4

ANTIMICROBIAL CONSUMPTION IN ANIMALS

4. Antimicrobial consumption in animals

Highlights

In 2024, the total consumption of antimicrobials in animals amounted to 87.46 tonnes of active compounds. Of this total, antimicrobial consumption in pigs accounted for 83.92%, followed by cattle at 9.46%, and poultry at 1.30%.

The Defined Animal Daily Dose (DADD) was revised for pigs and cattle in 2024, with notable changes to neomycin and procaine benzylpenicillin. These revisions significantly impacted the overall treatment proportion (DAPD) calculations, particularly for the antimicrobial classes aminoglycosides and beta-lactamase-sensitive penicillins.

In 2024, antimicrobial use in **pigs** reached 73.40 tonnes of active compounds, a 0.75% increase from 2023, while overall pig biomass rose by 0.48% due to higher exports. Overall DADD declined by 0.19%, though it rose in sows and piglets, and fell in weaners and finishers. In 2024, daily antimicrobial treatment affected 1.94% of sows and piglets, and finishers, with weaners receiving treatment most frequently (11.64%). Compared to 2023, overall DAPD increased for other penicillins (11.28%), sulfonamides with trimethoprim (6.46%), and beta-lactamase-sensitive penicillins (2.88%), while lincosamides and amphenicols declined by 32.73% and 20.80%, respectively. In sows and piglets, pleuromutilins and aminoglycosides rose by 24.14% and 8.98%, respectively while lincosamides dropped sharply by 73.51%. In weaners, sulfonamides with trimethoprim and other penicillins increased by 27.13% and 16.95%, respectively while amphenicols and tetracyclines fell by 37.32% and 5.76%, respectively. Among finishers, beta-lactamase-sensitive penicillins, tetracyclines and macrolides rose by 6.80%, 6.33% and 2.22%, respectively. Meanwhile, pleuromutilins declined by 6.57%.

In 2024, antimicrobial use in **cattle** increased to 8.28 tonnes of active compounds, representing a 4.08% rise compared to 2023, while overall cattle biomass declined by 1.8%. In 2024, daily systemic antimicrobial treatment affected 0.27% of adult cattle and 0.81% of young cattle. In adult cattle, the DAPD of other penicillins increased by 26.26%, macrolides by 22.54%, and aminoglycosides by 4.38%, while amphenicols dropped by 12.08%. Among young cattle, the use of amphenicols rose by 17.54%, macrolides by 13.30%, other penicillins by 12.59%, and sulfonamides with trimethoprim by 8.49%, while aminoglycosides declined by 4.78%. Intramammary treatments rose slightly in 2024 compared to 2023. Other penicillins were the most used for dry-cow treatment (50.00%), while beta-lactamase-sensitive penicillins dominated therapeutic intramammary treatments, accounting for 95.24% of use.

In 2024, antimicrobial consumption in **poultry** totaled 1,140.9 kg of active compounds, representing a 12.63% decrease compared to 2023.

In 2024, cephalosporins were primarily prescribed for **pets and horses** (46.0 kg) and used as intramammary treatments in cattle (35.0 kg). Fluoroquinolones (13.0 kg) were almost exclusively prescribed for horses and pets.

4.1 Introduction

The DANMAP programme has monitored national antimicrobial consumption in both humans and animals since 1995. From the early 1990s, growing political and public concern over antimicrobial use in Danish animal production led to significant changes, including the discontinuation of antimicrobials for growth promotion and the implementation of several initiatives, such as voluntary bans on the use of 3rd and 4th generation cephalosporins in pig and cattle production. Additionally, regulatory measures were introduced to govern their therapeutic use.

Figure 4.1 presents the total antimicrobial consumption in animals and humans beginning in 1990 and 1997, respectively. The increase and intensification of pig production during this period also played a significant role in shaping overall consumption trends.

The observed decline in antimicrobial consumption after 1994 was primarily attributed to the discontinuation of antimicrobials for growth promotion. Additional contributing factors likely included: 1) restrictions on veterinary practitioners' profit from sales of medicines, 2) implementation of Veterinary Advisory Service Contracts (VASCs), which introduced regular veterinary visits aimed at promoting preventive strategies and optimizing antimicrobial consumption, and 3) enforcement of the "cascade rule" [Order (DK) 142/1993], limiting the prescription of (cheaper) extemporaneously produced medicines.

Other important interventions included legislative restrictions on the use of fluoroquinolones in production animals implemented in 2002 and 2003. This was followed by a voluntary ban on the use of cephalosporins in pig production in 2010, extended to dairy cattle production in 2014.

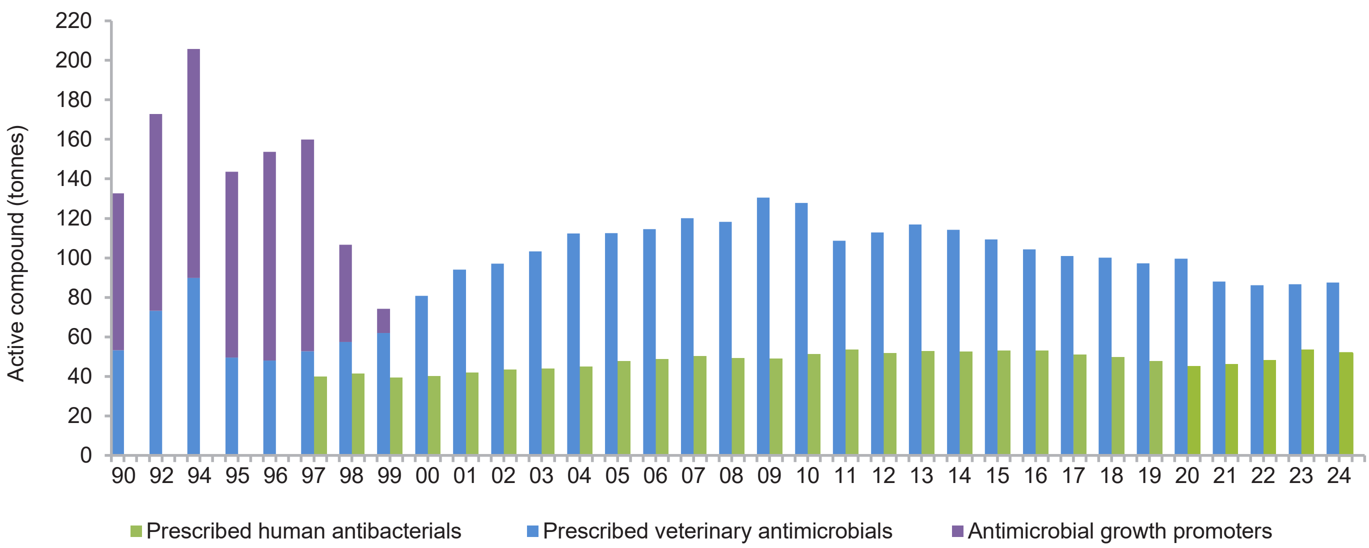
The national action plan against antimicrobial resistance has evolved over time, setting various goals to curb antimicrobial use. Initially, the plan aimed for a 10% reduction in antimicrobial consumption in production animals by 2014, using 2009 levels as the baseline. In 2015, a new objective was introduced under the national strategy to combat livestock-associated MRSA, targeting a 15% reduction in antimicrobial use in pig production between 2015 and 2018.

To support the goals outlined in the national action plan, the Yellow Card initiative was introduced in 2010, establishing herd-level surveillance of antimicrobial consumption in pig production. Under this initiative, antimicrobial use is monitored in individual herds against legally defined thresholds, enabling authorities to act against farmers with excessive usage per pig [DANMAP 2010].

The implementation of the Yellow Card system led to a noticeable reduction in antimicrobial consumption at the national level, particularly during its initial rollout from 2010 to 2011 and again following its revision between 2016 and 2018. In 2016, the initiative was updated to include multiplication factors that adjusted the weighting of specific antimicrobials in the monitoring system. Tetracyclines were initially assigned a factor of 1.2, which was increased to 1.5 in 2017. Fluoroquinolones, cephalosporins, and colistin were assigned the highest multiplication factor of 10 [DANMAP 2017], reflecting their critical importance and the need to discourage their use.

Figure 4.1 Antimicrobial consumption for humans and all animal species, tonnes of active compound, Denmark, 1990-2024

DANMAP 2024



Sources: Antimicrobials for humans: The Danish Medicines Agency. Antimicrobials for animals: Data are based on reports from the pharmaceutical industry of total annual sales (until 2001), from the Federation of Danish pig producers and slaughterhouses (1994-1995), from the Danish Medicines Agency and Danish Plant Directorate (1996-2000), and since 2001 from the VetStat. For DANMAP 2024, consumption data were extracted from the VetStat on 20 May 2025 and include all antimicrobials approved for use in animals

Other legislative measures have also likely influenced antimicrobial prescribing practices. For instance, in 2014, regulations governing group medication in pig herds were tightened [Order (DK) 534 of 27/05/2014]. These changes required more rigorous diagnostic procedures, including thorough laboratory testing, as well as more frequent veterinary visits. The aim was to ensure that antimicrobials administered orally to groups of pigs via water or feed were prescribed only when clearly justified, thereby encouraging more targeted treatments such as individual injections.

In 2017, the Ministry of Environment and Food and the Ministry of Health presented a new One Health strategy to combat antimicrobial resistance. This strategy established a comprehensive framework aimed at reducing the development and spread of AMR across both human and animal populations. In 2017, Denmark launched its first national action plan targeting antimicrobial resistance in animals, setting specific goals to further reduce antimicrobial use in animal production over the following years. This was followed by a second action plan in 2021. Most recently, in June 2024, a new national action plan against AMR in animals and food was adopted.

To help reduce the need for disposing of excess antimicrobials, a regulation introduced in 2019 [Order (DK) 1655/2018] permitted veterinarians and pharmacies to split packages of veterinary medicines. This initiative not only minimizes waste but may also improve surveillance by narrowing the gap between the quantities of antimicrobials prescribed and those actually consumed.

Official treatment guidelines for pigs and cattle have been available since 1996. Over time, the Danish Veterinary and Food Administration (DVFA) has updated the guidelines in collaboration with stakeholders and university experts [DANMAP 2010, www.foedevarestyrelsen.dk/].

In 2012, the Danish Veterinary Association (DVA) published treatment guidelines to promote the prudent use of antimicrobials in dogs and cats. These guidelines were developed by clinical specialists and experts from the Faculty of Health and Medical Sciences at the University of Copenhagen and the National Food Institute at the Technical University of Denmark. A revised edition of the guidelines for dogs and cats was published in 2018. Similarly, in 2017, the DVA released treatment guidelines for responsible use of antimicrobials in horses.

By 2020, the Danish dairy and beef producers' board had set a strategic goal to reduce antimicrobial use for mastitis and other cattle diseases by 20% compared to 2012 levels. Another objective was to lower the geometric mean bulk tank somatic cell count to 150,000 cells/ml. The strategy also promotes the use of simple penicillins (beta-lactamase-sensitive) for dry-cow therapy and mastitis treatment.

