BELGIAN VETERINARY SURVEILLANCE OF ANTIBACTERIAL CONSUMPTION

NATIONAL REPORT ON SALES AND USE OF ANTIBACTERIAL VETERINARY MEDICINAL PRODUCTS

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SUMMARY

This 15th BelVet-SAC report describes the results of the sales and use of antibacterial veterinary medicinal products in animals in Belgium in 2023 and their evolution since 2011.

In the previous BelVet-SAC reports, sales data were collected at the level of the manufacturers of medicated feed (antibacterial premixes) and wholesaler-distributors (pharmaceuticals = antibacterial veterinary medicines excluding premixes). However, the European Regulation 2019/6, in force since 2022, has abandoned the concept of the 'wholesaler with public duties'. Consequently marketing authorisation holders with the appropriate authorisation can now sell veterinary medicinal products directly to veterinarians, pharmacists and manufacturers of medicated feed. It was therefore decided to compile the sales data for 2022 and 2023 from the data collected at the level of the manufacturers of medicated feed (antibacterial premixes) and at the level of the holders of an authorisation to market antibacterial medicines in Belgium (antibacterial pharmaceuticals).

As in previous years, the use data are derived from the registrations in Sanitel-Med and for 2023 too, only the results for pigs, broiler chickens, laying hens and veal calves were calculated. Although the collection of antibacterial use in cattle and all poultry, of the species chicken and turkey, was started in 2023, because of the small quantity (only one quarter) of data available and the insufficient quality of the data they were not analysed for this 2023 BelVet-SAC report.

With a result of 55,0 mg /kg biomass in 2023 compared to 70,3 mg /kg biomass in 2022, another large decrease (-21,7 %) was achieved in the sale of antibacterials for animals in Belgium in 2023. The decline occurred in antibacterial pharmaceuticals (-21,9 %) as well as in antibacterial premixes (-18,6 %). This good result should be interpreted with some caution though. The difference in 2023 between the amount of antibacterial agents sold, for all animals, and the amount used in just four animal types was unusually low at 17 tonnes (previous years 40-55 tonnes). Fluctuations due to, for example, stockpiling can play a role in this, but the possibility that veterinary antibacterials are increasingly purchased outside Belgium must also be taken into account. Such a purchase is not covered in the existing collection of sales data. The Federal Agency for Medicines and Health Products (FAMHP), with the support from the European Commission, is currently working on the VetAMRTool, which will capture all purchases of antibacterial products through collection at the level of the veterinarian's and pharmacist's Register IN. This tool will be operational within a few years.

In this context, the use data are becoming increasingly important to monitor the situation in Belgium. The BD_{100}-species shows nice declines between 2018 and 2023 in pigs (-45,2 %), poultry (-40,4 %) and veal calves (-43,0 %), although the achievements in these sectors have had their own dynamics. However, all three sectors showed signs of stabilising use in 2023 and each sector faces specific challenges in meeting its targets.

In pigs, the focus should be on fattening pigs and weaned piglets. These animal categories evolved in a similar way in 2023, with further decreases in antibacterial use in the 'yellow' and 'red' benchmark colour zone, but the median BD_{100} stabilised compared to 2022, at 1,94 and 10,18 respectively. The number of alarm users did decrease in both categories, to 1,8 % and 2,4 % respectively, which brings the target of a maximum of 1 % alarm users by the end of 2024 within reach. An adjustment of the BD_{100}-action value is planned for weaned piglets (from 40 to 30 at the end of 2024), which is not the case for

fattening pigs, where the latest adjustment, from 9 to 6, was made beginning of 2023. However, for both categories, the BD_{100}-action values are deemed still too high to represent a proper level for unacceptable antibacterial use. In addition, the vast majority of tonnes of antibacterials used in pigs are currently located at companies in the yellow benchmark colour zone, and this quantity still weighs heavily on the total result for all animals in Belgium. The first priority of this sector should therefore be to achieve a larger percentage of companies with a green colour score, from which more rational BD_{100}-threshold values will follow.

The same can be said of the poultry sector. Here too, the majority of the tonnes of antibacterials used are at companies with a yellow colour score. Moreover, a very large proportion (>95%) of broiler farms are already well below the new BD_{100}-action value that will be officially applied end of 2024 (10, current P90-BD_{100} = 7,7) and the target of max. 1 % alarm users is already achieved. Although there was a limited decline in antibacterial use in 2023, to a median BD_{100} of 3,43, the reality is that this sector made a major leap forward between 2020 and 2021, but has remained stagnant since then. Both absolutely and relatively, the poultry sector has achieved the smallest reduction of the sectors monitored within Sanitel-Med. It is therefore necessary to demonstrate a renewed ambition to achieve a further reduction in antibacterial use, especially in broilers. In addition, the sector faces two specific challenges: finding and applying appropriate measures to control the fluctuating and in 2023 again increased use of quinolones, in broilers, and colistin, in laying hens.

Thanks to focused efforts, the use of colistin and quinolones in the veal calf sector decreased again in 2023. However, concerning the general antibacterial use in calves in 2023 there was little progress. The median BD_{100} decreased slightly, to 7,65, but the P90-BD_{100}, for example, increased noticeably. Given the still challenging reduction path, 2023 should have been an important year in keeping the objectives somewhat within reach. Although the number of alarm users decreased to 10 %, a new adjustment to both the BD_{100}-attention (from 8 to 6) and -action values (from 11 to 9) is planned at the end of 2024, which will increase pressure on the sector. So, it is clear that additional efforts will be needed.

Across sectors, all stakeholders will need to strengthen their commitment and put it into practice to achieve further reductions in antibacterial use, by providing the incentives, tools and resources needed to realise further success. The fact that every sector has a strong and effective quality system must be fully utilised. For veal calves, it will also be essential to work cross sectoral and involve the dairy sector in order to find a solution for the challenges this sector is facing.

In dairy cattle, it is positive to note that the sales of intramammary products decreased further in 2023. However, this decrease was again mainly the result of a decrease in the use of udder preparations for the treatment of mastitis, while the use of preparations for dry-cow therapy remained stable. The biggest challenge for this sector, together with the beef cattle sector, will be to obtain an efficient, complete and correct registration of their use data in Sanitel-Med.

In terms of antibacterial classes and routes of administration, trends from previous years continued in 2023: aminopenicillins, tetracyclines and the combination trimethoprim-sulfamide remained the most sold and used classes, especially for oral administration. The increase in the sales of the 3rd and 4th generation cephalosporins for intramammary use was notable. Even though they contain critically important antibacterials (CIAs), it was decided to assign these intramammary products an orange colour code. While they weigh less heavily in terms of sold mass than the quinolones in the results of the CIAs, it is a disappointing result that must be closely monitored.

The 2023 results show that the veterinary medicine in animal husbandry in Belgium remains on track to achieve the reduction targets by the end of 2024. Regarding the sector-specific targets of max. 1% alarm users, it was illustrated that this seems feasible for broilers and pigs, and more difficult to achieve for veal calves; in any case, further work is required here. The general target is -65 % in sales of antibacterial veterinary medicines compared to 2011, and in 2023 -62,4 % was achieved. In addition, the targets for the sales of feed medicated with antibacterials (-86,6 % compared to the target of -75 % relative to 2011), for the sales of colistin (0,62 mg/kg biomass compared to the target of 1 mg/kg biomass) and for the sales of CIAs (-75,8 % compared to the target of -75 % relative to 2011) were all achieved in 2023. Yet, specifically for the last target, it must be recognised that there is flirting with the threshold, which illustrates that it is necessary to strive for more prevention, but also that there is a need for continuous and effective supervision of the legislation on the conditions for the use of CIAs, to ensure that their use remains in accordance with the law.

It is clear that monitoring the sales and use of antibacterial veterinary medicines remains of great importance. The results of 2023 are mixed positive, and there remain many points of attention and work, such as focusing on more companies with a green benchmark colour score, seeking preventive measures to avoid the use of quinolones and colistin in poultry, intensifying intersectoral cooperation between the veal calf and dairy cattle sector and, for FAMHP, the timely implementation of the VetAMR data collection tool, not only to better cover sales data but also to map antibacterial use in all animals in the long term. The results achieved in 2023 should be a motivation to continue the good work and, when drawing up the policy for the next five years, to place the right emphasis in a well-informed and confident manner and to provide the necessary resources to achieve results.

SAMENVATTING

Dit 15de BelVet-SAC-rapport beschrijft de resultaten van de verkoop en het gebruik van antibiotica bij dieren in België in 2023 en de evolutie ervan sinds 2011.

In de vorige BelVet-SAC-rapporten werden de verkoopdata verzameld op het niveau van de mengvoeder-fabrikanten (antibacteriële premixen) en de groothandelaar-verdelers (farmaceuticals = antibacteriële diergeneesmiddelen uitgezonderd de premixen). De Europese verordening 2019/6, in voege sinds 2022, heeft het concept van 'groothandelaar-verdeler' achterwege gelaten. Bijgevolg kunnen vergunninghouders met de geschikte vergunning nu rechtstreeks diergeneesmiddelen verkopen aan dierenartsen, apothekers en mengvoederfabrikanten. Daarom werd beslist om voor 2022 en 2023 de verkoopgegevens samen te stellen uit de gegevens verzameld op niveau van de -fabrikanten van gemedicineerde voeders (antibacteriële premixen) en op niveau van de houders van een vergunning om in België antibacteriële geneesmiddelen op de markt te brengen (antibacteriële farmaceuticals).

De gebruiksdata zijn net zoals vorige jaren afkomstig van de registraties in Sanitel-Med en ook voor 2023 werden enkel resultaten van varkens, braadkippen, leghennen en vleeskalveren berekend. Weliswaar werd in 2023 de collectie van het antibioticagebruik bij runderen en alle pluimvee van de soort kip en kalkoen opgestart, maar door de kleine hoeveelheid (slechts één kwartaal) en onvoldoende kwaliteit van de data werden ze nog niet geanalyseerd voor het huidige BelVet-SAC rapport.

Met een resultaat van 55,0 mg /kg biomassa in 2023 tegenover 70,3 mg /kg biomassa in 2022, werd in 2023 opnieuw een grote daling (-21,7 %) gerealiseerd in de verkoop van antibiotica voor dieren in België. De daling situeerde zich in de antibacteriële farmaceuticals (-21,9 %) en in de antibacteriële premixen (-18,6 %). Dit goede resultaat dient wel met enige voorzichtigheid geïnterpreteerd te worden. Het verschil in 2023 tussen de verkochte hoeveelheid antibacteriële middelen, voor alle dieren, en de gebruikte hoeveelheid bij slechts vier diertypes was met 17 ton ongebruikelijk laag (vorige jaren 40-55 ton). Fluctuaties ten gevolge van bijv. stockvorming kunnen hierin een rol spelen maar er moet ook rekening gehouden worden met de mogelijkheid dat diergeneeskundige antibiotica in toenemende mate buiten België worden aangekocht. Dergelijke aankoop wordt in de bestaande collectie van verkoopdata niet gecoverd. Het Federaal Agentschap voor Geneesmiddelen en Gezondheidsproducten (FAGG), met de steun van de Europese Commissie, werkt momenteel aan de VetAMRTool, die via collectie ter hoogte van het Register IN van de dierenarts en de apotheker alle aankoop zal capteren. Deze tool zal binnen enkele jaren operationeel zijn.

In deze context nemen de gebruiksdata in belang toe om de situatie in België op te volgen. De BD_{100}-species toont voor zowel varkens (-45,2 %), pluimvee (-40,4 %) als vleeskalveren (-43,0 %) mooie dalingen tussen 2018 en 2023, hoewel de verwezenlijkingen in deze sectoren de afgelopen jaren een eigen dynamiek kenden. Alle drie de sectoren vertoonden in 2023 echter tekenen van een stabiliserend gebruik en ze staan elk voor specifieke uitdagingen om hun doelstellingen te halen.

Bij varkens moet de focus gaan naar de vleesvarkens en de gespeende biggen. Deze diercategorieën vertoonden in 2023 gelijkaardige evoluties, met verdere dalingen van het antibioticagebruik in de 'gele' en 'rode' benchmarkkleurzone, maar de mediane BD_{100} stabiliseerde t.o.v. 2022, op respectievelijk 1,94 en 10,18. Het aantal alarmgebruikers zakte wel in beide categorieën, naar respectievelijk 1,8 % en 2,4 %, wat het behalen van de doelstelling van max. 1 % alarmgebruikers eind 2024 binnen bereik

brengt. Bij de gespeende biggen is nog een aanpassing van de BD_{100}-actiewaarde voorzien (van 40 naar 30 eind 2024), wat niet zo is voor de vleesvarkens, waar de laatste aanpassing, van 9 naar 6, begin 2023 werd doorgevoerd. Voor beide categorieën worden de BD_{100}-actiewaarden echter als nog steeds te hoog beschouwd om een gepaste grens voor aanvaardbaar antibioticagebruik voor te kunnen stellen. Bovendien situeert de grote meerderheid van de gebruikte tonnen antibiotica bij varkens zich momenteel bij bedrijven in de gele benchmarkkleurzone, en deze hoeveelheid weegt nog steeds zwaar door in het totale resultaat voor alle dieren in België. In deze sector zou dus in de eerste plaats moeten gestreefd worden naar een groter percentage bedrijven met een groene kleurscore, waar dan rationelere BD_{100}-grenswaarden uit zullen volgen.

Van de pluimveesector kan hetzelfde gezegd worden. Ook daar zit de meerderheid van de gebruikte tonnen antibiotica bij de bedrijven met een gele kleurscore. Bovendien situeert een heel groot deel (>95 %) braadkippenbedrijven zich nu al een stuk onder de BD_{100}-actiewaarde die pas eind 2024 officieel van kracht wordt (10, huidige P90-BD_{100} = 7,7) en is het streefdoel van max. 1 % alarmgebruikers al gehaald. Hoewel er in 2023 een beperkte daling was van het antibioticagebruik, naar een mediane BD_{100} van 3,43, is de realiteit dat deze sector een grote sprong voorwaarts gemaakt heeft tussen 2020 en 2021, maar sindsdien ter plaatse is blijven trappelen. Zowel absoluut als relatief heeft de sector de kleinste reductie gerealiseerd van de binnen Sanitel-Med opgevolgde sectoren. Het is dus nodig dat er vernieuwde ambitie aan de dag wordt gelegd om een verdere reductie van het antibioticagebruik, voornamelijk bij braadkippen, te bekomen. Bovendien staat de sector voor twee specifieke uitdagingen: het vinden en toepassen van passende maatregelen om het fluctuerende en in 2023 opnieuw gestegen gebruik van quinolones, bij braadkippen, en colistine, bij leghennen, onder controle te krijgen.

Dankzij doelgerichte inspanningen is het gebruik van colistine en quinolones in de vleeskalversector opnieuw gedaald in 2023. In het algemene antibioticagebruik was er bij kalveren in 2023 echter weinig vooruitgang. De mediane BD_{100} nam licht af, tot 7,65, maar bijv. de P90-BD_{100} steeg opvallend. Gezien het nog uitdagende reductiepad zou 2023 nochtans een belangrijk jaar moeten geweest zijn om de doelstellingen enigszins binnen bereik te houden. Het aantal alarmgebruikers nam weliswaar af tot 10 % maar eind 2024 wordt een nieuwe aanpassing van zowel de BD_{100}-aandachts- (van 8 naar 6) als -actiewaarde (van 11 naar 9) voorzien, wat de druk op de sector zal doen toenemen. Het is dus duidelijk dat extra inspanningen nodig zullen zijn.

Over alle sectoren zal het zaak zijn dat alle belanghebbenden hun toewijding voor het bereiken van een verdere vermindering van het antibioticagebruik versterken en in de praktijk brengen, door het bieden van stimulansen, instrumenten en middelen die nodig zijn om verder succes te behalen. Dat elke sector over een sterk en doeltreffend kwaliteitssysteem beschikt moet daarbij ten volle benut worden. Bij de vleeskalveren wordt het ook essentieel om cross-sectoraal te werken en de melkveesector te betrekken om een oplossing te vinden voor de uitdagingen waar deze sector voor staat.

Bij melkvee is het positief om vast te stellen dat de verkoop van intramammaire producten verder daalde in 2023. Deze daling was echter opnieuw hoofdzakelijk een gevolg van een daling van het gebruik van uierpreparaten voor de behandeling van klinische mastitis terwijl het gebruik van droogzetpreparaten stabiel bleef. De grootste uitdaging voor deze sector, samen met de vleesveesector, wordt het bekomen van een performante, volledige en correcte registratie van hun gebruiksdata in Sanitel-Med.

Op vlak van antibioticaklassen en toedieningswegen was er in 2023 een verderzetting van trends van de voorbije jaren: aminopenicillines, tetracyclines en de combinatie trimethoprim-sulfamide bleven de meest verkochte en gebruikte klassen, vooral via orale weg. Opmerkelijk was de toename van de

verkoop van cefalosporines van de 3de en 4de generatie voor intramammair gebruik. Hoewel deze kritisch belangrijke antibiotica bevatten, werd beslist om deze antibiotica een oranje kleurcode toe te kennen. Hoewel ze minder zwaar doorwegen in verkochte massa dan de quinolones in de resultaten van de kritische belangrijke antibiotica, is het een teleurstellend resultaat dat goed moet opgevolgd worden.

Met de resultaten van 2023 blijft de diergeneeskunde in de dierhouderij in België op de goede weg om de reductiedoelstellingen eind 2024 te behalen. Voor wat betreft de sectorspecifieke streefdoelen van max. 1 % alarmgebruikers werd geïllustreerd dat dit haalbaar lijkt voor braadkippen en varkens, en moeilijker voor vleeskalveren; een verderzetting van het werk is hier hoe dan ook aan de orde. Algemeen wordt gestreefd naar -65 % in de verkoop van antibacteriële diergeneesmiddelen t.o.v. 2011 en in 2023 werd -62,4 % behaald. Daarbovenop werden de doelstellingen voor de verkoop van met antibiotica gemedicineerde voeders (-86,6 % tegenover doelstelling van -75 % t.o.v. 2011), voor de verkoop van colistine (0,62 mg/kg biomassa tegenover doelstelling van 1 mg/kg biomassa) en voor de verkoop van kritisch belangrijke antibiotica (-75,8 % tegenover doelstelling van -75 % t.o.v. 2011) allemaal behaald in 2023. Specifiek voor de laatste doelstelling moet wel erkend worden dat er geflirt wordt met de drempel, wat illustreert dat het noodzakelijk is om te streven naar meer preventie maar ook dat er behoefte is aan voortdurend en performant toezicht op de wetgeving over de voorwaarden voor het gebruik van kritisch belangrijke antibiotica, om ervoor te zorgen dat hun gebruik in overeenstemming blijft met de wet.

Het is duidelijk dat het opvolgen van de verkoop en het gebruik van antibacteriële diergeneesmiddelen van groot belang blijft. De resultaten van 2023 zijn gemengd positief, er blijven vele aandachts- en werkpunten, zoals het inzetten op meer bedrijven met een groene benchmarkkleur, het zoeken van preventieve maatregelen om het gebruik van quinolones en colistine in pluimvee te vermijden, het intensifiëren van de intersectorale samenwerking tussen de vleeskalver- en de melkveesector en, voor FAGG, het tijdig implementeren van de VetAMR-data-collectietool, niet alleen om de verkoopdata beter te coveren maar ook om het antibioticagebruik bij alle dieren op termijn in kaart te kunnen brengen. De behaalde resultaten in 2023 moeten een stimulans zijn om het goede werk verder te zetten en, bij het uittekenen van het beleid voor de komende vijf jaar, goed geïnformeerd en met vertrouwen de juiste accenten te leggen en de nodige middelen te voorzien om resultaten te kunnen boeken.

RÉSUMÉ

Ce 15e rapport BelVet-SAC décrit les résultats de la vente et de l'utilisation d'antibiotiques chez les animaux en Belgique en 2023 et leur évolution depuis 2011.

Les précédents rapports étaient basés sur les données de vente collectées auprès des fabricants d'aliments composés (prémélanges antibactériens) et des grossistes-répartiteurs (médicaments antibactériens à usage vétérinaire, à l'exception des prémélanges). Le règlement européen 2019/6, en vigueur depuis 2022, a abandonné le concept de « grossiste-répartiteur ». En conséquence, les titulaires d'autorisation disposant de l'autorisation appropriée peuvent désormais vendre directement des médicaments à usage vétérinaire aux vétérinaires, pharmaciens et fabricants d'aliments médicamenteux. Il a donc été décidé de recueillir les données relatives aux ventes de 2022 et 2023 au niveau des fabricants d'aliments composés (pour les prémélanges antibactériens) et au niveau des titulaires d'une autorisation de mise sur le marché de médicaments antibactériens en Belgique (pour les médicaments antibactériens à usage vétérinaire).

Comme les années précédentes, les données d'utilisation proviennent des enregistrements dans Sanitel-Med et seuls les résultats concernant les porcs, les poulets de chair, les poules pondeuses et les veaux de boucherie ont été calculés. En effet, même si la collecte des données d'utilisation des antibiotiques de bovins et tous les volailles des espèces poulet et dinde, a débuté en 2023, les données enregistrées ne couvrant qu'un trimestre et leur qualité étant également insuffisante, elles n'ont pas été analysées pour l'actuel rapport BelVet-SAC.

Avec un résultat de 55 mg/kg de biomasse en 2023 par rapport à 70,3 mg /kg de biomasse en 2022, une nouvelle baisse importante (- 21,7 %) a été enregistrée en 2023 dans les ventes d'antibiotiques pour animaux en Belgique. Cette baisse concerne les médicaments antibactériens (-21,9%) et les prémélanges antibactériens (- 18,6 %). Ce bon résultat doit toutefois être interprété avec prudence. La différence en 2023 entre la quantité de produits antibactériens vendus pour tous les animaux et la quantité utilisée pour seulement quatre types d'animaux était inhabituellement faible, à savoir 17 tonnes (années précédentes : 40 à 55 tonnes). Les fluctuations dues, par exemple, à la constitution de réserves peuvent jouer un rôle à cet égard, mais il faut également envisager l'achat croissant d'antibiotiques à usage vétérinaire à l'étranger. Les achats hors de Belgique ne sont pas couverts par la collecte actuelle de données sur les ventes. L'Agence fédérale des Médicaments et des Produits de Santé (AFMPS), avec le support de la Commission européenne, travaille actuellement sur un outil, VetAMRTool, qui permettra de saisir tous les achats par le biais d'une collecte au niveau du registre IN des vétérinaires et des pharmaciens. Cet outil sera opérationnel dans quelques années.

Dans ce contexte, les données d'utilisation gagnent en importance pour suivre la situation en Belgique. Le BD_{100}-species montre de belles réductions entre 2018 et 2023 pour les porcs (- 45,2 %), la volaille (- 40,4 %) et les veaux de boucherie (- 43,0 %), bien que les progrès dans ces secteurs aient connu leur propre dynamique au cours des dernières années. La consommation de ces trois secteurs a cependant montré en 2023 des signes de stagnation et chacun d'entre eux rencontre des défis spécifiques qu'il doit relever pour atteindre ses objectifs.

Pour les porcs, il faut mettre l'accent sur les porcs d'engraissement et les porcelets sevrés. Ces deux catégories animales ont connu une évolution similaire en 2023, avec de nouvelles diminutions de

l'utilisation d'antibiotiques dans les zones de couleur de benchmarking « jaune » et « rouge », mais leur BD_{100} médian s'est stabilisée par rapport à 2022, à 1,94 et 10,18, respectivement. Le nombre d'utilisateurs en zone d'alarme a diminué dans ces deux catégories, à 1,8 % et 2,4 % respectivement, ce qui rend l'objectif d'1 % maximum d'utilisateurs en zone d'alarme pour fin 2024 encore réalisable. Pour les porcelets sevrés, un nouvel ajustement de la valeur d'action BD_{100} est prévu (de 40 à 30 fin 2024), ce qui n'est pas le cas pour les porcs d'engraissement, pour lesquels le dernier ajustement, de 9 à 6, a été effectué début 2023. Toutefois, pour les deux catégories, les valeurs BD_{100} d'action sont jugées encore trop élevées pour pouvoir proposer une limite appropriée pour une utilisation acceptable d'antibiotiques. En outre, la grande majorité de la masse d'antibiotiques utilisés chez les porcs l'est par les exploitations situées dans la zone jaune du benchmarking, et leur utilisation pèse toujours lourdement sur le résultat global de tous les animaux en Belgique. L'objectif premier dans ce secteur devrait donc être d'augmenter le pourcentage d'exploitations en zone verte, ce qui sera ensuite suivi par des valeurs limite de BD_{100} plus rationnelles.

On peut faire le même constat pour le secteur volaille. Là aussi, la majorité de la masse d'antibiotiques utilisés l'est dans des exploitations situées en zone jaune. En outre, une très grande partie (> 95 %) des élevages de poulets de chair se situe déjà bien en dessous de la valeur d'action BD_{100} qui n'entrera officiellement en vigueur que fin 2024 (10, P90-BD_{100} actuel = 7,7) et l'objectif d'un maximum de 1 % d'utilisateurs en zone d'alarme a déjà été atteint. Bien que la baisse de la consommation d'antibiotiques en 2023 dans ce secteur ait été limitée, avec un BD_{100} médian de 3,43, il avait réalisé un grand bond en avant entre 2020 et 2021, mais il piétine depuis lors. Autant en termes absolus que relatifs, ce secteur a enregistré la plus faible réduction des secteurs suivis par Sanitel-Med. Une ambition renouvelée est donc nécessaire pour réduire davantage l'utilisation des antibiotiques, principalement chez les poulets de chair. En outre, le secteur est confronté à deux défis spécifiques : trouver et mettre en œuvre des mesures appropriées pour contrôler son utilisation fluctuante mais à nouveau plus élevée en 2023, des quinolones, chez les poulets de chair, et de la colistine, chez les poules pondeuses.

Dans le secteur des veaux de boucherie, grâce à des efforts ciblés, l'utilisation de la colistine et des quinolones a de nouveau diminué en 2023. Toutefois, l'utilisation globale d'antibiotiques chez les veaux n'a guère régressé en 2023. Le BD_{100} médian a légèrement diminué, passant à 7,65, mais le P90 du BD_{100}, par exemple, a particulièrement augmenté. Compte tenu du trajet de réduction assez ambitieux, 2023 aurait dû voir des progrès notables pour que les objectifs de fin 2024 puissent encore être atteints. Bien que le nombre d'utilisateurs en zone d'alarme soit tombé à 10 %, un nouvel ajustement de la valeur de vigilance de BD_{100} (de 8 à 6) et de la valeur d'action (de 11 à 9) est prévu fin 2024, ce qui augmentera la pression sur le secteur. Il est donc clair que des efforts supplémentaires seront nécessaires.

Dans tous les secteurs, toutes les parties prenantes devront renforcer et mettre en pratique leur engagement à réduire davantage l'utilisation des antibiotiques en fournissant les stimulants, les outils et les moyens nécessaires pour obtenir de nouveaux succès. Le fait que chaque secteur dispose d'un système de qualité solide et efficace doit être à cet égard pleinement exploité. En ce qui concerne les veaux de boucherie, il devient également essentiel de travailler de manière intersectorielle et d'impliquer le secteur des bovins laitiers pour trouver une solution aux défis auxquels le secteur des veaux de boucherie est confronté.

En ce qui concerne les bovins laitiers, il est positif de noter que les ventes de produits intra-mammaires ont continué à diminuer en 2023. Toutefois, cette baisse est à nouveau principalement due à une diminution de l'utilisation des préparations pour le traitement de la mammite clinique, tandis que

l'utilisation des préparations pour le tarissement est restée stable. Le plus grand défi concernant ce secteur, ainsi que celui des bovins de boucherie, sera d'obtenir un enregistrement performant, complet et correct de leurs données d'utilisation dans Sanitel-Med.

Quant aux classes d'antibiotiques et aux voies d'administration, 2023 a vu la poursuite des tendances des années précédentes : les aminopénicillines, les tétracyclines et l'association triméthoprime-sulfamide sont restées les classes les plus vendues et les plus utilisées, en particulier par voie orale. L'augmentation des ventes de céphalosporines de 3^{e} et 4^{e} générations pour un usage intra-mammaire est frappante. Bien qu'il s'agisse d'antibiotiques d'importance critique, il a été décidé de leur attribuer un code de couleur orange. Même si les céphalosporines ont moins de poids, en termes de masse vendue, que les quinolones dans les résultats des antibiotiques d'importance critique, il s'agit d'un résultat décevant qu'il convient de surveiller de près.

Avec les résultats de 2023, la médecine vétérinaire dans les élevages en Belgique reste sur la bonne voie pour atteindre les objectifs de réduction fixés pour la fin de 2024. En ce qui concerne l'objectif de limite de 1 % maximum d'utilisateurs en zone d'alarme, il semble réalisable pour le secteur des poulets de chair et celui des porcs, mais plus difficile à atteindre pour le secteur des veaux de boucherie ; la poursuite des efforts dans ce domaine s'impose de toute façon. Globalement, l'objectif est de réduire les ventes de médicaments antibactériens à usage vétérinaire de 65 % par rapport à 2011, et en 2023, la réduction cumulée a atteint 62,4 %. Les objectifs de réduction, visés pour fin 2024, des ventes d'aliments médicamenteux à base d'antibiotiques, de colistine et d'antibiotiques d'importance critique ont tous été atteints en 2023. En effet, depuis 2011, la vente d'aliments comprenant des antibiotiques a baissé de 86,6 % (objectif : - 75 %), les ventes de colistine ne dépassent pas 0,62 mg/kg de biomasse (objectif : maximum 1 mg/kg de biomasse) et les ventes d'antibiotiques d'importance critique ont baissé de 75,8 % (objectif : -75 %). En ce qui concerne ce dernier objectif, il faut toutefois reconnaître que la réduction est proche du seuil maximal, ce qui illustre la nécessité d'intensifier la prévention, mais aussi d'assurer un contrôle continu et efficace de l'application de la législation relative aux conditions d'utilisation des antibiotiques d'importance critique, afin de garantir que leur utilisation reste conforme à la loi.

Il est clair que le suivi de la vente et de l'utilisation des médicaments antibactériens à usage vétérinaire reste d'une grande importance. Les résultats de 2023 sont mixed positifs mais il reste de nombreux points à résoudre et à améliorer, sur lesquels doivent se concentrer les efforts : le nombre d'exploitations ayant un statut vert doit augmenter ; des mesures préventives doivent être mises en place pour éviter l'utilisation de quinolones et de colistine chez la volaille ; la coopération entre les secteurs des veaux de boucherie et des bovins laitiers doit s'intensifier et, pour l'AFMPS, l'outil de collecte de données VetAMR doit être rapidement mis en oeuvre, non seulement pour mieux couvrir les données de vente, mais aussi pour que l'utilisation d'antibiotiques chez tous les animaux puisse, à terme, être cartographiée. Les résultats obtenus en 2023 doivent nous encourager à poursuivre le bon travail déjà accompli et, bien informés et confiants, à mettre les bonnes priorités et fournir les moyens nécessaires lors de l'élaboration de la politique des cinq prochaines années pour pouvoir obtenir des résultats.

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DEFINITIONS AND ABBREVIATIONS

AMCRA	Centre of expertise on Antimicrobial Consumption and Resistance in Animals
AMR	Antimicrobial Resistance
ASU	Antimicrobial Sales and Use
ATCvet	Anatomical Therapeutic Chemical classification system for veterinary medicinal products
BD_{100}	Indicator which represents the % of time an animal is treated with antibacterials
CIA	Critically Important Antibacterials (the quinolones and cephalosporins of the 3rd and 4th generation)
DC	Dry Cow
$DDDA_{bel}$	Defined Daily Dose Animal for Belgium
DLP	Data-Lock-Point
EMA	European Medicines Agency
ESVAC	European Surveillance of Veterinary Antimicrobial Consumption project
FAMHP	Belgian Federal Agency for Medicines and Health Products
FASFC	Belgian Federal Agency for the Safety of the Food Chain
LA_{bel}	Long-Acting factor defined for Belgium
LC	Lactating Cow
MAH	Market Authorisation Holder
MMF	Manufacturers of Medicated Feed
SDP	Self-Defined Product
SPC	Summary of Product Characteristics
VMP	Veterinary Medicinal Product

I. INTRODUCTION AND SCOPE

Antimicrobial resistance (AMR) is a global "One Health" issue that threatens the future of human and veterinary medicinal treatment. This 15th BelVet-SAC report is presented to you, detailing the sales and use of antibacterial veterinary medicinal products (VMPs) in animals in Belgium in 2023, and their evolution over the years.

Over the past one and a half decade much progress has been made in reducing the use of veterinary antibacterials in Belgium, yet our focus should not weaken as it is known that use of antibacterials in human and veterinary medicine is the main driver of the development and spread of AMR.

In August 2023, the data-collection for bovines in Sanitel-Med became legally obliged. With that, Belgium now fulfils the requirements of the European directive 2019/6, to yearly report the use of antibacterials in pigs, poultry (chickens and turkeys) and bovines to the European Medicines Agency (EMA) from 2024 onwards – along with the overall national sales data of antibacterials for animals. In this BelVet-SAC report, use data (originating from Sanitel-Med) from bovines are not yet included. In the future, starting from the next BelVet-SAC report, these additional data will allow to close one of the major gaps in our understanding of the antibacterial use in Belgian animals.

In the foresight of that next step, new challenges have arisen. Due to the New Veterinary Regulation 2019/6, effective from 2022, the 'wholesaler with public duties' concept has been abandoned. Consequently, Market Authorisation Holders (MAHs) with the appropriate authorisation are now authorised to deliver directly to veterinarians, pharmacists and manufacturers of medicated feed (MMF). As a result, to capture the most complete dataset, this BelVet-SAC report for the first time uses the sales data from the MAHs for 2022 and 2023 (see ***Chapter III.1 Total sales and use of antibacterial VMPs in Belgium***). Consequently, the assessment of this years' results in light of the national reduction targets became more challenging (see ***Chapter III.5 The 2023 results in light of the reduction targets***), and it has made the assessment of the Sanitel-Med use data in pigs, poultry and veal calves particularly relevant (see ***Chapter III.2 Sales and use of antibacterial VMPs per animal species and category***). As always, this report also includes an analysis of the sales and use of veterinary antibacterials according to active substance class and administration route (see ***Chapter III.3 Sales and use of antibacterial VMPs per antibacterial class and administration route***) and according to the colour code of the Belgian centre of expertise in Antimicrobial Consumption and Resistance in Animals (AMCRA) (see ***Chapter III.4 Sales and use of antibacterial VMPs per AMCRA colour code***).

As a veterinarian can also buy VMPs from a distributor or manufacturer which can be an MAH with appropriate authorisation, in another member state, it is likely that with the current sales data collection tools we are still missing some data. That is why a new tool, the VetAMR data-collection system, is being developed by the FAHMP, with the support from the European Commission, meant to collect the data at the level of the veterinarian depot and at the level of the pharmacy via the Register In. This will allow a complete capture of the sales data in the coming years.

We wish you an interesting and pleasant reading!

II. INFORMATION ON THE DATA COLLECTION AND ANALYSIS

II.1 ANTIBACTERIAL SALES DATA

Data collection

a) Sales of veterinary antibacterial VMPs

i. Antibacterial pharmaceuticals and premixes

The sales data of all VMPs in every pharmaceutical formulation containing active antibacterial substances and authorised on the Belgian market, were aggregated.

