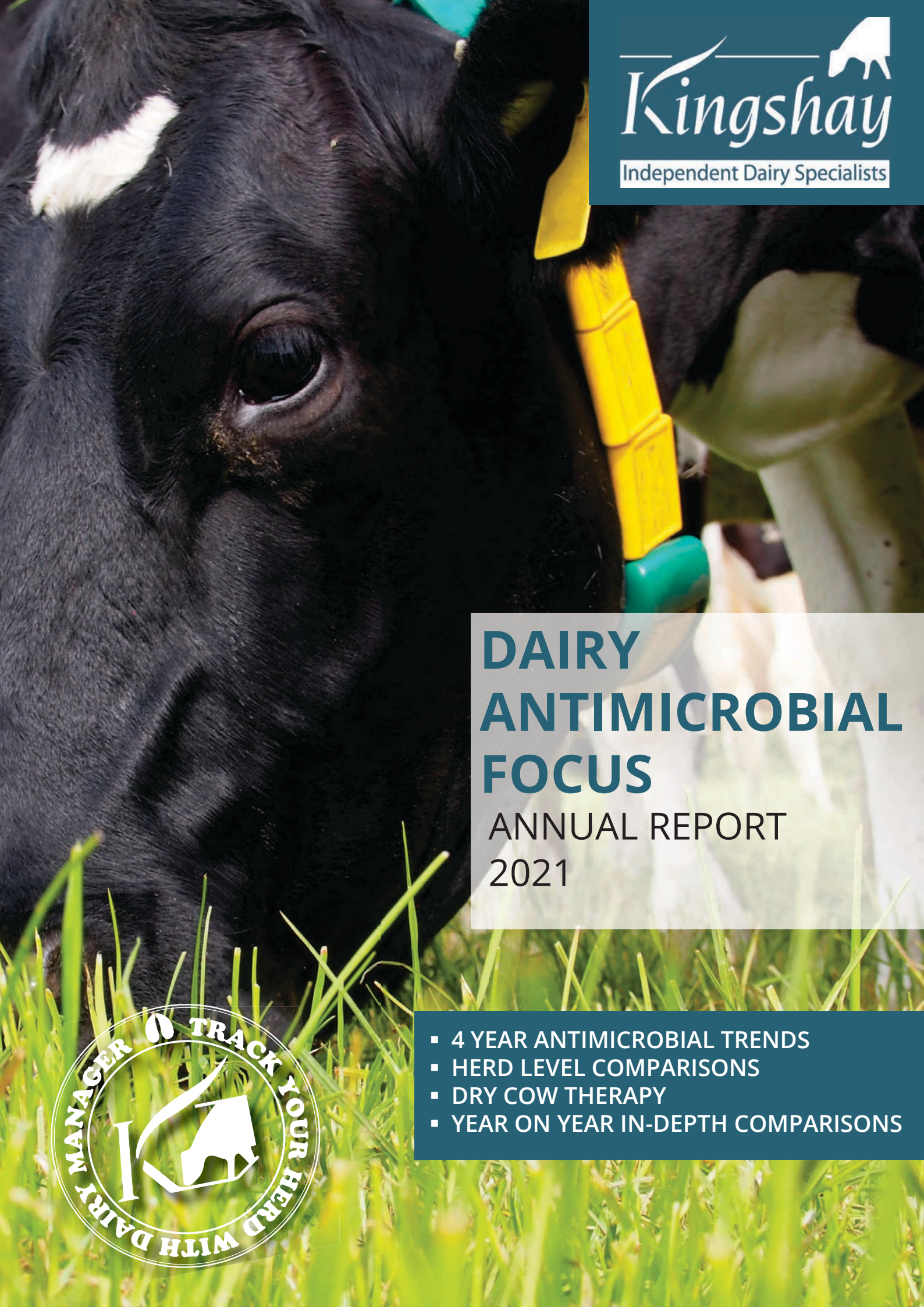


Kingshay

Independent Dairy Specialists

DAIRY ANTIMICROBIAL FOCUS

ANNUAL REPORT 2021

- 4 YEAR ANTIMICROBIAL TRENDS
- HERD LEVEL COMPARISONS
- DRY COW THERAPY
- YEAR ON YEAR IN-DEPTH COMPARISONS

TRACK YOUR HERD WITH DAIRY MANAGER

WELCOME

On behalf of the whole Kingshay team we would like to welcome you to the first annual Kingshay Dairy Antimicrobial Focus Report. This report summarises the antimicrobial purchasing trends from dairy herds across the UK providing valuable insight into how the sector is responding to the challenges presented by antimicrobial resistance and the need to preserve the effectiveness of the medicines we have available to us.

Responsible and reduced use of antimicrobials remains a key focus in livestock production and positive results published in November 2021, by the Veterinary Medicines Directorate, highlight the continued collaborative approach between vets and producers, as well as others working in the dairy sector.

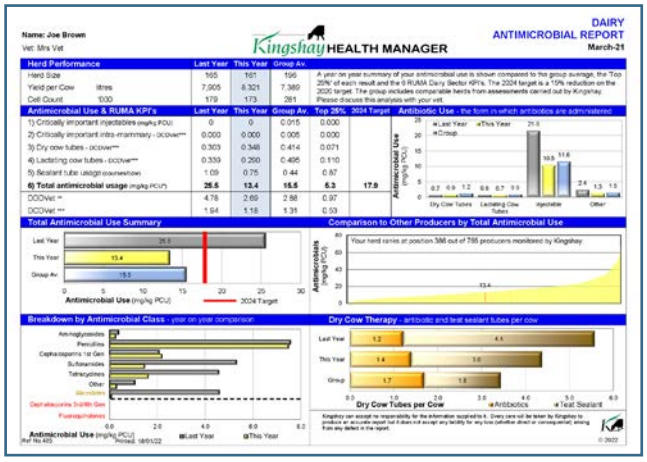
The Veterinary Antimicrobial Resistance and Sales Surveillance 2020 report showed that overall UK antibiotic sales for food-producing animals have reduced by 52%. In this, the first edition of the Kingshay Dairy Antimicrobial Focus Report we will look in more detail at the antimicrobial usage trends in the dairy UK sector. This report draws from 4 years of data from nearly 1,000 producers across the UK. The data has been collected as part of Kingshay's Antimicrobial Monitoring Service, which was developed in 2018 in response to a need from vets and producers for accurate, clear, and concise reporting of farm medicine usage.

