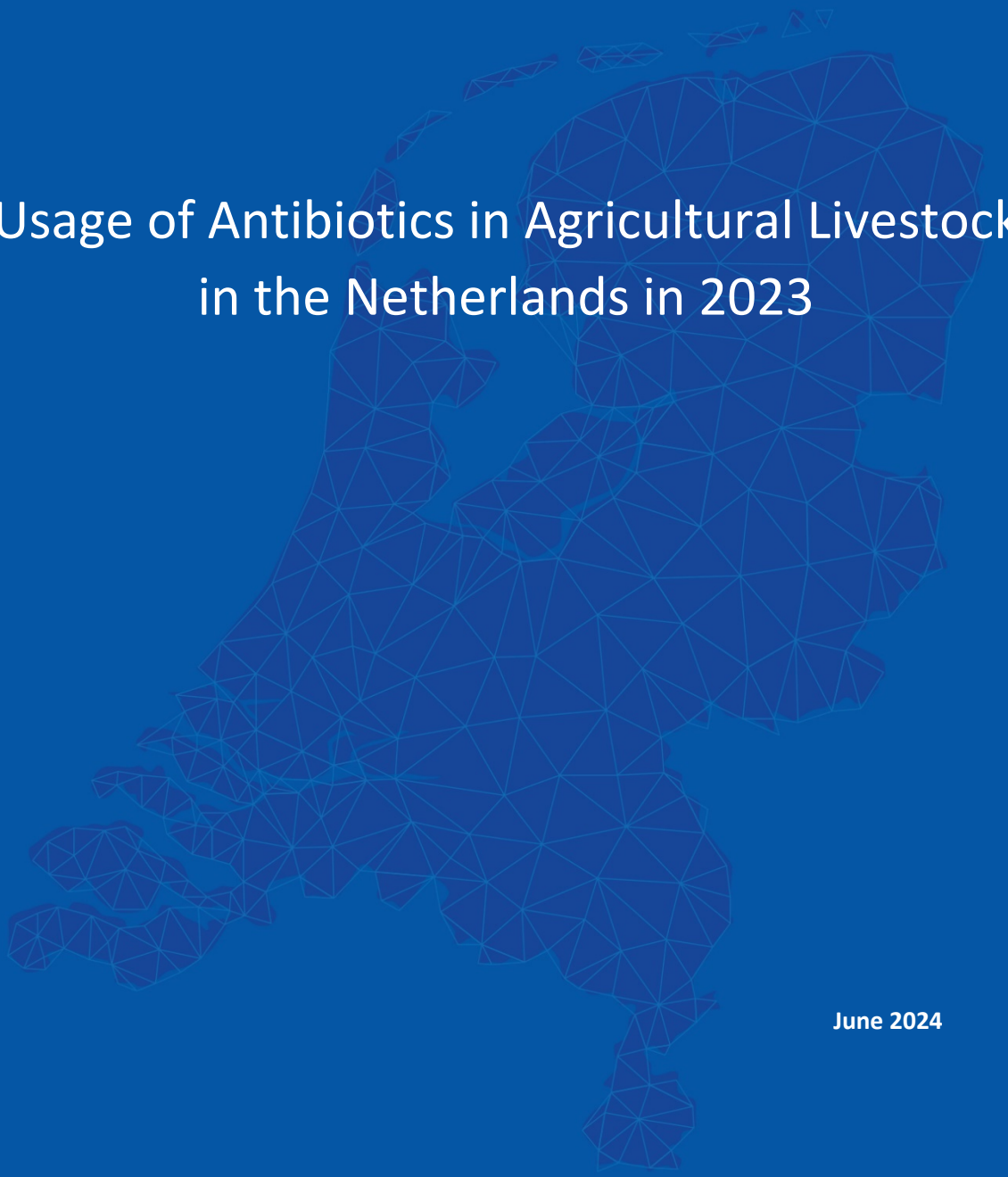
Autoriteit Diergeneesmiddelen

Usage of Antibiotics in Agricultural Livestock in the Netherlands in 2023



June 2024

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Reader's guide

This is a copy of the SDa report on the usage of antibiotics in agricultural livestock in the Netherlands in 2023, drawn up by the SDa expert panel.

The report and a cover letter by the SDa board have been combined in a single document, with the cover letter preceding this year's report. Additional information, including data on the amounts of antibiotics used in the various livestock sectors and on veterinarians' prescription patterns, can be found in the appendix to the report, which is available online.

Autoriteit Diergeneesmiddelen

Utrecht, June 2024

Re: SDa report *Usage of Antibiotics in Agricultural Livestock in the Netherlands in 2023*

Dear Sir or Madam,

It is with great pleasure that the Netherlands Veterinary Medicines Institute (SDa) presents its report *Usage of Antibiotics in Agricultural Livestock in the Netherlands in 2023*. In this publication, the SDa expert panel reports on the amounts of antibiotics used in the Dutch cattle, goat, pig, poultry, rabbit, and veal farming sectors in 2023.

In 2023, overall antibiotic use remained relatively stable in most livestock sectors. Antibiotic usage patterns in the cattle, dairy goat, pig, and poultry farming sectors were similar to those observed for 2022. Overall antibiotic use in the turkey farming sector dropped by 34.2% in 2023, while 7.6 and 8.5% increases were recorded for the veal and rabbit farming sectors, respectively.
The overall amount of antibiotics sold within the Dutch livestock sector rose by 4.5% in 2023, and the sales volume reduction from the government-specified reference year of 2009 now amounts to 76.4%. Sales of antibiotics classified as last-resort antibiotics for humans (i.e. fluoroquinolones and third- and fourth-generation cephalosporins) remained low and stable. In 2023, sales of polymyxins (including colistin) declined for the third consecutive year and were 10.8% lower than the year before.

Usage data for individual livestock sectors
2024 marks the thirteenth year in which the SDa reports on the usage of antibiotics in agricultural livestock in the Netherlands. The way in which the SDa – in close coordination with all stakeholders involved – is supplied with data on the amounts of antibiotics used and sold, has enabled the development and implementation of a solid monitoring and benchmarking system, which is frequently referred to by both domestic and international parties.

In the veal farming sector, antibiotic use followed a downward trend from 2015 to 2020, stabilized between 2020 and 2022, and then went up by 7.6% in 2023. In addition to conventional measures, structural measures spanning the animals' entire life cycle (from birth to slaughter) seem to be needed in order to maintain calf health, reduce the spread of infectious diseases at veal farms, and subsequently reduce the amounts of antibiotics used in the veal farming sector.

Several years ago, the poultry farming sector, originally only comprising conventionally housed fast-growing broilers, made considerable progress with the introduction of alternative housing and rearing systems for slower growing breeds. Antibiotic use at broiler farms with these slower growing breeds is very low. Broiler farms with conventional breeds generally record considerably higher usage levels, and no long-term downward trend in antibiotic use can be distinguished for these farms. The SDa does recognize that some of these farms with conventional breeds have made progress, and it urges the sector to expressly address the performance of broiler farms that are lagging in terms of their usage levels.

The dairy goat farming sector is characterized by low antibiotic usage levels. The number of goat farms according to data provided by the goat farming sector (i.e. the data the SDa relies on for antibiotic usage monitoring) deviates from the number of farms according to data provided by Statistics Netherlands (CBS). Goat farmers and veterinarians active at farms with fattening lambs, farms with rearing goats, hobby farms and a small number of dairy goat farms are to make sure the data provided to the SDa are in line with CBS data.

Antibiotic use in the cattle farming sector has been low and stable for several years, with limited usage level variation between individual farms.

The pig farming sector seems to have initiated a similar development. Use of colistin, categorized as one of the Veterinary Highly Important Antimicrobial Agents by the World Organisation for Animal Health (WOAH, formerly known as the Office International des Epizooties or OIE), continued to decline in the pig farming sector, indicating the action plan implemented by this livestock sector and the government has been effective.

The turkey farming sector has made considerable progress. Usage level differences between individual turkey farms have narrowed substantially and the sector has managed to reduce its overall antibiotic use by 79.3% throughout its monitoring period (2013 to 2023). The sector's reduction efforts have proved to be successful.

The proportion of rabbit farms recording action zone usage levels declined in 2023. Once the rabbit farms with action zone usage levels manage to reach target zone usage levels, the rabbit farming sector will be able to further reduce its overall antibiotic use.

Sales data

In 2023, the number of kilograms of antibiotics sold exceeded the number of kilograms used by 4.5%. The SDa compares antibiotic usage and sales data on an annual basis. Data on sales volumes are provided by FIDIN, the federation of the Dutch veterinary pharmaceutical industry. The 4.5% discrepancy between usage and sales data is slightly higher than the discrepancy recorded for 2022. Since January 2022, veterinarians are able to purchase veterinary medicinal products in other EU member states when the product concerned is not available in the country in which the veterinarian is established. As yet, no prominent effects have been observed as a result of this, but the SDa is aware it could contribute to discrepancies between the numbers of kilograms of antibiotics sold and used in the Netherlands. The EU is currently developing a monitoring platform that should also provide insight into imported and exported veterinary medicines.

Veterinarians' prescription patterns

Veterinarians active at dairy cattle farms, non-dairy cattle farms, broiler farms with slower growing breeds, farms with sows and suckling piglets, and farms with fattening pigs showed relatively little variation in their 2023 prescription patterns. Prescription pattern differences between individual veterinarians active at broiler farms with conventional breeds, farms with weaner pigs, veal farms (regardless of the type of veal calves), and turkey farms were still relatively large. With regard to the latter types of farms and production categories, there seems to be an opportunity to narrow veterinarians' prescription pattern differences. Implementing a more structured form of intervision, which has helped the pig farming sector to reduce colistin use in pigs, could help realize this goal.

Conclusion

The 2023 monitoring results show a primarily positive picture, with many livestock farmers recording antibiotic usage levels not exceeding their benchmark threshold representing acceptable use[1]. In the cattle, pig and broiler farming sectors, a considerable number of farms have managed to reach antibiotic usage levels consistent with acceptable use. Over the next year, the SDa will examine whether the other livestock sectors also meet the requirements for implementation of benchmark thresholds representing acceptable use.

[1] Types of farms or production categories benchmarked by means of benchmark thresholds representing acceptable use are characterized by low or very low antibiotic usage levels ($DDDA_F$ values), limited usage level differences between individual livestock farms, and limited usage level fluctuations over time. The livestock farms concerned are benchmarked by means of a single benchmark threshold, referred to as their action threshold. Farms with $DDDA_F$ values exceeding this threshold are required to take action in order to reduce their antibiotic usage levels.

In light of the overall objective of preventing the emergence and spread of resistant bacteria, reducing the amounts of antibiotics used and prescribed at livestock farms with persistently high usage levels should remain the main focus in the next few years.

On behalf of the SDa board,

Yours sincerely,

H.M. Meijdam, LLM
Chair

H.M.G. Schreurs, DVM, PhD
Director

Autoriteit Diergeneesmiddelen

REPORT

Usage of Antibiotics in Agricultural Livestock in the Netherlands in 2023

Trends and benchmarking of livestock farms and veterinarians

SDa expert panel

June 2024

Preface

This is a copy of the SDa report *Usage of Antibiotics in Agricultural Livestock in the Netherlands in 2023*. It was drawn up by the SDa expert panel in order to promote transparency and provide insight into the usage of antibiotics at Dutch livestock farms. This year's report consists of two separate parts: a concise main report summarizing the most important findings regarding the usage of antibiotics in the Dutch livestock sector, and an online appendix containing the underlying data. The order in which livestock sectors are presented in this year's report is based on both the number of farms (main food-producing livestock sectors versus smaller food-producing livestock sectors) and the amount of antibiotics used in the respective sectors. This order enables the SDa expert panel to indicate more clearly which sectors should be the main focus of efforts to further reduce the amounts of antibiotics used in the Dutch livestock sector.

With its benchmarking activities and annual report, the SDa aims to promote prudent usage of antibiotics by offering livestock farmers and veterinarians insight into their performance in terms of antibiotic usage levels and prescription patterns, respectively.

Since several years, the report also includes information on livestock farms with persistently high antibiotic usage levels (i.e. $DDDA_F$ values that have exceeded the action threshold two years in a row), and as a result, the SDa has been able to observe trends in the proportions of farms with persistently high usage levels. These trends are also discussed in this year's report.

Colophon:
Members of the SDa expert panel:
Prof. M.J.M. Bonten, PhD, medical microbiologist
I.M. van Geijlswijk, PhD, hospital pharmacist - clinical pharmacologist
Prof. D.J.J. Heederik, PhD, epidemiologist and chair
A.J. van Hout-van Dijk, DVM, PhD, veterinarian/senior researcher
L. Mughini-Gras, DVM, PhD, veterinarian/epidemiologist

Research staff:
P. Sanders, secretary of the SDa expert panel

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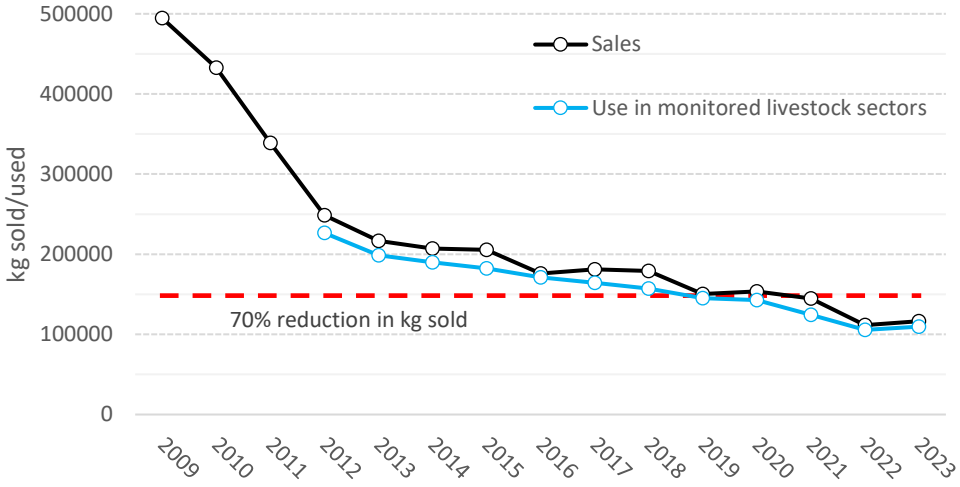
Contents

Summary

In most livestock sectors, overall antibiotic use remained relatively stable in 2023. The veal and rabbit farming sectors saw a rise in overall antibiotic use, while overall antibiotic use in the turkey farming sector declined in 2023. These sectors are discussed in greater detail below. Additional reductions in monitored livestock sectors' overall antibiotic use could probably be achieved by means of usage level reductions at livestock farms with persistently high $DDDA_F$ values, and through across-the-board usage level reductions in the veal farming sector, which is a major contributor to the total amount of antibiotics used in monitored livestock sectors. Usage of critically important antibiotics (i.e. antibiotics that are critically important in human medicine) remained low in 2023 and only represented a small proportion of overall antibiotic use.

Sales of antibiotics in terms of kilograms of active substances sold rose by 4.5% in comparison to 2022. Following this rise recorded for 2023, the sales volume reduction from the reference year of 2009 amounts to 76.4%. Factors contributing to the rise in the amounts of antibiotics sold may include increased use at veal farms, stockpiling of antibiotics, and use in unmonitored animal sectors.

Figure 1. Trends in the amounts of antibiotics sold and used from 2009 (reference year) to 2023



Usage of antibiotics in the main food-producing livestock sectors

Veal farming sector – In 2023, overall antibiotic use in the veal farming sector increased by 7.6%, to 16.4 $DDDA_{NAT}$. Antibiotic use in this livestock sector showed a downward trend from 2015 to 2020, stabilized between 2020 and 2022, and then went up in 2023. Mean antibiotic use at white veal farms, rosé veal starter farms, and rosé veal fattening farms increased slightly in 2023. The proportion of farms with usage levels exceeding the action threshold was high (over 25%) for each type of veal farm. The veal farming sector is characterized by wide usage level distributions, substantial between-farm usage level differences, and a considerable number of farms with persistently high usage levels. Measures are needed to reduce the amounts of antibiotics used in this livestock sector. The question is how this should be realized, considering the relatively high usage levels and pronounced between-farm usage level differences in comparison with other livestock sectors. As veal farmers usually obtain their veal calves from various dairy cattle farms located in the Netherlands and abroad, the veal farming sector has a relatively open character. Additional reductions in the amounts of antibiotics used in this sector will probably require structural measures in addition to conventional measures such as biosecurity, feed and barn climate optimization. The sector should take a close look at how it is structured and the performance of its supply chain of dairy cattle farms, in an effort to reduce the need for antibiotics by making sure veal farmers are supplied with healthier calves and reducing the spread of infectious diseases.