These data can be collected at different levels. In the previous BelVet-SAC reports, these data originated from the distributors and the MMF. However, due to the new veterinary legislation (Regulation 2019/6), effective from 2022, MAHs with the appropriate authorisation are now authorised to deliver directly to veterinarians, pharmacists and MMF. As a result, a better reflection of the total sales of antibacterial pharmaceuticals for animals in Belgium was expected at the level of the MAHs instead of the distributors. Therefore, from 2023 onwards and retrospectively also for 2022, the data coming from the MAHs (antibacterial pharmaceuticals) and the MMF (antibacterial premixes) were used as the source data for the calculation of the quantities of antibacterial VMPs sold.

The data collection from the MAHs is conducted biannually since 2016 and was accordingly performed in 2023. In July 2023 and January 2024, all MAHs with at least one authorised and commercialised antibacterial VMP in Belgium received a template with their own antibacterial VMPs. This template included the name of the VMP, its strength, pack size, pharmaceutical form and the national reference code (cti-ext). Upon submission, the MAHs provided the number of packages sold during the specified semester. Hence, the collected sales data consisted of all antibacterial VMPs authorised in Belgium, that were sold in Belgium during the year 2023 by the MAH to distributors and directly to veterinarians, pharmacists or MMF.

The data concerning the antibacterial premixes was, as for the previous BelVet-SAC reports, collected annually from the MMF, considering that they deliver directly to the farmer and only on prescription of the veterinarian. On December 19, 2023 the FAHMP sent a letter to the authorised MMF in Belgium, requesting information on the number of packages of antibacterial premixes sold. Together with the letter, a csv-file with the relevant VMPs was sent.

Figure 1 provides a schematic overview of the 'flow' of (antibacterial) VMPs in Belgium. They are only available on prescription or by delivery from the veterinarian. Belgian veterinarians can use antibacterial VMPs both in their daily practice or sell them to animal owners.

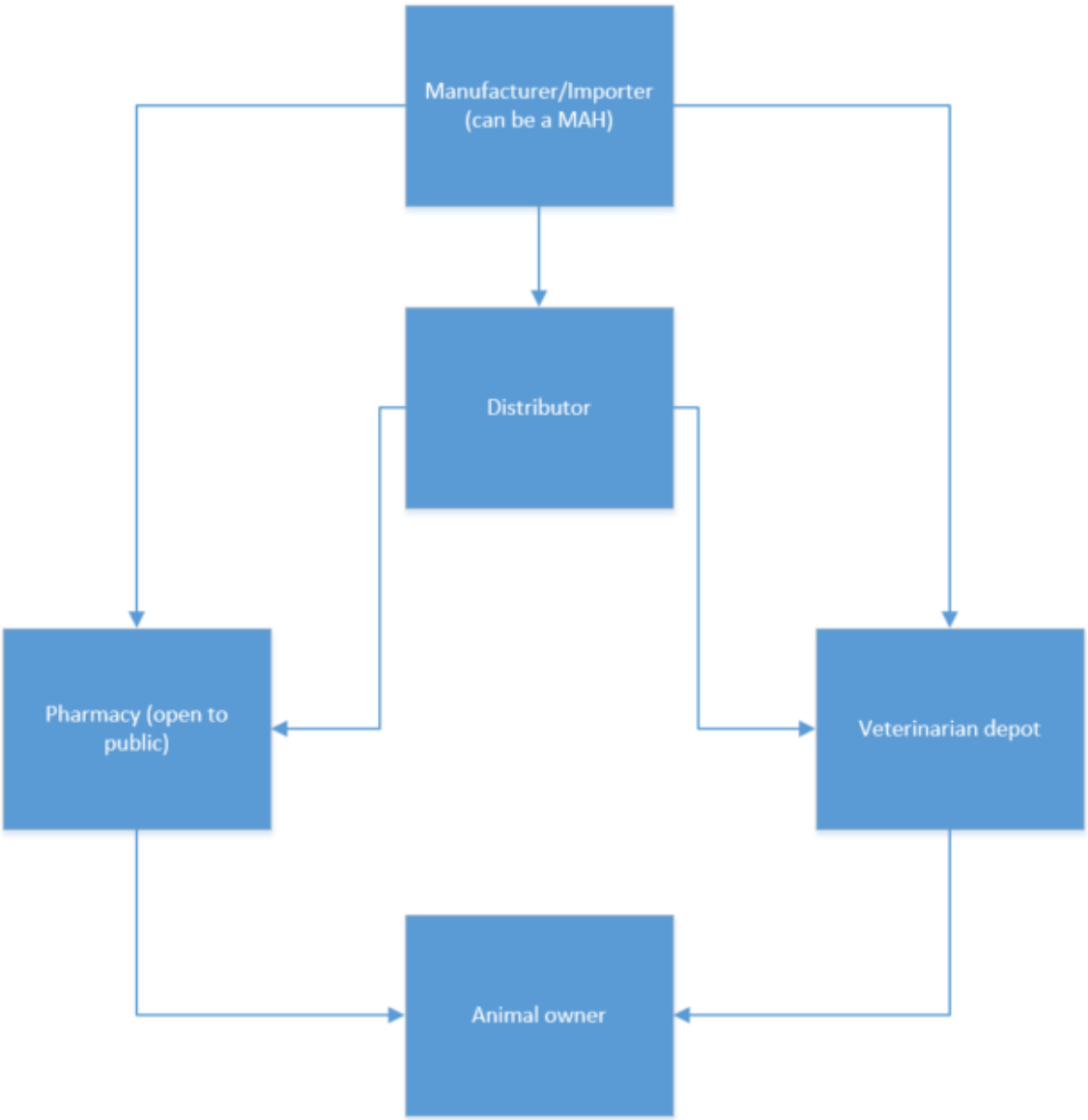


Figure 1. Distribution of VMPs in Belgium.

Figure 2 is a schematic overview specifically for (antibacterial) premixes and the medicated feed produced. Antibacterial premixes for production of medicated feed are supplied to manufacturers of medicated feed, either through distributors or directly by the MAHs. After manufacturing, the medicated feed is delivered to the animal owner on prescription of the veterinarian only.

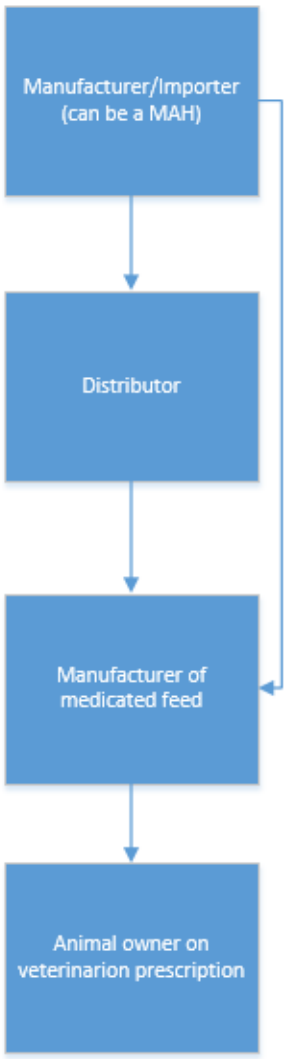


Figure 2. Distribution of feed medicated with antibacterial premixes in Belgium.

ii. Antibacterial classes included

Table 1 provides an overview of the groups of antibacterial substances covered in the BelVet-SAC data-collection system, together with the corresponding ATCvet codes[1].

[1] https://www.whocc.no/atcvet/atcvet_index/

The BelVet-SAC data collection covers all antibacterial VMPs (in every pharmaceutical formulation containing antibacterial active substances) that are authorised on the Belgian market. No antibacterial VMPs are excluded, which contrasts with the mandatory antimicrobial sales and use (ASU) collection system on EU level, where mainly antibacterial VMPs for dermatological use and for use in sensory organs are excluded. The sales data presented in this report may therefore slightly differ from what is reported for Belgium in the ASU report.

Table 1. Groups of antibacterial substances included in the data collection and corresponding ATCvet codes.

Groups of antibacterial substances	ATCvet codes
Antibacterial substances for gastro-intestinal use	QA07AA + QA07AB + QA07AX03 + QA07AX04 + QA02BD
Antibacterial substances for dermatological use	QD06A + QD06BA + QD06C + QD01AA + QD06BX01 + QD07C + QD09AA + QD10AF
Antibacterial substances for intrauterine use	QG51AA + QG51AG
Antibacterial substances for systemic use	QJ01 + QJ02AA + QJ02AB + QF04AM + QJ04BA50 + QJ04BA51
Antibacterial substances for intramammary use	QJ51+ QJ54
Antibacterial substances for use in sensory organs	QS01AA + QS01AB + QS01AE + QS01CA + QS01CC + QS02AA + QS02CA + QS03AA + QS03CA + QR01AX06 + QR01AX08 +
Antibacterial substances for use as antiparasitic	QP51AG +QP51BA01 + QA01AB17 + QG01AF01
Antibacterial substances for use in respiratory system	QR02AB

b) Animal population

Animal population data to calculate the produced biomass were derived from the Belgian Statistics Bureau (Statbel website[2,3]). From these animal population data, the biomass (in kg) was calculated according to Grave[4] et al., (2010), as shown in the formula below:

$$biomass\ (kg) = (kg\ beef + pork + poultry + small\ ruminants) + (n\ live\ dairy\ cattle \times 500\ kg)$$

The kg beef, pork, poultry and small ruminants is the slaughtered weight reported at the slaughterhouse.

The likewise calculated biomass is estimated to be 93% of the total animal biomass in Belgium. The biomass calculation also includes animals that were slaughtered in Belgium, but raised in other countries, yet it excludes animals that were raised in Belgium, but slaughtered abroad. It also excludes horses, rabbits and companion animals (estimated to be 7% of the total animal biomass in Belgium.

[2] https://statbel.fgov.be/en/themes/agriculture-fishery/animal-slaughtering#figures
[3] https://statbel.fgov.be/en/themes/agriculture-fishery/farm-and-horticultural-holdings#figures
[4] Grave K, Torren-Edo J and Mackay D (2010). Comparison of the sales of veterinary antibacterial agents between 10 European countries. *Journal of Antibacterial Chemotherapy*, 65, 2037-2010

Data analysis

The total number of packages sold per VMP for all MMF and MAHs was registered in a database that was developed for that purpose and that contained additional product information, consisting of:

- the different active antibacterial substances in the VMP per ml for liquids or per mg for solids
- the weight per active antibacterial substance
- the number of units in one package
- for active antibacterial substances expressed as a salt, the conversion to the base
- for active antibacterial substances expressed in International Units: the conversion factor to mg
- calculated from the above: the total amount of active antibacterial substance (per active antibacterial substance) in one package (per ml or per mg), If the VMP contained more than one antibacterial active antibacterial substance, the calculation was done for each substance.
- the ATC vet code for each (combination of) active antibacterial substance(s) required for the ASU reporting
- the class of the antibacterial VMP and the AMCRA colour code.

By means of this extra information, the number of packages sold was converted to the amount of active substance sold.

In the past, not all salts were converted to the corresponding amount of base. Therefore, the mg active antibacterial substance of the sales data from 2018 (the first full year of Sanitel-Med data collection) onwards have been recalculated in this report, with a revised list on which all salts are converted to base. In case the active antibacterial substance was expressed in international units, the ASU conversion factors[5] were used.

Data validation

a) External data validation

The data on antibacterial premixes collected by the FAMHP were compared to the data collected by the Belgian Feed Association (BFA)[6]. The datasets do not provide the exact same amounts as the FAMHP collects sold quantities and the BFA collects produced quantities. However, trends and evolutions in the different datasets can be compared.

The sales data were also compared to the reported use data in Sanitel-Med.

[5] EMA Antimicrobial Sales and Use (ASU) technical implementation protocol
[6] www.bfa.be

b) Internal data validation

The data supplied by the MMF was checked to contain the number of sold packages and not the sold mass (kg).

As explained, MAHs with the appropriate authorisation can now deliver VMPs directly to veterinarians, pharmacists or MMF. Therefore, an additional data collection was organised April 2024. The MAHs were asked to clarify the distribution of their VMPs sold in 2023: how many were sold to distributors versus how many were sold directly to veterinarians, pharmacists or MMF.

II.2 ANTIBACTERIAL USE DATA

Data collection in Sanitel-Med

a) *Notifications of antibacterial use at farm level*

Since 27 February 2017, veterinarians are legally obliged[7] to register all prescriptions, administrations and deliveries of antibacterial VMPs (pharmaceuticals as well as premixes, incl. premixes containing ZnO as an antidiarrheal substance) for pigs, broilers, laying hens and veal calves in the secured online data collection system 'Sanitel-Med'.

As of 10 August 2023, the mandatory data collection in Sanitel-Med is extended to all cattle and all categories of poultry of the species chicken and turkey.

Sanitel-Med, the data collection system of the FAMHP, is accessible as a web application or through automated data transfer using xml (webservices).

To manually register[8] the use of an antibacterial VMP in the web application the veterinarian first creates a 'Medicinal Delivery Document' containing the identification of the veterinarian and the farm as well as the type, number and date of the reference document (prescription or 'treatment and delivery document/register out' of the veterinarian). Secondly, one or more 'notifications' of the use of antibacterial VMPs are added to this Medicinal Delivery Document, each representing a specific prescription, delivery or administration of an antibacterial VMP.

The notification needs to mention the animal species and category for which the antibacterial VMP is intended as well as the unique identification product key and the quantity of the VMP (see below).

i. <u>The animal species and category</u>

The categories that can be selected for the animal species for which data collection currently is legally obliged are listed in ***Table 2***.

Note that only the categories listed in bold are taken in consideration for the 'Use Data' results presented in this report.

The categories listed in italics will be included in the analyses from 2025 onwards.

[7] https://www.ejustice.just.fgov.be/cgi_loi/change_lg.pl?language=nl&la=N&cn=2016072106&table_name=wet

[8] https://prd.sanitel.be/web/PRD_SanitelMed_Web/Account/Login?ReturnUrl=%2Fweb%2FPRD_SanitelMed_Web%2F

Table 2. Animal species and categories that can be selected in the Sanitel-Med data-collection.

Pigs	
Suckling piglets	**Fattening pigs**
Weaned piglets	**Sows**
Poultry	
Broilers;	*Lay rearing*
Laying hens	*Turkey breed*
Lay rearing – propagation – selection	*Turkey meat*
Meat rearing – propagation – selection	*Hatching eggs*
Lay propagation – selection	*Day-old chicks*
Meat propagation – selection	
Veal	
Veal calves	
Cows	
Veal (0 to 3 months) Meat	*Veal (0 to 3 months) Milk*
Veal (3 to 8 months) Meat	*Veal (3 to 8 months) Milk*
Young stock (8-24 months) Meat	*Young stock (8-24 months) Breed*
Bovine adult BEEF	*Bovine adult DAIRY*

ii. The name and quantity of the antibacterial VMP

The VMP needs to be selected from a regularly updated VMP list containing all antibacterial VMP packages that are commercialised in Belgium, identified through their national reference code (cti-ext). As for the antibacterial sales data, all groups of antibacterial substances listed in Table 1 are included. For pharmaceuticals, the number of packages needs to be registered, with the possibility of using decimals (incl. quantities lower than 1). For premixes, either the number of packages or the kg premix needs to be registered and using decimals is also possible.

VMPs that are not in the medicinal product list (e.g. VMPs authorised in Belgium or in another Member State but not commercialised in Belgium, products for human use or products prepared extemporaneously according to a veterinary prescription) need to be registered as 'Self-Defined Product' (SDP), requiring additional data fields to allow calculation of the used quantity of antibacterial active substance and the BD_{100}-indicator (see below).

Veterinarians can register the data at any moment on the condition that all data from a given quarter are registered on the 14th day of the following quarter at the latest. The farmer or responsible of the animals must check the correctness of the data at the latest on the final day of the first month of the following quarter. These 'deadlines' are the 'Data-Lock-Points' (DLP), hence, there are four DLP in a year for veterinarians and farmers (***Figure 3***).

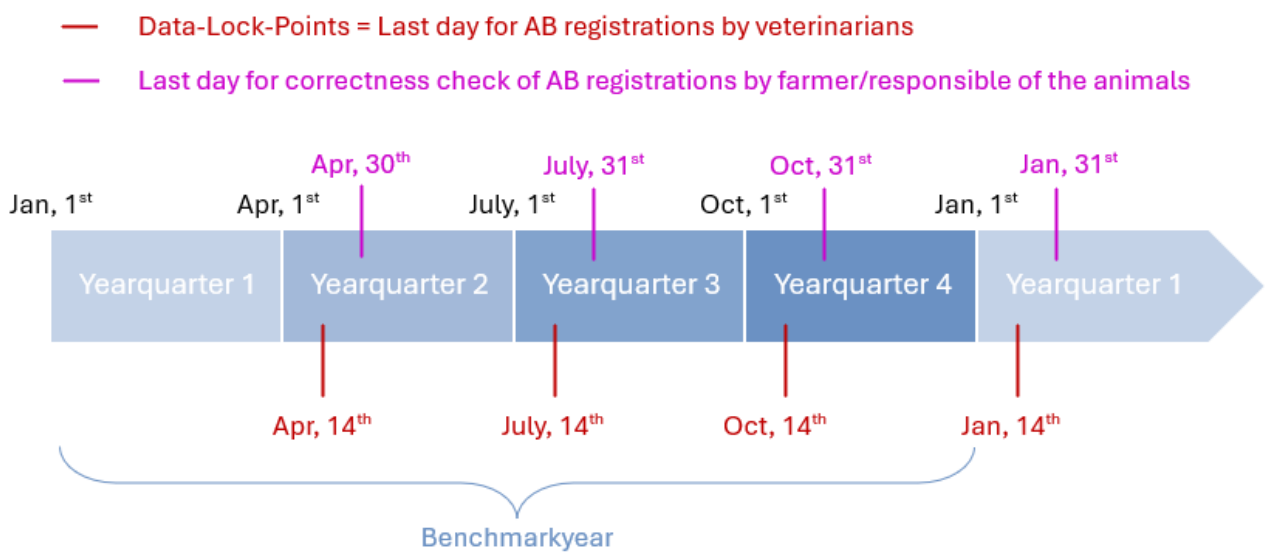


Figure 3. The timeline of the Sanitel-Med data-collection throughout a year.

So-called 'third parties' (i.c. other Belgian data collection systems) can transfer the required data, that are registered by the veterinarian in their collection system, to Sanitel-Med, on request of the veterinarian or the farmer. Nonetheless, the veterinarian and the farmer remain responsible for the completeness, correctness and timeliness of the registrations.

Reprising ***Figure 1***, explaining the origin of the antibacterial sales data, the data from Sanitel-Med originate at the bottom of the chain and cover data on the use of antibacterial VMPs at farm-level (***Figure 4***). However, from the info provided above, it can be noted that not all Sanitel-Med data are 'use data' in a strict sense; indeed, a prescription or a delivery is not 'proof' that the VMPs have also been used in practice, it is also not known whether they are used at the time of prescription or delivery. Nonetheless, it is deemed very likely that virtually all VMPs prescribed or delivered are eventually used. Therefore, the Sanitel-Med data are referred to as 'use data' – in contrast to the 'sales data' described previously.

A list with all notifications is accessible to AMCRA as a report, based on a query developed and maintained by the FAMHP, that can be extracted by AMCRA through a secured online business object tool provided by the Federal Agency for the Safety of the Food Chain (FASFC).

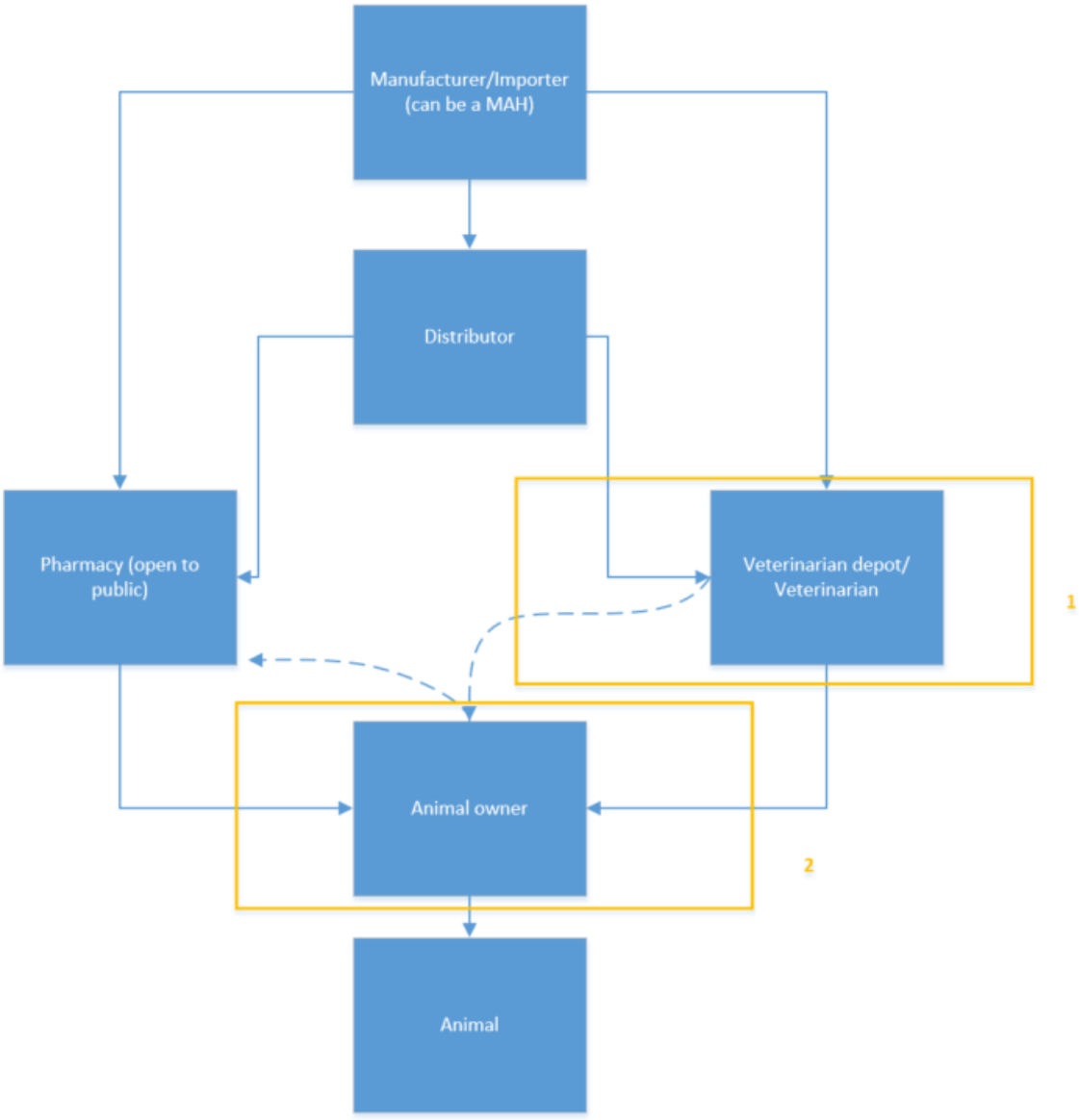


Figure 4. Origin of Sanitel-Med data concerning farm-level use of antibacterial pharmaceuticals. Veterinarians can directly administer antibacterials to the animals, deliver the antibacterials to the farmer (after which the farmer administers them to the animals following the guidelines of the veterinarian), or prescribe the antibacterials which can then be bought in a pharmacy (dashed line) or from an MMF (in case of medicated feed, not shown in the figure). The responsibility for registration in Sanitel-Med encompasses two levels (in orange): 1. the veterinarian who administers/delivers/prescribes the antibacterial VMP registers this in the data collection system, and 2. the animal owner checks and validates the registrations.

b) Number of animals present at farm level

The number of animals present at each farm is needed to calculate the animal mass 'at risk of treatment' at the farm (cf. further, Calculation of the indicator BD_{100}). This number is deduced from identification and registration data present in the SANITEL[9] -database (owned and managed by the FASFC and with a link to Sanitel-Med) or, specifically for poultry farms for the year 2018, from SANITEL-data combined with data from the yearly 'Biosecurity-survey' organized by the FASFC.

i. Veal calf farms

The average number of calves present at each farm is calculated per semester as the average over the six corresponding monthly numbers of animals. From January 2018 till July 2019, the monthly number of animals was calculated as the average occupation number, taking into account the number of arrivals, births, departures and deaths per month on the farm as notified in SANITEL. From August 2019 onwards, the monthly number of animals is calculated as the average of the number of calves notified as present in SANITEL each 1st, 10th and 20th day of each month and the 1st day of the subsequent month.

ii. Poultry farms

As of 2019, the SANITEL-capacity data of a poultry facility are calculated as the sum of the SANITEL-capacity data of the corresponding poultry sanitary units of that facility.

For 2018 preference was given to the yearly FASFC 'Biosecurity-survey' capacity numbers over SANITEL-data. These were either a separate capacity for broilers and laying hens on a facility, a total capacity for broilers and laying hens on a facility, or a total capacity for either broilers or laying hens on a facility. If for a given facility notifications were present in Sanitel-Med for a poultry category missing from the Biosecurity-survey but for which capacity data was available in SANITEL, the SANITEL-capacity was used.

iii. Pig farms

The SANITEL-data include capacity data (updated in SANITEL whenever the capacity changes in practice, for example by building a new stable or changing an existing one) as well as count data (the number of animals present needs to be registered in SANITEL by the herd veterinarian at least three times a year). The capacity is the preferred animal number in the calculations. If capacity data were not available, count data were used.

The number of suckling piglets is calculated from the number of sows using the formula

$$\#\ sucklers = {}^{\#\ sows \times 30}/_{12}$$

The number of gilts is added to the number of sows if these are present at the farm; if not, gilts are counted as fattening pigs. No separate antibacterial use analysis is done for gilts.

[9] https://favv-afsca.be/nl/sanitel

c) Number of active farms

The number of active farms (i.e., having raised animals, hence, where antibacterial VMPs could have been used), is needed to determine the reference population for benchmarking (cf. further, Quality control for defining the yearly reference populations for benchmarking). Being 'active' is encoded at sanitary unit level as a separate feature in SANITEL. A list of active sanitary units is accessible to AMCRA as a report, based on a query developed and maintained by the FAMHP, that can be extracted by AMCRA through a secured online business object tool provided by the FASFC.

d) Veterinary contract

A list with all agreement roles stopped, begun or active since 01/04/2017 between a herd veterinarian and a farm, containing the start and end dates of each agreement, is accessible to AMCRA as a report, based on a query developed and maintained by the FAMHP, that can be extracted by AMCRA through a secured online business object tool provided by the FASFC.

Data analysis

a) Determination of the numerator

i. Mg active antibacterial substance used

The quantity in mg of the active antibacterial substance used is calculated per Sanitel-Med notification, using the formula

$$active\ substance\ used\ (mg) = quantity\ antibacterial\ product\ \times strength$$

For pharmaceuticals, the quantity of antibacterial VMP is the number of packages times the number of units of antibacterial VMP per package. The strength is the number of units of active antibacterial substance per unit of VMP and is taken from the VMPs' summary of product characteristics (SPC). Where applicable, the same conversion factors for international units to mg or from salt to base were used as for the sales data analysis. If the VMP contains more than one active antibacterial substance, the calculation is done for each substance and the sum is made.

For premixes, if the number of packages of the premix is registered, this number is first recalculated to kg premix used. From the quantity in kg premix used, the quantity active antibacterial substance used is calculated by multiplying with the mg active antibacterial substance per kg premix, obtained from the SPC.

After calculating the total mg of active antibacterial substance used per notification, these amounts can be aggregated by farm, by type of active antibacterial substance, by animal category and by animal species, and recalculated to kg or tonnes used.

ii. Number of $DDDA_{bel}$ used

The $DDDA_{bel}$ (the Defined Daily Dose Animal for Belgium) is the daily dose (in mg) per kg live bodyweight for VMPs that are administered orally or through injection, and the daily dose (in mg) per animal for VMPs that are administered locally or topically. The number of $DDDA_{bel}$ used (# $DDDA_{bel}$) is calculated per notification using the formula

$$\#\ DDDA_{bel} = \ mg\ active\ antibacterial\ substance / DDDA_{bel}$$

The $DDDA_{bel}$-values for all antibacterial VMPs in the Sanitel-Med medicinal product list and for all SDPs are defined and maintained by AMCRA in 'Antibacterial-dosing' lists formulated per animal species[10]. Furthermore, per VMP also a minimum dose is defined, as the lowest dose mentioned in the SPC (mg) to be administered to a kg animal in a period that can be shorter than one day. These lists also contain the LA_{bel} (Long-Acting factor defined for Belgium) of each VMP. This LA_{bel} factor corrects for the longer duration of action of certain VMPs in the calculation of the BD_{100} (cf. further, Calculation of the indicator BD_{100}). For not-long-acting VMPs, the LA_{bel} equals 1. The procedures for determining the DDD_{bel} and LA_{bel} values are also available on the AMCRA website[10].

b) Determination of the denominator

i. Animals and kg at risk per species at national level

The national number of animals and the kg animal at risk (for antibacterial treatment) per species is calculated from the yearly average number of animals in Belgium per animal category, consulted in the Statbel database[5] (accession date: 24/05/2024). The categories retrieved from that database to calculate the total number of animals at risk and the standard weights (source: EMA 2013[11]) to calculate the corresponding kg at risk are shown in ***Table 3***. The exception is the weight of veal calves, for which the weight agreed with the sector for benchmark purposes is used.

Table 3. Categories and standard estimated weights at treatment for the calculation of the BD_{100}-species.

Piglets of <20 kg	12 kg	Laying hens	2 kg	Bovines < 1 year to be slaughtered as calves	160 kg
Pigs 20-50 kg + fatteners	50 kg	Broilers	1 kg		
Breeding pigs >50 kg	220 kg				

ii. Animals and kg at risk per animal category at farm level

Per animal category on each farm, the kg animal at risk of treatment is calculated using the formula

$$kg\ animals\ at\ risk = number\ of\ animals\ \times estimated\ standard\ weight\ (kg)\ at\ treatment$$

[10] https://www.amcra.be/nl/analyse-antibioticagebruik/

[11] https://www.ema.europa.eu/en/documents/scientific-guideline/revised-european-surveillance-veterinary-antimicrobial-consumption-esvac-reflection-paper-collecting_en.pdf

The estimated standard weights at treatment shown in ***Table 4*** are used (source: EMA 2013[11]). The exception is the weight of veal calves, for which the weight agreed with the sector for benchmark purposes is used.

Table 4. Categories and standard estimated weights at treatment for the calculation of the BD_{100} at farm level.

Suckling piglets	4 kg	Broilers	1 kg	Veal calves	160 kg
Weaned piglets	12 kg	Laying hens	2 kg		
Fattening pigs	50 kg				
Sows	220 kg				

c) Indicators

i. Mg used

The total amount of active antibacterial substance used is calculated from the sum of the mg used in all Sanitel-Med notifications for that species.

ii. BD_{100}

To compare and follow up on the use of antibacterial VMPs in the different animal categories, the BD_{100} is used, which represents the % of time an animal is treated with antibacterials. This indicator is calculated with the general formula:

$$BD_{100} = \left[\left({}^{\#DDDA_{bel}}/_{kg\ animals\ at\ risk \times days\ at\ risk}\right) \times LA_{bel}\right] \times 100$$

To obtain a result per combination of farm and animal category, the BD_{100} is first calculated per Sanitel-Med notification and per month (i.e., with 30,42 days at risk and with the number of animals at risk determined for that month). Then, the sum of these BD_{100}-values over all notifications in one month is made, from which an average over the 12 months in the year is calculated, resulting in a final average BD_{100} per animal category on a farm. The comparison between animal categories is then done based on the frequency distribution over all farm-animal category combinations that belong to the reference population for benchmarking (cf. further, Quality control for defining the yearly reference populations for benchmarking).

iii. BD_{100}-species

The BD_{100}-species is calculated with the BD_{100} formula but with numerator and denominator data at species level. It is per species the sum of:

- BD_{100}-species$_{mg/kg}$: in the numerator the total #$DDDA_{bel}$*LA_{bel} used for VMPs administered orally or through injection and in the denominator the animal weight (in kg) at risk.
- BD_{100}-species$_{mg/animal}$: in the numerator the total #$DDDA_{bel}$*LA_{bel} used for VMPs administered locally or topically and in the denominator the number of animals at risk.

d) Antibacterial use by the contract veterinarian

The part of the antibacterial use (excl. ZnO) at farm level by the contract veterinarian is calculated by linking the veterinarian responsible for a use notification in Sanitel-Med to the veterinarian having a contract with the farm at the document date. In addition, the part of the antibacterial use (excl. ZnO) at farm level by a veterinarian who is not the contract veterinarian but who is linked to the veterinary practice to which the contract with the farm is allocated, as a legal person, is also determined.

Quality control for possibly erroneous notifications

Numerator data are subjected to quality controls for possibly erroneous notifications. Notifications that are considered possibly erroneous and have not been confirmed as being correct are excluded for further calculations or analyses.

The notified quantity of antibacterials is considered possibly erroneous in the following cases:

- Intramammary or intrauterine VMPs used in non-adult categories of pigs and cows (piglets, fatteners, calves).
- The number of packages is greater than one – in case of a multi-package VMP for injection or cutaneous use.
- The number of packages is greater than 50.
- The administered number of packages is lower than the quantity needed to treat an animal of 1 kg (pigs), 0,042 kg (broilers), 2 kg (laying hens) and 35 kg (veal calves), with the minimum dose.
- The BD_{100} calculated for a notification is higher than 100.
- The premix ppm is unlikely low or high (based on the VMP specific SPC's and only relevant for registrations dated before 2022).

Quality control for defining the reference populations for benchmarking

The reference population for benchmarking is used to study the distribution of the BD_{100} in an animal category and its evolution. The reference population is defined per animal category as the group of farms that, for the period under consideration:

- were 'active' (see below, point a)
- had no 'errors' in their Sanitel-Med notifications (see below, point b)
- fulfilled the conditions with respect to 'minimum herd size and empty stables' (see below, points c and d).

In the reference populations, a further distinction is made between zero-use farms and use-farms (see below, point e).

a) Active during the whole period

A farm is eligible for inclusion in the benchmarking reference population for a certain period when it was encoded as 'active' in Sanitel during the whole period.

For poultry farms, more specifically, at least one sanitary unit needs to have been active during the whole period for the facility to be included.

Pig farms encoded as 'active' but not having any registration in Sanitel-Med and either having no recent animal count date (i.e., count date before the period considered) or having a recent count date (count date in the considered period) but with all counts in that period equalling zero, are excluded (considered de facto inactive).

Veal calf farms encoded as 'active', yet not having any registration in Sanitel-Med and having zero animals in the considered period, are excluded (considered de facto inactive).

b) Notification errors

Two types of errors are distinguished:

i. Notifications for which a BD_{100} cannot be (reliably) calculated due to missing denominator data or due to denominator data considered unreliable (in pigs: no recent count date, or a recent count date but counted animals equalling zero).

ii. Notifications where the delivered quantity is considered erroneous (see higher, Quality control for possibly erroneous notifications).

Farms that have notification errors that are not confirmed as correct are excluded from the benchmarking reference population.

c) Empty stables

Pig farms with recent count data equalling zero for two consecutive trimesters, poultry farms with facility capacities equalling zero at the start of two consecutive trimesters and veal calf farms with at least one semester without animals are excluded from the benchmarking reference populations.

d) Minimum herd size requirements

For the data until 2020 included, a minimum herd size was defined for all included animal categories, as shown in *Table 5*.

Table 5. Minimum herd size to be included in the benchmark reference groups (until 2020 included).

Weaned piglets	50 animals	Broilers	4900 animals	Veal calves	25 animals
Fattening pigs	100 animals	Laying hens	4900 animals		
Sows	10 animals				

Poultry and pig farms with animal numbers below the minimum for at least one quarter were excluded from the benchmarking reference population. Veal calf farms with animal numbers below the minimum for at least one semester were excluded from the reference population.

