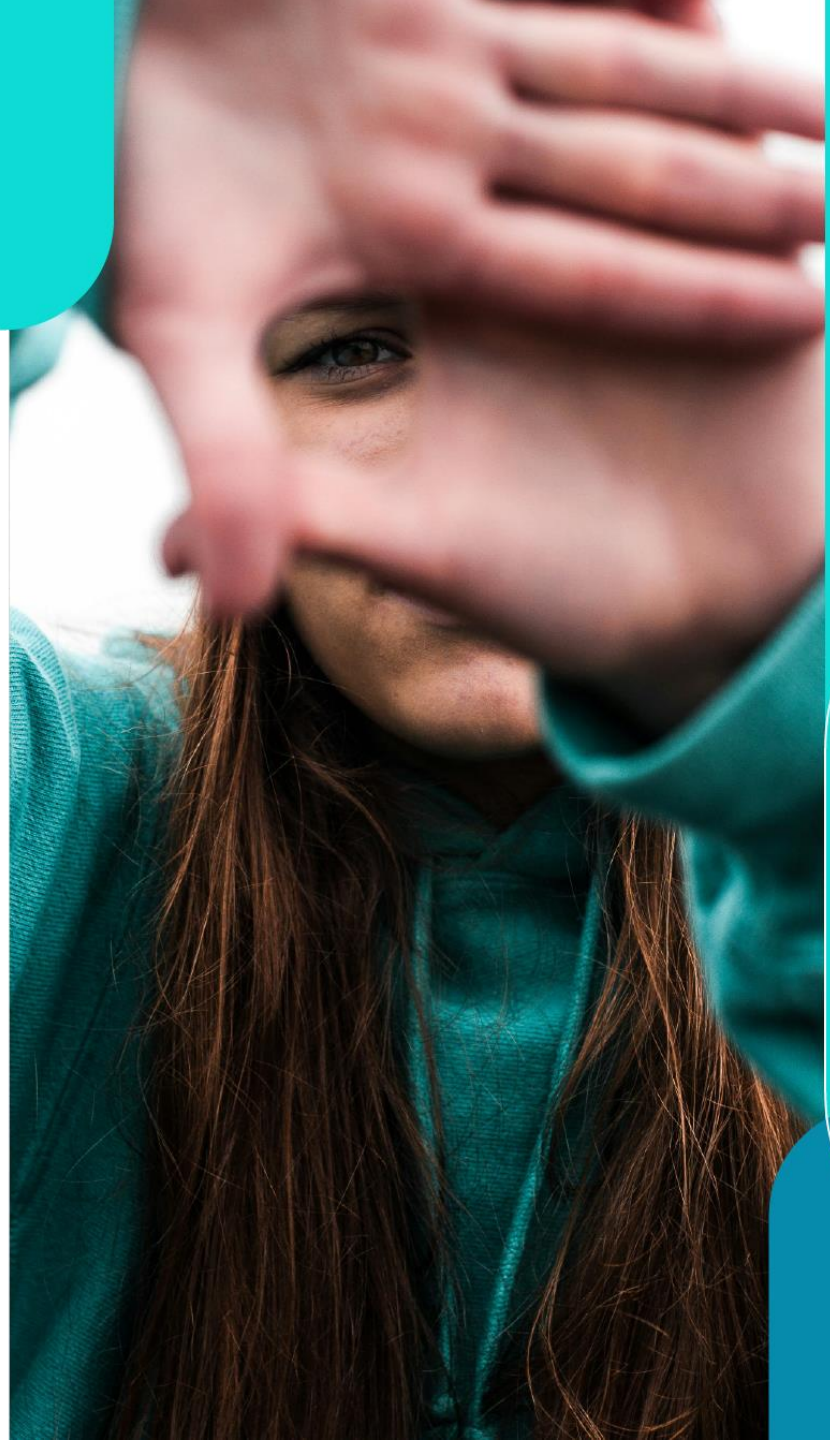
Towards One Health surveillance of AMR in Europe

Lucie Collineau, ANSES, France

Sofia Ny, Public Health Agency of Sweden

Heike Schmitt, National Institute for Public Health and the Environment (RIVM), The Netherlands

Moira Kelly, Sciensano, Belgium



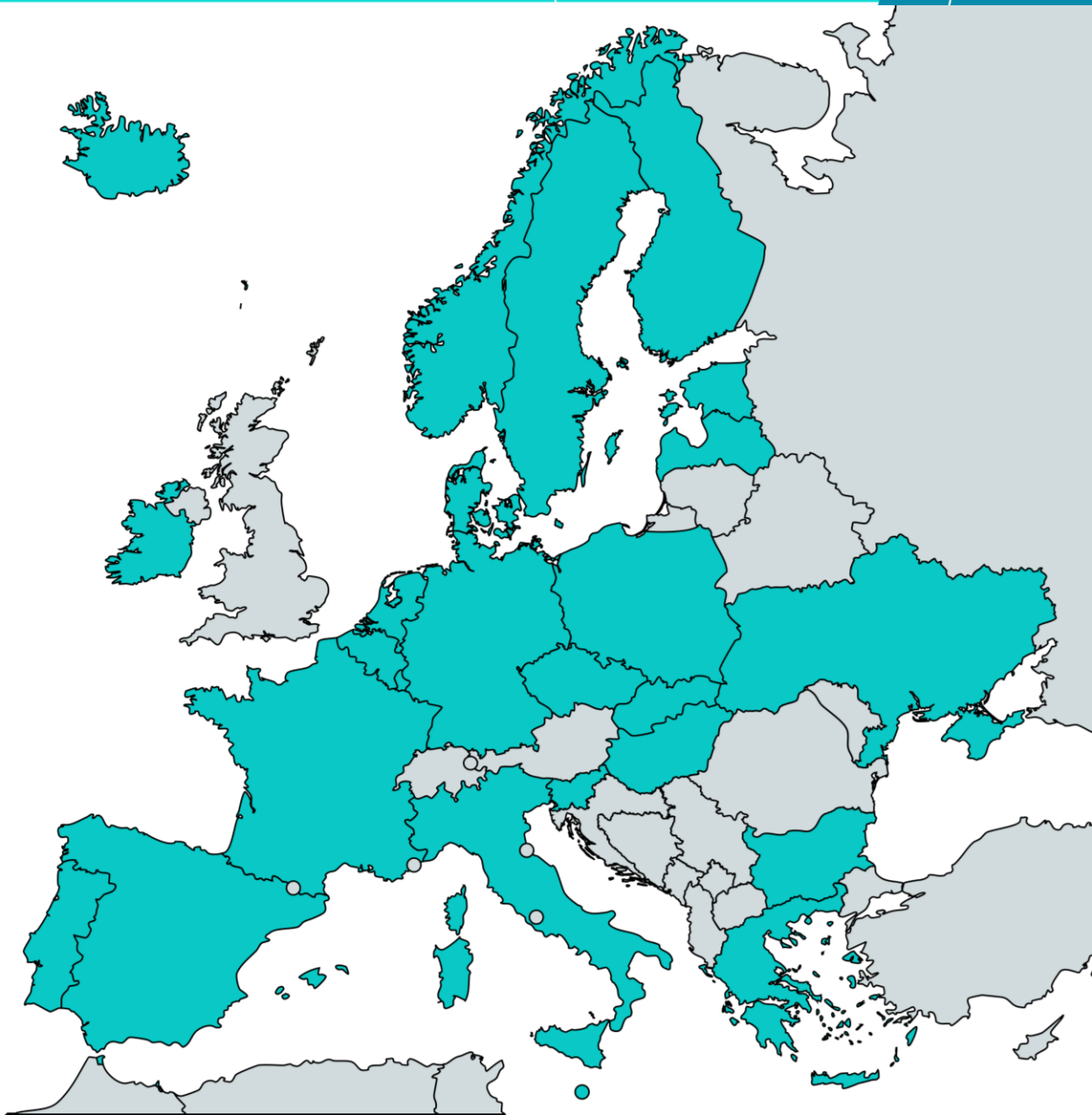
EU-JAMRAI

I- Introduction

Partnership, stakeholders and target groups

- 25 partner countries

- Main stakeholders/target groups
  - National AMR surveillance experts
  - National governmental agencies, expert laboratories and ministries
  - EU and UN agencies



