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ECDC ESTONIA COUNTRY VISIT AMR. STOCKHOLM: ECDC: 2019
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FINAL JOINT REPORT IN RESPECT OF A ONE HEALTH COUNTRY VISIT TO ESTONIA
FROM 25 MARCH 2019 TO 29 MARCH 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; a 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 Estonia from 25 to 29 March 2019. The visit was carried out following the invitation from the competent authorities to assist them in the preparation of their national strategy for tackling antimicrobial resistance (AMR) based on a 'One Health' perspective.

According to various European surveillance networks, the antimicrobial consumption in the human health sector in Estonia is low, and the total sales of antimicrobials in the veterinary sector are moderate. However, the veterinary competent authorities are concerned about the increasing use of critically important antimicrobials (CIAs) and the high levels of AMR. Although there is a low level of AMR in key bacteria obtained from human clinical isolates, there are hints that the current AMR situation in the human health sector might be evolving, with hospital outbreaks of resistant bacteria, growing numbers of patients with extended-spectrum beta-lactamase-producing Enterobacteriaceae and an increasing number of isolation-days in some hospitals.

Overall, the report concluded that One Health approach to tackle AMR issues in Estonia is not yet established. Informal collaboration on AMR between the relevant competent authorities and stakeholders has started, but the establishment of the Inter-sectoral steering committee is still pending. Whereas the veterinary AMR action plan for 2019-2023 is in place, the corresponding human health and environmental plans are due this year, as well as the finalisation of the overarching national One Health AMR action plan.

The competent authorities have recognised the need to raise the awareness of AMR among healthcare providers in the human health and veterinary sectors, relevant stakeholders and the general public. Concrete examples in this regard are included in the veterinary AMR action plan and it is expected that awareness-raising will feature prominently in the action plans which are still pending.

In the human health sector, the relatively limited size of the problem of AMR has led to underestimating the potential consequences that AMR could have in the future, and possibly to de-prioritising the necessary measures to safeguard the healthcare system from AMR threats. Current surveillance and control includes a lot of manual work, individual effort and personal connections, and these may not be sufficient to face potential future challenges. While hospitals seemed to cope well with the small numbers of patients with multidrug-resistant organisms at the time of the visit, the situation might change if the prevalence of AMR increases. The human resources allocated to the national coordination and oversight of AMR related work raise questions about their sustainability, as the resources did not seem to be proportionate to the scope of activities and the workload. There was also a lack of national funding for implementing improvements in diagnostic capacity and surveillance, including the absence of a functioning public AMR reference laboratory for human health.

In the veterinary sector, the competent authorities are introducing a new risk-based approach to target veterinarians purchasing the largest quantities of CIAs, an approach which may result in a better knowledge of the situation on the ground. However, in the absence of any legal basis on the prudent use of antimicrobials in animals, it might be difficult to achieve significant change in this

respect. In particular, the veterinary action plan sets targets to reduce the use of CIAs, but these are expressed as a 30 % reduction in sales by 2023, which could be achieved if the animal population decreases without any real change in prescribing patterns.

In relation to the environmental sector, although the monitoring of the substances under the Water Framework Directive was not carried out in previous years, it is planned to resume in 2019. Other monitoring programmes for residues of pharmacological substances in water are ongoing.

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

Table of Contents

ABBREVIATIONS AND DEFINITIONS USED IN THIS REPORT

Abbreviation	Explanation
AMR	Antimicrobial resistance
AST	Antimicrobial susceptibility testing
CIA	Critically important antimicrobial
CRE	Carbapenem-resistant Enterobacteriaceae
DDD	Defined daily doses
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
EQA	External quality assessment
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
EURL-AR	EU Reference Laboratory (for antimicrobial resistance)
EVA	Estonian Veterinary Association
FTE	Full-time equivalent
GP	General practitioner
HAI	Healthcare-associated infection
ICU	Intensive Care Unit
ID	Infectious Diseases
ISC	Inter-sectoral steering committee
IPC	Infection prevention and control
LTCF	Long-term care facility
MALDI-TOF	Matrix-assisted laser desorption/ionisation – time of flight
MDRO	Multidrug-resistant organism
MRSA	Methicillin-resistant *Staphylococcus aureus*
PCU	Population correction unit

Abbreviation	Explanation
PPS	Point prevalence survey
VFB	Veterinary and Food Board
VFL	Veterinary and Food Laboratory
VMP	Veterinary medicinal product
VRE	Vancomycin-resistant *Enterococci*
WHO	World Health Organization

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 Estonian authorities to carry out jointly a country visit from 25 to 29 March 2019. The overall aim of the visit was to follow-up on the Commission's One Health Action Plan against antimicrobial resistance (AMR) published on 29 June 2017 [1], in particular by assisting Estonia in further developing and implementing its national strategies and policies against AMR based on a One Health perspective.

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 other 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 25 March. At this meeting the objectives and scope of, and itinerary for, the country visit were confirmed.

2 OBJECTIVES AND SCOPE

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

The scope of the 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	2	Joint opening and closing meetings with the Ministry of Social Affairs, Ministry of Rural Affairs, Ministry of Environment, Health Board, Veterinary and Food Board (VFB) and Veterinary and Food Laboratory (VFL)
Veterinary and environmental aspects			
Competent authority			Meeting with the Ministry of Rural Affairs, Ministry of Environment, VFB and VBL
Industry stakeholders		1	Meeting with Estonian University of Life Sciences, University of Tartu Fisheries Information Centre, Estonian Veterinary Association (EVA), Estonian Small Animal Veterinary Association, Animal Breeders' Association of Estonia, Estonian Aquaculture Association, Estonian Chamber of Agriculture, large animal veterinary practitioner
Veterinary practices		1	One clinic treating pet animals
Farms		2	One dairy and one poultry farm
Human health aspects			
Competent authority		3	Meetings with the Health Board (including visit to reference laboratory), the State Agency of Medicines and the Estonian Health Insurance Fund
Hospitals		4	North Estonian Regional Hospital (hospital board, infection control unit, microbiology laboratory, pharmacy, wards); East Tallinn Central Hospital (infection control unit, microbiology laboratory, intensive care unit); Tartu University Hospital (hospital board, infection control unit, internal medicine ward, intensive care unit, pharmacy, microbiology and tuberculosis laboratory), West Tallinn Central Hospital (infection control unit, infectious diseases wards)
General practitioners (GPs)		1	One GP centre (Tallinn)
Community pharmacists		1	One community pharmacy (Tallinn)
Professional associations		1	Meetings with the Estonian Infectious Disease Society and the Estonian Society for Laboratory Medicine

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] 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

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 area of human health, ECDC 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 2002/77/EC on the prudent use of antimicrobial agents in human medicine, 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 [7] reiterated the call for action to tackle AMR. In June 2009, EU health ministers adopted a Council Recommendation on patient safety including the prevention and control of healthcare-associated infections [8], 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 [9], EU guidelines on the prudent use of antimicrobials in human medicine were published in June 2017 [10].
- 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 been carrying out a project on the Member States' measures to 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 overview report on this project has been already published in 2018 [11], with a final

6 http://www.who.int/antimicrobial-resistance/national-action-plans/en/
7 http://www.consilium.europa.eu/ueDocs/cms_Data/docs/pressData/en/lsa/101035.pdf
8 https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=OJ%3AC%3A2009%3A151%3ATOC
9 https://publications.europa.eu/en/publication-detail/-/publication/963104ce-5096-11e6-89bd-01aa75ed71a1/language-en
10 https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=OJ%3AC%3A2017%3A212%3ATOC
11 https://publications.europa.eu/en/publication-detail/-/publication/aa676ddd-2d87-11e8-b5fe-01aa75ed71a1/language-en

overview report expected in 2019. In addition, the afore-mentioned Directorate has been carrying out a series of audits on the implementation of the requirements laid down in Decision 2013/652/EU, and an interim overview report on this series was published in 2017 [12] with a final overview report expected in 2019.

