Food and Agriculture Organization of the United Nations

Veterinary Medicines Directorate

TACKLING ANTIMICROBIAL USE AND RESISTANCE IN FOOD-PRODUCING ANIMALS

LESSONS LEARNED IN THE UNITED KINGDOM

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FOREWORD

The United Kingdom of Great Britain and Northern Ireland and the Food and Agriculture Organization of the United Nations (FAO) recognize antimicrobial resistance (AMR) as a critical and growing threat to global health, food safety and security. We believe that this threat can only be successfully tackled through collective action, and so we are strongly committed to facilitating sharing of learning and expertise in this area. FAO thanks its partners in the United Kingdom for contributing their valuable experience of developing a successful multisectoral collaborative approach to antimicrobial stewardship in agriculture. This approach has transformed attitudes and behaviours around antimicrobial use, resulting in antimicrobial stewardship becoming a core principle across UK agriculture. Remarkably, this has been achieved on a voluntary basis, without the need for regulation.

This is of particular interest to FAO, since the new FAO Action Plan on AMR (2021–2025) includes key objectives on increasing stakeholder awareness and engagement, and promoting responsible use of antimicrobials. The United Kingdom's example demonstrates that building trusted relationships across all stakeholders, including between farmers, vets, and government, can lead to sustained behaviour change, and embed practices of responsible use across farming sectors. Industry leadership on the issue has empowered producers to take action. Farmers now have open conversations with their peers on the importance of addressing AMR, and the steps which can be taken in their respective areas.

FAO strongly believes in the importance of the One Health approach to tackle AMR, and works closely with WHO, WOAH and UNEP on the fight against resistance. It is clear to see that this has also been a priority for the United Kingdom, and that leadership across both the human and animal health fields has led to joined-up working and a shared understanding of the risks and priorities faced by colleagues on both sides. Finding common goals is key to achieving effective action.

FAO recognizes and supports the United Kingdom's continued efforts to address AMR, and is pleased to have established an FAO Reference Centre for AMR within the United Kingdom. The Centre has the remit of supporting FAO in knowledge transfer and skills development internationally, and we welcome the United Kingdom's commitment to supporting others and learning from global partners. Together, we can all work towards a future where AMR is controlled, leading to safe, secure, and sustainable food systems for all.

From the United Kingdom's perspective, UK agriculture has undergone a transformation over the last few years, embedding the principles of responsible antimicrobial use across all sectors of livestock production. This has been grounded in a clear understanding by all stakeholders of the importance of

preserving antimicrobial efficacy, and the role we must all play in ensuring these critical medicines remain available to protect both animal and human health.

The United Kingdom has taken a different approach to many other countries when developing its system of antibiotic stewardship. Rather than regulating, the government has worked in collaboration with farmers and vets, supporting them to lead action on reducing the unnecessary use of antibiotics. Each farming sector has developed tailored approaches, improving husbandry and adopting disease prevention measures to reduce reliance on antibiotics. Impressively, the sectors have also come together, as part of a Targets Task Force chaired by the Responsible Use of Medicines in Agriculture (RUMA) Alliance. It is this cross-sectoral learning and sharing of experience which has helped to unite the industry, instilling a shift in culture which has seen the United Kingdom halve its sales of antibiotics for food-producing animals since 2014. This incredible achievement is testament to the hard work and dedication of all involved.

Fundamental to sustainable behaviour change has been the development of strong vet-farmer relationships, with both parties working together to achieve shared stewardship goals. The United Kingdom is delighted to be building on this success by supporting the training of a cohort of Farm Vet Champions, who will work with producers and veterinary colleagues to promote robust antimicrobial stewardship both on farms and within vet practices.

At the heart of the United Kingdom's AMR strategy sits the importance of the One Health approach. We have allied ourselves across animal and human health disciplines, aligning priorities and working as a One Health team to support and challenge each other. This has enabled us to set ambitious goals and commitments under the United Kingdom's National Action Plan for AMR, and seek to deliver them in a joined-up fashion to achieve benefits for all.

The United Kingdom is strongly committed to tackling the threat of AMR, both domestically and internationally. We want to work alongside our global partners, to support the development and implementation of international initiatives to promote the responsible use of antimicrobials. We are proud of the achievements detailed within this report, which represent a concerted effort from all parties involved, and hope that the lessons we are able to share prove useful to others embarking on their own stewardship journeys. AMR truly is a global challenge, and we will continue play our part to ensure antibiotics remain effective tools to protect global health.

Keith Sumption
Chief Veterinary Officer
Food and Agriculture Organization of the United Nations

Christine Middlemiss
Chief Veterinary Officer
United Kingdom

PREFACE

Antimicrobial resistance (AMR) is recognized as one of the biggest threats to both human and animal health at a global level, with significant associated economic consequences. Resistance to antibiotics is a particular form of antimicrobial resistance which occurs in bacteria. Bacteria carrying resistance genes are present in humans, animals, food, and the environment and can be transferred between all of these through direct and indirect pathways, including foodborne transmission. The main driver of this resistance is antibiotic use. Responsible use of antibiotics in both humans and animals is therefore key to tackling this growing challenge.

The United Kingdom has a long history of livestock farming, with mature production systems covering cattle, pigs, poultry, sheep and fish. In addition, it has a thriving gamebird sector which annually rears more birds than the rest of the world combined. In total, the UK livestock industry is responsible for the health and welfare of over a billion farmed animals in its care each year. It is also responsible for the production of safe, high-quality food, both for domestic consumption and export to other markets.

Tackling AMR has been a key priority for the UK Government for many years, developing strategies designed to mitigate the risk since 2000. Since 2013, these AMR strategies have taken a One Health approach, including actions relevant to humans, animals and the environment (DH and DEFRA, 2013; HM Government, 2019b).

In 2014, political interest in AMR, media attention and public awareness of the issue were all increasing, leading the Prime Minister to commission an independent review on AMR, chaired by the economist Lord O'Neill. Around this time, there was increasing scrutiny of the livestock industry on their use of antibiotics in food-producing animals, with much of the narrative focusing on how this could impact upon resistance in humans, in the absence of a solid evidence base for these claims. The final report of the O'Neill review was published in 2016, and in response the government, through its Veterinary Medicines Directorate (VMD), committed to deepen its close working with the livestock sector on AMR to introduce sector-specific targets for antibiotic use reduction in food-producing animals.

A consequence of this engagement is that antibiotic sales for food-producing animals have halved since 2014 and over the same period, the use of highest-priority critically important antibiotics (HP-CIAs) has reduced by 79 percent (VMD, 2021a). The United Kingdom's achievement in reducing antibiotic consumption in agriculture makes it one of the lowest users of antibiotics across Europe, and the lowest of those countries with a significant livestock farming industry (EMA, 2021).

Remarkably, this has been achieved on an voluntary basis, with industry and government working in collaboration. Key to the success of this approach has been the industry taking ownership of the issue and driving the work, for example through the formation of the Targets Task Force (TTF) convened by the Responsible Use of Medicines in Agriculture (RUMA) Alliance. The TTF, composed of a specialist farmer and vet representing each livestock sector, has been an enormously successful initiative which has provided a forum for learning and experience to be shared across all sectors. Through industry leadership, each sector was able to study their systems closely and identify opportunities for improved antibiotic use and antibiotic reduction. The approach has led to fundamental behaviour change and a shift in attitudes across the industry. Antibiotic stewardship is now an established feature of UK farm management, with farmers and vets both engaged in embedding best practice for responsible use across the sectors.

The United Kingdom's engagement and voluntary approach is distinct from the more common regulatory and enforcement approach, and the lessons learned from adopting this approach can serve as an example for others exploring options for implementing antibiotic stewardship in their own livestock farming sectors. Through a series of first-hand accounts from key stakeholders involved in the process, the following chapters detail the development of the United Kingdom's approach, the steps taken by each sector, their challenges and successes, and ultimately the shared experience and knowledge they have gained along the way.

ABBREVIATIONS AND ACRONYMS

AHDB	Agriculture and Horticulture Development Board
AMR	antimicrobial resistance
BEIC	British Egg Industry Council
BPC	British Poultry Council
BVA	British Veterinary Association
BVPA	British Veterinary Poultry Association
CB	Companion of the Order of Bath
CBE	Commander of the Most Excellent Order of the British Empire
CEO	Chief Executive Officer
CHAWG	Cattle Health and Welfare Group
CMO	Chief Medical Officer
COGP	Code of Good Practice for Scottish Finfish Aquaculture
CVO	Chief Veterinary Officer
DEFRA	Department for Environment, Food and Rural Affairs
DHSC	Department for Health and Social Care
EC	European Commission
ECDC	European Centre for Disease Prevention and Control
EMA	European Medicines Agency
EMB	electronic medicine book
ESBL	extended spectrum beta-lactamase
ESVAC	European Surveillance of Veterinary Antimicrobial Consumption
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
FIIA	Food Industry Initiative on Antimicrobials
FVS	Fish Veterinary Society
GAP	global action plan
GFA	Game Farmers' Association
HP-CIAS	highest-priority critically important antimicrobials
MG-PCU	milligrams per population correction unit
NOAH	National Office for Animal Health
NPA	National Pig Association
PHE*	Public Health England
PVS	Pig Veterinary Society
RUMA	Responsible Use of Medicines in Agriculture Alliance

* In October 2021, Public Health England (PHE) transferred its health protection functions, including AMR into the newly formed UK Health Security Agency (UKHSA).

SHAWG	Sheep Health And Welfare Group
SSPO	Scottish Salmon Producers Organization
TTF	Targets Task Force
UN	United Nations
UNGA	United Nations General Assembly
VARSS	veterinary antimicrobial resistance and sales surveillance
VMD	Veterinary Medicines Directorate
WHO	World Health Organization
WOAH	World Organization for Animal Health

THE TIMELINE OF EVENTS

2010

Pharmaceutical companies voluntarily begin submitting antimicrobial sales data to the Veterinary Medicines Directorate (VMD) in 1993, becoming a statutory requirement in 2005.

The United Kingdom begins publishing annual reports of antimicrobial sales data online in 2006.

European Commission mandates the European Medicines Agency (EMA) to commence the European Surveillance of Veterinary Antimicrobial Consumption (ESVAC) project.

2011

The United Kingdom begins submitting antimicrobial sales data to the EMA to be included in the ESVAC report.

The British Poultry Council (BPC) founds the Antibiotic Stewardship scheme with an initial action to collect antibiotic use data.

2013

Annual report of the Chief Medical Officer highlights the scale of the threat of antimicrobial resistance (AMR) and makes recommendations to address it.

The UK Government publishes a five-year AMR strategy (2013–2018) based on a One Health approach.

First UK Veterinary Antibiotic Resistance and Sales Surveillance (VARSS) report is published by the VMD.

2014

UK Government commissions an independent review on AMR, chaired by Lord O'Neill.

EMA publishes advice on the use of antibiotics in animals, highlighting the issue of use of High Priority Critically Important Antimicrobials.

2015

WHO/WOAH/FAO Tripartite publishes the global action plan on AMR.

Antibiotic usage data from the poultry sector is shared voluntarily by the BPC with the VMD and included in the VARSS report.

2016

The Pig Industry Antibiotic Stewardship programme is formed to develop a coherent strategy to manage antibiotic use.

The Pig Sector Electronic Medicine Book (eMB) is launched, co-developed by industry and the VMD, to collect antibiotic use data and share this with the VMD.

The final report of the independent AMR review is published, outlining ten recommendations for reducing drug-resistant infections globally.

UK Government responds to the recommendations from the AMR review and announces various commitments including the reduction of overall antibiotic use in food-producing animals to an average of 50mg/kg by 2018.

Responsible Use of Medicines in Agriculture (RUMA) Alliance forms the Targets Task Force to develop industry-led, sector-specific targets for antibiotic stewardship in UK livestock farming.

EMA publishes updated advice on use of colistin products in animals.

United Nations General Assembly adopts resolution on AMR.

2017

RUMA Targets Task Force publishes sector-specific targets for antibiotic stewardship (2017–2020).

VARSS report 2016 shows that the target set by the government for reducing overall antibiotic use in food-producing animals has been met two years early.

Use of pig sector eMB becomes a requirement of the Red Tractor Farm Assurance Scheme.

2019

UK publishes its five year National Action Plan (2019–2024) and 20 Year Vision for AMR.

EMA publishes advice on specific requirements for the collection of data on antimicrobial medicinal products used in animals in the European Union.

RUMA Targets Task Force 2 is formed.

2020

RUMA Targets Task Force 2 publishes second set of sector specific targets for antibiotic stewardship in UK livestock farming (2021–2024).

EMA updates its 2014 advice on the categorization of antimicrobials.

