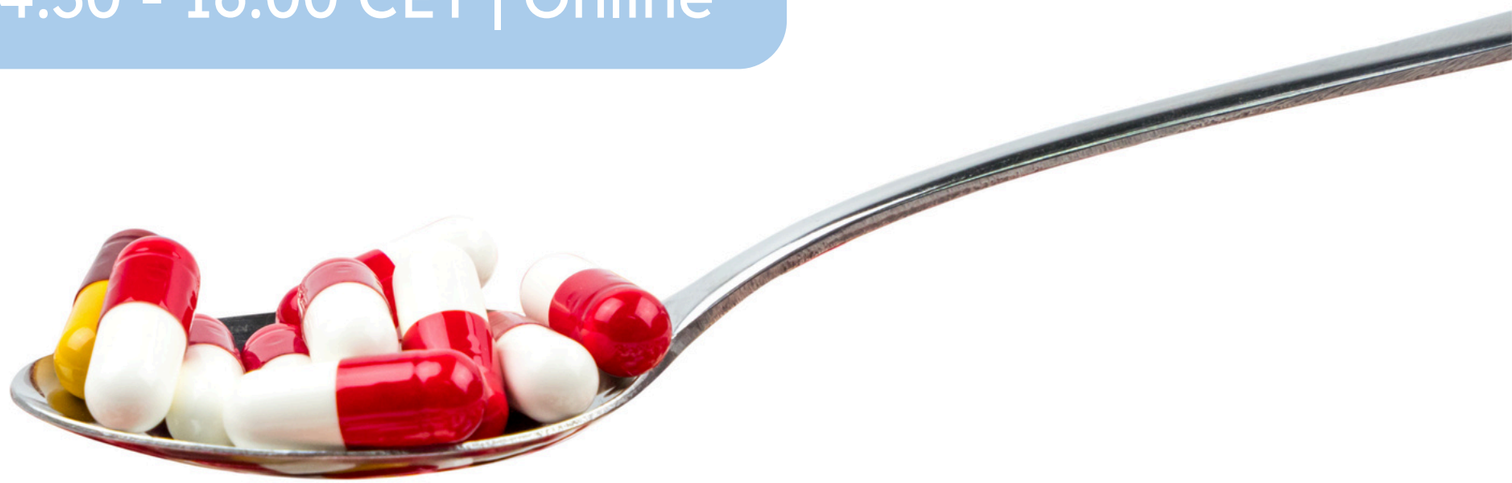
Tackling Antimicrobial Resistance in Food Production: A One Health Perspective

Wednesday 26 November | 14:30 - 16:00 CET | Online

Welcome



#EAAD #EAAD2025 #WAAW #WAAW2025
#WorldAMRWeek #AMRWeek

epha european public health alliance

una europa

Opening

14:30 – 14:35

Jaisalmer de Frutos Lucas
Policy Manager at EPHA

Introduction 14:35 – 14:40

Bruno Gonzalez-Zorn
Full Professor at Complutense University in Madrid

Panel Discussion

14:35 – 14:40

Jorge Matheu Alvarez

Scientist at Governance, Coordination and Monitoring Unit, AMR department, World Health Organization

Ernesto Liebana

BIOHAZ Team Leader at European Food Safety Authority

Azucena Mora

Full professor of Microbiology at University of Santiago de Compostela

Member of the Scientific Committee of AESAN (Spanish Food Safety Agency)

Wannes Vanderhaeghen

Head of Data Analysis Unit at AntiMicrobial Consumption and Resistance in Animals

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Presentation

Jorge Matheu Alvarez
Scientist at Governance, Coordination and Monitoring Unit, AMR department, World Health Organization

Food and Agriculture Organization of the United Nations

UN environment programme

World Health Organization

World Organisation for Animal Health
Founded as OIE

One Health Global response to AMR: Efforts on food production

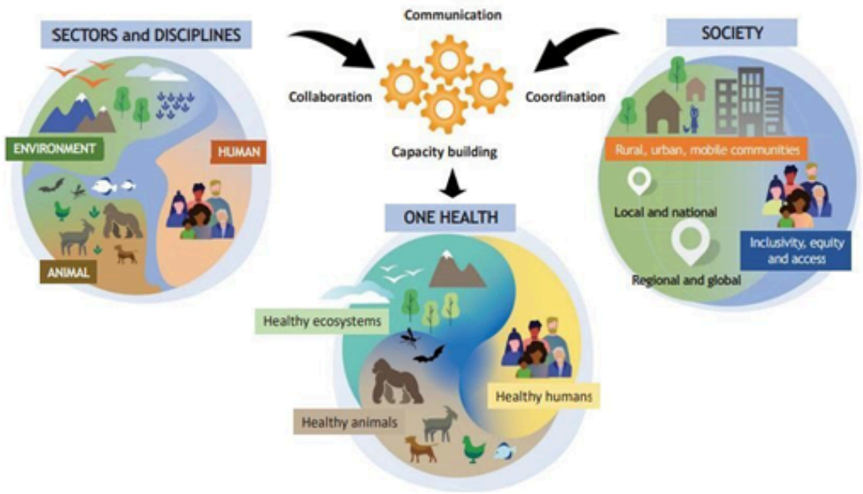
Jorge Matheu, AMR department, WHO HQ

Definition of One Health

One Health is an integrated, unifying approach that aims to sustainably balance and optimize the health of people, animals and ecosystems.

It recognizes the health of humans, domestic and wild animals, plants, and the wider environment (including ecosystems) are closely linked and inter-dependent.

The approach mobilizes multiple sectors, disciplines and communities at varying levels of society to work together to foster well-being and tackle threats to health and ecosystems, while addressing the collective need for clean water, energy and air, safe and nutritious food, taking action on climate change, and contributing to sustainable development.



One Health High Level Panel, 2021

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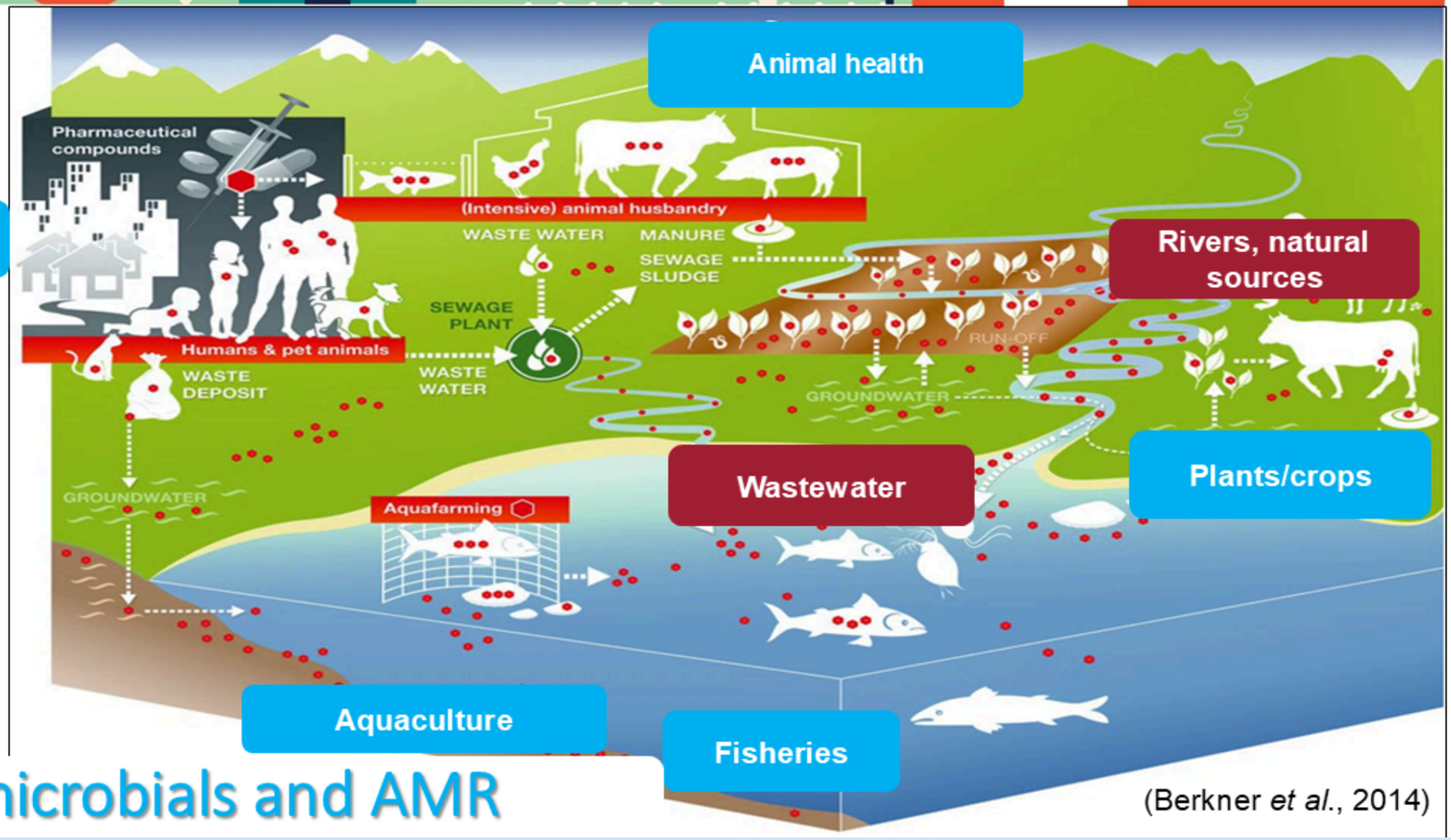
One Health AMR



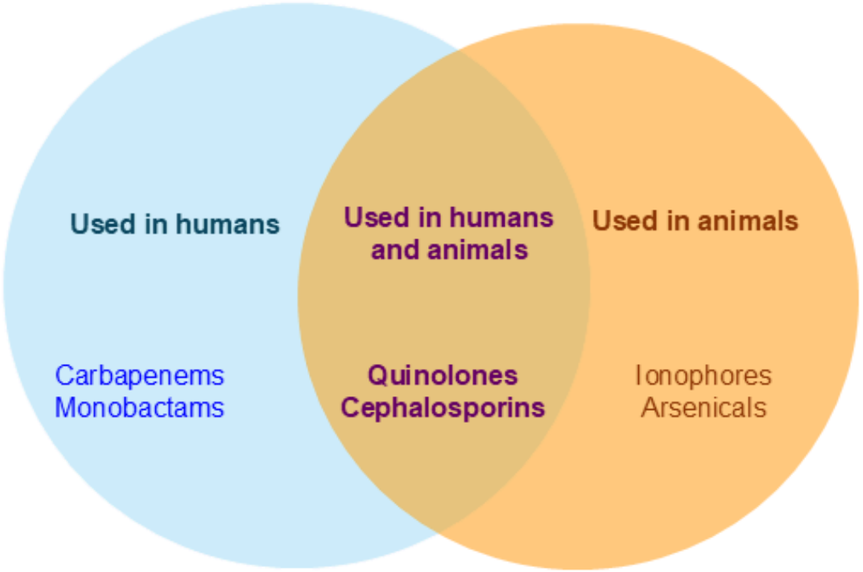
(Berkner *et al.*, 2014)

Use of antimicrobials and AMR

Context

- Common bacteria in different sectors
  - *Salmonella* spp — High
  - *Campylobacter* spp
  - *Escherichia coli* — Critical
  - *Enterococcus* spp
  - *Staphylococcus aureus* (MRSA) — High

Use of Antimicrobials in different sectors



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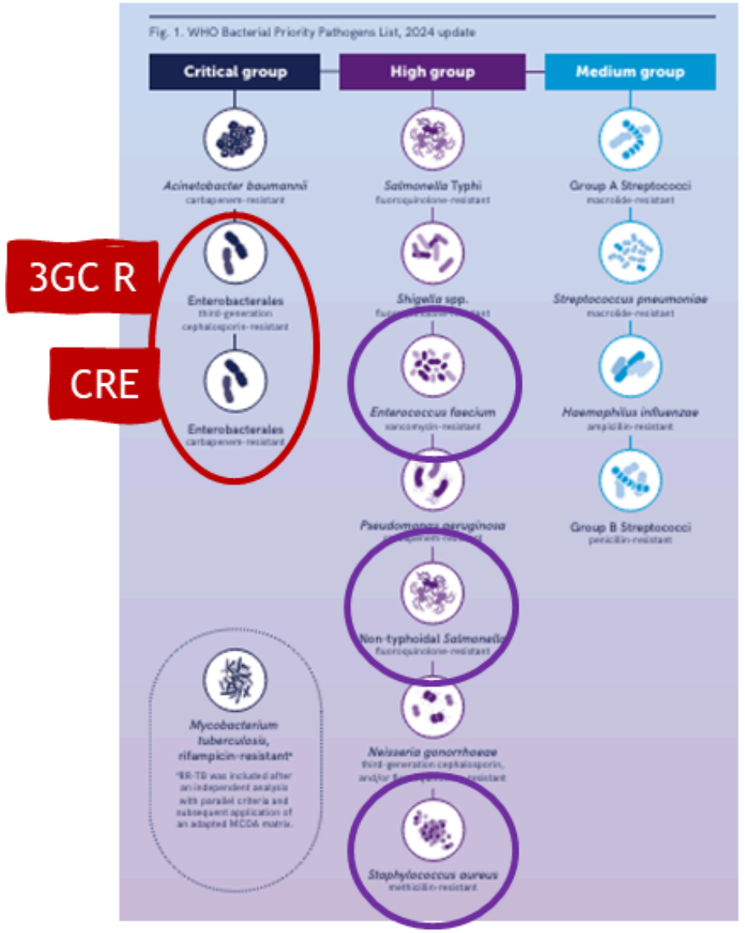
WHO Bacterial Priority Pathogen List 2024



Quadripartite Collaboration on One Health

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Agriculture | Environment | Human Health | Animal Health

One Health

The Quadripartite Joint Secretariat on AMR

World Health Organization

Political framework and guidance on OH AMR

UNGA Political Declaration 2024: 44 committments

GAP 2015

IACG 2019

QPT Strategic Framework 2022

One Health Joint Plan of Action 2022

https://www.qjsamr.org/technical-work/one-health-priority-research-agenda-for-amr