ECDC's mission, as part of its Founding Regulation No 851/2004, 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 Estonia (European Union summary report on AMR in zoonotic and indicator bacteria from humans, animals and food in 2016 [13]). ECDC, EFSA and EMA have also issued a 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 Estonia [14]. These reports largely draw conclusions for the EU as a whole based on the complete range of data available.

4 Observations and Conclusions

4.1 AMR Strategies, Action Plans and coordination, in a One Health context

4.1.1 National strategies and action plans on AMR

Findings

1. The draft national AMR One Health Action Plan, which is due to be finalised in 2019, was presented to the visit teams. Given that the national veterinary AMR action plan for 2019-2023 is already in place, whereas the corresponding human health and environmental action plans are due this year, the competent authorities have considered it practical to keep the separation between the different plans, and to link them by the overarching One Health Action Plan. It would be difficult otherwise for one Ministry to allocate funds to cross-cutting actions which would involve also other Ministries, as there is no specific budget for the AMR One Health Action Plan, but each Ministry has its own budget. Activities relevant for the human health sector, the veterinary sector and the environment will be included and funded under the human health plan (the National

[12] http://ec.europa.eu/food/audits-analysis/audit_reports/index.cfm
[13] https://www.efsa.europa.eu/en/efsajournal/pub/5182
[14] http://www.ema.europa.eu/docs/en_GB/document_library/Report/2017/07/WC500232336.pdf

Health Plan, which will be implemented for the period 2020- 2030), the veterinary and environmental action plans, respectively.

2. The AMR One Health Action Plan will address five areas of action:

    - Implementation of the One Health approach, including the establishment of an inter-sectoral steering committee (ISC), and the development and monitoring of annual implementation plans.
    - Antimicrobial use and diagnostics, including the prudent use of antibiotics and prevention and control of AMR.
    - Surveillance and monitoring.
    - Awareness and communication, including raising of awareness and improvement in training.
    - Research, including mapping of research needs and evidence-based policy making.

3. A 3-year strategic research & development project (RITA) will focus on the emergence of AMR in Estonia, aiming to determine the main pathways of spread and identify knowledge gaps. The project is funded through an Estonian Research Council grant and is expected to be launched in the second or third quarter of 2019.

4. Estonia is also participating in international collaborations, such as the EU Joint Action on AMR and Healthcare-Associated Infections (EU-JAMRAI) [15], in particular in work package 6 (policies for prevention of healthcare-associated infections – HAI) to prevent infections and limit the use of antibiotics and spread of resistant bacteria in healthcare settings. Estonia is also part of the Joint Programming Initiative on Antimicrobial Resistance (JPIAMR) [16].

5. The veterinary AMR action plan was approved in February 2019. It was developed by the Ministry of Rural Affairs, the Veterinary and Food Board (VFB), the Veterinary and Food Laboratory (VFL) and the Medicines Agency, in collaboration with the Estonian University of Life Sciences and the Estonian Veterinary Association (EVA). The first version of the plan covered the years 2017-2021. In February 2019, this first version was replaced by a new plan covering the years 2019-2023.

6. The current version of the veterinary plan contains a comprehensive sectoral analysis of the current situation concerning AMR, including the high use of critically important antimicrobials (CIAs) and the low level of awareness on this issue. The actions proposed concentrate on awareness-raising through training for all actors involved, research and further monitoring. It also identifies the multiple sources of funding needed for its implementation, at national and EU levels. The specific actions are clearly listed together with information on their targeting, people responsible for its implementation, timelines and funding arrangements.

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15 https://eu-jamrai.eu/

16 https://www.jpiamr.eu/

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

7. The competent authorities noted that, until 2017, there was no intersectoral approach to AMR, but that this changed during the Estonian EU presidency in 2017 and, furthermore, with the start of the preparation of a national AMR One Health Action Plan in 2018.

8. An ISC [17] has not yet been appointed, although this is planned for 2019. The following national authorities and organisations will be invited to participate in the ISC: the Ministries of Social Affairs, of Rural Affairs, of Environment, of Education, of Economic Affairs and Communication, and of Finance, the Health Board, the VFL, the VFB, the Medicines Agency, the Public Institute for Health Development, EVA and the Estonian Society of Infectious Diseases.

9. The responsibilities of the ISC are foreseen to include: coordinating of the implementation of the AMR One Health Action Plan, promoting the integration of the One Health approach into policy making, strengthening of the intersectoral collaboration and information sharing. The ISC will also develop an annual intersectoral implementation plan with relevant indicators, evaluate the effectiveness of activities and develop evidence-based recommendations.

10. The Communicable Diseases Prevention and Control Act (2003) and the Regulation of the Ministry of Social Affairs on Surveillance and Prevention of HAI in healthcare settings (2010) mandates IPC teams in hospitals. In one of the hospitals visited, there was also an infection control committee that met every 3 months consisting of members of the IPC team, clinical departments, pharmacy and the microbiology laboratory. Despite the absence of an infection control committee in other hospitals visited, the respective IPC teams were collaborating with the microbiology laboratory and the pharmacy, holding meetings at least once a year. The IPC teams reported either to the infection control committee or directly to the board of directors and provided annual reports of surveillance results and activities. Antimicrobial stewardship activities were carried out by the infectious disease (ID) clinicians of the IPC teams. In some of the smaller primary hospitals, IPC and antimicrobial stewardship services were provided by the IPC teams from larger hospitals, especially when the primary hospitals were part of a trust. This service may have the form of regular visits (e.g. on a weekly basis).

11. Regarding multi-disciplinary collaboration in primary care, the Estonian Infectious Diseases Society contributed to seminars for primary care providers that are part of an educational programme arranged by primary care groups. In case of difficult to treat infections, the general practitioner (GP) visited consulted with the ID department of the nearby hospital, either by sending the patient for a formal consultation or via a telephone call. No specific multi-disciplinary interventions to reduce antimicrobial use in primary care were mentioned to the ECDC team. This GP has neither received AMR statistics

[17] As recommended by Council Conclusions on the next steps under a One Health approach to tackle AMR of July 2016.

from the private diagnostic laboratory, nor any feedback on prescribing practices of antibiotics. Community pharmacies are not actively involved in multi-disciplinary antimicrobial stewardship activities in outpatient care. There was no collaboration between healthcare providers and veterinarians at local level.

4.1.3 Conclusions on AMR strategies, action plans and coordination in a One Health context

12. A One Health approach to tackle AMR issues in Estonia is not yet established, since only the corresponding veterinary action plan is available. Nevertheless, the finalisation of the human health and environmental plans, as well as the overarching AMR One Health Action Plan, is foreseen for this year.
13. The recently approved veterinary action plan for 2019- 2023 has been developed thanks to the collaboration of the relevant competent authorities with the academia and the veterinary professional association. The actions proposed in the plan concentrate on awareness-raising through training for all actors involved, research and monitoring.
14. Although multi-sectoral collaboration and coordination on AMR already exist, the formal ISC has not yet been created. Nevertheless, the presumed members of the committee and their responsibilities have already been established.