1. BACKGROUND

THE UK LIVESTOCK FARMING INDUSTRY

The United Kingdom supports a rich and diverse farming industry, with agricultural land use taking up 72 percent of its total land area. Several mature livestock sectors produce high-quality animal-source foods, supported by producer organizations and, in many cases, specialist veterinary services. Recent data puts the value of total UK livestock output at GBP 14.7 billion, with the largest proportion (30 percent) attributed to the dairy sector, followed by beef, poultry meat, pigs, sheep and laying hens (DEFRA, 2020a). In addition to these production sectors, the United Kingdom also rears more gamebirds annually than the rest of the world combined and has well-developed salmon and trout farming industries.

The United Kingdom is one of the most significant livestock producers in Europe, responsible for the health and welfare of over a billion animals each year. In 2019, the United Kingdom was the largest producer of sheep and goat meat across the European Union (responsible for 39 percent of total production), the third largest producer of cows' milk and beef, and the ninth largest producer of pig meat (DEFRA, 2020b).

Across the sectors, there is wide variation in the style and intensity of production, as well as the size of farms and the number of animals reared on each site. For example, some dairy systems rely on seasonal calving and outdoor grazing, whereas other herds have indoor-only high-yielding cattle and calve year-round. Calf rearing spans both dairy and beef sectors, with some dairy farms rearing calves for beef and others selling their calves to specialist rearers. Beef farms may operate suckler systems rearing calves with their mothers until weaning, or buy in weaned cattle of a range of ages to grow and finish for slaughter. Pig production varies from outdoor-bred to highly-specialized indoor systems, with separate units for finishing slaughter weight pigs. The sheep sector operates a unique stratified system tailored to the different breeds, environments, and habitats of the United Kingdom. This is comprised of three tiers: hill, upland and lowland, with hardier breeds adapted to harsher conditions on the hills and faster-growing breeds reared in the easier lowland conditions. Poultry production (both meat and eggs) may be indoor or outdoor, with the free-range laying hen sector expanding by 14 percent since 2017 to nearly 25 million hens. The majority of aquaculture production in the United Kingdom focuses on salmon and trout, with salmon production being the larger of the two and one of Scotland's most important rural sectors. Fi-

nally, the United Kingdom has a gamebird sector that rears around 62 million birds annually. This covers predominantly pheasant rearing with some partridge and a small number of mallard.

The United Kingdom adopts very high standards of animal welfare across its food-producing sectors, and this remains an important consideration for consumers. Antibiotics are essential medicines for protection of animal health and welfare. Optimal stewardship aims to ensure that all antibiotic use is responsible, and that the need for use is reduced as far as possible through improving animal health and adopting preventative veterinary practices. The varied nature of production systems across the United Kingdom, and differing disease challenges faced for each species farmed, means that levels of antibiotic usage vary between sectors.

2.
GROWING PRESSURE

THE BUILD-UP IN THE YEARS 2010–2014

In the United Kingdom, the VMD is the government agency responsible for assuring the safety, quality and efficacy of veterinary medicines. It acts as policy lead for animal health aspects of AMR and has been collecting data on sales of antibiotics for use in animals since 1993. This data collection was initially based on voluntary submission by pharmaceutical companies and became a statutory requirement in 2005.

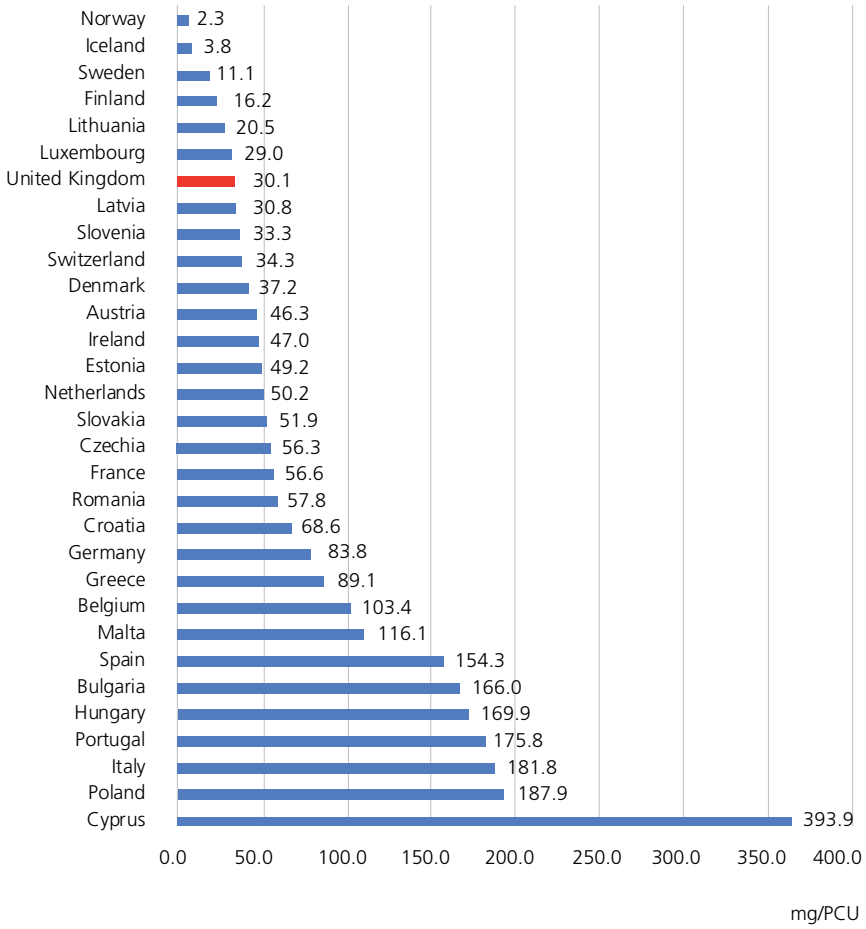
In April 2010, the European Medicines Agency (EMA) started the European Surveillance of Veterinary Antimicrobial Consumption (ESVAC) project to collect information on how antimicrobial medicines are used in animals across the European Union (EU) and European Economic Area Member States. This project was initiated following a request from the European Commission to develop a harmonized approach for the collection and reporting of data on the use of antimicrobial agents in animals. In the United Kingdom, the VMD started submitting antibiotic sales data to the EMA to be included in the ESVAC reports. These reports provided the first opportunity to benchmark usage between countries, due to standardized metrics of mg/PCU being applied (see Box 1 for further detail). The publication of the early ESVAC reports highlighted the need for UK livestock sectors to reduce levels of use, in common with equivalent European countries with similar levels of agricultural production.

In 2013, the VMD began publishing an annual report on antibiotic sales and resistance in bacteria from food-producing animals: the UK Veterinary Antibiotic Resistance and Sales Surveillance (VARSS) report. The VARSS report

BOX 1: Population correction unit (PCU) (VMD, 2021a)

When assessing antibiotic sales, it is important that the demographics of the animal population potentially exposed to treatment are also considered. This is achieved through use of the population correction unit (PCU), a technical unit of measurement (where 1 PCU = 1 kg of animal treated), which is calculated by multiplying a standardized average weight at time of treatment with the associated annual animal/slaughter numbers. The calculation also considers animals exported from the United Kingdom for slaughter or imported to the United Kingdom for fattening.

FIGURE 1. Quantity of antibiotics sold for use in food-producing animals for 31 European countries in 2020 as reported by ESVAC (mg/PCU).



Source: Adapted from European Medicines Agency. 2020. Sales of veterinary antimicrobial agents in 31 European countries in 2018. Trends from 2010 to 2018.

Available at: https://www.gov.uk/government/publications/veterinary-antimicrobial-resistance-and-sales-surveillance-2020

was the first time antibiotic sales data and resistance data were combined in one report. Initially, only sales data submitted by pharmaceutical companies to the VMD were included, meaning the data were an estimate of the quantity of antibiotics used, as not all antibiotics sold are administered to an animal. In addition, these data do not permit more detailed analyses such as consumption separated by animal species or production system. The VARSS reports have increasingly included data on antibiotic usage by animal production sector, submitted to the VMD voluntarily by the livestock industry (HM Government, 2019a and VMD, 2021a). The VARSS reports have become a key source of accurate information for stakeholders, including policymakers, the livestock industry, and other interested parties. They function as an independent and definitive source of data on usage and resistance, and present these data in an accessible format, including use of infographics which are easy to understand and share.

In 2013, then UK Chief Medical Officer (CMO), Professor Dame Sally Davies, used her annual report to highlight the scale of the threat of AMR, calling for actions and making a series of recommendations for risk mitigation (Davies, 2013). The CMO also urged politicians to prioritize AMR as a major area of concern, with the inclusion of AMR in the National Risk Register as a lever to impel action. Acknowledging AMR as a key risk to the United Kingdom in this way was novel at the time, and successfully raised its profile at high levels within government.

"The levels of national and global concern on AMR led to the inclusion of AMR in the government's National Risk Register for the first time in 2015. This was a huge milestone that started to generate serious action from right across government."

Professor Dame Sally Davies,

UK Special Envoy on AMR and former UK Chief Medical Officer

In the same year, the UK AMR Strategy (2013–2018) was released by the Department of Health and Social Care (DHSC, previously the Department of Health), the Department for Environment, Food and Rural Affairs (DEFRA), Public Health England (PHE), and the devolved administrations in Scotland, Wales and Northern Ireland (DH and DEFRA, 2013). The strategy was developed based on a One Health approach and included actions relevant to humans, animals and the wider environment. Its aim was to slow the development and spread of AMR through increased knowledge and understanding, to improve conservation and stewardship of existing treatments and to stimulate the development of new treatments. The report was heavily influenced by the CMO's report on AMR and was significantly strengthened in

THE STRATEGY WAS DEVELOPED BASED ON A ONE HEALTH APPROACH AND INCLUDED ACTIONS RELEVANT TO HUMANS, ANIMALS AND THE WIDER ENVIRONMENT

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its ambition as a result of the recommendations of that report. The strategy garnered a high level of commitment and action across government.

Throughout this period, pressure was mounting on the agriculture sector in the United Kingdom. Media interest was increasingly focused on the links between use of antibiotics in animals and development of resistance in humans, despite limited scientific evidence being available. Some coverage referred to the use of antibiotics as growth promoters in food-producing animals, a practice which had been banned in the United Kingdom and Europe since 2006. In addition, pressure was applied by lobby groups and non-governmental organizations campaigning for changes in farming practices. This attention led to increased public awareness of the issue, and in response to consumer demand, retailers also began questioning the farmers supplying their stores about use of antibiotics in the animals they farmed.

In parallel to this, at European level, the draft EU veterinary medicine regulation 2014 raised the possibility of a legal requirement for reporting antibiotic usage data in animals, with the priority species being poultry, pigs and cattle (EC, 2014). This fuelled discussions around collection of data, with livestock producers becoming aware that regulation could be imposed upon them and recognizing the benefits of taking proactive action ahead of this, to have a stronger voice in how the issue was addressed and avoid being subject to constraints which may not be tailored or relevant to their specific systems.

THE AMR REVIEW

As political momentum on AMR increased, in 2014, then UK Prime Minister David Cameron commissioned an independent review on AMR, chaired by the economist Lord Jim O'Neill (O'Neill, 2016). As part of this comprehensive review, eight interim reports were published focusing on different aspects of AMR, including one published in December 2015 with a specific focus on antimicrobials in agriculture and the environment. This interim report proposed three interventions: 1) a global target to reduce antibiotic use in food production and restriction of the use of antibiotics in animals that are important for use in humans; 2) reduction in antimicrobial manufacturing waste released into the environment; and 3) improved surveillance (O'Neill, 2015). The final full report, published in 2016, made ten recommendations to address the problem, including improved hygiene and infection prevention, reduction of unnecessary use of antimicrobials in agriculture and their dissemination into the environment, and improvement of global surveillance of drug resistance and antimicrobial consumption in humans and animals (O'Neill, 2016). The review was extremely influential both nationally and internationally, and the UK Government published a formal response setting out a series of key commitments it would make (HM Government, 2016), as described in chapter 6.

3.
CATALYSTS FOR CHANGE

INFLUENTIAL LEADERSHIP

"The Chief Veterinary Officers have been really supportive from the start."

Gwyn Jones, *former Chair of RUMA*

Strong leadership on AMR at the highest levels was critical in driving action within the UK Government. In the human health sector, the CMO campaigned nationally and internationally to raise the profile of AMR. In the animal health sector, the former UK Chief Veterinary Officer (CVO) Nigel Gibbens and the VMD's former Chief Executive Officer (CEO) Professor Peter Borriello recognized the need for improved antibiotic stewardship and supported the livestock industry to lead this work. Both felt that an important part of their role was to challenge the livestock industry, but critically to also support and champion them publicly when addressing inaccurate representation of the industry as well as inaccurate statements about AMR and relative contributory causes.