From 2021 onwards, these criteria were no longer taken into account to define the benchmarking populations for pigs.

e) Zero-use and use farms

A zero-use farm is defined as a farm that has no notifications in Sanitel-Med in a given period. For pig farms, this is at species level (no notifications during the benchmarking period for all categories present at the farm). For farms with broilers, laying hens and veal calves, this is defined at animal category level (no notifications for an animal category during the benchmarking period).

III. RESULTS

III.1 TOTAL SALES AND USE OF ANTIBACTERIAL VMPS IN BELGIUM

Number of antibacterial VMPs available on the Belgian market

Table 6 provides an overview of the number of antibacterial pharmaceuticals and antibacterial premixes available on the Belgian market since 2013 according to the commented compendium of the Belgian Centre for Pharmacotherapeutic Information[12].

Table 6. Armatorium of antibacterial VMPs on the Belgian market from 2012 to 2023.

	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Number of veterinary antibacterial pharmaceuticals on the market	294	298	339	329	323	325	326	308	327	346	353
Number of veterinary antibacterial premixes on the market	23	21	21	19	16	18	13	15	14	13	14
Total number of antibacterial VMPs on the market	317	319	360	348	339	343	339	323	341	359	367

The only new antibacterial VMPs registered on the market in the last 15 years are products containing tildipirosin (2011), pradofloxacine (2011), fusidic acid (2014), thiamfenicol (2015) and cefadroxil (2019). The observed increase in available VMPs is mainly due to the marketing of new formulations or new generic VMPs based on existing active antibacterial substances. It is remarkable to see that the number of registered VMPs is increasing although the total sales volumes are decreasing.

Table 7 gives an idea of the available VMPs with a critically important active antibacterial substance per target species. These VMPs can be indicated for several species and thus appear under more than one species.

[12] www.bcfi-vet.be

Table 7. Armatorium of antibacterial VMPs belonging to the critical antibacterial classes on the Belgian market in 2023 per target species.

AB class	Active Substance	Target species									
		Cat	Cattle	Dog	Goat	Ornamental bird	Pig	Poultry	Rabbit	Sheep	Other or not known
Cephalosporins 3G/4G											
	Cefoperazone		1								
	Cefovecin	1		1							
	Cefquinome		4				1				
	Ceftiofur		7				6				
Quinolones											
	Danofloxacin		1								
	Enrofloxacin	6	6	13	2	3	7	3	5	2	3
	Flumequine		1					1			
	Marbofloxacin	1	6	8			4				
	Orbifloxacin			1							
	Pradofloxacin	2		3							

Non-standardised total sales of antibacterial VMPs in Belgium

a) Response rate and data validation

Of the 37 contacted MMF, 36 delivered the data, whereas one declared to have ceased activities. Out of the 54 MAH with authorised antibacterial VMPs in Belgium, 53 responded to the inquiry. The one MAH that did not respond, reported zero sales in 2022, leading us to assume there were also no sales for 2023.

The sales data coming from the MMF matched the amount reported by the BFA to have been produced in 2023[13] and the amount found to have been used in 2023 (Sanitel-Med, see further). Overall, it was concluded that the data from the MMF covered 100 % of the sales of antibacterial premixes in 2023.

From the additional query into the sales from MAHs, it was found that a substantial amount of their sold quantities was delivered directly to veterinarians, pharmacists or MMF, which is legally allowed since 2022 for MAHs with the appropriate authorisation.

[13] https://www.bfa.be/BFA_Fact_Sheet

b) Non-standardised total sales of antibacterial VMPs in Belgium since 2018

Based on the available data it could not be concluded that the sales data from the MAHs were a full reflection of the total sales of antibacterial products for animals in Belgium in 2023 and 2022. Indeed, the new European legislation 2019/6, effective from 2022, also allows vets and pharmacies to purchase VMPs from distributors or manufacturers, which can be a MAH with appropriate authorisation, in another member state, and we do not yet capture these data from abroad.

However, considering that

- in the sales data of the distributors we are missing the part of the sales that went directly from the MAHs (with appropriate authorisation) to the veterinarian depot and to the pharmacy,
- several MAHs indicated that part of their data represented sales directly to the veterinarians and pharmacies,
- MMF remain the most reliable source of the yearly sold quantity of medicated feed,

it was deemed most accurate to use for this BelVet-SAC report the MAH sales data for 2022 and 2023 as the sales results for antibacterial pharmaceuticals for these years, and the sales data from the MMF for the antibacterial premixes.

The total sales of antibacterial VMPs for veterinary use in Belgium since 2018, in tonnes of active substance per year since 2018, is presented in ***Figure 5***. The results are subdivided into antibacterial pharmaceuticals and antibacterial premixes. As noted, until 2021, the sales of antibacterial pharmaceuticals is represented by data from the distributors, whereas for 2022 and 2023 the sales of antibacterial pharmaceuticals is represented by data from the MAHs.

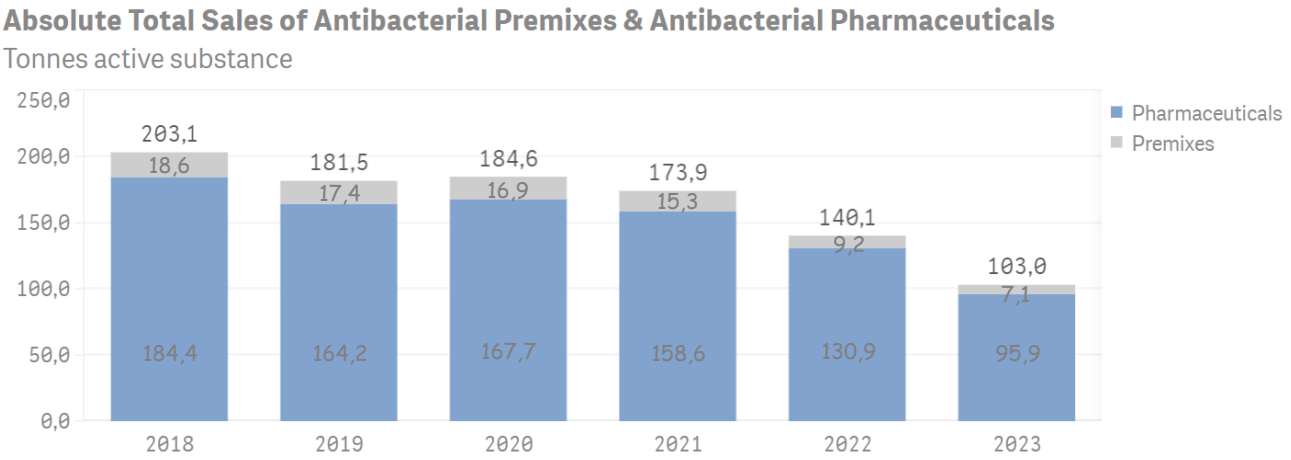


Figure 5. Total, non-standardised national sales in tonnes active substance of antibacterial VMPs via the distributors (antibacterial pharmaceuticals, until 2021), the MAHs (antibacterial pharmaceuticals, 2022 and 2023) and the MMF (antibacterial premixes) in Belgium for 2018-2023.

After a large drop in total sales between 2021 and 2022 (-19,5 %), there was an even larger decrease in the total quantity of antibacterial VMPs between 2022 and 2023 (-26,5 %). The decrease occurred in the pharmaceuticals (-17,5 % between 2021 and 2022; -26,7 % between 2022 and 2023) as well as the premixes (-39,6 % between 2021 and 2022; -23,6 % between 2022 and 2023).

Non-standardised total Sanitel-Med use data

a) Antibacterial use registrations in Sanitel-Med

Table 8 shows the number of notifications in Sanitel-Med in 2023 (accession date: 31/05/2024), the number of farms for which notifications were done and the number of veterinarians that registered the notifications, in total and per species. As a reference, the data for 2018 (the first full year of Sanitel-Med data-collection) and for 2022 were added.

Compared to previous BelVet-SAC reports, the dairy and beef sectors have been taken into account. As noted, the adapted RD of 21 July 2016 requires bovine veterinarians to register the antibacterial use in this species since August 2023. The same accounts for the other food producing chicken types and turkeys, which have now also been included in the results for poultry in *Table 8*.

Table 8. Number of AB-registrations (ZnO for 2018 not included) and number of farms and veterinarians with notifications per animal species in Sanitel-Med in 2023, 2022 and 2018.

	YEAR	TOTAL	PIGS		POULTRY[1]		VEAL CALVES		BOVINES MILK/BEEF	
		n	AB n	%	AB n	%	AB n	%	AB n	%
AB-registrations	**2023**	**352 261**	**89 734**	***25***	**16 692[2]**	***5***	**16 877**	***5***	**228 958**	***65***
	2022	136 113	92 451	*68*	15 081[3]	*11*	17 064	*13*	11 517	*8*
	2018	164 483	127 302	*77*	18 130	*11*	19 051	*12*	0	*0*
Farms	**2023**	**13 287**	**3 469**	***26***	**850[2]**	***6***	**239**	***2***	**9 804**	***74***
	2022	4 979	3 674	*74*	760[3]	*15*	243	*5*	476	*10*
	2018	5 204	4 325	*83*	745	*14*	258	*5*	0	*0*
Veterinarians	**2023**	**917**	**209**	***23***	**50[2]**	***5***	**18**	***2***	**772**	***84%***
	2022	264	214	*81*	47[3]	*18*	15	*6*	25	*9%*
	2018	323	270	*84*	63	*20*	20	*6*	0	*0*

[1] including the new categories: lay rearing – propagation – selection; meat rearing – propagation – selection; lay propagation – selection; meat propagation – selection; lay rearing; turkey breed; turkey meat; hatching eggs; day-old chicks.

[2] Including 478 registrations, 123 farms and 33 veterinarians with the new categories (farms and veterinarians not exclusively).

[3] Including 34 registrations, 18 farms and 12 veterinarians with the new categories (farms and veterinarians not exclusively).

The impact of this change is immediately apparent: the bovine sector by far emerges as the dominant sector in terms of AB-registrations, farms as well as veterinarians. Even though the obligation entered into force only in 2023, already in 2022 a small amount of veterinarians registered the use of antibacterials on some farms. It must be noted that the high number of registrations is not directly linked to the quantity of antibacterials used in bovines. Indeed, a notification can represent the treatment of a single animal, with a few ml of a VMP, just as well as the use of a whole bottle or box for a group of animals.

Apart from this, the trends in the pigs and veal calf data continued their decrease. In 2023, the number of pig registrations (excluding ZnO) was 30% lower than in 2018, and there were 12% less registrations for veal calves.

b) Comparison of the non-standardised total Sanitel-Med use data with total sales data

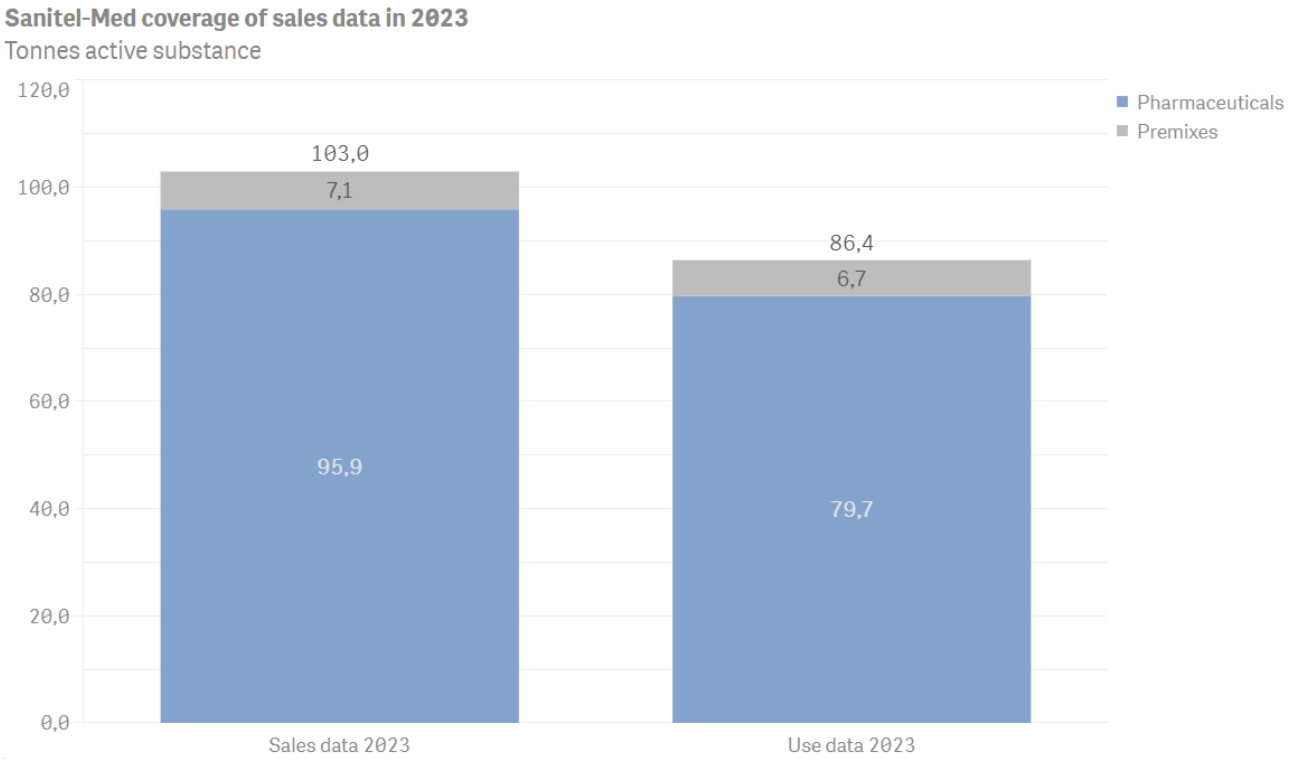


Figure 6. Comparison of tonnes active antibacterial substance used (Sanitel-Med) in 2023 with the tonnes sales from the MAHs and MMF for 2023, distinguishing between antibacterial premixes and antibacterial pharmaceuticals.

The mass antibacterials calculated from all Sanitel-Med notifications reached a total of 86,4 tonnes in 2023 (*Figure 6*), which was 3,8 tonnes lower than the result of 2022 (data not shown). Compared to the sales data of 2023, the use data covered 83,1 % of the sold quantity of antibacterial pharmaceuticals, whereas the coverage was 94 % for antibacterial premixes. The latter result was in line with the results in previous years, but coverage of pharmaceuticals was considerably higher than in previous years. This means the gap that is typically observed between the sales data and the use data grew much smaller in 2023, to 16,6 tonnes, while it was between 40 and 55 tonnes in the preceding years (*Figure 7*).

Even though it cannot be concluded that the sales data of antibacterials pharmaceuticals covered 100 % of sales to the veterinarians in 2023, the sales data from the MAHs for 2022 and 2023 were assumed to currently provide the best assessment of the quantities of antibacterial pharmaceuticals bought by veterinarians in Belgium in 2022 and 2023.

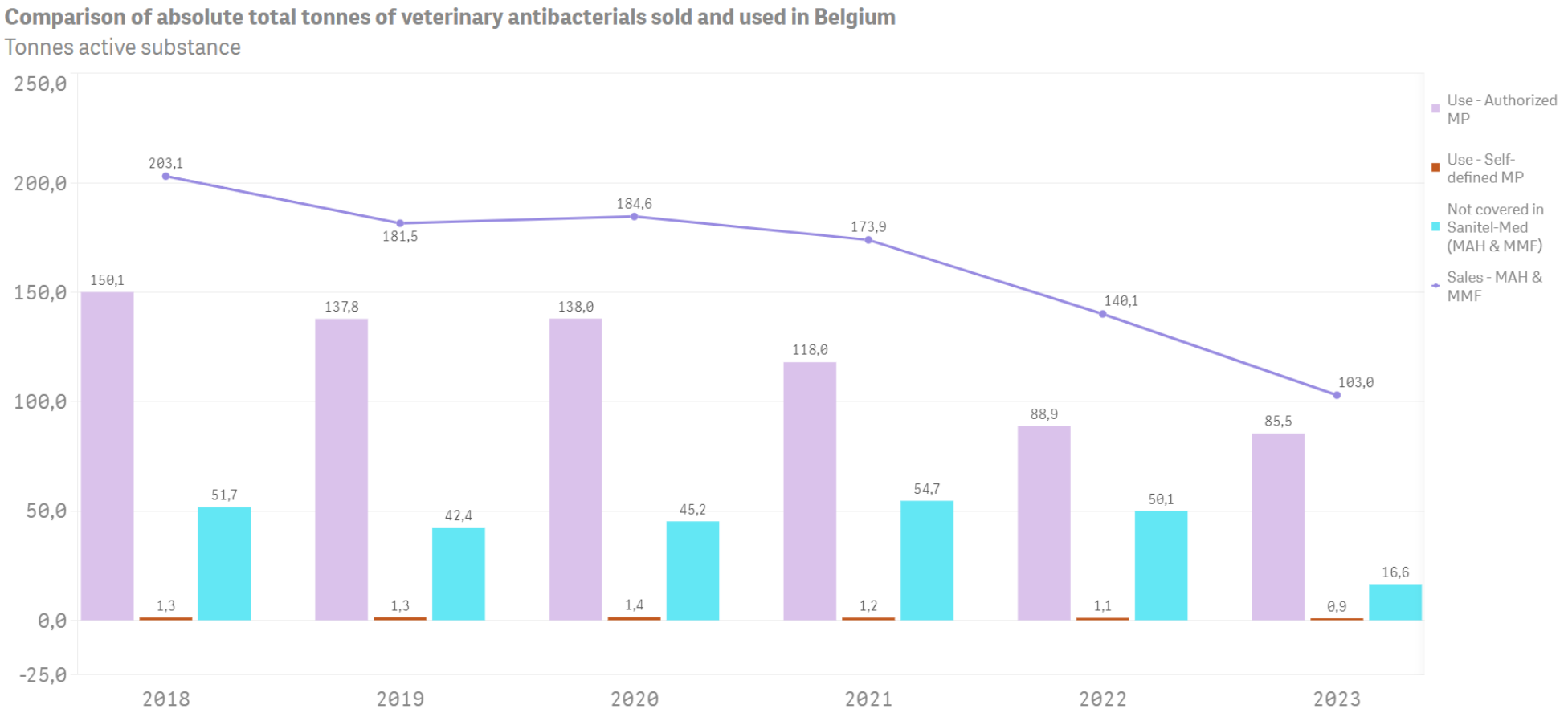


Figure 7. Comparison of tonnes active antibacterial substance used (Sanitel-Med, distinguishing based on product authorisation for use in Belgium) with the corresponding Belgian sales from the distributors (until 2021), MAHs (2022-2023) and MMF (2018-2023). The difference (= "Not covered in Sanitel-Med") between the 'sales' and 'use' amount is shown.

Animal biomass produced in Belgium in 2023

Table 9 illustrates that the produced biomass of animals in Belgium **decreased with 6,17%** between 2022 and 2023. This is the second year in a row that such a considerable decrease is observed. The production in 2023 was 13,3% lower compared to the peak year 2021 of produced biomass. Compared to 2011, the year serving as a reference for the national reduction targets, a decrease of 8,17% is apparent in the total biomass production in Belgium.

Table 9. Animal biomass produced in Belgium from 2018 to 2023.

Animal biomass	2018	2019	2020	2021	2022	2023
Meat (tonnes)						
Pork	1 073 121	1 038 916	1 098 714	1 140 002	1 032 197	929 740
Beef	277 312	263 750	254 509	247 122	238 137	240 180
Poultry	469 587	447 786	448 974	455 115	449 039	428 196
Sheep/goat	3 090	3 036	2 845	3 058	2 514	2 189
Total biomass from meat production	**1 823 110**	**1 753 488**	**1 805 042**	**1 845 297**	**1 721 886**	**1 600 305**
Dairy cattle						
Dairy cattle (number)	529 247	537 960	537 941	537 246	543 680	540 843
Dairy cattle metabolic weight (tonnes)	264 624	268 980	268 971	268 623	271 840	270 422
Total biomass (tonnes)	**2 087 734**	**2 022 468**	**2 074 013**	**2 113 920**	**1 993 726**	**1 870 727**
Evolution since previous year	**+ 1,73%**	**-3,13%**	**+2,55%**	**+1,92%**	**-5,69%**	**-6,17%**

Total sales of antibacterial VMPs in Belgium standardised per kg biomass

The declining total biomass production in Belgium over the last two years tempers the decrease in sales observed in absolute values (*Figure 8*). In 2023 the mg of active antibacterial substance sold via the MAHs for pharmaceuticals and via the MMF for premixes in relation to a kg biomass produced was **55,0 mg/kg**, coming from **70,3 mg/kg** in 2022.

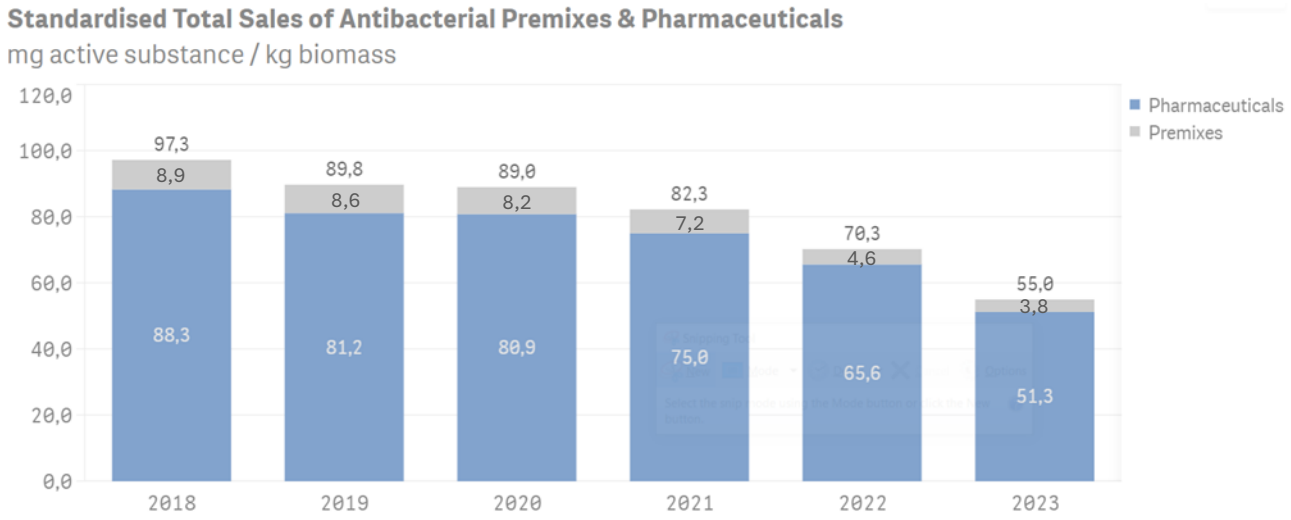


Figure 8. Sales of antibacterial pharmaceuticals and antibacterial premixes in mg/kg biomass for animals in Belgium in 2018-2023, comprised of data from the MMF for premixes for 2018-2023, from the distributors for pharmaceuticals for 2018-2021 and from the MAHs for pharmaceuticals for 2022-2023.

This represents **a decrease of 12 mg/kg or -14,6 % between 2021 and 2022** and an additional **decrease of 15,2 mg/kg or -21,7 % between 2022 and 2023** (*Figure 9*). The latter is composed of a 18,6 % reduction in premixes and a 21,9 % reduction in pharmaceuticals.

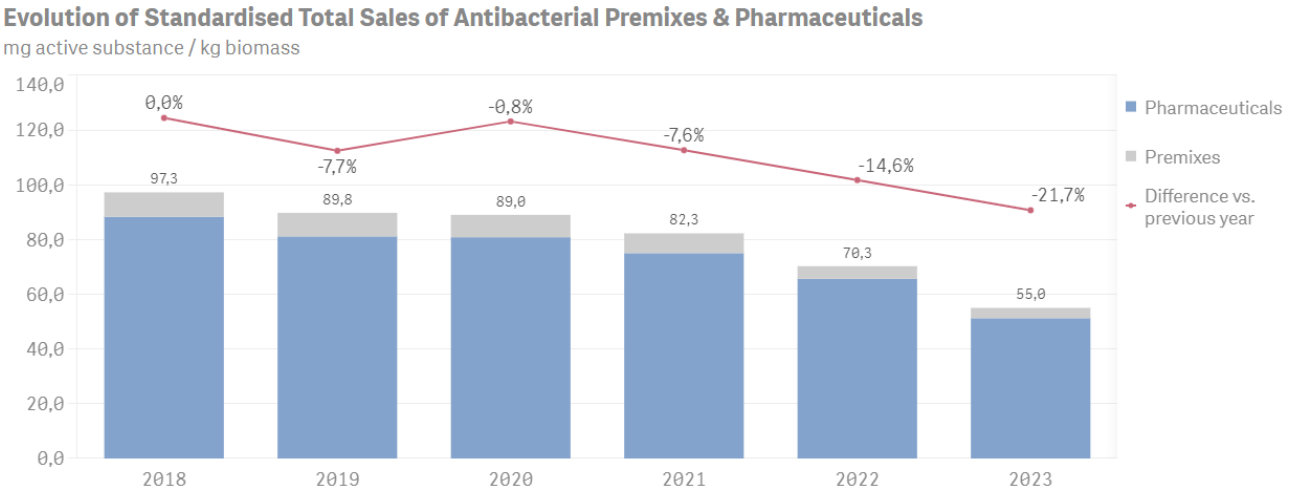


Figure 9. Year-to-year reduction of the total sales of antibacterial VMPs in Belgium based on the sales data since 2018 as presented in Figure 8.

III.2 SALES AND USE OF ANTIBACTERIAL VMPS PER ANIMAL SPECIES AND CATEGORY

Absolute Sanitel-Med use data per species/animal category

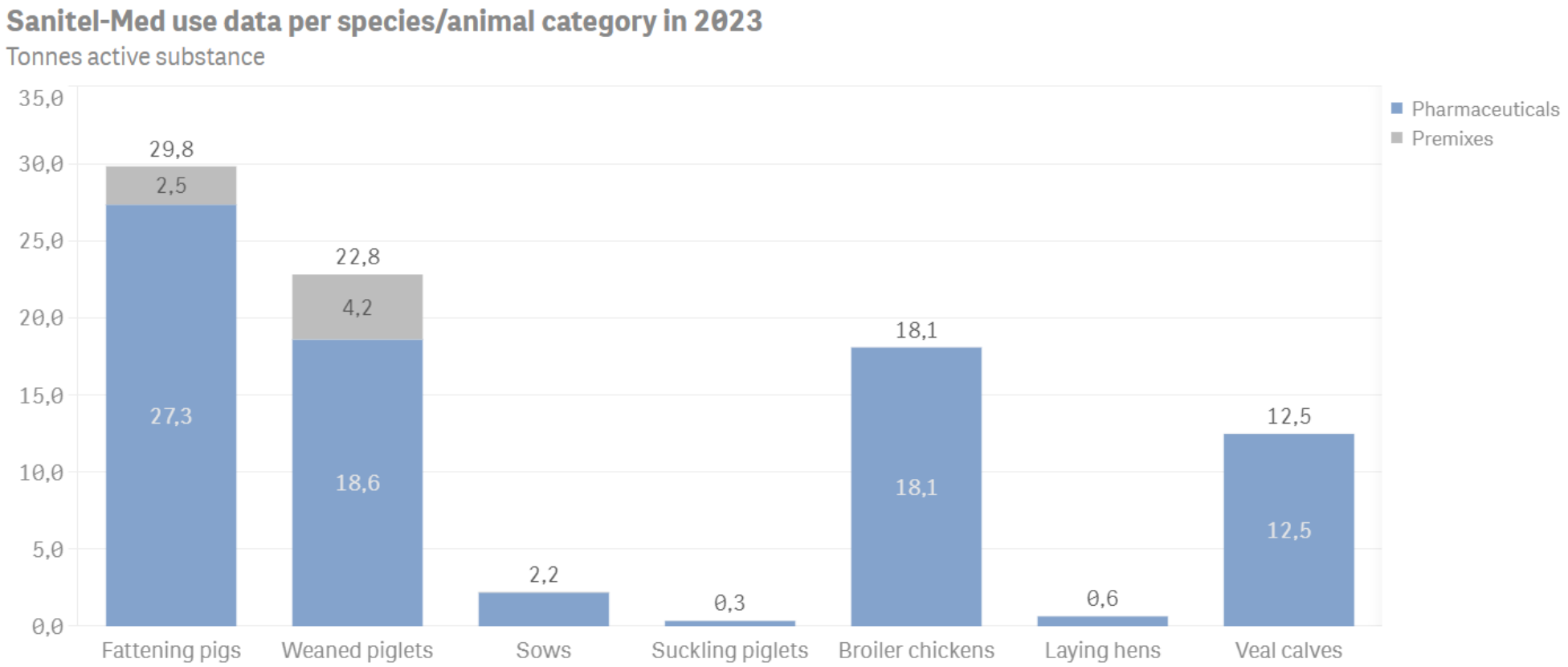


Figure 10. Tonnes active antibacterial substance of antibacterial pharmaceuticals and antibacterial premixes used in 2023 in pigs, poultry and veal calves.

Fattening pigs and weaned piglets remained the categories with the highest amount of antibacterials used (*Figure 10*), but their relative importance further decreased to 61 % of the tonnes used (from almost 70 % and 63 % of the tonnes used in 2021 and 2022, respectively). Fattening pigs represent the largest biomass of livestock in Belgium, explaining their status as users of the highest total amount of antibacterials. Both the use of antibacterial premixes and the use of antibacterial pharmaceuticals, in fattening pigs as well as in weaned piglets, decreased compared to 2022.

As the relative importance of pigs decreased, that of poultry increased, representing 22 % of all antibacterials used in 2023 – compared to 14,5 % in 2021 and 20 % in 2022. Veal calves also further increased in relative tonnes used, to 14,5 % (compared to 12 % in 2021 and 14 % in 2022). The increase of the relative importance of poultry and veal calves is not only due to the decrease in tonnes in pigs but also to the increase in tonnes used in poultry and veal calves: in 2022 18 tonnes and 12,2 tonnes of antibacterials in total were used in poultry and in veal calves respectively.

The BD_{100}- species

Table 10 and *Table 11* respectively show the number and the corresponding kg of animals at risk for treatment per species at national level between 2018 and 2023. This is the denominator for the BD_{100}-species. Similar to the slaughter data (biomass, *Table 9*), the overall number of animals present 'daily' in the farms, hence, the kg animals at risk for treatment with antibacterials, further decreased in 2023, especially for pigs.

Table 10. Number of animals at risk from 2018 till 2023 in pigs, poultry and veal calves.

	Animals at risk (x 10^3)					
	2018	**2019**	**2020**	**2021**	**2022**	**2023**
PIGS	6 209	6 085	6 218	6 042	5 751	5418
POULTRY[1]	43 624	44 902	49 016	48 919	48 754	48 754
VEAL CALVES[2]	170	171	171	173	168	170

[1] Data for poultry were not yet available for 2023. The data for 2022 were used. Any effect on the result is unclear, considering the small reduction in the used doses.

[2] Data for 2023 were the aggregated overall averages calculated from the semestrial averages used for the farm-level BD_{100}-calculations.

Table 11. Kg animals at risk from 2018 till 2023 in pigs, poultry and veal calves.

	Kg at risk (x 10^3)					
	2018	**2019**	**2020**	**2021**	**2022**	**2023**
PIGS	318 869	311 901	316 048	306 642	289 561	272 985
POULTRY[1]	54 921	55 860	60 838	60 892	60 474	60 474
VEAL CALVES	27 258	27 434	27 437	27 712	26 904	27 174

Table 12 and *Table 13* respectively show the evolution of daily doses used per species at national level, for VMPs for which the doses are expressed as mg/animal (VMPs for local or topical use) and for VMPs for which the doses are expressed as mg/kg (VMPs for systemic use). The sum of these is the numerator for the BD_{100}-species. The number of doses used of all types of antibacterial VMPs decreased in pigs and poultry, but increased slightly in veal calves.

Table 12. Doses used of VMPs administered locally or topically in pigs, poultry and veal calves.

	n $DDDA_{bel}$ × LA_{bel} (locally/topically)					
	2018	**2019**	**2020**	**2021**	**2022**	**2023**
PIGS	592 079	503 484	558 585	554 668	481 931	433 548
POULTRY	0	0	0	0	0	0
VEAL CALVES	2 055	3 414	3 413	4 469	3 867	2 402

Table 13. Doses used of VMPs administered orally or parenterally in pigs, poultry and veal calves.

	n $DDDA_{bel}$ × LA_{bel} ($x10^3$) (orally, injection)					
	2018	**2019**	**2020**	**2021**	**2022**	**2023**
PIGS	8 048 607	7 458 922	7 168 725	6 169 645	4 195 837	3 779 781
POULTRY	1 135 743	1 086 035	1 139 219	676 095	746 584	743 745
VEAL CALVES	1 408 425	1 114 499	1 108 719	899 492	799 432	800 754

The resulting BD_{100}-species (*Figure 11*) expresses the sector-level treatment days out of 100 days based on the total, national amount of daily doses of antibacterials used per species and the total, national mass of animals at risk per species. Between 2022 and 2023 the BD_{100}-species decreased for all species, with 4,6 % for pigs, 0,2 % for poultry and 0,8 % for veal calves. That gives a total result over the **past five years of -45,2 % for pigs, -40,4 % for poultry and -43,0 % for veal calves**.

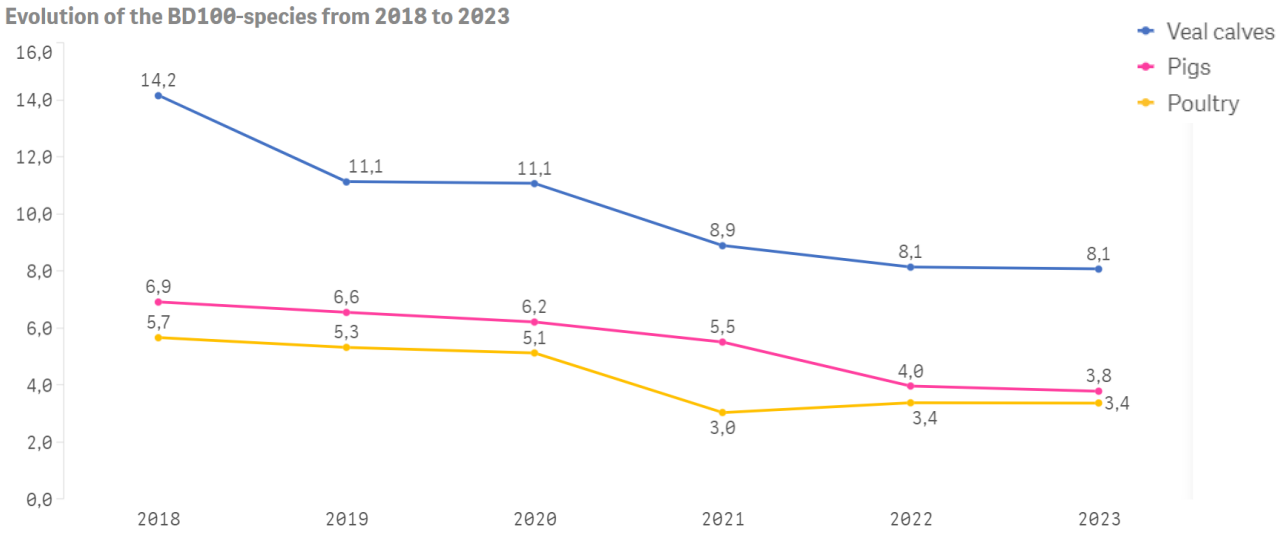


Figure 11. Antibacterial use (BD_{100}-species) from 2018 to 2023 in pigs, poultry and veal calves.