For the period 2021–2023, the board renewed its strategy for disease prevention in calves and cows, including updated udder health targets. The goals included a 10% annual reduction in antimicrobial use for cattle under 1 year old and a 3% annual reduction for cattle over 1 year old. Additionally, the strategy aimed to reduce the proportion of milk producers with somatic cell counts >200,000 cells/mL from 60% to 30%.

Since 28 January 2022, Order 2019/6 on veterinary medicinal products has been in effect in Denmark, aligning with EU Regulation 2019/6. This regulation places particular emphasis on reducing the risk of antimicrobial resistance [Order (DK) 6/2019]. It includes several key provisions regarding the prescription and use of veterinary medical products. These include limiting prescriptions to the exact quantity required for treatment, restricting the use of antimicrobials for metaphylactic or prophylactic purposes, and ensuring that all VMPs are used in accordance with their marketing authorizations (SPC). Furthermore, the regulation prohibits the routine use of antimicrobials to compensate for poor hygiene or management practices and designates certain critically important antimicrobials listed in Order 2022/1255 as being used exclusively for the treatment of specific infections in humans [DANMAP 2022, Textbox 4.1]

In line with recommendations from the European Medicines Agency (EMA) and a subsequent decision by the European Commission in 2017, Denmark along with all EU Member States was required to phase out the use of veterinary medicinal products (VMPs) containing zinc oxide in food-producing animals by June 2022. As a result, the use of prescribed zinc oxide in pig production has been banned in Denmark since that date [DANMAP 2022, Textbox 4.2].

Data sources

In Denmark, antimicrobials are available by prescription only, and data on antimicrobial consumption have been systematically collected since 1990.

Since 2001, data on all medicines prescribed for animal use have been systematically recorded in the national database VetStat. Since 2010, VetStat has been hosted and maintained by DVFA. In June 2021, DVFA launched an updated version of the VetStat platform.

The 2024 data presented in this report were extracted from this new VetStat on 20 May 2025. Data extraction, analysis, and interpretation were carried out by the National Food Institute at the Technical University of Denmark on behalf of DANMAP.

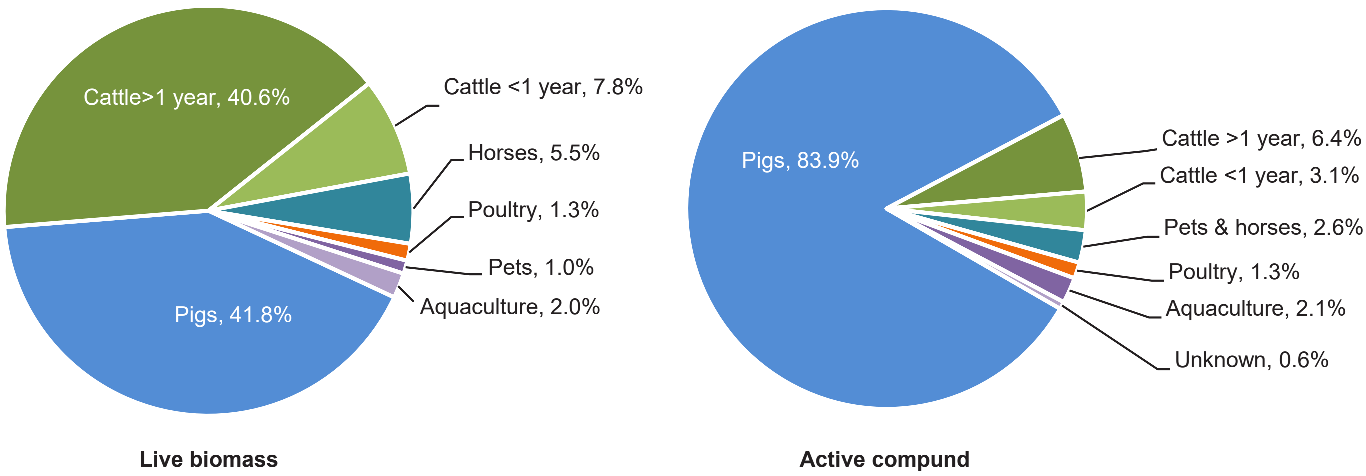
4.2 Total antimicrobial consumption in animals

In 2024, the total consumption of antimicrobials in all animals amounted to 87.46 tonnes of active compound, representing a 0.89% (775.60 kg) increase compared to 2023 (Figure 4.1). Of this total, antimicrobial consumption in pigs accounted for 83.92%, followed by cattle at 9.46%, and poultry at 1.30% (Figure 4.2, Table 4.1). By comparison, total antimicrobial consumption in human health care amounted to 51.57 tonnes.

Pig production is the primary driver of antimicrobial consumption in animals in Denmark. While cattle represent the largest share of live biomass, most of this biomass consists of dairy cows, which have significantly lower antimicrobial usage compared to growing animals such as those in slaughter pig production.

Between 2000 (the start of VetStat) and 2009, the total amount of antimicrobial active compounds used in animals increased by 61.7% (Figure 4.1). During this period, both the number of finishers produced, and the proportion of live pigs exported at approximately 30 kg rose. From 2009 to 2021, antimicrobial consumption declined, while the proportion of exported pigs increased. Between 2022 and 2024, there was a modest 1.5% increase in overall antimicrobial usage. Notably, the number of finishers produced fell by 20.00% compared to 2022, while the export of live pigs increased by 18.63%.

Figure 4.2 Distribution of live biomass and antimicrobial consumption in main animal species, tonnes, Denmark, 2024 DANMAP 2024



The live biomass is estimated from census data (pigs, cattle and pet animals) and production data (poultry, fur animals, aquaculture). The live biomass estimates for poultry (turkeys and broilers), aquaculture, horses and pet animals are based on 2012 data and may well be underestimated. The estimation procedures are described in Chapter 10, Section 10.2

Table 4.1 Antimicrobial consumption by animal species and age group, kg active compound, Denmark, 2023-2024 DANMAP 2024

	Aminoglycosides	Amphenicols	Cephalosporins (a)	Fluoroquinolones	Lincosamides	Macrolides	Other antimicrobials (b)	Other quinolones	Penicillins, b-lactamase sensitive	Penicillins, others	Pleuromutilins	Sulfonamides and trimethoprim	Tetracyclines	2023	2024
Pigs	19174.1	472.6	-	-	1219.4	11022.3	-	-	11488.5	8148.3	6225.6	5208.8	10435.6	72851.6	73395.3
Sows, piglets, gilts and boars	2212.9	247.1	-	-	1,28.7	366.1	-	-	6067.9	2123.6	743.8	3729.1	1044.3	16470.9	16663.5
Weaners, =<30kg	16829.4	203.1	-	-	1,033.9	7481.5	-	-	1681.4	5338.6	2245.0	1429.7	6754.7	42067.1	42997.3
Finishers and polts	131.9	22.3	-	-	56.8	3174.8	-	-	3739.1	686.0	3236.9	50.0	2636.7	14313.6	13734.5
Cattle	774.8	1072.0	35.2	-	5.1	230.4	5.0	-	4352.1	655.8	0.0	391.5	754.7	7952.4	8276.6
Intramammaries	23.6	-	35.0	-	4.5	-	-	-	229.7	176.7	-	-	-	457.3	469.6
Cows, bulls, heifers and steers >24 months	188.1	7.8	0.1	-	0.5	79.0	0.1	-	3542.9	348.9	0.0	285.5	481.8	4761.2	4934.8
Calves <12 months	546.1	1,051.8	0.0	-	0.1	146.8	4.9	-	474.4	119.7	-	104.5	258.3	2596.2	2706.6
Young cattle btw 12 and 24 months	17.0	12.4	0.0	-	0.0	4.6	0.0	-	105.0	10.5	-	1.5	14.6	137.7	165.7
Poultry	51.1	-	-	-	21.6	232.9	-	-	155.7	302.8	14.4	72.6	289.8	1305.8	1140.9
Broilers	32.1	-	-	-	16.0	76.5	-	-	44.2	154.4	-	71.4	154.2	697.2	548.7
Layer hens	-	-	-	-	-	148.5	-	-	45.8	14.2	14.4	-	24.4	191.3	247.2
Turkeys	12.7	-	-	-	5.3	.	-	-	65.3	123.5	-	-	79.0	378.9	285.8
Other poultry	6.4	-	-	-	0.3	8.0	-	-	0.3	10.7	-	1.2	32.2	38.4	59.2
Other production animals	10.2	134.9	-	-	0.7	0.2	0.0	316.8	0.6	9.6	-	1356.3	2.8	1588.2	1832.0
Aquaculture	8.4	134.8	-	-	-	-	-	316.8	-	.	-	1352.1	-	1580.6	1812.1
Fur animals	1.3	-	-	-	0.7	-	-	-	-	9.0	-	4.2	2.5	3.1	17.7
Other	0.5	0.0	-	-	-	0.2	0.0	-	0.6	0.5	-	0.0	0.3	4.5	2.2
Companion animals	2.9	0.5	46.0	13.0	75.5	0.4	51.2	-	15.5	476.3	0.1	1576.9	38.1	2353.6	2296.3
Horses	0.6	-	0.0	0.0	0.0	0.0	0.1	-	7.1	0.2	-	167.3	6.9	181.8	182.2
Pets	1.4	0.1	16.7	4.2	16.9	0.4	18.1	-	8.4	89.2	0.1	206.6	18.3	383.0	380.4
Unspecified	0.9	0.4	29.3	8.8	58.6	-	32.9	-	-	386.9	-	1203.0	12.9	1788.8	1733.7
Unknown (c)	71.6	11.5	0.4	0.1	-1.2	7.0	0.4	-3.0	282.7	69.4	2.8	15.3	65.6	636.4	522.6
Total	20084.8	1691.4	81.6	13.0	1321.1	11,493.2	56.6	313.8	16295.1	9662.1	6243.0	8621.4	11586.5	86688.0	87463.6

Data for 2024 were extracted from VetStat on 20 May 2025
Combination products are split into active compounds
A dash (-) indicates no antimicrobial usage
a) In 2024, 3rd generation cephalosporins were used in companion animals (0.76 kg), and cattle (0.14 kg)
b) Including other antiinfectives, dermatologicals, ontological, opthalmologicals, polymyxin, quinolones, and sulfonamides, plain
c) Including data with no information on animal species/age group, or mismatch between animal species and age group

4.3 Antimicrobial consumption by animal species

4.3.1 Antimicrobial consumption in pigs

In 2024, a total of 73.40 tonnes of antimicrobials were used in pig production, marking an increase of 0.75% (543.66 kg) compared to 2023 (Table 4.1). During the same period, the estimated live biomass of pigs increased by 0.48%, primarily due to an increase in the number of exported pigs.

Of this amount, approximately 16.66, 43.00 and 13.73 tonnes were used for sow and piglets, weaners, and finishers, respectively (Table 4.1).