Our objectives

To reinforce the European strategy for One Health surveillance of AMR

1. Strengthen the national surveillance systems on AMR in the human health sector
2. Achieve a full-scale implementation of the European AMR surveillance network in veterinary medicine (EARS-Vet)
3. Set up a European AMR surveillance network in the environmental sector (EARS-Env)
4. Develop a national annual One Health surveillance report in each participating member state

Our working umbrella

COUNCIL RECOMMENDATION

on stepping up EU actions to combat antimicrobial resistance in a One Health approach

(2023/C 220/01)

National Action Plans on AMR

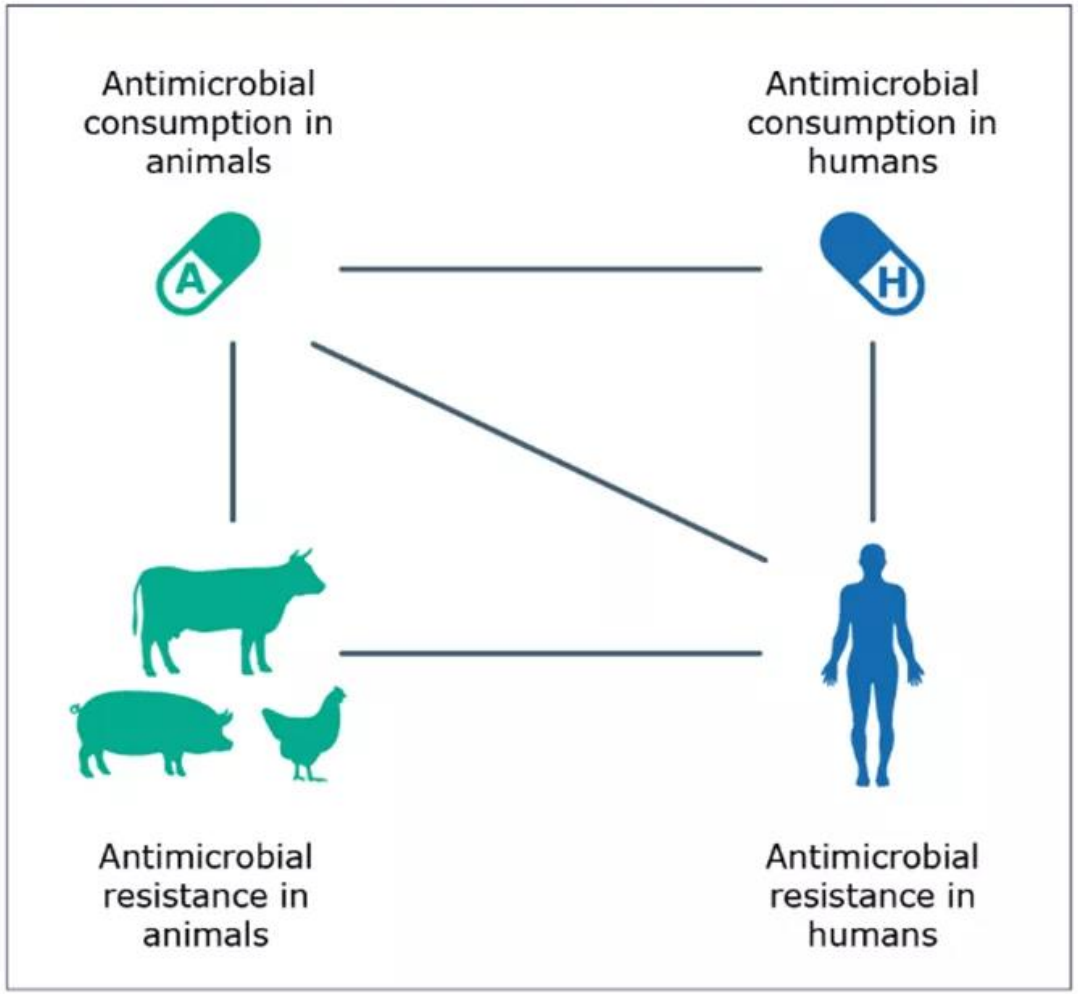
Surveillance of AMR in animals

Indicator type and number	Indicator
SURVEILLANCE Outcome Indicator 03	Extent of AMR surveillance in animals in each Member State
SURVEILLANCE Output Indicator 07	Extent to which monitoring and reporting of AMR is done in accordance with (Articles 1.4, 3 and 4 of) Commission Implementing Decision (EU) 2020/1729 on the monitoring and reporting of antimicrobial resistance in zoonotic and commensal bacteria

The JIACRA approach

Main gaps in the European surveillance

Environmental surveillance?



National integrated analysis of AMC and AMR?

Diseased animals?

Healthy animals

Carriage of zoonotic and indicator bacteria

Diseased humans

Bloodstream invasive infections

Other type of infections?

(JIACRA IV, 2019-2021). EFSA J. 2024

2- EARS-Vet and EARS-Env

Two networks to address AMR surveillance gaps

EARS-Vet: Surveillance of AMR in diseased animals

Lucie Collineau

French Agency for Food, Environmental and Occupational Health & Safety (ANSES), France

Diseased animals: a gap in the European AMR surveillance

So far, AMR surveillance in animals has been focusing on the food chain

- Harmonized active monitoring
- Indicator and zoonotic bacteria from healthy food-producing animals
- Valuable insights on **foodborne AMR transmission**

Limited data coverage

170 isolates, every second year in poultry, pig, cattle

No data about companion animals

Little guidance on antimicrobial stewardship in veterinary medicine

AMR surveillance in diseased animals also matters for public health

Example: the emergence of carbapenemase-producing Enterobacterales in food-producing and companion animals

Transboundary and Emerging Diseases

Research Article | Open Access

High Frequency of Detection of NDM-Producing Enterobacterales Among Companion Animals Hospitalized in an Italian Veterinary Teaching Hospital

R. Scarpellini, M. Pulido-Vadillo, C. Serna, B. Gonzalez-Zorn, J. L. Blanco, J. F. Delgado-Blas, M. Giunti, S. Piva

First published: 09 January 2025 | https://doi.org/10.1155/tbed/2622185

Research in Veterinary Science 183 (2025) 105497

Contents lists available at ScienceDirect

Research in Veterinary Science

journal homepage: www.elsevier.com/locate/rvsc

ELSEVIER

Carbapenem-resistant *Enterobacteriaceae* from dairy cattle milk: A systematic review and meta-analysis

Dian Meididewi Nuraini [a,b], Morsid Andityas [a,c], Peerapol Sukon [d], Patchara Phuektes [e,*]

Microbiol Spectr. 2024 Apr 2;12(4):e0341623. doi: 10.1128/spectrum.03416-23. Epub 2024 Ma

Carbapenemase-producing Enterobacterales strains causing infections in companion animals-Portugal

Joana Moreira da Silva [1 2], Juliana Menezes [1 2], Laura Fernandes [1 2], Sofia Santos Costa [3], Andreia Amaral [1 2], Constança Pomba [1 2 4]

Clin Microbiol Infect. 2018 Dec;24(12):1241-1250. doi: 10.1016/j.cmi.2018.04.004. Epub 2018 Apr 11.

