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FINAL JOINT REPORT IN RESPECT OF A ONE HEALTH COUNTRY VISIT TO IRELAND FROM 07 OCTOBER 2019 TO 11 OCTOBER 2019 TO DISCUSS POLICIES RELATING TO ANTIMICROBIAL RESISTANCE

In response to information provided by the competent authority, any factual error noted in the draft report has been corrected; any clarification appears in the form of a footnote.

Executive Summary

The European Centre for Disease Prevention and Control (ECDC) and the European Commission's Directorate General for Health and Food Safety jointly carried out this country visit to Ireland from 7 to 11 October 2019. The visit was carried out following the invitation from the competent authorities to assist them in the development and implementation of their national strategy for tackling antimicrobial resistance (AMR) based on a 'One Health' approach.

*Overall, the report concludes that there is a comprehensive inter-sectoral National Action Plan on AMR (*i*NAP) called for the period 2017-2020, which follows the structure of the WHO global action plan on AMR. There are clearly defined strategic objectives and related activities, timelines, responsibilities; however there are no quantitative targets or other indicators to enable measuring the plan's outcome.*

In addition to an inter-departmental co-ordination committee, i*NAP's implementation is overseen in the animal health and environmental sectors by an Animal Health Committee with their progress reports already published. On the human health side, implementation is led by the Health Service Executive which carry out the majority of actions and have developed an implementation plan over the life of* i*NAP. However, the implementation plan acknowledges that several of the actions are not achievable within the proposed timeframe and with the allocated funding.*

One of the actions that is taken jointly by the human and animal health and environmental sectors is the publication of One Health Report on Antimicrobial Use & Antimicrobial Resistance. The first published report included the human and animal resistance data. The new report, which will be published shortly, will also include data on the antimicrobials and resistant bacteria found in the environment.

In the human health sector in Ireland, the antimicrobial consumption in the community is higher than the European average. For hospitals, the consumption is lower than the average. The total sales of antimicrobials in the veterinary sectors are moderate. However, over 60% of the sales concern oral antimicrobials, a significant proportion attributed to the pig sector, where they are routinely used around the weaning period and there is also a relatively high use of intramammary tubes for dairy cows because of the blanket use of antimicrobials at the end of lactation.

The competent authorities will shortly launch a database to collect the use of antimicrobials at farm level in pigs, and at a later stage, for the rest of the farmed animals. The authorities intend to use this database to benchmark farmers. It was suggested, the data could also be used to set up the targets for the next reiteration of i*NAP.*

The veterinary components of i*NAP almost exclusively concentrate on farmed animals, as this sector is considered a priority. There are plans to include companion animals and horses in its next iteration. The* i*NAP initiatives linked directly to prudent use of antimicrobials are generally voluntary and many are stakeholder-driven. Despite this, there are clear cases of farmers not being receptive to the initiatives proposed by the stakeholders to reduce the use of antimicrobials, in particular in relation to the routine use of medicated feed in the pig producers. However, given that new EU legislation will become applicable in early 2022, there are no plans to strengthen the national regulatory framework on the prescription and use of antimicrobials. The Irish authorities are trying to find the right balance between compulsory and voluntary measures in order to*

maintain good cooperation with the vast majority of the stakeholders and have an influence in the antimicrobials prescribing patterns.

In the human health sector, multiple actions were undertaken to address the higher consumption of antimicrobials in the community, which aimed at sensitising general practitioners on the prudent use of antimicrobials, as well as the patients, who still seem to request antibiotics. In hospitals, antimicrobial stewardship teams were established; however, activities could not be conducted to optimal level due to either a lack of trained staff or time.

In terms of AMR surveillance, Ireland has high proportions of vancomycin-resistant Enterococci *among* Enterococcus faecium *bloodstream infections and these are among the highest in Europe. Additional information on AMR comes from the reporting of some healthcare associated infections (HAIs) and the mandatory notification of cases. However, national data on AMR in the community and on AMR for pathogens not covered by European surveillance are not available. National reference laboratories exist for specific pathogens but there are no formal reference services for other pathogens of concern such as vancomycin-resistant* Enterococci *and* Clostridioides difficile*.*

The CPE outbreak in 2017 and subsequent declaration of the National Public Health Emergency on CPE coincided with the launch of i*NAP and required a lot of resources. On a positive side, it also resulted in raising awareness and in putting AMR on the agenda of all actors, focusing efforts for the control of AMR and HAIs. However, there is a risk that the focus on one specific pathogen with AMR might lead to a neglect of control of other pathogens with AMR and the prevention of HAIs in general. In addition, there is a need to ensure the sustainability of the CPE control activities once the emergency is declared over.*

Ireland has participated in the point prevalence surveys of HAIs and there are regular audits of performance standards related to infection prevention and control (IPC). However, continuous outcome-based monitoring of HAIs is not in place and the IPC staffing levels of healthcare professionals with qualifications in IPC have improved but are still below the needs.

In relation to the environmental sector, the monitoring of Watch List substances under the Water Framework Directive is being carried out. The competent authorities are also working to address the issues with the quality of the water supply, waste water treatment and correct disposal of medicines. Additionally, the environmental and veterinary sectors have undertaken multiple actions on AMR surveillance, awareness raising and research.

In general, the commitment of actors, in all sectors and at all levels, to the control of AMR in Ireland is a positive example for other countries. There has been progress in AMR control on many levels and, while AMR will likely remain a significant challenge for the country, there are several achievements to build upon for future actions.

The report outlines various considerations which could be helpful in reviewing and implementing a national, One Health, AMR strategy.

INTRODUCTION

ABBREVIATIONS AND DEFINITIONS USED IN THIS REPORT

Abbreviation	Explanation
AHI	Animal Health Ireland
AHIC	Animal Health Implementation Committee
AMR	Antimicrobial resistance
AMRIC	Antimicrobial Resistance and Infection Control
AMS	Antimicrobial stewardship
APHA	Animal and Plant Health Association
ARO	Antimicrobial resistant organism
AST	Antimicrobial susceptibility testing
BDU	Bed-days used
(HP-)CIA	(Highest Priority) Critically important antimicrobial
CPE	Carbapenemase-producing Enterobacterales
DAFM	Department of Agriculture, Food and the Marine
DCCAE	Department of Communications, Climate Action and Environment
DDD	Defined daily doses
DHPLG	Department of Housing, Planning and Local Government
DoH	Department of Health
EAAD	European Antibiotic Awareness Day
EARS-Net	European Antimicrobial Resistance Surveillance Network
ECDC	European Centre for Disease Prevention and Control
EFSA	European Food Safety Authority
EEA	European Economic Area
EMA	European Medicines Agency
EPA	Environmental Protection Agency
ESAC-Net	European Surveillance of Antimicrobial Consumption Network
ESBL	Extended-spectrum beta-lactamase
ESVAC	European Surveillance of Veterinary Antimicrobial Consumption
EU	European Union
EUCAST	European Committee on Antimicrobial Susceptibility Testing
EQA	External quality assessment
FSAI	Food Safety Authority of Ireland
GP	General practitioner

Abbreviation	Explanation
GMS	General Medical Services
HAI	Healthcare-associated infection
HIQA	Health Information and Quality Authority
HPSC	Health Protection Surveillance Centre
HSE	Health Service Executive
ICU	Intensive Care Unit
ID	Infectious Diseases
*i*NAP	Ireland's National Action Plan on AMR
IPC	Infection prevention and control
ISC	Inter-sectoral steering committee
KPI	Key performance indicators
LTCF	Long-term care facility
MRSA	Meticillin-resistant *Staphylococcus aureus*
NCEC	National Clinical Effectiveness Committee
NCPERL	National CPE reference laboratory
NPHET	National Public Health Emergency Team
NRL	National Reference Laboratory
PCU	Population correction unit
PPS	Point prevalence survey
RVL	Regional Veterinary Laboratory
SDCT	Selective dry cow therapy
TASAH	Targeted Advisory Service on Animal Health
UCD	University College of Dublin
UK	United Kingdom
VCI	Veterinary Council of Ireland
VMP	Veterinary medicinal product
VRE	Vancomycin-resistant *Enterococci*
WHO	World Health Organization
WWTP	Waste water treatment plant

1 INTRODUCTION

The European Centre for Disease Prevention and Control (ECDC) and the European Commission's Directorate-General for Health and Food Safety were invited by the Irish authorities to carry out jointly a country visit from 7 to 11 October 2019. The visit followed-up on the Commission's One Health Action Plan against antimicrobial resistance (AMR) published on 29 June 2017 ([1]), and reviewed the current status of efforts to tackle AMR in Ireland, in particular the development and implementation of national strategies and policies against AMR based on a One Health approach.

The ECDC team focussed on the human health aspects of AMR while the Commission team concerned itself with veterinary aspects and, to a limited extent, environmental aspects. Both teams included national experts from European Union (EU) Member States. This report brings together the main observations and conclusions of the two teams and identifies areas where further developments could be beneficial.

An opening meeting was held on 7 October. At this meeting the objectives and scope of, and itinerary for, the joint country visit were confirmed.

2 OBJECTIVES AND SCOPE

The overall objective of this joint country visit was to assist Ireland in further developing and implementing its national strategies and policies against AMR based on a One Health approach. This objective involved (a) discussing the situation regarding the prevention and control of AMR with the relevant competent authorities, professional organisations and other stakeholders, and (b) exchanging information on examples of good practice implemented by Ireland and other Member States in addressing these issues, which could potentially be helpful in further developing and implementing national AMR strategies.

The scope of this joint country visit was as follows:

- For the human aspects of AMR, the visit focussed on the control of AMR through the prudent use of antimicrobials, and infection prevention and control (IPC).
- For the veterinary aspects of AMR, the visit focussed on the policies to tackle AMR through the reduced and more prudent use of antimicrobials, as advocated in the relevant EU guidelines for prudent use of antimicrobials in veterinary medicine ([2]).

1 https://ec.europa.eu/health/amr/sites/amr/files/amr_action_plan_2017_en.pdf
2 http://ec.europa.eu/health/antimicrobial_resistance/docs/2015_prudent_use_guidelines_en.pdf.

The discussions on the national AMR strategies, action plans and inter-sectoral coordination and cooperation took into account relevant guidance and documentation, including that jointly adopted by the World Health Organization (WHO), the Food and Agriculture Organization (FAO) of the United Nations, the World Organisation for Animal Health (OIE) ([3]), the European Medicines Agency (EMA) ([4]) and the European Food Safety Authority (EFSA) ([5]).

In pursuit of these objectives, the following meetings and visits took place:

Visits / Meetings		No.	Comments
Competent authority	Central	3	Joint opening and closing meetings, with Department of Health (DoH), National Patient Safety Office, Health Protection Surveillance Centre (HPSC), Health Products Regulatory Authority (HPRA), Health Service Executive (HSE), Health Information and Quality Authority, Department of Agriculture, Food and the Marine (DAFM), Environmental Protection Agency (EPA), Department of Housing, Planning and Local Government (DHPLG), Food Safety Authority of Ireland (FSAI), Irish Water, and representatives of the National Zoonoses Committee and Science Foundation Ireland.
Veterinary and environmental aspects			
Competent authority		3	In addition to the above: 1) Joint communication meeting: DoH, HPSC, HSE, DAFM, DHPLG, EPA (consultant veterinarian from Irish Famers' Journal was also present); 2) Meeting with the representatives of the environmental sector: DHPLG, Department of Communications, Climate Action and Environment, EPA, Irish Water, DAFM and representatives of academia (National University of Ireland in Galway and Maynooth University) were also present; 3) Stakeholders meeting: see lists below, DAFM and FSAI were also present.
Professional associations		1	Veterinary Council of Ireland (VCI), Veterinary Ireland
Industry and other stakeholders (e.g. research organisations)		1	Animal and Plant Health Association (APHA), Animal Health Ireland (AHI), Athlone Institute of Technology, Irish Co-operative Organisation Society, Irish Farmers Association (IFA) and poultry, pig and dairy/beef farmers, Meat Industry Ireland, *safe*food, St David's Poultry Practice, Teagasc, University College Dublin (UCD).
Human health aspects			
Competent authority		1	National Reference Laboratory (Dublin) (Joint communication meeting: see above in veterinary and environmental section).
Hospitals/Long-term care facilities (LTCF)		3	Large teaching hospital (Dublin); regional hospital (North East); LTCF, (North East).
General practitioners (GPs)		2	Dublin.
Community pharmacists		1	Dublin.
Professional associations		1	Irish College of General Practitioners, Royal College of Surgeons in Ireland.
Other stakeholders:		1	Pharmacists stakeholder meeting (Dublin)

[3] http://apps.who.int/iris/handle/10665/204470

[4] http://www.ema.europa.eu/ema/index.jsp?curl=pages/special_topics/general/general_content_000439.jsp&mid=WC0b01ac0580a7815

[5] https://www.efsa.europa.eu/en/topics/topic/antimicrobial-resistance

A list of the legal instruments referred to in this report is provided in Annex I and refers, where applicable, to the last amended version.