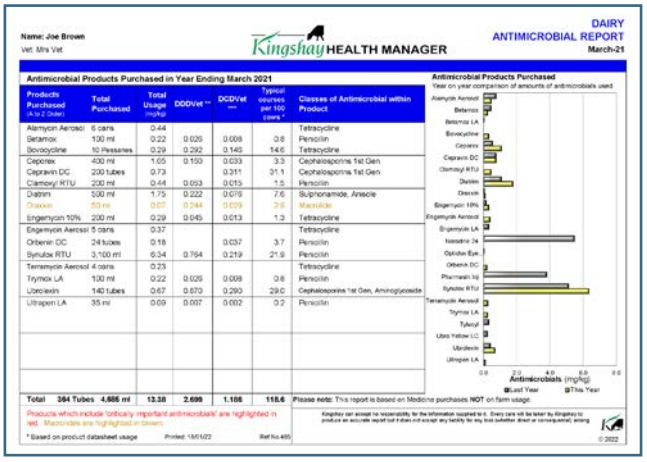
Enabling dairy farmers to easily meet the reporting requirements of farm assurance schemes and milk purchasers, the antimicrobial monitoring service provides individualised reports detailing all antimicrobial purchases. The reports provide detailed analysis of which products have been bought and in what volume and focus on key areas of antimicrobial usage such as dry cow therapy. Designed to provide clear, accurate and actionable insights the reports can be used as part of the annual medicines review with the farm's veterinary surgeon as they facilitate identification of areas of highest antimicrobial usage. Once the key areas of usage have been identified it is then possible to put in place management and disease control strategies to reduce the farm's antimicrobial usage.

Since its inception the service has developed to provide benchmarking with other producers and RUMA targets further facilitating on farm discussions which have brought about sustainable reductions in antimicrobial usage, as demonstrated by the figures in this report.

To find out more about our Antimicrobial Monitoring Service and Kingshay's other services, please call our team on 01458 851555, email dairy.manager@kingshay.co.uk or visit www.kingshay.com.

Report authors Christina Ford, Kathryn Rowland and Tim Potter





Example of Antimicrobial Monitoring Service Reports

CONTENTS

SUMMARY

The last few years have seen an impressive decline in the total antimicrobial usage, but how many herds have successfully reached the 2020 RUMA target?

Kingshay has been monitoring antimicrobial usage for the last 4 years, with over 550 herds continually being assessed every year for the last 3 years. This year there were 940 herds included in the analysis sample.

Analysis of the data showed that 79% of herds were below the RUMA (Responsible Use of Medicines in Agriculture Alliance) target of 21 mg/kg PCU for 2020, an increase of 45% from 2018.

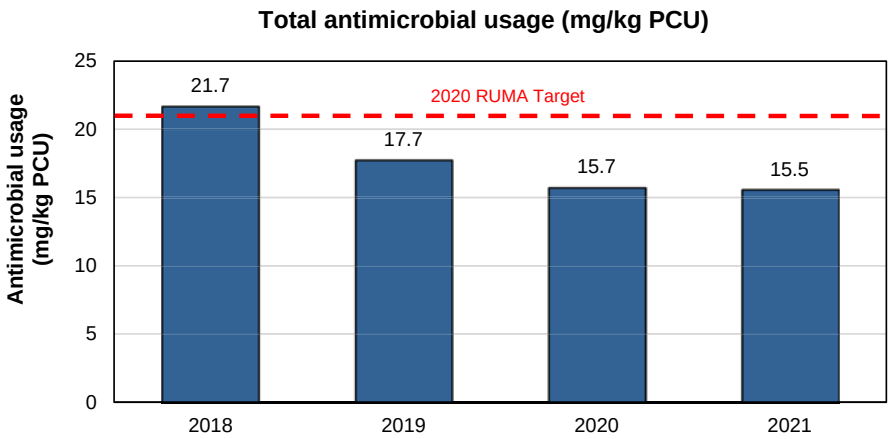


Figure 1 - Antimicrobial use trends over 4 years

However, the total antimicrobial usage was only one of six targets that RUMA set ***(see page 4)***. There has been a continuation of reduced usage across the targets, with the amount of critically important antimicrobials reducing from 1.1 mg/kg PCU in 2018 to 0.02 mg/kg PCU in 2021. Only 7% of herds used a critical antimicrobial in 2021 down from 79% in 2018, a huge reduction in these antimicrobials that need to be protected for human medicine.

One target that was not met was the teat sealant tube usage of 0.7 courses/cow ***(see page 4)***. This has decreased over the years from 0.61 courses/cow in 2018 to 0.39 courses/cow this year, as opposed to the increased usage that was intended.

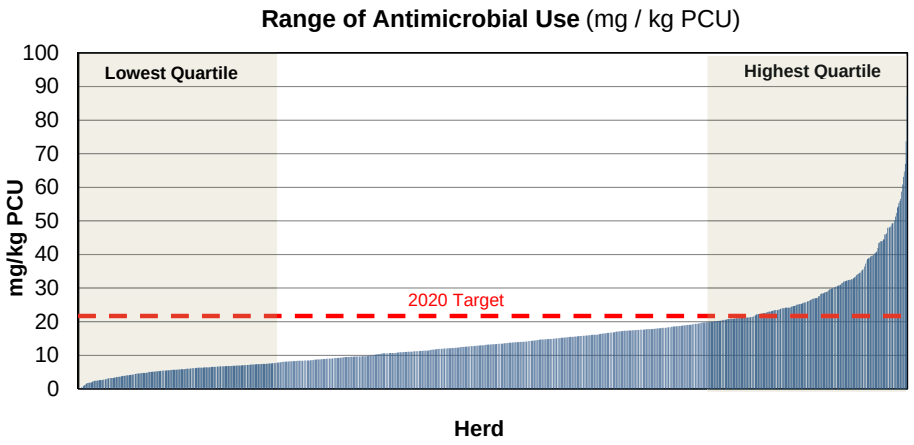


Figure 2 - Range of Antimicrobial use by individual herds

Across the UK there is a large range in total usage from 0.28 to 87.51 mg/kg PCU which has narrowed compared to last year where the range was 119.31 mg/kg PCU. Further analysis reveals it is not always the same herds in the highest quartile each year ***(see page 10)***.