Carbapenem-resistant Enterobacteriaceae in wildlife, food-producing, and companion animals: a systematic review

R Köck [1], I Daniels-Haardt [2], K Becker [3], A Mellmann [4], A W Friedrich [5], D Mevius [6], S Schwarz [7], A Jurke [2]

EARS-Vet

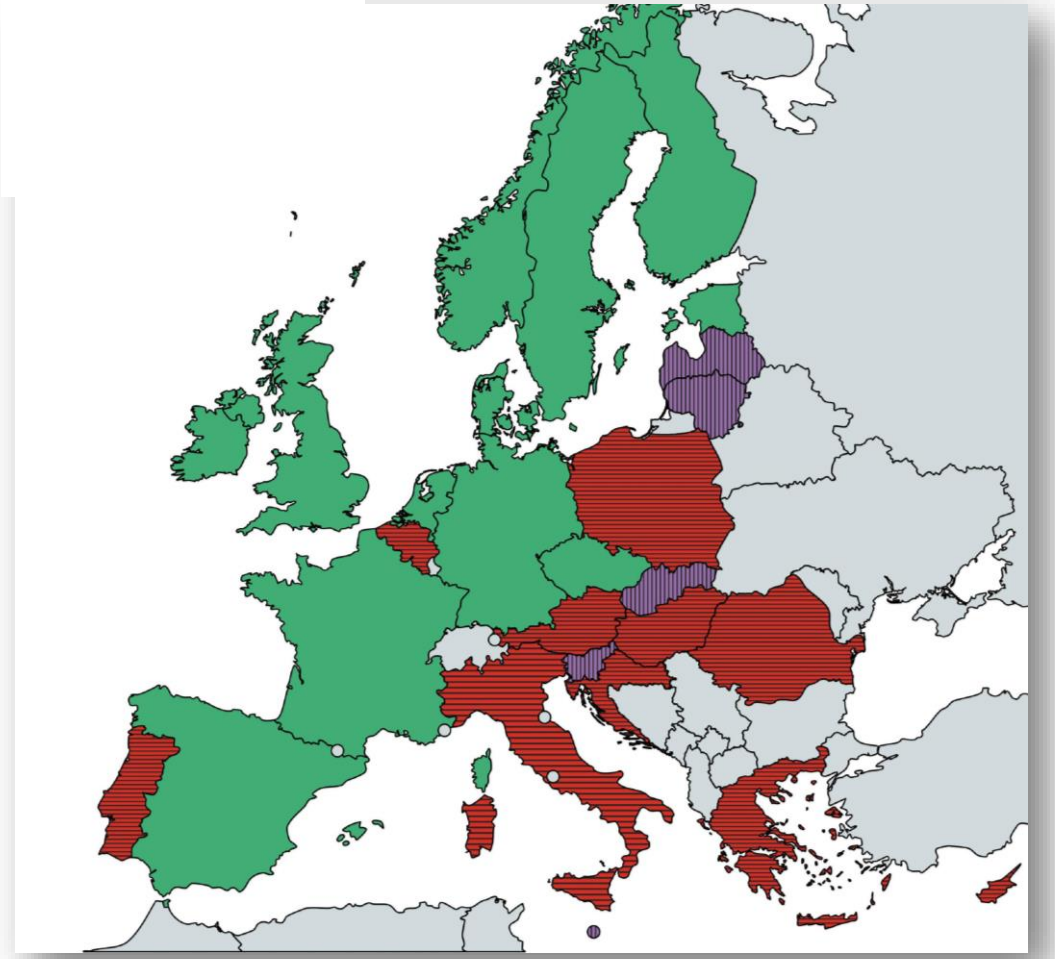
The European Antimicrobial Resistance Surveillance network in Veterinary medicine

- A unique network initiated in EU-JAMRAI1
- Our ambition: **Paralleling EARS-Net in the human sector, we aim to close a gap on AMR surveillance in clinical isolates from animals**, in order to:
  - Complement the existing EFSA monitoring in the food chain
  - Support antimicrobial stewardship in veterinary medicine
  - Add on the JIACRA pool of data
  - Support risk assessment
  - Advise EU-level policy making and monitoring of interventions
  - Improve animal health and public health

EARS-Vet: Main achievements from EU-JAMRAI I

- A review of existing national surveillance systems
- The definition of a preliminary scope
  - 6 animals species : cattle, chicken turkey, pig, dog, cat
  - 11 bacterial species
  - AMR profiles of interest to animal and human health
- Selection of methods and standards
- Pilot study

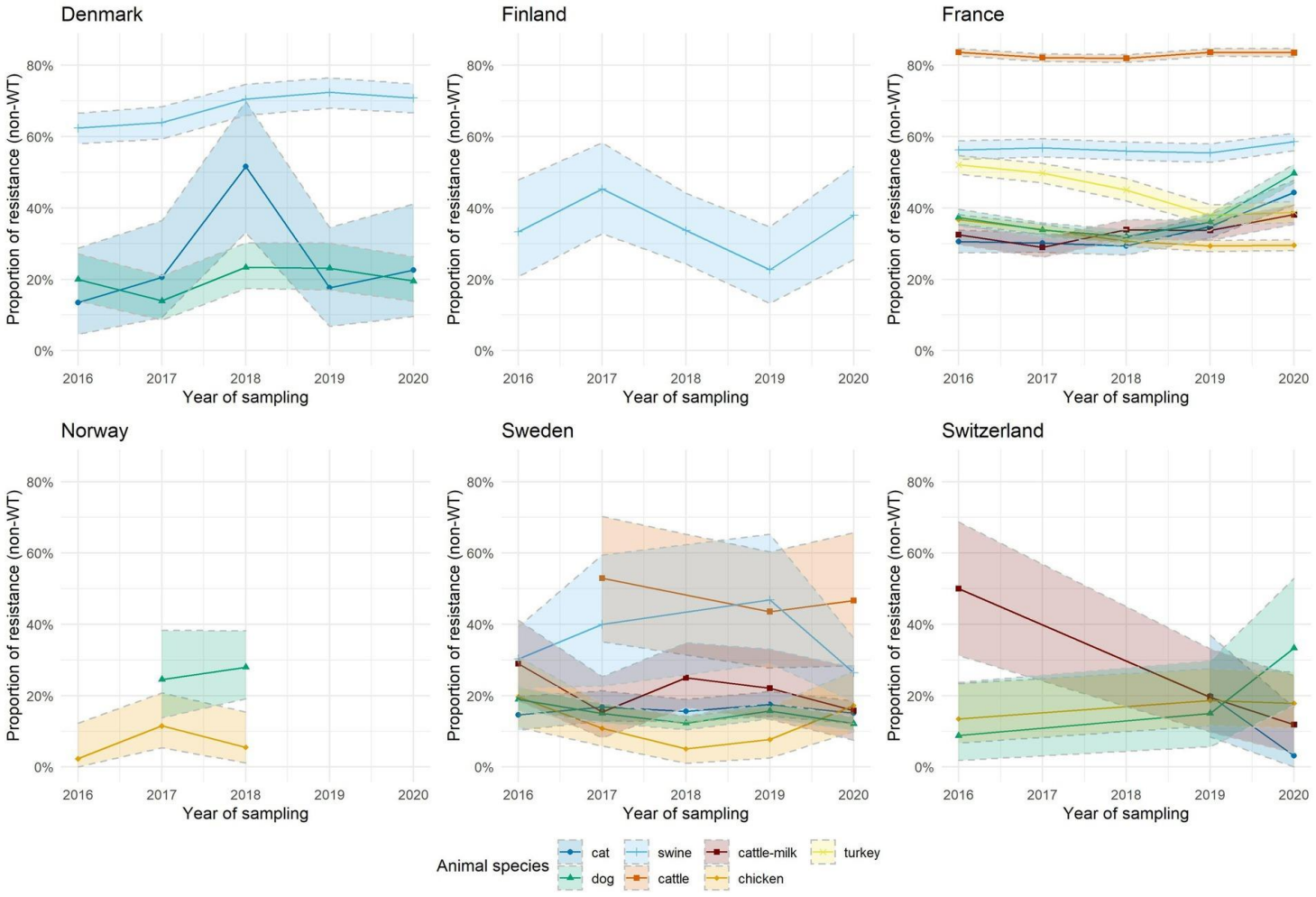
EU countries with an existing national surveillance system of AMR in clinical isolates from animals, 2021



Mader et al. 2022

Pilot study: a proof of concept of what EARS-Vet can achieve

Trends of *E. coli* resistance to aminopenicillins over 2016–2020



Lagrange et al. 2023

EARS-Vet pilot study:

- 9 countries, 11 partners
- Sharing available data over 2016 – 2020
- A unique dataset of 140,110 isolates
- Strengths
  - Trends and variability within and between countries
  - Access to raw data
  - Relatively low cost (passive surveillance)
- Limitations
  - Data volume and representativeness
  - Comparability and lack of harmonisation
  - Missing ECOFFs interpretation criteria

EARS-Vet: our ambition for EU-JAMRAI 2

- **Making EARS-Vet a full-scale initiative**
  - **Expand the network:** 40 partners, 18 countries
  - Facilitate **routine data collection, analysis and reporting**
  - **Improve harmonization** and data comparability
  - **WGS of selected isolates**
    - Evaluate dissemination of well-known resistances
    - Explore resistance mechanisms of rare or emerging resistances
  - **Integration within the EU AMR surveillance landscape**

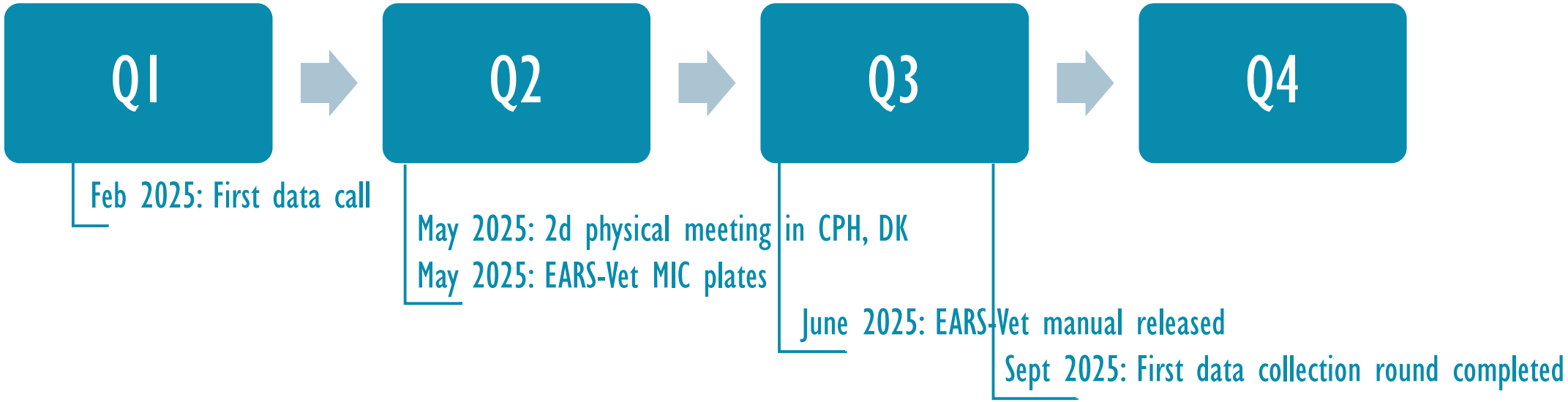
EARS-Vet: Activities completed during year 1

- **Facilitate routine data collection, analysis and reporting**
  - Update of the EARS-Vet scope; extension to horses, sheep and goats
  - Development of EARS-Vet database and WHONET module
  - Data sharing agreement signed by all partners in Feb 2025
  - First open data call launched in Feb 2025
- **Improve harmonization**
  - Drafting EARS-Vet manual
  - Definition of customized EARS-Vet MIC plates
- **WGS of selected isolates**
  - Selection of AMR isolates to be sent to WGS
- **Established collaboration with EFSA, FAO InFARM, AHWP SOA8**

First EARS-Vet physical meeting in Paris, April 2024

EARS-Vet: Next steps

- Planned activities and milestones in year 2



- Already thinking about year 3 and beyond
  - Dissemination of the results: EARS-Vet report and dashboard, scientific publication, policy brief
  - Integration within the EU AMR surveillance landscape
  - EARS-Vet sustainability

How is Ears-Vet supporting countries to implement the Council Recommendation?

COUNCIL RECOMMENDATION

on stepping up EU actions to combat antimicrobial resistance in a One Health approach

(2023/C 220/01)

Developing integrated systems for the surveillance of AMR and AMC encompassing human health, animal health, plant health, food, wastewater and the environment […](5e)

Continue to assess on the basis of EFSA opinions animal diseases caused by bacteria resistant to antimicrobials, to ascertain if it is needed to list any of those diseases in Regulation (EU) 2016/429(57) with a view to categorising them for any regulatory surveillance, control or other management measures (6)

Ears-Vet

Surveillance of AMR in animals

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EARS-Env: Surveillance of AMR in the environment

Heike Schmitt,

National Institute for Public Health and the Environment (RIVM), The Netherlands

AMR and the environment: context

- **Scientific consensus** :
  - AMR is present in the environment (water, soils), including in pathogens
  - Anthropogenic pressures affect AMR dynamics
  - Exposure to AMR in the environment represents an additional transmission route

Environmental surveillance contributes to understanding the spread of AMR and better estimating the related human and animal health risks.

Contents lists available at ScienceDirect

Environment International

journal homepage: www.elsevier.com/locate/envint

Environmental contamination in a high-income country (France) by antibiotics, antibiotic-resistant bacteria, and antibiotic resistance genes: Status and possible causes

Marisa Haenni [a], Christophe Dagot [b], Olivier Chesneau [c], Delphine Bibbal [d], Jérôme Labanowski [e], Michèle Vialette [f], Damien Bouchard [g], Fabrice Martin-Laurent [h], Louisiane Calsat [i], Sylvie Nazaret [j], Fabienne Petit [h,i], Anne-Marie Pourcher [m], Anne Togola [n], Morgane Bachelot [o], Edward Topp [p], Didier Hocquet [q,r,*]

@EU-JAM

REVIEWS

Antibiotic resistance in the environment

D. G. Joakim Larsson [1,2] ✉ and Carl-Fredrik Flach [1,2]

Available online at www.sciencedirect.com

ScienceDirect

Current Opinion in Microbiology

Natural recreational waters and the risk that exposure to antibiotic resistant bacteria poses to human health

Anne FC Leonard [1], Dearbháile Morris [2], Heike Schmitt [3] and William H Gaze [1]

Overall goal for JAMRAI-2

- Call for integrated surveillance including the environment
  - Council Recommendations, UNGA
- Lack of harmonized approaches towards AMR surveillance in the environment

Goal: to define a common surveillance strategy addressing the contribution of the environment to AMR in the One Health framework

Two ambitions

Surveillance: from science to action

Jointly determine objectives, common sampling strategies and indicators for surveillance

- For countries as guidance for their NAP actions

EARS-Env: An environmental AMR surveillance network

Establish a network to support joint national surveillance in Europe

- For integration with other sectors and networks where possible

Process towards Environmental AMR surveillance

Y1: Two questionnaires (present and future) on existing surveillance and vision of the partners

Own vision

Use of questionnaire responses to develop strategies and objectives

Consultation with other stakeholders

Alignment with other sectors and current European regulations

Antimicrobial usage

Explore what we need to know about usage of antimicrobials (fungicides)