3 BACKGROUND

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 term 'One Health' recognises that human and animal health are interconnected, that diseases are transmitted from one to the other and the threat of AMR should be tackled in both. The One Health approach also encompasses the environment as another link between humans and animals and likewise a potential source of new resistant organisms. The importance of adopting a One Health approach to tackling AMR has been recognised globally, notably by the WHO Assembly which urged all its country members, including EU Member States, to develop and have in place by 2017 national action plans on AMR that are aligned with the objectives of the WHO global action plan on AMR, adopted at the 68th World Health Assembly in May 2015 ([6]).

Joint country visits aim at supporting Member States in the design and implementation of their national AMR action plans, and the visits build upon previous work carried out by the ECDC and the Commission:

- In the human health area, ECDC has developed a process of country visits to discuss and assess the situation regarding the prevention and control of AMR through the prudent use of antibiotics and infection control. These are based on Council Recommendation of 15 November 2001 on the prudent use of antimicrobial agents in human medicine ([7]), which advocates a range of actions to be taken to prevent and control the development of AMR. The Council conclusions on AMR of 10 June 2008 ([8]) reiterated the call for action to tackle AMR. On 9 June 2009, the Council adopted a Recommendation on patient safety including the prevention and control of healthcare-associated infections ([9]), which further stressed the importance of combating AMR as a patient safety issue. In response to a call contained in the Council Conclusions on the next steps under a One Health approach to tackle AMR of July 2016 ([10]), EU guidelines on the prudent use of antimicrobials in human health were published in June 2017 ([11]).
- In the veterinary area and as part of the Commission's work to tackle AMR, the Directorate for Health and food audits and analysis of the Directorate-General for Health and Food Safety has carried out a project on the Member States' measures to

6 http://www.who.int/antimicrobial-resistance/national-action-plans/en/
7 https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1571828703539&uri=CELEX:32002H0077
8 http://www.consilium.europa.eu/ueDocs/cms_Data/docs/pressData/en/lsa/101035.pdf
9 https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1571829439267&uri=CELEX:32009H0703(01)
10 https://publications.europa.eu/en/publication-detail/-/publication/963104ce-5096-11e6-89bd-01aa75ed71a1/language-en
11 https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=OJ%3AC%3A2017%3A212%3ATOC

tackle AMR relating to the use of veterinary medicines, including the identification of examples of good practice which could potentially be helpful to other Member States in addressing this issue. This work took into account the above mentioned guidelines for prudent use of antimicrobials in veterinary medicine, which were published in 2015. An interim overview report on this project was published in 2018 ([12]) and a final overview report in 2019 ([13]). In addition, the afore-mentioned Directorate has been carrying out a series of audits on the implementation of the requirements laid down in Commission Implementing Decision 2013/652/EU. An interim overview report on this series was published in 2017 ([14]) and a final overview report in 2019 ([15]).

ECDC's mission, as set out in its Founding Regulation (Regulation (EC) No 851/2004 of the European Parliament and of the Council), is (i) to identify, assess and communicate current and emerging threats to human health from communicable diseases; (ii) in the case of other outbreaks of illness of unknown origin which may spread within or to the Community, the Centre shall act on its own initiative until the source of the outbreak is known; and (iii) in the case of an outbreak which clearly is not caused by a communicable disease, the Centre shall act only in cooperation with the competent authority upon request from that authority. As part of this mission, ECDC may be requested, by the European Commission, a Member State, or another country to provide scientific or technical assistance in any field within its mission.

ECDC and EFSA have published a summary report on AMR in bacteria from humans, animals and food, including data from Ireland (European Union summary report on AMR in zoonotic and indicator bacteria from humans, animals and food in 2017) ([16]). ECDC, EFSA and EMA have also issued a second joint report on the integrated analysis of the consumption of antimicrobial agents and occurrence of AMR in bacteria from humans and food-producing animals (Joint Interagency Antimicrobial Consumption and Resistance Analysis report – JIACRA II), including data from Ireland ([17]). These reports largely draw conclusions for the EU as a whole based on the complete range of data available.

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12 https://publications.europa.eu/en/publication-detail/-/publication/aa676ddd-2d87-11e8-b5fe-01aa75ed71a1/language-en

13 https://publications.europa.eu/en/publication-detail/-/publication/be1710ba-b1aa-11e9-9d01-01aa75ed71a1/language-en/format-PDF/source-search

14 https://publications.europa.eu/en/publication-detail/-/publication/57108bb1-6dc0-11e7-b2f2-01aa75ed71a1/language-en/format-PDF/source-search

15 https://publications.europa.eu/en/publication-detail/-/publication/bf59a2db-b1aa-11e9-9d01-01aa75ed71a1/language-en/format-PDF/source-search

16 https://efsa.onlinelibrary.wiley.com/doi/epdf/10.2903/j.efsa.2019.5598

17 http://www.ema.europa.eu/docs/en_GB/document_library/Report/2017/07/WC500232336.pdf

4 OBSERVATIONS AND CONCLUSIONS

4.1 AMR STRATEGIES, ACTION PLANS AND COORDINATION, BASED ON A ONE HEALTH APPROACH

4.1.1 National strategies and action plans on AMR

1. In 2014, the Irish Government added AMR to its National Risk Assessment report. In the same year, the National Interdepartmental Antimicrobial Resistance Consultative Committee was established and met for the first time in 2015. The committee has since developed Ireland's National Action Plan on Antimicrobial Resistance 2017-2020, also referred to as '*i*NAP' ([18]) and now oversees its implementation. The committee is chaired jointly by the Medical Officer of Health and the Chief Veterinary Officer and consists of members representing the human and animal health, and environmental sectors. Representation of the human health sector does not include professional associations of physicians, nurses and pharmacists, although some of these are mentioned as collaborators and stakeholders. On the veterinary side, apart from the representatives from the Department of Agriculture, Food and the Marine (DAFM) and Food Safety Authority of Ireland (FSAI), there are representatives from the research institutions, veterinary professional bodies, farmers and dairy cooperatives associations, and Animal Health Ireland (AHI), which is an organisation for the eradication of non-statutory animal diseases. The Environmental Protection Agency (EPA) represents the environmental sector with its multiple departments and agencies involved. The Committee meets twice a year, or more frequently if required, and the minutes of the meetings are publicly available ([19]).

2. The *i*NAP follows the structure of the WHO global action plan on AMR and includes the following five strategic objectives: 1. Improve awareness and knowledge of AMR; 2. Enhance surveillance of antibiotic resistance and antibiotic use; 3. Reduce infection and disease spread; 4. Optimise the use of antibiotics in human and animal health and 5. Promote research and sustainable investment in new medicines, diagnostic tools, vaccines and other interventions. *i*NAP has received a dedicated budget for prioritised actions in the human health sector in 2018 and 2019. The funding on the veterinary and environmental side was not specified, which was explained by the fact that the stakeholders' led actions do not require public investments. However, the funding had been made available for the comprehensive research work done in both sectors, as well as for the extensive

[18] https://health.gov.ie/wp-content/uploads/2017/10/iNAP_web-1.pdf https://www.agriculture.gov.ie/amr/irelandsnationalactionplanforantimicrobialresistance2017-2020inap/

[19] https://www.agriculture.gov.ie/amr/nationalinterdepartmentalamrconsultativecommittee/ https://www.gov.ie/en/collection/81c518-national-interdepartmental-amr-consultative-committee-meetings/?referrer=/national-patient-safety-office/patient-safety-surveillance/antimicrobial-resistance-amr-2/national-interdepartmental-amr-consultative-committee-meetings/

works aimed at improving the water infrastructure and other actions undertaken by the environmental sector ([20]).

4.1.2 Multi-sectoral collaboration and coordination, including One Health approach

3. Health Service Executive (HSE) Antimicrobial Resistance and Infection Control (AMRIC) Oversight Group and AMRIC Implementation Team are the structures within the wider HSE governance structure that provide respectively for oversight of healthcare associated infections (HAIs) and AMR issues, and implementation of the human health part of *i*NAP. The AMRIC Division of the Health Protection Surveillance Centre was recently established by merging existing microbiology teams and surveillance programmes to provide technical guidance, review and support to the above structures. Responsibilities include surveillance of specific reportable microorganisms (and infections thereof), such as bloodstream infections caused by *Staphylococcus aureus*, including meticillin-resistant *S. aureus* (MRSA), *Clostridioides difficile,* the public health emergency on carbapenemase-producing Enterobacterales (CPE) and other AMR issues. AMRIC assessed the implementation of the human health part of *i*NAP in 2018 and prepared an implementation plan for 2019-2020 for *i*NAP activities assigned to the HSE). Among the implemented actions were updates of community prescribing guidelines, a gap analysis of surveillance capabilities for AMR and HAIs, as well as the development of guidance and toolkits for CPE control for several settings. However, the implementation plan for 2019-2020 acknowledges that several of the actions assigned to HSE are not achievable within the proposed timeframe and funding. The HSE report on a quarterly basis to the Department of Health on implementation progress in accordance with the *i*NAP Implementation Plan 2019-2020.

4. The *i*NAP Animal Health Implementation Committee (AHIC) was set up in January 2018. It is chaired by the Chief Veterinary Officer, and tasked with overseeing the completion of the 54 *i*NAP AHIC projects allocated to the animal health and environmental sectors. This committee brings together various animal and environmental health stakeholders to collaborate on achieving the completion of the outlined projects. Two progress reports have been produced to show the progress achieved in 2018 with the next progress report due for publication in 2020, reflecting progress made in 2019. The progress reports, minutes of the committee meetings and full list of stakeholders involved are available on-line ([21]).

5. The National Public Health Emergency on CPE was declared on 25 October 2017 at the time of the launch of the *i*NAP and is managed by the National Public Health Emergency Team (NPHET). The NPHET provides advice on the strategy to contain CPE and oversees surveillance and management of CPE at the national level.

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[20] In their response to the draft report, the competent authorities clarified that an annual budget of approximately € 600 000 is used to support database development, research into AMR, communications and conferences.

[21] https://www.agriculture.gov.ie/amr/inapanimalhealthimplementationcommittee/

6. A number of actions are taken jointly by the human and animal health and environmental sectors. Among others, the first One Health Report on Antimicrobial Use & Antimicrobial Resistance ([22]) was published in January 2019, which required collaboration across the human and animal health sectors to evaluate the data collected from humans and animals. The new report covering the data from 2017 and 2018 is well under way and will also include the data from the monitoring of Watch List substances under the Water Framework Directive, research data on a number of resistant bacteria found in the environment and from clinical isolates obtained from species previously not covered – companion animals and horses ([23]) Taking this collaborative approach one step forward and setting up an alert system for emerging resistant pathogens from the human, animal and environmental isolates, could be considered.

7. The first One Health conference, which coincided with the World Antibiotic Awareness Week in 2018, was organised by the DAFM, DoH and HSE and was supported by the EPA. The conference aimed at heightening the awareness on AMR and facilitating the knowledge transfer and exchange of best practice amongst healthcare and veterinary professionals in relation to use, prescribing and management of antibiotics in human and animals. In addition, there are extensive communication efforts aimed at raising AMR awareness undertaken by all three sectors (see 4.2.7, 4.3.3 and 4.3.5). Additional joint public awareness campaigns, in line with the One Health approach could be considered. There is distinctive branding ('RESIST') used by the human health side, that could potentially be used for the animal health and environmental sectors to channel the same message. Other Member States have successfully adapted the elements of human health campaigns to highlight the need for the prudent use of antimicrobials in the animal sector and there is potential to use the same approach ([24]).

4.1.3 Conclusions on AMR strategies, action plans and coordination based on a One Health approach

8. There is a comprehensive inter-sectoral National Action Plan on AMR (*i*NAP) for the period 2017-2020, which follows the structure of the WHO global action plan on AMR. There are clearly defined strategic objectives and related activities, timelines, responsibilities; however there are no quantitative targets or other indicators to enable measuring the plan's outcome.

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22 https://www.gov.ie/pdf/?file=https://assets.gov.ie/11418/66ec356a49754ee7a0b53268170b9b9c.pdf

23 In their response to the draft report, the competent authorities noted that the National Reference Laboratory considers resistance in bacteria from companion animals and horses as an at least equal priority as resistance from farmed animals. However, tracking resistance in companion animals has generally not been included in DAFM remit.

24 In their response to the draft report, the competent authorities noted that possible joint public awareness campaigns, in line with the One Health approach will be discussed between DAFM and DoH, and the possibility of using human health AMR RESIST campaign logo and materials on animal health side will be explored.

9. In addition to the inter-departmental co-ordination committee, the *i*NAP's implementation is overseen by HSE in the human health sector and by Animal Health Committee in the animal health and environmental sectors, with progress reports having already been published. However, on the human side, the current implementation plan acknowledges that several of the actions are not achievable within the proposed timeframe and with the allocated funding.

10. One of the actions taken jointly by the human and animal health and environmental sectors is the publication of a One Health Report on Antimicrobial Use & Antimicrobial Resistance. The first published report included the human and animal resistance data. The new report, which will be published shortly, will also include data on the antimicrobials and resistant bacteria found in the environment.