4.2 HUMAN ASPECTS OF AMR

4.2.1 Laboratory capacity

15. There are twelve diagnostic microbiology laboratories in Estonia, including the laboratory of the Health Board with reference laboratory functions and a private laboratory consortium. The remaining laboratories are affiliated to hospitals. The hospital clinical microbiology laboratories visited performed species identification with matrix-assisted laser desorption/ionisation – time of flight (MALDI-TOF) mass spectrometry and AST mainly with disc diffusion applying the European Committee on Antimicrobial Susceptibility Testing (EUCAST) breakpoints. Only one of the laboratories visited performed automated antimicrobial susceptibility testing (AST) using the VITEK system. Disk diffusion was complemented with gradient tests or broth microdilution for a limited number of antimicrobial agents. The hospitals visited performed screening for carriage of multidrug-resistant organisms (MDROs) for patients directly transferred from hospitals abroad or from Estonian hospitals with known AMR problems or outbreaks based on a risk assessment for each case. Neither national nor hospital-specific guidelines for screening for MDRO carriage existed.
16. The number of blood cultures taken was considered adequate in relation to the number of beds and bed-days and had increased over the years. For positive blood cultures, species identification was performed with MALDI-TOF in combination with Rapid AST according to the respective EUCAST protocol. The laboratories visited reported, in general, a good quality of the received clinical samples. One hospital laboratory reported the use of rapid molecular diagnostics for viral infections and for microorganism and

AMR identification, while two laboratories used rapid molecular testing for *Clostridioides difficile*. Further molecular testing of MDR bacteria was performed on a pay-by-case basis by one of the private SYNLAB laboratories. SYNLAB performs molecular testing for methicillin-resistant *Staphylococcus aureus* (MRSA), vancomycin-resistant enterococci (VRE) and carbapenem-resistant Enterobacteriaceae (CRE).

17. There is no Estonian national external quality assessment (EQA) scheme for microbiology laboratories, but there is the possibility to use international schemes such as the UK-NEQAS, INSTAND and LABQUALITY schemes. The Estonian laboratories submitting data to the European Antimicrobial Resistance Surveillance Network (EARS-Net) participate in the EARS-Net EQA. The reimbursement of tests by the National Health Insurance Fund has a quality control and EQA component. Accreditation of laboratories is voluntary. Out of the 12 national laboratories, 8 have been accredited in the field of clinical microbiology using the ISO15189 standard. The Estonian Society for Laboratory Medicine has a separate microbiology section which also functions as the National AST Committee and coordinates all activities related to AST.

18. The laboratory of the Health Board has a reference function for food and waterborne infections, sexually transmitted infections, invasive pneumococcal infections, rare bacterial species and viruses. As part of the monitoring and surveillance, *Salmonella* spp. and *Campylobacter* spp. isolates from Estonian microbiology laboratories are collected and processed for species confirmation, serotyping and AST. The Health Board laboratory also participates in the European Gonococcal Antimicrobial Surveillance Programme.

19. The Health Board laboratory has been appointed as the reference laboratory for AMR in the human health field, but does not currently have the capacity or funding to fulfil this role, as this laboratory cannot confirm phenotypic AMR with molecular methods or perform molecular typing in case of outbreaks. Partial funding was approved for 2019 and there are plans for expansion of the capacity for molecular diagnostics to establish an independent AMR reference laboratory function in 2020.

4.2.2 Monitoring of AMR in human health

20. The Health Board is the competent authority responsible for AMR monitoring in the human health field. Laboratories and clinicians are obliged to report information for communicable diseases, outbreaks and MDROs in invasive infections through an electronic notification system (NAKIS). An annual overview on this information is published on the homepage of the National Health Board. For the time being, this report is only available using aggregated data and thus no feedback could be provided to local laboratories or hospitals. In March 2019, CRE were added to the list of organisms notifiable by laboratories.

21. Data on AMR in invasive bacterial isolates are available from the EARS-Net, in which Estonia has participated in since 2001. For EARS-Net, AMR data are submitted in paper form to the Health Board, which compiles them before uploading to the European

Surveillance System. EARS-Net currently covers 11 laboratories and nearly 100% of the hospitalized patients in the country. In 2017, the level of AMR in microorganisms under surveillance by EARS-Net was, overall, consistently below the EU/ European Economic Area (EEA) average. There have been only very few cases of CRE in the country.

22. In all hospitals visited, the antimicrobial susceptibility rates were monitored locally. The data were analysed, fed back to the clinical departments and included in the annual report. There have also been efforts to centrally link data available in the laboratory information systems of the hospital laboratories for continuous country-wide AMR monitoring, but this has not been successful so far due to the lack of appropriate IT solutions. Further investigations into the epidemiology of AMR have been carried out in 2012 [18] and 2015 depending on research grants. There is currently no monitoring of AMR in outpatients.

4.2.3 Monitoring of antibiotic usage in human health

23. Estonia regularly reports antibiotic consumption data to the European Surveillance of Antimicrobial Consumption Network (ESAC-Net). The consumption data, provided by the Medicines Agency, are based on total wholesaler data aggregated at country level, with separation of antibiotics bought by community and hospital pharmacies. Information on sales includes the number of defined daily doses (DDD) and of packages. Antimicrobial use in the community (11.8 DDDs per 1 000 inhabitants per day) is among lowest in the EU (EU average 21.8 DDDs per 1 000 inhabitants per day). In the hospital sector, antimicrobial use was 1.79 DDDs per 1 000 inhabitants per day (EU average 2.02 DDDs per 1 000 inhabitants per day). Broad-spectrum antibiotics use in hospitals was 26.4% of the total use of antibiotics, as reflected in the 2016-2017 ECDC point prevalence survey of HAIs and antimicrobial use in acute care hospitals results (EU average 41.3%).

24. So far, there has not been any assessment of the appropriateness of antimicrobial prescribing. Feedback on prescription patterns has not been provided to prescribers in the community. There is the option to implement a reporting system to provide individual GPs with their consumption statistics, based on the database of the National Health Insurance Fund. A comparison between the sales and reimbursement data at the regional level showed a substantial overlap of the total consumption recorded by the two systems. Feedback to hospitals on their antimicrobial consumption and comparison of antimicrobial consumption across hospitals is not provided by the national level. Hospitals usually prepare their own consumption statistics based on data from their pharmacies. The four hospitals visited measured the total DDD consumption over 100 inpatients-days at least annually, and three of these hospitals also provided ward-disaggregated statistics as feedback to their different departments.

[18] Pavelkovich *et al*., Detection of Carbapenemase-producing Enterobacteriaceae in the Baltic Countries and St. Petersburg Area, Biomed Res Int, 2014.

4.2.4 Antibiotic utilisation and treatment guidance in human health

25. The Estonian Health Insurance Fund reimburses 50% of the cost for prescriptions of antibiotics in the community. Prescriptions for children under 4 years of age are fully reimbursed. The National Health Insurance Fund covers the vast majority of the population and most antibiotics used in the community are reimbursable (including several relevant antibiotics in the following list of ATC-3 groups: J01A, J01C, J01D, J01E, J01F, J01M, and J01X). The reimbursed prescriptions are registered in the digital prescription database of the National Health Insurance Fund. Antibiotics are prescription-only medicines and the pharmacy licence is revoked if inspectors find violations in this regard, making it unlikely that over-the-counter sale of antibiotics take place frequently. However, there are no quantitative data on possible purchases of antibiotics in other countries (e.g. Russia) or via the internet.

26. GPs are contracted by the National Health Insurance Fund and receive a remuneration per capita based on the size of their patient list. They can receive an annual incentive of up to 3% of the total remuneration within a quality bonus scheme that, so far, does not include any indicators on antibiotic prescribing. There are national treatment guidelines for common infections in the community issued by the Estonian Society for Infectious Diseases, and these are regularly updated taking into account the AMR trends detected by EARS-Net surveillance. Conferences on these topics are frequently organised at local level. The GP visited used the national guideline for the treatment of infections in the community and had recently attended a seminar on antimicrobial treatment. Nurses can prescribe antimicrobials (e.g. for uncomplicated cystitis in women), after special training. Nurses are also involved in assessment and management of common upper respiratory tract infections.

