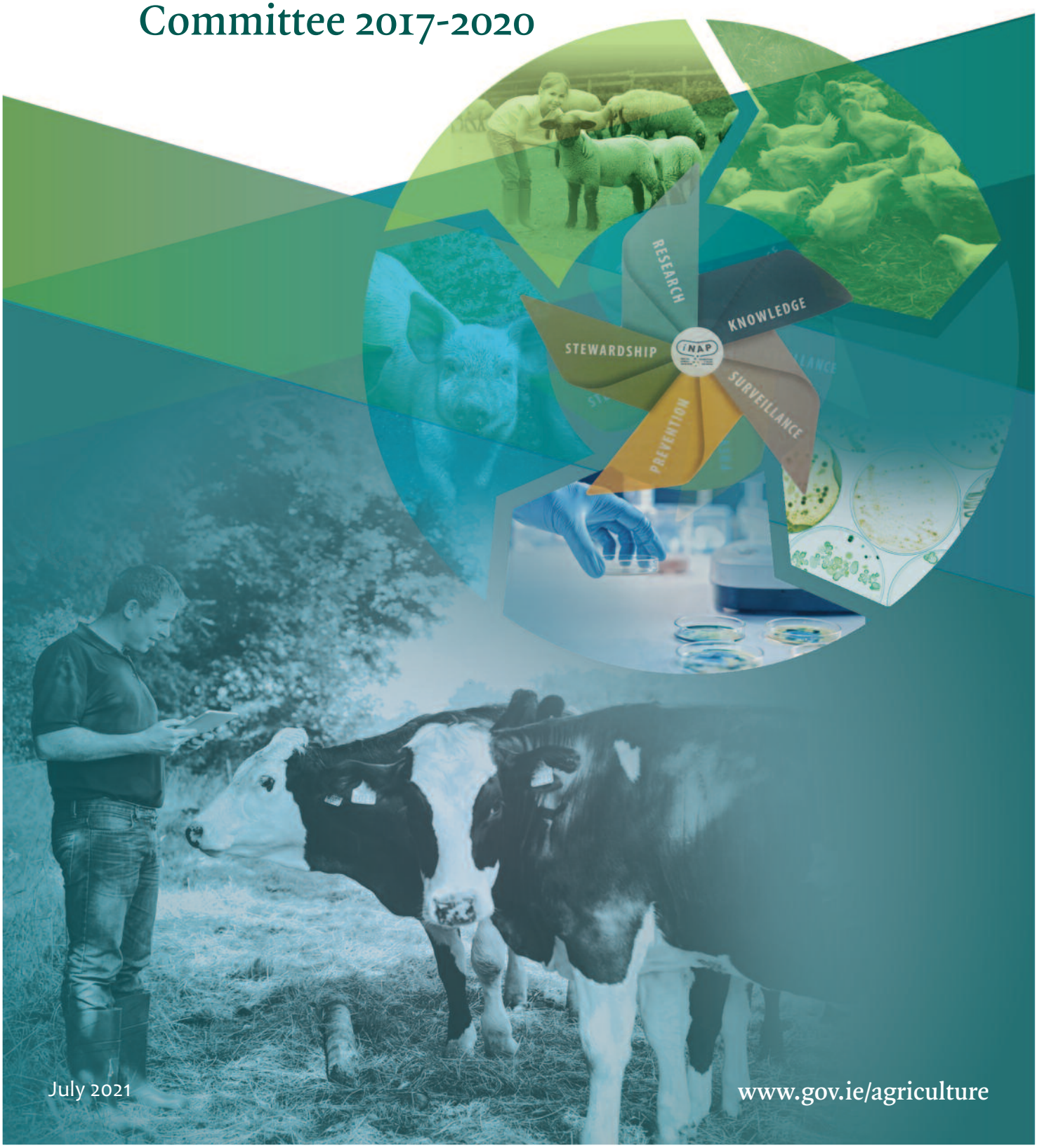
An Roinn Talmhaíochta,
Bia agus Mara
Department of Agriculture,
Food and the Marine

iNAP
PROTECTING ANTIBIOTICS FOR THE FUTURE
ANTAIBHEATHAIGH A CHOSAINT DON TODHCHAÍ

Report of the *i*NAP Animal Health Implementation Committee 2017-2020



July 2021

www.gov.ie/agriculture

Table of Contents

Foreword

Dr. Martin Blake,
Chief Veterinary Officer

Ireland's first National Action Plan on Antimicrobial Resistance 2017-2020 (*i*NAP) has set out a structured framework for working effectively together across all sectors of Irish society to tackle the very real threat of antimicrobial resistance (AMR). Our National Action plan has provided a very successful platform to implement policies and actions to prevent, monitor and combat AMR across the health, agricultural and environmental sectors using a One Health approach. This plan acknowledged that no one sector can successfully address AMR alone, and a One Health approach is viewed as being critically important to achieving sustainable progress.

The establishment of the *i*NAP Animal Health Implementation Committee in January 2018 has played a pivotal role in facilitating multidisciplinary collaborative efforts across key stakeholders in the animal health and environmental sectors. All stakeholders within the *i*NAP Animal Health Implementation Committee have demonstrated a clear commitment to supporting *i*NAP, and I commend the leadership and dedication shown in progressing the Animal Health actions outlined in the plan. These actions have provided a roadmap for a coordinated national 'One Health' response to AMR that can be built on going forward. Actions taken to improve animal health, and prevent disease, are key to reducing the use of antibiotics, and effectively tackling AMR. These actions align well with Ireland's National Farmed Animal Health Strategy with one of the key enabling principles being 'Prevention is Better than Cure''. Sustained optimal animal health is critical to the future profitability and sustainability of our farming and processing industries, and to the protection of public health and of our shared environment.

To summarise, while considerable progress has already been made in the past three years, *i*NAP2 *2021-2025* must be even more ambitious. I look forward to continued positive partnership with all sectors, and their committed leadership, with support from the Department to address the challenge of AMR.

Dr. Martin Blake
Chief Veterinary Officer

Key Concepts and Definitions

Antibiotic: A natural or synthetic substance that inhibits the growth of or destroys bacteria.

Antimicrobial: An agent that kills microorganisms or stops their growth. Antimicrobial medicines can be grouped according to the microorganisms they act primarily against. For example, antibiotics are used against bacteria and antifungals are used against fungi. All antibiotics are antimicrobials but not all antimicrobials are antibiotics.

Antimicrobial Resistance (AMR): The ability of a microorganism (like viruses, bacteria and some parasites) to grow/survive in the presence of an antimicrobial (such as antibiotics) that should be capable of killing it when given at the correct dose. In general when we talk about AMR we are referring to bacterial resistance to antibiotics.

Antimicrobial stewardship: a systematic approach to optimising antimicrobial therapy, through a variety of structures and interventions. Antimicrobial Stewardship includes not only limiting inappropriate use but also optimising antimicrobial selection, dosing, route, and duration of therapy to maximise clinical cure, while limiting the unintended consequences, such as the emergence of resistance, adverse drug events, and cost.

Benchmarking: in the context of antimicrobials, refers to the process of measuring the level of antimicrobial prescribing by a veterinary practitioner, or usage by a farmer and comparing this to others in the sector.

Biosecurity: this refers to practices used to prevent both the introduction, and the spread of diseases within a farm.

Metaphylaxis: This term refers to the treatment of a group of animals after the diagnosis of infection and/or clinical disease in part of the group, with the aim of preventing the spread of infectious disease to animals in close contact, and at considerable risk, and which may already be (sub-clinically) infected or incubating the disease.

Prophylaxis: This term refers to treatment of an animal or a group of animals, before clinical signs of infectious disease, in order to prevent the occurrence of disease or infection e.g. blanket dry cow therapy.

What is 'One Health'?

The 'One Health' concept promotes a "whole of society" approach which recognises that the health of people is connected to the health of animals and the environment. The goal of the 'One Health' concept is to encourage multidisciplinary collaborative efforts across different sectors such as health, agriculture and the environment to achieve the best health outcomes for people and animals.

Abbreviations and Acronyms

Abbreviation	Meaning
AHI	Animal Health Ireland
AHIC	Animal Health Implementation Committee
AMs	Antimicrobials
AMR	Antimicrobial Resistance
AMU	Antimicrobial Usage
APHA	Animal and Plant Health Association
BVD	Bovine Viral Diarrhoea Virus
CMO	Chief Medical Officer
CVERA	Centre for Veterinary Epidemiology and Risk Analysis
CVO	Chief Veterinary Officer
CVRL	Central Veterinary Research Laboratory
DAFM	Department of Agriculture, Food and the Marine
DoH	Department of Health
EFSA	European Food Safety Authority
EMA	European Medicines Agency
EPA	Environmental Protection Agency
ESRI	Economic and Social Research Institute
ESBL	Extended spectrum beta lactamase
EU	European Union
FAO	Food and Agriculture Organisation
FSAI	Food Safety Authority of Ireland
HP-CIAs	Highest Priority Critically Important Antimicrobials
HPRA	Health Products Regulatory Authority
HSE	Health Service Executive
ICBF	Irish Cattle Breeding Federation
ICMSA	Irish Creamery Milk Suppliers Association
ICOS	Irish Co-operative Organisation Society
IFA	Irish Farmers Association
IGFA	Irish Grain and Feed Association
MII	Meat Industry Ireland
OIE	World Organisation for Animal Health
PVP	Private Veterinary Practitioner
SPC	Summary of Product Characteristics
UCD	University College Dublin
VCI	Veterinary Council of Ireland
VI	Veterinary Ireland
WHO	World Health Organisation

Background

In 2015, all countries committed to a *Global Action Plan on Antimicrobial Resistance* through decisions that were made at the World Health Organisation (WHO) World Health Assembly, the Food and Agriculture Organisation (FAO) Conference and the World Assembly of the World Health Organisation for Animal Health (OIE). The *WHO Global Action Plan on AMR* was also introduced that year. In September 2016, Heads of State at the United Nations' General Assembly committed to dealing with the increasing AMR threat through a sustainable multi-sector approach.