THE CHIEF VETERINARY OFFICERS HAVE BEEN REALLY SUPPORTIVE FROM THE START

Professor Dame Sally Davies visiting the pig farm.

In spite of widespread support for a One Health approach to tackle the problem of AMR, the discussion at the time was heavily weighted towards emphasizing the impacts of the use of antibiotics in food-producing animals. There was a risk that exaggeration of the role of agriculture in development of AMR would lead to an unhelpful defensive position being adopted by the livestock industry. Nigel Gibbens and Peter Borriello acted to shift the discussion from apportioning blame to the agriculture sector towards a joint approach to dealing with a joint issue, where everybody has a role to play. This strengthened relationships between the leaders on the animal and human health sides, with a key focus on increasing understanding of veterinary antibiotic usage and farming practices among human health colleagues (see Box 2 for further details).

"The relationship between the human and animal sectors has evolved from apportioning responsibility to working collaboratively with mutual respect and recognition of the need to act."

Nigel Gibbens CBE, *former CVO*

"The discussion used to be polarized back then, at many levels and across stakeholders. But the sustained drive to treat AMR as a One Health issue has really helped break down silos and has changed the conversation from defensiveness to tackling a shared problem. We've certainly got a great working relationship with DHSC, we're allies on the same One Health team!"

Kitty Healey, *Head of Surveillance Division, Head of Antimicrobial Resistance at the VMD*

It was crucial to recognize that regardless of the debate about the strength of the scientific evidence linking the use of antibiotics in livestock to AMR in humans, there was clear evidence that use of antibiotics in animals drives development of resistance in animals. Therefore, there were compelling arguments for the responsible use of antibiotics in order to preserve the efficacy of the existing stock of veterinary antibiotics, maintain animal health and reduce production losses. Peter Borriello also recognized that there was another key economic argument to be made to livestock sectors. If production could be maintained at the same level with lower use of antibiotics, farmers would make cost savings through reducing unnecessary inputs, but also through having healthier animals that were more resilient and more productive. In industries where profit margins are often very small, these savings could make a substantial difference to the economic viability of production.

"The VMD needs credit for helping to underpin the work that has been done voluntarily by the livestock sectors."

Nigel Gibbens CBE, *former CVO*

BOX 2: Visit to the pig farm

RUMA organized a visit to a pig farm for Professor Dame Sally Davies, then UK Chief Medical Officer, and other stakeholders from the human health sector. The goal was to raise awareness of farming practices among human medics and highlight elements of veterinary health provision, such as dosing by weight of animal, which they had previously been unaware of. The human health colleagues were also impressed by the high levels of on-farm biosecurity observed. Dame Sally remembers this visit as an important moment in building a closer relationship between the human and animal health sectors:

"It was so important, and almost unprecedented at that time, for human medical professionals and veterinary medical professionals to come together – but this visit did just that. In this arena, we brought together the voices of medics, saying 'This matters to us in human medicine and we're trying to reduce it', with the vets agreeing that 'Yes, it can be done'. Most importantly, the [farmers] at the pig farm then showed us all how it could be done. Their influence was in their action, and we've been following their example ever since."

Professor Dame Sally Davies, *former CMO*

THE IMPORTANCE OF DATA

"The RUMA Targets Task Force has shown clearly that where we have data we can set targets and we can hit them."

Cat McLaughlin, *Chair of RUMA*

The VMD, as the government agency responsible for AMR in animals, played a crucial role in supporting the livestock industry, working in partnership with key food-producing animal sectors to develop, facilitate and coordinate antibiotic usage data collection systems. The VMD's strategy was to take a stepwise approach, focused initially on those sectors using the highest level of antibiotics based on the sales data that were available. These sectors were the poultry and pig sectors, followed by cattle.

The poultry meat sector had already taken significant steps on antibiotic stewardship, with the British Poultry Council (BPC) Antibiotic Stewardship Group being set up in 2011. The BPC is the trade association for the poultry meat industry in the United Kingdom and represents companies from primary breeding, through growing, to slaughter and processing, and covering chicken, turkey, duck, and goose. The BPC stewardship group had a focus on responsible use of antibiotics and reduction in use of HP-CIAs, with one of their key goals being the collection of accurate data on antibiotic use within the poultry meat sector.

Panel discussion at RUMA conference, chaired by Gwyn Jones with Christianne Glossop, Paul Cosford and Kitty Healey on stage.

The BPC were motivated to start collecting usage data because they understood the importance of having robust evidence on what was happening within their sector. Up to that point, sales data obtained from the pharmaceutical companies and published by the VMD had grouped antibiotic products for pigs and poultry together. This meant that it was not possible to establish what proportion of the total volume each sector was using. Both industries were facing challenge from lobby groups, and the poultry sector recognized that their best defence was accurate data.

The BPC became the first UK food-producing animal sector to develop a data collection mechanism and share antibiotic usage data with the VMD, to be included in the VARSS report. This programme was extremely successful in delivering a strategy for responsible use of antibiotics and had already achieved a reduction in total antibiotic use of 44 percent between 2012 and 2015. The importance of data in driving changes and allowing farms to benchmark their antibiotic use became especially clear following this achievement in the poultry meat sector.

THE IMPORTANCE OF DATA IN DRIVING CHANGES AND ALLOWING FARMS TO BENCHMARK THEIR ANTIBIOTIC USE BECAME ESPECIALLY CLEAR FOLLOWING THIS ACHIEVEMENT IN THE POULTRY MEAT SECTOR

"If you've got the data, then you can speak from a position of strength. When you don't have the data it's all speculation. And that's the key thing, is being able to speak from a position of knowledge."

Daniel Parker, *Poultry vet and member of the Targets Task Force (TTF)*

With the poultry meat sector starting to publish usage data and demonstrating a significant reduction in use, the pig sector was under pressure to take action. In 2016, the pig industry developed its stewardship programme and in the same year launched the electronic Medicine Book (eMB) for pigs. This is a digital system to collect data on antibiotic use at farm level, which was developed by the Agriculture and Horticulture Development Board (AHDB) Pork, the levy body, with support from the VMD and the assistance of pig producers, allied industry members, and vets. During the early stages of development of the eMB, AHDB funded a fact-finding mission to the Netherlands to better understand their approaches to antibiotic stewardship. This enabled the system built in the United Kingdom to benefit from the learning and experience shared by Dutch colleagues. The eMB allows sharing of anonymous, aggregated data with the VMD to be included in the VARSS reports. The eMB also has a benchmarking facility, which allows farmers to see how antibiotic use on their farm compares to grouped, anonymized data from others operating similar production systems.

"I think that people have been a lot more receptive to it [eMB] because they see that it is actually going to help them with management on the farm and it's not necessarily a stick to beat them with."

Martin Smith, *Pig Vet and member of RUMA's Independent Scientific Group*

In order to support joint analysis of surveillance data between human and animal sectors, the VMD and PHE published the first UK One Health report on human and animal antibiotic use, sales and resistance in 2015, with the second report published in 2019. This helped to align the data across human and animal sectors and identified recommendations to address data limitations and to improve integrated analyses (PHE, 2015; VMD, 2019). These reports are important in fostering development of coordinated surveillance activities across animal and human health in the United Kingdom.

RUMA'S LEADING ROLE

In response to increasing scrutiny of the livestock sector, RUMA began discussions with its members in 2015 on how best to respond, and held a conference to bring the issues to the fore and help it to develop a response strategy. RUMA is an independent non-profit group, involving organizations representing all stages of the food chain from "farm to fork". It formed in 1997, with the goal of promoting the highest standards of food safety and animal health and welfare in the UK livestock industry. RUMA recognized early on that there was a need for leadership on this issue in farming. It saw that a united approach to communicate actions being taken across the livestock industry would be of benefit to all.

RUMA had previously been more of a technical resource rather an active organization. However, after the 2015 conference, RUMA realized that in order to successfully take on this role it needed to re-structure and place a key focus on improving its communications strategy and public relations. In order to achieve this, it took the step of increasing cost of membership to ensure sufficient funding for these activities. The conference had been a key step in beginning discussions around how the livestock industry could start to take control of the issue, through being transparent and accountable, taking ownership and taking action, rather than the narrative continuing to be driven from the outside.

"We had three RUMA conferences, which included international speakers, and it worked very well. The first conference was fully booked, we turned people away much to our surprise; we were then under pressure to repeat that for the second and third conference which we managed to do."

Gwyn Jones, *former Chair of RUMA*

Following its re-structure, one of RUMA's first jobs was to anticipate and respond to the upcoming AMR Review report in May 2016, with the announcement that it intended to set up a task force. This would go on to play a key role in bringing the sectors together to work in collaboration with government on targets for the reduction of antibiotic use in food-producing animals.

GLOBAL ACTION PLAN ON AMR

RECOGNIZING THE GROWING IMPORTANCE AND IMPACTS OF AMR, WHO, WOAH AND FAO FORMED A TRIPARTITE TO WORK TOGETHER ON THE CHALLENGE

Recognizing the growing importance and impacts of AMR, the World Health Organization (WHO) in collaboration with the World Organization for Animal Health (WOAH) and the Food and Agriculture Organization of the United Nations (FAO) formed a tripartite to work together on the challenge. In 2015, they adopted the global action plan (GAP) on AMR, which urged members to develop national action plans in line with the principles of the GAP (WHO, 2015). In 2016 at the UN General Assembly (UNGA), heads of state came together to discuss AMR for the very first time – in fact, only the fourth time that a health topic had been discussed at UNGA. As a result, they committed to support and implement the GAP at national, regional and global levels (UN, 2016). This ensured that international attention was firmly focused on AMR, and galvanized action in many nations. Recognizing the importance of global co-operation, the United Kingdom continues to promote global One Health action through commitments under the current UK national action plan for Antimicrobial Resistance 2019–2024), leading international policy dialogue at the highest political levels and as a major supporter of the UN and wider multilateral system.

4.
A CLOSER COLLABORATION

THE GOVERNMENT'S RESPONSE

Shortly after the publication of the final report from the O'Neill review on AMR, the UK Government published a formal response to its recommendations, setting out key commitments across the human, animal and environment sectors (HM Government, 2016). In the animal health sector, these included:

1. reduction in antibiotic use in livestock and fish farmed for food to a multispecies average of 50mg/kg by 2018, using methodology harmonized across other countries in Europe;
2. working closely with individual sectors to ensure that appropriate sector-specific reduction targets are agreed by 2017; and
3. within sector-specific strategies, consulting with species experts to set agreed rules for antibiotics which are most critically important for human health, and which reserve them as a last resort.

RUMA used this opportunity to reprise its plan for the TTF to engage and set the sector-specific targets, and the VMD committed to work closely with the livestock sector to tackle this challenge, using a voluntary approach with industry and government working in collaboration.

"The voluntary approach would have the effect of more intelligent and agile stewardship on antibiotics."

Professor Peter Borriello CB, *former VMD CEO*

The 50mg/kg target was seen as a tool to measure progress, but not an end goal. In parallel to this numerical target, it was considered crucial to have tailored, sector-specific targets for reduction which were owned by the livestock industry and not imposed by government. By focusing on their respective sectors, producers would be able to understand why and when antibiotics were being used and identify where effective interventions could be made to reduce use. This increased knowledge and understanding would lead to a change in attitudes, habits and behaviour, and this was considered to be the ultimate goal since changes driven by a better understanding of their production systems would achieve sustainable reductions in antibiotics use in the long term.

INCREASED KNOWLEDGE AND UNDERSTANDING WOULD LEAD TO A CHANGE IN ATTITUDES, HABITS AND BEHAVIOUR

"The goal is around behaviour change, a culture change around prescribing, for example, and standards of antibiotic stewardship. The targets are part of that journey. They're not an end in themselves. They are communication tools that help track the difference people are making through their actions, and they are milestones on the way to achieving the goal."

Kitty Healey, *Head of Surveillance Division, Head of Antimicrobial Resistance at the VMD*

"…the key to success in my opinion is eliciting a culture change. Producers have got to understand that antibiotics are not going to solve all of their health problems. To some extent they are a crutch, and they should only be used as a crutch for the minimum period to enable the producers to make the changes required to resolve the health problem for the longer-term."

