Update on the EU Agencies activities in the field of AMR

Ole Heuer (ECDC)
Pierre-Alexandre Beloeil (EFSA)
Barbara Freischem (EMA)

AMR One Health meeting,
15 October 2019, 10:00h – 17:00h,
Conference Centre A. Borschette, Room 2A, Rue Froissart 36, Brussels

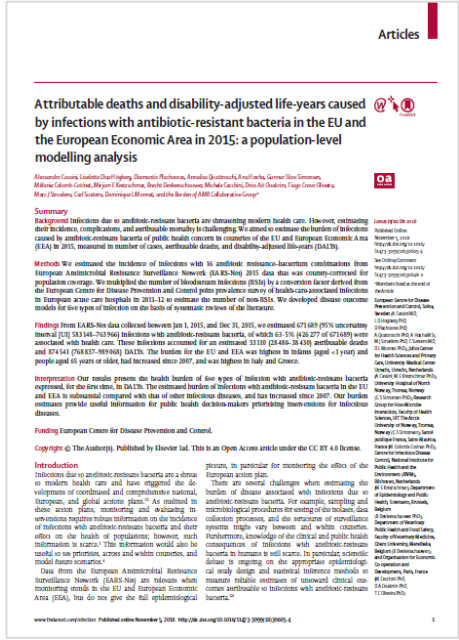
European Centre for Disease Prevention and Control

Update on EU Agencies Activities on AMR (ECDC)

Ole Heuer, DVM, PhD, Senior Expert and Group Leader Surveillance, SRS Unit, ECDC

AMR One Health Network Meeting, Brussels, 15th October, 2019

ECDC outputs in 2018



https://www.ecdc.europa.eu/sites/portal/files/documents/AMR-surveillance-EARS-Net-2017.pdf
https://www.ecdc.europa.eu/sites/portal/files/documents/ESAC-NET-reportAER-2017-updated.pdf
https://ec.europa.eu/health/amr/action_eu_en
http://www.oecd.org/health/health-systems/AMR-Tackling-the-Burden-in-the-EU-OECD-ECDC-Briefing-Note-2019.pdf
Cassini A, et al. Lancet Infectious Diseases 5 November 2018;
Plachouras D, et al.; Ricchizzi E, et al.; Suetens C, et al. Eurosurveillance 15 November 2018.

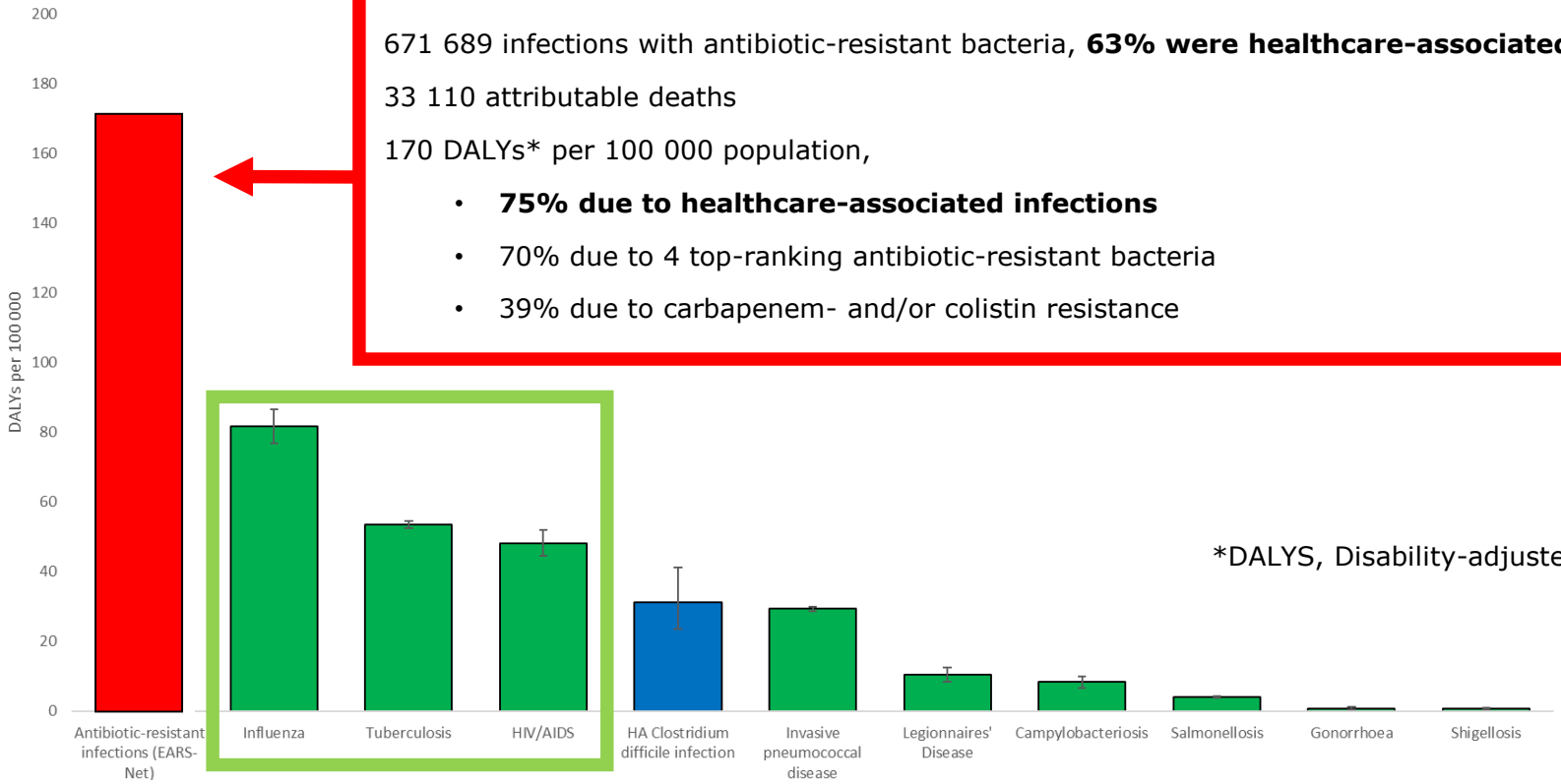
Burden of infections with antibiotic-resistant bacteria is comparable to burden of influenza, TB & HIV/AIDS combined