With the launch of the new VetStat platform, minor adjustments were made to the recorded strength of active compounds of certain products. These updates influenced the Defined Animal Daily Dose (DADD), and subsequently the DAPD, prompting a revision of veterinary antimicrobial products for pigs and cattle covering the period from 2010 to 2024, as reflected in this year's DANMAP report. The revision was guided by the Summary of Product Characteristics (SPCs), which serve as the gold standard for veterinary medicinal products. In cases where SPCs were unavailable searching the internet, the previously established DADD values were retained.

The **treatment proportion** (DAPD) of the total population serves as an indicator of antimicrobial selection pressure within the population. Figures 4.3, 4.4, and 4.5 illustrate DAPD values for the overall population of pigs, as well as for specific age groups of pigs and cattle.

This year, all figures showing the measured DAPD are presented with the revised DADD values.

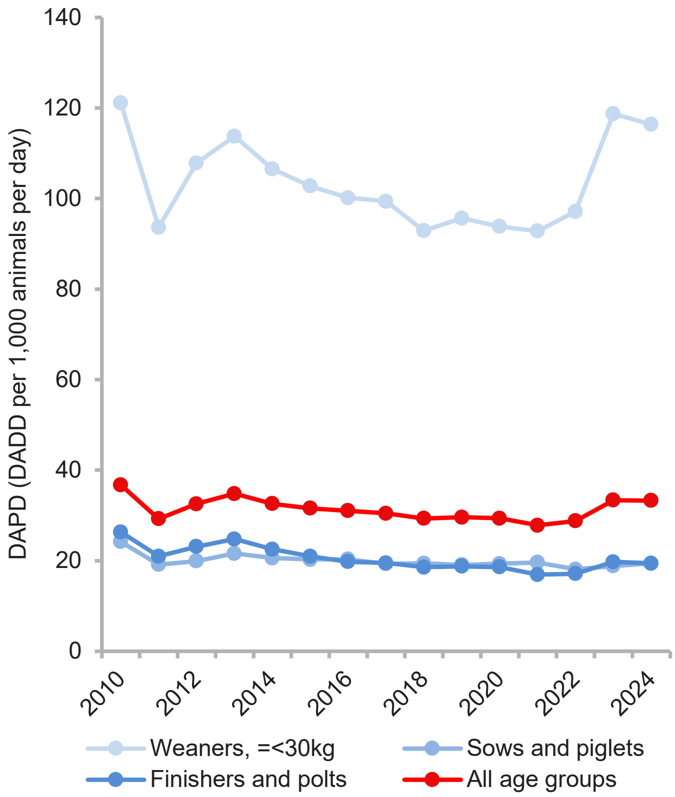
From 2004 to 2009, the DAPD showed a steady increase across all age groups. This was followed by a marked decline in 2010 and 2011, coinciding with the introduction of the Yellow Card initiative. Between 2013 and 2021, a slight but consistent downward trend in treatment proportion was observed (Figure 4.3).

In contrast to the decreasing trend in DAPD observed from 2013 to 2021, a substantial increase of approximately 20% was observed from 2021 to 2023. This was particularly due to increased usage in weaners.

In 2024, the overall DAPD decreased by 0.19 percent. However, trends varied across age groups: DAPD increased by 2.98 percent in sows and piglets, while it declined by 2.00 percent in weaners and by 1.53 percent in finishers (Figures 4.3).

In 2024, it is estimated that on any given day, approximately 1.94% of sows, piglets, and finishers, and 11.63% of weaners were treated with antimicrobials.

Figure 4.3 Total antimicrobial consumption in the pig production, DAPD, Denmark, 2010-2024 DANMAP 2024



The category "Sows and piglets" also includes boars, which make up approximately 4-5% of the estimated live biomass for this age group
Data for 2024 were extracted from VetStat on 20 May 2025

Compared to 2023, antimicrobial consumption in 2024 in the overall population, increased for other penicillins (11.28%), sulfonamides with trimethoprim (6.46%), and beta-lactamase-sensitive penicillins (2.88%). In contrast, usage declined for lincosamides (32.73%), amphenicols (20.80%), and pleuromutilins 4.64%). For aminoglycosides, macrolides, sulfonamides with trimethoprim, and tetracyclines, the year-on-year variation was less than 1% (Figure 4.4).

Among sows and piglets, the change from 2023 to 2024 in DAPD values showed increased usage of pleuromutilins (24.14%), aminoglycosides (8.98%), beta-lactamase-sensitive penicillins (5.39%), sulfonamides with trimethoprim (4.47%), and tetracyclines (1.98%). In contrast, lincosamide usage declined markedly by 73.51%, and amphenicol use decreased by 6.77% (Figure 4.4).

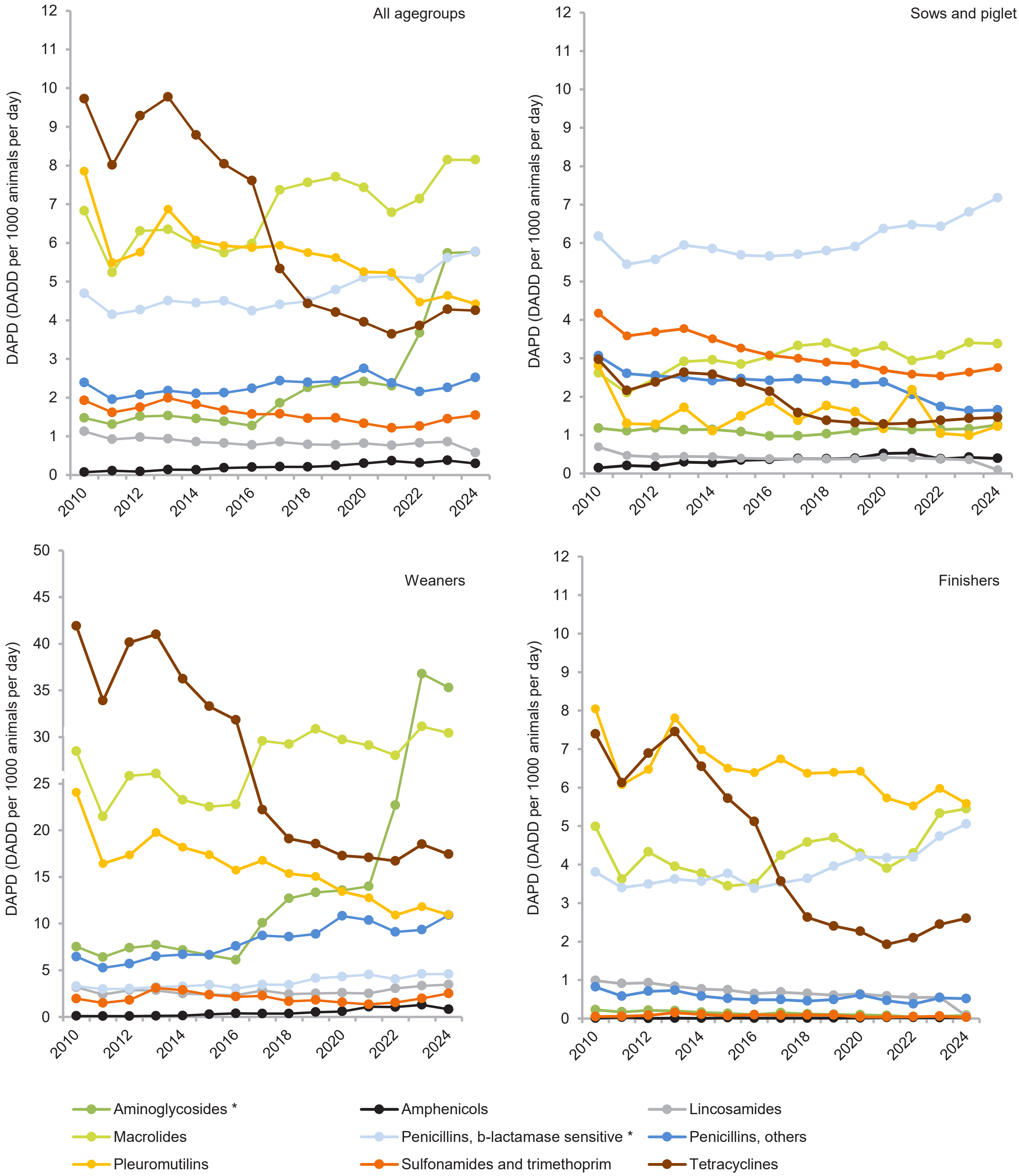
Following the ban on prescribed zinc oxide in pig production (effective June 2022), the discontinuation of colistin, and the enforcement of Regulation (EU) 2019/6 on veterinary medicinal products (effective 28 January 2022), the use of aminoglycosides, primarily neomycin and apramycin, in weaners increased significantly. The DAPD values of aminoglycosides rose from 13.99 in 2021 to 36.78 in 2023. In 2024, usage declined slightly to 35.29 DAPD, representing a 4.05% decrease compared to the previous year (Figure 4.4). Additional changes in weaners from 2023 to 2024 included a 27.13% increase in the DAPD of sulfonamides with trimethoprim and a 16.95% increase in other penicillins. In contrast, reductions were observed in the DAPD of amphenicols (37.32%), pleuromutilins (7.46%), tetracyclines (5.76%), and macrolides (2.22%) (Figure 4.4).

In finishers, the change from 2023 to 2024 showed that the DAPD for beta-lactamase-sensitive penicillins, tetracyclines and macrolides increased by 6.80%, 6.33% and 2.22%, respectively. Meanwhile, pleuromutilins declined by 6.57% (Figure 4.4).

In 2024, the three most commonly used active compounds in sows and piglets were procaine benzylpenicillin, tulathromycin, and sulfadoxine. Among weaners, the most frequently used compounds were tylosin, apramycin, and neomycin. For finishers, tiamulin, procaine benzylpenicillin, and tylosin were the predominant choices (Table 4.2).

