., tonnes sold were calculated using the updated conversion factors. Differences observed within historical data after application of the conversion factors are more significant in the case of penicillins than in other antimicrobial classes, as a consequence of the updates introduced to benzylpenicillin derivatives. Up-to-date data can be accessed through the dynamic ESVAC interactive database at any time. The same principle applies to any corrections made to historical datasets (e.g. identification of under- or double reporting in a given year).

Although the reporting of the qualitative and quantitative composition of antimicrobial VMPs (variable strength) is critical for calculating overall tonnes sold, there are discrepancies on how it has been reported across years and countries, and even within single datasets. Therefore, the rules for reporting the qualitative and quantitative composition of antimicrobial VMPs were revised in the latest ESVAC protocol to increase data harmonisation and data quality[32]. Efforts to increase harmonisation of data reporting will continue.

Additionally, differences in the criteria for inclusion in data-collection systems and data reporting to ESVAC of the VMPs under surveillance should also be taken into consideration.

Despite the various factors noted above, ESVAC sales data can be considered as valid and important for following trends at European and national level, especially in those countries with well-established and stable data-collection systems.

Concluding remarks

The main indicator used in this report to express the consumption of veterinary antimicrobials, the overall sales in mg/PCU, declined considerably between 2011 and 2020. This indicates that efforts at both national and EU/EEA level have been successful, resulting in a continuous decrease overtime in the overall use of antimicrobial VMPs in food-producing animals in most participating European countries. Furthermore, substantial progressive reduction has also been observed for secondary indicators, namely sales in mg/PCU of 3rd- and 4th-generation cephalosporins, polymyxins and quinolones. Sales of fluoroquinolones registered more modest aggregated reduction.

National campaigns for responsible and prudent use of antibiotics in animals, setting of reduction targets, restriction of use of certain antimicrobials in food-producing animals, prescription control measures, awareness-raising campaigns as well as EU guidance are among the actions implemented at country level to reduce the sales of veterinary antimicrobials across Europe. Reduced sales of antimicrobial VMPs in many countries indicate the potential for a reduction in other countries as well.

[32] Available on the EMA website (www.ema.europa.eu) via: Home > Regulatory > Veterinary medicines > Overview > Antimicrobial resistance > European Surveillance of Veterinary Antimicrobial Consumption > Sales data collection form and protocol.

Annex 1. Additional tables and figures regarding 2020 data

Table A1. Sales, in tonnes of active substance, of antimicrobial VMPs applicable mainly to food-producing animals by antimicrobial class (presented according to the ATCvet hierarchical system), by country, in 2020 (tablets not included)

Country	Tetracyclines	Amphenicols	Penicillins	1st- and 2nd-gen. cephalosporins	3rd- and 4th-gen. cephalosporins[1]	Sulfonamides	Trimethoprim	Macrolides	Lincosamides	Fluoroquinolones	Other quinolones	Aminoglycosides	Polymyxins	Pleuromutilins	Others[2]	Total tonnes
Austria	22.1	0.4	9.3	0.04	0.2	3.5	0.7	3.5	0.1	0.5	0	1.3	1.5	0.4	0.1	43.7
Belgium	35.7	3.2	74.2	0.59	0.1	29.0	5.8	13.2	4.7	0.5	0.8	2.8	2.8	0.6	6.4	180.4
Bulgaria	24.3	0.4	8.2	0.01	0.04	2.5	0.3	16.4	2.8	1.3	0	1.6	2.0	1.1	0.2	61.1
Croatia	8.1	0.5	7.6	0.01	0.1	1.8	0.3	1.3	0.03	0.7	0.1	0.8	0.9	0.2	0.1	22.6
Cyprus	16.2	0.1	9.7	<0.01	0.1	7.0	1.4	2.3	6.3	0.3	0.05	0.6	2.0	2.2	0.1	48.3
Czechia	10.9	0.4	12.8	0.1	0.4	6.0	0.7	2.2	0.1	1.4	0	1.7	0.4	2.1	0.2	39.3
Denmark	14.4	1.9	28.7	0.1	<0.01	7.4	1.5	13.0	2.2	<0.01	0.5	9.2	<0.01	7.7	2.3	88.7
Estonia	1.6	0.05	1.6	0.01	0.1	0.5	0.1	0.2	0.04	0.1	0	0.4	0.03	1.0	0.1	5.7
Finland	1.8	0.1	4.1	<0.01	<0.01	1.4	0.3	0.2	0.02	0.1	0	0.03	0	<0.01	0	8.0
France	128.4	5.9	60.8	1.3	0.1	85.9	14.0	29.4	2.8	0.7	1.8	46.6	9.54	3.4	3.7	394.4
Germany	147.9	6.2	271.8	0.6	1.3	63.8	8.9	59.8	12.5	6.2	0	23.8	59.98	10.7	11.0	684.6
Greece	53.4	1.4	19.1	0.01	0.2	9.8	1.3	4.3	0.6	2.5	1.3	10.4	2.30	1.0	0.7	108.4
Hungary	46.0	2.0	41.4	0.1	0.4	5.6	1.2	7.1	1.7	9.3	0	2.6	6.02	11.7	1.0	136.1
Iceland	0.04	0	0.4	0	<0.01	<0.01	<0.01	0	0	<0.01	0	0.1	0	0	0	0.5
Ireland[3]	42.8	3.7	27.2	1.1	0.4	10.2	1.3	5.2	1.9	0.8	0	7.1			1.4	102.9
Italy	185.7	18.7	231.4	0.5	0.6	101.3	9.7	32.9	44.3	4.7	3.0	28.5	2.7	19.0	6.3	689.3
Latvia	1.1	0.03	1.0	0.05	0.1	0.2	0.04	1.0	0.03	0.2	0	0.7	0.1	0.2	0.04	4.8
Lithuania	0.8	0.1	1.9	0.03	0.04	1.2	0.3	0.7	0.05	0.4	0	0.2	<0.01	0.4	0.1	6.2
Luxembourg	0.6	0.1	0.4	<0.01	0.03	0.2	0.03	0.03	0.03	0.05	0	0.2	0.02	<0.01	0.02	1.6
Malta[4]	0.6	0.03	0.1	<0.01	<0.01	0.3	0.05	0.2	<0.01	0.1		0.1	<0.01	0.1	0.1	1.7
Netherlands	51.6	4.6	39.3	0.1	<0.01	25.8	4.7	23.8	0.1	0.1	2.5	1.9	1.4	0.4	0.1	156.4
Norway	0.1	0.1	2.8	0	<0.01	1.2	0.2	<0.01	<0.01	<0.01	0.1	0.1	0	0.04	<0.01	4.7
Poland	205.7	9.8	277.7	0.7	1.7	37.0	7.3	112.8	10.7	58.7	0.0	32.5	41.4	47.3	10.0	853.2
Portugal	61.1	4.5	39.3	0.04	0.4	7.3	1.4	20.2	6.1	7.4	0.0	5.0	11.8	12.9	0.4	177.9
Romania	46.3	7.2	41.1	0.02	0.6	5.9	1.0	22.9	5.1	17.0	0.2	14.2	6.6	3.4	2.2	173.7
Slovakia	3.2	0.1	2.3	0.04	0.1	1.4	0.2	0.3	0.1	0.8	<0.01	0.9	0.5	1.6	0.3	11.8
Slovenia	1.3	0.2	2.8	<0.01	0.04	0.4	0.1	0.05	<0.01	0.2	<0.01	0.6	0.02	0.1	<0.01	5.9
Spain	279.9	51.7	425.1	0.4	2.9	97.5	17.0	88.9	124.5	30.2	0	88.1	3.5	22.5	12.2	1244.5
Sweden[5]	0.6		5.4		<0.01	1.5	0.3	0.3	0.04		0.1	0.4			0.2	8.7
Switzerland[6]	6.8	0.6	8.8	0.1	0.1	6.7	0.6	1.1		0.2	0	2.5	0.1		0.1	27.7
United Kingdom	72.4	4.2	56.7	1.0	0.3	20.6	4.1	20.8	5.1	0.7	0	17.4	<0.01	7.1	4.0	214.4
Total 31 countries	**1,471.7**	**128.3**	**1,713.1**	**7.0**	**10.2**	**542.7**	**84.8**	**483.9**	**232.0**	**145.1**	**10.4**	**302.3**	**155.6**	**158.5**	**61.8**	**5,507.4**

[1] For the countries where injectable 3rd- and 4th-generation cephalosporins are solely or almost solely marketed for dogs and cats, the data provide a considerable overestimate for food-producing animals.
[2] The class 'Others' includes the following sub-classes: Imidazole derivatives (metronidazole), Nitrofuran derivatives (furazolidone) and Other antibacterials (bacitracin, furaltadone, novobiocin, rifaximin, spectinomycin). Of note is that some of the sales could be for non-food-producing animals such as companion animals, fur animals, exotic birds and racing pigeons.
[3] Polymyxins and pleuromutilins are aggregated with 'Others' for commercial confidentiality reasons.
[4] Fluoroquinolones and other quinolones are aggregated for commercial confidentiality reasons.
[5] For commercial confidentiality reasons, amphenicols, polymyxins and pleuromutilins are aggregated with 'Others', 1st- and 2nd-generation cephalosporins are aggregated with 3rd- and 4th-generation cephalosporins, and fluoroquinolones are grouped with other quinolones.
[6] For reasons of commercial confidentiality, pleuromutilins are grouped with 'Others' and lincosamides are grouped with macrolides.

Table A2. Distribution of sales, in mg/PCU, of antimicrobial VMPs applicable mainly to food-producing animals[1], by product form and country, in 2020

Country	Premix	Oral powder	Oral solution	Injectable products	Oral paste	Bolus	Intramammary products	Intrauterine products	Total mg/PCU
Austria	1.2	29.1	8.6	5.8	0.4	<0.01	1.0	0.1	46.3
Belgium	9.7	16.7	64.4	11.9	0.1	0.1	0.4	0.2	103.4
Bulgaria	88.5	6.1	60.2	10.4	0	0	0.7	0.2	166.0
Croatia	1.3	3.4	49.6	12.8	0	0.7	0.6	0.3	68.6
Cyprus	320.1	4.9	53.3	15.1	0	0	0.4	<0.01	393.9
Czechia	8.6	9.3	26.8	9.5	0.1	0.1	1.4	0.4	56.3
Denmark	0.6	2.0	18.3	15.6	0.7	<0.01	0.2	<0.01	37.2
Estonia	0	1.7	29.7	16.5	0.2	0	1.0	0.1	49.2
Finland	2.5	2.0	0.3	9.7	1.3	0	0.4	0	16.2
France	18.2	0.1	25.0	12.2	0.1	0.1	0.8	0.1	56.6
Germany	0.01	35.2	39.1	7.8	0.3	0.01	0.9	0.4	83.8
Greece	43.2	0.6	29.2	15.8	<0.01	0.1	0.1	0.03	89.1
Hungary	66.0	4.0	91.3	7.8	<0.01	0	0.4	0.4	169.9
Iceland	0.04	0	<0.01	3.4	0.1	0	0.3	0	3.8
Ireland	17.0	4.8	9.8	13.6	0.1	0.1	1.5	0.02	47.0
Italy	70.6	0.4	95.2	14.9	0.2	<0.01	0.5	0.1	181.8
Latvia	0	1.2	16.1	11.0	0	0	1.5	0.9	30.8
Lithuania	0	2.6	11.0	5.3	0	0.8	0.5	0.3	20.5
Luxembourg	0	4.6	11.0	11.8	0.2	0.03	1.1	0.3	29.0
Malta	58.2	4.7	37.2	14.2	0.3	0	0.7	0.9	116.1
Netherlands	0.4	1.7	38.4	8.8	0.3	<0.01	0.5	0.1	50.2
Norway	0.1	0.01	0.1	1.5	0.6	0	0.04	<0.01	2.3
Poland	2.5	0.5	172.5	10.2	0	0	2.0	0.2	187.9
Portugal	100.7	0.3	63.8	10.5	<0.01	<0.01	0.4	0.02	175.8
Romania	3.7	0.6	40.4	12.6	0	0.1	0.2	0.2	57.8
Slovakia	8.4	7.3	25.3	9.8	0.02	<0.01	0.8	0.2	51.9
Slovenia	0.04	8.3	14.9	8.4	0	0	1.2	0.4	33.3
Spain	46.5	0	92.4	15.2	<0.01	<0.01	0.2	0.02	154.3
Sweden	0.3	0.01	0.9	8.2	1.6	0	0.1	<0.01	11.1
Switzerland	16.0	2.3	1.2	9.8	0.6	0.02	3.6	0.8	34.3
United Kingdom	12.1	1.8	9.9	5.9	0.1	0.03	0.3	0.01	30.1
Total 31 countries	**20.0**	**6.6**	**50.7**	**10.7**	**0.2**	**0.04**	**0.7**	**0.2**	**89.0**

[1] Injectable products included in the analysis also encompass those antimicrobial VMPs that are used for treatment of companion animals; tablets are eliminated from these data.

Table A3. Percentage of sales, in mg/PCU, of premixes by antimicrobial class (according to ATCvet system), by country, in 2020[1]

Country	Tetracyclines	Amphenicols	Penicillins	Sulfonamides	Trimethoprim	Macrolides	Lincosamides	Other quinolones	Aminoglycosides	Polymyxins	Pleuromutilins	Others[2]	Total mg/PCU premixes
Austria	37%	0%	0%	0%	0%	61%	0%	0%	0%	0%	3%	0%	1.2
Belgium	27%	2%	66%	0.5%	0.1%	4%	<0.01%	0%	1%	0.04%	1%	<0.01%	9.7
Bulgaria	50%	0.04%	0%	1%	0%	44%	0%	0%	0%	2%	2%	0%	88.5
Croatia	70%	0.5%	0%	19%	0%	0%	0%	0%	11%	0%	0%	0%	1.3
Cyprus	39%	0%	11%	16%	3%	6%	15%	0%	0%	4%	6%	0%	320.1
Czechia	32%	0.02%	18%	17%	3%	21%	0.2%	0%	0%	1%	8%	1%	8.6
Denmark	0%	0%	1%	61%	12%	0%	0%	26%	0%	0%	0%	0%	0.6
Finland	66%	7%	0%	13%	3%	12%	0%	0%	0%	0%	0%	0%	2.5
France	41%	0%	8%	32%	5%	4%	0.2%	0.02%	8%	1%	1%	0%	18.2
Germany[3]	0%	0%		0%	0%	0%	0%	0%	0%	0%		100%	0.01
Greece	65%	2%	13%	13%	2%	1%	0.4%	0%	0.2%	2%	2%	0%	43.2
Hungary	55%	0.3%	18%	1%	0.1%	7%	0.1%	0%	0%	6%	12%	1%	66.0
Iceland	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0.04
Ireland[4]	73%	0.02%	8%	10%	2%	5%	0%	0%	0.04%	0%		2%	17.0
Italy	36%	0.5%	32%	20%	1%	1%	4%	0.04%	1%	0.05%	5%	0%	70.6
Malta	47%	0%	0%	22%	4%	10%	0%	0%	0%	0%	9%	7%	58.2
Netherlands	69%	0%	0%	26%	5%	0%	0%	0%	0%	0%	0%	0%	0.4
Norway	0.4%	52%	0%	0%	0%	0%	0%	48%	0%	0%	0%	0%	0.1
Poland	23%	0.03%	22%	14%	3%	28%	0%	0%	0%	2%	8%	0%	2.5
Portugal	45%	1%	15%	6%	1%	15%	0.1%	0%	1%	7%	10%	<0.01%	100.7
Romania[5]	16%	5%	40%	3%	1%	3%	1%	8%	<0.01%	0%	14%	9%	3.7
Slovakia	46%	0%	4%	4%	1%	2%	0%	0%	0%	1%	42%	0%	8.4
Slovenia	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0.04
Spain	23%	2%	35%	11%	2%	14%	5%	0%	1%	<0.01%	4%	0.04%	46.5
Sweden[6]													0.3
Switzerland[7]	40%	0%	23%	26%	1%	7%	0%	0%	0%	1%		1%	16.0
United Kingdom	49%	1%	12%	14%	3%	15%	0.3%	0%	1%	0%	4%	0%	12.1
Total 31 countries	**37.6%**	**1.1%**	**24.1%**	**14.6%**	**1.9%**	**9.7%**	**2.9%**	**0.1%**	**1.7%**	**1.2%**	**4.8%**	**0.2%**	**20.0**

[1] In 2020, no sales of premixes were reported in Estonia, Latvia, Lithuania and Luxembourg.
[2] The class 'Others' includes the following sub-classes: Imidazole derivatives (metronidazole), Nitrofuran derivatives (furazolidone) and Other antibacterials (bacitracin, spectinomycin). Of note is that some of the sales could be for non-food-producing animals such as companion animals, fur animals, exotic birds and racing pigeons.
[3] Penicillins and pleuromutilins are aggregated with 'Others' for commercial confidentiality reasons.
[4] Pleuromutilins are aggregated with 'Others' for commercial confidentiality reasons.
[5] No sales of other quinolones were reported in 2020; sales indicated in this table correspond to sales of fluoroquinolones.
[6] For reasons of commercial confidentiality, data at class level cannot be shown in this table.
[7] For reasons of commercial confidentiality, pleuromutilins are grouped with 'Others'.

Table A4. Percentages of sales, in mg/PCU, of oral powders by antimicrobial class (according to ATCvet system), by country, in 2020[1]

Country	Tetracyclines	Amphenicols	Penicillins	Sulfonamides	Trimethoprim	Macrolides	Lincosamides	Other quinolones	Aminoglycosides	Polymyxins	Pleuromutilins	Others[2]	Total mg/PCU oral powders
Austria	64%	0%	17%	7%	1%	6%	0%	0%	0.3%	5%	0.1%	0%	29.1
Belgium[3]	7%	0%	27%	54%	11%	1%	0%	0.03%	0%	0%	0.1%	0%	16.7
Bulgaria	57%	0%	19%	12%	0%	0%	0%	0%	0%	1%	12%	0%	6.1
Croatia	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	3.4
Cyprus	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	4.9
Czechia	73%	0%	1%	11%	2%	2%	0%	0%	3%	0%	8%	0%	9.3
Denmark	59%	2%	1%	2%	0.4%	22%	0%	4%	0.3%	0%	9%	0%	2.0
Estonia	0%	0%	64%	30%	6%	0%	0%	0%	0%	0%	0%	0%	1.7
Finland	32%	0%	12%	47%	9%	0%	0%	0%	0%	0%	0.2%	0%	2.0
France	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0.1
Germany[4]	14%		60%	15%	2%	0.5%	0%	0%		3%	1%	5%	35.2
Greece	0%	0%	80%	0%	0%	<0.01%	0%	0%	0%	20%	0%	0%	0.6
Hungary	44%	0%	56%	0%	0%	0%	0%	0%	0%	0%	0%	0%	4.0
Ireland	88%	0%	0%	10%	2%	0%	0%	0%	0%	0%	0%	0%	4.8
Italy[5]	0.1%	1%	93%	2%	0%	2%	0%	0.2%	1%	0%	0%	0.03%	0.4
Latvia	0%	0%	48%	33%	7%	0%	0%	0%	0%	12%	0%	0%	1.2
Lithuania	31%	0%	52%	14%	3%	0%	0%	0%	0%	0%	0%	0%	2.6
Luxembourg	47%	0%	2%	37%	7%	0%	0%	0%	0%	7%	0%	0%	4.6
Malta	11%	2%	49%	12%	2%	22%	0%	0%	0%	0%	0.04%	3%	4.7
Netherlands	53%	0%	0%	33%	7%	3%	2%	0%	0%	3%	0%	0%	1.7
Norway	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0.01
Poland	85%	0%	14%	<0.01%	<0.01%	1%	0%	0%	0%	0%	0%	0%	0.5
Portugal	6%	0%	12%	32%	6%	1%	0%	0%	42%	0%	0%	0%	0.3
Romania	17%	0%	83%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0.6
Slovakia	70%	0%	8%	11%	1%	0%	0%	0%	8%	2%	1%	0%	7.3
Slovenia	21%	1%	70%	5%	3%	0%	0%	0%	0%	0%	0%	0%	8.3
Sweden	18%	0%	0%	62%	12%	0%	0%	0%	0%	0%	7%	0%	0.01
Switzerland	0%	0%	0%	86%	12%	0%	0%	0%	2%	0%	0%	0%	2.3
United Kingdom	27%	0%	60%	11%	2%	<0.01%	0%	0%	0%	0%	<0.01%	0%	1.8
Total 31 countries	**22.6%**	**0.1%**	**49.8%**	**16.8%**	**2.6%**	**1.2%**	**0.02%**	**<0.01%**	**3.5%**	**2.4%**	**1.1%**	**<0.01%**	**6.6**

[1] In 2020, no sales of oral powders were reported in Iceland and Spain.
[2] The class 'Others' includes the following sub-classes: Nitrofuran derivatives (furazolidone) and Other antibacterials (furaltadone). Of note is that some of the sales could be for non-food-producing animals such as companion animals, fur animals, exotic birds and racing pigeons.
[3] Negligible quantities of fluoroquinolones are included with other quinolones.
[4] Amphenicols and aminoglycosides are aggregated with 'Others' for commercial confidentiality reasons.
[5] Negligible quantities of 1st- and 2nd-generation cephalosporins sold in Italy are included with 'Others'.