671 689 infections with antibiotic-resistant bacteria, **63% were healthcare-associated infections**

33 110 attributable deaths

170 DALYs* per 100 000 population,

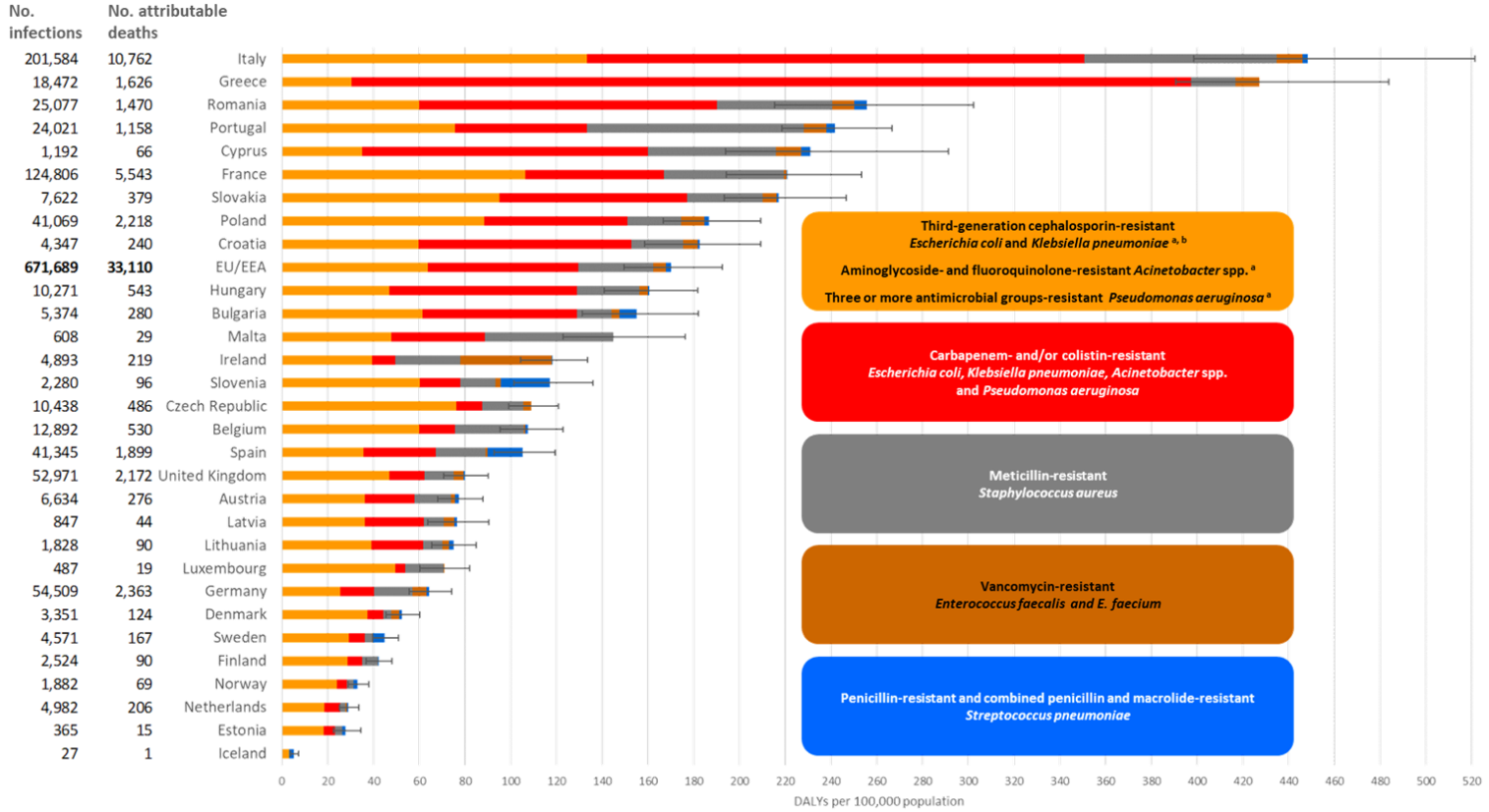
- **75% due to healthcare-associated infections**
- 70% due to 4 top-ranking antibiotic-resistant bacteria
- 39% due to carbapenem- and/or colistin resistance



*DALYS, Disability-adjusted life years

Adapted from: Cassini A, et al. Eurosurveillance 2018;23(16):pii=17-00454; Cassini A, et al. Lancet Infectious Diseases. 5 November 2018.

Estimated burden of infections with antibiotic-resistant bacteria, age-group standardised, EU/EEA, 2015



Source: Cassini A, et al. Lancet Infectious Diseases. 5 November 2018.

Upcoming ECDC outputs in 2019

- **Mid-October**
  - **Update on AMR and antimicrobial consumption data in humans** (AMR: ECDC Atlas; Antimicrobial consumption: ESAC-Net database) made publicly available
  - Media toolkit, including summary of surveillance reports made available to each EU/EEA country under embargo
- **Early November**
  - Report from a survey on healthcare workers' knowledge and attitudes about antibiotics and antibiotic resistance made available to each EU/EEA country under embargo
- **Monday 18 November: European Antibiotic Awareness Day**
  - **EAAD event**, Europahuset, Stockholm
  - **Reports** (EARS-Net 2018, ESAC-Net 2018, Survey of healthcare workers' knowledge and attitudes made publicly available (end of embargo)

Interagency work (ECDC, EMA, EFSA) in response to EC request for a third JIACRA report

Joint Interagency Antimicrobial Consumption and Resistance Analysis (JIACRA)

Purpose

To provide integrated analysis of relationships between AMC in human and veterinary medicine, and the occurrence of AMR in bacteria from humans and food-producing animals

Published

1st JIACRA report Jan 2015
https://ecdc.europa.eu/en/publications-data/ecdcefsaema-first-joint-report-integrated-analysis-consumption-antimicrobial

2nd JIACRA report July 2017
https://ecdc.europa.eu/en/publications-data/ecdcefsaema-second-joint-report-integrated-analysis-consumption-antimicrobial

(3rd JIACRA report to be published in December, 2020)

JIACRA III report

- Analysis of on data from **five EU-wide surveillance networks** managed by the three agencies (ECDC, EFSA, EMA)
- Present results of analysis to assess the **relationship between AMC and AMR in food-producing animals and humans**
- Conclusions and recommendations in a **one-health perspective** based on results of integrated analysis of data from the five surveillance network