Broiler farming sector – In 2023, antibiotic usage levels for both broiler farms with conventional breeds and broiler farms with slower growing breeds were similar to those recorded for 2022. Broiler farms with slower growing breeds are characterized by low usage levels (mean antibiotic use in 2023: 1.6 $DDDA_F$). Persistently high usage levels at farms with slower growing broiler breeds are rare. In 2023, the number of slower growing broilers as a proportion of the overall broiler population continued to rise. With regard to broiler farms with conventional breeds, mean antibiotic use in 2023 was over 7 times higher (11.7 $DDDA_F$), no distinct downward trend in antibiotic usage levels can be distinguished, and high or persistently high usage levels are a regular occurrence. Additional efforts should be made to reduce the number of broiler farms with conventional breeds with high or persistently high usage levels.
Mean antibiotic use at broiler parent/grandparent stock rearing farms was low (5.0 $DDDA_F$), but with relatively large usage level differences between individual rearing farms. Antibiotic use at parent/grandparent stock production farms was low, with limited between-farm usage level differences.

Pig farming sector – At 5.9 $DDDA_{NAT}$, overall antibiotic use in the pig farming sector has stabilized following the prominent decline observed for 2022. In 2023, the proportion of pig farms recording action zone usage levels continued to decline, and the proportion of farms with persistently high usage levels was below 10% for each production category in this livestock sector.
In the second half of 2024, the SDa expert panel will re-evaluate the current provisional benchmark threshold (see the Terms and definitions section for a description of this term) for the weaner pigs production category and examine whether a benchmark threshold representing acceptable use can be introduced for farms with weaner pigs.

Goat farming sector – Antibiotic use at dairy goat farms was low (mean antibiotic usage level of approximately 1 $DDDA_F$), with limited between-farm usage level differences. Non-dairy goat farms were also requested to provide data on the amounts of antibiotics used, but – just like last year – it was decided not to include these data in the SDa report. This decision was made because the data on antibiotic use in non-dairy goat animal categories (i.e. fattening lambs, rearing goats, and goats kept as a hobby) were incomplete and deemed to be of insufficient quality. The SDa expert panel hopes goat farmers, veterinarians and the government will take the measures necessary to ensure the goat farming sector's data coverage will soon reach 100%.

Cattle farming sector – In 2023, overall antibiotic use in the dairy cattle farming sector remained stable at a low level of approximately 3 $DDDA_{NAT}$. Overall antibiotic use in the non-dairy cattle farming sector (i.e., suckler cow farms, rearing farms, and beef farms) continued to decline, to 0.25 $DDDA_{NAT}$. The various types of cattle farms each had over 90% of farms recording target zone usage levels, and only very few farms with persistently high usage levels.

Layer farming sector – Antibiotic use at layer farms is low and stable at about 1-2 $DDDA_F$. The majority of layer farms did not record any antibiotic use for 2023. Antibiotic use at pullet rearing farms was low, with limited between-farm usage level differences.
At layer parent/grandparent stock rearing farms, however, antibiotics were still used on a regular basis (resulting in a mean $DDDA_F$ value of 8.1), and these farms show considerable between-farm usage level differences. Antibiotic use at layer parent/grandparent stock production farms was low.

Usage of antibiotics in smaller food-producing livestock sectors

Rabbit farming sector - Following the steep decline recorded for 2022, overall antibiotic use in the rabbit farming sector rose by 8.5% in 2023 (to 25.7 $DDDA_{NAT}$). The sector's farm-level data do show progress, however, and 2023 saw fewer rabbit farms recording action zone antibiotic usage levels. The SDA expert panel expects the rabbit farming sector will be able to continue its downward $DDDA_F$ trend, which is already spanning several years.

Turkey farming sector - The turkey farming sector's overall antibiotic use in 2023 amounted to 6.1 $DDDA_{NAT}$, which represents a 34.2% reduction from the sector's 2022 $DDDA_{NAT}$ value. Turkey farms' mean $DDDA_F$ has now reached the lowest level in the sector's monitoring history. Most turkey farms recorded $DDDA_F$ values below the SDa-defined benchmark threshold, which is why the sector's reduction efforts should be aimed primarily at turkey farms with high or persistently high usage levels.

Usage of critically important agents

In most livestock sectors, use of fluoroquinolones and third- and fourth-generation cephalosporins is low and stable. In 2023, colistin use continued to decline for the third consecutive year. No or virtually no colistin was used in the broiler, turkey, dairy cattle, veal, non-dairy cattle, goat, and rabbit farming sectors, and colistin use in the pig farming sector continued to decline. The layer farming sector recorded a minor increase in colistin use.

In addition to colistin, third- and fourth-generation cephalosporins and fluoroquinolones, the EMA Antimicrobial Advice Ad Hoc Expert Group's (AMEG) classification also lists "other quinolones" as Category B antibiotics, i.e. antibiotics that are critically important in human medicine. Use of AMEG Category B antibiotics in animals should be restricted (EMA, 2019). In the Netherlands, quinolones are currently still categorized as second-choice antibiotics. Their categorization is based on the Dutch WVAB guideline, which was drawn up by the Veterinary Antibiotic Use Policy Working Group (WVAB) of the Royal Dutch Society for Veterinary Medicine (KNMvD). In the broiler and veal farming sectors, quinolones are still used on a regular basis, while in the other livestock sectors, they are used sporadically or not at all.

Veterinarians' prescription patterns

Veterinarians active at dairy cattle farms, non-dairy cattle farms, broiler farms with slower growing breeds, farms with sows and suckling piglets, and farms with fattening pigs showed relatively little variation in their 2023 prescription patterns. Prescription pattern differences between individual veterinarians active at broiler farms with conventional breeds, farms with weaner pigs, veal farms (regardless of the type of veal calves), and turkey farms were still relatively large.

The proportions of veterinarians recording action zone prescription patterns were similar for 2022 and 2023. Broiler farms with conventional breeds and rosé veal starter farms both had over a quarter of their veterinarians exceeding the action threshold for the Veterinary Benchmark Indicator (VBI). With regard to these types of farms, action is required to reduce the proportion of veterinarians with action zone prescription patterns.

Developments in antibiotic usage monitoring

- The provisional benchmark thresholds for the suckler pigs production category, turkey farms, rabbit farms, white veal farms, rosé veal starter farms, and rosé veal fattening farms will be re-evaluated in 2024. This means the SDa expert panel will assess whether the type of farm or production category's current benchmark threshold needs adjusting and examine whether a benchmark threshold representing acceptable use can be introduced for the type of farm or production category concerned.
- The benchmarking method for veterinarians will also be re-evaluated in 2024.
- Pursuant to Regulation (EU) 2019/6, as of 2026 EU member states will be legally required to collect data on the use of antimicrobial veterinary products in all food-producing animals. The implications for the Netherlands are that as of 2026 (in order to facilitate reporting as of 2027), antibiotic usage monitoring will also include usage data pertaining to goats, ducks and horses, and in 2029 (to facilitate reporting as of 2030), usage monitoring will extend to also include data on antimicrobial veterinary products used in dogs and cats. The addition of these animal species is associated with certain challenges, for instance as to how to determine the average number of animals in the respective animal populations, which is to serve as the denominator in antibiotic usage calculations. The ease with which companion animal owners can change veterinarians is another factor to be taken into account, as this complicates accurate recording of prescribed antibiotics.

Moreover, no quality assurance systems are currently in place for these animal sectors. In the sectors already subjected to antibiotic usage monitoring, quality assurance systems have facilitated and accelerated the introduction of a monitoring system. With regard to the additional animal sectors referred to above, the SDa expert panel feels it would be wise to begin preparations for their antibiotic usage monitoring in a timely manner. Otherwise, it might take longer than anticipated to include these sectors in the existing monitoring framework. Stakeholders have a key role to play in this respect. In each of the additional animal sectors, the relevant stakeholders should initiate steps to facilitate the introduction of antibiotic usage monitoring in the sector concerned. The SDa expert panel will provide advice on the implementation of a benchmarking method for the new animal sectors and animal species in a timely manner.

Terms and definitions

Benchmark threshold	For livestock farms: a value set by the SDa to which a livestock farm's usage of antibiotics (in Defined Daily Doses Animal at the farm level, $DDDA_F$) is compared. Benchmark thresholds are assigned for each type of farm or production category within a particular livestock sector. There are two different types of benchmark thresholds: benchmark thresholds representing acceptable use, and provisional benchmark thresholds. For veterinarians: the value to which the amount of antibiotics prescribed by a particular veterinarian is compared. Benchmark thresholds for veterinarians correspond to the $DDDA_F$-based benchmark thresholds for the types of farms or production categories concerned.
Benchmark threshold representing acceptable use	This type of benchmark threshold reflects a usage level deemed to be acceptable for the type of farm or production category concerned. The types of farms and production categories that are benchmarked by means of benchmark thresholds representing acceptable use, are characterized by low or very low usage levels, limited variation in $DDDA_F$ values between individual livestock farms, and limited usage level fluctuations over time. They are only assigned a single benchmark threshold: their action threshold. Livestock farms with $DDDA_F$ values exceeding this threshold are required to take action in order to reduce their antibiotic usage levels.
Cattle farming sector	In this report, the term "cattle farming sector" includes the dairy cattle farming sector (i.e. dairy cattle farms) and the non-dairy cattle farming sector (i.e. suckler cow farms, rearing farms, and beef farms). It does not include the veal farming sector (i.e. white veal farms, rosé veal starter farms, rosé veal fattening farms, and rosé veal combination farms), unless stated otherwise.
DDD_{VET}	The active-substance-based Defined Daily Dose for veterinary medicinal products. The DDD_{VET} is the assumed average dose administered to a particular type of livestock in Europe, in mg/kg body weight.

$DDDA_F$	The Defined Daily Dose Animal at the farm level. The $DDDA_F$ is used to express the amount of antibiotics used at a particular livestock farm. The $DDDA_F$ is determined by first calculating the total number of treated kilograms for a particular livestock farm for a particular year (based on the antibiotics supplied to the farm concerned), and then dividing this number by the average number of kilograms of animal present on the farm concerned. The $DDDA_F$ is expressed in DDDA/animal-year. In the initial SDa reports, the ADDD/Y unit of measurement was used.
$DDDA_{NAT}$	The Defined Daily Dose Animal at the national level. The $DDDA_{NAT}$ is used to express the amount of antibiotics used within a particular livestock sector in the Netherlands. The $DDDA_{NAT}$ is determined by first calculating the total number of treated kilograms within a particular livestock sector for a particular year, and then dividing this number by the average number of kilograms of animal present within the livestock sector concerned. The $DDDA_{NAT}$ is expressed in DDDA/animal-year.
$DDDA_{VET}$	The Defined Daily Dose Animal at the veterinarian level. The $DDDA_{VET}$ is used to express a veterinarian's antibiotic prescription pattern for a particular type of farm or production category for a particular year. To determine the $DDDA_{VET}$, the first step is to calculate the total number of treated kilograms for which a particular veterinarian prescribed antibiotics during a specific year (the overall number of treated kilograms for all livestock farms that had a registered one-to-one relationship with this veterinarian in the year concerned). This number is then divided by the average number of kilograms of animal present based on all livestock farms that had a registered one-to-one relationship with the veterinarian concerned, including those with persistently high usage levels – which are not included when determining the veterinarian's VBI value. Due to its inclusion of livestock farms with persistently high usage levels, the $DDDA_{VET}$ is better suited for monitoring trends in veterinarians' overall prescription patterns.
EUROSTAT	The statistical office of the European Union.
Livestock farms with persistently high usage levels	Livestock farms whose $DDDA_F$ values have exceeded their action threshold two years in a row. Besides being useful for sector-based usage level monitoring, identification of livestock farms with persistently high usage levels is required when determining a veterinarian's VBI value, as those farms are excluded from the SDa's VBI calculations.

Mass balance	A comparison between the number of kilograms of active substances sold according to recorded sales data and the number of kilograms of the active substances used according to veterinarian-reported delivery data (delivery records).
PCU	The Population Correction Unit. The PCU is used by the European Medicines Agency as a unit of measurement for the number of kilograms of animal. In general, the PCU is calculated using the number of animals slaughtered in a particular year (adjusted for imported and exported animals). However, in the case of livestock not kept for meat production (e.g. dairy cattle), the PCU is calculated using the number of live animals present within the livestock sector concerned.
Poultry farming sector	In this report, the term "poultry farming sector" includes all monitored poultry farms (i.e. turkey farms, broiler farms, layer farms, pullet rearing farms, rearing farms for layer or broiler parent/grandparent stock, and production farms for layer or broiler parent/grandparent stock), unless specified otherwise.
Provisional benchmark threshold	This type of benchmark threshold reflects a usage level not yet consistent with acceptable use. Following their implementation, provisional benchmark thresholds are adjusted on a regular basis while the livestock farms concerned move towards more acceptable usage levels. Types of farms and production categories benchmarked by means of provisional benchmark thresholds are characterized by relatively high mean $DDDA_F$ values, wide $DDDA_F$ distributions and substantial usage level fluctuations over time. They are only assigned a single benchmark threshold: their action threshold. Livestock farms with $DDDA_F$ values exceeding this threshold are required to take action in order to reduce their antibiotic usage levels.
Rabbit farming sector	In this report, the term "rabbit farming sector" refers to meat rabbit farms, and rabbit farming sector data pertain to all rabbits present on meat rabbit farms (i.e. breeding does with kits, weaned meat rabbits, and replacement breeding does). Collectively, these rabbits are referred to as "meat rabbits".
Transitional benchmark thresholds	Some of the livestock sectors have negotiated transitional benchmark thresholds with the Ministry of Agriculture, Nature and Food Quality in order to help livestock farmers move towards their SDa-defined benchmark threshold in a more gradual fashion.
Treated kilograms	The number of kilograms of a particular type of livestock that can be treated with a single packaging unit of the antibiotic concerned.

VBI (as implemented in 2021)	The Veterinary Benchmark Indicator. The VBI reflects a veterinarian's antibiotic prescription pattern with respect to a particular type of farm or production category in one of the livestock sectors. The VBI is calculated by first determining the total number of treated kilograms for which the veterinarian prescribed antibiotics during a particular year (the overall number of treated kilograms for all livestock farms that had a registered one-to-one relationship with this veterinarian in the year concerned) and then dividing this number by the average number of kilograms of animal present based on all livestock farms concerned. Livestock farms with persistently high usage levels are not included in VBI calculations.

Antibiotic use at the national level

Amounts of antibiotics sold and used

In 2023, overall sales of antibiotics (i.e. the overall number of kilograms of active substances sold) were 4.5% higher than the year before, and overall antibiotic use in monitored livestock sectors rose by 4.0%. These increases in the amounts of antibiotics sold and used were preceded by steep declines in 2022 (Figures 2 and 3). Figure A1 in the online appendix shows, by pharmacotherapeutic group, how the amounts sold have changed over the 2011-2023 period. The amount of antibiotics sold in 2023 represents a 76.4% reduction from the reference year of 2009. Figure 3 shows the long-term developments in both the amount of antibiotics sold (in kilograms, solid line) and the amount of antibiotics used (in kilograms, bars) in monitored livestock sectors. It also shows the annual numbers of kilograms of live weight of agricultural livestock present in the monitored livestock sectors (in metric tons, black dotted line). The bars reflect both the total amount of antibiotics used (in kilograms) and the amounts used by the individual livestock sectors. The black dotted line shows a modest downward trend in the number of kilograms of live weight of agricultural livestock, which has declined by 12% over the 2009-2023 period. The numbers of kilograms of antibiotics sold and used have declined much more prominently over this period, indicating these reductions were not solely the result of a declining livestock population.