On 17 June 2016, the European Union (EU) Council published its conclusions on *''the next steps under a 'One Health' approach to combat antimicrobial resistance''*. The European Commission increased its commitment to tackle AMR by launching a second action plan that same month which was called *'A European One Health Action Plan against Antimicrobial Resistance (AMR)'*. This plan was to support Member States in implementing National AMR Action Plans, support innovative ways to tackle AMR and to strengthen the EU as a global leader in dealing with this threat.

Introduction

In 2014, the Irish Government added AMR to its National Risk Assessment (NRA) document. The Chief Veterinary Officer – CVO (Department of Agriculture, Food and the Marine - DAFM) and Chief Medical Officer – CMO (Department of Health - DoH) established a National Interdepartmental AMR Consultative Committee as a whole of government approach to address the AMR challenge. This high-level Committee was ultimately responsible for developing Ireland's National Action Plan on Antimicrobial Resistance 2017-2020 (iNAP) https://www.gov.ie/en/publication/babe6-irelands-national-action-plan-for-antimicrobial-resistance-2017-2020-inap/ that is based on the five Strategic Objectives in the *'WHO Global Action Plan on AMR'*. On 25th October 2017, the Ministers for the Department of Health, and the Department of Agriculture co-launched *i*NAP, as part of a One Health Strategy. As a One Health strategy it recognises that humans and animals share the same environment, and that joint action is needed to deal with the AMR threat to public health, animal health and the environment. Consequently *i*NAP requires co-ordinated multi-stakeholder action to implement the five key WHO Strategic Objectives to tackle AMR as follows:

1. **Improving awareness and knowledge of AMR;**
2. **Enhancing surveillance of antibiotic resistance and antibiotic use;**
3. **Reducing the spread of infection and disease;**
4. **Optimising the use of antibiotics in human and animal health; and**
5. **Promoting research and sustainable investment in new medicines, diagnostic tools, vaccines and other interventions.**

*i*NAP Animal Health Implementation Committee

An Animal Health Implementation Committee (AHIC) was set up in January 2018, chaired by Ireland's Chief Veterinary Officer, and tasked with overseeing the completion of the Animal Health and Environment actions outlined in *i*NAP. This committee brought together various animal health and environment stakeholders to collaborate on achieving completion of the projects outlined in the Animal Health Implementation Plan which was developed jointly with the stakeholders. The stakeholders represented on the committee are Animal Health Ireland (AHI), the Animal and Plant Health Association (APHA), Bord Bia, the Environmental Protection Agency (EPA), Food Safety Authority of Ireland (FSAI), Health Products Regulatory Authority (HPRA), Irish Cattle Breeding Federation (ICBF), Irish Co-operative Organisation Society (ICOS), Irish Creamery Milk Suppliers Association (ICMSA), Irish Farmers' Association (IFA), Irish Grain and Feed Association (IGFA), Meat Industry Ireland (MII), Teagasc, Safefood (since October 2018) University College Dublin (UCD), Veterinary Council of Ireland (VCI) and Veterinary Ireland (VI). See Appendix 2 for details of *i*NAP AHIC members.

*i*NAP Animal Health Implementation Committee Terms of Reference

- To provide a mechanism to guide and co-ordinate actions to address AMR in the animal health sector.
- To provide a forum for the sharing of information so that all stakeholders are kept up to date on actions being carried out across the sector.
- To provide a mechanism to identify any new or emerging issues, synergies, research gaps and opportunities, and to develop innovative solutions to address issues that arise.

Review and Main Achievements of *i*NAP 2017-2020

The key achievements of iNAP (2017-2020) are best outlined in the context of the interventions and activities completed and ongoing in relation to the plan's five strategic objectives. These five strategic objectives were first published by the World Health Organisation (WHO), in their global action plan to tackle AMR in 2015. The WHO in 2015 required all countries to develop a national action plan that was aligned with their global action plan.

Strategic Objective One: Improving awareness and knowledge of AMR

Under Strategic Objective One the *i*NAP AHIC facilitated a number of very successful events to improve knowledge and awareness of AMR over the past three years.

In 2018 *'One Health 2018: A Joint Approach for Healthcare and Veterinary Professionals'* was held in Dublin to mark European Antibiotic Awareness Day, and World Antibiotic Awareness Week. This event provided an opportunity for healthcare and veterinary professionals to share learning on the opportunities and challenges encountered in relation to prescribing, use and management of antibiotics in human and animal health. Presentations and discussions during the conference included how best to support the delivery of high quality, safe and effective care whilst ensuring appropriate antimicrobial stewardship in both human and animal health.

In November 2019 the *Antimicrobial and Anthelmintic Resistance Conference- "Awareness to Action"* took place in Tullamore, County Offaly. This event aimed to facilitate the sharing and learning of best practice amongst farmers, vets and other professionals involved in the agri-food sector, laying emphasis on clear concise practical actions which can be taken on Irish farms to reduce their need to use antimicrobials.

In 2020 a webinar titled *"Handle Antimicrobials with Care - One Health"* was organised to mark European Antibiotic Awareness Day on November 18th, and featured a number of thought provoking presentations from a number of experts across the human, environmental and agricultural spheres, as well as a stakeholder panel discussion. These events served to place a spotlight on AMR at a national level, and embodied two keys objectives of *i*NAP in relation to improving knowledge and awareness of AMR, and also optimising the use of antibiotics in human and animal health.

Strategic Objective One: Improving awareness and knowledge of AMR

Also in 2020, the annual Environment, Health and Wellbeing Conference, jointly organised by the Environmental Protection Agency, the Health Service Executive and the Economic and Social Research Institute included a dedicated session on AMR, *i*NAP1 outcomes and learnings, as well as development of Ireland's second National Action Plan on AMR (*i*NAP2).

Other *i*NAP projects delivered actions around awareness raising and further education of the veterinary profession both at postgraduate and undergraduate level. Engagement with Agricultural colleges and educators of farm advisors resulted in AMR being included as a topic of relevance and importance for further education.

In 2019 the Department collaborated with the Irish Farmers Journal (IFJ) on a "One Health" campaign aimed at farmers/farm advisors and other readers of the IFJ. This initiative involved fortnightly articles both online and published in the journal, in tandem with a short video discussing each theme. The initiative started in September 2019 and continued for 26 weeks. This initiative met several strategic objectives under *i*NAP in terms of Strategic Objective 1, improving knowledge and awareness of AMR, Strategic Objective 3 reducing the spread of infection and disease by promoting improved animal health and biosecurity and Strategic Objective 4, optimising the use of antibiotics in animal health.

A nationwide survey of Irish Farmers conducted by the IFA and APHA in 2018 revealed a high level of awareness amongst farmers of AMR and its potential impact on both human and animal health. It was particularly encouraging that 83% of farmers surveyed were using vaccines to prevent disease, whilst 76% of farmers had a herd health plan in place to prevent disease, with almost half of the remaining respondents planning to have a herd health plan in the future.

Promotion of awareness at all links in the food production chain included certain retailers, who as members of the Food Safety Authority of Ireland's Retail Forum have signed up to a statement of intent with regard to the responsible use of antibiotics in food production systems. The Environmental Protection Agency provided information in various formats to improve understanding and awareness around the correct disposal of antimicrobials underlining the importance of protecting environmental health from development and spread of AMR in the bacteria in our shared ecosystem.

All committee members worked collaboratively both with committee colleagues but also with their respective stakeholders to build a solid foundation of knowledge and awareness of AMR across the agri-food and environmental sectors.

Pictured at the launch of "Antimicrobial and Anthelmintic Resistance Conference- "Awareness to Action"which took place in Tullamore, County Offaly in November 2019 Pictured from (L to R) were: Dr Kaye Burgess, Teagasc, Mike Magan, Animal Health Ireland, Professor Michael Diskin, Teagasc, Associate Professor Nola Leonard, UCD, Minister for Agriculture, Food and the Marine, Michael Creed T.D., Dr Caroline Garvan, DAFM, and Dr Martin Blake, Chief Veterinary officer, DAFM.

Strategic Objective Two: Enhancing surveillance of antibiotic resistance and antibiotic use

Surveillance of both AMR and usage trends is a key indicator of progress and effective policy development and implementation. In line with Strategic Objective 2 of *i*NAP, the National Antimicrobial Usage (AMU) Database for pigs was launched in November 2019 and continues to collect farm level data on the amount of antimicrobials used on commercial Irish pig farms on a quarterly basis. It will be a requirement under the Bord Bia Quality Assurance Standard that pig farmers submit antimicrobial usage (AMU) data to DAFM. The AMU reports generated allow farmers to benchmark themselves against their peers and assess how their AMU compares to the national average.

Measuring antimicrobial use is a pivotal part of the national effort to reduce overall use and promote responsible use where necessary. It is envisaged that while usage data is gathered at farm level for pigs, data will be collected from prescribing vets in time for all other species. Work began in Q4 2020 to gather the business requirements to support development of a National Veterinary Prescription System (NVPS) to allow for the collection of prescription level usage data electronically. The development of NVPS, in addition to addressing strategic objective 2 of iNAP, reflects the requirements of EU Veterinary Medicine Regulations (EU) 2019/6 which specifies a stepwise approach to the collecting and reporting of antimicrobial usage data. Since 2009, the Health Products Regulatory Authority (HPRA) has been collating data on antibiotic sales for the previous year provided to the HPRA by the marketing authorisation holders (MAHs) that market veterinary antibiotics and reporting this data to the EMA as part of the European Surveillance of Veterinary Antimicrobial Consumption (ESVAC) project. The EMA publishes an annual ESVAC report which serves to highlight trends in sales of veterinary antibiotics throughout Europe over time. The collection of this sales data will be required as part of EU Veterinary Medicine Regulation (EU) 2019/6.

In addition, under the National AMR Surveillance Programme, annual monitoring and surveillance is carried out to determine the development and spread of resistance in the pig and poultry sectors. The AMR monitoring and surveillance is aimed at establishing AMR levels, identifying trends, as well as new and emerging resistance patterns. The national programme focuses on the intensive pig and poultry sectors in alternate years, as required under EU legislation. In 2018 and 2020 the programme focused on poultry (meat-producing broiler chickens) and in 2017 and 2019 on pigs. The European legislation includes the requirement to sample fresh poultry, pig and beef meat at retail level in order to monitor levels of resistant bacteria in food.