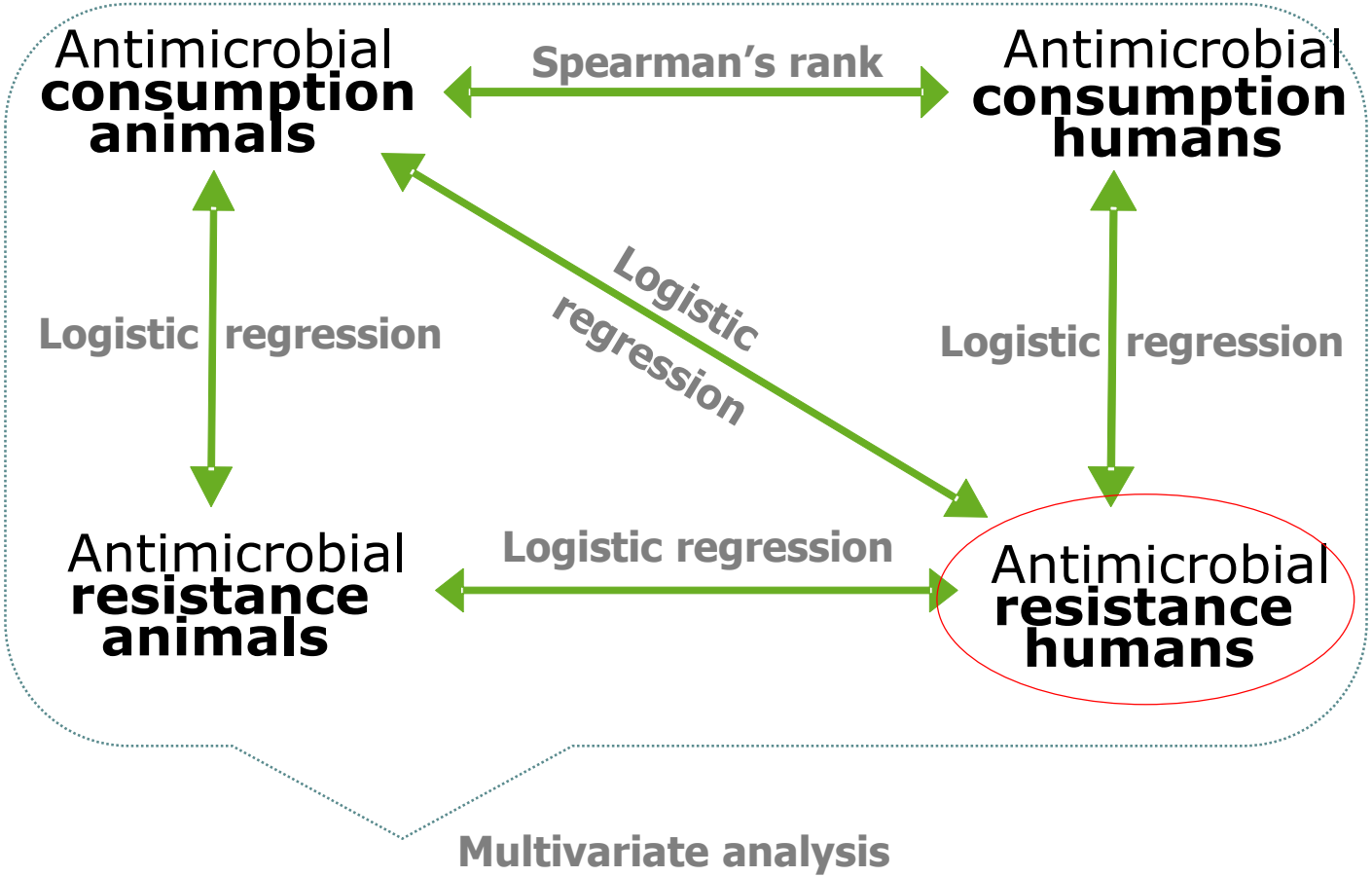
JIACRA III report

Joint Interagency Antimicrobial Consumption and Resistance Analysis (JIACRA)

Analysis, report production and content of JIACRA III

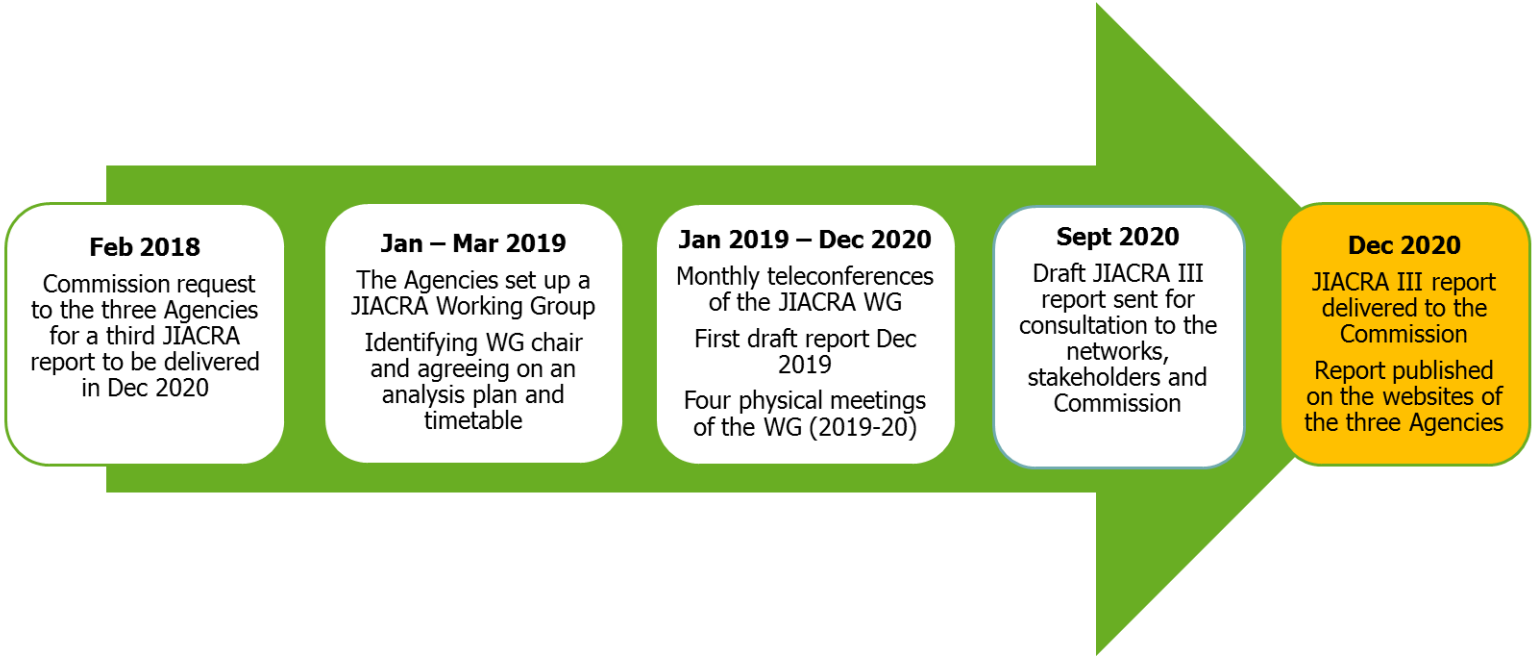
- *Joint Working Group of staff and external experts from the three Agencies*
- *ECDC coordinates the work and ECDC provides the chair of the WG (JIACRA III)*
- *Monthly teleconferences of the JIACRA III WG and 3-4 physical meetings/year in 2019 and 2020*
- *Main bacterial pathogens considered: Salmonella, Campylobacter, E. coli, K. pneumoniae, (E. faecium)*
- *Data on antimicrobial resistance: 3rd- and 4th-generation cephalosporins, fluoroquinolones, aminopenicillins, macrolides, tetracyclines, polymyxines, carbapenems, glycopeptides*
- *Data on antimicrobial consumption: Total antimicrobial consumption in humans and animals (mg/kg)*