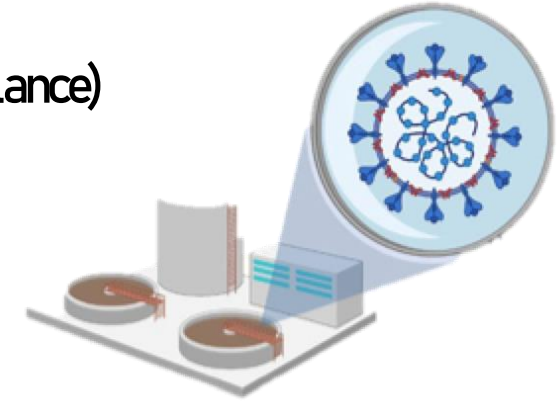
Pilot

Surveillance campaign with central elements of the surveillance strategy

Design of environmental surveillance

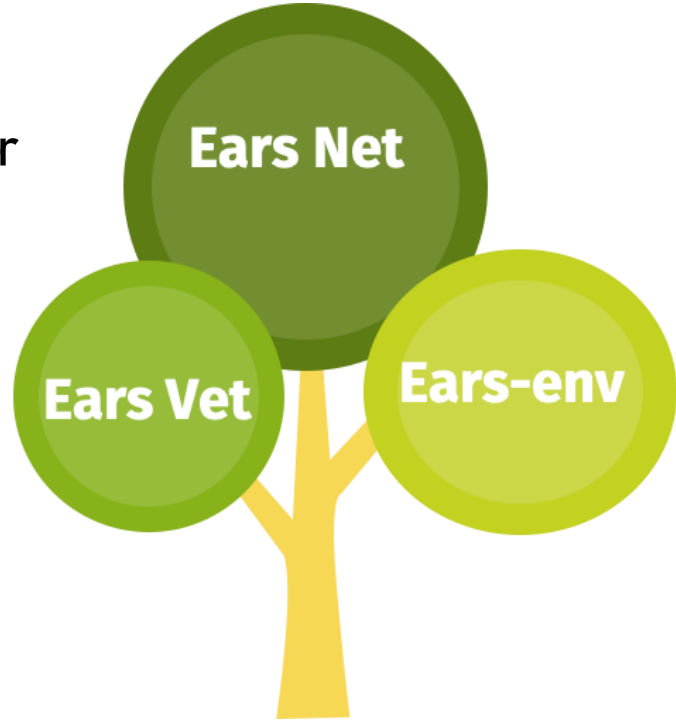
Definition of objectives

- AMR trends in the environment and/or in humans (wastewater-based surveillance)
- Emergence of new forms of AMR
- Study efficiency of interventions
- Provide data for risk assessment



Sampling strategies

- Propose specific approaches for environmental matrices per objective: water, soil, wastewater



Determine common indicators and methods

- Depending on objectives
- Taking into account human health/ animal health sector

Collaboration with other initiatives

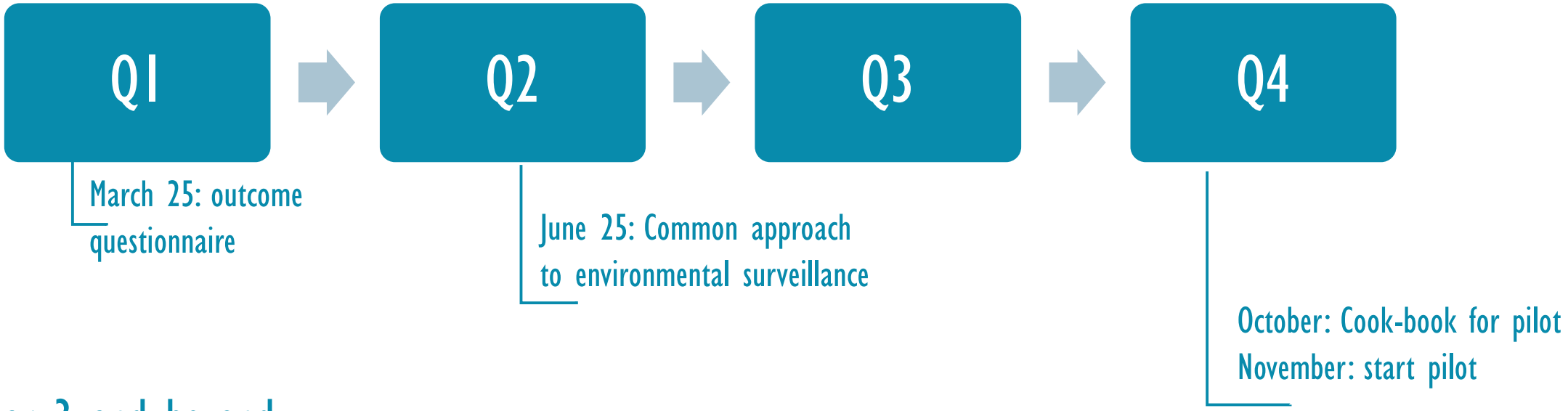
Seeking input from human and animal health sector

- Information needs for environmental surveillance
- Choice of common indicators

Co-ordination with activities at different levels:

- Existing experience (Eionet, quadripartite integrated surveillance)
- Collaboration with JA EU-WISH
- Input for Urban Waste Water Treatment Directive

Next steps



Year 3 and beyond

- Evaluation of pilot outcome
- Final determination of joint environmental AMR surveillance approach

How is Ears-Env supporting countries to implement the Council Recommendation?

EU Council recommendation

COUNCIL RECOMMENDATION

on stepping up EU actions to combat antimicrobial resistance in a One Health approach

(2023/C 220/01)

Developing integrated systems for the surveillance of AMR and AMC encompassing human health, animal health, plant health, food, wastewater and the environment […](5e)

UNGA political declaration

identifying appropriate methods for environmental surveillance, to inform the integration of environmental aspects in […] national action plans

Surveillance of AMR in the environment

Indicator type and number	Indicator
SURVEILLANCE Outcome Indicator 04	Improved surveillance of AMR in the environment (water and/or soil) at EU level
SURVEILLANCE Output Indicator 08	Monitoring of the levels of pollution in water caused by antibiotics, antifungal, fungicide and plant protection products is done in accordance with the Watch List under the Water Framework Directive
SURVEILLANCE Output Indicator 09	*Levels of AMR in urban waste water as per the recast Urban Wastewater Treatment Directive surveillance obligations for agglomerations of 100,000 population equivalent and above*
SURVEILLANCE Output Indicator 10	*Extent to which EU Agencies and MS competent authorities consider risk of AMR in the assessment of active substances and products, respectively where relevant*

Panel discussion: Expectations and added value of EARS-Vet and EARS-Env networks

Scan and submit your question to the panellists

Ernesto LIEBANA,
EFSA, BIOHAZ Team Leader

Caroline WHALLEY,
EEA, Environmental Specialist

Peter HOEJSKOV,
WHO-Europe, Food Safety & Zoonotic Diseases

Questions:

1. What are your expectations about veterinary and environmental surveillance? What content would you like to see to make this surveillance useful from your perspective?

2. Where do you see the added value of the EARS-Vet and EARS-Env network compared to existing surveillance in Europe? Where do they fit within the European surveillance landscape?

3- Improving Human and One Health surveillance

Improving human health surveillance

Sofia Ny, Public Health Agency of Sweden

Strengthen the national surveillance systems on AMR in the human health sector

Now

Part 1

- Perform an inventory of national AMR surveillance in JAMRAI 2 countries.
- Collect information about the systems and content but not the surveillance data itself. No duplication with Ears-Net and GLASS.

Later

Part 2: Use the results from the inventory to make an interactive roadmap of national surveillance.

Part 3: Make and inventory of capacity strengthening projects. Based on the inventories and the roadmap suggest and reinforce capacity strengthening projects.

Why are we making an inventory?

- A joint compilation of national surveillance systems is currently missing
  - which AMR pathogens that are under national surveillance?
  - how is the surveillance structured?
  - what is the data used for?

- Knowledge about national surveillance systems will make it easier to collaborate.

- There is a lot of data but not in a format that allows joint publication and visualisation.

Inventory of national microbiological surveillance of AMR

Information collected via questionnaire

- National recommendations in place affecting AMR surveillance?
- How is WGS used at the national reference laboratory for AMR?
- How is the national surveillance structured?
- Several questions include legal perspectives.

Status: deadline for answering questionnaire was end of February, analysis ongoing.