4.2 HUMAN HEALTH ASPECTS OF AMR

4.2.1 Organised multidisciplinary and multisectoral collaboration at local level

11. At local level in larger hospitals, clinical microbiologists, medical scientists, surveillance scientists, IPC nurses and pharmacists collaborate within antimicrobial stewardship (AMS) and IPC teams, in Drugs and Therapeutics committees and, where available, in Antimicrobial Stewardship Committees. The clinical microbiologist will often be the connecting link between these groups. The national guidelines recommend that the Antimicrobial Stewardship Committees hold regular meetings (quarterly or biannually). In smaller hospitals without an on-site clinical microbiologist, where local governance arrangements have been put in place, a consultant microbiologist based in a larger hospital will provide advice. The clinical microbiologist or the local IPC team will also be responsible to inform the hospital director and other relevant persons and teams of the antimicrobial consumption statistics received by the hospital groups from the national surveillance team on a regular basis.

12. There seemed to be no formal collaboration or networking at regional level between the HSE Hospital Groups and the HSE Community Health Organisations. This is despite the fact that at the national level the collaboration between Hospital and Community services (through the AMRIC Implementation Team and AMRIC Oversight Group) exists since 2018. At local level, there were examples of collaboration between hospitals and LTCFs in the form of provision of clinical support by hospital consultants, but the visiting team was also informed that due to a lack of resources this only rarely took place. Although there are local initiatives undertaken by general practitioners (GPs) aiming at improving antimicrobial prescribing, the team did not witness multidisciplinary activities in community care.

4.2.2 Laboratory capacity

13. The visited hospitals had microbiology laboratories on site that received samples from the hospital as well as from GPs in the catchment area. Species identification

was performed with matrix-assisted laser desorption/ionisation time-of-flight (MALDI-TOF) mass spectrometry combined with semi-automated antimicrobial susceptibility testing (AST), typically using VITEK 2 or Phoenix systems. European Committee on Antimicrobial Susceptibility Testing (EUCAST) criteria were used for interpretation of AST results and reports were made available to clinicians via electronic systems and using selective reporting. 24/7 services were available for rapid species identification from blood cultures and advice to clinicians. AST for colistin in CPE is performed at the reference laboratory due to the requirement for broth microdilution. In general, sample quality seemed to be good and problems related to transport of samples to other sites for microbiological analyses were not reported. Turnaround time from sampling to test result was satisfactory. For some highly specialised analyses, samples were sent abroad.

14. Laboratory accreditation is not a legal requirement in Ireland; however, a vast majority of laboratories are accredited by the Irish National Accreditation Board (INAB). Laboratories also participate in UK-NEQAS and other commercial external quality assessments (EQA) as well as in the EQA of the European Antimicrobial Resistance Surveillance Network (EARS-Net). In 2018, 87% of EARS-Net laboratories participated in the related EQA. The majority of EARS-Net laboratories perform AST according to the EUCAST guidelines or EUCAST harmonised guidelines. National reference laboratories (NRLs) for bacterial pathogens are established for specific bacteria or resistance mechanisms and are located at different geographic sites. Related to AMR, these include the National MRSA Reference Laboratory, the National CPE Reference Laboratory (NCPERL), the National Gonococcal Reference Laboratory, the National Mycobacteria Reference Laboratory and the National Meningitis and Sepsis Reference Laboratory.

15. The ECDC team visited the MRSA reference laboratory at St James's hospital in Dublin. This reference laboratory performs AST, detection of AMR genes with polymerase chain reaction (PCR) and molecular typing using staphylococcal protein A (spa) typing as well as DNA microarray. The implementation of whole genome sequencing is planned for the future. Molecular typing is performed for all isolates from bloodstream infections and upon request from hospitals on additional isolates. The NCPERL is located at the University Hospital Galway. The NCPERL and the MRSA Reference Laboratory do not have an overarching governance structure and a dedicated stable budget. It rather seemed that reference laboratory functions were appointed or established based on personal initiatives and highly experienced staff at certain locations, without a formal selection process. The reference laboratory budgets have to be re-negotiated every year inhibiting long-term planning. There are no reference laboratory services for other important healthcare-associated pathogens such as vancomycin-resistant *Enterococcus* spp. (VRE) and *C. difficile*.

16. The national requirements for screening for CPE ([25]) outline two options for screening: targeted population risk-based screening and broader population screening based on hospital risk assessment. Related to local CPE outbreaks, both visited hospitals had opted for the broader screening policy and performed universal admission screening and weekly screening in the wards. The microbiology laboratories processed an estimated 1 000–2 000 screening samples per month depending on the size of the hospital. Both microbiology laboratories had recently bought new equipment to perform rapid testing for CPE to respond to outbreaks. Screening methods varied and were mainly culture-based in one hospital and mainly based on molecular methods in the other hospital. CPE screening had an impact on available resources and resulted in overtime of staff.

4.2.3 Monitoring of AMR in human health

17. Ireland has participated in the European surveillance of AMR in invasive infections since 1999 (EARSS, from 2004 EARS-Net), with high population coverage estimated at 100% in 2018. The EARS-Net data shows a declining trend of resistance for MRSA, from 23.7% in 2011 to 12.4% in 2018, an increasing trend for *Escherichia coli* with resistance to third-generation cephalosporins from 9% in 2011 to 12.9% in 2018, a stable situation for *Klebsiella pneumoniae* with carbapenem resistance (proportion fluctuating between 0% and 0.6%). In addition, continuously high proportions of vancomycin resistance in *Enterococcus faecium* have been observed from 2011 to 2016, but seem to be levelling off in recent years (40.2% in 2018, which is the 3rd highest proportion in the EU) ([26]).

18. Additional information on AMR and HAIs comes from the reporting of key performance indicators (KPI) including hospital-acquired *S. aureus* bacteraemia and hospital-acquired *C. difficile* infection and the mandatory notification of CPE cases. The number of newly detected CPE cases has increased considerably from 2012 to 2018 and currently fluctuates around 50 and 60 new cases per month. This increase is at least partially due to enhanced surveillance and an increased detection of CPE from screening samples, while the number of CPE detections from clinical samples has remained stable in the last 2 years. However, new hospital outbreaks of CPE continue to be reported each month ([27]). CPE have also been detected from the hospital environment (showers, sinks, etc.) in some of these outbreaks.

19. For *C. difficile*, the performance monitoring data shows a slightly increasing trend in the rate of hospital-acquired *C. difficile* infection per 10 000 bed-days used (BDU)

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25 https://www.hpsc.ie/a-z/microbiologyantimicrobialresistance/strategyforthecontrolofantimicrobialresistanceinirelandsari/carbapenemresistantenterobacteriaceaecre/guidanceandpublications/Requirements%20for%20Screening%20for%20Carbapenemase-Producing%20Enterobacterales%20(CPE)%20April%202019.pdf

26 https://www.ecdc.europa.eu/en/surveillance-atlas-infectious-diseases

27 https://www.hpsc.ie/a-z/microbiologyantimicrobialresistance/strategyforthecontrolofantimicrobialresistanceinirelandsari/carbapenemresistantenterobacteriaceaecre/surveillanceofcpeinireland/cpemonthlysurveillancereports/NPHET_CPE_Aug%202019.pdf

from January 2017 to April 2019. Enhanced surveillance is also performed for *C. difficile* infection with 56 hospitals participating in the second quarter of 2019. These hospitals reported 461 cases of *C. difficile* infection in hospitalised patients (4.6 cases per 10 000 BDU) for the second quarter of 2019, of which 306 cases were deemed to be hospital acquired ([28]). Results of molecular typing of a subset of *C. difficile* isolates shows evidence of clonal dissemination between hospitals.

20. At local hospital level, regular review of the AMR situation seems to be less well established. Hospital microbiology laboratories did not prepare a breakdown of AMR statistics for specific departments or units nor did they regularly provide AMR statistics to prescribers in their hospital ([29]). GPs also did not receive any information on the AMR situation in their community overall or specifically for the samples they had provided. One GP assumed that data on the local AMR situation is being taken into account for the preparation of national treatment guidelines in primary care; however, national data on AMR in the community and on AMR for pathogens not covered by EARS-Net surveillance are not available.

4.2.4 Monitoring of antibiotic usage in human health

21. Consumption of antimicrobials of Anatomical Therapeutic Chemical (ATC) group J01 in the community in Ireland was at 22.9 defined daily doses (DDD) per 1 000 inhabitants per day, slightly higher than the EU/EEA average in 2017 (21.8 DDD per 1 000 inhabitants per day). There was no significant trend in the consumption of antimicrobials in the community between 2013 and 2017. The most commonly used antibiotics were penicillins, primarily amoxicillin and amoxicillin/clavulanic acid. Efforts have been made to decrease the use of amoxicillin-clavulanic acid and fluoroquinolones.

22. For hospitals, data from the European Surveillance of Antimicrobial Consumption Network (ESAC-Net) indicate that consumption is lower than the EU/EEA average in DDDs per 1 000 inhabitants per day. No information was given on the amount of antibiotics used for prophylaxis ([30]). As for the community, penicillins are the most frequently used antibiotic group in hospitals. Consumption of cephalosporins, fluoroquinolones and other broad spectrum antimicrobials was low overall. There has been a decrease in carbapenem use since the declaration of the Public Health Emergency on CPE. However, a concomitant increase in 3rd generation cephalosporin use may reflect replacement of carbapenems by other antimicrobial

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28 https://www.hpsc.ie/a-z/microbiologyantimicrobialresistance/clostridioidesdifficile/cdifficiledataandreports/CDINationalReport_Q22019_v1.0_Reviewed.pdf

29 In their response to the draft report, the competent authorities noted that some laboratories were able to provide GPs with regular AST data on urinary isolates or data for prescribers as part of local HAI surveillance programmes.

30 In their response to the draft report, the competent authorities noted that while quantitative antimicrobial consumption data does not breakdown prescriptions by prescriber indication, findings of annual antimicrobial point prevalence surveys (in which the majority of hospitals participate) provide qualitative data demonstrating that approximately 10% of prescriptions are for surgical and 9% for medical prophylaxis.

agents. Standardised data on antimicrobial consumption for benchmarking is available online and is used by AMS teams for identifying targets for improvement. However, data at ward and prescriber level or by antimicrobial group are not available in all hospitals. In addition, there were no qualitative and quantitative clinical targets for the improvement of antimicrobial prescribing.

4.2.5 Antibiotic utilisation and treatment guidance in human health

23. Guidelines for AMS in hospitals were published in 2009. These guidelines recommend the establishment of AMS programmes in acute care hospitals. The AMS teams have been introduced in the hospital sector with involvement of clinical microbiologists and clinical pharmacists. The AMS teams report to the Drugs and Therapeutics Committee. However, AMS programmes are not fully active in some hospitals, as evidenced by Health Information and Quality Authority (HIQA) reports. In the visited hospitals, AMS teams were established, but activities could not be conducted to optimal level due to a lack of trained staff. Prescribing is paper-based inhibiting easy access to antimicrobial prescriptions for review. Still, there are efforts to optimise antimicrobial prescribing in hospitals with for example introduction of special pages for the prescription of antimicrobials into the medical charts. The visited facilities had introduced restricted antibiotic lists and various approaches were applied for either pre-authorisation or post-prescription review of antibiotics.

24. Detailed guidelines for the clinical management of infections exist at hospital level, such as a "Guide to Treatment of Infection with Carbapenem Resistant Organisms". However, these guidelines could be further disseminated through local AMS teams to ensure practical application through training, audit or other face-to-face educational interventions. Detailed guidance on the prescribing of antibiotics is also available online for specific conditions in primary care including influenza, meningitis, infections in pregnancy and the postpartum period, infections of the upper and lower respiratory, urinary, gastrointestinal and genital tracts, and dental, skin and soft tissue infections. On the same webpage, there is information on safe prescribing, AMS and prescribing in long-term care facilities (LTCFs). Point-of-care diagnostic tests to better target antibiotic prescribing such as C-reactive protein or rapid streptococcal antigen test are not frequently used in primary care as these tests are not reimbursed ([31]). The FeverPAIN scoring system is recommended for the assessment of the likelihood of streptococcal pharyngitis in cases of sore throat.

25. Antimicrobial pharmacists are currently being introduced in community care in each of the nine Community Healthcare Organisations across Ireland with the aim to support the appropriate use of antibiotics in community care through interaction

[31] In their response to the draft report, the competent authorities noted that while it is correct to say that the point of care diagnostic tests are not reimbursed and are not frequently used in primary care, it is unclear whether the fact that they are not reimbursed is why they are not used. There is also the issue that it is not universally accepted that they are safe and reliable in practice and achieve the intended reduction in antimicrobial use.

with community pharmacists, LTCFs and GPs. For the first time, GPs have recently received feedback on the antimicrobial consumption (recommended first-line antibiotics) for General Medical Services (GMS) Scheme patients on their list ([32]). In addition, there have been GP-initiated pilot studies to support appropriate antimicrobial use in community healthcare. It will be important to facilitate the cooperation of GPs and pharmacists with a microbiologist from a local hospital to implement a more integrated approach to AMS at community and hospital levels ([33]) .

