Targets Task Force Report 2020

Responsible use of antibiotics in UK farming
Progress against 2020 targets
New targets 2021-2024

RESPONSIBLE USE OF MEDICINES IN AGRICULTURE ALLIANCE

ruma

Foreword

"The reductions in antibiotic use that have been achieved by the UK livestock sectors over the last five years has been a great success story, and the creation of the previous sector targets was a key part in helping to galvanise this change. It has also allowed diverse sectors to come together, learn from each other and develop a collective sense of ownership. This has resulted in the creation of multiple sector stewardship groups, which have allowed representatives from across the industry to share best practice and improve responsible use of antibiotics, as well as infection prevention and control.

As highlighted in this report, there are still areas where improvements can be made, including the availability of data and building consensus in the less integrated and more fragmented ruminant sectors. There are also many other challenges ahead. For example, some of the rapid reductions we have seen have been achieved by focusing on reducing prophylactic and continual use. Now these have been largely eliminated, further reductions are likely to be harder to achieve and, as highlighted in this report, require a focus on preventing disease and improving farm management.

The livestock sectors already have good progress behind them. The ambition outlined in this document, alongside the proactive, holistic approaches and focus on behaviour change principles, gives me every confidence that they will once again succeed. We look forward to working with the sectors as we continue on this endeavour, which will ultimately be of benefit to the reputation of the UK livestock sectors as well as helping to protect human and animal health."

Professor S. Peter Borriello *CB, Chief Executive Officer, Veterinary Medicines Directorate*

CVOs' statement

"This report highlights the tremendous achievements and progress that have been made across the UK livestock sectors since the original targets were set at the end of 2017. In the UK, antibiotic use in food producing animals has halved since 2014 and over the same period the use of Highest Priority Critically Important Antibiotics for human health has reduced by 75%. This has been achieved primarily through voluntary activities with, for example, support from industry bodies, codes of practice and farm assurance schemes. This is testament to the sense of collaboration and accountability that the livestock sectors have developed, which is clearly demonstrated within this report.

The new targets for reducing, replacing and refining antibiotic use build on the successes already achieved and, although they vary according to the diverse nature of the different sectors, there are many common principles. These include the importance of data in driving change and allowing farms to benchmark their antibiotic use, which has greatly helped vets work with their farmers to create bespoke farm health plans. Other important initiatives outlined in this report include plans to improve farmer and vet training (such as the creation of a network of Farm Vet Champions, based on the Welsh Arwain Vet Cymru project), identify and help Persistent High Users to improve their management practices and, importantly, to monitor health and welfare and ensure that this is safeguarded.

We would like to thank everyone from across the UK's four nations and all levels of the supply chain, who have been involved in bringing these targets together as well as RUMA for co-ordinating and facilitating this process. We are once again pleased to endorse these ambitions and extend out support to the sectors as they develop high health animal production systems for the future."

Chief Veterinary Officers: *Christine Middlemiss (United Kingdom), Christianne Glossop (Wales), Robert Huey (Northern Ireland) and Sheila Voas (Scotland)*

Preface

Cat McLaughlin, Chair, RUMA

The Targets Task Force (TTF) group was conceived in Spring 2016 as RUMA prepared to respond to Lord Jim O'Neill's seminal Antimicrobial Resistance (AMR) Review[1]. Concern had been building over the critical issue of antibiotic resistance for a number of years and globally livestock farming was receiving considerable attention over the role it might be playing in contributing to the issue.

By the time the UK Government published its response to the O'Neill report in September 2016, the concept of the TTF had gathered momentum within RUMA – and was ideally positioned to deliver on one of the Government's key objectives: developing industry-led, sector-specific targets for antibiotic stewardship in UK livestock farming by the end of 2017.

The TTF, comprising a specialist vet and leading farmer or sector representative for each key UK livestock sector, first met in December 2016. I cannot emphasise enough how much of a unique initiative this was – never before had land-based agriculture sectors worked with aquaculture sectors in such a way, or been helped by government and industry observers before in a supportive voluntary and collaborative environment.

The group worked throughout 2017, researching, developing concepts and consulting. Several sectors were already well along their stewardship journey but rather than disengage, they were able to support those just starting out.

Looking back, I realise what little information and experience everyone had to work on at the time these first targets were developed. Data was lacking almost everywhere and most targets had to be based on educated estimates. Each sector faced very individual challenges but despite the differences, something quite incredible happened under the collective banner of the TTF – the UK livestock industry took 'ownership' of its respective sectors and their part in this huge global issue, bringing their stakeholders with them.

Since the TTF published its collective report in October 2017[2], detailing the objectives each sector would aim to achieve by the end of 2020, the industry as a whole has significantly reduced antibiotic use and achieved a huge reduction in use of Highest Priority Critically Important Antibiotics. Furthermore, this has been done on a voluntary basis, which we believe is unique globally. Antibiotic stewardship is now part of everyday language and it is rare to find a copy of a weekly farming paper that does not mention somewhere ways in which antibiotics can be used more responsibly.

So as the first targets ran their course, the original TTF group (TTF1) was refreshed and reformed to create TTF2, charged with developing the next tranche of targets to take us to 2024 in line with the UK National Action Plan[3]. We are still learning and whilst the research, data analysis and lessons accumulated in just three years are impressive, many challenges still exist. However, the new team made good use of the information and research it had access to, consulted more widely and addressed some of the shortcomings. Despite this, developing these targets and securing industry support is challenging, and my heartfelt thanks goes out to each and every one of the team.

As it charts progress to date, lessons, and aspirations for the future, this is a lengthy report. In it we end many of the first targets early, examining the UK's progress over the past five years in terms of antibiotic stewardship in agriculture and

[1]O'Neill J (2016). Tackling drug-resistant infections globally: final report and recommendations.
[2]RUMA (2017). Targets Task Force Report 2017
[3]UK Government (2019). UK 5-year action plan for antimicrobial resistance 2019 to 2024

aquaculture. We also include each sector's story, contributed in their words, about how they took stock and planned next steps. This time around we have also been able to consult more widely before publication, and are pleased to say that the reception has been positive and constructive across all four nations, from government to farming unions, supply chain to retail and farm assurance, and from veterinary to environmental interests. Furthermore, the revised approaches in the cattle and sheep (ruminant) sectors in particular have been met with enthusiasm for the way in which they augment many of the initiatives already in motion.

Finally, I would like to take the opportunity to thank both the original Targets Task Force (TTF1) for their pioneering spirit and bravery in establishing the original targets in 2017, and the refreshed Targets Task Force (TTF2) for the hard work they have put in to develop the targets this year, taking responsibility, setting ambitious targets as well as consulting with stakeholders.

I sincerely hope all sectors of our tremendous industry across all four nations embrace these targets with the same enthusiasm and professionalism as we saw them approach the 2017-2020 targets.

Cat McLaughlin
Chair, RUMA

The TTF 'team' that helped to pull this report together were:

- **Cattle group chair:** Mark Jelley, Northamptonshire beef farmer and NFU Livestock Board member
- **Beef:** Mark Jelley; Dr Elizabeth Berry, cattle vet and British Cattle Veterinary Association Council member
- **Dairy:** Graham Young, Lancashire dairy farmer and NFU Dairy Board Vice-Chairman; Dr Elizabeth Berry, cattle vet and BCVA Council member
- **Calves:** Hannah Dyke, Yorkshire calf rearer; Richard Cooper, specialist cattle vet with Evidence Group
- **Sheep:** Charles Sercombe, Leicestershire sheep farmer; Dr Fiona Lovatt, specialist sheep vet representing the Sheep Veterinary Society
- **Pigs:** Richard Lister, Yorkshire pig farmer and Chairman of the National Pig Association; Richard Pearson, pig vet and Senior Vice President of Pig Veterinary Society; and members of the Pig Health and Welfare Council Antimicrobial Use subgroup
- **Salmon:** Dr Iain Berrill, Head of Technical, Scottish Salmon Producers Organisation; SSPO Prescribing Vets group
- **Trout:** Oliver Robinson, Chief Executive Officer of British Trout Association; Dr Peter Scott, fish vet and Director of BTA
- **Gamebirds:** Paul Jeavons, Worcestershire game farmer and Chairman of the Game Farmers' Association Health and Welfare Committee; Will Ingham and Isy Manning, poultry vets with Poultry Health Services
- **Laying hens:** Paul McMullin, Consultant Veterinarian to the British Egg Industry Council
- **Poultry Meat:** Thomas Wornham, Hertfordshire poultry producer; Daniel Parker, poultry vet and Veterinary Adviser to the British Poultry Council
- **Observers:** Fraser Broadfoot, Veterinary Research Officer, Veterinary Medicines Directorate; Paul Cook, Head of Microbiological Risk Assessment, Food Standards Agency
- **Support:** Derek Armstrong, Lead Veterinary Science Expert, AHDB; Clive Brown, Head of Beef & Lamb Knowledge Exchange, AHDB; Dr Georgina Crayford, Technical Manager, Red Tractor Assurance; Dr Mandy Nevel, Head of Animal Health and Welfare, AHDB; Dr Grace O Gorman, Technical Policy Manager, NOAH; James Russell, President, British Veterinary Association; Dr Mary Vickers, LIP Product Manager (Data & Technology), AHDB
- **Chairing and Organisation:** Gwyn Jones, Chair of Targets Task Force, RUMA; Catherine McLaughlin, Chair, RUMA; Chris Lloyd, Secretary General, RUMA; Amy Jackson, Communications Officer, RUMA
- **With additional thanks to:** Jules Dare, Mike Kirby, Kathryn Rowland, Gareth Hateley, members of the Cattle Stewardship Group and researchers from Universities of Bristol, Edinburgh, Liverpool, Nottingham and the Royal Agricultural University.

Responsible use of antibiotics in UK farming
Targets Task Force Report, 2020: Summary

Antibiotic sales and use in the UK

- UK sales of antibiotics to treat food producing animals have halved since 2014[4]
- The UK retains a position of fifth-lowest sales of antibiotics for food producing animals in Europe, the lowest among more commercially productive European countries[5]
- Highest Priority Critically Important Antibiotic (HP-CIA) sales for UK food producing animals have also fallen 75% since 2014, and sales of colistin are virtually nil[4]
- Less than 30% of the UK's antibiotics are used to treat disease in food producing animals[6], despite over a billion farm animals being reared and managed in the UK every year
- Levels of antibiotic resistance found through Government monitoring and surveillance are also stabilising and falling in response to reductions in use[4]

Achieving the 2017-2020 targets

- A key factor in these reductions has been the work of RUMA's Targets Task Force (TTF) which – in 2017 – identified 40 sector-specific targets for responsible stewardship of antibiotics to be achieved across nine different livestock sectors by 2020
- Over three-quarters of the targets have been or are on track to be achieved by the end of 2020, a significant achievement considering lack of data and baseline information at the start of the process

Progress against 2017-2020 targets

Table 1: Summary of progress against targets in each sector 2017-2020 (Source: RUMA)

KEY: Data unavailable | Achieved early | On track to being achieved (data for 2020 due in 2021) | Not yet achieved (data for 2020 due in 2021)

SPECIES AND TARGET	STATUS
Beef	
Reduce to 10 mg/kg overall use	Data unavailable

SPECIES AND TARGET	STATUS
Dairy	
Reduce to 21.5 mg/kg overall use	Data unavailable
10% fall in intramammary lactating cow tube sales	Achieved (2019 sales data)
20% fall in intramammary dry cow tube sales	Achieved (2019 sales data)
Increase sealant tube sales from 0.5 to 0.7 courses/cow	2018: 0.5 courses/cow; 2021 data due 2022
Halve sales of highest priority intramammary tubes	Achieved (2018 & 2019 sales data)

[4]Veterinary Medicines Directorate (2019). Veterinary Antimicrobial Resistance and Sales Surveillance 2019

[5]European Medicines Agency (2020). Sales of veterinary antimicrobial agents in 31 European countries in 2018: Trends 2010-2018

[6]HM Government (2019). UK One Health Report: antibiotic use and antibiotic resistance in animals and humans 2013-2017.

SPECIES AND TARGET	STATUS
Dairy & Beef	
Halve sales of highest priority injectable products	Achieved (2019 sales data)
Annual increase in vaccine sales for respiratory disease	Uptake static 2019; 2020 data due 2021
Monitor health & welfare metrics	Measures reported in 2020 industry report
Develop standardised antibiotic usage metrics	Dairy metrics published 2018; Beef 2019
Development of centralised database	Database developed, live 2021
Farmer and vet training	Widespread training continuing to take place
Disseminate responsible use messages	Strong communication throughout media & knowledge exchange initiatives

SPECIES AND TARGET	STATUS
Sheep	
Reduce overall use by 10%	Data unavailable
Halve use of highest priority antibiotics	Data unavailable
Co-ordinate collection of antibiotic use data	Metrics published 2019/centralised database live 2021
Reduce lameness (including 5% yearly rise in footrot vaccine sales)	Vaccine sales 2019 up 1% on 2018; 2020 data due 2021
Reduce abortion (including 5% yearly rise in enzootic abortion vaccine sales)	Vaccine sales 2019 up 1% on 2018; 2020 data due 2021
Reduce antibiotic use in neonatal lambs by 10% yearly	Achieved targeted 34% reduction 2016-2020
Plan to tackle vet and farmer behaviour	Communications ongoing – communications campaigns on 'Plan Prevent Protect'

SPECIES AND TARGET	STATUS
Pigs	
Reduce overall use to 99 mg/kg by 2020	Data due 2021, 104mg/kg reported Q1&2 2020 (usage data)
Highest priority antibiotic use stays below specified levels	Achieved (2019 sales data)

SPECIES AND TARGET	STATUS
Salmon	
100% usage data captured for Scottish salmon	Achieved (2017-2019)
Overall use maintained at 5 mg/kg or less	Data due in 2021; use at low (but fluctuating) levels
No highest priority antibiotics used routinely	Achieved (2017-2019 usage data)
Atlantic salmon vaccinated before seawater phase	Achieved (2017-2019)
Autogenous vaccine development	Achieved (2017-2019)

SPECIES AND TARGET	STATUS
Trout	
90% usage data captured for trout	Achieved (2018-2019)
Overall use maintained at 20 mg/kg or less	Achieved (2017-2019 usage data)
No highest priority antibiotics used routinely	Achieved (2017-2019 usage data)
Compliance with Code of Good Practice	Achieved (2017-2019)
Vaccines used for seagrown trout	Achieved (2017-2019)
Vaccines promoted in freshwater farms	Achieved (2017-2019)
Autogenous vaccine development	Working closely with vaccine developers

SPECIES AND TARGET	STATUS
Gamebirds	
Halve total tonnes of antibiotics used	Data due 2021, achieved 52% in 2018 (2019: 49%)
Reduce highest priority antibiotic use by 25%	Data due 2021, achieved 27% in 2018 (2019: 10%)

SPECIES AND TARGET	STATUS
Laying Hens	
Maintain <1% birds medicated/day	Achieved (2016-2019 usage data)
Maintain <0.05% HP-CIA days medicated	Achieved (2016-2019 usage data)

SPECIES AND TARGET	STATUS
Poultry meat	
Reduce overall use in broilers to 25 mg/kg or less	Achieved (2015-2019 usage data)
Reduce overall use turkeys to 50 mg/kg or less	Achieved (2017-2019 usage data)

The 2021-2024 targets

- Over the past three years, experience, technical developments, data and behavioural and microbiological research have fundamentally changed our understanding of antibiotic use and resistance; these findings have informed the new targets (see Table 2)
- The new sector targets fall into three groups in terms of focus
    1. Ruminant sectors of beef, dairy, calves and sheep, for which usage remains largely unknown or unproven due to unavailability of data. The focus in these sectors going forward is on: Understanding and benchmarking use on-farm; engagement between farmer and vet; development of health plans
    2. Pigs and gamebirds are still on their downward trajectory and are making strong progress on reducing use. The new targets plan to reduce use by a further 30% and 40% respectively
    3. Those which have already achieved low levels of use, and whose target is to maintain them in the face of biosecurity or disease control challenges amid shifting external environmental and market forces. This group includes Salmon, Trout, Laying hens and Poultry meat sectors
- In conclusion, the UK farming industry remains in a strong position at the end of 2020 – but there's more to do…

Table 2: Summary of 2021-2024 targets and indicators of progress in each sector (Source: RUMA)

MEASUREMENT METRIC	TARGET/INDICATOR OF PROGRESS
Dairy, Beef, Calves and Sheep Targets	
Calculation, benchmarking and central upload of data	Data from 95% of UK dairy herds captured by 2024
	Data from 50% of UK calf rearing units captured by 2024
	Data from 8,000 (10% of total) UK beef herds captured by 2024
	Data from 8,000 (10% of total) UK sheep flocks captured by 2024
Farm Vet Champions (FVCs) network	2,800 FVCs in 900 veterinary practices across UK by 2024 or 50% of farm vets at 50% of farm vet practices if total numbers change
Training uptake among vets	Specify appropriate training within Farm Vet Champion plan
Medicines best practice training uptake among farmers	Reduced training non-compliances in Red Tractor Dairy
	Training becomes requirement in Beef/Lamb farm assurance
Medicines best practice training uptake among students	All vet school and agriculture college/university courses include medicines best practice content by 2024
Farmer & vet herd/flock health plans	Reduced non-compliances annually in Dairy & Beef farm assurance for development of annual health/medicines plan
	Increased health planning on sheep farms tracked through FVCs
Impact of Bovine Viral Diarrhoea	Reduced non-compliances for BVD control in Red Tractor Dairy
	Calves sourced from farms eradicating BVD, or screened
Dairy, Beef, Calves and Sheep Indicators of Progress	
Antibiotic use (centralised data)	15% mg/kg fall in dairy herds by 2024; baseline 2020/21
	25% mg/kg fall in calf rearing units by 2024; baseline 2020/21
Number of calves treated	7.5 fewer treated/100 calves by 2024; baseline 2020/21
Sales of lactating cow tubes in dairy	Annual reduction in 3-yr rolling average; baseline of 0.69 DCD_{Vet}
Sales of dry cow tubes in dairy	Annual reduction in 3-yr rolling average; baseline of 0.59 DCD_{Vet}
Oral antibiotic sales for lambs	Annual reduction of 10% in doses/year; baseline 7.45 million
Highest priority antibiotic use (from centralised data)	Reduction in dairy mg/kg by 2024; baseline 2020/2021
	Establish baseline for calves from 2020/2021 data, then review
	Ensure does not rise in sheep above 0.05% of total sheep use
Highest priority antibiotic sales	Reduction in cattle injectables by 2024; baseline 0.26 mg/kg
	Reduction in dairy intramammary tubes for dairy cows by 2024; baseline 0.03 DCD_{Vet}
Mortality rates	Mortality falls in beef & dairy cows; baseline 2020
	Calf mortality falls 1%/year 2020-2024; baseline 2018
	Increase in lamb survivability from various indicators
Health and welfare metrics	Fall in dairy lameness and mastitis from various 2019 indicators
	Fall in beef respiratory disease from various 2019 indicators
	Increased annual uptake of vaccines in sheep, baseline 2019

MEASUREMENT METRIC	TARGET/INDICATOR OF PROGRESS
Pig Targets	
Persistently High Users (PHUs)	Introduce a programme in 2021 supporting PHUs to reduce use
Pig Health metrics	Monitor effects of reduced antibiotic use annually
Plan for weaner management	Identify/launch best-practice weaner management before 2022
Shift from in-feed medication	Ensure Government post-Brexit plans support switch to in-water
e-Medicine Book (eMB) data	Maintain/increase on-time submission of data to eMB annually
Medicines training uptake	Review gaps and increase opportunities for uptake, baseline 2020
Pig Indicators of Progress	
Antibiotic use (from eMB)	30% reduction in total use by 2024, baseline 2020
Highest priority antibiotic use (from eMB)	Use equal to or lower than 2019 baselines
Antimicrobial resistance surveillance	Monitor current data; aim for reduction on 2020 baselines

MEASUREMENT METRIC	TARGET/INDICATOR OF PROGRESS
Salmon Targets	
Highest priority antibiotic use	Only prescribed as last resort after sensitivity testing
Vaccination of Atlantic salmon	All Atlantic salmon vaccinated before seawater phase
Use of autogenous vaccines	To be developed in absence of licensed vaccines
Prescribing Vets' group input	Quarterly meetings, antibiotic stewardship a standard item
Compliance with Code of Good Practice	All producers compliant with Code of Good Practice
Collection/collation of data	100% collection and reporting of antibiotic use
Salmon Indicators of Progress	
Antibiotic use (from usage data)	Aim for maximum 5 mg/kg annually
Metric for % fish treated	Develop new metric to indicate the % of fish treated annually

MEASUREMENT METRIC	TARGET/INDICATOR OF PROGRESS
Trout Targets	
Stewardship of antibiotics	No preventative use; no highest priority antibiotics used routinely; pathogen surveillance through 'bug bank' initiative
Vaccine uptake	Vaccination in freshwater phase to be increased, baseline 2020
Promotion of best practice	All members compliant with quality standards
Trout Indicators of Progress	
Antibiotic use (from usage data)	Maintain usage below 20 mg/kg
Metric for % fish treated	Develop new metric to indicate the % of fish treated annually

MEASUREMENT METRIC	TARGET/INDICATOR OF PROGRESS
Gamebird Targets	
Discussion with vets	Every rearer to calculate use and discuss with their vet
Improve husbandry	Monitor uptake of new British Game Alliance Game Farm Audits
Increase education	Enhance existing learning tools
Medicated feed stewardship	Work with Game Feed Trade Association to steward sales
Monitor welfare effects	Ensure antibiotic reductions are safe and sustainable
Research into damaging diseases	Promote research into ways to reduce disease pressures
Gamebird Indicators of Progress	
Antibiotic use (from usage data)	Reduce use by 40%, baseline 2019 of 10.4 tonnes
Highest priority antibiotic use (from usage data)	Reduce use by 19% to 47kg, baseline 2019 of 58 kg

MEASUREMENT METRIC	TARGET/INDICATOR OF PROGRESS
Laying Hens Indicators of Progress	
Antibiotic use (usage data)	Maintain bird days treated below 1%
HP-CIA use (usage data)	Fluoroquinolone days medicated remains below 0.05%

MEASUREMENT METRIC	TARGET/INDICATOR OF PROGRESS
Poultry Meat Indicators of Progress	
Antibiotic use (usage data)	Use remains < 25mg/kg PCU in broiler production; reviewed 2021
	Use remains < 50mg/kg PCU in turkey production; reviewed 2021

Contents

1. Introduction

i) The story so far

Since the concept of a Targets Task Force was first announced by RUMA in May 2016, there has been considerable progress in reducing, refining or replacing antibiotic use in UK farming. Overall sales (mg/kg – Figure 1) in the UK in 2019 were 31mg/kg, some 50% lower than in 2014. In 2018 the UK also retained its position of having the fifth-lowest sales of antibiotics (mg/PCU) for food-producing animals in Europe (Table 3 – 2019 comparisons not yet available), 70% lower than the European average of 103 mg/PCU.