Table A5. Percentage of sales, in mg/PCU, of oral solutions by antimicrobial class (according to ATCvet system), by country, in 2020

Country	Tetracyclines	Amphenicols	Penicillins	Sulfonamides	Trimethoprim	Macrolides	Lincosamides	Fluoroquinolones	Other quinolones	Aminoglycosides	Polymyxins	Pleuromutilins	Others[1]	Total mg/PCU oral solutions
Austria	44%	0.3%	20%	10%	2%	11%	0.5%	2%	0%	3%	4%	4%	0%	8.6
Belgium	25%	1%	38%	11%	2%	10%	3%	0.3%	1%	2%	2%	0.4%	4%	64.4
Bulgaria	26%	2%	30%	7%	1%	7%	12%	5%	0%	2%	6%	0.3%	0.4%	60.2
Croatia	45%	0.3%	31%	6%	1%	7%	0.05%	2%	1%	0%	5%	1%	0.1%	49.6
Cyprus	5%	0%	64%	10%	2%	2%	3%	3%	1%	6%	5%	0.5%	0.5%	53.3
Czechia	16%	1%	41%	21%	2%	4%	0.3%	6%	0%	2%	2%	6%	0.3%	26.8
Denmark	19%	0.3%	18%	1%	0.2%	25%	2%	<0.01%	0%	14%	<0.01%	15%	4%	18.3
Estonia	40%	1%	9%	12%	2%	5%	0.3%	0.4%	0%	3%	1%	28%	1%	29.7
Finland[2]	39%	0%	33%	0%	0%	27%	0.2%	0.1%	0%	0%	0%	0%	1%	0.3
France	37%	0.1%	12%	22%	4%	9%	1%	0.2%	1%	6%	5%	1%	1%	25.0
Germany	32%	0.1%	19%	3%	0.3%	17%	3%	1%	0%	2%	16%	2%	3%	39.1
Greece	42%	0.1%	19%	7%	0.4%	8%	1%	6%	4%	8%	3%	1%	1%	29.2
Hungary	20%	2%	38%	7%	1%	4%	2%	12%	0%	2%	4%	7%	0.2%	91.3
Iceland	0%	0%	93%	0%	0%	0%	0%	7%	0%	0%	0%	0%	0%	0.01
Ireland[3]	1%	3%	58%	18%	0.1%	2%	8%	1%	0%	6%			2%	9.8
Italy[4]	23%	2%	35%	11%	2%	8%	9%	1%	1%	5%	1%	2%	1%	95.2
Latvia	34%	0.4%	4%	0%	0%	36%	0.3%	6%	0%	5%	4%	9%	1%	16.1
Lithuania	7%	0.1%	18%	25%	6%	19%	1%	10%	0%	1%	<0.01%	13%	1%	11.0
Luxembourg	67%	0%	5%	2%	0.1%	2%	4%	1%	0%	16%	<0.01%	0.2%	2%	11.0
Malta[5]	39%	4%	7%	11%	1%	20%	0.3%	11%		1%	1%	0.4%	4%	37.2
Netherlands	36%	0%	22%	15%	3%	19%	<0.01%	0.1%	2%	1%	1%	0.3%	0.1%	38.4
Norway	7%	0%	46%	0%	0%	0%	0.2%	0.1%	0%	19%	0%	28%	0.4%	0.1
Poland	25%	0.5%	33%	4%	1%	14%	1%	7%	0%	3%	5%	6%	1%	172.5
Portugal	21%	4%	34%	1%	0.04%	7%	9%	10%	0%	2%	8%	4%	0.3%	63.8
Romania	29%	1%	21%	3%	1%	18%	4%	12%	0.1%	4%	5%	2%	0.4%	40.4
Slovakia	11%	1%	21%	18%	3%	3%	1%	12%	0.1%	6%	7%	13%	4%	25.3
Slovenia	30%	2%	42%	7%	1%	0%	0%	1%	<0.01%	11%	1%	4%	0%	14.9
Spain	24%	3%	35%	7%	1%	3%	14%	1%	0%	9%	0.5%	1%	1%	92.4
Sweden[6]														0.9
Switzerland	0%	1%	19%	71%	0%	0%	0%	7%	0%	0%	0.1%	0%	2%	1.2
United Kingdom	23%	0.05%	34%	7%	1%	6%	7%	0.5%	0%	10%	<0.01%	5%	6%	9.9
Total 31 countries	**26.3%**	**1.3%**	**30.3%**	**7.5%**	**1.3%**	**10.3%**	**5.9%**	**3.5%**	**0.3%**	**4.8%**	**4.2%**	**3.0%**	**1.4%**	**50.7**

[1] The class 'Others' includes the following sub-classes: Imidazole derivatives (metronidazole), Nitrofuran derivatives (furazolidone) and Other antibacterials (bacitracin, furaltadone, spectinomycin). Of note is that some of the sales could be for non-food-producing animals such as companion animals, fur animals, exotic birds and racing pigeons.
[2] Negligible quantities of 1st- and 2nd-generation cephalosporins are included with 'Others'.
[3] Polymyxins and pleuromutilins are aggregated with 'Others' for reasons of commercial confidentiality.
[4] Negligible quantities of 1st- and 2nd-generation cephalosporins are included with 'Others'.
[5] Fluoroquinolones and other quinolones are aggregated for reasons of commercial confidentiality.
[6] For reasons of commercial confidentiality, data at class level cannot be disclosed.

Table A6. Percentage of sales, in mg/PCU, of injectable products by antimicrobial class (according to ATCvet system), by country, in 2020

Country	Tetracyclines	Amphenicols	Penicillins	1st- and 2nd-gen. cephalosporins	3rd- and 4th-gen. cephalosporins[1]	Sulfonamides	Trimethoprim	Macrolides	Lincosamides	Fluoroquinolones	Aminoglycosides	Polymyxins	Pleuromutilins	Others[2]	Total mg/PCU injectable products
Austria	9%	7%	40%	0%	4%	8%	2%	6%	1%	6%	17%	0%	0.4%	2%	5.8
Belgium	5%	11%	64%	2%	0.3%	6%	1%	4%	4%	1%	1%	0.2%	0.1%	7%	11.9
Bulgaria	19%	0.5%	28%	0.1%	1%	4%	1%	9%	2%	4%	31%	0.01%	0.3%	2%	10.4
Croatia	9%	11%	31%	0%	2%	12%	2%	4%	0.4%	11%	18%	0%	0%	1%	12.8
Cyprus	24%	8%	38%	0%	3%	4%	1%	1%	1%	5%	14%	0.2%	1%	3%	15.1
Czechia	14%	4%	49%	0%	5%	5%	1%	1%	0.3%	4%	16%	0%	0.5%	0.6%	9.5
Denmark	9%	5%	56%	0%	<0.01%	12%	2%	3%	3%	0.01%	8%	0%	1%	1%	15.6
Estonia	11%	1%	56%	0.2%	4%	1%	0.1%	0.7%	1%	6%	17%	0%	3%	2%	16.5
Finland	13%	0.5%	79%	0%	<0.01%	4%	0.9%	0.2%	0.5%	1%	0.2%	0%	0%	0%	9.7
France	11%	7%	33%	0.1%	0.1%	7%	1%	9%	1%	0.3%	30%	1%	0.02%	1%	12.2
Germany[3]	4%	9%	51%	0%	2%	15%	3%	4%	2%	4%	6%	0.1%		2%	7.8
Greece	22%	2%	27%	0%	1%	2%	0.5%	3%	1%	1%	40%	0.03%	0.02%	2%	15.8
Hungary	7%	8%	43%	<0.01%	6%	3%	1%	3%	1%	8%	19%	0.1%	1%	0.9%	7.8
Iceland	7%	0%	74%	0%	0.04%	0%	0%	0%	0%	0.1%	18%	0%	0%	0%	3.4
Ireland[3]	21%	10%	33%	0.1%	0.9%	4%	1%	9%	0.2%	2%	18%	0%		0.4%	13.6
Italy[4]	11%	16%	32%	0%	1%	14%	1%	5%	4%	3%	12%	0.1%	0.3%	7%	14.9
Latvia	7%	1%	40%	1%	4%	8%	2%	3%	0.2%	5%	29%	0%	1%	0.4%	11.0
Lithuania	16%	7%	54%	1%	2%	5%	1%	4%	1%	4%	5%	0%	0%	2%	5.3
Luxembourg	12%	9%	47%	0.4%	4%	8%	2%	3%	1%	6%	8%	0.3%	0%	2%	11.8
Malta	5%	5%	33%	0%	3%	3%	1%	0%	3%	3%	43%	0%	0%	6%	14.2
Netherlands	15%	17%	41%	0%	<0.01%	17%	3%	3%	0%	0.1%	3%	0.1%	0.1%	0%	8.8
Norway	2%	1%	89%	0%	0.02%	4%	1%	0.1%	0%	0.2%	3%	0%	0.2%	0.0%	1.5
Poland	10%	13%	33%	0.1%	3%	3%	0.4%	3%	2%	8%	23%	0.1%	1%	2%	10.2
Portugal	20%	10%	22%	0.1%	3%	3%	1%	6%	1%	8%	26%	0.1%	0.2%	1%	10.5
Romania	23%	13%	25%	0%	1%	3%	1%	3%	0.9%	5%	25%	0.1%	0.1%	2%	12.6
Slovakia	20%	2%	37%	1%	4%	7%	1%	7%	0.2%	4%	17%	0%	1%	0.4%	9.8
Slovenia	9%	7%	33%	0%	2%	10%	2%	3%	0%	10%	22%	0%	0%	0%	8.4
Spain	9%	19%	25%	0%	2%	3%	1%	8%	2%	16%	14%	0.04%	0.3%	2%	15.2
Sweden[5]	6%		80%		0.03%	6%	1%	2%	0.5%	0.3%	2%			1%	8.2
Switzerland[6]	12%	7%	42%	0%	1%	8%	2%	2%		2%	25%	<0.01%		0.2%	9.8
United Kingdom	24%	8%	32%	1%	1%	3%	1%	8%	0.4%	1%	22%	0%	0.2%	0%	5.9
Total 31 countries	**12.0%**	**11.0%**	**35.8%**	**0.1%**	**1.4%**	**6.9%**	**1.2%**	**5.6%**	**1.7%**	**5.1%**	**16.7%**	**0.1%**	**0.3%**	**2.0%**	**10.7**

[1] For the countries where the injectable 3rd- and 4th-generation cephalosporins are solely or almost solely marketed for dogs and cats, the data provide a considerable overestimate for food-producing animals.
[2] The class 'Others' includes sales of spectinomycin (classified as 'Other antibacterials' in the ATCvet system).
[3] Pleuromutilins are aggregated with 'Others' for reasons of commercial confidentiality.
[4] Negligible quantities of other quinolones are included with fluoroquinolones.
[5] For commercial confidentiality reasons, amphenicols, polymyxins and pleuromutilins are aggregated with 'Others' and 1st- and 2nd-generation cephalosporins are grouped with 3rd- and 4th-generation cephalosporins.
[6] For reasons of commercial confidentiality, pleuromutilins are grouped with 'Others' and lincosamides are grouped with macrolides.

Table A7. Number of VMP presentations[1] containing 1, 2, 3 and 4 antimicrobial active substances, by country, in 2020 (tablets excluded from the data)

Country	1 substance	2 substances	3 substances	4 substances	Total number of VMP presentations
Austria	235	22	2		259
Belgium	281	39	4		324
Bulgaria	187	41	7		235
Croatia	124	16	3	3	146
Cyprus	110	18	2		130
Czechia	414	62	12	2	490
Denmark	205	33	2		240
Estonia	103	21	3		127
Finland	63	12	1		76
France	482	112	7		601
Germany	447	54	5		506
Greece	260	50	5		315
Hungary	317	38	6	1	362
Iceland	21	4	1		26
Ireland	241	34	3	1	279
Italy	731	120	13	2	866
Latvia	130	25	9		164
Lithuania	77	22	4		103
Luxembourg	184	48	9		241
Malta	78	41	9	1	129
Netherlands	168	37	3		208
Norway	49	8	1		58
Poland	533	64	11		608
Portugal	413	57	9		479
Romania	432	80	8	3	523
Slovakia	259	32	9		300
Slovenia	113	13	3		129
Spain	981	131	9		1,121
Sweden	90	19	1		110
Switzerland	124	38	30		192
United Kingdom	277	23	6		306
Total 31 countries	**8,129**	**1,314**	**197**	**13**	**9,653**

[1] VMP presentation, in this context, could be determined by differences in any of the characteristics of a medicinal product, i.e. pharmaceutical form, pack size, composition, strength or target species.

Table A8. Number of VMP presentations[1] of premixes, oral powders and oral solutions containing 1, 2, 3 and 4 antimicrobial active substances sold, by country, in 2020

Country	1 substance	2 substances	3 substances	4 substances	Total number of VMP presentations for premixes, oral powders and oral solutions
Austria	95	6			101
Belgium	115	20			135
Bulgaria	112	19			131
Croatia	41	6		2	49
Cyprus	53	8			61
Czechia	182	29	2		213
Denmark	89	8			97
Estonia	28	4			32
Finland	22	4			26
France	256	51			307
Germany	194	20			214
Greece	143	17			160
Hungary	183	12			195
Iceland	3				3
Ireland	69	11			80
Italy	318	46	5	2	371
Latvia	32	4			36
Lithuania	22	7			29
Luxembourg	57	19			76
Malta	50	25	7	1	83
Netherlands	75	15			90
Norway	13	1			14
Poland	288	23			311
Portugal	168	17			185
Romania	255	34	1	2	292
Slovakia	106	14	1		121
Slovenia	40	4			44
Spain	446	25			471
Sweden	29	1			30
Switzerland	43	10	24		77
United Kingdom	111	13			124
Total 31 countries	**3,638**	**473**	**40**	**7**	**4,158**

[1] VMP presentations, in this context, is determined by differences in any of the characteristics of a medicinal product, i.e. pharmaceutical form, pack size, composition, strength or target species.

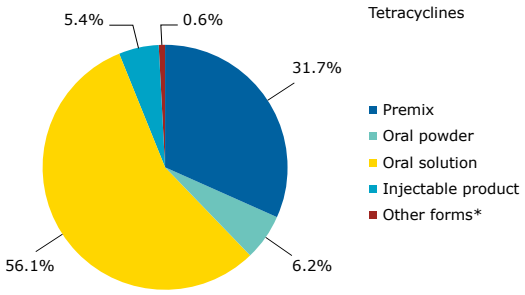
Table A9. Sales, in tonnes of active substance, of VMP presentations[1] sold as premixes, oral powders and oral solutions containing 1, 2 and 3 active substances, by country, in 2020[2]

Country	1 substance		2 substances		3 substances		Total tonnes (premixes, oral powders and oral solutions)
	Tonnes	%	Tonnes	%	Tonnes	%	
Austria	33.5	91%	3.2	9%			36.7
Belgium	118.1	75%	40.4	25%			158.4
Bulgaria	50.3	88%	6.7	12%			57.0
Croatia	16.3	91%	1.3	7%			17.9
Cyprus	37.8	81%	8.6	19%			46.4
Czechia	25.8	83%	5.0	16%	0.5	2%	31.3
Denmark	45.1	91%	4.6	9%			49.6
Estonia	3.1	84%	0.6	16%			3.6
Finland	1.6	68%	0.8	32%			2.4
France	205.8	68%	95.9	32%			301.7
Germany	552.4	91%	55.0	9%			607.5
Greece	80.8	91%	8.0	9%			88.8
Hungary	121.4	94%	7.8	6%			129.2
Iceland	<0.01	100%					0.01
Ireland	61.4	89%	7.9	11%			69.3
Italy	435.2	69%	187.9	30%	6.5	1%	629.8
Latvia	2.6	96%	0.1	4%			2.7
Lithuania	2.9	70%	1.2	30%			4.1
Luxembourg	0.7	84%	0.1	16%			0.8
Malta	1.1	75%	0.3	21%	0.1	3%	1.5
Netherlands	104.6	83%	21.4	17%			125.9
Norway	0.4	100%	<0.01	0.2%			0.4
Poland	742.6	93%	54.4	7%			797.0
Portugal	156.3	94%	10.5	6%			166.8
Romania	126.6	94%	6.4	5%	1.1	1%	134.2
Slovakia	7.3	78%	2.0	21%	0.1	1%	9.4
Slovenia	3.8	92%	0.3	8%			4.1
Spain	1,013.2	90%	106.8	10%			1,120.0
Sweden	0.9	99%	<0.01	1%			0.9
Switzerland	6.7	43%	3.7	23%	5.3	34%	15.8
United Kingdom	141.2	83%	28.1	17%			169.4
Total 31 countries	**4,099.4**	**85.7%**	**669.0**	**14.0%**	**13.6**	**0.3%**	**4,782.5**

[1] VMP presentations, in this context, is determined by differences in any of the characteristics of a medicinal product, i.e. pharmaceutical form, pack size, composition, strength or target species.

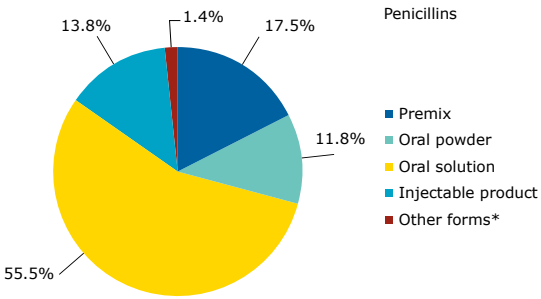
[2] In addition, 0.01% of the total sales of premixes, oral powders and oral solution preparations contained 4 active substances, accounting for 0.5 tonnes (which is included in the total tonnes of premixes, oral powders and oral solutions).

Figure A1. Distribution of sales of tetracyclines for food-producing animals, in mg/PCU, by the major product forms sold, aggregated by the 31 European countries, in 2020



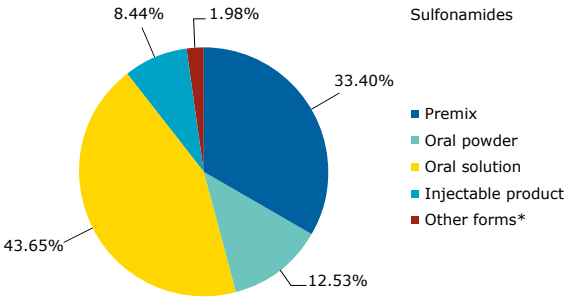
* 'Other forms' includes boluses, oral pastes and intramammary and intrauterine products.

Figure A2. Distribution of sales of penicillins for food-producing animals, in mg/PCU, by the major product forms sold, aggregated by the 31 European countries, in 2020



* 'Other forms' includes boluses, oral pastes and intramammary and intrauterine products.

Figure A3. Distribution of sales of sulfonamides for food-producing animals, in mg/PCU, by the major product forms sold, aggregated by the 31 European countries, in 2020



* 'Other forms' includes boluses, oral pastes and intramammary and intrauterine products.