It is important to note that the result of poultry is subject to change depending on the final kg of animals at risk. Furthermore, the result for veal calves is affected (i.e. halved) by the change in the standard weight applied in the calculations (160 kg instead of 80 kg). This was done to be in line with the results in the benchmarking reports for veal calf farmers and veterinarians (where 160 kg has been applied since the start of the benchmarking).

Farm-level antibacterial use

At farm level, antibacterial use, expressed as the % of time an animal is treated (the average BD_{100}), is calculated per animal category present. Per animal category, reference populations for benchmarking are defined. The results presented below pertain to these benchmark reference populations.

a) Reference populations for benchmarking in 2023

Table 14 presents the number of farms per animal category that, after applying the farm-level quality controls, were found eligible to be included in the 2023 reference populations for benchmarking.

Table 14. Number of farms and zero-use farms per Sanitel-Med animal category that were part of the 2023 reference populations for benchmarking.

	PIGS				POULTRY		VEAL CALVES
	Sucklers	Weaners	Fatteners	Breeders	Broilers	Laying hens	
n farms	1 410	1 443	3 751	1 416	767	214	226
n (%) zero-use farms[1]	223 (16)	119 (8)	710 (19)	223 (16)	126 (16)	140 (65)	1 (0,4)

[1] *For pigs, zero-use is at farm level (for example, if four animal categories are present at the farm, zero-use is only when there is no AMU in all four categories), whereas for poultry and veal calves, zero use is at animal category level.*

b) Distribution of farm-level antibacterial use per animal category in 2023

Figure 12 depicts the distribution of the farm-level BD_{100} in the 2023 reference populations (excluding the zero-use farms) of the Sanitel-Med animal categories as box-plots with the median use indicated.

The use remained the highest in veal calves, weaners and broilers. Similar as for the BD_{100}-species, it must be noted that compared to previous BelVet-SAC reports, the result for veal calves is affected (halved) by the change in the standard weight applied in the calculations (160 kg instead of 80 kg). This was done to avoid confusion with the results of the benchmarking in the reports for veal calf farmers and veterinarians (where 160 kg is applied since the start of the benchmarking).

The right-skewed distribution with 'tails' of high users persisted in all categories. This illustrates that even though in each category there is a 'concentration' of farms in the lower use zones, considerable variation remains, with a smaller number of farms 'scattered' around the higher use zones.

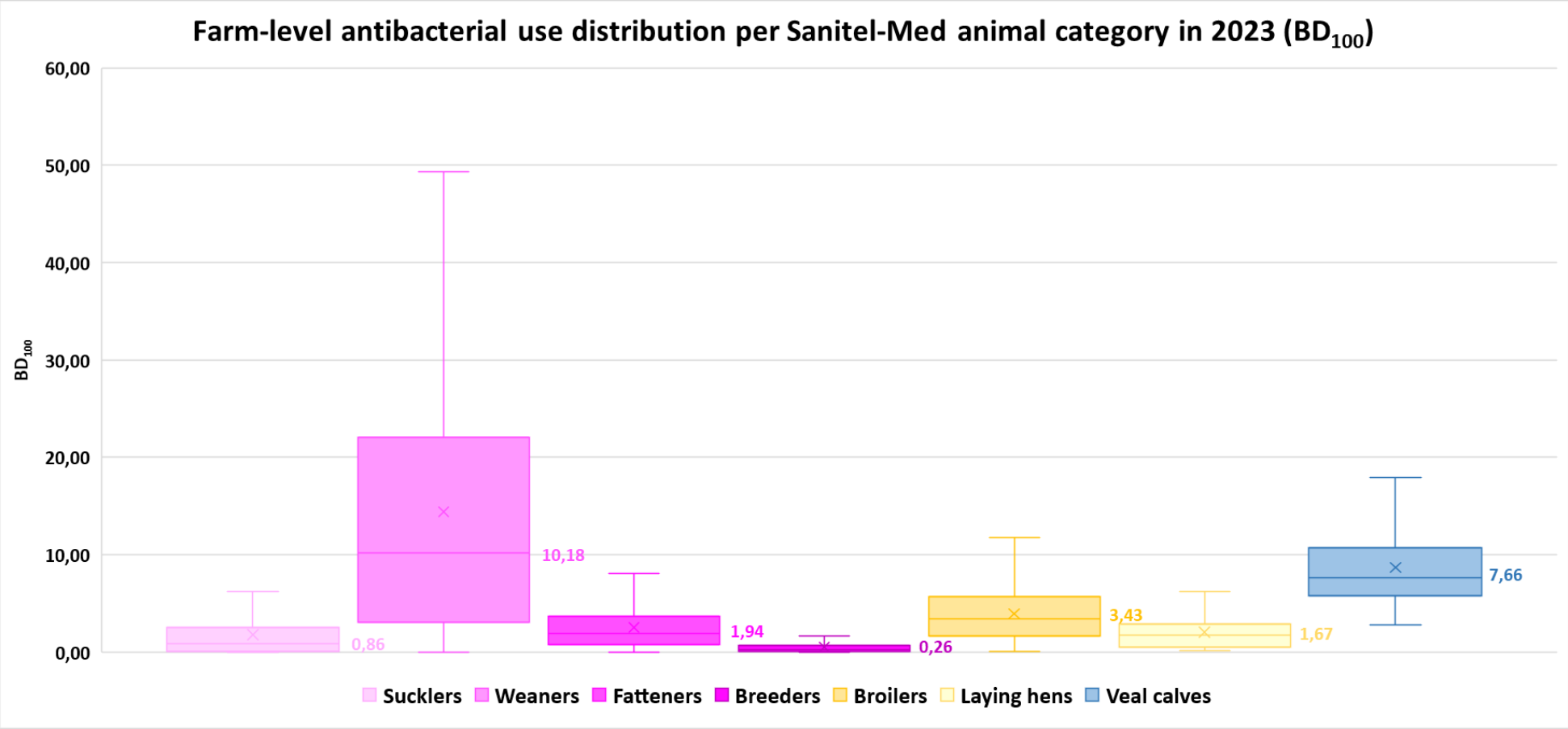


Figure 12. Box-plots representing the BD_{100}-distribution in the 2023 reference populations* of the Sanitel-Med animal categories. Outliers are not shown. The median values are provided next to the lines in the boxes.

** zero-use farms (see Table 14) were excluded*

c) Evolution of median farm-level antibacterial use per animal category from 2018 to 2023

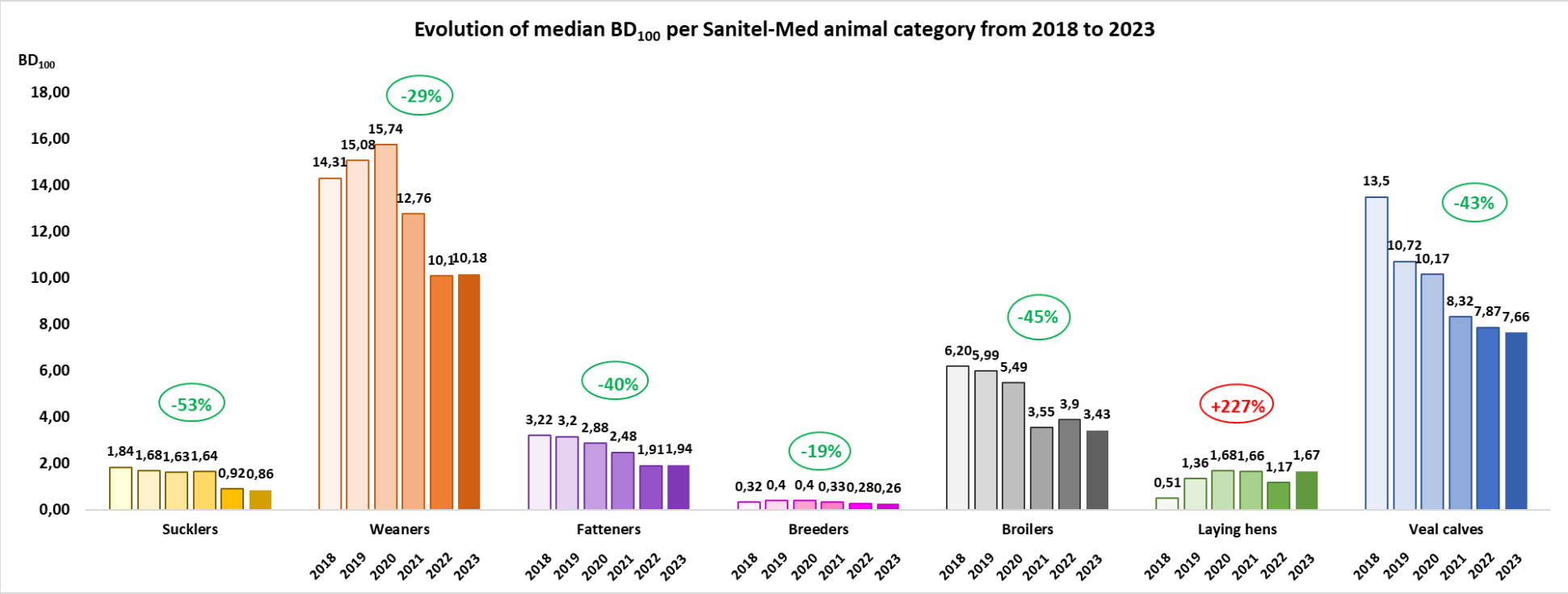


Figure 13. Evolution of the median of the BD_{100}-distribution in the reference populations for benchmarking* from 2018 till 2023 per Sanitel-Med animal category. The total decrease/increase in 2023 compared to 2018 (in %) is given per animal category.

**Zero-use farms (see Table 14) excluded.*

After the spectacular decreases in pigs in 2022, the median BD_{100} values in the four pig categories rather stabilised in 2023 (***Figure 13***). There were minor decreases in suckling piglets and breeding pigs but minor increases in weaned piglets and fattening pigs. As will be illustrated in the detailed analyses per category, this does not mean that overall no further reductions were realised in any pig category, rather that the use of antibacterial VMPs stabilised for most

of the farms with use situated below and around the attention BD_{100}-value. In poultry, the main category broilers achieved a modest reduction in the median BD_{100}-value, whereas in the laying hens the median BD_{100} increased again, reaching the record-high levels of 2020 and 2021. In veal calves a moderate decrease was achieved in the median BD_{100}.

d) Percentage of farms and use in the three colour zones in the different species

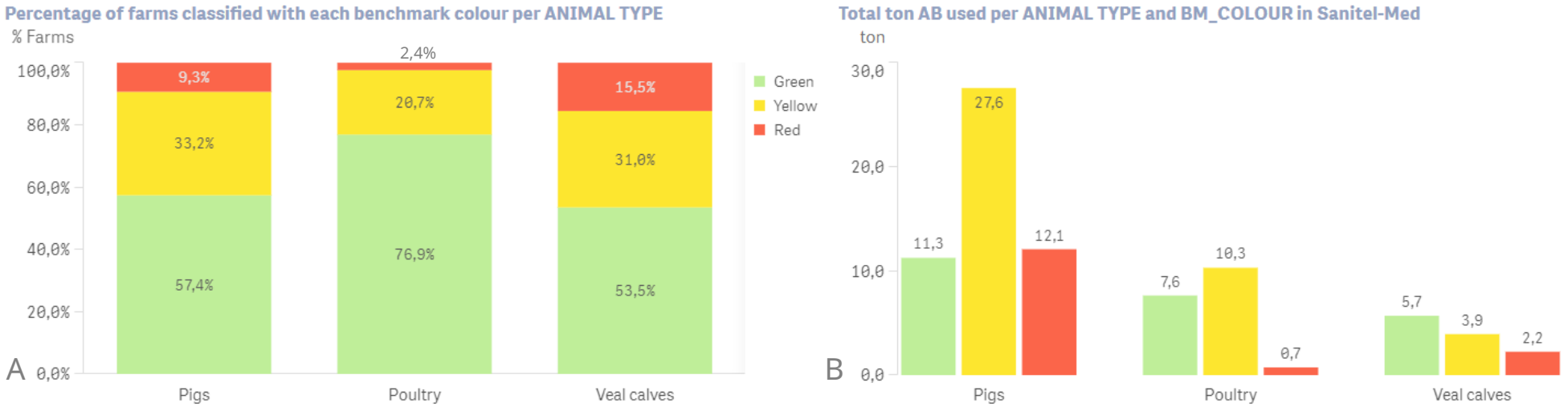


Figure 14. A. Percentage of pig, poultry and veal calf farms* classified in the three benchmarking colour zones in 2023. B. Total ton of antibacterials used in the animal categories with the respective benchmarking colour score.

** Including zero-use farms (see Table 14)*

The percentage of farms with a red benchmarking colour score was the lowest in poultry and the highest in veal calves (***Figure 14A***). In each species, there were more than 50 % of farms (zero-use farms included) that had a green benchmarking result. Noteworthy, when excluding the zero-use farms, the result was only 47,9 % in pigs (data not shown). When looking at the quantity of antibacterials used (in tonnes) in the different colour zones (based on the underlying categories in pigs and poultry), in pigs and poultry (broilers more specifically) the majority of the used antibacterials is situated in the yellow farms, whereas in veal calf farms this was in the green farms (***Figure 14B***).

e) Antibacterial use by the contract-veterinarian

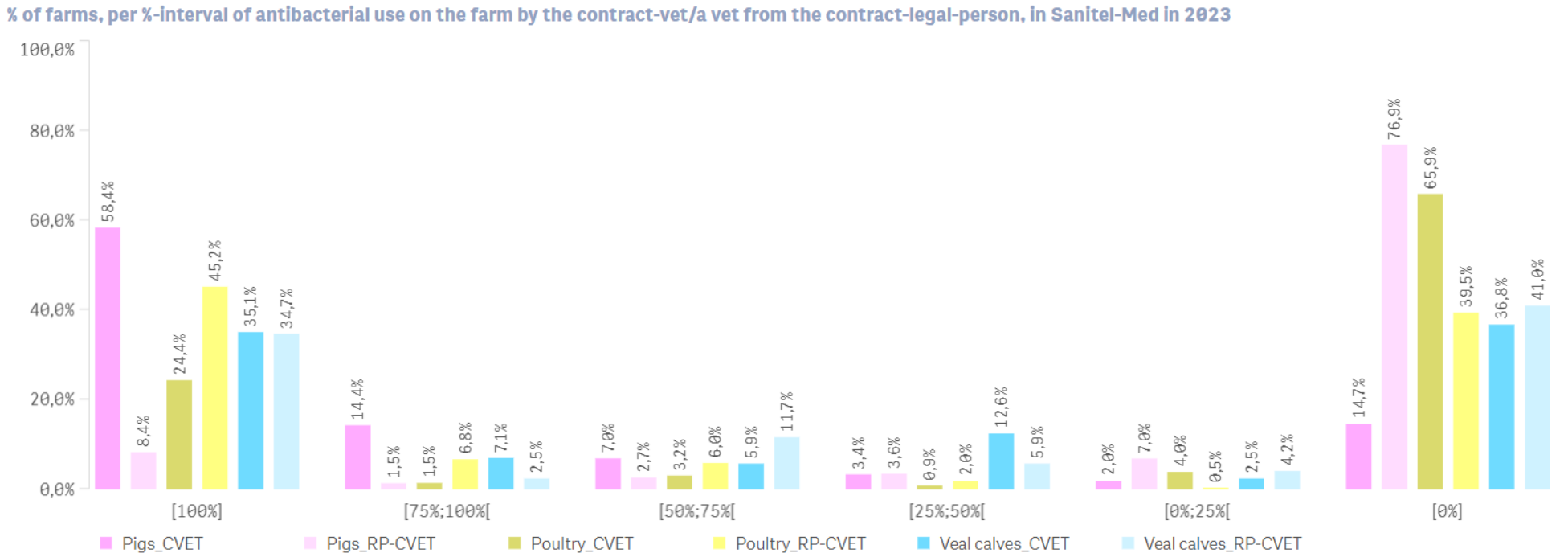


Figure 15. The percentage of farms (Y-axis) where the antibacterial use, per %-use-intervals of 25 (X-axis), was done by the contract veterinarian (CVET) or by a vet belonging to the contract-legal-person (RP-CVET) on pig, poultry and veal calf farms in 2023.

The Belgian contract-veterinarian is the veterinarian responsible for the epidemiological surveillance for the farm. The 'contract' can be concluded with an individual veterinarian but also with a 'legal person veterinarian', which typically represents a veterinary practice.

As shown previously in 2022, in pigs almost 60 % of the farms have 100 % of their antibacterial use coming from a single designated contract-veterinarian, with an additional 8 % of farms having 100 % of their antibacterial use coming from the contract-veterinary practice (***Figure 15***). Only 15 % of pig farms have none of their antibacterial use coming from a single designated contract-veterinarian. In contrast, in poultry two thirds of farms have none of their antibacterial use coming from a single designated contract-veterinarian, but 45 % of farms have 100 % of their antibacterial use coming from the contract-veterinary practice, in combination with 25 % of farms having 100 % of their antibacterial use coming from the contract-veterinarian, resulting in a total of approx. 70 % of poultry farms where 100 % of the antibacterial use comes from veterinarians having a contract with then farm. This is the same total % as in veal calves, albeit there the distribution is half/half for individual and legal-person contract-veterinarians. These results suggest that in all animal species, improvement is possible in terms of having all (100 %) antibacterial use done by the contract-veterinarians.

Distribution of the antibacterial use in pig farms (use data)

a) Suckling piglets

The antibacterial use in suckling piglets further decreased in 2023 in a large part of the farms, as can be deduced from the BD_{100}-percentiles shown in ***Table 15a***. Total reductions since 2018 amount to around 60 %. The 90th percentile is now firmly below the final action value of the reduction path (***Table 15b***). Even though the kg used in this category is relatively futile compared to pigs as a whole, it is a critical category directly after birth, and the results are rewarding.

Table 15a. Parameters describing the distribution of the farm-level antibacterial use in the reference populations for benchmarking of suckling piglets from 2018 to 2023 and the % difference (diff) over the years.

Parameters BD_{100}	2018	2019	2020	2021	2022	2023	diff 23-22	diff 23-18
P25	0,12	0,12	0,21	0,12	0,02	0,04	**+100,00%**	**-66,67%**
P50	1,84	1,68	1,63	1,64	0,92	0,86	**-6,52%**	**-53,26%**
P75	5,77	5,17	4,74	4,68	2,95	2,51	**-14,92%**	**-56,50%**
P90	11,58	9,94	9,94	8,57	5,30	4,35	**-17,92%**	**-62,44%**
Mean	4,42	3,83	3,89	3,47	2,00	1,77	**-11,50%**	**-59,95%**
Sum	5401	4599	4776	4807	2540	2107	**-17,05%**	**-60,99%**
Total n farms	1358	1326	1373	1649	1545	1410	ND	ND
% farms with zero use[1]	10%	9%	10%	16%	18%	16%	ND	ND

[1] *Zero use farms were not included in the data for determining the parameter values.*

Table 15b. The thresholds of the BD_{100} reduction path 2021-2024 for suckling piglets.

Date of application	Attention value	Action value
01/01/2021	**2**	**10**
01/01/2023	**2**	**6**
01/01/2024	**2**	**5**

b) Weaned piglets

In 2023, it appears that the antibacterial use has been reduced in the higher quarter of the weaned piglet farms' population, whereas it remained stable in the lower three quarters (***Table 16a***). It is tempting to point to the role of the reduction path, with a further reduction of the action threshold-BD_{100}-value foreseen at the end of 2024 (***Table 16b***). Indeed, particularly the highest users seem to have further decreased their use, even though at the end of 2023 still more than 10 % of the farms had a BD_{100}-result above that anticipated value.

Table 16a. Parameters describing the distribution of the farm-level antibacterial use in the reference populations for benchmarking of weaned piglets from 2018 to 2023 and the % difference (diff) over the years.

Parameters BD_{100}	2018	2019	2020	2021	2022	2023	diff 23-22	diff 23-18
P25	3,61	4,40	3,69	3,27	2,66	3,03	**+13,91%**	**-16,07%**
P50	14,31	15,08	15,74	12,76	10,10	10,18	**+0,79%**	**-28,86%**
P75	31,77	30,53	31,55	28,85	22,09	22,03	**-0,27%**	**-30,66%**
P90	53,23	50,85	55,09	49,75	37,82	33,62	**-11,11%**	**-36,84%**
Mean	22,29	21,93	22,53	20,61	15,68	14,42	**-8,04%**	**-35,31%**
Sum	28 979	28 443	29 988	30 461	22 086	19 092	**-13,56%**	**-34,12%**
Total n farms	1370	1367	1401	1614	1575	1433	ND	ND
% farms with zero use[1]	5%	5%	5%	8%	11%	8%	ND	ND

[1] *Zero use farms were not included in the data for determining the parameter values.*

Table 16b. The thresholds of the BD_{100} reduction path 2021-2024 for weaned piglets.

Date of application	Attention value	Action value
01/01/2021	**14**	**50**
01/01/2023	**14**	**40**
31/12/2024	**14**	**30**

Notwithstanding these promising results, the weaned piglets remain the category with by far the highest use of antibacterials in pigs, and the least reduction achieved. More than half of the farms treat all their weaned piglets 10 % of the time, which translates into 5 days in a standard weaner cycle duration (50 days).

c) Fatteners

Table 17a. Parameters describing the distribution of the farm-level antibacterial use in the reference populations for benchmarking of fattening pigs from 2018 to 2023 and the % difference (diff) over the years.

Parameters BD_{100}	2018	2019	2020	2021	2022	2023	diff 23-22	diff 23-18
P25	1,18	1,27	1,14	0,94	0,65	0,73	**+12,31%**	**-38,14%**
P50	3,22	3,16	2,88	2,48	1,91	1,94	**+1,57%**	**-39,75%**
P75	6,53	6,37	5,86	4,99	3,84	3,67	**-4,43%**	**-43,80%**
P90	10,76	10,49	10,03	8,39	6,05	5,50	**-9,09%**	**-48,88%**
Mean	4,74	4,72	4,28	3,65	2,67	2,54	**-4,87%**	**-46,41%**
Sum	15 616	15 287	14 169	12 701	8 618	7 737	**-10,22%**	**-50,45%**
Total n farms	3 600	3 518	3 620	4 293	4 127	3 751	ND	ND
% farms with zero use[1]	8%	8%	9%	19%	22%	19%	ND	ND

[1] *Zero use farms were not included in the data for determining the parameter values.*

Table 17b. The thresholds of the BD_{100} reduction path 2021-2024 for fattening pigs.

Date of application	Attention value	Action value
01/01/2021	2,7	9
01/01/2023	2,7	6
01/01/2024	2,7	6

The results observed in the fattening pigs resemble those in the weaned piglets (*Table 17a*), even though it appears that a reduction effort has taken place in still a larger part of the farms. As the action threshold value in this category is not set to change anymore in the current reduction path (*Table 17b*) a more likely explanation for the observed reductions is that farmers want to build in some 'security' as to avoid crossing the action value in the near future.

d) Breeders

Table 18a. Parameters describing the distribution of the farm-level antibacterial use in the reference populations for benchmarking of breeding pigs from 2018 to 2023 and the % difference (diff) over the years.

Parameters BD_{100}	2018	2019	2020	2021	2022	2023	diff 23-22	diff 23-18
P25	0,05	0,09	0,09	0,07	0,06	0,07	+16,67%	+40,00%
P50	0,32	0,40	0,40	0,33	0,28	0,26	-7,14%	-18,75%
P75	0,97	1,03	1,05	0,91	0,74	0,71	-4,05%	-26,80%
P90	1,96	2,06	2,11	1,87	1,28	1,28	0,00%	-34,69%
Mean	0,87	0,86	0,84	0,75	0,52	0,49	-5,77%	-43,68%
Sum	1 062	1 030	1 039	1 071	661	589	-10,89%	-44,54%
Total n farms	1 350	1 321	1 368	1 689	1 555	1 416	ND	ND
% farms with zero use[1]	10%	9%	10%	16%	18%	16%	ND	ND

[1] *Zero use farms were not included in the data for determining the parameter values.*

Table 18b. The thresholds of the BD_{100} reduction path 2021-2024 for breeding pigs.

Date of application	Attention value	Action value
01/01/2021	0,28	1,65
01/01/2023	0,28	1,65
01/01/2024	0,28	1,65

In breeding pigs the antibacterial use decreased modestly in a large part of the benchmarking population (*Table 18a*). Less than 5 % of farms were in the red zone (data not shown) but at the same time still only around 50 % of farms were in the green zone, which is the lowest % of all pig categories. The lack of reducing threshold values might create a lack of an incentive for reducing (*Table 18b*).

It is noteworthy that in all pig categories the % of zero users decreased in 2023, after increasing in the previous years, which is even more remarkable given that the number of pig farms, in general as well as in the benchmarking reference groups, was overall decreasing (*Tables 15-18*). In 2023 there were 725 pig farms reporting no antibacterial use, compared to 922 in 2022. However, the absolute number of consecutive zero users only slightly decreased in the period 2023-2022 (449) compared to the period 2022-2021 (481) leading to an increase of the relative number of zero use farms (62 % in 2023-2022, vs. 52 % in 2022-2021). One possible explanation is that in 2023 there were effectively less farms that could work without using antibacterials.

In conclusion for the pig sector, 2023 appears to have been a year of consolidation, with modest reductions being achieved, foremost in the categories and use zones where pressure continued to be applied according to the reduction paths. The overall results are rewarding, considering that the sector is more or less on track to achieve the goals set for 2024. This is also an important conclusion because it shows the usefulness of the reduction paths as a driver for tailored reductions. Challenges remain, for example to reduce the number of yellow farms, as these are currently associated with the largest amount of antibacterial use. The fattening pigs and especially the weaned piglets remain categories where progress needs to be made.

Distribution of the antibacterial use in poultry (use data)

a) Broilers

The results of the broilers are among the most remarkable overall: there was a truly spectacular decrease in 2021 compared to 2020, almost halving the treatment days in the sector, but since then no progress has been made. After a moderate increase in 2022, a moderate decrease in 2023 now finds the sector at the level it achieved in 2021, one year on in the reduction path (*Tables 19a* and *19b*).

Table 19a. Parameters describing the distribution of the farm-level antibacterial use in the reference populations for benchmarking of broilers from 2018 to 2023 and the % difference (diff) over the years.

Parameters BD_{100}	2018	2019	2020	2021	2022	2023	diff 23-22	diff 23-18
P25	3,28	2,83	2,41	1,85	2,13	1,64	**-23,00%**	**-50,00%**
P50	6,20	5,99	5,49	3,55	3,90	3,43	**-12,05%**	**-44,68%**
P75	11,54	10,53	10,45	5,55	6,04	5,71	**-5,46%**	**-50,52%**
P90	16,98	16,12	15,44	7,68	7,98	7,66	**-4,01%**	**-54,89%**
Mean	8,19	7,38	6,99	3,87	4,32	3,98	**-7,87%**	**-51,40%**
Sum	4816	4473	4390	2602	2712	2524	**-6,93%**	**-47,59%**
Total n farms	680	694	722	766	759	767	ND	ND
% farms with zero use[1]	14%	14%	14%	14%	16%	16%	ND	ND

[1] *Zero use farms were not included in the data for determining the parameter values.*

Table 19b. The thresholds of the BD_{100} reduction path 2021-2024 for broilers.

Date of application	Attention value	Action value
01/01/2021	**6**	**14**
01/01/2023	**5**	**12**
31/12/2024	**5**	**10**

Most notable is that already since 2021, the P90 BD_{100}-value has been way below the action value foreseen for the end of 2024 (*Table 19b*). This appears again to be an illustration of the usefulness of the reduction paths, as the lack of pressure results in a steady state. It must be noted though that the sector organisation Belplume has adapted the action BD_{100}-value for 2024 already at the beginning of 2024.

Consultation with the sector has revealed that the spectacular decrease has been due to solving two of the four main health problems that were afflicting the sector, and that the lack of further reductions is a result of the current inability to solve the remaining two problems. Anyway, the broilers are on track to achieve the reduction targets set in the current sector specific objectives.

The number of zero users in broilers has been relatively stable over the years yet increased with 2% in 2022 (*Table 19a*). Remarkably, of the zero-users in 2023, approx. two thirds were also zero-users in 2022 and 2021, and only a quarter were zero-users only in 2023. It is unclear if those long-term zero-users are for example biological farms.

b) Laying hens

Table 20a. Parameters describing the distribution of the farm-level antibacterial use in the reference populations for benchmarking of laying hens from 2018 to 2023 and the % difference (diff) over the years.

Parameters BD_{100}	2018	2019	2020	2021	2022	2023	diff 23-22	diff 23-18
P25	0,24	0,36	0,61	0,70	0,44	0,42	**-4,55%**	**+75,00%**
P50	0,51	1,36	1,68	1,66	1,17	1,67	**+42,74%**	**+227,45%**
P75	1,32	3,26	2,72	3,13	1,92	2,85	**+48,44%**	**+115,91%**
P90	2,97	4,58	6,81	5,29	3,73	4,38	**+17,43%**	**+47,47%**
Mean	1,02	1,56	2,56	2,05	1,62	1,94	**+19,75%**	**+90,20%**
Sum	80	127	207	169	146	149	**+2,05%**	**+86,25%**
Total n farms	187	188	198	210	213	214	ND	ND
% farms with zero use[1]	66%	65%	60%	65%	65%	65%	ND	ND

[1] Zero use farms were not included in the data for determining the parameter values.

Table 20b. The thresholds of the BD_{100} reduction path 2021-2024 for laying hens.

Action value[1]	**3**

[1] This sole action value was agreed upon in consultation with the sector. An evolution in time of the value (reduction path) is currently not foreseen.

The farm-level use for laying hens increased again in 2023, with high percentages (***Table 20a***) – which are however partly explained by the overall low level of antibacterial use in this animal type. The result is unfortunate but should not be worrisome. It still concerns a minority of the farms and there are no indications that this will change in the future. Consultation with the sector learned that health problems increased, and the fluctuations observed are explained as the result of the low overall use and the need to temporarily, on a small number of farms, use more antibacterials. Noteworthy, even when excluding the high number of zero-use farms, still more than three quarters of the farms remain below the BD_{100}-action value (***Table 20b***). it is also worth mentioning that 54 % of the zero-users in 2023 were three-year zero-users and another 16 % were two-year zero-users.

In conclusion for the poultry sector, the results cannot be considered bad. However, it is disappointing that over the course of the reduction path so far, progress has been made easily in the early stages but ever since the 'drive' to take the next steps seems to be missing. In terms of targets, the sector appears on course to fulfil its ambition, yet, for the future it seems clear that the ambition should go further. Considering that the moderately positive BD_{100}-results are not corresponding to reductions in the used tonnes, the latter in contrast having gone up, means that in the future the focus should go to the early weeks of the cycles, when the animals weigh (much) less than the used standard weight of 1 kg. Furthermore, the farms currently in the yellow zone harbour the majority of the antibacterial use, and so ways need to be considered to encourage them to reduce their use and reach the green zone.

Distribution of the antibacterial use in veal calves (use data)

The veal calf sector clearly had a difficult year. Overall, a minor reduction was achieved (BD_{100}-species, the total number of treatment days and the median BD_{100} all slightly decreased) (*Table 21a*) but several farms also saw an increasing antibacterial use, leading to some descriptive parameters slightly increasing. In light of the remaining high level of antibacterial use in the sector, and the distance to go on the reduction path, 2023 ought to have been a crucial year, and it remains to be seen what will be possible in a single year remaining. It has been clear since the start of the reduction path (*Table 21b*) that the targets are ambitious and would require profound and concerted efforts from the sector, the government, the dairy sector and the scientific world. The efforts done so far are commendable yet it will be important for the sector and the other stakeholders to carefully investigate what is causing the current status-quo and to come up with solutions to tackle the remaining challenges. At the end of 2024, the new threshold values will come into effect and this will lead to an increase of the number of red farms to approx. 30 % with the current results. This will put an important burden on the sector and it is in the interest of all stakeholders to support where possible.

Table 21a. Parameters describing the distribution of the farm-level antibacterial use in the reference populations for benchmarking of veal calves from 2018 to 2023 and the % difference (diff) over the years.

Parameters BD_{100}	2018	2019	2020	2021	2022	2023	diff 23-22	diff 23-18
P25	9,87	7,89	7,41	6,00	5,56	5,74	**+3,24%**	**-41,81%**
P50	13,50	10,72	10,17	8,32	7,87	7,66	**-2,67%**	**-43,26%**
P75	19,57	14,45	14,10	12,27	10,72	10,69	**-0,28%**	**-45,36%**
P90	23,64	18,06	19,53	16,62	13,22	14,84	**+12,25%**	**-37,21%**
Mean	14,80	11,47	11,47	9,58	8,53	8,69	**+1,88%**	**-41,28%**
Sum	3523	2673	2696	2300	1987	1954	**-1,66%**	**-44,54%**
Total n farms	240	234	235	241	235	226	ND	ND
% farms with zero use[1]	1%	0%	0%	0%	1%	0%	ND	ND

[1] *Zero use farms were not included in the data for determining the parameter values.*

Table 21b. The thresholds of the BD_{100} reduction path 2021-2024 for veal calves.

Date of application	Attention value	Action value
01/01/2021	**10**	**15**
01/01/2023	**8**	**11**
31/12/2024	**6**	**9**

In conclusion, the results for veal calves for 2023 point to the big challenges posed to the sector for reducing their structurally high antibacterial use. Though the efforts made so far should not be minimised, it is clear that renewed energy and solutions are needed, and all stakeholders involved should investigate how they can contribute to tackle this shared, important problem.

Antibacterial use in cows (use and sales data)

a) Use data of antibacterials in cows

As noted in *Table 8*, the number of notifications for bovines in 2023 already firmly outnumbered the notifications for the pigs, broilers, laying hens and veal calves combined. Still, it tells nothing of the actual level of antibacterial use in bovines. Moreover, as it is only legally obliged since August 2023, these data only cover four full months (September-December) and so assessing the antibacterial use for dairy and beef bovines would require extrapolating the available data. This was deemed unfitting for the current report, as the quality of the available data appears questionable, due to a high number of potentially incorrect AB-registrations. It is expected that in 2025 it will be possible to more reliably include the data for 2024.

b) Sales of DC and LC injectors per dairy cow

Despite the sales data not allowing to calculate species-specific results, some types of antibacterial VMPs can be allocated to one animal species, hence providing relevant information, even in the absence of use data. An example that has been followed up in the BelVet-SAC report in the past years is the sales of intramammary VMPs used during the dry period (dry cow therapy, DC) and treatment of udder infections during the lactating period (lactating cow, LC).

In *Figure 16*, the sales of intramammary VMPs are presented as the number of injectors sold per cow per year. That number appears to be decreasing, albeit predominantly in terms of injectors sold for the treatment of mastitis during the lactating period. Over the course of the last six years, the sales of DC applicators remained relatively stable.