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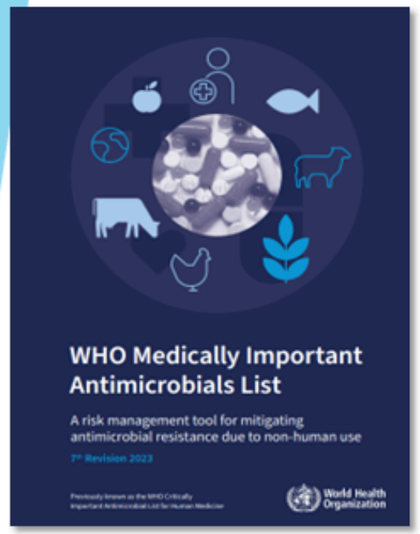
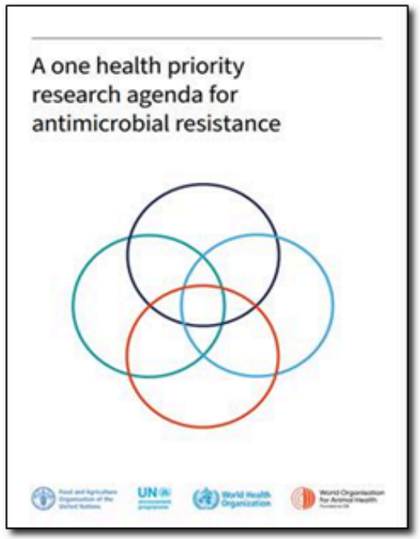
One Health AMR Guidance and tools to support NAP implementation

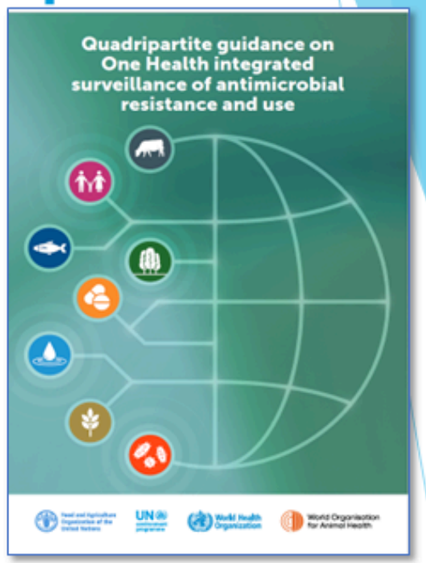


Responsible use in non-human sectors



OH AMR Research

OH AMR Legislation



OH Integrated Surveillance

UNGA Political declaration 2024

Critical need to enhance collaboration, cooperation and partnership

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FAO RENOFARM

- Provides comprehensive support in implementing good production practices that lead to a reduced need for antimicrobials and a prudent and responsible use when antimicrobials are needed.
- RENOFARM is guided by the Farm 5Gs:
  - **Good Health Services:** Ensuring access to good health services, including guidance on prudent AMU.
  - **Good Production Practices:** Implementing good production and husbandry practices across all farm production value chains, optimal farm biosecurity and hygiene measures, prudent AMU and efficient farm waste management.
  - **Good Alternatives:** Embracing alternative approaches, such as vaccines, biosecurity measures, alternative feeds, feed additives, integrated pest management (IPM), and biological control methods.
  - **Good Incentives:** Promoting economic and productivity outcomes at the farm level through measures like regulatory frameworks, quality control mechanisms, and bolstering functional supply chains.
  - **Good Connection:** Strengthening the connection of farmers to reduce their dependence on antimicrobials involves enhancing their access to crucial resources and support.

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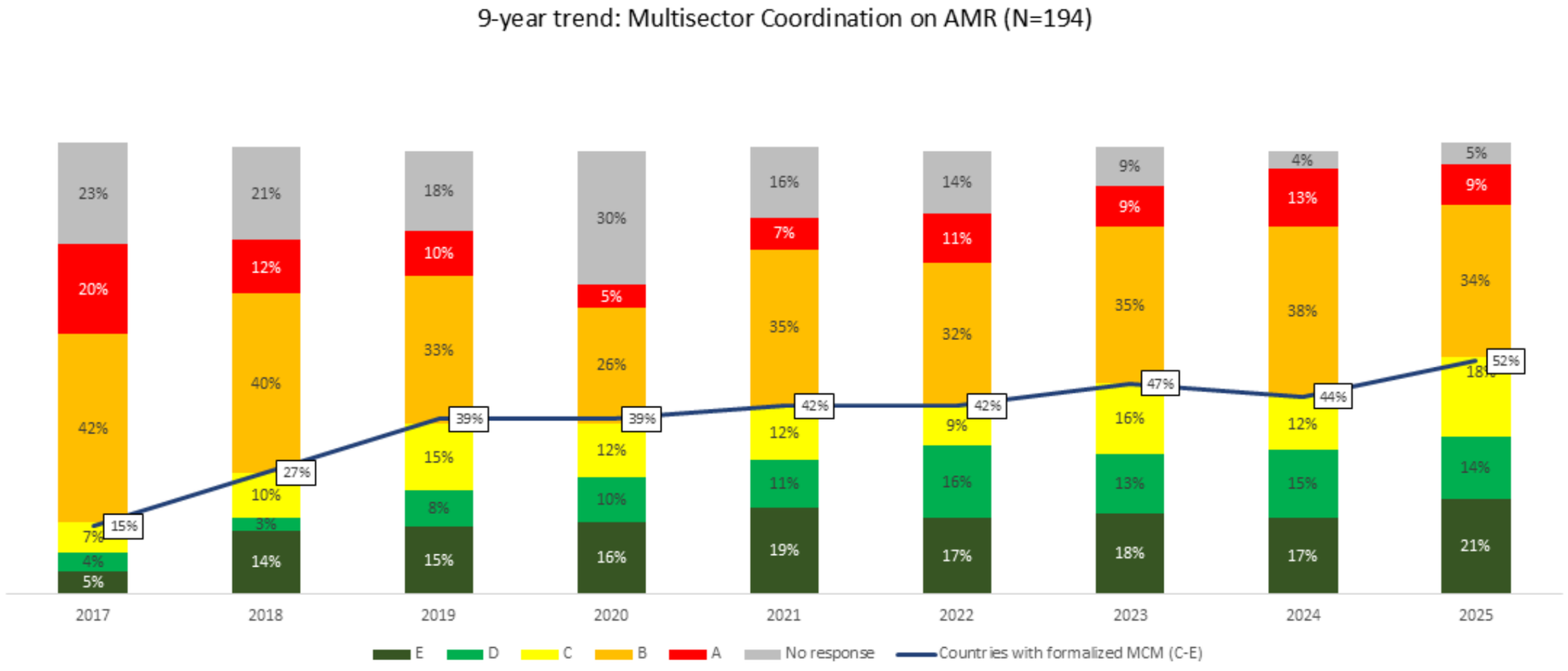
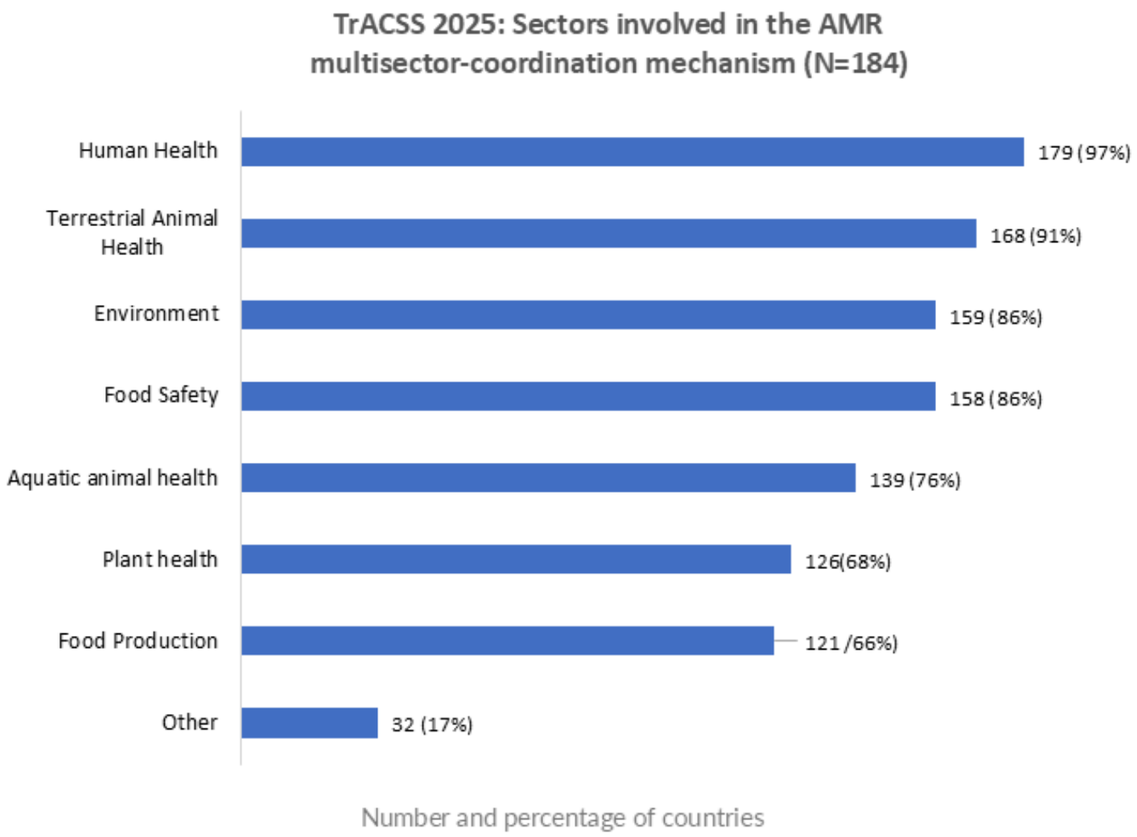
Multisector coordination on AMR



Steady increase in percentage of countries with formalized MCM

A - No formal multi-sectoral governance or coordination mechanism (MCM) exists. B - MCM on AMR established with Government leadership; C - Formalized MCM with technical working groups established with clear terms of reference, regular meetings, and funding and reporting/accountability. D - Joint working on issues; E - Integrated approaches used to implement the AMR NAP with relevant data and lessons learned from all sectors to adapt NAP implementation.