Figure A4. Distribution of sales of 3rd- and 4th-generation cephalosporins for food-producing animals, in mg/PCU, by the major product forms sold, aggregated by the 31 European countries, in 2020

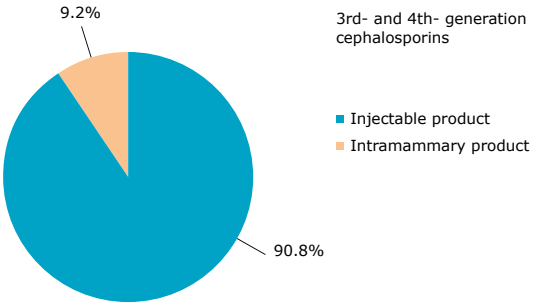
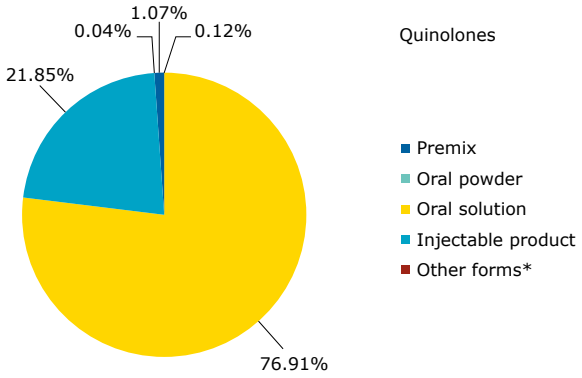
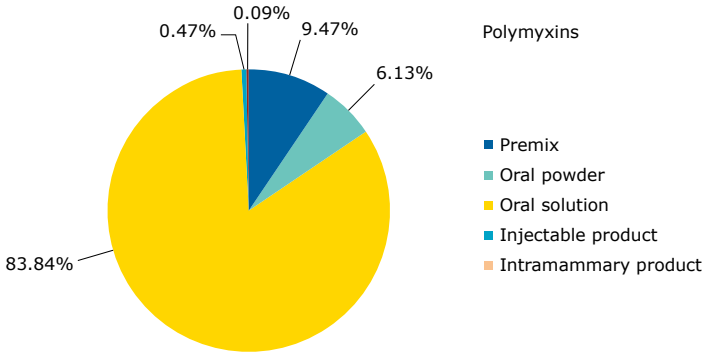


Figure A5. Distribution of aggregated sales of fluoroquinolones and other quinolones for food-producing animals, in mg/PCU, by the major product forms sold, aggregated by the 31 European countries, in 2020



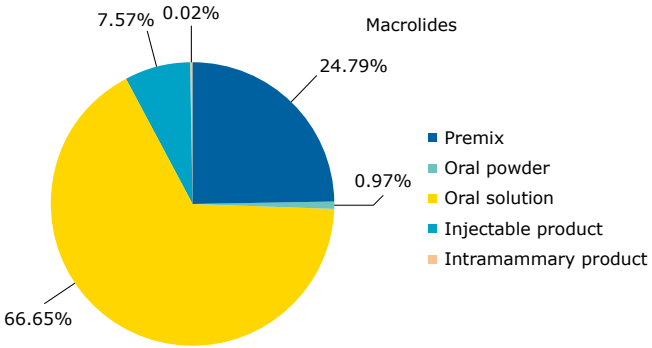
* 'Other forms' includes boluses, oral pastes and intrauterine products.

Figure A6. Distribution of sales of polymyxins for food-producing animals, in mg/PCU, by the major product forms sold, aggregated by the 31 European countries, in 2020



* 'Other forms' includes boluses and intramammary products.

Figure A7. Distribution of sales of macrolides for food-producing animals, in mg/PCU, by the major product forms sold, aggregated by the 31 European countries, in 2020



Annex 2. Additional tables and figures regarding 2019 data

Advice on how to read this section:
In this section are included figures and tables with 2019 data which are not available through the ESVAC interactive database. All of the other figures and tables that are published with 2020 data only in this report, can also be accessed for 2019 data via the ESVAC interactive database.

Table A10. Summary of information on number of years of data collection, legal basis for data collection at national level, national data providers, sources for ESVAC data and characteristics of data, by country, in 2019

Country	Number of years of data collection	Legal basis	National data provider to ESVAC	Sources for ESVAC data (approx. number)	Sales data, prescription data or purchase data[1]	Sales between wholesalers and/or MAHs[2] excluded (Yes/No)	Products sold on special licence included[3] (Yes/No)
Austria	>5 years	Mandatory to report	Austrian Agency for Health and Food Safety	MAHs (n=10) Wholesalers (n=10)	Sales to pharmacies	Yes	No
Belgium	>5 years	Mandatory to report	Federal Agency for Medicines and Health Products	Wholesalers (n=22) Feed mills (n=43)	Sales to veterinarians and pharmacies; sales by feed mills to farmers	Yes	No
Bulgaria	>5 years	Not mandatory	Bulgarian Food Safety Agency	Wholesalers (n=38)	Sales to veterinarians, farmers and pharmacies	Yes	No
Croatia	>5 years	Mandatory to report	Ministry of Agriculture, Veterinary Directorate	Wholesalers (n=16)	Sales to pharmacies and veterinarians	Yes	No
Cyprus	>5 years	Mandatory to report	Ministry of Agriculture, Rural Development and Environment – Veterinary Services	Wholesalers (n=22) Feed mills (n=27)	Sales by wholesalers to veterinarians, pharmacies and feed mills	Yes	Yes (36%)
Czechia	>5 years	Mandatory to report	Institute for State Control of Veterinary Biologicals and Medicines	Wholesalers (n=101) Feed mills (n=42)	Sales by wholesalers to veterinarians and pharmacies; sales by feed mills to farmers	Yes	Yes (<0.2%)
Denmark	>5 years	Mandatory to report	Danish Veterinary and Food Administration	VetStat (n=1) obtaining data from pharmacies (n=529) Feed mills (n=1)	Prescription data from pharmacies and feed mills	Yes	Yes (2.5%)
Estonia	>5 years	Mandatory to report	State Agency of Medicines	Wholesalers (n=8)	Sales to veterinarians and pharmacies	Yes	Yes (1%)
Finland	>5 years	Mandatory to report	Finnish Medicines Agency	Wholesalers (n=2) Importers of medicated feed n=1)	Sales to pharmacies and veterinarians	Yes	Yes (5.2%)
France	>5 years	Mandatory to report	National Agency for Veterinary Medicinal Products (Anses-ANMV)	MAHs (n=57)	Sales to wholesalers and feed mills	Yes	No

Country	Number of years of data collection	Legal basis	National data provider to ESVAC	Sources for ESVAC data (approx. number)	Sales data, prescription data or purchase data[1]	Sales between wholesalers and/or MAHs[2] excluded (Yes/No)	Products sold on special licence included[3] (Yes/No)
Germany	>5 years	Mandatory to report	Federal Office of Consumer Protection and Food Safety	MAHs (n=28) Wholesalers (n=14) PSURs[4] data for premixes	Sales to veterinarians	Yes	No
Greece	5 years	Mandatory to report	Greek National Organisation for Medicines	MAHs (n=85)[5]	Sales to pharmacies and veterinarians	Yes	No
Hungary	>5 years	Not mandatory	National Food Chain Safety Office Directorate of Veterinary Medicinal Products	Wholesalers (n=34)	Sales to pharmacies, veterinarians, feed mills, farmers and retailers	Yes	No
Iceland	>5 years	Mandatory to report	Icelandic Medicines Agency	Wholesalers (n=2)	Sales to veterinarians and pharmacies	Yes	Yes (9.7%)
Ireland	>5 years	Mandatory to report	Health Products Regulatory Authority	MAHs (n=62)	Sales to wholesalers, pharmacies, veterinarians and licensed merchants	Yes	No
Italy	>5 years	Mandatory to report	Italian Ministry of Health	MAHs (n=43)	Sales to wholesalers and feed mills	Yes	No
Latvia	>5 years	Mandatory to report	Food and Veterinary Service	Wholesalers (n=18)	Sales to pharmacies, veterinarians, veterinary clinics and farmers	Yes	No
Lithuania	>5 years	Mandatory to report	State Food and Veterinary Service	Wholesalers (n=46)	Sales to pharmacies, veterinarians and farmers	Yes	No
Luxembourg	>5 years	Mandatory to report	Ministry of Health	Wholesalers (n=3)	Sales to pharmacies and veterinarians	Yes	No
Malta	3 years	Not mandatory	Ministry for Agriculture, Fisheries and Animal Rights	Wholesalers (n=19) Medicated feed mill (n=1) Medicated feed traders (n=3)	Sales to pharmacies, veterinarians and farmers	Yes	No
Netherlands	>5 years	Not mandatory	Federation of the Dutch Veterinary Pharmaceutical Industry (FIDIN)	MAHs (n=16)	Sales to wholesalers and veterinarians	Yes	No
Norway	>5 years	Mandatory to report	Norwegian Veterinary Institute	Wholesalers (n=5) Feed mills (n=1)	Sales by wholesalers to pharmacies and veterinarians; sales by feed mills to fish farmers (only as medicated feed)	Yes	Yes (2.0%)

Country	Number of years of data collection	Legal basis	National data provider to ESVAC	Sources for ESVAC data (approx. number)	Sales data, prescription data or purchase data[1]	Sales between wholesalers and/or MAHs[2] excluded (Yes/No)	Products sold on special licence included[3] (Yes/No)
Poland	>5 years	Mandatory to report	Ministry of Agriculture and Rural Development	Wholesalers (n=134)	Sales to veterinarians	Yes	No
Portugal	>5 years	Mandatory to report	Directorate-General for Food and Veterinary	Wholesalers (n=78)	Sales to pharmacies and veterinarians	Yes	No
Romania	5 years	Mandatory to report	Institute for Control of Biological Products and Veterinary Medicines	MAHs (n=79)[6]	Sales to wholesalers	Yes	No
Slovakia	>5 years	Mandatory to report	Institute for State Control of Veterinary Biologicals and Medicaments	Wholesalers (n=60)	Sales to pharmacies, military forces, State Veterinary and Food Administration, veterinarians, farmers and feed mills	Yes	Yes (<2%)
Slovenia	>5 years	Mandatory to report	Administration of the Republic of Slovenia for Food Safety, Veterinary Sector and Plant Protection (AFSVSPP)	Wholesalers (n=10)	Sales to pharmacies, feed mills and veterinarians	Yes	Yes (0.2%)
Spain	>5 years	Not mandatory	Spanish Agency for Medicines and Health Products	Retailers (n=765) Feed mills (n=15) Pharmacies (n=2,147)[7]	Sales to veterinarians, farmers and pet owners	Yes	No
Sweden	>5 years	Mandatory to report	National Veterinary Institute and Swedish Board of Agriculture	The Swedish eHealth Agency (n=1) obtaining data from pharmacies (n>1,400)	Dispensed veterinary prescriptions and requisitions[8]	Yes	Yes (7.7%)
Switzerland	>5 years	Mandatory to report	Federal Food Safety and Veterinary Office	MAHs (n=16)	Sales to veterinarians, pharmacies and medicated feed mills	No[9]	No
United Kingdom	>5 years	Mandatory to report	Veterinary Medicines Directorate	MAHs (n=63)	Sales to wholesalers, veterinarians, feed mills and veterinary pharmacies	Yes	No

[1] Purchase/import data from e.g. pharmaceutical industry and/or from wholesalers in other countries.
[2] MAHs = marketing authorisation holders.
[3] Antimicrobial VMPs available through special licence/marketing authorisation or through parallel trade. The type of authorisation procedure used might differ among Member States. The % refers to the proportion of their sales in comparison to the total sales reported for that year.
[4] PSURs = periodic safety update reports.
[5] Negligible sales from a few MAHs with a very small market share, and which do not have local representatives in Greece, are not included in the dataset.
[6] For 2015–2019, data were collected from MAHs, while for 2014 the data were obtained from MAHs and wholesalers and include MAHs' sales to wholesalers and wholesalers' sales to pharmacies and veterinarians.
[7] Since 2017, data have been collected from retailers and pharmacies, but data from feed mills were used to verify the sales of medicated feed.
[8] Data represent veterinary prescriptions and requisitions dispensed by pharmacies for use in their own practice.
[9] No data provided by wholesalers or feed mills.

Table A11. Sales, in tonnes of active substance, of antimicrobial VMPs marketed mainly for food-producing animals[1], PCU and sales in mg/PCU, by country, in 2019

Country	Sales (tonnes) for food-producing animals	PCU (1,000 tonnes)	mg/PCU
Austria	40.5	950.7	42.6
Belgium	175.1	1,717.3	101.9
Bulgaria	43.4	385.5	112.7
Croatia	20.1	319.4	62.8
Cyprus	49.4	123.5	399.7
Czechia	37.8	702.0	53.8
Denmark	87.7	2,362.4	37.1
Estonia	6.1	114.9	53.5
Finland	9.4	494.4	19.1
France	407.4	6,985.4	58.3
Germany	654.5	8,327.2	78.6
Greece	99.8	1,199.6	83.2
Hungary	152.1	801.8	189.7
Iceland	0.5	131.3	3.5
Ireland	87.5	2,144.0	40.8
Italy	731.3	3,827.5	191.1
Latvia	6.6	161.3	41.1
Lithuania	6.5	310.7	20.8
Luxembourg	1.6	53.8	29.0
Malta	1.5	13.8	110.3
Netherlands	153.1	3,172.4	48.2
Norway	4.7	1,999.6	2.3
Poland	840.6	4,538.0	185.2
Portugal	149.5	1,019.8	146.6
Romania	169.0	3,134.6	53.9
Slovakia	10.2	241.8	42.3
Slovenia	7.9	177.1	44.9
Spain	1,007.2	7,950.0	126.7
Sweden	8.6	781.1	11.1
Switzerland	29.2	817.4	35.7
United Kingdom	216.2	7,099.9	30.5
Total 31 countries	**5,214.9**	**62,058.3**	**84.03***

[1] Tablets are excluded as they are used almost solely in companion animals; injectable antimicrobial VMPs can also be used in companion animals; a few other products may solely be used in companion animals, but as their proportional use is minor, these are included in the sales for food-producing animals.

* Total mg/PCU for 31 countries represents aggregated sales (tonnes) for food-producing animals, including horses and farmed fish, normalised by the aggregated PCU (1,000 tonnes).

Table A12. Sales for food-producing animals, in mg/PCU, of the various antimicrobial classes in 31 European countries in 2019[1]

Country	Tetracyclines	Amphenicols	Penicillins	1st- and 2nd-gen. cephalosporins	3rd- and 4th-gen. cephalosporins	Sulfonamides	Trimethoprim	Macrolides	Lincosamides	Fluoroquinolones	Other quinolones	Aminoglycosides	Polymyxins	Pleuromutilins	Others*	Total mg/PCU
Austria	20.7	0.5	9.0	0.04	0.2	4.1	0.8	3.1	0.1	0.5	0	1.3	1.6	0.4	0.1	42.6
Belgium	21.6	1.8	40.7	0.2	0.1	16.4	3.3	6.4	3.0	0.2	0.3	1.5	1.8	0.6	4.0	101.9
Bulgaria	38.5	4.3	22.0	0.02	0.1	8.3	0.8	17.0	7.8	4.1	0	4.2	1.6	3.2	0.7	112.7
Croatia	21.9	1.6	20.6	0.03	0.3	6.4	1.0	4.2	0.1	2.0	0.1	2.8	1.5	0.3	0.2	62.8
Cyprus	130.7	8.6	69.3	0.02	0.4	65.4	13.0	19.2	49.4	2.2	0.3	5.2	14.0	21.0	1.0	399.7
Czechia	15.2	0.4	17.4	0.1	0.5	8.6	1.1	2.7	0.1	1.8	0	2.2	0.6	2.7	0.3	53.8
Denmark	6.1	0.7	11.1	0.03	<0.01	3.7	0.7	5.6	0.9	<0.01	0.2	3.8	<0.01	3.3	1.0	37.1
Estonia	15.2	0.4	14.5	0.1	0.8	4.7	0.9	1.8	0.6	1.1	0	3.6	0.5	8.3	0.9	53.5
Finland	5.4	0.2	8.2	0.02	<0.01	3.5	0.7	0.4	0.3	0.1	0	0.1	0	<0.01	0	19.1
France	20.6	0.8	9.1	0.2	0.02	11.4	1.9	4.3	0.4	0.1	0.3	6.8	1.4	0.5	0.5	58.3
Germany	16.9	0.7	31.1	0.1	0.2	6.9	1.0	6.8	1.6	0.7	0	2.6	7.9	1.0	1.1	78.6
Greece	42.2	0.3	13.1	0	0.1	8.8	0.8	4.2	0.3	1.6	3.3	5.7	1.5	0.8	0.5	83.2
Hungary	57.4	4.0	62.7	0.1	0.5	10.6	2.1	9.2	4.5	12.2	0.1	3.1	9.3	13.7	0.1	189.7
Iceland	0.3	0	2.6	0	<0.01	0.04	<0.01	0	0	<0.01	0	0.5	0	0	0	3.5
Ireland[2]	17.5	1.7	8.5	0.2	0.1	6.1	0.6	2.6	0.1	0.3	0	2.5			0.4	40.8
Italy	51.2	5.3	58.9	0.1	0.2	28.6	2.9	10.7	14.0	1.8	1.1	7.8	0.9	5.4	2.2	191.1
Latvia	11.2	0.2	10.1	0.3	0.7	1.8	0.4	5.8	0.2	1.3	<0.01	5.4	1.3	2.2	0.4	41.1
Lithuania	1.5	0.5	6.8	0.2	0.2	4.6	1.0	0.5	0.3	1.5	0	1.3	0.7	1.2	0.6	20.8
Luxembourg	10.6	0.9	6.5	0.1	0.6	3.5	0.7	1.6	0.4	0.8	0	2.6	0.4	<0.01	0.4	29.0
Malta[3]	37.1	3.1	9.0	0.1	0.3	18.2	3.2	13.4	1.0	8.5		5.9	0.1	3.0	7.4	110.3
Netherlands	16.9	1.4	11.1	0.03	<0.01	7.9	1.4	7.3	0.03	0.1	0.8	0.6	0.4	0.2	0.03	48.2
Norway	0.04	0.1	1.4	0	<0.01	0.5	0.1	<0.01	<0.01	<0.01	0.03	0.1	0	0.02	<0.01	2.3
Poland	46.0	2.0	62.1	0.2	0.4	7.4	1.5	22.7	2.1	13.2	<0.01	6.7	10.6	9.2	1.3	185.2
Portugal	48.5	1.8	35.7	0.03	0.3	10.4	2.0	13.8	5.3	6.2	<0.01	3.7	8.5	10.0	0.3	146.6
Romania	13.6	2.2	12.0	<0.01	0.1	1.8	0.3	6.2	1.8	5.2	0.1	5.1	2.5	2.3	0.5	53.9
Slovakia	11.8	0.3	7.8	0.2	0.4	5.4	0.7	2.2	0.3	3.2	0.02	2.0	1.3	5.4	1.2	42.3
Slovenia	5.4	0.9	28.9	0.04	0.2	2.5	0.6	0.2	<0.01	1.8	<0.01	3.6	0.1	0.5	0.1	44.9
Spain	30.0	6.0	40.4	0.2	0.3	9.1	1.3	10.1	12.5	3.6	0	8.8	0.9	2.3	1.2	126.7
Sweden[4]	0.7		7.0		<0.01	1.9	0.4	0.5	0.04		0.1	0.4			0.2	11.1
Switzerland[5]	7.5	0.7	11.1	0.4	0.1	10.2	0.7	1.4		0.2	0	3.0	0.3		0.2	35.7
United Kingdom	10.2	0.6	7.5	0.1	0.03	3.0	0.6	2.3	0.6	0.1	0	2.9	<0.01	2.1	0.5	30.5
Total sales[6] for 31 countries (mg/PCU)	**22.9**	**2.0**	**25.3**	**0.1**	**0.1**	**8.4**	**1.3**	**7.2**	**3.5**	**2.3**	**0.2**	**4.5**	**2.8**	**2.5**	**0.9**	**84.0**
Median[7] of 31 countries (mg/PCU)	**16.9**	**0.9**	**11.1**	**0.1**	**0.2**	**6.4**	**0.8**	**4.2**	**0.4**	**1.3**	**0**	**3.0**	**1.1**	**1.2**	**0.5**	**53.5**

* The class 'Others' includes the following sub-classes: Imidazole derivatives (metronidazole), Nitrofuran derivatives (furazolidone) and Other antibacterials (bacitracin, furaltadone, novobiocin, rifaximin, spectinomycin).Of note is that some of the sales could be for non-food-producing animals such as companion animals, fur animals, exotic birds and racing pigeons.

[1] For the countries where the injectable 3rd- and 4th-generation cephalosporins are solely or almost solely marketed for dogs and cats, the data provide a considerable overestimate for food-producing animals.

[2] Polymyxins and pleuromutilins are aggregated with 'Others' for reasons of commercial confidentiality.

[3] For commercial confidentiality reasons, fluoroquinolones and other quinolones are aggregated.