Daniel Parker, *Poultry Vet and member of the TTF*

THE ROLE OF VETS

In the United Kingdom, antibiotics for use in animals are only available with a prescription from a vet. As a result, vets' prescribing behaviour plays an important role in how antibiotics are used at farm level. Vets found themselves in a challenging position, faced with needing to reduce the amount of antibiotics

BOX 3: Farm vet champions

This initiative provides online training on antibiotic stewardship to practising farm vets across the United Kingdom, with modules covering a broad range of species and topics and no limit on the number of vets per practice who can sign up to take part. This project was inspired in part by the success of the Arwain Vet Cymru project, which was funded by the Welsh government and identified a veterinary prescribing champion for each farm vet practice in Wales. The second stage of the Farm Vet Champions project will support UK veterinary professionals in setting practice-level and personal specific, measurable, achievable realistic and timely goals relating to antibiotic stewardship, monitoring progress against these and ultimately improving vet-farmer engagement and prescribing practices. The initiative is led by RCVS Knowledge, the charity partner of the Royal College of Veterinary Surgeons. The VMD has provided funding support for the project, in recognition of the important role it will play in developing veterinary leadership on antibiotic stewardship.

they were prescribing and thus potentially generating less profit for their business. Vets had to work to change their business model and engage farmers in implementing changes to reduce antibiotic use, switching to being paid for prevention rather than cure. Recognizing the key role of vets in driving how antibiotics are managed, a new initiative called the Farm Vet Champions project has been developed (see Box 3 for further details).

RUMA'S INDEPENDENT SCIENTIFIC GROUP

One of the conclusions from the 2015 RUMA conference was that if RUMA was to take the lead on the industry response to the AMR crisis, it must continue to base all decisions and activities on science and evidence. An Independent Scientific Group was formed with experts from across the veterinary and medical professions, who would go on to provide advice to the group on which antibiotic categorization advice RUMA should follow and the degree to which antibiotic use in livestock is contributing to the drug-resistant infection crisis in human medicine, as well as advise and support the TTF process.

"We knew RUMA had to stand above industry detractors and ensure that we were always operating on sound science and evidence, even if that told a story we didn't like. This is where the scientific group played an incredibly important role."

Gwyn Jones, *former Chair of RUMA*

RUMA'S TARGETS TASK FORCE

Recognizing the necessity for action on the issue of antibiotic stewardship, and the importance of industry taking the lead and driving forward their own changes rather than seeing these imposed on them, RUMA convened a group to develop industry-led sector-specific targets for reduction in antibiotic use.

"The various industry actors decided to work together to the common good of the industry, in a pre-competitive approach, and that was a key difference and a really important message."

Daniel Parker, *Poultry Vet and member of the TTF*

The RUMA TTF held their first meeting in December 2016. This was the first time that the different food-producing animal sectors had all come together to work as a collective on a single issue, and there was initial uncertainty about how the group would work as a whole. An external facilitator was brought in for the first meeting to guide the discussions around mapping out the process for developing the targets. This was very successful and helped members to open up to each other, share ideas and begin the process of problem-solving together.

The TTF comprised a specialist vet and farmer representing each of the sectors covering beef, dairy, laying hen, fish (both salmon and trout), gamebirds, pigs, poultry meat (chicken, turkey and duck) and sheep. These representatives were identified as leaders in their sectors, who were well-connected and had influence, as well as the mindset to strive for change and seek solutions to challenges.

"It was all about the individuals involved. They had to be well-placed, influential, and able to go back and consult with the rest of their industry... When you get people in a room together, who generally have nothing to do with each other because they work in their own sectors, they start to compare notes and they start to get really interested, and they start to realize they have some common problems… And this cross-feeding of ideas happened and was really unbelievable."

Amy Jackson, *former Communications Consultant for RUMA*

Government representatives of the VMD and the Food Standards Agency attended the meetings as observers, providing their support as well as advice and expertise on data collection and analysis. In addition, the British Veterinary Association (BVA), the Red Tractor Farm Assurance scheme (see Box 4) and the National Office for Animal Health (NOAH) also attended as observers. The BVA is the national representative body for the UK veterinary profession, Red Tractor is the United Kingdom's largest food standards scheme and NOAH is the

association representing the companies that research, develop, manufacture and market licensed animal medicines in the United Kingdom. Being present for the meetings gave these organizations the opportunity to follow the discussions being had by each sector, provide their support and gain insight into the process of target development.

"It's quite a tricky but interesting role working with lots of different sectors…Our position has always been that we [VMD] are not experts in each sector, you [TTF members] are the experts. We never pretend to be expert in cattle or pigs for example, but we are experts in AMR, and the main AMR principles are common between sectors, so we can offer help and support."

Fraser Broadfoot, *Head of Antimicrobial Resistance Stewardship and Usage Team at the VMD and TTF observer*

The TTF group met bi-monthly and worked to develop draft targets, taking a holistic view on antibiotic stewardship and covering not only reduction in antibiotic use but also development of improved data collection systems for antibiotic usage at farm level, improved husbandry and biosecurity practices, and training on stewardship for farmers and vets. The targets were initially drafted by the farmer and vet representing each sector, and these were then presented to wider groups for further consultation and to develop action

BOX 4: Red Tractor Farm Assurance

The Red Tractor Farm Assurance scheme was established in 2000, through combining several sector-specific assurance schemes into a single scheme with a unified logo, branding and coordinated standards. Red Tractor set requirements that farms need to meet in order to market their products as assured. These standards are species- or product-specific and currently cover pigs, poultry (chicken, duck and turkey), beef, lamb and dairy as well as crops and fresh produce. Although it is a voluntary scheme, for some sectors this certification opens up significant access to market for their products, since many retailers require their producers to comply with Red Tractor standards. These are regularly updated to ensure that they are based on the latest available evidence and the standards are fit for purpose.

"Red Tractor is a voluntary scheme, but in certain sectors like dairy and pigs and poultry, the vast majority of farms are Red Tractor assured because they have to be, because their customer requires it. So, it does mean when we make a change or we introduce something in to the standards, it does have a wide-reaching impact."

Georgina Crayford, *Technical Manager for Pigs at Red Tractor Farm Assurance*

plans. A large amount of responsibility was placed on members of the TTF, and they relied on the group for support and assistance, as well as a forum for constructive challenge where members could push each other to be more ambitious in their goals and hold each other accountable.

"One of the best things we did was to bring the sectors together where they challenged but supported each other."

Gwyn Jones, former Chair of RUMA

The targets and strategies developed for each sector varied according to their specifications and features. Each sector was starting from a different point with some already well-developed stewardship programmes, such as the poultry meat sector which had had a stewardship programme in place since 2011. Others were at the very beginning of the process, such as the sheep and beef sectors. The sectors that were more advanced shared their experience and lessons learned with those that were just starting out. In general, more integrated sectors with smaller numbers of producers and the use of specialist vets find it easier to lead, communicate and manage improvements to antibiotic stewardship and are able to gather comprehensive sector-wide data. In contrast, the greater the number of individual producers in the sector, the more challenging it is to drive change as it becomes harder to engage everyone. For example, the integrated nature of the poultry sector was an important factor in helping them to collect usage data, as opposed to other sectors such as beef and sheep, which are still developing data collection systems.

CLEAR, EFFECTIVE COMMUNICATION WAS CRITICAL

Clear, effective communication was critical for RUMA, and one of their first priorities in 2016 had been to appoint a communications consultant who went on to play a crucial role in supporting the TTF. A huge amount of effort went into ensuring transparency around the work of the TTF and communicating messages on the bigger picture of antibiotic stewardship.

"It is RUMA's role to provide the factual arguments… and to be the honest broker. The TTF, farmers, vets, and the pharmaceutical companies do not always get the opportunity to individually defend what they are doing. That's where RUMA can step in… we can put forward an independent, factual, transparent and honest viewpoint."

Cat McLaughlin, *Chair of RUMA*

It was very important to ensure that accurate sources of information were easily accessible, and that the evidence base underpinning RUMA's work and that of the TTF were readily available so that they could be used by the media or anybody searching for information. In order to achieve this, RUMA set up the farmantibiotics.org website, which had two purposes: to be as

factual and balanced a resource as possible, holding credible reference information from United Kingdom, European and global sources; and to display this for the public, media or anyone with an interest in the topic, sharing progress and challenges (RUMA, 2021a).

"As well as a resource bank, the Farm Antibiotics website is a showcase… The public might go onto it and not understand absolutely everything on there, but they can look and say "Wow, there's a lot on here, look at all those resources and projects… they've got a lot of information there for farmers and vets if they need it"… I think it's about signalling the seriousness with which we're taking this and showing we have nothing to hide."

Amy Jackson, ***former Communications Consultant for RUMA***

After 10 months of work, the targets were published at the end of 2017 and were designed to run for a three-year period from 2017–2020 (RUMA, 2017). Forty targets were set, covering the various sectors and representing a huge achievement for all those involved in the TTF. This unique initiative had successfully accomplished one of the key commitments in the government's response to the AMR Review, and had done so under their own momentum taking full ownership of the challenge faced.

"It could have gone so many different ways. If O'Neill hadn't had such a strong focus on targets then perhaps targets might not have been implemented when they were. And having seen the tremendous progress achieved over recent years, that would have been a missed opportunity. But it's all about how it's done and what your end goal is – is your end goal the target? Because that's short-sighted. Your end goal must be what you are using the targets to achieve. They must be focused not just on the numerical measures, but also on encouraging initiatives that will actually lead to long-term, sustainable behaviour change."

Kitty Healey, ***Head of Surveillance Division, Head of Antimicrobial Resistance at the VMD***

THE SECTORS' STORIES

Poultry meat sector

"I think the Targets Task Force has been incredibly useful in bringing those people together, and also supporting them to enable them to do that… I think it's more about support and shared learning."

Daniel Parker, ***Poultry Vet and member of the TTF***

THE POULTRY MEAT SECTOR BECAME THE FIRST UK FOOD-PRODUCING ANIMAL SECTOR TO PIONEER A DATA COLLECTION MECHANISM AT FARM LEVEL

The poultry meat sector became the first UK food-producing animal sector to pioneer a data collection mechanism at farm level and share antibiotic usage

data with the VMD, collecting data covering over 90 percent of the industry. Through the formation of the BPC Antibiotic Stewardship Group in 2011, the poultry meat sector made significant progress in reducing overall antibiotic use and use of HP-CIAs. Reduction in use of HP-CIAs was achieved through ending the use of third and fourth generation cephalosporins in 2012, and the use of colistin in 2016. In addition, the BPC has committed to only use fluroquinolones and macrolides as last-resort therapies when no other product is demonstrated to be effective through laboratory investigation.

Having already made significant progress in their antibiotic stewardship programme, the poultry meat sector played an important role in the TTF through sharing their experience and lessons learned on best practice for responsible use of antibiotics with other livestock sectors. At the start of the TTF, the data collected by the poultry meat sector showed that both duck and broiler chicken production were already well below the UK Government's multispecies average target of 50mg/PCU, and that the turkey sector had made significant progress between 2014–2016 in reducing their mg/PCU.

Based on this, it was decided that the usage target for the chicken meat sector from 2018 through to 2020 should be 25mg/PCU and for the turkey sector, over the same time period, the target set was 50mg/PCU. It was highlighted that disease patterns affecting flock health could change and impact the achievability of these targets, and therefore they would be reviewed regularly by the BPC Antibiotic Stewardship Group (RUMA, 2017).

Pig sector

"[In the pig sector there are] no more than 200-300 decision makers... so you have these big players who can influence a large chunk of the production. Allied to those, you have their veterinary advisors who have to be registered with Red Tractor and a member of PVS (Pig Veterinary Society). We know that around 95 percent of pigs produced are looked after by 110/120 pig vets."

Mark White, *Pig Vet and member of TTF1*

The pig industry Antibiotic Stewardship Programme was established by the National Pig Association (NPA) in 2016, the same year that the eMB Pigs data collection system was introduced. Although the use of eMB to upload antibiotic use data was initially voluntary, in 2017 Red Tractor Farm Assurance created a new assurance standard which required pig farmers to upload the amount of antibiotics used in their pigs on a quarterly basis. Since almost all commercial pigs are covered under farm assurance, this had the effect of increasing the numbers of farmers submitting usage data, with the data collected currently covering 95 percent of the industry. Having the eMB in place when the TTF started gave the sector a big advantage, because it enabled more accurate target-setting and facilitated monitoring of progress towards achieving them. Pig producers were supported by the NPA and for vets, group discussions were held during meetings of the PVS to agree ambitious but achievable targets for reduction in antibiotic use, without risking animal health and welfare. The Pig Health and Welfare Council also played a key role in helping to drive development of the eMB and acted as an industry-specific catalyst to coordinate initiatives.