JIACRA reports



Interagency work (ECDC, EMA, EFSA) in response to EC request for a third JIACRA report

Joint Interagency Antimicrobial Consumption and Resistance Analysis (JIACRA)



EUROPEAN ANTIBIOTIC AWARENESS DAY

A EUROPEAN HEALTH INITIATIVE

English (en)

Plan a campaign | For healthcare workers | Get informed | Get involved | Campaigns in Europe | News | About

Communicating to professionals in hospitals and long-term care facilities

Up to half of all antibiotic use in hospitals is unnecessary of inappropriate. Antibiotic misuse in hospitals is a major driver of antibiotics resistance. What can be done?

View materials

New communication toolkit | Patient stories | Data and reports

#KeepAntibioticsWorking: join us on social media!

As a healthcare professional, **what can you do to keep antibiotics working?** What can a patient association do to contribute? What can policymakers do at European level? What can a parent do? Everyone can join the campaign on European Antibiotics Awareness Day- posting his/her own **message**, **picture** or **video** using the **#KeepAntibioticsWorking** hashtag. Tell the world what you do, in your professional or personal life, at individual or collective level, to use antibiotics responsibly and **#KeepAntibioticsWorking!**

Read about the #KeepAntibioticsWorking campaign

https://antibiotic.ecdc.europa.eu

Thank you!

EUROPEAN ANTIBIOTIC AWARENESS DAY

A EUROPEAN HEALTH INITIATIVE

18 November

E-mail: EAAD@ecdc.europa.eu
Website: http://antibiotic.ecdc.europa.eu
Facebook: EAAD.EU
Twitter: @EAAD_EU (#EAAD #KeepAntibioticsWorking)
Global Twitter: #AntibioticResistance

WORLD ANTIBIOTIC AWARENESS WEEK

18-24 NOVEMBER

ANTIBIOTICS HANDLE WITH CARE

EUROPEAN MEDICINES AGENCY
SCIENCE MEDICINES HEALTH

Update from the EMA on AMR-related activities

Focus in 2019

European Commission AMR One Health Network,
15 October 2019

Presented by Barbara Freischem,
Head of Department, Veterinary Surveillance and Regulatory Support

The European Medicines Agency

Since March 2019 in
Amsterdam, the Netherlands

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SPARK building
Orlyplein 24
1043 DP Amsterdam

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1083 HS Amsterdam

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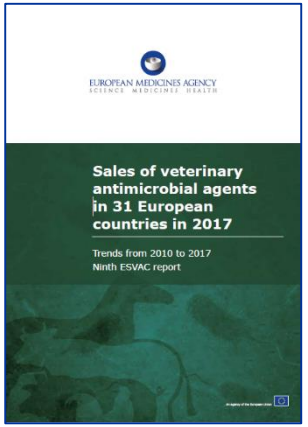
Outline

1. ESVAC report 2019
2. Implementation of the new veterinary regulation, Regulation (EU) 2019/6
3. Antimicrobial Advice Ad Hoc Expert Group (AMEG)
4. Other relevant activities

1. ESVAC 2019 report *(2017 sales data)*

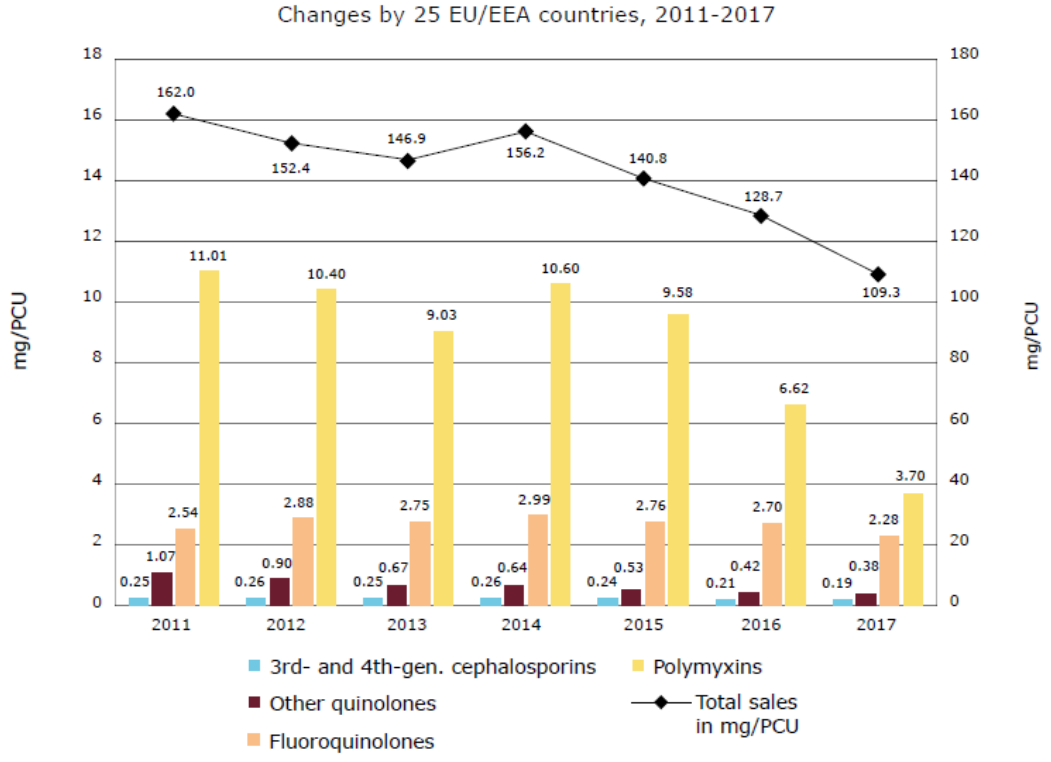
9 countries
(2009)