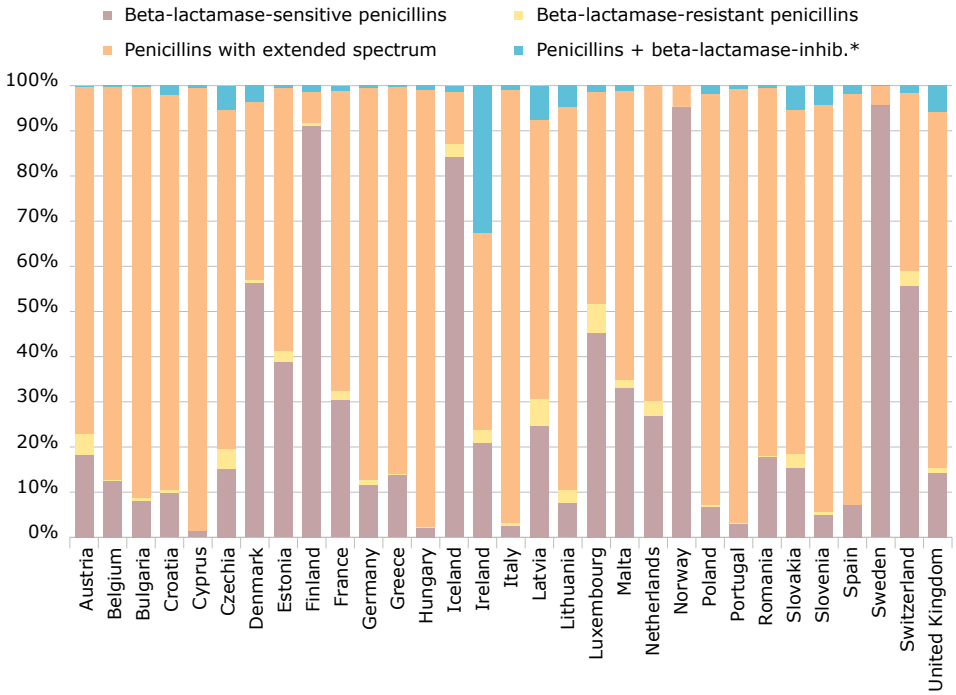
[4] For commercial confidentiality reasons, amphenicols, polymyxins and pleuromutilins are aggregated with 'Others', 1st- and 2nd-generation cephalosporins are aggregated with 3rd- and 4th-generation cephalosporins and fluoroquinolones are aggregated with other quinolones.

[5] For commercial confidentiality reasons, pleuromutilins are grouped with 'Others' and lincosamides are grouped with macrolides.

[6] Total sales expressed in mg/PCU consist of total quantity of antimicrobial active substances (mg) divided by total PCU (kg) for 31 countries.

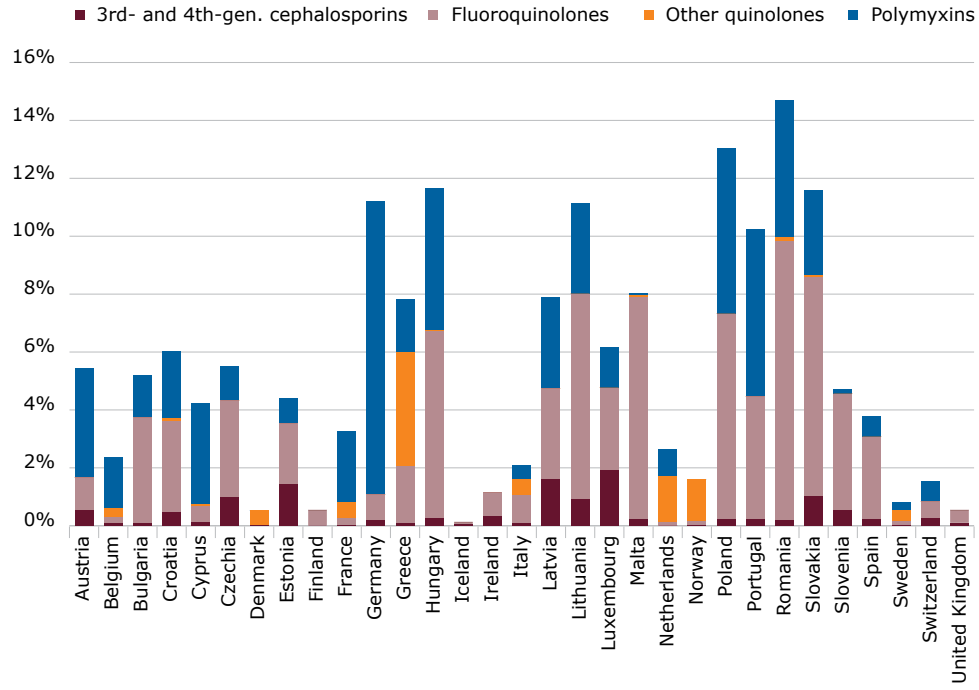
[7] Median shows the 16th value ranked from smallest to largest out of 31 observed values for each antimicrobial class.

Figure A8. Distribution of sales, in mg/PCU, of penicillins by subclass for food-producing animals, in 31 European countries, in 2019



* In the ATCvet system, these are classified as combinations of penicillins that include beta-lactamase inhibitors. In 2019, all penicillins included in this group were aminopenicillins (amoxicillin, ampicillin and metampicillin).

Figure A9. Proportion of the total sales of 3rd- and 4th-generation cephalosporins, fluoroquinolones, other quinolones and polymyxins for food-producing animals, in mg/PCU, for 31 European countries, in 2019[1,2,3]



[1] Variations between the countries should be interpreted with great care due to the large differences in dosing between these classes/subclasses of antimicrobials.
[2] No sales of other quinolones were reported for Austria, Bulgaria, Czechia, Estonia, Finland, Germany, Iceland, Ireland, Lithuania, Luxembourg, Spain, Switzerland and the United Kingdom.
[3] No sales of polymyxins in Finland, Iceland and Norway.

Figure A10. Spatial distribution of overall sales of all antimicrobials for food-producing animals, in mg/PCU, for 31 countries, in 2019

Figure A11. Percentage of sales for veterinary use, in tonnes of antimicrobial active substance, of premixes, oral powders and oral solutions containing 1, 2, 3 and 4 antimicrobial active substances, in 2019

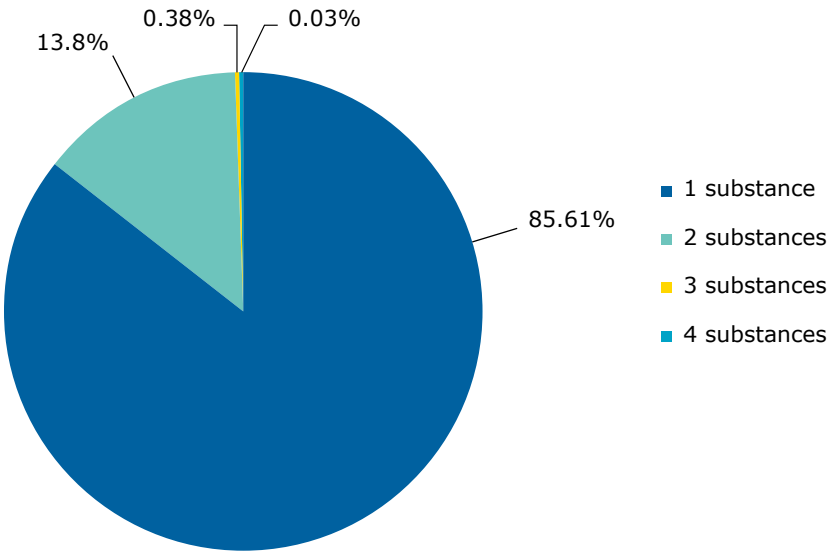
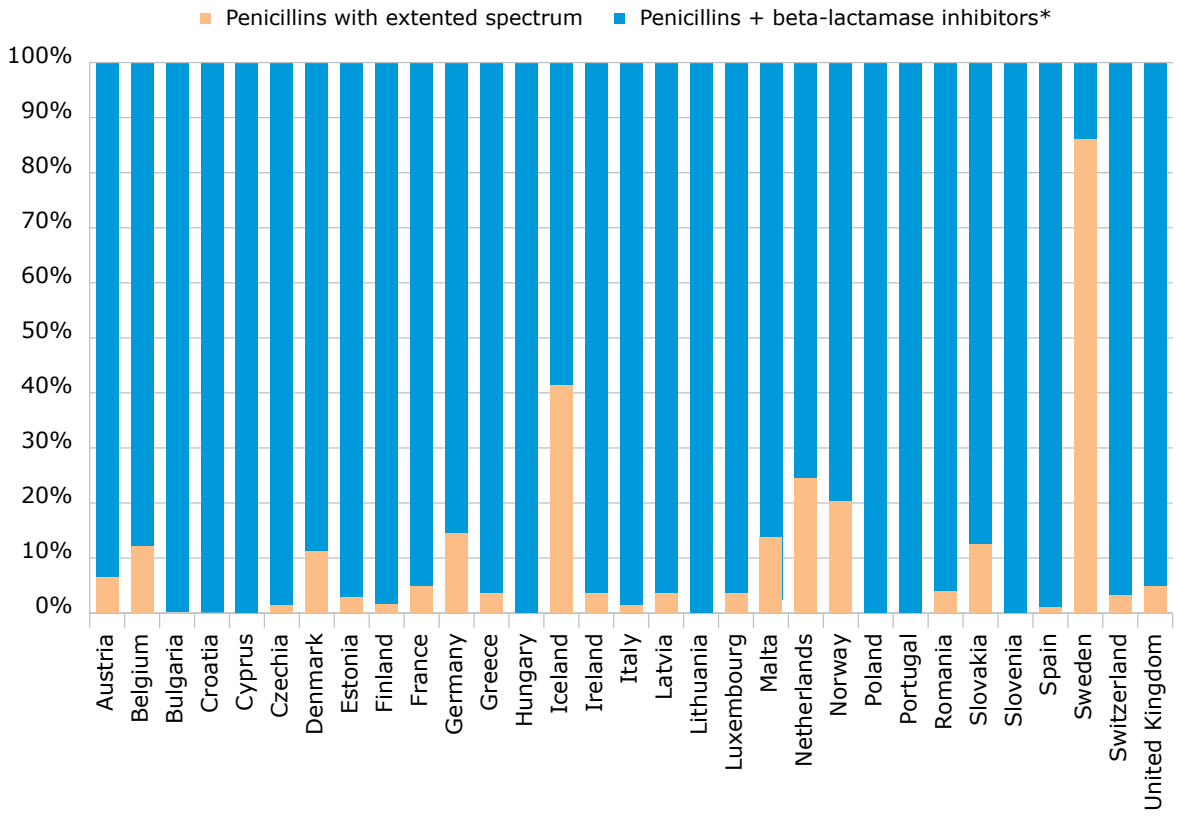


Figure A12. Distribution of sales (by quantity of active substance) of tablets containing penicillins by subclass, by country, in 2019[1,2]



* In the ATCvet system, classified as combinations of penicillins which include penicillins + beta-lactamase inhibitors.
[1] Some tablet formulations are authorised for use in food-producing, fur and companion animals.
[2] No sales of penicillins with extended spectrum in Bulgaria, Croatia, Cyprus, Hungary, Lithuania, Poland and Slovenia.

Table A13. Sales, in tonnes of active substance, of antimicrobial VMPs applicable mainly to food-producing animals by antimicrobial class (presented according to the ATCvet hierarchical system), by country, in 2019 (tablets not included)

Country	Tetracyclines	Amphenicols	Penicillins	1st- and 2nd-gen. cephalosporins	3rd- and 4th-gen. cephalosporins[1]	Sulfonamides	Trimethoprim	Macrolides	Lincosamides	Fluoroquinolones	Other quinolones	Aminoglycosides	Polymyxins	Pleuromutilins	Others[2]	Total tonnes
Austria	19.7	0.5	8.6	0.03	0.2	3.9	0.8	3.0	0.1	0.5	0	1.3	1.5	0.4	0.1	40.5
Belgium	37.1	3.2	70.0	0.4	0.1	28.1	5.6	10.9	5.1	0.4	0.5	2.6	3.1	1.1	6.9	175.1
Bulgaria	14.8	1.7	8.5	<0.01	0.04	3.2	0.3	6.5	3.0	1.6	0	1.6	0.6	1.2	0.3	43.4
Croatia	7.0	0.5	6.6	<0.01	0.1	2.0	0.3	1.3	0.03	0.6	0.02	0.9	0.5	0.1	0.1	20.1
Cyprus	16.1	1.1	8.6	<0.01	0.1	8.1	1.6	2.4	6.1	0.3	0.03	0.6	1.7	2.6	0.1	49.4
Czechia	10.7	0.3	12.2	0.1	0.4	6.0	0.8	1.9	0.1	1.3	0	1.5	0.4	1.9	0.2	37.8
Denmark	14.4	1.7	26.2	0.1	<0.01	8.8	1.8	13.3	2.0	<0.01	0.4	8.9	<0.01	7.9	2.3	87.7
Estonia	1.7	0.05	1.7	0.01	0.1	0.5	0.1	0.2	0.1	0.1	0	0.4	0.1	1.0	0.1	6.1
Finland	2.7	0.1	4.0	<0.01	<0.01	1.8	0.4	0.2	0.2	0.1	0	0.03	0	<0.01	0	9.4
France	143.7	5.4	63.5	1.1	0.1	79.9	13.3	29.8	2.7	0.9	2.3	47.8	10.0	3.5	3.4	407.4
Germany	140.8	6.2	259.1	0.7	1.3	57.7	8.0	57.0	12.9	5.8	0	22.0	66.1	8.0	8.8	654.5
Greece	50.6	0.3	15.7	0	0.1	10.5	1.0	5.0	0.4	2.0	3.9	6.9	1.8	0.9	0.6	99.8
Hungary	46.0	3.2	50.3	0.1	0.4	8.5	1.7	7.4	3.6	9.8	0.1	2.5	7.5	11.0	0.1	152.1
Iceland	0.04	0	0.3	0	<0.01	<0.01	<0.01	0	0	<0.01	0	0.1	0	0	0	0.5
Ireland[3]	37.6	3.6	18.2	0.5	0.3	13.1	1.4	5.6	0.2	0.7	0	5.4			0.9	87.5
Italy	195.9	20.2	225.6	0.5	0.7	109.3	11.3	41.1	53.5	7.0	4.0	29.8	3.5	20.5	8.3	731.3
Latvia	1.8	0.03	1.6	0.05	0.1	0.3	0.1	0.9	0.02	0.2	<0.01	0.9	0.2	0.4	0.1	6.6
Lithuania	0.5	0.1	2.1	0.1	0.1	1.4	0.3	0.1	0.1	0.5	0	0.4	0.2	0.4	0.2	6.5
Luxembourg	0.6	0.1	0.3	<0.01	0.03	0.2	0.04	0.1	0.02	0.04	0	0.1	0.02	<0.01	0.02	1.6
Malta[4]	0.5	0.04	0.1	<0.01	<0.01	0.3	0.04	0.2	0.01	0.1		0.1	<0.01	0.04	0.1	1.5
Netherlands	53.7	4.3	35.3	0.1	<0.01	25.1	4.5	23.1	0.1	0.2	2.5	2.0	1.4	0.8	0.1	153.1
Norway	0.1	0.2	2.8	0	<0.01	1.1	0.2	<0.01	<0.01	<0.01	0.1	0.2	0	0.05	<0.01	4.7
Poland	208.7	9.1	281.6	0.8	1.8	33.6	6.7	102.8	9.6	59.7	<0.01	30.3	48.2	41.7	6.0	840.6
Portugal	49.5	1.8	36.4	0.03	0.3	10.6	2.1	14.1	5.4	6.4	<0.01	3.7	8.7	10.2	0.3	149.5
Romania	42.8	7.0	37.7	0.02	0.3	5.6	1.0	19.5	5.8	16.3	0.2	16.0	8.0	7.4	1.5	169.0
Slovakia	2.9	0.1	1.9	0.1	0.1	1.3	0.2	0.5	0.1	0.8	<0.01	0.5	0.3	1.3	0.3	10.2
Slovenia	1.0	0.2	5.1	<0.01	0.04	0.4	0.1	0.04	<0.01	0.3	<0.01	0.6	0.01	0.1	<0.01	7.9
Spain	238.7	47.6	321.3	1.3	2.2	72.1	10.6	80.4	99.3	28.7	0	69.8	7.1	18.7	9.5	1007.2
Sweden[5]	0.5		5.5		<0.01	1.4	0.3	0.4	0.03		0.04	0.3			0.1	8.6
Switzerland[6]	6.2	0.5	9.0	0.3	0.1	8.3	0.6	1.2		0.2	0	2.4	0.2		0.1	29.2
United Kingdom	72.6	4.3	52.9	0.6	0.2	21.0	4.2	16.6	4.3	1.0	0	20.5	<0.01	14.6	3.5	216.2
Total 31 countries	**1,418.9**	**123.2**	**1,572.7**	**7.0**	**9.3**	**524.2**	**79.2**	**445.7**	**214.7**	**145.4**	**14.2**	**280.1**	**171.1**	**156.1**	**53.2**	**5,214.9**

[1] For the countries where injectable 3rd- and 4th-generation cephalosporins are solely or almost solely marketed for dogs and cats, the data provide a considerable overestimate for food-producing animals.
[2] The class 'Others' includes the following sub-classes: Imidazole derivatives (metronidazole), Nitrofuran derivatives (furazolidone) and Other antibacterials (bacitracin, furaltadone, novobiocin, rifaximin, spectinomycin). Of note is that some of the sales could be for non-food-producing animals such as companion animals, fur animals, exotic birds and racing pigeons.
[3] Polymyxins and pleuromutilins are aggregated with 'Others' for commercial confidentiality reasons.
[4] Fluoroquinolones and other quinolones are aggregated for commercial confidentiality reasons.
[5] For commercial confidentiality reasons, amphenicols, polymyxins and pleuromutilins are aggregated with 'Others', 1st- and 2nd-generation cephalosporins are aggregated with 3rd- and 4th-generation cephalosporins, and fluoroquinolones are grouped with other quinolones.
[6] For reasons of commercial confidentiality, pleuromutilins are grouped with 'Others' and lincosamides are grouped with macrolides.

Table A14. Distribution of sales, in mg/PCU, of antimicrobial VMPs applicable mainly to food-producing animals[1], by product form and country, in 2019

Country	Premix	Oral powder	Oral solution	Injectable products	Oral paste	Bolus	Intramammary products	Intrauterine products	Total mg/PCU
Austria	1.3	26.6	7.3	5.8	0.6	<0.01	1.0	0.1	42.6
Belgium	10.1	18.4	61.4	11.2	0.1	0.1	0.4	0.2	101.9
Bulgaria	34.8	10.6	55.5	11.0	0	0	0.6	0.2	112.7
Croatia	3.1	4.3	41.0	12.9	0	0.8	0.5	0.2	62.8
Cyprus	341.9	6.7	35.4	15.5	0.1	<0.01	0.3	<0.01	399.7
Czechia	8.5	10.2	23.5	9.6	0.1	0.1	1.5	0.4	53.8
Denmark	0.9	2.6	18.0	14.9	0.6	<0.01	0.2	<0.01	37.1
Estonia	0	1.0	33.4	17.5	0.1	0	1.3	0.1	53.5
Finland	4.5	3.3	0.1	9.9	0.8	0	0.4	0	19.1
France	19.1	0.2	26.0	11.9	0.1	0.1	0.8	0.1	58.3
Germany	0.03	33.1	36.7	7.3	0.2	0.01	0.8	0.5	78.6
Greece	44.1	0.9	26.0	12.0	<0.01	0.1	0.1	0.04	83.2
Hungary	69.6	3.5	107.2	8.3	0.01	0	0.6	0.5	189.7
Iceland	0.1	<0.01	<0.01	3.2	0.04	0	0.2	0	3.5
Ireland	15.4	4.4	9.3	10.5	0.1	0.1	0.9	0.01	40.8
Italy	79.8	0.1	94.1	16.2	0.2	<0.01	0.5	0.2	191.1
Latvia	0	1.2	22.2	14.9	0	0	2.0	0.8	41.1
Lithuania	0.01	1.4	11.4	6.0	0	0.9	1.0	0.2	20.8
Luxembourg	0	8.5	8.4	10.7	0.1	0.1	1.2	0.05	29.0
Malta	52.5	3.9	39.8	12.9	0.03	0	0.6	0.5	110.3
Netherlands	0.4	1.8	37.5	7.7	0.3	0.01	0.5	0.1	48.2
Norway	0.1	0.02	0.1	1.5	0.6	0	0.1	0	2.3
Poland	2.4	1.1	169.4	10.1	0	0	2.0	0.2	185.2
Portugal	84.9	1.5	52.1	7.8	0.02	<0.01	0.3	0.01	146.6
Romania	4.4	0.9	37.5	10.9	0	0.1	0.1	0.2	53.9
Slovakia	5.8	6.0	20.5	9.2	0.01	<0.01	0.8	0.1	42.3
Slovenia	0.01	26.1	8.7	8.7	0	0	1.0	0.4	44.9
Spain	32.3	<0.01	79.5	14.6	<0.01	<0.01	0.3	0.01	126.7
Sweden	0.2	0.01	0.9	8.3	1.5	0	0.1	<0.01	11.1
Switzerland	16.1	3.4	1.4	9.6	0.6	0.01	3.5	1.1	35.7
United Kingdom	12.7	1.4	9.6	6.3	0.05	0.03	0.4	0.02	30.5
Total 31 countries	**18.4**	**6.5**	**47.9**	**10.2**	**0.2**	**0.03**	**0.7**	**0.2**	**84.0**

[1] Injectable products included in the analysis also encompass those antimicrobial VMPs that are used for treatment of companion animals; tablets are eliminated from these data.