Figure 1: Antibiotics sales for food producing animals in the UK 2014-2019 (Source: VMD[7])

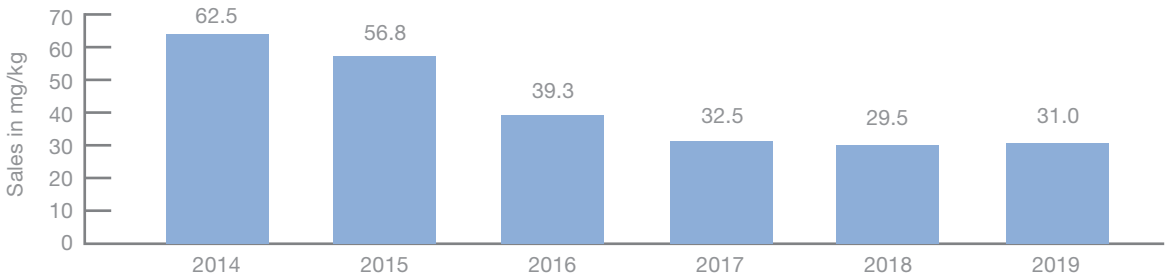


Table 3: Sales (tonnes of active ingredient) of veterinary antimicrobial agents for food-producing animals, PCU and sales in mg/PCU, by country, for 2018 (Source: ESVAC[8])

Country	Sales (tonnes)	PCU (1,000t)	Sales in mg/PCU	Country	Sales (tonnes)	PCU (1,000t)	Sales in mg/PCU
Norway	5.7	1,927.5	2.9	Netherlands	183.9	3,200.8	57.5
Iceland	0.6	116.4	4.9	France	456.2	7,107.0	64.2
Sweden	9.8	782.7	12.5	Croatia	19.6	293.0	66.8
Finland	9.3	496.8	18.7	Romania	230.7	2,788.2	82.7
United Kingdom	**212.9**	**7,215.7**	**29.5**	Germany	753.1	8,517.6	88.4
Lithuania	10.7	323.8	33.1	Greece	113.0	1,243.9	90.9
Luxembourg	1.8	54.7	33.6	Belgium	195.0	1,724.4	113.1
Latvia	6.0	167.3	36.1	Bulgaria	47.8	399.9	119.6
Denmark	93.6	2,446.7	38.2	Malta	2.1	14.2	150.9
Switzerland	32.9	818.5	40.2	Poland	782.2	4,672.6	167.4
Slovenia	7.8	179.8	43.2	Hungary	150.2	831.8	180.6
Ireland	98.6	2,142.1	46.0	Portugal	191.8	1,028.1	186.6
Slovakia	12.1	246.6	49.3	Spain	1,724.1	7,865.4	219.2
Austria	48.0	957.2	50.1	Italy	932.1	3,819.3	244.0
Estonia	6.1	114.0	53.3	Cyprus	53.4	114.5	466.3
Czechia	40.2	704.6	57.0	**Total/average**	**6,431.4**	**62,315.1**	**103.2***

Before this widespread action across the industry, some sectors (eg salmon) had already made significant reductions in antibiotic use through use of vaccines and proactive health management to protect against specific diseases. The UK poultry meat sector also launched its antibiotic stewardship programme in 2011 and went on to achieve reductions of 83% by 2017.

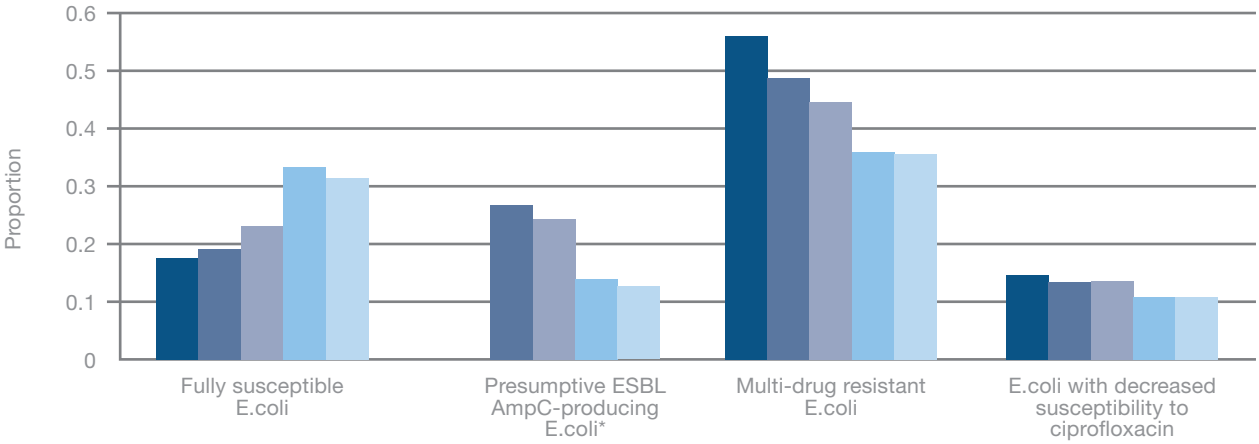
[7]Veterinary Medicines Directorate (2019). Veterinary Antimicrobial Resistance and Sales Surveillance 2019

[8]European Medicines Agency (2020). Sales of veterinary antimicrobial agents in 31 European countries in 2018: Trends from 2010 to 2018. Tenth ESVAC report

Other sectors became mobilised on the issue of antibiotic use in 2016. The pig sector for example launched its stewardship plan and other sectors progressively joined efforts to reduce, replace or refine use. This activity became more focused throughout 2017 as the sector-specific targets were being identified and developed.

Of course, reduction in use is only the first step; the end goal is to slow down or reduce the development of resistance through improved stewardship, and retain antibiotic effectiveness across all user groups, including human medicine. Through harmonised surveillance programmes, levels of resistance across veterinary medicine use have generally stopped increasing and are now mostly falling[7] (Figure 2).

Figure 2: Examples of reductions in AMR discovered through harmonised surveillance
■ 2014/15, ■ 2015/16, ■ 2016/17, ■ 2017/18 and ■ 2018/19 (Source: VMD)



* Data not available for 2014/15

ii) Looking forward

With the UK farming industry ending 2020 in a strong position, we need to now look forward. During 2018, the UK Government developed its five-year National Action Plan to tackle AMR. Alongside aspirations for stewardship in healthcare, the report includes goals to reduce overall antibiotic use in farm animals by a further 25% from 2016 to 2020, and define new goals for 2021 to 2024. The industry as a whole is close to the inferred target of 29 mg/kg (based on 2016 antibiotic sales of 39 mg/kg 2016[9]) but will not know whether it has achieved the former goal until October 2021 when sales data are compiled. The latter goal is met through the publication of this report.

Each of the UK's four nations has since developed its own strategy to deliver against the National Action Plan[10]. In recognition of this, RUMA has taken an inclusive approach to TTF2 target-setting, ensuring that any reduction strategies can complement devolved priorities.

It is appropriate to reiterate, as we develop our targets further, the RUMA position on antibiotic use in food animal production. Antibiotics are essential medicines to protect animal health and welfare and food safety, and zero use is neither desirable nor ethical; the vision is optimal stewardship of antibiotics through improving animal health, preventative veterinary practices, and elimination of any remaining unnecessary use.

[9]Veterinary Medicines Directorate (2017). UK – Veterinary Antibiotic Resistance and Sales Surveillance Report 2016; NOTE: 2016 sales data were subsequently revised to 39 mg/kg due to error as explained in UK-VARSS 2016 Erratum

[10]Scottish Animal Health and Antimicrobial Resistance Group Scotland's Healthy Animals; Welsh Government Animal and Environment Antimicrobial (AMR) Delivery Group; DAERA Changing the Culture 2019-2024 – One Health

2. Lessons and Developments

While the new targets have been developed over the past 12 months, the thinking behind them has evolved over the previous three years as work to address the first Targets Task Force (TTF1) goals progressed. As a result, experience and a number of technical, data-related and research-focused developments and observations have helped to inform the new targets – and have prompted a complete change in thinking of how some sectors will progress from this point, with many of these lessons in the cattle and sheep sectors.

i) Sectoral differences

Some key factors that impact speed of progress are:

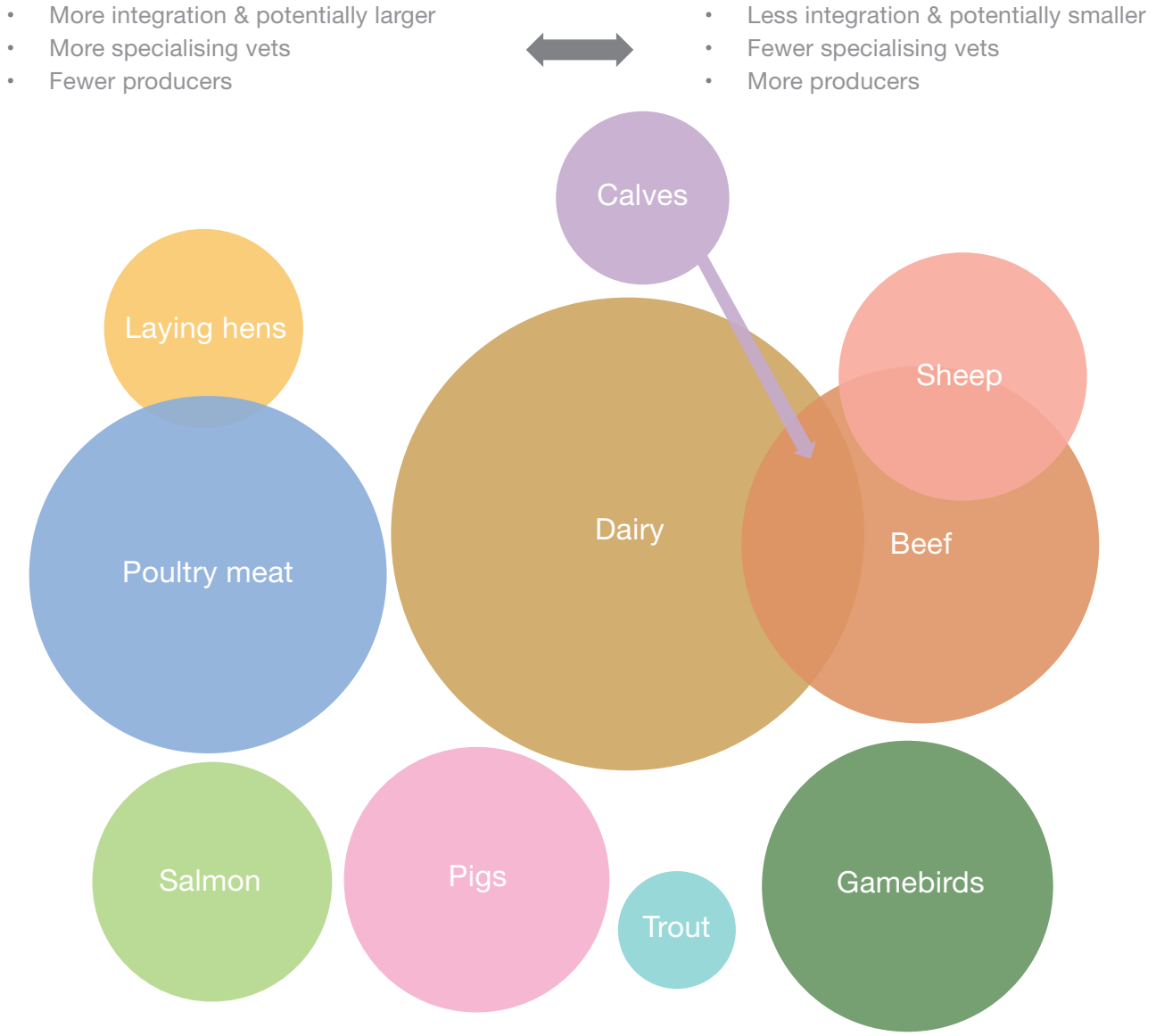
- **The level of integration in the sector supply chain** – a high level of integration through suppliers, farmers, processors and retailers makes changes to antibiotic stewardship protocols easily communicated and managed, and data capture is easier.
- **The number of producers and vets in the sector** – the greater the number of individual producers in the sector, the harder it is to drive change as it simply becomes harder to reach everyone. Similarly, this is the case in terms of veterinary 'cover' in reaching individual farms.
- **Approach to veterinary support** – sectors serviced by a small number of species-specific vets have tended to demonstrate faster reductions in antibiotic use.
- **The context of antibiotic administration** – while it is a legal requirement for all farmers to keep medicine records, it is more difficult for some to make use of data through, for example, electronic record-keeping or apps. Lack of effective broadband infrastructure in rural areas can exacerbate this, as well as practical challenges of working outside with animals.

Some of these factors are illustrated in Figure 3. While such patterns have emerged, they do not hold true universally and some sectors – despite being very numerous or fragmented – have been able to find ways to capture data and communicate effectively.

Examples include the trout and gamebird sectors, which have few integrated supply chains and smaller farms; yet they have managed to capture data, communicate best practice effectively and reduce antibiotic use. Similarly, the sheep sector, although it cannot yet collect and collate significant quantities of usage data and has many producers, has achieved reduced sales of neonatal oral antibiotics through communications and campaigns.

A new requirement to justify HP-CIA use in cattle within farm assurance schemes from Welsh Lamb and Beef, Quality Meat Scotland, Northern Ireland Beef & Lamb and Red Tractor has helped towards significant reductions in use of intramammary and injectable products.

Figure 3: An illustration typifying some of the differences between UK livestock sectors, with circles representing the approximate relative financial value of each sector in the UK[11]



ii) The power of data

RUMA can show that where good data is available for a sector, targets are generally met. Where there is little or no data, or where datasets are not robust, then progress against targets is difficult to demonstrate.

Monitoring antibiotic use in individual sectors is an important part of the picture. Many antibiotic products are licensed to be sold to multiple species, so sales data only tell part of the story.

To truly understand which products are being used to treat which animals at farm level, and what opportunities exist to use products more responsibly, collecting antibiotic usage data is critical.

The greatest progress in reducing, refining or replacing overall use is apparent where it has been possible to centrally capture large amounts of sector data (see Table 4).

[11]Defra/National Statistics (2020). Total Income from Farming in the United Kingdom, first estimate for 2019. 7 May 2020

Table 4: Data capture on total antibiotics per sector as at 2019 (Source: VMD and various)

SECTOR	Aspects/quantity of sector data captured	Progress in achieving antibiotic use targets
High levels of data capture correlate with positive progress on reductions		
Pigs	Usage data captured for 95% of UK sector	Reduced overall use 60% from 2015; 2019 results within 11 mg/kg of 2020 target
Gamebirds	Usage data captured for 90% of UK sector	Reduced overall use by 49%; close to target
Laying hens	Usage data captured for 90% of UK sector	Maintained existing low overall use below target
Poultry meat	Usage data captured for 90% of UK sector	Reduced overall use 76% from 2012; below target
Salmon	Usage data captured for 100% of UK (Scottish) sector	Largely maintained historic reductions in use despite external climatic and disease challenges
Trout	100% collection and reporting of antibiotic use	Reduced overall use 50% from 2016; below target
Dairy	100% sales data captured for intramammary lactating cow tubes	Reduced sales 25% from 2015; on target
	100% sales data captured for intramammary dry cow tubes	Reduced sale 21% from 2015; on target
Sheep	100% sales data captured for oral antibiotics spectinomycin and neomycin	Reduced sales 34% from 2016; meeting target of 34% reduction by 2020
Low levels of data capture correlate with little or unknown levels of progress		
Beef	Convenience sample covering 5.6% of GB slaughter animals	Reduced use 20% from 2017 to 2018
Calves	No data captured	Unknown
Dairy	Convenience sample covering 34% of the UK national herd	Increased use by 3% from 2017 to 2019
Sheep	Convenience sample covering 0.5% of UK sector	Scattered datasets; cannot evidence change

The pig sector set up its electronic Medicine Book (eMB-Pigs) in 2016, progressively resolving issues such as data accuracy and protection. A direct 'copy and paste' of the same system into the ruminant sector proved impossible due to the structure of the sectors and existing data systems. AHDB has now developed a Medicine Hub for ruminants as a centralised database for UK ruminants and this is expected to go live in January 2021.

The pig sector was able to use Red Tractor assurance as a lever to encourage participation. With fewer major producers in the pig sector (c. 1,800) and 95% of pigs assured (on a whole life basis in Red Tractor or Quality Meat Scotland), this has worked well and has allowed data to be scrutinised and cleaned. It has also allowed sharing of information across the four nations.

Data submission could be encouraged through the animal health and welfare policies and plans being developed in each nation, for example the Animal Health and Welfare Pathway in England.

iii) Effective targets

New social science research led by the University of Nottingham has examined how UK beef and sheep farmers respond to targets[12]. It suggests that farmers are likely to recognise the problem of antibiotic resistance, but relate less easily to overarching targets (eg overall usage targets of 10 mg/kg in the beef sector by 2020) which appear far removed from the situation on their own farm.

The responsibility becomes generalised and shifts to others (eg vets or, so-called 'bad' farmers) to take action. Many also think that they are already low users (although they may not have any evidence to back this up) and further reductions will negatively impact the health and welfare standards on their own farms. This then creates a conflict – and a barrier to change.

The study found farmers are more likely to respond to interventions they can personally relate to. This raises the question of whether numerical targets, in the absence of data, have been counterproductive in the ruminant sectors and adds weight to the importance of farmers knowing what is actually used on their farm, and with their vet, benchmarking this use so that informed targets can be set which are relevant to them.

With concerns also raised about the dangers of focusing on reductions in antibiotic use rather than on implementing the changes on-farm that lead to improvements in animal health and welfare (which in turn reduces unnecessary use), some TTF2 groups have considered whether numerical usage targets should be indicators of progress rather than targets in their own right.

iv) Ranges in antibiotic use

Many sectors anecdotally report a wide range of antibiotic use among their producers. Studies of dairy and sheep farms published subsequent to the targets being identified in 2017 also highlighted a significant range in levels of antibiotic use from farm to farm within the sample, with a few very high users at the extreme end – some of which may be persistently high users (PHUs) due to on-farm challenges or lack of support. In Hyde et al (2017) the highest 25% of antimicrobial users represented more than half (52%) of the total mass (mg) of antibiotics used (Figure 4). A similar pattern was noted in a study of antibiotic use on sheep farms[13] (Figure 5).

Within a sector, differences in use may occur between different enterprise types. Calf rearing, spanning dairy and beef, is frequently (anecdotally) believed to be the highest user of antibiotics within cattle. Young calves are immunologically naïve[14] and so more susceptible to disease. This means it is vital they get a good start in life before being moved to new farms for rearing.

Risk factors include how well colostrum management is undertaken on the source-farm, the potential for stress in transit and mixing[15] at collection points, as well as changes in environment and nutrition. Farms with a calf-rearing enterprise have a higher preponderance to use antibiotics for pneumonia[16] treatment and data from the British Cattle Movement Service (BCMS), collated by University of Nottingham and published in the 2020 CHAWG report[17], shows heifer replacements on GB dairy farms have higher mortality rates than their suckler herd counterparts.

[12]Doidge et al (2020). Farmers' perceptions of preventing antibiotic resistance on sheep and beef farms: risk, responsibility and action. Frontiers in Veterinary Science, 7, 524

[13]Davies et al (2017). Quantitative analysis of antibiotic usage in British sheep flocks, Veterinary Record 181, 511 (2017). Graph reproduced from Veterinary Record with permission from BMJ Publishing Group Ltd

[14]Bragg et al (2020). Prevalence and risk factors associated with failure of transfer of passive immunity in spring born beef suckler calves in Great Britain. Prev Vet Med. 2020 Aug;181:105059

[15]Taylor et al (2010). The epidemiology of bovine respiratory disease: What is the evidence for predisposing factors? Can Vet J. 2010 Oct;51(10):1095-102

[16]Doidge et al (2020). Antimicrobial use practices and opinions of beef farmers in England and Wales. Veterinary Record Published Online First: 28 August 2020

[17]BCMS and University of Nottingham (2020). In Cattle Health and Welfare Group Report 2020. www.chawg.org.uk.

For this reason, a separate 'sector' for calves reared away from the cow has been created for TTF2 to allow a positive focus on this area. This will also clarify use for growing / finishing beef producers by removing any distorting effect on antibiotic use in the calf rearing phase.

Figure 4: Antibiotic usage (mg/PCU) from sales data to 292 dairy farms from four veterinary practices. (Source: Hyde et al, 2017[18])

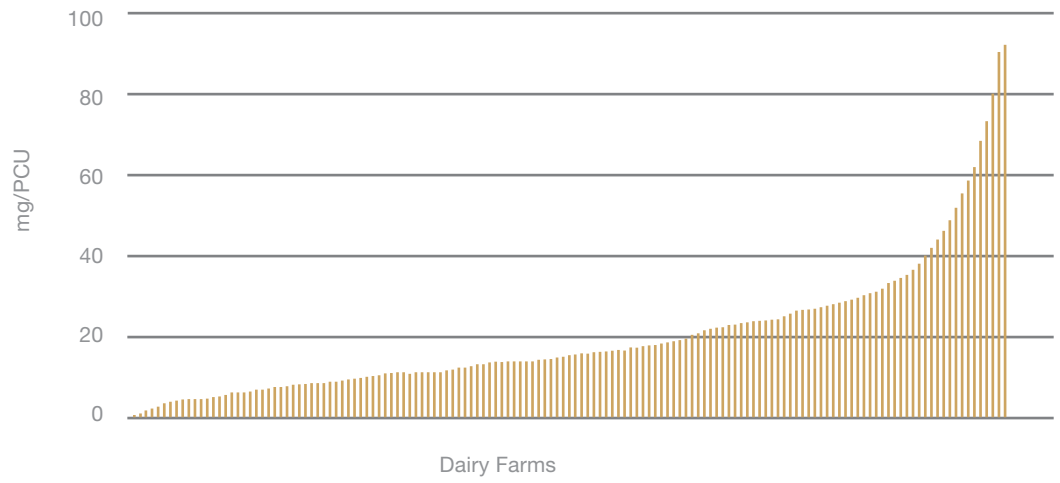
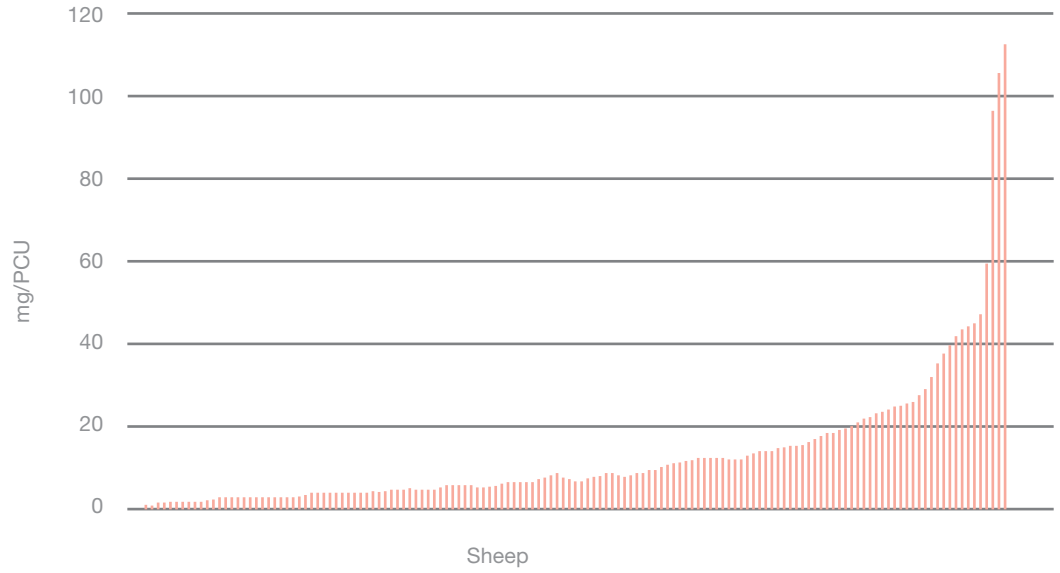


Figure 5: Distribution of antibiotic usage compiled from prescribing records of eight veterinary practices over a 12-month period. (Source: Davies et al, 2017[13])



v) Sales data for specific products, including vaccines

Vaccines have been a 'gamechanger' in sectors such as salmon, laying hens and pigs, where some particularly damaging diseases are now being managed without antibiotics. In the sheep and cattle sectors however, vaccine uptake is lower and there may be further opportunity to increase vaccination rates to reduce disease and consequent use of antibiotics. For this reason, increased vaccine sales for specific diseases was a TTF1 target for the cattle and sheep sectors.