AMR Multisector Coordination
Sectors involved

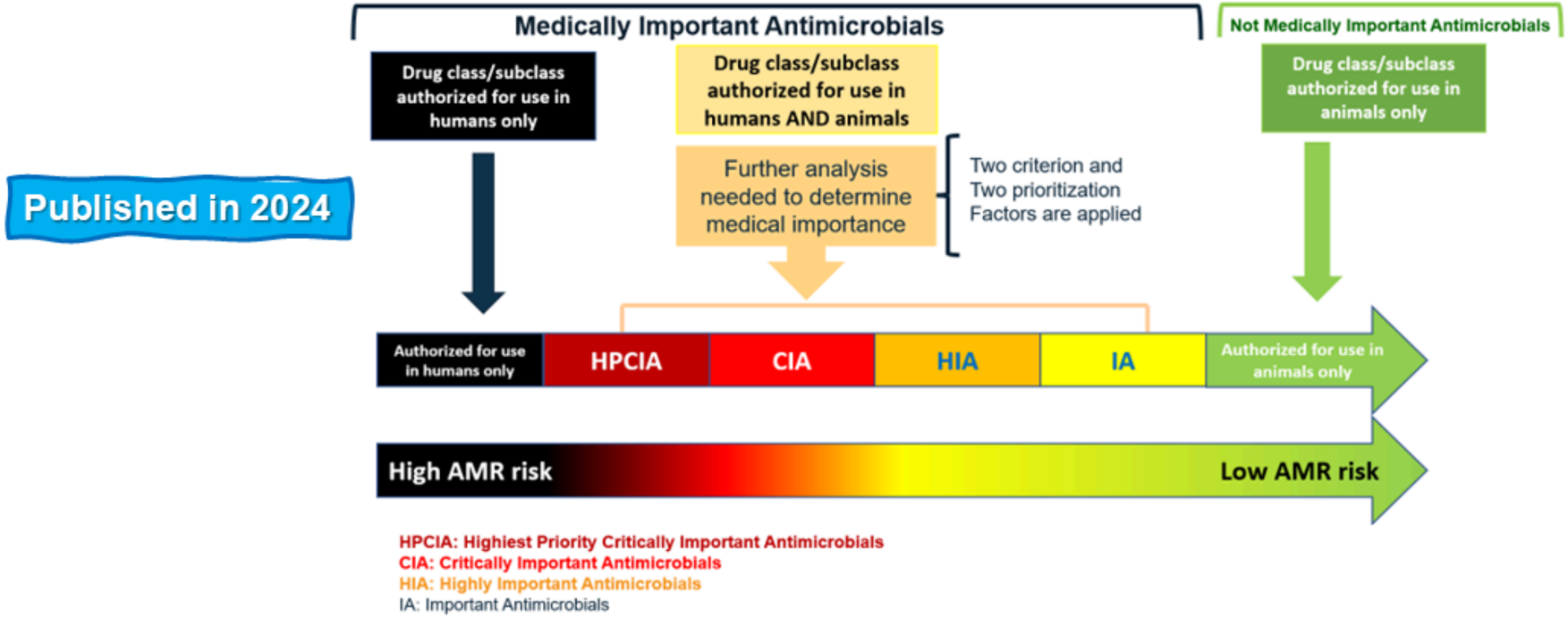


46%
Of countries have **all sectors listed** involved in the AMR MCM

WHO Medically Important Antimicrobial List -WHO MIA List- 2024

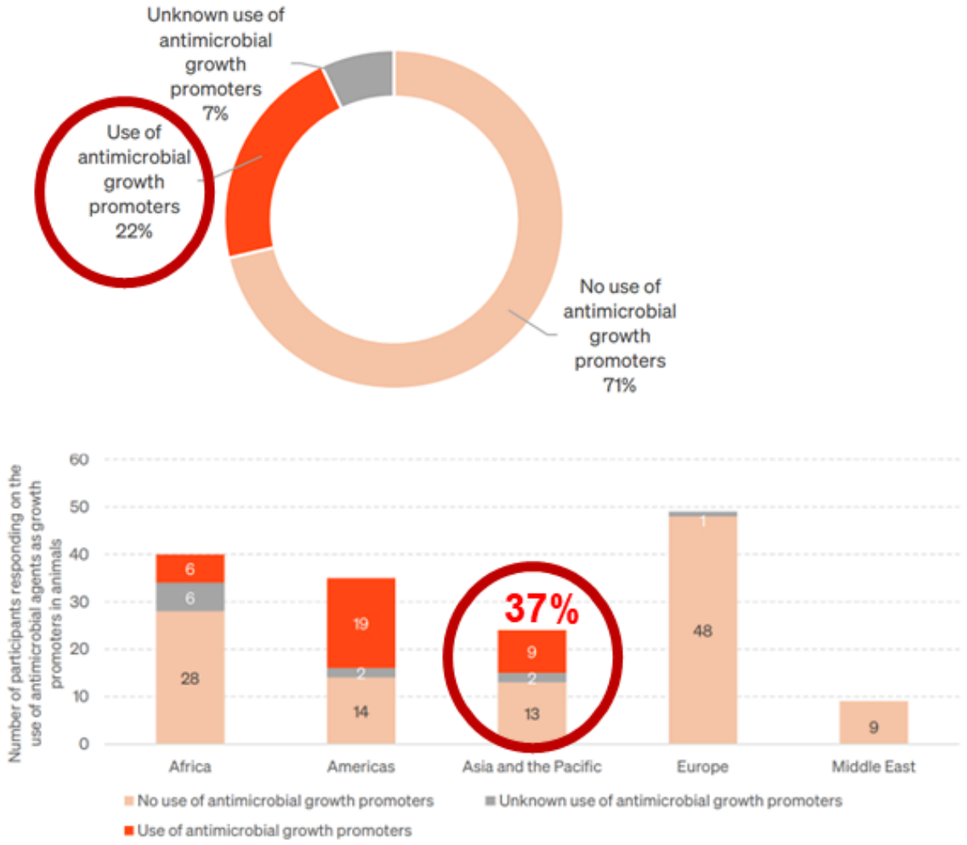
World Health Organization

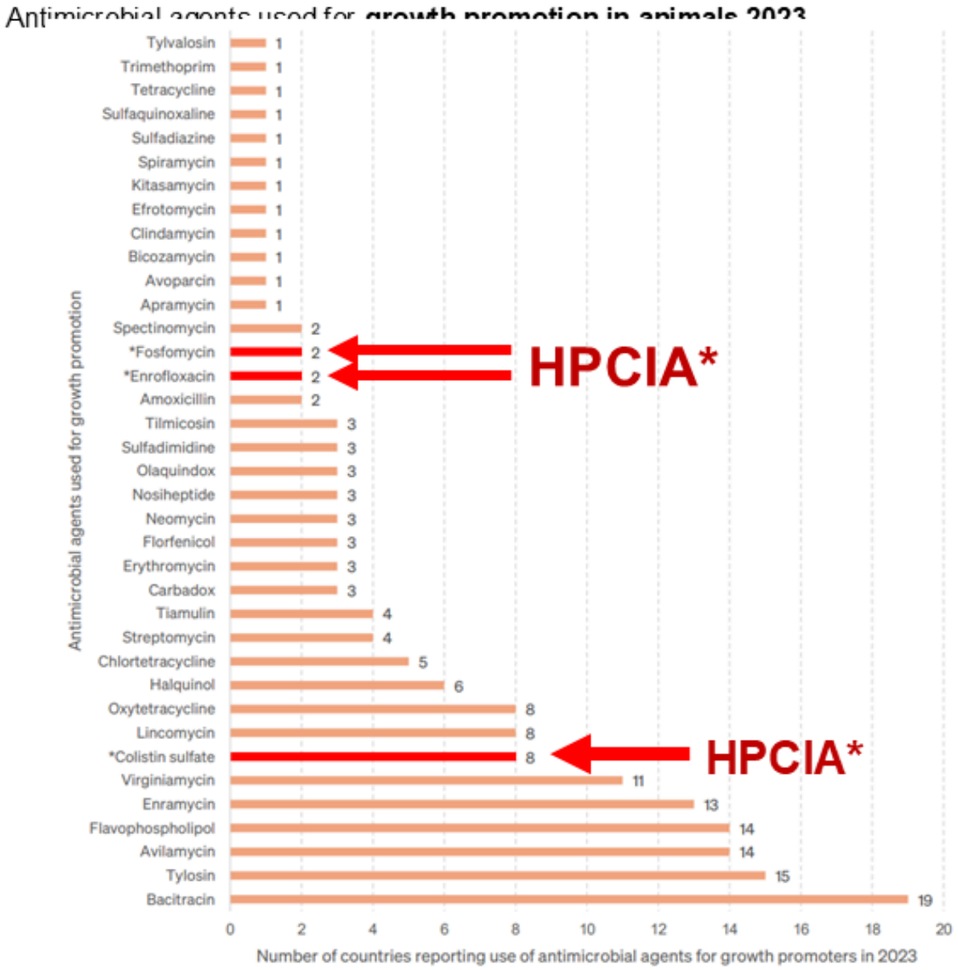
- Previously known as the **WHO Critically Important Antimicrobial List –WHO CIA List-**
- **All classes** of antimicrobials were analyzed and included in one of the three groups
- The **categorization** is based on **resistance mechanisms**. The most common resistance mechanism affects all agents in a particular class of antimicrobials.



9th WOAH report: Use of HPCIA for growth promotion is still common

Use of antimicrobial growth promoters in 157 Participants in 2023

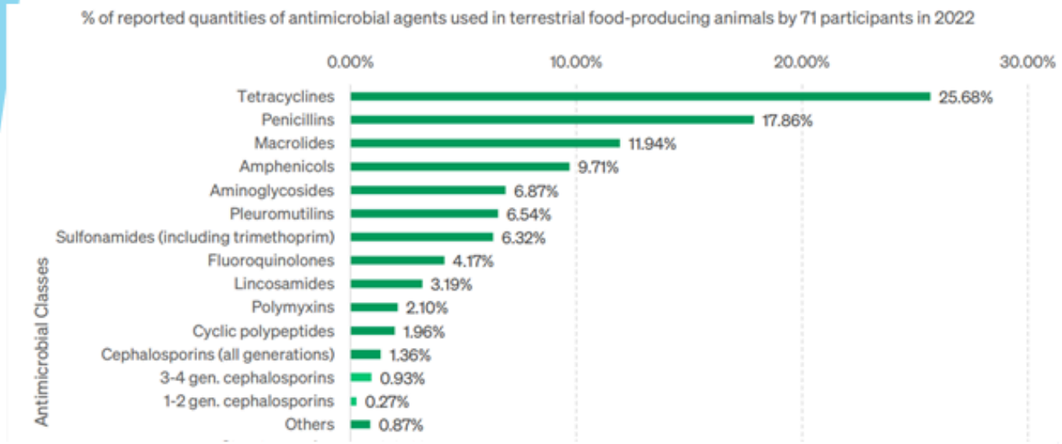


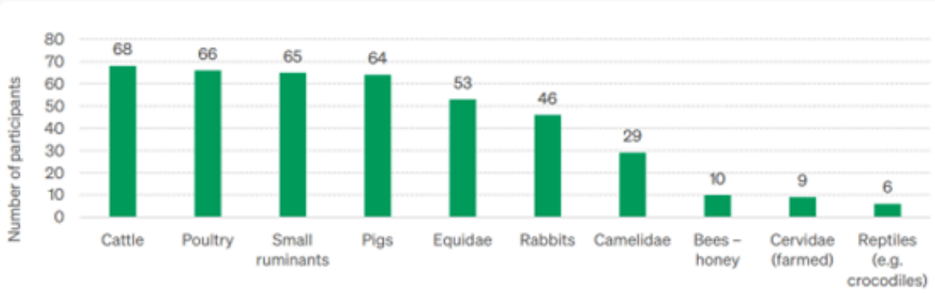


WOAH 9th Annual Report on Antimicrobial Agents Intended for Use in Animals, 2025

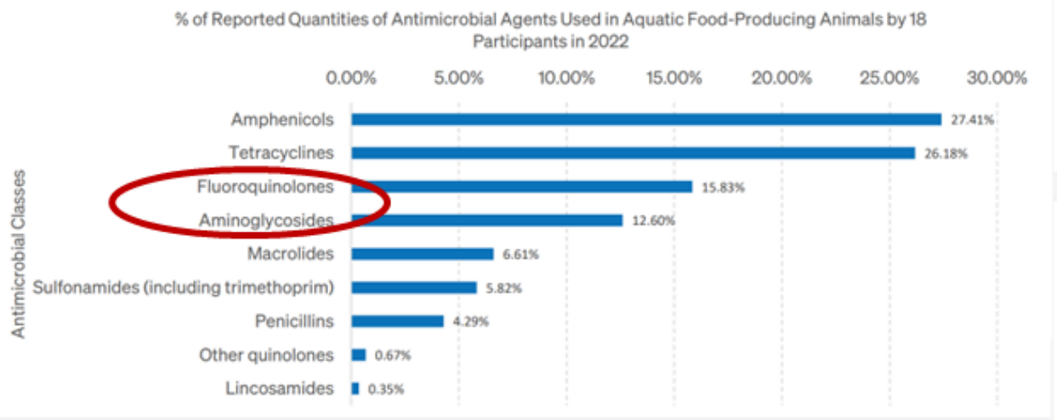
*HPCIA: Highest Priority Critically Important Antimicrobials

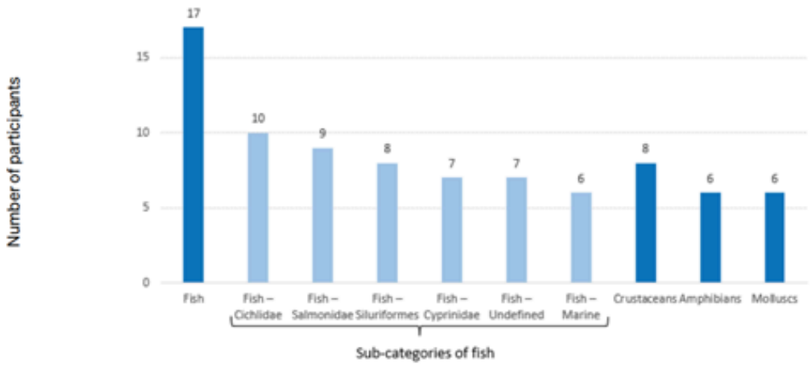
9th WOAH Report 2025:Use of antimicrobials in Animals 2022





Terrestrial food-producing animals covered according to the label of the veterinary product





Aquatic food-producing animals covered according to the label of the veterinary product

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GISSA - Global Architecture for Integrated AMR and AMU Surveillance

Quadripartite Global Systems

Health System

World Health Organization

GLASS
Global Antimicrobial Resistance and Use Surveillance System

AMR/AMU

Agricultural System

World Organisation for Animal Health

ANIMUSE Global Database

AMU

Food and Agriculture Organization of the United Nations

AMR
in animals and food

AMU
in plant production and protection

Environmental health

UN environment programme

AMR and Residues

Global Integrated Surveillance for AMR and AMU

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World Organisation for Animal Health

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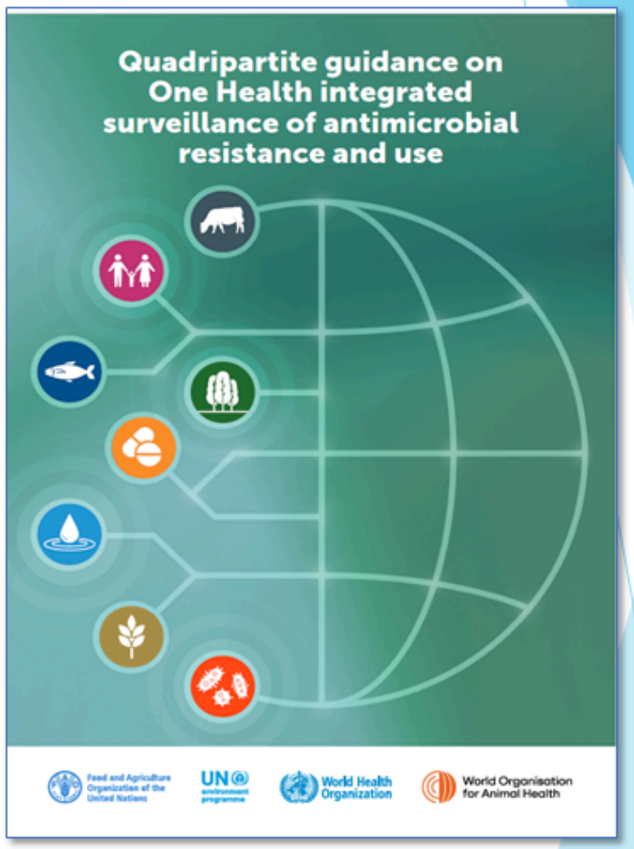
One Health Integrated Surveillance of AMR/AMU

To be published soon



Thank you

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Presentation

Ernesto Liebana
BIOHAZ Team Leader at European Food Safety Authority

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ADDRESSING AMR THROUGH ONE HEALTH: INSIGHTS INTO EFSA'S ACTIVITIES IN MONITORING & RISK ASSESSMENT.

Dr. Ernesto Liebana, BIOHAZ Team Leader and EFSA AMR coordinator

European Public Health Alliance (EPHA) webinar on "Antibiotic Use in Food Production" 26 November 2025

EUROPEAN FOOD SAFETY AUTHORITY

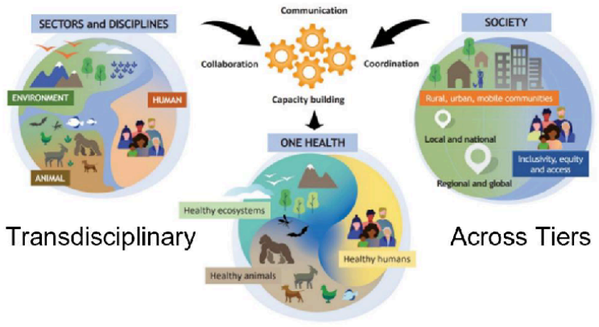
THE EU ONE HEALTH RESPONSE TO AMR

EU AMR One-Health Network

(i) trans-sectoral and integrated approach
- enhance MSs discussions
- exchange information and sharing of best practices

ONE HEALTH HIGH-LEVEL EXPERT PANEL WHO

4 Cs



Transdisciplinary

Across Tiers

Across domains

2017 EU AMR 'One Health' Action Plan

INTER-AGENCY WG ON AMR

EFSA, ECDC, EMA, ECHA, EEA

- Regular meetings, with at least one annual physical meeting per year.
- The coordination of the working group will rotate among the agencies. Each term will last 18 months.
- Each agency will designate one focal point (with an alternate) to coordinate agency's contributions
- Commission representative will be invited to participate in the meetings
- External ad hoc members and observers may attend the meetings as needed.