Figure 4.4 Antimicrobial consumption in the total pig production and in each age group at antimicrobial class level, DAPD, Denmark, 2010-2024

DANMAP 2024



* Please note that the reported level differs noticeably from previous DANMAP reports due to DADD revisions
The category “Sows and piglets” also includes boars, which make up approximately 4-5% of the estimated live biomass for this age group
DAPDs are calculated as the number of standard doses for one kg animal divided by the estimated live biomass in the age group or the total population (in tonnes)
Data for 2024 were extracted from VetStat on 20 May 2025
Combination products are split into active compounds

Table 4.2 Antimicrobial consumption in each age group of pig production at antimicrobial class and active compound level, DAPD, using new DADD, Denmark, 2015-2024 **DANMAP 2024**

Antimicrobial class	Active compound	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Sows, piglets, gilts and boars											
Aminoglycosides	Apramycin	0.12	0.13	0.08	0.08	0.15	0.15	0.16	0.14	0.15	0.15
	Dihydrostreptomycin	0.75	0.60	0.51	0.51	0.53	0.59	0.59	0.64	0.67	0.71
	Gentamicin	0.00	0.02	0.03	0.04	0.03	0.03	0.01	0.01	0.03	0.00
	Neomycin	-	-	0.10	0.17	0.15	0.13	0.11	0.10	0.08	0.11
	Paromomycin	0.01	0.01	0.01	0.02	0.03	0.05	0.09	0.10	0.09	0.16
	Spectinomycin	0.20	0.21	0.24	0.23	0.22	0.23	0.18	0.16	0.14	0.14
Amphenicols	Florfenicol	0.34	0.36	0.39	0.38	0.40	0.52	0.54	0.38	0.42	0.39
Cephalosporins	Cefquinom	0.00	-	0.00	0.00	-	-	-	-	-	-
	Ceftiofur	0.00	0.00	0.00	0.00	-	-	-	-	-	-
Lincosamides	Lincomycin	0.40	0.38	0.38	0.37	0.38	0.42	0.40	0.38	0.35	0.09
Macrolides	Gamithromycin	-	0.51	1.19	1.32	1.35	1.40	1.01	0.86	0.73	0.51
	Spiramycin	0.03	0.00	-	-	-	-	-	-	-	-
	Tildipirosin	0.35	0.28	0.19	0.19	0.15	0.13	0.10	0.07	0.08	0.06
	Tilmicosin	0.14	0.14	0.14	0.16	0.09	0.08	0.06	0.04	0.03	0.02
	Tulathromycin	2.09	1.88	1.61	1.50	1.32	1.38	1.38	1.71	2.20	2.47
	Tylosin	0.23	0.23	0.20	0.17	0.19	0.31	0.39	0.39	0.37	0.32
	Tylvalosin	0.01	0.00	0.01	0.06	0.05	0.02	0.00	0.00	0.00	0.00
Other antimicrobials	Colistin	0.32	0.36	0.12	0.00	0.00	0.00	-	-	-	-
Penicillins, b-lactamase sensitive	Benzylpenicillin	0.16	0.04	0.00	-	-	-	-	-	-	-
	Penethamathydroiodid	-	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Procaine benzylpenicillin	5.53	5.62	5.70	5.80	5.90	6.37	6.47	6.43	6.81	7.18
Penicillins, others	Amoxicillin	2.37	2.33	2.40	2.32	2.25	2.27	1.97	1.64	1.58	1.61
	Amoxicillin (beta-lactamase inhibitor)	0.09	0.09	0.06	0.09	0.08	0.11	0.09	0.10	0.06	0.05
	Ampicillin	0.01	-	-	-	-	-	-	-	-	-
Pleuromutilins	Tiamulin	1.50	1.87	1.38	1.76	1.61	1.17	2.18	1.05	0.99	1.23
	Valnemulin	-	-	0.00	-	-	-	-	-	-	-
Sulfonamides and trimethoprim	Sulfadiazine	2.06	1.93	1.83	1.65	1.64	0.66	-	-	0.00	0.53
	Sulfadoxine	0.65	0.63	0.65	0.74	0.72	1.57	2.15	2.11	2.19	1.76
	Sulfamethoxazole	0.01	0.00	0.01	0.03	0.01	0.01	0.00	0.00	0.00	0.00
	Trimethoprim	0.54	0.51	0.50	0.48	0.47	0.45	0.43	0.42	0.44	0.46
Tetracyclines	Chlortetracycline	0.04	0.04	0.03	0.04	0.03	0.03	0.06	0.03	0.03	0.03
	Doxycycline	0.33	0.22	0.13	0.15	0.11	0.08	0.07	0.14	0.14	0.06
	Oxytetracycline	2.00	1.88	1.42	1.20	1.17	1.18	1.18	1.21	1.27	1.37
Weaners, =<30kg											
Aminoglycosides	Apramycin	0.82	0.69	0.66	0.61	0.89	1.27	1.63	3.64	13.85	13.45
	Dihydrostreptomycin	1.35	1.07	1.07	1.04	1.25	1.41	1.42	1.28	1.51	1.48
	Gentamicin	-	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
	Neomycin	-	-	2.69	6.19	6.18	5.79	5.88	11.63	14.66	13.21
	Paromomycin	0.12	0.07	0.04	0.06	0.08	0.08	0.12	0.15	0.18	0.20
	Spectinomycin	4.34	4.29	5.61	4.80	4.94	5.02	4.93	6.00	6.58	6.95
Amphenicols	Florfenicol	0.27	0.37	0.35	0.35	0.51	0.58	1.08	1.05	1.29	0.81
Cephalosporins	Cefquinom	0.00	0.00	0.00	-	-	-	-	-	-	-
	Ceftiofur	0.01	0.00	-	0.00	0.00	0.00	-	-	-	-
Lincosamides	Lincomycin	2.40	2.33	2.84	2.45	2.52	2.57	2.52	3.05	3.33	3.47
Macrolides	Gamithromycin	-	0.41	0.98	0.91	1.30	1.69	1.21	0.90	0.68	0.65
	Spiramycin	0.00	-	-	-	-	-	-	-	-	-
	Tildipirosin	0.47	0.35	0.26	0.22	0.23	0.24	0.20	0.14	0.13	0.11
	Tilmicosin	5.46	4.97	5.29	5.06	5.88	6.41	6.48	5.32	5.54	5.05
	Tulathromycin	1.23	1.04	1.08	0.89	0.89	1.00	1.14	1.33	2.07	2.60
	Tylosin	14.60	14.75	18.90	17.81	18.05	16.40	16.50	16.00	17.19	16.72
	Tylvalosin	0.78	1.25	3.07	4.34	4.49	3.97	3.56	4.33	5.51	5.30

The category “Sows and piglets” also includes boars, which make up approximately 4-5% of the estimated live biomass for this age group
DAPDs are calculated as the number of standard doses for one kg animal divided by the estimated live biomass in the age group or the total population (in tonnes)
Data for 2024 were extracted from VetStat on 20 May 2025
Combination products are split into active compounds
A dash (-) indicates no antimicrobial usage

continued ... Table 4.2 Antimicrobial consumption in each age group of pig production at antimicrobial class and active compound level, DAPD, using new DADD, Denmark, 2015-2024 DANMAP 2024

Antimicrobial class	Active compound	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
continued ... Weaners, =<30kg											
Other antimicrobials	Colistin	7.78	8.21	3.14	0.01	-	-	-	-	-	-
Penicillins, b-lactamase sensitive	Benzylpenicillin	0.30	0.07	0.00	-	-	-	-	-	-	-
	Penethamathydroiodid	-	0.00		0.00	-	-	-	-	-	-
	Procaine benzylpenicillin	3.14	2.96	3.46	3.45	4.13	4.31	4.54	4.04	4.59	4.59
Penicillins, others	Amoxicillin	5.48	6.81	8.25	8.37	8.65	10.28	9.70	8.15	8.50	9.93
	Amoxicillin (beta-lactamase inhibitor)	1.16	0.77	0.47	0.21	0.24	0.54	0.67	0.95	0.84	0.98
	Ampicillin	0.01	0.00	-	-	-	-	-	-	-	-
Pleuromutilins	Tiamulin	17.38	15.65	16.12	14.99	14.86	13.29	12.76	10.91	11.80	10.92
	Valnemulin	-	0.09	0.65	0.37	0.20	0.15	0.01	-	-	
Sulfonamides and trimethoprim	Sulfadiazine	1.23	0.88	0.99	0.57	0.63	0.24	0.01	-	-	0.65
	Sulfadoxine	0.21	0.23	0.24	0.28	0.36	0.61	0.87	1.10	1.48	1.30
	Sulfamethoxazole	0.53	0.69	0.65	0.54	0.51	0.45	0.25	0.19	0.17	0.15
	Trimethoprim	0.39	0.36	0.38	0.28	0.30	0.26	0.22	0.26	0.33	0.42
Tetracyclines	Chlortetracycline	5.71	5.28	4.07	3.47	3.29	2.66	2.06	1.16	0.98	0.82
	Doxycycline	23.17	22.26	14.02	12.07	11.55	11.44	11.97	12.49	14.04	13.08
	Oxytetracycline	4.41	4.29	4.13	3.55	3.71	3.17	3.05	3.07	3.48	3.54
Finishers and polts											
Aminoglycosides	Apramycin	-	-	0.00	-	0.00	0.00	0.00	0.00	0.00	0.00
	Dihydrostreptomycin	0.04	0.02	0.03	0.02	0.03	0.03	0.03	0.02	0.02	0.02
	Gentamicin	-	-	-	-	-	0.00	-	-	-	0.00
	Neomycin	-	-	0.00	0.01	0.02	0.03	0.03	0.01	0.02	0.03
	Paromomycin	0.00	-	0.00	-	0.00	0.00	-	-	0.00	-
	Spectinomycin	0.10	0.08	0.12	0.08	0.06	0.04	0.03	0.02	0.02	0.03
Amphenicols	Florfenicol	0.02	0.01	0.01	0.01	0.01	0.02	0.03	0.02	0.02	0.03
Cephalosporins	Ceftiofur	0.00	0.00	0.00	0.00	0.00	0.00	-	-	-	-
Lincosamides	Lincomycin	0.74	0.65	0.69	0.65	0.60	0.64	0.59	0.55	0.55	0.07
Macrolides	Gamithromycin	-	0.01	0.02	0.02	0.03	0.03	0.02	0.01	0.01	0.02
	Spiramycin	0.00	-	-	-	-	-	-	-	-	-
	Tildipirosin	0.03	0.01	0.02	0.00	0.01	0.00	0.00	0.00	0.00	0.00
	Tilmicosin	0.08	0.05	0.06	0.06	0.07	0.07	0.05	0.05	0.01	0.01
	Tulathromycin	0.03	0.02	0.03	0.02	0.02	0.04	0.02	0.02	0.03	0.06
	Tylosin	3.18	3.05	3.39	3.56	3.48	3.17	2.99	3.03	3.36	3.37
	Tylvalosin	0.13	0.37	0.73	0.92	1.10	0.98	0.82	1.18	1.92	1.98
Other antimicrobials	Colistin	0.06	0.03	0.01	-	-	-	-	-	-	-
Penicillins, b-lactamase sensitive	Benzylpenicillin	0.01	0.00	-	-	-	-	-	-	-	-
	Penethamathydroiodid	-	-	-	0.00	-	-	-	-	-	-
	Procaine benzylpenicillin	3.76	3.38	3.52	3.64	3.96	4.20	4.18	4.19	4.73	5.05
Penicillins, others	Amoxicillin	0.51	0.48	0.49	0.45	0.49	0.61	0.46	0.37	0.53	0.51
	Amoxicillin (beta-lactamase inhibitor)	0.01	0.01	0.00	0.00	0.00	0.00	0.01	0.00	0.01	0.00
	Ampicillin	0.00	-	-	-	-	-	-	-	-	-
Pleuromutilins	Tiamulin	6.50	6.38	6.68	6.25	6.26	6.35	5.72	5.52	5.98	5.58
	Valnemulin	-	0.01	0.07	0.12	0.14	0.07	0.00	-	-	-
Sulfonamides and trimethoprim	Sulfadiazine	0.02	0.03	0.02	0.02	0.03	0.01	-	0.00	-	0.00
	Sulfadoxine	0.01	0.01	0.00	0.01	0.01	0.01	0.02	0.02	0.02	0.01
	Sulfamethoxazole	0.03	0.04	0.04	0.05	0.04	0.02	0.02	0.02	0.03	0.01
	Trimethoprim	0.01	0.02	0.01	0.02	0.01	0.01	0.01	0.01	0.01	0.01
Tetracyclines	Chlortetracycline	0.84	0.80	0.59	0.46	0.43	0.34	0.22	0.14	0.08	0.09
	Doxycycline	3.45	3.10	1.88	1.37	1.15	1.18	1.09	1.30	1.57	1.70
	Oxytetracycline	1.44	1.22	1.10	0.80	0.83	0.74	0.62	0.66	0.79	0.81

The category “Sows and piglets” also includes boars, which make up approximately 4-5% of the estimated live biomass for this age group
DAPDs are calculated as the number of standard doses for one kg animal divided by the estimated live biomass in the age group or the total population (in tonnes)
Data for 2024 were extracted from VetStat on 20 May 2025
Combination products are split into active compounds
A dash (-) indicates no antimicrobial usage

4.3.2 Antimicrobial consumption in cattle

In 2024, approximately 8.28 tonnes of active antimicrobial compounds were recorded for use in cattle, representing an increase of 4.08% compared to 2023 (Table 4.1). During the same period, the estimated live biomass of cattle decreased by 1.80%.