4.2.6 Infection prevention and control in human health

26. There is the general recognition that IPC is crucial for AMR control in Ireland. *i*NAP and the 10-year Sláintecare plan emphasise that IPC activities should be central to the role of healthcare providers at the hospital level and in the community. *i*NAP also includes a section on workforce planning, which focuses on sustainability, skills and awareness raising of the whole breadth of IPC responsibilities. The Medical Officer of Health is responsible for investigating and implementing control measures against notifiable diseases and outbreaks as described in Irish legislation based on the Infectious Disease Regulations (1981). The Health Act provides the legislative authority for the isolation of a person who is a probable source of infection if necessary.

27. The prevention of HAIs is part of the patient safety programme of the HSE. *i*NAP established a back-to-basics approach focusing on hand hygiene, standard precautions and the prevention of infections associated with medical devices. National guidelines for MRSA and *C. difficile* follow an established framework, are evidence-based and include patient involvement. It will be important to understand whether the CPE emergency has affected adherence to these guidelines. National Clinical Guidelines are quality assured by the National Clinical Effectiveness Committee (NCEC) and endorsed by the Minister for Health, which promotes their importance. The NCEC has also published Standards for Clinical Practice Guidance (2015) which are available to help produce high quality and fit for purpose guidance, policies and procedures. National Standards developed by HIQA are endorsed by the Minister for Health. KPIs include hospital-acquired *S. aureus* bloodstream infections, healthcare-acquired *C. difficile* cases and a review of the CPE screening volume and results. If a monthly report indicates a particular indicator is above the target, the hospital will be requested to provide a commentary on the local figures. In the event that the hospital remains above the target for a particular indicator, the national team may request a site visit to the hospital in question to evaluate further, and a report, agreed with the hospital, is published.

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[32] In their response to the draft report, the competent authorities noted that while a GP receives data about patients on their GMS list, the said GP may not have necessarily prescribed the medication as it may have been prescribed in the Emergency or Outpatients Departments or by an out-of-hours GP but the prescription is attributed to the patient's number and hence, their GP.

[33] In their response to the draft report, the competent authorities noted that there may also be other approaches to providing a microbiologist or Infectious Disease support, e.g. regional or national.

28. National standards for the prevention and control of HAIs were updated for acute services in 2017 and for the community in 2018. HIQA performs unannounced inspections in acute care hospitals and LTCFs. Visits to acute services include a review of the integration of IPC and AMS into the governance of the hospital. The results of these inspections are publicly available after review. HIQA has also developed tools for monitoring the management of multidrug-resistant organisms, *C. difficile* and devices. A gap in this system is related to private healthcare providers who are currently not monitored within this system ([34]). There is also currently no system for the continuous monitoring of HAIs in acute care hospitals in Ireland. Good participation in the ECDC point prevalence surveys in acute care and LTCFs indicate both a need and a willingness for a more comprehensive solution.

29. Ireland has an active IPC society with annual meetings, network meetings and teaching activities. This society is open to IPC nurses and doctors working in the field, but currently there are few doctors among its members ([35]). All hospitals have an IPC nurse available. These nurses are mostly working with a consultant microbiologist on site as part of the IPC team. However, there is variation as to how these teams are organised. Strategic direction of activities related to IPC may not be specified in all consultant microbiologist job descriptions, which could result in a lack of clarity or loss of continuity with regard to consultant microbiologist oversight of IPC and AMS programmes. Naming one of the consultants as lead for IPC or identifying clear contractual roles and responsibilities for consultant microbiologists or Infectious Disease physicians with respect to IPC and AMS may solve this and could be implemented nationwide as part of revised standard practice. It was mentioned several times during the visit, that there was a limit in career advancement possibilities for IPC nurses and stewardship pharmacists. This has led to the loss of experienced and motivated staff to other areas where grade advancement is easier.

30. At the hospitals visited, alcohol gel for hand hygiene was readily available in common areas and at the point of care. Examples of best practice such as clear signaling of hand hygiene points were evident at both sites. The level of cleaning was also very good although there were areas where a lack of storage space had led to clutter. Problems were reported due to a lack of isolation capacity combined with high bed occupancy including examples of corridor patients and overcrowding of bays. HSE estate services work centrally planning new builds and refurbishment of HSE buildings or buildings for HSE activities. The primary care centre visited was built with a strong IPC input. HSE has building standards that include IPC related

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[34] In their response to the draft report, the competent authorities noted that the Patient Safety (Notifiable Patient Safety Incidents) Bill 2019 was brought forward and introduced to the Irish Parliament in December 2019, and will see the extension of the Health Information and Quality Authority's remit to private health services.

[35] In their response to the draft report, the competent authorities noted that both the national society for Clinical Microbiology (Irish Society of Clinical Microbiologists) and for Infectious Disease Physicians (Infectious Disease Society of Ireland) hold annual or bi-annual meetings/conferences at which they also address IPC and AMR issues.

concerns, including material choice, space, design of sinks among other requirements. The roll out of these new centres is an example of best practice in terms of integrating IPC into healthcare construction and this should also be carried forward for possible renovations of acute hospital structures ([36]).

31. There are well established campaigns for the vaccination of healthcare workers against influenza. Although vaccinations are predominantly performed in hospitals by the Occupation Health Service, there is an increased emphasis on peer vaccination. This last initiative appears to be having a positive impact on vaccination rates. Material on influenza vaccination was available and displayed at all the sites visited by the team including the long-term care facility. However, at a national level, vaccination rates are still sub-optimal and there is room for continued improvement.

32. The declaration of the public health emergency for CPE has affected IPC in general. The effort and resources that hospitals affected by outbreaks have put into CPE control were impressive, especially taking into account the infrastructure challenges, such as aging facilities, the lack of single-bed rooms for isolation, the widespread use of open bay wards as well as the high bed-occupancy rate. In many ways the public health emergency for CPE had a positive influence on IPC in the country, raising the standard of IPC and bringing extra resources including both staff and material. However, in some cases the emergency seems to have resulted in other aspects of the work being sidelined. Cohorting and isolation of patients has proved a strain on already scarce isolation rooms in hospitals. Furthermore, the increased screening activity has led to the need for contact tracing on an unprecedented scale and a lot of work, mainly for IPC nurses, to explain the activity and results to the people affected. However, the lessons learnt in this process may be of great importance.

4.2.7 Educational programmes on AMR

33. There is no standardisation of teaching on IPC and AMR between the six medical schools, but they all include IPC and AMR related subjects within their curriculum. The Nursing and Midwifery Board of Ireland (NMBI, formerly "An Bord Altranais"), is the independent, statutory organisation, which regulates the nursing and midwifery professions in Ireland. In nursing schools, IPC is part of the curriculum but without focus on AMR. IPC nurses complete the 3-year nursing degree course, have about 5 years of work experience and are then required to complete a 1-year diploma with possibly a Master's degree. For the past decade, the HPSC and the Royal College of Surgeons in Ireland have collaborated to offer a 4-day educational course aimed at healthcare workers who are not specialists in IPC to provide an introduction and update on key topics related to IPC, HAI, AMR and

[36] In their response to the draft report, the competent authorities stated that there is a HSE guidance document that addresses the role of IPC in renovations and construction of acute hospitals. It was updated and agreed between the AMRIC Implementation Team and HSE Estates in the first quarter of 2019 and is due for update again in 2020.

AMS. The courses are attended by about 150 healthcare workers each year. The focus of these courses alternates between acute and long-term care. There are also webinars that for example GPs can attend remotely to claim continuing education points. The Pharmaceutical Society of Ireland as the Pharmacy regulator is responsible for accreditation of pharmacy degree programmes provided by Universities in Ireland. Pharmacy training must include health promotion, public health aspects and disease prevention and control.

4.2.8 Public information related to AMR

34. Ireland has participated in the European Antibiotic Awareness Day (EAAD) since 2009 and in the WHO 'SAVE LIVES Clean Your Hands' annual campaign since 2008. For EAAD, a number of events, also with a focus on One Health, have been organised including seminars and campaigns under this platform. Other activities included radio and print media campaigns, public relations campaigns (with Ministerial support), press releases and press interviews, social media campaigns and staff broadcasts. The key messages have been focusing on patients instead of the general population benefits of prudent antibiotic use. In relation to social media activities, the twitter calendar on HSELive has more than 30 000 followers, among them media and GPs. In 2017, *i*NAP was jointly launched by the Ministers for Health and Agriculture. At the same time there was the declaration of National Public Health Emergency on CPE by the Minister for Health. The first objective of the *i*NAP is to improve awareness and knowledge about AMR. For the implementation of this objective dedicated and ongoing funding has been provided for AMR campaigns and AMRIC team initiatives.

35. Regarding the public perception of AMR, a national survey was undertaken in 2017. The survey was conducted in the context of "Healthy Ireland", a national framework for action to improve the health and wellbeing of the people of Ireland. The 2017 survey included several questions about AMR, and these questions will be repeated in the next edition of the survey in 2020. The survey showed that:

    - 39% of respondents were prescribed antibiotics in the past 12 months;
    - 1% of those who were not prescribed antibiotics in the past 12 months took them;
    - 51% of respondents correctly disagreed that antibiotics can kill viruses;
    - 67% of respondents correctly disagreed that antibiotics work on most coughs and colds;
    - 90% of respondents are aware that, if taken too frequently, antibiotics may not work in the future;
    - 71% of respondents are aware that resistance to antibiotics is a problem in hospitals.

36. In terms of information on websites and campaigns, the main platforms where information and campaign material is presented are: www.Health.gov.ie (and the National Patient Safety Office (also active on Twitter and supporting HSE campaign), the Sláintecare website (including other communication channels such as newsletters, YouTube and social media), www.hse.ie/hcai and www.undertheweather.ie. The main message of the latter website is about getting better without antibiotics, and it has reached 586 000 visits in 2018.

37. It is clear that awareness of AMR is quite high according to the latest surveys, but increased knowledge has not changed behaviours. For this reason, it was decided to strengthen responsibility in the health service for how and when antibiotics are provided. A new campaign has been launched ("RESIST") using a behavioural science approach. This campaign focuses currently on hand hygiene for healthcare workers. The next stage in 2020 will be directed to AMR and community prescribing. The idea is to provide GPs with tools that help them within their clinics such as videos, posters and merchandising, social media campaigns as well as other resources. The branding "RESIST" has been chosen in order to use a message that can be used in different contexts and sectors and with different audiences, and is broadly understandable.

4.2.9 Marketing related issues

38. Independent drug information is available on the website of the Health Products Regulatory Authority. Prescription only medicines including systemic antimicrobials for human and veterinary use cannot be advertised to the public, but can be promoted to healthcare professionals. Non-prescription medicines which include some topical antifungals and antivirals can be advertised and promoted directly to the public. Access of pharmaceutical representatives to GPs and pharmacies is not regulated. Pharmaceutical companies can sponsor educational courses by giving unrestricted research grants, but personal gifts to physicians are not allowed ([37]).

4.2.10 Conclusions on human health aspects of AMR

39. The declaration of the National Public Health Emergency on CPE is an intervention that is unique in the EU/EEA. It has had a positive effect not only for CPE control but also in raising awareness and in putting AMR on the agenda of all actors, focusing efforts and increasing staffing levels in positions important for control of AMR and HAIs. The effort and resources that hospitals affected by outbreaks put into CPE control are impressive, in particular taking into account the existing infrastructure such as the low proportions, and therefore often

[37] Regulation 21 of the Medicinal Products (Control of Advertising) Regulations 2007 (as amended) contains prohibitions on the offer and acceptance of gifts by health professionals: http://www.irishstatutebook.ie/eli/2007/si/541/made/en/print https://www.ipha.ie/getattachment/About-Us/Our-Role/Codes-of-Practice/IPHA-Code-of-Practice-for-the-Pharma-Industry_V8-4_effective-01-02-19.pdf.aspx (page 20).

unavailability, of single rooms for patient isolation as well as the high bed-occupancy rate. However, there is risk that the focus on one specific pathogen with AMR might lead to a neglect of control of other pathogens with AMR and of activities to prevent HAIs in general. An in-depth evaluation of the CPE emergency regarding its impact on CPE control, but also on the control of other pathogens with AMR and the availability of medical care would therefore be important. In addition, there is a need to ensure the sustainability of the CPE control activities in the future, i.e. once the national public health emergency is declared over.