Pathogens that are part of the inventory:

- *Escherichia coli:*
  Third-generation cephalosporin resistance, carbapenem resistance, colistin resistance
- *Klebsiella pneumoniae:*
  Third-generation cephalosporin resistance, carbapenem resistance, colistin resistance
- *Pseudomonas aeruginosa:*
  carbapenem resistance
- *Acinetobacter baumannii:*
  carbapenem resistance
- *Staphylococcus aureus:*
  methicillin resistance
- *Enterococcus faecium* and *Enterococcus faecalis:*
  vancomycin resistance
- *Streptococcus pneumoniae:*
  penicillin resistance and macrolide resistance
- *Haemophilus influenzae:*
  ampicillin resistance
- *Clostridioides difficile*

Culture materials:

- Blood/CSF
- Urine
- Wound/tissue
- Upper respiratory tract
- Lower respiratory tract
- Diarrhea (C. difficile)

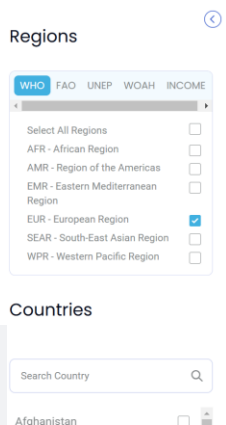
Visualisation of data in a joint dashboard

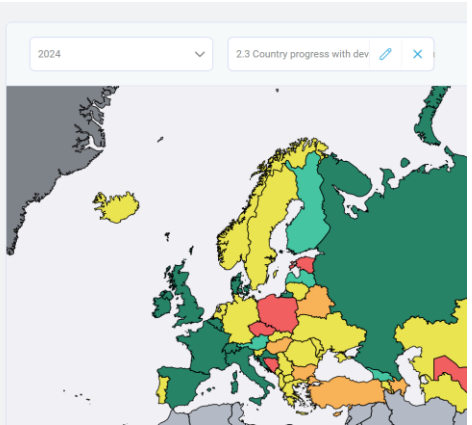
Some examples of what the dashboard will visualise

- Which AMR pathogens are notifiable i.e. under mandatory surveillance in partner countries.
- Current national surveillance of AMR pathogens isolated from urine samples, the estimated coverage and comparability of the collected data.
- Which partner countries that have national treatment recommendations in place for the most common infections.

TrACSS great source of inspiration!

Global Database for Tracking Antimicrobial Resistance (AMR) Country Self- Assessment Survey





Food and Agriculture Organization of the United Nations

UN environment programme

World Health Organization

World Organisation for Animal Health
Founded as OIE

Dashboard target groups

- National surveillance experts
- EU and UN agencies
- Policy advisors.

Technical information

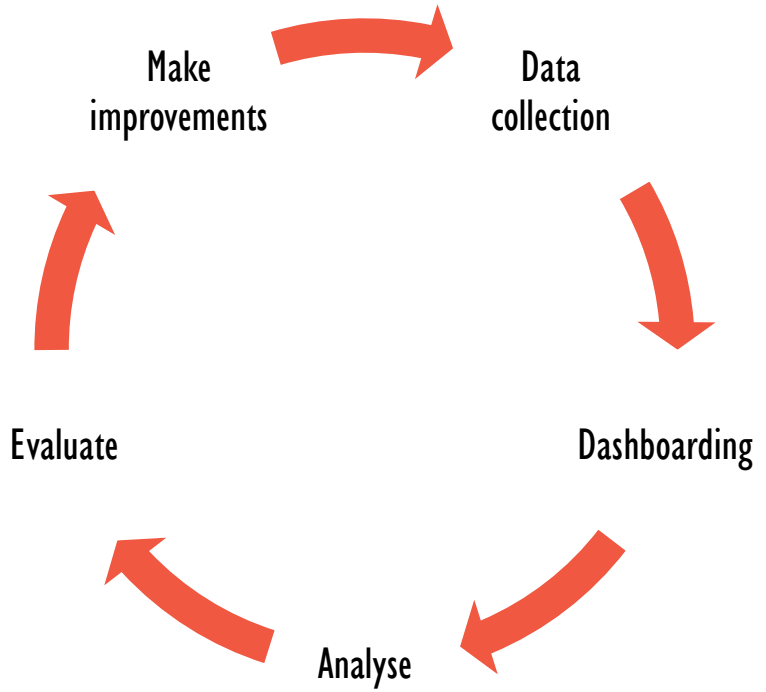
- Developed using R-shiny by a working group of people from 8 partner countries.
- Code open to the public via GitHub.
- First version online in June 2025.

Why are we making a dashboard?

- Makes complex data understandable and easy to access.
- Increases the availability of key information that many actors are interested in.
- Is important for collective memory and accountability.
- Provides a baseline - a good opportunity for follow up, sustainability and development.

What is the long-term plan for the dashboard?

- JAMRAI 2 project: develop the concept and the content of the dashboard.
- The plan is to complete two development cycles.
- Looking at different options for long-term hosting.



How are we supporting the implementation of the Council Recommendation?

COUNCIL RECOMMENDATION

on stepping up EU actions to combat antimicrobial resistance in a One Health approach

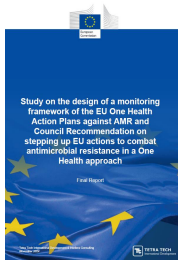
(2023/C 220/01)

Guidelines for the treatment of common infections (11.a and supporting 13).

Pathogens resistant to last line treatments are notifiable diseases under national legislation (5.b).

Expand human AMR surveillance by including more specimen types (in addition to blood samples) (5.a).