Of this amount, approximately 0.46 tonnes were used for intramammary therapeutic purposes or dry-cow treatment. Around 5.10 tonnes of antimicrobials were administered systemically to young cattle (under 12 months of age), with the remaining proportion used in adult cattle (over 12 months) (Table 4.1).

Except for 2024, systemic antimicrobial consumption in adult cattle declined over the past decade: it was 3.52 DAPD in 2015 and 2.58 DAPD in 2023. In 2024, the DAPD was 2.74 (Figure 4.5). During the same period, systemic antimicrobial consumption in young cattle increased significantly. In 2015, the treatment proportions were 5.93 DAPD. By 2024, this value had risen to 8.13 DAPD (Figure 4.5). Notably, during the same period, the biomass of young cattle declined by 9.14%.

In 2024, it is estimated that on any given day, approximately 0.27% of adult cattle, and 0.81% of young cattle were treated with systemic antimicrobials.

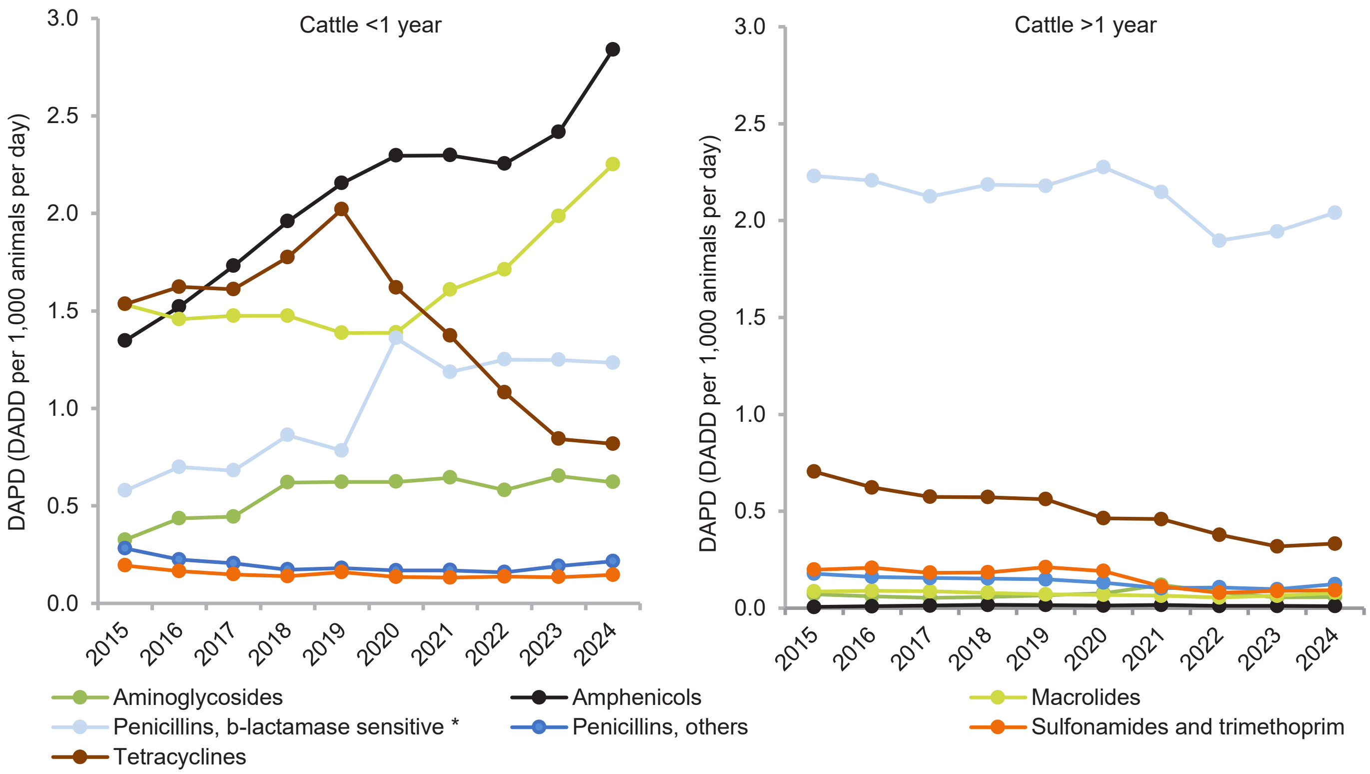
In young cattle, change from 2023 to 2024 in DAPD values showed increased usage of amphenicols (17.54%), macrolides (13.30%), other penicillins (12.59%), and sulfonamides with trimethoprim (8.49%), and decreased usage of aminoglycosides (4.78%). Subsequently, the increase observed in 2024 is primarily attributed to the use of amphenicols, which remains the most frequently used antimicrobial class in young cattle (Figure 4.5).

Among adult cattle, change from 2023 to 2024 in DAPD values showed increased usage of other penicillins (26.26%), macrolides (22.54%), beta-lactamase-sensitive penicillins (5.00%), aminoglycosides (4.38%), and tetracyclines (4.55%). In contrast, amphenicol use decreased by 12.08%. In 2024, treatments with beta-lactamase-sensitive penicillins accounted for 74.55% based on the new DADD (Figure 4.5).

In 2024, the most frequently used active compounds for systemic treatments in young cattle were florfenicol, tulathromycin, and procaine benzylpenicillin. Among adult cattle, the most frequently used compounds were procaine benzylpenicillin, and oxytetracycline (Table 4.3).

Figure 4.5 Antimicrobial consumption in cattle production by age groups at antimicrobial class level, DAPD, Denmark, 2015-2024

DANMAP 2024



* Please note that the reported level differs noticeably from previous DANMAP reports due to DADD revisions
DAPDs are calculated as the number of standard doses for one kg animal divided by the estimated live biomass in the age group or the total population (in tonnes)
Intramammary applications are not included (doses needed for calculating DAPD not available)
The DAPDs of amphenicols in cattle <1 year differ from previous reports, due to missing data in the old VetStat
Data for 2024 were extracted from VetStat on 20 May 2025
Combination products are split into active compound

Table 4.3 Antimicrobial consumption in each age group of cattle production at antimicrobial class and active compound level, DAPD, using new DADD, Denmark, 2015-2024 DANMAP 2024

Antimicrobial class	Active compound	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Cattle <1 year											
Aminoglycosides	Apramycin	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.04	0.01
	Dihydrostreptomycin	0.18	0.17	0.15	0.22	0.20	0.18	0.16	0.16	0.23	0.20
	Neomycin	0.00	-	0.01	0.00	0.00	0.01	0.00	0.00	-	0.00
	Paromomycin	0.12	0.25	0.28	0.38	0.41	0.42	0.47	0.41	0.39	0.41
	Spectinomycin	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Amphenicols	Florfenicol	1.35	1.52	1.73	1.96	2.15	2.30	2.30	2.25	2.42	2.84
Cephalosporins	Cefquinom	0.01	0.01	0.01	0.01	0.01	0.00	0.00	-	-	-
	Ceftiofur	0.01	0.01	0.01	0.01	0.00	0.00	-	-	-	0.00
Fluoroquinolones	Enrofloxacin	0.00	-	-	-	-	-	-	-	-	
Lincosamides	Lincomycin	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Macrolides	Gamithromycin	0.08	0.11	0.13	0.12	0.10	0.12	0.12	0.06	0.05	0.04
	Spiramycin	0.00	0.00	0.00	-	0.00	-	-	-	-	-
	Tildipirosin	0.46	0.41	0.43	0.46	0.43	0.39	0.34	0.20	0.07	0.04
	Tilmicosin	0.08	0.14	0.13	0.14	0.10	0.14	0.17	0.14	0.08	0.11
	Tulathromycin	0.81	0.73	0.73	0.69	0.69	0.69	0.94	1.27	1.69	1.99
	Tylosin	0.10	0.07	0.05	0.06	0.06	0.05	0.04	0.05	0.10	0.06
Other antimicrobials	Colistin	0.11	0.07	0.03	0.02	0.01	-	-	-	-	-
Penicillins, b-lactamase sensitive	Benzylpenicillin	0.06	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Penethamathydroiodid	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.01	0.00
	Procaine benzylpenicillin	0.51	0.68	0.68	0.86	0.78	1.35	1.18	1.25	1.24	1.23
Penicillins, others	Amoxicillin	0.25	0.21	0.20	0.17	0.18	0.17	0.17	0.16	0.19	0.22
	Amoxicillin (beta-lactamase inhibitor)	0.03	0.01	0.00	0.00	0.00	0.00	0.00	0.00	-	-
	Ampicillin	0.00	0.00	-	-	0.00	-	-	-	-	-
Sulfonamides and trimethoprim	Sulfadiazine	0.14	0.12	0.11	0.10	0.12	0.06	0.01	0.00	0.00	0.03
	Sulfadoxine	0.02	0.02	0.01	0.02	0.02	0.05	0.10	0.11	0.11	0.09
	Sulfamethoxazole	-	-	-	-	0.00	-	-	-	-	-
	Trimethoprim	0.03	0.03	0.02	0.02	0.03	0.02	0.02	0.02	0.02	0.02
Tetracyclines	Chlortetracycline	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Doxycycline	0.27	0.25	0.27	0.31	0.47	0.37	0.27	0.18	0.10	0.12
	Oxytetracycline	1.26	1.37	1.34	1.47	1.55	1.25	1.10	0.90	0.74	0.70
Cattle >1 year											
Aminoglycosides	Apramycin	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Dihydrostreptomycin	0.07	0.06	0.05	0.06	0.06	0.07	0.12	0.08	0.05	0.06
	Gentamicin	-	-	-	-	-	0.00	-	-	-	-
	Neomycin	0.00	-	-	-	0.00	0.00	0.00	0.00	-	-
	Paromomycin	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Spectinomycin	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Amphenicols	Florfenicol	0.01	0.01	0.01	0.02	0.02	0.01	0.02	0.01	0.01	0.01
Cephalosporins	Cefquinom	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-	-	-
	Ceftiofur	0.04	0.04	0.04	0.04	0.03	0.00	0.00	-	-	0.00
Fluoroquinolones	Enrofloxacin	0.00	-	-	-	-	-	-	-	-	-
Lincosamides	Lincomycin	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Macrolides	Gamithromycin	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Spiramycin	0.00	0.00	0.00	0.00	-	-	-	-	-	-
	Tildipirosin	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Tilmicosin	-	-	0.00	-	0.00	0.00	0.00	-	-	-
	Tulathromycin	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	Tylosin	0.08	0.08	0.07	0.07	0.06	0.06	0.05	0.05	0.06	0.06
Other antimicrobials	Colistin	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-
Penicillins, b-lactamase sensitive	Benzylpenicillin	0.03	0.01	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01
	Penethamathydroiodid	0.00	0.10	0.15	0.17	0.18	0.18	0.17	0.18	0.20	0.21
	Procaine benzylpenicillin	2.20	2.10	1.97	2.01	2.00	2.09	1.97	1.70	1.73	1.82