Investigating further into the products used, Penicillin remains the most popular class of products with usage at 5.06 mg/kg PCU in 2020 reducing slightly to 5.01 mg/kg PCU in 2021 ***(see page 5)***.

Methodology Used

To ensure robust data, Kingshay obtained client sales data from the vet practice for each herd. Herd details including livestock numbers were gathered from the farmer. The report was then validated by both the vet and farmer to ensure its accuracy. Other enterprises (such as beef/sheep units) where antimicrobial sales were on the same account were removed (where known). Adjustments were made for products bought in bulk and not used in the time period.

Reporting the Results

The final report sent to both farmer and vet consists of an evaluation against the 6 RUMA Targets, summary of administration routes and antimicrobial class. Along with dry cow therapy and a detailed list of all products used and the amount, the report includes benchmarking with other herds, as well as comparisons to last year's results.

TRENDS OVER 4 YEARS

Since 2018 significant reductions in antimicrobial usage have been observed, with total antimicrobial usage dropping by 6.2 mg/kg PCU to 15.5 in the year ending March 2021.

RUMA Targets

The majority of the farms successfully reduced their usage to be below the 2020 RUMA target of 21mg/kg PCU. All 5 antimicrobial RUMA targets were achieved as highlighted in the ***Table 1***. The only target that fell short was teat sealant usage, which will be analysed in more detail on ***Page 8***.

Antimicrobial Use (March year end) compared to 6 RUMA Dairy Sector Targets	RUMA 2020 Targets	2021 Comparison to RUMA Targets	2018	2019	2020	2021
1) Critically important injectables (mg/kg PCU)	0.480	-96%	0.848	0.301	0.039	0.017
2) Critically important intra-mammary - DCDVet	0.166	-95%	0.188	0.075	0.009	0.008
3) Dry cow tubes - DCDVet	0.586	-20%	0.509	0.512	0.484	0.471
4) Lactating cow tubes - DCDVet	0.727	-32%	0.833	0.596	0.558	0.491
5) Sealant tube usage (courses/cow)	0.70	-45%	0.61	0.41	0.36	0.39
6) Total antimicrobial usage (mg/kg PCU)	**21.0**	**-26%**	**21.7**	**17.7**	**15.7**	**15.5**

Table 1 – Trends over 4 years compared to RUMA Dairy Sector Targets

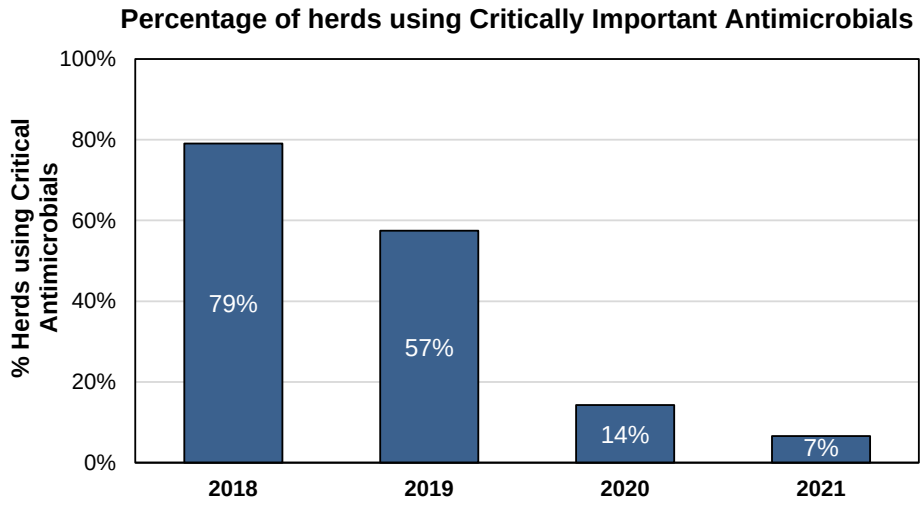
Mg/kg PCU (Population Corrected Unit) - Milligrams per kilogram PCU, a standardised unit of measurement developed by the European Medicines Agency to monitor antibiotic use and sales across Europe, which has also been adopted by the UK in its national reports. This enables comparisons between different species. Although it is an estimation it does enable year-on-year comparisons to be made and trends to be seen.

What is kg? - The standardised average weight in kilograms (kg) of all animals at time of treatment multiplied by average number of animals on the farm.

What is Mg? - The active ingredient weight in milligrams (mg) of all antibiotic products purchased by the farm.

Critically Important Antimicrobials

The biggest success was seen in the reduction of Highest Prority - critically important antimicrobials (HP-CIAs) where there was a 98% drop in usage from 2018 to 2021, with only 7% of herds using at least 1 HP-CIA, compared to 79% of herds in 2018. This is likely to be due to the increased awareness of these products and their importance in human health along with the change in the Red Tractor Standards in 2018, stating that; Highest Priority Critically Important Antibiotics must only be used as a last resort under veterinary direction.



Critically Important Antimicrobials consist of Cephalosporins 3rd/4th Gen and Fluroquinolones (products such as Marbox, Naxcel, Advocin 180 and Cephaguard DC).