31 countries
(2017)



- Drop in sales (mg/PCU) of 32.5% since 2011 (25 countries)
- Sales in 2017 varied from 3.1 to 423.1 mg/PCU (median=61.9 mg/PCU)
- All EU Member States report since 2017 (plus 2 EEA countries & Switzerland)

1. ESVAC 2019 report



[1] Austria, Belgium, Bulgaria, Cyprus, Czechia, Denmark, Estonia, Finland, France, Germany, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden and United Kingdom.

Changes in sales over time - 2011 to 2017 in 25 countries

1. ESVAC 2019 report

Spatial distribution of overall sales of all antimicrobials for food-producing animals, in mg/PCU, for 31 countries, for 2017

2. Implementation of the new veterinary regulation, Regulation (EU) 2019/6

New rules on veterinary medicines and medicated feed

- Regulation (EU) 2019/4 on medicated feed
- Regulation (EU) 2019/5 amending the tasks of the EMA
- Regulation (EU) 2019/6 on veterinary medicines

} apply from 28 Jan. 2022

- Key objectives include
  - Tackling AMR
  - Reduction of administrative burden
  - Aligning rules on oral administration

2. Implementation of Regulation (EU) 2019/6

Main **objectives** :

- simplify the regulatory environment and reduce administrative burden for pharmaceutical companies developing veterinary medicines, for example through streamlined pharmacovigilance rules;
- stimulate the development of innovative veterinary medicines, including products for small markets (minor use and minor species);
- improve the functioning of the internal market for veterinary medicines;
- strengthen EU action to fight antimicrobial resistance through specific measures ensuring prudent and responsible use of antimicrobials in animals, including reserving certain antimicrobials for the treatment of infections in people.

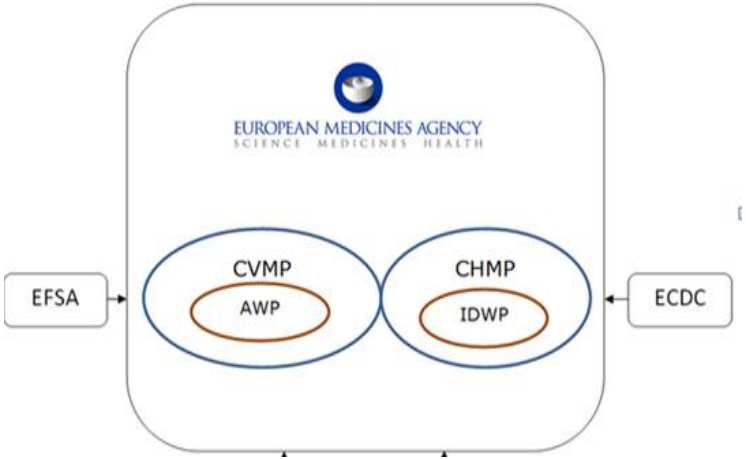
2. Implementation of Regulation (EU) 2019/6

EUROPEAN MEDICINES AGENCY

- Regulations (EU) 2019/4 and (EU) 2019/6 require the European Commission to adopt delegated and implementing acts
- In 2019:
  - EMA: 4 AMR-related request for advice
    - Criteria designating antimicrobials for human use only
    - Recommendations for substances/classes to be included
    - Recommendation on specific requirements for the collection of data on antimicrobial medicines used in animals
    - Format for the collection of data
  - EFSA: 1 AMR-related act
    - Specific limits for carry-over of 24 specific antimicrobials
  - Engagement of experts from relevant EU agencies

3. Antimicrobial Advice Ad Hoc Expert Group (AMEG)

- 2017-19: Revision of advice
  - **Preliminary Risk Profiling** – adopted in June 2019
  - **Categorisation** of antibacterials used in animals according to the risk that their use in animals poses to human health based on WHO's critically important antimicrobials
    - Public consultation → ended March 2019
    - Revision ongoing
    - Adoption at CVMP + CHMP → Dec. 2019
    - Publication Jan. 2020



4. Other activities of cross-Agency relevance

1. Reflection paper on antimicrobial resistance in the environment: considerations for current and future risk assessment of veterinary medicinal products
    - Published for public consultation on 16 November 2018
    - Consultation ended on 31 August 2019
    - Next steps dependent of the Agency moving out of business continuity in 2020
        - Finalisation in view of comments received
2. TATFAR – input into activity 1.4 - methodology for measuring and reporting the consumption of antimicrobials per species in veterinary medicine
3. Alternatives to Antimicrobials – EMA Reflection paper under revision

Any questions?