DAPDs are calculated as the number of standard doses for one kg animal divided by the estimated live biomass in the age group or the total population (in tonnes)
Data for 2024 were extracted from VetStat on 20 May 2025
Combination products are split into active compounds
A dash (-) indicates no antimicrobial usage

continued ... Table 4.3 Antimicrobial consumption in each age group of cattle production at antimicrobial class and active compound level, DAPD, using new DADD, Denmark, 2015-2024 DANMAP 2024

Antimicrobial class	Active compound	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
continued ... Cattle <1 year											
Penicillins, others	Amoxicillin	0.18	0.16	0.16	0.15	0.15	0.13	0.10	0.11	0.10	0.12
	Amoxicillin (beta-lactamase inhibitor)	0.00	0.00	0.00	0.00	0.00	0.00	-	-	-	-
	Ampicillin	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-	-	-
Pleuromutilins	Tiamulin	-	-	-	-	-	-	-	-	-	0.00
Sulfonamides and trimethoprim	Sulfadiazine	0.15	0.16	0.14	0.14	0.16	0.06	0.00	0.00	0.00	0.02
	Sulfadoxine	0.02	0.02	0.02	0.02	0.02	0.10	0.09	0.07	0.07	0.06
	Trimethoprim	0.03	0.03	0.03	0.03	0.04	0.03	0.02	0.01	0.01	0.02
Tetracyclines	Chlortetracycline	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Doxycycline	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.00	-
	Oxytetracycline	0.70	0.62	0.57	0.56	0.55	0.46	0.45	0.38	0.32	0.33

DAPDs are calculated as the number of standard doses for one kg animal divided by the estimated live biomass in the age group or the total population (in tonnes)
Data for 2024 were extracted from VetStat on 20 May 2025
Combination products are split into active compounds
A dash (-) indicates no antimicrobial usag

The consumption of intramammary treatments, measured as doses per cow per year, is presented in Figure 4.6. From 2015 to 2023, usage declined by 17.24%. However, in 2024, there was a 2.67% increase compared to the previous year.

In 2019, a notable shift occurred in dry-cow treatments: the use of beta-lactamase-sensitive penicillins for this purpose almost ceased, while the use of other penicillins, particularly cloxacillin, increased substantially. This shift resulted from a product shortage in which the primary beta-lactamase-sensitive penicillins for dry-cow treatment was unavailable for extended periods during 2019. Consequently, other penicillins, especially products containing cloxacillin, had to be used as alternatives [Personal communication; Michael Farre, Danish Agriculture and Food Council] (Figure 4.6).

In 2024, other penicillins remained the most frequently used antimicrobials for dry-cow treatment, accounting for 50.00% of total usage, followed by beta-lactamase-sensitive penicillins at 24.94%. Cephalosporins were used exclusively for dry-cow treatments in 2024 (Figure 4.6).

For therapeutic intramammary treatments, beta-lactamase-sensitive penicillins remained the dominant antimicrobial class from 2015 to 2023, and in 2024, they accounted for 97.18% of all therapeutic intramammary treatments.

4.3.3 Antimicrobial consumption in poultry

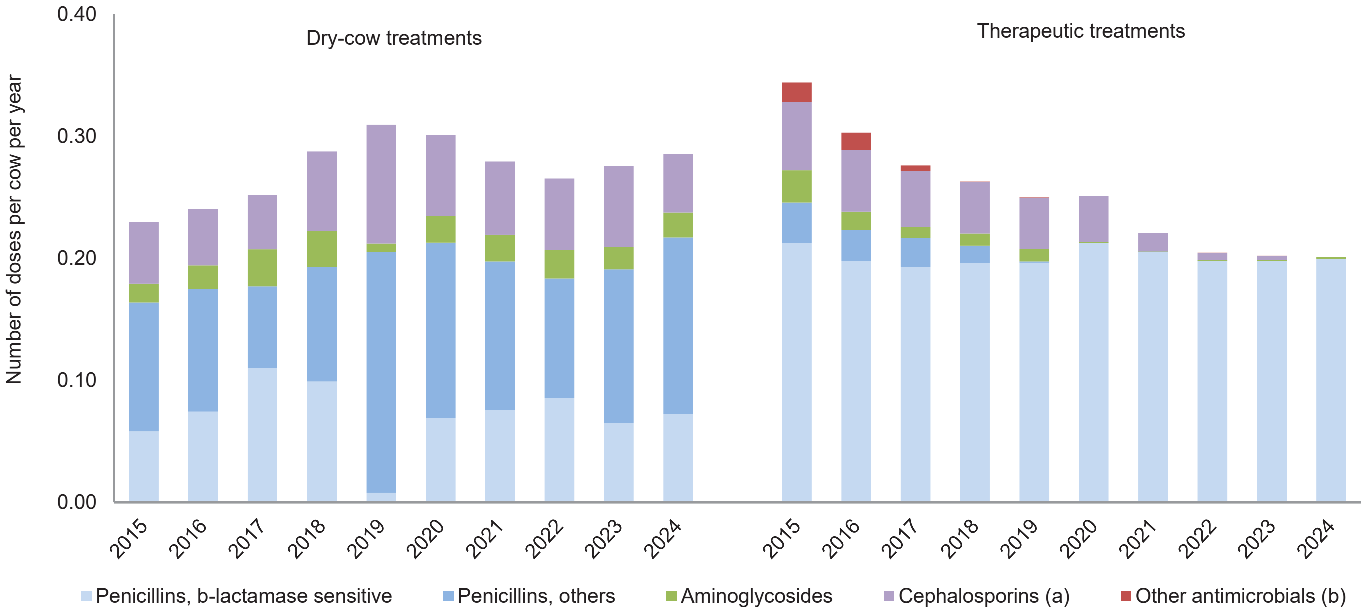
Poultry production in Denmark comprises broiler chickens, laying hens, and turkeys, supplemented by smaller-scale operations involving ducks, geese, and game birds. Among these sectors, conventional broiler production is characterized by stringent biosecurity protocols, which contribute to comparatively low levels of antimicrobial usage relative to other livestock sectors. However, due to the overall low baseline usage, disease outbreaks in a limited number of farms can exert a substantial influence on national antimicrobial consumption statistics (Table 4.4).

Marked fluctuations in antimicrobial usage, both increases and decreases, are frequently attributable to disease outbreaks affecting multiple flocks within a single production unit [personal communication, Susanne Kabel, Danish Agriculture and Food Council].

Historically, the Danish VetStat surveillance system lacked the resolution to disaggregate antimicrobial usage data by specific poultry production types. This limitation was addressed through the revised VetStat system, which has enabled more granular reporting since June 2021. As longitudinal data accumulates, this enhancement will facilitate more precise monitoring of antimicrobial usage trends across distinct poultry production categories.

In 2024, total antimicrobial consumption in the poultry sector declined by 12.63% in terms of kilograms of active compound compared to 2023. Despite this overall reduction, usage of certain antimicrobial classes increased: other penicillins by 99.69 kg, macrolides by 56.60 kg, and sulfonamides in combination with trimethoprim by 41.40 kg. In contrast, the use of beta-lactamase-sensitive penicillins and tetracyclines decreased by 160.23 kg and 207.14 kg, respectively (Table 4.4).

Figure 4.6 Consumption of antimicrobials for intramammary application in cattle, treatments per cow per year, Denmark, 2015-2024
DANMAP 2024



For intramammary treatment, the consumption has been estimated as the number of doses divided by the estimated live biomass in the age group
Data for 2024 were extracted from VetStat on 20 May 2025
Combination products are split into active compounds
a) 1st generation cephalosporins only
b) Includes lincomycin for dry-cow treatments. For therapeutic treatment, mainly sulfonamides-trimethoprim, but also lincomycin and bacitracin

Table 4.4 Consumption of antimicrobials in poultry, kg active compound, Denmark, 2015-2024 DANMAP 2024

	Aminoglycosides	Amphenicols	Fluoroquinolones	Lincosamides	Macrolides	Other antimicrobials[a]	Other quinolones	Penicillins, b-lactamase sensitive	Penicillins, others	Pleuromutilins	Sulfonamides and trimethoprim	Tetracyclines	Total
2015	258.47	4.37	1.00	129.12	133.31	9.96	-	204.43	565.96	0.63	445.46	818.09	2570.78
2016	60.19	4.83	-	23.77	175.58	8.00	-	264.55	257.65	0.38	111.00	764.56	1670.51
2017	64.87	5.06	-	31.75	244.87	-	1.00	355.55	334.77	0.45	84.60	487.45	1610.37
2018	50.56	-	-	25.28	194.95	-	-	357.83	242.58	0.83	36.60	521.12	1429.73
2019	54.80	0.23	0.01	27.36	274.83	-	-	368.37	234.30	0.64	64.25	694.27	1719.07
2020	58.19	-	-	29.01	156.91	-	-	334.10	237.34	0.23	54.60	1590.93	2461.31
2021	58.87	-	-	27.69	168.64	-	-	115.38	204.10	0.38	34.80	656.61	1266.46
2022	50.42	-	-	14.98	433.96	-	-	232.70	139.88	19.38	12.60	442.43	1346.35
2023	50.23	-	-	15.28	176.34	-	-	315.90	203.06	16.88	31.20	496.92	1305.80
2024	51.15	-	-	21.65	232.94	-	-	155.68	302.75	14.38	72.60	289.78	1140.92

Data for 2024 were extracted from VetStat on 20 May 2025
Combination drugs are divided into active compounds
a) Other antimicrobials also include polymyxins
A dash (-) indicates no antimicrobial usage

4.3.4 Antimicrobial consumption in aquaculture, fur animals, and companion animals

Aquaculture

Antimicrobial consumption in aquaculture is mainly driven by the summer air temperatures and hours of summer sunlight because bacterial diseases are more likely to occur when water temperatures are high [Villumsen and Bojesen, 2022. Microbiol Spectr. 10(5):e0175222]. Although the aquaculture production continues to focus on developing improved vaccination strategies to reduce the risk of bacterial diseases that may require treatment with antimicrobials, the antimicrobial consumption varies significantly from year to year. In 2024 the antimicrobial consumption decreased by 12.01% compared to the average consumption in the previous five years. The decrease was primarily due to decreased usage of combination products of sulfonamides and trimethoprim (Table 4.5).