Figure 3 also shows individual livestock sectors' relative contributions to the total number of kilograms used. It should be noted that the number of kilograms used is not an accurateindicator of the actual level of exposure to antibiotics in a particular type of livestock, as the animals' weight is not taken into account. One cannot conclude, for example, that given the small number of kilograms used in the broiler farming sector according to Figure 3, antibiotic exposure in broilers must have been relatively low. The number of Defined Daily Doses Animal ($DDDA_{NAT}$ value) is a more accurate indicator of the average level of exposure to antibiotics in a particular type of livestock (see Figure 5). Of the number of kilograms of antibiotics sold in 2023, 6,745 kg (5.8%) could not be attributed to recorded antibiotic use in monitored livestock sectors. Selective monitoring of antibiotic use in the Netherlands seems to be the most likely reason why a proportion of the kilograms of antibiotics sold cannot be attributed to a particular sector or animal category. As the SDa's monitoring results currently only include antibiotic use in poultry, dairy cattle, non-dairy cattle, veal calves, pigs, and meat rabbits, no data are available on antibiotic use in other animals, such as sheep, horses, and companion animals. It is possible to identify which substances included in the total volume of antimicrobial veterinary medicines sold are only authorized for use in non-food-producing animals and

horses. Sales of these substances amounted to 4,542 kg (3.9% of overall sales) in 2023, and have fluctuated between 4,000 and 4,900 kg (2.3-3.9% of overall sales) since 2018. Stockpiling by wholesalers or veterinary practices can also contribute to discrepancies between the amounts of antibiotics sold and used. A range of factors determine how many kilograms of antibiotics are sold during a particular year. For example, if a particular antimicrobial veterinary medicinal product is expected to see a price increase next year, this will often lead to stockpiling of the product concerned during the current year, and lower sales volumes in the following year. This is what happened between 2016 and 2017 and between 2019 and 2020. The total numbers of kilograms used and sold are likely to move closer together when, in a couple of years, usage monitoring will extend to include the remaining animal species. After all, pursuant to Regulation (EU) 2019/6, as of 2026 EU member states will be legally required to collect data on the use of antimicrobial veterinary medicinal products in goats, sheep, and horses, among other animal species. It should be noted that occasionally, larger discrepancies between the numbers of kilograms used and sold will still occur, due to year-to-year fluctuations in the amounts of veterinary medicinal products kept in stock by wholesalers and veterinary practices (i.e. products that have been purchased but not yet prescribed). Article 113 of Regulation (EU) 2019/6 also introduces a new challenge, as it provides a legal basis for purchasing antimicrobial veterinary medicinal products not authorized in the Netherlands in other EU member states, for use under the cascade in the event of shortages of Dutch veterinary medicinal products. While data on the use of these products in the Netherlands will be recorded, corresponding sales data might not. Vice versa, under this Regulation, other EU member states could import Dutch veterinary medicinal products initially purchased by a party located in the Netherlands. The EMA's Antimicrobial Sales and Use (ASU) data monitoring platform is expected to enable identification of such data discrepancies.

Figure 2. Developments in sales of antibiotics over the 1999-2023 period, in number of kilograms of active substances sold (x1,000) (source: FIDIN), by main pharmacotherapeutic group

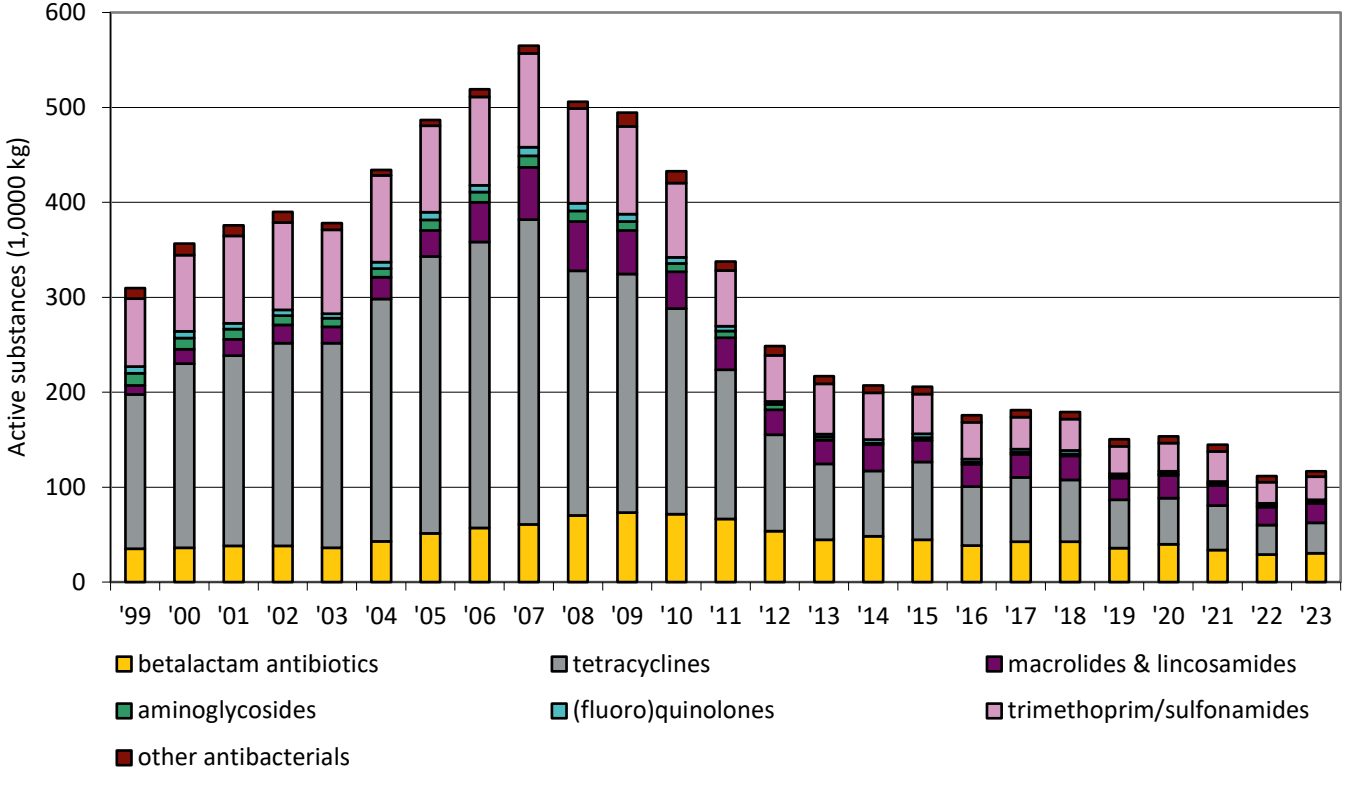
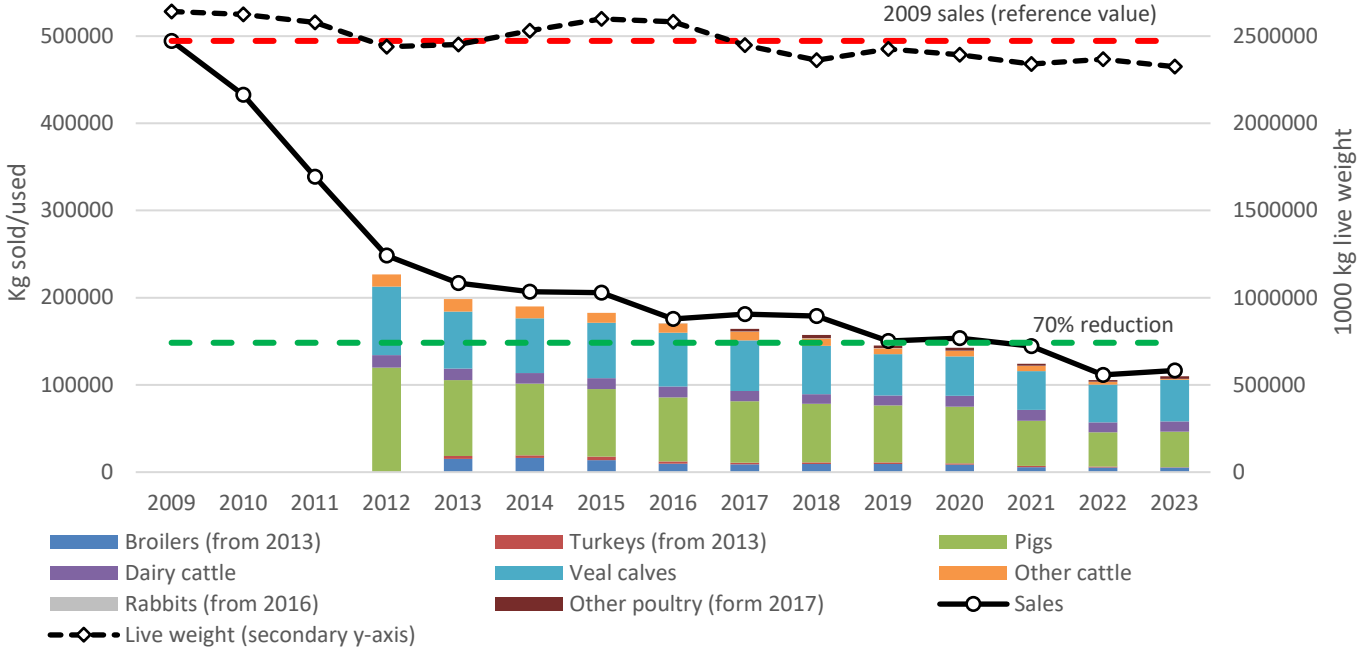


Figure 3. Long-term developments in the numbers of kilograms of active substances sold and used. The bars comprise the numbers of kilograms used in the individual monitored livestock sectors, and the black dotted line reflects the annual numbers of kilograms of live weight of agricultural livestock for the livestock sectors subjected to SDa monitoring in 2023



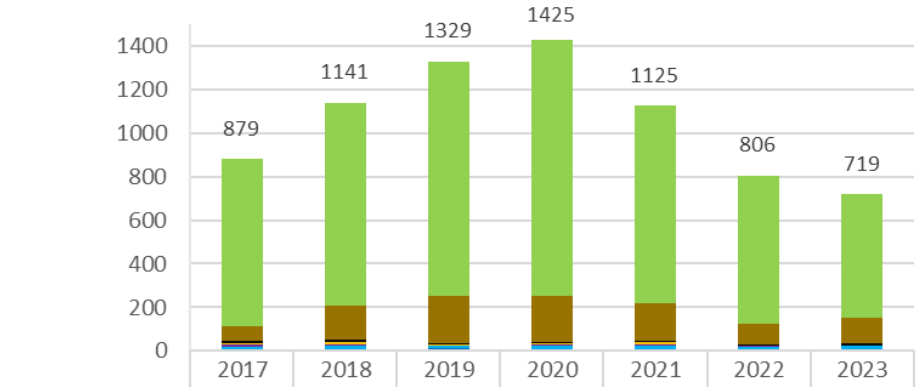
Usage of critically important agents

Use of fluoroquinolones and third- and fourth-generation cephalosporins in the Dutch livestock sector is low and stable. In 2023, fluoroquinolones and third- and fourth-generation cephalosporins were used very sparingly, if at all, in the various monitored livestock sectors (with a maximum of 0.15 $DDDA_{NAT}$, recorded for the turkey farming sector). The target value for livestock farms' usage of these third-choice antibiotics is 0 $DDDA_F$.

In 2023, colistin use continued to decline for the third consecutive year and was 10.8% lower than the year before. No or virtually no colistin was used in the broiler, turkey, dairy cattle, veal, non-dairy cattle, goat, and rabbit farming sectors. Colistin use in pigs continued to decline, by 16.6%. Colistin use in layers, however, rose by 21.0% (Figure 4). Layers are the only animal species category exceeding the EMA's benchmark threshold of 1 mg/PCU, with colistin use amounting to 1.7 mg/PCU (see the Terms and definitions section for a description of this unit of measurement).

In addition to colistin, third- and fourth-generation cephalosporins and fluoroquinolones, the EMA Antimicrobial Advice Ad Hoc Expert Group's (AMEG) classification also lists "other quinolones" as Category B antibiotics, i.e. antibiotics that are critically important in human medicine (EMA, 2019). In the Netherlands, quinolones are categorized as second-choice antibiotics. They are used on a regular basis in the broiler and veal farming sectors, while in the other livestock sectors, they are used sporadically or not at all (Table A1).

Figure 4. Colistin use in kilograms of active substance from 2017 to 2023, by animal species category



	2017	2018	2019	2020	2021	2022	2023
Pigs	767	935	1075	1175	905	683	570
Laying hens	66	152	218	209	177	97	117
Other poultry*	13	13	7	7	2	3	8
Other cattle	2	8	4	8	11	1	0
Dairy cattle	12	8	4	5	5	4	3
Veal calves	13	15	11	13	23	14	15
Broilers	5	7	8	9	3	5	5
Rabbits	0	1	3	0	0	0	0
Turkeys	0	0	0	0	0	0	1
Total	879	1141	1329	1425	1125	806	719

* In this figure, the “Other poultry” category includes layer pullets, layer parent/grandparent stock, and broiler parent/grandparent stock.

Antibiotic use by livestock sector

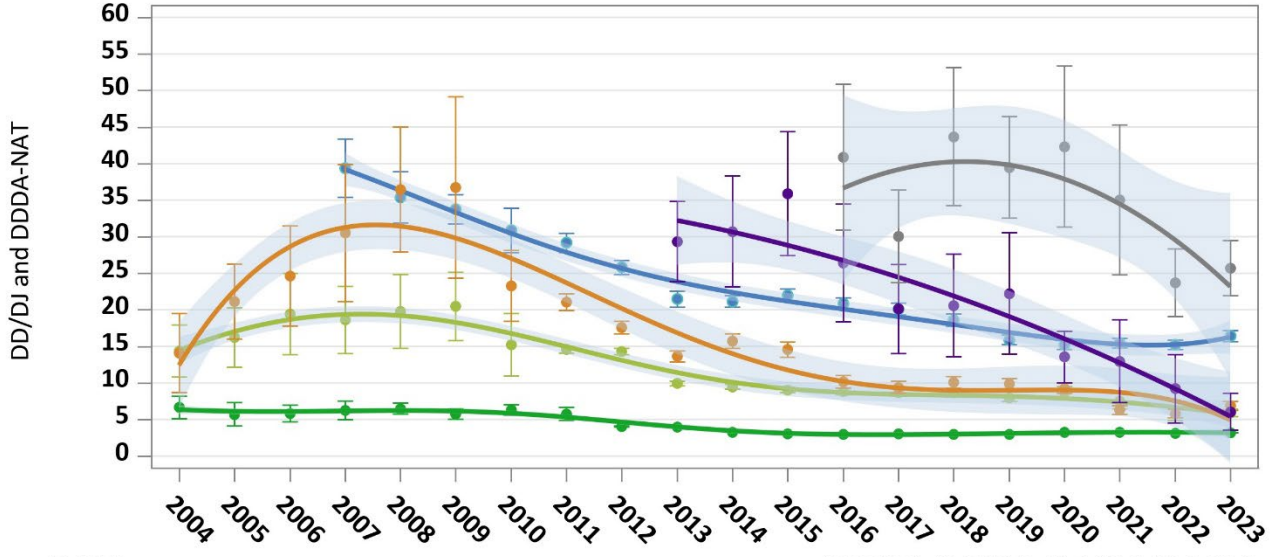
This chapter describes the trends observed in individual livestock sectors' overall antibiotic use in terms of $DDDA_{NAT}$ (Defined Daily Dose Animal at the national level), with the information presented in sector-specific sections. The main food-producing livestock sectors (sectors comprising at least 250 livestock farms each) are discussed first, followed by the smaller food-producing livestock sectors. Figure 5 shows the long-term $DDDA_{NAT}$ developments for the various livestock sectors. A sector's $DDDA_{NAT}$ value reflects the average number of days per year an animal in the livestock sector concerned was treated. In addition to the $DDDA_{NAT}$-based antibiotic usage data, the sections below also include information on antibiotic usage trends and benchmarking results for the various types of farms or production categories. When presenting farm-level antibiotic usage data, $DDDA_F$ (Defined Daily Dose Animal at the farm level) values are used. Livestock farms are benchmarked by means of one of the following types of SDa-defined benchmark thresholds:

1. Benchmark thresholds representing acceptable use, which do not have to be adjusted for several years following their implementation
2. Provisional benchmark thresholds, which have to be adjusted on a regular basis

Some of the livestock sectors (the turkey, rabbit, and broiler farming sectors) have negotiated transitional benchmark thresholds with the Ministry of Agriculture, Nature and Food Quality in order to help livestock farmers move towards their SDa-defined benchmark threshold in a more gradual fashion. The transitional benchmark thresholds are used during a predefined period, after which will be replaced by the SDa-defined benchmark threshold. The sector-negotiated transitional benchmark thresholds and their respective periods of validity can be found in Tables A55 to A58 in the online appendix.