[18]Hyde et al (2017). Quantitative analysis of antimicrobial use on British dairy farms, Veterinary Record 181, 683 (2017). Graph reproduced from Veterinary Record with permission from BMJ Publishing Group Ltd

Vaccines are an invaluable tool, but sales can be affected by commercial forces, eg manufacturing challenges or stockpiling in anticipation of supply shortages, for example related to Brexit. Research has also suggested that vaccine uptake cannot be used as a proxy for responsible stewardship of antibiotics[19,20]. For example, it has been shown that the uptake of the footrot vaccine in particular is poorly associated with the uptake of other features of the Five Point Plan to control lameness in sheep. However, it does indicate whether farmers are adopting measures likely to lead to lower antibiotic use. As vaccination is one of the tools in the box of preventative disease measures, it is appropriate to track uptake as one of the measures of good preventative medicine.

For these reasons, it may be more appropriate to monitor vaccine sales to indicate a direction of travel rather than specify hard numerical targets. The same applies to teat sealants and intramammary antibiotics, or even sales of non-steroidal anti-inflammatory products (NSAIDs) in the future.

vi) The role of the vet

Antibiotics remain 'prescription-only by vets' (POM-V) in the UK, so ensuring the culture within vet practices is directed towards responsible stewardship and that vets discuss and, if necessary, challenge antibiotic use expectations with clients, is pivotal. This is especially important on beef and sheep enterprises where veterinary visits can be less frequent. Davies et al (2017)[13] confirmed the importance of the vet as 21% of the unexplained variation in mg/kg antibiotic use on-farm occurred between veterinary practices. Two studies led by the University of Nottingham have also suggested that the vet's relationship with the farmer, time pressure, habit, geographical region, confidence in the farmer and the personality of the vet are all significant factors in the decision to prescribe[21,22].

As a result, the role of the vet as 'gatekeeper' has emerged as a key factor in driving change in how antibiotics are managed. A promising new initiative to tackle this is the two-year Arwain Vet Cymru project in Wales, led by the University of Bristol in collaboration with the Welsh Government, Welsh Lamb and Beef Producers (WLBP) and Iechyd Da.

The project will see a network of trained 'Prescribing Champions' and their practices receiving practical support to encourage improved communication and promote behaviour change[23]. This type of initiative recognises the need to acquire skills in areas like behaviour change strategies that can be invaluable in helping vets to improve engagement with farmers[24]. Techniques like participatory practice change in antimicrobial use have been particularly successful in reducing use of HP-CIAs, for example[25].

[19]Best et al (2020). Uptake of the lameness Five Point Plan and its association with farmer-reported lameness prevalence: A cross-sectional survey of 532 UK sheep farmers. Preventative Veterinary Medicine 181

[20]Lovatt & Davies (2019). Poster presentation at AACTING conference, Bern July 2019

[21]Kaler & Green (2013). Sheep farmer opinions on the current and future role of veterinarians in flock health management on sheep farms: a qualitative study. Preventive Veterinary Medicine, 112(3-4), 370-377

[22]Doidge et al (2019). To prescribe or not to prescribe? A factorial survey to explore veterinarians' decision making when prescribing antimicrobials to sheep and beef farmers in the UK. PLoS ONE, 14(4), 1–17

[23]Bristol Veterinary School, University of Bristol. Wales to lead the way in responsible antibiotics use in veterinary surgeries – Arwain Vet Cymru.18 November 2019 (accessed 14 July 2020).

[24]Bellet et al (2015). Preventative services offered by veterinarians on sheep farms in England and Wales: Opinions and drivers for proactive flock health planning. Preventive Veterinary Medicine, Vol 122, Issue 4, 381-38

[25]Morgans LC (2019). A participatory, farmer-led approach to changing practice around antimicrobial use on UK dairy farms.

vii) Categorisation of antibiotics

Both the VMD and RUMA follow advice on classifying antibiotics from the European Medicines Agency. This is done on the basis of being the most geographically relevant and taking into account the availability of alternatives to treat animal disease. In January 2020, the European Medicines Agency (EMA) changed its advice on how it categorises antibiotics for use in food-producing animals[26]. It created a Category A to D list, with Category A not for use in farm animals. All quinolones and fluoroquinolones are now in Category B – Highest Priority Critically Important Antibiotics (HP-CIAs) – with polymyxins (colistin) and 3rd and 4th generation cephalosporins also remaining in this category. This particularly affects the future use of oxolinic acid in aquaculture to treat certain conditions for which vaccines or effective alternatives are sometimes not available.

Furthermore, a new 'Caution' Category C has been created which contains some products that are commonly used in UK agriculture to treat specific diseases. This new category includes macrolides (whose sales in the UK have already fallen by two-thirds since 2014), amphenicols, lincosamides (mainly lincomycin) and pleuromutilins. The EMA's advice supports use of Category B (HP-CIA) medicines only when there are no antibiotics in Categories C or D that could be clinically effective, and states that use should be based on antimicrobial susceptibility testing wherever possible. Category C should be considered when no antibiotics in Category D are clinically effective. These factors are a consideration for the sectors as they plan future responsible use targets.

viii) Lifecycle, environmental and disease factors

Environmental factors have an enormous impact on disease patterns and risk, eg warmer sea temperatures bring novel challenges to salmon farming such as algae, new bacterial infections and jellyfish. Some species also have variable vulnerabilities at different stages of their lifecycles, eg dairy calves brought to rearing farms, or pigs at weaning. Infectious disease can have an enormous impact on antibiotic requirements in a season, eg the swine dysentery outbreak of 2019[27]. These factors need to be taken into account when interpreting and presenting data. However, knowledge about the spread of AMR in the environment also remains sparse, and factors that might contribute to the spread of resistant genes, eg the method of administration through water or feed versus other routes, or how to minimise the impact of any AMR in waste, are new research areas. The new targets are based on existing knowledge so adjustments may be needed as new research emerges.

[26]European Medicines Agency (2019). Categorisation of antibiotics in the European Union. 12 December 2019

[27]APHA (2019). Swine dysentery – a threat to the GB pig industry. January 2019

3. Ruminants: Beef and Dairy cattle, calves and sheep

i) Progress against 2020 targets

BEEF AND DAIRY CATTLE

Sourcing or collating data from beef and dairy herds again proved difficult in 2020. In previous years' reports against targets, examples from several different datasets were reported in an attempt to indicate progress. However, while extremely valuable to the groups using them, each dataset varies so significantly in ranges of results and averages that reporting them risks providing an inaccurate or conflicting picture of what is happening in the wider sector. With the exception of data collection, the cattle sectors can report positive news against their other targets (Table 5).

Table 5: Summary of progress in the beef and dairy sectors against 2020 targets

TARGET	Progress
Beef	
10 mg/kg overall use or 10% reduction in use (no baseline in 2016)	Cannot be measured due to data limitations
Dairy	
21.5 mg/kg overall use (20% reduction from estimated use of 26.2 mg/kg in 2016)	Cannot be measured due to data limitations
Intramammary lactating cow course doses: 10% reduction from 0.81 to 0.73 DCD_{Vet}	Sales 2015: 0.80 DCD_{Vet} (baseline year)
	Sales 2016: 0.82 DCD_{Vet}
	Sales 2017: 0.69 DCD_{Vet}
	Sales 2018: 0.78 DCD_{Vet}
	Sales 2019: 0.60 DCD_{Vet}
	Result: 25% reduction in 2019; target achieved
Intramammary dry cow course doses: 20% reduction from 0.73 (adjusted figure) to 0.58 DCD_{Vet}	Sales 2015: 0.73 DCDVet (baseline year)
	Sales 2016: 0.61 DCD_{Vet}
	Sales 2017: 0.54 DCD_{Vet}
	Sales 2018: 0.64 DCD_{Vet}
	Sales 2019: 0.58 DCD_{Vet}
	Result: 21% reduction in 2019; target achieved
Sealant tube sales: 40% increase in average courses/dairy cow from 0.5 to 0.7	Sales 2015: 0.50 (baseline year)
	Sales 2018: 0.51
	(Sales 2019 N/A)
	Result: target not achieved by 2019
Intramammary HP-CIA cow course doses: 50% reduction from 0.33 to 0.17 DCD_{Vet}	Sales 2015: 0.33 DCD_{Vet} (baseline year)
	Sales 2016: 0.24 DCD_{Vet}
	Sales 2017: 0.17 DCD_{Vet}
	Sales 2018: 0.12 DCD_{Vet}
	Sales 2019: 0.03 DCD_{Vet}
	Result: 91% reduction in 2019; target achieved

TARGET	Progress
Dairy and Beef	
Injectable HP-CIA products licensed for cattle: 50% reduction from 0.92 (2016 adjusted baseline year) to 0.46 mg/kg	Sales 2016: 0.92 mg/kg (adjusted baseline year)
	Sales 2017: 0.70 mg/kg
	Sales 2018: 0.50 mg/kg
	Sales 2019: 0.26 mg/kg
	Result: 77% reduction in 2019[28]; target achieved
Monitor vaccine uptake for IBR and pneumonia	Vaccine uptake of total possible candidate animals[29]
	2015: 36% pneumonia, 22% IBR
	2016: 37% pneumonia, 22% IBR
	2017: 38% pneumonia, 25% IBR
	2018: 40% pneumonia, 26% IBR
	2019: 36% pneumonia, 26% IBR
Monitor H&W metrics	Indicative measures reported in CHAWG report published November 2020[30]
	Culling/death rate in first 100 days of dairy lactation – static 2017-2019
	Mastitis as a reason for leaving dairy herd – slight downward trend 2017-2019
	Percentage of dairy cows with chronic high cell counts – downward trend 2015-2019
	Mastitis incidence in dairy cows (cases/100 cows/year) – downward trend 2016-2020
	Lameness as a reason for leaving dairy herd – no discernible trend 2017-2019
	Beef animal mortality England – no discernible trend 2016-2018
	Beef animal mortality Scotland – upward trend 2016-2019
Develop measurement metrics	Dairy cattle metrics released 2019[31]
	Beef cattle metrics released 2020[32]
	Youngstock updates added to both documents late 2020
Development of database	Medicine Hub launch due January 2021
Farmer and vet training: Animal Medicines Best Practice, MilkSure	MilkSure[33] training – 212 GB & 63 NI vet champions. In 2019, 1,610 farms undertook training for the first time and 71 topped up. As of August 2020, 344 farms have registered for the first time and 667 have topped up their training. AMBP training – 420 sessions completed[34]

[28]Veterinary Medicines Directorate (2019). Veterinary Antimicrobial Resistance and Sales Surveillance 2019

[29]AHDB (2020). Use of vaccines in cattle and sheep: Update report 2020 (Kynetec data by kind permission of MSD Animal Health)

[30]CHAWG (2020). CHAWG Report 2020 www.chawg.org.uk

[31]CHAWG (2019). Cattle Health and Welfare Group Antimicrobial Usage Subgroup Dairy Benchmarking Consultation Paper

[32]CHAWG (2020). Cattle Health and Welfare Group Antimicrobial Usage Subgroup recommendations for measuring and comparing the use of antibiotics on beef farms

[33]MilkSure www.milksure.co.uk

[34]The Animal Medicines Best Practice Programme (AMBP) training programme www.noah.co.uk/farmer-training/

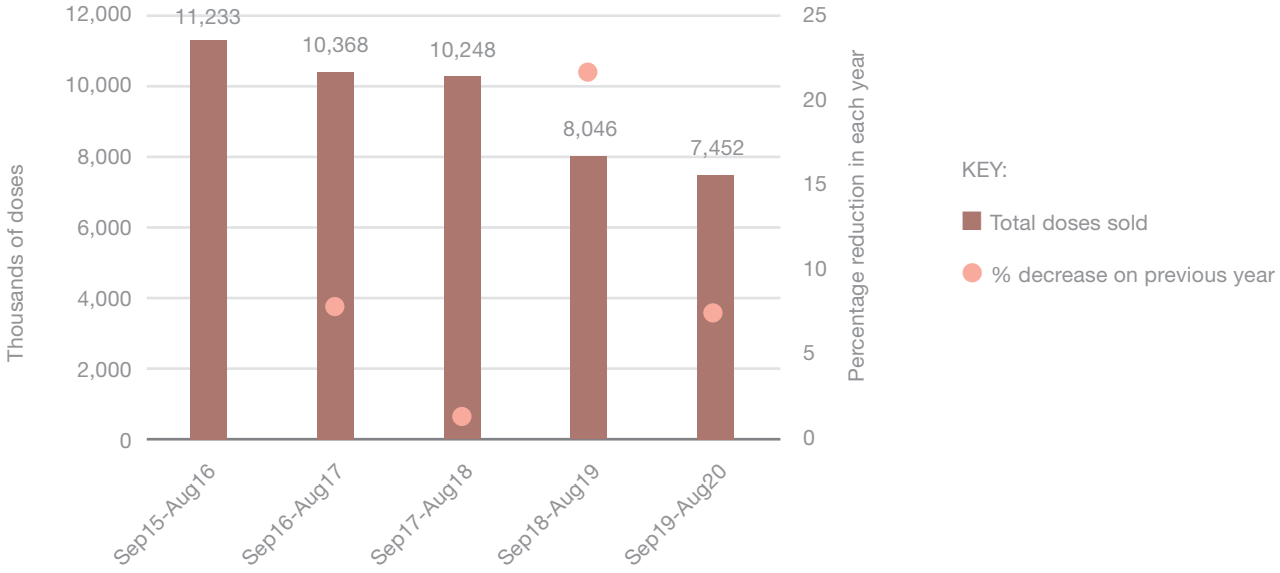
TARGET	Progress
Responsible use messages	UK farming media have embraced responsible antibiotic stewardship as a standard topic; farm features frequently discuss antibiotic stewardship policy.
	#ColostrumIsGold and #VaccinesWork knowledge exchange and promotion campaigns are run annually by AHDB and NOAH. Several health and welfare initiatives continue to be launched and maintained, such as AHDB's new QuarterPro programme for mastitis, as well as the Mastitis Control Plan, Healthy Feet and other Knowledge Exchange initiatives[35].
	AHDB knowledge exchange teams have disseminated around 10,000 copies of health advice for beef, sheep and dairy producers since 2016 (download and print). In addition, there have been nearly 500 views of webinars, while more than 1,350 vets and health professionals have attended physical training[35].

SHEEP

As with cattle, collating or obtaining data from sheep flocks proved difficult in 2020. However, with the exception of these challenges, the sheep sector can report positively against other 2020 targets (Table 6).

Industry data on the sales of oral antibiotics[36] licensed to be used in UK neonatal lambs has been tracked since 2016. This data includes sales figures for the two leading oral antibiotic products for the whole of the UK. There was a 34% decrease in total sales of oral antibiotics licensed to be used in UK neonatal lambs from 2016 to 2020. The reduction from the 2018 lambing season to 2019 lambing season was 22%, and from 2019 lambing season to 2020 lambing season, 7%. This was a tremendous achievement with the total % reduction from 2016-2020 reaching its target of a compounded 34% (Figure 6).

Figure 6: Sales of oral antibiotics for UK lambs. (Source: Kynetec data)



[35]AHDB www.ahdb.org.uk

[36]Kynetec data supplied by kind permission of MSD Animal Health

Table 6: Summary of progress in the sheep sector against 2020 targets

TARGET	Progress
Monitor and reduce antibiotic use, aiming for a 10% reduction 2016-2020 (no baseline in 2016)	Cannot be measured due to data limitations
Monitor and reduce use of HP-CIAs by 50% (no baseline in 2016)	Cannot be measured due to data limitations
Co-ordinate collection of antibiotic use data	Sheep metrics released 2019[37] Medicine Hub due to be launched January 2021
Reduce lameness by increased uptake of the five-point plan, aiming for a 5% year-on-year increase in foot rot vaccine sales 2017-2020[29]	Vaccine sales 2016: 13% of national potential uptake (baseline year)
	Vaccine sales 2017: 15% of national potential uptake
	Vaccine sales 2018: 13% of national potential uptake
	Vaccine sales 2019: 14% of national potential uptake
	2020 vaccine uptake will be reported in 2021
Reduce abortion, aiming for a 5% year-on-year increase in vaccine sales for enzootic abortion in ewes 2017-2020[29]	Vaccine sales 2016: 40% of national potential uptake (baseline year)
	Vaccine sales 2017: 40% of national potential uptake
	Vaccine sales 2018: 41% of national potential uptake
	Vaccine sales 2019: 42% of national potential uptake
	2020 vaccine uptake will be reported in 2021
Reduce antibiotic use in neonatal lambs, aiming for a 10% decrease in sales year-on-year 2016-2020	Sales 2016: 11.23 million (baseline year)
	Sales 2017: 10.37 million (7.6% reduction on baseline year)
	Sales 2018: 10.25 million (8.7% reduction on baseline year)
	Sales 2019: 8.05 million (28.3% reduction on baseline year)
	Sales 2020: 7.45 million (33.7% reduction on baseline year)
	Target sales: 7.37 million (34.4% reduction)
Deliver a knowledge exchange plan to tackle vet and farmer behaviour, particularly with respect to the 'hotspot' issues	#ColostrumIsGold, now run by AHDB, continues to be a successful way of promoting messages about the benefits of good colostrum management at lambing time. A campaign promoting vaccination of ewes against Enzootic Abortion also ran in 2019.
	In addition to this AHDB knowledge exchange teams have disseminated around 10,000 copies of health advice for beef, sheep and dairy producers since 2016 (download and print). In addition, there have been nearly 500 views of webinars, while more than 1,350 vets and health professionals have attended physical training[34].

Sheep vaccine sales data has been tracked from 2012 to 2019, and a second comprehensive document on sheep and cattle vaccine uptake has been published by AHDB[29]. The report shows the proportion of first-time breeding ewes vaccinated against enzootic abortion increased marginally in 2019, from 41% to 42%, and the proportion of eligible sheep vaccinated against foot rot increased from 13% to 14%, as shown in Table 6. Overall, 35.8 million doses of vaccines were sold for use in UK sheep in 2019. This was lower than the previous three years and primarily indicates a decrease in sales of clostridial and pasteurella vaccines, where it was estimated that the percentage of eligible animals vaccinated fell from 68% to 62% and 51% to 46%, respectively. It has been suggested that the fall in vaccine sales, particularly in these areas, resulted from uncertainty in the sector due to doubt over future export markets and subsidy payments.

[37]Sheep Antibiotics Guardian Group (2019). Calculation of metrics for benchmarking antibiotic use on sheep farms.

ii) Overarching approach to 2024 targets

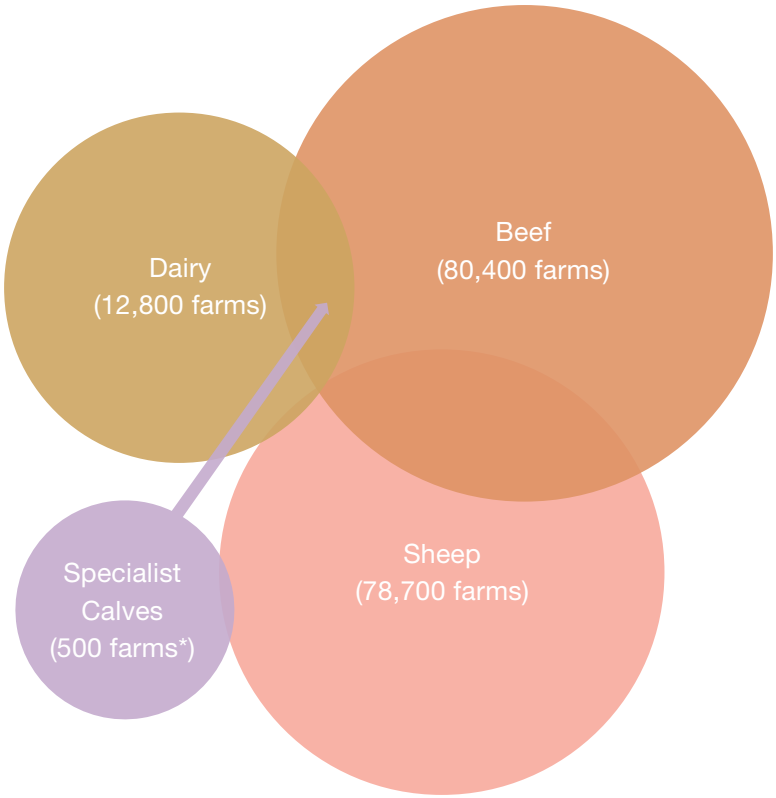
BACKGROUND

While they are likely to be relatively low users of antibiotics, the large number of individual producers and complex supply chains in the cattle and sheep sectors across the UK continue to pose significant challenges to data collection, as well as knowledge exchange and behaviour change.

Conversely many dairy producers operate on direct supply chains to processors or retailers on aligned contracts, while only half the calf rearing enterprises do so. This adds to difficulties obtaining and collating data held on-farm and communicating the need to benchmark antibiotic use or change practices.

A further complication with the cattle and sheep sectors is overlap (Figure 7). For example, some dairy farms rear calves for beef, and others will sell them at a few weeks of age to other farms or calf rearers who provide specialist facilities for rearing. Within beef farms, some rear dairy-bred calves, some 'grow' weaned cattle of a range of ages, some finish cattle for slaughter and some have suckler cow herds, rearing calves on their mothers until weaning. Furthermore, some undertake all or any combination of these, plus many beef farms also have sheep. This means that when veterinary surgeons prescribe antibiotics licensed for multiple species to these farms, it can be difficult to allocate use to different enterprises.