The TTF pig representatives set a target to reduce antibiotic use by 64 percent by 2020 and to achieve it, the pig sector worked hard to engage all stakeholders, coming together as a collective to make progress. The fact that there are relatively few major pig producers was an important factor facilitating communication and sharing of information. Also, the close working relationships between farmers and vets, and the fact that most pig vets are specialists who are members of the PVS, made it easier to disseminate sector-wide messaging. Although farmers responded in different ways to the challenge, with some making rapid and substantial progress and others being slower to engage, overall the sector successfully managed to achieve significant reductions in antibiotic use.

"As we get overall usage down, we've tried to introduce other factors to improve the training of stockmen so they've got a better understanding of the products they're using, why they're using them"

Pig Farmer

The data captured annually via eMB showed that antibiotic usage dropped by 62 percent, from the 278mg/PCU starting point in 2015 to 105mg/PCU in 2020. HP-CIA use has also fallen significantly since 2015 (VMD, 2021a).

Sheep sector

"Within the sheep sector we aimed to improve vet-farmer engagement and to win hearts and minds, and with some success – in 2018, the UK sheep industry was short-listed for an Antibiotic Guardian Award in the category 'Community Communications'."

Fiona Lovatt, *Sheep Vet and member of TTF*

The sheep industry is made up of a high number of small separate farms, with the vast majority using local general veterinary practices, rather than specialists in the treatment of sheep. This presents a wide and diverse population of veterinary surgeons and farmers to be reached with messaging on antibiotic stewardship. The TTF representatives for the sheep sector consulted with their sector on the development of the targets through an industry stakeholder group called the Sheep Antibiotic Guardian group, which included members from the National Sheep Association (NSA), Sheep Veterinary Society (SVS), National Farmers Union (NFU), AHDB, Quality Meat Scotland, Hybu Cig Cymru – Meat Promotion Wales, Red Tractor, Farm Assured Welsh Livestock and RUMA. This was a sub-group of, and consulted with, the Sheep Health and Welfare Group (SHAWG). The group agreed that the issue for their sector was not the amount of antibiotics used, but instead how they were being used. It was considered important not to concentrate too heavily on numerical targets but to focus on key hot-spot areas for antibiotic use, including neonatal lambs, enzootic abortion and the treatment and control of foot infections. By

following these principles, the targets agreed were to reduce antibiotic use by 10 percent between 2017 and 2020 and reduce use of HP-CIAs by 50 percent over the same period.

The group concentrated on promoting messages on the importance of involving vets in flock health planning, flock health clubs and benchmarking groups; and preventing disease, using the "plan ahead, prevent disease and protect the flock" principles. However, there were a number of challenges faced by the sector, including: 1) the sector is extensive, and grass based and there is a perception that antibiotic use is low, which can lead to complacency; 2) relatively low veterinary involvement; 3) a fragmented supply chain with low economic return; 4) only 55 percent of the industry is farm assured; 5) entrenched practices such as routine prophylaxis for lambs; and 6) a lack of antibiotic usage data. Lack of data is one of the biggest challenges, as it hampers target-setting and measurement of progress. Collection of data is a challenge for the industry as on-farm paper records are often filled in retrospectively and therefore represent a less accurate record, and many farms are mixed beef and sheep with commonly used antibiotics for both species, meaning it is not possible to collect species-specific data from veterinary practice records.

Traditionally the UK sheep industry has been a low user of antibiotics, so there was concern that both farmers and vets might not appreciate the importance of reducing usage levels. However, by working under the leadership of the SHAWG, prominent sheep veterinary and farming organizations came together to communicate simple, coordinated messages. This was achieved through briefings and case studies in national farming media, best practice infographics, social media, webinars with vets and producers, and events on-farm with vets and producers. However, there were also challenges to overcome in communicating a clear message on prevention of disease rather than withholding antibiotic treatment when it is required.

This approach helped to improve vet-farmer engagement and it has also stimulated the development of the Medicine Hub for sheep and cattle, a web-based tool for recording antibiotic usage data in these sectors which was developed by AHDB and launched in January 2021. It is hoped that this will become an important source of data for the sheep sector. There have also been some specific successes, including the reduction of antibiotic use in neonatal lambs, which fell 34 percent between 2016 and 2020.

Beef sector

"Sheep and beef cattle are low users of antibiotic, but without good data we cannot measure or prove that fact. However, we could see from the partial data sets we had that both sectors improved and that we are in a better place and everyone is tuned into what we are trying to do."

Gwyn Jones, *former Chair of RUMA*

The TTF representatives for the beef sector worked with the wider sector to develop the targets. The Beef Antimicrobial Use Working Group was established as a sub-group of the Cattle Health and Welfare Group (CHAWG), and they liaised closely with the TTF representatives. The beef, like the sheep sector, has a high number of producers and relatively low levels of veterinary involvement, and uses generally lower levels of antibiotics.

The lack of antibiotic usage data available for this sector meant that it was not possible to set a numerical reduction target with confidence, but the group was committed to reducing use. Initial efforts focused on reducing the need for antibiotics in the first place, and promoting the role that vaccination and the better management of feed, environment and endemic disease control could play in achieving this. Herd health planning was considered crucial and was promoted following the principles of: 1) keeping diseases out (biosecurity); 2) preventing disease spread within the farm; 3) increasing animal resilience to disease (through colostrum management, improved husbandry and vaccination); and 4) disease elimination (focusing on Bovine Viral Diarrhoea and Johne's disease). The group worked with CHAWG stakeholders to promote training of both farmers and vets on responsible use and prescribing of medicines in beef production systems (RUMA, 2017).

Dairy sector

"Dairy has issues such as lameness, calf rearing, biosecurity and endemic diseases. Improving on these lowers antibiotic use, but again we need proper data for the full picture."

Gwyn Jones, *former Chair of RUMA*

Similar to the beef and sheep sectors, there was no comprehensive dataset relating to on-farm usage of antibiotics available for the dairy sector. However, in contrast to beef and sheep, 98 percent of holdings were registered members of the Red Tractor Farm Assurance scheme. The scheme requires farmers to create a Herd Health Plan, with a requirement that the farmer collates data on antibiotic usage and reviews this with their vet on an annual basis. However, there is no requirement for this information to be recorded in a centralized database. In an attempt to gain an estimate of usage, data gathered by FarmVet Systems, a software company which extracts sales data from veterinary practice management systems, were analysed. These data represented 33 percent of UK dairy cattle, and it was based on this estimate of usage across the sector that the targets were set. (RUMA, 2017).

However, it is worth noting that the drawbacks of using partial data soon became evident. The mean figures fluctuated significantly year-on-year and a large fall the year after targets were set even led some in the sector to suggest the target had been met early. A decision was therefore made to move away from using these data during the targets cycle, and to focus instead on

the metrics with high reliability such as sales of injectable HP-CIAs and intramammary tubes. An important learning was the need to be flexible and not become too wedded to what had been decided with imperfect information, or before circumstances changed. Meanwhile, the sector committed to continuing to work towards identifying how to collect robust and representative antibiotic usage data from dairy farms.

Whilst working towards this goal, the sector continued to take other actions helping to drive responsible use, based on preventative measures such as vaccination and improving husbandry practices. Work has been ongoing to develop the Medicine Hub, enabling dairy producers to record their antibiotic usage data and the sector as a whole to monitor progress against agreed targets.

Gamebird sector

"Once I'd got these vets together and explained that everybody else was looking at reduction and we were still going the wrong way, I think the game vets identified that there was a problem and they all came on-board. Well nearly all of them came on-board… But now they're all behind us, and we've got 91 percent [data] collection as of this year."

Paul Jeavons, *Gamebird Farmer and member of the TTF*

The UK gamebird sector, led by the Game Farmers' Association (GFA), started collecting antibiotic usage data in 2015. The GFA represents the game rearers in the United Kingdom, who collectively rear around 62 million game birds annually. This production sector is quite specific to the United Kingdom, covering predominantly pheasant rearing plus approximately nine million partridge and a small number of mallard.

Antibiotic use was previously relatively high in the sector, principally due to gamebirds being reared outdoors where they are at higher risk of coming into contact with infectious diseases. The sector set itself an ambitious target to reduce antibiotic use by 50 percent by 2020. A campaign was launched by the GFA focusing on correct prescribing, with a strong emphasis on communication to frontline gamebird rearers. In addition, articles were published in specialist magazines targeting landowners (who finance the rearing), to ensure that they also understood the importance of improving stewardship.

The campaign launched a joint communication, published each Spring, to highlight sub-targets and challenges for the year. This communication is based on the outputs of annual meetings attended by a representative of each specialist veterinary gamebird practice, one representative from each of the compounders (companies producing feed-mixes), all the game shooting organizations, and other key stakeholders. Attendees present to each other on a range of topics, including particular disease challenges for gamebirds. This joint communication represents a powerful message, because it is signed off

by a number of key organizations including the VMD, the British Veterinary Association, the British Veterinary Poultry Association, the Countryside Alliance and the Game and Wildlife Conservation Trust. Upon release, this document is published in all the shooting press as a pull-out or a centre page.

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 targets set. Currently, the data collected on antibiotic usage covers 91 percent of the gamebird population. Data are collected from specialist game bird veterinary practices, of which there are seventeen in the United Kingdom.

AN IMPORTANT INTERVENTION THAT HELPED IN REDUCING ANTIBIOTIC USAGE WAS DECREASING THE INCORPORATION OF ANTIBIOTICS IN COMPOUND GAMEBIRD FEEDS

An important intervention that helped in reducing antibiotic usage was decreasing the incorporation of antibiotics in compound gamebird feeds, some of which had previously been used prophylactically. The compounders began a process of rigorous checking with the vet for each prescription they received to ensure that the treatment was necessary, and this had a huge impact on reducing prophylactic treatments.

"Every time a vet sends a script to a compounder, the compounder sends back the joint communication with the written reminder on best practice concerning the prescribing and supply of antibiotics for gamebirds. The compounder also asks for the BVPA (British Veterinary Poultry Association) membership number of that vet, as all the vets prescribing are requested to be a member of the BVPA. That proves that they know what's going on. Also they have to go to at least one out of the two BVPA game sub-committee meetings every year, so they know what's going on in this world."

Paul Jeavons, *Gamebird Farmer and member of the TTF*

The outcome of these efforts was a halving in antibiotic use, successfully meeting the 2020 target two years early (RUMA, 2020a).

Aquaculture sector

"It's useful to go back from those [TTF] meetings and talk to clients about it, people that are using the drugs…everybody's got the same issue, we've all got the same drivers…"

Peter Scott, *Fish Vet and member of the TTF*

The UK aquaculture sector is dominated by production of Atlantic salmon and trout. The majority of salmon producers are vertically-integrated companies, meaning that they have direct ownership of each stage of production including hatcheries, processing and export. Almost all producers are members of the Scottish Salmon Producers Organization (SSPO), and it is a requirement of membership that companies adhere to the Code of Good Practice for Scottish Finfish Aquaculture (CoGP). The CoGP focuses strongly on fish health and welfare, especially on preventative strategies and on co-operation between farms and companies in managing the health of fish produced within Farm Management Areas. Fish are covered by animal welfare legislation, but are not covered by the Veterinary Surgeons Act, and as such veterinary involvement in aquaculture has been variable. However, the use of antibiotics does require veterinary prescription, and under the CoGP all farms must have a Veterinary Health Plan which covers the use of medicines. Veterinary care is supplied by a relatively small number of vets, and all of the vets currently prescribing for the Scottish industry are believed to be members of the Fish Veterinary Society (FVS) (RUMA, 2017). In addition, almost all salmon farms in Scotland are members of the Royal Society for the Prevention of Cruelty to Animals assurance scheme, ensuring that they farm fish in accordance with a set of published welfare standards, including on responsible antibiotic usage.

Rainbow trout aquaculture is a smaller, more fragmented industry, with the British Trout Association representing those responsible for around 80 percent of production. The majority of trout are grown in freshwater, but in Scotland transfer of fish to the sea for on-growing is also practised. The nature of freshwater trout production makes it impossible to operate the all-in all-out systems which are normal in salmon production, and this can impact on pathogen control. FVS members are involved in providing services to trout aquaculture, but some smaller producers make use of local general practices which might not employ FVS members (RUMA, 2017). The trout sector faces a number of specific challenges, including a paucity of effective vaccines and the major issue of proliferative kidney disease, a protozoal disease which has no treatment and makes the trout susceptible to secondary bacterial disease. The relatively smaller size of the industry inhibits new pharma investment.