27. There are no national guidelines for antimicrobial treatment in hospitalised patients, but it is mandatory for each hospital to have local treatment guidelines in place. The four hospitals visited had guidelines on antimicrobial treatment and surgical prophylaxis. The guidelines were available in electronic and printed form, in two of these hospitals, in pocket booklet form. Furthermore, these four hospitals had a list of antimicrobials with restricted use that required approval and a system to re-evaluate the prescriptions within 3 days after the initiation of therapy. In one hospital, a policy for intravenous to oral switch of antibiotics had been introduced and was subsequently audited. Community pharmacies have not been actively involved in AMR policies, such as antimicrobial stewardship and public information campaigns.

4.2.5 Infection prevention and control in human health

28. IPC activities in Estonia are based on cooperation between the National Health Board and the national societies for Infectious Diseases and Infection Prevention and Control. The Health Board had very limited staffing for AMR activities – 0.4 full-time equivalent (FTE) of an ID clinician, one person to work on the national electronic reporting of notifiable diseases/pathogens, and one laboratory staff member to assist with the data entry for EARS-Net. This very limited workforce was responsible for all IPC activities

including national surveillance, HAIs, AMR, and the support to field epidemiologists in case of outbreak investigations. There were no staff coverage arrangements in case of the unavailability of staff assigned to AMR activities. Due to the staff shortages at national level, many activities rely on non-governmental actors, such as the ID and IPC societies.

29. Estonian legislation establishes that there has to be at least 1 IPC nurse per 250 beds, while there are no requirements in place for the minimum number of IPC doctors in hospitals. In the hospitals visited, the IPC team consisted of IPC nurses and ID doctors with at least a 90% of their working time allocated to IPC. These IPC teams were responsible for hospital infection control, antimicrobial stewardship, hospital-specific IPC and treatment guidelines, surveillance, and internal education. Many of these IPC teams felt overworked and there was little availability of additional coverage in case of problems such as staff leave or if escalation in the work force is needed due to outbreaks. Some hospitals had introduced IPC contact persons on the wards ("link nurses"). Generally, there was the impression that the IPC staff were accepted and appreciated by other departments in the hospitals visited and that they had the ability to implement change when needed.

30. National standards for hospital-related infections were published in 2000 by the Ministry of Social Affairs. The Health Board had also published guidelines on hand hygiene (2014), isolation of patients in healthcare settings (2016), IPC in long-term care facilities (2018) and waste management (2019). There were neither national guidelines nor hospital-specific guidelines in the hospitals visited for the screening of patients for MDROs. Each hospital is responsible for the production of its own IPC guideline. The hospitals visited based their recommendations on the WHO "five-moments" for hand hygiene. There was good awareness over optimal placement of alcohol-based hand rub dispensers and, in general, very good availability of dispensers in patient areas. However, dispensers were less widespread in public areas and the ECDC team saw examples of wards where there were no dispensers beside the beds. All the hospitals visited had good availability of hospital scrubs for staff, which were all "above the elbow". The use of watches and rings was not widespread but staff performing procedures with these still on were observed by the ECDC team.

31. The hospitals were very clean with no litter and clear surfaces. Nearly all the furniture was made of materials that could easily be wiped clean. Terminal cleans were performed by a combination of external cleaning staff and healthcare personnel. It was mentioned several times that it was difficult to motivate the external cleaning staff for this task. The bed occupancy rates were low (approximately 70%) in the hospitals visited, with little risk of overcrowding at present. However, there was a lack of isolation capacity in general wards and intensive care units (ICUs). This was a worrying situation, especially in combination with the rising number of isolation-days. The hospitals visited were performing monitoring of infection control activities including alcohol-based hand rub consumption, hand hygiene compliance rates and influenza vaccination rates and demonstrated overall satisfactory results with improvement over the years. Electronic

alerts and notification in the electronic patient record about infection and colonisation with MDROs had been introduced in some of the visited hospitals.

32. Estonian hospitals have taken part in the ECDC point prevalence surveys (PPS). In the 2016-2017 PPS, Estonia participated with 23 acute care hospitals and 4 220 patients. The HAI prevalence was 4.2 % (95 CI: 2.4-7.3 % – EU average 5.5 %) and the prevalence of antimicrobial use was 25.1 % (95 CI: 21.2–29.0). There were 0.13 FTEs per 250 beds dedicated to antimicrobial stewardship. Six ICUs in three hospitals participated in ECDC-surveillance of HAIs since 2011, four hospitals have taken part in *C. difficile* infections' surveillance since 2017 and two hospitals have participated in surgical site infection surveillance for caesarean sections and coronary artery bypass grafts since 2016.

33. The ECDC team did not visit any long-term care facilities (LTCFs) and thus was unable to make any direct observations about IPC in these facilities. However, it was frequently mentioned that there is a problem with overcrowding and a lack of medically trained staff in LTCFs, which would mean that LTCFs could represent a reservoir for the spread of MDROs.

4.2.6 Educational programmes on AMR

34. Nurses have one module that includes AMR, IPC and HAI as part of their basic training. There is currently no formal training for IPC nurses that could include AMR. Tallinn Health Care College ran a course for IPC nurses in 2014, from which 20 nurses graduated. IPC training is generally provided by hospitals. The hospitals visited provide regular training on IPC and hand hygiene to nurses and nursing assistants. Medical students receive training on AMR and IPC during the fourth year of their undergraduate medical studies. Residents also receive training on antibiotic prescribing in hospitals. Medical doctors can attend courses on AMR and IPC provided by the Infectious Diseases and Infection Prevention and Control societies. In the hospitals visited, there were structured introductory courses for newly appointed staff that included IPC and further training available to both nurses and doctors.

35. The current pharmacist education is purely pharmacological and training abroad is required to graduate as a clinical pharmacist. This means that there are very few clinical pharmacists working currently in Estonian hospitals and thus it is not possible to include pharmacists in multi-disciplinary antibiotic stewardships teams as in other EU countries.

4.2.7 Public information related to AMR

36. Estonia has participated in the past editions of the European Antibiotic Awareness Day (EAAD) with the publication of press releases, articles and interviews. In general, the communication efforts have been focused around European/World Days or Weeks (e.g. EAAD, World Antibiotic Awareness Week and World Hand Hygiene Day). The competent authorities have focused mainly on the need to clarify that antibiotics are not effective against viruses. For the past 3 years, the Ministry of Social Affairs has been the institution leading the activities around the EAAD, together with the Health Board, but

there has been no full-fledged campaign targeting a single population segment. Activities have also taken place to a minor extent at the Ministry of Rural Affairs and the Veterinary and Food Board linking AMR to the outbreaks of African Swine Fever in animals.

37. There has been no national hand hygiene campaign, but several targeted and regular campaigns have been organised in health-care centers, hospitals, kindergardens, schools etc, for example in association with the Hand Hygiene Day. Activities were mostly composed of lectures, competitions, and the use of information material such as posters and leaflets. Pharmacist associations have not been involved in the communication, but the Health Insurance Fund has involved GPs in the past. The Infectious Diseases society has been participating, especially at hospital level. Training programmes for GPs have been organised and are available as e-courses with continuous education credits.

38. There was no evaluation of the communication campaigns, except for surveys to determine the public knowledge about antibiotics. In 2015, a survey was organised at national level targeting the general population. Estonia has been also participating in the latest ECDC survey among healthcare workers launched in 2018. In the latest Eurobarometer survey, 9% of Estonian respondents stated that their last course of antibiotics had not been obtained from a healthcare provider. Several health professionals encountered during the visit felt that there was little public awareness of AMR in Estonia.

39. AMR is sporadically covered in the media, while vaccination and tuberculosis receive more coverage. Influenza vaccination is a very important issue for the human health authorities as the vaccination coverage for the population is among the lowest in Europe. Health-care workers´ vaccination coverage is however higher (25,7% coverage in the 2015/2016 influenza season and 48,4% coverage in the 2018/2019 influenza season). This topic has been linked to AMR, in the sense that vaccination prevents unnecessary antimicrobial use and that antibiotics are ineffective against influenza. There have not been any educational programmes on AMR for the general public or schools. While e-bug is available, it does not seem to have been implemented in schools.