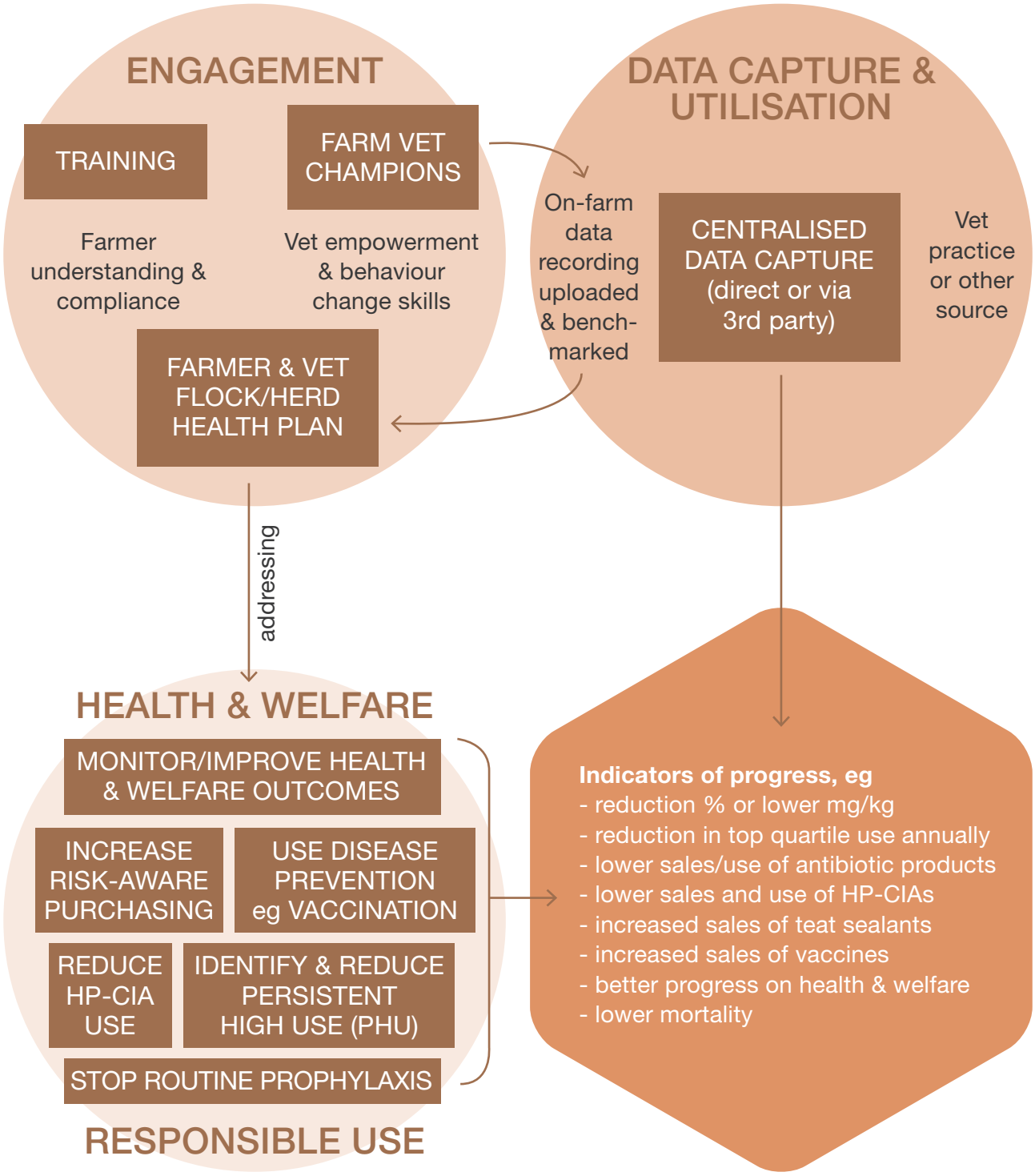
Figure 7: Structure and approximate number of holdings with cattle and sheep. (Defra[38], APHA[39])
**Industry estimate for number of dedicated calf-raring units; to be confirmed in 2021.*



[38]UK Government (2020). Structure of the agricultural industry in England and the UK at June, October 2020 – Note includes dairy holdings with 10 or more cows.
[39]APHA (2019) The SAM database

The resulting approach being taken by all four ruminant sectors is a common one (Figure 8), with emphasis on data capture, engagement between farmer and vet, and on-farm interventions through a flock or herd health plan which tackles key areas of responsible use of antibiotics and health and welfare. Sales or usage data and health and welfare results will provide indication of progress. This means that reductions in use will be outcomes of the correct actions by farmer and vet, removing the need to 'chase numbers' and reduce use at the risk of health and welfare.

Figure 8: Targets identified by the ruminant sectors, with usage and sales data indicators of progress



DATA COLLECTION AND COLLATION – THE MEDICINE HUB

Annual reviews of antibiotic use alongside administration and reasons for treatments are already requirements of most quality assurance schemes, including Welsh Lamb and Beef, the Quality Meat Scotland Cattle and Sheep Assurance Scheme, the Northern Ireland Beef & Lamb Farm Quality Assurance Scheme, and Red Tractor dairy, beef and lamb assurance schemes. However, feeding data into a centralised data hub either directly or via a third party or veterinary practice will provide the added advantage of allowing national benchmarking and reporting.

Since the early pilot of a medicines recording tool for ruminants, AHDB has continued to develop the Medicine Hub; a web-based tool that will enable dairy, beef and sheep producers to record antibiotic usage data and, optionally, other medicine use on their enterprise. It will be available from January 2021 and is currently in late stages of development and testing to ensure data is secure as well as ensuring all necessary features are working correctly before it becomes available for use.

The Medicine Hub will allow farms to demonstrate that numbers of antibiotic treatments are low, helping to promote UK livestock produce, and ultimately support their trade and reputation claims. The data can also be used to track progress against industry targets for responsible medicine use. Medicine use data can be entered in a number of ways, such as the total amount of a product used or as individual or group treatments. Reports will then be produced on an individual enterprise basis or for a group of enterprises, and users will be able to compare their data against similar enterprises. Users will not be able to access other individual producers' data without their explicit consent.

AHDB is also aiming to develop mechanisms that will allow data to be imported from external data sources, such as farm software and veterinary practice systems to prevent the need for duplication of data entry, but steps will need to be taken to ensure there is no double-counting. Ultimately the MH will link to national traceability systems (such as BCMS) to validate animal numbers on enterprises but this is unlikely to be available initially.

Farm level antibiotic use will be calculated using metrics recommended by the Cattle Health and Welfare Group and the Sheep Antibiotic Guardian Group. These metrics are based on the total amount of antibiotic active ingredient used related to the estimated weight of livestock on the farm. In many cases this is a different calculation to that used to record national antibiotic use and therefore care is needed when interpreting the data. All data entered into the hub will contribute to reporting of antibiotic use on an anonymised, aggregated basis to allow a national antibiotic use figure to be generated for the beef, dairy and sheep sectors. The Medicine Hub will be available on the AHDB website.

VET AND FARMER ENGAGEMENT

While dairy farmers often see the vet weekly for routine visits, beef and sheep farmers generally see the vet less often. The aim of the cattle and sheep sector groups is to increase vet/farmer engagement and encourage more health planning and preventative approaches to disease control, which should also improve productivity.

INNOVATION IN THE RUMINANT SECTORS: 'FARM VET CHAMPIONS'

A key way to improve veterinary prescribing practices at farm level is through using a model similar to Arwain Vet Cymru[22], mentioned earlier in this report. As a result, 'Farm Vet Champions' (FVCs) has become one of the core initiatives for sheep and cattle in TTF2.

The approach involves creating FVCs within all general practitioner farm vet practices that are likely to have direct contact with mixed farms. This will primarily target cattle and sheep, but will also include goats and smaller herds of pigs as well as back-yard poultry, turkeys and gamebirds.

The concept is to recruit, train and encourage a UK-wide network of FVCs to set, meet and record both personal and practice-level specific medicine prescribing goals. Individual vets will be encouraged to 'sign up' to become an FVC, but can operate at either an individual level or at a practice or practice group level. There will be no restriction on the number of farm vets within a practice who can sign up to become an FVC. Additionally, the ability for an individual vet to join will ensure the project continues to engage with individuals who perhaps work in less progressive practices or who are changing jobs, working on temporary contracts or not currently working in practice.

The initiative aims to build veterinary capacity and capability through education via online learning platforms which will track progress. Additionally, it aims to evolve the practice-to-farm culture, securing both veterinary and farmer buy-in through training in behaviour-change strategies[41] and through implementing antibiotic stewardship campaigns across the range of livestock species at the point of interaction between practising vets and their farm clients[42].

There are approximately 5,575 farm vets currently working in the UK in around 1,840 practices that expect to treat cattle, sheep, goats, pigs or poultry[40], hence goals have been set relating to the maximum number of vets who could potentially join the scheme.

Led by RCVS Knowledge (the charitable partner of the Royal College of Veterinary Surgeons), discussions between the British Veterinary Association and its farm specialist divisions (Sheep Veterinary Society, British Cattle Veterinary Society, Goat Veterinary Society, Pig Veterinary Society), the National Office of Animal Health and the four nations' Chief Veterinary Officers, has been met with great positivity, and the hope is that a joined-up, cross-sector structure can be developed across the whole of the UK.

HERD AND FLOCK HEALTH PLANNING

This final element of the ruminant approach relies on the vet and farmer developing a herd or flock health plan that specifically focuses on addressing areas including: Upload and benchmarking usage data; HP-CIA use or any routine prophylaxis; patterns of persistently high use; disease prevention; risk-aware purchasing; and health and welfare outcome metrics. It is planned that FVCs will have specific personal and practice goals in these areas too.

[40]Personal communication with Andrew Grainger Senior Data Analyst, Royal College of Veterinary Surgeons in September 2020

[41]Bellet et al (2015). Preventative services offered by veterinarians on sheep farms in England and Wales: Opinions and drivers for proactive flock health planning. Preventive Veterinary Medicine, Vol 122, Issue 4, 381-38

[42]Morgans et al (2020) A participatory, farmer-led approach to changing practice around antimicrobial use on UK dairy farms. University of Bristol

iii) Ruminant targets for 2024

Target 1: Calculate, benchmark and upload data

TARGET	Dairy	Beef	Calves
On-farm calculation of use, benchmarking, and direct or indirect capture of on-farm or veterinary practice data centrally	Data from 2,000 dairy farms captured centrally in 2021; 95% of UK herds captured centrally by 2024	Data from 1,000 beef farms captured centrally in 2021, doubling each year to reach 8,000 UK herds by 2024 – c.10% of total UK holdings	Data from 200 calf rearing units captured centrally in 2021; data from 50% of UK calf rearing units (number TBC in 2022) by 2024

TARGET	Sheep
On-farm calculation of use, benchmarking, and direct or indirect capture of on-farm or veterinary practice data centrally	Data from 1,000 sheep farms captured centrally in 2021, doubling each year to reach 8,000 UK sheep farms by 2024 – c.10% of total UK holdings

Individual farms will be encouraged to establish their own levels of use on-farm which will then support discussions with the vet and benchmarking activities. Both benchmarking and national reporting will be aided by centralised collection of data. The new Medicine Hub will be in operation by January 2021, and could fulfil such a purpose, taking individual, group and prescribing data and potentially interacting with ScotEID, EIDCymru, LIS and Identification, Registration and Movement (IRM) databases in Northern Ireland in the future.

To create momentum towards this, farm assurance scheme standards could facilitate collection of national data into a centralised database, once appropriate data sources have been identified. This builds on the current requirement in most schemes whereby an annual collation of antibiotics used has to be reviewed with the vet. Data could be submitted directly or via a third party.

A further incentive could be a requirement to submit data to the centralised database as part of the emerging devolved health and welfare plans, such as the Animal Health and Welfare Pathway in England, coming into effect in 2022/23. In essence, this means that to qualify for public money for investment in on-farm developments, certain 'cross-compliance' measures will need to be fulfilled, one of which could be submission of data to the central database.

Target 2: Create 'Farm Vet Champion' network

TARGET	All ruminant sectors
Create network of Farm Vet Champions in veterinary practices	2,800 Farm Vet Champions in 900 practices across the UK by 2024 (half the practices expecting to treat cattle, sheep, goats, pigs or poultry)

Building on the work already being done in Wales through the Arwain Vet Cymru project[23], a network of Farm Vet Champions will help vets in each practice have tools and support to set realistic goals that ensure prescription and on-farm data are recorded, interpreted and reviewed correctly and that vets have the confidence to have difficult conversations with clients about antibiotic use. As Arwain Vet Cymru runs for two years, these initiatives have potential to merge.

Target 3: Increase training uptake

TARGET	Dairy	Beef, Calves and Sheep
Increase training uptake among vets	Specify appropriate training including changing behaviour (eg motivational interviewing) within Farm Vet Champion plan	
Increase uptake of medicines best practice training among farmers	Annually reduce non-compliances for medicines training in Red Tractor	Medicines training becomes a requirement in farm assurance schemes across all four nations (as is already in FQAS in Northern Ireland) potentially starting with Red Tractor in Oct 2021 (following public consultation); reducing non-compliances annually where applicable once this becomes a requirement
Increase uptake of medicines best practice training among vet/agriculture students	All agriculture and vet courses include medicines best practice content by 2024 as monitored through Landex and via vet school survey	

There is already a requirement within the Red Tractor Dairy Standards that at least one person responsible for administering medicines on farm has undertaken training on antibiotic best practice, so a decline in non-compliance with this requirement across the Red Tractor dairy membership would be an indication of increased uptake of training.

The Northern Ireland Beef and Lamb Farm Quality Assurance Scheme was the first beef and lamb scheme to make such training a requirement and Red Tractor is likely to follow suit in the next version of its standards, to be implemented from October 2021. It is hoped the Welsh Lamb and Beef and Quality Meat Scotland assurance schemes will adopt this requirement within the next few years.

The number of courses for vets has also grown. They include BCVA CPD courses, and Antimicrobial Stewardship in Veterinary Practice, developed by a consortium of academics from all the UK vet schools working with the British Society for Antimicrobial Chemotherapy. This latter course is delivered via FutureLearn and has been completed by almost 3,000 users in 120 countries. Uptake of all veterinary courses could be monitored and reported through the Farm Vet Champion Scheme, BCVA or BVA. Medicines training in agricultural colleges can be monitored through Landex, and in vet schools via direct contact.

Target 4: Herd/flock plan development

TARGET	Dairy	Beef	Calves
Farmer and vet to develop a bespoke plan for each farm and review health and performance indicators annually, with the aim of: • identifying key health and welfare issues and making recommendations for improvement • responsibly reducing antibiotic usage, where appropriate, without negatively impacting welfare • ensuring proactive, farm-specific health planning • reviewing and, where appropriate, reducing the use of HP-CIAs • recommending alternative disease prevention strategies to reduce and replace prophylactic treatments • promoting risk-aware purchasing, for example from high-health herds	Reducing non-compliances annually in Red Tractor against requirements to develop a herd health plan with the vet and for the vet to conduct an annual health and performance review	Reducing non-compliances annually in Red Tractor Beef & Lamb assurance, FAWL Beef and Lamb Scheme, QMS Cattle and Sheep Assurance Scheme, and NI Beef & Lamb Farm Quality Assurance Scheme where there is requirement to develop a herd health plan and for the vet to conduct an annual health and performance review	
The impact of BVD is reduced through better disease management in calf enterprises	Reducing non-compliances annually in Red Tractor against requirements to manage BVD through an eradication programme designed in conjunction with the farm vet		Calves entering rearing facilities come from farms engaged in BVD eradication (eg in a CHeCS-accredited scheme and/or NI or Scottish BVD Eradication Programmes, Gwaredu BVD or BVD Free England) **OR** Calves entering a rearing facility are screened for BVD and PIs are removed.

TARGET	Sheep
Farmer and vet to develop a bespoke plan for each farm (as above)	Improve vet and farmer communication, the uptake of 'Plan, Prevent, Protect' measures and support for flocks that have not previously been demonstrating best practice (eg using routine prophylaxis) Aim to track most of these via the FVC through goals that are set and achieved

iv) Indicators of progress against 2024 targets

As a result of usage calculation and benchmarking, better farmer-vet engagement and the annual medicines review required in all major assurance schemes, an annual health and welfare flock or herd plan should include the elements in Target 4, thus allowing the specific areas concerning responsible stewardship and health and welfare to be targeted.

Lastly, while management of BVD is a target for calves only, the TTF2 cattle groups acknowledge the devastating impact of BVD on cattle, and that the immunity suppression this disease causes is likely to be directly associated with use of antibiotics. The groups believe that the stringent action being undertaken in Scotland and Wales through the Scottish BVD Eradication Programme and Gwaredu BVD respectively must be mirrored in England, or there is a risk of persistently infected cattle migrating across internal borders and the disease perpetuating when, on an island such as Great Britain, there is an opportunity to permanently eradicate the disease. The groups therefore call on Defra to take decisive regulatory action on BVD in England through the Pathway Programme.

Indicators of progress 1: Overall use of antibiotics

INDICATOR OF PROGRESS	Dairy	Beef & Sheep	Calves
Antibiotic use overall as determined through centralised data	15% reduction in mean use mg/kg by 2024, against 2020/2021 baseline (once established)	No reduction target initially due to anticipated lack of robust baseline	25% reduction in mean use mg/kg by 2024, against 2020/2021 baseline (once established)
Number of animals treated as determined through centralised data			7.5 fewer animals treated per 100 calves nationally by 2024, against 2020/2021 baseline (once established)
Mean use of lactating cow intramammary tubes as determined by sales (course doses)	Annual reduction in rolling three-year average sales from 2017-19 baseline of 0.69 DCD_{Vet}		
Mean use of dry cow intramammary tubes as determined by sales (course doses)	Annual reduction in rolling three-year average sales from 2017-19 baseline of 0.59 DCD_{Vet}		

INDICATOR OF PROGRESS	Sheep
Annual oral antibiotic sales for neonatal lambs	Track annual usage of oral antibiotics licensed for lambs and aim to reduce use by 10% per year (2020 baseline of 7.45 m doses)

A survey of 96 BCVA members conducted in September 2020 suggested reductions of 15% and 25% in antibiotic use in dairy and calves respectively should be possible. A numerical mg/kg target can be set in 2022 for dairy and calves using centralised data submitted for 2020 and 2021.There will be a full review of progress in data collation and the setting of robust numerical targets at the mid-point, in early 2023.

Trends in sales of intramammary antibiotics can continue to be used to indicate whether risk assessments before treating at drying off are being carried out as part of a responsible approach, and whether prevention of clinical mastitis is being addressed.

Indicators of progress 2: Responsible use of antibiotics

INDICATOR OF PROGRESS	Dairy	Beef	Calves
Mean use of HP-CIAs as determined by centralised usage data	Fall in HP-CIA use by 2024 based on 2021 data baseline		Establish HP-CIA usage baseline for 2021 then assess to decide if reduction target is meaningful/possible
Mean use of HP-CIAs as determined by sales	Fall in sales of injectable HP-CIA products for cattle by 2024, based on 2019 sales of 0.26 mg/kg		
	Annual reduction in rolling three-year average sales from 2017-19 baseline of 0.69 DCD_{Vet}		

INDICATOR OF PROGRESS	Sheep
Mean use of HP-CIAs as determined by centralised data	Ensure HP-CIA use does not rise above 0.05% of total sheep use

Sales of HP-CIA injectable products used in cattle (both dairy and beef) have fallen by 72% from 2016-2019, and HP-CIAs formed less than 0.2% of use in the 2019 convenience sample of beef farms[7]. It is important these products remain available for last resort use and that the focus on responsible use continues. Use of HP-CIAs and even the new EMA category C[26] antibiotics – if it's possible to capture centrally – should be monitored to determine usage patterns. Sales of injectable and intra-mammary products are more easily monitored through sales data collated by the VMD.

Currently available data is limited but indicates that use of HP-CIAs (EMA category B[26]) is negligible in sheep. It continues to be considered inappropriate to use these products except under direct veterinary supervision and following sensitivity testing which shows no other treatment option.

In the calf rearing sector, respiratory disease is one of the most common diseases encountered. There are a large number of antimicrobials licensed for treating calf pneumonia which include both short, medium and long-acting preparations, and ones of varying molecular weight. Setting targets based solely on a mg/kg bodyweight basis may fail to capture progress away from longer acting preparations (in situations where shorter courses are more appropriate) and from low molecular weight EMA category C antibiotics[26], such as macrolides, to EMA category D drugs such as tetracyclines.

An additional optional metric for calves is therefore to establish a baseline for (modelled) days under antibiotic treatment (Defined Daily Dose $_{veterinary}$; DDD_{vet}) in calf rearing enterprises by 2024. It is anticipated that the Medicine Hub will have the capability to calculate DDD_{vet} at a future date, using population data from livestock movement databases, but in the meantime on-farm capture would be helpful for individual farms monitoring responsible use with their vets. An interim reduction target could be set if there is evidence that there is poor correlation between 'days under treatment' and DDD_{vet}.

Indicators of progress 3: Health and welfare metrics*

INDICATOR OF PROGRESS	Dairy	Beef	Calves
Monitor for possible health and welfare compromise through annual mortality data	Mortality in dairy cows reduces by 2024 from 2020 baseline (to be established in 2021)	Mortality in suckler cows reduces by 2024 from 2020 baseline (to be established in 2021)	Mortality at ≤6 months reduces 1% annually between 2020 and 2024 based on 2018 baseline[43]
Health and welfare priority 1	Reduction in lameness by 2024 as indicated by data in annual reporting, using the 2020 CHAWG report baseline OR rising annual enrolment in AHDB Healthy Feet and Healthy Feet Lite programmes from 2020 baselines	Reduction in risk of respiratory conditions by 2024 as indicated by rise in rolling three-year vaccine uptake from 2017-19 baseline of 38% (calf pneumonia) and 26% (IBR) (AHDB Vaccines report) OR by lower PME lung lesions reported in abattoirs annually from FSA baseline in 2020 CHAWG report	
Health and welfare priority 2	Reduction in mastitis as indicated by chronic infection rates and dry period cure rates against baselines in 2020 CHAWG report		

INDICATOR OF PROGRESS	Sheep
Monitor for possible health and welfare compromise through annual mortality data	Survivability data will be tracked via various available datasets as currently reported by SHAWG[44]
Health and welfare priority 1	Levels of sheep lameness and neonatal survivability are key indicators that will be monitored to assess maintenance or improvement of sheep health and welfare (various baselines, eg reference[13] including data in SHAWG report)
Health and welfare priority 2	Annual usage of sheep vaccines will be tracked (especially vaccines against Enzootic Abortion and Foot rot), aim for increased uptake each year from 2019 baseline

**For review in 2022 after national health and welfare plans have been developed across four nations as part of post-Brexit preparations, and centralised data collection is under way.*

[43]Hyde et al (2020). Quantitative analysis of calf mortality in Great Britain. J Dairy Sci 2020 Mar;103(3):2615-2623

[44]SHAWG (2020). SHAWG report 2020. www.shawg.org.uk

Mastitis and lameness are key causes of antibiotic use on dairy farms, and need to be focus areas to allow responsible reductions in usage; there is an opportunity to include an obligation to tackle these in each nation's evolving health and welfare plans. Data gathered annually (currently reported by CHAWG[30]) gives an indication of trends.