The DAFM AMR surveillance programme also collates clinical isolates from other animal populations analysed by regional laboratories. Sampling targets are outlined by EU Commission Implementing Decision 2013/652/EU. The results of the official testing carried out by the National Reference Laboratory are collated and transmitted to EFSA annually, where they are included in the EU summary report on AMR in zoonotic and indicator bacteria from humans, animals and food.

The surveillance data over the 2017- 2020 period indicated positive trends with regard to occurrence of AMR in certain zoonotic pathogens - Salmonella spp., Campylobacter spp. and commensal Esherichia coli in broilers. Results indicated a reduction in antimicrobial resistance levels. The results with regard to monitoring of the same pathogens and commensals in pigs did not indicate the same positive trend in reducing resistance levels. Reducing the overall use of antibiotics, particularly in feed, remains a challenge for the pig industry, similar to most other European Member States.

Strategic Objective Two: Enhancing surveillance of antibiotic resistance and antibiotic use

The publication of Ireland's first *One Health Report on Antimicrobial Use and Antimicrobial Resistance* took place in January 2019. This report was overseen by the Interdepartmental Consultative Committee and provided an overview for the first time into the antimicrobial use (AMU) and antimicrobial resistance (AMR) surveillance data in both humans and food-producing animals in Ireland. This report highlighted the importance of scientific evidence to better inform and drive policy decisions to reduce antimicrobial usage, thereby halting the spread of AMR. The current global pandemic has delayed publication of Ireland's second One Health Report, but this report will be published in the near future, and will include data on resistant bacteria found in the environment, as well as clinical isolates from companion animals, including dogs and horses.

Protection of our aquatic environment is crucial for ensuring healthy aquatic ecosystems as well as healthy and sustainable water supplies. However, pollution of water bodies is an ever-increasing problem and our waters represent a potential route for transmission of AMR to humans, animals and the food chain. Under the European Union (EU) Water Framework Directive (WFD) a 'Watch List' mechanism has been implemented across all EU Member States to assess the occurrence and prevalence of a number of emerging pollutants of concern, including a range of antimicrobials, in our surface waters. Monitoring of these antimicrobials has also been undertaken across four surface waters by the Environmental Protection Agency (EPA) from 2016-2019.

The environmental dimension of AMR is an area of research which of increasing priority to the EPA Research Programme and there has been significant and increasing investment in AMR-focused national and European research by the Agency over the last number of years. Since 2017, the EPA have committed almost €1.3 million to national and European research in this area. Projects funded include:

- Antimicrobial Resistance and the Environment – Sources, Persistence, Transmission and Risk Management (AREST)
- Public health Impact of Exposure to antibiotic Resistance in recreational waters (PIER)
- Biodiversity as-an ecological barrier for the spread of clinically relevant antibiotic resistance in the environment (ANTIVERSA)
- Analysis of antimicrobial resistance in private water drinking supplies (WADA)
- Survival of mobile antibiotic resistance in water (SWAM).

The Agency has also recently provided funding for a national research gap analysis to be carried out on the environmental dimension of AMR. The key aim of this gap analysis is to identify research needs to inform *i*NAP2 as well as future research funding.

Continued analysis of both sales and use of antibiotics, in conjunction with trends in the development and spread of AMR are key measures to address the challenge of AMR. Due to actions completed under iNAP the range of data available continues to expand which will enhance progress from a policy implementation and outcomes perspective.

Strategic Objective Three: Reducing the Spread of Infection and Disease

As outlined in the National Farmed Animal Health Strategy 2017-2021, optimal animal health is critical to the future profitability and sustainability of farming and processing industries, and to the protection of public health and the environment. The comprehensive set of actions contained in the National Farmed Animal Health Strategy (NFAHS) acknowledged that prevention of disease minimises financial losses to farmers, the broader agri-food industry and the country. The NFAHS strategic actions work in tandem with iNAP actions completed under objective three, both in terms of promoting better animal health, but also at a broader societal level to reduce AMR development and spread.

In line with objective three, measures were implemented in relation to improving animal health and disease prevention. Research findings and previous successful implementation of measures to improve disease prevention and reduce the need for antibiotics were shared with farmers in the pig, poultry and dairy sectors. Peer to peer learning across all sectors was promoted through discussion groups, including the learnings from ongoing studies and methods that have been employed in other countries to reduce the need for antibiotics. Biosecurity is a vitally important tool in the national effort to prevent and suppress disease. The key role of biosecurity in delivering good animal health was underlined by the launch of Ireland's first National Farmed Animal Biosecurity Strategy in November last, as part of Animal Health Awareness Week 2020. Implementation of an effective biosecurity strategy aligns well with strategic objective three of *i*NAP.

CellCheck is an industry-led public-private partnership initiative, co-ordinated by Animal Health Ireland (AHI), to prevent and control bovine mastitis and improve milk quality, which also encourages reduced and more prudent usage of antimicrobials in Irish dairy production. CellCheck has been working in partnership with the DAFM Regional Veterinary Laboratory (RVL) in Limerick to harmonize methods and standards of commercial services available for mastitic milk samples. Participating laboratories also contribute results from commercial samples received into a central, anonymized database, which means that there is a more comprehensive understanding of the pathogens causing mastitis in Irish herds, and any related antimicrobial resistance patterns.

The CellCheck Implementation Group reviewed the level of milk recording nationally, and at individual processor level, to identify drivers and constraints to adoption at processor level. Milk recording is seen as a key management tool to support farmers in improving udder health, lowering bulk tank somatic cell count, increasing farm profitability and sustainability, and in tandem, driving down the use of antibiotics.

The continued progress of the industry-led national BVD eradication programme during this period, co-ordinated by AHI, has resulted in a further decrease in the prevalence of infection and the associated clinical signs, including diarrhoea and pneumonia in calves. This in turn has contributed to a reduced need for antimicrobial treatments in this age group.

Strategic Objective Three: Reducing the Spread of Infection and Disease

Under Strategic Objective three DAFM and Teagasc published a paper on methods that have been deployed in other EU Member States to reduce the use of antibiotics on farms. This report outlined the main strategies employed by other European nations in order to achieve a reduction in antibiotic usage in food animal production. Strategies to reduce antimicrobial use were broadly divided into (i) efforts to reduce the need for antimicrobials and (ii) efforts to change behaviour around antimicrobial usage. Strategies deployed in other Member States to reduce the need for antimicrobials included vaccination, improvements in husbandry and biosecurity, disease eradication schemes and breeding programs. Strategies to change behaviour centred on the monitoring of antimicrobial use, regulation (voluntary or legislative) and education/communication. From an environmental standpoint, the EPA established an internal cross-office team on AMR as a mechanism to enable information exchange and discussion of relevant research findings in the context of individual work areas, including regulation of intensive agriculture, dairy, slaughtering, rendering and waste management sectors.

Following completion of the collaborative pilot National Farm Hazardous Waste Collection Scheme (2013-2017) a report was prepared by the EPA providing a detailed summary and analysis of the farm hazardous waste collections and specific observations to inform considerations on future management of this waste stream. Work carried out under the National Farm Hazardous Waste Collection Scheme, as well as the assessment report, formed the basis of the establishment of an Antimicrobial Disposal Sub-group which reviewed the potential for the establishment of a collection system for both human and animal hazardous waste.

This objective cuts across the ambition to maintain a competitive and innovative agri-food sector that supports the rural economy and contributes to societal wellbeing. Sustained optimal animal health is critical to the future profitability, and sustainability of our farming and processing industries, and to the protection of public health and of the environment.

Strategic Objective Four: Optimising the use of antibiotics in animal health

In terms of optimising use of antibiotics in animal health, there was considerable engagement and collaboration by stakeholders and members of the AHIC work to develop and publish guidance on antimicrobial stewardship, both at prescriber level and also for farmers.

Under Strategic Objective 4, DAFM published a policy document specific to protecting public health first and foremost. In 2018 guidance on the restricted use of Highest Priority Critically Important Antimicrobials (HPCIAs) was published which set out the conditions under which these highest priority antimicrobials for human medicine should be prescribed and used in animals. This guidance document was revised in 2020 to reflect the updated recommendations of the European Medicines Agency's Antimicrobial Expert Group (AMEG) on the categorisation of antimicrobials.

The DAFM guidance was agreed collaboratively with the AHIC and focused on antimicrobials of last resort in human health. In acknowledging the importance of these particular classes of HP-CIAs, the guidance outlines conditions that should be met in order to prescribe these classes of antimicrobials. These HP-CIAs include 3rd and 4th generation cephalosporins, fluoroquinolones, macrolides, and polymyxins. The guidance emphasises that restricting the use of these particular antibiotics is vital to keep them effective for future use in human health but reducing their overall use will also keep them available and effective to protect animal health and welfare.

The Cellcheck Technical Working Group of AHI has published a factsheet on *"Responsible Antibiotic Use in Mastitis Control"* which highlights the optimal approach to clinical mastitis treatment. This document is an excellent practical reference point for dairy farmers as they work with their veterinary practitioner to address mastitis control and antibiotic use. In addition, the Technical Work Group now uses national sales data to undertake regular reviews of the levels of usage of both in-lactation and dry cow mastitis tubes and trends in these over time. To assist with the transition from blanket to selective dry cow therapy, the Technical Working Group has devised and implemented a funded one to one consultation for farmers with specifically-trained veterinary practitioners.

The Veterinary Council of Ireland (VCI) published guidelines on the ethical use of antibiotics which reinforce role of the veterinary practitioner, who society has entrusted and depends upon to safeguard and protect the use of antibiotics. The VCI guidance promotes the responsible and prudent use of antibiotics in the animal health sector, which supports strategic objective 4 of *i*NAP.

As part of the role of the HPRA, the indications, prudent and recommended use of veterinary antibiotic products as detailed in the summary of product characteristics are subject to review and updating by the HPRA, and were updated as required over the period.