The sector-specific sections below also include information on the prevalence of persistently high antibiotic usage levels (i.e. $DDDA_F$ values that have exceeded the SDa-defined action threshold two years in a row).

Figure 5. Long-term developments in antibiotic use according to LEI Wageningen UR data (in DD/AY, for 2004 to 2010) and SDa data (in DDDA$_{NAT}$, for 2011 to 2023), presented as so-called spline curves, with point estimates and 95% confidence intervals for each year. Tabulated sector-specific usage data are included underneath the graph, presented from high to low based on the sectors' overall antibiotic use in 2023. Underlying data can be found in the appendix



	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Rabbits	.	.	.	.	.	.	.	.	.	.	.	.	40.9	30.1	43.7	39.5	42.4	35.1	23.7	25.7
Veal calves	.	.	.	39.4	35.4	33.8	30.9	29.2	25.9	21.5	21.2	22.1	20.9	20.1	18.6	15.9	15.2	15.5	15.3	16.4
Broilers	14.1	21.2	24.7	30.5	36.5	36.8	23.3	21.1	17.6	13.7	15.8	14.6	10.2	9.4	10.1	9.9	9.3	6.3	5.8	6.9
Turkeys	.	.	.	.	.	.	.	.	.	29.4	30.7	35.9	26.4	20.2	20.6	22.3	13.6	13.0	9.2	6.1
Pigs	14.4	16.2	19.5	18.7	19.8	20.5	15.2	14.6	14.3	10.0	9.5	9.0	8.9	8.7	8.7	8.0	8.8	7.6	5.8	5.9
Dairy cattle	6.7	5.7	5.9	6.3	6.5	5.8	6.3	5.8	4.1	4.0	3.3	3.1	3.0	3.1	3.0	3.0	3.3	3.3	3.2	3.2

Main food-producing livestock sectors

Veal farming sector

In 2023, overall antibiotic use in the veal farming sector increased by 7.6%, to 16.4 $DDDA_{NAT}$. Antibiotic use in this livestock sector showed a downward trend from 2015 to 2020, stabilized between 2020 and 2022, and then went up in 2023 (Figure 5). Persistently high usage levels are still a regular occurrence in this sector. Measures need to be taken to reduce the amounts of antibiotics used. The question is how this should be realized, considering the veal farming sector's relatively high usage levels and pronounced between-farm usage level differences in comparison with other livestock sectors. As veal farmers usually obtain their veal calves from various dairy cattle farms, which are often located abroad, the veal farming sector has a relatively open character. Additional reductions in the amounts of antibiotics used in this sector will probably require structural measures in addition to conventional measures such as biosecurity, feed and barn climate optimization. The sector should take a close look at how it is structured and the performance of its supply chain of dairy cattle farms, in an effort to reduce the need for antibiotics by making sure veal farmers are supplied with healthier calves and reducing the spread of infectious diseases. The practice of importing veal calves should also be taken into account in this respect.
On January 1, 2023, the minimum age at which German calves are allowed to be transported was increased from 14 to 28 days, resulting in higher body weights at the start of the production cycle. However, the denominator used in $DDDA_{NAT}$ calculations (i.e. the average number of kilograms of animal present in the livestock sector) has not been adjusted to account for this. It remains to be seen how the new minimum transport age will affect the veal farming sector's $DDDA_{NAT}$ values.

Revised results for the years 2019-2022

In 2023, the SDa received revised veal farming sector data for the 2019-2023 period, as an error was detected in the livestock sector's registration system. Due to this error, which was detected in 2023, delivery record data could be attributed to both starter stage and fattening stage rosé veal calves on a farm. In addition, it was discovered that at the time of data submission to the SDa, some of the veal farming sector's data for the respective reporting years had not yet been processed. In light of this, some revisions have been made to previously reported veal farming sector data for the years 2019-2022. The most important revisions are included in the appendix to this report, in Tables A62 to A64.

Antibiotic use by type of farm

All types of veal farms (white veal farms, rosé veal starter farms, rosé veal fattening farms, and rosé veal combination farms) show substantial between-farm usage level differences. The rosé veal combination farms reporting category has now been largely discontinued, with the farms' antibiotic usage data being recorded under either the rosé veal starter farms reporting category or the rosé veal fattening farms reporting category.

Antibiotic use at white veal farms has been relatively stable over the past six years, at approximately 20 $DDDA_F$ (Figure 8a). White veal farms' 2023 usage levels show a lot of variation, with $DDDA_F$ values exhibiting a nearly symmetrical distribution curve (Figure 6). White veal farms are also characterized by substantial year-to-year fluctuations in $DDDA_F$ values (Figure A4), which suggests white veal farmers have difficulty getting their use of antibiotics under control.

Mean antibiotic use at rosé veal starter farms has been hovering around the 70 $DDDA_F$ level since 2019, and usage levels differ substantially between individual farms (Figures 7 and 8b). Hardly any rosé veal starter farms recorded low usage levels for 2023, and similar to white veal farms, rosé veal starter farms show considerable year-to-year usage level fluctuations (Figure A6). A new calculation method, which will also provide group-based information on the amounts of antibiotics used in veal calves, is expected to be implemented in mid-2024. The SDa expert panel hopes this will help raise veal farmers' awareness and will eventually result in a downward trend in their antibiotic use. The substantial between-farm usage level differences do suggest there is room for improvement in this respect.

Antibiotic use at rosé veal fattening farms is relatively low, with mean usage levels of approximately 4 $DDDA_F$ since 2019, the year in which new benchmark thresholds were introduced. Veal fattening farms do, however, show considerable variation in $DDDA_F$ values (Figure 8c).

As stated above, on January 1, 2023, the minimum age at which German calves are allowed to be transported was increased from 14 to 28 days, resulting in higher body weights at the start of the production cycle. The denominator used in $DDDA_F$ and $DDDA_{NAT}$ calculations (i.e. the average number of kilograms of animal present in the livestock sector) has not been adjusted to account for this, and it remains to be seen how the new minimum transport age will affect the veal farming sector's $DDDA_F$ and $DDDA_{NAT}$ values.

Figure 6. 2023 $DDDA_F$ distribution for white veal farms (N = 747). The red line represents the SDa-defined provisional benchmark threshold

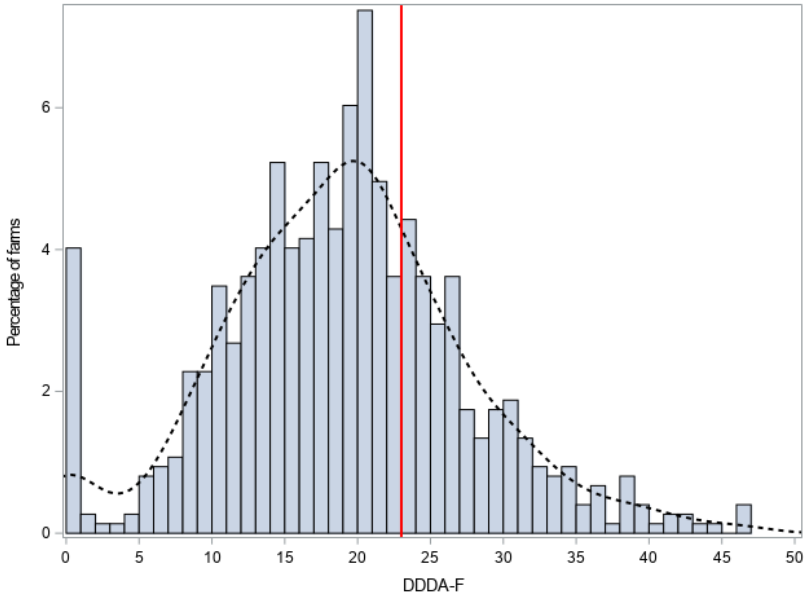
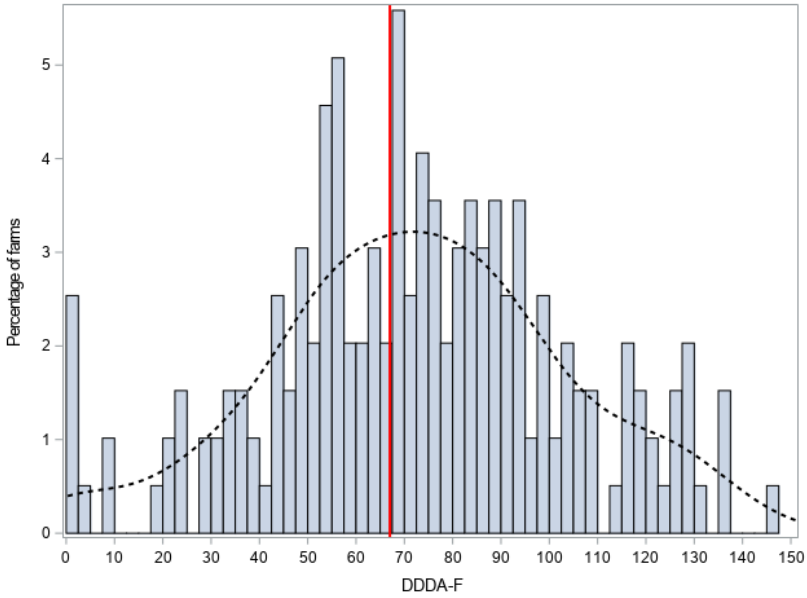
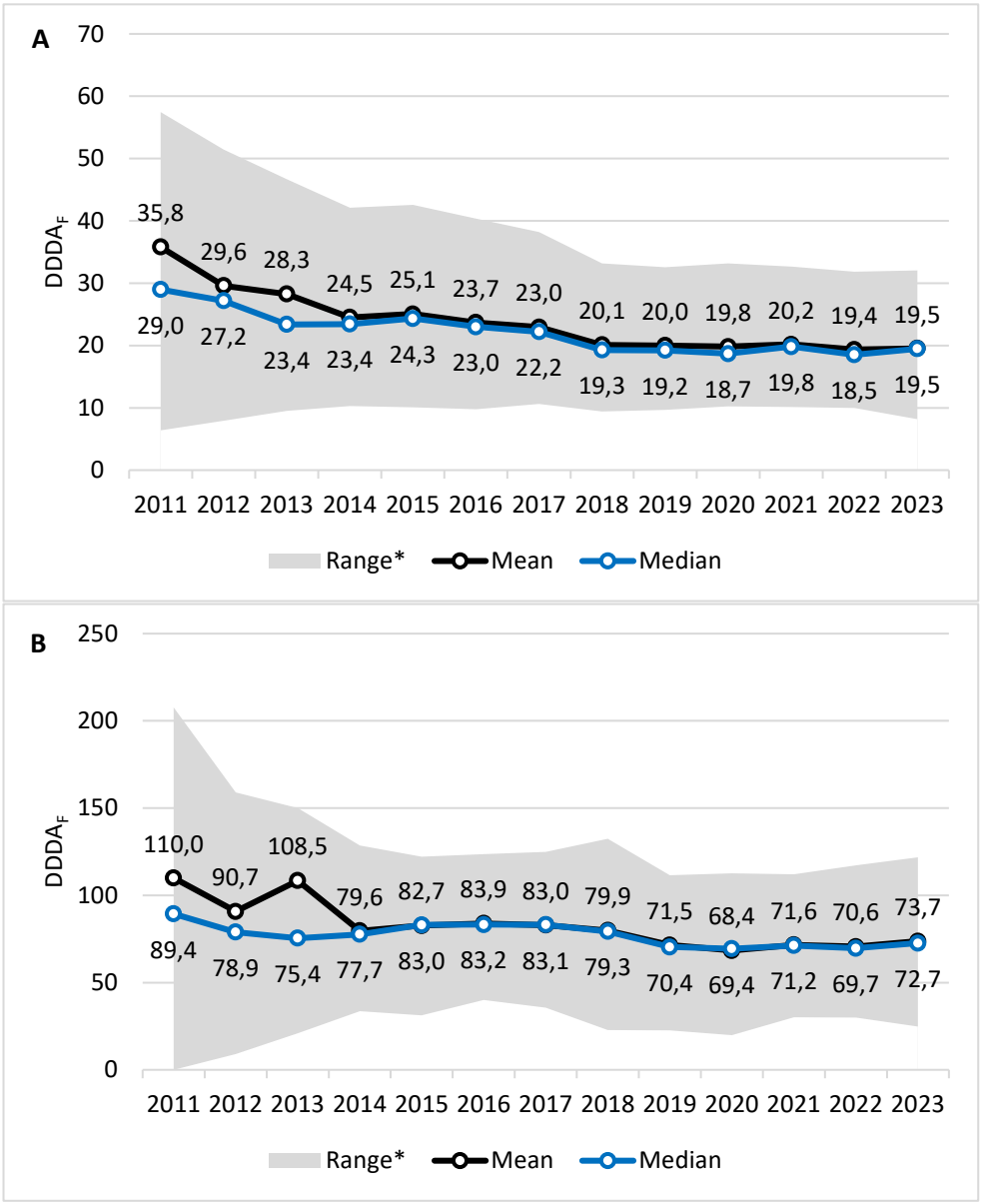
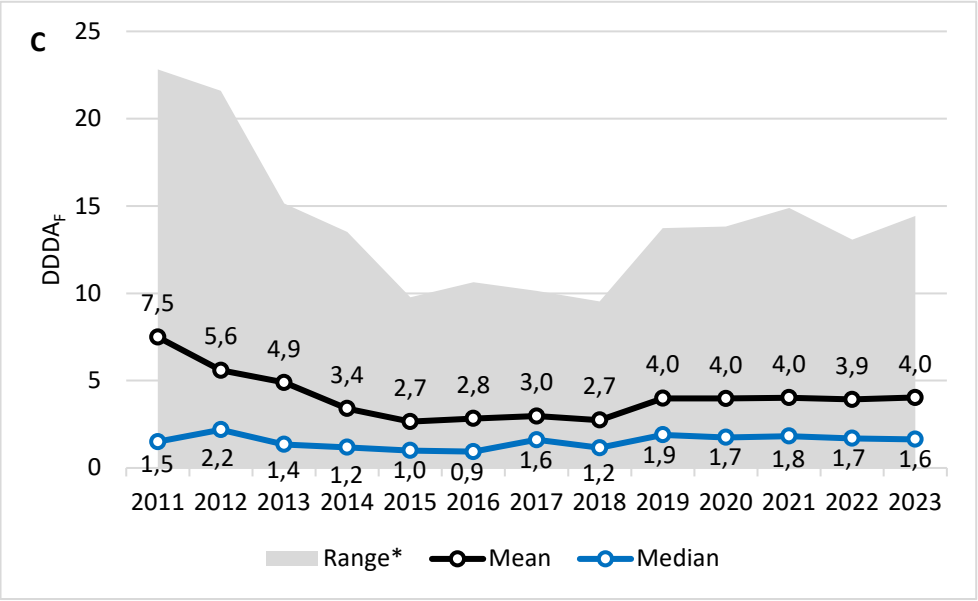


Figure 7. 2023 $DDDA_F$ distribution for rosé veal starter farms (N = 201). The red line represents the SDa-defined provisional benchmark threshold



Figures 8a to 8c. Long-term $DDDA_F$ trends for (a) white veal farms, (b) rosé veal starter farms, and (c) rosé veal fattening farms. The graphs show the mean and median $DDDA_F$ values and $DDDA_F$ ranges for the years concerned





* DDDA$_F$ ranges represent the middle 90% of farms, with the lower limit corresponding to the 5th percentile and the upper limit corresponding to the 95th percentile.

Benchmarking

White veal farms are benchmarked by means of a provisional benchmark threshold of 23 DDDA$_F$. In 2023, the proportion of white veal farms with action zone usage levels was 27%, slightly higher than the year before (Table 1). The proportion of farms with persistently high usage levels also went up slightly but was still relatively small. This is in part due to the substantial year-to-year usage level fluctuations observed for individual farms. With regard to white veal farms, reduction efforts should still be aimed at across-the-board usage level reductions.

The majority of rosé veal starter farms exceeded their 67 DDDA$_F$ provisional benchmark threshold in 2023. A large proportion of farms had persistently high usage levels, and this number was slightly higher than the year before (Table 1).

Rosé veal fattening farms are benchmarked by means of a 4 DDDA$_F$ benchmark threshold representing acceptable use. Although rosé veal fatting farms' median antibiotic use in 2023 was low (1.6 DDDA$_F$), a relatively large proportion recorded action zone usage levels (Table 1). The number of farms with persistently high usage levels was relatively high as well. In view of these findings, efforts to reduce antibiotic use at rosé veal fattening farms should be focused on the farms with high or persistently high DDDA$_F$ values.