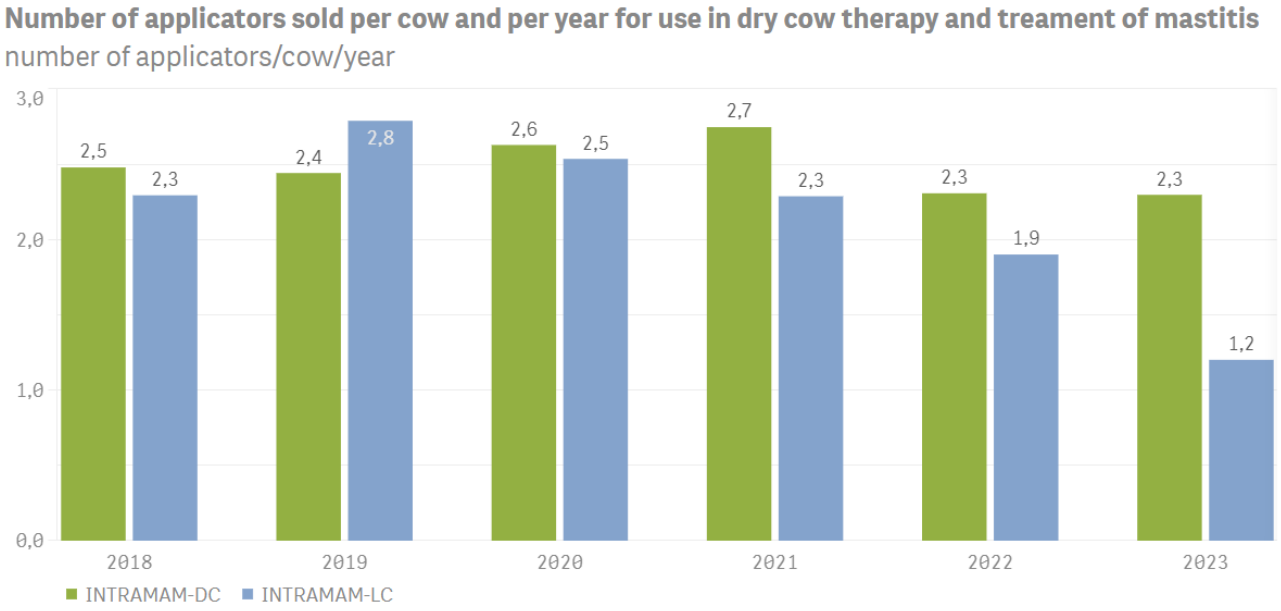


Figure 16. Number of intramammary preparations sold per cow per year between 2018 and 2023.

III.3 SALES AND USE OF ANTIBACTERIAL VMPS PER ANTIBACTERIAL CLASS AND ADMINISTRATION ROUTE

Sales of antibacterial VMPs per antibacterial class

Antibacterial pharmaceuticals and antibacterial premixes can be classified into different antibacterial classes based on their active antibacterial substance. The classification used in this report can be found in Annex I – Table I.1.

Figure 17 presents the proportion of the total sales per antibacterial class for 2023.

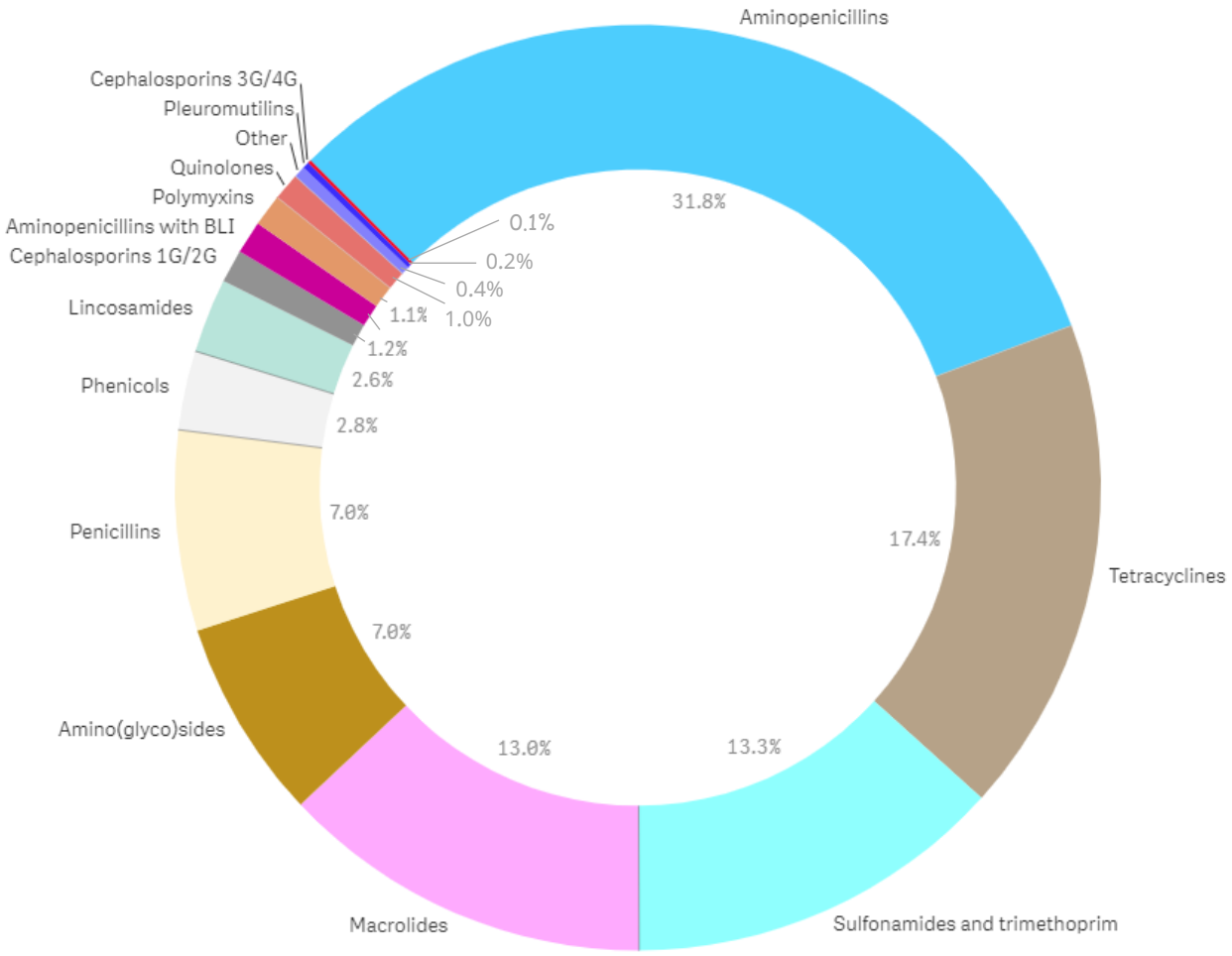


Figure 17. Proportion of sales of antibacterial pharmaceuticals and antibacterial premixes per antibacterial class in 2023.

The most sold group of antibacterial substances in veterinary medicine remained the aminopenicillins (absolute amount: 32,7 tonnes = 31,8 %; increasing to 33,9 tonnes or 33,0 % when including the

aminopenicillins in combination with a beta-lactamase inhibitor). Tetracyclines (absolute amount: 17,9 tonnes = 17,4 %) were the second most sold group, followed by the sulfonamides and trimethoprim (13,7 tonnes; 13,3 %) and macrolides (13,4 tonnes; 13,0 %). Amino(glyco)sides and penicillins both accounted for 7,0 % of sales, with the other classes each accounting for less than 3 % of the sales.

Table 22 and *Figure 18* show the evolution in the last six years of the sold antibacterial pharmaceuticals and premixes per antibacterial class, in mg/kg biomass.

Table 22. Evolution of the sales in mg/kg biomass per antibacterial class since 2018. In the evolution graph in the last column, the red dot indicates the maximum value in that period, the green dot the minimum value.

Class AB Mg/Kg Biomass	2018	2019	2020	2021	2022	2023	18 » 19	19 » 20	20 » 21	21 » 22	22 » 23	2023%	Evolution
Aminopenicillins	30,41	30,06	30,81	26,89	22,29	17,50	-1,1%	2,5%	-12,7%	-17,1%	-21,5%	31,80%	
Tetracyclines	26,12	19,83	19,18	17,32	13,42	9,57	-24,1%	-3,3%	-9,7%	-22,5%	-28,7%	17,38%	
Sulfonamides and trimethoprim	18,24	17,69	16,72	16,35	12,23	7,30	-3,0%	-5,5%	-2,2%	-25,2%	-40,3%	13,27%	
Macrolides	5,95	5,52	6,42	6,62	6,34	7,17	-7,2%	16,4%	3,0%	-4,2%	13,1%	13,03%	
Amino(glyco)sides	3,68	4,48	4,20	4,45	4,27	3,86	21,7%	-6,3%	6,0%	-4,0%	-9,6%	7,01%	
Penicillins	5,09	4,22	4,19	3,84	5,23	3,85	-17,2%	-0,8%	-8,3%	36,4%	-26,4%	6,99%	
Phenicols	1,59	1,56	1,57	1,81	1,82	1,52	-1,8%	0,4%	15,3%	0,6%	-16,3%	2,77%	
Lincosamides	2,20	2,57	2,32	1,90	2,09	1,43	16,7%	-9,9%	-18,1%	10,2%	-31,6%	2,60%	
Cephalosporins 1G/2G	0,38	0,52	0,62	0,60	0,49	0,64	37,9%	19,3%	-3,7%	-17,5%	29,2%	1,16%	
Aminopenicillins with BLI	0,50	0,57	0,55	0,57	0,55	0,63	14,5%	-3,3%	4,4%	-3,1%	14,2%	1,15%	
Polymyxins	1,72	1,50	1,33	1,16	0,57	0,62	-13,0%	-11,3%	-12,7%	-50,9%	8,1%	1,12%	
Quinolones	0,44	0,48	0,65	0,35	0,59	0,53	9,8%	36,7%	-46,0%	66,4%	-10,4%	0,96%	
Other	0,14	0,15	0,14	0,18	0,16	0,23	12,6%	-10,7%	32,6%	-10,7%	38,4%	0,41%	
Pleuromutilins	0,74	0,55	0,27	0,18	0,16	0,13	-25,9%	-50,6%	-32,0%	-14,0%	-20,7%	0,23%	
Cephalosporins 3G/4G	0,07	0,07	0,07	0,06	0,05	0,06	-5,5%	3,6%	-13,5%	-17,0%	22,0%	0,11%	
Total mg/kg Biomass	**97,27**	**89,76**	**89,03**	**82,28**	**70,27**	**55,04**	**-7,7%**	**-0,8%**	**-7,6%**	**-14,6%**	**-21,7%**	**100,00%**	-

In 2023, the sales of seven out of the eight main antibacterial classes decreased, with the most sold three classes even reaching their lowest level to date. The macrolides were the only class increasing and this immediately to the highest level in recent years. Note that starting from this report, the data of the macrolides and lincosamides are shown separately, as is the case for the different classes of penicillins.

Two other classes with an increased use in 2023, the aminopenicillins associated with clavulanic acid and the cephalosporins of the 1st and 2nd generation, also achieved their highest level to date. Other remarkable results were the increase of the use of cephalosporins of the 3rd and 4th generation and the polymyxins (see also Chapter III.4). The quantity sold of quinolones on the contrast decreased again, after the increase between 2021 and 2022 (as noted retrospectively based on the MAH data). Together, the cephalosporins of the 3rd and 4th generation and the quinolones (= the Critically Important Antibacterials, CIAs) decreased with 7,9 % in 2023 compared to 2022.

The evolution graphs in *Figure 18* illustrate the consistent decreases between 2018 and 2023 for the tetracyclines, sulfonamides and trimethoprim, and pleuromutilins, with also lincosamides and polymyxins showing mostly decreasing trends. Macrolides, aminopenicillins associated with clavulanic acid and the group of 'other' antibacterials show mostly increasing trends.

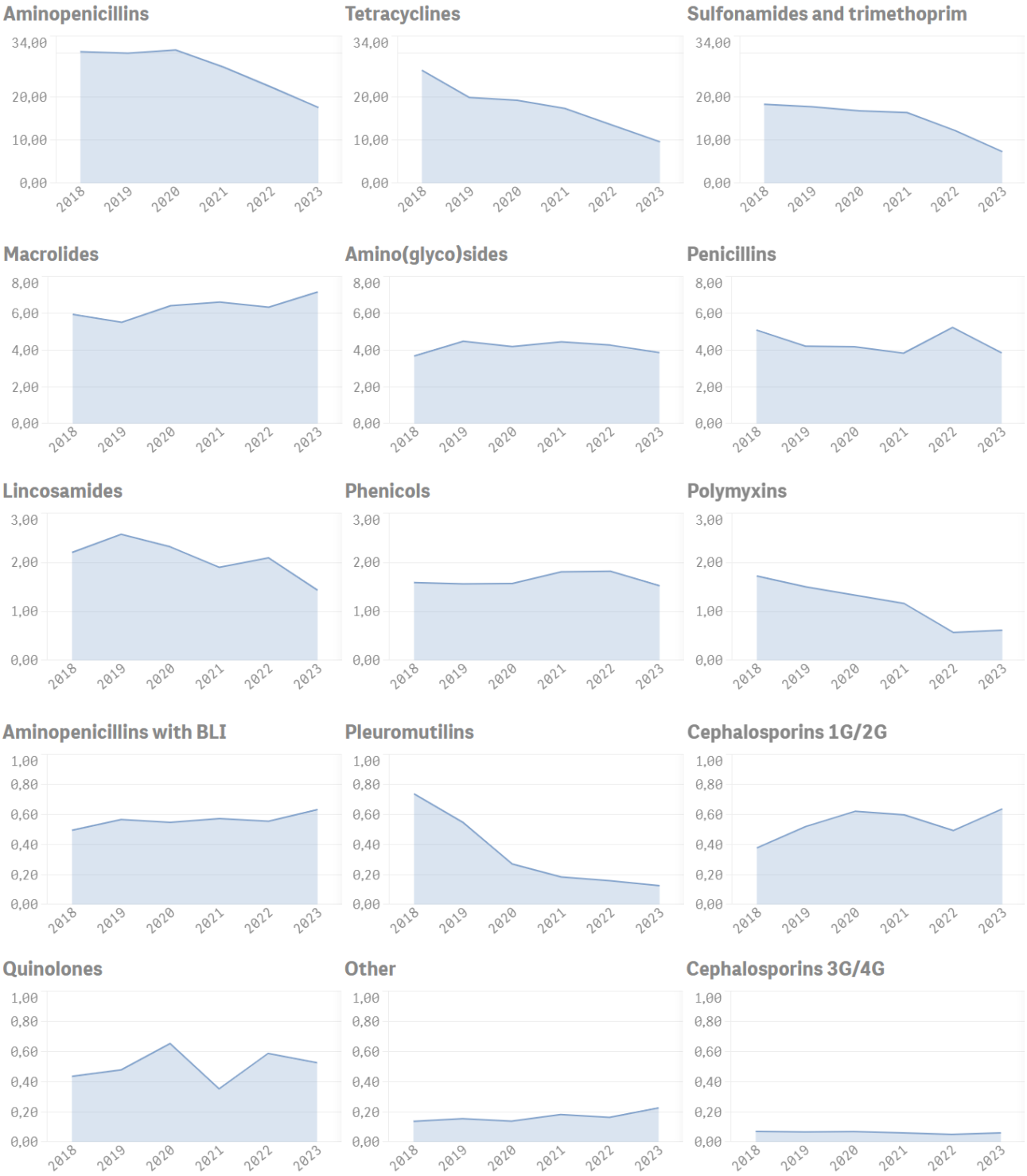


Figure 18. Evolution in the sales (mg/kg biomass) per antibacterial class between 2018 and 2023.

Sales of antibacterial VMPs per administration route

In 2023, VMPs for oral administration accounted for three quarters of the total sales of antibacterials, followed by injectable VMPs (17,5 %), premixes (7 %) and VMPs for intramammary use (0,5 %) (***Figure 19***). The share of VMPs with 'Other' administration routes corresponds roughly half/half to intra-uterine and cutaneous VMPs.

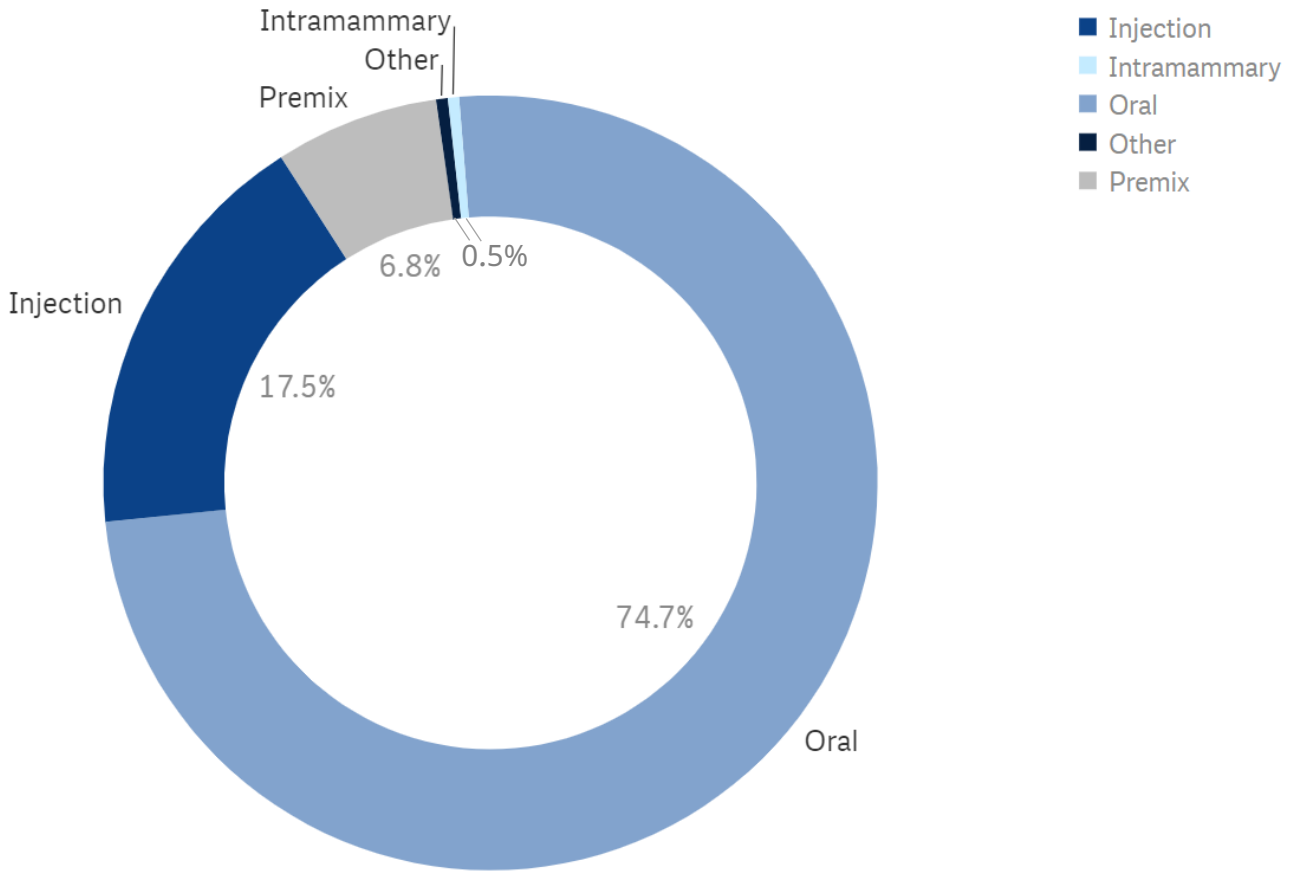


Figure 19. Proportion of sales of antibacterial pharmaceuticals and antibacterial premixes per administration route in 2023.

Sales of antibacterial VMPs per antibacterial class and administration route

Evidently, for the majority of the antibacterial classes, the VMPs sold in 2023 were mainly for oral administration (*Figure 20*). For the penicillins and phenicols, injectable VMPs had the largest share. VMPs for injectable administration had also important shares (>20 %) in the sold quantities of cephalosporins, lincosamides and amino(glyco)sides. Remarkably, for the cephalosporins of the 3rd and 4th generation more than two thirds of the sold VMPs were for intramammary use. Most premixes were aminopenicillins and pleuromutilins (tiamulin).

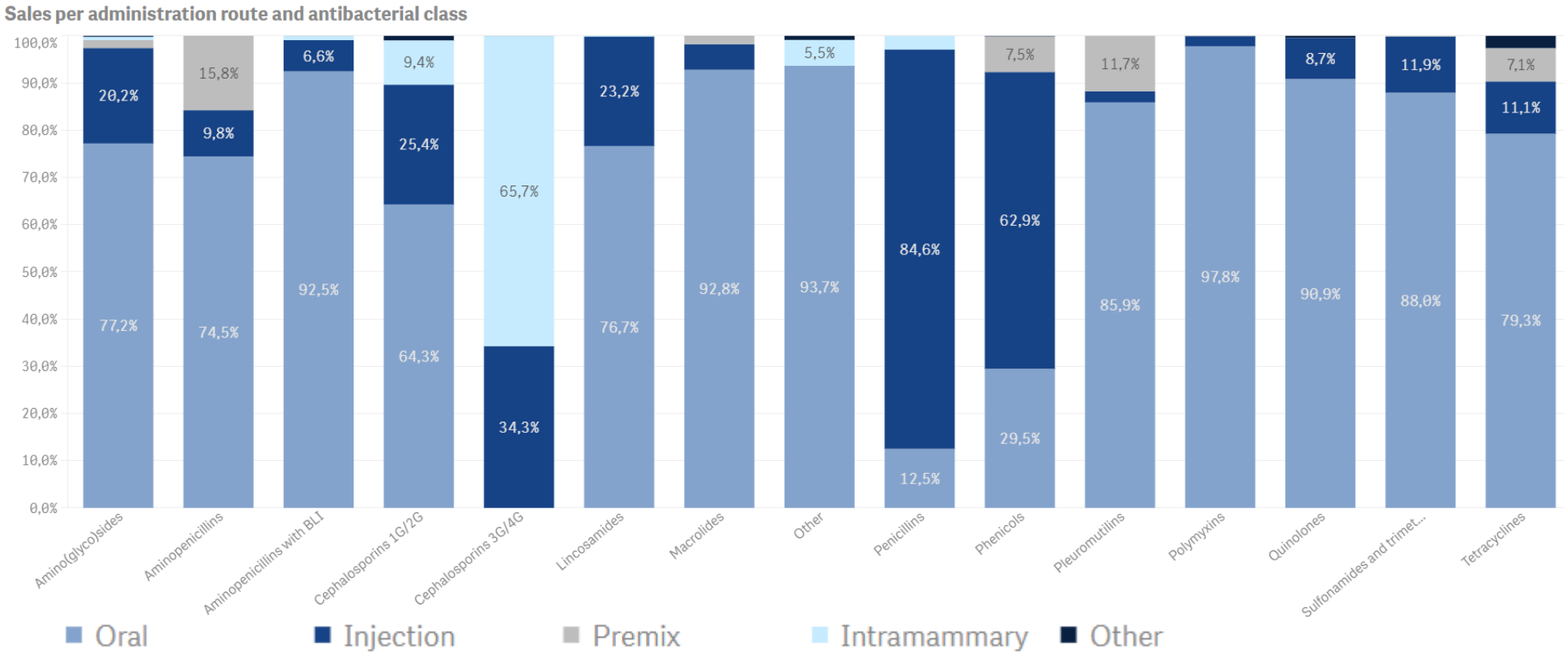
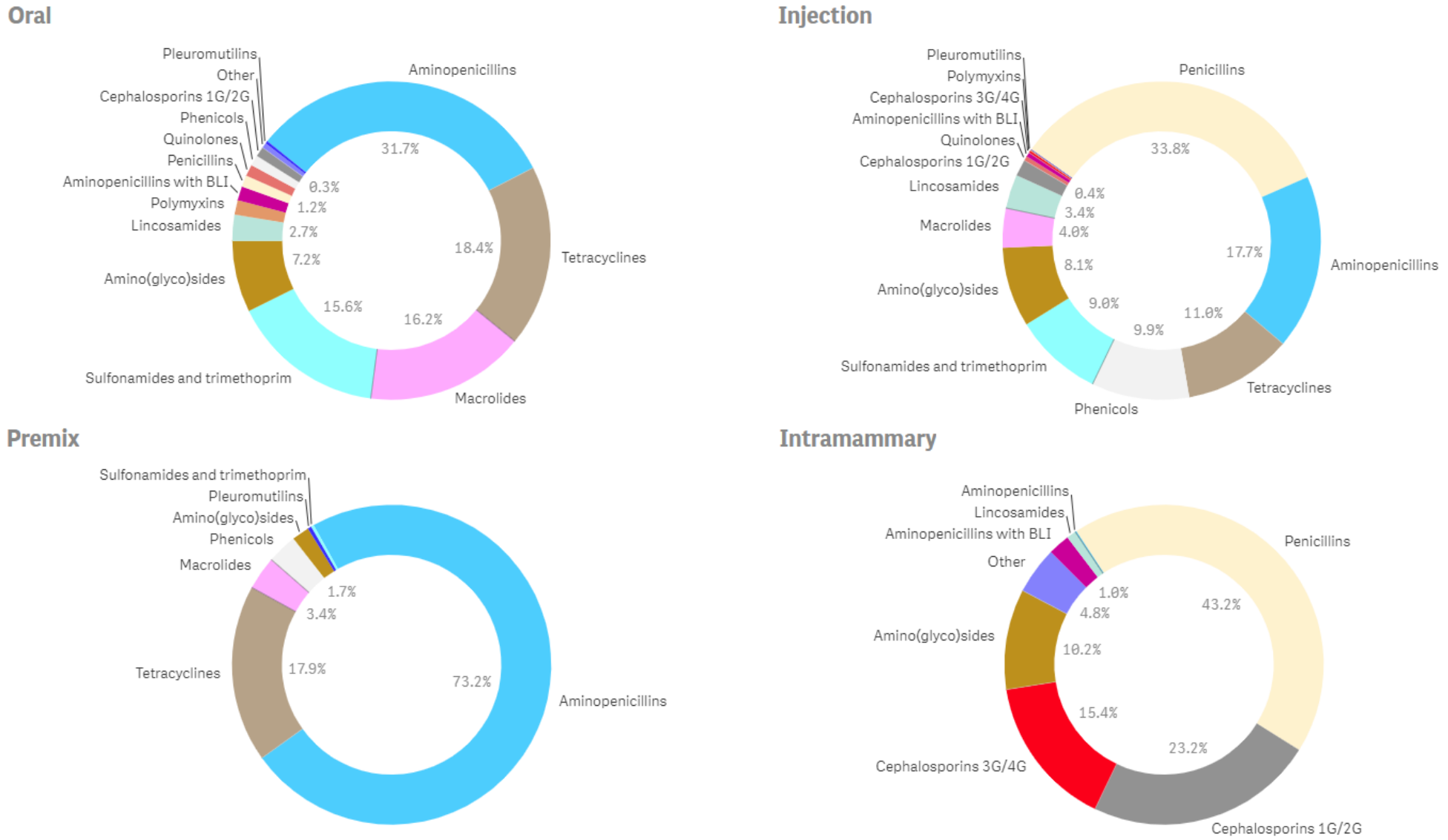


Figure 20. Proportion of sales (mg/kg biomass) per administration route for each antibacterial class in 2023.

Figure 21 depicts the proportion of each antibacterial class per administration route for 2023.



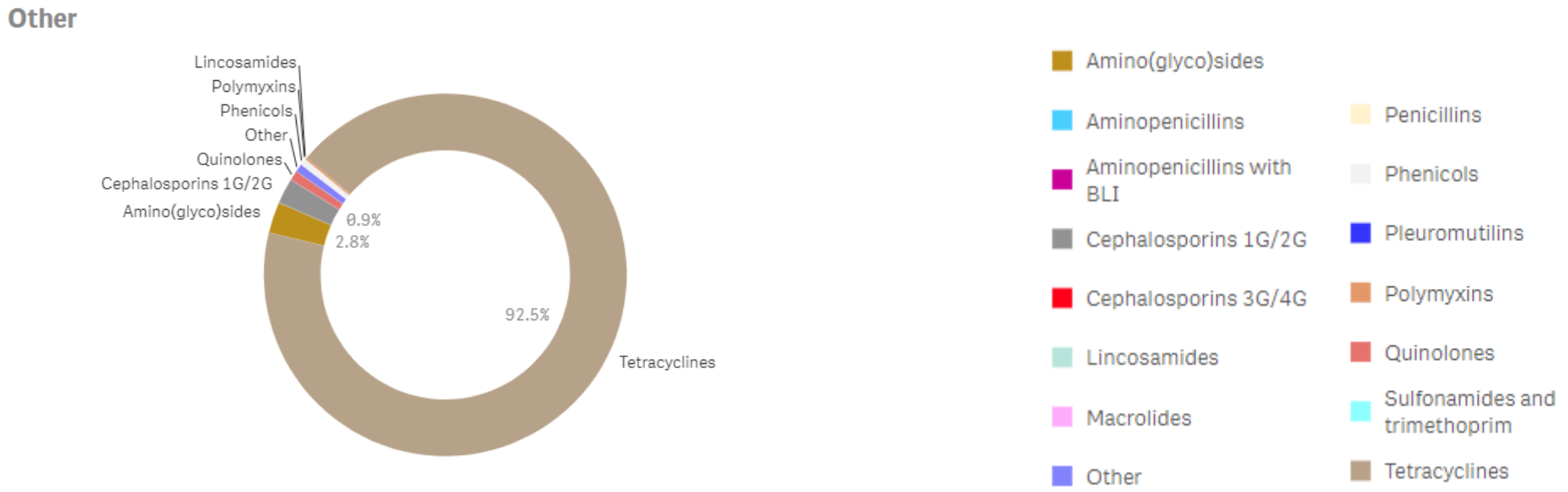


Figure 21. Proportion of sales (mg/kg biomass) per antibacterial class for each administration route in 2023.

As oral VMPs are the majority of sold VMPs in almost all antibacterial classes, the distribution for the oral VMPs looks very similar to the distribution presented for the total sales data in ***Figure 19***, with the largest share for the aminopenicillins (31,7 %), the tetracyclines (18,4 %), the macrolides (16,2 %) and the sulfonamides and trimethoprim combination VMPs (15,6 %). For injectable VMPs, the top three classes are the penicillins (33,8 %), aminopenicillins (17,7 %) and tetracyclines (11,0 %). Also for the intramammary VMPs, the penicillins (43,2%) are the most common antibacterial class, followed by the 1st and 2nd (23,2 %) and 3rd and 4th (15,4 %) generation of cephalosporins and the amino(glyco)sides (10,2 %).

Comparison of Sanitel-Med use data with sales data per antibacterial class

Table 23. Total tonnes per antibacterial class sold in 2023 vs. total tonnes used and tonnes used in pigs, poultry and veal calves in 2023. Next to the tonnes used by each species the % this covers of the sales data is shown.

Total tonnes per antibacterial class sold in 2023 and total tonnes used in pigs, poultry and veal calves

Antibacterial class	Sales 2023	Total use 2023	% sales	Use in pigs 2023	% sales (pig)	Use in poultry 2023	% sales (poultry)	Use in veal 2023	% sales (veal)
Totals	**102,96**	**86,42**	**84%**	**55,21**	**54%**	**18,72**	**18%**	**12,49**	**12%**
Aminopenicillins	32,75	34,58	106%	28,05	86%	2,91	9%	3,63	11%
Tetracyclines	17,90	15,72	88%	10,56	59%	1,54	9%	3,63	20%
Sulfonamides and trimethoprim	13,66	10,02	73%	6,80	50%	2,26	17%	0,95	7%
Macrolides	13,42	11,55	86%	2,81	21%	5,94	44%	2,80	21%
Amino(glyco)sides	7,22	5,92	82%	2,09	29%	2,81	39%	1,02	14%
Penicillins	7,20	1,71	24%	0,60	8%	1,05	15%	0,06	1%
Phenicols	2,85	1,73	61%	1,40	49%	0,00	0%	0,33	12%
Lincosamides	2,68	2,84	106%	1,40	52%	1,41	53%	0,03	1%
Cephalosporins 1G/2G	1,19	0,01	1%	0,00	0%	0,00	0%	0,00	0%
Aminopenicillins with BLI	1,19	0,00	0%	0,00	0%	0,00	0%	0,00	0%
Polymyxins	1,15	1,52	132%	1,33	116%	0,19	16%	0,00	0%
Quinolones	0,99	0,66	67%	0,00	0%	0,61	62%	0,04	4%
Other	0,42	0,00	0%	0,00	0%	0,00	0%	0,00	0%
Pleuromutilins	0,23	0,17	73%	0,17	73%	0,00	0%	0,00	0%
Cephalosporins 3G/4G	0,11	0,00	0%	0,00	0%	0,00	0%	0,00	0%

The five most used classes of antibacterials in 2023 corresponded to the five most sold classes of antibacterials in 2023, even though the macrolides and trimethoprim-sulfamide trade places in the sales vs. use ranking. Remarkably, three classes appeared to have higher used quantities than sales quantities: the aminopenicillins, the lincosamides and the polymyxins. Pigs accounted for more than half of sales for the aminopenicillins, the tetracyclines, polymyxins and pleuromutilins, whereas poultry accounted for 62 % of all quinolones sold.

Farm-level use of the various antibacterial classes in pigs, poultry and veal calves

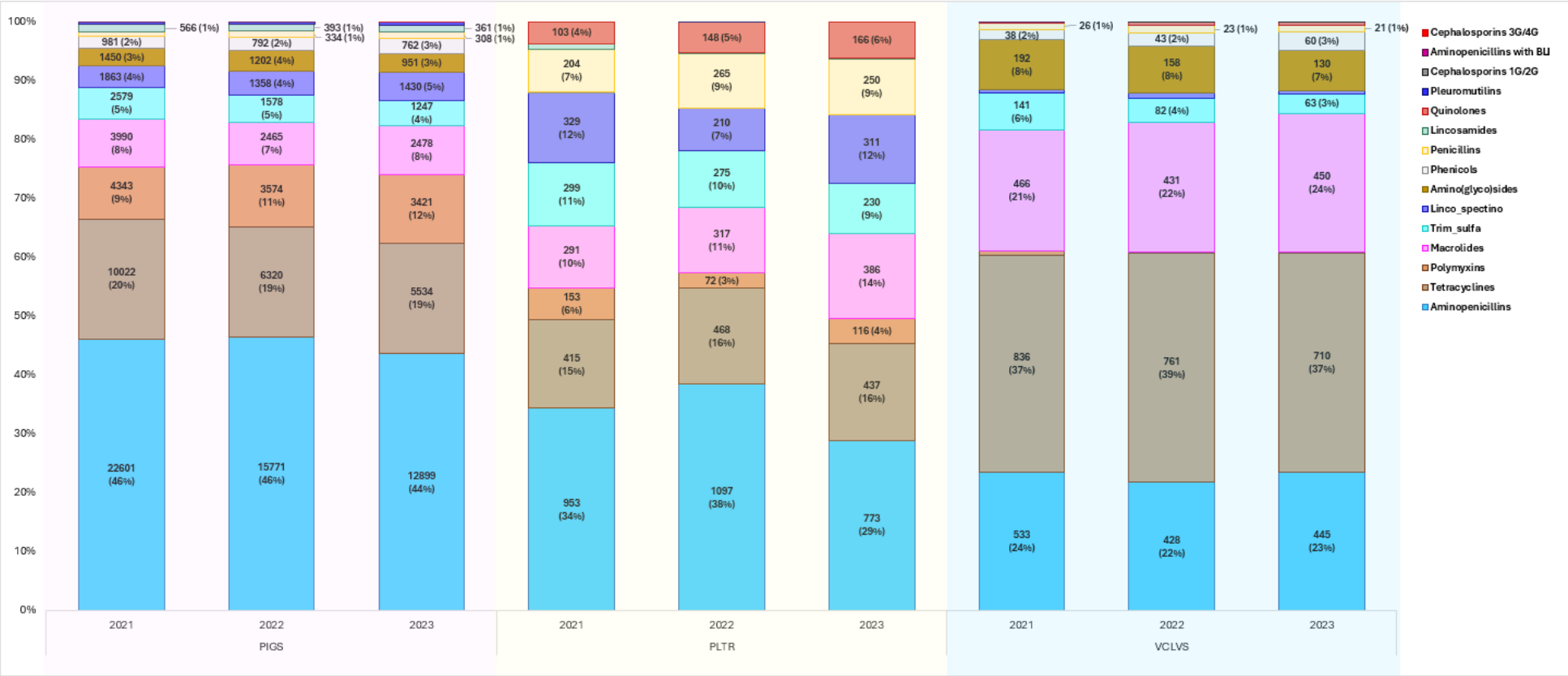


Figure 22. Number of treatment days with the different antibacterial classes and percentage of the total number of treatment days per species in 2021, 2022 and 2023. Numbers/percentages not shown are classes where use was below 1% of treatment days.