Human AMR surveillance dashboard



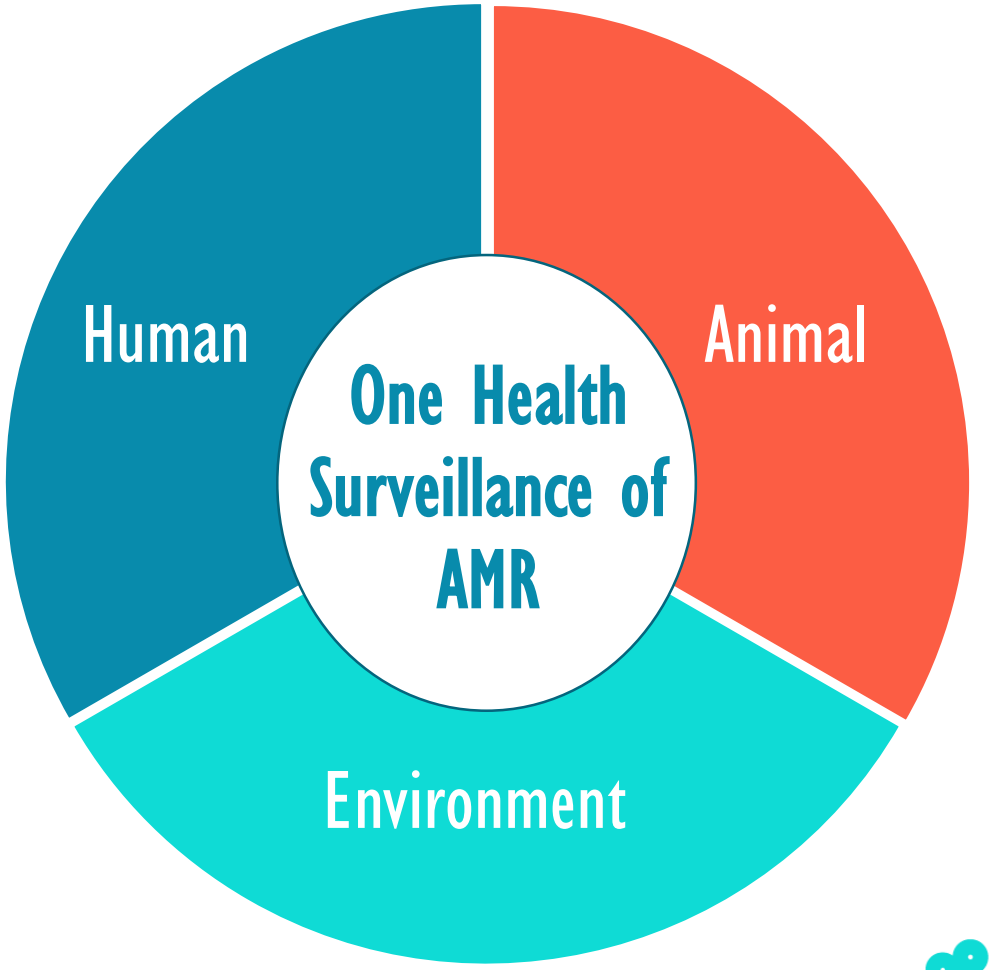
Surveillance of AMR in human health

Indicator type and number	Indicator
SURVEILLANCE Outcome Indicator 01	AMR surveillance status in humans in each Member State
SURVEILLANCE Output Indicator 01	Extent to which epidemiological surveillance in the EU is implemented according to Commission Implementing Decision (EU) 2018/945 on the communicable diseases and related special health issues to be covered by epidemiological surveillance as well as relevant case definitions
SURVEILLANCE Output Indicator 02	Number of Member States whose AMR surveillance of bacteria in humans includes all isolates from clinical microbiology laboratories (in addition to bloodstream and cerebrospinal fluid isolates (invasive isolates))
SURVEILLANCE Output Indicator 03	Number of Member States with national legislation requiring that infections caused by critical (high negative human health impact) multidrug-resistant organisms resistant to last line treatments are notifiable diseases (e.g. carbapenem-resistant *Acinetobacter baumannii*, carbapenem-resistant Enterobacteriaceae (e.g. *Klebsiella pneumoniae*, *Escherichia coli*) and *Candida auris*)
SURVEILLANCE Output Indicator 04	*Number of Member States with expanded surveillance in humans to pathogens with emerging or established AMR due to their exposure to substances in the environment, in particular those used in plant protection products or biocidal products*

One Health surveillance

Moira Kelly, Sciensano, Belgium

Towards National One Health Surveillance of AMR



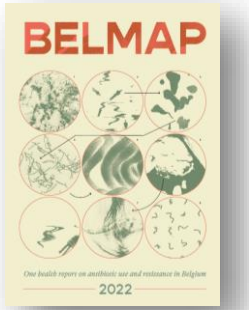
Why One Health Surveillance of AMR?

Fragmented Data

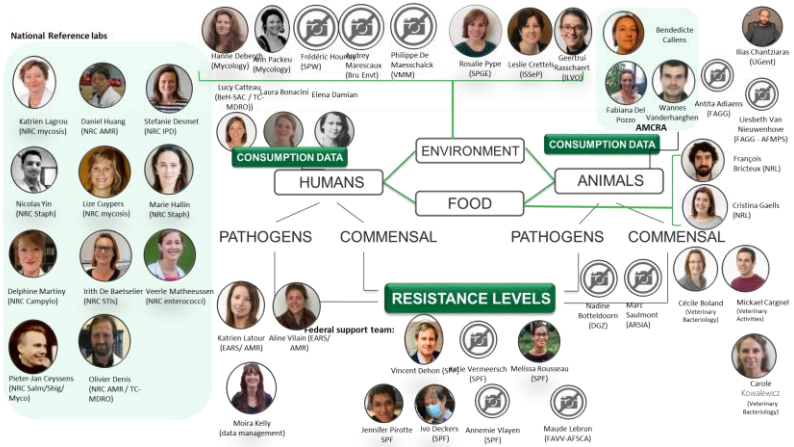
Disjointed action

Clear overview

Common language



Collaboration



United recommendations and priorities

How to support national OH Surveillance?

Year 1

Map the national surveillance landscape

- What programs/data to include in OH report
- Who to include in OH network

Year 2

Build the OH network and capacity

OH EpiCap tool

- Collaboration of actors across sectors
- How to improve ”One Healthness” of surveillance landscape

Year 3-4

Develop the OH report

Improve reporting of the data:

- Interactive dashboards
- Integrated analyses
- Common primary/secondary indicators

Y1 Results – Mapping exercise

Structured questionnaire:

- Programs / Actors
- Mandatory/voluntary
- Participation in national / supranational networks
- Data availability
- WGS reported

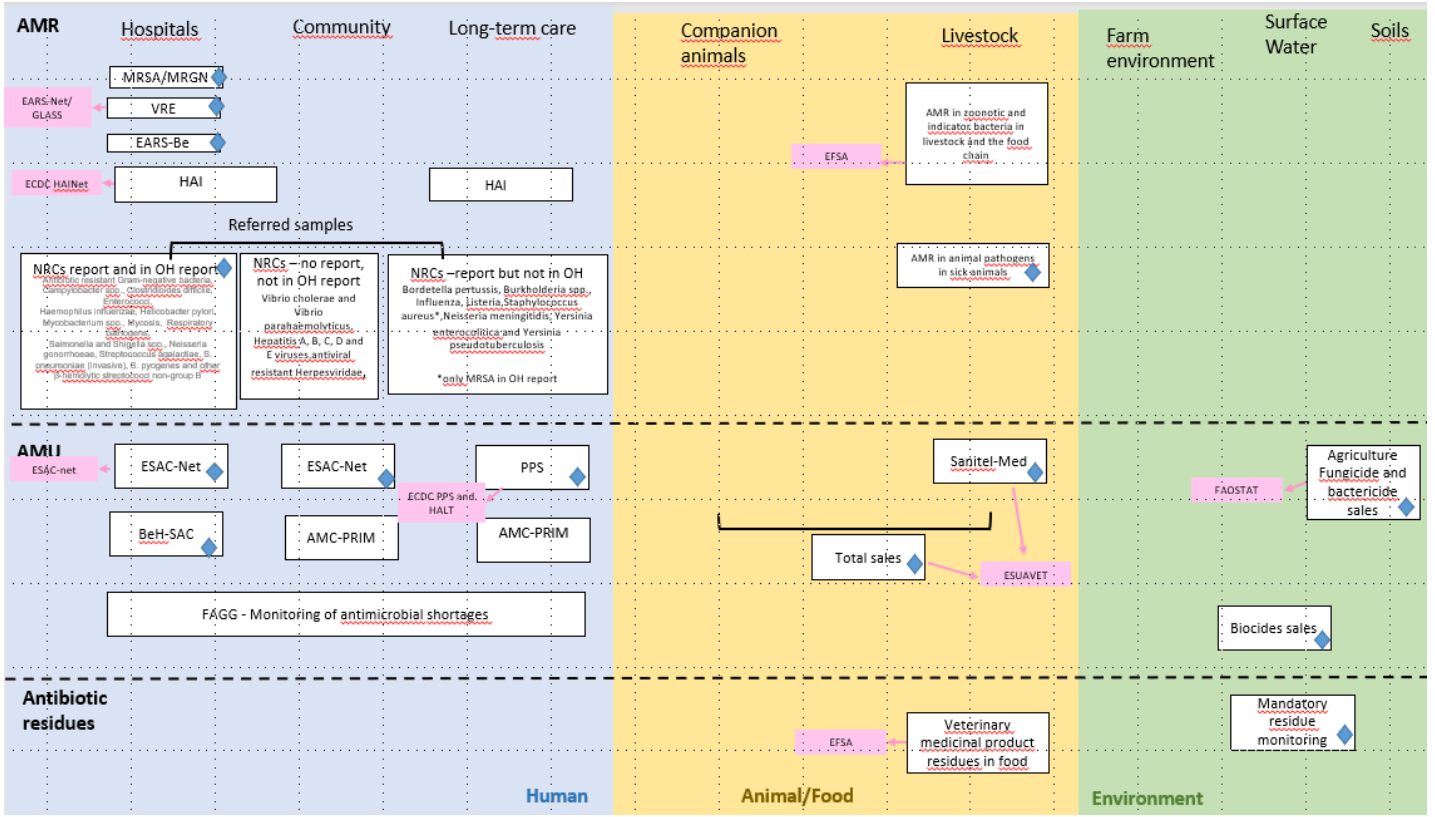
Broader scope (AMR and AMC, all sectors, all antimicrobials)

First step in building OH AMR network

***Aimed at supporting national level reporting**

Scope and data adapted to national situation

Common template for results:



Y1 Results – Workshop

10-11th February 2025, Brussels

Day 1: Current OH surveillance of AMR

- Mapping exercise results/experience
- SWOT analysis of current OH surveillance landscape

Day 2: Future/optimal OH surveillance of AMR

- Presentations from established OH AMR reports
- Panel discussion with policy makers
- Discussion of potential key indicators

OUTPUTs:

- White paper: OH AMR surveillance in Europe – where are we today, and where do we want to be tomorrow?
- Key indicator selection

How to support national OH Surveillance?