KEY OUTCOME INDICATORS AND TRENDS

KEY OUTCOME INDICATOR COMPLETE SUSCEPTIBILITY IN INDICATOR *E. COLI*

Marked variations among reporting countries

Lower KOI CS were generally observed in countries in eastern and southern Europe and the highest in countries in the northern Europe

Statistically significant **increasing trends** (from 2014-2023) registered **in 48% of the reporting countries** (14 of 29)

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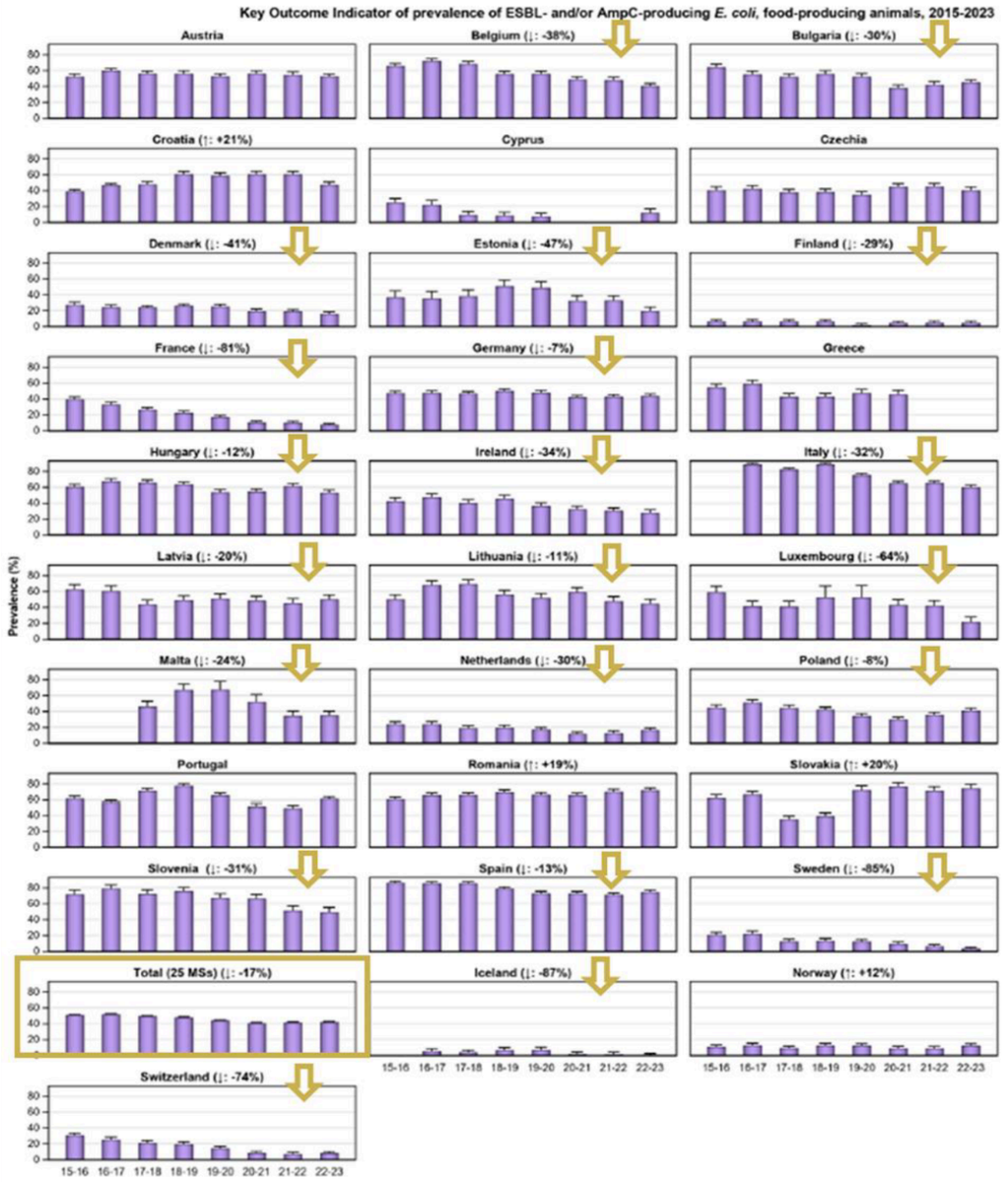
KEY OUTCOME INDICATOR PREVALENCE OF ESBL- AND/OR AMPC-PRODUCING *E. COLI*

Marked variations among reporting countries

Higher KOI ESBL were generally observed in countries in eastern and southern Europe and the highest in countries in the northern Europe

Statistically significant **decreasing trends** (from 2015-2023) have been observed in **70% of the reporting countries** (21 of 30)



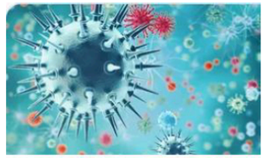
DETECTING EMERGING SIGNALS: THE EXAMPLE OF CARBAPENEM RESISTANCE

CPE in the FOOD CHAIN in THE EU/EFTA. PART 1: 2025 (ToR1/3)

Self-task Mandate BIOHAZ, SO adopted 12 March 2025

Current status: Occurrence, genes, bacteria, clones, mobile genetic elements, Sources, geographical and temporal distribution

Methods in use: Detection, cgharacterization



Biological Hazards

WG Carbapenemases

Transmission dynamics: Documented transmission routes, risk factors

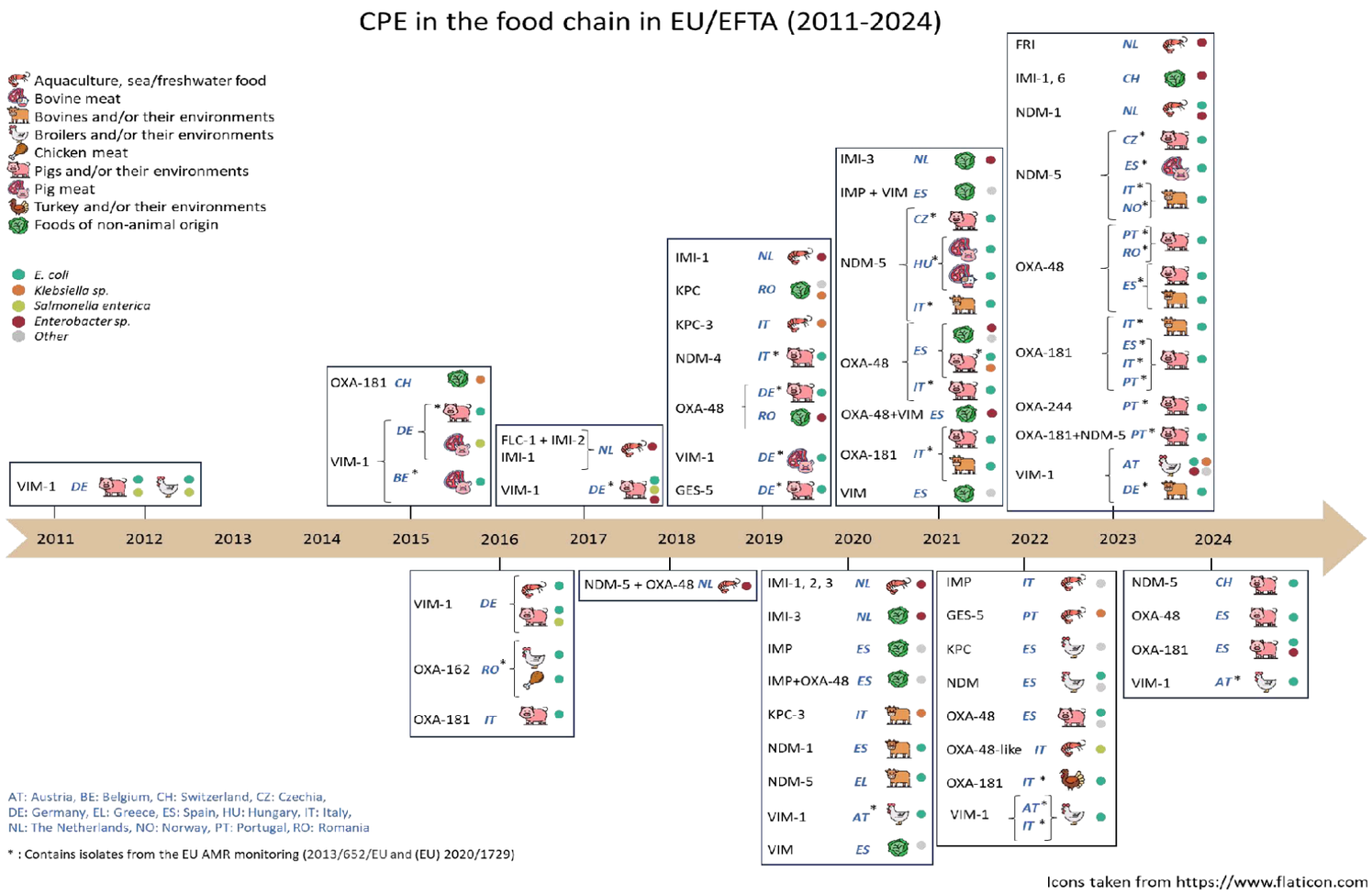
Contingency, mitigation plans:

Observers:

EUROPEAN MEDICINES AGENCY
SCIENCE MEDICINES HEALTH

European Commission

Temporal distribution and sources



Most reports from terrestrial animals, mainly from **pigs**, followed by bovines and poultry.

Compared to meat, more frequently detected in **food derived from aquatic animals and food of non-animal origin** (including imported products) exhibiting greater diversity in bacterial species and carbapenemase genes

Increase in number of reports, mainly from pigs, with a **surge** in

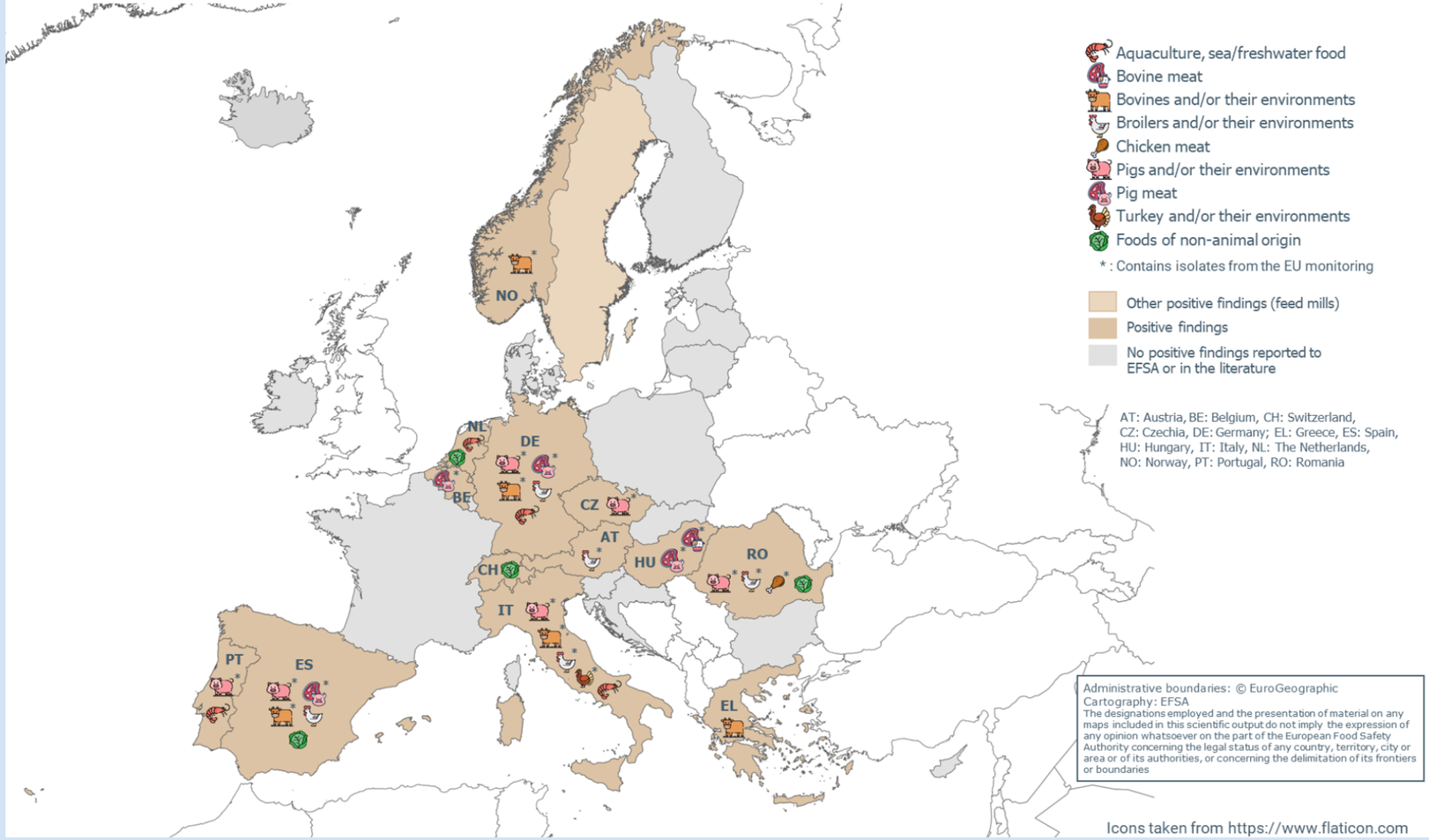
2021:
OXA-18: Italy

2023:
OXA-48: Spain

OXA-181, OXA-48, OXA-244 & *bla*NDM-5: Portugal

Geographical distribution

CPE in the food chain in the EU/EFTA (2011-2024)



Reported in 14 EU/EFTA countries (11 of them though the official EU monitoring)

Pig production a source across multiple countries (e.g. Germany, Italy, Czechia, Spain & Portugal)

CPE- RECOMMENDATIONS to fill identified gaps

MONITOR additional sources:

- seafood (aquaculture),
- foods of non-animal origin,
- Imports into EU
- others

Perform further studies to clarify transmission:

- trace-back-forward investigations,
- drivers for spread, risk factor analysis

MONITORING additional bacteria:

Klebsiella spp., *Enterobacter* spp., *Salmonella* spp., others

Detection methods:

- Increase sensitivity
- perform/harmonize characterization of MGE

Different types of studies/research that could be conducted were proposed:

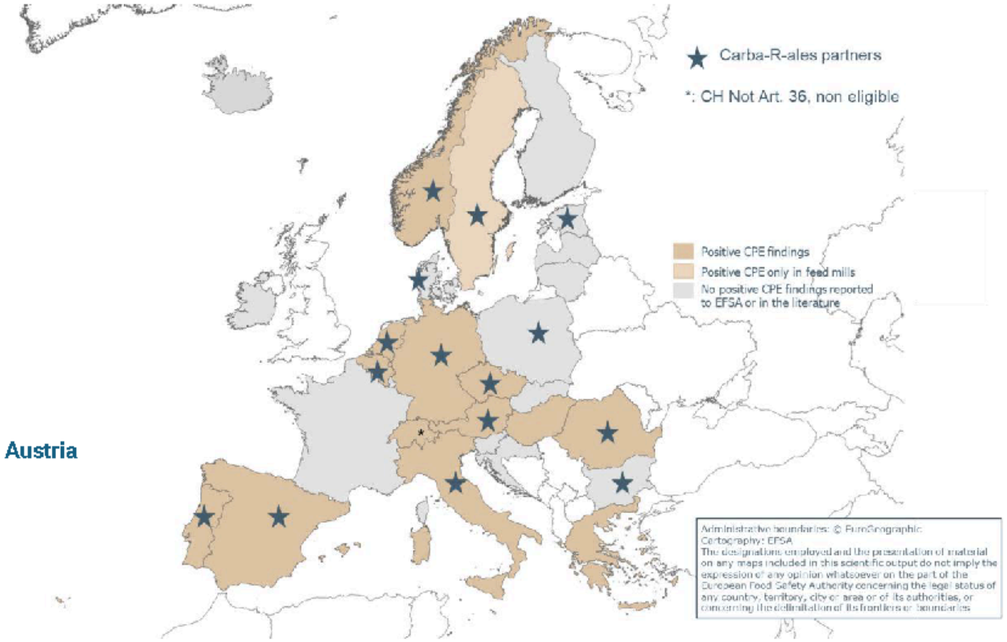
Molecular epidemiology, temporal and spatial correlation, experimental validations, advanced computational modelling, metagenomics/microbiome analysis

EFSA FPA GRANT: Carba-R-ales PROJECT

DTU & Co

Data Generation on Carbapenemase-producing Enterobacterales (CPEs) in the food chain in the EU/EFTA.