Further information

Barbara Freischem at barbara.freischem@ema.europa.eu

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AMR One Health meeting
15 October 2019
Conference Centre A. Borschette, Brussels

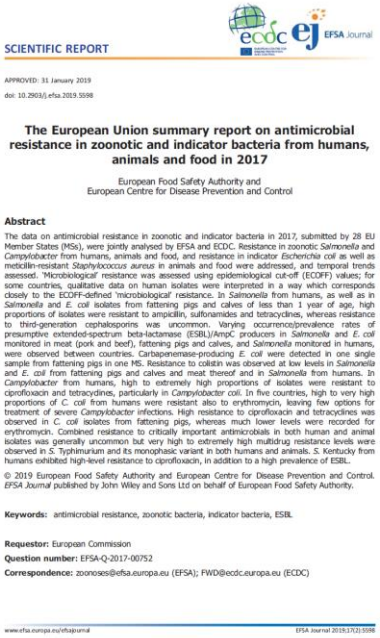
Update on AMR-related Mandates

Trusted science for safe food

efsa
European Food Safety Authority

Recent EFSA Outcomes on AMR monitoring

EFSA/ECDC 2018 EU SR on AMR



SCIENTIFIC REPORT

APPROVED: 31 January 2019

doi: 10.2903/j.efsa.2019.5598

The European Union summary report on antimicrobial resistance in zoonotic and indicator bacteria from humans, animals and food in 2017

European Food Safety Authority and
European Centre for Disease Prevention and Control

Abstract

The data on antimicrobial resistance in zoonotic and indicator bacteria in 2017, submitted by 28 EU Member States (MSs), were jointly analysed by EFSA and ECDC. Resistance in zoonotic *Salmonella* and *Campylobacter* from humans, animals and food, and resistance in indicator *Escherichia coli* as well as meticillin-resistant *Staphylococcus aureus* in animals and food were addressed, and temporal trends assessed. 'Microbiological' resistance was assessed using epidemiological cut-off (ECOFF) values; for some countries, qualitative data on human isolates were interpreted in a way which corresponds closely to the ECOFF-defined 'microbiological' resistance. In *Salmonella* from humans, as well as in *Salmonella* and *E. coli* isolates from fattening pigs and calves of less than 1 year of age, high proportions of isolates were resistant to ampicillin, sulfonamides and tetracyclines, whereas resistance to third-generation cephalosporins was uncommon. Varying occurrence/prevalence rates of presumptive extended-spectrum beta-lactamase (ESBL)/AmpC producers in *Salmonella* and *E. coli* monitored in meat (pork and beef), fattening pigs and calves, and *Salmonella* monitored in humans, were observed between countries. Carbapenemase-producing *E. coli* were detected in one single sample from fattening pigs in one MS. Resistance to colistin was observed at low levels in *Salmonella* and *E. coli* from fattening pigs and calves and meat thereof and in *Salmonella* from humans. In *Campylobacter* from humans, high to extremely high proportions of isolates were resistant to ciprofloxacin and tetracyclines, particularly in *Campylobacter coli*. In five countries, high to very high proportions of *C. coli* from humans were resistant also to erythromycin, leaving few options for treatment of severe *Campylobacter* infections. High resistance to ciprofloxacin and tetracyclines was observed in *C. coli* isolates from fattening pigs, whereas much lower levels were recorded for erythromycin. Combined resistance to critically important antimicrobials in both human and animal isolates was generally uncommon but very high to extremely high multidrug resistance levels were observed in *S.* Typhimurium and its monophasic variant in both humans and animals. *S.* Kentucky from humans exhibited high-level resistance to ciprofloxacin, in addition to a high prevalence of ESBL.

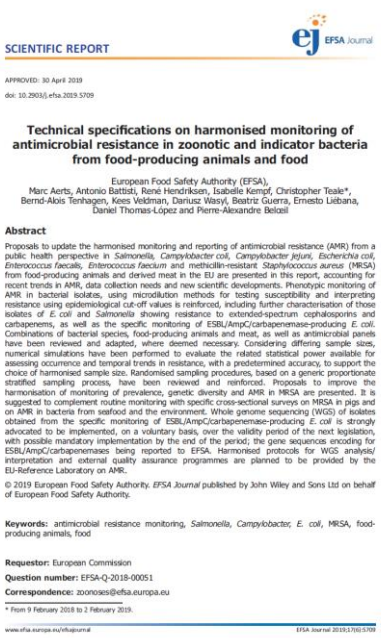
Keywords: antimicrobial resistance, zoonotic bacteria, indicator bacteria, ESBL

Requestor: European Commission

Question number: EFSA-Q-2017-00752

Correspondence: zoonoses@efsa.europa.eu (EFSA); FWD@ecdc.europa.eu (ECDC)

Technical Specifications on AMR monitoring



SCIENTIFIC REPORT

APPROVED: 30 April 2019

doi: 10.2903/j.efsa.2019.5709

Technical specifications on harmonised monitoring of antimicrobial resistance in zoonotic and indicator bacteria from food-producing animals and food

European Food Safety Authority (EFSA),
Marc Aerts, Antonio Battisti, René Hendriksen, Isabelle Kempf, Christopher Teale*,
Bernd-Alois Tenhagen, Kees Veldman, Dariusz Wasyl, Beatriz Guerra, Ernesto Liebana,
Daniel Thomas-López and Pierre-Alexandre Belœil

Abstract

Proposals to update the harmonised monitoring and reporting of antimicrobial resistance (AMR) from a public health perspective in *Salmonella*, *Campylobacter coli*, *Campylobacter jejuni*, *Escherichia coli*, *Enterococcus faecalis*, *Enterococcus faecium* and methicillin-resistant *Staphylococcus aureus* (MRSA) from food-producing animals and derived meat in the EU are presented in this report, accounting for recent trends in AMR, data collection needs and new scientific developments. Phenotypic monitoring of AMR in bacterial isolates, using microdilution methods for testing susceptibility and interpreting resistance using epidemiological cut-off values is reinforced, including further characterisation of those isolates of *E. coli* and *Salmonella* showing resistance to extended-spectrum cephalosporins and carbapenems, as well as the specific monitoring of ESBL/AmpC/carbapenemase-producing *E. coli*. Combinations of bacterial species, food-producing animals and meat, as well as antimicrobial panels have been reviewed and adapted, where deemed necessary. Considering differing sample sizes, numerical simulations have been performed to evaluate the related statistical power available for assessing occurrence and temporal trends in resistance, with a predetermined accuracy, to support the choice of harmonised sample size. Randomised sampling procedures, based on a generic proportionate stratified sampling process, have been reviewed and reinforced. Proposals to improve the harmonisation of monitoring of prevalence, genetic diversity and AMR in MRSA are presented. It is suggested to complement routine monitoring with specific cross-sectional surveys on MRSA in pigs and on AMR in bacteria from seafood and the environment. Whole genome sequencing (WGS) of isolates obtained from the specific monitoring of ESBL/AmpC/carbapenemase-producing *E. coli* is strongly advocated to be implemented, on a voluntary basis, over the validity period of the next legislation, with possible mandatory implementation by the end of the period; the gene sequences encoding for ESBL/AmpC/carbapenemases being reported to EFSA. Harmonised protocols for WGS analysis/interpretation and external quality assurance programmes are planned to be provided by the EU-Reference Laboratory on AMR.