Figure 3 - Percentage of herds using Critically Important Antimicrobials over 4 years

TRENDS OVER 4 YEARS

EMA Classification

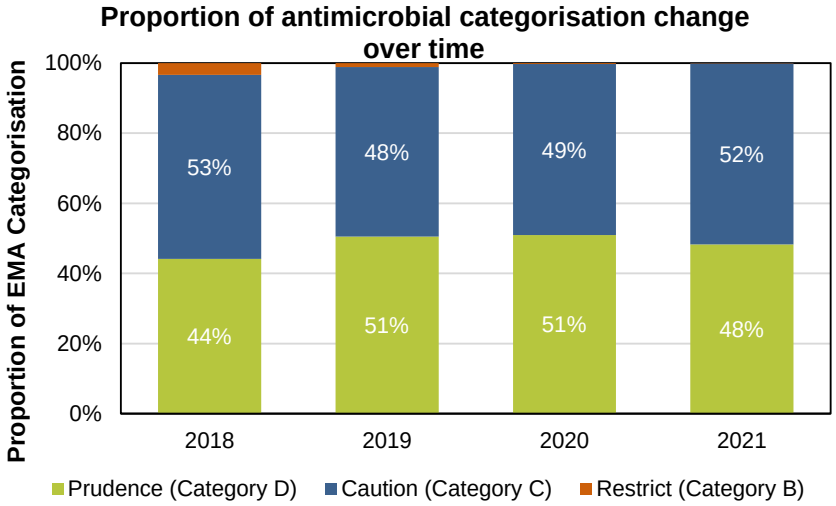


Figure 4 - Proportion of Antimicrobial use broken down by the EMA classification over the last 4 years (with a March year-end)

In 2019 the European Medicines Agency reviewed the classification of Antimicrobials into 4 categories -Avoid, Restrict, Caution and Prudence. ***(See Figure 5)*** for the EMA definitions for each category. None of the farms analysed used any products from the Avoid category. ***Figure 4*** highlights the change in proportion over the 4 years for the 3 remaining categories. Products in the Restrict category have reduced from 3.31% in 2018 to 0.11% in 2021. The reductions were significant when comparing 2018 to 2021 but when looking at the last year comparisons the reductions are very slight. This gives the impression that the easiest changes have been made by selecting alternative products but now comes the challenge to continue to reduce usage by improving herd health using prevention rather than cure.

AVOID (Category A)
- Antibiotics in this category are not authorised as veterinary medicines in the EU
- Should not be used in food-producing animals
- May be given to companion animals under exceptional circumstances

CAUTION (Category C)
- For antibiotics in this category there are alternatives in human medicine
- For some veterinary indications, there are no alternatives belonging to Category D
- Should be considered only when there are no antibiotics in Category D that could be clinically effective

RESTRICT (Category B)
- Antibiotics in this category are critically important in human medicine and use in animals should be restricted to mitigate the risk to public health
- Should be considered only when there are no antibiotics in Categories C or D that could be clinically effective
- Use should be based on antimicrobial susceptibility testing, wherever possible

PRUDENCE (Category D)
- Should be used as first line treatments, whenever possible
- As always, should be used prudently, only when medically needed

Figure 5 - EMA Definitions

Antimicrobial Class

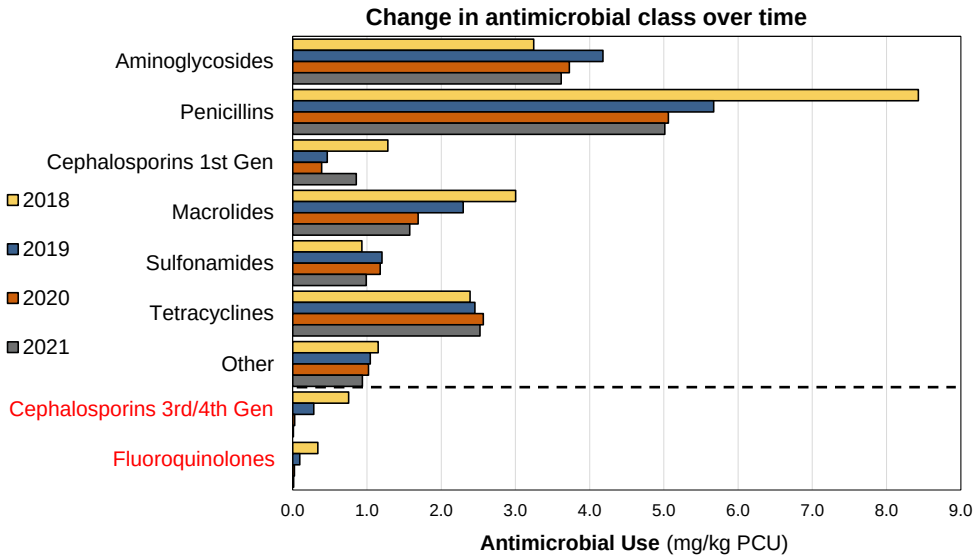


Figure 6 - Antimicrobial use over 4 years by Antimicrobial Class

When we split out the usage by antimicrobial class it is clear to see the products that are used the most, with Penicillins being the most frequently used products for all 4 years. However, the reduction between 2018 to 2019 does not go un-noticed, at 33%. Purchase volumes of tetracyclines and sulphonamides have remained comparatively consistent across the period, whilst purchases of HP-CIAs have dropped significantly. There has been a decrease in the purchases of macrolides (a drop of 48% compared to 2018 to 1.58 mg/kg PCU) probably due in part to varying approach of processors to the use of these products.

HERD LEVEL COMPARISONS

Although average antimicrobial use is reducing year on year, there is still a wide range of antimicrobial usage across UK dairy farms.