In all species, moderate changes occurred in the relative importance of the different antibacterial classes (*Figure 22*). In pigs, the proportion of lincomycin-spectinomycin increased between 2022 and 2023. In poultry, the proportion of aminopenicillins, which had increased in 2022, decreased again, as opposed

to the trend in the proportion of lincomycin-spectinomycin. The increasing importance of quinolones is also clearly detectable in poultry (see also Chapter III.4). Also the use of macrolides became more important in poultry, whereas the use of lincosamides decreased. Most remarkable in veal calves was the almost complete cessation of the use of polymyxins (see also Chapter III.4) and the continued increase of the use of macrolides.

Sales of intramammary antibacterial VMPs per antibacterial class

Figure 23 presents the evolution in sales of intramammary VMPs in the last six years per antibacterial class. Most classes are decreasing, with an exception for the cephalosporins of the 3rd and 4th generation. The sold quantity of aminopenicillins has strongly decreased since a peak in 2019, and it is also reassuring that the increase for the aminopenicillins supplemented with clavulanic acid that was visible until 2022 did not continue in 2023.

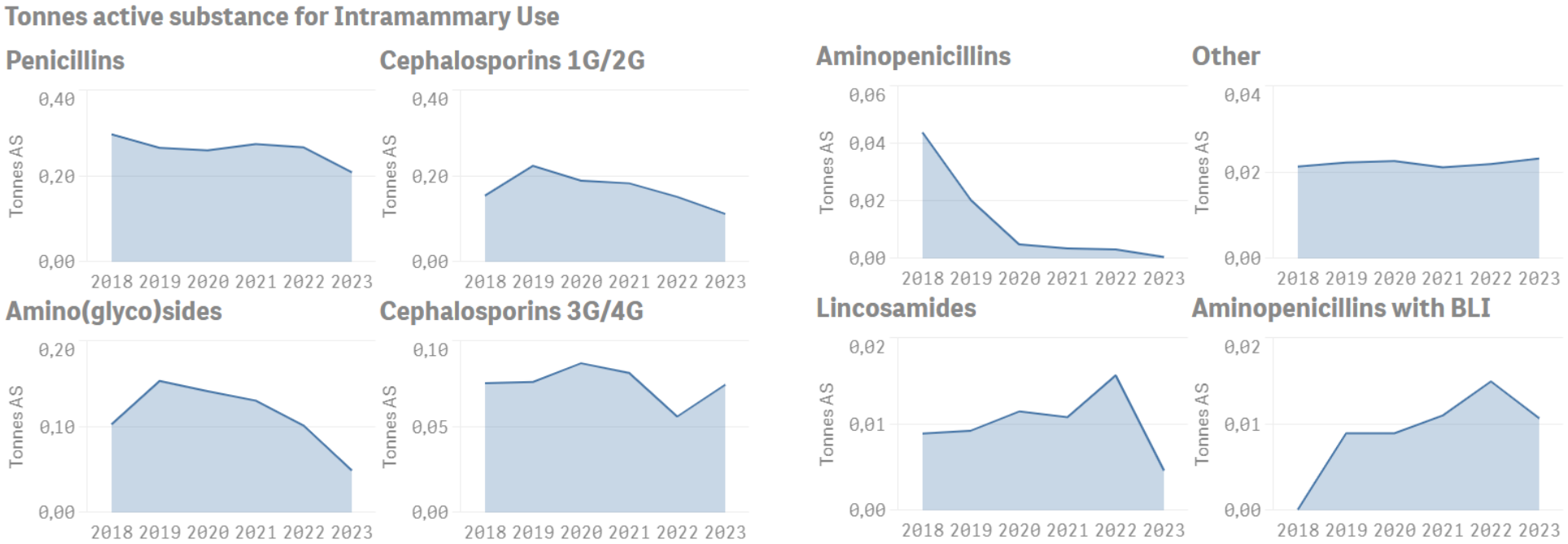


Figure 23. Evolution in sales of antibacterials for intramammary use per antibacterial class between 2018 and 2023.

III.4 SALES AND USE OF ANTIBACTERIAL VMPS PER AMCRA COLOUR CODE

Sales of antibacterial VMPs per AMCRA colour code

The AMCRA[14] colour codes for veterinary antibacterial VMPs are linked to the AMCRA formulary which offers guidelines to veterinarians for responsible use of antibacterial VMPs. The first version of these guidelines, for the food producing animals pigs, poultry and bovines, was printed in 2013. Since then also guidelines for cats, dogs and horses have been published and the printed versions have been supplemented by an online version[15] and a free app for iOS and Android.

In these guidelines, the different antibacterial classes available in veterinary medicine are assigned a colour code to differentiate in terms of their importance for public and animal health. The ranking of importance is based on the WHO list on antibacterial substances with importance for human medicine[16] and the lists produced by the World Organisation for Animal Health (WOAH), indicating the importance of antibacterial substances for veterinary medicine[17]. When creating these lists, priority was given to the importance for public health.

The VMPs with a yellow colour code contains the antibacterial classes with the lowest importance for human medicine in terms of the risk for selection and for transfer of AMR and therefore no additional restrictions, on top of any legal requirements, are suggested for the use of these substances. They comprise some penicillins, the sulfonamides (and diaminopyrimidines), the cephalosporins of the 1st and 2nd generation and the phenicols.

The VMPs with an orange colour code are of a higher importance for human medicine and should therefore be used restrictively in veterinary medicine and only after accurate diagnostics allowing the therapy to be targeted. This group contains the highest amount of different molecules including the macrolides, lincosamides, polymyxins, amino(glyco)sides, tetracyclines and aminopenicillins.

The VMPs with a red colour code are the VMPs of the highest importance for human medicine and therefore their use in veterinary medicine should be avoided as much as possible. AMCRA advises to only use these CIAs under very strict conditions. Their use in food producing animals is, in agreement with the AMCRA advise, regulated by royal decreee since 2016, with an extension to all animals set to come into force September 1st, 2024. This group contains the cephalosporins of the 3rd and 4th generation and the quinolones.

Figure 24 shows the proportion of the antibacterial sales in mg/kg biomass per AMCRA colour code for 2023. This figure shows that the orange group remains the most used group with 74,2 %, while the red molecules are used only to a limited extent (1,0 %). It must be noted though that the red molecules are generally more modern molecules with a high potency and therefore a low molecular weight in relation to their treatment potential, leading to an inherently lower mass needed to treat an animal.

[14] www.amcra.be
[15] https://formularium.amcra.be/
[16] https://www.who.int/publications/i/item/9789241515528
[17] https://www.woah.org/app/uploads/2021/06/a-oie-list-antimicrobials-june2021.pdf

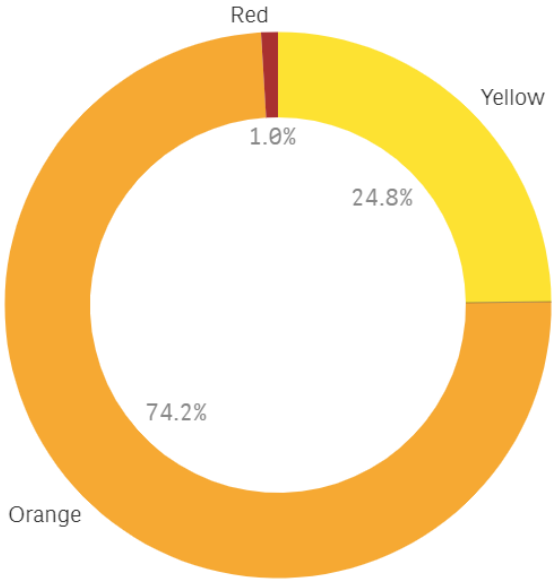


Figure 24. Proportion of sales, in mg active antibacterial substance per kg biomass, of antibacterial VMPs per AMCRA colour code in 2023.

This distribution of the antibacterial sales in mg/kg biomass per AMCRA colour code for 2023 is slightly different than in previous years (***Figure 25***), with the higher proportion of orange products sold resulting in a lower share of the yellow VMPs, while the share of red VMPs is with 1% at the highest in six years.

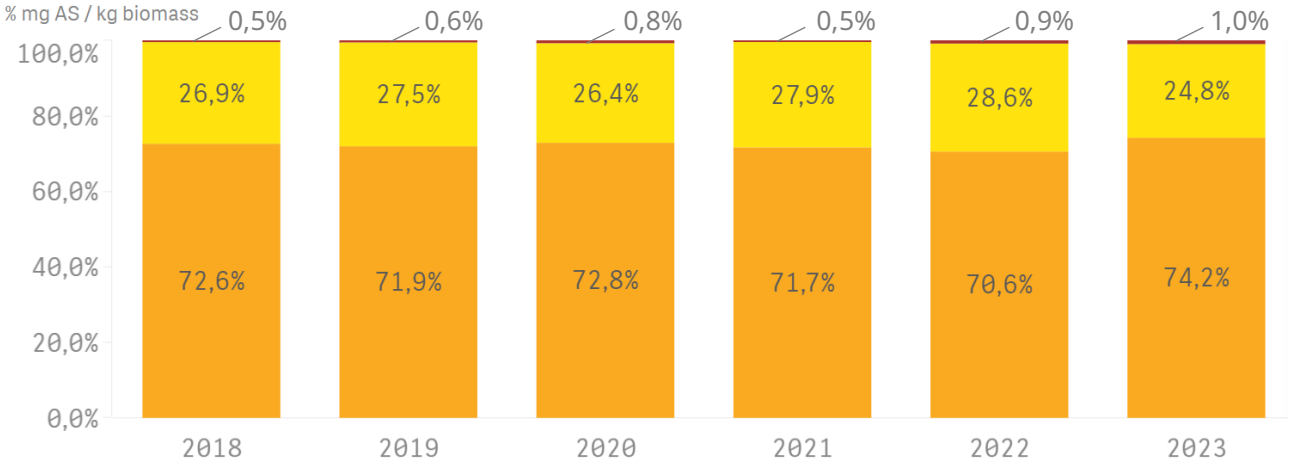


Figure 25. Evolution in the distribution of the antibacterial sales (mg/kg biomass) per AMCRA colour code between 2018 and 2023.

Figure 26 shows the evolutions for each AMCRA colour code separately expressed in mg/kg biomass. This illustrates that with the stable proportions over time, both the quantity of orange and yellow VMPs have steadily decreased. The quantity of red VMPs, being relatively very low, is subject to greater fluctuations.

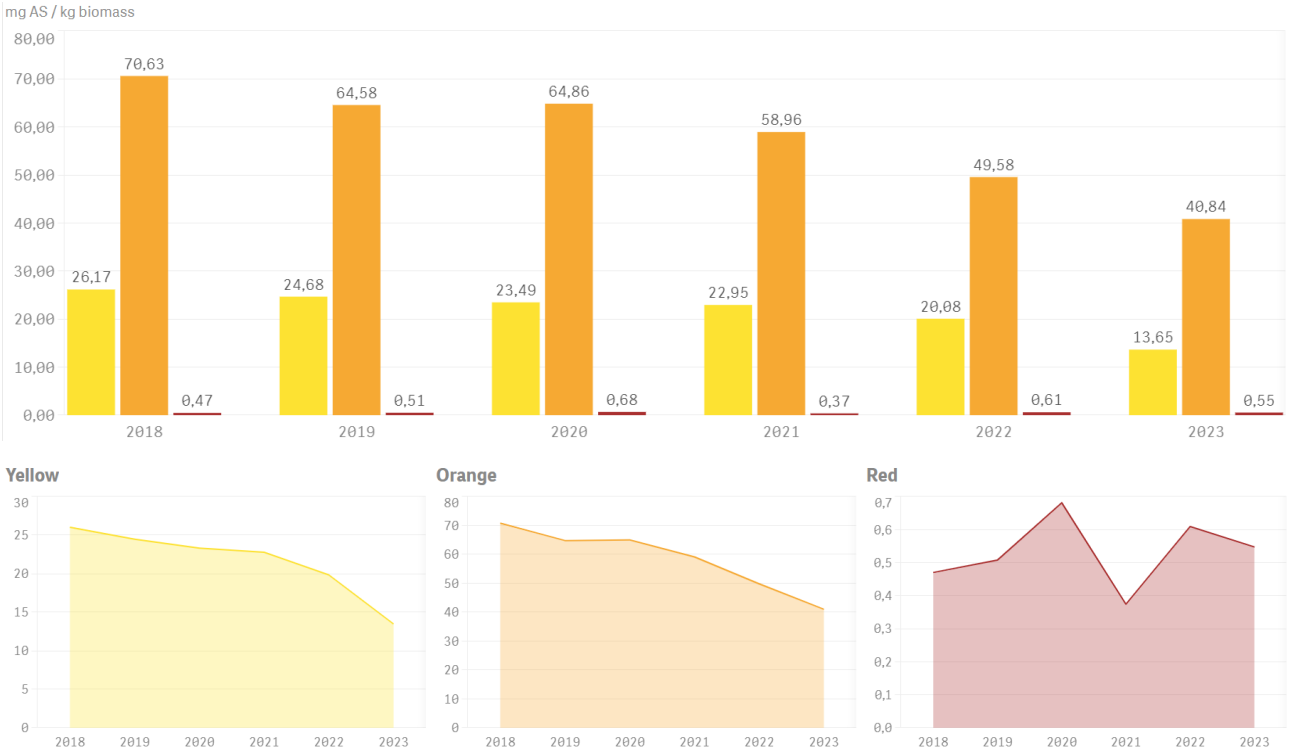


Figure 26. Evolution in the antibacterial sales (mg/kg biomass) per AMCRA colour code between 2018 and 2023. The top graph uses the same Y-axis, allowing comparing of the quantities used, while the lower graphs have different Y-axes, allowing for a better view on the respective evolutions.

Between 2022 and 2023, the sales of orange and yellow molecules respectively decreased with 17,6 % and 32,0 %. After a huge increase of 62,7 % of the sales of red molecules in 2022, in 2023 a reduction of 10,1 % was again observed.

It is important to note that in the graphs above, the cephalosporins of the 3rd and 4th generation for intramammary application are included in the orange group of molecules, as established in the AMCRA guidelines. The proportion of this application route in relation to the red molecules, and overall more details about the red molecules, are provided below.

Sales and use of VMPs with a red AMCRA colour code

a) *Overall sales of VMPs with a red AMCRA colour code*

Within the antibacterials with a red AMCRA colour code, the quinolones have a more important contribution than the cephalosporins of the 3rd and 4th generation (*Figure 27*). The sold amount

cephalosporins of the 3rd and 4th generation appears to decrease continuously over the past years, whereas that of the quinolones fluctuated, with peaks in 2020 and 2022. As shown in ***Figure 28***, this is mainly attributable to fluctuations in sales of flumequine.

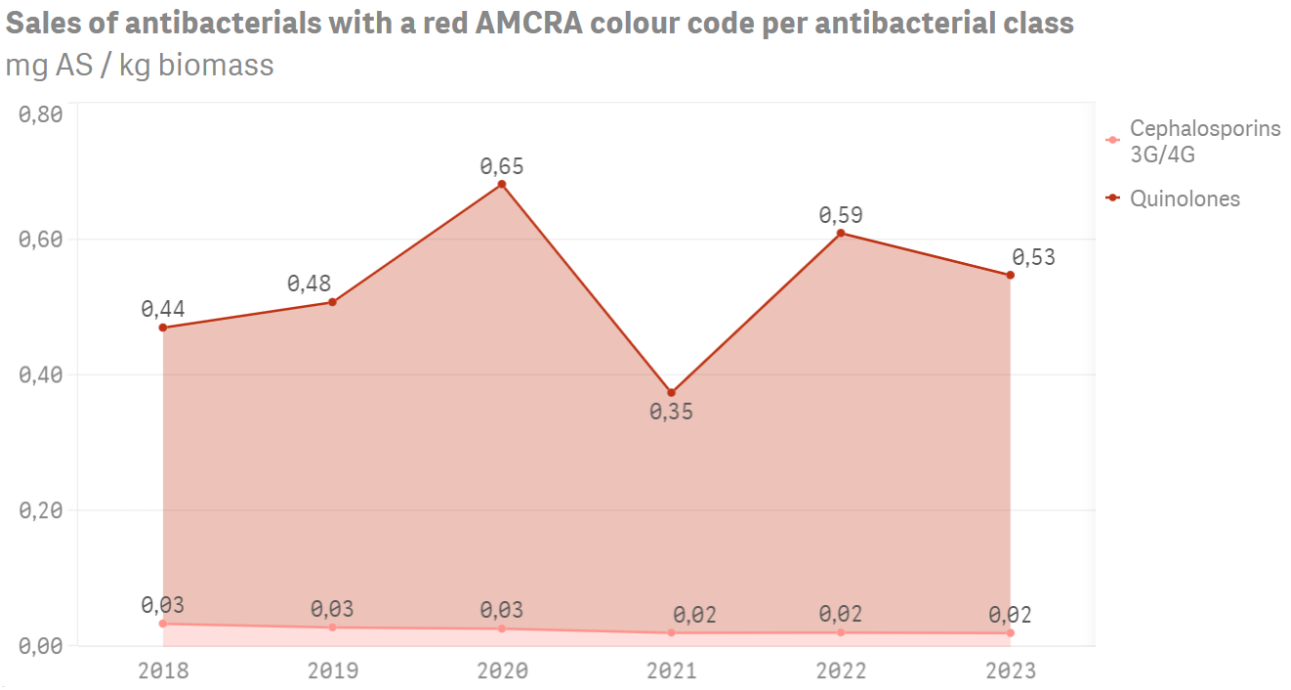


Figure 27. Evolution since 2018 in the sales (mg/kg biomass) of the two antibacterial classes with a red AMCRA colour code, excluding the 3rd and 4th generation cephalosporins for intramammary application.

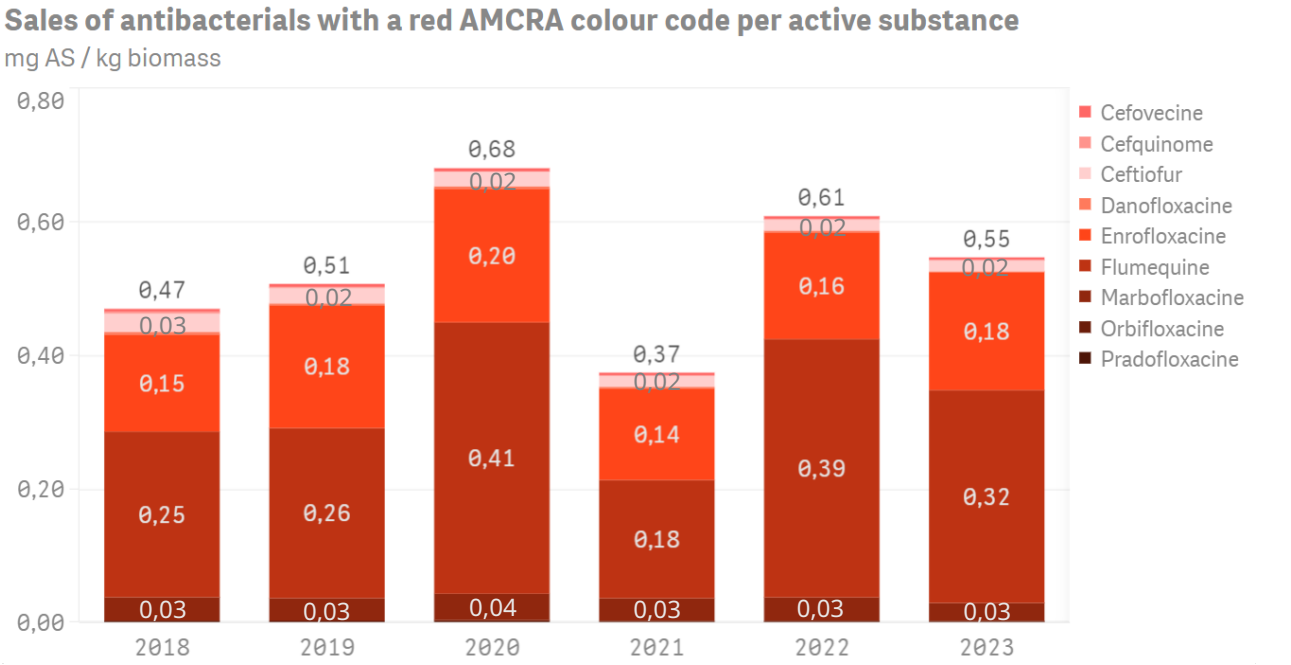


Figure 28. Evolution since 2018 in the sales (mg/kg biomass) of the active antibacterial substances with a red AMCRA colour code, excluding the 3rd and 4th generation cephalosporins for intramammary application.

b) VMPs with a red colour code for pigs, poultry and veal calves

After the strong increase in the absolute amount of quinolones used in poultry in 2022, there was a further minor increase in 2023 (*Figure 29*). One in eight poultry farms used quinolones in 2023, increasing to one in six taking only the broiler farms into account – the category where the use of quinolones is situated.

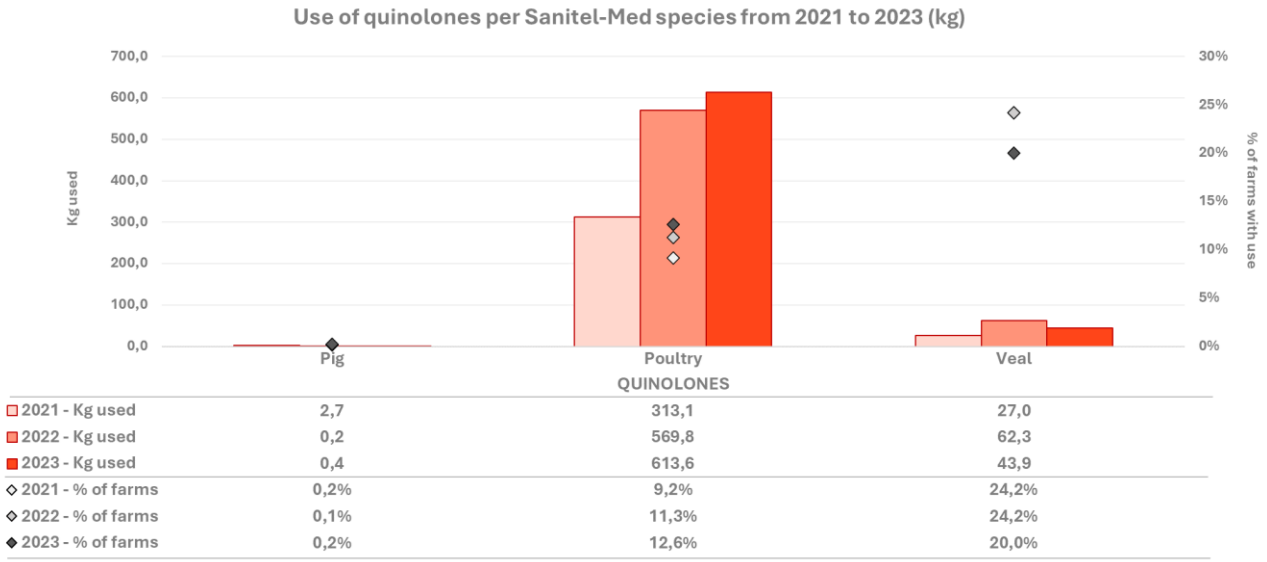


Figure 29. Kg used of the quinolones in pigs, poultry and veal calves from 2021 to 2023, and the % of farms with notifications of use of these critical substances.

Veal calves recorded a decrease in the use of quinolones in 2023 compared to 2022, with however still one in five veal calf farms having used quinolones in one or some of its animal(s).

As in previous years, use of quinolones in pigs was negligible. It was however remarkable that, after two years of complete absence of registrations of cephalosporins of the 3rd and 4th generation, in 2023 some use was recorded (*Figure 30*), in total four registrations on two farms, with ceftiofur and cefquinome. As an aside, also a veal calf farm recorded use of cefquinome, though it was an intramammary applicator, probably used topically (data not shown).

Overall, these data show that with respect to the use of CIAs in the species monitored in Sanitel-Med, the use of quinolones in the broilers remains a concern. The evolutions, reasons and remediations are closely watched and discussed among AMCRA and the sector. As all evolutions occur within the legal framework in place for use of CIAs in animals in Belgium, also the government needs to continue playing its role in monitoring good practices in the field.

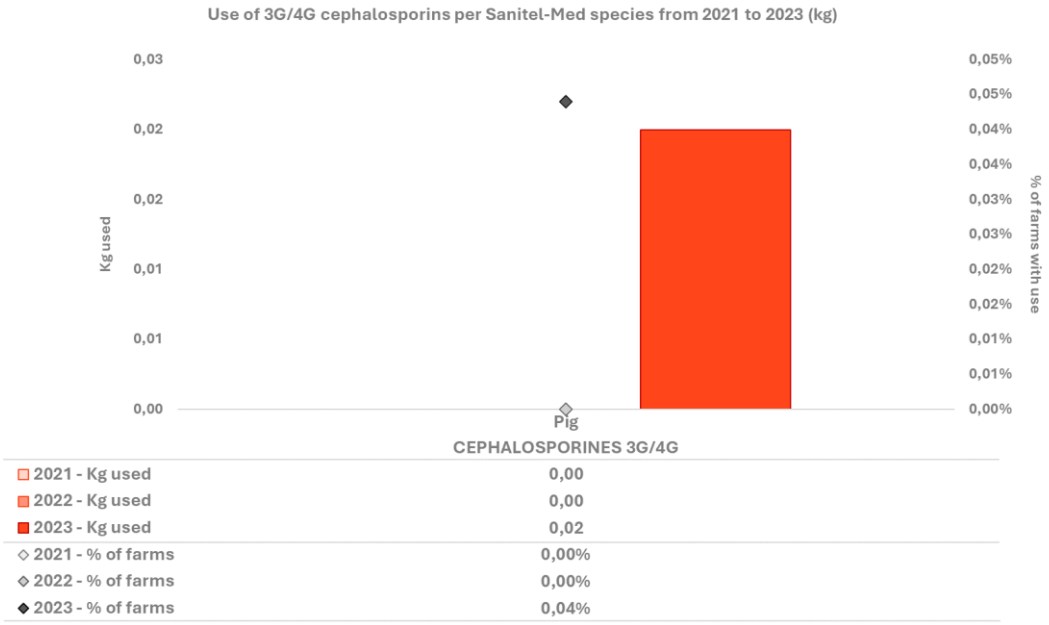


Figure 30. Kg used of the 3rd and 4th generation cephalosporins in pigs from 2021 to 2023, and the % of farms with notifications of use of these critical substances.

c) *Intramammary VMPs*

As noted, cephalosporins of the 3rd and 4th generation for intramammary application have an orange AMCRA colour code. ***Figure 31*** shows that the intramammary use of the molecules outweighs their systemic use, yet proportionally to the quinolones this group overall remains of minor importance.

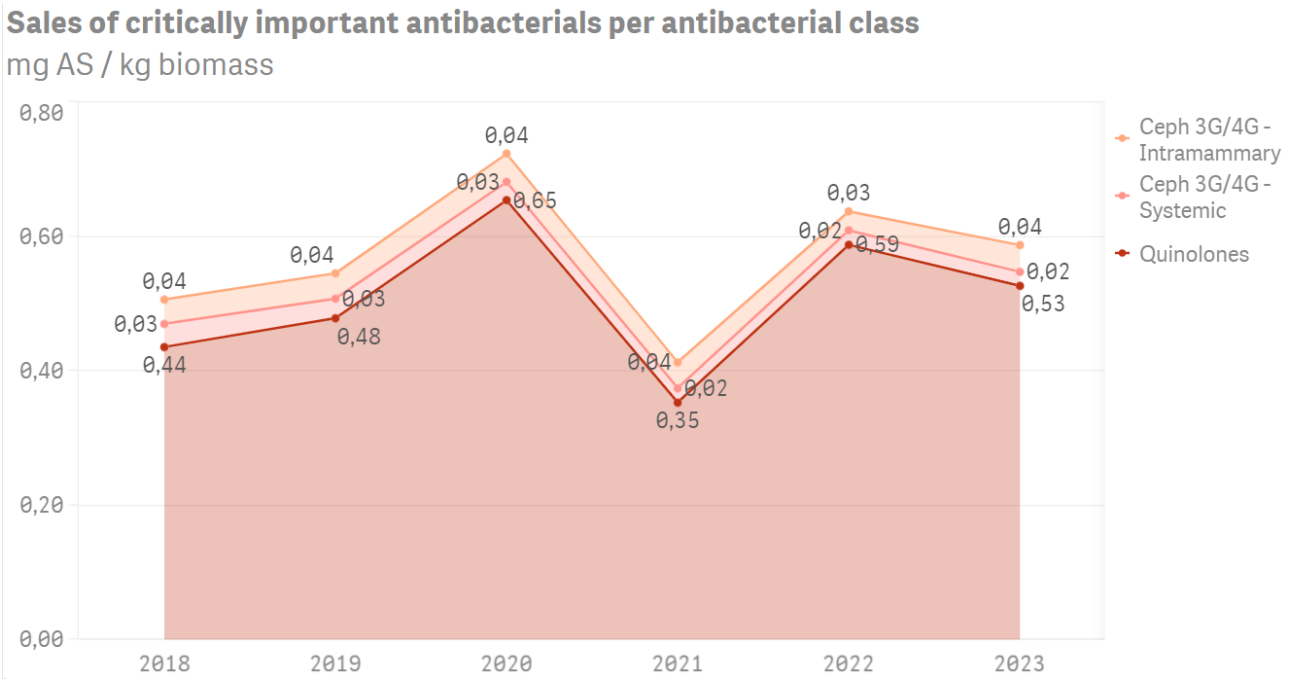


Figure 31. The evolution of sales of 3rd and 4th generation cephalosporins for intramammary and systemic application and the quinolones.

Use of colistin

Colistin was labelled a CIA with the highest priority for public health by the WHO but it retained its orange colour code in the AMCRA guidelines after making agreements with the stakeholders involved concerning its veterinary use. As noted from the evolution of the sales date over the years, this has led to success, and also the use data have shown over the past years that in pigs, the main species using colistin, the use has gradually decreased. Also in 2023 a lower used absolute amount was recorded (*Figure 32*). It remains to be seen whether the current level represents the 'necessary use' or whether further reductions in the future remain possible.

In poultry, use of colistin unfortunately increased again – almost exclusively in laying hens. Similar as for quinolones in broilers, the sector explains this as a result of necessary use due to disease problems. Here as well, the evolutions, reasons and remediations are closely watched and discussed among AMCRA and the sector. So far the government has not installed legal restrictions, and if there will be continued evidence of responsible use it might remain that way in the future.

Finally, in veal calves, use of colistin in 2023 diminished to almost zero.

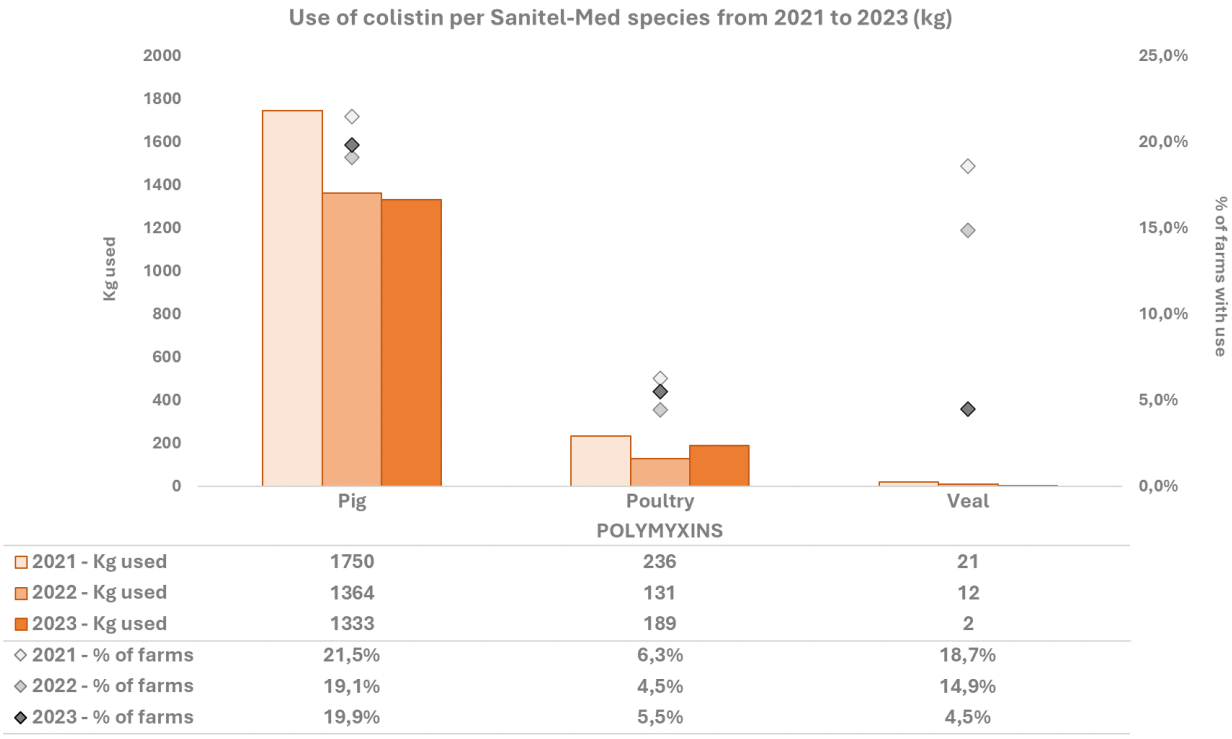


Figure 32. Kg used of polymyxins (colistin) in pigs, poultry and veal calves from 2021 to 2023, and the % of farms with notifications of use of colistin.

III.5 THE 2023 RESULTS IN LIGHT OF THE REDUCTION TARGETS

This BelVet-SAC report has the important function of informing the Belgian policy on antimicrobial sales and use in animals. This policy is constructed around reduction targets. The current targets, stemming from the AMCRA Vision 2024[18] and as such included in the covenant[19] between government and sectoral stakeholders as well as in the Belgian "One Health" National Action Plan on the fight against AMR 2020-2024[20], are set until the end of 2024.

In general, it must be noted that even though the national targets refer to 'use' of antibacterials, the indicator by which this is monitored in Belgium relies on the sales data, because the available use data in Belgium currently only cover the pigs, broilers, laying hens and veal calves, whereas the sales data cover all animal species.

There are four targets at national level:

1. A maximal antibacterial use of 60 mg/PCU, corresponding to approx. 50 mg/kg biomass or a reduction of 65% compared to the reference year 2011, by the end of 2024.

   This stems from the goal to progress towards the European median antibacterial use by the end of 2024.