40. Ireland participates in the European Antimicrobial Resistance Surveillance Network (EARS-Net) with a good coverage of the population and EARS-Net reports have repeatedly indicated high proportions of VRE among *E. faecium* bloodstream infections and these are among the highest of all EU/EEA countries. Additional information on AMR and HAIs comes from the reporting of key performance indicators including hospital-acquired *S. aureus* bacteraemia and hospital-acquired *C. difficile* infection and the mandatory notification of CPE cases. However, national data on AMR in the community and on AMR for pathogens not covered by EARS-Net surveillance are not available. National reference laboratories exist for specific pathogens with AMR such as CPE and MRSA, but do not have an overarching governance structure or a dedicated stable budget. In addition, there are no formal reference services for other pathogens of concern such as VRE and *C. difficile.*

41. Antimicrobial consumption in the community continues to be higher than the EU/EEA average. There have been well-designed communication campaigns on prudent antibiotic use and AMR, however, material from the campaigns was not visible in the majority of visited facilities. In addition, patients still seem to request antibiotics from both GPs and pharmacists. GPs have just started receiving feedback on their antibiotic prescriptions for patients on their GMS list. In addition, there have been GP-initiated pilot studies to further support appropriate antimicrobial use in community healthcare. In the visited hospitals, AMS teams were established, however, activities could not be conducted to optimal level due to either a lack of trained staff or time.

42. Ireland has participated in the point prevalence surveys of HAIs with high hospital and LTCF coverage. In addition, there are regular audits of performance standards related to IPC. However, continuous outcome-based monitoring of HAIs – such as surgical site infections and HAIs in intensive care units - is not in place. IPC staffing levels have improved over the last few years, but many nurses with a qualification in IPC are reported to have chosen another career path due to a lack of opportunities for career development in IPC.

43. The commitment of actors, at all levels, to the control of AMR in Ireland is a positive example for other countries. There has been progress in AMR control on many levels and while AMR will likely remain a significant challenge for the

country, there are several achievements to build upon for future actions.

4.3 VETERINARY AND ENVIRONMENTAL ASPECTS OF AMR

4.3.1 Monitoring of AMR in animals and food, including relevant laboratory capacity

44. The DAFM laboratory network's surveillance work, as part of the harmonised, EU-wide AMR monitoring in food and animals to fulfil the requirements of Decision 2013/652/EU is described in Section 3 (Situational analyses and assessment – Animal Health) of *i*NAP. One of the network's tasks under *i*NAP is to provide, together with the private testing laboratories, accurate, cost-effective AST services for farmers and veterinary practitioners. Another task is to collaborate with other sectors on the production of the One Health Report on Antimicrobial Use & Antimicrobial Resistance (as mentioned in 4.1.2).

45. The NRL for antimicrobial resistance in animals, food and feed is hosted by DAFM at Backweston. The NRL processes samples from the above-mentioned AMR monitoring programme carried out by DAFM and also receives *Salmonella* spp. isolates from the DAFM approved private laboratories carrying out sampling for the industry under the National Salmonella Control Plan and food hygiene checks carried out in the slaughterhouses. Additionally, the NRL receives resistant clinical isolates from six DAFM Regional Veterinary Laboratories (RVLs), which process diagnostic specimens from veterinary practitioners. Further collaboration with the Irish Equine Centre and the veterinary hospital of UCD enables the NRL to receive additional resistance data from clinical isolates from other animals, including horses and companion animals. The data on clinical isolates from the companion animals is limited, as the majority of testing is done in the private laboratories, including laboratories abroad (mostly in the United Kingdom – UK).

46. The resistance data obtained from the EU harmonised monitoring are analysed and acted upon. On discovery of high prevalence of ESBL-producing *E. coli* in broiler samples, DAFM alerted the poultry industry, which in turn took comprehensive actions to reduce the level of use of antimicrobials (see 4.3.4). A noticeable decrease in the prevalence of ESBL-producing *E. coli* and overall resistance levels in samples from broilers has already been noted on foot of actions taken to improve biosecurity, overall management and husbandry practices. However, the level of resistance to ampicillin, tetracyclines and sulfamethoxazole in *Salmonella* and to tetracyclines in commensal *E. coli* isolates from pigs remains worryingly high and highlight the need for urgent actions to be taken by the pig industry.

47. The resistance data obtained feeds into the annual Animal Health Surveillance reports, as well as into the One Health Report on Antimicrobial Use & Antimicrobial Resistance, with the later combining data from animals, humans and,

from the next edition, also the environment (an advanced draft of the new report, which will be published shortly, was available at the time of the visit).

48. In 2018, the RVLs processed over 3 000 mastitis samples, over 450 gastrointestinal samples and over 550 respiratory cases samples from farmed animals. The AST is carried out using the disc diffusion method and establishing veterinary clinical breakpoints. Upon re-testing and confirmation of unusual resistance patterns, the isolates are sent to the NRL for whole genome sequencing.

49. The DAFM laboratory network also participates in the CellCheck initiative and collaborates closely with a number of private laboratories to harmonise the methods and standards of services available for mastitic milk samples. Any commercial laboratory that successfully participates in the DAFM proficiency testing scheme is recognised as a 'CellCheck Partner Lab', delivering milk testing to an agreed standard and undergoing continual evaluation in this area. Participating laboratories also contribute results from commercial samples received into a central, anonymised database, which means that there is a more comprehensive understanding of the pathogens causing mastitis in Irish herds, and any related AMR patterns. This successful cooperation is considered as a good practice and highlights the benefits of the public and private laboratories working together: a) the existence of harmonised standards and performance evaluation, and b) widening the scope of AMR surveillance.

50. While the main body dealing with research is Teagasc, the DAFM laboratory staff also contribute to the research projects related to AMR. One of these concerned the first isolation of multidrug-resistant *E. coli* of bovine origin in Ireland on a beef suckler farm with high calf and cow mortality rates. This highlighted the risk of the resistant bacteria spreading among the animal population, as well as the risk of colonisation by the strain of the members of the farmer's family and the potential further spread to sick patients due to some of the family members working in the healthcare sector. Significant management changes were introduced on the farm which mitigated these risks and significantly improved the survival rates of the animals. This case study was presented during the visit, as well as during the One Health Seminar in Dublin in 2018.

51. The DAFM laboratory network is aiming at widening its scope of surveillance and rolling out new methods in RVLs. To pursue these aims, the network has also been involved in international cooperation such as the EU Joint Action on AMR and Healthcare-Associated Infections (EU-JAMRAI) ([38]) on standardisation of methods, and on a project concerning whole genome sequencing (Establishing Next Generation Sequencing Ability for Genomic Analysis in Europe – ENGAGE) ([39]).

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[38] In their response to the draft report, the competent authorities noted that the EU-JAMRAI country visit took place in December 2019 and included representatives from the NRL, RVLs and laboratories responsible for AST testing of equine and companion animals which previously collaborated on the preparation of the 2018 One Health Report (https://eu-jamrai.eu). This visit had already been planned at the time of the EC/ECDC visit in October 2019.

[39] http://www.engage-europe.eu/

4.3.2 Monitoring the use of antimicrobials in animals

52. According to the European Surveillance of Veterinary Antimicrobial Consumption (ESVAC) report published in October 2019 ([40]), the level of total sales of antimicrobials in the veterinary sector in 2017 was 46.6 mg/PCU (population correction unit), within a range of 3.1 mg/PCU to 423.1 mg/PCU for the other countries contributing data to ESVAC. Although the sales decreased from 52.1 mg/PCU in 2016, the figures fluctuated without a clear decreasing or increasing trend over recent years, with 46.5 mg/PCU reported in 2011 and 55.9 mg/PCU in 2013. Worryingly, the figures for the sales of the critically important antimicrobials (CIAs), especially 3rd and 4th generation cephalosporins show an increasing trend accounting for 0.1% of the total sales in 2010 and 0.3% in 2017.

53. The antimicrobials most frequently sold in 2017 were tetracyclines (41.6% of total sales in tonnage), followed by penicillins (20.9%) and sulphonamides in combination with trimethoprim (18.1%). In terms of pharmaceutical form, the premixes constituted 33.5% and oral remedies 32.6% of total sales, respectively. While there are no species-specific data, there are clear indications that the premixes are routinely used by the pig industry. While it is recognised that the infrastructure on the farms is often not suitable and substantial investments in the drinking systems would be required to allow other forms of dosing, the reliance on medicated feeds has a number of disadvantages and every effort should be made to revert this situation. In addition, the use of medicated feed around the weaning period is often employed to compensate for poor husbandry practises, such as overstocking, or to remedy a poor animal health situation due to lapses in biosecurity on the farms.

54. Although the amount of sales of intramammary tubes (1.5 mg/PCU) in terms of overall sales of antimicrobials is not significant, the relatively high level of use of intramammary tubes in dairy cows, often containing CIAs, is recognised by the competent authority and the stakeholders as a priority issue. The blanket use of antimicrobials when drying off the cows is still preferred over the selective dry cow therapy (SDCT) and competent authorities and stakeholders are taking various measures to tackle this problem and significant progress has been made (see 4.3.4).

4.3.3 Environmental monitoring of antimicrobials and AMR

55. The environmental sector plays a vital role in the *i*NAP implementation and its AMR related activities go beyond the EU harmonised monitoring of certain antimicrobials under Directive 2000/60/EC of the European Parliament and of the Council (the EU Water Framework Directive). In the last EPA's State of the Environment Report 2016 ([41]), AMR is recognised as an emerging risk. The reports are published every 4 years and, in the 2020 edition, AMR is to feature as one of the most significant challenges facing Ireland's environment, health and wellbeing.

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40 https://www.ema.europa.eu/en/documents/report/sales-veterinary-antimicrobial-agents-31-european-countries-2017_en.pdf

41 https://www.epa.ie/irelandsenvironment/stateoftheenvironmentreport/

AMR has also been identified as a key national research priority in a recent Environment and Health Research Knowledge Gap exercise undertaken by EPA and HSE.

56. EPA's AMR related activities span across three strategic objectives of *i*NAP ('Improve awareness and knowledge of AMR; Enhance surveillance of antibiotic resistance and antibiotic use and Reduce the spread of infection and disease'). Within EPA, a newly established Cross-Office subgroup on AMR consisting of representatives of all relevant environment work areas within the organisation enable greater coordination, exchange of information and reporting on progress against *i*NAP actions. The progress of the actions assigned to the environmental sector can be seen in the progress reports published on the DAFM website, with the latest available edition covering the period of July to December 2018 ([22]).

57. Although only EPA represents the environmental sector in the National Interdepartmental AMR Consultative Committee, there are several competent authorities and bodies dealing directly or indirectly with the environmental aspects of AMR. The Department of Housing, Planning, and Local Government (DHPLG) is responsible for implementing both national and EU policy regarding water services and water quality. The department's policy-making capacity is closely linked to the environmental research funded by EPA, which provides the scientific support for overall policy development and its implementation. In addition, Irish Water, the national water utility responsible for public water and wastewater services, is working on improving the quality of the drinking water supply and upgrading the water and wastewater infrastructure, while the Department of Communications, Climate Action and Environment (DCCAE) co-operates with EPA and other stakeholders on the initiatives for the safe disposal of veterinary medicines under the National Hazardous Waste Management Plan.

58. Apart from representing the sector in the Interdepartmental Consultative Committee on AMR, EPA is also part of the subgroup dealing specifically with the disposal of antimicrobials, and another subgroup tasked with the production of the One Health Reports. EPA is also a member of the *i*NAP Animal Health Implementation Committee, which tracks the progress of the animal health, environmental and common aspects of the *i*NAP implementation. Additionally, EPA is active in the international fora on AMR, such as the European Joint Programme on One Health, Zoonoses and Emerging Threats Mirror Group.

59. As mentioned above, one of the EPA's statutory roles is the coordination of environmental research and there is a large number of research initiatives focussing on assessing the potential impact of AMR, as well as antimicrobials, on the environment. This work feeds directly into *i*NAP Objective 2 ('Enhance surveillance of antibiotic resistance and antibiotic use'). As part of its Research Strategy for 2014-2020, EPA has committed €3.5 million to AMR-focused research in Ireland. In addition, over €400 000 have been committed to enable Irish-based researchers to participate in Water Joint Programming Initiatives (JPI) AMR projects, with

additional €500 000 to be committed to the upcoming joint JPI Water, JPI Ocean and JPI on AMR Calls on aquatic pollutants in 2020. EPA oversees the whole lifecycle of the research projects, from identifying the research priorities to the evaluation of applications from research organisations and the post-award management including data dissemination and archiving (*i*NAP Strategic Objective 1).

60. One of two ongoing large-scale projects is the Antimicrobial Resistance and the Environment – Sources, persistence, Transmission and risk management (AREST) project ([42]), carried out in line with the One Health approach in collaboration with, among others, academia, HSE (co-funding with EPA), DAFM, Teagasc and the local authorities. The project, expected to be completed in 2022, will provide: a) national level data on the key sources (e.g. healthcare, agriculture) of antimicrobial resistant organisms (AROs), b) data on the hotspots and AMR drivers in the environment, and c) evidence of the level of the contamination with AROs and efficiency of treatment processes for their removal from drinking water, wastewater and manure. This will in turn inform priority areas for action for the policy makers and, by producing visual representation of data, support the dissemination of this information to a wider audience, including the public.