Antibiotic usage data, combined with high aspiration and a desire for pragmatism, led to setting of usage targets of 5mg/kg in salmon and 20mg/kg in trout. Data for the fish sector are collected from prescribing vets and trade bodies. No HP-CIAs are licensed for use in aquaculture in the United Kingdom, but oxolinic acid (which under the Antimicrobial Advice Ad Hoc Expert Group guidance became an HP-CIA in 2020) is used under the prescribing cascade, especially in the trout sector (VMD, 2021b; EMA, 2019). Due to the relatively low levels of antibiotic use in fish production, it was decided that efforts should focus on maintaining availability whilst simultaneously discouraging use. Strategies to achieve this include use of vaccines against bacterial pathogens, including development of autogenous vaccines where there are no commercially-available options (RUMA, 2020b), and continuing to minimize the use of HP-CIAs (RUMA, 2017).

Laying hens sector

"…the British Egg Industry Council (BEIC), they represent probably around 90 percent of the egg producers in the United Kingdom, because they own the Lion Code which is the code of practice related to salmonella control. So if you want to be a member of the Lion Code, you have to be a member of the BEIC as well."

Daniel Parker, *Poultry Vet and member of the TTF*

ALL EGG PRODUCERS, PULLET REARERS AND BREEDING COMPANIES ARE REQUIRED TO REPORT ANY USE OF AN ANTIBIOTIC

The collection of antibiotic usage data for the laying hen industry is organized by the BEIC. Sharing these data with BEIC is mandatory through the Lion Code of Practice, which covers over 90 percent of the UK laying hen industry. All egg producers, pullet rearers and breeding companies are required to report any use of an antibiotic to the BEIC on a quarterly basis. The BEIC collate the aggregate annual antibiotic data and provide it to the VMD, who carry out the calculations and validation of the usage by active ingredient using ESVAC principles (RUMA, 2017; VMD, 2018)

In 2020, the laying hen industry used 3.1 tonnes of antibiotic active ingredient. The sector monitors total usage on the basis of bird/days medicated (daily doses) as a proportion of the estimated total number of bird/days at risk based on Lion Code census figures. On this basis, for 2020 the laying hen industry used 0.47 actual bird days treated/100 bird days at risk (percentage bird days). Use of antibiotics in egg production was already low compared with some other animal production systems. The sector adopted a broad objective of ensuring that the total tonnage used in egg production does not increase. Another key target was to assess usage trends by class of antibiotic. The targets set were the following: 1) total bird/days medicated remains below 1 percent; and 2) use of HP-CIA days medicated remains below 0.05 percent (RUMA, 2017).

The data available showed that the total use of antibiotics has remained below 1 percent since 2016 and no HP-CIAs were used between 2017 and 2020 (VMD, 2021a).

5.
DELIVERY OF RESULTS

ACHIEVEMENTS

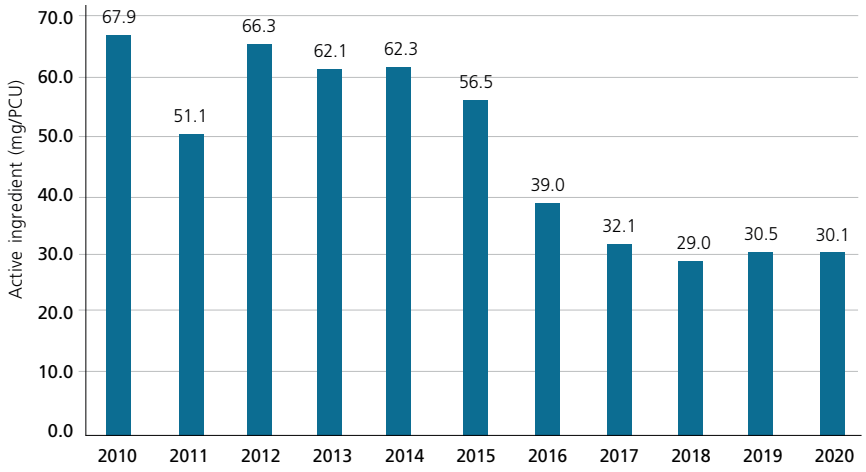
"Harnessing the enthusiasm and capabilities of the livestock sectors themselves to take forward this work, farmers worked together to create their own targets. The targets go beyond the 50mg/kg blanket, they recognized that there was a job to be done, they understood their own sectors and they were able to set their own destiny, and they did it really well"

Nigel Gibbens CBE, *former CVO*

The TTF identified forty sector-specific targets for responsible stewardship of antibiotics to be achieved across different livestock sectors by 2020. In the RUMA report published in 2020, it was highlighted that over three-quarters of the targets have already been met or were on track to be achieved by the end of 2020, which was a significant achievement (RUMA, 2020a).

"[The voluntary approach worked so well] because industry decided to do it themselves, because they believed in it for themselves, for their animals and

FIGURE 2. Total sales of antibiotics for use in food-producing animals



Source: UK Veterinary Antibiotic Resistance and Sales Surveillance Report 2020 (UK-VARSS 2021).

Published November 2021. New Haw, Addlestone: Veterinary Medicines Directorate. Available at: https://www.gov.uk/government/publications/veterinary-antimicrobial-resistance-and-sales-surveillance-2020

for their customers. This approach became more than just a tick-box exercise, but a cause that truly mattered. And they learned together, they came together as a community, RUMA did that very well. It worked far better than I ever imagined it could!"

Professor Dame Sally Davies, *former CMO*

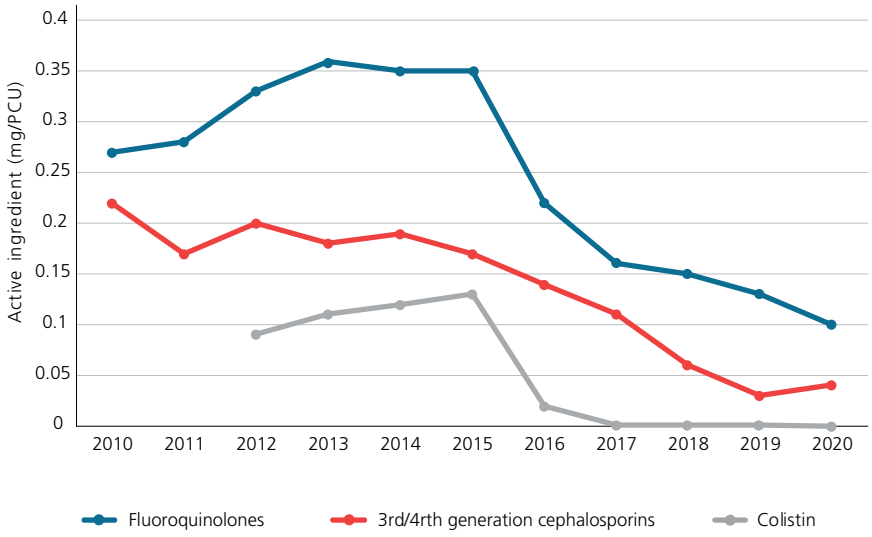
THE UNITED KINGDOM'S ACHIEVEMENT IN REDUCING ANTIBIOTIC CONSUMPTION MAKES IT ONE OF THE LOWEST USERS OF ANTIBIOTICS ACROSS EUROPE

The latest VARSS report, published in 2021, shows that antibiotic sales for food-producing animals have halved since 2014 (Figure 2) (VMD, 2021a). Over the same period, the use of HP-CIAs has reduced by 79 percent (Figure 3). The United Kingdom's achievement in reducing antibiotic consumption makes it one of the lowest users of antibiotics across Europe. The latest published data in the ESVAC project shows that the United Kingdom is the lowest user of antibiotics amongst European countries with significant livestock farming (EMA, 2021). This has been achieved primarily through the voluntary collaborative approach between the industry and government.

"I think the big one is the fact that it's a voluntary scheme and we've managed to do this on a voluntary basis and without regulation. I think that's been the biggest achievement of all."

Gwyn Jones, *former Chair of RUMA*

FIGURE 3. Sales of HP-CIAs in food-producing animals



Note: Colistin mg/PCU not available for 2010 and 2011 as it was not considered an HP-CIA at this time.

Source: UK Veterinary Antibiotic Resistance and Sales Surveillance Report 2020 (UK-VARSS 2021).
Published November 2021. New Haw, Addlestone: Veterinary Medicines Directorate.
Available at: https://www.gov.uk/government/publications/veterinary-antimicrobial-resistance-and-sales-surveillance-2020

"It feels like the reason that it worked is because it grew organically, through people who were very dedicated to the cause. It wasn't about defensiveness, or scoring points, or soundbites. Instead, it was a recognition that this is something that's really important, there is a lot at stake here, and how do we make it work."

Kitty Healey, *Head of Surveillance Division, Head of Antimicrobial Resistance at the VMD*

The ultimate goal of reducing antibiotic consumption and improving stewardship is to reduce antibiotic resistance, and the United Kingdom's efforts are leading to successes in this area. Monitoring of antibiotic resistance in bacteria isolated from animals in the United Kingdom occurs under two surveillance programmes, covering both healthy and sick animals. The 2020 United Kingdom-VARSS report shows trends of decreasing antibiotic resistance in *E. coli* in healthy broilers and turkeys at slaughter since 2014, and very low and decreasing prevalence of ESBL-/AmpC-producing *E. coli* since 2016 (VMD, 2021a). Based on most recently available data, the United Kingdom has also had one of the largest increases in levels of fully susceptible *E. coli* amongst European countries, as well as one of the lowest prevalences of ESBL-/AmpC- *E. coli* in key livestock sectors (EFSA and ECDC, 2021).

"We've actually managed to turn around resistance. Why did we do this in the first place? It was about reducing the risk of antibiotic resistance developing. Antibiotics are hugely important, we need them. We are trying to protect their longevity, protect their efficacy, to stop resistance developing in the first place, and to achieve the original objectives of safe food, and maintaining good health and welfare in our farmed animals."

Cat McLaughlin, *Chair of RUMA*

"Most of the key veterinary pathogens remain susceptible to authorized antibiotics, including those that have been available for many years. The VMD now intends to enhance this programme of work and undertake a more detailed analysis of antibiotic susceptibility in a range of animal pathogens, expanding the scope of current surveillance activities."

Professor Peter Borriello CB, *former VMD CEO*

In addition to the successful reduction in antibiotic use, there have been many other important achievements highlighted by different stakeholders. One of these is the establishment of the TTF to bring the livestock sectors together to lead on antibiotic stewardship, a unique approach which allowed sharing of knowledge and experiences between sectors. Moreover, the work that leading farmers and vets did to engage their wider sectors helped to raise aware-

Sheep vet and Targets Task Force member Fiona Lovatt celebrating RUMA's success at the Antibiotic Guardian Awards

ness and build knowledge of AMR and antibiotic stewardship.

"The numbers themselves are hugely important to celebrate. In some ways though, it's more about the qualitative things. It's been bringing together different mindsets, different attitudes, and different production systems and allowing people to have that safe space. We now trust each other as a RUMA family, that's all the stakeholders, the VMD observers... It's made for a better community approach, that sense of 'we're all going in the same direction and we're all supporting each other'."

Cat McLaughlin, *Chair of RUMA*

The volume and tone of messages in the farming media has changed, and there is now information published regularly on responsible antibiotic use. This has become a key part of farm management and it has begun to be seen as a measure of health and welfare among producers. There is a sense of pride in what has been achieved, and this has given the industry the confidence to talk about antibiotic stewardship openly and honestly.

Another important aspect was that this collaboration allowed the development of a strong relationship, built on trust, between the industry and government.

"The VMD has been a big part of this. The VMD is part of this story; you sit on our boards, you've been on our Targets Task Force… It's been a big part and a team player."

Gwyn Jones, *former Chair of RUMA*

The efforts of RUMA were also recognized by winning two Antibiotic Guardian Awards (see Box 5 for further details).

BOX 5: Antibiotic Guardian Awards

The Antibiotic Guardian Awards were developed by Public Health England in 2014 to recognize the important work of organizations who have demonstrated achievements in tackling AMR at local, regional and national levels. In 2018, RUMA won two Antibiotic Guardian Awards, one for "Prescribing and Stewardship" for the work of the Targets Task Force, and the other for "Community Communications".

RESPONSIBLE USE OF MEDICINES IN AGRICULTURE ALLIANCE

ruma

Targets Task Force Report 2017

The Targets Task Force

Driving grassroots change in antibiotic stewardship

Background

In May 2016, RUMA anticipated that targets for reducing antibiotic use in farming, as part of a One Health approach, would be recommended in the forthcoming O'Neill report.

To ensure any targets were meaningful, RUMA decided they should be developed by those who know best – the vets and farmers looking after the livestock.

Hence the Targets Task Force was announced.

Building The Task Force

Leading farming and veterinary representatives were recruited from eight different sectors. The Veterinary Medicines Directorate, British Veterinary Association, Food Standards Agency and Red Tractor agreed to observe and support the process.

The group first met in December 2016 in a facilitated session to set goals, then met bi-monthly through 2017.