As a result of extensive collaboration and engagement a number of guidance policy documents were developed by the farming and veterinary stakeholders involved in the *i*NAP Animal Health Sector Implementation Committee. These included a *Code of Good Practice Regarding the Responsible Prescribing and Use of Antibiotics in Farm Animals* as well as the following sector specific guidelines- *Codes of Good Practice Regarding the Responsible Use of Antimicrobials on Pig/Dairy/Beef Suckler and Sheep Farms.*

Strategic Objective Four: Optimising the use of antibiotics in animal health

Actions taken to improve animal health, and prevent disease, are key to reducing the use of antibiotics, and effectively tackling AMR, and align well with Ireland's National Farmed Animal Health Strategy with one of the key enabling principles being 'Prevention is Better than Cure'. The practical strategies outlined in these codes of practice highlight some of the important actions that farmers can take to reduce their overall use of antibiotics and to improve their herd health.

Optimal use of antibiotics will reduce the development and spread of AMR and maintain the efficacy of antimicrobials into the future. The AHIC acknowledged the importance of antimicrobial stewardship, and the actions completed under this objective serve as valuable tools into the future.

Strategic Objective Five: Promoting research and sustainable investment in new medicines, diagnostic tools, vaccines and other interventions

There has been a growing focus on, and interest, in the area of behavioural science, and the investigation of the behavioural change interventions that are critical to achieving sustainable reductions in AMU. Change takes time, and changing human behaviour is a very challenging task. Two separate studies are underway, one with Safefood and Teagasc titled *"Use of antimicrobials in animal health on the island of Ireland: knowledge, attitudes and behaviour"*. The second project which was commissioned by DAFM, and is being lead by the Economic and Social Research Institute (ESRI), focuses on the application of behavioural science to determine what factors are driving decision-making in relation to antimicrobial use, and what policy level interventions would be appropriate to deliver favourable outcomes. Both projects will continue into the next iteration of iNAP. The results of both studies will complement each other.

It is expected that the Safefood and Teagasc research will identify farm level interventions which will support behaviour change leading to more prudent use of antimicrobials. These interventions will then be piloted and evaluated as part of the AMU-FARM project due to begin in mid 2021. This research project has also surveyed farmer attitudes to selective dry cow strategies, including an attitudinal survey to milk recording. The results of the milk recording survey were presented to Teagasc Knowledge Transfer meetings, and milk recording companies to inform the development of their 2021 communication strategies.

The ESRI research will give a better understanding of the factors which influence antimicrobial use on farm including the vet/farmer relationship, what farmers and veterinary practitioners understand about antimicrobials, priority issues facing veterinary practitioners and farmers, and how communications around antimicrobials are perceived. This study aims to assist DAFM with regard to more effective communication, with the farming and veterinary sectors in particular.

Strategic Objective Five: Promoting research and sustainable investment in new medicines, diagnostic tools, vaccines and other interventions

DAFM and Teagasc continue to support and contribute to a number of collaborative research projects with Irish Universities and international partners which collectively aim to better understand the key drivers of AMU in the pig industry which is generally accepted as being a sector with high AMU.

The PATHSURVPIG project (2014-2018) investigated respiratory disease on Irish pig farms, associated risk factors, and the relationship with performance, welfare and antimicrobial use. During this research infectious diseases of primary importance to the Irish pig industry were identified. The effects of these diseases on growing-finishing efficiency, disease treatment costs and measures to prevent disease occurrence were also identified during this research. Results suggested that more work was needed with veterinary practitioners at farm level to improve pig health through improved nutritional management, internal biosecurity, improved herd health planning and appropriate vaccination programmes.

The Antimicrobial Use and Resistance in Animal Production (AMURAP) research project, (2016-2020) had key objectives with regard to better understanding the current use of antimicrobials in Irish pig farms, and the factors involved, with the goal of helping farmers reduce their use without incurring a negative economic impact. The AMURAP project also carried out research to determine the actual effect of specific antimicrobial use practices on the occurrence of resistance in zoonotic and commensal bacteria on the farms.

The second stage of the AMURAP project is now following batches of pigs in high- and low-usage farms and measuring levels of AMR throughout the pig's life cycle. Particular attention will be paid to resistance against the highest priority critically important antimicrobials for human medicine. The project aims to provide a better understanding of how AMR evolves through the production period, how it is affected by AMU, and to identify patterns of use that present the highest risk for the development of resistance. Thus, farmers will have improved knowledge of the strategies available to minimise the risk of AMR while maintaining good health status in their herds.

The AHI-co-ordinated Pig HealthCheck programme that commenced in 2019 will contribute to the continued translation of the outputs of these and other projects into practice in the industry.

Most actions completed under strategic objective 5 were in relation to research completed and ongoing. Investment in new medicines, diagnostic tools and vaccines continues at an international level.

One Health AMR Country Visit

The European Centre for Disease Prevention and Control (ECDC) and the European Commission's Directorate General for Health and Food Safety (DG Santé G) jointly carried out a One Health AMR country visit to Ireland from the 7th-11th October 2019.

The visit was organised in conjunction with colleagues in the Department of Health, as well as the EPA. The purpose of the visit was to assist Ireland in further developing and implementing its national strategies and policies to address AMR, based on a One Health approach. Joint country visits are one of the many initiatives set out in the Commission's One Health Action Plan against AMR and contribute to its aim of making the EU a best practice region in the fight against AMR. The final report from European Commission/ECDC of their findings and recommendations has informed Ireland's second National Action Plan on AMR (iNAP2) which is due to commence this year. The contribution made by all stakeholders in the *i*NAP Animal Health Implementation Committee was highlighted and acknowledged by DAFM. The stakeholders gave their time to showcase the progress being made in advancing the animal health actions outlined in *i*NAP during the visit. The EPA coordinated a dedicated day as part of the visit focusing on relevant activities in the environment sector with progress in areas such as Watch List substance monitoring, environmental research, awareness raising, water quality, waste water treatment and hazardous waste disposal being acknowledged in the final report.

Some of the key recommendations made in the final report for possible future actions were:

- Inclusion of quantitative targets into the next national action plan as tangible measures of progress and outcomes.
- Establishment of a combined database and alert system for key pathogens with AMR found in human, veterinary and environmental samples.
- Expanding the collaboration in communication activities between different sectors by, for example, expanding the "RESIST"* brand to include animal health.
- Continuing with the use of the European Antibiotic Awareness Day platform to communicate One-Health messages on prudent use of antibiotics and on AMR, in coordination with DAFM, DoH and with the EPA.
- Including actions to address AMR in the companion animal and equine sectors in the next iNAP.
- Exploring additional incentives for the correct disposal of hazardous farm waste, including veterinary antimicrobials, and human medicines.

* RESIST is the new identity for a number of initiatives under the HSE Antimicrobial Resistance and Infection Control programme (AMRIC).

The final report from European Commission/ECDC provided a very useful assessment of actions that have been taken to tackle AMR and is available here https://www.ecdc.europa.eu/en/publications-data/country-visit-ireland-discuss-policies-relating-antimicrobial-resistance Work will continue with the National Interdepartmental Consultative Committee on the recommendations of the One Health visit which will be used to inform Ireland's second National Action Plan on AMR (iNAP2) which will commence in 2021.

Conclusion

This report highlights the considerable progress that has been made in the last three years to address the development and spread of antimicrobial resistance, specifically in the area of animal health and the environment. There was proactive engagement and leadership shown by all members of the AHIC committee, and a willingness to work in a collaborative way to deliver the many actions that were included in this first action plan. However many challenges remain, and sustained commitment is needed if we are to continue to make progress against what has been referred to as 'the silent pandemic', whilst at the same time ensuring the sustainability of the agri-food sector into the future.

Minimising the occurrence of disease on Irish farms through herd health plans, and disease eradication strategies built on the foundations of vaccination and bio-security is key not just to reduce the level of antimicrobial consumption in Irish agriculture, but to achieve the highest international standards of animal health, improving the productivity and profitability and the economic, environmental and social sustainability of Irish farms.

It is also vital that we continue to make progress in protecting our environment to ensure that we minimise the risks of further spread and evolution of antimicrobial resistance. Our aquatic and terrestrial environments are vulnerable to discharges from human and animal sources and we must move closer to developing and implementing risk management strategies to reduce these discharges and also mitigate against the transfer of AMR from these sources.

The next action plan, *i*NAP2, which will be a five-year action plan, will build on work already done during this plan. However, *i*NAP2 will be even more ambitious, with a clear focus on measurable outcomes, in order to allow progress to be measured in a tangible way. Managing the public health threat of AMR requires a multifaceted 'One Health' approach involving many different sectors, both nationally and internationally. A proactive, science and evidence-based approach will continue to inform effective integrated policy measures and provide assurance to society at large.

This Animal Health Implementation Committee was established as part of a whole of government response infrastructure, intended to deliver equitable solutions to infectious disease challenges for people, animals and our shared environment. This committee has delivered actions that provide a foundation from which to advance our ambition to address AMR, but these actions also enhance the health and wellbeing outcomes on Irish farms as well as being vital to the continued health of our society and economy.

Appendix 1. Summary Report of the *i*NAP Animal Health Implementation Committee 2017-2020.

The Committee met twelve times between 2017 and 2020.

Of the 54 projects set out for completion by the Animal Health Implementation Committee, twenty-six are now completed, twenty-seven are ongoing and will continue under *i*NAP2, and one (No. 52 delayed by Covid-19) has yet to begin.

Strategic Objective 1 - Improve awareness and knowledge of AMR

Strategic Intervention:
1.3 Design and implement both general and specific awareness strategies in the animal health sector.

Project no.	Activities	Description	Lead Organisation	Other organisations involved
1	1.3.1	**Produce and disseminate a specific newsletter on AMR (Q3-Q4 2018).** Outputs: A newsletter containing AMR information as well as a poster on AMR was sent to all registrants in 2018. This action has been completed.	Veterinary Council	-
2	1.3.1	**Utilisation of Veterinary Council website and newsletters to highlight AMR events as well as holding regional meetings in partnership with key stakeholders (Q2 2018-Q4 2020).** Outputs: VCI promoted and highlighted AMR events and information updates in newsletter, website and social media. CVE Credits were awarded to any events relating to AMR to endorse importance and relevance to VCI registrants.	Veterinary Council	-
3	1.3.1	**Communicate best practice in relation to AMR through different media such as newsletters to highlight international, EU and national reports and activities on AMR (Q2 2018-Q4 2020).** Outputs: The Veterinary Council have provided informative updates on AMR via its website and newsletter to registrants.	Veterinary Council	

Strategic Objective 1 - Improve awareness and knowledge of AMR

Strategic Intervention:
1.3 Design and implement both general and specific awareness strategies in the animal health sector.