GP/EFSA/BIOHAW/2024/01

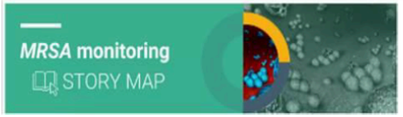


- **Coordinated by : TECHNICAL UNIVERSITY OF DENMARK -DTU FOOD- Denmark**
- Austrian Agency for Health and Food Safety – Institute for Medical Microbiology and Hygiene Graz – **Austria**
- SCIENSANO, Belgian National Public Health Institute – **Belgium**
- National Diagnostic and Research Veterinary Medical Institute – **Bulgaria**
- Státní veterinární ústav Praha – **Czech Republic**
- National Centre for Laboratory Research and Risk Assessment - LABRIS – **Estonia**
- The Federal Institute for Risk Assessment. Bundesinstitut für Risikobewertung – **Germany**
- Istituto Zooprofilattico Sperimenentale del Lazio e della Toscana– **Italy**
- Norwegian Veterinary Institute – **Norway**
- Institute of Marine Research – IMR – **Norway**
- PAŃSTWOWY INSTYTUT WEERYNARYJNY – PAŃSTWOWY INSTYTUT BADAWCZY – **Poland**
- The National Institute of Agricultural and Veterinary Research – INIAV – **Portugal**
- Wageningen Bioveterinary Research, institute within the legal entity Stichting Wageningen – **The Netherlands**
- Institutul de Diagnostic şi Sănătate Animală – IDSA – **Romania**
- Institutul de Igiena si Sanatate Publica Veterinara - IHVPH – **Romania**
- Central Veterinary Laboratory – **Spain**
- National Food Center Spanish Agency for Food Safety and Nutrition – CAN AESAN OA – **Spain**
- Laboratory veterinarian| Dep. Animal health and antibiotic strategies - Swedish Veterinary Agency – **Sweden**

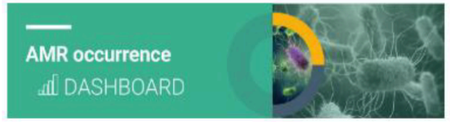
ONLINE VISUALISATION TOOLS: DASHBOARDS & STORY MAPS

- **2022 visualisation tools**

STORY MAPS

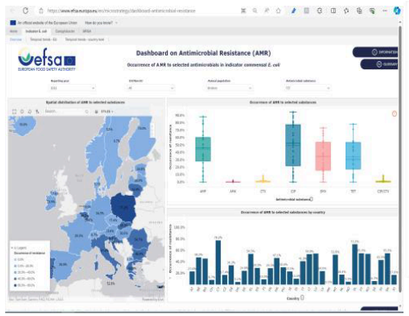


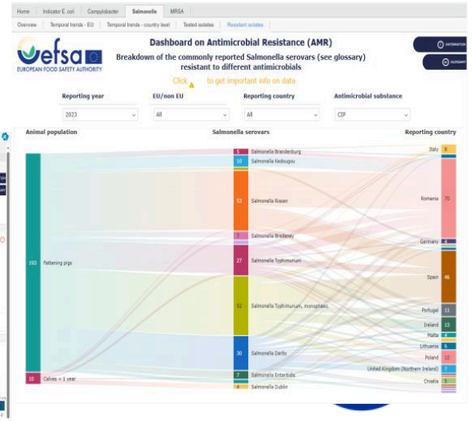
DASHBOARDS



- **2023 Visualisation tools**

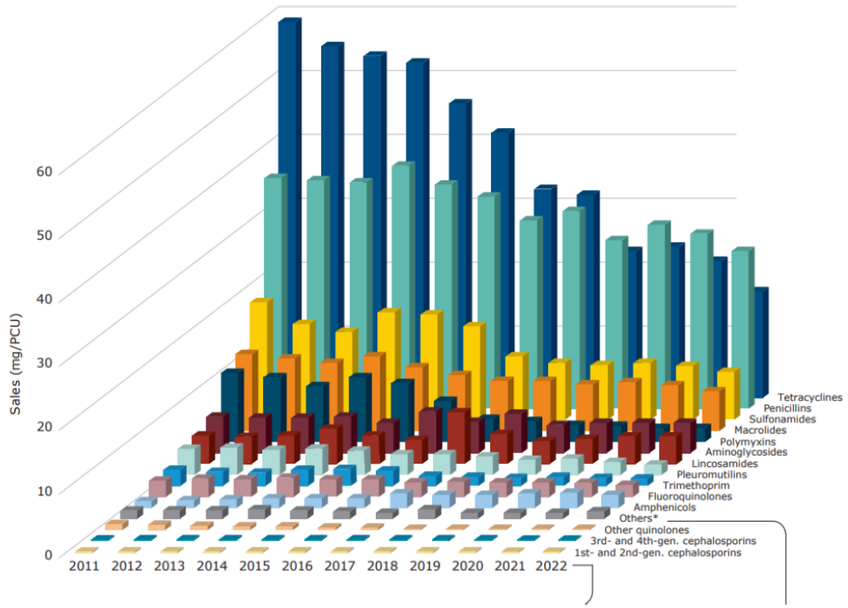
New: story map on AMR in *Salmonella* spp.



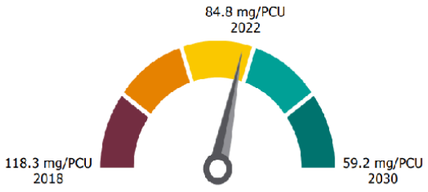


CONSUMPTION IN ANIMALS

Figure 16. Trends of aggregated sales (mg/PCU) by antibiotic class in 25 European countries[1] from 2011 to 2022[2]



Farm-to-Fork goal: reduce EU sales of antimicrobials for farmed animals + aquaculture by 50% by 2030



- **The ESVAC project formally comes to an end in November 2023 with the publication of its final report.**
- **From January 2024, all EU / EEA MSs must report their data on the volume of sales and use of antimicrobial medicinal products in animals, in line with the Veterinary Medicinal Products Regulation.**
- **EU / EEA MSs must use EMA's Antimicrobial Sales and Use Platform to report their data.**

Joint reporting on the consumption of antimicrobial agents and occurrence of AMR in bacteria from humans and food-producing animals (JIACRA)

- As part of the implementation of the EU action plans on AMR, the **European Center for Disease Prevention and Control** (ECDC), the **European Food Safety Authority** (EFSA) and the **European Medicines Agency** (EMA) have been requested by the European Commission to analyse possible **relationships** between the **consumption of antimicrobial agents** and the **occurrence of antimicrobial resistance** in humans and food-producing animals.
- JIACRA builds on previous collaboration between the three EU agencies, including harmonisation of approaches, expertise and previous joint publications on related subjects.
- So far, four JIACRA reports have been published, with a fifth report expected to be delivered end of 2026.

2015
(2011-2012)

2017
(2013-2015)

2021
(2016-2018)

2024
(2019-2021)

JIACRA V
2026

AMR ANIMAL PATHOGENS: EFSA OUTPUTS

8 Scientific Opinions:

0–33%	33–66%	66–100%
Not listed	Uncertainty about listing	Listed
Any probability range that crosses into the 33–66% zone		

From recent Council Recommendations: "Continue to assess, on the basis of follow-up to several recent scientific opinions EFSA, 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 ('Animal Health Law') with a view to categorise them for any regulatory surveillance, control or other management measures."

Antimicrobial-resistant bacterium	Animal species	Link	Date published	Outcome of the assessment on listing (probability range)
Staphylococcus pseudintermedius	Dogs and cats	https://efsa.onlinelibrary.wiley.com/doi/epdf/10.2903/j.efsa.2022.7080	01/02/2022	**Uncertain** (33–90%)
Rhodococcus equi	Horses	https://efsa.onlinelibrary.wiley.com/doi/epdf/10.2903/j.efsa.2022.7081	02/02/2022	**Uncertain** (10–66%)
Enterococcus faecalis	Poultry	https://efsa.onlinelibrary.wiley.com/doi/epdf/10.2903/j.efsa.2022.7127	21/02/2022	**Uncertain** (33–66%)
Enterococcus cecorum	Poultry	https://efsa.onlinelibrary.wiley.com/doi/epdf/10.2903/j.efsa.2022.7126	25/02/2022	**Uncertain** (33–75%)
Brachyspira hyodysenteriae	Swine	https://efsa.onlinelibrary.wiley.com/doi/epdf/10.2903/j.efsa.2022.7124	15/03/2022	**Uncertain** (33–66%)
Pseudomonas aeruginosa	Dogs and cats	https://efsa.onlinelibrary.wiley.com/doi/epdf/10.2903/j.efsa.2022.7310	03/05/2022	**Uncertain** (33–90%)
Escherichia coli	Dogs and cats, horses, swine, poultry, cattle, sheep and goats	https://efsa.onlinelibrary.wiley.com/doi/epdf/10.2903/j.efsa.2022.7311	10/05/2022	**Uncertain** (33–66%)
Staphylococcus aureus	Cattle and horses	https://efsa.onlinelibrary.wiley.com/doi/epdf/10.2903/j.efsa.2022.7312	10/05/2022	**Uncertain** (60–90%)

EARS-Vet : The European Antimicrobial Resistance Surveillance network in Veterinary medicine

- 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 development of veterinary antimicrobial guidelines
  - Support risk assessment, e.g. zoonotic risks
  - Advise EU-level policy making
  - Monitor interventions
  - Etc.

AMR ENVIRONMENT

SCIENTIFIC OPINION

EFSA Journal

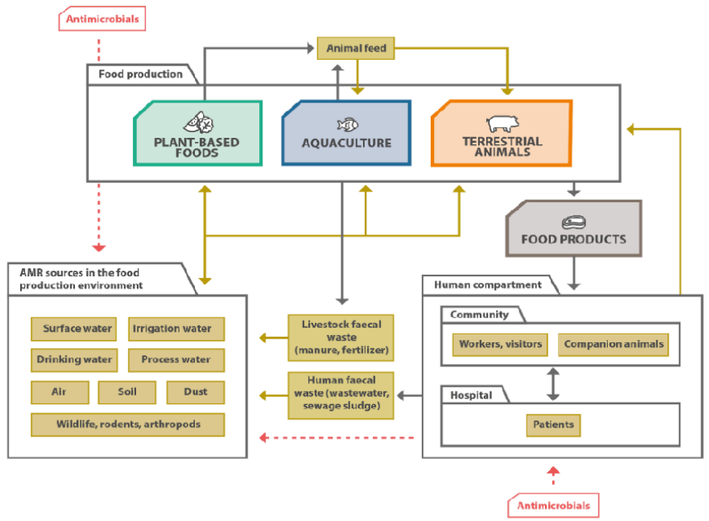
ADOPTED: 29 April 2021

doi: 10.2903/j.efsa.2021.6651

Role played by the environment in the emergence and spread of antimicrobial resistance (AMR) through the food chain

EFSA Panel on Biological Hazards (BIOHAZ),
Konstantinos Koutsoumanis, Ana Allende, Avelino Alvarez-Ordonez, Declan Bolton, Sara Bover-Cid, Marianne Chemaly, Robert Davies, Alessandra De Cesare, Lieve Herman, Friederike Hilbert, Roland Lindqvist, Maarten Nauta, Giuseppe Ru, Marion Simmons, Panagiotis Skandamis, Elisabetta Suffredini, Hector Arguello, Thomas Berendonk, Lina Maria Cavaco, William Gaze, Heike Schmitt, Ed Topp, Beatriz Guerra, Ernesto Liebana, Pietro Stella and Luisa Peixe

Sources and transmission routes



- Faecal matter (fertilisation and irrigation water)
- Feed, and humans
- Water (with human and animal faecal material)

WATERESIST

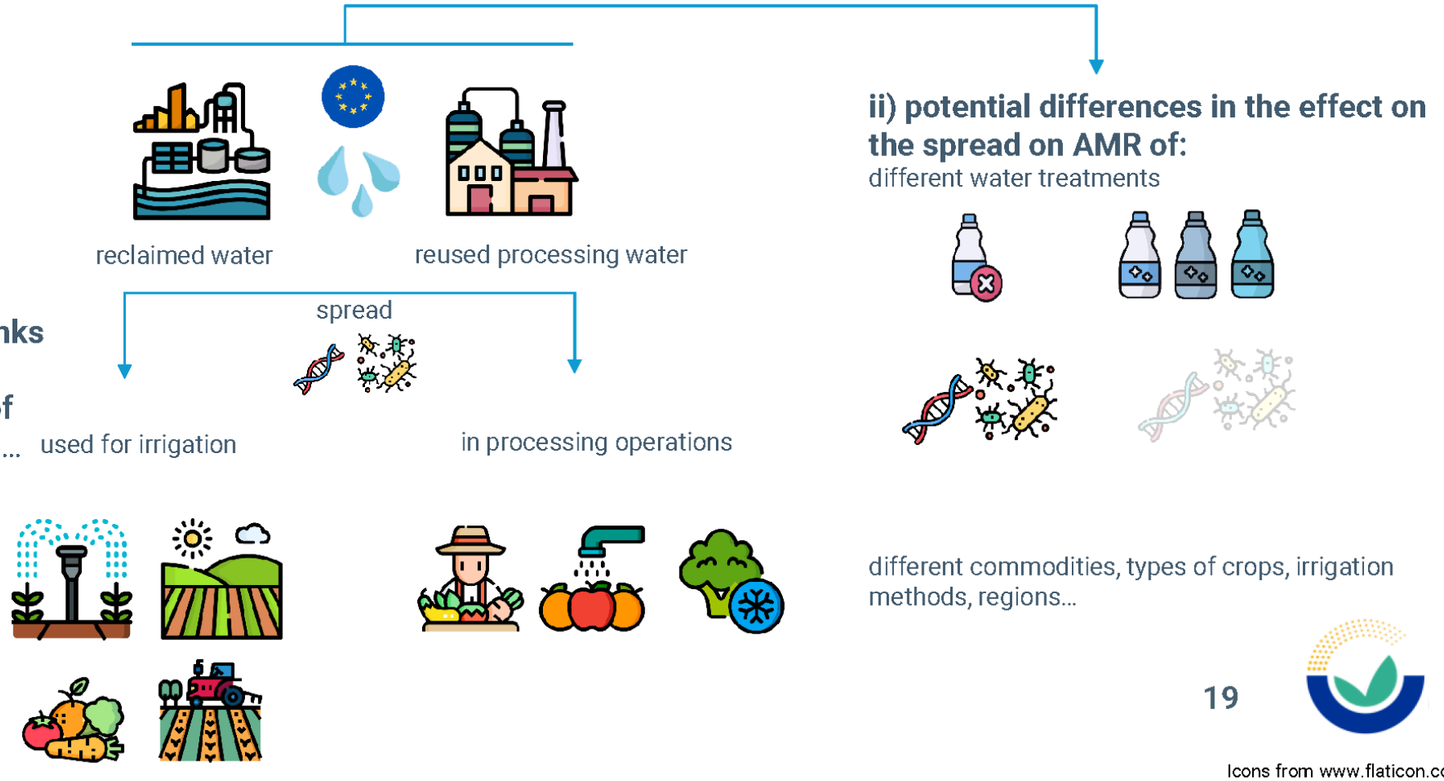
Role of Water Used in the Growing, Handling and Processing of Fruits, Vegetables and Herbs on the Spread of AMR (03-2024 to 03-2026)

Direct contract, 950,000 €, …to gain insights on the **occurrence/variety of ARB** and **ARGs**…in order to help **to assess the role of this water in the spread of ARB and ARGs to fruits/vegetables/ herbs (FVH)** in different European regions.