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- Who to include in OH network

Year 2 — Build the OH network and capacity

OH EpiCap tool

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Year 3-4 — Develop the OH report

Improve reporting of the data:

- Interactive dashboards
- Integrated analyses
- Common primary/secondary indicators

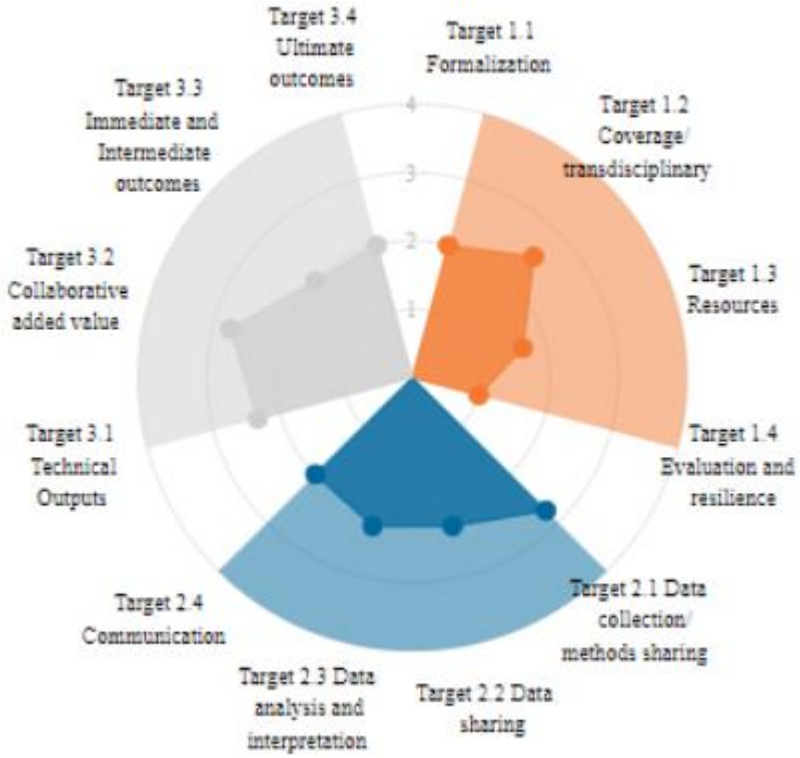
OH EpiCap Tool

- **8-12 panelists**
- **Consensus evaluation for each indicator**

-Organisation -Operation –Impact

- **Input into application**
- **Diagnostics of strengths and weaknesses**

-concrete and direct actions to reinforce collaborations

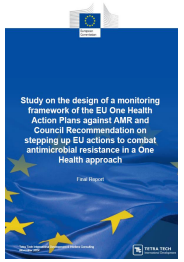


How are we supporting countries to implement Council Recommendations?

COUNCIL RECOMMENDATION

on stepping up EU actions to combat antimicrobial resistance in a One Health approach

(2023/C 220/01)



Monitoring Framework

Close existing surveillance and monitoring gaps and ensure completeness of data [...] on both AMR and AMC at all levels to support the prudent use of antimicrobials in human health (5)

Developing integrated systems for the surveillance of AMR and AMC encompassing human health, animal health, plant health, food, wastewater and the environment [...](5e)

Year 1 — Mapping

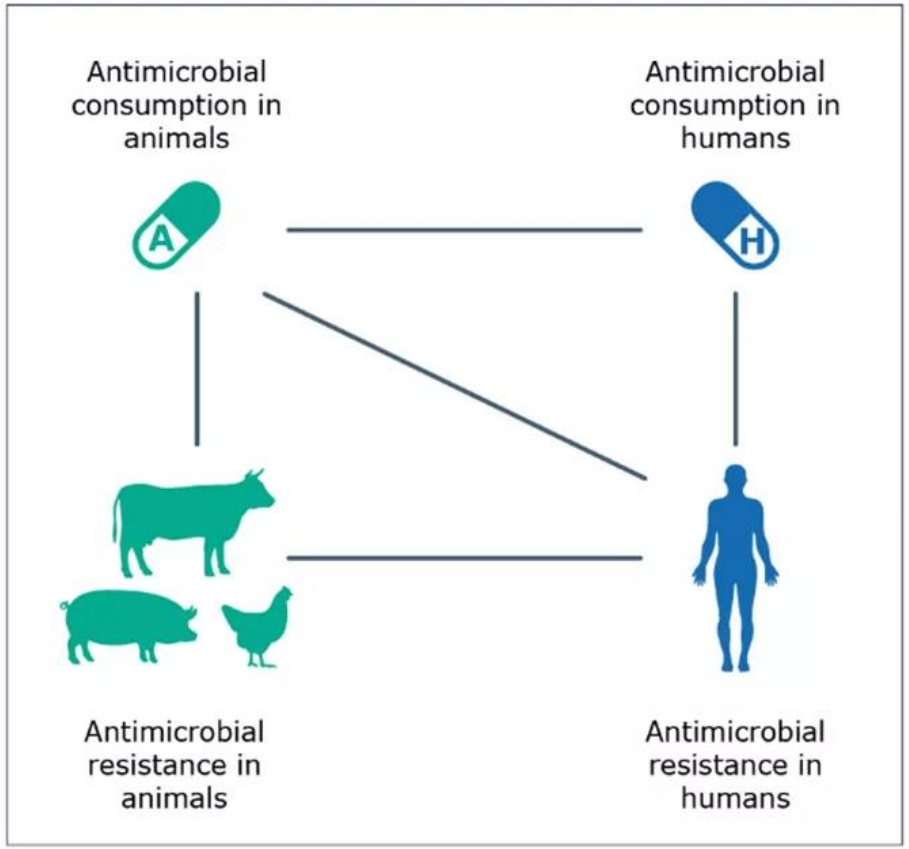
Year 2 — OH network

Year 3-4 — OH report

Integrated surveillance

Indicator type and number	Indicator
SURVEILLANCE Outcome Indicator 05	*Extent to which integrated surveillance of AMC & AMR is achieved at EU level*
SURVEILLANCE Output Indicator 11	*Number of Member States with any form of integrated and continuous systems for monitoring and surveillance of AMR and AMC encompassing human health, animal health, plant health, food, wastewater and the environment*

Summary



(JIACRA IV, 2019-2021). EFSA J. 2024

Main surveillance gaps

- Diseased animals? **EARS-Vet**
- Environmental surveillance? **EARS-Env**
- Expanding surveillance in humans? **Human AMR surveillance dashboard**
- National analysis of AMR from a One Health perspective? **National One Health reports**

Panel discussion: How do we direct the EU-JAMRAI 2 surveillance work to add value to the current surveillance landscape in Europe?

Ernesto LIEBANA,
EFSA, BIOHAZ Team Leader

Caroline WHALLEY,
EEA, Environmental Specialist

Peter HOEJSKOV,
WHO-Europe, Food Safety & Zoonotic Diseases

Dominique MONNET,
ECDC, Head of section AMR & HCAI

Ariane VANDER STAPPEN,
European Commission, AMR and human nutrition Unit

Velina PENDOLOVSKA,
European Commission, Health security Unit

Scan and submit your questions

Questions:

1. What aspects within human microbiological surveillance of AMR are most important to move forward?

2. What is the added value of One Health surveillance of AMR? What components of One Health AMR analysis/report could be most valuable in reducing the public health burden of AMR?

Have your say!

Give your opinion about the future One Health Surveillance.

@EU-JAMRAI

EU-JAMRAI Joint Action Antimicrobial Resistance and Healthcare-Associated Infections

Co-funded by the European Union

Towards One Health surveillance of AMR in Europe