Table A15. Percentage of sales, in mg/PCU, of premixes by antimicrobial class (according to ATCvet system), by country, in 2019[1]

Country	Tetracyclines	Amphenicols	Penicillins	Sulfonamides	Trimethoprim	Macrolides	Lincosamides	Other quinolones	Aminoglycosides	Polymyxins	Pleuromutilins	Others[2]	Total mg/PCU premixes
Austria	42%	0%	0%	0%	0%	55%	0%	0%	0%	0%	3%	0%	1.3
Belgium	28%	1%	64%	0%	0%	4%	<0.01%	0%	1%	0.4%	2%	<0.01%	10.1
Bulgaria	62%	6%	0%	1%	0%	29%	0%	0%	0%	1%	1%	0%	34.8
Croatia	52%	0.1%	0%	28%	0%	3%	0%	0%	17%	0%	0%	0%	3.1
Cyprus	36%	2%	10%	19%	4%	5%	14%	0%	0%	4%	6%	0%	341.9
Czechia	26%	0%	24%	20%	4%	19%	0.2%	0%	0%	0.3%	6%	1%	8.5
Denmark	1%	0%	1%	70%	14%	0%	0%	15%	0%	0%	0%	0%	0.9
Finland	69%	4%	0%	11%	2%	7%	7%	0%	0%	0%	0%	0%	4.5
France	47%	0%	7%	28%	4%	4%	0.2%	0%	8%	0.5%	1%	0%	19.1
Germany[3]	68%	0%		0%	0%	0%	0%	0%	0%	0%		32%	0.03
Greece	70%	0.5%	9%	13%	1%	3%	0.2%	0.4%	0%	2%	1%	0%	44.1
Hungary	51%	0.5%	21%	2%	0.3%	6%	1%	0%	0%	7%	11%	0%	69.6
Iceland	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0.1
Ireland[4]	70%	0.01%	2%	15%	3%	9%	0%	0%	0.3%	0%		1%	15.4
Italy	32%	1%	27%	18%	1%	7%	8%	0.5%	1%	0.3%	5%	1%	79.8
Lithuania	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0.01
Malta	48%	0%	0%	25%	5%	6%	1%	0%	0%	0%	5%	11%	52.5
Netherlands	70%	0%	0%	25%	5%	0%	0%	0%	0%	0%	0%	0%	0.4
Norway	0%	70%	0%	0%	0%	0%	0%	30%	0%	0%	0%	0%	0.1
Poland	26%	0.2%	24%	8%	2%	29%	0%	0%	0%	4%	8%	0%	2.4
Portugal	43%	1%	16%	11%	2%	8%	0.3%	0%	1%	7%	11%	0%	84.9
Romania[5]	24%	2%	21%	6%	1%	3%	1%	3%	2%	0%	31%	5%	4.4
Slovakia	49%	1%	6%	3%	1%	4%	0%	0%	0%	1%	36%	0%	5.8
Slovenia	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0.01
Spain	24%	1%	35%	10%	2%	20%	3%	0%	1%	<0.01%	5%	0.02%	32.3
Sweden[6]													0.2
Switzerland[7]	36%	0%	23%	29%	1%	8%	0%	0%	0%	2%		1%	16.1
United Kingdom	48%	1%	12%	14%	3%	11%	0.4%	0%	1%	<0.01%	12%	0%	12.7
Total 31 countries	**38.1%**	**0.9%**	**21.7%**	**14.8%**	**1.9%**	**10.1%**	**3.6%**	**0.2%**	**1.8%**	**1.3%**	**5.6%**	**0.2%**	**18.4**

[1] In 2019, no sales of premixes were reported in Estonia, Latvia and Luxembourg.
[2] The class 'Others' includes the following sub-classes: Imidazole derivatives (metronidazole), Nitrofuran derivatives (furazolidone) and Other antibacterials (bacitracin, spectinomycin). Of note is that some of the sales could be for non-food-producing animals such as companion animals, fur animals, exotic birds and racing pigeons.
[3] Penicillins and pleuromutilins are aggregated with 'Others' for commercial confidentiality reasons.
[4] Pleuromutilins are aggregated with 'Others' for commercial confidentiality reasons.
[5] No sales of other quinolones were reported in 2019; sales indicated in this table correspond to sales of fluoroquinolones.
[6] For reasons of commercial confidentiality, data at class level cannot be shown in this table.
[7] For reasons of commercial confidentiality, pleuromutilins are grouped with 'Others'.

Table A16. Percentages of sales, in mg/PCU, of oral powders by antimicrobial class (according to ATCvet system), by country, in 2019

Country	Tetracyclines	Amphenicols	Penicillins	Sulfonamides	Trimethoprim	Macrolides	Lincosamides	Other quinolones	Aminoglycosides	Polymyxins	Pleuromutilins	Others[1]	Total mg/PCU oral powders
Austria	65%	0%	16%	9%	2%	4%	0%	0%	0.4%	4%	<0.01%	0%	26.6
Belgium	15%	0%	24%	49%	10%	2%	0%	0%	0%	1%	0.1%	0%	18.4
Bulgaria	46%	0%	21%	14%	0%	0%	0%	0%	0%	1%	18%	0%	10.6
Croatia	2%	0%	98%	0%	0%	0%	0%	0%	0%	0%	0%	0%	4.3
Cyprus	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	6.7
Czechia	71%	0%	1%	13%	2%	2%	0%	0%	3%	0%	7%	0%	10.2
Denmark	52%	1%	0.7%	14%	3%	17%	0%	2%	0.1%	0%	10%	0%	2.6
Estonia	0%	0%	56%	37%	7%	0%	0%	0%	0%	0%	0%	0%	1.0
Finland	24%	0%	6%	58%	12%	0%	0%	0%	0%	0%	0.2%	0%	3.3
France	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0.2
Germany[2]	16%		59%	14%	2%	1%	0%	0%		2%	1%	5%	33.1
Greece	0%	0%	85%	0%	0%	0%	0%	0%	0%	15%	0%	0%	0.9
Hungary	23%	0%	77%	0%	0%	1%	0%	0%	0%	0%	0%	0%	3.5
Iceland	0%	0%	0%	83%	17%	0%	0%	0%	0%	0%	0%	0%	<0.01
Ireland	87%	0%	0%	11%	2%	0%	0%	0%	0%	0%	0%	0%	4.4
Italy	13%	0%	69%	6%	0%	9%	0%	0%	3%	0%	0%	0%	0.1
Latvia	0%	0%	22%	50%	10%	0%	0%	0%	0%	18%	0%	0%	1.2
Lithuania	3%	0%	37%	50%	10%	0%	0%	0%	0%	0%	0%	0%	1.4
Luxembourg	59%	0%	1%	30%	6%	0%	0%	0%	0%	4%	0%	0%	8.5
Malta	17%	0%	41%	14%	1%	24%	0%	0%	2%	0%	0.1%	0.2%	3.9
Netherlands	54%	0%	0%	34%	7%	2%	1%	0%	0%	2%	0%	0%	1.8
Norway	58%	0%	0%	35%	7%	0%	0%	0%	0%	0%	0%	0%	0.02
Poland	45%	0.02%	48%	<0.01%	<0.01%	0.2%	0%	0%	0%	0%	8%	0%	1.1
Portugal	66%	0%	5%	12%	2%	0.1%	0%	0%	15%	0%	0%	0%	1.5
Romania	10%	0%	90%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0.9
Slovakia	65%	0%	4%	17%	1%	0%	0%	0%	10%	2%	1%	0%	6.0
Slovenia	6%	0.3%	91%	2%	1%	0%	0%	0%	0%	0%	0%	0%	26.1
Spain	0%	0%	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%	<0.01
Sweden	0%	0%	0%	55%	11%	0%	0%	0%	0%	0%	34%	0%	0.01
Switzerland	0%	0%	0%	89%	8%	0%	0%	0%	3%	0%	0%	0%	3.4
United Kingdom	36%	0%	48%	14%	3%	0.03%	0%	0%	0%	0%	0%	0%	1.4
Total 31 countries	**23.8%**	**0.1%**	**48.4%**	**16.8%**	**2.6%**	**1.2%**	**0.01%**	**0.03%**	**3.7%**	**2.1%**	**1.5%**	**<0.01%**	**6.5**

[1] The class 'Others' includes sales of furaltadone (classified as 'Other antibacterials' in the ATCvet system). Of note is that the sales could be for non-food-producing animals such as companion animals, fur animals, exotic birds and racing pigeons.

[2] Amphenicols and aminoglycosides are aggregated with 'Others' for commercial confidentiality reasons.

Table A17. Percentage of sales, in mg/PCU, of oral solutions by antimicrobial class (according to ATCvet system), by country, in 2019

Country	Tetracyclines	Amphenicols	Penicillins	Sulfonamides	Trimethoprim	Macrolides	Lincosamides	Fluoroquinolones	Other quinolones	Aminoglycosides	Polymyxins	Pleuromutilins	Others[1]	Total mg/PCU oral solutions
Austria	34%	0.4%	23%	12%	2%	12%	1%	2%	0%	3%	7%	4%	0%	7.3
Belgium	25%	1%	38%	11%	2%	8%	4%	0.3%	0.5%	2%	2%	1%	5%	61.4
Bulgaria	17%	4%	31%	11%	1%	11%	14%	7%	0%	1%	2%	2%	1%	55.5
Croatia	46%	0.5%	31%	8%	2%	6%	0.1%	2%	0.1%	0%	4%	1%	0.2%	41.0
Cyprus	7%	0.1%	66%	4%	0.5%	2%	1%	5%	1%	9%	3%	2%	1%	35.4
Czechia	16%	1%	40%	21%	2%	3%	0.3%	6%	0%	1%	3%	6%	0.4%	23.5
Denmark	18%	0.3%	16%	1%	0.3%	27%	2%	<0.01%	0%	14%	<0.01%	16%	4%	18.0
Estonia	40%	1%	11%	10%	2%	5%	1%	0.5%	0%	3%	1%	23%	2%	33.4
Finland[2]	1%	0%	17%	0%	0%	81%	0%	0.3%	0%	0%	0%	0%	2%	0.1
France	39%	0.1%	13%	20%	4%	9%	1%	0.3%	1%	5%	5%	1%	1%	26.0
Germany	30%	0.2%	20%	3%	0.3%	17%	4%	1%	0%	1%	19%	1%	3%	36.7
Greece	31%	0.04%	22%	11%	1%	10%	0.3%	5%	12%	4%	3%	1%	1%	26.0
Hungary	19%	3%	39%	8%	2%	4%	3%	11%	0.1%	1%	4%	5%	0.1%	107.2
Iceland	0%	0%	0%	0%	0%	0%	0%	100%	0%	0%	0%	0%	0%	<0.01
Ireland[3]	6%	8%	42%	32%	0.3%	4%	1%	1%	0%	5%			2%	9.3
Italy[4]	25%	2%	34%	13%	2%	5%	8%	1%	1%	5%	1%	2%	1%	94.1
Latvia	44%	0.3%	11%	0.03%	<0.01%	23%	0.02%	3%	<0.01%	4%	5%	9%	0.04%	22.2
Lithuania	5%	0.5%	22%	25%	5%	2%	2%	11%	0%	6%	6%	11%	4%	11.4
Luxembourg	50%	0%	6%	3%	0.2%	15%	2%	1%	0%	20%	1%	0.02%	1%	8.4
Malta[5]	26%	6%	7%	11%	1%	24%	1%	20%		0.5%	0.2%	1%	2%	39.8
Netherlands	38%	0.03%	20%	15%	3%	19%	<0.01%	0.1%	2%	1%	1%	1%	0.1%	37.5
Norway	3%	0%	51%	0%	0%	0%	0.2%	0.1%	0%	22%	0%	23%	0.3%	0.1
Poland	26%	0.4%	33%	4%	1%	13%	1%	7%	<0.01%	2%	6%	5%	1%	169.4
Portugal	19%	0.5%	38%	1%	0.2%	12%	10%	11%	<0.01%	2%	4%	2%	0.5%	52.1
Romania	27%	2%	20%	3%	1%	15%	5%	11%	0.2%	5%	7%	3%	0.4%	37.5
Slovakia	16%	0.2%	16%	18%	2%	4%	1%	14%	0.1%	0.4%	5%	16%	5%	20.5
Slovenia	31%	1%	19%	13%	3%	0%	0%	11%	<0.01%	16%	1%	6%	0%	8.7
Spain	27%	3%	32%	7%	1%	3%	14%	2%	0%	8%	1%	1%	1%	79.5
Sweden[6]														0.9
Switzerland	0%	1%	8%	85%	0%	0%	0%	3%	0%	0%	0.2%	0%	2%	1.4
United Kingdom	24%	1%	30%	7%	1%	6%	5%	1%	0%	13%	<0.01%	6%	5%	9.6
Total 31 countries	**27.1%**	**1.3%**	**29.6%**	**7.9%**	**1.3%**	**9.7%**	**5.5%**	**3.8%**	**0.4%**	**4.4%**	**4.9%**	**2.8%**	**1.3%**	**47.9**

[1] The class 'Others' includes the following sub-classes: Imidazole derivatives (metronidazole), Nitrofuran derivatives (furazolidone) and Other antibacterials (bacitracin, furaltadone, spectinomycin). Of note is that some of the sales could be for non-food-producing animals such as companion animals, fur animals, exotic birds and racing pigeons.
[2] Negligible quantities of 1st- and 2nd-generation cephalosporins are included with 'Others'.
[3] Polymyxins and pleuromutilins are aggregated with 'Others' for reasons of commercial confidentiality.
[4] Negligible quantities of 1st- and 2nd-generation cephalosporins are included with 'Others'.
[5] Fluoroquinolones and other quinolones are aggregated for reasons of commercial confidentiality.
[6] For reasons of commercial confidentiality, data at class level cannot be disclosed.

Table A18. Percentage of sales, in mg/PCU, of injectable products by antimicrobial class (according to ATCvet system), by country, in 2019

Country	Tetracyclines	Amphenicols	Penicillins	1st- and 2nd-gen. cephalosporins	3rd- and 4th-gen. cephalosporins[1]	Sulfonamides	Trimethoprim	Macrolides	Lincosamides	Fluoroquinolones	Aminoglycosides	Polymyxins	Pleuromutilins	Others[2]	Total mg/PCU injectable products
Austria	8%	8%	40%	0%	3%	8%	2%	6%	1%	6%	18%	0%	0.4%	1%	5.8
Belgium	5%	13%	62%	1%	0.3%	6%	1%	5%	4%	1%	2%	0.2%	0.1%	7%	11.2
Bulgaria	23%	2%	25%	0.1%	1%	4%	1%	9%	2%	4%	30%	<0.01%	0.2%	2%	11.0
Croatia	8%	11%	26%	0%	2%	12%	2%	12%	0.4%	10%	17%	0%	0%	1%	12.9
Cyprus[3]	27%	7%	36%	0%	3%	4%	1%	1%	2%	4%	14%	0.2%	1%	3%	15.5
Czechia	16%	3%	49%	0%	5%	5%	1%	1%	0.2%	3%	16%	0%	1%	0.5%	9.6
Denmark	11%	4%	54%	0%	0.03%	14%	3%	2%	3%	0.01%	8%	0%	1%	1%	14.9
Estonia	11%	1%	53%	0.2%	4%	5%	1%	1%	1%	6%	15%	0%	3%	2%	17.5
Finland	15%	0.5%	77%	0%	<0.01%	5%	1%	0.2%	0.4%	1%	0.2%	0%	0%	0%	9.9
France	10%	6%	34%	0.1%	0.1%	7%	1%	9%	1%	0.3%	31%	1%	0.02%	1%	11.9
Germany[4]	4%	9%	49%	0%	2%	15%	3%	4%	2%	4%	7%	0.1%		2%	7.3
Greece	27%	0.5%	21%	0%	1%	4%	1%	3%	1%	2%	41%	0.02%	0.04%	3%	12.0
Hungary	7%	11%	42%	0%	5%	3%	1%	3%	0.2%	7%	18%	0.1%	1%	0.3%	8.3
Iceland	7%	0%	77%	0%	0.05%	0%	0%	0%	0%	0.1%	16%	0%	0%	0%	3.2
Ireland[4]	22%	9%	36%	0%	1%	3%	1%	9%	0.3%	3%	18%	0%		0.4%	10.5
Italy	13%	13%	32%	0%	1%	13%	1%	5%	3%	3%	15%	0.2%	0.1%	6%	16.2
Latvia	5%	1%	43%	0.2%	4%	8%	2%	4%	0.3%	4%	28%	0%	1%	1%	14.9
Lithuania	12%	7%	58%	1%	3%	6%	1%	3%	2%	3%	4%	0%	0%	2%	6.0
Luxembourg	11%	9%	50%	<0.01%	4%	6%	1%	3%	2%	7%	6%	0.2%	0%	2%	10.7
Malta	5%	6%	35%	0%	2%	1%	0.1%	0%	3%	4%	45%	0%	0%	7%	12.9
Netherlands	15%	18%	43%	0%	<0.01%	14%	3%	3%	0%	0.1%	3%	0.2%	0.1%	0%	7.7
Norway	2%	1%	89%	0%	0.01%	4%	1%	0.1%	0%	0.3%	4%	0%	0.3%	0%	1.5
Poland	10%	13%	33%	0%	3%	3%	0.4%	3%	2%	8%	23%	0.1%	1%	1%	10.1
Portugal	20%	12%	23%	<0.01%	4%	2%	0.4%	6%	1%	8%	24%	0.1%	0.3%	1%	7.8
Romania	19%	14%	25%	0%	1%	2%	0.4%	3%	1%	7%	27%	0.1%	0.3%	1%	10.9
Slovakia	19%	3%	37%	1%	4%	6%	1%	12%	0.2%	3%	13%	0%	1%	0.5%	9.2
Slovenia	8%	8%	33%	0%	2%	11%	2%	3%	0%	10%	23%	0.1%	0%	0%	8.7
Spain	7%	24%	23%	<0.01%	2%	3%	1%	10%	2%	14%	13%	0.1%	0.3%	2%	14.6
Sweden[5]	6%		81%		0.03%	8%	2%	2%	0.4%	0.2%	2%			0.4%	8.3
Switzerland[6]	11%	7%	46%	0%	1%	7%	1%	1%		2%	24%	<0.01%		0.3%	9.6
United Kingdom	22%	6%	34%	0.3%	0.5%	5%	1%	6%	1%	1%	23%	0%	0.2%	0%	6.3
Total 31 countries	**11.5%**	**11.6%**	**35.6%**	**0.1%**	**1.3%**	**7.0%**	**1.2%**	**5.9%**	**1.7%**	**4.9%**	**16.9%**	**0.1%**	**0.3%**	**1.9%**	**10.2**

[1] For the countries where the injectable 3rd- and 4th-generation cephalosporins are solely or almost solely marketed for dogs and cats, the data provide a considerable overestimate for food-producing animals.
[2] The class 'Others' includes sales of spectinomycin (classified as 'Other antibacterials' in the ATCvet system).
[3] Negligible quantities of other quinolones are included in fluoroquinolones.
[4] Pleuromutilins are aggregated with 'Others' for reasons of commercial confidentiality.
[5] For commercial confidentiality reasons, amphenicols, polymyxins and pleuromutilins are aggregated with 'Others' and 1st- and 2nd-generation cephalosporins are grouped with 3rd- and 4th-generation cephalosporins.
[6] For reasons of commercial confidentiality, pleuromutilins are grouped with 'Others' and lincosamides are grouped with macrolides.