The veal farming sector's coaching program for farmers with persistently high usage levels, which was introduced in 2023, has not yet yielded the desired effect. Neither white veal farms nor rosé veal starter farms nor rosé veal fattening farms have shown a decrease in the proportion of farms with persistently high usage levels, but the SDa expert panel expects this will happen with the continuation of this program. The coaching program uses a step-by-step approach to reduce antibiotic usage levels at a selection of farms with persistently high usage levels. As a first step, an advisory team is assembled, comprising the veal farmer, the farmer's veterinarian, and the farmer's feed consultant/a representative of the legal owner of the calves. This advisory team prepares an action plan, among other things, which is aimed at reducing the amount of antibiotics used at the farm concerned. If after 1.5 years the desired usage level reduction has not been realized, an external process supervisor is added to the advisory team (Stichting Brancheorganisatie Kalversector (SBK), 2024).

Table 1. 2022 and 2023 benchmarking results for veal farms according to the SDa-defined action threshold, by type of farm

Number of farms	Type of farm							
	White veal farms		Rosé veal starter farms		Rosé veal fattening farms		Rosé veal combination farms	
	2022	2023	2022	2023	2022	2023	2022	2023
In target zone	554 (74%)	542 (73%)	93 (46%)	82 (41%)	352 (66%)	333 (65%)	26 (40%)	22 (34%)
In action zone	198 (26%)	205 (27%)	108 (54%)	119 (59%)	184 (34%)	176 (35%)	39 (60%)	42 (66%)
With persistently high usage levels	71 (9%)	78 (10%)	72 (36%)	74 (37%)	134 (25%)	129 (25%)	16 (25%)	11 (17%)

Broiler farming sector

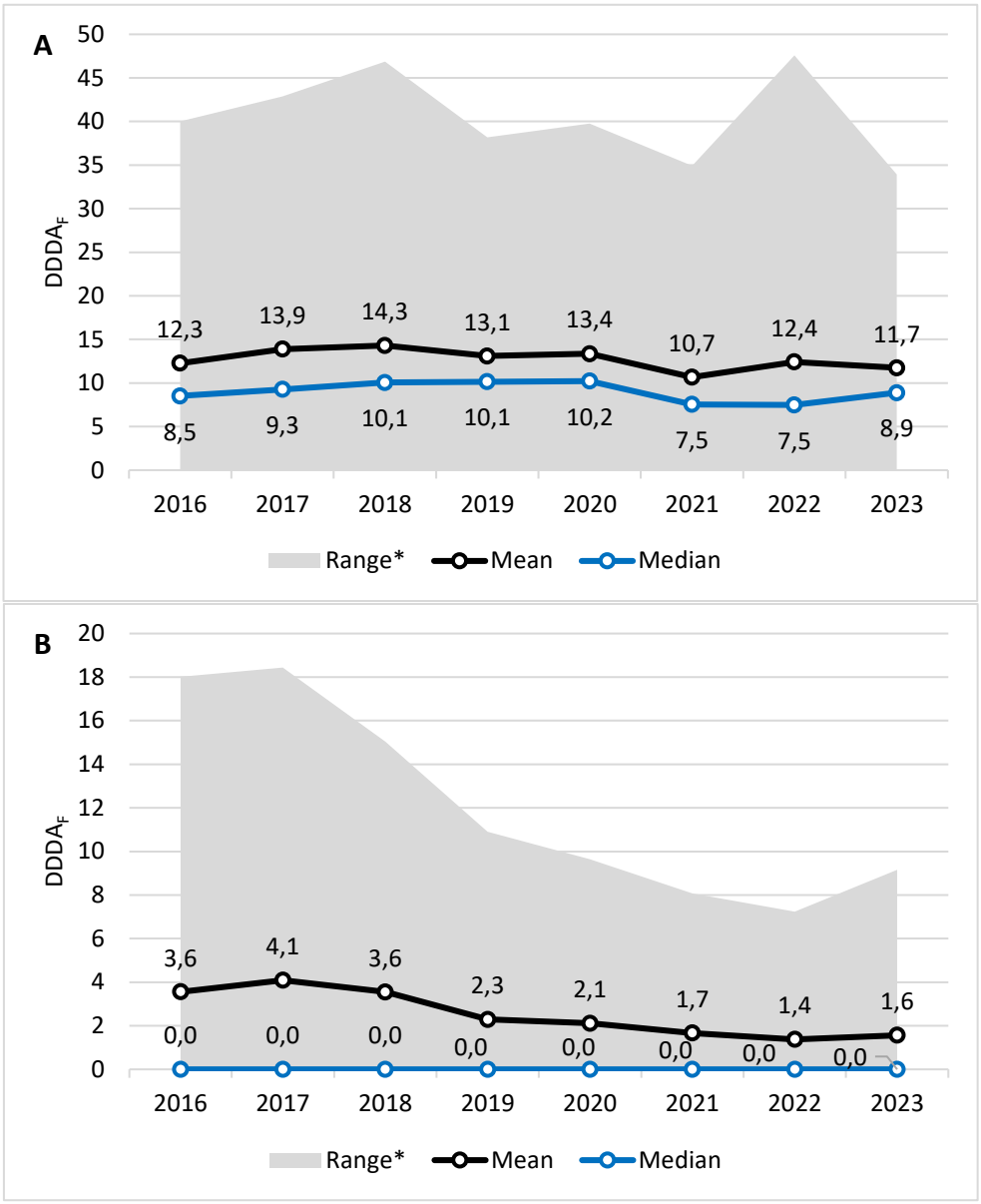
Overall antibiotic use in the broiler farming sector rose from 5.8 $DDDA_{NAT}$ in 2022 to 6.9 $DDDA_{NAT}$ in 2023. Broiler farms' mean antibiotic use (in $DDDA_F$), however, did not show a similar increase. This difference between the sector's $DDDA_{NAT}$ and $DDDA_F$ developments over the 2022-2023 period can be explained by a substantial decline in the CBS-reported number of broilers, on which the denominator used in $DDDA_{NAT}$ calculations is based. The denominator used in $DDDA_F$ calculations is based on sector-provided data on the number of broilers present at individual broiler farms, and according to these sector-provided data, the broiler population has not declined to the same extent. Broiler farms' $DDDA_F$ values for 2023 show usage levels similar to the year before, and it is unclear why CBS and the broiler farming sector differ in their broiler population data, and why this discrepancy varies from year to year. Previous efforts by the broiler farming sector, in consultation with the parties involved, to find out the reason for this discrepancy have not provided a clear explanation. The SDa expert panel urges the sector to revisit this issue, as this uncertainty regarding animal population data is undesirable. The broiler farming sector's $DDDA_F$-based relative contributions of first-, second- and third-choice antibiotics are not in line with the $DDDA_{NAT}$-based equivalents (Tables A1 and A13 in the online appendix, respectively). Second-choice antibiotics accounted for only 43.6% of the sector's antibiotic use in terms of $DDDA_F$, while accounting for 72.0% of its antibiotic use in terms of $DDDA_{NAT}$. Previous reporting years showed similar discrepancies between the sector's $DDDA_F$- and $DDDA_{NAT}$-based relative contributions of second-choice antibiotics. This discrepancy can be explained by broilers' body weight at the time of treatment. In comparison with first-choice antibiotics, second-choice antibiotics are associated with a higher body weight at the time of treatment. While the denominator in $DDDA_F$ calculations is based on broilers' body weight at the time of treatment, which in the event of treatment with second-choice antibiotics amounts to an average of 1.8 kg, the denominator in $DDDA_{NAT}$ calculations is based on broilers' standardized body weight of 1 kg, resulting in a lower denominator in $DDDA_{NAT}$ calculations for second-choice antibiotics. This lower denominator subsequently leads to a relatively high $DDDA_{NAT}$ value for second-choice antibiotics.

Antibiotic use by type of farm

A distinction is made between two categories of broilers: conventional breeds and slower growing breeds. Conventional breeds are mainly intended for the foodservice industry (e.g. restaurants, catering operations, and institutions) and for export. Slower growing breeds, on the other hand, are primarily intended for supermarkets in the Netherlands. In 2023, the proportion of slower growing broiler breeds continued to rise, with these breeds accounting for 51% of the average number of broilers present at broiler farms. Mean $DDDA_F$ values recorded for broiler farms with conventional breeds consistently exceed those recorded for farms with slower growing breeds (Figures 9a and 9b). In 2023, mean antibiotic use at broiler farms with conventional breeds declined slightly, while their median $DDDA_F$ value increased (Figure 9a). This reduction in mean $DDDA_F$ despite the higher median $DDDA_F$ value is due to a narrowing of the $DDDA_F$ distribution. No distinct long-term trend in antibiotic use at broiler farms with conventional breeds can be distinguished (Figure 9a). There is still considerable between-farm variation in $DDDA_F$ values, which suggests additional usage level reductions should be feasible (Figure 10). $DDDA_F$ values for broiler farms with slower growing breeds have stabilized at a low level (Figure 9b). The majority of these farms (77%) did not record any antibiotic use for 2023. The shift from conventional towards slower growing breeds over the past few years has contributed considerably to the decline in antibiotic use observed for the broiler farming sector as a whole.

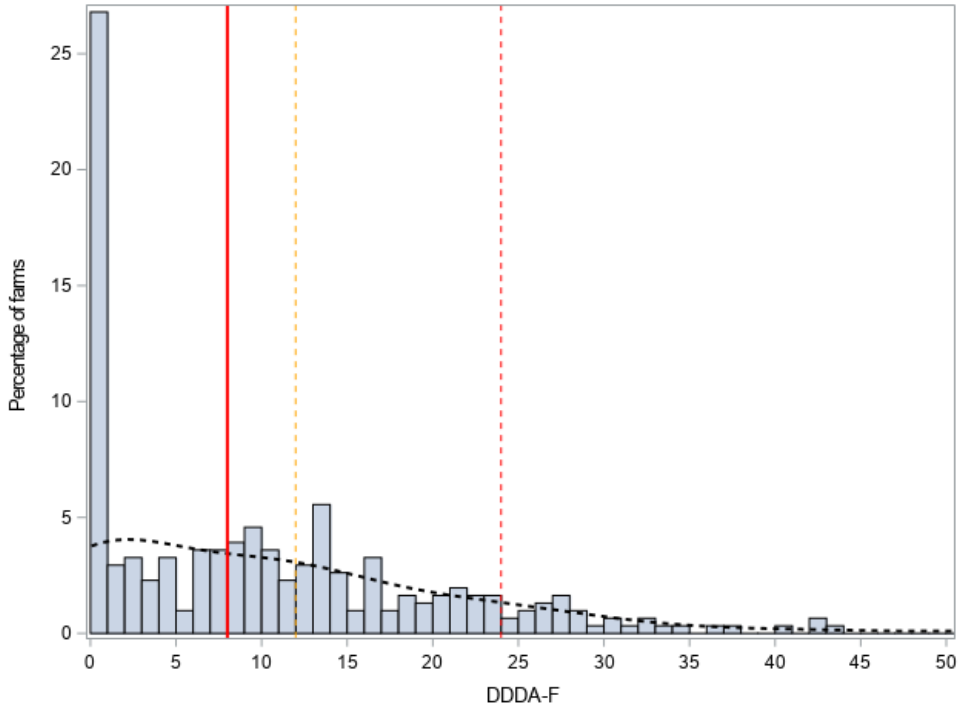
In 2023, mean antibiotic use at broiler parent/grandparent stock rearing farms was low (5.0 $DDDA_F$), but with relatively large usage level differences between individual rearing farms (Figure A17). Antibiotic use at parent/grandparent stock production farms was low, with limited between-farm usage level differences (Figure A18). Please be aware that antibiotic use at these rearing and production farms does not contribute to the broiler farming sector's $DDDA_{NAT}$ value.

Figures 9a and 9b. Long-term $DDDA_F$ trends for (a) broiler farms with conventional breeds, and (b) broiler farms with slower growing breeds. The graphs show the mean and median $DDDA_F$ values and $DDDA_F$ ranges for the years concerned



* $DDDA_F$ ranges represent the middle 90% of farms, with the lower limit corresponding to the 5th percentile and the upper limit corresponding to the 95th percentile.

Figure 10. 2023 DDDA$_F$ distribution for broiler farms with conventional breeds (N = 306). The red solid line represents the SDa-defined action threshold



Benchmarking

In 2019, the broiler farming sector's benchmark threshold representing acceptable use was set at 8 DDDA$_F$, irrespective of the type of breed. As agreed with the Ministry of Agriculture, Nature and Food Quality, this benchmark threshold is phased in over several years, with separate implementation processes for both types of broiler farms (i.e. those with conventional and those with slower growing breeds). Details on the phased implementation of this benchmark threshold can be found in the online appendix (Tables A55 and A56). In 2023, broiler farms continued to be benchmarked by means of their sector-negotiated signaling and action thresholds, which were 12 and 24 DDDA$_F$, respectively, for broiler farms with conventional breeds, and 8 and 12 DDDA$_F$, respectively, for broiler farms with slower growing breeds. In 2023, 53% of broiler farms with conventional breeds exceeded the SDa-defined benchmark threshold, a slightly higher proportion of farms than the year before. The majority of these farms had also recorded action zone usage levels for 2022 (Table 2). With regard to broiler farms with conventional breeds, it should be noted that the SDa-defined action threshold of 8 DDDA$_F$ is deemed to be a distant goal to work towards, and that the broiler farming sector is

currently still using higher benchmark thresholds. In 2023, 13% of broiler farms with conventional breeds exceeded their 24 $DDDA_F$ sector-negotiated action threshold, and 26% exceeded their 12 $DDDA_F$ sector-negotiated signaling threshold (Table 2). The $DDDA_F$ distribution for broiler farms with conventional breeds has a long tail consisting of farms with $DDDA_F$ values several times the benchmark threshold representing acceptable use (Figure 10). Reducing the amounts of antibiotics used at farms included in this tail should be the main focus of reduction efforts for broiler farms with conventional breeds. A recent study has identified several measures that can help reduce the amounts of antibiotics used at broiler farms. These measures include the presence and use of a hygiene lock, the use of stable-specific clothing, and materials being stored per stable, in a recognizable manner (Mallioris et al., 2023).
In 2023, 6% of broiler farms with slower growing breeds exceeded the SDa-defined action threshold, and hardly any farms with slower growing breeds had persistently high usage levels (Table 2). Evidently, the introduction of slower growing breeds has had a very positive effect on the usage of antibiotics in the broiler farming sector.