61. Another large scale undertaking is the Public health Impact of Exposure to antimicrobial Resistance in recreational waters (PIER) project ([43]), which examines the human health and wellbeing outcomes from exposure to AROs in coastal waters. The project team including among others, academia and HSE, is investigating, if natural recreational water users are at a higher risk for colonisation and infection with AROs and, if this risk can be reduced by wastewater treatment. The outcome, expected in 2023, will support the development of monitoring strategies, regulatory activities and policy development for AMR prevention and control in the environment.

62. The above projects link well with the previous findings of AROs in Irish coastal recreational waters ([44,45]), and untreated sewage discharges ([43]), as well as with the Beach Bum Survey carried out in the UK ([46]). While it is accepted that the wastewater treatment plants (WWTPs) do not remove or inactivate all AROs, these findings also highlight the importance of addressing the ongoing issue with the untreated sewage released into the environment. The researcher noted that these projects also reflect on the restricted scope of the current EU bathing water legislation, which focuses on microbiological testing for indicator organisms rather than on the examination of the characteristics of these microorganisms and an

42 https://www.nuigalway.ie/medicine-nursing-and-health-sciences/medicine/disciplines/bacteriology/research/arest/
43 https://www.nuigalway.ie/medicine-nursing-and-health-sciences/medicine/disciplines/bacteriology/research/pier/
44 https://www.ncbi.nlm.nih.gov/pubmed/31299565
45 https://www.ncbi.nlm.nih.gov/pubmed/28449738
46 https://www.ncbi.nlm.nih.gov/pubmed/29343413

environmental site assessment to ensure that there is no uncontrolled source of contamination.

63. There is also vast research collaboration with the European partners, among others, JPI Water ([47]), JPI AMR ([48]) (which looks into the agricultural impact on the rise of AMR), and an upcoming BiodivERsA project ([49]) (which looks into biodiversity as an ecological barrier for the spread of AMR in the environment). EPA funded the research carried out in Ireland as part of the JPI Water StARE study ([50]) (which looks at the antibiotic resistance prevalence in WWTPs in seven European countries). The latter highlighted the variations in AMR prevalence in different geographic regions and the need for the implementation of integrated environmental resistance surveillance.

64. EPA is also leading on the implementation of the National Hazardous Waste Management Plan 2014-2020 with one of the objectives being to maximise the collection of hazardous waste including, among others, unused and expired human and veterinary medicines, with a view to reducing the environmental and health impacts of any unregulated waste (*i*NAP Strategic Objective 3). More specifically, the aims of the plan are to assess and develop potentially new producer responsibility obligations for certain hazardous waste streams (e.g. a take-back scheme for unused or expired human medicines), as well as to provide the recommendations for solutions for hazardous farm waste collection (following the completion of a pilot project). The results of two successful projects were presented to the Commission team. HSE lead the DUMP ('Dispose Unused Medicines Properly') campaign targeting unused and expired human medicines that ran successfully in over 250 pharmacies in south-west of Ireland between 2007 and 2018. During the 2018 campaign, EPA partnered with HSE to perform an analysis of over 4 000 kg of various medicinal waste collected. As the scheme is no longer in place, and the pharmacies are obliged to accept unwanted medicines at their own expense, there are concerns from the sector about the cost of a permanent scheme. With regard to disposal of veterinary medicines, between 2013 and 2017, EPA together with DCCAE, DAFM, Teagasc and the local authorities, ran a highly successful Farm Hazardous Waste Pilot Project. With 46 collection events, over 1 063 tonnes of hazardous waste collected (approx. 30% of 49 tonnes of veterinary medicines and their packaging collected were injectable antibiotics) and over 9 000 farmers attending, the project clearly showed that there is a demand for a permanent solution for disposal of farm waste, including unused medicines.

65. In addition to the surveillance work carried out in connection with the research, EPA is also responsible for the monitoring in surface waters of certain

47 http://www.waterjpi.eu/
48 https://www.jpiamr.eu/
49 https://www.biodiversa.org/
50 http://www.waterjpi.eu/resources/newsletter/archive/2019/newsletter-04-may-june-2019/water-jpi-stare-project-presents-the-first-trans-europe-surveillance-on-antibiotic-resistance-in-wastewater-treatment-plants

antimicrobials from the Watch list under the EU Water Framework Directive. The locations for water sampling are selected taking in the account potential contamination. The criteria include, among others, proximity of the WWTPs processing wastewater from pharmaceutical facilities or other industry facilities, agglomerations, large volume septic tanks and agricultural pressures. The analysis of the results from the 2016-2017 programme have been analysed and reported via the Water Information system for Europe. The preliminary results from the 2018-2019 programme show findings of erythromycin above the levels of quantification at two out of four sites sampled in 2019. It is expected that the same locations will be sampled in 2020 with testing covering additional substances detailed in the recently reviewed Watch list.

66. Other AMR related activities of the environmental sector include comprehensive actions undertaken by Irish Water to improve the quality of the public drinking water supply and to address the large-scale wastewater non-compliance (the later subject to the European Court of Justice ruling against Ireland; while in respect of drinking water quality, the Commission has commenced infringement proceedings and a Letter of Formal Notice was issued in July 2018). The work needed for developing, upgrading and maintaining the public water infrastructure require advance planning, and substantial investments. The multiple 5-year investment plans covering the period up to 2030 have been put in place with 3 billion euro already spent and a further 17.1 billion euro in identified needs for the next decade. Irish Water is also looking at establishing secure and sustainable reuse and disposal methods for the wastewater sludge with the first National Wastewater Sludge Management Plan published in 2016. This work includes support for the research project by UKWIR (UK and Ireland Water Industry Research collaborative platform) to gain an understanding of the effect of various wastewater and biosolids treatment options on AMR, and producing biosolids from the sludge.

67. There are private water supplies serving over 17% of the population that are not under Irish Water jurisdiction. It is recognised that the quality of the drinking water supplied by the private water schemes and private wells is generally poorer than publicly supplied (in 2017, 99.5% of public group water supplies met the *E. coli* standards, against only 96.7% of private group supplies and 95.7% of small private supplies). There are identified shortfalls in the monitoring and registration of private supplies and DHPLG and EPA work with the local authorities to improve this situation. Various on-line sources, including EPA's own website ([51]) provide information for private well users, which are exempt from any testing requirements, the associated risks of microbiological contamination and recommended actions to improve the safety of the water supply.

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51 http://www.epa.ie/water/dw/hhinfo/
http://erc.epa.ie/water/wells/#.XmKGz0x2uUm
https://www.epa.ie/livegreen/yourhomeyourhealth/

68. The above mentioned Live Green website is an example of EPA activities under the *i*NAP Strategic Objective 1. While AMR is not explicitly mentioned, it contains some relevant advice on the disposal of medicines, and other AMR related issues. EPA also provided sponsorship in 2017 for a television programme (part of a series) on Radió Teilifís Éireann ('10 Things to Know About Superbugs') featuring the EPA funded JPI Water research project StARE. In February 2019, the Eco-Eye series Living Beach episode described another EPA and HSE funded research initiative under AREST project.

4.3.4 Activities to promote the reduced and/or prudent use of antimicrobials in animals

4.3.4.1 Sector specific targets for reducing, refining or replacing antimicrobial use

69. Although there is clear progress in implementing *i*NAP, there are no targets or other indicators to measure its real impact (in terms of reduction of the use of antimicrobials and the levels of AMR). The competent authority explained that they have considered establishing targets but, in the absence of data on the usage per species, it was deemed unfeasible ([52]). A recently published study ([53]) by Teagasc, DAFM and UCD which looked into measures deployed in other Member States to reduce the use of antimicrobials, the use of targets has been recognised as a positive tool to motivate and change the behaviour of veterinarians and farmers.

70. The competent authorities have developed a database to collect the data on the use of antimicrobials at farm level. This database is due to be launched shortly for pigs, and at a later stage for the remaining farmed animals ([54]). The database will also progressively provide the competent authorities with sector specific usage data, which could be used for establishing the targets. The usage of the database will be obligatory under the new Bord Bia quality assurance scheme for the pig sector (see below). The authorities intend to use the data, among other purposes, to allow farmers to benchmark themselves according to their use of antimicrobials and develop a better understanding of their usage patterns. There are already indications that benchmarking (as part of a pilot project in pig sector, see section 4.3.4.3) has succeeded in reducing the use of antimicrobials among some of the highest users. In the above mentioned study ([53]), the use of benchmarking in other Member States was recognised as an effective motivational tool for farmers and veterinarians. For competent authorities, the benchmarking allows identification of best practice and

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[52] In their response to the draft report, the competent authorities noted that there is a lack of data on use of antimicrobials to set usage targets and there was a need to improve education and AMR awareness before setting realistic quantitative targets. The competent authority acknowledged the difficulty to measure *i*NAP outcome qualitatively and noted that the use of quantitative antimicrobial usage targets for animal health sector will be considered for the next iteration of *i*NAP.

[53] https://www.agriculture.gov.ie/media/migration/animalhealthwelfare/amr/inap/iNAPAnimalHealthImplementationCommitteeReportProject30011019.pdf

[54] In their response to the draft report, the competent authorities confirmed that the database to collect the use of antimicrobials in pigs at farm level was launched on 1 November 2019, and that the databases for the rest of the farmed animals will be launched at a later stage.

targeted intervention, when the prescribing and usage pattern deviate significantly from the average.

71. Other drivers for change include pressure from the consumer. Due to welfare concerns, marketing the meat as 'antibiotic free' is generally not recommended and the competent authority stated clearly that they will not support such an approach. However, there are already signs that the consumers are interested in buying products produced in line with prudent use principles. One of the biggest retailers has showed interest in obtaining data on the use of antimicrobials at farm level in the pig sector in order to include it in the quality criteria they require from their suppliers. Also six out of the seven main retailers have signed up to a 'responsible antibiotic use' initiative run by FSAI, DAFM and Bord Bia.

4.3.4.2 Availability of veterinary antimicrobials and veterinary care

72. With one exemption, the current legislation (European Communities (Animal Remedies) (No 2) Regulations 2007) allows for any veterinarian to prescribe veterinary medicinal products (VMPs) providing that he or she has sufficient knowledge of the animal or animals to form an opinion of their health status and has visited the farm or the premises where the animals are held sufficiently often and recently enough to have an accurate picture of the health, welfare and disease status of the animals. The legislation also lays down controls regarding what constitutes a real relationship between a veterinarian and farmer and outlines criteria that must be met for an animal to be considered under the care of a veterinarian. The requirement to visit the farm does not apply to the prescribing of an intramammary antimicrobial agent, if the animal belongs to a herd covered by a mastitis control programme meeting the specific requirements laid down in the above-mentioned legislation. This exception is called 'Schedule 8' route and requires the prescribing veterinarian to have an up-to-date knowledge of the herd health situation, which could be achieved by consulting the relevant data and reports, but without him or her having to visit the farm. The majority of the dairy cow population is covered by the co-operative mastitis control programmes and the 'Schedule 8' prescribing route is used widely. In 2015, 45% of lactation tubes and 51% of dry cow therapy tubes were supplied via 'Schedule 8' ([55]). There are however some positive developments regarding 'Schedule 8' route as the co-operatives are no longer stocking intramammary tubes containing CIAs and actively promoting milk recording ([56]).

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55 S.J. More, T.A. Clegg, F. McCoy. The use of national-level data to describe trends in intramammary antimicrobial usage on Irish dairy farms from 2003 to 2015. J. Dairy Sci., 100 (2017), pp. 6400-6413.

56 In their response to the draft report, the competent authorities noted that the majority of mastitis tubes are supplied by private veterinary practitioners and that the DAFM Policy Document on HP - CIAs is driving behavioural change with regard to the prescribing practices around 3rd and 4th generation cephalosporins. The competent authorities also noted that individual co-op figures and the AHI are identifying annual decreases in the relatively high use of intramammary tubes for dairy cows. The adoption of SDCT will also reduce intramammary use over the next 2 years as compliance with the new veterinary legislation will include mandatory adoption of SDCT as part of the new veterinary prescription process. A significant 7% reduction in intramammary tube usage has been achieved over the last 8 years (when corrected for dairy cow population). This will improve further as farmers are now becoming increasingly aware of the benefit of SDCT.

73. As one of the actions under *i*NAP's Strategic Objective 4 ('Optimise the use of antibiotics in human and animal health') the Veterinary Council of Ireland (VCI) recently updated its Code of Professional Conduct in relation to prescribing practices in animals under veterinary care ([57]). The guidance, complementary to the VCI 'Ethical use of antibiotics' poster ([58]), is stricter than the legislative requirements. Under the new rules, an antibiotic can only be prescribed if a veterinarian clinically examined an animal or animals in the last 30 days (90 days for other VMPs). In order to prescribe, the veterinarian is also required to have an established, even if informal, client-patient-practice relationship. The Commission team noted that the guidance, goes beyond the current legal requirements (which are either a visit, or using 'Schedule 8' provisions). The guidance is not mandatory, however the veterinarians could potentially face disciplinary action over not adhering strictly to the recommended time limits.