Table A19. Number of VMP presentations[1] containing 1, 2, 3 and 4 antimicrobial active substances, by country, in 2019 (tablets excluded from the data)

Country	1 substance	2 substances	3 substances	4 substances	Total number of VMP presentations
Austria	234	23	2		259
Belgium	278	42	6		326
Bulgaria	219	37	7		263
Croatia	111	16	2	6	135
Cyprus	107	21	3		131
Czechia	335	53	12	3	403
Denmark	193	39	3		235
Estonia	110	25	5		140
Finland	65	16	1		82
France	488	119	8		615
Germany	471	54	5		530
Greece	228	46	2	1	277
Hungary	316	40	6	1	363
Iceland	20	6	1		27
Ireland	231	37	6	1	275
Italy	560	99	10	1	670
Latvia	137	27	9	2	175
Lithuania	93	25	6	1	125
Luxembourg	179	37	8		224
Malta	70	33	7	1	111
Netherlands	173	37	3		213
Norway	43	12	1		56
Poland	500	66	9	1	576
Portugal	377	46	5		428
Romania	427	83	6	4	520
Slovakia	288	49	10	2	349
Slovenia	109	17	3	1	130
Spain	952	128	9		1,089
Sweden	95	21	1		117
Switzerland	133	38	33		204
United Kingdom	293	24	5	1	323
Total 31 countries	**7,835**	**1,316**	**194**	**26**	**9,371**

[1] VMP presentation, in this context, could be determined by differences in any of the characteristics of a medicinal product, i.e. pharmaceutical form, pack size, composition, strength or target species.

Table A20. Number of VMP presentations[1] of premixes, oral powders and oral solutions containing 1, 2, 3 and 4 antimicrobial active substances sold, by country, in 2019

Country	1 substance	2 substances	3 substances	4 substances	Total number of VMP presentations for premixes, oral powders and oral solutions
Austria	94	6			100
Belgium	115	19			134
Bulgaria	131	12			143
Croatia	44	7		3	54
Cyprus	49	7			56
Czechia	170	30	2		202
Denmark	87	7			94
Estonia	31	5			36
Finland	21	4			25
France	270	55			325
Germany	212	19			231
Greece	123	15			138
Hungary	183	14			197
Iceland	2	1			3
Ireland	74	9			83
Italy	293	44	4	1	342
Latvia	33	5			38
Lithuania	27	6	1		34
Luxembourg	55	15			70
Malta	39	17	5	1	62
Netherlands	75	14			89
Norway	11	3			14
Poland	282	25			307
Portugal	148	15			163
Romania	246	31	1	2	280
Slovakia	120	21	1		142
Slovenia	37	5			42
Spain	447	23			470
Sweden	29	2			31
Switzerland	47	10	27		84
United Kingdom	121	12			133
Total 31 countries	**3,616**	**458**	**41**	**7**	**4,122**

[1] VMP presentations, in this context, is determined by differences in any of the characteristics of a medicinal product, i.e. pharmaceutical form, pack size, composition, strength or target species.

Table A21. Sales, in tonnes of active substance, of VMP presentations[1] sold as premixes, oral powders and oral solutions containing 1, 2 and 3 active substances, by country, in 2020[2]

Country	1 substance		2 substances		3 substances		Total tonnes (premixes, oral powders and oral solutions)
	Tonnes	%	Tonnes	%	Tonnes	%	
Austria	29.7	89%	3.7	11%			33.4
Belgium	114.1	74%	40.3	26%			154.4
Bulgaria	35.5	91%	3.4	9%			38.9
Croatia	13.1	85%	1.5	10%			15.5
Cyprus	37.4	79%	10.0	21%			47.4
Czechia	23.9	80%	5.4	18%	0.4	1%	29.7
Denmark	44.3	88%	6.3	12%			50.7
Estonia	3.3	84%	0.6	16%			4.0
Finland	2.5	64%	1.4	36%			3.9
France	228.2	72%	88.5	28%			316.7
Germany	533.3	92%	48.1	8%			581.4
Greece	78.4	92%	6.7	8%			85.1
Hungary	133.7	92%	10.8	8%			144.5
Iceland	0.01	92%	<0.01	8%			0.01
Ireland	53.7	86%	8.8	14%			62.5
Italy	456.6	69%	199.6	30%	9.6	1%	666.1
Latvia	3.6	96%	0.2	4%			3.8
Lithuania	2.4	62%	1.5	37%	0.1	2%	4.0
Luxembourg	0.7	80%	0.2	20%			0.9
Malta	0.9	69%	0.4	27%	0.05	4%	1.3
Netherlands	104.4	83%	21.4	17%			125.9
Norway	0.4	96%	0.02	4.5%			0.4
Poland	736.3	94%	48.6	6%			784.9
Portugal	128.0	91%	13.3	9%			141.2
Romania	124.6	93%	8.3	6%	0.9	1%	133.8
Slovakia	6.2	80%	1.5	19%	0.1	1%	7.8
Slovenia	5.8	94%	0.3	6%			6.2
Spain	818.9	92%	69.6	8%			888.5
Sweden	0.9	99%	0.01	1%			0.9
Switzerland	5.9	35%	5.1	30%	6.1	36%	17.0
United Kingdom	142.1	84%	26.3	16%			168.5
Total 31 countries	**3,869.1**	**85.6%**	**631.8**	**14.0%**	**17.2**	**0.4%**	**4,519.2**

[1] VMP presentations, in this context, is determined by differences in any of the characteristics of a medicinal product, i.e. pharmaceutical form, pack size, composition, strength or target species.

[2] In addition, 0.03% of the total sales of premixes, oral powders and oral solutions preparations contained 4 active substances, accounting for 1.1 tonnes (which is included in the total tonnes of premixes, oral powders and oral solutions).

Annex 3. Variables to be reported or used for calculation of active ingredient for each antimicrobial VMP: standardisation of the data

Table A22. Variables reported to ESVAC for each antimicrobial VMP, for 2020

Variable		Description of variable	Justification
COUNTRY		**ISO Country Code:** 2 letter code (alpha-2 code), according to the International Standard for country codes. (http://www.iso.org/iso/country_codes)	To identify the country for which sales data are reported.
YEAR		**Four-digit number**	To identify the calendar year for reported sales data
PRODUCT INFORMATION	**MA**	**Marketing Authorisation Identification** Number, number and letter combination or name of the MAH. Additional information: for VMPs available through special licence/marketing authorisation or through parallel trade, the field should be marked "Special licence".	To identify the VMP and enable a link with other databases.
	PRESENTATION ID	**Identification Number of Product Presentation** VMP package code (can be a number or number and letter combination) is a unique identifier for each VMP presentation (name, pharmaceutical form, strength and pack size). As a key variable in many databases, identification numbers should be stable over time, so that medicinal products that are no longer marketed or authorised can still be identified to enable the analysis of historical data.	To enable the identification of all VMP presentations marketed in a country. To enable the validation and analysis of each presentation pack size in which the VMP is sold. To enable the analysis of historical data. To enable the identification of duplicate reporting of sales.
	NAME	**Veterinary Medicinal Product Name (in national language)** Name of medicinal product as per product information (summary of product characteristics, labelling and package leaflet), e.g.: Harmony vet 50 mg tablets 2 x 30; Harmony vet long acting 10 mg/ml suspension for injection.	To identify and validate recorded details.
	FORM	**Pharmaceutical Form/Route of Administration** Form should be selected from the standardised defined list: boluses (BOLUS), injectable products (INJ), intramammary products for lactating cow treatment (INTRAMAM), intramammary products for dry cow treatment (INTRAMAM-DC), intrauterine products (INTRAUT), oral pastes (ORAL PASTE), oral solutions (ORAL SOLU), oral powders or granules (ORAL POWD), premixes (PREMIX), capsules and tablets (TABL).	To enable the analysis of data by administration route/pharmaceutical form.
	LONG ACTING	**Long-acting Injectable Products** This refers to injectable products with long-acting/ prolonged release formulation, for which the active substance(s) are released over an extended period of time.	Optional.

	Variable	Description of variable	Justification
PRODUCT INFORMATION	**PACKSIZE**	**Content Quantity in Package: Pack Size** Numerical value only to indicate the pack size, e.g.: 100 for 100 tablets or 100 intramammary syringes; 10 for 10 ml injection; 2 for a package of 2 kg premix; 300 for a box of 10 blisters of 30 tablets; 12 for a box of 12 intramammary syringes.	To enable the calculation of the quantity of antimicrobial active substance in each product presentation. For validation purposes at country level prior to submission via ESVAC web-based application. For validation purposes by ESVAC BI (Business Intelligence) application after data submission.
	PACKSIZEU	**Content Unit of Measurement** e.g.: ML, L, G, KG, PIECE (e.g. tablets, capsules, boluses and intramammary products). The pack size unit should be harmonised with the strength unit, e.g. if the pack size is 1 kg, the strength unit should be per kg.	To enable the calculation of the quantity of antimicrobial active substance in each product presentation. For validation purposes at country level prior to submission via ESVAC web-based application. For validation purposes by ESVAC BI web-based application after data submission.
	ATCVET	**ATCvet – 5th level: Anatomic Therapeutic Chemical (Classification) Veterinary** Value to be selected as per the latest version of the ATCvet index.	To standardise the approach for analysis and reporting of data per antimicrobial class as well as anatomical and therapeutic group. If an ATCvet code has not been assigned for a substance or for fixed-combinations, the Agency has to be contacted.
	SPECIES	**Animal Species** All the animal species for which the VMP is authorised, e.g. cattle (CA), pigs (PIG), poultry (POU), chicken (Gallus gallus) (GG), turkeys (TU), ducks (DU), geese (GE), sheep (SH), goats (GO), horses (HO), food-producing rabbits (RA), finfish (FI), dogs (DOG), cats (CAT), mink (MI), foxes (FO), other food-producing animals (ZZ), not known (NO), other non-food-producing animals (YY).	Species details are currently used to support data preparation for the JIACRA[33] reports. Completion of this variable is optional for VMPs available through special licence/marketing authorisation or through parallel trade.
NO PACKS		**Number of Packages Sold** Numerical value to indicate the number of packages of the product presentation sold within the reporting period (year) in the reporting country.	To calculate the mass (in tonnes) of antimicrobial active substance sold for each product presentation. For validation purposes at country level prior to submission via ESVAC web-based application. For validation purposes by ESVAC BI web-based application after data submission.
ACTIVE SUBSTANCE INFORMATION	**INGR_ID**	**Active Substance Code Value** Identification number of each substance automatically attributed by the macro or the ESVAC web-based application.	Serves as a unique identifier for each active substance per each VMP. For data management purposes.
	INGR	**Antimicrobial Active Substance Name** Name to be selected from the defined list of antimicrobial active substance names as presented according to the latest version of the ATCvet index. In the case of fixed-combination products, all antimicrobial active substance names must be provided separately.	Important for avoiding misinterpretation of a substance name given in a language other than English. The system only accepts the latest version of names published in the ATCvet index. If a substance name is not published in the ATCvet index, the Agency has to be contacted.

[33] Joint inter-agency antimicrobial consumption and resistance analysis (JIACRA) reports present work done by EMA, EFSA and ECDC to analyse the potential relationship between the consumption of antimicrobials by humans and animals and the occurrence of antimicrobial resistance.

	Variable	Description of variable	Justification
ACTIVE SUBSTANCE INFORMATION	**SALT**	**Salt of Antimicrobial Active Substance when Strength is Expressed in International Units (IU)** Name to be selected from the defined list of names of salt of antimicrobial active substances. Currently only applicable to colistin sulfate and colistin methane sulfonate.	Only in cases where the strength of an antimicrobial active substance is given in IU (IU/G, IU/ML or IU/PIECE) and the substance is included in the pre-defined list, to allow for conversion to mass of active substance. For validation purposes at country level prior to submission via ESVAC web-based application. For validation purposes by ESVAC BI web-based application after data submission.
	DERIVATIVE[34]	**Name of Derivative or Compound of Antimicrobial Active Substance** Name to be selected from the defined list of derivatives/compounds (Table 3), e.g. for procaine benzylpenicillin, procaine benzylpenicillin should be given as the derivative variable and benzylpenicillin as the antimicrobial active substance name variable.	To support the calculation of the mass of antimicrobial active moiety[35] in a standardised manner. For validation purposes at country level prior to submission via ESVAC web-based application. For validation purposes by ESVAC BI web-based application after data submission.
	STRENGTH	**Quantity of the Antimicrobial Active Substance** Numerical value of the concentration or quantity of the antimicrobial active substance in mg/g/IU per relevant unit ml/mg/l/g/kg/piece as declared in the product information (e.g. 10 for 10 MG/ML). In the case of fixed-combination products, the strengths of all the antimicrobial active substances per presentation must be provided separately.	To enable the calculation of the quantity of antimicrobial active substance in each product presentation and to validate the calculated active substance content. For validation purposes at country level prior to submission via ESVAC web-based application. For validation purposes by ESVAC BI web-based application after data submission.
	STRENGTHU	**Unit of Measurement for Strength** Unit of measurement of strength to be chosen from a defined list (e.g. IU/G, IU/ML, IU/PIECE, G/KG, G/L, G/PIECE, MG/ML, MG/G, MG/PIECE). Should be compatible with the pack size unit. In the case of fixed-combination products, the unit of measurement of all antimicrobial active substances per presentation must be provided separately.	To enable the calculation of the quantity of antimicrobial active substance in each product presentation. For validation purposes at country level prior to submission via ESVAC web-based application. For validation purposes by ESVAC BI web-based application after data submission.
	CONV FACT IU	**Conversion Factor when Strength is given in IU** When strength unit is e.g. IU/ML or IU/PIECE, a conversion factor from the defined list (Table A23) is assigned automatically by the macro or ESVAC web-based application for the harmonised calculation of the mass of the active substance.	To enable the calculation of the mass of antimicrobial active substance per product package. If an antimicrobial active substance with strength given in IU is not listed, the Agency should be contacted.

[34] Previously referred to as prodrug

[35] An active substance can have different derivatives with the same therapeutic moiety. In this context, active moiety should be interpreted as the part of the derivative or compound that is responsible for the antimicrobial pharmacological action and not as a synonym for active substance.

	Variable	Description of variable	Justification
ACTIVE SUBSTANCE INFORMATION	**CONV FACT DERIV**	**Conversion Factor of Certain Derivatives or Compounds** Only when strength of the VMP is given for the listed derivatives/compounds and not for the active moiety (e.g. procaine benzylpenicillin that is a derivative/compound for the active moiety benzylpenicillin), is a conversion factor from a defined list (Table A24) automatically assigned by the macro or ESVAC web-based application for the harmonised calculation of the mass of the active moiety.	To enable the calculation of the mass of the antimicrobial active moiety per product package. For validation purposes by ESVAC BI web-based application after data submission. If a derivative/ compound is not listed, the Agency should be contacted.
	INGR CONTENT	**Content of Antimicrobial Active Substance in Package** As a clarifying step in the calculation of the sales volume of the antimicrobial active substance, this variable provides the mass (in grams) of antimicrobial active substance per one unit of product package. This value is calculated automatically by the macro or ESVAC web-based application.	To enable the calculation of the sales volume. For validation purposes by ESVAC BI web-based application after data submission.
	CONTENT UNIT	**Unit of Antimicrobial Active Substance in Package** The unit of antimicrobial active substance per product package is given in grams for all antimicrobial substances. This field is filled automatically by the macro or ESVAC web-based application.	To enable the calculation of the sales volume. For validation purposes at country level prior to the submission via ESVAC web-based application.
TONNES SOLD		**Tonnes of Antimicrobial Active Substance Sold** Based on all the details provided, this represents the volume of the antimicrobial active substance in tonnes per product presentation. This value is calculated automatically by the macro or ESVAC web-based application.	Provides the sales volume of the antimicrobial active substance in tonnes.

Table A23. Conversion factors for calculation from IU to mg of antimicrobial active substances

Active ingredient	IU/mg	Conversion factor (mg/IU)
Apramycin	552	0.00181
Bacitracin	74	0.01351
Benzylpenicillin	1,670	0.00060
Chlortetracycline	1,000	0.001
Colistin sulfate	20,500	0.00005
Colistin methane sulfonate	12,700	0.00008
Dihydrostreptomycin	777	0.00129
Erythromycin	920	0.00109
Framycetin	706	0.00142
Gentamicin	620	0.00161
Kanamycin	796	0.00126
Neomycin	762	0.00131
Oxytetracycline	880	0.00114
Paromomycin	750	0.00133
Polymyxin B	8,403	0.00012
Spiramycin	3,200	0.00031
Streptomycin	760	0.00132
Tetracycline	982	0.00102
Tobramycin	875	0.00114
Tylosin	1,000	0.001

Table A24. Conversion factors for certain derivatives or compounds used to calculate the quantity of antimicrobial active moiety

Derivative or compound	Conversion factor	Active moiety
Benethamine benzylpenicillin	0.61	Benzylpenicillin
Benzathine benzylpenicillin	0.68	Benzylpenicillin
Cefapirin benzathine	0.78	Cefapirin
Cefalexin benzathine	0.74	Cefalexin
Cloxacillin benzathine	0.78	Cloxacillin
Oxacillin benzathine	0.77	Oxacillin
Penethamate hydriodide	0.60	Benzylpenicillin
Procaine benzylpenicillin	0.57	Benzylpenicillin

Further details and background information on the methodology used to established both the IU and the derivative conversion factors can be found in the data reporting protocol published on the Agency's website[36].

[36] Available on the EMA website (www.ema.europa.eu) via: Home > Regulatory > Veterinary medicines > Overview > Antimicrobial resistance > European Surveillance of Veterinary Antimicrobial Consumption > Sales data collection form and protocol.

Annex 4. Population correction unit (PCU)

Table A25. Animal categories included in the calculation of the population correction unit (PCU) and data types to be reported

Animal category
Cattle (heads/number of animals)
Slaughtered cows
Slaughtered heifers
Slaughtered bullocks and bulls
Slaughtered calves and young cattle
Slaughtered bovine — Import
Slaughtered bovine — Export
Fattening bovine — Import
Fattening bovine — Export
Living dairy cows
Pigs (heads/number of animals)
Slaughtered pigs
Slaughtered pigs — Import
Slaughtered pigs — Export
Fattening pigs — Import
Fattening pigs — Export
Living sows
Poultry (heads/number of birds)
Slaughtered broilers
Slaughtered turkeys
Slaughtered poultry — Import
Slaughtered poultry — Export
Caprinae (heads/number of animals)
Slaughtered sheep and goats
Slaughtered sheep — Import
Slaughtered sheep — Export
Fattening sheep — Import
Fattening sheep — Export
Living sheep
Slaughtered goats — Import
Slaughtered goats — Export
Fattening goats — Import
Fattening goats — Export
Equidae (heads/number of animals)
Living horses
Rabbits (heads/number of animals)
Slaughtered rabbits
Fish (tonnes)
Biomass of farmed fish produced

Table A26. Theoretical weights at the likely time for treatment used to calculate the population correction unit[1]

Animal category	Weight in kg
Slaughtered or livestock (Eurostat)	
Slaughtered cows	425
Slaughtered heifers	200
Slaughtered bullocks and bulls	425
Slaughtered calves and young cattle	140
Dairy cows	425
Slaughtered pigs	65
Living sows	240
Broilers	1
Turkeys	6.5
Slaughtered sheep and goats	20
Living sheep	75
Horses	400
Rabbits	1.4
Imported/exported for fattening or slaughter (TRACES data)	
Slaughtered bovine	425
Fattening bovine	140
Slaughtered pigs	65
Fattening pigs	25
Slaughtered poultry	1
Slaughtered sheep	20
Fattening sheep	20
Slaughtered goats	20
Fattening goats	20

[1] The data sources used are comprehensively described in Appendix 2 of the Agency's report 'Trends in the sales of veterinary antimicrobial agents in nine European countries: 2005-2009' (EMA/238630/2011).