Objective 1: Optimize ARB/ARGs detection methods: culture, PCR-based, metagenomics).

Objective 2: Occurrence ARB/ARGs, using reclaimed water for irrigation

Objective 3: Occurrence ARB/ARGs using "reused/recycled" water during handling/processing



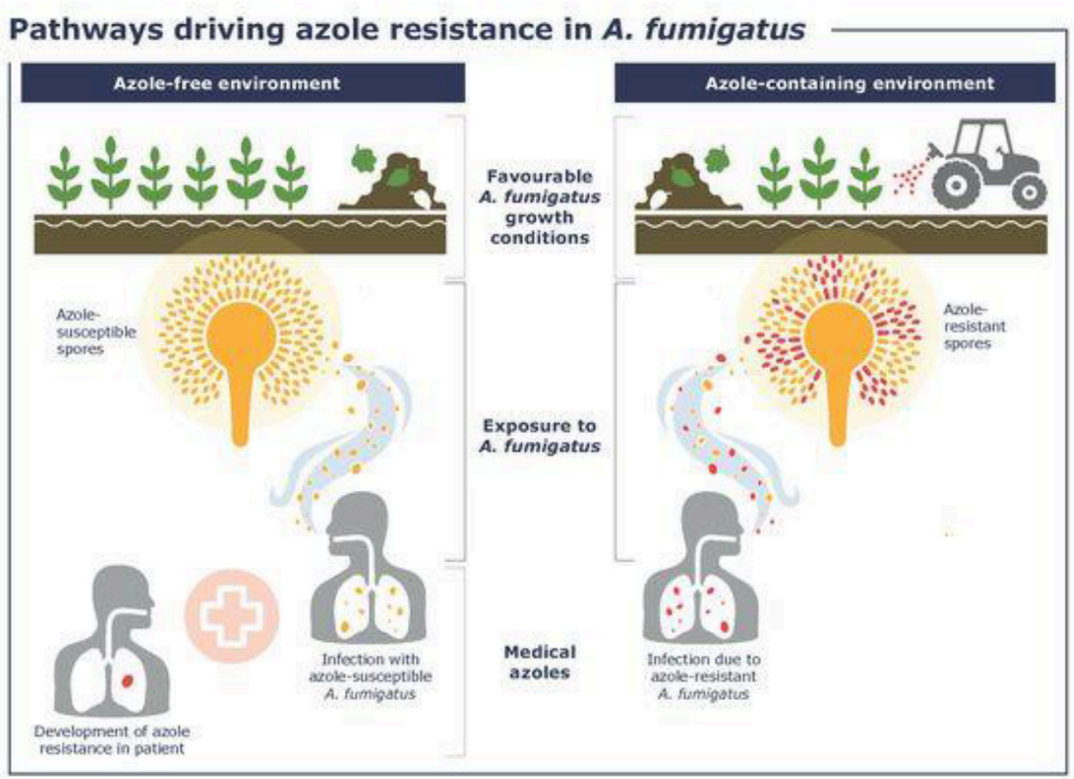
Icons from www.flaticon.com

BACKGROUND

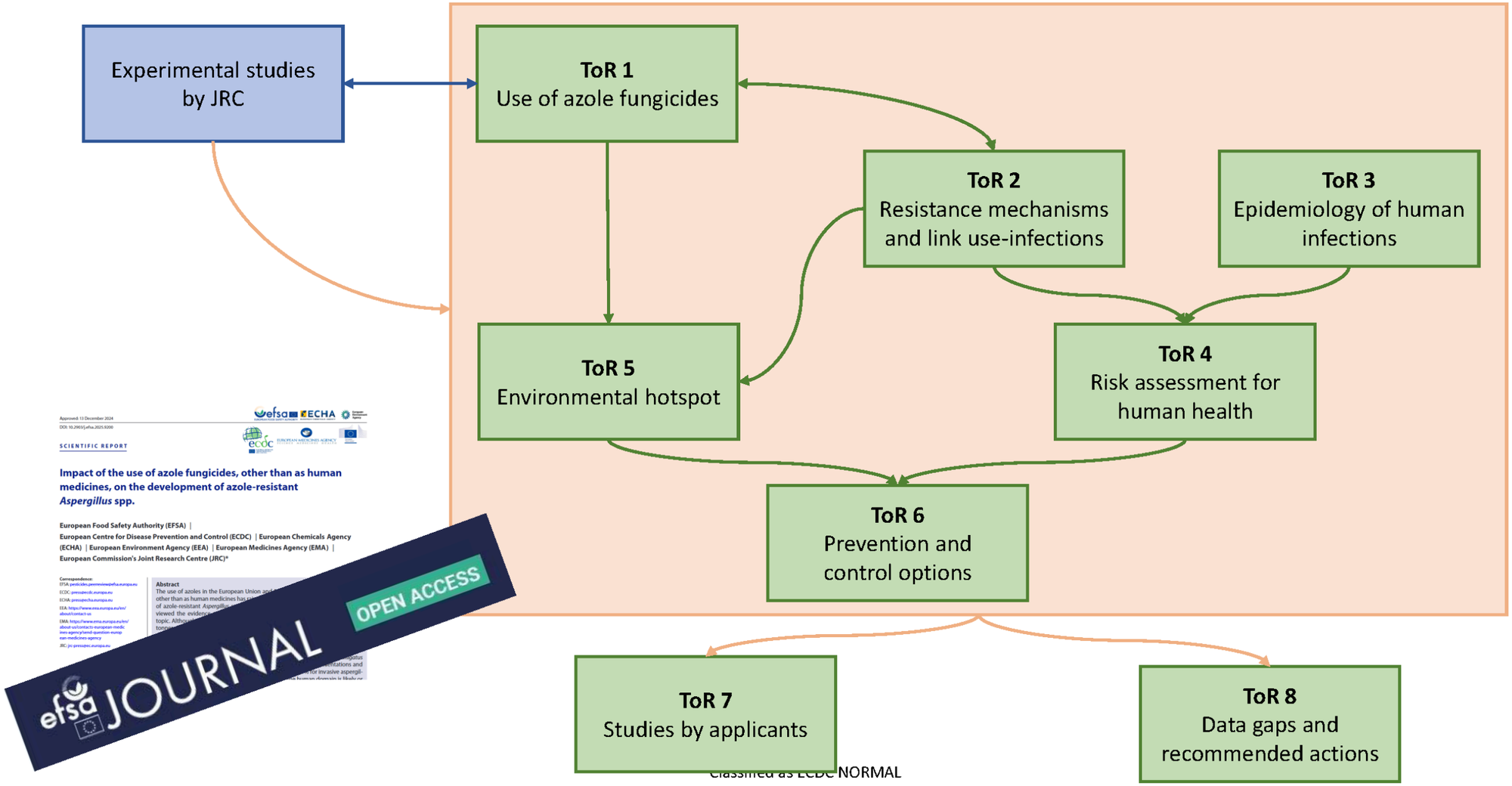
Azoles are broad-spectrum antifungals:

- Human medicinal products ✗
- Veterinary medicinal products (VMPs) — European Medicines Agency
- Plant protection products (PPPs) — EFSA
- Biocidal products (BPs) — ECHA
- Industrial chemicals — ECHA

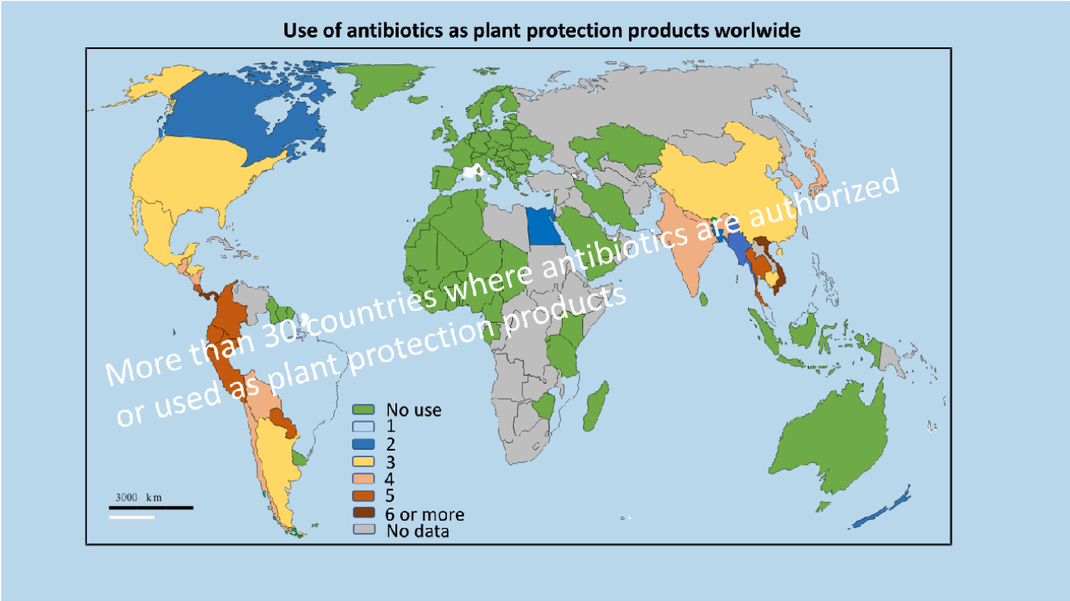
https://www.youtube.com/watch?v=-mlGuNbN_ss



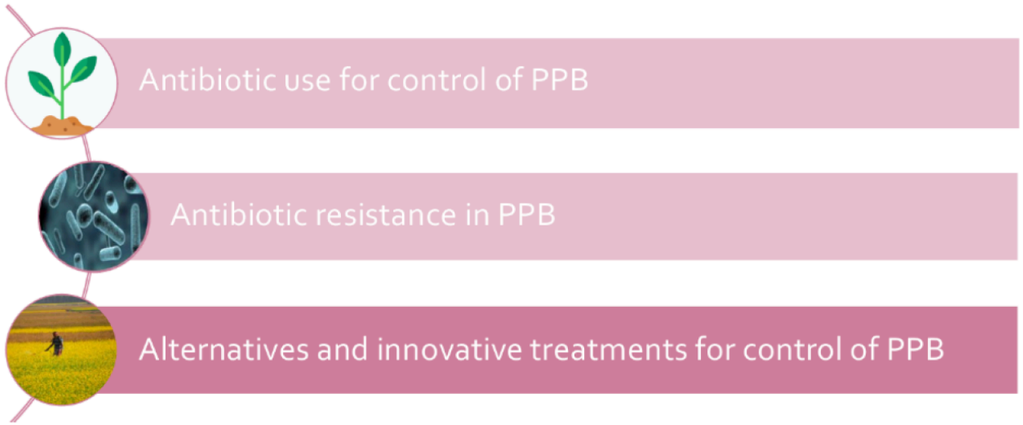
TERMS OF REFERENCE



THE PLANTIBIO PROJECT



Collection, analysis and synthesis of data about…



External Scientific Report

UCLouvain

APPROVED: 11 December 2023
doi: 10.2903/sp.efsa.2024.EN-8522

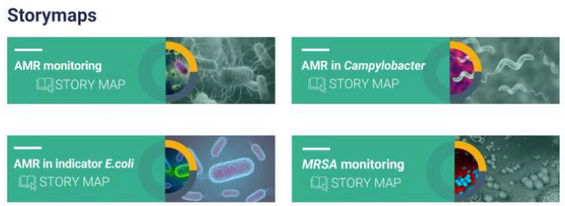
Data collection on antibiotics for control of plant pathogenic bacteria

Verhaegen, M., Mahillon, J., Caulier, S., Mingeot-Leclercq*, M.-P., Bragard, C.