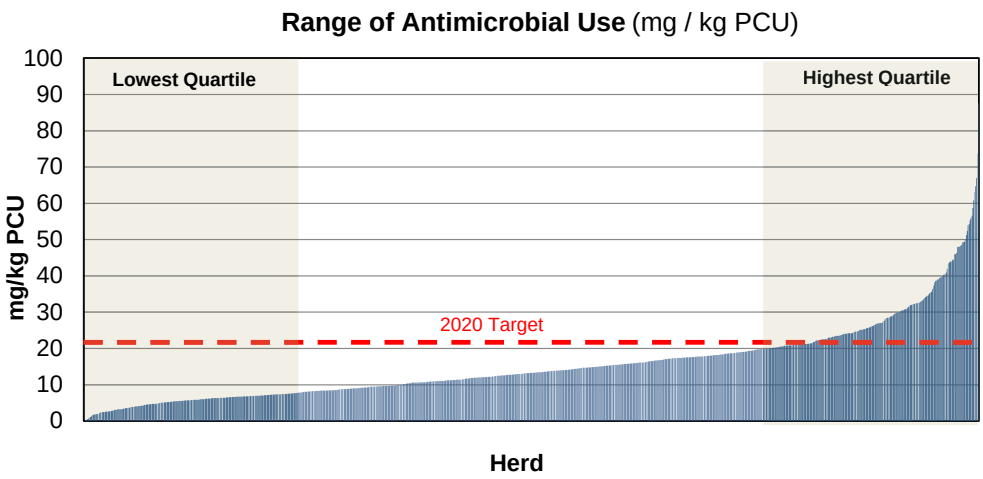


Figure 7 - Range of Total Antimicrobial use by individual herd (year ending March 2021)

When looking at the individual usage of the herds analysed, there is a significant range from 0.28 to 87.51mg/kg PCU in 2021, this has however reduced since last year where there was a range of 119.31mg/kg PCU. 746 out of the 940 herds in 2021 demonstrated total usage less than 21mg/kg PCU, the 2020 RUMA target. This is nearly 80% of all herds, up 4% on 2020. This continued reduction just proves the importance of monitoring and benchmarking for farmers and vets to understand what their usage means within the industry. If the highest 10% of herds reduced their usage by a third, the overall average would come down by 1.3mg/kg PCU to 14.2mg/kg PCU - a total reduction of 8%.

Herd Size & Milk Yield Correlations

Looking at the spread of those herds by both herd size and milk yield, there is no statistical correlation seen on antimicrobial usage as demonstrated in ***Figures 8 & 9***. Calving pattern, milking frequency, housing period and breed were analysed against total antimicrobial usage and there were no direct correlations to the different systems.

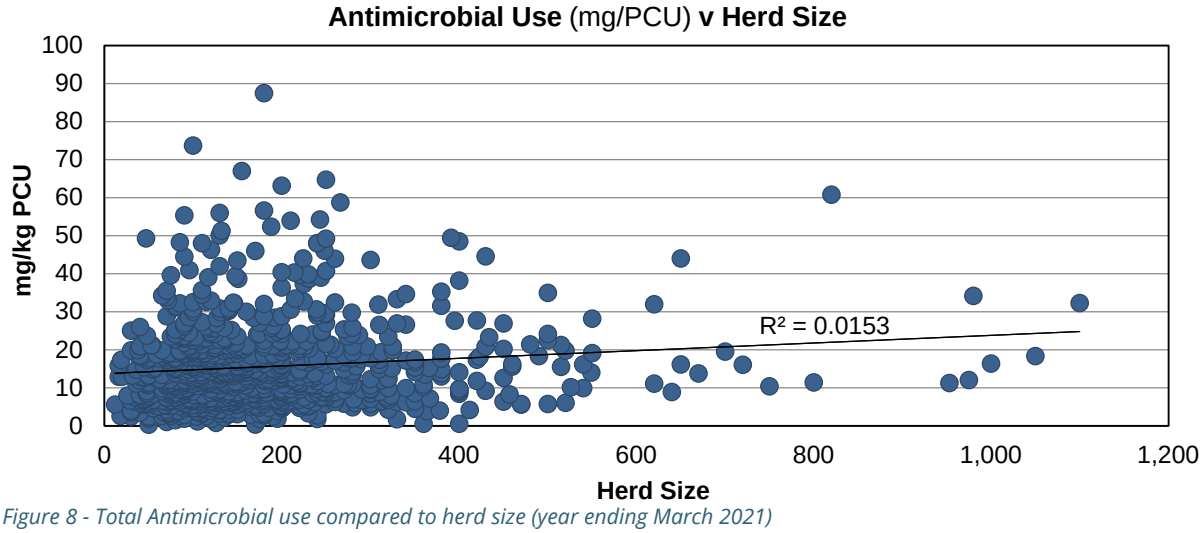


Figure 8 - Total Antimicrobial use compared to herd size (year ending March 2021)

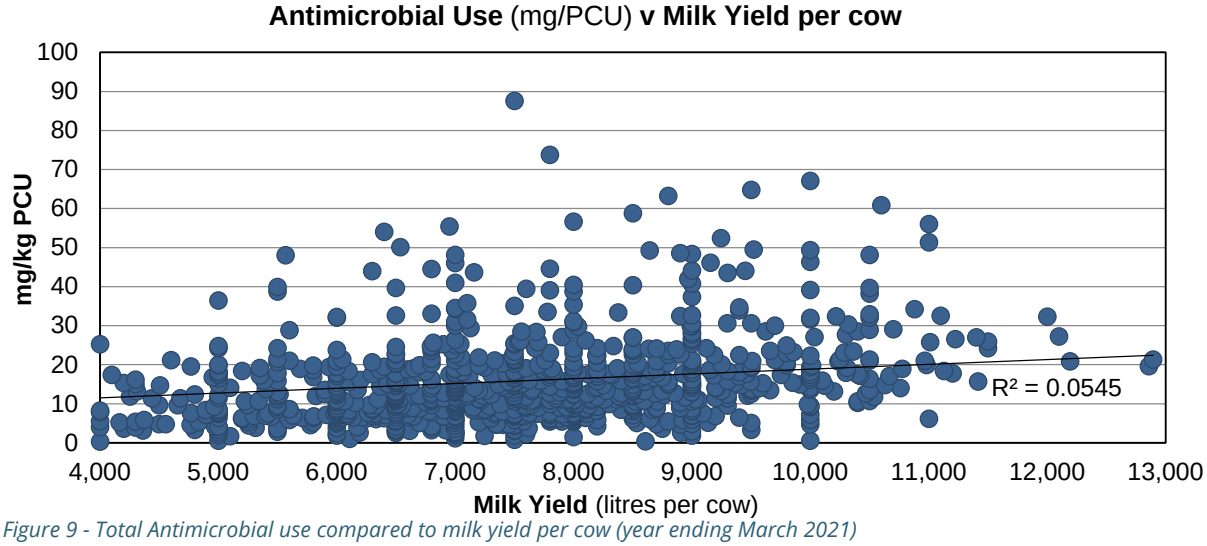


Figure 9 - Total Antimicrobial use compared to milk yield per cow (year ending March 2021)