Project no.	Activities	Description	Lead Organisation	Other organisations involved
4	1.3.1	**Further develop DAFM'S AMR webpage (Q2 2018-Q4 2020).** Outputs: DAFM regularly updated content of website with any relevant international reports on AMR as well as World Antimicrobial Awareness Week events (18-24 Nov) and published the Codes of Good Practice on Responsible Use of Antimicrobials in Dairy/ Pig/Beef and Sheep Sectors developed by stakeholders from iNAP AHIC on the AMR webpage. The DAFM webpage has moved to gov.ie/agriculture new site in line with overall DAFM approach to make it easier for public to navigate and search for key words of interest.	DAFM	-
5	1.3.1	**Develop a series of communications (website, newsletter, social media content) containing the key iNAP messages for communication with stakeholders at all levels and with consumers (Q3-Q4 2018).** Outputs: FSAI gave iNAP presentations to a national meeting of HSE Environmental Health Officers (EHOs) who are responsible for enforcing hygiene legislation (in May 2019) and to a meeting of the Western Regional Zoonoses Committee (in September 2019). The latter Committee is comprised of officers from the: HSE (medical officers, EHOs, chemists); DAFM (veterinary inspectors and veterinary research officers from regional veterinary laboratories) and Local Authorities (veterinary staff).	FSAI	Bord Bia
6	1.3.1	**Use the FSAI's Retail Forum and Bord Bia's activities to inform retailers and processors about progress being made and to encourage the development of policies around responsible use of antibiotics rather than the development of 'antibiotic free' campaigns' (Q1-Q4 2020).** Outputs: Bord Bia marketing teams have been made aware of the Bord Bia position in support of the responsible use of antibiotics within farming and that 'antibiotic free' campaigns may not be in the interest of best practice. Seven retailers plus the trade association, Retail Ireland, have signed up to the FSAI Retail Forum's statement of intent around the responsible use of antibiotics in food production systems.	FSAI/Bord Bia	DAFM, IBEC's Food Drink Ireland (FDI) and Meat Industry Ireland (MII), DAFM,

Strategic Objective 1 - Improve awareness and knowledge of AMR

Strategic Intervention:
1.3 Design and implement both general and specific awareness strategies in the animal health sector.

Project no.	Activities	Description	Lead Organisation	Other organisations involved
7	1.3.1	**Carry out a survey of farmers, akin to the Healthy Ireland survey, dealing with issues relating to antibiotic use and the link between human health, animal health and the environment (Q3-Q4 2018).** Outputs: Responses were returned from 315 Farmers throughout the country which highlighted that Farmers are concerned about AMR. The survey provided a benchmark for future actions. Results indicated that 93% are of the opinion that there is a need to improve awareness among farmers. The survey also found that 83% of Farmers are using vaccination to prevent disease, with 77% having a herd health plan. Vaccination was viewed as the best solution to decrease antibiotic use by 28% of farmer, with 19% of farmers considering education as the best solution. 18% suggested better herd management, and 16% suggested less intensive farming as the best solutions to decreasing antibiotic use.	APHA	Veterinary Ireland, DAFM
8	1.3.12	**Veterinary Ireland policy document to be re-circulated to members, with a focus on working with industry stakeholders to implement the recommendations (Q3 2018-Q4 2019).** Outputs: This action was completed in August 2018.	Veterinary Ireland	-
9	1.3.2	**AMR related topic to be included in each of the major Veterinary Ireland Continuing Veterinary Education events over the next three years (Q3 2018-Q4 2020).** Outputs: In 2018 Cattle Association of Veterinary Ireland (CAVI) conference included AMR as a topic. The 2019 CAVI conference included a session on the future of prescribing. The Joint Veterinary Ireland Companion Animal and Equine Conferences included a lecture on "The Rational Use of Antibiotics, as well as a Companion Animal/Equine Vets Mini MBA session on AMR in 2019. In 2020 Covid pandemic prevented conferences taking place.	Veterinary Ireland	DAFM

Strategic Objective 1 - Improve awareness and knowledge of AMR

Strategic Intervention:
1.4 Design and implement educational modules for animal keepers and for the veterinary profession

Project no.	Activities	Description	Lead Organisation	Other organisations involved
10	1.4.1	**Develop a specific AMR CPD module and identify ways in which members of the veterinary profession (practitioners and nurses) can be incentivised to take them (Q2-Q4 2018).** Outputs: There is ongoing education of veterinary students regarding Antimicrobial Resistance across many platforms. All VCI registrants were notified in the December 2019 VCI newsletter about an online course in Antimicrobial Stewardship in veterinary practice that is now available free of charge with Continuing Veterinary Education (CVE) credits. https://www.futurelearn.com/courses/antimicrobial-stewardship-in-veterinary-practice.	Veterinary Council	UCD
11	1.4.2	**Engage with the Veterinary College to ensure specific AMR modules are included in the syllabus of undergraduate veterinary practitioner and veterinary nurses (Q3 2018-Q2 2019).** Outputs: The veterinary medicine curriculum will address appropriate use of antimicrobials and AMR across the domains of knowledge, skills and professionalism. Enhancement of the current curriculum is ongoing and DAFM and UCD will liaise about opportunities to further highlight this area to current students.	DAFM	Veterinary Ireland, UCD
12	1.4.3	**Engage with the Agricultural Colleges to ensure inclusion of AMR as a dedicated section within the medicines' module in the syllabus of undergraduate agricultural degrees (Q3-Q4 2018).** Output: Level 7 & 8 Institute of Technology (IT) course providers agreed to include all required AMR content in various strands of their teaching programmes. Teagasc will customise this material for Level 6 students with a focus on best practice at farm level. AMR learning outcomes were included in Level 5 & 6 Agricultural Programmes for about 2000 participants each year. Level 5 focuses on the concept of AMR and prudent use. Level 6 focuses on preventative measures and lowering the risk of AMR incidence. Teagasc AMR webpage was launched in August 2019 @ https://www.teagasc.ie/animals/amr/	Teagasc	DAFM

Strategic Objective 1 - Improve awareness and knowledge of AMR

Strategic Intervention:
1.4 Design and implement educational modules for animal keepers and for the veterinary profession

Project no.	Activities	Description	Lead Organisation	Other organisations involved
13	1.4.3	**Piloting of an AMR and disease prevention module in training and advisory courses for farm managers (Q2-Q3 2018).** Outputs: Teagasc included AMR as a topic in many events aimed at farmers. In Q4 2018, a series of 13 on-farm events were organised and delivered by Teagasc & AHI in collaboration with various milk processors. The booklet prepared for the event included an article on selective dry cow therapy. In January 2019 12 Calf Care events were held promoting best practice around calving and calf rearing that were jointly organised by Teagasc, AHI and various milk processors; 1,300 farmers attended in total. A booklet was produced to accompany the events, available at http://animalhealthireland.ie/wp-content/uploads/2019/01/CalfCare-Booklet-WebVersion.pdf A key 2019 priority involved customising and extend the advisory messages for farmers through available channels (e.g. Today's Farm article (Jan/ Feb 2019), Moorepark Open Day (July 2019), advisory newsletters). Teagasc distributed the World Organisation for Animal Health (OiE) infographic for farmers to all its customers with the February 2019 Advisory Newsletter. Teagasc is gathering and publishing relevant AMR materials as a series of webpages @ on www.teagasc.ie. A training day took place in September 2019 regarding AMR and selective dry cow therapy. AMR was a topic on BETTER farm beef days and a workshop was held on AMR in sheep. "One Health – Awareness to Action" conference on AMR and Anthelmintic Resistance took place in Tullamore in the last quarter of 2019. Presenters included farmer experiences on reduction of antibiotic use. Workshops included: Selective Dry Cow Therapy; Responsible Prescribing of Antibiotics; Calf Management and Health; Biosecurity, Medicated Feeds, Pigs and Poultry; Anthelmintic Resistance (Cattle and Sheep); and Lameness in Sheep. A nationwide series of 13 CalfCare events were held during the months of December and January. The events were run in partnership with Teagasc, AHI and 9 Dairy Coops supporting the events in their region – Arrabawn, Centenary Thurles, Carbery, Dairygold, Glanbia, Kerry Agri Business, Lakeland Dairies, North Cork Creameries and Tipperary Coop.	Teagasc	Animal Health Ireland, IFA, ICMSA, Veterinary Ireland, DAFM.
14	1.4.4	**Distribution of information in relation to the important changes to the benefit risk profile of antimicrobials and updated product information (Q1 2019).** Outputs: The benefit risk profile and product information of all veterinary medicinal products is subject to regular review and updating. In accordance with Regulation 2019/6 there are particular initiatives in place regarding antimicrobials, and a number of implementing acts are expected to take effect by the date of application of the regulation on 28 January 2022. Independent national reviews of the labelling of the products concerned didn ot take place as this would be considered disproportionate, given the anticipated changes in the coming years.	HPRA	

Strategic Objective 1 - Improve awareness and knowledge of AMR

Strategic Intervention:
1.5 Provide information to improve understanding and awareness around correct disposal of antimicrobials

Project no.	Activities	Description	Lead Organisation	Other organisations involved
15	1.5.1	**Use of the Live Green website (a National Sustainability Information Portal for Householders (www.epa.ie/livegreen), to provide advice on medicines (including antimicrobials) in the home and how to dispose of them correctly.** Outputs: On the 'Your Home, Your Health' webpage of the Live Green website one of the top tips included is: "Flushing household chemicals, medication, oil, pesticides, herbicides, paint etc. into your septic tank may contaminate your drinking water supply & damage the environment".	EPA	
Strategic Intervention: **1.6 To educate and improve understanding of AMR amongst the general public**				
16	1.6.1	**Feature topic on AMR to be included in RTÉ series Eco-Eye and/or 10 Things to Know About.** Outputs: The EPA provided sponsorship to the RTÉ series Eco-Eye in 2018 and 2019. In February 2019, the Eco-Eye series featured EPA-funded researcher Dr Dearbhaile Morris (NUIG) in its 'Living Beach' episode who described research to be undertaken as part of EPA- and HSE-funded AREST project.		