Annex 5. List of antimicrobial classes/active substances reported in ESVAC

Table A27 includes all of the substances for which sales have been reported, divided by class or subclass. This includes sales reported for all product forms, including tablets, which are excluded from the analysis in mg/PCU for food-producing animals based on the assumption that they are intended for companion animals. Note that in ESVAC, sales are reported by classes/subclasses irrespective of whether the VMP sold is a single or a fixed-combination product – i.e. not by ATCvet classes. An exception to this are combinations of penicillins and beta-lactamase inhibitors, which are reported as such, as in Figure 5.

Pharmacologically active substances that may be used in food-producing animals must be listed in Table 1 of the Annex to Commission Regulation (EU) No 37/2010. The table details, among other things, the food-producing animal species for which the maximum residue limits (MRLs) have been established. Table 2 of that annex contains substances that are prohibited for use in any food-producing animals; some of these are included in Table A27 below because they are used in companion animals for which no MRLs are required.

Table A27. List of substances reported sold in ESVAC 2010–2020

Class/subclass	Substances		
Tetracyclines			
	Chlortetracycline	Doxycycline	Oxytetracycline
	Tetracycline		
Amphenicols			
	Chloramphenicol[1]	Florfenicol	Thiamphenicol
Penicillins			
Beta-lactamase-sensitive penicillins			
	Benzathine benzylpenicillin	Benzathine phenoxymethylpenicillin	Benzylpenicillin
	Penethamate hydriodide	Phenoxymethylpenicillin	Pheneticillin
	Procaine benzylpenicillin		
Beta-lactamase-resistant penicillins			
	Cloxacillin	Dicloxacillin	Nafcillin
	Oxacillin		
Penicillins with extended spectrum			
	Amoxicillin	Ampicillin	Metampicillin[2]
Combinations of penicillins with beta-lactamase inhibitors			
	Amoxicillin	Ampicillin	
Cephalosporins[3]			
1st-generation cephalosporins			
	Cefacetrile	Cefadroxil[2]	Cefalexin
	Cefalonium	Cefapirin	Cefazolin
	Cefalotin		
3rd-generation cephalosporins			
	Cefoperazone	Cefovecin[2]	Ceftiofur
4th-generation cephalosporins			

Class/subclass	Substances		
	Cefquinome		
Sulfonamides and trimethoprim			
Sulfonamides			
	Formosulfathiazole	Phthalylsulfathiazole	Sulfacetamide
	Sulfachlorpyridazine	Sulfaclozine	Sulfadiazine
	Sulfamonomethoxine	Sulfadimethoxine	Sulfadimidine
	Sulfadoxine	Sulfafurazole	Sulfaguanidine
	Sulfalene	Sulfamerazine	Sulfamethizole
	Sulfamethoxazole	Sulfamethoxypyridazine	Sulfanilamide
	Sulfapyridine	Sulfaquinoxaline	Sulfathiazole
	Sulfazuinoxaline		
Trimethoprim and derivatives			
	Trimethoprim		
Macrolides and lincosamides			
Macrolides			
	Erythromycin	Gamithromycin	Oleandomycin
	Spiramycin	Tildipirosin	Tilmicosin
	Tulathromycin	Tylosin	Tylvalosin
Lincosamides			
	Clindamycin[2]	Lincomycin	Pirlimycin
Aminoglycosides			
	Amikacin[2]	Apramycin	Dihydrostreptomycin
	Framycetin	Gentamicin	Kanamycin
	Neomycin	Paromomycin	Streptomycin
Quinolones			
Fluoroquinolones			
	Danofloxacin	Difloxacin	Enrofloxacin
	Ibafloxacin[2]	Marbofloxacin	Norfloxacin[2]
	Orbifloxacin[2]	Pradofloxacin[2]	
Other quinolones			
	Cinoxacin[2]	Flumequine	Oxolinic acid
Imidazole derivatives			
	Metronidazole[1]		
Pleuromutilins			
	Tiamulin	Valnemulin	
Polymyxins			
	Colistin	Polymyxin B[2]	
Nitrofuran derivatives			
	Furazolidone[1]	Nifurpirinol[1]	
Other antibacterials			
	Bacitracin	Fosfomycin	Furaltadone[1]
	Natamycin	Nitroxoline[2]	Novobiocin
	Rifaximin	Spectinomycin	

[1] Included in Table 2 (prohibited substances) of the Annex to Commission Regulation (EU) No 37/2010.
[2] MRLs not established for any food-producing animals.
[3] In accordance with the Commission Implementing Decision C(2012) 182 of 13 January 2012 (https://ec.europa.eu/health/documents/community-register/html/vo22101.htm), the use of 3rd- and 4th-generation cephalosporins in poultry is prohibited.

Annex 6. Selection of antimicrobial classes of WHO CIAs and AMEG Category B highlighted in the report

The WHO list of CIAs for human medicine[37] and the list of antimicrobials categorised by AMEG[38] were used as a basis for selecting the classes of antimicrobials highlighted in this report. The classes/subclasses highlighted are those antimicrobials that are categorised as HP CIAs for human medicine in the WHO list and are also authorised in veterinary medicines in the EU. This includes the antimicrobials that belong to AMEG Category B "Restrict": 3rd- and 4th-generation cephalosporins, polymyxins, fluoroquinolones and other quinolones (Table A28), and in addition, macrolides.

Table A28. Antimicrobial classes highlighted in the report and their classification

Antimicrobial	AMEG classification	WHO classification
3rd- and 4th-generation cephalosporins	Category B	Highest priority CIAs (3rd- and higher-generation cephalosporins)
Fluoroquinolones and other quinolones	Category B	Highest priority CIAs
Macrolides	Category C	Highest priority CIAs
Polymyxins	Category B	Highest priority CIAs

[37] WHO Critically important antimicrobials for human medicine, 6th revision. (https://www.who.int/publications/i/item/9789241515528)
[38] EMA/AMEG 2019. Categorisation of antibiotics in the European Union. Answer to the request from the European Commission for updating the scientific advice on the impact on public health and animal health of the use of antibiotics in animals (https://www.ema.europa.eu/en/documents/report/categorisation-antibiotics-european-union-answer-request-european-commission-updating-scientific_en.pdf)

Annex 7. Distribution of veterinary medicines: legal framework and data sources by country

Austria

Distribution of veterinary medicines

In Austria, all VMPs are prescription-only medicines. They are dispensed by pharmaceutical companies or wholesalers to veterinarians. Only veterinarians are allowed to sell VMPs to farmers. Veterinarians must confirm the distribution of veterinary drugs to owners of food-producing animals and horses if used for food production. Distribution of VMPs to farmers is restricted to VMPs registered for topical or oral use. Distribution of VMPs for intramammary use or for systemic use (injection) and premixes is restricted to farms that are members of the Austrian Animal Health Service. VMPs sold by public pharmacies must be prescribed by a veterinarian; such sales are negligible for farm animals.

Legal basis for the monitoring of sales

The collection of sales data by pharmaceutical companies and wholesalers is based on the national law on animal drug control: BGBl. II Nr. 83/2014 Veterinär-Antibiotika-MengenströmeVO.

Data sources

Sales data must be uploaded to the national database by those pharmaceutical companies either producing or importing VMPs, and by wholesalers assigned by the industry to distribute a product.

Belgium

Distribution of veterinary medicines

In Belgium, all VMPs containing antimicrobial agents are prescription-only medicines. This includes medicated premixes containing antimicrobial agents that are pharmaceutically active substances.

VMPs (pharmaceutical formulation) are distributed through wholesaler-distributors to veterinarians and pharmacists; the wholesaler-distributor obtains the VMPs from a wholesaler or the authorised producer. Antimicrobial VMPs are only available to animal owners via delivery from a pharmacy, on veterinary prescription, or directly from the veterinarian.

Premixes are distributed through wholesalers or wholesaler-distributors directly to feed mills. Only farmers are receivers from feed mills. Medicated feed is distributed on veterinary prescription only.

Note: since 1 June 2014, the Federal Agency of Medicines and Health Products (FAHMP) has imposed a fee per package, according to the active ingredient content, for all veterinary antibiotics on the Belgian market on behalf of the MAHs. A higher fee is imposed for critically important antibiotics such as cephalosporins, quinolones and macrolides. Since 1 April 2018, the fees have increased (75%).

Legal basis for the monitoring of sales

The collection of sales data is based on the national law on medicines of 25 March 1964 (Article 12) and on the Royal Decree of 14 December 2006 on medicines for human and veterinary use (Articles 221 and 228). Wholesaler-distributors and feed mills are obliged to keep records of all sales and to deliver these records to FAHMP on a yearly basis.

Data sources

To avoid double counting, all wholesaler-distributors are asked to provide sales data for the antimicrobial VMPs delivered to pharmacies and veterinarians, while sales data for antimicrobial premixes are provided by the Belgian feed mills licensed to produce medicated feed and to deliver it to Belgian farmers.

Data collection for both concerned parties is organised via a secure web application with a login and password delivered by letter.

Import data on medicated feed produced in another EU country and delivered to Belgian farmers are not included in the material.

Bulgaria

Distribution of veterinary medicines

In Bulgaria, all VMPs containing antimicrobial agents are prescription-only medicines. This includes medicated premixes containing pharmaceutically active substances like antimicrobial agents. VMPs are distributed through wholesalers to veterinarians, farms and pharmacists; the wholesalers acquire the VMPs from another wholesaler or the authorised manufacturer. Antimicrobial VMPs are only available to animal owners by delivery from a pharmacy or wholesaler, on veterinary prescription, or directly from the veterinarian. Premixes are distributed through wholesalers directly to feed mills. Only farmers receive feed from feed mills. Medicated feed is distributed on veterinary prescription only.

Legal basis for the monitoring of sales

The collection of sales data is based on the national law on veterinary activities, promulgated in the State Gazette (SG), Issue No. 7/25.01.2013. At the request of the Executive Director of the Bulgarian Food Safety Agency (BFSA), in the interests of pharmacovigilance, the holder of a marketing authorisation for VMPs shall provide data on the volume of VMP sales. Wholesalers, pharmacies and farmers are obliged to keep records of all sales and purchases, and to deliver them to BFSA on request.

Data sources

Sales data are collected from all manufacturers, importers and wholesalers, which are also either MAHs or official representatives of MAHs in Bulgaria (to avoid double counting, sales of other wholesalers are excluded). The data include sales to veterinarians, farms and pharmacies.

Croatia

Distribution of veterinary medicines

In Croatia, all antimicrobial VMPs are prescription-only medicines. They are dispensed by pharmaceutical companies or wholesalers of VMPs to veterinary practices (surgeries, clinics and hospitals), veterinary pharmacies and feed mills. Animal owners can only buy antimicrobial VMPs on veterinary prescription in a veterinary pharmacy.

Large farms have authorised their own veterinary practices for their animals and can buy premixes on veterinary prescription from a veterinary pharmacy to use in feed mills. Feed mills should have a record of veterinary prescriptions covering each amount of antimicrobial VMP used.

Legal basis for the monitoring of sales

The collection of sales data by wholesalers is based on the national law, published in the Official Gazette of the Republic of Croatia, No: 84/08, 56/13, 94/13, 15/15 and 32/19.

Data sources

Sales data for veterinary antimicrobial agents are obtained each year from the authorised wholesalers.

Cyprus

Distribution of veterinary medicines

In Cyprus, all VMPs containing antimicrobials are prescription-only medicines. They are dispensed either by pharmacies or veterinary clinics. Veterinarians are only allowed to administer VMPs to those animals under their direct personal responsibility. The supply of VMPs to pharmacies and veterinary clinics is conducted by authorised wholesalers.

Medicated feeding stuffs containing antimicrobials are manufactured on a prescription basis, and only by authorised feed mills. Feeding stuffs manufactured in or imported into Cyprus are distributed by authorised suppliers and only administered on prescription by a veterinarian.

Legal basis for the monitoring of sales

The data are provided under legal requirements for wholesalers/veterinarians/pharmacists to give any information requested.

Data sources

Data on sales of veterinary antimicrobial agents are collected each year from all authorised wholesalers and licensed feed mills in Cyprus.

Czechia

Distribution of veterinary medicines

In Czechia, all VMPs containing antimicrobial agents are prescription-only medicines. This includes medicated feeding stuffs manufactured from medicated premixes containing antimicrobials. There are five categories of receivers of antimicrobial VMPs from wholesalers: wholesalers (when selling to each other, such deliveries are notified to avoid double reporting), veterinarians, pharmacies, farmers, and feed mills. Only farmers are receivers from feed mills (only the amount finally sold/delivered to farmers in Czechia territory is counted; deliveries of VMPs from wholesalers to feed mills are notified but not counted in the final consumption figures to avoid double reporting). Medicated feed must be prescribed by veterinarians and produced by feed mills authorised by the Institute for State Control of Veterinary Biologicals and Medicaments.

Legal basis for the monitoring of sales

The collection of sales data is based on a national law on pharmaceuticals: Act No. 378/2007 Coll.

Data sources

Sales data are collected from all wholesalers and feed mills licensed in Czechia.

Brief description of data collection

Manufacturers/wholesalers fill in the template with their quarterly sales data, divided into five categories (no data about customers); only sales to veterinarians, pharmacies and farmers are used to calculate consumption.

In the case of medicated premixes, the data reported by manufacturers of medicated feeding stuffs are used for calculation. Sales to wholesalers and manufacturers of medicated feeding stuffs are used for the verification of VMP sales.

Denmark

Distribution of veterinary medicines

In Denmark, all VMPs are prescription-only medicines and can only be dispensed either through pharmacies or via a small number of dispensing companies approved by the Danish Medicines Agency to dispense VMPs on the same legal terms as those to which the pharmacies are subject. Both pharmacies and dispensing companies are supplied by

pharmaceutical companies and wholesalers. An exemption from the pharmacy/dispensing-company monopoly has been granted for medicated feeds, i.e. feeds into which VMPs formulated as premixes are mixed prior to sale. Medicated feed must be prescribed by veterinarians and produced by feed mills authorised by the Danish Medicines Agency.

Legal basis for the monitoring of sales

All sales of prescription medicines by pharmacies, dispensing companies and feed mills are mandated to be reported to the VetStat database, owned by the Ministry of Environment and Food of Denmark. The pharmacy/dispensing-company sales records include sales of all prescription medicines to animal owners, as well as of medicines purchased by veterinary practitioners for use in their practice. Furthermore, it is mandatory for the veterinarians to report to VetStat the medicines used in their own practices for food-production animals. Data on antimicrobial sales for companion animals are gathered from sales reported by pharmacies to veterinarians.

Data sources

Data on sales of all prescription medicines at package level from pharmacies, dispensing companies, veterinarians and feed mills are retrieved from the VetStat database.

Estonia

Distribution of veterinary medicines

In Estonia, antimicrobial VMPs are prescription-only medicines. VMPs must be dispensed through pharmacies (general and veterinary) and veterinarians, who are supplied by wholesalers.

Legal basis for the monitoring of sales

Wholesalers are obliged to report the sales of VMPs to the State Agency of Medicines under the Medicinal Products Act of 2005.

Data source

The State Agency of Medicines collects sales data at package level from wholesalers. Only sales to pharmacies (general and veterinary) and veterinarians are taken into account, in order to avoid double reporting caused by the inclusion of sales to other wholesalers.

Finland

Distribution of veterinary medicines

In Finland, all VMPs that contain antimicrobials are prescription-only medicines, which are available either from pharmacies on veterinary prescription or directly from veterinarians. Veterinarians are allowed to dispense medicines for the treatment of animals under their care but are not allowed to profit from the sales. Pharmacies and veterinarians are supplied by wholesalers. Medicated feeds may either be produced by feed mills or imported into Finland, but always require a prescription from a veterinarian.

Legal basis for the monitoring of sales

Wholesalers are obliged to provide information to the Finnish Medicines Agency on the sales of VMPs in accordance with the Medicines Act (375/1987). Production and imports of medicated feeds must be reported to the Finnish Food Safety Authority in accordance with the Decree on Medicated Feeds (10/EEO/2008).

Data source

The sales data are obtained at package level from wholesalers by the Finnish Medicines Agency, which monitors the sales of VMPs. Sales of antimicrobial agents in medicated feed are monitored by the Finnish Food Authority, which collects data from feed mills and other importers.

France

Distribution of veterinary medicines

In France, all VMPs are available on prescription only. VMPs are distributed by feed mills for premixes and through wholesalers to veterinarians and pharmacists for all other pharmaceutical forms; wholesalers and feed mills obtain the VMPs from MAHs.

Legal basis for the monitoring of sales

A law published at the end of 2014 makes the provision to the competent authority of data on antimicrobial sales mandatory.

Data sources

The sales data are collected from MAHs at package level by Anses-ANMV (the French Agency for Veterinary Medicinal Products), in collaboration with the French Veterinary Medicine Industry Association. Double reporting is avoided because the data are not provided by the wholesalers but directly by the MAHs, which do not trade with one another.

Germany

Distribution of veterinary medicines

In Germany, all VMPs containing antimicrobial agents are prescription-only medicines. Veterinarians are allowed to dispense drugs for the treatment of animals under their care. Veterinarians are supplied with VMPs by either pharmaceutical companies or wholesalers. Sales of antimicrobial VMPs by public pharmacies require a prescription from a veterinarian; such sales are considered negligible in Germany.

Medicated feeds may be produced by authorised feed mills but always require a prescription from a veterinarian.

Legal basis for the monitoring of sales

The collection of sales data from pharmaceutical companies and wholesalers is based on the German Medicinal Products Act and is further specified in a specific regulation.

Data sources

Sales data for antimicrobial VMPs that were dispensed to veterinarians located in Germany are reported by pharmaceutical companies and wholesalers. Since prescribed premixes are directly dispensed to feed mills and not to veterinarians, they are not included in the national system of data reporting. Sales data for premixes are thus derived from periodic safety update reports.

Greece

Distribution of veterinary medicines

In Greece, all antimicrobial VMPs are prescription-only medicines. MAHs or local representatives provide VMPs to wholesalers and retailers. Wholesalers can also provide VMPs to retailers. Only retailers can provide VMPs to the customer with a valid prescription.

Legal basis for the monitoring of sales

The collection of sales data by MAHs is based on the joint ministerial law: KYA 282371/16-06-2006.

Data sources

In delivering data for 2020, sales of veterinary antimicrobial agents were reported to ESVAC for the sixth time. Data were provided by 68 MAHs. Negligible sales from a few MAHs with a very small market share, and without local representatives in the country, were not included in the reported datasets.

Hungary

Distribution of veterinary medicines

In Hungary, all VMPs that contain antimicrobials are prescription-only medicines. All VMPs must be dispensed through authorised retailers, which are only supplied by authorised wholesalers. Wholesalers are authorised by the county government office, and retailers are authorised by the district government office.

Antimicrobial VMPs can be bought from a wholesaler by other wholesalers, retailers, veterinarians, farmers or feed mills. All VMPs must be tracked and documented, as it must be possible to trace the journey of each batch from the manufacturer to the farmer.

According to EU rules, medicated feeds are classified as feed and not as VMPs. They must be prescribed by veterinarians and produced by feed mills authorised by the government office. Medicated feeds may be imported into Hungary but require a prescription by a veterinarian, as with nationally produced medicated feeds. Importation of medicated feeds is supervised by the office which authorises importers and distributors.

Legal basis for the monitoring of sales

There is no legal basis for the mandatory reporting of sales data; monitoring of sales takes place voluntarily.

Data sources

Data are collected from wholesalers in Hungary. The wholesalers only submit data for those products they have sold to veterinarians, feed mills, farmers and retailers, but not to other wholesalers (i.e. there is no double reporting).

Iceland

Distribution of veterinary medicines

In Iceland, all antimicrobial VMPs and almost all other VMPs are prescription-only medicines. They must be dispensed to animal owners by veterinarians (or used by the veterinarians in their practices), or by pharmacies, i.e. veterinarians are allowed to dispense VMPs in the same way as pharmacies. Veterinarians and pharmacies can only purchase VMPs from licensed wholesalers. No medicated feeding stuffs for livestock are produced by feed mills in Iceland.

Legal basis for the monitoring of sales

Wholesalers in Iceland are mandated to provide sales statistics for both human and veterinary medicinal products, as well as for medicated feeding stuffs, to the Icelandic Medicines Agency.

Data sources

The data on sales of veterinary antimicrobial agents at package level are provided by wholesalers in Iceland, of which there are only two.