2. Reduce the use of colistin to a maximum of 1 mg/PCU by the end of 2024.
3. Achieve a reduction of at least 75% compared to 2011 in the use of feed medicated with antibacterials.
4. Yearly preserving the achieved reduction of 75% compared to 2011 in the use of CIAs (quinolones and cephalosporins of the 3rd and 4th generation).

A fifth target is situated at the species level: for food-producing animals there ought to be species-specific targets in the form of animal category specific target BD_{100}-threshold values and the goal of obtaining a maximum of 1% alarm users.

Below, the 2023 results are assessed in relation to these five targets.

Target 1: a maximum sales of antibacterials of 50 mg/kg biomass by the end of 2024

a) Evolution in antibacterial sales (mg/kg biomass) since the reference year 2011

Between 2022 and 2023 **a reduction of 21,7 %** in the total amount of antibacterials sold per kg biomass was achieved, continuing the descending trend that has generally characterised the results over the past 12 years. This leads to a cumulative reduction, compared to the reference year 2011, of **62,4 %** (***Figure 33***). Evidently, this is a very good result in the scope of the target: it suggests that the 65 % reduction by the end of 2024 is within reach.

[18] https://www.amcra.be/nl/visie-2024/
[19] https://www.amcra.be/swfiles/files/Convenant-AB-2021-2024_ondertekend.pdf
[20] https://www.health.belgium.be/sites/default/files/uploads/fields/fpshealth_theme_file/en-amr_one_health_national_plan_final_0.pdf

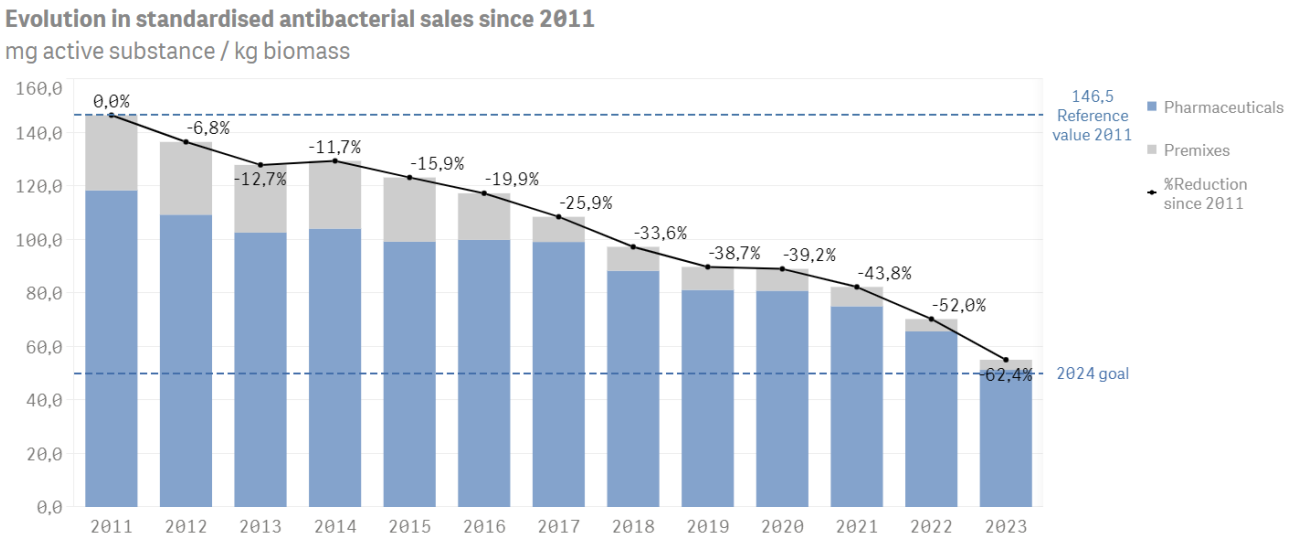


Figure 33. Year-to-year results of total antibacterial VMP sales (mg/kg biomass) with 2011 as a reference year.

b) Positioning of Belgium in comparison to the EU member states

The baseline of the first target for the national use level is the aim to achieve the median European antibacterial use. These data are available in the ESVAC reports: between 2009 and 2022 the EMA ran the European Surveillance of Veterinary Antibacterial Consumption (ESVAC) project that collected antibacterial **sales data** in EU Member States in a comparable manner, allowing to evaluate trends and to compare sales within and between countries. Voluntary participation in the ESVAC project increased from 9 to 31 reporting countries over the years. The data that were collected in Belgium and presented in the previous BelVet-SAC reports were also collected in the framework of this EU-wide ESVAC data-collection effort.

From January 2024, all EU EEA Member States must report their data via EMA's Antimicrobial Sales and Use Platform (ASU)[21] on the **volume of sales and use of antimicrobial medicinal products in animals**, in line with the Veterinary Medicinal Products Regulation[22].

In 2023, the 13th and final ESVAC report, presenting results on antibacterial usage in 31 EU/EEA countries up to the year 2022 was released[23]. In this report the antibacterial consumption in animals up to 2022 is presented in relation to the animal production in the country (PCU). The latter is comparable to the biomass used in the national mg/kg biomass indicators, but it also includes horses and rabbits and corrects more thoroughly for import and export.

Figure 34 presents the results of the 31 participating countries, illustrating that despite the positive results obtained over the past years, Belgium keeps residing at the tenth position. Indeed, most other countries have also taken action in the past years, leading to considerable decreases in the veterinary antibacterial consumption in these countries. This important realisation must be taken into account

[21] https://www.ema.europa.eu/en/veterinary-regulatory-overview/antimicrobial-resistance-veterinary-medicine/antimicrobial-sales-use-platform
[22] https://www.ema.europa.eu/en/veterinary-regulatory-overview/veterinary-medicinal-products-regulation
[23] https://www.ema.europa.eu/en/veterinary-regulatory-overview/antimicrobial-resistance-veterinary-medicine/european-surveillance-veterinary-antimicrobial-consumption-esvac-2009-2023

when interpreting the Belgian results: in a European context it is are not a unique performance, and in striving to achieve the middle of the 'peloton' we cannot afford to 'sit back and relax'.

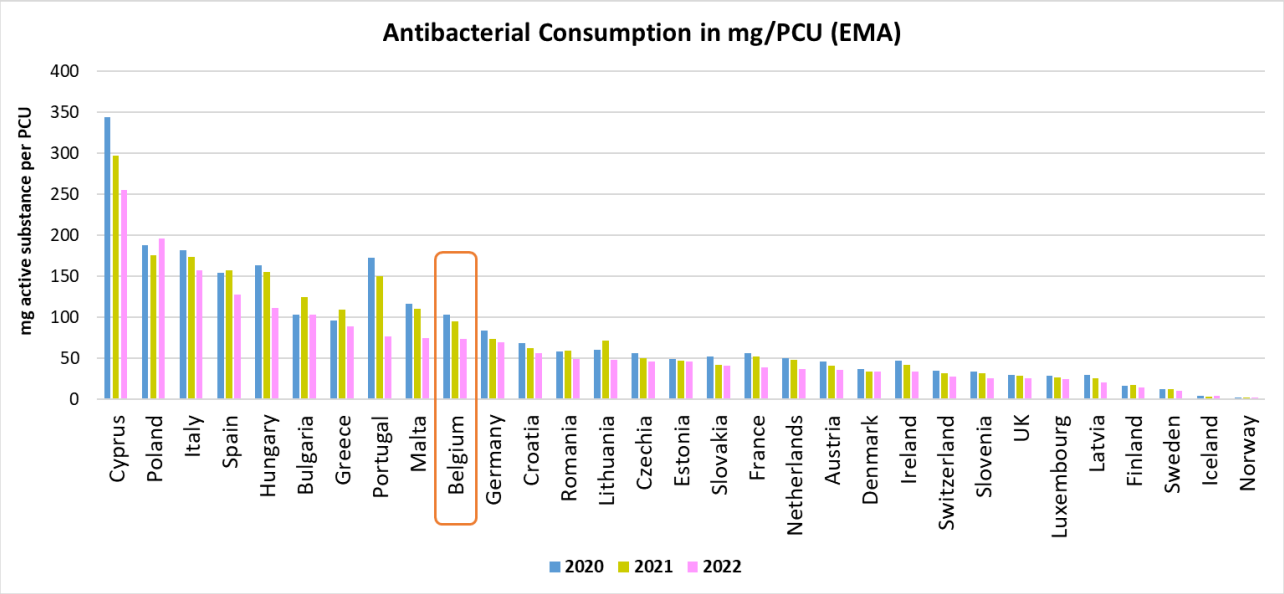


Figure 34. Overall sales of antibacterials for food-producing species, incl. horses and rabbits, in mg/PCU, per country in 2020-2022 (source: 13th ESVAC report on Sales of veterinary antibacterial substances).

Compared to countries with a comparable PCU composition as Belgium and a relatively comparable structure of livestock farming (Austria, Germany, the Netherlands, Spain), the use in Belgium is higher, except for the use in Spain (*Figure 35*).

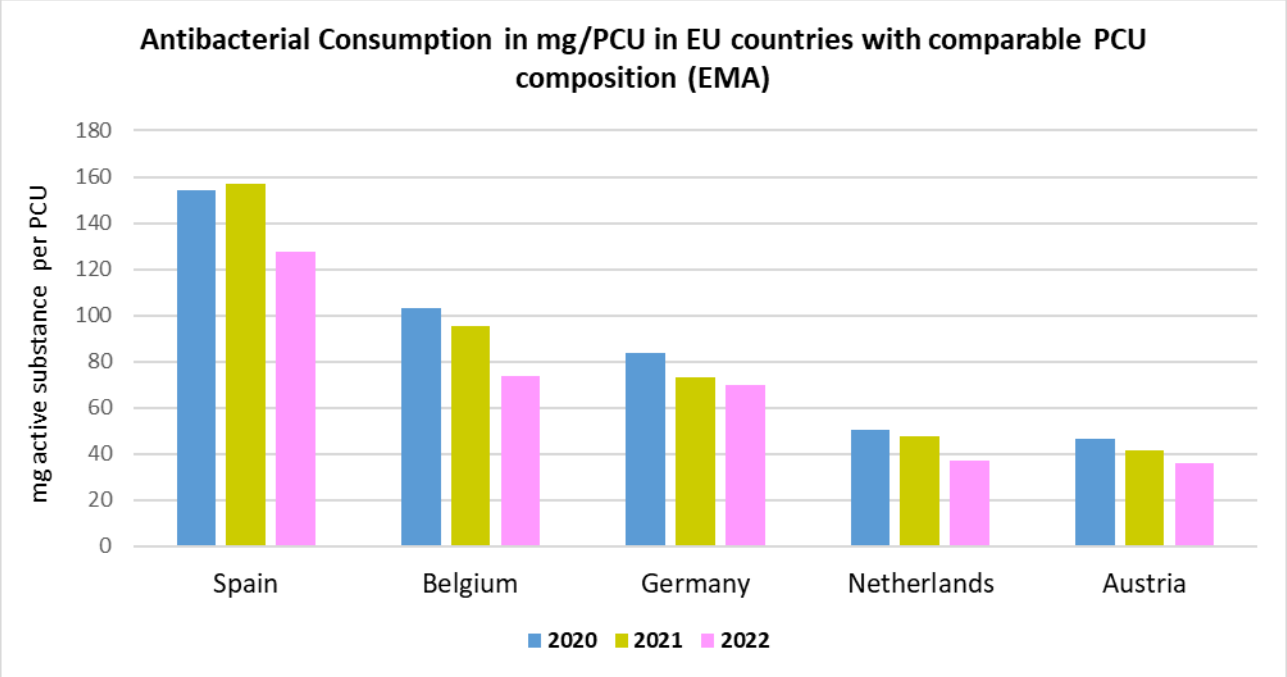


Figure 35. Overall sales of antibacterials in mg/PCU in 2020-2022 (source: 13th ESVAC report on Sales of veterinary antibacterial substances) for Belgium and countries with a comparable PCU composition.

Target 2: a maximum sales of colistin of 1 mg/kg biomass by the end of 2024

In Chapter III.2 it was already noted that polymyxin sales had increased from 0,57 mg/kg biomass in 2022 to 0,62 mg/kg biomass in 2023. This is still well within reach of the 2024 target. ***Figure 36*** presents the evolution in colistin sales (mg/kg biomass) since 2012, with the lower dotted line representing the 2024 goal of 1 mg/kg biomass (note that the target of 1 mg/PCU is loosely translated to a target of 1 mg/kg biomass, as achieving the latter will surely lead to achieving the former because the PCU denominator is typically bigger than the kg biomass denominator). Even though the target is still within reach, caution is warranted as to not let the situation worsen any further.

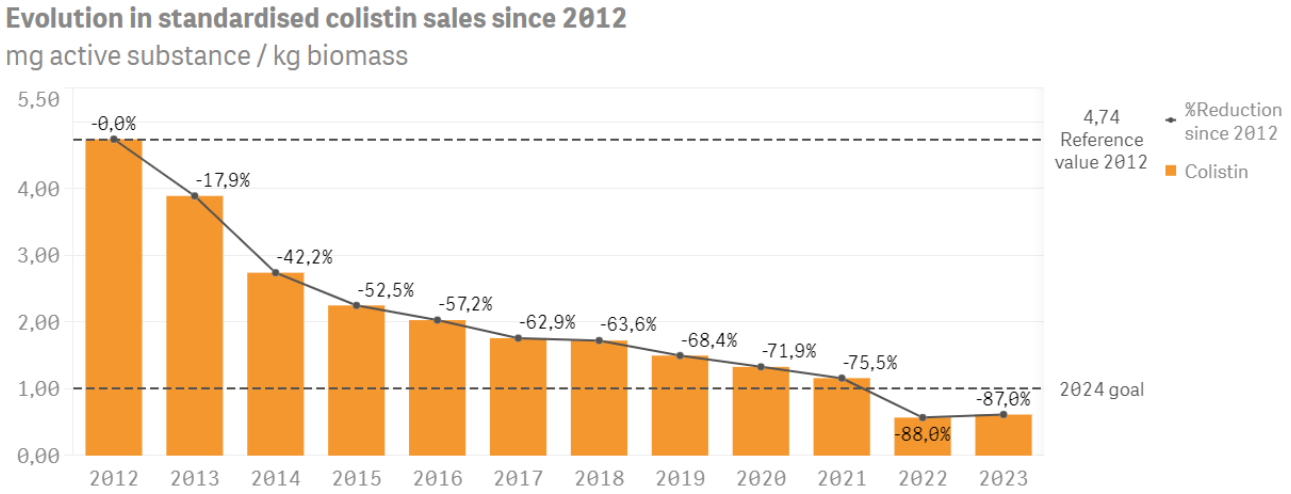


Figure 36. Evolution of colistin sales (mg/kg biomass) and current progress regarding the 2024 reduction target of 1 mg colistin/kg biomass.

Target 3: a 75 % reduction in sales of medicated feed containing antibacterials between 2011 and 2024

As mentioned in Chapter III.1, the sales of antibacterial premixes further reduced in 2023 with 18,6 %, resulting in a cumulative reduction of 86,6 % compared to the reference year 2011 (***Figure 37***). This means that our position relative to the target, which was already achieved in 2022, is further strengthened. This is a very nice achievement, thanks to the coordinated efforts of the sector of the MMF and the veterinarians. It is praiseworthy that the sector has set the target to completely fade out the production of antibacterial medicated feed by the end of 2027. However, it will need to be closely monitored to ensure this does not translate into an increase in pharmaceuticals.

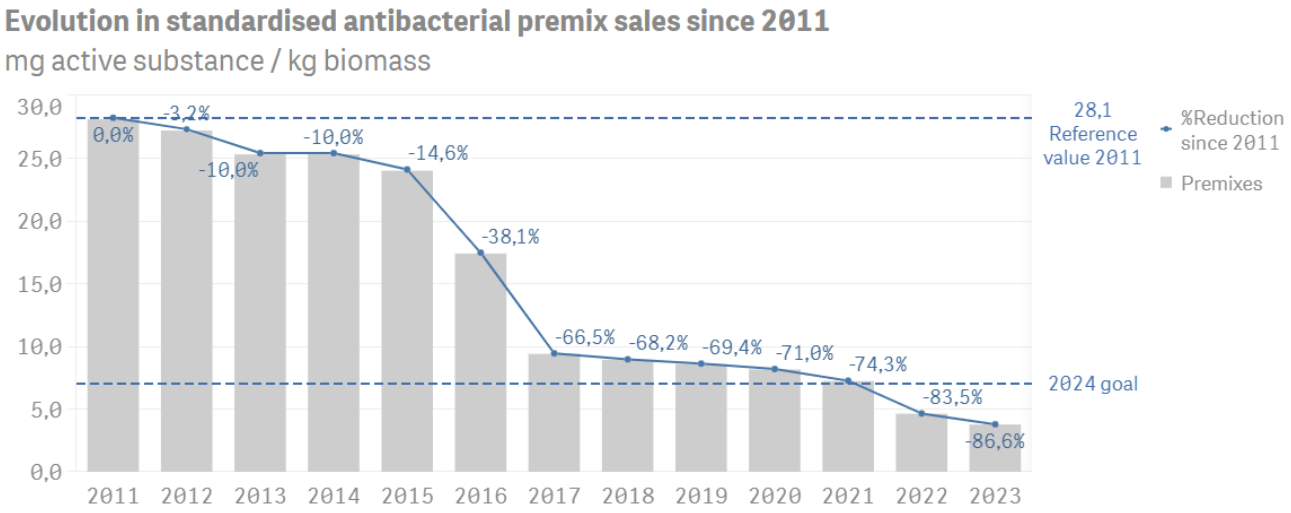


Figure 37. Evolution of medicated premix sales (mg/kg biomass) and current progress regarding the 2024 reduction target of 75 % reduction since the reference year 2011.

Target 4: maintain a minimum of 75 % reduction compared to 2011 of sales of CIAs

In Chapter III.2 it was already noted that sales of the CIAs (quinolones and cephalosporins of the 3rd and 4th generation – including those for intramammary application) had decreased in 2023, after an increase in 2022. ***Figure 38*** illustrates that this leads to 'flirting' with the -75 % reduction target. In 2022, it appears (retrospectively) that this target was crossed but fortunately in 2023 it was regained.

This should be a wake-up call for all stakeholders, and especially for the poultry sector, that sustained efforts are required in order to maintain the target, as well as to the government that they need to closely monitor the good practices in the field.

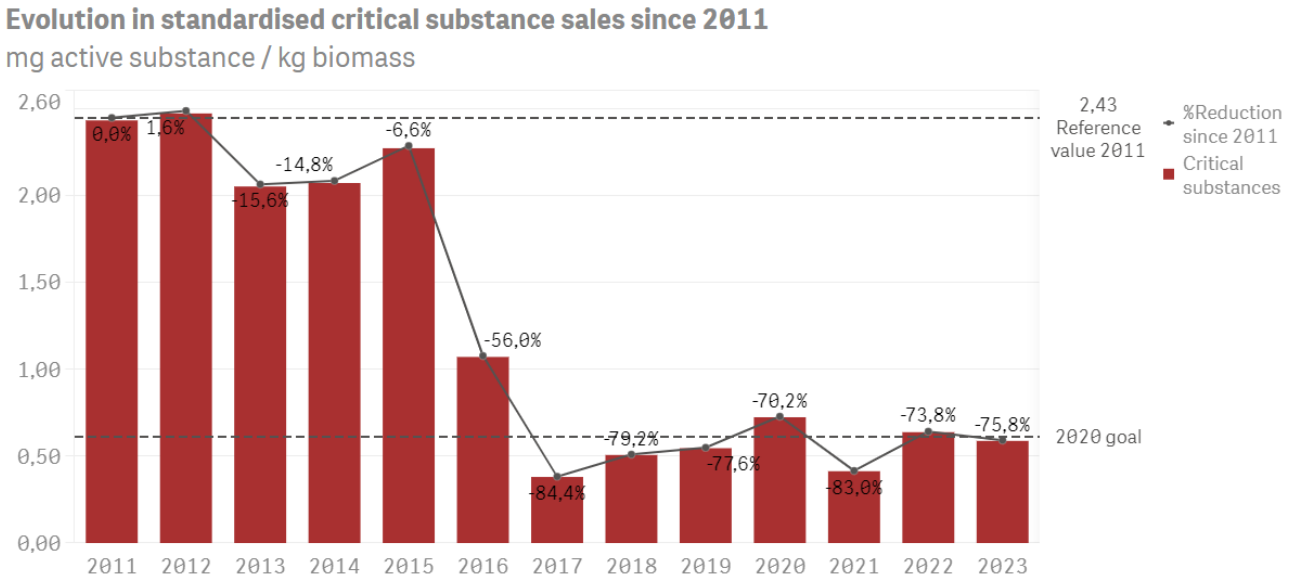


Figure 38. Evolution of the sales of CIAs (quinolones and cephalosporines of the 3rd and 4th generation) in mg/kg biomass since the reference year 2011.

Target 5: species-specific threshold values at farm-level and no more than 1% 'alarm users' by 2024

In 2020, benchmark threshold values (BD_{100}) were defined in close cooperation with the sectors for each animal category of pigs, for broilers and for veal calves, the three species for which at that time (and still today) reliable and long-term use data were available. These values made part of so-called 'reduction paths', with gradually decreasing thresholds over time (see ***Tables 15b-21b***). This means it was clear from the onset what the threshold values would be for low users (green zone), intermediate users (yellow zone), and high users (red zone) during the whole period between 2021 and end of 2024.

Additionally, the concept of 'alarm use' was introduced, representing farms that have been 'red' for two consecutive years (with the exception of farms that have reduced the past year with minimum 20% of the action value) or have been repeatedly 'red' in the last three years. As such, this group is a subset of the red zone and they receive a purple colour score.

Figure 39 summarises the percentage of farms, including zero-use farms, in each benchmarking colour zone, based on the farm-level use results for 2023 for the species involved, as well as for the pig categories separately. Pig farms with multiple pig categories receive a colour score based on their worst-scoring category.

Compared to 2022, the situation has improved for pigs (-1,3 % alarm users) and veal calves (-3,5 % alarm users) while remaining very good for broilers. Evidently, in addition to the actual use levels, the results are linked to the evolution in the threshold BD_{100}-values scoping the antibacterial use policy at farm level. The results for 2022 were assessed with the threshold values implemented on 1 January 2023, and in most categories, the threshold values have not changed since (except for the suckling piglets, where the action BD_{100}-value was decreased from 6 to 5, see ***Table 15b***).

For pigs, it appears that the goal of 1% alarm users is within reach, however, end of 2024 a new adjustment of the action value is foreseen, from 40 to 30. This will no doubt lead to more red and potential purple users, so the sector should not weaken its efforts to further reduce the use, especially in this category.

The most difficult task undoubtedly awaits the veal calf sector, where with the current action BD_{100}-value already approx. 10 % of farms are alarm users and end of 2024 a new reduction of the action value, from 11 to 9, is foreseen. This will require concerted efforts from all stakeholders, including the government, to keep the burden bearable and support the farmers and veterinarians in achieving the ambitious target.

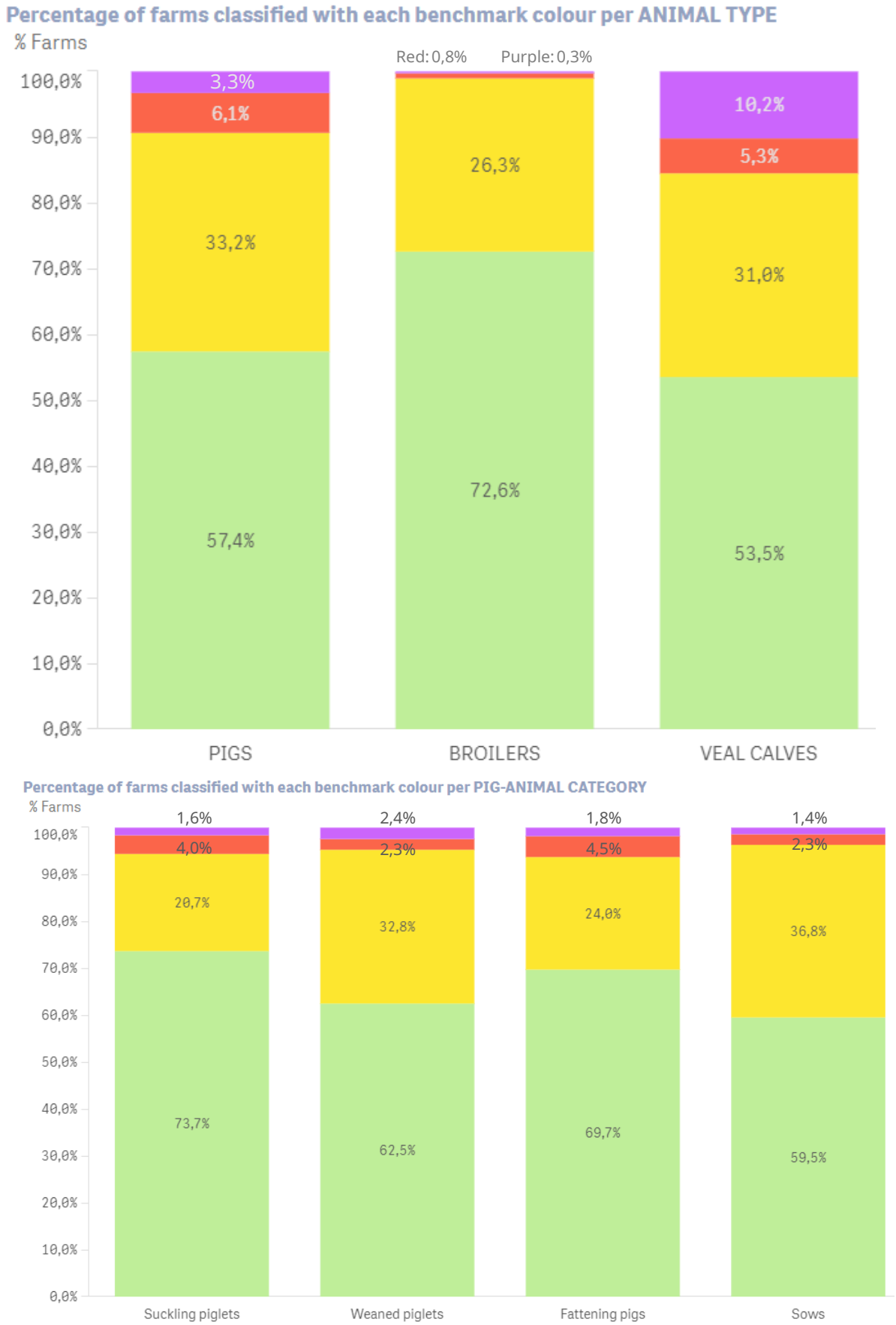


Figure 39. Distribution of the percentage of farms* in the different benchmarking colour zones for pigs, broilers and veal calves and separately for the pig categories.

** Including zero-use farms.*

IV. DISCUSSION

This annual BelVet-SAC report is now published for the 15th time and describes the sales and use of antibacterial VMPs in Belgium in 2023 and their evolution over the years. The increasing attention for AMR in a "One Health" context, threatening public and animal health, and the key role played by the use of antibacterials in the development and spread of AMR, make long-term, detailed data on the sales and use of antibacterials of utmost importance.

In Belgium, the BelVet-SAC report has become a cornerstone of the policy concerning the sales and use of antibacterials in animals, by informing the Government, sectors and other stakeholders, and by delivering the data that form the basis for the reduction targets. The year 2023 has been an unusual year, both promising and challenging. Promising, because the results of 2022 were exceptionally good and with the end of the current period for the reduction targets (2024) nearing, the results of 2023 were eagerly awaited. Furthermore, 2023 was the first full year that some changes at the legislative level, driven by EU regulation 2019/6, were expected to play into reality, as for example the data-collection for the whole poultry sector (parents and grandparents of chickens, and turkeys) and the whole bovine sector needed to launch. Yet, that legislation posed challenges as well, most importantly the need to switch the data source for the sales of antibacterial pharmaceuticals from the distributors to the MAHs, in order to capture a more complete picture of the sold quantities of VMPs.

1. Overall assessment of the sales and use of antibacterial VMPs in Belgium

In 2023, a total quantity of 103 tonnes active antibacterial substance was sold in Belgium, comprised of 95,9 tonnes of antibacterial pharmaceuticals and 7,1 tonnes of antibacterial premixes. Together with a considerable decrease of the animal biomass in Belgium in 2023 (-6,2 %), this led to a final result of **55,0 mg/kg biomass of sold antibacterial VMPs in Belgium in 2023**. This is a **reduction of 21,7 %** compared to the 70,3 mg/kg biomass of sold veterinary antibacterials in Belgium in 2022. The latter value is higher than what was reported in the BelVet-SAC report of 2022, due to the retrospective adjustment of the sales data source for 2022, as explained above. Nonetheless, it is a commendable continuation of the reducing trend observed over the past years.

Despite this undeniably good result, some words of caution are in order. The gap in 2023 between the sold amount of antibacterials, for all animals, and the amount used in only four animal types (pigs, broilers, laying hens and veal calves) was uncommonly low at a level of merely 17 tonnes. Provisional data from the bovines suggest it might be that this is the order of magnitude of the quantity used in bovines alone, hence, raising the question how the antibacterials used in all other animals (such as turkeys, goats and sheep, rabbits and companion animals) should fit in the comparison and, ultimately, suggesting that the sold quantity might be an underestimation. Yet, care must be taken with drawing conclusions based on a comparison of sales and use of a single year, as fluctuations might be at play, for example driven by stock forming. Still, it is possible that antibacterials for use in animals in Belgium are increasingly bought outside of Belgium. This may be perfectly legitimate, following the implementation of EU regulation 2019/6, but it evidently causes difficulties if the data-collection relies on monitoring domestic sales. The FAMHP, with the support from the European Commission, is currently developing the new VetAMRTool which should effectively solve these difficulties by mapping all incoming antibacterials in the 'Register IN' of the veterinary depot and the pharmacy. However, the

tool is only expected to be ready for use in a few years, which means that in the interpretation of the sales results for the coming years a certain level of uncertainty needs to be taken into account.

In this respect, it is more relevant than ever to rely on the use data to assess how the consumption of antibacterials in animals in Belgium is evolving. As noted, data for beef and dairy cows were not yet available for the full year, due to which it was decided to exclude these data altogether from the analyses of 2023. For pigs, poultry (broilers and laying hens) and veal calves, data are now available for six full years. Since 2018, these sectors have all considerably decreased their use of antibacterials. The BD_{100}-species shows results of **-45,2 % for pigs, -40,4 % for poultry and -43,0 % for veal calves**. However, they also all showed a rather stabilising use in 2023 and overall these sectors currently find themselves at different positions in terms of their targets, prospects and achievements.

2. The antibacterial use in pigs

In absolute quantities, pigs have come the longest way since 2018, having reduced the use in this sector with over 50 tonnes (data not shown in this report). However, it is by far also the sector with the largest biomass, hence impact on the total, national results. Two age groups, the weaned piglets and the fattening pigs are of particular importance.

The fatteners are the single animal category that, over all animals kept or bred in Belgium, represents the highest biomass and hence has a huge impact on the national consumption results. In 2023 the median BD_{100} in this category remained stable (1,94) but a further reduction was obtained in the 'yellow' and 'red' benchmark colour zone. The number of alarm users also decreased to 1,8 % bringing the target of max. 1 % alarm users within reach. Still, the threshold BD_{100}-value above which farmers should take action to reduce their use is not set to change anymore until at least the end of 2024. That value now represents approx. a week of antibacterial use for all fattening pigs present on the farm, repeatedly or for a prolonged period of time. This is an untenably high threshold to maintain in the future. Furthermore, a majority of the used tonnes is now located in farms with a yellow colour score.

This is also true for the weaned piglets. They are the animal category with the highest antibacterial use, expressed in treatment days, over all animals kept or bred in Belgium, along with the broilers and the veal calves. Remarkably, it is also the category with the largest between-farm variation in the antibacterial use, i.e. with a fairly long tail towards higher users. These 'problem' farms should at least aim to follow the example of the majority of farms with weaned piglets where use is still present (sometimes even abundantly) but is nonetheless considerably lower. Antibacterial use in this category keeps decreasing, albeit in the 'yellow' and 'red' benchmark colour zone, as the median BD_{100}-value stabilised at 10,18. The driving factor is likely the impending reduction in the action-BD_{100}-value end of 2024 from 40 to 30. This will probably knock the target of obtaining max. 1 % alarm users a bit out of course, even though this % reduced to 2,4 % in 2023. So, the first concern should be to try to achieve the current targets. Nevertheless, it should be clear to all stakeholders that an action value of 30, representing antibacterial use for all weaned piglets during 30% of the time, is also untenable as a future action value, especially considering that action is only required when this occurs repeatedly or for a longer period.

A blind eye should not be turned to the fact that many efforts have already been made by veterinarians and farmers. All stakeholders should strengthen and bring into practice their commitment to achieve a continued reduction of antibacterial use, by providing incentives, tools and resources that will be

required to achieve further success, especially since the sector has a strong-rooted and effective quality scheme. Also the ambition of the MMF to reduce and eventually fade out the use of feed medicated with antibacterials is step in the good direction. The good economic prospects should be a further stimulant to show adequate ambition.

The first concern for the pig sector should be to reduce the number of farms with a yellow colour score, especially in the weaners and fatteners, as more than half of the current tonnes of antibacterials used is located in animal categories with a yellow benchmarking colour score. Such achievement will automatically lead to an overall further decrease in the antibacterial use in the farms, and will pave the way to achieve more sustainable threshold values. As the results of the past years dully illustrate, the threshold values have been fairly effective in achieving the laudable results so far.

3. The antibacterial use in poultry

Purely based on the %, the poultry sector, more specifically the broilers, has realised a nice reduction of its antibacterial use. However, this achievement was entirely condensed in the first year after starting the sector-specific reduction path, making it difficult to be fully enthusiastic about it. For two years now, it seems the sector has been contemplating 'on the spot', with notably over 90 % of farms demonstrating a BD_{100} already far below the action-BD_{100}-value (P90 = 7,7) that has yet to be formally implemented (10, currently at 12) and the target % of alarm users already being obtained. The sector admits that some enduring health issues are difficult to fix and so, similar to the situation in pigs and veal calves, it should be clear to all stakeholders involved that they should follow suit in supporting the sector where needed, be it in providing incentives, tools or knowledge, to take the necessary next steps. However, the sector itself should also demonstrate a sense of fairness and ambition, and realise this cannot be an endpoint in terms of acquiring an acceptable level of antibacterial use.

As in pigs, there is a huge amount of tonnes of antibacterials used in the farms with a yellow benchmark score, which should be the focus for the next years. In addition, a true working point for this sector is the continued fluctuation, to unacceptably high levels, of the use of quinolones. Even though it is true that the use of these substances is legally regulated, meaning that every use of quinolones should be due to the proven unavailability of other suitable substances, the very fact itself that use is needed due to resistance, should raise the alarm for the sector. It should be a motivation to deal with the root cause, preventing the need for using quinolones, rather than appearing at ease with the fact that one in six broiler farms regularly need to orally apply quinolones.

The antibacterial use in the laying hens might appear worrying, due to the apparent lack of a sustainably reducing trend and in contrast a fluctuating pattern over the past years. However, such a pattern might be consistent with a genuinely low and acceptable level of antibacterial use, as the sector suggests, where temporary disease issues lead to periods of higher and lower use. It is a fact that around two thirds of farms yearly do not use antibacterials, and this are not always the same farms. Furthermore, a steadily increasing trend is not observed. The main action point for this sector should therefore be to try to find sustainable alternatives for the use of colistin, which is making out the majority of antibacterials use in laying hens. Undeniably, it is a substance that is monitored more closely than many other, not least by the human sector, and it is in the interest of everyone to avoid overly negative attention due to remarkable use patterns.