In 2024, three antimicrobial classes accounted for the majority of treatments for bacterial infections in aquaculture: sulfonamides with trimethoprim made up 74.61% of total use, followed by other quinolones (oxolinic acid) at 14.48%, and amphenicols (florfenicol) at 7.44% (Table 4.5).

Companion animals - horses and pets

The information available on antimicrobial consumption in companion animals is not as accurate as for production animals, since VetStat allows registration of antimicrobials for companion animals without defining animal species. Table 4.6 shows the antimicrobial consumption registered for companion animals in three categories: horses, pets, and "unspecified".

The total amount of antimicrobials estimated for consumption in companion animals in 2024 was 2296.33 kg (Table 4.6). As in previous years, a substantial amount of sulfonamide/trimethoprim registered as used for pets or unspecified is oral paste, a product normally used for horses. Thus, a substantial amount of sulfonamide/trimethoprim included in Table 4.6 is likely to have been used for horses (1202.96 kg in 2024).

A large proportion of antimicrobials for dogs and cats are prescribed for the treatment of chronic or recurrent disease, mainly dermatitis. Due to the close contact between owners and their pets, repeated use of critically important antimicrobials may pose a risk to the owners, and the use of these antimicrobials is therefore monitored carefully.

Since the treatment guidelines by DVA were published in 2012 (revised in 2018), the use of cephalosporins has been reduced from 272.70 kg in 2012 to 45.98 kg of active compound in 2024. The pets accounted for 56.37% of all the cephalosporins consumed in animals (Table 4.1 and 4.6).

In 2024, the consumption of fluoroquinolones in companion animals, mainly dogs and cats, was 12.98 kg active compound (Table 4.1 and 4.6).

Table 4.5 Consumption of antimicrobials in aquaculture, kg active compound, Denmark, 2015-2024 DANMAP 2024

	Aminoglycosides	Amphenicols	Other antibacterials[a]	Other quinolones	Penicillins, b-lactamase sensitive	Penicillins, others	Sulfonamides and trimethoprim	Tetracyclines	Total
2015	-	311.09	-	1004.50	-	5.05	1655.01	0.72	2976.36
2016	-	315.34	0.00	893.07	-	13.55	1085.88	0.40	2308.24
2017	-	350.26	-	636.81	0.04	35.03	679.34	0.10	1701.57
2018	-	323.47	-	899.34	-	51.58	2292.56	0.50	3567.45
2019	-	292.56	-	446.88	-	43.90	1720.93	22.01	2526.28
2020	-	341.19	-	565.26	-	27.05	1030.20	1.00	1964.70
2021	-	295.42	0.12	366.33	1.71	19.50	1088.90	1.42	1773.39
2022	-	143.85	-	366.53	-	-	1940.76	0.60	2451.74
2023	-	124.93	-	523.98	-	-	931.70	-	1580.61
2024	8.40	134.83	-	316.78	-	-	1352.08	-	1812.09

Data for 2024 were extracted from VetStat on 20 May 2025
Combination products are split into active compounds
a) Other antibacterials also includes lincosamides
A dash (-) indicates no antimicrobial usage

Table 4.6 Estimated consumption of antimicrobials for horses, pets and unspecified animals, kg active compound, Denmark, 2015-2024
DANMAP 2024

	Aminoglycosides	Amphenicols	Cephalosporins	Fluoroquinolones	Lincosamides	Macrolides	Other antimicrobials[a]	Other quinolones	Penicillins, b-lactamase sensitive	Penicillins, others	Pleuromutilins	Sulfonamides and trimethoprim	Tetracyclines	Total
Horses														
2015	2.82	-	0.43	0.00	0.01	0.06	0.02	-	6.88	0.05	-	114.58	4.75	129.61
2016	0.78	-	0.13	0.01	-	-	0.03	-	5.21	0.02	-	108.02	5.30	119.50
2017	0.86	0.09	0.11	0.00	-	-	0.04	-	5.38	0.06	-	106.44	2.98	115.95
2018	0.70	0.05	0.15	-	-	0.08	0.04	-	5.96	0.01	-	100.56	3.78	111.33
2019	0.95	-	0.08	0.00	-	0.02	0.02	-	4.92	0.09	-	94.19	3.82	104.09
2020	1.71	-	0.00	0.00	0.00	-	0.02	-	5.32	0.03	-	111.46	3.52	122.06
2021	0.20	-	0.01	0.00	0.00	0.02	0.06	-	5.20	0.13	-	106.03	1.99	113.65
2022	0.35	0.00	0.04	0.00	0.02	1.00	0.16	-	5.07	0.39	-	137.09	7.32	151.45
2023	0.30	0.00	0.01	0.03	0.01	-	0.26	-	5.91	0.57	-	167.02	7.67	181.77
2024	0.61	-	0.02	0.00	0.00	0.02	0.12	-	7.08	0.17	-	167.32	6.88	182.20
Pets														
2015	4.80	0.12	61.76	5.60	21.78	3.31	6.83	-	13.18	123.44	1.75	226.16	20.46	489.20
2016	3.39	0.43	55.31	5.38	21.78	2.31	7.38	0.06	9.81	131.16	0.25	269.09	21.49	527.84
2017	3.80	0.70	41.70	5.22	18.38	1.66	8.32	-	9.16	125.79	0.13	272.44	19.34	506.63
2018	3.93	0.28	35.86	4.94	17.51	1.66	14.34	1.00	10.00	113.72	0.50	253.22	21.12	478.08
2019	3.73	0.26	32.33	4.45	17.19	7.35	15.02	0.00	10.35	108.43	0.63	236.83	14.79	451.35
2020	4.34	0.56	30.68	5.06	19.07	3.84	17.61	-	12.88	103.42	0.50	262.32	17.75	478.01
2021	3.20	0.67	27.98	4.74	19.25	2.16	20.82	-	11.46	100.15	0.13	270.77	23.66	484.99
2022	1.69	0.01	22.30	3.87	16.48	0.23	24.39	-	9.39	79.53	0.13	165.50	22.26	345.77
2023	2.21	0.64	21.56	4.31	17.72	2.19	24.46	-	10.02	86.54	0.16	194.37	18.81	383.00
2024	1.38	0.12	16.67	4.15	16.88	0.36	18.12	-	8.45	89.17	0.13	206.62	18.34	380.39
Unspecfied														
2015	41.28	0.33	95.87	8.73	46.84	0.04	25.13	1.00	1.50	429.17	-	946.83	17.02	1613.73
2016	37.45	0.38	81.64	9.71	48.91	0.27	26.31	-	2.21	468.68	-	1015.35	17.02	1707.93
2017	33.22	0.21	69.14	9.27	50.12	0.00	28.25	-	1.94	469.78	-	1071.67	14.71	1748.31
2018	31.84	1.32	61.41	9.76	45.80	-	34.83	-	1.84	452.95	-	1136.63	12.96	1789.33
2019	29.24	0.23	60.64	9.87	48.83	0.13	36.80	-	1.90	442.56	0.13	1140.68	16.04	1787.07
2020	22.62	0.42	56.90	10.70	52.24	0.06	40.17	-	2.90	446.94	-	1221.66	15.65	1870.25
2021	17.26	0.39	49.36	10.11	57.52	-	47.35	-	0.79	457.54	-	1284.34	14.46	1939.13
2022	1.28	0.40	38.82	8.76	54.31	-	51.89	-	-	395.35	-	1100.12	11.94	1662.86
2023	1.04	0.41	36.93	8.73	55.63	-	49.24	-	-	390.36	-	1233.67	12.82	1788.82
2024	0.91	0.39	29.31	8.83	58.61	-	32.92	-	-	386.95	-	1202.96	12.85	1733.74

Data for 2024 were extracted from VetStat 20 May 2025
Combination products are split into active compounds
The estimates include all veterinary approved antimicrobials, for use in horses, pets, as well as products without a specified animal species (unknown)
a) Other antimicrobials also include other otologicals, pleuromutilins, polymyxins and sulfonamides, plain
A dash (-) indicates no antimicrobial usage

Vibe Dalhoff Andersen and Marianne Sandberg
For further information:
Marianne Sandberg, marsan@food.dtu.dk

Textbox 4.1

The effect of the discontinued use of zinc oxide on antimicrobial usage in Danish pig farms

Background

On June 26, 2022, Denmark implemented a ban on veterinary medicinal products containing zinc oxide, generally used for prevention of *E. coli*-related post-weaning diarrhoea in pigs. The decision followed an EU directive issued in 2017 driven by environmental concerns. A five year phase-out period allowed farms the time to gradually discontinue the use of zinc oxide. In the year the ban was enforced, a national increase in antimicrobial usage (AMU) in pigs – primarily driven by an increase in the peroral use of neomycin in weaners – was observed by DANMAP.

Method

In this study, the farm-level effect of the discontinued use of zinc oxide on AMU in weaners and finishers in Denmark was assessed [1]. The study included 4020 conventional, organic, free-range and breeding farms in Denmark supervised by 146 veterinarians from January 2018 to December 2023. Data was extracted from two national databases: farm characteristics from the Central Husbandry Register (CHR) and antimicrobial prescription records from the Danish Veterinary Medicine Statistic Program database (VetStat). Separate datasets were compiled for weaners and finishers, using only data from the longest period under one veterinarian. The monthly within-farm AMU was standardized by converting the amount of antimicrobials prescribed into number of Defined Animal Daily Doses (ADDkg) administered per pig, on the respective farm, per day, in the respective study month (ADDkg/pig-day). The VetStat data showed that each month before the ban, ~75% of farms with weaners used zinc oxide and that a gradual decline in usage began about a year before the ban was enforced (Figure 1). Farms discontinuing zinc oxide use within that year were classified as zinc-using prior to the ban. Additionally, a farm-level time variable marked AMU before, 1-5 months after, or >5 months after zinc discontinuation (for zinc-using weaner farms) or the legal ban (for other farms). The three level data (AMU in a study month, on a farm, supervised by a veterinarian) was analysed using a linear mixed-effect model including time-dependent and farm-specific fixed effects as well as the random effects of the individual farms and veterinarians.

Results

Figure 2 presents the estimated percentage changes in AMU (ADDkg/pig-day) on the individual farms 1-5 and >5 months after the implementation of the ban or the within-farm discontinuation of zinc oxide. The most significant effect was seen in zinc-using farms, where AMU for weaners increased by ~5% on average 1-5 months after the within-farm discontinuation of zinc oxide, followed by a ~17% increase after >5 months. In contrast, the AMU for finishers initially decreased by ~5% on average 1-5 months after the ban – likely a collateral effect of the increased AMU in weaners – but returned to pre-ban levels thereafter. An effect was also seen >5 months after the ban in non-zinc-using farms, where AMU in weaners increased by ~19% on average – however, this increase occurred from a ~14% lower average pre-ban AMU compared to zinc-using farms, indicating that non-zinc-using farms generally had a lower disease frequency. The rise in AMU among non-zinc-using farms may be attributed to a national increased disease frequency or shifts in veterinary prescribing practices in response to the ban.