Ireland

Distribution of veterinary medicines

In Ireland, antimicrobial VMPs may only be supplied on prescription. The products are supplied to the trade by wholesalers authorised by the Department of Agriculture, Food and the Marine. In accordance with the prescription of the prescribing veterinarian, the prescribed products can be dispensed either by the veterinarian or by a pharmacist. By way of an exception to this rule, intramammary antimicrobial substances can also be dispensed by licensed agricultural merchants. Medicated feeds containing antimicrobials are prepared from authorised premixes, again under veterinary prescription. They are incorporated into the feed under a special authorisation granted by the Department of Agriculture, Food and the Marine. The licences for incorporation are granted either to feed mills or to farms that have the appropriate facilities. It should be noted that the sale, supply or possession of any unauthorised veterinary medicine in Ireland is a criminal offence.

Legal basis for the monitoring of sales

There is currently no legal basis requiring wholesalers to supply data relating to the volume of sales of authorised VMPs. However, MAHs are obliged to report sales data.

Data sources

Each year, the Health Products Regulatory Authority (HPRA) collects data from veterinary pharmaceutical manufacturers currently holding Irish marketing authorisations. These holders are requested by HPRA to only report sales in Ireland. HPRA checks the information provided against data collected for previous years. Fluctuations in the data from year to year are followed up with the individual company to guard against data errors. The importation of medicated feed is permitted. However, in practice, given the logistics involved, this is not seen as a major route of supply into the country.

Italy

Distribution of veterinary medicines

In Italy, antimicrobial agents for use in animals are prescription-only medicines. Therefore, their sale to the end-user can only take place upon presentation of a veterinary prescription. Since April 2019, electronic veterinary prescriptions have been mandatory. The sale of veterinary medicines (including antimicrobial agents) on Italian territory may take place as described below:

Wholesale of veterinary medicines

This type of sale includes all forms of business transaction except sales to the end-user. Such sales can only be made on storage premises authorised for the purpose by the local competent authority.

Wholesale of VMPs includes transactions between:

- MAHs or their representatives and wholesalers;
- MAHs or their representatives and pharmacies;
- wholesalers;
- wholesalers and pharmacies;
- wholesalers and feed mills authorised to produce medicated feeds (premixes for medicated feed).

Direct sale of VMPs

Holders of authorised wholesale veterinary medicines storage premises may, as a result of further authorisation by the local competent authority, also make direct sales of such products to breeders, pet owners, veterinarians and veterinary care facilities. This type of transaction also includes the sale of premixes for medicated feed by wholesalers, pharmacies and manufacturers to farms authorised to produce medicated feed for their own use. Such sales may take place only in the presence of a pharmacist and, in the case of antimicrobial agents, only by electronic veterinary prescription.

Retail of VMPs

The retail sale of VMPs containing antibiotics can only take place at pharmacies, by electronic veterinary prescription, and only in the presence of a pharmacist.

Farmers, veterinarians and breeding and healthcare facilities may, on request, be authorised by the local competent authority to hold stocks of VMPs. Stocks of veterinary drugs, including antibiotics, can only be purchased if an electronic veterinary prescription has been issued. Farms cannot hold stocks of antibiotics in the form of medicated feed or veterinary drugs administered in feed, water or liquid feed. Only small quantities can be held, not exceeding a treatment period of seven days.

Veterinarians cannot sell veterinary drugs (including antibiotics). When required for professional reasons, veterinarians are allowed to deliver open packages of veterinary medicines from their stocks to breeders or animal owners in order to start the therapy. For companion animals, the veterinarian may also deliver unopened packages.

Legal basis for the monitoring of sales

The collection of sales data by pharmaceutical companies is based on the national law 193/2006 (Article 32(3)) transposing EC Directive 2004/28. The collection of sales data through the electronic veterinary prescription system is based on the national decree of 8 February 2019.

Data sources

Sales data for premixes are collected from pharmaceutical companies producing or importing VMPs. Data of sales along the veterinary medicine supply chain for all other pharmaceutical forms are collected though the national computerised traceability system, as a result of the issuing of an e-prescription.

Latvia

Distribution of veterinary medicines

In Latvia, all VMPs containing antimicrobial agents are prescription-only medicines. This includes medicated feed manufactured from medicated premixes containing antimicrobial agents. VMPs are distributed through wholesalers to pharmacies, veterinarians and licensed farms. VMPs for licensed farms must have been ordered by the veterinarian contracted to provide routine healthcare services. Animal owners without a licence can only purchase VMPs containing antibiotics by veterinary prescription in pharmacies.

Legal basis for the monitoring of sales

Sales data are collected by the Food and Veterinary Service. This task is mandated by the Law of Pharmacy and the related Regulation of the Cabinet of Ministers.

Data sources

Sales data are collected from all wholesalers in Latvia at package level by the Food and Veterinary Service. Wholesalers are asked to provide detailed reports of medicines sold in order to determine real consumption of VMPs and to avoid double reporting or export of VMPs.

Lithuania

Distribution of veterinary medicines

In Lithuania, all VMPs that contain antimicrobial agents are prescription-only medicines. All VMPs must be dispensed to veterinarians or farmers through wholesalers or pharmacies. Medicated feed is also subject to prescription by a veterinarian.

Legal basis for the monitoring of sales

Wholesalers are obliged to provide information on sales of VMPs to the State Food and Veterinary Service of the Republic of Lithuania, in accordance with national law.

Data sources

Data on sales of antimicrobial VMPs at package level are obtained from wholesalers by the State Food and Veterinary Service of the Republic of Lithuania.

Luxembourg

Distribution of veterinary medicines

In Luxembourg, all VMPs containing antimicrobial agents are prescription-only medicines. This includes medicated premixes containing pharmaceutical agents.

VMPs containing antimicrobial agents are distributed through wholesalers to pharmacies or to veterinarians (via pharmacies' records). Veterinarians are allowed to keep VMPs in stock and to dispense them to farmers for the treatment of animals in their care.

Legal basis for monitoring

Wholesalers, pharmacies, veterinarians and farmers are legally obliged to keep records of all sales. They are legally bound to provide any data or information requested of them.

Data sources

The data on sales of veterinary antimicrobial agents at package level are obtained from the authorised wholesalers on a yearly basis.

Malta

Distribution of veterinary medicines

All VMPs that contain antimicrobials are registered as prescription-only medicines. In accordance with Regulation 58 of Subsidiary Legislation 437.47, distribution of VMPs is subject to the holding of an authorisation. In accordance with Regulation 60 of Subsidiary Legislation 437.47, a veterinary prescription is required for the dispensing of VMPs for food-producing animals to the public. For all types of medicated feed, a veterinary prescription is required in accordance with Subsidiary Legislation 437.73, and an authorised medicated feed mill or authorised feed trader can distribute the finished medicated feed directly to farms.

Legal basis for monitoring

There is no legal basis for the reporting of veterinary antimicrobial sales data in Malta and monitoring is done on a voluntarily basis by the Veterinary Medicines Section, which falls under the administration of the Ministry for Agriculture, Fisheries, Food and Animal Rights.

Data sources

The Veterinary Medicines Section collects sales data on antimicrobials once a year from all authorised veterinary distributors, medicated feed mills and medicated feed traders.

Netherlands

Distribution of veterinary medicines

In the Netherlands, antimicrobial VMPs are available on prescription only. Veterinarians purchase approximately 40% of their VMPs directly from manufacturers and approximately 60% through wholesalers. About 98% of the total volume of antimicrobial VMPs is dispensed by MAHs who are either direct members of the Dutch federation of the veterinary pharmaceutical industry (FIDIN) or are represented by FIDIN members. An estimated 2% are sold by authorisation holders not associated with FIDIN. Veterinarians sell the products directly to animal owners. Pharmacies dispense only minor quantities of VMPs, but no antimicrobial VMPs.

Legal basis for the monitoring of sales

Currently, there is no legal basis for the mandatory reporting of sales data; monitoring of sales takes place voluntarily.

Data sources

The sales data are obtained at package level from the MAHs who are (represented by) members of FIDIN. Since sales data are obtained from MAHs only, including both their sales to wholesalers and their direct sales to veterinarians, there is no double reporting of wholesalers' sales.

Norway

Distribution of veterinary medicines

In Norway, all VMPs are prescription-only medicines, which are generally dispensed through pharmacies supplied by drug wholesalers. The exception is medicated feed, which is dispensed by feed mills to fish farmers. Veterinarians, in general, are not allowed to dispense VMPs. Medicated feeds are not used for food-producing animals with the exception of farmed fish; this is due to the small size of livestock herds compared to those in most other European countries. However, group/flock treatment of livestock with antimicrobial agents is possible, again subject to veterinary prescription, through drinking water or as top dressing on feed by using an oral solution or oral powder, respectively.

Legal basis for the monitoring of sales

Wholesalers and feed mills in Norway are mandated to provide sales statistics for both human and veterinary medicinal products, as well as for medicated feed, to the Norwegian Institute of Public Health (NIPH).

Data sources

Data on sales of veterinary antimicrobial agents at package level are obtained from NIPH, which collects its data from authorised wholesalers and feed mills (only relevant for aquaculture). To avoid double reporting through the inclusion of sales between wholesalers, the wholesalers and feed mills are asked by NIPH to only report sales to pharmacies and animal owners in Norway.

Poland

Distribution of veterinary medicines

Most VMPs, including antimicrobial VMPs, are prescription-only medicines. VMPs are distributed by wholesalers to veterinarians. Antimicrobial VMPs are only available to animal owners if the veterinarian delivers them. Veterinarians and medicated feed producers are allowed to buy medicated premixes from wholesalers. However, before purchase, medicated feed producers must obtain confirmation from the district veterinary officer.

Legal basis for the monitoring of sales

In accordance with the national pharmaceutical law, wholesalers are obliged to provide data on sales of VMPs.

Data sources

Sales data are collected from wholesalers who deliver VMPs directly to veterinarians. Wholesalers fill in the template with their quarterly sales data.

Portugal

Distribution of veterinary medicines

In Portugal, all VMPs containing antimicrobial agents are prescription-only medicines. This includes medicated premixes containing pharmaceutically active substances, such as antimicrobial agents. VMPs containing antimicrobial agents are provided by wholesaler-distributors to retailers of VMPs (both human and animal pharmacies), farmers, veterinarians, producers' organisations, veterinary clinics and hospitals, and feed mills.

Wholesaler-distributors obtain the VMPs from a wholesaler or from the MAH/manufacturer. Antimicrobial VMPs are only available to animal owners/farmers by means of an official veterinary prescription. Veterinarians do not sell VMPs and can

only charge for those they use to treat animals in their care. Premixes are distributed through wholesalers or wholesaler-distributors directly to feed mills. Only farmers are receivers from feed mills. Medicated feeds containing antimicrobial premixes must also be prescribed by a veterinarian and can only be manufactured by officially authorised feed mills.

Legal basis for the monitoring of sales

The collection of sales data is based on national law No. 148/2008, dated 29 July (Article 120), amended and reprinted as national law No. 314/2009, dated 28 October.

Data sources

Data are provided by wholesalers who are authorised to sell VMPs containing antibiotics.

Romania

Distribution of veterinary medicines

In Romania, all VMPs containing antimicrobial agents are prescription-only medicines.

Wholesalers must supply medicinal products only to those authorised to perform retail activities or those who are legally allowed to purchase medicinal products from wholesalers. Retail distribution of VMPs is performed only by those authorised to carry out such operations in accordance with the national legislation.

Marketing of VMPs is carried out according to the veterinary legislation in force, i.e. only through veterinary pharmaceutical establishments which are authorised by the National Sanitary Veterinary and Food Safety Authority.

Legal basis for the monitoring of sales

The collection of sales data is based on the national law on veterinary activities — Order of the National Sanitary Veterinary and Food Safety President — promulgated in the Official Monitor of 15 October 2015.

The MAHs are obliged to report sales of antimicrobials each year before 15 March and to deliver these records to the Institute for Control of Biological Products and Veterinary Medicines, which reports the data to ESVAC.

Data sources

For 2014, the sales data were collected from 37 wholesalers and the 11 MAHs which distributed their own products. The data include sales to veterinarians, farmers and pharmacies. Since 2015, in accordance with the updated veterinary law, the sales data have been collected from MAHs only.

Slovakia

Distribution of veterinary medicines

In Slovakia, all VMPs containing antimicrobial agents are prescription-only medicines, including medicated feeding stuffs manufactured from medicated premixes containing antimicrobial agents. There are seven categories of receivers of antimicrobial VMPs from wholesalers: wholesalers (when selling to each other), pharmacies, veterinarians, farmers, military forces, the State Veterinary and Food Administration and feed mills. Farmers and wholesalers are very seldom receivers from feed mills. Medicated feed must be prescribed by veterinarians and produced by feed mills authorised by the Institute for State Control of Veterinary Biologicals and Medicaments in Nitra.

Legal basis for the monitoring of sales

The collection of import data is based on a national law on pharmaceuticals: Act No. 362/2011 Coll.

Data sources

For 2011 and 2012, import data were collected from all wholesalers licensed in the Slovak Republic; since 2013, data have represented sales from wholesalers to end-users.

Brief description of data collection

Wholesalers send their quarterly import data (number of packs, pack size, name of the product, batch number, etc.) and manufacturers send their quarterly production data to the Institute for State Control of Veterinary Biologicals and Medicaments in Nitra.

Slovenia

Distribution of veterinary medicines

In accordance with applicable legislation, antimicrobial VMPs are dispensed in the Republic of Slovenia on the basis of a veterinary prescription only. Wholesalers deliver antimicrobial VMPs to retailers, i.e. pharmacies and veterinary organisations.

Legal basis for the monitoring of sales

Wholesalers are required by law to report to the competent authority on the turnover (sales) of all medicinal products.

Data sources

Data on sales of veterinary antimicrobial agents at package level are obtained from the wholesalers.

Spain

Distribution of veterinary medicines

In Spain, all VMPs containing antimicrobials are prescription-only medicines, so they can only be dispensed on veterinary prescription. All suppliers of VMPs (retailers, pharmacies and farmers' co-operatives) to end-users are authorised in accordance with the relevant national law and are subject to a mandatory pharmacist control service. Dispensing is most frequently done by retailers. Veterinarians in Spain are allowed to use VMPs in their daily practice, but they cannot sell VMPs to animal owners.

Medicated feeds containing antimicrobial premixes must also be prescribed by a veterinarian and can only be manufactured by feed mills authorised by regional competent authorities according to specific legislation and the feed hygiene regulation (Hazard Analysis and Critical Control Point principles).

Legal basis for the monitoring of sales

There is a legal basis for the mandatory reporting of sales data by the distributors of VMPs, while monitoring of sales by MAHs takes place voluntarily.

Data sources

For 2017–2020, sales data at package level were collected from all suppliers of VMPs (retailers, pharmacies and farmers' cooperatives) to end-users by the Spanish Agency for Veterinary Medicinal Products (AEMPS), in collaboration with the Spanish veterinary medicine industry association (Veterindustria) and the Spanish business association of additives and premixes for animal health and nutrition (Adiprem).

Sweden

Distribution of veterinary medicines

In Sweden, antimicrobial VMPs may only be sold on prescription. VMPs must be dispensed through pharmacies, which are supplied by drug wholesalers or MAHs. Feed mills may only mix antimicrobial VMPs in feed if they are controlled and authorised by the Swedish Board of Agriculture. Sales of medicated feed to farmers are only allowed on prescription (i.e. the farmer presents the prescription to the feed mill). Mixing of antimicrobials in feed may also take place on farms, provided that the Swedish Board of Agriculture has controlled and authorised the establishment for this purpose. In such cases, the premix is purchased on prescription and dispensed by a pharmacy.

Legal basis for the monitoring of sales

All pharmacies in Sweden are required to provide sales statistics on a daily basis to a central database at the Swedish eHealth Agency. The eHealth Agency is required to share data on sales with the Swedish Board of Agriculture and the National Veterinary Institute, who are required to maintain statistical confidentiality. All feed mills and farms authorised to mix medicated feed are requested to report their purchases and sales on a yearly basis to the Board of Agriculture.

Data sources

Pharmacy data on the dispensation of prescriptions to animal owners or requisitions by a veterinarian (e.g. sales from pharmacies to animal owners or to veterinarians for use in practice) at package level are obtained from the Swedish eHealth Agency.

Switzerland

Distribution of veterinary medicines

In Switzerland, all VMPs are prescription-only medicines and must be dispensed by either the treating veterinarian or a pharmacy. Medicated feeds for livestock (terrestrial animals) are either produced in feed mills using authorised premixes, or incorporated on-site following prescription and dispensing by veterinarians. Group treatment of livestock with antimicrobial agents is possible, subject to veterinary prescription and supervision, through medicated feed, drinking water or as top dressing.

Legal basis for the monitoring of sales

It needs to be highlighted that since 1 January 2019, the regulatory framework for data collection in Switzerland has been governed by new legislation. The legal basis for data collection is Article 4 of the Ordinance on the Information System on Antibiotics in Veterinary Medicine (Verordnung über das Informationssystem Antibiotika in der Veterinärmedizin, ISABV-V), enacted in October 2018. It requires MAHs to transmit sales data at least once a year to the Federal Food Safety and Veterinary Office in order to publish statistics on the sales of antibiotics (Article 6 ISABV-V). Sales of veterinary antimicrobials are published yearly in the ARCH-VET report, which covers sales and resistance to veterinary antimicrobials. Note that figures published in the national ARCH-VET report differ from figures in the present report since all ATCvet groups are included in the national report.

Data sources

Data are obtained at package level from the MAHs. They are requested, processed and analysed by the Federal Food Safety and Veterinary Office.

Data coverage

Coverage is assumed to be nearly 100% for the sales of authorised antimicrobial agents. Since no prescription figures are available at national level yet, sales figures cannot be validated further. Veterinarians may import VMPs for companion and food-producing animals, including products containing antimicrobial agents, based on a single authorisation valid for one year and delivered by Swissmedic, the Swiss Agency for Therapeutic Products. As these products are not sold by MAHs or wholesalers in Switzerland, and since these single authorisations are not given for defined quantities, these products cannot be monitored and are therefore not included in the statistics.

United Kingdom

Distribution of veterinary medicines

In the United Kingdom, antimicrobial VMPs may only be supplied on prescription. The products can be dispensed either by the veterinarian or by a veterinary pharmacist, and wholesale dealers must be authorised by the United Kingdom Veterinary Medicines Directorate. Medicated feeds must be prescribed by veterinarians and manufactured either by authorised feed mills or by authorised farms. Medicated feeds are used primarily for pig and poultry production.

Legal basis for the monitoring of sales

MAHs are legally required to supply data relating to the volume of sales of authorised VMPs at the request of the Veterinary Medicines Directorate.

Data sources

The United Kingdom Veterinary Medicines Directorate collects data from those veterinary pharmaceutical MAHs that hold current United Kingdom marketing authorisations.

Annex 8. References to national reports

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Annex 9. Country and affiliation of the ESVAC national contact points/alternates

Table A29. List of ESVAC national contact points/alternates 2020

Country	Name and affiliation
Austria	**Reinhard Fuchs** Austrian Agency for Health and Food Safety Betriebsstätte Graz Zinzendorfgasse 27/1 8010 Graz AUSTRIA **Klemens Fuchs (Alternate)** Austrian Agency for Health and Food Safety Betriebsstätte Graz Zinzendorfgasse 27/1 8010 Graz AUSTRIA Email: ab-mengenstrom@ages.at
Belgium	**Antita Adriaens** Federaal Agentschap voor Geneesmiddelen en Gezondheidsproducten — Agence Fédérale des Médicaments et des Produits de Santé Bâtiment Eurostation, bloc 2 Place Victor Horta, 40/40 B-1060 Brussel — Bruxelles BELGIUM **Dries Minne (Alternate)** Federaal Agentschap voor Geneesmiddelen en Gezondheidsproducten — Agence Fédérale des Médicaments et des Produits de Santé Eurostation gebouw, blok 2 Victor Hortaplein 40/40 B-1060 Brussel — Bruxelles BELGIUM Email : infovet@fagg-afmps.be
Bulgaria	**Milena Atanasova** Bulgarian Food Safety Agency Българска агенция по безопасност на храните Directorate for control of veterinary medicinal products Shose Bankya 7 1331 Sofia BULGARIA Email: cvmp@cvmp.bg
Croatia	**Iva Gruden Zdunić** Ministarstvo Poljoprivrede Uprava za veterinarstvo i sigurnost hrane Planinska 2a 10000 Zagreb CROATIA Email: uprava.veterinarstva@mps.hr
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Annex 10. ESVAC sales advisory expert group members and observers

Table A30. List of ESVAC sales advisory expert group members

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