Keywords: antimicrobial resistance monitoring, *Salmonella*, *Campylobacter*, *E. coli*, MRSA, food-producing animals, food

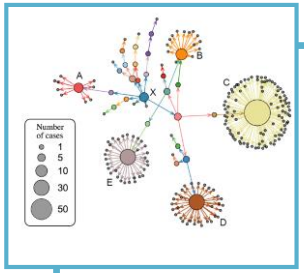
Requestor: European Commission

Question number: EFSA-Q-2018-00051

Correspondence: zoonoses@efsa.europa.eu

* From 9 February 2018 to 2 February 2019.

Update on AMR-related Mandates



. EFSA ECDC WGS Data Collection and Analysis

. NGS for Risk Assessment

. Environment and AMR

. AMR GP Feed Residues

EU Mandate EFSA-ECDC WGS

"Technical support to collect and analyse whole genome sequencing (WGS) data in the joint ECDC-EFSA molecular typing database"

at least *L. monocytogenes*, *Salmonella*, *E.coli*

- **ToR1:** to analyse **outcome of ECDC and EFSA Surveys on WGS** capacity for foodborne pathogens in MSs (food and PH).
- **ToR2:** … to assess the **state of the art of pipelines** for collecting and analysing WGS data…
- **ToR3:** … to assess **needs/requirements** for analysis and comparability; interactions among databases; roles and responsibilities.
- **ToR4:** to prepare a **Technical Report**: identification, comparison of potential solutions for a joint EFSA-ECDC.

Published in May 2019, https://efsa.onlinelibrary.wiley.com/doi/epdf/10.2903/sp.efsa.2019.EN-1337

=> ECDC-EFSA are drafting a road map for implementation: basis for a new upcoming EC Mandate

efsa
European Food Safety Authority

BIOHAZ Panel

Opinion on the application and use of Next Generation Sequencing (including Whole Genome Sequencing) for risk assessment of foodborne microorganisms

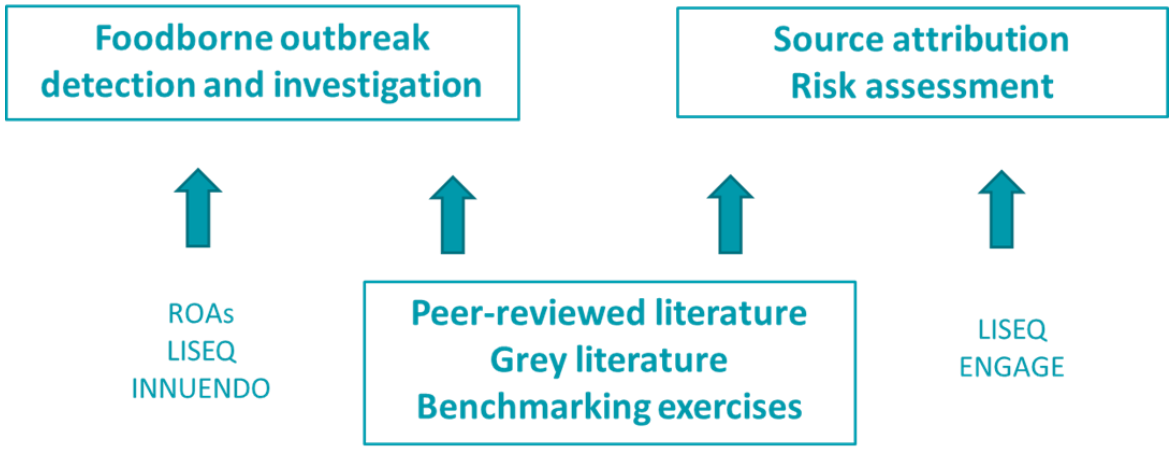
(by 31 December 2019)

BIOHAZ Panel is asked to issue
a **Scientific Opinion** on **Whole Genome Sequencing and Metagenomics** for **outbreak investigation**, **source attribution** and **risk assessment of foodborne microorganisms**.

1. Evaluate the **possible use of NGS** (e.g. WGS and metagenomic strategies) in **foodborne outbreak detection/investigation** and **hazard identification** (e.g. generation of data on virulence and AMR genes, plasmid typing) based on the outcomes of **the ongoing WGS outsourcing activities**, **experience from different countries** and **underlining the added value for risk assessment**.

2. Critically analyse **advantages, disadvantages and limitations of existing NGS-based methodologies** (including WGS an metagenomics) as compared to **microbiological methods cited in the current EU food legislation** (e.g. *Salmonella* serotyping, STEC monitoring, AMR testing), taking into account benchmarking exercises.

ToR 1. Possible use of NGS: added value for MRA



- **ROA**: EFSA/ECDC Rapid Outbreak Assessments
- **LISEQ**: EFSA's tender on 'closing data gaps for performing risk assessment on *L. monocytogenes* in ready-to-eat (RTE) Foods - activity 3: the comparison of isolates from different compartments along the food chain, and from humans using whole genome sequencing (WGS) analysis'
- **INNUENDO**: EFSA's thematic grant on 'analytical platform and standard procedures for the integration of WGS to surveillance and the outbreak investigation of food-borne pathogens in the context of small countries with limited resources'
- **ENGAGE**: EFSA's thematic grant on 'establishing next generation sequencing ability for genomic analysis in Europe'

ToR 2. To critically analyse existing NGS-based methodologies

- **Classical microbiological methods required in the EU food safety legislation**
  - *Salmonella* serotyping
  - STEC serogroup identification
  - **AMR monitoring in zoonotic and comensal bacteria**

- **SWOT analysis of NGS-based alternative methods**
  - Strengths
  - Weaknesses
  - Opportunities
  - Treats
  - Consider benchmarking exercises

Adoption of the draft opinion by the BIOHAZ Panel tabled for the plenary meeting on **23-24 October 2019**