The effect of the zinc oxide ban resembles that of the antimicrobial growth promoter (AGP) ban in 2000, where antimicrobial treatment for diarrhoea doubled in the first year [2]. However, this increase declined again as producers adapted to the change and the Danish pig production was not negatively impacted long-term [3]. A similar adjustment may follow the zinc oxide ban but has yet to emerge. While the average zinc-using farm increased AMU in weaners following the discontinuation of zinc oxide, some farms faced substantial increases, whereas others had few or no problems maintaining gut health in weaners during the transition – a pattern that was similarly observed after the discontinued use of AGPs. This between-farm variation indicated that the effect of the absence of zinc oxide on the prevalence of post-weaning diarrhoea was significantly influenced by individual farm management practices.

Figure 1 The proportion of farms with weaners using zinc oxide (vertical axis) each study month throughout the study period (horizontal axis), estimated from the extracted VetStat data. Horizontal dashed lines mark the year preceding the enforcement of the ban DANMAP 2024

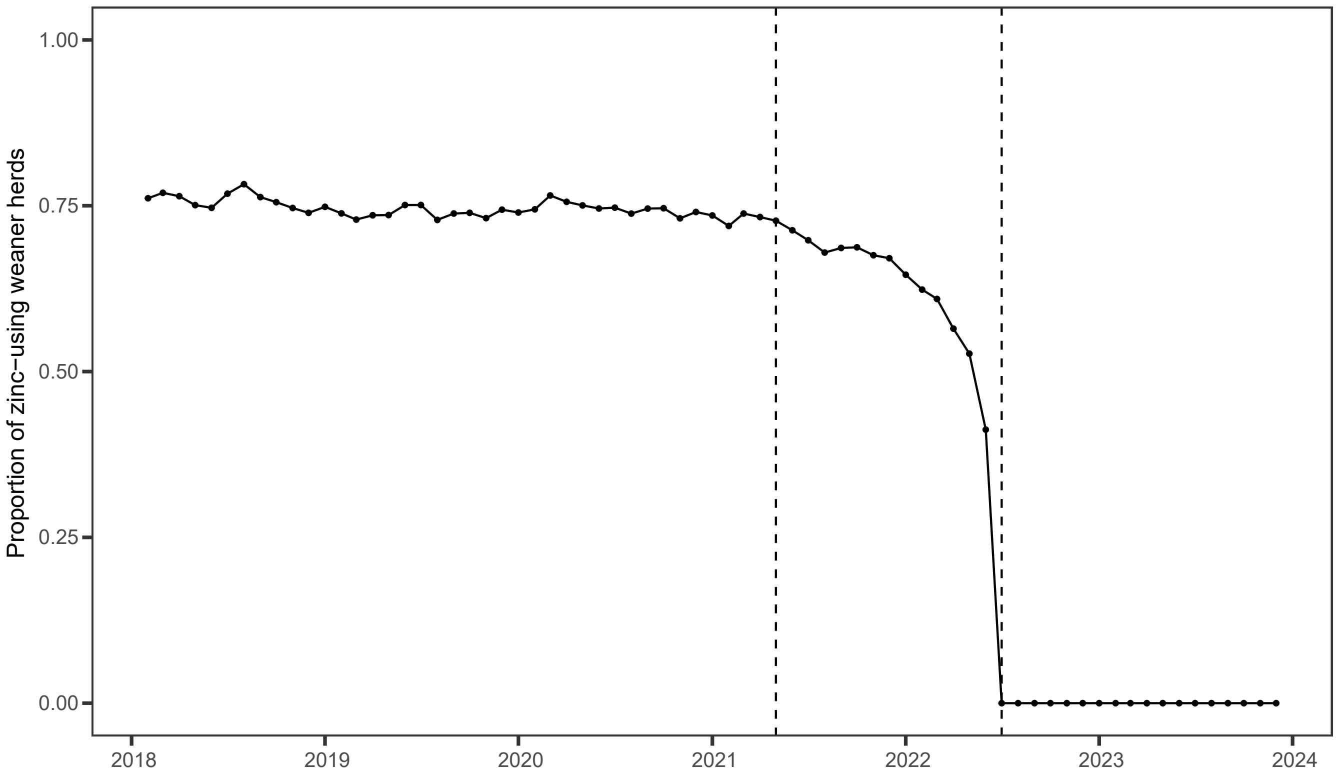
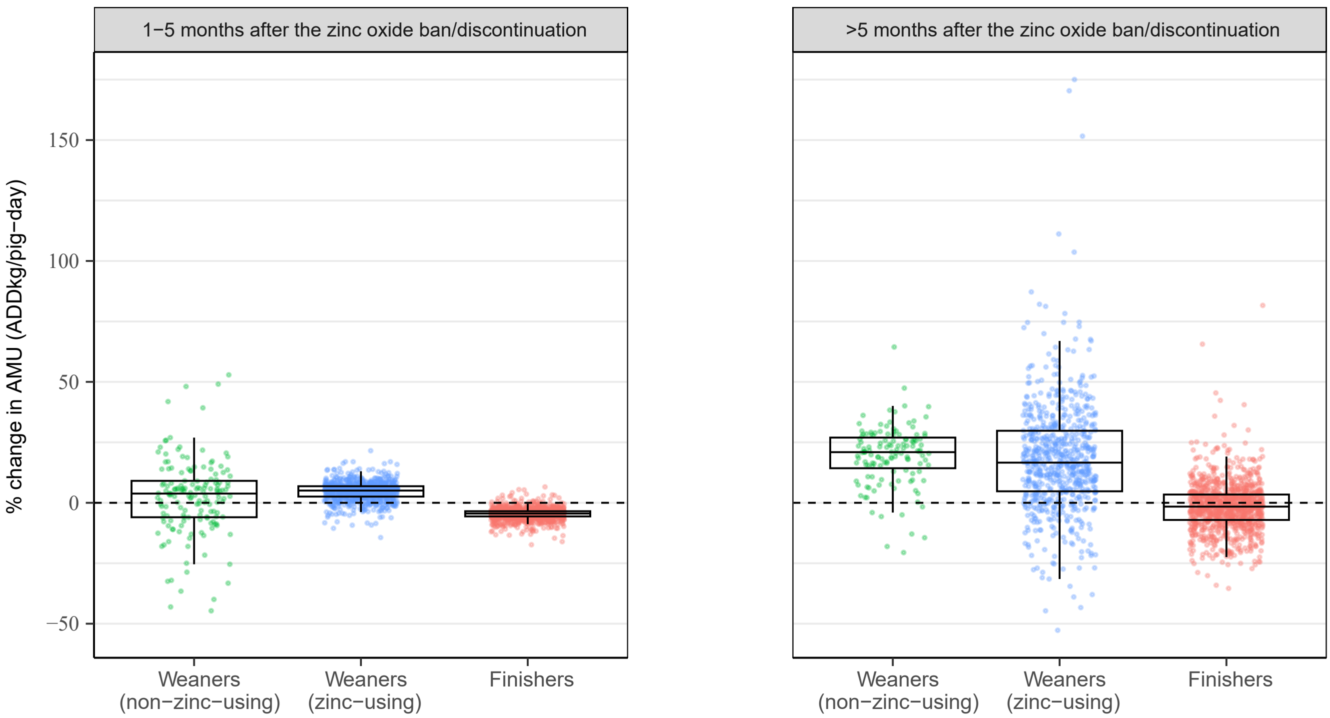


Figure 2 The effect of the zinc oxide ban, estimated as the predicted percentage change in AMU (ADDkg/pig-day) in weaners and finishers in the individual farms *1-5 months* and *>5 months* after the zinc oxide ban/discontinuation, compared to before the zinc oxide ban/discontinuation. The effect was predicted for the individual farms in the study where data was available both before and after the ban/discontinuation (number of farms from left to right: 158, 840, 1268, 131, 689, 1028) DANMAP 2024



continued ... Textbox 4.1

Josefine Ostenfeld Nielsen, DTU
For further information contact: josos@food.dtu.dk

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Textbox 4.2

The european sales and use of antimicrobials for veterinary medicine (ESUAvet): 2023 surveillance report

The European Sales and Use of Antimicrobials for Veterinary Medicine (ESUAvet) annual surveillance report is a new initiative launched by the European Medicines Agency aimed at addressing the critical challenge of antimicrobial resistance in veterinary medicine across the European Union. In March 2025, the first ESUAvet report was published, summarizing data reported from 2023 by all EU member states, as well as Iceland and Norway.

Data is reported by participating countries via the *Antimicrobial Sales and Use* (ASU) Platform, which was strategically developed to support the EU's commitment to mandatory data collection and transparent reporting on the sales and use of antimicrobial medicinal products across all animal sectors throughout the EU and European Economic Area. In this first year of ESUAvet reporting, countries were required to report sales data for all animals and use of antimicrobials for cattle, pigs, chickens, and turkeys. The reporting will be expanded in 2027 to include additional production animal species, such as horses, and in 2030 to encompass companion animals including cats, dogs, and fur animals.

Results of the 2023 ESUAvet Report and data comparisons
According to the 2023 ESUAvet report, 71.1 tonnes of antimicrobial active compounds were sold for treatment of animals in Denmark, corresponding to 20.1 mg/kg animal biomass. This places Denmark in the mid-range compared to the other countries in the report.

Only sales results were presented in the 2023 ESUAvet report, as the data on antimicrobial use across all participating countries was not considered complete and accurate enough for quantitative analysis. Many countries are still in the process of developing or refining systems for collecting data on antimicrobial use.

For Denmark, sales data was reported by the Danish Medicines Agency, based on pharmacy sales records. Use data was reported by the Danish Veterinary and Food Administration (DVFA), using data from *VetStat*, the national database for veterinary prescription medicine use, based on reports from veterinarians, feed mills, and pharmacies. Because sales and use data are derived from different sources and reflect different levels of the supply chain, they should not be directly compared.

It is also important to acknowledge that differences in data processing methods and analytical approaches can impact the results. For this reason, the ESUAvet report includes a disclaimer noting that the country-level results presented may differ from those published in national reports. In Denmark, the DVFA and DANMAP have jointly identified challenges related to data harmonization between the antimicrobial use determined in the reporting process to the ASU platform and DANMAP respectively. The primary discrepancy in methodology concerns classification and quantification of antimicrobial products, including the use of different International Units and derivative conversion factors. These differences highlight the continued strategic importance of thorough methodologies and established national surveillance systems like DANMAP.

Anne-Mette Jensen, Jensine Wilm and Frederik Fabricius, The Danish Veterinary and Food Administration
Vibe Dalhoff Andersen, DTU Food
For further information contact: 15@fvst.dk