Respiratory disease is another key cause of antibiotic use in cattle as discussed earlier in this report. Vaccination can help to reduce both BRD and IBR, reducing both mortality and morbidity in calves[45]. Many farms are able to manage disease effectively through good management and building design. Where vaccine adoption takes place instead of improved management, respiratory disease may show little improvement. As such, vaccine uptake, which is already measured[29], is a crude proxy indicator of farms moving towards a more proactive and preventative approach to disease, ie worth monitoring but not appropriate for target setting. The same can also be said for vaccines against enteric pathogens (eg rotavirus or coronavirus).

Ante-mortem and offal data indicating lung-related issues could also be used to understand levels of disease in the national herd (albeit up to 18-20 months later). There are issues related to recording standardisation and lesion detection sensitivity that again mean that target-setting is inappropriate, but trend monitoring worthwhile. Other indicators of progress could be post-mortem information on pneumonia incidence compared with other diseases, as well as seasonal distribution and causes of pneumonia, with baseline figures from Farm Post Mortems in the 2020 CHAWG report[30].

It is important to recognise that responsible antibiotic use includes use when they are needed to safeguard animal health and welfare. Data captured in the biannual CHAWG report could provide an indication of issues arising from reduced antibiotic use that has not improved health and welfare. The baseline figures here are provided from the 2020 CHAWG report[30]. Health and welfare indicators also form part of annual farm-level vet reviews for Red Tractor assurance, in which benchmarks are discussed, as well as Red Tractor dairy assessments, where a small sample of cows is examined for indicators such as body condition score and mobility.

Young animals are potentially more vulnerable to illness than older stock. As an industry, we must ensure that our efforts to reduce antibiotic use do not result in treatment being omitted or delayed, and that animal welfare remains uncompromised. As such, it is important that TTF2 targets do not just capture antibiotic usage, but also some of the down-steam consequences of any inappropriate reduction.

There are likely to be some challenges in youngstock rearing in coming years, due to industry agreeing that from 2023, all dairy-born calves should be reared, with no euthanasia of otherwise healthy animals. This could see some disadvantaged animals entering the supply chain, which should be anticipated and proactively tackled as it may challenge progress made in reducing calf mortality risk.

[45]Sherwin and Down (2018). Calf immunology and the role of vaccinations in dairy calves. In Practice 2018;40:102-114

v) Additional detail on beef cattle

BACKGROUND

For reasons expressed previously, the beef sector group is proposing a move away from a numerical mg/kg target until a representative dataset covering the main enterprises in the sector has been established. Efforts will be directed towards populating the centralised electronic Medicine Hub database as quickly as possible with robust and validated data from farm or veterinary practice, so that trends can be monitored and mg/kg use examined as an indicator of progress.

A key concern of the beef sector has been the range of enterprises within it, and placing dairy-bred calves into a separate sector will allow beef, dairy and calf sectors to focus on their specific challenges.

MEASUREMENT METRICS

The metrics that beef enterprises should use to measure their antibiotic use were defined by the Cattle Health and Welfare Group in 2019[46]. The key measure is:

$$\frac{\textit{mg (total weight of antibiotic active ingredient used)}}{\textit{kg (average total liveweight of animal population on the farm)}}$$

Any enterprises rearing calves off their mothers (up to and including six months of age) can also calculate use separately, as advised in the later section on calves. Additional metrics on percentage of animals treated and treatment days per animal are also proposed. Where possible, metrics will be calculated through the Medicine Hub, and can use livestock movement database BCMS to calculate animal populations over the assessment period. More details can be found in the beef metric report[32].

[46]RUMA, Measuring antibiotic use. November 2020

vi) Additional detail on dairy cattle

BACKGROUND

Data collection to the centralised Medicine Hub is a key target of TTF2. Sizeable pockets of data are already being captured by consultants and veterinary practices which have been working proactively with clients. For this reason, while setting a numerical target from the outset is impossible without data, the aim will be to secure the migration of significant pockets of existing data on to the Medicine Hub in a relatively short time, so that a numerical mg/kg target can be set based on this data to indicate progress.

MEASUREMENT METRICS

The metrics that dairy enterprises should use to measure their antibiotic use were defined by the Cattle Health and Welfare Group in 2019[31]. The key measures are:

Core Metric One = mg/Population Correction Unit (PCU)
Core Metric Two = Average number of antibiotic courses per dairy cow for dry cow therapy
Core Metric Three = Average number of antibiotic courses per dairy cow for lactating cow therapy

Please note that any enterprises rearing calves off their mothers (up to and including six months of age) can also be calculated separately. However, the usage in calves must also be included in the total farm usage, unless they are included in a separate beef enterprise on the holding.

Additional metrics on percentage of animals treated and treatment days per animal are also proposed. Where possible, metrics will be calculated through the Medicine Hub, and can use the livestock movement database BCMS to calculate animal populations over the assessment period. More details can be found in the dairy metric report[31].

vii) Additional detail on calves

BACKGROUND

The calf rearing sector plays an extremely valuable role within the cattle industry. Calf rearers raise young animals – predominantly from the dairy sector – and rear them off their mothers during their early months of life. These animals are ultimately destined to become part of the UK beef industry or the next generation of dairy cows.

Young animals, like young humans, are more vulnerable to communicable, infectious disease. Their initial peri-natal care has a huge influence on their subsequent susceptibility to disease, particularly whether they receive adequate quantities of good quality colostrum in the first few hours of life on the dairy farm. However, proper care during transport and when mixing calves from different farms in collection centres and markets with exposure to varying temperatures and feeding also has a huge bearing on whether they thrive or whether they succumb to disease.

Previous research has shown there is a significant variation between calf rearing units in terms of their approach to managing and treating infectious disease[47], and subsequently the amount of antibiotics they use. Currently, such differences are largely obscured through measures of antibiotic use which group calves with older stock of greater bodyweight, 'diluting' variations in usage levels. This approach is not helpful in driving change; hence calves have been separated from the beef and dairy sectors and have targets of their own.

Addressing how dairy-bred calves are reared and identifying targets to reduce antibiotic use as well as disease, morbidity and mortality is especially timely; new moves to phase out euthanasia of dairy bulls will potentially result in many more animals entering this supply chain in coming years. Measuring antibiotic use between different units within the sector should help to identify farms which need further support in terms of disease prevention, and which may be using antibiotics to 'prop up' inadequate management systems. Ultimately, ensuring those antibiotics needed to treat disease in these calves are used responsibly will help to preserve the effectiveness of the medicines we need to safeguard animal health and welfare.

Around 30-40% of the calf rearing sector is managed by a few companies specialising in calf rearing, working closely with farmers at one end and processors and retailers at the other. It should be possible therefore to secure pockets of usage data to submit to the Medicine Hub relatively early. Once sufficient data is on the Hub, ranges of use across the sector can be examined and targets for mg/kg and HP-CIA use (if appropriate) set. Additional targets covering numbers of calves treated and mortality will help to monitor patterns of use and impact on health and welfare, respectively.

Finally, these targets are based around standardised calculations which should be applied at individual farm level using farm level data. These are simplified models, and producer groups and other stakeholders may wish to take a more 'granular' approach to facilitate more accurate/ representative calculations where data sources allow (eg animal movement and tracing databases, animal weights).

[47]Example: Gorden & Plummer (2010). Control, Management, and Prevention of Bovine Respiratory Disease in Dairy Calves and Cows Vet Clin North Am Food Anim Pract. 2010 Jul; 26(2): 243-259

CALF DEFINITIONS AND MEASUREMENT METRICS

Calf rearers are defined as units that:

1. Rear dairy/dairy-cross-beef animals of either sex, typically feeding some milk or milk replacer in the early period before selling on to a growing/finishing unit at less than six months of age (or rearing them further themselves).

However, in the future it is also proposed that they will include farms that:

2. Rear female dairy animals on their own farm, or have them reared under contract by a third party on a different farm.

Due to seasonal variations in calf supply, all of the following metrics should be calculated on a 12-month basis for the purposes of benchmarking and reporting. Individual calf units may find it useful to calculate metrics per batch or per quarter for their own internal use. However, where possible, metrics will be calculated through the AHDB Medicine Hub and will use BCMS or future livestock movement databases to calculate animal populations over the assessment periods.

New youngstock sections were added to both the CHAWG dairy and CHAWG beef AMU metrics documents in 2020[31,32], covering youngstock up to six months of age. The overarching measure is:

$$\frac{\text{mg (total weight of antibiotic active ingredient used for calves <6 months of age)}}{\text{kg (average total liveweight of calves <6 months of age on the farm)}}$$

However additional metrics are recommended, for recording and monitoring on each farm to gauge progress, and for uploading to centralised data to provide a national indicator.

i) Key metric 1: Milligrams per kilogram liveweight used

The key metric for usage monitoring in calves is weight of antibiotic agent administered (measured in milligrams) per average kilogram of liveweight present on farm under six months of age. Where possible this should take into account the exact number of days that calves spend on farm, but if this is not possible then the number of calves leaving the six-month age bracket within year should be used. The calculation is:

$$\frac{\text{number of milligrams administered}}{\text{average weight of stock on farm}}$$

Where:

- number of milligrams administered is the total number of milligrams of antibiotic active ingredient administered in the time period. For combination products (eg trimethoprim + sulfonamides) the milligrams of individual ingredients must be added.
- average weight of stock on farm is either:

    • the average number of animals in the risk period, based on the number of days stock are on farm within the 0-6 month age category (preferred), multiplied by the average standardised weight

    OR

    • the number of animals leaving the 0-6 month age window (though sales, deaths or aging) within the year, multiplied by the average standardised weight.

Standardised weights are detailed in the CHAWG AMU Beef benchmarking document[32], but summarised below (Table 7) for animals under six months of age.

Table 7: Standardised weight for calves (Source: CHAWG)

	Dairy-sired female	Dairy-sired male	Beef-sired female	Beef-sired male
Standardised weight at ages <6 months	108 kg	118 kg	112 kg	122 kg

ii) Key Metric 2. Proportion of animals undergoing antibiotic treatment

In some units within the calf rearing sector metaphylactic use of antibiotics is commonplace, and may be used as a 'sticking plaster' instead of addressing underlying causes, such as poor sourcing or inadequate housing design/ventilation or nutrition. It is therefore of relevance to know what proportion of animals entering a rearing system receive one or more antibiotic treatments.

Equally, animals that have had one bout of respiratory disease are considered at much higher risk of recurrence and may receive multiple treatments. As the level of persistence with animals may vary between units, it is pertinent to be able to discriminate between units where antibiotic use is a result of small number of animals with repeated illness, and those where a larger number of animals are affected, but may be euthanised after one or two disease recurrences. The calculation is:

$$\frac{\text{number of animals leaving the 0-6 months window, receiving one or more antibiotic treatments within the timeframe}}{\text{number of animals entering the rearing system in the timeframe}}$$

iii) Key metric 3: Mortality incidence risk

Young animals are potentially more vulnerable to illness than older classes of stock. The industry must ensure that efforts to reduce antibiotic use do not result in treatment being omitted or delayed, and that animal welfare remains uncompromised. It is important that TTF2 targets set do not just capture usage of antibiotics but also some of the down-steam consequences that may capture any inappropriate reduction in antibiotic use.

There are likely to be some challenges to the youngstock industry in the coming years due to restructuring of the industry to prevent the early slaughter and euthanasia of calves. This is likely to see some less viable animals entering the supply chain, potentially challenging previous progress made in reducing calf mortality. The calculation is:

$$\frac{\text{number of animals that die within 0-6 months of age within the year}}{\text{number of animals leaving the 0-6 month age window (through sales, deaths or aging) within the year}}$$

Though the numerator or denominator may represent slightly different animals, this is a deliberate simplification and will give an accurate estimation of mortality risk in the vast majority of units. Again, for producer groups that want extremely accurate figures for benchmarking, a mortality rate (which accounts for exact number of days at risk) is recommended.

ADDITIONAL OBJECTIVES

In the calf rearing sector, calf respiratory disease is one of the most common diseases encountered. There are a large number of antibiotics licensed for the purposes of treating calf pneumonia, which include both short, medium and long-acting preparations, and ones of varying molecular weight.

Setting targets based solely on a mg/kg bodyweight basis may fail to capture progress in the industry away from longer acting preparations (in situations where shorter courses are more appropriate) and from low molecular weight EMA category C antibiotics[26], such as macrolides, to EMA category D, such as the tetracyclines. In these cases, it would be useful to establish a baseline for (modelled) days under antibiotic treatment (Defined Daily Dose$_{veterinary}$ or DDD$_{vet}$).

It is hoped that the AHDB Medicine Hub will have the capability to calculate DDDvet at a future date using population data from livestock movement databases, but in the meantime on-farm capture would be helpful for individual farms monitoring responsible use with their vets. An interim reduction target will be set if there is evidence that there is poor correlation between 'days under treatment' and DDD$_{vet}$. The calculation for DDD$_{vet}$ is:

$$\frac{\textit{kg of treatable weight}}{\textit{average weight of stock on farm}}$$

Treatable weight is determined by taking the product's mg/kg dose rate from the main datasheet indication, and calculating the total weight that would be treatable. For long-acting products, this weight is then multiplied by the number of days that the product is active for. Average weight of stock on farm is the average weight of animals present on the farm for the period under assessment, as described for the mg/kg liveweight calculation.

Further examples of antibiotic use metric calculations for the calf sector can be found in Annex 1 to this report on the Targets Task Force section of the RUMA website[48].

[48]RUMA Targets Task Force

vii) Additional detail on sheep

BACKGROUND

The vision of the Sheep Antibiotic Guardian Group (SAGG) is to develop an enhanced reputation for sheep health and welfare, with active veterinary involvement in flock health planning that enables farmers to realise their flock productivity potential while demonstrating responsible medicine stewardship. The aim is to safeguard animal welfare by using antibiotics only when necessary with a primary emphasis on flock-level preventative measures.

Similar to the cattle sectors, data largely remains lacking. However, several datasets from 2019 have been collated and made available from seven industry and veterinary practice groups comprising 960 sheep farms[49] (Table 8). The mean use for each of these datasets ranged from 2.26 mg/kg to 20.43 mg/kg and the median use for each group ranged from 1.07 mg/kg to 11.4 mg/kg. Levels of HP-CIA use were extremely low. Out of 401,414 total lambs sold from Group 3, 36.2% were treated with an antibiotic within the first seven days of life. Out of 23,414 lambs sold from Group 5 there were 44% that were treated with an oral antibiotic at birth.

Table 8: Data from seven industry/veterinary practice groups 2019 (960 farms) (Source: Misc)

GROUP	Number of flocks	Minimum use in mg/kg	Maximum use in mg/kg	Mean use in mg/kg	Median use in mg/kg	HP-CIA usage
Group 1 (UK)	135	0	18.52	3.40	3.12	0.0004 mg/kg
Group 2 (UK)	62	0	18.33	2.26	1.07	0.0002 mg/kg
Group 3 (UK)	332	0	N/A*	20.43	4.69	0.0049 mg/kg
Group 4 (England & Wales)	350	0	50.03	5.49	3.19	0.0040 mg/kg
Group 5 (England)	43	0.72	49.24	10.90	8.72	0
Group 6 (England)	26	2.48	60.48	16.80	11.40	0
Group 7 (England)	12	2.81	17.09	8.65	8.16	0

* Figure not made available

Due to challenges with wider data collection and the counterproductive impact of setting numerical targets without data[12], the sheep sector group – like the beef sector group – is not setting a numerical mg/kg target until a representative dataset has been established. Efforts will be directed into collating robust and validated data as quickly as possible so that trends can be monitored and mg/kg use examined as an indicator of progress.

'Plan ahead, Prevent disease, and Protect the flock' are principles used across all four of the hot-spot areas (including pneumonia this time) and details can be found in RUMA's Good Practice Guidelines[50]. For example, in the control of lameness, the advice is to follow the industry recognised Five-point plan for lameness control[51]– ie, to plan ahead and prevent an increase in disease challenge by avoiding the spread of infection, treating clinical cases quickly, quarantining to prevent incursion of CODD or other foot rot strains and culling persistently lame sheep; protect the flock by breeding in resilience and vaccinating where appropriate.

[49]With thanks to Evidence Group, Bishopton Vet Group, St Boniface Veterinary Clinic, Frame, Swift & Partners and others.

[50]RUMA & SHAWG. Industry guidance document for veterinary surgeons and farmers on responsible use of antibiotics in sheep v1, 30 June 2019

[51]Clements & Stoye (2014), The 'Five-Point Plan': a successful tool for reducing lameness in sheep. Vet Record, 2014. 175(9): p.225

MEASUREMENT METRICS

The core metric that all sheep enterprises should use to measure their antibiotic use was defined by the Sheep Health and Welfare Group in 2019, and can be found on the RUMA website[37]. It is the total mass of antibiotic per unit of sheep weight (mg/kg) and can be calculated as:

$$\frac{\text{mg total mass antibiotic}}{[20 \times \text{total numbers of lambs } (a+b)] + [75 \times \text{number of ewes } (c)] \text{ (kg)}^*}$$

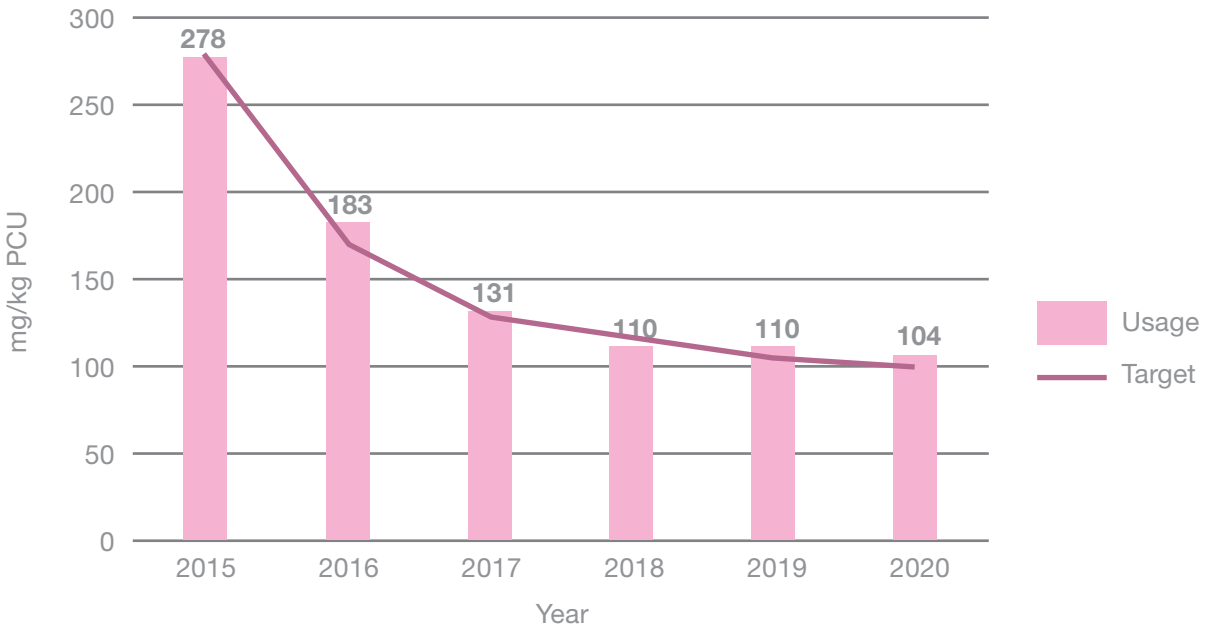
Total mass of antibiotic relates to the total amount used in the whole flock in the year where **a is the number of lambs that are finished from this flock in the year (note that this figure may include some lambs born in the previous year), **b** is the number of lambs sold (as stores or for breeding) or retained for breeding in that year (note that this figure does not include the lambs retained on farm as stores at the end of the year) and c is the number of adult ewes put to the ram in that year (not including ewe lambs).*

4. Pigs

i) Progress against 2020 targets

The original Targets Task Force pig group set out ambitious proposals to reduce antibiotic use in pigs by 64% by 2020, and subsequent hard work and collaboration between all stakeholders resulted in excellent progress. From the data captured annually via AHDB's e-Medicine Book (eMB)[52] accounting for approximately 95% of slaughter pigs, antibiotic usage dropped by 60%, from the 278 mg/kg PCU starting point in 2015 to 110 mg/kg PCU in 2018 and 2019, but with a provisional 2020 figure up to and including June 2020 of 104 mg/kg PCU. HP-CIA use has also fallen significantly since 2015 (Figure 9 and Table 9).

Figure 9: Antibiotic usage in the UK pig sector. (Source: eMB/AHDB)



**2020 is Q1 and Q2 data only*

Antibiotic use is declining in line with the targets set, except in 2019 when the target of 104 mg/kg PCU was missed by a small margin. Further analysis of the eMB data shows that this was due to increased use of tiamulin and lincosamides to treat swine dysentery cases affecting some pig farms during 2019[27] – a full breakdown of products used in 2019 is shown in Figure 10. Such specific use is responsible and protects the welfare of the pigs concerned.

The year to date figure published for 2020 demonstrates that sustained efforts from producers, vets and wider industry have maintained impetus in terms of responsible and reduced antibiotic usage.