Table 2. 2022 and 2023 benchmarking results for broiler farms according to both the SDa-defined action threshold and sector-negotiated transitional benchmark thresholds, by type of farm

Type of benchmark threshold(s)	Number of farms	Type of farm			
		Broiler farms with conventional breeds		Broiler farms with slower growing breeds	
		2022	2023	2022	2023
SDa-defined	In target zone	187 (52%)	143 (47%)	577 (96%)	561 (94%)
	In action zone	170 (48%)	163 (53%)	22 (4%)	34 (6%)
	With persistently high usage levels	109 (31%)	107 (35%)	2 (0%)	3 (1%)
Sector-negotiated (transitional)	In target zone	246 (69%)	187 (61%)	577 (96%)	561 (94%)
	In signaling zone	63 (18%)	80 (26%)	12 (2%)	20 (3%)
	In action zone	48 (13%)	39 (13%)	10 (2%)	14 (2%)
	With persistently high usage levels	10 (3%)	15 (5%)	1 (0%)	0 (0%)

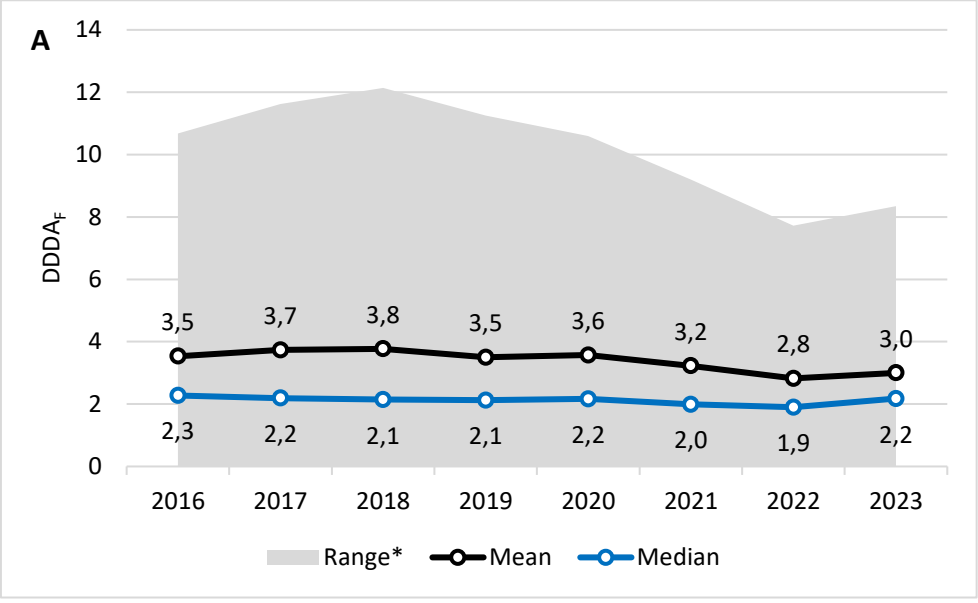
Pig farming sector

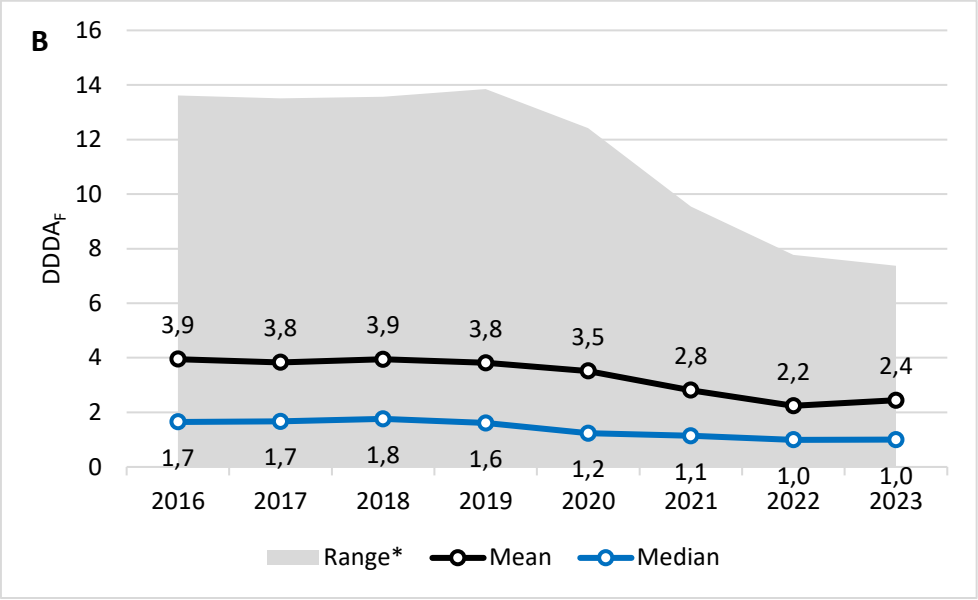
Overall antibiotic use in the pig farming sector has stabilized following the prominent decline observed for 2022. The pig farming sector's 2023 $DDDA_{NAT}$ value of 5.9 represents a 71% reduction from the 2009 reference year.

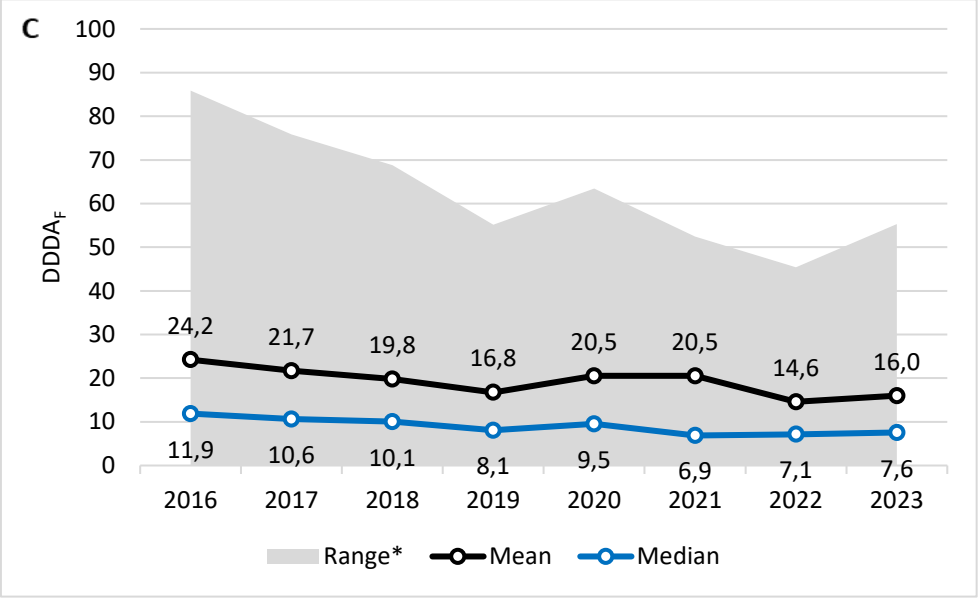
Antibiotic use by production category

Antibiotic usage data for the individual production categories (i.e. sows/suckling piglets, weaner pigs, and fattening pigs) show a similar picture (Figures 11a to 11c). Farms with sows and suckling piglets and farms with fattening pigs are characterized by low mean $DDDA_F$ values, and $DDDA_F$ ranges that have generally narrowed over the years. Antibiotic use at farms with weaner pigs had declined substantially over the 2016-2022 period, but rose slightly in 2023. This rise was accompanied by a wider $DDDA_F$ range.

Figures 11a to 11c. Long-term $DDDA_F$ trends for (a) farms with sows and suckling piglets, (b) farms with fattening pigs, and (c) farms with weaner pigs. The graphs show the mean and median $DDDA_F$ values and $DDDA_F$ ranges for the years concerned







* DDDA$_F$ ranges represent the middle 90% of farms, with the lower limit corresponding to the 5th percentile and the upper limit corresponding to the 95th percentile.

Benchmarking

Both the sows and suckling piglets production category and the fattening pigs production category is benchmarked by means of a 5 $DDDA_F$ benchmark threshold representing acceptable use. In 2023, the proportion of farms with sows and suckling piglets recording action zone usage levels was 12%, slightly lower than in 2022. At 11%, the proportion of farms with fattening pigs included in the action zone was identical to the proportion recorded for 2022. In 2023, both production categories saw a decline in the proportion of farms with persistently high usage levels (Table 3).

Table 3. 2022 and 2023 benchmarking results for farms with sows and suckling piglets and farms with fattening pigs, according to the SDa-defined action threshold

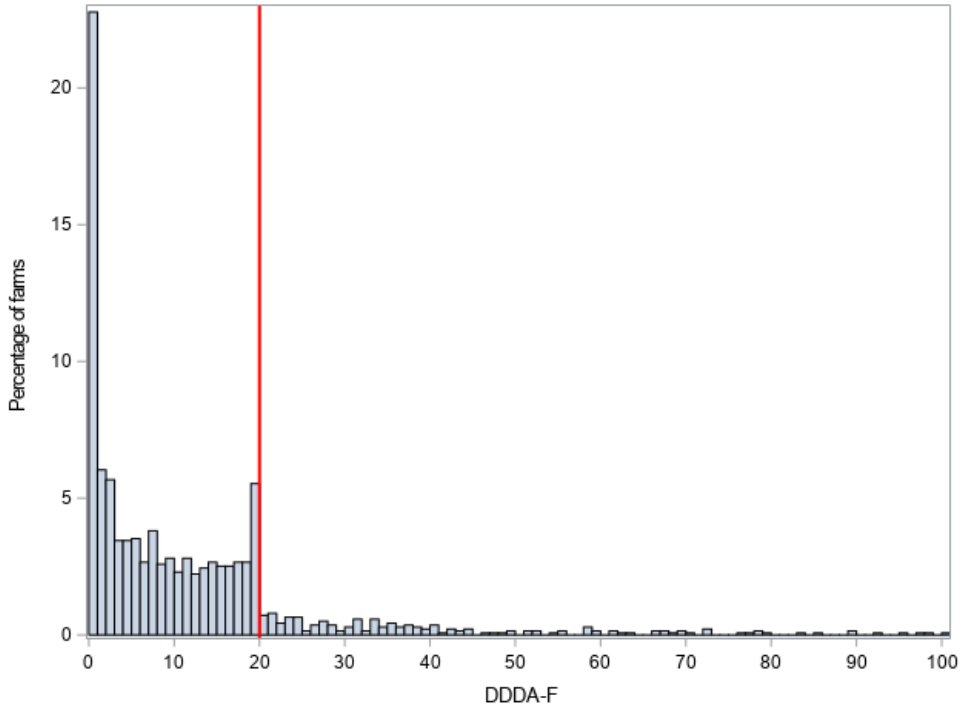
Number of farms	Production category			
	Sows/suckling piglets		Fattening pigs	
	2022	2023	2022	2023
In target zone	1,140 (86%)	1,102 (88%)	2,601 (89%)	2,523 (89%)
In action zone	178 (14%)	148 (12%)	330 (11%)	297 (11%)
With persistently high usage levels	107 (8%)	68 (5%)	146 (5%)	81 (3%)

The weaner pigs production category is currently still benchmarked by means of a provisional benchmark threshold. The SDa expert panel will re-evaluate this provisional benchmark threshold in 2024 and examine whether a benchmark threshold representing acceptable use can be introduced for farms with weaner pigs. Despite a rise in the mean $DDDA_F$ value for farms with weaner pigs, the proportion of farms with action zone usage levels declined slightly in 2023, to 15% (Table 4). Notably, a relatively large percentage of farms recorded usage levels just below their 20 $DDDA_F$ benchmark threshold (Figure 12).

Table 4. 2022 and 2023 benchmarking results for farms with weaner pigs, according to the SDa-defined action threshold

Number of farms	Weaner pigs production category	
	2022	2023
In target zone	1,233 (84%)	1,184 (85%)
In action zone	230 (16%)	208 (15%)
With persistently high usage levels	144 (10%)	105 (8%)

Figure 12. 2023 $DDDA_F$ distribution for farms with weaner pigs (N = 1,392). The red line represents the SDa-defined action threshold



Goat farming sector

Antibiotic use by type of farm

The goat farming sector comprises both dairy goat farms and other (i.e. non-dairy) goat farms. Antibiotic use at dairy goat farms is low. In 2023, mean antibiotic use amounted to 1.2 $DDDA_F$, similar to the mean $DDDA_F$ values for 2021 and 2022.

Non-dairy goat farms were also requested to provide data on the amounts of antibiotics used, but – just like last year – it was decided not to include these data in the SDa report. This decision was made because the data on antibiotic use in non-dairy goat animal categories (i.e. fattening lambs, rearing goats, and goats kept as a hobby) were incomplete and deemed to be of insufficient quality. As shown in Table 5, farms with up to 50 goats seem to be the main source of missing antibiotic usage data. Hobby farms

with non-dairy goats are expected to be the main driver in this respect. In addition, no data on the numbers of animals were provided for 31 of the 93 other goat farms, which means no $DDDA_F$ values could be calculated for these farms. Furthermore, for a number of farms either no animal category, or an incorrect animal category (a category other than the predefined animal categories of dairy goats, rearing goats, fattening lambs, and goats kept as a hobby) was provided. As the 2023 data provided to the SDa do not cover all goat farms, the SDa expert panel is not yet able to report on the amounts of antibiotics used in the goat farming sector as a whole.

An active policy from goat farmers, veterinarians and the government is needed to ensure the goat farming sector's data coverage will soon reach 100%. It is important for the goat farming sector to improve the quantity and quality of the data provided to the SDa, as this will enable the SDa to start reporting on antibiotic use in non-dairy goats.

Table 5. Comparison of the number of goat farms according to CBS data and the number of goat farms for which antibiotic usage data have been provided, categorized by farm size (CBS, 2024). In this table, the "All goat farms" group includes both dairy goat farms and other (i.e. non-dairy) goat farms

		Number of farms	
Group	**Farm size**	**CBS data**	**Sector-provided data**
All goat farms	**Number of animals unknown**		36
	20-50 animals*	98	9
	50-100 animals	22	10
	100-200 animals	26	17
	200-500 animals	50	45
	500 animals or more	349	325
	Total number of farms	545	442

* Anyone keeping 25 goats or more is legally required to report the use of antibiotics in their animals.

Cattle farming sector

Overall antibiotic use in the dairy cattle farming sector remained stable at a low level of approximately 3 $DDDA_{NAT}$. In the non-dairy cattle farming sector (i.e., suckler cow farms, rearing farms, and beef farms), overall antibiotic use continued to decline, to a level of just 0.25 $DDDA_{NAT}$.

Antibiotic use by type of farm

Mean antibiotic use at dairy cattle farms has been approximately 2 $DDDA_F$ ever since 2014. In addition to their consistently low mean $DDDA_F$ values, dairy cattle farms are also characterized by relatively minor between-farm usage level differences and limited year-to-year usage level fluctuations at individual farms.

Most suckler cow farms, rearing farms, and beef farms did not record any antibiotic use for 2023, and mean antibiotic use for these types of farms remained below 1 $DDDA_F$. 2023 saw a further decline in mean antibiotic use and between-farm usage level differences for rearing farms and beef farms.

Benchmarking

Over 90% of dairy cattle farms, rearing farms, suckler cow farms, and beef farms recorded target zone usage levels for 2023. Only a small minority of cattle farms had persistently high usage levels in 2023.

Table 6. 2022 and 2023 benchmarking results for cattle farms according to the respective SDa-defined action thresholds, by type of farm

Number of farms	Type of farm							
	Dairy cattle farms		Rearing farms		Suckler cow farms		Beef farms	
	2022	2023	2022	2023	2022	2023	2022	2023
In target zone	13,997 (97%)	13,618 (97%)	669 (94%)	668 (96%)	7,247 (92%)	7,316 (92%)	2,434 (93%)	2,492 (97%)
In action zone	477 (3%)	462 (3%)	44 (6%)	26 (4%)	629 (8%)	621 (8%)	180 (7%)	87 (3%)
With persistently high usage levels	195 (1%)	171 (1%)	16 (2%)	7 (1%)	376 (5%)	298 (4%)	127 (5%)	31 (1%)

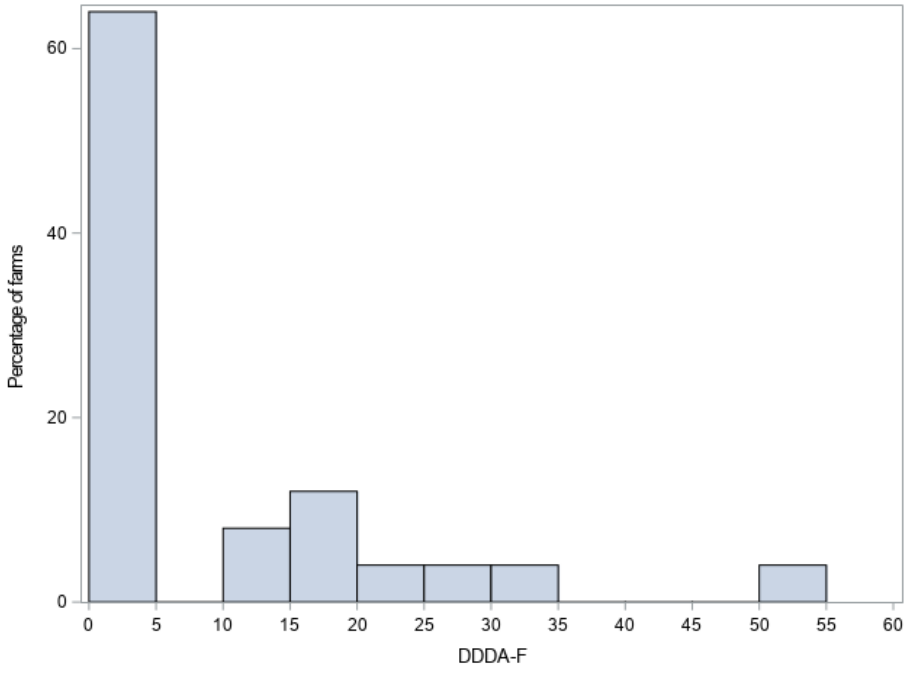
Layer farming sector

Antibiotic use by type of farm

Antibiotic use at layer farms is low and stable, at a level of about 1-2 $DDDA_F$. The majority of layer farms did not record any antibiotic use for 2023. However, colistin use remains a source of concern, as the amount of colistin used at a number of layer farms was relatively large. Mean colistin use increased from 0.3 $DDDA_F$ in 2022 to 0.5 $DDDA_F$ in 2023. In terms of kilograms of active substance, colistin use at layer farms went up by 21.0%. Antibiotic use at pullet rearing farms was low, with limited usage level differences between individual farms.