Strategic Objective 2 - Enhance surveillance of antibiotic resistance and antibiotic use

Strategic Intervention:
2.4 Further develop the national AMR surveillance system in the animal health sector

Project no.	Activities	Description	Lead Organisation	Other organisations involved
17	2.4.1	**Carry out a review of the current AMR surveillance programme in animals and introduce any improvements that are necessary to ensure we have an accurate picture of the levels of AMR in animals; that we can detect any emerging issues of concern to human and animal health and farmers are able to access information in relation to resistance profiles on their farms (Q3 2018-Q4 2019).** Outputs: The veterinary laboratories have enhanced their capabilities in surveillance and investigation of resistant isolates and are examining ways of improving quality of surveillance on clinical isolates and dissemination of findings. A framework to support and address standards & capability for laboratories carrying out AST testing is being developed. AMR monitoring carried out under EU Regulation 2013/652. DAFM have developed the next generation technology of maldiTof*, MIC and whole genome sequencing protocols for this work.	DAFM	Department of Health, Veterinary Ireland, IFA, ICOS, ICMSA, AHI.
18	2.4.3	**Collate regular reports in relation to the results of AMR surveillance and activities and communicate these to industry stakeholders (Q2 2019-Q4 2020).** Outputs: Labs shared culture and susceptibility results back to farmer and their PVP. The Reference Veterinary Laboratory published quarterly updates in the Irish Veterinary JournaL. The annual All Ireland Surveillance Report summarises all findings from the previous 12 months, which means stakeholders have access to what resistance trends are being detected in clinical isolates.	DAFM	Veterinary Ireland, IFA, ICOS, ICMSA.
19	2.5.1	**Collaborate with the health sector in the production of a One Health Report (Q1-Q2 2018).** Outputs: Ireland's first 'One Health Report on Antimicrobial Use and Antimicrobial Resistance' Report (based primarily on 2016 surveillance data) was published in January 2019.	DAFM	HPRA, Department of Health

* MALDI-TOF is a mass spectrometry technology that employs a laser which bombards the sample ionizing it. The ions are then separated by their mass to charge ratio, and this is recorded at a time-dependent manner with the lightest ions reaching the detector first. The result is a mass spectrum of the proteins contained in the sample, which can be considered as a finger print for each microorganism.

Strategic Objective 2 - Enhance surveillance of antibiotic resistance and antibiotic use

Strategic Intervention:
2.4 Further develop the national AMR surveillance system in the animal health sector

Project no.	Activities	Description	Lead Organisation	Other organisations involved
20	2.6.1 2.6.2 2.6.3	**Construct a national antimicrobial consumption (AMC) database that enables the measurement of the use of antibiotics in the animal health sector in Ireland beginning with information derived from manufacturers and wholesalers then moving on to the pig and poultry sectors and veterinary practices. It is planned that Antimicrobial Consumption databases will be constructed for cattle and sheep after pig and poultry databases are established.** Outputs: AMU database for pigs was launched on 1st November 2019 and has collected AMU data at farm level on a quarterly basis. The AMU reports generated allow farmers to benchmark themselves against their peers and see how their AMU compares to the national average. The database findings also serve as a benchmark for current and future policy initiatives and interventions.	DAFM	
21	2.6.4	**Develop and implement a system for the collection of data in relation to usage of intra-mammary tubes in the dairy sector (Q1 2019–Q4 2020).** Outputs: Analysis of sales data showed a 28% reduction in sales of both in-lactation and dry cow intramammary tubes, in the period 2010-2018. Further work is ongoing to investigate changes in patterns of usage of HP-CIAs within these product types. It is planned to repeat this assessment on an annual basis The CellCheck TWG document on HP-CIAs in mastitis control has now been released (https://online.flippingbook.com/view/819673/) following publication by DAFM of a revised HP-CIA policy document.	Animal Health Ireland	ICOS, ICMSA, DAFM, Veterinary Ireland
22	2.6.5	**Carry out surveys to monitor levels of antibiotic usage in the beef and lamb sector with a view to providing re-assurances to customers (Q2 2018-Q4 2019).** Outputs: Meat Industry Ireland members engaged regularly with customers in terms of their queries regarding antimicrobial use in their supply chain. A peer-reviewed paper 'Antimicrobial drug usage from birth to 180 days of age in Irish dairy calves and in suckler beef calves (B. Earley, A. Arguello, E. O'Riordan, P. Crosson, A. Cappelleri, M. McGee) was accepted for publication in the Journal of Applied Animal Research (JAAR) on 15th May 2019) . Teagasc held a meeting with industry stakeholders (Bord Bia, Dawn Meats, ABP Food Group, Dutch Jumbo supermarket representatives) on AMU from birth to 6 months in artificially reared dairy calves & in suckler beef calves.	Teagasc/ Meat Industry Ireland.	Processors, IFA, ICMSA, DAFM.

Strategic Objective 2 - Enhance surveillance of antibiotic resistance and antibiotic use

Strategic Intervention:
2.7 Research to focus on assessing the potential impact of AMR, as well as antimicrobials, in environmental compartments

Project no.	Activities	Description	Lead Organisation	Other organisations involved
23	2.7.1 2.7.2 2.7.3	**Continued funding of research focusing on assessing the potential environmental impact of AMR and antimicrobial use, with the ultimate aim of identifying pressures, informing policy and developing solutions around the topic.** **Funding of research which will characterise hotspots, examine and develop feasible solutions enabling detection and removal of antimicrobials from environmental compartments, for example removal of antimicrobials in conventional and advanced wastewater treatment, rapid and low concentration detection methods, timely identification and characterisation of emerging AMR microbes of environmental concern.** **Research to determine baseline levels of antimicrobial residue and antimicrobial resistance present in relevant targeted industries.** Outputs: The EPA has provided funding for a number of national research projects which aim to address activities 2.7.1 -2.7.3 in iNAP. Specifically: AREST project (co-funded by HSE): Antimicrobial Resistance and the Environment – Sources, persistence, Transmission and risk management PIER Project: Public health Impact of Exposure to antibiotic Resistance in recreational waters commenced in 2018. WADA PhD Scholarship project: Analysis of antimicrobial resistance in private water drinking supplies SWAM PhD Scholarship project: Survival of mobile antibiotic resistance in water	EPA	Department of Health, Veterinary Ireland, IFA, ICOS, ICMSA, AHI.
24	2.7.4	**2.7.4 National participation in Horizon 2020 Societal Challenge Five initiatives around AMR.** Outputs: The EPA provided €500,000 in research funding to the open Water JPI, Oceans JPI and JPI on AMR Joint Transnational Call on Aquatic Pollutants. This funding permitted Ireland-based researchers to participate in the Call. Awards are expected early 2021. As part of the 2018/2019 transnational BiodivERsA Call on 'Biodiversity and its influence on animal, human and plant health', funding has been awarded for a project entitled 'Biodiversity as an ecological barrier for the spread of clinically relevant antibiotic resistance in the environment (ANTIVERSA)'. One Ireland-based research team (Dr Fiona Walsh, Maynooth University, funded by the EPA) is involved in the project. The project commenced in February 2020.	EPA	

Strategic Objective 2 - Enhance surveillance of antibiotic resistance and antibiotic use

Strategic Intervention:
2.8 Monitoring and reporting programme for EU designated priority substances

Project no.	Activities	Description	Lead Organisation	Other organisations involved
25	2.8.1	**Collection and reporting of data regarding levels and persistence of certain antimicrobials (e.g. macrolide antibiotics) within specific environments in line with priority list of substances for Union-wide monitoring.** Outputs: Sampling and analysis was completed for the Water Framework Directive Watch List substances in surface waters for 2016/2017 and 2018/2019. Exceedances of erythromycin were detected at two sites (Analee and Liffey rivers) during one round of 2019 sampling. Levels of other antibiotics were, in most cases, below the required limit of detection across remaining samples analysed. All data has been input to the 2020 One Health Reporting process.	EPA	Department of Health, Veterinary Ireland, IFA, ICOS, ICMSA, AHI.

Strategic Objective 3 - Reduce the spread of infection and disease

Strategic Intervention:
3.5 - Implement measures aimed at improving infection and disease prevention on farms in Ireland, thereby reducing the need for antibiotics

26	3.5.1	**Capture accurate information in relation to actions that pig farmers have taken to reduce the amounts of antibiotics being used on their farms and share it with other farmers (Q1-Q2 2019) ubstances for Union-wide monitoring.** Outputs: The results from the Antimicrobial Use and Resistance in Animal Production (AMURAP) (Project 41), PAthSURVPIGS (Project 42) and Biocheck questionnaires were disseminated to participating farmers as part of the "Benchmark Your Farm" initiative. The objective was to raise awareness and inform the farmer of their disease status, biosecurity status and antimicrobial use to allow comparison between their farm and the other farms in the sample. The Teagasc AMR webpage presents case studies of best practice on pig farms, which have been discussed with farmers. A meeting was held in December 2019 with farmers participating in 12 case studies together with advisors, AHI and vets to discuss actions taken, and the results that were obtained.	DAFM	Teagasc, IFA, Veterinary Ireland, AHI.