Quartile Analysis

Breaking the herds down into quartiles ranked by total antimicrobial usage, you can see the trends as shown in ***Table 2***. HP-CIAs are consistently low across the quartiles, with surprisingly, the lowest quartile having the highest usage for critically important intra-mammary. However, this is still a very low usage. Dry cow tubes increase as the total antimicrobial usage increases.

Quartile analysis of Antimicrobial usage (mg/kg PCU)	Lowest 25% - Lowest quartile	Av. of 2nd 25%	Av. of 3rd 25%	Highest 25% - Highest quartile
1) Critically important injectables (mg/kg PCU)	0.008	0.014	0.030	0.016
2) Critically important intra-mammary DDDVet	0.017	0.002	0.009	0.004
3) Dry cow tubes DDDVet	0.380	0.427	0.503	0.557
4) Lactating cow tubes DDDVet	0.344	0.388	0.571	0.650
5) Sealant tube usage (courses/cow)	0.34	0.42	0.40	0.39
6) Total antimicrobial usage (mg/kg PCU)	**5.4**	**10.6**	**16.3**	**29.9**
DDDVet	1.44	2.12	3.25	4.40
DCDVet	0.76	1.07	1.49	1.88

Table 2 - Quartile analysis of antimicrobial usage (year ending March 2021)

DCD Vet (Defined Course Dose)
Average dose per treatment course, taking into account daily dose rate & course length.

DDD Vet (Defined Daily Dose)
Average number of standard courses per cow per year, taking into account dose rate and treatment duration.

DRY COW THERAPY

The use and benefits of selective dry cow therapy has been encouraged for many years. Since collecting records in 2018 there has not been further improvements and the use of teat sealants is lower than the 2020 RUMA target at 1.54 tubes per cow.

The overall trend has seen a drop in the number of tubes used per cow for teat sealants over the last 4 years from 2.45 tubes per cow in 2018 (when selective dry cow therapy was already widely promoted) to 1.44 tubes per cow in 2020.

Dry Cow Therapy		2018	2019	2020	2021
Antibiotics	tubes/cow	1.94	1.91	1.77	1.75
Teat Sealant	tubes/cow	2.45	1.66	1.44	1.54

Table 3 – Dry cow therapy (antibiotics vs teat sealants)

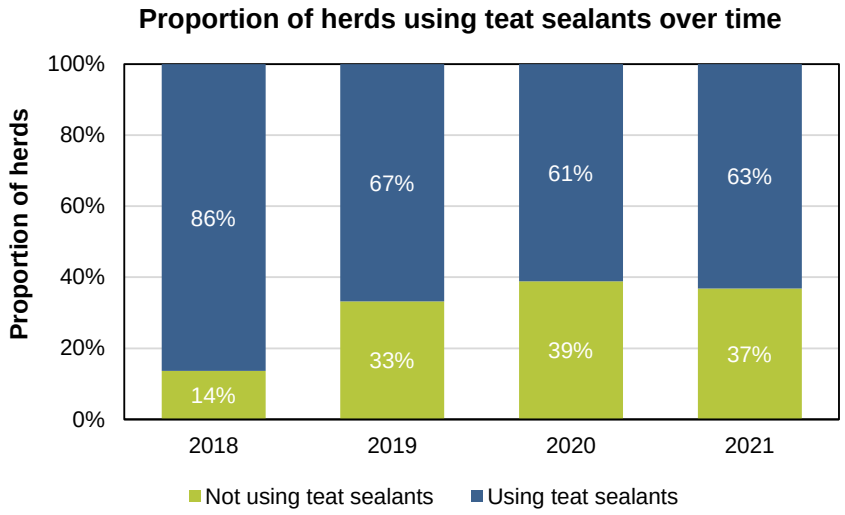


Figure 10 – Proportion of herds using teat sealants over time

The drop in number of tubes used may be due to the addition of herds supplying cheese contracts as these herds are often reluctant to use teat sealants due to concerns over black spots in cheese. ***Figure 10*** shows the proportion of herds using teat sealants and demonstrates the opportunity for increased uptake of these products as part of dry cow therapy. Veterinary surgeons need to work with their clients to implement protocols to enable the effective use of teat sealants if the RUMA targets are to be met.

Table 4 highlights the teat sealant products used for the year ending March 2021. Some herds may be using a combination of different tubes throughout the year, dependant on cost, efficacy and also product availability.

The most popular product was Ubroseal DC with 466 herds using this product.

Teat sealant product name	Number of herds using product (2021)	Number of tubes used (2021)
Cepralock DC	105	32,937
Noroseal DC	80	32,415
Ubroseal DC	466	219,159
Orbeseal DC	114	54,182

Table 4 -Teat sealant products used in 2021

SELECTIVE DRY COW THERAPY

Dry cow management is important, regardless of what treatment is applied at drying off, as the dry period is a high-risk period for acquiring new infections.

Selective dry cow therapy (SDCT) is one of the key steps to reducing antimicrobial usage on dairy farms and represents a move away from the blanket approach to dry cow treatment introduced in the 1950s by the Five-Point Mastitis Control Plan. Improvements in both milking hygiene and cow genetics along with the development of non-antibiotic teat sealants now provide an opportunity for many farms to reduce antibiotic use at drying-off by selectively targeting their use to only cows that have evidence of an udder infection.