4.2.8 Marketing related issues

40. Advertising of medical products is regulated by the Medicinal Products Act and prescription-only medicines, such as antibiotics, can only be advertised to healthcare professionals. Gifts from the pharmaceutical industry to medical doctors are allowed up to a value of 6,40 € and have to be work-related. The provision of sample packages of antibiotics to doctors by the pharmaceutical industry is prohibited. The GP visited stated that she receives visits from representatives of the pharmaceutical industry, but not in relation to antibiotics. The prescribing behaviour of doctors does not affect their salary. One full-time inspector at the Medicines Agency monitors the advertising of medicines by checking websites, inspecting marketing authorisation holders and participating in events hosted by the pharmaceutical industry. Pharmaceutical manufacturers have set their own ethical standard in a guideline.

4.2.9 Conclusion on human health aspects of AMR

41. Compared to other EU/EEA countries, the situation in Estonia is characterised by the low level of AMR in key bacteria and the low consumption of antimicrobials as documented, respectively, by EARS-Net and by ESAC-Net. These AMR and antimicrobial consumption levels are based on a good country coverage for both AMR and antimicrobial consumption surveillance data. The hospitals visited showed good infrastructure and a low bed occupancy rate. In addition, there were many examples of good practice, including awareness of hand hygiene and availability of alcohol-based hand rub, detailed analyses of local hospital AMR and antimicrobial consumption data, hospital-specific treatment guidelines, restrictions of the use of last-line antimicrobials, and reports of good inter-departmental collaboration.

42. Many of the activities to control AMR were conducted by only a few well-trained and dedicated people and teams at local level. In addition, the limited human resources allocated to the national coordination and oversight of AMR related work raise questions about their sustainability, as the resources did not seem to be proportionate to the scope of activities and the workload. There is also a lack of national funding for implementing improvements in diagnostic capacity and surveillance. For example, there was no functioning public AMR reference laboratory for human health. At the same time, there are resources such as the prescription database of the National Health Insurance Fund that could in the future be used for feedback to practitioners on antimicrobial prescribing. There is also the potential to increase the efficiency of surveillance by improved IT solutions and linking different data sources.

43. While hospitals currently seem to cope well with the small numbers of patients with MDRO, there are signs that this situation might change in the future due to more import events from other countries with a higher AMR prevalence or the occurrence of outbreaks in Estonian hospitals. Hints that the AMR situation may be evolving include the VRE and MDR *A. baumannii* outbreaks detected in two Estonian hospitals, the increasing number of patients with ESBL- (Extended-spectrum beta-lactamase) -producing Enterobacteriaceae, and the increasing number of isolation-days in some of the hospitals visited. Current surveillance and control activities include a lot of manual work, individual efforts and personal connections, and therefore they do not seem to be sufficient to cope with potential future challenges if the number of patients with MDRO increases.

44. The relatively limited size of the problem of AMR in the country has led to underestimating the potential consequences that AMR could have in the future and possibly to de-prioritising the necessary measures to safeguard the healthcare system from AMR threats. The development of the One Health Action Plan with involvement of relevant stakeholders is welcome and provides an opportunity for improving preparedness of the country to detect and respond to future emerging AMR threats.

4.3 VETERINARY AND ENVIRONMENTAL ASPECTS OF AMR

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

45. The Veterinary and Food Laboratory (VFL) under the Ministry of Rural Affairs is the National Reference Laboratory for AMR. Its central laboratory is located in Tartu with regional laboratories or units in Tallinn, Saaremaa and Rakvere, employing a total of 121 staff members. All laboratories are accredited by the Estonian Accreditation Centre.

46. The main focus of the AMR monitoring work carried out by the VFL is related to the requirements of Commission Implementing Decision 2013/652/EU on the monitoring and reporting of AMR in zoonotic and commensal bacteria.

47. The VFL collaborates closely with the EU Reference Laboratory for AMR (EURL-AR) by sending strains for confirmatory testing, participating in proficiency testing, workshops and training courses organized by the EURL-AR. In 2017, the EURL-AR carried out an on-the-spot visit to the VFL.

48. AMR data obtained are analysed and publicly available in the form of the Zoonoses Report, which is published annually [19]. The most recent report relates to the outcome of the official monitoring carried out in 2017, which included 68 caecal samples from fattening pigs, 150 samples from pork and 150 samples from beef taken at retail, together with a small number of samples from other animals (under voluntary schemes).

49. In comparison with 2015, the 2017 results showed decreasing or similar levels of AMR in *E.coli*, as well as a relatively good situation as regards *Salmonella* spp., with a low number of resistant strains. However, there was a risk that the resistance to colistin could increase (3 isolates in 2017 from none in 2015). In 2015, there was already a concerning high level of AMR in *Campylobacter coli* strains, with 87.9 % isolates resistant to at least one antibiotic and it has further increased in 2017 to 95 %. During the same period, there has also been a decrease in *Campylobacter coli* multi-resistant strains (from 18.2 % to 15 %). The level of AMR in *Enterococcus faecalis* strains from fattening pigs was high, with most strains resistant to tetracyclines, erythromycin and chloramphenicol. Although the proportion of *E. faecium* strains simultaneously resistant to three and more antibiotics was relatively low, around 80 % of the strains were found to be resistant to at least one antibiotic and a large part of them resistant to erythromycin and quinupristin/dalfopristin.

50. The Zoonoses Report from 2016 reflects the results obtained from the official monitoring of 73 samples from broiler chickens collected at slaughter, 75 samples of broiler meat taken from retail (meat originating from Estonia and other Member States) and a small number of samples from other species.

[19] https://vet.agri.ee/?op=body&id=820

51. The level of AMR detected in isolates from poultry samples was concerning:

- While, compared to 2014, the proportion of *Enterococcus* spp. isolated at slaughterhouse level resistant to tetracyclines has decreased, the resistance to ciprofloxacin has significantly increased.
- 73 % of *Enterococcus faecalis* isolates from slaughterhouse samples were resistant to at least one antibiotic which, although a reduction from the situation in 2014 (84.9 %), is still very high.
- Only 6.8% of *E.coli* isolates collected at slaughterhouse level were susceptible to all tested antimicrobials and 58.8 % of the isolates were multi-resistant. In addition, the levels of resistance to ampicillin and ciprofloxacin have remained very high (respectively, 89 % and 87.7 % in 2016 in comparison to 88.7 % and 91.5 % in 2014).
- At retail level, 61.3 % of *E. coli* isolates (from samples of different origin) were resistant to 3rd generation cephalosporins. Of these isolates, 97.2 % were multi-resistant, including 43.5 % ESBL- and 56.5 % AmpC-producing strains.

52. Apart from the above-described work on AMR monitoring, the VFL carries out AST on clinical isolates: annually, around 1 000 analyses using the disc diffusion method and 300-400 analyses determining the minimum inhibitory concentration using commercial plates.

53. The competent authorities noted that the throughput of commercial samples in the VFL is small and that the vast majority of these are milk samples. Private diagnostic services, in particular abroad, are used by the industry and the companion animal sector due to, among other factors, a quicker delivery of AST results. The competent authorities have no access to these AMR data [20], although they were confident that the number of samples tested privately is marginal, and that most antibiotics therapies are initiated without bacteriological diagnosis or susceptibility testing.

54. Although not commercially available, molecular methods are also used. The Commission team was informed about the detection of the *mec*A gene in two of MRSA isolates tested in 2018 and that the VTL tested three *Salmonella* spp isolates, suspected of being resistant to colistin, but all tested negative for the *mcr-1* and *mcr*-2 genes. Also in 2018, the VFL started to perform Next Generation Sequencing in order to gain experience in this field, and a number of isolates of *Salmonella* spp., *E.coli* and *Listeria* spp. were collected for the library construction. The data analysis is ongoing.