UCLouvain, Earth&Life Institute-Applied microbiology, Louvain Drug Institute*

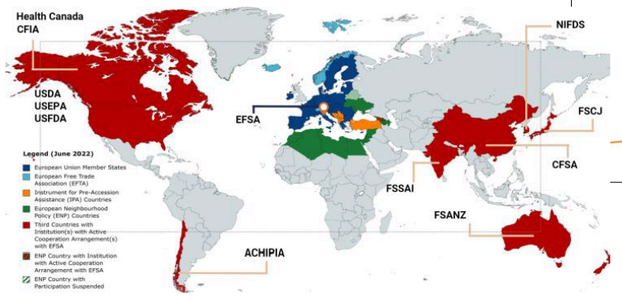
https://efsa.onlinelibrary.wiley.com/doi/epdf/10.2903/sp.efsa.2024.EN-8522

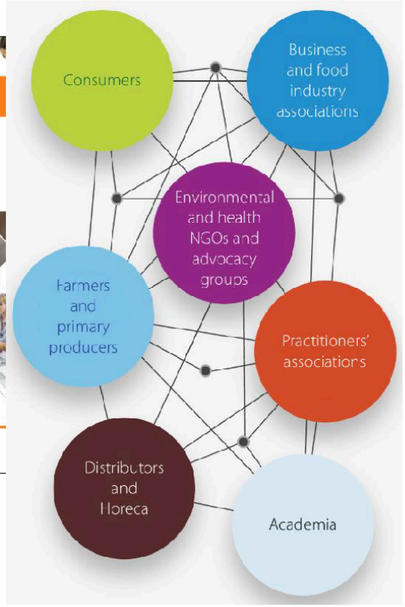
JOIN EFFORTS: IMPROVING COMMUNICATION, EDUCATION AND STAKEHOLDER ENGAGEMENT



Podcast | 17 April 2023

Episode 6 – Antibiotics: handle with care





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EUROPEAN FOOD SAFETY AUTHORITY

Presentation

Azucena Mora

Full professor of Microbiology at University of Santiago de Compostela

Member of the Scientific Committee of AESAN (Spanish Food Safety Agency)

#EAAD #EAAD2025 #WAAW #WAAW2025 #WorldAMRWeek #AMRWeek

From Farm to Fork: Understanding and Mitigating **A**ntimicrobial **R**esistance across the Food Chain

Dr. Azucena Mora, Full Professor of Microbiology (USC), Member of the Scientific Committeeofthe Spanish Agency for Food Safety & Nutrition (AESAN)

Reference Laboratory of E. coli (LREC)
Facultad de Veterinaria de Lugo, USC

- EFSA - PUNTO FOCAL
- COMITÉ CIENTÍFICO
- BUSCADOR DE EMPRESAS Y ALIMENTOS Y SUS DECLARACIONES
- LEGISLACIÓN ALIMENTARIA
- PUBLICACIONES
- CAMPAÑAS
- RED DE ALERTA
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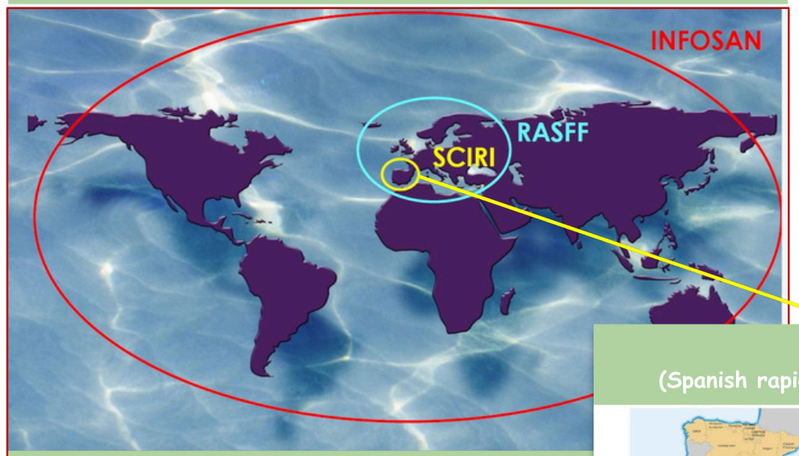
Organización Mundial de la Salud

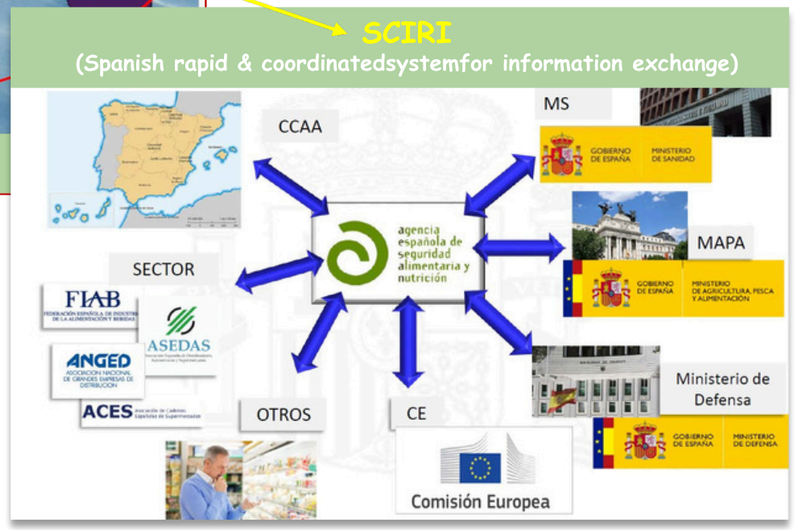
FAO FIAT PANIS

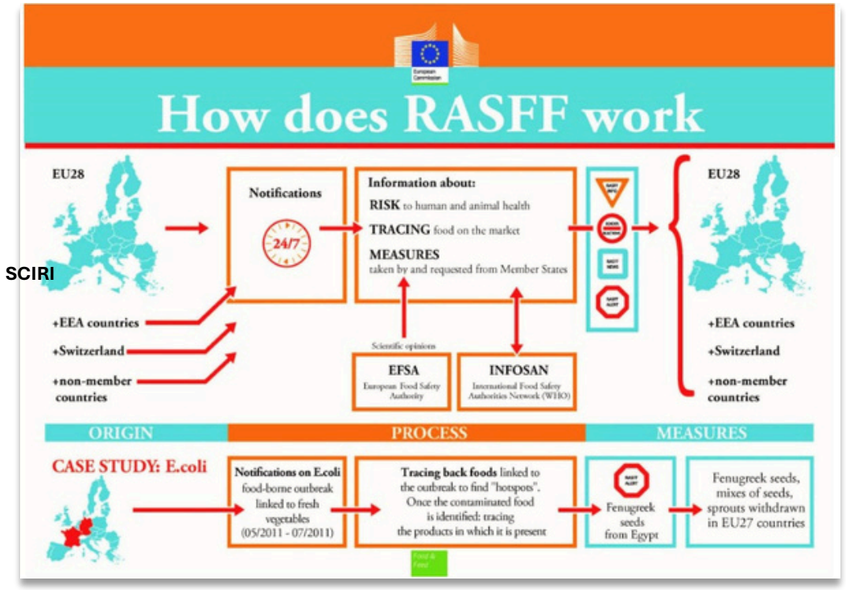
Azucena Mora USC UNIVERSIDADE DE SANTIAGO DE COMPOSTELA

FOOD ALERT NETWORKS



24h x 7d = 365 days





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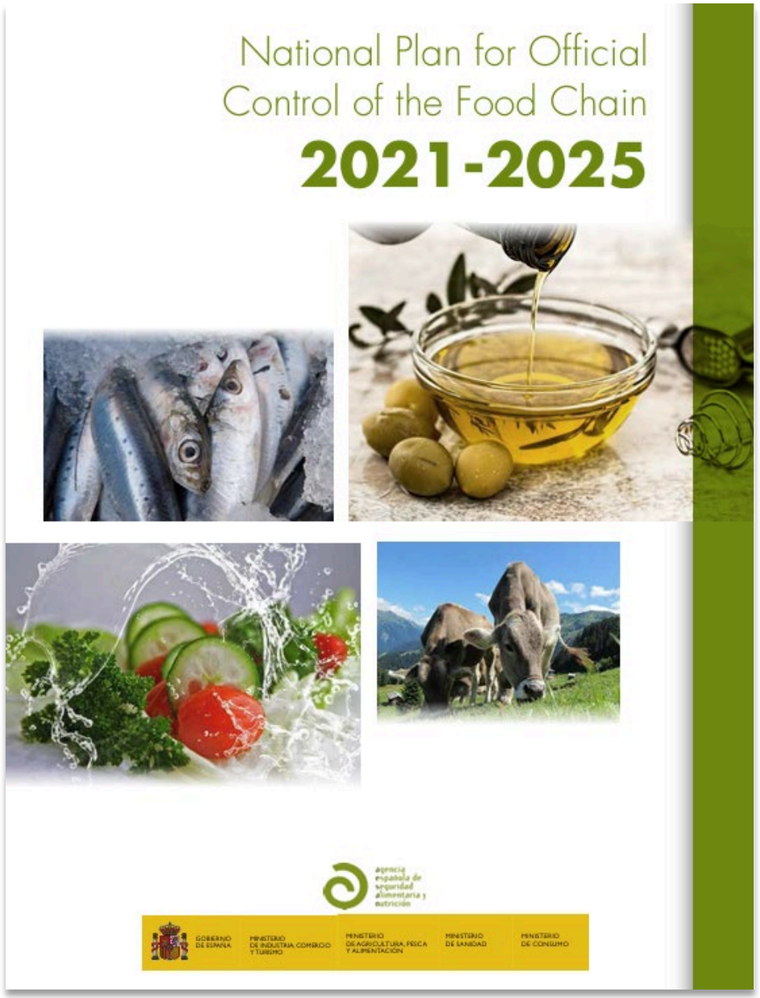

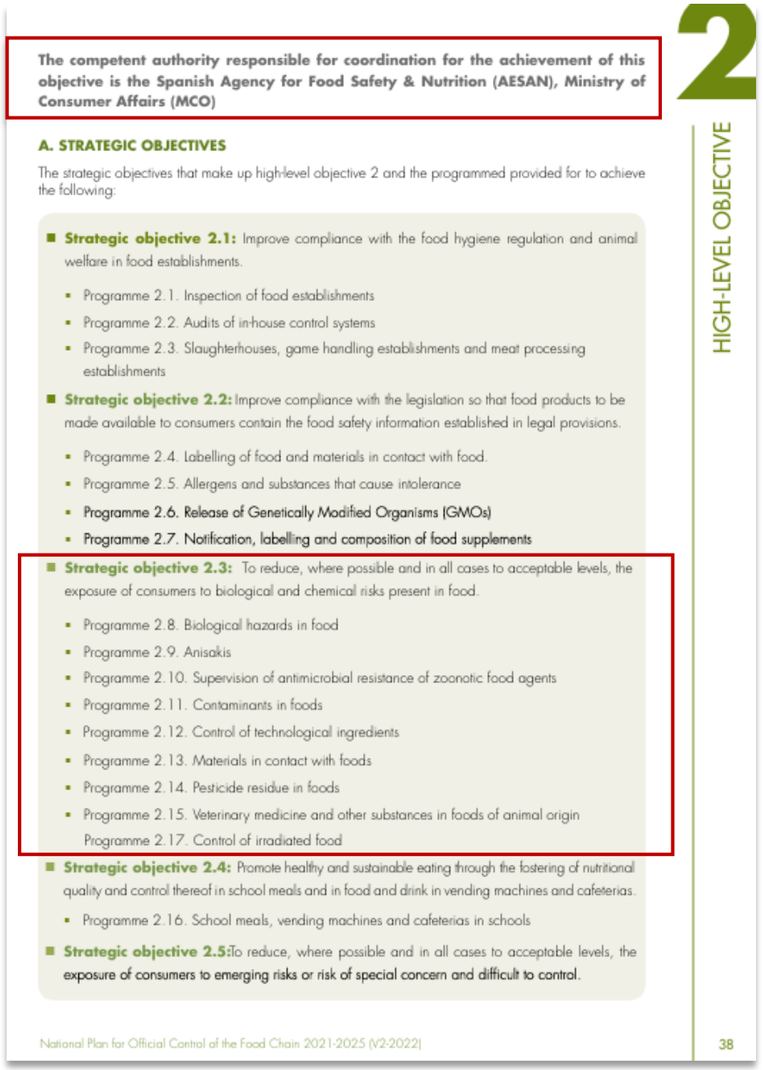

The competent authority responsible for coordination for the achievement of this objective is the Spanish Agency for Food Safety & Nutrition (AESAN), Ministry of Consumer Affairs (MCO)

2

HIGH-LEVEL OBJECTIVE

A. STRATEGIC OBJECTIVES

The strategic objectives that make up high-level objective 2 and the programmed provided for to achieve the following:

- **Strategic objective 2.1:** Improve compliance with the food hygiene regulation and animal welfare in food establishments.
  - Programme 2.1. Inspection of food establishments
  - Programme 2.2. Audits of in-house control systems
  - Programme 2.3. Slaughterhouses, game handling establishments and meat processing establishments
- **Strategic objective 2.2:** Improve compliance with the legislation so that food products to be made available to consumers contain the food safety information established in legal provisions.
  - Programme 2.4. Labelling of food and materials in contact with food.
  - Programme 2.5. Allergens and substances that cause intolerance
  - Programme 2.6. Release of Genetically Modified Organisms (GMOs)
  - Programme 2.7. Notification, labelling and composition of food supplements
- **Strategic objective 2.3:** To reduce, where possible and in all cases to acceptable levels, the exposure of consumers to biological and chemical risks present in food.
  - Programme 2.8. Biological hazards in food
  - Programme 2.9. Anisakis
  - Programme 2.10. Supervision of antimicrobial resistance of zoonotic food agents
  - Programme 2.11. Contaminants in foods
  - Programme 2.12. Control of technological ingredients
  - Programme 2.13. Materials in contact with foods
  - Programme 2.14. Pesticide residue in foods
  - Programme 2.15. Veterinary medicine and other substances in foods of animal origin
  - Programme 2.17. Control of irradiated food
- **Strategic objective 2.4:** Promote healthy and sustainable eating through the fostering of nutritional quality and control thereof in school meals and in food and drink in vending machines and cafeterias.
  - Programme 2.16. School meals, vending machines and cafeterias in schools
- **Strategic objective 2.5:** To reduce, where possible and in all cases to acceptable levels, the exposure of consumers to emerging risks or risk of special concern and difficult to control.