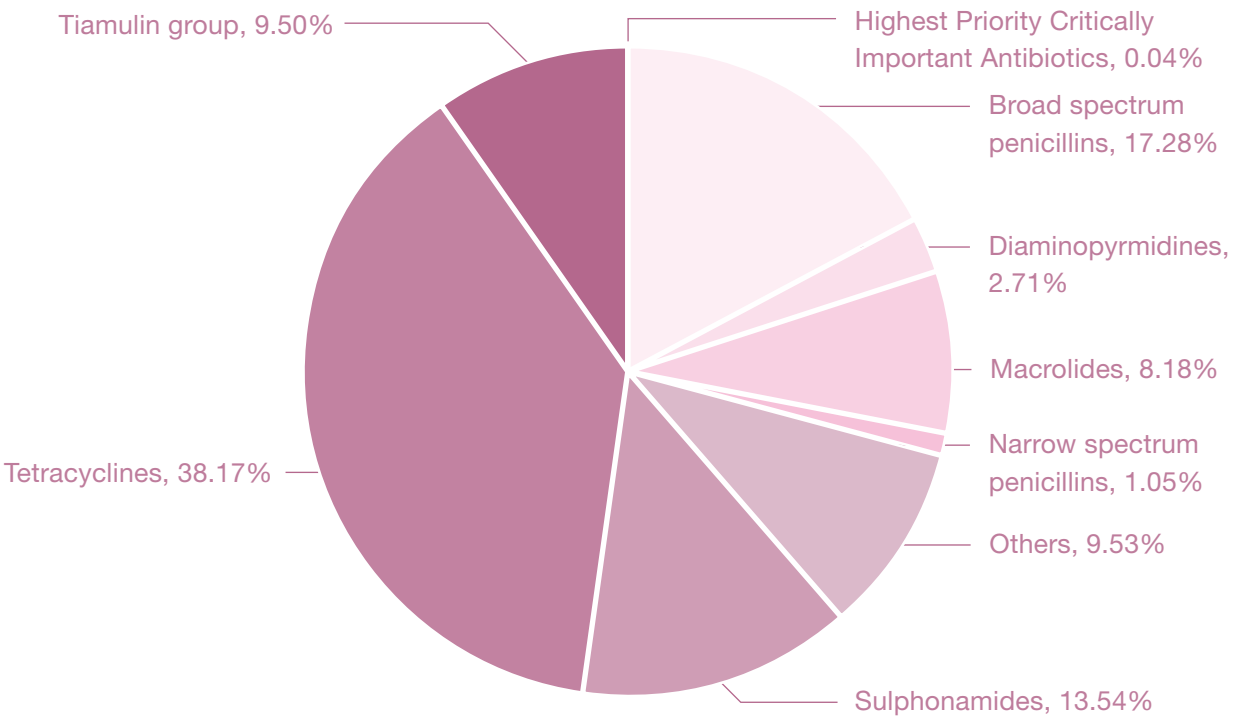
[52]AHDB, e-Medicine Book. https://emb-pigs.ahdb.org.uk/

Table 9: Summary of progress in the pig sector against 2020 targets

TARGET	Progress
Reduce antibiotic use to 99 mg/kg PCU	
Year 1 reduction target 35%: 2016 target 171 mg/kg PCU	2016: 183 mg/kg PCU
Year 2 reduction target 25%: 2017 target 128 mg/kg PCU	2017: 131 mg/kg PCU
Year 3 reduction target 10%: 2018 target 115.5 mg/kg PCU	2018: 110 mg/kg PCU
Year 4 reduction target 10%: 2019 target 104 mg/kg PCU	2019: 110 mg/kg PCU
Year 5 reduction target 5%: 2020 target 99 mg/kg PCU	2020: 104 mg/kg PCU *(this figure covers Q1 and Q2 only)*
Reduce use of HP-CIAs 2015 baseline of 1 mg/kg PCU. Use to not rise above:	Total use of HP-CIAs in 2019 was 0.04 mg/kg PCU:
0.1 mg/kg PCU for fluoroquinolones	0.03 mg/kg PCU for fluoroquinolones
0.015 mg/kg PCU for 3rd & 4th generation cephalosporins	0.01 mg/kg PCU for 3rd/4th generation cephalosporins
0.1 mg/kg PCU for colistin	0.002 mg/kg PCU for colistin[53]

The final review of the antibiotic reduction targets as part of TTF1 will be carried out in 2021 when pig producers have submitted their antibiotic usage data to eMB for the full four quarters of 2020.

Figure 10: Antibiotic usage in pigs recorded in eMB for 2019 by class. (Source: eMB/AHDB)



[53] National aggregated figures for antibiotic usage calculated from individual unit data held in the eMB, for 95% of the pig industry in the UK. Calculations used for the eMB data are in-line with the methods used by the European Surveillance of Veterinary Antimicrobial Consumption (ESVAC) project. Data capture and calculation courtesy of AHDB

ii) Approach to 2024 targets

BACKGROUND

Significant progress in reducing and stewarding antibiotic use has been achieved despite the challenges faced by the sector which were documented in the 2017 Targets Task Force report[2], some of which are still relevant today. Many of these challenges require systematic changes which take time, require investment and can be complex; the improvements in antibiotic usage attained by industry should be considered in the context of these difficulties.

The focus on responsible use has remained a priority as the Pig Health and Welfare Council's Antimicrobial Usage sub-group (PHWC AMU) formulates the second phase of antibiotic reduction targets. The group remains mindful that disease outbreaks can have a dramatic effect on antibiotic usage, which is more visible as we approach lower levels of use. The sector will also face other challenges with regulatory change through the next phase of targets creating significant uncertainty. The changes have been carefully considered and discussed with industry and VMD to formulate the proposals for phase 2 of the pig sector antibiotic reduction targets.

MEASUREMENT METRICS

The metric the pig sector uses is the milligram per kilogram per population correction unit or mg/kg PCU – this can be considered as the average quantity of active ingredient sold per kilogram bodyweight of food-producing animal in the UK based on an estimated weight[54].

iii) Pig sector targets for 2024

The PHWC AMU sub-group has again set ambitious targets in the face of the significant challenges highlighted. In addition, there are legislative changes proposed at an EU level involving the Veterinary Medicines Regulations and Medicated Feeds Regulations which propose:

- A ban on group prophylactic use of antibiotics
- Tighter controls on antibiotic 'carryover' in feed mill operations
- Prescription and treatment timelines for medicated feed

A ban on use of therapeutic zinc oxide in piglet diets is also expected to come into force in 2022. There remains substantive uncertainty regarding the impacts of this legislation, notwithstanding the significant uncertainties regarding the implementation of regulations post-EU exit. The following proposals are based on assumptions that legislation very similar to the EU legislation will be introduced into UK law but even so, interpretation and implementation of the law could have significant effects on how veterinary medicines can be prescribed.

[54]As defined in the annual VARSS report published by the Veterinary Medicines Directorate; also at https://www.ruma.org.uk/measuring-antibiotic-use/

Target 1: Persistently High Users (PHUs)

TARGET	Details
Identify and support PHUs in achieving reductions in use	Implement a programme to support and encourage PHUs to undertake efforts to reduce antibiotic usage as detailed in a unit specific Antibiotic Reduction Plan agreed by producer and vet

Persistently High Users over a rolling four quarters will be identified using eMB data and they will be supported and encouraged to make responsible reductions to their antibiotic use. The ultimate aim is to reduce the number of producers using significantly higher levels than the national average.

INNOVATION IN THE PIG SECTOR: SUPPORTING REDUCTIONS IN PERSISTENTLY HIGH USERS (PHUs)

A new development in the 2021-2024 targets is supporting reductions among Persistent High Users (PHUs).

PHUs will be defined as the top 5% of antibiotic users in each of the main categories of production recorded by eMB, except Boar Studs and Gilt Units. The top 5% in each category will be calculated using the last four quarters' rolling data. The 'top 5%' cut-off value will be calculated by totalling all antibiotic use from the last 12 months/ 4 quarters divided by the total PCU for that category.

The PHWC AMU sub-group acknowledges that the definition for a PHU in the pig sector will require regular review to ensure it is appropriate and commits to carry out the first review within two years of the target being set, in 2022.

The top 10% of users in each category will be advised that they are at risk of being categorised as a PHU within the eMB system. Once identified, a PHU may require further support in order to achieve reductions in antibiotic usage; the PHWC AMU sub-group has developed a template and guidance to support an Antibiotic Reduction Plan which will help the producer and their vet outline key issues and actions which will facilitate antibiotic reduction on the unit. Potential support mechanisms from Government, such as the Animal Health and Welfare Pathway, may provide opportunities for producers to make improvements which could bring about reduced antibiotic usage but it is recognised these funding streams are in progress and are not currently available.

In December 2020 the Red Tractor farm assurance scheme is consulting on a proposed new requirement in the Red Tractor Pig Standards that assured farms identified as being PHUs must develop and implement an Antibiotic Reduction Plan. The new requirement, if approved, will be implemented from October 2021.

Target 2: Monitoring pig health

TARGET	Details
Monitor pig health metrics	Monitor the effect of reduced antibiotic use on pig health by encouraging use of reliable data sources such as the AHDB Pig Health Scheme

The primary focus of this target is to monitor the effects of reduced antibiotic usage but this will also serve as an alert for disease control and quickly identify any negative consequences from antibiotic reduction on animal health and welfare. The aspiration to reduce antibiotic use must not be at the ultimate expense of pig health and welfare.

Target 3: Weaner management plan

TARGET	Details
Develop a best-practice plan for weaner management	Co-ordinated support to review weaner management on pig units and develop best-practice guidelines in the face of the pending ban on use of therapeutic zinc oxide in 2022

Addressing weaner management is a key focus, particularly against the backdrop of a likely ban on therapeutic zinc oxide due to come into force in 2022. Key industry stakeholders including AHDB, vets and producers need to work collectively to formulate a plan.

It is recognised that the risk factors for post-weaning diarrhoea may vary significantly from farm to farm and will therefore require a unit-specific review of weaner management, but this will require co-ordinated support. The overall aim is to prevent the removal of zinc oxide becoming a significant driver for increased antibiotic use in the pig sector. The availability of future Government grants or funding opportunities across the four nations may be able to help producers to better support piglet health at weaning when they become available.

Target 4: Targeted delivery of veterinary medicines

TARGET	Details
Encourage the move from in-feed to in-water administration of antibiotics	In-water administration of antibiotics allows for more accurate targeting and thus more responsible use. Changing to in-water from in-feed medication requires significant infrastructure and/or management changes, so Government sponsorship of these changes would enable and speed up change

The availability of future grant funding, via post-Brexit health and welfare strategies in each nation (eg Defra's Animal Health and Welfare Pathway), is pivotal to seeing through infrastructure and management changes affecting the way in which medicines are delivered. The aim is to enable more producers to make the step from medicating in feed to medicating in water, which improves the ability to target treatments more accurately.

A caveat is that the mode of medicine administration is dependent upon the veterinary surgeon's clinical decision about the appropriate treatment and delivery method for the pigs and disease presentation at the time. The move to utilise in-water medication is complicated by wet-fed systems which are operated by about 30% of producers. Medicating via a wet-fed system poses many challenges, so the scope for broad uptake is limited.

Target 5: Submission of antibiotic usage data

TARGET	Details
Submission of data to eMB by the quarterly deadlines	Maintain / increase the submission of accurate antibiotic usage data via the eMB as per the outlined timetable of deadlines for all pig producers, including non-assured units

The timeliness of accurate antibiotic usage data has improved since the eMB was developed but there will be a continued drive to encourage the timely submission of data by the 95% of pig producers that currently contribute data. Non-assured producers who do not currently submit usage data will be further encouraged to contribute their data to eMB.

TARGET	Details
Evaluate current veterinary medicines training for pig producers; increase uptake of training courses	A review of current training opportunities will identify gaps; opportunities will be identified to develop new resources and to encourage increased uptake of training in responsible antibiotic use and understanding of AMR across the pig sector

A range of training materials will be required to address varying requirements from different stakeholders, which may relate to their level of responsibility and engagement with veterinary medicines. The PHWC AMU sub-group acknowledges that a review of the current available training will support the call for any further materials required. In December 2020 Red Tractor will consult on a proposed new standard requiring at least one person responsible for overseeing medicine use on the unit to undertake training in the responsible use of medicines. The new requirement, if approved, will be implemented from October 2021.

In making these proposals for antibiotic use in the pig sector, the PHWC AMU sub-group recognises that pig health and welfare are the most important considerations and must not be sacrificed for the purposes of meeting arbitrary usage targets.

iv) Indicators of progress against 2024 targets

Indicator of progress 1: Overall antibiotic use

INDICATOR	Details
Antibiotic reduction using eMB data	30% reduction in total antibiotic use by 2024, 2020 baseline (once confirmed)

The annual publication of the eMB data by AHDB will be used to monitor progress against this target and the direction of travel before the endpoint in 2024. The total antibiotic reduction figure for 2020-2024 will be calculated when the final 2020 figure is published by AHDB. For example, if the final antibiotic usage for 2020 is 104 mg/kg PCU then a 30% reduction would result in an antibiotic usage target of 73 mg/kg PCU by 2024; this equates to an overall reduction of 74% from the 2015 baseline. The reduction target is an average figure for the sector and is not a farm level target.

Indicator of progress 2: HP-CIA use

INDICATOR	Details
HP-CIA use using eMB data	HP-CIA use to be equal to or below 2020 baselines (once confirmed), 2021-2024

The annual publication of the eMB data by AHDB will be used to monitor the progress of this target.

Indicator of progress 3: AMR data

INDICATOR	Details
Monitor published antibiotic resistance data	Continue to monitor AMR relevant to the pig sector via VARSS, FSA and other reliable data sources; aim that levels do not rise above 2020 baselines (once confirmed) and, if possible, reduce

It is recognised that antibiotic resistance and the One Health agenda are key considerations when discussing antibiotic reduction and responsible use principles. Therefore, the continued monitoring of published antibiotic resistance data is important to ensure that appropriate action is taken if it is necessary to do so.

5. Salmon

i) Progress against 2020 targets

In 2019, the Scottish salmon farming sector continued to build on the progress achieved since the start of the TTF initiative (Table 10).

Preventative health management, including the widescale use of vaccines against key bacterial pathogens, has been critical in supporting the sector's continued low usage of antibiotics. Indeed, many of the targets set at the start of TTF1 focus on, or have defined links to, core principles of preventative health management. The sector has been successful in meeting all of these targets, with antibiotics only ever used for therapeutic treatments, in response to the clinical presentation of bacterial infection, which means that many farms and a significant number of salmon are not treated with antibiotics.

2019 was a challenging year for salmon farming and for fish health management, in particular. There were difficult environmental conditions, with increased water temperatures and occurrences of harmful algal and jellyfish blooms. Furthermore, the sector experienced a small number of isolated bacterial infections for which there are currently no vaccines. However, it should be noted that vaccine development to address these challenges is under way.

The sector continues to use relatively low quantities of antibiotics when assessed against national livestock targets. None of the infections treated in salmon involved bacteria known to be human pathogens, which is significant when considering AMR risk. Overall, however, antibiotic use increased in 2019 compared with 2018, with 2,759kg of antibiotic used by the sector. This equated to 13.5 mg/kg of production, higher than the ambitious target initially established for salmon.

It is important to highlight that significant differences occur in required dosing for the various available antibiotics and that most antibiotics used in 2019 were either oxytetracycline hydrochloride (75.5%) or florfenicol (24.3%), both of which require higher dosing rates, with minimal use of oxolinic acid (0.2%) at a lower dose rate. Due to reclassification in 2020, oxolinic acid will be on the HP-CIA list for the TTF2 targets; prescribing decisions taken in 2019 were made before this change but regardless, its use is very limited and only within guidelines agreed by the Scottish Salmon Producers' Organisation Prescribing Vets group..

Table 10: Summary of progress in the salmon sector against 2020 targets

TARGET	Progress
Overall antibiotic usage maximum of 5 mg/kg	2017: total use 16.1 mg/kg
	2018: total use 6.5 mg/kg
	2019: total use 13.5 mg/kg
	2020: data due in 2021
All Atlantic salmon to be vaccinated against relevant bacterial pathogens before the seawater production phase	100% of salmon vaccinated prior to seawater transfer
Autogenous vaccines to be developed and used where necessary in species new to aquaculture (eg cleaner fish) and in the face of emerging bacterial diseases	Cleaner fish are a key component of sea lice management. Autogenous vaccines used where no authorised vaccine is available.
No HP-CIAs to be used routinely in any farmed fish species, and only following sensitivity testing	No HP-CIAs used in 2019 Sensitivity testing remains standard practice
Compliance with the Code of Good Practice for Scottish Finfish Aquaculture	100% produced in compliance with the CoGP
Information on the use of all antibiotics to be collated and reported	Throughout the TTF initiative (2017-2019), data collected and reported for 100% of the salmon produced in Scotland

ii) Approach to 2024 targets

There are a number of factors that contextualise the already low but fluctuating levels of antibiotics used by the sector and the continued challenges in meeting the ambitious use target.

The sector has previously documented the impact of a bi-phasic production cycle for salmon on antibiotic use, and specifically the differences in relative use of antibiotics during the freshwater and marine phases of production. Production biomasses are much higher during the marine phase and therefore overall use figures can be skewed by a small number of treatments. It is important to state that antibiotic treatments are still relatively infrequent in the salmon farming sector and are only ever used in response to the clinical presentation of bacterial infection.

Salmon farmers take a holistic approach to health management. This is critical as health professionals and veterinary surgeons know from considerable experience that health challenges are commonly interlinked. Challenges to fish health, however they arise, can have implications for a fish's susceptibility to a host of pathogens, not least bacterial infections.

Salmon are farmed in the natural, wild lochs around Scotland. They are highly sensitive to environmental changes. As ectotherms (cold-blooded), the development and physiology of salmon, like many of the pathogens that can affect them, is strongly influenced by water temperature. Furthermore, variations in the quality and composition of the water, including the presence of potentially harmful organisms in the water (algae, plankton, jellyfish) can compromise fish health. Salmon farmers and health professions must remain vigilant to changing environmental conditions.

Into the future, we expect that environmental conditions and emerging bacterial challenges will continue to place pressure on fish health management and the need for antibiotic prescriptions by fish veterinary surgeons. The sector will continue to work to overcome these challenges, through the development of new and efficacious vaccines, but also through collaborative working, sharing experiences, and through a holistic and preventative approach to fish health.

In the meantime, use of antibiotics remains wholly in response to clinical presentation of a bacterial infection. There is no preventive use of antibiotics in Scottish salmon farming.

Further detail of the Scottish salmon farming sector can be found in Annex 2 to this report on the Targets Task Force section of the RUMA website[55].

INNOVATION IN THE SALMON SECTOR: THE PRESCRIBING VETS GROUP

Early in the TTF1 initiative the sector undertook a pivotal activity to support antibiotic stewardship, by forming the Scottish Salmon Producers Producers Organisation (SSPO) Prescribing Vets group.

Although the group sits within an SSPO grouping, it is autonomous, with a highly respected veterinary surgeon, Prof. Randolph Richards CBE, MA, VetMB, PhD, CBiol, FSB, FRSM, MRCVS, FRAGS, FRSE, acting as its independent chairman. SSPO provides secretariat functions only.

Currently the group comprises the head / lead veterinary surgeon from each practice that supports the sector. It therefore covers 100% of the salmon farmed in Scotland. These veterinary surgeons bring with them a wealth of experience and knowledge. All are members of the Fish Veterinary Society. Furthermore, members of the group have held or currently hold key positions within professional and other relevant national bodies including FVS, BVA, SSPCA and VPC.

The group is the main route through which antibiotic use data is collated, through which progress against the various TTF targets is assessed and, importantly, where fish health and antibiotic stewardship is discussed.

The value of this group to driving forward improvements in fish health management and in antibiotic stewardship within the salmon farming sector cannot be overstated.

[55]RUMA Targets Task Force

iii) Salmon sector targets for 2024

Target 1: HP-CIA use

TARGET	Details
HP-CIAs only prescribed following sensitivity testing which indicates no other treatment option is effective	Three antibiotics are authorised for use within the UK salmon sector: Oxytetracycline hydrochloride, florfenicol and amoxicillin trihydrate. None of these are classified as HP-CIAs Sensitivity testing has been and will remain standard practice by the Scottish salmon farming sector

Overall, the vast majority of antibiotics prescribed by veterinary surgeons are either oxytetracycline or florfenicol. These make up around 99% of all antibiotics. Oxolinic acid has previously been used in small quantities (<1% of antibiotics used) through the prescribing cascade and in January 2020 it was reclassified by the EMA as an HP-CIA[26]. It is only used where absolutely necessary and is mainly used to treat broodstock fish that are not destined for the food chain. Sensitivity testing is the norm prior to antibiotic treatment and this practice will continue, including whenever oxolinic acid is used. Overall, veterinary surgeons report high efficacy when antibiotics are used and sensitivity testing to date does not demonstrate a significant concern over the development of pathogen resistance in the species being targeted. It is also noteworthy that these pathogens are not bacteria of concern for human health and, to our knowledge, there are no records evidencing resistance transfer to human pathogens.

Target 2: Vaccination

TARGET	Details
All Atlantic salmon will be vaccinated against relevant bacterial pathogens before the seawater production phase	Vaccination rates will form part of the sector's annual TTF update report

Vaccination is a pivotal aspect of the sector's approach to preventative fish health management. Fish respond extremely well to vaccines, and this has resulted in a significant reduction in the need for antibiotic treatments. Fish are routinely vaccinated against key bacterial (and viral) challenges prior to seawater transfer. The sector will continue with this practice and will report on vaccination rates in each annual update report.

Target 3: Autogenous vaccine use

TARGET	Details
In the absence of appropriate licensed vaccines, autogenous vaccines to be developed and used wherever possible, in the face of emerging bacterial diseases	Autogenous vaccines have been shown to be highly effective at protecting fish health and welfare, so while necessary development is undertaken to establish commercial vaccines, the sector will use autogenous vaccines wherever possible and appropriate

Commercially available licensed vaccines provide protection against key bacterial challenges. However new and emerging bacterial diseases can present a health and welfare challenge for fish. With vaccines the preferred approach for managing fish health, and while necessary development is undertaken to establish commercial vaccines, the sector will use autogenous vaccines wherever possible. With fish highly responsive to vaccine technology, autogenous vaccines have been shown to be highly effective at protecting fish health and welfare.

Target 4: Quarterly meetings of SSPO Prescribing Vets group

TARGET	Details
The SSPO Prescribing Vets group to meet at regular (minimum) quarterly intervals, with antibiotic stewardship maintained as a rolling agenda item	The group will continue to meet throughout TTF2 and will maintain a rolling focus on antibiotic stewardship. Furthermore, it is envisaged that during TTF2 it will take a more prominent role in representing the veterinary views of the sector in relevant political and regulatory fora

The impact of the SSPO Prescribing Vets group has been considerable. The group includes veterinary representation covering all salmon farmed in Scotland and is the main route through which antibiotic use data is collated, progress against TTF targets is assessed and fish health and antibiotic stewardship are discussed (see 'Innovation in the salmon sector').

Target 5: Compliance with the Code of Good Practice

TARGET	Details
All producers compliant with the Code of Good Practice for Scottish Finfish Aquaculture	CoGP is accepted as the norm for all Scottish finfish producers

The Code of Good Practice for Scottish Finfish Aquaculture (CoGP)[56] is an independently audited scheme that was established in 2006. It seeks to ensure a high standard of practice amongst all salmon farmers, elevating minimal standards significantly above any legal baselines. The Code was the first of its kind amongst salmon farming nations and it is seen as globally leading. It does not seek to compete with third-party assurance schemes, but instead seeks to complement those schemes, with many retailers viewing compliance with the Code as mandatory before any other third party schemes are considered. It is also a mechanism to help drive and support legislative change, with new regulations often drawing from the provisions already set out within the Code. It is updated in line with relevant changes to current farming practice and in response to the latest scientific research.

The CoGP was developed around the core pillars of fish health and biosecurity. For example, a requirement for detailed biosecurity and health and welfare plans sit (ie no commas and swap around biosecurity and H&W) at the heart of the Code, with guidance provided on how those documents should be developed and maintained. With health and biosecurity key aspects of the Code, its relevance to antibiotic stewardship is unequivocal. The salmon farming sector remains committed to the Code and to its core principles and will remain compliant across all salmon farms.