55. The Commission team was informed about several AMR research projects carried out between 2010 and 2017 in collaboration with the University of Life Sciences. These include work on *Staphylococcus* spp. isolated from milk, pigs and companion animals, the occurrence of MRSA in the environment of small animal clinic, and work on animal

[20] *In their response to the draft report the Competent Authority noted that irrespective of the type of laboratory which measures the antimicrobial resistance from commercial samples; none has the obligation or the right to report them directly to the surveillance authority*.

and human isolates of *Salmonella* spp. and *Campylobacter* spp. The research projects on AMR profiles of *Campylobacter* spp. isolated from Estonian, Latvian and Lithuanian broiler meat sold in Estonia and from Estonian patients with severe enteric infection included collaborations with laboratories of several Estonian hospitals and researchers in Finland and Latvia.

4.3.2 Monitoring the use of antimicrobials in animals

56. According to the most recent European Surveillance of Veterinary Antimicrobial Consumption (ESVAC) report published in October 2018 [21], the level of total sales of antimicrobials in the veterinary sector in 2016 was 64 mg/PCU (population correction unit), within a range of 2.9 to 453.4 mg/PCU for the other countries contributing data to ESVAC. Although the sales of veterinary antimicrobial agents decreased by 17 % from 2014 to 2016, this was mainly due to a notable reduction in the total population of some food-producing animal species, mainly pigs and dairy cattle. While the total sales figures for all antimicrobials are not alarming, the competent authorities rightly recognised a problem with increasing overall sales of 3rd and 4th generation cephalosporins (from 0.36 mg/PCU in 2010 to 0.73 mg/PCU in 2016).

57. The antibiotics most frequently sold were penicillins (including in combinations), tetracyclines, pleuromutilins and aminoglycosides (respectively, 48 %, 24 %, 10 % and 5 % of all antibiotics sold for veterinary purposes). Given the size of the country, there are limitations of the market for veterinary medicinal products (VMPs) and once an antimicrobial drug ceases to be available, this can cause significant increase in the sale of others. Similarly, changes in the treatment strategy on one or two major farms or outbreaks affecting larger farms may significantly influence sales patterns of different antimicrobials.

58. According to the ESVAC data, there are no sales of premixes, and the competent authority confirmed that since 2015 none of the feedmills has produced medicated feed (other than feed with zinc oxide). An unknown amount of medicated feed, at least for aquaculture and possibly other food-producing animals, is brought in from other Member States. The Ministry of Environment has data suggesting that only 1 out of 30 aquaculture farms reported the use of antimicrobials in 2018. The Commission team noted that other Member States with similar issues have developed specific procedures to establish what antimicrobials are actually used in animals and the quantities supplied from other countries, and similar arrangements could be considered in Estonia. In addition, the VFB could also obtain the information from the Ministry of Environment and follow it up.

59. There is currently no system for the reporting of the quantities of antimicrobials used for the treatment of animals by species, which makes it impossible to conduct more precise analysis of their reasonable use. Setting up an electronic database for reporting the use of antibiotics in food-producing and companion animals is included in the veterinary

[21] https://www.ema.europa.eu/documents/report/sales-veterinary-antimicrobial-agents-30-european-countries-2016-trends-2010-2016-eighth-esvac_en.pdf.

AMR action plan with the funding allocated. The Ministry of Rural Affairs and the VFB are in charge of this initiative.

4.3.3 Environmental monitoring of antimicrobials and AMR

60. The Ministry of Environment carried out monitoring of substances, including macrolides under Commission Implementing Decision (EU) 2015/495 in 2015 and 2016. The monitoring was not carried out in 2017 and 2018, since the competent authorities interpreted that under the Water Framework Directive [22] such monitoring was not required every year. The representatives of the Ministry of Environment met undertook to clarify the monitoring requirements with the relevant Commission services. Such monitoring is foreseen to recommence in 2019 for the macrolides and additional antimicrobials listed in the new Commission Implementing Decision (EU) 2018/840.

61. The Ministry of Environment participates in two additional ongoing projects on the monitoring of pharmacological substances in water. In particular, these include antimicrobials other than those subject to the above-mentioned monitoring. There are no current plans to monitor the presence of resistant microorganism in the environment.

62. In addition to the monitoring programmes, the Ministry of Environment manages the disposal of pharmaceuticals via a take-back scheme. This is a free of charge service for the public allowing people to take back to a pharmacy the remainder of their medicines or expired medicines. Pharmacists are required to ask for some information from the person bringing back the medicines, although the provision of these data is voluntary. The competent authorities recognised that there is low buy-in from pharmacists and low public knowledge about the scheme.

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

63. The veterinary action plan on AMR contains targets to reduce the use of CIAs (including macrolides), which are expressed as a 30 % reduction in sales by 2023. The Commission team advised the competent authorities to use some caution in over-relying on targets linked to total sales, since they could be met due to a decrease in the animal population and without any real change in the prescribing patterns.

64. There are no benchmarking systems concerning antimicrobial prescribing and use by veterinarians and use at farm level. The Commission team noted that other Member States have found such schemes useful for gauging antimicrobial use and prescribing patterns, incentivising a reduced and more prudent use of antimicrobials and, in some cases, as a tool to guide official controls or advisory initiatives. Nevertheless, setting these up would require obtaining data on the use of antimicrobials by veterinarians and/or at farm level. E-prescriptions are not used for VMPs and there are no plans to

[22] Directive 2000/60/EC of the European Parliament and of the Council establishing a framework for the Community action in the field of water policy.

introduce them in the near future. As mentioned above, the competent authorities have started developing an e-database for recording the use of antimicrobial per species, but this will take time and would not necessary provide data on farm level use. The VFB obtained, from wholesalers, data on quantities of 3rd and 4th generation cephalosporins and fluoroquinolones purchased by veterinarians in 2018. Representatives of the VFB admitted that this was a challenging task as wholesalers were reluctant to provide these data. The Commission team suggested that the VFB could ask the Medicines Agency for assistance in this matter.

4.3.4.2 Availability of veterinary antimicrobials and veterinary care

65. In Estonia some veterinarians are employed directly by the farmers. In other Member States such arrangements have helped to ensure that the veterinarian was fully aware of the health situation on the farm and able to provide advice on herd health and prophylactics. However, the representative of one of the veterinary associations met was very concerned about the strong dependence of veterinarians on farmers, who could easily pressure veterinarians into prescribing antimicrobials even if they were not essential or into prescribing more potent antimicrobials than needed. This representative also informed the Commission team that some veterinarians allow their licence numbers to be used by farmers, who can then purchase VMPs by themselves. The VFB was aware of this issue although it believed it was not a wide-spread practice. As of 2019, the VFB's new control programme for practising veterinarians is meant to provide more information of the situation on the ground and to tackle this issue (see section 4.3.4.3).

66. The representatives of the Estonian Small Animal Veterinary Association and the small animal practitioner met did not have concerns about the pressure from the pet owners to prescribe antimicrobials. However, it was recognised that the public knowledge on AMR was low, and that pet owners often needed to be persuaded about the need of using diagnostic tests and AST, rather than prescribing antimicrobials blindly.

67. The representatives of the veterinary associations met informed the Commission team that there is a recognised shortage of veterinarians working with food-producing animals. In particular, there is an acute lack of veterinarians specialising in poultry and there are no veterinarians working in the aquaculture sector. Although any practising veterinarian could prescribe VMPs for fish, specialists from Denmark have to be called for help when there has been a serious problem at fish farms. The Commission team noted that a fish diagnostic service is available at the University of Tartu Fisheries Information Centre.