Setting The Targets

Some sectors already had data to act as a starting point, but others needed to make educated estimates or access private datasets. Agreeing targets then required in-depth negotiations with other leaders in that sector, based on health & welfare challenges and the potential to change. Both total usage and use of highest-priority Critically Important Antibiotics (HP-CIAs) were considered, as well as non-numerical targets.

Some of the numerical Targets

Fish

Targeted use 2018-2020:
- Salmon remains at a maximum of 5mg/kg
- Trout remains at a maximum of 20mg/kg

Dairy

Targeted reductions 2016-2020:
- 20% in the amount of antibiotics used
- Intra-mammary and injectable HP-CIAs halved

Beef

Targeted reductions 2016-2020:
- 10% in the amount of antibiotics used, or usage of 10mg/kg, whichever is lower
- HP-CIAs halved

Sheep

Targeted reductions 2016-2020:
- 10% in the amount of antibiotics used
- HP-CIAs halved

Laying hens

Targeted use 2018-2020:
- Total bird/days medicated remains below 1%
- Colistin and 3rd/4th Generation Cephalosporins not permitted

Pigs

Targeted reductions 2016-2020:
- 82.4% in the amount of antibiotics used, to reach 99mg/PCU
- HP-CIA use remains minimal

Poultry meat

Targeted use 2018-2020:
- Chicken sector, 25mg/PCU
- Turkey sector, 50mg/PCU

Gamebirds

Targeted reductions:
- 25% in the amount of antibiotics and HP-CIAs used 2018-17
- Further 25% reduction 2018-2020

Outcomes

By October 2017, all eight sectors had announced individual targets and plans to achieve them – to widespread praise.

"The species specific antibiotic usage targets . . . show that the agriculture sectors are "facing up to the AMR challenge" in a positive and proactive way."

Professor Peter Borriello, Chief Executive, Veterinary Medicines Directorate

"The single most impressive change that I've seen during my time as Chief Veterinary Officer is the engagement of livestock sectors, with leadership of RUMA, to produce individual sector-specific plans to reduce antibiotic use through improved animal health and welfare."

Professor Nigel Gibbens, then Chief Veterinary Officer

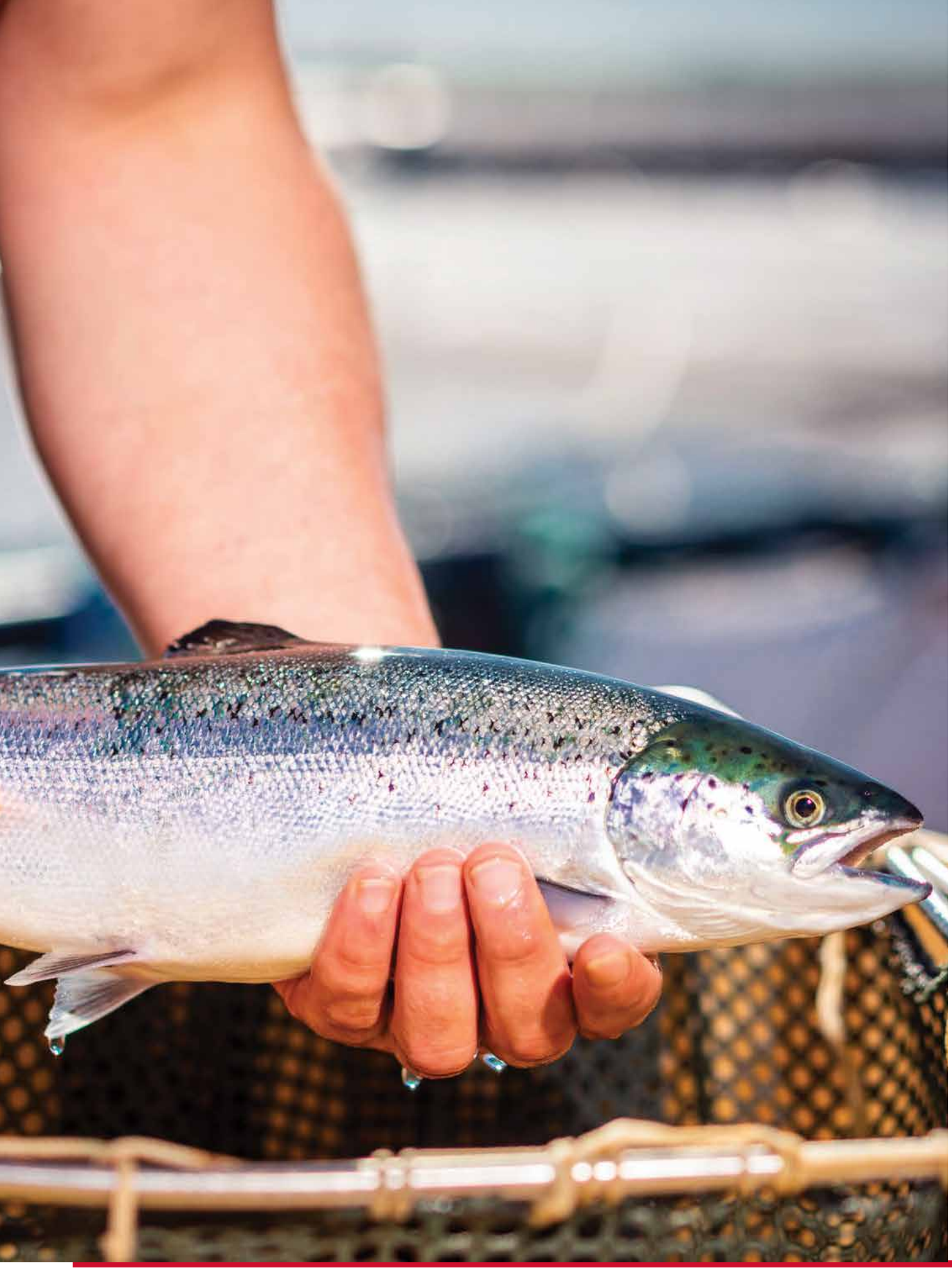
Meanwhile, the work to fulfil the targets continues with the Task Force members driving change in their sectors, and meeting 6-monthly to examine progress.

RUMA's Targets Task Force, proud winners of the Prescribing and Stewardship category in the 2018 Awards

ANTIBIOTIC GUARDIAN

www.ruma.org.uk

www.farmantibiotics.org



6.

ANALYSING THE SCIENCE – A PERSPECTIVE FROM BEHAVIOURAL SCIENCE

The following chapter has been contributed by the Behavioural Insights Team, jointly owned by the UK Cabinet Office, the innovation charity Nesta, and its employees. Its mission is to generate and apply behavioural insights to inform policy, improve public services and deliver results for citizens and society.

A SIGNIFICANT PART OF THE CHALLENGE OF REDUCING AGRICULTURAL ANTIBIOTIC USE INVOLVES **BEHAVIOUR CHANGE**, BOTH OF FARMERS AND OF VETS

A significant part of the challenge of reducing agricultural antibiotic use involves behaviour change, both of farmers and of vets. A number of barriers to behaviour change exist, including low awareness and buy-in from the farming community; potentially misaligned incentives between individual farmers and vets, and the common good; lack of know-how on what to do differently; and lack of engagement with outside voices advocating this issue. Below we highlight some key principles of behaviour change which have been critical to the United Kingdom's success in reducing use of antibiotics in food-producing animals.

Avoid unproductive blame and guilt. Behavioural science shows that negative or admonishing messaging can drive behaviour change, but usually only when a) the criticism is seen as legitimate, and b) taking action is relatively easy. Initially, neither of these conditions were met: a) a sense of scape-goating delegitimized the criticisms levelled against farmers from public health experts, which risked inviting a mentality of entrenching into a reactive, defensive position; and b) it wasn't obvious what could be done about it, as there was too much focus on apportioning blame and less focus on supporting farmers and vets to take simple steps.

Make it relevant and salient. Once the blame issue was resolved, and responsibility was seen as shared, energies were moved from self-defence, to thinking about "what to do". And importantly, the motivation to act was further increased by making the issue salient and relevant to farmers themselves, focusing on the impacts of AMR on livestock, farming practices and the economics of food production, rather than only on the downstream impacts on human health.

Use "regulation by reputation". In many markets, soft reputational pressures can be as effective as regulation. For example, the introduction of res-

taurant hygiene ratings has been shown to cause improved standards across the whole sector - both because it taps into emotions of pride vs. shame among producers/suppliers, but also because making this information public creates commercial pressure to not be at the bottom of the pile. The same was seen here - by publishing data on antibiotic use, the best performing sectors were rewarded (reputationally and emotionally), while the other sectors had new incentives to act. In addition, whilst data gathered is anonymized and individual producers' use never published, there is the option within some data collection systems for farmers to "benchmark" against others in their sector operating similar farming models. Building the right narrative around this is key. This can't be a scenario of an outside agent (for example government, or the public health sector) shaming farmers. Rather, it must come from within the group (see "use the right messenger" below). The movement to reduce antibiotic use began to be seen as one associated with pride, professionalism, and good farming. That is, you might risk being perceived as a second-rate farmer by your peers, if you don't take this issue seriously.

Make it easy. Publishing this data was enough to motivate some to action. But not all farmers were attuned to it, or understood it, or knew what to do. A focus was therefore placed on the on-farm interventions that would increase awareness of a farmer's own position relative to others (this use of direct peer comparisons is a well evidenced behaviour change technique), and critically, what they could do about it by working with their vet.

Use the right messengers. We don't like being criticized or told what to do by others, who might lack the credibility or insight into our lives and livelihoods. But we do often listen to our own (in-group) peers and leadership figures. Public health or media advocates were critical in initially raising the importance of the agenda, but could also feel alienating or even (despite being well intentioned) condescending, feeding into the blame narrative noted above. The voices which really drove action were from legitimate messengers that farmers and vets identified with - including the United Kingdom's Chief Veterinary Officer, the CEO of the VMD and the leaders of producers' associations.

ANTIBIOTICS ARE PRESCRIPTION\ONLY MEDICINES. VETS HAVE THE JOB OF PROTECTING ANIMAL HEALTH, AS WELL AS TO THE INCENTIVE TO SELL ANTIBIOTICS

Follow the incentives. In the United Kingdom, antibiotics are prescription-only medicines. Vets have the job of protecting animal health, as well as the incentive to sell antibiotics - both potential barriers to reducing prescription rates. It was therefore important to adapt veterinary business models to ensure that they remained viable whilst aligning with the imperative to significantly reduce antibiotic use. This can involve shifting towards greater veterinary involvement in health planning, and payment for prevention of disease rather than cure.

Make it someone's problem to solve, and give them the convening power to build collective action. Antimicrobial resistance is a tragedy of the commons: it may be in an individual's best interest to liberally use antibiotics,

but to our collective detriment when everyone does the same. This misalignment of incentives between the individual and the collective, combined with a diffusion of responsibility for solving the problem, can make it very difficult to galvanize the collective action needed. Conventional policy solutions to this tragedy of the commons would be to either strictly regulate antibiotic use (a path not taken here), or privatize the common resource so that self-interest aligns with the common good (but "antibiotic efficacy" can't be privatized in the same way that an over-grazed piece of common land can be). But what can be done, is to "privatize" the problem. By setting up the taskforce, clear ownership of the problem and accountability were ensured. And by creating this group within the farming sector, it had the credibility and ability to galvanize collaboration and a common purpose across the industry. Of course, there may always be a bad incentive for one farmer or vet to continue over-using antibiotics, freeloading off others' hard work. This is why the "regulation by reputation" noted above is so important - social and reputational pressures help boost compliance with the sector's collective efforts.

For further insights into promoting behaviour change, see *Behaviour Change for Nature*, published by the Behavioural Insights Team (Rare and The Behavioural Insights Team, 2019).

7.
FUTURE PROSPECTS

"Livestock products will continue to be necessary because they are high-quality proteins, in many societies they are essential. This is subsistence level agriculture as well as the demand of wealthy people. Livestock are not going away but the way we use, the way we grow livestock and its proportion in our diet needs to change. That will enable a change in how livestock are produced, under less disease pressure probably, and this a big challenge looking forward."

Nigel Gibbens CBE, *former CVO*

The human population is projected to reach 9.8 billion by 2050 and livestock products play an important role in feeding this growing number because of the high-quality protein and nutrients they provide. On average, animal-source foods contribute 39 percent of the protein and 17 percent of the total calories of global diets. Meat, milk, eggs and fish provide important micronutrients for growth, especially in children, and in many regions livestock are the only available source of these (Health for Animals, 2021). Due to the important role they play in diets, livestock remain essential. However, the goal must be to produce this food in the most sustainable way, minimizing environmental impacts whilst respecting animal welfare. Food systems need to adapt, and careful planning is required to ensure that these adaptations take into account the need to reduce disease pressures, and therefore reduce the need for use of antibiotics. Preventing animal disease through vaccination, biosecurity and good husbandry increases the availability of safe and sustainable food.