Target 6: Collection and collation of data

TARGET	Details
Information on the use of all antibiotics to be gathered and collated by SSPO and made available for publication by VMD and RUMA	The SSPO Prescribing Vets group will continue to be the main mechanism by which antibiotic use data is collated and transferred to relevant organisations (VMD, RUMA). It will also continue to support the sector's overall contribution to the annual report of progress against these TTF2 targets. The salmon farming sector is committed to publishing antibiotic use data covering 100% of the salmon farmed in Scotland

[56]Code of Good Practice for Scottish Finfish Aquaculture (CoGP). http://thecodeofgoodpractice.co.uk/

The Scottish Salmon Producers' Organisation (SSPO) has committed to these specific targets for antibiotic stewardship at a farm level. Indicators have been identified to aid annual assessment of performance against the key stewardship targets.

iv) Indictors of progress against 2024 targets

Indicator of progress 1: Antibiotic usage

INDICATOR	Details
Antibiotic use in salmon to be maximum of 5 mg/kg[57]	This metric remains the same as within TTF1 and it is important to state that it is highly ambitious. It is significantly lower than nationally determined livestock targets and while it was difficult for the sector to realise this target within TTF1, it is maintained in TTF2

Within the salmon sector, antibiotics are only ever used to treat fish in response to the clinical presentation of a bacterial infection. There is no prophylactic use of antibiotics and any use is supported by appropriate sensitivity testing. Overall, antibiotics are used on a relatively small percentage of farms.

Indicator of progress 2: Development of new metric

INDICATOR	Details
Develop a metric to assess % fish treated	To demonstrate responsible use by the sector, our annual update reports will include an assessment of the percentage of fish treated with antibiotics

Further detail of the Scottish salmon farming sector can be found in Annex 2 to this report on the Targets Task Force section of the RUMA website[48]*.*

[57]mg/kg is calculated based on the overall production output of salmon for each calendar year. This information is published by Marine Scotland in their Annual Production Survey of Scottish Fish Farms. Due to the timing of publication of the Marine Scotland Survey, and that of the RUMA TTF annual report, it may be necessary to use estimated production figures based on the previous year's Production Survey. Where this is the case, corrected mg/kg figures will be provided using the published production output figures in the following year's TTF report.

6. Trout

i) Progress against 2020 targets

The trout sector has made solid progress towards achieving its 2020 targets over the past three years in terms of both data captured and quantity of antibiotics used. As a result, all targets have been achieved (Table 11) and proportional use of different antibiotics remains relatively stable but with some changes from oxolinic acid towards oxytetracycline (Table 12).

In addition to this, it can be confirmed that there has been no preventative use of antibiotics during this period; use of antibiotics has been only when disease has been clinically diagnosed. As a result, a large proportion of farms use no antibiotics in any one year.

Table 11: Summary of progress in the trout sector against 2020 targets

TARGET	Details
Information on the use of all antibiotics to be gathered and collated	90% industry data collected (50% in 2016 base year)
Achieve 20 mg/kg overall use by 2020	2016 (base year): estimate total use 20-40 mg/kg
	2017: total use 19.8 mg/kg
	2018: total use 12.8 mg/kg
	2019: total use 9.8 mg/kg Note – no antibiotics were used preventatively
No HP-CIAs to be used routinely in any farmed fish species, and only following sensitivity testing which shows no other treatment option	No HP-CIAs (as categorised pre-January 2020) were used in 2019
All sea-grown Rainbow Trout to be vaccinated against relevant bacteria pathogens before transfer to marine sites	All fish vaccinated
Use of appropriate vaccines to be promoted in freshwater trout farms	All fish vaccinated as required, subject to vaccine availability
Compliance with the Code of Good Practice (CoGP) for Scottish Finfish	All farms complied with the CoGP; no antibiotics are used routinely but only for treatment as part of good welfare under veterinary direction.

Table 12: Active ingredient (mg/kg) of antibiotics used on a sample of trout farms 2017–2019

	Active ingredient in mg/kg (%)			Change
Antibiotic	**2017**	**2018**	**2019**	**2017–2019**
Oxytetracycline	7.6 (38)	3.8 (30)	5.2 (53)	-2.5
Oxolinic acid	7.0 (35)	5.7 (45)	2.5 (25)	-4.5
Florfenicol	4.4 (22)	2.2 (17)	1.9 (20)	-2.5
Amoxicillin	0.8 (4)	1.1 (17)	0.2 (2)	-0.5
Total	**19.8**	**12.8**	**9.8**	**-10.0**

ii) Approach to 2024 targets

Trout farming has changed significantly over the past 20 years with the market size of fish increasing to 350-650g portion size and a large proportion of 3kg fish now sold. The overall tonnage produced has not increased significantly during this period, so this shift has resulted in a reduction of the overall number of individual fish farmed. This in turn has reduced stocking levels and improved the health status across the sector.

Throughout UK trout farming there has been widespread use of available vaccines, although the small size of the sector has meant that these remain few, and some important ones have been lost. The sector is now working towards increased use of autogenous vaccines. The small size of the sector has also led to little or no development of new antibiotics, and one primary quinolone, oxolinic acid, has been and remains important. It is the most useful antibiotic for treatment of bacterial septicaemias like furunculosis and Enteric Redmouth (ERM), and is only prescribed where disease has already been clinically diagnosed. However, changes to the EMA's guidance on antibiotics for use in food-producing animals, published in January 2020, means oxolinic acid is now in category B, making it an HP-CIA[26].

While the elevation of oxolinic acid to category B indicates that it should only ever be used as a last resort, there are few other options to treat furunculosis and ERM in particular. The most likely alternative is oxytetracycline, but this can produce a poorer clinical response and therefore cost in terms of animal welfare terms. Where substitution of oxolinic acid with oxytetracycline is clinically viable, it should be noted that oxytetracycline dosages are eight times higher than oxolinic acid, hence this would increase the overall amount of antibiotic used. However, it is anticipated that many vets addressing an outbreak of furunculosis or ERM may deem it clinically necessary to continue prescribing oxolinic acid where fish health and welfare is at risk and there are concerns over the efficacy of oxytetracycline.

INNOVATION IN THE TROUT SECTOR: BUG BANKS

There has been no growth of resistance problems associated with use of oxolinic acid (OA) over the 30+ years of its use. However, to monitor the situation, as OA is a very important drug for animal welfare purposes, the trout sector is setting up The Bug Bank, a unique and innovative monitoring scheme to look at isolates from all over the country on a rolling basis.

The project will be looking at sensitivity profiles, majoring on the four antibiotics used to treat fish in the UK (oxolinic acid, florfenicol, oxytetracycline and amoxycillin) plus any others of general interest. The Defra laboratory at Cefas in Weymouth will be involved, carrying out minimum inhibitory concentration (MIC) determinations – considered the 'gold standard' for determining the susceptibility of organisms to antimicrobials – to support and further inform studies which already extend back to 1960. As an observation there is more sensitivity in recent years than in samples collected from 1960-1999, and no resistance to oxolinic acid in particular has been identified in isolates tested.

A spin-off of this study is planned, to enable the building of a 'bug bank' which may be used to detect common pathogen types across different farms and support the manufacture of autogenous vaccines.

Target 1: Antibiotic stewardship

TARGET	Details
Continue to improve stewardship of all antibiotics	No HP-CIAs to be used routinely, and use, where required, to meet the EMA's guidance on Category B antibiotics
	Surveillance of pathogens undertaken through Defra/Cefas (bug bank) initiative to monitor for susceptibility and resistance
	Continue to deliver no preventative use of antibiotics

Target 2: Vaccine uptake

TARGET	Details
Maintain or improve vaccine uptake	Current routine use of vaccines in the majority of freshwater production to be further increased. All sea-grown Rainbow Trout to be vaccinated against relevant bacteria pathogens before transfer to marine sites
	Development and use of autogenous vaccines to be facilitated through Defra/Cefas 'bug bank' initiative

Target 3: Compliance with the Code of Good Practice

TARGET	Details
Continue to promote best practice	All members to be compliant with the Code of Good Practice (CoGP) for Scottish Finfish[57] and Quality Trout UK[58]

Overall, antibiotics will continue to be used in a responsible manner when they are required, balancing a desire to reduce overall use against the need to protect fish health and welfare.

Vaccines are already routinely used by all farms which have ERM on-site. Furunculosis vaccines are only viable by using bivalent vaccines licensed for salmon and including pathogens which are not a problem on trout farms. No dip (method of administration) furunculosis vaccines exist to protect fry and the past three years have all seen ERM vaccine supply issues. It may be possible to minimise their impact by use of autogenous vaccines.

Indicator of progress 1: Antibiotic usage

INDICATOR	Details
Maintain usage below 20 mg/kg	Through capturing 90% or more of usage data across the UK sector, sustain usage levels at less than 20 mg/kg overall 2021-2024

Indicator of progress 2: New metric

INDICATOR	Details
Develop a metric for the numbers of fish requiring antibiotic treatment in a cycle	Explore the development of a metric capturing the % of fish requiring antibiotic treatment in a production cycle

[58]Quality Trout UK http://www.qualitytrout.co.uk/

Given these issues with vaccine supply and the re-categorisation of oxolinic acid, the trout sector is aiming to maintain maximum antibiotic use at 20 mg/kg – this will be the indicator of progress for the sector through the next three years. However, it is hoped that ongoing projects aimed at improving knowledge, vaccine supply and stewardship of antibiotic use will support the continued use of oxolinic acid when clinically necessary under the EMA guidelines.

Furthermore, to underline a continuing commitment to no preventative use of antibiotics in the sector, this will be included as a specified target, along with the ambition to develop a further metric capturing the percentage of fish treated in any one production cycle.

7. Gamebirds

i) Progress against 2020 targets

The gamebird sector remains fully committed to sustainable antibiotic reduction and first met its reduction target for the TTF1 period (2016-2020) two years early. Like other livestock sectors, however, it has learned the importance of balancing antibiotic reduction with animal welfare needs. This has resulted in a more comprehensive set of targets for TTF2 (2021-2024) which focus on finding safe ways to reduce the need to treat using antibiotics, as well as ensuring that when they do have to be used, antibiotics are used correctly.

Antibiotic use has previously been high in the sector, principally due to gamebirds being reared outdoors where they come into contact with infectious diseases such as hexamita, especially in wet weather. Historically such diseases were prevented by the use of dimetridazole (eg Emtryl) until this product was removed from use in food producing animals in the 1990s, when antibiotics began to be used instead.

Responding to the O'Neill Report in 2016, the UK gamebird sector, led by the Game Farmers' Association (GFA), set itself an ambitious target to reduce antibiotic use by 50% by 2020 – and achieved this two years early in 2018. Its success came largely through teamwork across the sector, playing to the strength of the relatively few gamebird veterinary practices who between them handle most gamebirds reared in the UK and all of whom fully embraced the campaign.

There has been a focus on correct prescribing, particularly outside this group, and a strong emphasis on communication to frontline gamebird rearers. This had been led through the publication each spring of a *Joint Communication*[59], highlighting sub-targets and challenges for the year in question. Comprehensive annual collection of antibiotic usage data, administered by the GFA and overseen by the VMD, has been a key element of the sector's campaign and enabled careful monitoring of progress against the TTF1 target.

Further analysis of these headline results reveals that most of the reductions have come from decreasing the incorporation of antibiotics in compound gamebird feeds, some of which had previously been used prophylactically.

Soluble antibiotics have not seen the same reductions, as they have been used as a targeted treatment in preference to in-feed medication. Indeed, there was a slight increase in soluble product use in 2019 resulting from a combination of wet weather and widespread mycoplasma infection. Met Office data shows that the months of June, July and August 2019 were the seventh-wettest since 1910, with rainfall in some counties 179% above average. These months exactly coincided with the period during which gamebirds must be released and the rain led to ideal conditions for gamebird diseases which had to be treated, mainly with soluble antibiotics. The sector currently has no easy options for treating serious outbreaks of mycoplasmosis and fluoroquinolones had to be used in some cases, raising HP-CIA usage back above 2018 levels, but still below the 2016 baseline (Table 13).

[59]Game Farmers Association. Antibiotic Use in Gamebirds Must Fall Further. 22 April 2020

Table 13: Summary of progress in the gamebird sector against 2020 targets

TARGET	Progress
Halve total tonnes of antibiotics (50% reduction)	2016 (baseline year): total usage 20.2 tonnes
	2017: total usage 13.0 tonnes (36% reduction on baseline)
	2018: total usage 9.7 tonnes (52% reduction on baseline)
	2019: total usage 10.4 tonnes (49% reduction on baseline)
	Result: Target achieved in 2018. 2020 results awaited in 2021
Reduce HP-CIAs by 25%	2016 (baseline year): total usage 64.6 kg
	2017: total usage 50.0 kg (23% reduction on baseline)
	2018: total usage 47.0 kg (27% reduction on baseline)
	2019: total usage 58.0 kg (10% reduction on baseline)
	Result: Target achieved in 2018. 2020 results awaited in 2021

ii) Approach to 2024 targets

Like several other sectors, the gamebird sector began to find, towards the end of the TTF1 period, that there was a need to temper enthusiasm for reducing antibiotic use with the reality of gamebird welfare and the need to treat diseases influenced by the weather and for which medicines other than antibiotics are not available. This experience has informed the way the sector has gone about setting its TTF2 targets.

There are no agreed Population Correction Units (PCUs) for pheasants and partridges and so, with VMD approval, the sector has always set its numerical targets not in terms of mg/PCU but in terms of desired percentage reductions from the total UK gamebird antibiotic use in a designated base year. For TTF2, the base year will be 2019, in which total antibiotic use in the UK gamebird sector was 10.4 tonnes of active ingredient.

The sector is aware that its ambitious 40% reduction target will not be achieved just by making sure all antibiotics are being correctly prescribed. It also requires more focus on reducing the need to prescribe and that will come from better understanding and better husbandry. Hence there are a number of new targets covering those areas.

INNOVATION IN THE GAMEBIRD SECTOR: JOINT COMMUNICATION ACROSS THE SECTOR

In 2016, a voluntary exercise was carried out to measure antibiotic use throughout the UK gamebird sector. Co-ordinated by the Game Farmers' Association, it involved all known specialist gamebird vets and game feed producers, and collated data on prescribing and in-feed medication records to calculate a national total of antibiotic used. This measuring exercise, devised and agreed in consultation with the VMD, also sparked the idea of an annual consultation.

The next year duly saw this approach evolve, with wider parts of the gamebird sector invited to develop and agree a joint approach across the whole industry to steward antibiotic use. The following year, the Royal College of Veterinary Surgeons added its name to a communication clarifying prescribing practices/ animals under their care definitions.

Now approaching its fifth year in February 2021, the annual meeting is carefully timed to precede the busiest time of year for gamebird rearing. It involves representatives from the game rearing and shooting parts of the sector, game feed, veterinary specialists and RUMA, and discusses research into disease, quality assurance standards, training, better management of medicated feed, prescribing and other best practice. Copies of the resulting Joint Communication are sent to all stakeholders including feed mills, farms and shoots, clarifying the responsibility everyone has to deliver on the agreed approach.

iii) Gamebird targets for 2024

Target 1: Discussion with vets

TARGET	Details
Every gamebird rearer to calculate their own use of antibiotics and discuss the results, including any welfare impacts, with their vet to understand where they sit within the range of emerging results	This will enable vets to identify and support persistently high users within the sector who need support, as well as anyone experiencing emerging welfare issues arising from inappropriate antibiotic reductions

Target 2: Improved husbandry

TARGET	Details
Further improve husbandry across the sector	Gamebird rearers to follow the relevant Government welfare code for their location and independently audit their farms to ensure they are meeting those codes

Key to this will be the new Game Farm Audit, devised by the British Game Alliance with assistance from the Game Farmers' Association and launched in 2020. It takes the Government codes as the basis of its standards and uses independent on-farm auditors to check the farm is meeting all the requirements. Involvement is voluntary but the gamebird sector will be encouraging all game rearers to get involved during the TTF2 period.

Target 3: Education

TARGET	Details
Education and training of gamebird rearers in ways to achieve best practice husbandry and to reduce the need to treat with antibiotics	Existing tools to be enhanced during TTF2

The sector's annual Joint Communication will continue but there will be more focus and detail in an additional range of events and online tools. For example, the GFA is already developing the idea of antibiotic guardianship and is promoting good case studies to its members. The National Gamekeepers' Organisation, meanwhile, has regional meetings often involving local gamebird vets at which antibiotic reduction is discussed.

Target 4: Medicated feeds

TARGET	Details
Encourage even greater efficiency in the supply of antibiotic medicated feeds to avoid waste and overproduction	Work with Game Feed Trade Association members to reduce the minimum amounts of medicated feed they will deliver, so that no excess needs to be ordered

Examples already in progress include encouraging liaison between feed companies towards the end of the rearing season so that remaining compounded product can be shared and used up, rather than going to waste, with resulting benefits to the environment.

Target 5: Welfare

TARGET	Details
Monitor the welfare effects of antibiotic reduction	This will help ensure that reductions are safe and sustainable

Nationally, this can be achieved via the regular meetings held by gamebird sector vets at which they review each year's results. Vets are already discussing how best to formalise this in regard to antibiotic reduction monitoring.

Target 6: Research

TARGET	Details
Research in support of the above targets	Find ways to reduce disease pressures through improvements to husbandry, so as to avert the need for antibiotic interventions

Funded by the sector, the British Veterinary Poultry Association (BVPA) is already researching mycoplasma and some of the protozoal gamebird diseases. Such research can also support other targets, including those involving audit standards or education and training.

Target 7: HP-CIAs

TARGET	Details
Continue to use HP-CIAs in line with European Medicines Agency requirements	The sector is already recommending that HP-CIA use is signed off by a vet on a custom-made form which confirms such requirements have been met

iv) Indicators of progress against 2024 targets

Indicator of progress 1: Antibiotic use

INDICATOR	Details
Total usage 6.24 tonnes in 2024, from a 2019 baseline usage of 10.4 tonnes, denoting a reduction of 40%	• Achieving this commits the sector to: • Maintaining annual data collection using its already proven methodology, and • Retaining the TTF1 focus on correct prescribing

Indicator of progress 2: HP-CIAs

INDICATOR	Details
Keep HP-CIA use below 47kg, denoting a 27% reduction on 2016 usage	Maintain guardianship of HP-CIAs

The sector has already laid the foundations for the second of these by including in its 2020 *Joint Communication* a recommendation that all antibiotic prescriptions should be signed off by a member of the BVPA.

8. Laying Hens

i) Progress against 2020 targets

In 2019, members of the British Egg Industry Council (BEIC) Lion Code[60], which represents over 90% of the industry, met the sector target for percentage bird days treated to remain below 1%. The data, published as 'daily doses/100 chicken days at risk' represents the average number of daily doses administered per chicken over a 100-day period, which is provided directly to BEIC.

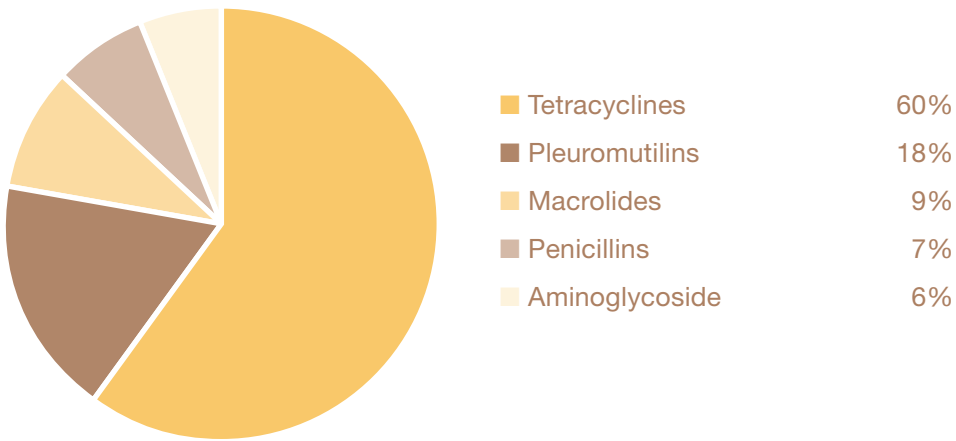
The laying hen sector used 4.8 tonnes of antibiotic active ingredient in 2019. This represents 0.683 daily doses/100 days (or % bird days treated), and is a very slight increase on the figure reported for 2018. However, in the course of 2019, the sector identified that it had been underestimating the total bird population in the scheme. As a result, it has recalculated figures for this and previous years. The like-for-like comparison with 2018 is therefore an increase of 0.129 daily doses/100 days (Table 14).

Table 14: Summary of progress in the laying hen sector against 2020 targets

TARGET	Progress
Total antibiotic use below 1% bird days treated	2016 (baseline year): adjusted usage 0.665%
	2017: adjusted usage 0.510%
	2018: adjusted usage 0.554%
	2019: adjusted usage 0.683%
Total fluoroquinolone + colistin (HP-CIA) days medicated remains below 0.05%	2016 (baseline year): usage 0.030%
	2017: usage zero
	2018: usage zero
	2019: usage zero

When analysed by active ingredient class, tetracycline and pleuromutilins account for 78% of the use and there were no HP-CIAs used. Reductions were seen in pleuromutilins and penicillins this year, balanced by slight increases in other active ingredients, particularly tetracyclines. (Figure 11 and Table 15).

Figure 11: Percentage of actual daily doses of antibiotics used by BEIC Lion Code members in 2019
(Source: BEIC)



[60]British Lion Code of Practice http://www.britisheggindustrycouncil.co.uk/download/LCoPV7.pdf

Given the generally low-level use of antibiotics in this sector, year-to-year fluctuations are to be expected. It is accepted that flocks which require medication are treated in the most responsible way possible to avoid adverse welfare outcomes. In 2018 the sector initiated the collection of data on reasons for medication, and in 2019 there are reports covering 87% of records. While indications listed in 2019 are broadly similar to those in 2018, there has been a rise in enteric disorders.

It is encouraging to see that, again, no HP-CIAs were used in 2019, which is again in line with the target to keep their use below 0.05% bird days treated. Colistin and 3rd and 4th generation cephalosporins cannot be used under the BEIC Lion Code. In addition, fluoroquinolones cannot be used in day old chicks, and any other use can only be where no other medication is appropriate to maintain bird welfare.

Table 15: Daily doses of active ingredient used by members of the BEIC Lion Code 2016-19 as a proportion of all bird days at risk. (Source: BEIC)

	% Bird-Days treated (% of total treatments)				
	2016	**2017**	**2018**	**2019**	**2017–2019**
Tetracyclines	0.260 (33)	0.280 (55)	0.333 (60)	0.409 (60)	+0.149
Pleuromutilins	0.252 (32)	0.149 (29)	0.112 (20)	0.124 (18)	-0.128
Penicillins	0.050 (7)	0.050 (7)	0.046 (7)	0.047 (9)	-0.008
Macrolides	0.04 (5)	0.019 (4)	0.040 (8)	0.060 (7)	+0.017
Aminoglycosides	0.02 (3)	0.010 (2)	0.024 (4)	0.040 (6)	+0.020
Other, includes:	0.034 (4)	0	0	0.003 (0.4)	-0.031
Fluoroquinolones*	0.001 (<0.2)	0	0	0	
Colistin*	0.029 (4)	0	0	0	
Total	**0.665**	**0.510**	**0.554**	**0.683**	**+0.018**

** Highest Priority Critically Important Antibiotics*

ii) Approach to 2024 targets

The collection of antibiotic usage data for the UK laying hen sector is organised by the British Egg Industry Council (BEIC). Producers' requirement to share this data with BEIC is obligatory through the Lion Scheme, which represents over 90% of the UK egg industry. All egg producers, pullet rearers and breeding companies are required to report any use of an antibiotic to their subscriber. This is reported to the BEIC on a quarterly basis and denominator data is available from monthly records of the total number of birds in the scheme, averaged over the year. BEIC has already presented data on treatment indications in 2018 at a meeting of the poultry-focussed veterinary association, the BVPA, and will continue to liaise with the veterinary profession.