68. The Commission team visited a large broiler farm owned by a foreign company and a part of a bigger enterprise with other poultry farms, a hatchery and a slaughterhouse. In contrast to the prior use of fluoroquinolones as first choice treatment without any diagnostic analyses, in 2017, the company made a commercial decision to raise broilers without antibiotics and to market the meat as such. The Commission team was informed that this farm did not use antimicrobials since April 2017, and since May 2018 at any of the company's other broiler farms in Estonia. It was explained that this was possible due

to constant microclimate monitoring, avoiding stress on the birds, improving water cleanliness, improved feed quality and use of feed additives. Official monitoring data are not yet available to demonstrate whether the resistance situation has changed.

69. In relation to the above, the Commission team noted that while there are benefits of improving husbandry practices and biosecurity in order to reduce the use of antimicrobials, the use of an 'antibiotic-free' label is a marketing decision, and that the general public could interpret that meat not labelled as 'antibiotic-free' contains harmful levels of antibiotics. In addition, the team advised the competent authorities that if they decide to endorse such a scheme, they will need to consider carefully how to police it.

4.3.4.3 Reducing the need for veterinary antimicrobials

70. Prior to 2019, all veterinarians were subjected to inspections by the VFB every 3 years. As of 2019, the VFB's official control programme for practising veterinarians is risk-based and, 78 out of 793 veterinarians registered to practice have been selected for inspection this year. The volume of purchase of 3rd and 4th generation cephalosporins and fluoroquinolones is one of the risk factors considered when drawing up the control programme.

71. The Commission team noted that as there are no legal restrictions on the use of CIAs, it might be difficult to achieve significant improvements in the prescribing patters of veterinarians. The competent authorities are placing great emphasis of the new EU Animal Health Law and the Regulation on VMPs [23] in order to have a legal base for a stricter approach. Until these become applicable, the targeted inspections are expected to further raise the awareness of AMR and prudent use of antimicrobials and will give the competent authorities a better knowledge of the situation on the ground. Also, if any of the inspected veterinarians is identified as illegally allowing the farmers to buy VMPs on their behalf, they could be penalised.

72. Treatment guidelines for food-producing animals by the Ministry of Rural Affairs and the Estonian University of Life Sciences were issued in 2017. For some diseases, 3rd and 4th generation cephalosporins and fluoroquinolones are listed as treatment of second or third choice. The representatives of the University informed the Commission team that, in light of the current prescribing practises, the guidelines had to be realistic in order to be followed-up and that the recommendation was still to use CIAs as little as possible.

73. The veterinarian met on a large dairy farm visited (and working exclusively for that farm) was aware of the afore-mentioned treatment guidelines and of the competent authorities' intention to reduce the use of 3rd and 4th generation cephalosporins, but seemed unaware of any advice to restrict the use of other CIAs. Despite some prudent practices implemented on the farm, such as a reduced use of cephalosporins in cases of lameness and selective dry cow treatment, the farm still used significant quantities of fluoroquinolones and 3rd and 4th generation cephalosporins. The farm veterinarian stated

[23] Regulation (EU) 2019/6 of the European Parliament and of the Council on VMPs and repealing Directive 2001/82/EC.

that some time and adaptation of husbandry practices would be needed if it became necessary to further reduce the use of these CIAs on the farm.

74. In line with the 'prevention is better than cure' approach, the competent authorities want to concentrate on the biosecurity on farms in the beef and poultry sectors, where the requirements are not currently as strict as in the pig sector (due to the African Swine Fever outbreak).

75. The Commission team highlighted the need to focus on companion animals due to their close contact with their owners and the risk of transmission of resistant microorganisms between animals and humans. The small animal practitioner visited was aware of the Federation of Companion Animal Veterinary Associations' (FECAVA) guidelines for responsible antibiotic treatment and infection prevention and control [24] and FECAVA posters were displayed in the practice. The competent authorities could consider using these guidelines as a base for developing national ones. The Commission team noted the existence of other useful examples in this regard, including a collaboration of human infection prevention and control specialist with the veterinary sector under the One Health approach, which is documented in the interim overview report on the prudent use of antimicrobials in animals [11].

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

76. The competent authorities recognised the need that all actors, veterinarians, farmers, food and feed business operators, are aware of AMR related issues. Therefore, training and awareness raising features prominently in the veterinary action plan, where there is an analysis of the training options and sources of information already available and planned.

77. The veterinary AMR action plan sets out that relevant information, including on the responsible use of antimicrobials, is widely available and lists some of the websites of the competent authorities and stakeholders with general information and specific guidelines. The competent authorities recognised that having one website with all necessary information would be beneficial.

78. The Commission team was informed that the recent veterinary graduates in Estonia are aware of the AMR issues and that the current veterinary curriculum adequately addresses the prudent use of antimicrobials. In general, the veterinarians met were aware of the principles of responsible use of antimicrobials, infection prevention and control procedures, and carried out susceptibility testing when required. However, some of the veterinarians met also expressed their concerns that what they had learned at university was not always followed by other veterinary colleagues and, therefore that new graduates could easily become disillusioned when they start practising.

79. In terms of post-graduate training, there is a requirement for the veterinarians to attend training every 5 years. Courses and conferences organised by the pharmaceutical

[24] https://www.fecava.org/en/policies-actions/guidlines

industry do not count towards this target. The fulfilment of requirements on continuous professional development is checked by the VFB as part of their inspections of practising veterinarians. The courses attended do not need to be related to AMR, but the Commission team was informed of the availability of training courses on this topic. In the veterinary action plan, there is information on a 1-day training course on the use of antibiotics in farm animals, for veterinarians, farmers and feed and food business operators.

80. There is an ongoing multiannual programme of knowledge transfer intended for farmers and food and feed business operators which was developed by the Ministry of Rural Affairs under the Estonian Rural Development Plan. In particular, it includes material on the principles of using antimicrobials, animal health, biosecurity and record keeping, which is available on the dedicated website. The Commission team was also given details of recent AMR-related sessions organised by the Estonian Chamber of Agriculture and Commerce and the annual conference for pig farmers during their annual gatherings.

4.3.6 Conclusion on veterinary and environmental aspects of AMR

81. According to ESVAC data, the level of total sales of antimicrobials in the veterinary sector in Estonia is moderate. However, the use of CIAs, mainly 3rd and 4th generations cephalosporins, is higher than average. The competent authorities are concerned about this situation and the high levels of AMR in animals and products of animal origin.

82. A veterinary AMR action plan for 2019-2023 has recently been approved and the development of the corresponding environmental action plan, as well as the public health one, is foreseen. The actions proposed in the veterinary plan concentrate on raising awareness through training, research and monitoring. The plan also sets targets to reduce the use of CIAs, but these are expressed as a 30 % reduction in sales by 2023, however this could be achieved if the animal population decreases without any real change in prescribing patterns. In addition to the plan, the competent authority has developed voluntary treatment guidelines, but they still contain CIAs as second or third treatment option, with no restrictions on their use.

83. The competent authorities have identified low levels of awareness on AMR among veterinarians, and the veterinary association expressed concerns about veterinarians being financially dependent on farmers, which could restrict their treatment choices.

84. The authorities are now introducing a new risk-based approach to target veterinarians who are purchasing the largest quantities of CIAs. This approach may result in a better knowledge of the situation on the ground. However, in the absence of any legal basis on the prudent use of antimicrobials in animals, it might be difficult to achieve significant change in this respect. The competent authorities are placing great emphasis of the new EU Animal Health Law and on the Regulation on VMPs in order to have a legal base for a stricter approach. In the meantime, the Medicines Agency could assist the veterinary authorities in obtaining sales data from wholesalers and further cooperation could also be beneficial in tackling the low availability of VMPs.

85. In relation to the environmental sector, although the monitoring of the substances under the Water Framework Directive was not carried out in 2017 and 2018, it is planned to resume in 2019. Other monitoring programmes for residues of pharmacological substances in water are ongoing.