NGS for Risk Assessment: AMR monitoring

Table of contents

3.7. Microbiological methods used in the scope of current EU food legislation and SWOT analysis of NGS-based alternatives 37
3.7.1. *Salmonella* serotyping 37
3.7.2. STEC serotyping 41
3.7.3. SWOT analysis of WGS-based *Salmonella*/STEC serotyping 44
3.7.4. Monitoring of antimicrobial resistance in zoonotic and commensal bacteria 45
3.7.4.1. SWOT analysis of WGS-based AMR monitoring 45
3.7.4.2. SWOT analysis of metagenomics-based AMR monitoring 51
3.7.5. Concluding remarks: 51
4. Conclusions 54
5. Recommendations (if appropriate) 55
References 55
Glossary 66
Abbreviations 70
Appendix A – Closing data gaps for performing risk assessment on *L. monocytogenes* in ready-to-eat (RTE) Foods - activity 3: the comparison of isolates from different compartments along the food chain, and from humans using whole genome sequencing (WGS) analysis, LISEQ (SSI/ANSES/PHE/UA) 71
Appendix B – Establishing next generation sequencing ability for genomic analysis in Europe (ENGAGE) 73
Appendix C – Analytical platform and standard procedures for the integration of WGS to surveillance and the outbreak investigation of food-borne pathogens in the context of small countries with limited resources (INNUENDO) 74
Appendix D – EFSA/ECDC joint Rapid Outbreak Assessments (ROAs) 76
Appendix E – Uncertainty analysis 78

- Cross-referring to EFSA's report on '*Technical Specifications on harmonised monitoring of antimicrobial resistance in zoonotic and indicator bacteria from food-producing animals and food*'

- The assessment of this Opinion will confirm the conclusion that it would be appropriate to follow "***a gradual approach to the integration of WGS within the harmonized AMR monitoring***".

EC Mandate: Environment and AMR

BIOHAZ Panel

Self-tasking mandate for a scientific opinion on the role played by the environment in the emergence and spread of antimicrobial resistance (AMR) through the food chain

(by 31 December 2020)

WG: EFSA+ ECDC (1 member) + EMA (observer) + EEA (observer)

AMR, a major global threat

European Food Safety Authority

EU Action Plans against the threats of AMR

a One Health approach, addressing:

- **Man,**
- **Animals,**
- **Environment**

1st Action Plan 2011-2016

7 priority areas including '**intention to contain the risks of spreading AMR via the environment**'

*'need to **improve scientific understanding** of the role played by the environment in the emergence and transmission of resistance through animal, human and manufacturing waste in water and soil, and to **explore** what **action** may be **required to reduce associated risks**.'*

2nd Action Plan 2017 - ...

Specific actions to make the **EU** a **'best practice region'** including

*'better addressing the **role of the environment**'*

and

*'**closing knowledge gaps** on AMR in the environment'*

. WHO
. FAO
. OIE
. Codex Alimentarius

EFSA Advisory Forum

Priorities Areas of work, Rank Nr. 1

Background: the role of the environment

Environmental Sources…

. Effluents and/or residues from terrestrial/aquatic food-producing animals (e.g. slurry, manure, air)

. Post-harvest food plants (e.g. slaughterhouses and food processing plants)

. Urban and hospital wastewater treatment plants

. Crop production and horticulture (due to direct use of antimicrobials)

Food-producing environments (in the mandate):

all environments where food of animal or non-animal origin is produced/processed,

. **at primary level** (e.g. animal farms, fruits and vegetables cultivation fields etc.)

. **at post-harvest level** (e.g. slaughterhouses, processing plants etc.)

Food-producing environments can be contaminated: by R- bacteria/determinants from environmental sources …

Large uncertainties on the role played by the environment on emergence, spread and persistence of R-bacteria..

AMR from a 'One Health' perspective:

Environment also source of R-bacteria/genes to man and animals.

…and from there, R-bacteria/determinants

can further spread to man and animals …

What …

In relation to the food chain and environmental contamination with AMR bacteria/determinants, there is a need to **review scientific evidence**, to identify…

- Main sources and routes of transmission?
- Which AMR-bacteria/determinants - public health priority?
- Strategies and Control Options to mitigate the risks?

… to provide EU risk managers information on options to manage AMR-related risks at environmental level

To contribute to the fight against AMR

AMR and Environment: ToRs

ToR 1

To **identify** the **main environmental sources and transmission routes leading to the contamination of foods** of animal and non-animal origin **with antimicrobial-resistant bacteria and/or resistance determinants**

ToR 2

Among **antimicrobial-resistant bacteria and/or resistance determinants contaminating food** through the **routes identified** above, to **identify** the **ones of highest priority for public health**, if possible their **relative importance**, and the **main risk factors** influencing their **occurrence and persistence in food-producing environments and food**.

ToR 3

To **review** and, if possible, **assess** the **impact** of existing or new possible **strategies and options to mitigate the risk** of **emergence, spread** and **food-borne transmission** of the **antimicrobial-resistant bacteria** identified above

ToR 4

To **identify data gaps influencing the assessment** of the **food chain-related AMR risks posed by the environment** and **provide recommendations** to inform future EU research priorities on this topic

EC Mandate: AMR GP Feed Residues

Scientific Opinion to evaluate the specific maximum levels of cross-contamination for 24 antimicrobial active substances in non-target feed below which there would not be an effect on antimicrobial resistance, and the levels for which there would be growth promotion/increase yield

(by 30 September 2021)

- **WG: BIOHAZ** (leading), **AHAW**, **FEEDAP** Panel members, and external experts, as well as 1 expert representing **EMA**.

The EC requests **to assess the impact of the presence of low-level concentration in feed of 24 antimicrobial active substances … on animal health, human health and, where possible, on the environment.**

EC Mandate AMR GP Feed Residues

ToR 1

To assess the **specific concentrations of antimicrobials** resulting from **cross-contamination in non-target feed for food-producing animals,** below which there would not be an effect on the emergence of and/or selection for resistance in microbial agents relevant for human and animal health

- The **endpoint** for this assessment should be the **excretion of resistant bacteria** from the animals.
- The assessment should **consider the impact on the environment of low-level concentrations in feed**, where possible

ToR 2

To assess **which levels of the antimicrobials** have a **growth promotion/increase yield effect**.

Acknowledgements

- EC
- ECDC, EMA
- EFSA Scientific Panels
- Biocontam Unit

Thank you for your attention!