74. The VCI requirement of an established veterinarian-client relationship does not preclude multiple veterinarians providing services to the same farmer. In addition to the VCI guidelines, the new Bord Bia Quality Assurance Scheme for the pig sector, due to be introduced later this year, will include a requirement for a farmer to nominate one veterinarian with overall knowledge of herd health. The farmer can use several veterinarians, but the designated one must have overall responsibility for the herd.

75. The above mentioned study on measures implemented by other Member States ([53]) noted their good experience with connecting veterinarians and farmers in a binding one-to-one relation, with the veterinarian being responsible for the implementation on mandatory herd health and treatment plans and becoming the primary advisor. However, there were concerns aired that any requirement to use one veterinarian will adversely affect the operation of a freely competitive veterinary services market.

76. Another action under *i*NAP's Strategic Objective 4 was the recent publication of the DAFM policy document on Highest Priority CIAs (HP-CIAs). As there are no national legislative provisions restricting the use of CIAs, this document provides advice on using them as a last resort and a list of VMPs containing CIAs that are available on the market. Apart from being informative, the policy document is meant to support the veterinarians who refrain from using CIAs when pressured to do so by their clients. The restrictions in other Member States on the use of CIAs resulting in significant decreases in consumption of these classes were mentioned in the above mentioned study ([40]). The future impact of the new EU legislation on VMPs (Regulation (EU) 2019/6 of the European Parliament and of the Council) which come into effect in January 2022 was also considered. It is too early to assess

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57 http://vci.ie/getmedia/ba56821b-a76e-4df4-9d10-7319e4fc47a2/VCI-Animals-under-Veterinary-Care-Guidance.pdf?ext=.pdf

58 https://www.vci.ie/Publications/ETHICAL-USE-OF-ANTIBIOTICS-(1)

the impact of the policy; however in light of increasing total sales of CIAs more drastic measures might be required ([59]).

77. Apart from the DAFM policy, a similar message regarding the use of CIAs and antibiotics in general is included in the Code of Good Practice Regarding the Responsible Prescribing and Use of Antibiotics in Farm Animals developed by the Irish Farming Association (IFA), Veterinary Ireland and the Irish Creamery Milk Suppliers Association under the leadership of Animal and Plant Health Association (APHA), the representative body for manufacturers and distributors of animal and plant health products, and with support from other stakeholders and authorities. Although the guidance is rather general, the involvement of a large variety of stakeholders, often with conflicting agendas, must be appreciated ([60]). The sector specific guidelines are to follow shortly ([61]).

78. An interesting intervention aimed at reducing the use of HP-CIAs was recently launched by the UCD Veterinary Hospital. The bacteriology laboratory introduced a 2-tier system of reporting of AST results providing only the first choice agents for the particular organism and/or condition. Only if there is resistance with no suitable product for treatment on the primary list, the susceptibility results for agents on the secondary list are released.

4.3.4.3 Reducing the need for veterinary antimicrobials

79. The representative of the IFA stated that antibiotics are, and will remain, a vital tool for farmers in maintaining and protecting the health and welfare of the animals, and are also needed to produce affordable food. The IFA supports the fight against AMR and encourages its members' efforts to follow best practise in animal husbandry and to use the antimicrobials prudently. One of the biggest poultry processors explained that the poultry industry has already entered a post-antibiotic era and how they have managed to move from routinely medicating each batch of broilers to not using any antimicrobials in over 90% of the birds they currently place on the market. The Commission team was presented with exemplary cases where farmers have managed to eliminate or substantially reduce the use of antimicrobials in different animal sectors.

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[59] In their response to the draft report, the competent authorities noted that the new VMP Regulation will change the regulatory framework around supply and use of antimicrobials to promote responsible use and it is impractical to try to implement new legislation before then. In addition, the authorities are seeking to strike the correct balance between compulsory and voluntary measures to positively influence antimicrobial prescribing patterns. Progress has been achieved with 13% national sales reduction in 2018 which can improve with industry initiatives on biosecurity and data collection to improve on-farm animal health.

[60] In their response to the draft report, the competent authorities noted that DAFM policy is to work in partnership with stakeholders and the process of reaching agreement with diverse stakeholders leads to more effective outcomes. This collaborative approach lays down a framework for future initiatives.

[61] In their response to the draft report, the competent authorities noted that the sector specific guidelines for pig and dairy farms were launched at the DAFM and Teagasc AMR and Anthelmintic Resistance Conference in November 2019.

80. A pig farmer gave a presentation outlining his 2-year journey from managing a herd with multiple health issues and frequent use of medicated feed to not using any in-feed antibiotics or zinc oxide and lower labour costs. This is in contrast to the heavy reliance of the pig industry on medicated feed due to a lack of investment in water delivery systems which allow for appropriate treatments at the correct dosage and duration ([62]).

81. A dairy and beef famer focused on reducing the somatic cell count in his dairy herd, with a view to introducing SDCT; with regard to the rearing of calves, he managed to improve husbandry standards with better colostrum management, hygiene, infrastructure and diseases management. All farmers met highlighted the importance of changing the mind-sets and practises, while cooperating with their veterinarians, other advisors and farmers. All agreed that there are substantial costs required to improve farm infrastructure, provide better nutrition and implement comprehensive vaccination programmes. However, the end result is better farm profitability, and improved welfare and performance of the animals.

82. Many of these initiatives are included in *i*NAP under Strategic Objective 5 ('Promote research and sustainable investment in new medicines, diagnostic tools, vaccines and other interventions') aimed at addressing knowledge gaps concerning links between the health and welfare of animals, as well as with other factors (e.g. farm biosecurity and the use of antimicrobials). The *i*NAP Animal Health Plan implementation progress reports provide detailed information on many initiatives currently in place. The outcomes or expected outcomes of some projects are highlighted below.

83. Teagasc is carrying out research in relation to mastitis controls and trailing SDCT in several herds based on the results of routine milk recordings. This runs alongside a comprehensive CellCheck programme promoting milk recording and SDCT led by AHI with support from DAFM and EU funded Targeted Advisory Service on Animal Health (TASAH). The programme includes on-farm educational events, co-financed on-farm veterinary consultations and establishment of a 'Partner Laboratories' network overseen by DAFM Laboratories (see 4.3.1). In addition, the dairy processors offer financial incentives for suppliers to promote milk recording, and pledge additional support towards CellCheck veterinary consultation visits. All these initiatives have already contributed in 2019 to an increased number of cows being milk recorded (20% increase over 2018). The goal is that the farmers will have data driven prescriptions for intra-mammary tubes and, as a final goal, will be able to opt out from current blanket use of antibiotics for all cows to dry them off.

84. Other AHI actions under *i*NAP include the CalfCare project to promote best practice around calving and calf rearing, and the TASAH funded biosecurity assessments of

[62] In their response to the draft report, the competent authorities noted that the water based antimicrobial delivery systems are not without their own issues in terms of solubility of antimicrobials in water and precipitation of antimicrobials out of solution and that the targeted feed delivery systems generally reduce use of antimicrobials.

pig and, more recently, poultry farms. The results of the pig farms assessed so far show high external biosecurity, mostly due to the type of production, but low internal biosecurity, highlighting the need for better farm husbandry practices.

85. AHI is also running a number of disease eradication programmes (Johne's disease, Bovine Viral Diarrhoea, Infectious Bovine Rhinotracheitis). Additionally, the Beef HealthCheck programme, run in collaboration with DAFM and the industry; provides farmers and their veterinarians with a feedback on the health status of their herds through the provision of the slaughter data. Based on the standard scoring of a set of conditions, the farmers receive online reports of each batch slaughtered. These data allow targeted health interventions such as parasite control, nutrition, vaccination to control losses and to improve the herd health. A similar Pig HealthCheck programme is about to start. These activities are not included in *i*NAP, but their overall aim is improving the health status of the national herd, which should also result in the reduced use of antimicrobials.

86. UCD and Teagasc, in collaboration with DAFM and other partners, are heavily involved in various projects in the pig sector ([63]). The WELpig project (now completed) investigated the links between poor welfare, production diseases, antimicrobial usage and resistance. The project showed that the largest proportion of antimicrobial use in pig production occurs in weaner pigs, and the main reason identified for medicating these pigs is respiratory disease. It also showed that farmer perception and behaviour may be a barrier to rapid reduction. Despite 80% of the surveyed producers using in-feed antimicrobials, the majority perceived that they use very little antimicrobials and less or at least the same amount as used in other countries. These findings are now being followed up by two ongoing projects led by Teagasc: Surveillance, Welfare and Biosecurity in Farmed Animals (SWAB) and *safe*food funded Antimicrobials projects looking into the behavioural aspect of using and prescribing of antimicrobials.

87. The PathSurvPigs project (now completed), led by Teagasc in co-operation with UCD and other partners, focused on respiratory disease as a cause for use of antimicrobials following the conclusions of the WELpig project. This project covered 30% of pigs in Ireland and produced the first baseline of respiratory pathogens and lesions in the country. The biosecurity risk assessment for pigs was piloted in a cohort of farms highlighting the internal farm biosecurity issues (as mentioned above, currently the biosecurity risk assessment is implemented at the country level by AHI). The projects developed an economic stochastic model to quantify the economic effect of health and welfare problems. The project also used benchmarking of the participating farms ranking the prevalence of health issues and the use of antimicrobials, allowing the farmers to compare themselves with their peers and take actions.

88. An ongoing Teagasc, UCD and DAFM project on Antimicrobial Use and Resistance in Animal Production (AMURAP) aims at quantifying antimicrobial use in the pig

[63] https://www.teagasc.ie/animals/pigs/research/research-projects/

and poultry sector, and also at studying the relationship between antimicrobial use and the presence of AMR. Antimicrobial use data was obtained from the cohort of farms created in the PathSurvPigs project and guided the creation of the DAFM antimicrobial use database which is about to be launched.

89. Finally, an ongoing project ZincO, led by Teagasc in collaboration with UCD, is testing applied solutions in selected farms in order to understand the transition from antimicrobials and zinc oxide to new approaches in pig production, and also to create examples of good practice to control post-weaning diarrhoea and other related issues.

90. The comprehensive research is supporting the policy making and the stakeholders. It also highlights the need for social sciences. It is accepted that the current plan, and research, almost exclusively concentrates on farmed animals, as this sector is considered a priority ([64]).

4.3.5 Communication and awareness activities on AMR and the prudent use of antimicrobials in animals

91. Ongoing work under *i*NAP Strategic Objective 1 aims to raise AMR awareness among health professionals such as veterinarians and veterinary nurses during their undergraduate and postgraduate studies, farmers, including future farmers in education and the general public. Underlining stakeholder willingness to contribute to solutions are the results of attitudinal survey conducted amongst farmers in 2018, which found that 86% of farmers, out of 315 responding, are concerned about AMR. 83% of responding farmers also replied that they use vaccines and 77% have a herd plan in place The survey also found that 93% identified the need to improve awareness amongst farmers

92. Practising veterinarians must be registered with the veterinary council and to maintain the registration they must obtain 20 Continuing Veterinary Education credits per year or 60 credits over the previous 3 years. There are no requirements that the training has to include subjects relevant to AMR. There are however training opportunities available and there is good exposure to AMR issues due to various initiatives in the public and private sectors, e.g. the first One Health conference in 2018 (see 4.1.2) for healthcare and veterinary professionals.

93. There is also a free e-learning course about to be launched, developed by the University of Surrey (UK) with contributions from UCD on AMS ([65]), aimed at veterinary surgeons, nurses and pharmacists to evaluate AMS within their local context, to critically reflect on their own prescribing practices and to motivate lasting change. There are also courses organises by AHI funded by TASAH under

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64 In their response to the draft report, DAFM noted that it has funded a reference social science study with the Economic and Social Research Institute on behavioural factors influencing prescribing behaviours of vets and use of antimicrobials by farmers.

65 https://www.futurelearn.com/courses/antimicrobial-stewardship-in-veterinary-practice

the CellCheck initiative aimed at training the veterinarians who can then pass on the knowledge to the farmers.

94. DAFM is engaging with the Agricultural Colleges to ensure inclusion of AMR as a dedicated section in the syllabus of undergraduate agricultural degrees. . The curricula of Teagasc agricultural college for future farmers and farm managers already include the principles of AMR and the prudent use of antibiotics. Postgraduate exposure is maintained via the Teagasc AMR dedicated website, relevant articles in its own press and sectoral workshops for the farming community. In addition, Teagasc, together with DAFM, are organising a conference in November 2019 on Antimicrobial and Anthelmintic Resistance under One Health approach with an emphasis on clear concise practical actions which can be taken by the farmers to reduce their need to use antimicrobials and anthelmintics.

95. Recently, the Irish Farmers Journal and DAFM teamed up to develop a One Health campaign aimed at informing farmers about AMR. The Irish Farmers Journal is the largest farming newspaper, on paper and online, with 247 000 readers on a weekly basis. The initiative started with an article with a link to the first video of the series of 12 videos. At the time of the visit three videos were available online with a new video launched every week ([66]). The message is simple: a) what are the risks AMR poses to the animals, environment, but also to the farmer, his or her family and other people, and b) what can be done at farm level to help to reduce the spread of AMR. The initiative has been very well received.