"We still need to feed our population, and animal protein is still one of the most sustainable sources of protein for the ever-expanding global human population. So, we need to try and get that right balance, and we also know that we need to balance with environmental aspects… A lot of it in my mind comes down to, if you've got healthy animals, well-managed systems, highly skilled stockpeople, veterinary expertise supporting it all, and then ultimately the trust and a kind of social contract for farmers and vets to produce the food that our consumers want to buy, we'll be heading in the right direction. That, in my mind, is where sustainable agriculture and production systems come together."

Cat McLaughlin, *Chair of RUMA*

In order to meet these challenges, new opportunities are being explored for collaboration at all levels of the food system, and RUMA has been building links and engaging in dialogue with the Food Industry Initiative on Antimicrobials (FIIA). The FIIA was established in late 2017 and brings together retailers, manufacturers, processors and food service companies to promote and support responsible antimicrobial use and action on AMR. This initiative supports and engages with other industry groups already working in this area, with the aim of ensuring that work is aligned and duplication of efforts is avoided (RUMA, 2021b). Measurement of antibiotic use and support for farmers to identify and capture good practices are key priorities for FIIA, and through working together on this issue as a collective its members are able to influence activity and effectively support best practice across the industry.

The United Kingdom's sectoral approach successfully harnessed the power of the livestock industry to set its own targets and understand the challenges of the food system as a whole. This deeper understanding of their own sectors will enable producers to more effectively plan for the future and consider how they can produce food in the most sustainable way. In 2019, the original Targets Task Force was refreshed and reformed to create the TTF2, in charge of developing new sector-specific targets for 2021–2024 (HM Government, 2019b; RUMA, 2020a).

THE UNITED KINGDOM'S SECTORAL APPROACH SUCCESSFULLY HARNESSED THE POWER OF THE LIVESTOCK INDUSTRY TO SET ITS OWN TARGETS AND UNDERSTAND THE CHALLENGES OF THE FOOD SYSTEM AS A WHOLE

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"It's a chance for us to start a new conversation based on an old theme. We've learned so much, and we've got ourselves into a really good place… It's a hugely unique initiative and achievement that we have all made, but we need to keep thinking why we were doing it in the first place. If we can remember that, and keep having that conversation about responsible use for all medicine types, not just antibiotics but also vaccines, anti-virals… These are all hugely important production tools, and we need to be able to use them all, understand what we're doing, and use them for the purpose that they were intended."

Cat McLaughlin, *Chair of RUMA*

The second set of targets built on the achievements of the first, taking advantage of all the lessons learned to inform their development. These new targets group sectors into three categories:

1. 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 the fish, laying hen and poultry meat sectors (RUMA, 2020a).
2. Pigs and gamebirds which are still on their downward trajectory and are making strong progress on reducing use. The new targets aim, by 2024, to reduce use by a further 30 percent from the 2020 baseline and 40 percent from the 2019 baseline respectively.
3. The ruminant sectors of beef, dairy, calves and sheep, for which usage remains largely unknown or unproven due to unavailability of data. The focus is on understanding and benchmarking use on-farm, engagement between farmer and vet, and development of health plans.

THE UK GOVERNMENT IS COMMITTED TO BUILDING ON THE SIGNIFICANT REDUCTIONS IN ANTIBIOTIC USE IN ANIMALS BY WORKING TO IMPROVE ANIMAL HEALTH AND ADDRESS ENDEMIC DISEASE CHALLENGES

The UK Government is committed to building on the significant reductions in antibiotic use in animals achieved so far, by working to improve animal health and address endemic disease challenges as outlined in the National Action Plan for AMR 2019–2024. (HM Government, 2019b). The plan recognizes that good farm management, biosecurity and animal husbandry systems are crucial to minimize the occurrence of disease and therefore reduce the need for antibiotics. Farmers need to be supported to produce healthier animals to the very highest standards of welfare, and in some cases investment in infrastructure will be required for farmers to implement these measures. DEFRA is developing the Animal Health and Welfare Pathway, co-designed with farmers and the wider industry. This will provide support for endemic disease control, through provision of capital grants and financial support for vet visits to conduct health and welfare management, planning, and diagnostic testing (DEFRA, 2020c; RUMA, 2020a).

These support mechanisms may provide opportunities for producers to make improvements which could bring about reduced antibiotic usage. For example, one of the new pig sector targets involves encouraging the switch from in-feed to in-water administration of antibiotics where appropriate, allowing for more targeted treatments and therefore more responsible use. However, for some farms this change requires significant infrastructure and management change, and support through the pathway could help to speed this progress (RUMA, 2020a).

"How do you support producers when actually big financial infrastructure improvements are required? This is where the pathway is going to be helpful because there are no new big pots of money available right now, but the Animal Health and Welfare Pathway, which is a joint industry-DEFRA programme, will have the potential to financially support some bigger pieces of work that may make some big improvements."

Rebecca Veale, *Senior Policy Advisor at the National Pig Association*

Farm assurance schemes such as Red Tractor will continue to play an important role in the future, adapting and updating their standards to reflect the changes happening in the various sectors, ensuring that farmers are supported in the progress they are making, and that they are not penalized if the changes needing to be implemented require longer timeframes.

"I think continuing, where it's needed, continuing to evolve the standards so that it continues to help support the sectors with what they want to achieve, as well as also the main outcome which is behaviours and practices that limit development of resistance."

Georgina Crayford, *Technical Manager for Pigs at Red Tractor Farm Assurance*

The UK Government recognizes that no country could tackle AMR in the life of a single five-year plan and has therefore set out its 20-year vision for containing and controlling AMR by 2040. This longer-term vision includes nine ambitions for change, one of which is to continue to be a good global partner. In line with this ambition, an international Reference Centre for AMR was established in 2018, and designated as an FAO Reference Centre in 2019 (see Box 6 for further details).

The United Kingdom recognizes that there is not one solution for antibiotic stewardship in food-producing animals, and that each country faces different challenges. However, through sharing experiences and lessons learned, it is hoped that this report will provide insight and be a useful resource for others exploring options to implement their own stewardship programmes, and will therefore contribute to the global fight against AMR.

"There isn't one solution. There's not one solution for any country, there's not one solution for any sector, it's all about having a tailored approach, I think… And for us this was the collaboration, the team-working policy development approach, with the people who were actually going to need to deliver it and make it work."

Kitty Healey, *Head of Surveillance Division, Head of Antimicrobial Resistance at the VMD*

BOX 6: The United Kingdom's FAO Reference Centre for AMR

DEFRA's UK Reference Centre for AMR was officially launched in October 2018 with a vision to safeguard animal and human health from the threat of AMR. It became the world's first designated FAO Reference Centre for AMR in April 2019. The Centre also has a strong affiliation with UK Aid's Fleming Fund. With a primary focus on low- and middle- income countries, the Centre provides scientific and policy expertise within the global community to tackle AMR in terrestrial and aquatic animals and their environments, in line with the FAO Action Plan on AMR 2021–2025 (FAO, 2021). Partner countries to date include Bangladesh, Ghana, Ethiopia and Nigeria. The Reference Centre is a joint initiative across three Executive Agencies of DEFRA: Animal and Plant Health Agency; Centre for Environment, Fisheries and Aquaculture Science; and the VMD. In particular, the VMD delivers international projects aimed at improvement in capacity for effective regulation of veterinary medicines.

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8.
LESSONS LEARNED AND KEY ELEMENTS OF SUCCESS

The United Kingdom's voluntary collaborative approach demonstrates that significant successes can be achieved when the livestock industry takes ownership of the issue and drives the work of their own sectors. Through industry leadership on antibiotic stewardship, each sector was able to study their systems closely and identify opportunities for antibiotic use reduction. Farmers began examining their individual practices and implementing changes, improving husbandry practices and engaging in disease prevention measures to reduce their reliance on antibiotics. Increased awareness and understanding amongst both producers and vets led to behaviour change, instilling a shift in culture which will remain sustainable over the long term. In addition, tailoring the targets to each sector has been fundamental in acknowledging that each faces different challenges. The approach of the TTF has provided a forum for learning and experience to be shared across all sectors, so that each can benefit from this collective knowledge when planning their strategies.

Stakeholders who have played key roles in this initiative have identified several important elements which contributed to its success, listed in Box 7.

BOX 7: Key elements for the success of this initiative

1. A strong relationship between farmers and vets: *"The important thing for me is making sure the veterinary-farm bond is strong…my feeling is that the changes here are driven by vets and vets' relationships with farmers…I think the veterinary relationship is absolutely key."*

Peter Scott, Fish vet and member of the TTF

2. Setting targets tailored to the challenges of each livestock sector: *"We have an overall target that we need to achieve and all the sectors need to play a part in that, and further to that you need to understand your sector; understand why and when you use antibiotics; and you need to understand where you can intervene and reduce that use wherever your starting point is."*

Nigel Gibbens CBE, former CVO

3. Access to data to set and monitor targets and assess impacts: *"I think because of the great work that RUMA has done in basically turning around the perception of antibiotic use in pig farming, I think farmers have realized, even the reticent ones, have seen the power and the benefit of having data that we can then point to and say, "We've delivered these reductions."*

Georgina Crayford, Technical Manager for Pigs at Red Tractor Farm Assurance

4. Involvement of influential individuals to ensure sustainability: *"There needs to be engagement with all the right stakeholders on human and animal sides, and then it is creating proper leaders in those areas…it needs to be self-sustained."*

Professor Peter Borriello CB, former VMD CEO

5. A mature livestock system with active producers' associations: *"…this is a system that works best perhaps when you have got a pretty mature livestock system with producers associations that are active, capable and able to take part in the debate, and have a lot of influence with the stakeholders."*

Nigel Gibbens CBE, former CVO

6. Clear and transparent communication which includes everyone, to change mindsets: *"I think the big lesson is you've got to talk to people, communication is the big one, bring everyone on your side and get the understanding. It was important to have skilled and experienced communications resource involved."*

Gwyn Jones, former Chair of RUMA

7. A dedicated organization to lead on the work, such as RUMA: *"RUMA had membership from across all the key sectors…it was hitting all levels of the food supply chain…it provided reach, momentum and critical mass. All that representation needs to be in one room, so, if RUMA doesn't exist in another country, maybe it should, maybe it should be started."*

Amy Jackson, former Communications Consultant for RUMA

8. Ensuring the issue is tackled collectively: *"…this should not be done as a competitive issue, this should be done co-operatively."*

Daniel Parker, Poultry vet and member of the TTF

9. Government and the livestock industry working together, building a trusting relationship: *"… that relationship [with the VMD] has been a key aspect of this, no question about that, because we've been able to introduce government ideas, government thoughts and opinions on things. Suddenly our farmer members met the VMD and realized they're not as dangerous as they thought maybe, or as unrealistic, or anything like that."*

Gwyn Jones, former Chair of RUMA

10. Challenge and accountability: *"I think it's provided a good challenge as well…with everybody presenting their ideas around the targets and then other sectors giving their thoughts on whether that's gone far enough or what their experiences of trying to do something are… the public nature of it as well, the commitment to publicly publish the targets and progress against the targets, that's all helped with the accountability I think, as well giving an opportunity to demonstrate what it has achieved."*

Georgina Crayford, Technical Manager for Pigs at Red Tractor Farm Assurance

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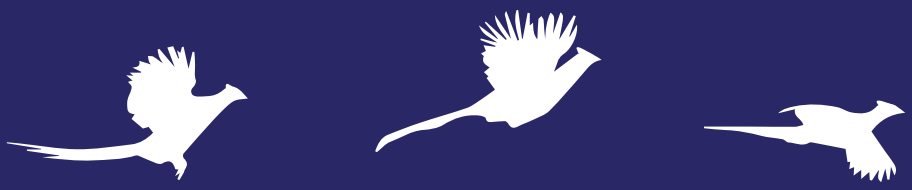

This publication describes the United Kingdom's multisectoral voluntary approach to antibiotic stewardship in food-producing animals, developed as a collaboration between industry and government. It is a tribute to all those involved for their tremendous efforts, commitment, and continuous work to improve responsible use of antibiotics and achieve significant reductions in their use across livestock sectors. Keys to success include the development of strong relationships between producers, veterinarians and government, industry-led target-setting and cross-sectoral learning and sharing of experiences. This has built a collective sense of ownership and responsibility, resulting in effective behaviour change for improved stewardship.

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