5 OVERALL CONCLUSIONS

According to various European surveillance networks, the antimicrobial consumption in the human health sector in Estonia is low, and the total sales of antimicrobials in the veterinary sector are moderate. However, the veterinary competent authorities are concerned about the increasing use of CIAs and the high levels of AMR. Although there is a low level of AMR in key bacteria obtained from human clinical isolates, there are hints that the current AMR situation in the human health sector might be evolving, with hospital outbreaks of resistant bacteria, growing numbers of patients with ESBL-producing Enterobacteriaceae and an increasing number of isolation-days in some hospitals.

The One Health approach to tackle AMR issues in Estonia is not yet established. Informal collaboration on AMR between the relevant competent authorities and stakeholders has started, but the establishment of the ISC is still pending. Whereas the veterinary AMR action plan for 2019-2023 is in place, the corresponding human health and environmental plans are due this year, as well as the finalisation of the overarching national One Health AMR action plan.

The competent authorities have recognised the need to raise the awareness on AMR among healthcare providers in the human health and veterinary sectors, relevant stakeholders and the general public. Concrete examples in this regard are included in the veterinary AMR action plan and it is expected that awareness-raising will feature prominently in the action plans which are still pending.

In the human health sector, the relatively limited size of the problem of AMR has led to underestimating the potential consequences that AMR could have in the future, and possibly to de-prioritising the necessary measures to safeguard the healthcare system from AMR threats. Current surveillance and control includes a lot of manual work, individual effort and personal connections, and these may not be sufficient to face potential future challenges. While hospitals seemed to cope well with the small numbers of patients with multidrug-resistant organisms at the time of the visit, the situation might change if the prevalence of AMR increases. The human resources allocated to the national coordination and oversight of AMR related work raise questions about their sustainability, as the resources did not seem to be proportionate to the scope of activities and the workload. There was also a lack of national funding for implementing improvements in diagnostic capacity and surveillance, including the absence of a functioning public AMR reference laboratory for human health.

In the veterinary sector, the competent authorities are introducing a new risk-based approach to target veterinarians purchasing the largest quantities of CIAs, an approach which may result in a better knowledge of the situation on the ground. However, in the absence of any legal basis on the prudent use of antimicrobials in animals, it might be difficult to achieve

significant change in this respect. In particular, the veterinary action plan sets targets to reduce the use of CIAs, but these are expressed as a 30 % reduction in sales by 2023, which could be achieved if the animal population decreases without any real change in prescribing patterns.

In relation to the environmental sector, although the monitoring of the substances under the Water Framework Directive was not carried out in previous years, it is planned to resume in 2019. Other monitoring programmes for residues of pharmacological substances in water are ongoing.

6 CONSIDERATIONS FOR POSSIBLE FUTURE ACTIONS

6.1.1 One Health aspects of AMR

The visit team identified the following points under the One Health approach which may be useful to be taken into consideration by the relevant competent authorities in further developing and implementing the national AMR One Health Action Plan and sectoral action plans:

- Proceeding with the establishment of the ISC and making sure that representatives of GPs, paediatricians, pharmacists, microbiologists, dentists and nurses are included into the human health subcommittee.
- Finalising the national One Health AMR action plan and ensuring that the proposed activities are aligned with and incorporated into the corresponding human, veterinary and environmental AMR plans.
- Increasing the awareness on AMR and the appropriate use of antimicrobials in the population and healthcare professionals through national campaigns and availability of information material, with wide involvement of stakeholders (such as professional associations and scientific societies, GPs, nurses, pharmacists, veterinarians, educators, student associations and the civil society) and use of available information channels (social media campaigns, websites, media outreach and letters). Focusing on specific target audiences and topics. Implementing simple performance indicators such as web visits, media clippings, social media reach and event participation. Creating a long-term communication strategy involving all relevant actors/organisations at the national level.

6.1.2 Human aspects of AMR

Concerning human health and based on the visit's observations and conclusions, the ECDC team identified the following points which may be useful to be taken into consideration by the relevant competent authorities in further developing and implementing the national AMR One Health action plan and the human health action plan:

- Strengthening the functions of the Health Board to work on AMR and antimicrobial use in order to improve the capacity to investigate and respond to emerging AMR threats at national level.
- Ensuring the availability of an adequately funded AMR reference laboratory with capacity for molecular testing to support the detection and investigation of AMR threats. Determine the criteria for sending of isolates to this reference laboratory.
- Establishing a national AMR surveillance system by linking the existing laboratory information systems of local clinical microbiology laboratories to a central registry. This system should include a feedback mechanism to the local clinical microbiology laboratories.
- Updating and implementing the existing guidelines for the treatment of infections in the community taking into account recent recommendations on short duration of therapy.
- Providing analysis and reports on antimicrobial consumption in the community at regional/local level and feedback to prescribers on prescription practices using data from National Health Insurance Fund.
- Developing national guidelines for surgical prophylaxis, the treatment of infections in hospitals, and IPC guidelines for hospitals that include recommendations for the screening of high-risk patients for MDRO carriage.
- Collecting data on antimicrobial consumption from hospital pharmacies at national level and provide feedback to the hospitals on their antimicrobial consumption level and patterns.
- Formalising and strengthening the training on antimicrobial use and IPC for postgraduate health professionals. Making sure that the e-learning module on AMR for doctors is properly advertised and repeated early, providing opportunities to "train the trainers". In hospitals, considering using material from the EAAD toolkit for healthcare professionals in hospital with key messages translated in Estonian [25].
- Including antibiotic stewardship in the basic training of pharmacists in order to enable the formation of multidisciplinary antibiotic stewardship teams. Engaging pharmacists in antimicrobial stewardship and AMR information campaigns.
- Designating a national focal point for e-Bug and liaising with the Ministry of Education for the implementation of e-Bug in Estonia.
- Exploring the potential of including indicators of the appropriateness of antimicrobial prescribing in the quality bonus scheme of the National Health Insurance Fund.
- Including diagnosis and treatment of infectious diseases in the decision support tool that is under development by the National Health Insurance Fund.

[25] https://antibiotic.ecdc.europa.eu/et/tervishoiutootajatele/materjalid-haiglate-ja-teiste-tervishoiuasutuste-tootajatele

6.1.3 Veterinary and environmental aspects of AMR

The Commission team identified the following points which may be useful to be taken into consideration by the relevant competent authorities in further developing and implementing the national AMR One Health action plan and the veterinary and environmental action plans:

- Considering development of regulatory measures to strengthen the actions promoting the prudent use of antimicrobials and, in particular, restricting the use of the CIAs.
- Exercising caution when interpreting the sales data of CIAs in relation to the 30% reduction target as per the veterinary action plan.
- Promoting better availability and use of diagnostics and AST to improve the reduced and responsible use of antimicrobials.
- Exploring the ways to enhance the veterinary competent authorities' cooperation with other competent authorities, in particular with the Medicines Agency, in order to obtain more easily sales data from wholesalers. This should allow to target the lack of prudent use of antimicrobials and to tackle the low availability of VMPs.
- Considering ways to obtain the data on antimicrobials, including medicated feed imported from other Member States in order to gain a better picture of the antimicrobials used in animals. Where appropriate, the veterinary competent authorities could consider using the data obtained by the environmental competent authorities.
- Including actions to fight AMR in the companion animals' sector, in particular awareness-raising, developing IPC and treatment guidelines to reduce the need for antibiotics and to tackle the lack of prudent use of antimicrobials.
- For the environmental competent authorities, liaising with the Commission services on interpretation of the Water Framework Directive, ensuring that the monitoring of the antimicrobials included under the watch list is carried out at the required frequency.

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 29 March 2019.

ANNEX 1 – LEGAL REFERENCES

Legal Reference	Official Journal	Title
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. 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
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
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
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

Council Rec. 2002/77/EC	Official Journal L 034 , 05/02/2002 P. 0013 - 0016	Council Recommendation of 15 November 2001 on the prudent use of antimicrobial agents in human medicine