At layer parent/grandparent stock rearing farms, however, antibiotics were still used on a regular basis (resulting in a mean $DDDA_F$ value of 8.1), and these farms show considerable between-farm usage level differences (Figure 13). They also recorded relatively high usage levels for second-choice antibiotics, with these antibiotics accounting for 62% of overall antibiotic use at layer parent/grandparent stock rearing farms. In light of the above, additional usage level reductions seem to be feasible. Antibiotic use at layer parent/grandparent stock production farms was low.

Figure 13. 2023 $DDDA_F$ distribution for layer parent/grandparent stock rearing farms (N = 25)

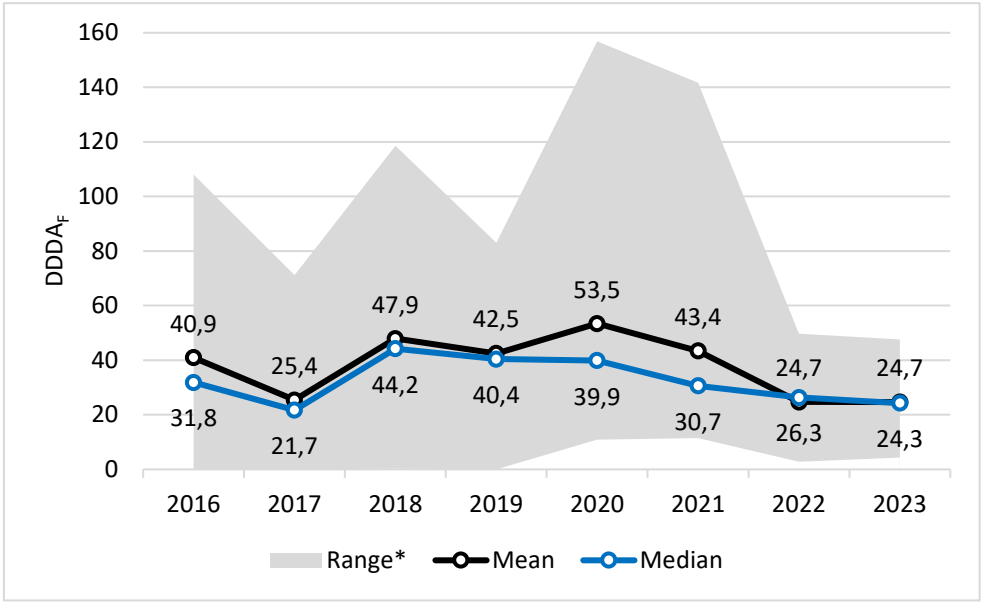


Smaller food-producing livestock sectors

Rabbit farming sector

Following the steep decline recorded for 2022, overall antibiotic use in the rabbit farming sector rose by 8.5% in 2023, resulting in a $DDDA_{NAT}$ value of 25.7. This represents a 37.2% reduction from the $DDDA_{NAT}$ value recorded for 2016, the first year for which rabbit farming sector antibiotic usage data were included in the SDa report.
Farm-level data do show progress, however, with rabbit farms' median usage level declining from 26.3 $DDDA_F$ in 2022 to 24.3 $DDDA_F$ in 2023. At 24.7 $DDDA_F$, mean antibiotic use was identical to the year before. The difference between the rabbit farming sector's $DDDA_{NAT}$ and mean $DDDA_F$ results is due to the respective calculation methods. The main difference between the two calculation methods comes down to $DDDA_{NAT}$ being a weighted measure, with larger farms contributing more than smaller farms. In contrast, mean $DDDA_F$ is an unweighted measure, with all farms contributing equally.

Figure 14. Long-term $DDDA_F$ trends for rabbit farms. The graphs show the mean and median $DDDA_F$ values and $DDDA_F$ ranges for the years concerned



* $DDDA_F$ ranges represent the middle 90% of farms, with the lower limit corresponding to the 5th percentile and the upper limit corresponding to the 95th percentile.

Benchmarking

In 2022, a 30 $DDDA_F$ provisional benchmark threshold was introduced for rabbit farms. In 2023, the proportion of rabbit farms not exceeding this SDa-defined action threshold rose to 71%. Six of the nine rabbit farms that did exceed this benchmark threshold, had also recorded action zone usage levels for 2022.

In order to help rabbit farms move towards their SDa-defined benchmark threshold, the rabbit farming sector and the Ministry of Agriculture, Nature and Food Quality have agreed on the use of two transitional benchmark thresholds: a 30 $DDDA_F$ signaling threshold and a 40 $DDDA_F$ action threshold. In 2023, the 40 $DDDA_F$ transitional action threshold was exceeded by four rabbit farms, two of which had also exceeded this benchmark threshold in 2022.

Table 7. 2022 and 2023 benchmarking results for rabbit farms according to both the SDa-defined action threshold and sector-negotiated transitional benchmark thresholds

Type of benchmark threshold(s)	Number of farms	Rabbit farms	
		2022	2023
SDa-defined	In target zone	18 (58%)	22 (71%)
	In action zone	13 (42%)	9 (29%)
	With persistently high usage levels	N/A*	6 (19%)
Sector-negotiated (transitional)	In target zone	18 (58%)	22 (71%)
	In signaling zone	9 (29%)	5 (16%)
	In action zone	4 (13%)	4 (13%)
	With persistently high usage levels	N/A*	2 (6%)

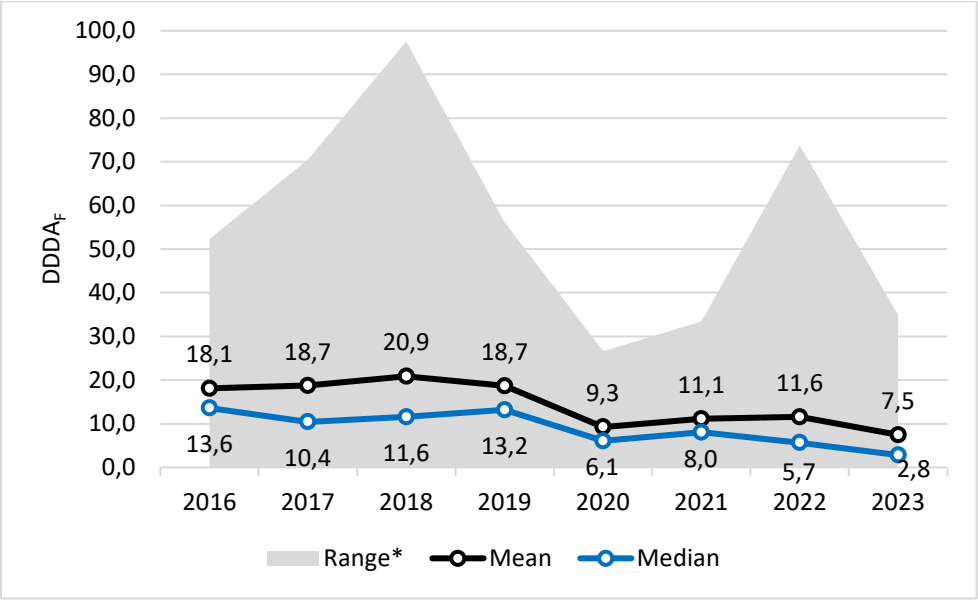
* Quantification of farms with persistently high usage levels in 2022 would require data on the number of farms exceeding the respective action threshold in 2021. However, the benchmark thresholds were only introduced in 2022.

Turkey farming sector

In 2023, overall antibiotic use in the turkey farming sector once again dropped sharply, to 6.1 $DDDA_{NAT}$. This represents a 34.2% reduction from the 2022 level, and a 79.3% reduction from the $DDDA_{NAT}$ value recorded for 2013, the first year for which turkeys farming sector antibiotic usage data were included in the SDa report. The SDa expert panel is pleased to see the turkey farming sector's usage of antibiotics trending downwards.

Farm-level data show a substantial decline in both mean and median usage levels. The 2023 mean and median $DDDA_F$ values are the lowest ever recorded for turkey farms since the SDa started monitoring the usage of antibiotics in this livestock sector. 2023 also saw distinctly smaller between-farm usage level differences than the year before (Figure 15). There were still a number of turkey farms with usage levels several times the mean $DDDA_F$ value. When the sector continues to focus its reduction efforts on these farms, a further reduction in turkey farms' mean $DDDA_F$ value should be feasible.

Figure 15. Long-term $DDDA_F$ trends for turkey farms. The graph shows the mean and median $DDDA_F$ values and $DDDA_F$ ranges for the years concerned



* $DDDA_F$ ranges represent the middle 90% of farms, with the lower limit corresponding to the 5th percentile and the upper limit corresponding to the 95th percentile.

Benchmarking

Turkey farms are benchmarked by means of a 10 $DDDA_F$ provisional benchmark threshold. The proportion of turkey farms exceeding this SDa-defined action threshold decreased from 34% in 2022 to 30% in 2023. 2023 also saw a decline in the proportion of farms with persistently high usage levels (Table 8).

To help turkey farmers move towards their SDa-defined benchmark threshold in a more gradual fashion, the turkey farming sector and the Ministry of Agriculture, Nature and Food Quality have agreed on the application of transitional benchmark thresholds (Table A57 in the online appendix). In 2023, the sector-negotiated transitional action threshold (of 20 $DDDA_F$) was exceeded by three turkey farms (9%). Another three turkey farms exceeded the sector-negotiated transitional signaling threshold. Reducing the amounts of antibiotics used at these farms should be the turkey farming sector's primary focus in this respect. If farms with usage levels over the 20 $DDDA_F$ transitional action threshold were to be excluded from the mean $DDDA_F$ calculation, this would lower the turkey farming sector's mean $DDDA_F$ value from 7.5 (the actual level) to 4.7.

Table 8. 2022 and 2023 benchmarking results for turkey farms according to both the SDa-defined action threshold and sector-negotiated transitional benchmark thresholds

Type of benchmark threshold(s)	Number of farms	Turkey farms	
		2022	2023
SDa-defined	In target zone	25 (66%)	23 (70%)
	In action zone	13 (34%)	10 (30%)
	With persistently high usage levels	10 (26%)	8 (24%)
Sector-negotiated (transitional)	In target zone	29 (76%)	27 (82%)
	In signaling zone	4 (11%)	3 (9%)
	In action zone	5 (13%)	3 (9%)
	With persistently high usage levels	3 (8%)	2 (6%)

Veterinarians' prescription patterns

Prescription pattern indicators

With regard to veterinarians, the SDa uses two indicators: the $DDDA_{VET}$ and the VBI. The $DDDA_{VET}$ is used to provide insight into prescription pattern trends, and the VBI is used for benchmarking purposes. The two indicators are discussed in greater detail in the sections below.

The prescription pattern trend indicator: $DDDA_{VET}$
A veterinarian's $DDDA_{VET}$ value represents the number of days per year the average animal within an animal population for which the veterinarian was responsible, was given antibiotics. As the $DDDA_{VET}$ is calculated using data from all livestock farms with which the veterinarian had a registered one-to-one relationship, it is an indicator of the veterinarian's prescription pattern with regard to all livestock farms where veterinary care was provided. This makes the $DDDA_{VET}$ measure well suited for reporting on prescription pattern trends.

The benchmark indicator: VBI
The VBI is calculated in almost the same manner as the $DDDA_{VET}$, but with one major difference: livestock farms with persistently high usage levels are excluded from VBI calculations, and therefore do not contribute to their veterinarian's VBI value. For each of these farms, the veterinarian and the farmer concerned are to develop a joint approach aimed at reducing the farm's antibiotic usage level.
Veterinarians are benchmarked by comparing their VBI value to the benchmark threshold for the type of farm or production category concerned. If, after the exclusion of any farms with persistently high usage levels, the VBI value exceeds the relevant action threshold, veterinarians have to review their antibiotic prescription patterns with the aim of reducing the amounts of antibiotics used at the livestock farms under their care.

In the case of livestock sectors that have negotiated a transitional action threshold with the Ministry of Agriculture, Nature and Food Quality (i.e. the turkey and broiler farming sectors), benchmarking results are presented according to both the sector-negotiated transitional benchmark thresholds and the SDa-defined action threshold. Within these livestock sectors, the farms and veterinarians will be benchmarked by means of the sector-negotiated transitional benchmark thresholds until their sector-negotiated benchmark thresholds are replaced by their SDa-defined benchmark threshold.

Prescription pattern trends

The 2023 $DDDA_{VET}$ distributions for veterinarians active at **dairy cattle farms**, **non-dairy cattle farms**, **broiler farms with slower growing breeds**, **farms with fattening pigs**, and **farms with sows and suckling piglets** (Figures A42, A43, A45, A47 and A48, respectively, in the online appendix) are relatively narrow, and similar to the respective 2022 distributions. The amounts of antibiotics prescribed for these types of farms or production categories were relatively small.

Although the $DDDA_{VET}$ distribution for veterinarians active at **white veal farms** narrowed in 2023, the amounts of antibiotics prescribed were still relatively large, and no clear trend can be distinguished in this respect (Figure A49).

The amounts of antibiotics prescribed for **rosé veal fattening farms** trended upwards from 2017 to 2022. While this trend seems to have stabilized in 2023, no substantial reduction was achieved, and veterinarians' $DDDA_{VET}$ values show a large amount of variation (Figure A51).

With regard to veterinarians active at **farms with weaner pigs** (Figure A46) and **rosé veal starter farms** (Figure A50), prescription pattern differences between individual veterinarians increased in 2023 and were relatively large. The considerable variation in the amounts of antibiotics veterinarians prescribed for these farms, suggests it should be possible to realize a reduction in the amounts prescribed.

The mean $DDDA_{VET}$ value for veterinarians active at **broiler farms with conventional breeds** had increased in 2022, but this was followed by a decline in 2023. 2023 also saw less pronounced $DDDA_{VET}$ differences between individual veterinarians (Figure A44). However, the $DDDA_{VET}$ data do not indicate any substantial long-term improvement over the 2017-2023 period, similar to the $DDDA_F$ data for broiler farms with conventional breeds.

Only a few veterinarians were active at **turkey farms**. Even though the differences between individual veterinarians' prescription patterns decreased in 2023, they continue to be relatively large.

Table 9. 2023 $DDDA_{VET}$ data, by type of farm/production category. Provided are the mean and median $DDDA_{VET}$ values, and the 75th and 90th percentiles

Livestock sector	Type of farm/ production category	N	Mean	Median	P75	P90
Broiler farming sector	Farms with conventional breeds	69	9.6	8.1	13.4	19.4
	Farms with slower growing breeds	72	1.1	0.5	1.5	2.9
Turkey farming sector	Turkey farms	10	6.3	4.0	6.4	21.7
Pig farming sector	Sows/suckling piglets	159	3.0	2.5	4.0	5.5
	Weaner pigs	159	13.3	8.5	15.9	28.9
	Fattening pigs	189	2.5	2.3	3.2	4.8
Veal farming sector	White veal farms	56	20.6	17.3	19.1	22.4
	Rosé veal starter farms	51	58.5	54.8	71.3	83.2
	Rosé veal fattening farms	83	2.3	1.1	2.2	4.6
	Rosé veal combination farms	19	9.4	10.1	12.1	14.0
Cattle farming sector	Dairy cattle farms	672	2.4	2.4	2.8	3.1
	Rearing farms	215	0.6	0.0	0.5	1.0
	Suckler cow farms	664	0.6	0.4	0.8	1.4
	Beef farms	351	0.5	0.2	0.6	1.4
	Non-dairy cattle farms combined	681	0.6	0.4	0.7	1.3

Benchmarking of veterinarians

All types of farms and production categories had the majority of their veterinarians recording target zone prescription patterns for 2023 (Table 10). With regard to types of farms with provisional benchmark thresholds, the highest proportions of veterinarians with action zone prescription patterns were recorded for rosé veal starter farms (31%) and rosé veal combination farms (26%). Twelve percent of veterinarians active at rosé veal fattening farms were included in the action zone. Broiler farms with conventional breeds, for which the SDa has defined a benchmark threshold representing acceptable use, also had a relatively large number of veterinarians being included in the action zone. Only a few veterinarians were active at turkey farms, and one of them was included in the action zone. With regard to the other types of farms and production categories (broiler farms with slower growing breeds, all production categories in the pig farming sector, white veal farms, dairy cattle farms, and non-dairy cattle farms), only a small proportion of veterinarians had action zone prescription patterns.