There continues to be a focus on disease prevention, including widespread vaccination programs. It is also a requirement for all farms to have a written biosecurity and veterinary health plan and, in addition, the Lion Training Passport provides a common training standard on key topics, including welfare, biosecurity and medicine usage. From January 2021 the Lion Training Passport is a required standard for all farms.

[61]Lion Training Passport http://liontrainingpassport.co.uk/

For the 2020 reporting year, BEIC will continue to focus on disease prevention, including widespread vaccination programmes. BEIC has already started to share data on reasons for medication with prescribing vets. Its new online antimicrobial usage recording system was tested in 2019 and has been in routine use for all data from January 2020.

INNOVATION IN THE LAYING HEN SECTOR: ONLINE RECORDING SYSTEMS

While it is a basic legal requirement that all use of veterinary medicines is recorded on farm, the layer sector, like other sectors represented on RUMA, had no direct access to this on a consolidated basis.

We initiated a system in 2015 whereby each BEIC subscriber completed a spreadsheet on a quarterly basis for submission centrally and the data arising from the process has been analysed to produce the summaries in this report. The spreadsheet evolved with improved error checking each year, and in 2018 the addition of recording the indication for treatments.

By 2019 it was decided that the system had matured enough to commission an online antimicrobial recording system. This was tested by various subscribers in late 2019 and launched for routine use by all subscribers from 1 January 2020. Feedback from users has been positive, and the built-in validation included has reduced the number of records which need to be queried before analysis is carried out. It is hoped that development of this system will continue to facilitate the analysis of the data, and to improve feedback to subscribers, producers and vets.

The early gains achieved in the reduction of HP-CIAs in the early stages of this reporting period have been balanced by some increases in the use of less critically important antibiotics in the past two years. The next reporting period will include some significant structural changes of the industry with a move away from enriched colony cage production for retail supply towards 'barn' and free-range production. It is anticipated that this could increase certain health challenges. For these reasons it is appropriate to maintain all of the current targets.

iii) Indicators of progress for 2024

Indicator of progress 1: Antibiotic use

INDICATOR	Details
Bird days treated remain below 1%	Using online recording system

Indicator of progress 2: HP-CIA use

INDICATOR	Details
Fluoroquinolone (HP-CIA) days medicated remain below 0.05%	Current use is nil

9. Poultry Meat

i) Progress against 2020 targets

In 2019, the poultry meat sector was again able to deliver well within its responsible antibiotic use targets of 25 mg/kg for broilers and 50 mg/kg for turkeys, achieving 17.5 mg/kg and 42 mg/kg respectively (Table 16). Data for 2019 showed further significant reductions in use of Highest Priority Critically Important Antibiotics (HP-CIAs). Use in ducks remained low at 1.7 mg/kg.

Table 16: Summary of progress in the poultry meat sector against 2020 targets

TARGET	Progress
Total antibiotic use below 25 mg/kg PCU in broiler chickens	2014: total usage 48.8 mg/kg PCU
	2015: total usage 27.3 mg/kg PCU
	2016: total usage 17.1 mg/kg PCU
	2017: total usage 9.9 mg/kg PCU
	2018: total usage 12.4 mg/kg PCU
	2019: total usage 17.5 mg/kg PCU
Total antibiotic use below 50 mg/kg PCU in turkeys	2014: total usage 219.5 mg/kg PCU
	2015: total usage 199.8 mg/kg PCU
	2016: total usage 86.4 mg/kg PCU
	2017: total usage 45.2 mg/kg PCU
	2018: total usage 46.7 mg/kg PCU
	2019: total usage 42.0 mg/kg PCU
Ducks – no target	2014: total usage 15.1 mg/kg PCU
	2015: total usage 8.2 mg/kg PCU
	2016: total usage 5.4 mg/kg PCU
	2017: total usage 3.3 mg/kg PCU
	2018: total usage 1.8 mg/kg PCU
	2019: total usage 1.7 mg/kg PCU

Although the past two years have seen small increases in usage in the sector, the 19.7 tonnes of antibiotics used in 2019 represents an overall reduction of 76% since 2012. Recent increases have been due to disease challenges, so where antibiotics have been used, it has been done responsibly and in the interests of bird health and welfare. Even so, the sector remains well below Government approved, industry-led sector-specific targets.

Use of HP-CIAs was not a specific target, but use of fluoroquinolones was subject to clinical governance measures where any producer requiring the use of fluroquinolones to treat a flock of birds reported the case in detail to the BPC – where and why the product was used, the number of birds treated, the clinical outcome of the treatment and the veterinary health plan to avoid having to use the product in further bird placements.

As a result, fluoroquinolone use has fallen by 97% since 2012, which means the risk of cross-resistance developing to ciprofloxacin, an important last-resort antibiotic in humans, is being minimised. Use of HP-CIAs overall have also seen huge reductions, dropping by 97.3% since 2012.

While not classified as HP-CIAs by the European Medicines Agency, macrolides are important first line antibiotics used to treat children with campylobacter infection and are now classified as category C (use with 'Caution') by the EMA[26], hence it is very positive to see use of these has fallen 96% since 2012 too.

ii) Approach to 2024 targets

Half of the meat eaten in the UK is poultry, and British Poultry Council's Antibiotic Stewardship plays a vital role in delivering good bird health and welfare; ensuring the sustainable and responsible use of antibiotics, safeguarding the efficacy of antibiotics, and helping to produce food that consumers trust. British poultry farmers and vets need antibiotics in their toolbox to protect the health and welfare of birds. Zero use is neither ethical nor sustainable as it goes against a farmer's duty to address any health and welfare issues.

The British poultry meat sector is committed to upholding the UK's position at the forefront of international efforts to keep antibiotics effective for future generations and tackling antimicrobial resistance. Supported by requirements of Red Tractor farm assurance, UK poultry meat producers have stopped all preventative treatments and the Highest Priority Critically Important Antibiotics that are critically important for humans are used only as a 'last resort' for chickens and turkeys.

Antibiotic use is already below 2020 targets (25 mg/kg PCU for chicken and 50 mg/kg PCU for turkeys) so the approach is working. Use of HP-CIAs – although not a specific target – has fallen dramatically as well over the past eight years, particularly fluoroquinolones. Despite this, the sector maintains a close eye on resistance levels.

The 2019 One Health Report[62] reported the level of fluoroquinolone-resistant campylobacter in chicken, turkey, retail poultry meat and humans (Figure 12). The data shows very little change in the % of non-susceptible isolates in healthy chickens and turkeys between the two sampling points in 2014 and 2016. This is despite rapidly reducing use of fluroquinolone antibiotics in the broiler population over this time frame (Figure 13).

The poultry meat sector has taken a responsible approach by minimising the use of fluroquinolone antibiotics on production farms thus removing selection pressure for fluroquinolone resistance. However, understanding why some Campylobacter isolates are susceptible to fluroquinolone antibiotics and others are resistant, the distribution of resistant isolates in the production chain, and what drive more fluoroquinolone-susceptible campylobacter in poultry populations are key questions that need answering. Researching and addressing these will enable more progress to be made in reducing fluroquinolone-resistant campylobacters in poultry populations and thus poultry products.

[62]HM Government (2019). UK One Health Report: antibiotic use and antibiotic resistance in animals and humans 2013-2017. January 2019

Figure 12: Percentage of non-susceptible Campylobacter isolates tested. (Source: HM Government)

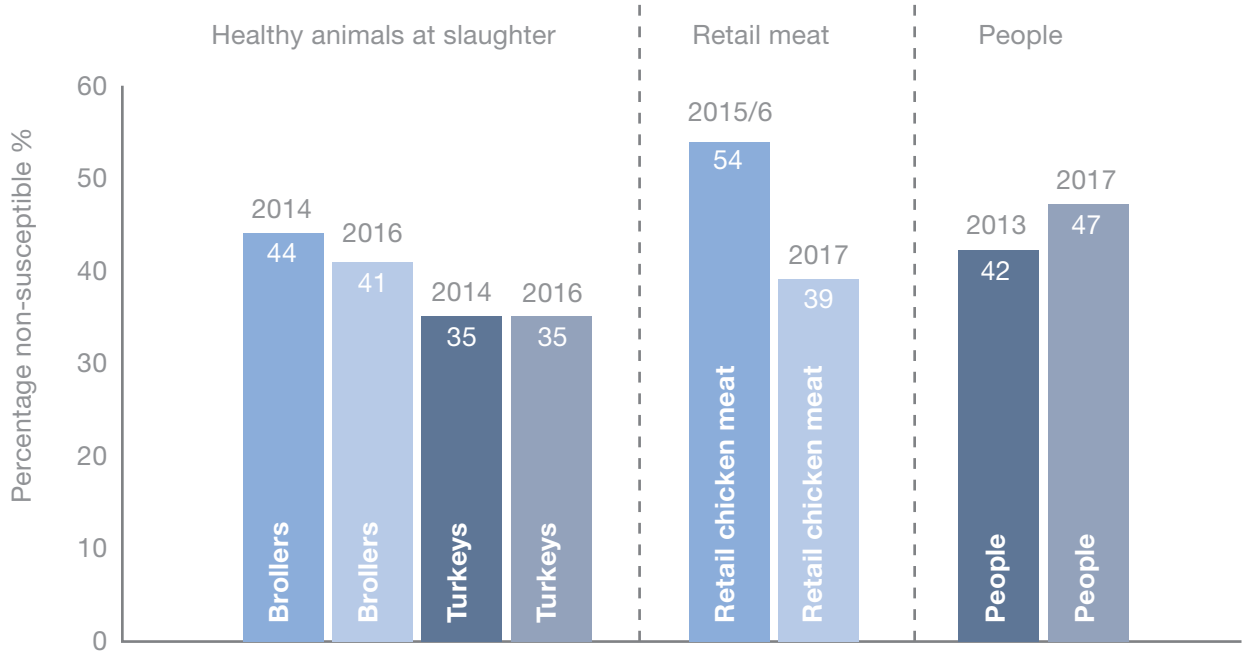
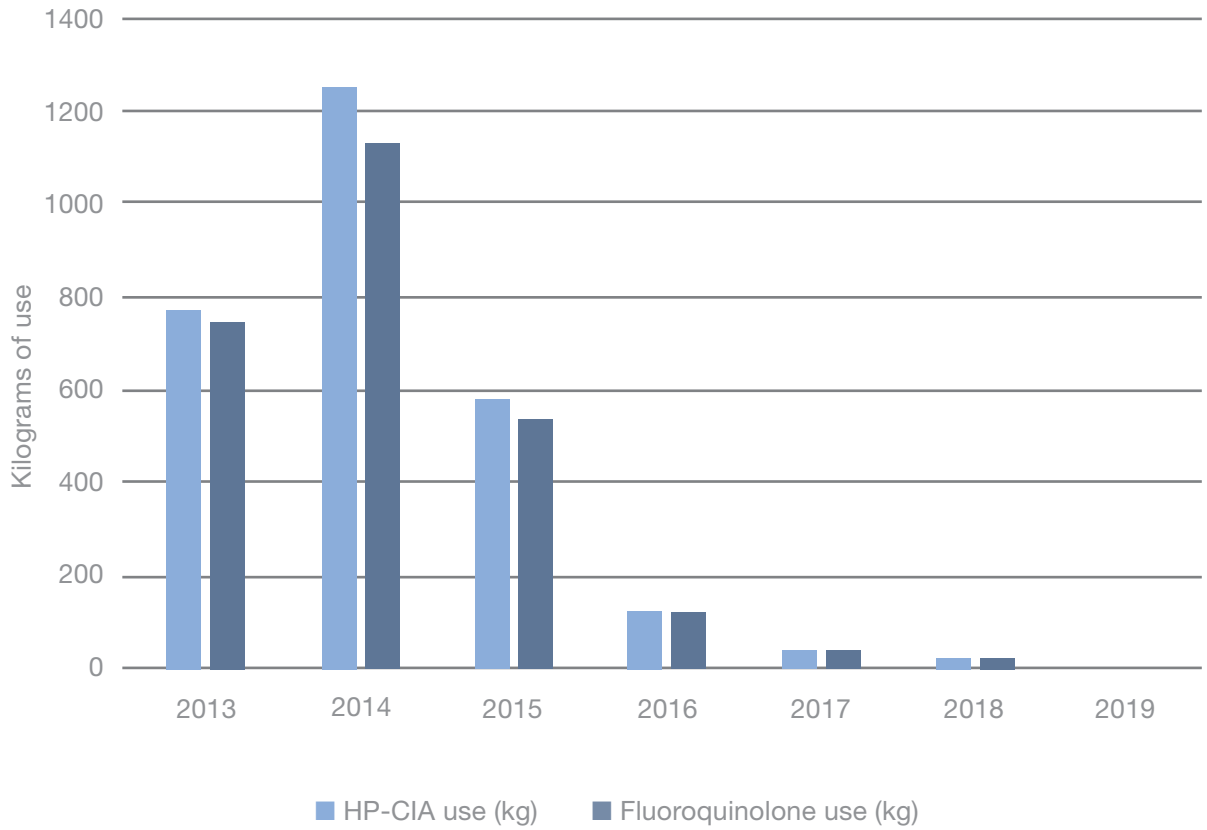


Figure 13: Use of HP-CIAs (inc. fluoroquinolones) in UK poultry meat rearing. (Source: BPC)



INNOVATION IN THE POULTRY MEAT SECTOR: ESBL SURVEILLANCE

Extended-spectrum beta-lactamase (ESBL) enzymes pass on resistance to most beta-lactam antibiotics. Recent research has found significant differences in those ESBL-producing E. coli common in poultry and those found in people, suggesting the role of poultry and poultry meat in the transfer of ESBLs to people is less important than other sources. BPC members, with the support of broiler breeder Aviagen, took part in surveys of E. coli in broiler house environments both in 2013 and 2019, at a point when bird flocks were reaching maturity. In 2019, 25% (47/188) of sheds and 21.6% (79/365) of individual samples were confirmed as positive for ESBLs. These results show a significant reduction compared with the survey conducted in 2013, where 84% of sheds and 81.3% of individual samples yielded ESBL-positive samples.

While not all the houses sampled in 2013 were sampled again in 2019, there has nevertheless been a significant overall reduction in positive samples between the two periods and this coincides with a significant reduction (80.2%) in antibiotic use across the poultry sector over the same period.

FSA research has found the same trend of resistance levels dropping in line with antibiotic use – broiler meat samples showed that the presence of ESBLs fell from 16.3% in 2016 to 6.1% in 2018. The report says this suggests that tighter controls on antimicrobial usage by the poultry industry might be having a positive impact in reducing ESBL E.coli found in chicken, although further work is needed to explore this.

iv) Indicators of progress against 2024 targets

Poultry meat goals for 2021-2024 will remain the same as they are currently although the intention is to conduct a review of 2020 usage in 2021, and revise sector-wide goals if required.

Indicator of progress: Antibiotic use

INDICATOR	Details
Total antibiotic use below 25 mg/kg PCU in broiler chickens	Monitor antibiotic use in broiler chicken production
	Review in 2021 once 2020 figures are known
Total antibiotic use below 50 mg/kg PCU in turkeys	Monitor antibiotic use in turkey production
	Review in 2021 once 2020 figures are known

Having seen an overall rise in antibiotic usage in the sector over the past two years, next steps for the sector and to drill down in to the data and look at the challenges facing producers and the reason for usage and treatment outcome, as well as targeting any persistent high users within each business. That said, the vast majority of birds go without needing any treatment and it's mainly those challenged directly by disease in any cycle that receive veterinary treatment in the interests of safeguarding bird health and welfare. The sector will continue to be open and transparent in its antibiotic usage, identify high users and develop farm action plans to drive change with veterinary and management input.

[63]Parker and Elvidge (2020). Falling resistance in E coli isolated from broilers in the UK. Veterinary Record 187, 74-75.
[64]Food Standards Agency/APHA (2019). RDFS102109 - EU Harmonised Surveillance of Antimicrobial Resistance (AMR) in E. coli from Retail Meats in UK (2018 - Year 4, chicken). June 2019

Further contacts

For general queries, please contact RUMA on secretarygeneral@ruma.org.uk

For general veterinary enquiries, please contact the British Veterinary Association on bvahq@bva.co.uk

For technical queries relating to the implementation of targets for specific species, please refer to the following:

SECTOR	Details	Veterinary queries
Dairy, Beef or Calves	c/o RUMA secretarygeneral@ruma.org.uk	British Cattle Veterinary Association office@cattlevet.co.uk
Sheep	Sheep Antibiotic Guardian Group c/o RUMA, secretarygeneral@ruma.org.uk	Sheep Veterinary Society secretariat@sheepvetsoc.org.uk
Pigs	Pig Health and Welfare Council c/o National Pig Association, npa@npanet.org.uk	Pig Veterinary Society office@pigvetsoc.org.uk
Salmon	Scottish Salmon Producers Organisation enquiries@scottishsalmon.co.uk	Fish Veterinary Society secretary@fish-vet-society.org.uk
Trout	British Trout Association btaoffice@britishtrout.co.uk	Fish Veterinary Society secretary@fish-vet-society.org.uk
Gamebirds	Game Farmers Association secretary@gfa.org.uk	British Veterinary Poultry Association bvpa@bvpa.org.uk
Laying hens	British Egg Industry Council info@britisheggindustrycouncil.com	British Veterinary Poultry Association bvpa@bvpa.org.uk
Poultry meat	British Poultry Council info@britishpoultry.org.uk	British Veterinary Poultry Association bvpa@bvpa.org.uk

Glossary and abbreviations

AHDA	Animal Health Distributors' Association
AHDB	Agriculture & Horticulture Development Board – parent organisation of the levy boards
AHDB Beef & Lamb	The levy board representing beef and lamb producers in England
AHDB Dairy	The levy board representing dairy producers in Great Britain
AHDB Pork	The levy board representing pig producers in England
AMR	Antimicrobial Resistance
AMU	Antimicrobial Use
Antibiotic	A medicine specifically used to prevent and treat bacterial infections. 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, protozoa, and fungi. Antibiotics are antimicrobials.
APHA	Animal and Plant Health Agency, formerly AHVLA
AHWBE	Animal Health and Welfare Board England
BCMS	British Cattle Movement Service
BCVA	British Cattle Veterinary Association
BEIC	British Egg Industry Council
BMPA	British Meat Processors' Association
BPC	British Poultry Council
BTA	British Trout Association
BVPA	British Veterinary Poultry Association
BVA	British Veterinary Association
BVD	Bovine Viral Diarrhoea
Cefas	Centre for Environment, Fisheries and Aquaculture Science
CHAWG	Cattle Health and Welfare Group of Great Britain
CoGP	Code of Good Practice for Scottish Finfish Aquaculture
CTS	Cattle Tracing System
CVO	Chief Veterinary Officer
Dairy UK	The trade association for the British dairy supply chain.
Defra	The UK Government's Department for Environment, Food and Rural Affairs
DCD_{Vet}	Defined Course Dose for animals, the assumed average dose per kg animal per species per treatment
DDD_{Vet}	Defined Daily Dose for animals, the assumed average dose per kg animal per species per day
DMCP	Dairy Mastitis Control Plan
DSC	Disease Surveillance Centres
EBV	Estimated Breeding Value
EFSA	European Food Safety Authority
eMB-Pigs	The electronic Medicine Book, designed by AHDB to electronically collate antibiotic usage data from the UK pig sector
EMA	European Medicines Agency
EMA AMEG	European Medicines Agency's Antimicrobial Expert Group
FSA	Food Standards Agency
FSS	Food Standards Scotland
FUW	Farmers Union of Wales
FVS	Fish Veterinary Society
GFA	Game Farmers' Association
HCC	Hybu Cig Cymru, responsible for the development, promotion and marketing of Welsh red meat

HP-CIA	Highest Priority Critically Important Antibiotic (for human medical purposes), as defined by the the European Medicines Agency (category B)
IBR	Infectious Bovine Rhinotracheitis
iSAGE	Innovation for Sustainable Sheep and Goat Production in Europe
Medicine Hub	The centralised database for medicine use in UK ruminants, developed by AHDB
Metaphylaxis	The treatment of a group of animals after the diagnosis of infection and/or clinical disease in part of the group, with the aim of preventing the spread of infectious disease to animals in close contact and at considerable risk and which may already be (sub-clinically) infected or incubating the disease. Also called Control treatment.
mg/kg PCU and mg/kg	Milligrams per PCU, the unit of measurement developed by the EMA to monitor antibiotic use and sales across Europe, which has also been adopted by the UK in its national reports although convention in 2017 was to refer to mg per kg for simplicity.
NFU	National Farmers' Union (England and Wales)
NFU Cymru	The National Farmers' Union (Wales)
NFUS	National Farmers' Union of Scotland
NPA	National Pig Association
NSA	National Sheep Association
PCU	Population Correction Unit, which is used to help measure antibiotic use. PCU takes into account the animal population as well as the estimated weight of each particular animal at the time of treatment with antibiotics
PCV2	Porcine Circovirus Type 2 viruses
PCVAD	Porcine Circovirus Associated Disease
PHU	Persistently High Use/Users (of antibiotics)
PI	Persistently Infected (with BVD)
Prophylaxis	The treatment of an animal or a group of animals, before clinical signs of infectious disease, in order to prevent the occurrence of disease or infection. Also called Preventative treatment.
PRRS	Porcine Reproductive and Respiratory Syndrome Virus, also known as Blue Ear Disease
PVS	Pig Veterinary Society
QMS	Quality Meat Scotland, the levy board representing the red meat industry in Scotland
RABDF	Royal Association of British Dairy Farmers
RCVS	Royal College of Veterinary Surgeons
Red Tractor	A food assurance scheme which covers production standards on food safety, hygiene, animal health, welfare and environment
RTFS	Rainbow Trout Fry Syndrome
RUMA	Responsible Use of Medicines in Agriculture
SHAWG	Sheep Health and Welfare Group
SSPCA	Scottish Society for Prevention of Cruelty to Animals
SSPO	Scottish Salmon Producers' Organisation
SVA	Sheep Veterinary Association
SWISH	South West Initiative for Sheep Health
Therapeutic treatment	The curative treatment of a sick animal or group of animals following the diagnosis of infection and/or clinical disease in those animals.
TTF	Targets Task Force group, established to reduce antibiotic use in food producing animals
TTF1	The first Targets Task Force and the period their targets cover (2017-2020)
TTF2	The second Targets Task Force and the period their targets cover (2021-2024)
VARSS	Veterinary Antimicrobial Resistance and Sales Surveillance, a collection of reports from the VMD providing the details of UK veterinary antibiotic resistance & sales surveillance
VMD	Veterinary Medicines Directorate
VPC	Veterinary Products Committee
WHO	World Health Organisation
WLBP	Welsh Lamb and Beef Producers Ltd

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