SDCT may not be appropriate for all farms; herds with a bulk tank SCC over 200,000 or evidence of high rates of infection with Staph. Aureus or Strep agalactiae will need to focus on controlling these issues before looking to implement a policy of selective treatment. The implementation of SDCT requires accurate mastitis records along with repeated individual cow SCCs. Having this data will enable farms to work with their veterinary surgeon to select which cows to treat with antibiotics and to decide which animals can be treated with a teat sealant alone. Done properly and regularly reviewed as part of the health planning process SDCT can provide a more targeted approach to dry cow management and a more judicious use of antibiotics without compromising future cow health or performance.

CHANGES YEAR ON YEAR

Changes in Antimicrobial use show that it is not always the same producers that are in the Highest 25% year on year.

The ultimate aim of the targets is not to drive the dairy industry towards zero antibiotic use. We must acknowledge that antibiotics are an important tool to treat sick animals and to maintain animal welfare, but they are only part of the picture. They must be used alongside good husbandry, biosecurity and preventative measure, including vaccination, so that all agricultural sectors can reach a sustainable level of usage that ensures animal welfare is maintained but does not compromise the long-term effectiveness of these valuable products.

In the face of a disease outbreak antibiotics may be required for immediate management, but it is important to identify the cause of the disease and formulate a management plan to help reduce the risk of recurrence.

Figure 11 demonstrates the change in antimicrobial use from 2020 to 2021. Over 350 herds reduced their usage by an average of 6.05 mg/kg PCU. However, 332 herds increased their usage by an average of 5.64 mg/kg PCU. This increase may have been due to a shift in the products used to try and reduce the amount of critical and also moderately critical products. Last year saw issues with supply of certain products due to COVID-19, both in the UK and across the world.

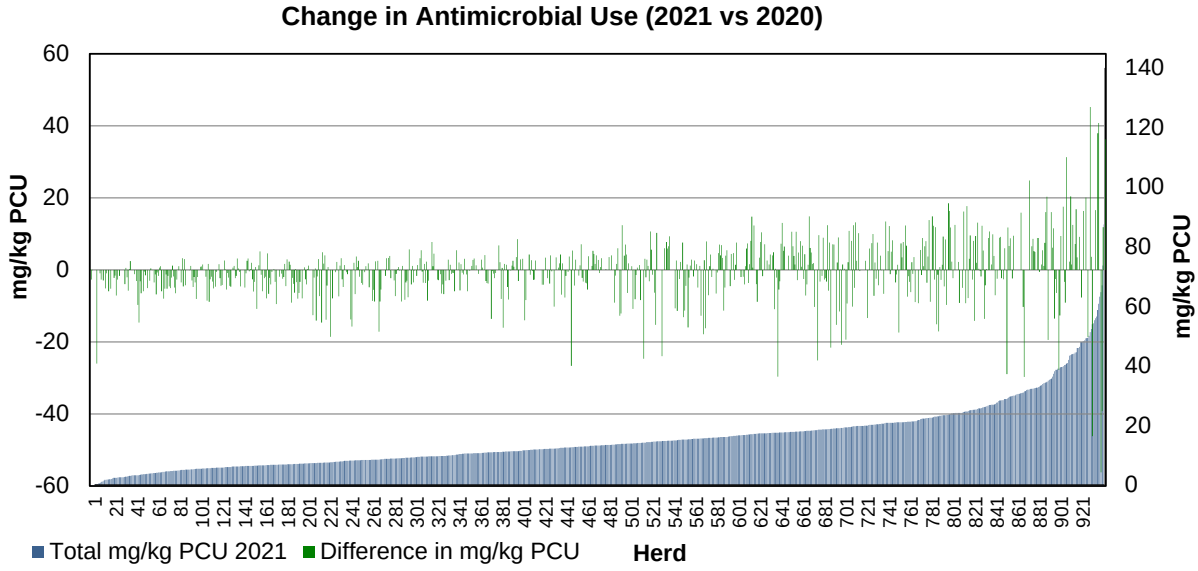


Figure 11 – Change in antimicrobial use (2021 vs 2020)

The highest 5% of herds with the highest antimicrobial usage saw significant rises in their usage, in some cases over 50% more than the previous year. With future years, any reductions will be influenced by product selection and course dose as well as attention to detail on cow and calf health with prevention rather than cure being key to any further reductions.