Strategic Objective 3 - Reduce the spread of infection and disease

Strategic Intervention:
3.5 - Implement measures aimed at improving infection and disease prevention on farms in Ireland, thereby reducing the need for antibiotics

Project no.	Activities	Description	Lead Organisation	Other organisations involved
27	3.5.1	**Carry out a study to investigate methods that the poultry industry have implemented to reduce the need for antibiotics and share it with other farmers (Q3-Q4 2018).** Outputs: Presentations were given to industry highlighting methods employed by processors, in conjunction with their veterinary practice to reduce AMU through increased use of vaccination, attention to hygiene in the hatcheries and water quality, as well as improved gut health through optimal nutrition, use of organic acids, pre/probiotics.	DAFM	Teagasc, MII (poultry processors), Veterinary Ireland
28	3.5.1	**Carry out a study to investigate methods that the dairy industry has implemented to reduce the need for antibiotics and share it with other farmers (Q3–Q4 2019).** Outputs: The CellCheck Implementation Group initiated a process to record and feedback changes in the level of milk recording nationally, and at individual processor level, to identify drivers and constraints to adoption at processor level. Overall, it was found that there has been a ~10% increase in the number of recording herds from 2018 to 2019, albeit with variation between processors. ■ A social science study on constraints and drivers to uptake at farm level has been conducted. ■ Preliminary data from a parallel study of herds involved in the National Farm Survey 2017 to investigate the economic rationale for milk recording i.e. ' does milk recording drive profitability?' has been completed, with recording herds found (even after costs of recording are taken into account) to have- ■ Dairy gross margins increased by 13.8% ■ Dairy milk yield increased by 13.5% ■ Bulk tank somatic cell count lowered by 23% It is intended to publish these findings when complete.	Animal Health Ireland	ICOS, Teagasc, Veterinary Ireland
29		**Carry out a study to investigate methods that beef farmers with low antibiotic usage have implemented and share it with other farmers (Q1–Q2 2020).** Outputs: A Code of Good Practice on the Responsible Use of Antimicrobials on Beef and Suckler Farms was launched and published in Q4 2020.	DAFM	Teagasc, Veterinary Ireland
30	3.5.2	**Carry out a study in relation to methods that have been deployed in other Member States to reduce the need for antibiotics on farms and share it with industry (Q3-Q4 2018).** Outputs: A report was published in September 2019 and added to AMR Webpage on DAFM website.	DAFM	Teagasc

Strategic Objective 3 - Reduce the spread of infection and disease

Strategic Intervention:
3.6 - Implement relevant priorities in the National Hazardous Waste Management Plan

Project no.	Activities	Description	Lead Organisation	Other organisations involved
31	3.6.1	**Ensure that actions within the plan are appropriately executed by the designated responsible body, including but not limited to those related to disposal of antimicrobials.** Outputs: A waste characterisation study was completed by the EPA in collaboration with HSE to analyse wastes collected as part of the 2018 Disposal of Unused Medicines Properly (DUMP) scheme (operated at 250 pharmacies in South-west of Ireland The drafting of the next iteration of the NHWMP has begun.	EPA	
32		**Continued operation of the National Farm Hazardous Waste Collection initiative nationally to increase collection of veterinary medicine wastes, including antimicrobials, as well as many other hazardous farm waste streams.** Outputs: A report detailing an assessment of the 5 years of the pilot collection scheme has been prepared by the EPA and circulated to the Antimicrobial Disposal Sub-Group which was established to examine the issue of waste management as a One Health issue.	EPA	DAFM, DECC, EPA, Local Authorities, IFA, ICMSA, VI

Strategic Intervention:
Intervention 3.7 – Consider implications of emerging AMR research findings in the context of EPA licensing procedures

33	3.7.1	**Liaise with researcher funders and performers on the implications of emerging research findings in this area.** Outputs: An EPA cross-office team on AMR was established (including personnel from the following EPA teams:- WWTP regulation, Drinking Water Quality, Surface Water Quality, Intensive Agriculture regulation, Hazardous Waste Planning), which aims to facilitate information sharing on AMR across work areas and discuss the implications of relevant research on EPA work. The EPA-HSE-ESRI annual Environment, Health & Wellbeing Conference (November 26th 2020) included for a special session on iNAP1 and the development of iNAP2 and other relevant AMR presentations and discussions.	EPA	

Strategic Objective 4 - Optimise the use of antibiotics in human and animal health

Strategic Intervention:
4.4 Develop sector specific guidelines in relation to prudent use of antimicrobials in animals

Project no.	Activities	Description	Lead Organisation	Other organisations involved
34	4.4.1	**Develop and champion adherence to a code of good practice regarding the prudent use of antibiotics for veterinary practitioners (Q2 2018).** Outputs: An updated code of conduct was sent out to all registrants. DAFM Code of Practice for Responsible Use of Antimicrobials on Dairy Farms and Pig Farms is available on VCI website. VCI Code of Professional Conduct review commenced in 2020 .	Veterinary Council	DAFM, Veterinary Ireland
35	4.4.1	**Develop and champion adherence to a code of good practice regarding the prudent use of antibiotics for pig farmers (Q2-Q3 2018).** Outputs: The Code of Practice Regarding the Responsible Use of Antimicrobials on Pig Farms was launched and published in Oct 2019.	APHA	Pig veterinary practitioners, MII (pig processors), IFA, Bord Bia, Teagasc, DAFM.
36	4.4.1	**Develop and champion adherence to a code of good practice regarding the prudent use of antibiotics for poultry farmers (Q3-Q4 2018).** Outputs: Code of Good Practice for Responsible Use of AMs in Poultry draft guidelines have been agreed by the poultry committee. This document will be launched in 2021.	APHA	MII (poultry processors) poultry veterinary practitioners, Teagasc, Bord Bia.
37	4.4.1	**Develop and roll out a workshop focusing on Selective Dry Cow Therapy (Q1–Q4 2019).** Outputs: A series of 33 webinars were held over a four-week period from 23rd of September 2019. These were jointly hosted by AHI and Teagasc and were open to all Teagasc dairy discussion groups. Dairy Processors and milk recording organisations were encouraged to participate by inviting their milk quality advisors to join the discussion groups who were based in their catchment area. The hour-long webinar was a combination of videos and case studies followed by a Q&A session. Links to the videos are available at (http://animalhealthireland.ie/?page_id=10490). Two further rounds of training for veterinary practitioners on delivery of the dry cow consults were held in September 2020.	AHI	ICOS, ICMSA, IFA, Teagasc, DAFM, Veterinary Ireland

Strategic Objective 4 - Optimise the use of antibiotics in human and animal health

Strategic Intervention:
4.4 Develop sector specific guidelines in relation to prudent use of antimicrobials in animals

Project no.	Activities	Description	Lead Organisation	Other organisations involved
38	4.4.1	**Develop and champion adherence to a code of good practice regarding the prudent use of antibiotics for dairy farmers (Q3-Q4 2018).** Outputs: The Code of Practice Regarding the Responsible Use of Antimicrobials on Dairy Farms was published and launched in November 2019.	ICOS/APHA	Veterinary Ireland, AHI, ICMSA, IFA, Teagasc, DAFM, MII, Bord Bia
39	4.4.1	**Develop and champion adherence to a code of good practice regarding the prudent use of antibiotics for beef and lamb farmers (Q3-Q4 2018).** Outputs: Codes of Practice Regarding the Responsible Use of Antimicrobials on Beef/Suckler and Sheep Farms was published and launched in Q4 2020.	APHA	Veterinary Ireland, Teagasc, IFA, AHI, MII, Bord Bia, DAFM
40	4.4.2	**Develop a policy in relation to the use of critically important antibiotics in the animal health sector in Ireland (Q1-Q2 2018).** Outputs: DAFM Policy Document on Highest Priority Critically Important Antimicrobials was launched in 2018. This document was revised in 2020 to reflect recommendations of EMA AMEG regarding the categorisation of AMs for use in animals.	DAFM	Veterinary Council, Veterinary Ireland, IFA, ICOS, ICMSA, APHA
41	4.4.3	**Revise the Code of Ethical Practice to ensure it provides for the maintenance of professional standards in relation to prudent use of antibiotics in accordance with international best practice (Q1-Q3 2018).** Outputs: VCI Code of Professional Conduct was reviewed in 2020 and relevant aspects of the Code will be updated as required.	Veterinary Council	
42	4.4.4	**Carry out a formal review of the use of medicated feed in Ireland to identify ways of better targeting antibiotic treatment for large numbers of animals (Q1–Q3 2019).** Outputs: DAFM carried out a review of Veterinary Written Directives (VDWs) & their compliance with Summaries of Product Characteristics (SPCs) and presented these findings to pig veterinary consultants who were also issued with a written reminder in April 2019 relating to their statutory responsibilities in this area. The October 2019 edition of 'IGFA Feed Issues' publication highlighted the AMU Database & alerted feed mills about the need to provide this data to DAFM. DAFM sent the latest version of the medicated scripts Form 16 to the Animal Feed sector of the Agricultural Industries Confederation (AIC) which is a UK feed industry trade association. The Form 16 Guideline document has since been updated and reviewed.	DAFM	IGFA, Teagasc, IFA

Strategic Objective 4 - Optimise the use of antibiotics in human and animal health

Strategic Intervention:
4.4 Develop sector specific guidelines in relation to prudent use of antimicrobials in animals

Project no.	Activities	Description	Lead Organisation	Other organisations involved
43	4.4.5	**Revise the various quality assurance schemes to ensure that they include elements related to the prudent use of antibiotics in accordance with international best practice (Q3 2018-Q4 2019).** Outputs: The new Sustainable Assurance Poultry Standard has been accredited by the Irish National Accreditations Board (INAB). This standard now contains the requirement that reflect the iNAP Committee recommendations with regards to antimicrobial use. The updated Sustainable Assurance Scheme for pigs is nearing completion and will include several new requirements that reflect the recommendations of the iNAP AHI Committee.	Bord Bia	DAFM, Teagasc
44	4.4,6	**Develop tools that allow farmers to readily assess the cost and volume of antibiotics being used on their pig farms (Q3 2018-Q4 2019).** Outputs: The cost/benefit analysis of AMU in Irish pig farms is ongoing using the Teagasc Pig Production Economic Model (https://academic.oup.com/jas/article/97/7/2803/5488099).	Teagasc	DAFM

Strategic Objective 4 - Optimise the use of antibiotics in animal health

Strategic Intervention:
4.5 Ensure legislation provides a mechanism for tackling inappropriate use