Veterinarians active in livestock sectors with sector-negotiated transitional benchmark thresholds for 2023 (i.e. the broiler and turkey farming sectors), have been benchmarked by means of these sector-negotiated benchmark thresholds. Their benchmarking results are included in Table 11.

The proportions of veterinarians with action zone prescription patterns are smaller than the associated proportions of livestock farms with action zone usage levels, in part as a result of farms with persistently high usage levels not contributing to VBI values. The SDa expert panel urges veterinarians and livestock sectors to develop and implement targeted measures for livestock farms with persistently high usage levels, in order to reduce the amounts of antibiotics used at these farms. In addition, veterinarians with action zone prescription patterns should take appropriate steps to facilitate usage level reductions at the farms with which they have a registered one-to-one relationship.

Table 10. 2023 benchmarking results for veterinarians according to the VBI-based benchmarking method implemented in 2021. Benchmark thresholds representing acceptable use are printed in bold

Livestock sector	Type of farm/ production category	Benchmark threshold	Target zone		Action zone	
			N	%	N	%
Broiler farming sector	Farms with conventional breeds	**8**	44	70%	19	30%
	Farms with slower growing breeds	**8**	71	100%	0	0%
Turkey farming sector	Turkey farms	10	8	89%	1	11%
Pig farming sector	Sows/suckling piglets	**5**	149	94%	9	6%
	Weaner pigs	20	148	94%	10	6%
	Fattening pigs	**5**	181	96%	7	4%
Veal farming sector	White veal farms	23	51	91%	5	9%
	Rosé veal starter farms	67	35	69%	16	31%
	Rosé veal fattening farms	**4**	73	88%	10	12%
	Rosé veal combination farms	12	14	74%	5	26%
Cattle farming sector	Dairy cattle farms	**5**	670	100%	1	0%
	Non-dairy cattle farms	**2**	207	97%	7	3%

Table 11. Benchmarking results for veterinarians active in livestock sectors with transitional benchmark thresholds, according to the VBI-based benchmarking method implemented in 2021

Livestock sector	Type of farm	Benchmark thresholds	Target zone		Signaling zone		Action zone	
			N	%	N	%	N	%
Broiler farming sector	Farms with conventional breeds	12 + 24	46	69%	16	24%	5	7%
	Farms with slower growing breeds	8 + 12	71	100%	0	0%	0	0%
Turkey farming sector	Turkey farms	14 + 20	8	80%	2	20%	0	0%

Livestock sectors' progress towards government-defined reduction targets

Following the introduction of new benchmark thresholds in 2019, the Dutch government and the livestock sectors discussed and agreed on required antibiotic usage level reductions and the time frame within which they should be realized. Those agreements were based on the SDa's pre-2019 benchmarking method which relied on both a signaling threshold and an action threshold, whereas the SDa's current benchmarking method is based on just a single benchmark threshold per type of farm or production category. The veal, pig and broiler farming sectors and the Ministry of Agriculture, Nature and Food Quality agreed on the following reduction targets, with 2017 as the reference year: by 2022, a 25% reduction in the number of farms exceeding the old signaling threshold (for pig farms) or the old action threshold (for broiler and veal farms), and by 2024, a 50% reduction in the number of farms exceeding their old signaling or action threshold. The veal farming sector additionally agreed to realize a 15% reduction from its 2017 $DDDA_{NAT}$ value by 2022.

The broiler and pig farming sectors have already met their 2022 and 2024 reduction targets. The veal farming sector had managed to meet its 15% $DDDA_{NAT}$ reduction target by 2022, and its 2023 $DDDA_{NAT}$ value represents an 18% reduction from the $DDDA_{NAT}$ value recorded for the 2017 reference year. White veal farms have already met their 2024 reduction target, but additional reductions in the number of farms exceeding the old action threshold are needed for rosé veal starter and rosé veal fattening farms to meet their 50% reduction targets (Table A59 in the online appendix). The targeted reductions in the number of farms exceeding their old signaling or action threshold do not account for any changes in the number of active farms over the years. In many cases, less prominent reductions in the number of farms with high usage levels would be observed if the results were adjusted to account for changes in the number of active livestock farms (Table A59). However, in the case of the broiler and pig farming sectors, the adjusted reductions would still meet the 2024 reduction targets.

The SDa expert panel would like to note that high usage levels in the context of reduction target agreements between livestock sectors and the Dutch government are distinct from *persistently* high usage levels, a concept introduced by the SDa in 2020 in light of the introduction of its new benchmarking method for veterinarians. In the context of the SDa's new benchmarking method, livestock farms are deemed to have persistently high usage levels if their $DDDA_F$ values have exceeded the action threshold two years in a row. Livestock farms with persistently high usage levels are not included when calculating a veterinarian's VBI value, and these farms require targeted measures aimed at reducing their antibiotic usage levels. Although livestock sectors and veterinarians have committed themselves to help reduce the number of livestock farms with persistently high usage levels, no quantitative reduction targets have been set in this respect.

Antibiotic monitoring in an international context

Implications of Regulation (EU) 2019/6 for monitoring efforts in the Netherlands

On January 28, 2022, Regulation (EU) 2019/6 of the European Parliament and of the Council of 11 December 2018 on veterinary medicinal products entered into force, repealing the directive on the Community code relating to veterinary medicinal products, Directive 2001/82/EC (EUR-Lex, 2019). Regulation (EU) 2019/6, commonly referred to as the Veterinary Medicinal Products Regulation (VMPR), sets out that all EU member states are to collect data on the sales and use of antimicrobials (including antibiotics) used in animals and subsequently report their data to the European Medicines Agency (EMA).

The VMPR allows for a progressive stepwise approach with regard to the monitoring obligations. As of **2024**, data on the use of antimicrobial medicinal products in the main food-producing livestock populations have to be reported, with the reported data pertaining to the preceding calendar year. This initial reporting obligation concerns data on antimicrobial use in all types of cattle (with several EU member states, including the Netherlands, having to report data pertaining to veal calves separately), pigs, broilers, and turkeys. As of **2027**, data on the use of antimicrobials in goats, sheep, ducks, geese, layers, farmed fish and all horses (including those not intended for human consumption) during the preceding calendar year will have to be reported too. Data on antimicrobial use in goats and layers in the Netherlands are already being collected as part of the SDa's monitoring efforts. The duck farming sector has started registering delivery record data, and the SDa expects it will be able to include this sector in its 2025 report. Monitoring of antimicrobial use in the remaining above-mentioned animal populations is yet to be initiated. Given the monitoring obligation with regard to farmed fish only pertains to finfish species not being farmed in the Netherlands, the fish farming sector will not be included in SDa reports. As of **2030**, member states will also have to report on antimicrobial use, during the preceding calendar year, in companion animals (i.e. dogs and cats) and fur animals.
The current monitoring infrastructure in the Netherlands is ready for the initial stage of this process, pertaining to the main food-producing livestock populations, but it is not yet fully equipped to facilitate monitoring of the animal populations that are to be added during the subsequent stages.

In addition, as of 2023 more extensive sales data reporting is required to enable the provision of data on all antimicrobials sold. This means sales data reporting will also have to include antimicrobials purchased in other EU countries for use under the cascade (e.g. veterinary medicinal products not available in the Netherlands) and antibiotic-containing preparations prepared for individual animals (veterinary medicinal products prepared extemporaneously in accordance with the terms of a veterinary prescription and used in accordance with Articles 112-114 of the VMPR; these preparations are primarily intended for use in companion animals). Use of antimicrobials which until January 2022 could be made available under an exceptional provision (such as small pack sizes of antimicrobial veterinary medicinal products intended for doves, for example), is no longer allowed under the VMPR.

In order to minimize the administrative burden on all levels, the EMA set up the Union Product Database (UPD) to facilitate extensive sales data reporting. Marketing authorization holders are required to record the annual volumes of sales for their veterinary medicinal products in this database, and the EMA will extract the sales data from the UPD and ask member states to validate the data. The Ministry of Agriculture, Nature and Food Quality will serve as our country's rapporteur, and the SDa and FIDIN will be responsible for verifying the reported data. Following verification, the final data will also be included in the SDa's annual report on the usage of antibiotics in agricultural livestock in the Netherlands.

As at April 2024, over 95% of packages of veterinary medicinal products sold could already be linked to UPD-specified packages, and for 47 packages (of 300 packages in total), sales data had already been submitted to the UPD. The UPD's level of completeness regarding the packages of veterinary medicinal products used will become apparent over the next months (packages used may include packages sold prior to 2023, which may not yet have been entered into the UPD due to input prioritization considerations).

Reporting of data on the sales of veterinary antimicrobial agents in Europe

From 2010 to 2022, data on sales of veterinary antimicrobial agents from all EU member states were collected and subsequently reported on an annual basis as part of the EMA's European Surveillance of Veterinary Antimicrobial Consumption (ESVAC) project (EMA, 2021). Pursuant to Regulation (EU) 2019/6, collection and reporting of volume of sales data has become mandatory as of 2023. As a result, the ESVAC project came to an end following publication of the 2022 sales data in the final ESVAC report, which was published in 2023. ESVAC activities have since been transferred to the EMA Project Group for the Collection of Antimicrobial Sales and Use data (ASU Project Group).

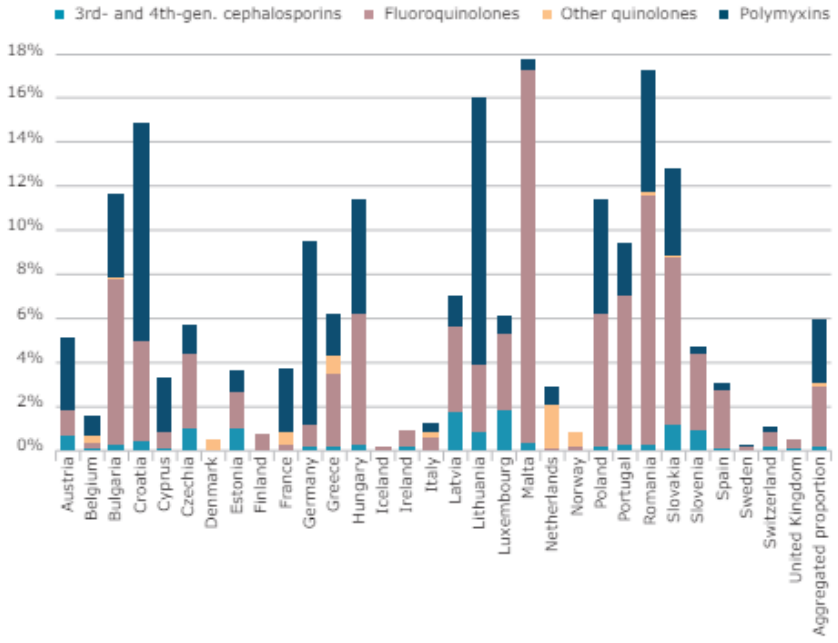
The final ESVAC report was published in November 2023 and presents data on trends regarding the sales of veterinary antimicrobial agents in European countries from 2010 to 2022 (EMA, 2023). In ESVAC reports, sales of antimicrobial veterinary medicinal products are expressed in mg/PCU. In general, the PCU is calculated using the number of animals slaughtered in a particular year (adjusted for imported and exported animals). However, in the case of livestock not kept for meat production (e.g. dairy cattle), the PCU is calculated using the number of live animals present within the livestock sector concerned. As discussed in a journal article by the SDa expert panel, mg/PCU is a suboptimal indicator for quantifying antimicrobial use and will result in systematic underestimation of usage levels in livestock sectors characterized by relatively high meat production (Sanders et al., 2021).

Summary of the key findings of the thirteenth ESVAC report:

- The downward trend in overall sales of antibiotic veterinary medicinal products in Europe (in mg/PCU), which had stagnated in 2020, was resumed in 2022. Overall sales decreased by 13% in comparison to 2021.
- Sales of third- and fourth-generation cephalosporins declined by almost half between 2011 and 2022.
- Aggregated sales of polymyxins continued to decline in 2022, resulting in a 42% reduction (in mg/PCU) from the 2017 level.
- With its ESVAC indicator of 37 mg/PCU, the Netherlands ranked 13th out of 31 participating countries in a sales volume ranking (with sales volumes in mg/PCU ranked from lowest to highest; median 45.8 mg/PCU, weighted mean 73.9 mg/PCU) (see also Figure 17).

- Other quinolones (i.e. quinolones other than fluoroquinolones) have been included as one of the AMEG (EMA Antimicrobial Advice Ad Hoc Expert Group) Category B antimicrobials highlighted in the ESVAC report. Use of AMEG Category B antibiotics in animals should be restricted. Other classes of antibiotics included in Category B are fluoroquinolones, third- and fourth-generation cephalosporins, and polymyxins. In the Netherlands, other quinolones (effectively only comprising flumequine) are categorized as second-choice antibiotics. Of all 31 countries participating in ESVAC reporting, highest sales of other quinolones were reported for the Netherlands, with sales of this antibiotic class amounting to 0.8 mg/PCU.

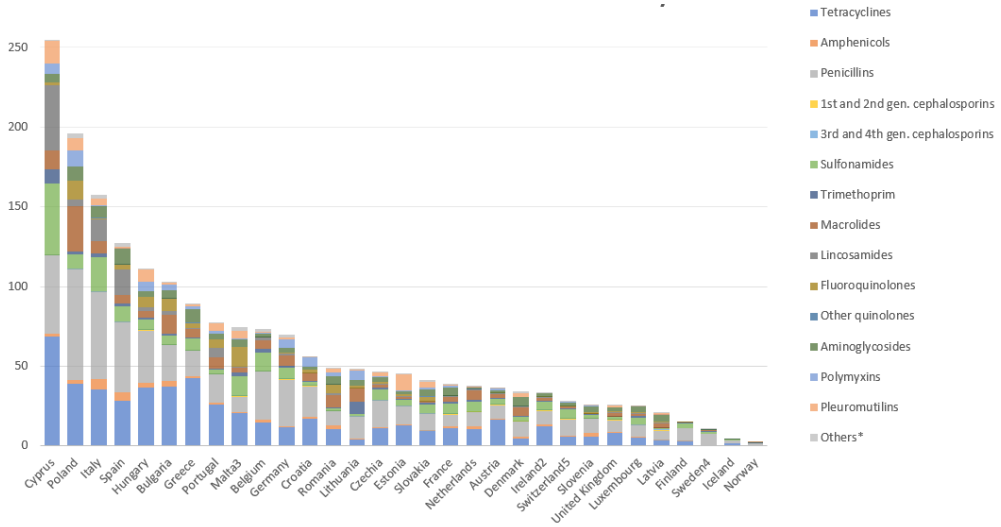
Figure 16. Proportion of sales of 3rd- and 4th-generation cephalosporins, fluoroquinolones, other quinolones, and polymyxins of total sales, in mg/PCU, of antibiotic veterinary medicinal products for food-producing animals in 31 European countries



Source: European Medicines Agency, European Surveillance of Veterinary Antimicrobial Consumption, 2022. Sales of veterinary antimicrobial agents in 31 European countries in 2022 (EMA/299538/2023).

- In 2022, sales of quinolones (including fluoroquinolones) in the Netherlands amounted to 0.83 mg/PCU; the EU median and weighted mean were 0.91 mg/PCU and 2.2 mg/PCU, respectively.
- In 2022, polymyxin sales in the Netherlands amounted to 0.30 mg/PCU, while the median and weighted mean for all participating countries combined were 0.62 mg/PCU and 2.1 mg/PCU, respectively.
- With regard to sales of critically important antibiotics as a proportion of total sales of antibiotic veterinary medicinal products in 2022, the Netherlands was one of the middle-ranking countries (Figure 16). In absolute terms, however, consumption of these antibiotics in the Netherlands amounted to 1.1 mg/PCU, which was well below the 4.5 mg/PCU mean. Sales of other quinolones accounted for over 70% of sales of critically important antibiotics in the Netherlands.

Figure 17. Antibiotic consumption in 2022 according to the thirteenth ESVAC report, in mg/PCU per country



Source: European Medicines Agency, European Surveillance of Veterinary Antimicrobial Consumption, 2022. Sales of veterinary antimicrobial agents in 31 European countries in 2022 (EMA/299538/2023).

Appendix to the report

The appendix to this report is published on the SDa website.

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