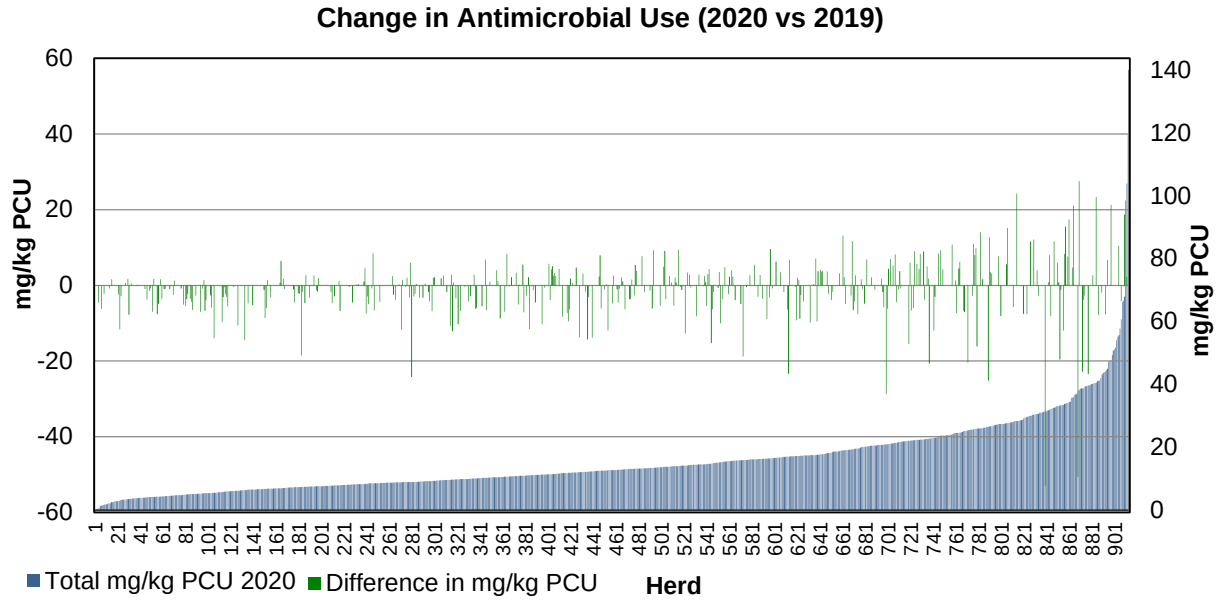


Figure 12 – Change in antimicrobial use (2020 vs 2019)

A similar trend was seen the previous year, with some herds making drastic changes to antimicrobial use. ***Figure 12*** demonstrates the change in antimicrobial use from 2019 to 2020. 233 herds reduced their usage by an average of 5.86 mg/kg PCU, though 169 herds increased their usage by an average of 5.01 mg/kg PCU.

GLOSSARY

Term	Definition
Antibiotic	A medicine used to prevent and treat bacterial infections specifically. This report is primarily focused on the use of antibiotics, as a subset of wider antimicrobials.
Antimicrobial	A product which kills or slows the spread of a range of microorganisms, including bacteria, viruses, protozoans, and fungi. Antibiotics are antimicrobials.
Critically Important Antimicrobial (CIA)	Identified by European Medicines Agency as being of most importance in human medicine (category B).
DCDVet (Defined Course Dose)	Average dose per treatment course, taking into account daily dose rate & course length.
DDDVet (Defined Daily Dose)	Average number of standard courses per cow per year, taking into account dose rate and treatment duration.
EMA	European Medicines Agency.
mg/kg PCU (Population Corrected Unit)	Milligrams per kilogram PCU, the unit of measurement developed by the European Medicines Agency to monitor antibiotic use and sales across Europe, which has also been adopted by the UK in its national reports. Uses average weight at time of treatment (calculated as average weight over whole lifetime). Calculation assumes all beef animals are for slaughter.
RUMA (Responsible Use of Medicines in Agriculture Alliance)	Is a unique, independent non-profit group involving organisations that represent all stages of the food chain from 'farm to fork'. RUMA aims to produce a co-ordinated and integrated approach to best practice in animal medicine use. It has an established communications network with government departments and many non-governmental organisations.

ANTIMICROBIAL PROJECT TEAM

KATHRYN ROWLAND

Senior Farm Services Manager

Kathryn joined in 2002 and now manages the Dairy Manager service. A key part of her role is analysing key performance data and writing technical articles for publication. She also runs the Profit Manager service and business management training workshops.

CHRISTINA FORD

Product Owner

Christina manages the Antimicrobial reporting service alongside other corporate projects and joined Kingshay in 2019 to further develop the services we provide. She is also involved with data analysis and industry trends.

SIMON WITHERS

Business Development Manager

Simon joined Kingshay in October 2020 taking on a new strategic role as a Business Development Manager. Simon is a key member of the Kingshay leadership team, initially focussed on supporting existing customers and developing further sales within our Dairy Manager costings service.

MARY-KATE MAHONY

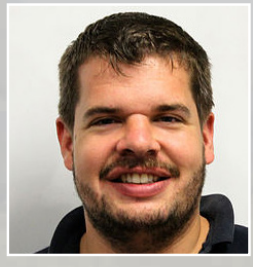
Farm Services Specialist

Mary-Kate is the main contact for any technical and customer service queries regarding your herd(s) and is responsible for the smooth running of the costings service. She joined the team last year and also helps out analysing antimicrobial data.

RICHARD SIMPSON

Development Director

Richard has been heavily involved in the design, development and operation of the costings service from the beginning, when it first started over 20 years ago. He joined Kingshay in 1994 and now manages the data integration and large data projects for Dairy Manager, alongside leading the Kingshay team.



TIM POTTER

Senior Clinical Director

Tim is part of the Kingshay Leadership team. Since completing his PhD examining antimicrobial resistance in calf pneumonia his research focus has been on the responsible use of medicines and calf health regularly delivering training on these topics both nationally and internationally.

Kingshay

INDEPENDENT DAIRY SPECIALISTS

PUT OUR INDEPENDENT INFORMATION, SERVICES AND ADVICE TO WORK ON YOUR FARM TO BUILD A HEALTHIER, MORE PROFITABLE FUTURE.

Technical Knowledgebase

Our Dairy Insight Users have a wealth of Dairy Industry knowledge at their fingertips, via the Kingshay App, the internet and regular mailings.
We also offer membership options for veterinary practices, farm advisers, colleges, universities and corporate bodies.

Dairy Manager

If you measure it, you can improve it. The UK's leading dairy costings service with options to track herd health status and bottom line profit.

AgriBudget

The Farm Finance planner, AgriBudget, offers a 1 to 5 year budgeting tool to monitor cash flow, review enterprise gross margins and future business performance. A must have for farmers and consultants.

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Our K38⁰ cubicle provides freedom of movement and ultimate cow comfort with its unique patented design and superior function. Exclusively available through Batemans.

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Our team of Agricultural Consultants and Associates bring their skills and expertise to your door wherever you farm in the UK. We provide tailored workshops on a wide range of subjects, to suit your specific requirements.

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The online training provider for farmers. FarmIQ provides a variety of online courses allowing you to decide the time, place and pace of your learning. Courses created by industry leading experts.

Data Services

Over the past 10 years, we have combined our skills and expertise to develop bespoke tools to organisations across the agricultural industry.

For any further information on the above services, call our team on **01458 851555.**

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