45	4.5.1	**Review legislation underpinning the prescription, sale and supply of antimicrobials in the animal health sector to better reflect current best knowledge, thinking and practice- to ensure that the legislative framework more clearly supports and promotes best practice with regard to prudent use in line with the objective of treating the animal that needs an antibiotic with the most appropriate antibiotic, at the correct dose for the correct duration (Q1 2018-Q4 2020).** Outputs: Public Consultation and stakeholder engagement carried out extensively from 2019 in relation to transposing the new Veterinary Medicinal Regulations 2019/6 governing the sale and supply of antimicrobials in the animal health sector from Jan 2022. Drafting of the new regulations began in Q1 2021.	DAFM	

Strategic Objective 4 - Optimise the use of antibiotics in animal health

Strategic Intervention:
4.6 Harmonisation and updating of product labelling for older antibiotics

Project no.	Activities	Description	Lead Organisation	Other organisations involved
46	4.6.2	**Carry out a review of SPCs for veterinary antibiotics with the objective of ensuring that they comply with international best practice in relation to prudent use (Q1–Q4 2020).** Outputs: The SPCs of all veterinary medicinal products are subject to regular review and updating. In accordance with Regulation 2019/6 there are particular initiatives in place regarding antimicrobials, and a number of implementing acts are expected to take effect by the date of application of the regulation on 28 January 2022. Independent national reviews of the SPCs of the products concerned did not take place as this would be disproportionate, given the anticipated changes in the coming years.	HPRA	DAFM

Strategic Objective 5 - Promote research and sustainable investment in new medicines, diagnostic tools, vaccines and other interventions

Strategic Intervention:
5.4 Take action to address research gaps

47		**Carry out a study to identify research currently underway, or that has been carried out in area of AMR and identifies knowledge gaps (Q4 2018-Q1 2019).** Outputs: This study has been completed and existing knowledge gaps have been identified.	DAFM	
48		**Carry out a research project in relation to use of selective dry cow therapy, the impact on mastitis control and farm profitability (Q1 2018-Q4 2020).** Outputs: Teagasc carried out a new Study in Autumn/Spring 2020 on the use of selective dry cow treatment (SDCT) at quarterly rather than at cow level. UCD undertook a project on 'Intramammary use over time and sociological work on attitudes to SDCT'.	Teagasc/UCD	AHI
49		**Carry out a research study in relation to investigating antimicrobial use in the pig and poultry industries in Ireland (Antimicrobial Use and Resistance in Animal Production - AMURAP).** Outputs: Study is ongoing with Covid and Avian influenza causing unforeseen delays.	Teagasc/UCD	DAFM

Strategic Objective 5 - Promote research and sustainable investment in new medicines, diagnostic tools, vaccines and other interventions

Strategic Intervention:
5.4 Take action to address research gaps

Project no.	Activities	Description	Lead Organisation	Other organisations involved
50	4.6.2	**Carry out a research project to investigate respiratory disease on Irish pig farms, associated risk factors, and the relationship between performance, welfare and antimicrobial use.** Outputs: Project PathSurvPigs was completed in September 2019, findings and recommendations were shared with industry.	Teagasc	DAFM
51		**Carry out a research project investigating the use of Biocheck.Ugent to benchmark and improve biosecurity in Irish pig farms (Q1 2018-Q4 2018).** Outputs: This project was part of a larger project 'PathSurvPig (14/S832)'. The Biocheck UGent questionnaire was used to survey the biosecurity status of 60 pig farms. The results have helped to raise AMR awareness among pig farmers and are being used with the AMURAP, PATHSURVPIGS and other relevant Teagasc Projects. . PVPs are using Biocheck UGent to carry out risk assessments on farm for biosecurity. Bord. Bia have now included the Biocheck Ugent assessment (or equivalent)as a requirement of the Pig Quality Assurance Standard, with these being co-ordinated by AHI. To date, over 200 herds have been assessed. This activity is one of 5 elements of an AHI-led Pig HealthCheck programme contributing to reduced AMU through measures to including biosecurity assessments, review of the National Salmonella Control Plan, capture and feedback of ante- and post-mortem abattoir data and recorded AMU and measures to identify and address risks for tail biting. Parallel Biocheck assessments for broiler and layer flocks have also been introduced by AHI for the poultry sector.	Teagasc	DAFM, AHI
52		**Make a presentation to Science Foundation Ireland with a view to encouraging the development of new diagnostic tools, vaccines and other interventions (Q1 2019).** Update: This action has not progressed due to restrictions and challenges imposed by Covid 19.	DAFM	Department of Health

Strategic Objective 5 - Promote research and sustainable investment in new medicines, diagnostic tools, vaccines and other interventions

Strategic Intervention:
5.4 Take action to address research gaps

Project no.	Activities	Description	Lead Organisation	Other organisations involved
53	4.6.2	**Applying Behavioural Science to the Problem of Antimicrobial Resistance with the Agricultural Sector.** Outputs: The Behavioural Research Unit (BRU) of the ESRI have designed an interactive computerised environment for delivery of a survey to vets and farmers. This combines methods from experiments with survey and qualitative techniques. The experiment touches on three different points at which behaviour might contribute to AMR: a) prior to use (i.e. AMU prevention behaviour); b) non-clinical factors in the prescription of antibiotics by vets; c) non-clinical factors in the use of antibiotics by farmers. The survey will be carried out and analysed in 2021, with unforeseen delays due to Covid in 2020.	ESRI	
54		**Use of antimicrobials in animal health on the island of Ireland: knowledge, attitudes and behaviour.** Outputs: Publication of a review paper on current antimicrobial use (AMU) data collection methods within animal production in Ireland in the *Irish Veterinary Journal* which can be found at: Martin, H., Manzanilla, E.G., More, S.J., O'Neill, L., Bradford, L., Carty, C.I., Collins, Á.B. and McAloon, C.G., 2020. Current antimicrobial use in farm animals in the Republic of Ireland. Irish Veterinary Journal, 73(1), pp.1-10. AMU calculator for dairy farmers to monitor their own AMU (+ accompanying press release and online dissemination) was launched. Paper submitted based on secondary qualitative analysis from Task 2: Huey, S., Kavanagh, M., Regan, A., Dean, M., McKernan,C., McCoy, F. Ryan, E. G., Cabellero, J., & McAloon, C. I. Understanding farmer attitudes towards selective dry cow therapy in Ireland. Submitted to Journal of Dairy Science. (Under review). The farmer survey and fieldwork to measure behavioural patterns, knowledge and attitudes towards AMU is ongoing. The veterinarian survey has commenced fieldwork, measuring attitudes, knowledge and behaviour relating to AMU using qualitative and quantitative methods. Paper published based on the AHI-funded summer student who worked with the safefood project to explore farmers' attitudes towards milk recording: Regan, Á., Clifford, S., Burrell, A., Balaine, L., & Dillon, E. Exploring the relationship between mastitis risk perception and farmers' readiness to engage in milk recording.Preventative Veterinary Medicine https://doi.org/10.1016/j.prevetmed.2021.105393 A presentation of the findings from the milk recording attitudinal study was given to Teagasc KT and a number of milk recording agencies to inform the development of their 2021 communication strategies.	Safefood	Teagasc, Queens University Belfast, UCD, AHI

Appendix 2 Members of the *i*NAP Animal Health Implementation Committee

Organisation	Name	Title
Animal Health Ireland (AHI)	Dr. David Graham	Chief Executive
Animal and Plant Health Association (APHA)	Mr. John Keogh	Chief Executive
Bord Bia	Ms. Alice McGlynn	Accreditation and Policy Manager, Quality Assurance
Department of Agriculture, Food and the Marine (DAFM)	Dr. Martin Blake Dr. Rob Doyle Dr. Paul Corkery Dr. Caroline Garvan Ms Julie Bolton	Chief Veterinary Officer Senior Superintending Veterinary Inspector Senior superintending Veterinary Inspector Superintending Veterinary Inspector Veterinary Inspector
Environmental Protection Agency (EPA)	Dr. Jonathan Derham Dr. Aisling O'Connor	Head of Programme; Scientific Officer
Food Safety Authority of Ireland (FSAI)	Dr. Lisa O'Connor	Chief Specialist, Biological Safety
Health Products Regulatory Authority (HPRA)	Dr. Lorraine Nolan	Chief Executive
Irish Cattle Breeding Federation (ICBF)	Mr. Mike Lynch	IT Projects Technical Leader
Irish Co-operative Organisation Society (ICOS)	Mr. Ray Doyle	Livestock Services Executive
Irish Creamery Milk Suppliers Association (ICMSA)	Mr. Lorcan McCabe	Deputy President
Irish Farmers Association (IFA)	Mr. Tomás Bourke	Executive Secretary Animal Health
Irish Grain and Feed Association (IGFA)	Ms. Deirdre Webb	Director
Meat Industry Ireland (MII)	Mr. Joe Ryan	Director
Safefood	Ms. Linda Gordon	Chief Specialist in Food Science
Teagasc	Dr. Edgar Garcia Manzanilla	Head of Pig Development Department
University College Dublin (UCD/CVERA)	Dr. Simon More	Professor of Veterinary Epidemiology and Risk Analysis
Veterinary Council of Ireland (VCI)	Ms. Niamh Muldoon	Registrar
Veterinary Ireland (VI)	Mr. Conor Geraghty	President

Supported By:

An Roinn Talmhaíochta, Bia agus Mara
Department of Agriculture, Food and the Marine

HPRA
An tÚdarás Rialála Táirgí Sláinte
Health Products Regulatory Authority

Meat Industry Ireland
Ibec

ahi Animal Health Ireland.ie

icbf

safefood

APHA
Animal & Plant Health Association

icos
Irish Cooperative Organisation Society

teagasc
Agriculture and Food Development Authority

Bord Bia
Irish Food Board

IFA

UCD DUBLIN

epa
Environmental Protection Agency
An Gníomhaireacht um Chaomhnú Comhshaoil

Irish Creamery Milk Suppliers Association
ICMSA
The Family Farm Organisation

Comhairle na dCréidiúna
Veterinary Council

Food Safety
Authority of Ireland

igfa
The Irish Grain and Feed Association
Feeding the Food Chain

Veterinary Ireland

An Roinn Talmhaíochta,
Bia agus Mara
Department of Agriculture,
Food and the Marine

iNAP
PROTECTING ANTIBIOTICS FOR THE FUTURE
ANTAIBHEATHAIGH A CHOSAINT DON TODHCHAÍ