4.3.6 Conclusions on veterinary and environmental aspects of AMR

96. According to ESVAC data, the level of total sales of antimicrobials in the veterinary sector in Ireland, including CIAs, is moderate. However over 60% of the sales concern oral antimicrobials, with significant proportion attributed to the pig sector, where they are routinely used around the weaning period. There is also a relatively high use of intramammary tubes for dairy cows. This is because the blanket use of antimicrobials is still preferred over SDCT. The competent authorities and stakeholders are taking some measures to tackle these issues.

97. The veterinary and environmental components of *i*NAP are carefully considered and the work is overseen by Animal Health Implementation Committee. Although there is clear progress in implementing the plan, there are no targets or other indicators to measure its real impact. The plan almost exclusively concentrates on farmed animals, as this sector is considered a priority. There are plans to include companion animal and horses in its next iteration.

98. The *i*NAP initiatives linked directly to prudent use of antimicrobials are generally voluntary and many are stakeholder-driven. Despite this, there are clear cases of farmers not being receptive to the initiatives proposed by the stakeholders to reduce the use of antimicrobials, in particular in relation to the routine use of

[66] https://www.agriculture.gov.ie/amr/campaigns/

medicated feed in the pig producers. However, given that new EU legislation will become applicable in early 2022, there are no plans to strengthen the national regulatory framework on the prescription and use of antimicrobials. The Irish authorities are trying to find the right balance between compulsory and voluntary measures in order to maintain the good cooperation with the vast majority of the stakeholders and have an influence on the antimicrobials' prescribing patterns.

99. The competent authorities will shortly launch a database to collect the use of antimicrobials at farm level in pigs, and at a later stage, for other farmed animals. The database will allow farmers to benchmark themselves There are already indications that benchmarking has succeeded in reducing the use of antimicrobials among some of the highest users.

100. In relation to the environmental sector, the monitoring of watch list substances under the Water Framework Directive is being carried out. The competent authorities are also working to address the issues with the quality of the water supply, untreated waste water and the correct disposal of medicines. Additionally, the environmental and veterinary sectors have undertaken multiple actions on awareness raising, surveillance of AMR and research.

101. The commitment of all actors, including stakeholders, to the control of AMR in Ireland is a positive example for other countries. This has resulted in significant progress, in particular at farm level, and several achievements upon which future actions could be built. Nevertheless, there is more work to be done to ensure that all farmers are on board.

5 OVERALL CONCLUSIONS

There is a comprehensive inter-sectoral National Action Plan on AMR (*i*NAP) called for the period 2017-2020, which follows the structure of the WHO global action plan on AMR. There are clearly defined strategic objectives and related activities, timelines, responsibilities; however there are no quantitative targets or other indicators to enable measuring the plan's outcome.

In addition to an inter-departmental co-ordination committee, *i*NAP's implementation is overseen in the animal health and environmental sectors by an Animal Health Committee with their progress reports already published. On the human health side, implementation is led by the HSE which carry out the majority of actions and have developed an implementation plan over the life of *i*NAP. However, the implementation plan acknowledges that several of the actions are not achievable within the proposed timeframe and with the allocated funding.

One of the actions that is taken jointly by the human and animal health and environmental sectors is the publication of One Health Report on Antimicrobial Use & Antimicrobial Resistance. The first published report included the human and animal resistance data. The

new report, which will be published shortly, will also include data on the antimicrobials and resistant bacteria found in the environment.

In the human health sector in Ireland, the antimicrobial consumption in the community is higher than the European average. For hospitals, the consumption is lower than the average. The total sales of antimicrobials in the veterinary sectors are moderate. However over 60% of the sales concern oral antimicrobials, with significant proportion attributed to the pig sector, where they are routinely used around the weaning period and there is also a relatively high use of intramammary tubes for dairy cows because of the blanket use of antimicrobials at the end of lactation.

The competent authorities will shortly launch a database to collect the use of antimicrobials at farm level in pigs, and at a later stage, for the rest of the farmed animals. The authorities intend to use this database to benchmark farmers. It was suggested, the data could also be used to set up the targets for the next reiteration of *i*NAP.

The veterinary components of *i*NAP almost exclusively concentrate on farmed animals, as this sector is considered a priority. There are plans to include companion animals and horses in its next iteration. The *i*NAP initiatives linked directly to prudent use of antimicrobials are generally voluntary and many are stakeholder-driven. Despite this, there are clear cases of farmers not being receptive to the initiatives proposed by the stakeholders to reduce the use of antimicrobials, in particular in relation to the routine use of medicated feed in the pig producers. However, given that the new EU legislation will become applicable in early 2022, here are no plans to strengthen the national regulatory framework on the prescription and use of antimicrobials. The Irish authorities are trying to find the right balance between compulsory and voluntary measures in order to maintain the good cooperation with the vast majority of the stakeholders and have an influence in the antimicrobials prescribing patterns.

In the human health sector, multiple actions were undertaken to address the higher consumption of antimicrobials in the community, which aimed at sensitising GPs on the prudent use of antimicrobials, as well as the patients, who still seem to request antibiotics. In hospitals, AMS teams were established; however, activities could not be conducted to optimal level due to either a lack of trained staff or time.

In terms of AMR surveillance, Ireland has high proportions of VRE among *Enterococcus faecium* bloodstream infections and these are among the highest in Europe. Additional information on AMR comes from the reporting of some HAIs and the mandatory notification of cases. However, national data on AMR in the community and on AMR for pathogens not covered by European surveillance are not available. NRLs exist for specific pathogens but there are no formal reference services for other pathogens of concern such as VRE and *C. difficile*.

The CPE outbreak in 2017 and subsequent declaration of the National Public Health Emergency on CPE coincided with the launch of *i*NAP and required a lot of resources. On a positive side, it also resulted in raising awareness and in putting AMR on the agenda of all actors, focusing efforts for the control of AMR and HAIs. However, there is a risk that

the focus on one specific pathogen with AMR might lead to a neglect of control of other pathogens with AMR and the prevention of HAIs in general. In addition, there is a need to ensure the sustainability of the CPE control activities once the emergency is declared over.

Ireland has participated in the point prevalence surveys of HAIs and there are regular audits of performance standards related to IPC. However, continuous outcome-based monitoring of HAIs is not in place and the IPC staffing levels of healthcare professionals with qualifications in IPC have improved but are still below the needs.

In relation to the environmental sector, the monitoring of Watch List substances under the Water Framework Directive is being carried out. The competent authorities are also working to address the issues with the quality of the water supply, waste water treatment and correct disposal of medicines. Additionally, the environmental and veterinary sectors have undertaken multiple actions on AMR surveillance, awareness raising and research.

In general, the commitment of actors, in all sectors and at all levels, to the control of AMR in Ireland is a positive example for other countries. There has been progress in AMR control on many levels and, while AMR will likely remain a significant challenge for the country, there are several achievements to build upon for future actions.

6 CONSIDERATIONS FOR POSSIBLE FUTURE ACTIONS

The points below have been identified by the ECDC and Commission teams, and they may be useful for the relevant competent authorities to be taken into consideration in further developing and implementing the national AMR One Health Action Plan and sectoral action plans.

6.1.1 One Health aspects of AMR

- Including quantitative targets into the next national action plan or the related implementation plans to be able to measure the outcome.
- Establishing an 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 EAAD platform to communicate about One-Health messages on prudent use of antibiotics and on AMR, in coordination with DAFM and with EPA.

6.1.2 Human health aspects of AMR

- Evaluating the National Public Health Emergency on CPE and developing a plan for sustainability of effective actions. This should also include an evaluation of the impact of the CPE emergency on AMR issues in general and on the availability and quality of medical care. Scientific analyses of the effectiveness of

the enhanced control measures during the CPE emergency to inform future IPC strategies should be encouraged as it will be informative for Ireland as well as other EU/EEA countries.

- Establishing a national reference service for AMR including the current reference laboratories, but with a clear governance structure and dedicated long-term funding. Consider expanding the laboratory reference services to additional pathogens of relevance, such as VRE and *C. difficile*.
- Using the development of the national laboratory information system to establish a comprehensive national system for collection of electronic AMR data directly from clinical microbiology laboratories, including data on AMR from community-acquired infections.
- Establishing a national system for continuous monitoring of HAIs in intensive care units and of surgical site infections, also including the strengthening of the related resources for surveillance of HAIs at national level.
- Improving the AMS activities by building on current activities such as the newly started feedback system to GPs on their prescribing of antibiotics for public patients in the community, the hospital-group AMS networks established in some areas of the country, and the pilot study on out-of-hours prescribing of antibiotics. Consider establishing local AMS teams for the community, which would be composed of a GP, a community pharmacist as well as a microbiologist from the referral hospital. Other healthcare professionals could also be included.
- Ensuring that the necessary structures are in place to provide regular and timely review of existing guidelines on antimicrobial prescribing with a continued emphasis on evidence-based prescribing practice.
- Encouraging and incentivising the participation of GPs and pharmacists in continuous professional education on AMR and AMS.
- Improving the career status/paths for IPC nurses to be able to retain the trained staff in these crucial positions.
- Continuing with the campaigns to raise awareness about prudent use of antibiotics such as “underthewheather.ie” and “RESIST” as well as with the involvement in EAAD. The strategy to use behaviour change approaches and concepts to address antibiotic prescribing habits could be encouraged.
- Continuing to carry out regular surveys of the knowledge and attitudes of the general public (Healthy Ireland Survey), as well as of healthcare professionals, about antibiotics, antibiotic use and AMR.
- Continuing to use the opportunity of the annual EAAD for organising hospital and community level events.
- Rolling out, in the coming years, an antibiotic awareness campaign targeting community and residential services.

- Distributing the e-Bug materials for schools in a more structured way, in order to sustain the change in behaviour of the population regarding antibiotics and thereby further diminish pressure from patients on prescribers on the long term.
- Fostering the existing coordination of communication interventions among different sectors.
- Continuing to work closely with health stakeholders, academics, professional organisations and researchers, so these organisations become "ambassadors" for the key messages related to prudent antibiotic use, to the general public and to their membership.

6.1.3 Veterinary and environmental aspects of AMR

- Using the new data on usage of antimicrobials from the database for setting up targets for the next plan(s), alongside using the data for benchmarking as planned.
- Including actions to fight AMR in the companion animal and horse sectors in the next *i*NAP. Consider carrying out behavioural studies applicable to this sector, more targeted awareness-raising, developing IPC and treatment guidelines to reduce the need for antibiotics and promote prudent use of antimicrobials.
- Exploring additional incentives for the correct disposal of hazardous farm waste, including veterinary antimicrobials, and human medicines. These could include the possibilities of the pharma industry i.e. producers and distributors, co-funding of the disposal schemes.

7 CLOSING MEETING

The ECDC and Commission teams presented the main findings and preliminary conclusions of the visit to the competent authorities in a closing meeting held on 11 October.

ANNEX 1 – LEGAL REFERENCES

Legal Reference	Official Journal	Title
Reg. 851/2004	OJ L 142, 30.4.2004, p. 1-11	Regulation (EC) No 851/2004 of the European Parliament and of the Council of 21 april 2004 establishing a European Centre for disease prevention and control
Dir. 90/167/EEC	OJ L 92, 7.4.1990, p. 42-48	Council Directive 90/167/EEC of 26 March 1990 laying down the conditions governing the preparation, placing on the market and use of medicated feedingstuffs in the Community
Dir. 96/23/EC	OJ L 125, 23.5.1996, p. 10-32	Council Directive 96/23/EC of 29 April 1996 on measures to monitor certain substances and residues thereof in live animals and animal products and repealing Directives 85/358/EEC and 86/469/EEC and Decisions 89/187/EEC and 91/664/EEC
Dir. 2000/60/EC	OJ L 327, 22.12.2000, p. 1-73	Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy
Dir. 2001/82/EC	OJ L 311, 28.11.2001, p. 1-66	Directive 2001/82/EC of the European Parliament and of the Council of 6 November 2001 on the Community code relating to veterinary medicinal products
Dir. 2008/105/EC	OJ L 348, 24.12.2008, p. 84-97	Directive 2008/105/EC of the European Parliament and of the Council of 16 December 2008 on environmental quality standards in the field of water policy, amending and subsequently repealing Council Directives 82/176/EEC, 83/513/EEC, 84/156/EEC, 84/491/EEC, 86/280/EEC and amending Directive 2000/60/EC of the European Parliament and of the Council
Dec. 2013/652/EU	OJ L 303, 14.11.2013, p. 26-39	2013/652/EU: Commission Implementing Decision of 12 November 2013 on the monitoring and reporting of antimicrobial resistance in zoonotic and commensal bacteria

Dec. 2015/495/EU	OJ L 78, 24.3.2015, p. 40–42	Commission Implementing Decision (EU) 2015/495 of 20 March 2015 establishing a watch list of substances for Union-wide monitoring in the field of water policy pursuant to Directive 2008/105/EC of the European Parliament and of the Council