4. The antibacterial use in veal calves

With the reduction path over halfway, 2023 ought to have been a key year to keep track of the targets for the veal calf sector. Yet, unfortunately, little progress was made, with several farms having an increased use and overall only a slight reduction achieved in 2023. The sector should be credited with focussing on and succeeding in reducing the use of quinolones and colistin in 2023. However, the stakes remain high: currently there are still around 15 % farms with high use and approx. 10 % farms with alarm use and at the end of 2024 the threshold values will be reduced a provisionally last time. With the use levels for 2023, this threatens to increase the number of red and alarm farms even further. It will be important for the sector and all other stakeholders to carefully investigate what is causing the current status-quo and to come up with solutions to tackle the remaining challenges. More than any other sector, the challenges for the antibacterial use in veal calves should be addressed cross-sectoral, as the dairy sector, which delivers the 'resources' for the industrial veal calf fattening, is responsible for the starting quality of the calves, for example in terms of colostrum-intake, age and general health condition. But also the government and the scientific world should come forward with concrete initiatives to support the major challenges awaiting the sector.

5. Antibacterial classes and administration routes

Trends from previous years continued in 2023: aminopenicillins, tetracyclines and the combination trimethoprim-sulfamide remained the most sold and used classes, especially for administration by oral route. The increase in sales of 3rd and 4th generation cephalosporins for intramammary use was notable. These have an orange colour code and weigh less heavily in terms of sold mass than the quinolones in the results of the CIAs, but it is a worrying result that must be closely monitored.

6. The results in light of the reduction targets

Between 2011 and 2023, the sales data show a decrease of 62,4 % mg/kg biomass. Evidently, this is a success and it brings the goal of achieving a 65 % mg/kg biomass reduction by 2024 close at hand. The slight uncertainty lingering around this result due to the suspicion some sales data (from foreign countries) might be missing, should bring a bit caution in cheering this result, however, it should also be a stimulant not to loosen the reins but instead continue the work.

The sales of feed medicated with antibacterial premixes also further decreased in 2023 with a staggering 18,6 % mg/kg biomass reaching -86,6 % mg/kg biomass since 2011. With that, the target of reducing 75 % mg/kg biomass by 2024 is even more firmly exceeded than was the case in 2022. These results are reassuring that the newly set target of completely phasing out the production of feed medicated with antibacterial premixes by 2027 is far from a distant dream. Whereas the reductions so far have not been translated into an increased use of pharmaceuticals, it will need to be closely monitored what the effect will be of these final steps.

The result for the CIAs, quinolones and cephalosporines of the 3rd and 4th generation, is less positive. Even though there was a decrease between 2022 and 2023, the result of 2023 is -75,8 % lower than 2011, a meagre 0,8 % more than the target of maintaining the 75 % reduction since 2020. Furthermore, the adjusted data of 2022 show that this 'red line' was crossed. This 'flirting' with the threshold shows that it is absolutely necessary to aim for more prevention of the diseases requiring use of the CIAs. Furthermore, there is a need for continued monitoring of the legislation on the conditions for the use of

CIAs, to ensure their use complies with the law. As the intramammary use of cephalosporines of the 3rd and 4th generation falls outside the RD of 21 July 2016, it is disappointing to note their application appears to have increased, especially considering this route of application is the main route for these molecules. Even without proper use data in place, this should be a working point for the bovine sector.

Sales of colistin in 2023 increased by 8,1 % compared to 2022. This is likely due to an increase in the use of colistin as an oral product via water in laying hens. Indeed, in pigs, the use of colistin still slightly decreased. The laying hen sector is called upon to take the necessary measures to sustainably address the risk factors and infections that require the need of using colistin. Despite the increase in 2023, total sales of colistin in 2023 were 0,62 mg/kg biomass, still meeting the target of reaching a maximum of 1 mg/kg biomass by the end of 2024.

V. OUTLOOK AND CONCLUSIONS

Clearly, the work is not yet done. With antibacterial use being such a complex and important issue, obtaining and maintaining an efficient monitoring is challenging yet imperative. This will remain for many years to come.

For the near future, the main challenges lie in controlling the sales data collection, in anticipation of the VetAMRTool that is being developed by the FAHMP, with the support from the European Commission, and in obtaining a streamlined collection and quality dataset of the antibacterial use in poultry (chickens and turkeys) and bovines. It was illustrated that even though the bulk of the antibacterial consumption in animals remains with pigs, broilers and veal calves, the number and composition of the 'actors' involved has dramatically changed in 2023, with bovine vets and farms by far outnumbering the three other sectors combined. It is important to realise that this has implications for the communication about and with the animal sectors. With increasing numbers and diversity come increasing challenges to reach everyone and keep everyone involved and in line with the requirements. This is all the more important considering that in the longer run, things will complicate even more when also owners (for food producing animals) and veterinarians of horses, sheep, goats, rabbits, companion animals, … will get involved. It will require dedication of time and resources to manage all this. Fortunately, as has been illustrated by the successes of the past years, when all stakeholders unite, good results can be obtained.

In conclusion, monitoring the sales and use of antibacterial VMPs remains of great importance.

Results for 2023 have been mixed, with an overall decrease in the sold amount of antibacterials but mixed results in the species-specific use.

Pigs, broilers, laying hens and veal calves, all have their own challenges and points of attention for the coming years, with a special mention of the need to focus on farms with a yellow benchmarking score.

Overall, united efforts of all stakeholders involved will be required to fulfil the absolutely necessary further reductions to obtain a healthy and sustainable level of antibacterial use to prevent further development and spread of AMR.

For bovines, the main challenge will be to come to a performant collection of the use data, which should finally allow to assess the situation in this major sector.

A main challenge for the FAMHP will lie in the timely development of the VetAMR-data-collection tool.

As 2024 is the year where the targets and policy for the coming period of 5 years are to be decided, the results of 2023 should be stimulating to keep up the good work, while the working points must be assuredly identified in order to provide the necessary resources to tackle them.

ACKNOWLEDGEMENTS

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ANNEX

ANNEX I

Antibacterial consumption (kg) per antibacterial substance

Table I.1. The evolution of sales in kg per antibacterial substance since 2018 (when relevant), grouped per antibacterial class, AMCRA colour code and administration route.

			Total kg anti-bacterials	Antibacterial pharmaceuticals (kg)					Antibacterial premixes (kg)
Class[1]	Antibacterial substance[1]	Year	Total	Sub-total	Oral	Injection	Intra-mammary	Other	Premix
Cephalosporins 1G/2G	Cefadroxil	2023	**54,0**	**54,0**	54,0	-	-	-	-
	Cefalexin	2018	**726,4**	**726,4**	619,9	-	106,6	-	-
		2019	**1.000,2**	**1.000,2**	658,2	157,8	184,1	-	-
		2020	**1.241,9**	**1.241,9**	689,0	397,9	155,0	-	-
		2021	**1.196,0**	**1.196,0**	697,2	372,3	126,6	-	-
		2022	**917,7**	**917,7**	515,2	306,8	95,7	-	-
		2023	**1.050,1**	**1.050,1**	712,8	302,9	34,4	-	-
	Cefalonium	2018	**9,3**	**9,3**	-	-	9,3	-	-
		2019	**8,7**	**8,7**	-	-	8,7	-	-
		2020	**10,8**	**10,8**	-	-	10,8	-	-
		2021	**8,9**	**8,9**	-	-	8,9	-	-
		2022	**8,0**	**8,0**	-	-	8,0	-	-
		2023	**9,6**	**9,6**	-	-	9,6	-	-
	Cefapirin	2018	**45,3**	**45,3**	-	-	31,5	13,7	-
		2019	**41,3**	**41,3**	-	-	28,1	13,2	-
		2020	**28,3**	**28,3**	-	-	15,8	12,6	-
		2021	**51,1**	**51,1**	-	-	39,3	11,8	-
		2022	**50,0**	**50,0**	-	-	39,6	10,4	-
		2023	**75,2**	**75,2**	-	-	63,8	11,3	-
	Cefazolin	2018	**7,3**	**7,3**	-	-	7,3	-	-
		2019	**3,2**	**3,2**	-	-	3,2	-	-
		2020	**7,7**	**7,7**	-	-	7,7	-	-
		2021	**8,5**	**8,5**	-	-	8,5	-	-
		2022	**8,4**	**8,4**	-	-	8,4	-	-
		2023	**4,3**	**4,3**	-	-	4,3	-	-
Other	Bacitracin	2018	**28,2**	**28,2**	28,2	-	-	-	-
		2019	**25,4**	**25,4**	25,4	-	-	-	-
		2020	**32,1**	**32,1**	32,1	-	-	-	-
		2021	**46,1**	**46,1**	46,1	-	-	-	-
		2022	**-2,5**	**-2,5**	-2,5	-	-	-	-
		2023	**15,9**	**15,9**	15,9	-	-	-	-
	Metronidazol	2018	**234,9**	**234,9**	234,9	-	-	-	-

			Total kg anti-bacterials	Antibacterial pharmaceuticals (kg)					Antibacterial premixes (kg)
Class[1]	Antibacterial substance[1]	Year	Total	Sub-total	Oral	Injection	Intra-mammary	Other	Premix
		2019	**264,4**	**264,4**	264,4	-	-	-	**-**
		2020	**231,0**	**231,0**	231,0	-	-	-	**-**
		2021	**318,9**	**318,9**	318,9	-	-	-	**-**
		2022	**302,1**	**302,1**	302,1	-	-	-	**-**
		2023	**379,7**	**379,7**	379,7	-	-	-	**-**
Penicillins	Benzyl-penicillin	2018	**9.332,3**	**9.332,3**	-	9.256,0	76,3	-	**-**
		2019	**6.939,8**	**6.939,8**	-	6.839,1	100,7	-	**-**
		2020	**7.020,4**	**7.020,4**	-	6.908,0	112,4	-	**-**
		2021	**7.448,2**	**7.448,2**	-	7.314,1	134,1	-	**-**
		2022	**8.437,4**	**8.437,4**	-	8.335,9	101,5	-	**-**
		2023	**6.152,1**	**6.152,1**	-	6.088,1	64,0	-	**-**
	Cloxacillin	2018	**215,1**	**215,1**	-	-	215,1	-	**-**
		2019	**158,1**	**158,1**	-	-	158,1	-	**-**
		2020	**138,8**	**138,8**	-	-	138,8	-	**-**
		2021	**132,1**	**132,1**	-	-	132,1	-	**-**
		2022	**156,9**	**156,9**	-	-	156,9	-	**-**
		2023	**134,3**	**134,3**	-	-	134,3	-	**-**
	Fenoxymethyl penicillin	2018	**1.078,4**	**1.078,4**	1.078,4	-	-	-	**-**
		2019	**1.424,4**	**1.424,4**	1.424,4	-	-	-	**-**
		2020	**1.512,4**	**1.512,4**	1.512,4	-	-	-	**-**
		2021	**520,7**	**520,7**	520,7	-	-	-	**-**
		2022	**1.827,6**	**1.827,6**	1.827,6	-	-	-	**-**
		2023	**902,9**	**902,9**	902,9	-	-	-	**-**
	Nafcillin	2018	**6,0**	**6,0**	-	-	6,0	-	**-**
		2019	**7,3**	**7,3**	-	-	7,3	-	**-**
		2020	**8,9**	**8,9**	-	-	8,9	-	**-**
		2021	**8,6**	**8,6**	-	-	8,6	-	**-**
		2022	**8,7**	**8,7**	-	-	8,7	-	**-**
		2023	**10,9**	**10,9**	-	-	10,9	-	**-**
Phenicols	Florfenicol	2018	**-**	**3.040,8**	460,2	2.579,9	-	0,7	**279,2**
		2019	**-**	**2.915,7**	642,6	2.272,4	-	0,7	**243,0**
		2020	**-**	**2.980,6**	768,9	2.210,9	-	0,8	**268,9**
		2021	**-**	**3.521,5**	1.102,2	2.418,1	-	1,2	**302,0**
		2022	**3.636,4**	**3.408,4**	1.133,6	2.273,1	-	1,7	**217,0**
		2023	**2.821,9**	**2.631,9**	839,4	1.791,0	-	1,6	**215,0**
	Thiamfenicol	2020	**3,1**	**3,1**	-	-	-	3,1	**-**
		2022	**1,2**	**1,2**	-	-	-	1,2	**-**
		2023	**1,5**	**1,5**	-	-	-	1,5	**-**
Pleuromutilins	Tiamulin	2018	**-**	**1.002,5**	993,0	9,5	-	-	**539,1**
		2019	**-**	**818,0**	806,2	11,8	-	-	**288,4**
		2020	**-**	**451,6**	441,7	9,9	-	-	**109,0**
		2021	**-**	**312,5**	304,7	7,8	-	-	**76,1**

			Total kg anti-bacterials	Antibacterial pharmaceuticals (kg)					Antibacterial premixes (kg)
Class[1]	Antibacterial substance[1]	Year	Total	Sub-total	Oral	Injection	Intra-mammary	Other	Premix
		2022	**316,8**	**295,8**	290,2	5,6	-	-	**19,4**
		2023	**247,5**	**207,0**	201,5	5,5	-	-	**27,5**
Sulfonamides and trimethoprim	Sulfachlor-pyridazine	2018	**921,4**	**921,4**	921,4	-	-	-	**-**
		2019	**402,1**	**402,1**	402,1	-	-	-	**-**
		2020	**679,7**	**679,7**	679,7	-	-	-	**-**
		2021	**188,5**	**188,5**	188,5	-	-	-	**-**
		2022	**459,4**	**459,4**	459,4	-	-	-	**-**
		2023	**301,2**	**301,2**	301,2	-	-	-	**-**
	Sulfadiazine	2018	**-**	**28.688,7**	27.023,4	1.665,3	-	-	**36,9**
		2019	**-**	**27.329,0**	25.277,9	2.051,2	-	-	**-**
		2020	**-**	**26.039,9**	25.950,6	89,3	-	-	**75,6**
		2021	**-**	**24.894,9**	24.800,9	94,0	-	-	**220,9**
		2022	**16.042,6**	**16.042,6**	15.946,3	96,3	-	-	**110,9**
		2023	**9.214,1**	**9.214,1**	9.112,8	101,3	-	-	**15,6**
	Sulfadi-methoxine	2018	**35,2**	**35,2**	35,2	-	-	-	**-**
		2019	**29,9**	**29,9**	29,9	-	-	-	**-**
		2020	**3,2**	**3,2**	3,2	-	-	-	**-**
		2021	**0,1**	**0,1**	0,1	-	-	-	**-**
		2023	**11,6**	**11,6**	11,6	-	-	-	**-**
	Sulfadoxine	2018	**1.238,4**	**1.238,4**	-	1.238,4	-	-	**-**
		2019	**816,4**	**816,4**	-	816,4	-	-	**-**
		2020	**935,8**	**935,8**	-	935,8	-	-	**-**
		2021	**1.104,8**	**1.104,8**	-	1.104,8	-	-	**-**
		2022	**1.404,3**	**1.404,3**	-	1.404,3	-	-	**-**
		2023	**1.208,5**	**1.208,5**	-	1.208,5	-	-	**-**
	Sulfa-methoxazol	2018	**792,6**	**792,6**	678,4	114,2	-	-	**-**
		2019	**1.222,8**	**1.222,8**	1.138,5	84,3	-	-	**-**
		2020	**1.141,6**	**1.141,6**	1.050,9	90,7	-	-	**-**
		2021	**2.379,7**	**2.379,7**	2.297,6	82,1	-	-	**-**
		2022	**2.285,9**	**2.285,9**	2.225,5	60,4	-	-	**-**
		2023	**624,6**	**624,6**	579,0	45,6	-	-	**-**
	Trimethoprim	2018	**-**	**6.369,7**	5.766,2	603,6	-	-	**7,4**
		2019	**-**	**5.977,7**	5.387,4	590,4	-	-	**-**
		2020	**-**	**5.781,2**	5.558,0	223,2	-	-	**15,1**
		2021	**-**	**5.727,1**	5.470,9	256,2	-	-	**44,2**
		2022	**4.057,5**	**4.057,5**	3.745,3	312,2	-	-	**22,2**
		2023	**2.285,6**	**2.285,6**	2.014,6	271,1	-	-	**3,1**
Amino-(glyco)sides	Apramycin	2018	**-**	**0,2**	0,2	-	-	-	**101,1**
		2019	**-**	**-**	-	-	-	-	**153,4**
		2020	**-**	**298,0**	298,0	-	-	-	**108,2**
		2021	**-**	**787,3**	787,3	-	-	-	**239,1**
		2022	**432,4**	**291,1**	291,1	-	-	-	**157,4**

			Total kg anti-bacterials	Antibacterial pharmaceuticals (kg)					Antibacterial premixes (kg)
Class[1]	Antibacterial substance[1]	Year	Total	Sub-total	Oral	Injection	Intra-mammary	Other	Premix
		2023	**563,6**	**454,9**	454,9	-	-	-	**123,2**
	Framycetin	2018	**17,2**	**17,2**	-	-	15,8	1,4	-
		2019	**24,3**	**24,3**	-	-	24,3	0,0	-
		2020	**26,4**	**26,4**	-	-	26,4	0,0	-
		2021	**33,2**	**33,2**	-	-	33,1	0,0	-
		2022	**23,9**	**23,9**	-	-	23,0	0,9	-
		2023	**10,4**	**10,4**	-	-	10,1	0,3	-
	Gentamicin	2018	**172,8**	**172,8**	-	170,4	-	2,4	-
		2019	**164,5**	**164,5**	-	161,7	-	2,9	-
		2020	**183,2**	**183,2**	-	180,3	-	2,9	-
		2021	**189,0**	**189,0**	-	186,4	-	2,6	-
		2022	**201,5**	**201,5**	-	198,9	-	2,6	-
		2023	**205,0**	**205,0**	-	191,4	-	13,6	-
	Kanamycin	2018	**53,2**	**53,2**	-	-	53,2	-	-
		2019	**102,0**	**102,0**	-	-	102,0	-	-
		2020	**83,8**	**83,8**	-	-	83,8	-	-
		2021	**67,1**	**67,1**	-	-	67,1	-	-
		2022	**48,1**	**48,1**	-	-	48,1	-	-
		2023	**11,3**	**11,3**	-	-	11,3	-	-
	Neomycin	2018	**44,9**	**44,9**	-	3,8	28,0	13,1	-
		2019	**30,5**	**30,5**	-	-	19,9	10,5	-
		2020	**22,9**	**22,9**	-	-	22,4	0,5	-
		2021	**32,6**	**32,6**	-	10,9	21,7	-	-
		2022	**206,2**	**206,2**	-	184,6	21,5	-	-
		2023	**190,0**	**190,0**	-	173,2	16,8	-	-
	Paromomycin	2018	**1.927,4**	**1.927,4**	1.739,2	188,2	-	-	-
		2019	**1.973,8**	**1.973,8**	1.813,3	160,5	-	-	-
		2020	**1.923,2**	**1.923,2**	1.912,4	10,8	-	-	-
		2021	**2.136,0**	**2.136,0**	2.136,0	-	-	-	-
		2022	**2.053,8**	**2.053,8**	2.053,8	-	-	-	-
		2023	**1.869,8**	**1.869,8**	1.869,8	-	-	-	-
	Spectinomycin	2018	-	**5.356,2**	3.993,7	1.362,5	-	-	**4,4**
		2019	-	**6.587,9**	5.322,8	1.265,1	-	-	**0,6**
		2020	-	**6.046,3**	4.625,8	1.420,4	-	-	**1,1**
		2021	-	**5.908,8**	4.610,7	1.298,1	-	-	-
		2022	**5.526,6**	**5.526,6**	4.298,6	1.228,0	-	-	-
		2023	**4.345,2**	**4.345,2**	3.250,1	1.095,1	-	-	-
	Streptomycin dihydro	2018	**6,0**	**6,0**	-	-	6,0	-	-
		2019	**21,7**	**21,7**	-	14,4	7,3	-	-
		2020	**13,7**	**13,7**	-	4,8	8,9	-	-
		2021	**13,9**	**13,9**	-	5,3	8,6	-	-
		2022	**8,7**	**8,7**	-	-	8,7	-	-
		2023	**10,9**	**10,9**	-	-	10,9	-	-

			Total kg anti-bacterials	Antibacterial pharmaceuticals (kg)					Antibacterial premixes (kg)
Class[1]	Antibacterial substance[1]	Year	Total	Sub-total	Oral	Injection	Intra-mammary	Other	Premix
Aminopenicillins	Amoxicillin	2018	-	**52.456,6**	49.052,3	3.404,3	-	-	**10.670,8**
		2019	-	**49.375,4**	45.868,2	3.507,1	-	-	**11.112,1**
		2020	-	**52.451,3**	48.949,9	3.501,4	-	-	**11.180,2**
		2021	-	**46.621,8**	43.094,1	3.527,7	-	-	**10.007,1**
		2022	**44.504,2**	**37.460,4**	35.525,8	1.934,6	-	-	**6.744,6**
		2023	**31.555,7**	**27.410,8**	24.385,7	3.025,1	-	-	**5.164,3**
	Ampicillin	2018	**356,0**	**356,0**	-	312,2	43,9	-	-
		2019	**311,7**	**311,7**	-	291,3	20,4	-	-
		2020	**262,4**	**262,4**	-	257,5	4,9	-	-
		2021	**213,1**	**213,1**	-	209,6	3,5	-	-
		2022	**231,2**	**231,2**	-	228,1	3,1	-	-
		2023	**172,0**	**172,0**	-	171,4	0,6	-	-
Aminopenicillins with BLI	Amoxicillin clavulanic acid	2018	**1.033,8**	**1.033,8**	932,5	101,2	0,1	-	-
		2019	**1.146,6**	**1.146,6**	1.053,4	84,2	8,9	-	-
		2020	**1.137,2**	**1.137,2**	1.090,6	37,7	8,9	-	-
		2021	**1.210,4**	**1.210,4**	1.110,5	88,9	11,0	-	-
		2022	**1.106,3**	**1.106,3**	1.081,4	9,9	15,0	-	-
		2023	**1.185,2**	**1.185,2**	1.096,1	78,4	10,7	-	-
Cephalosporins 3G/4G	Cefoperazon	2018	**5,4**	**5,4**	-	-	5,4	-	-
		2019	**4,2**	**4,2**	-	-	4,2	-	-
		2020	**3,6**	**3,6**	-	-	3,6	-	-
		2021	**3,5**	**3,5**	-	-	3,5	-	-
		2022	**3,1**	**3,1**	-	-	3,1	-	-
		2023	**2,7**	**2,7**	-	-	2,7	-	-
	Cefquinome	2018	**70,1**	**70,1**	-	-	70,1	-	-
		2019	**71,9**	**71,9**	-	-	71,9	-	-
		2020	**83,5**	**83,5**	-	-	83,5	-	-
		2021	**77,9**	**77,9**	-	-	77,9	-	-
		2022	**52,9**	**52,9**	-	-	52,9	-	-
		2023	**71,9**	**71,9**	-	-	71,9	-	-
Lincosamides	Clindamycin	2018	**135,8**	**135,8**	135,8	-	-	-	-
		2019	**136,3**	**136,3**	136,3	-	-	-	-
		2020	**149,5**	**149,5**	149,5	-	-	-	-
		2021	**147,0**	**147,0**	147,0	-	-	0,0	-
		2022	**142,6**	**142,6**	142,6	-	-	0,1	-
		2023	**143,7**	**143,7**	143,7	-	-	0,0	-
	Lincomycin	2018	-	**4.461,1**	3.661,9	790,3	8,9	-	**4,4**
		2019	-	**5.066,2**	4.326,5	730,5	9,3	-	**0,6**
		2020	-	**4.657,9**	3.833,0	813,4	11,5	-	**1,1**
		2021	-	**3.867,9**	3.098,6	758,5	10,8	-	-
		2022	**4.032,0**	**4.032,0**	3.312,1	704,2	15,7	-	-
		2023	**2.536,2**	**2.536,2**	1.910,8	620,8	4,6	-	-

			Total kg anti-bacterials	Antibacterial pharmaceuticals (kg)					Antibacterial premixes (kg)
Class[1]	Antibacterial substance[1]	Year	Total	Sub-total	Oral	Injection	Intra-mammary	Other	Premix
Macrolides	Gamithro-mycin	2018	**39,3**	**39,3**	-	39,3	-	-	-
		2019	**36,7**	**36,7**	-	36,7	-	-	-
		2020	**16,2**	**16,2**	-	16,2	-	-	-
		2021	**14,3**	**14,3**	-	14,3	-	-	-
		2022	**9,6**	**9,6**	-	9,6	-	-	-
		2023	**3,9**	**3,9**	-	3,9	-	-	-
	Spiramycin	2018	**158,8**	**158,8**	158,8	-	-	-	-
		2019	**185,8**	**185,8**	185,8	-	-	-	-
		2020	**164,5**	**164,5**	164,5	-	-	-	-
		2021	**169,6**	**169,6**	169,6	-	-	-	-
		2022	**162,7**	**162,7**	162,7	-	-	-	-
		2023	**112,3**	**112,3**	112,3	-	-	-	-
	Tildipirosin	2018	**49,2**	**49,2**	-	49,2	-	-	-
		2019	**47,2**	**47,2**	-	47,2	-	-	-
		2020	**37,3**	**37,3**	-	37,3	-	-	-
		2021	**20,6**	**20,6**	-	20,6	-	-	-
		2022	**27,3**	**27,3**	-	27,3	-	-	-
		2023	**20,4**	**20,4**	-	20,4	-	-	-
	Tilmicosin	2018	-	**2.122,5**	2.051,2	71,3	-	-	**676,0**
		2019	-	**2.372,8**	2.318,5	54,3	-	-	**546,0**
		2020	-	**2.669,0**	2.600,9	68,1	-	-	**561,1**
		2021	-	**1.905,7**	1.819,5	86,2	-	-	**468,0**
		2022	**2.505,1**	**2.429,1**	2.367,5	61,6	-	-	**112,0**
		2023	**2.817,6**	**2.661,6**	2.606,0	55,5	-	-	**184,0**
	Tulathromycin	2018	**128,1**	**128,1**	-	128,1	-	-	-
		2019	**119,5**	**119,5**	-	119,5	-	-	-
		2020	**113,7**	**113,7**	-	113,7	-	-	-
		2021	**146,0**	**146,0**	-	146,0	-	-	-
		2022	**102,7**	**102,7**	-	102,7	-	-	-
		2023	**122,7**	**122,7**	-	122,7	-	-	-
	Tylosin	2018	-	**9.040,3**	8.316,0	724,3	-	-	**140,9**
		2019	-	**7.674,8**	7.087,0	587,8	-	-	**133,8**
		2020	-	**9.664,3**	9.039,5	624,8	-	-	**85,7**
		2021	-	**11.078,0**	10.377,0	701,0	-	-	**175,0**
		2022	**9.690,3**	**9.670,3**	8.987,5	682,8	-	-	**110,0**
		2023	**10.227,5**	**10.217,5**	9.695,8	521,8	-	-	**55,0**
	Tylvalosin	2018	-	**46,2**	46,2	-	-	-	**14,4**
		2019	-	**37,5**	37,5	-	-	-	**1,7**
		2020	-	-	-	-	-	-	**3,3**
		2021	-	-	-	-	-	-	**6,8**
		2022	**14,0**	**14,0**	14,0	-	-	-	**0,9**
		2023	**40,3**	**40,3**	40,3	-	-	-	-

			Total kg anti-bacterials	Antibacterial pharmaceuticals (kg)					Antibacterial premixes (kg)
Class[1]	Antibacterial substance[1]	Year	Total	Sub-total	Oral	Injection	Intra-mammary	Other	Premix
Other	Fusidic acid	2018	**1,6**	**1,6**	-	-	-	1,6	-
		2019	**0,0**	**0,0**	-	-	-	0,0	-
		2020	**0,0**	**0,0**	-	-	-	0,0	-
		2021	**0,0**	**0,0**	-	-	-	0,0	-
		2022	**3,8**	**3,8**	-	-	-	3,8	-
		2023	**3,6**	**3,6**	-	-	-	3,6	-
	Rifaximin	2018	**21,3**	**21,3**	-	-	21,3	-	-
		2019	**22,3**	**22,3**	-	-	22,3	-	-
		2020	**22,6**	**22,6**	-	-	22,6	-	-
		2021	**21,2**	**21,2**	-	-	21,2	-	-
		2022	**21,9**	**21,9**	-	-	21,9	-	-
		2023	**23,2**	**23,2**	-	-	23,2	-	-
Polymyxins	Colistin	2018	-	**3.208,5**	3.169,3	39,2	-	-	**390,0**
		2019	-	**2.959,2**	2.925,7	33,5	-	-	**71,5**
		2020	-	**2.751,4**	2.718,1	33,3	-	-	**6,2**
		2021	-	**2.454,2**	2.425,3	28,9	-	-	-
		2022	**1.135,8**	**1.135,8**	1.103,4	32,4	-	-	-
		2023	**1.151,6**	**1.151,6**	1.126,9	24,7	-	-	-
	Polymyxin B	2018	**0,7**	**0,7**	-	-	-	0,7	-
		2019	**0,9**	**0,9**	-	-	-	0,9	-
		2020	**1,0**	**1,0**	-	-	-	1,0	-
		2021	**0,8**	**0,8**	-	-	-	0,8	-
		2022	**0,8**	**0,8**	-	-	-	0,8	-
		2023	**0,9**	**0,9**	-	-	-	0,9	-
Tetracyclines	Chlor-tetracycline	2018	**687,4**	**687,4**	132,9	-	-	554,5	-
		2019	**590,0**	**590,0**	76,0	-	-	514,0	-
		2020	**637,0**	**637,0**	133,8	-	-	503,2	-
		2021	**565,9**	**565,9**	87,9	-	-	478,0	-
		2022	**623,4**	**623,4**	67,0	-	-	556,5	-
		2023	**507,2**	**507,2**	104,1	-	-	403,1	-
	Doxycycline	2018	-	**34.545,1**	34.545,1	-	-	-	**5.772,4**
		2019	-	**26.124,4**	26.124,4	-	-	-	**4.815,0**
		2020	-	**23.487,3**	23.487,3	-	-	-	**4.508,5**
		2021	-	**22.957,7**	22.957,7	-	-	-	**3.750,0**
		2022	**16.699,4**	**15.234,4**	15.234,4	-	-	-	**1.737,5**
		2023	**11.207,0**	**10.114,5**	10.114,5	-	-	-	**1.265,0**
	Oxy-tetracycline	2018	-	**13.524,6**	8.419,5	5.037,5	-	67,6	**3,7**
		2019	-	**8.578,7**	4.865,5	3.652,5	-	60,7	-
		2020	-	**11.148,9**	6.315,2	4.768,9	-	64,8	-
		2021	-	**9.340,9**	5.268,0	4.015,5	-	57,4	-
		2022	**9.164,3**	**9.164,3**	5.419,2	3.690,1	-	55,0	-
		2023	**6.010,6**	**6.010,6**	3.969,6	1.981,1	-	59,8	-

			Total kg anti-bacterials	Antibacterial pharmaceuticals (kg)					Antibacterial premixes (kg)
Class[1]	Antibacterial substance[1]	Year	Total	Sub-total	Oral	Injection	Intra-mammary	Other	Premix
Cephalosporins 3G/4G	Cefovecin	2018	**9,1**	**9,1**	-	9,1	-	-	-
		2019	**9,4**	**9,4**	-	9,4	-	-	-
		2020	**9,8**	**9,8**	-	9,8	-	-	-
		2021	**9,0**	**9,0**	-	9,0	-	-	-
		2022	**8,5**	**8,5**	-	8,5	-	-	-
		2023	**7,2**	**7,2**	-	7,2	-	-	-
	Cefquinome	2018	**5,5**	**5,5**	-	5,5	-	-	-
		2019	**3,4**	**3,4**	-	3,4	-	-	-
		2020	**1,8**	**1,8**	-	1,8	-	-	-
		2021	**1,3**	**1,3**	-	1,3	-	-	-
		2022	**2,0**	**2,0**	-	2,0	-	-	-
		2023	**1,4**	**1,4**	-	1,4	-	-	-
	Ceftiofur	2018	**57,4**	**57,4**	-	57,4	-	-	-
		2019	**46,1**	**46,1**	-	46,1	-	-	-
		2020	**44,9**	**44,9**	-	44,9	-	-	-
		2021	**34,9**	**34,9**	-	34,9	-	-	-
		2022	**32,6**	**32,6**	-	32,6	-	-	-
		2023	**30,3**	**30,3**	-	30,3	-	-	-
Quinolones	Danofloxacin	2018	**8,4**	**8,4**	-	8,4	-	-	-
		2019	**6,5**	**6,5**	-	6,5	-	-	-
		2020	**7,3**	**7,3**	-	7,3	-	-	-
		2021	**5,8**	**5,8**	-	5,8	-	-	-
		2022	**6,5**	**6,5**	-	6,5	-	-	-
		2023	**3,2**	**3,2**	-	3,2	-	-	-
	Enrofloxacin	2018	**304,0**	**304,0**	245,6	58,4	-	-	-
		2019	**372,2**	**372,2**	326,2	46,0	-	-	-
		2020	**416,2**	**416,2**	360,7	55,5	-	-	-
		2021	**289,7**	**289,7**	244,7	45,1	-	-	-
		2022	**317,9**	**317,9**	260,2	57,7	-	-	-
		2023	**330,5**	**330,5**	285,8	44,7	-	-	-
	Flumequine	2018	**519,5**	**519,5**	519,5	-	-	-	-
		2019	**516,5**	**516,5**	516,5	-	-	-	-
		2020	**845,0**	**845,0**	845,0	-	-	-	-
		2021	**375,5**	**375,5**	375,5	-	-	-	-
		2022	**773,5**	**773,5**	773,5	-	-	-	-
		2023	**598,0**	**598,0**	598,0	-	-	-	-
	Marbofloxacin	2018	**72,7**	**72,7**	14,3	56,6	-	1,8	-
		2019	**67,6**	**67,6**	14,9	50,6	-	2,0	-
		2020	**82,1**	**82,1**	17,3	62,9	-	2,0	-
		2021	**70,9**	**70,9**	14,0	55,3	-	1,7	-
		2022	**69,3**	**69,3**	12,7	55,1	-	1,5	-
		2023	**49,6**	**49,6**	10,6	37,8	-	1,2	-

			Total kg anti-bacterials	Antibacterial pharmaceuticals (kg)					Antibacterial premixes (kg)
Class[1]	Antibacterial substance[1]	Year	Total	Sub-total	Oral	Injection	Intra-mammary	Other	Premix
	Orbifloxacin	2018	**2,9**	**2,9**	-	-	-	2,9	-
		2019	**3,2**	**3,2**	-	-	-	3,2	-
		2020	**3,9**	**3,9**	-	-	-	3,9	-
		2021	**3,3**	**3,3**	-	-	-	3,3	-
		2022	**3,3**	**3,3**	-	-	-	3,3	-
		2023	**3,2**	**3,2**	-	-	-	3,2	-
	Pradofloxacin	2018	**2,1**	**2,1**	2,1	-	-	-	-
		2019	**1,8**	**1,8**	1,8	-	-	-	-
		2020	**2,1**	**2,1**	2,1	-	-	-	-
		2021	**1,3**	**1,3**	1,3	-	-	-	-
		2022	**1,2**	**1,2**	1,2	-	-	-	-
		2023	**0,9**	**0,9**	0,9	-	-	-	-

[1] The colours reflect the AMCRA colour code of the active substances and associated classes.

[2] Cephalosporins of the 3rd and 4th generation are classified as orange when used intramammary, and as red when used systemically