National Plan for Official Control of the Food Chain 2021-2025 (V2-2022)

38

agencia española de seguridad alimentaria y nutrición

Spanish zoonosis report

EFSA Spain zoonosis& AMR report

EU One Health zoonosis& report

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Meeting of the Scientific Committee No. 100

FOOD RISK ASSESS EUROPE OPEN ACCESS

Volume 2, Issue 2
April 2024
0027E

Technical report | Open Access

Report of the Scientific Committee of the Spanish Agency for Food Safety and Nutrition (AESAN) on the microbiological criteria for *Vibrio cholerae*, as additional control measures at border control posts, applicable to imported frozen prawns and other fishery products

Antonio Valero Díaz, Rosa María Capita González, Baltasar Mayo Pérez, Azucena del Carmen Mora Gutiérrez, María Dolores Rodrigo Aliaga

First published: 07 May 2024 | https://doi.org/10.2903/fr.efsa.2024.FR-0027

FOOD RISK ASSESS EUROPE OPEN ACCESS

Volume 3, Issue 3
July 2025
0069E

Technical report | Open Access

Report of the Scientific Committee of the Spanish Agency for Food Safety and Nutrition (AESAN) on the effects of climate change on the risk of transmission of foodborne pathogens

Antonio Valero Díaz, Rosa María Capita González, Baltasar Mayo Pérez, Azucena del Carmen Mora Gutiérrez, María Dolores Rodrigo Aliaga, Gloria Sánchez Moragas, Paula Arrabal Durán ... See fewer authors

First published: 15 September 2025 | https://doi.org/10.2903/fr.efsa.2025.FR-0069

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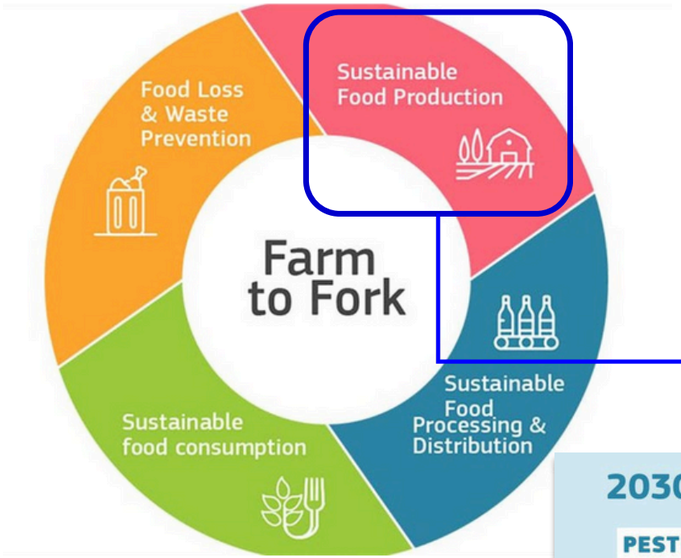
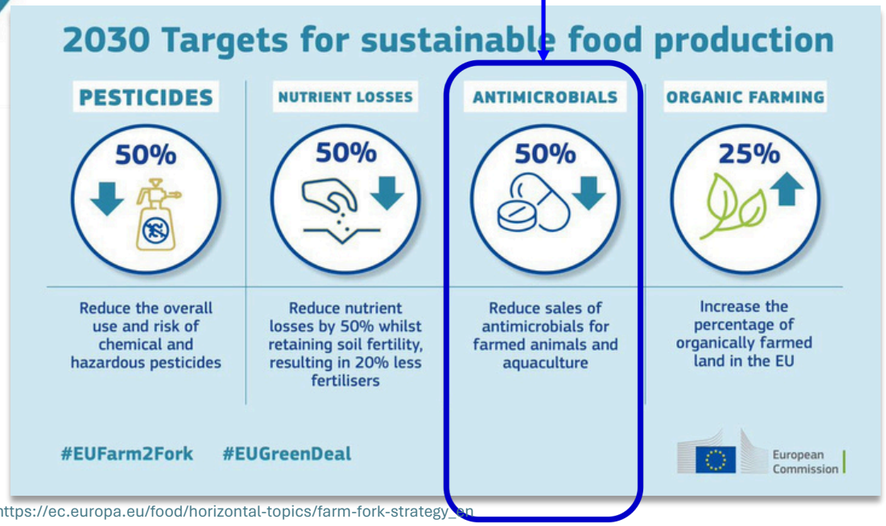
From Farm to Fork: Understanding Antimicrobial Resistance



"The farm to Fork Strategy is at the heart of the EuropeanGreenDeal.

We are moving towards a more healthy and sustainable EU Food system"



https://ec.europa.eu/food/horizontal-topics/farm-fork-strategy_en

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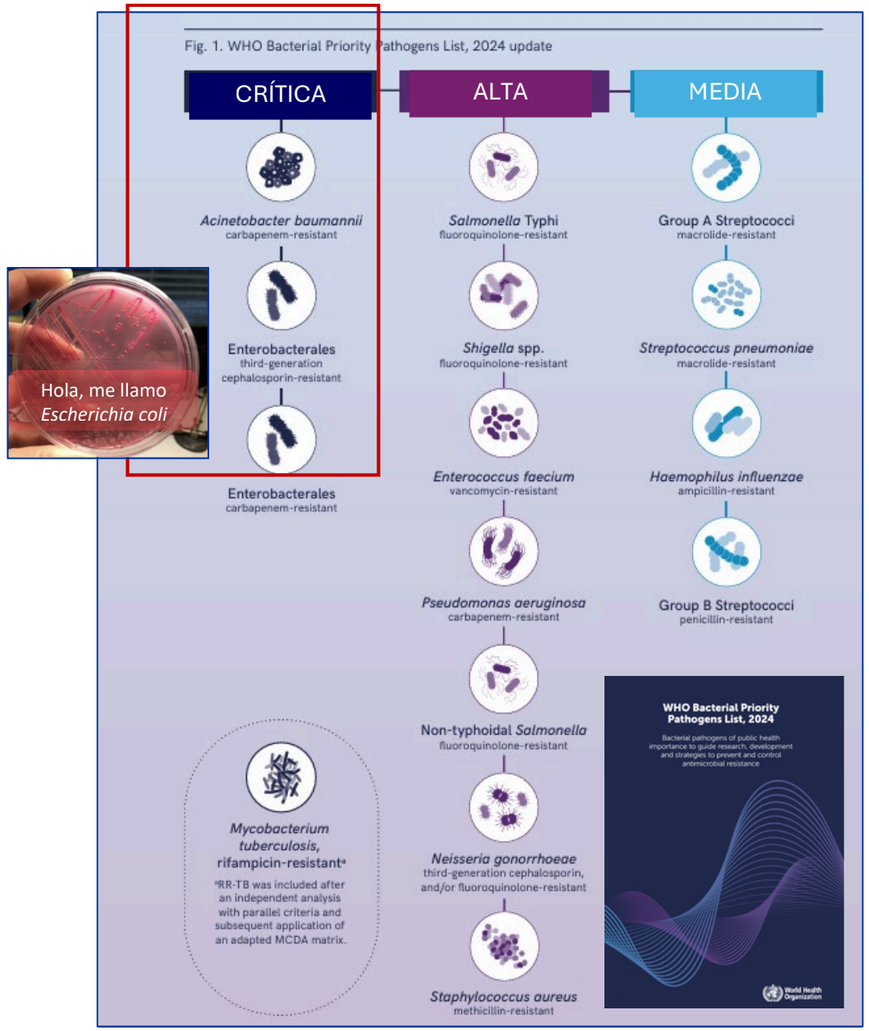
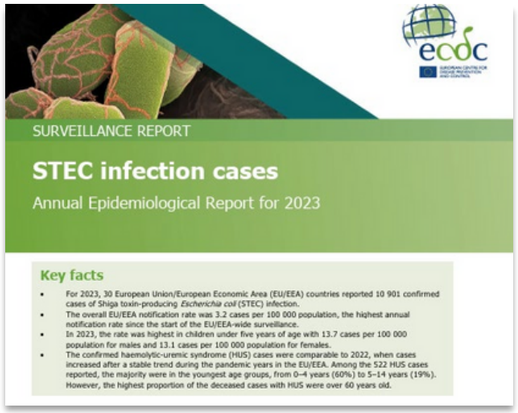
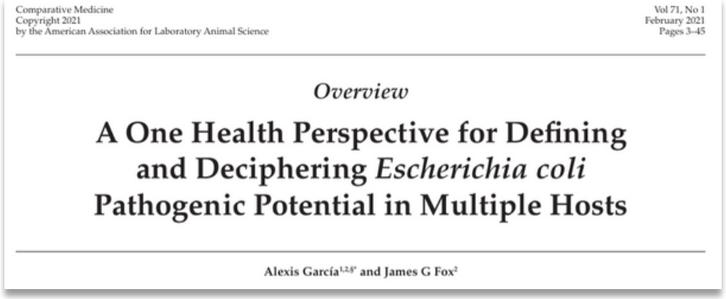
Why Escherichia coli? E. coli at the Nexus of One Health and AMR Surveillance



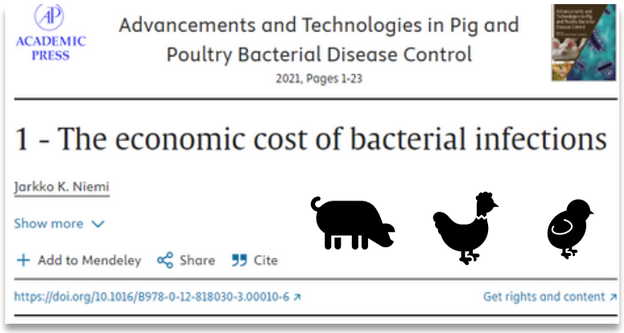




USDA **Economic Research Service**
U.S. DEPARTMENT OF AGRICULTURE

Total cost of foodborne illness estimates for 15 leading foodborne pathogens

	Mean estimates, 2018	
	Cases	**Cost**
Campylobacter spp. (all species)	845.024	$2.181.485.783
Clostridium perfringens	965.958	$384.277.856
Cryptosporidium spp. (all species)	57.616	$58.394.152
Cyclospora cayetanensis	11.407	$2.571.518
Listeria monocytogenes	1.591	$3.189.686.110
Norovirus	5.461.731	$2.566.984.191
Salmonella (non-typhoidal species)	1.027.561	$4.142.179.161
Shigella (all species)	131.254	$159.202.402
Shiga toxin-producing *Escherichia coli* O157 (STEC O157)	63.153	$311.036.907
non-O157 Shiga toxin-producing *Escherichia coli* (STEC non-O157)	112.752	$31.701.852
Toxoplasma gondii	86.686	$3.744.008.907
Vibrio parahaemolyticus	34.664	$45.735.332
Vibrio vulnificus	96	$359.481.557
Vibrio non-cholera species other than *V. parahaemolyticus* and *V. vulnificus*	17.56	$81.749.064
Yersinia enterocolitica	4	$313.297.920
	97.65	
Total for all 15 pathogens	8.914.713	$17.571.792.712



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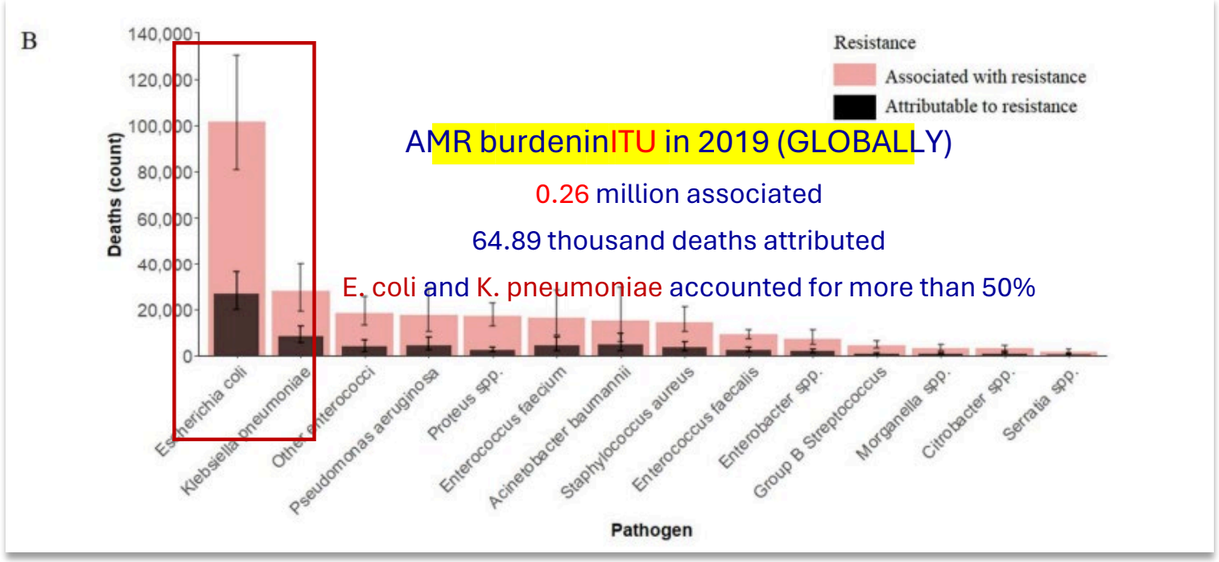
Human burden from AMR (GLOBALLY)

AMR in deaths in 2021
4.71 million associated
1.14 million attributable

Global Burden of Disease 2021 Antimicrobial Resistance Collaborators. Global burden of bacterial antimicrobial resistance 1990–2021: a systematic analysis with forecasts to 2050. **Lancet 2024; 404: 1199-1226.**



AMR burdeninITU in 2019 (GLOBALLY)

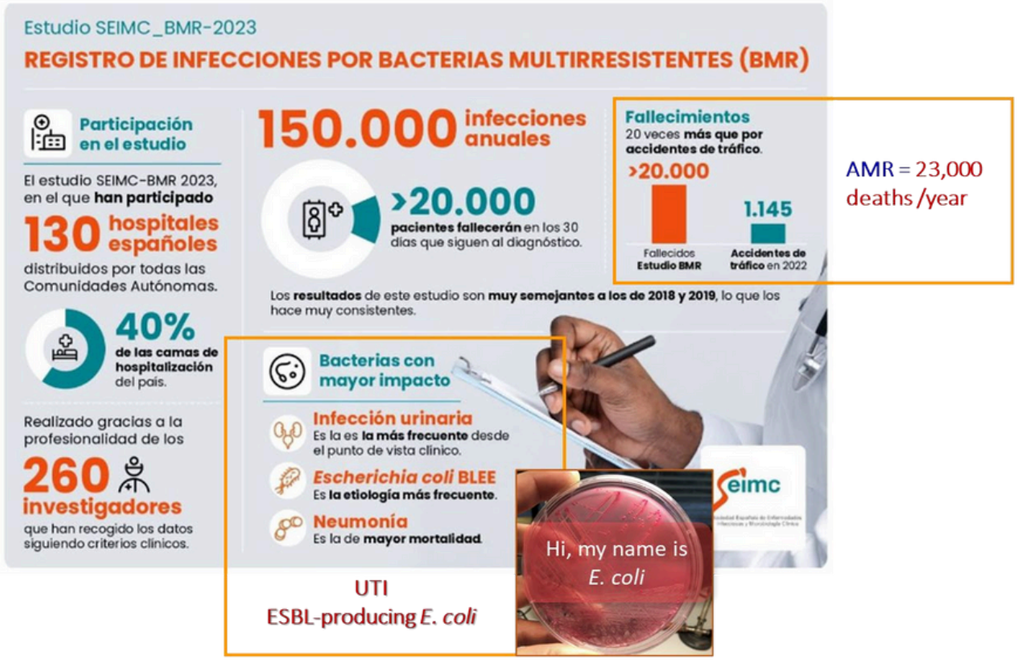
0.26 million associated

64.89 thousand deaths attributed

E. coli and K. pneumoniae accounted for more than 50%

J. Clin. Med. **2022**, *11*, 2817. https://doi.org/10.3390/jcm11102817

SPANISH SUPERBUGS CAUSE 20x more DEATHS than traffic accidents



AMR = 23,000 deaths /year

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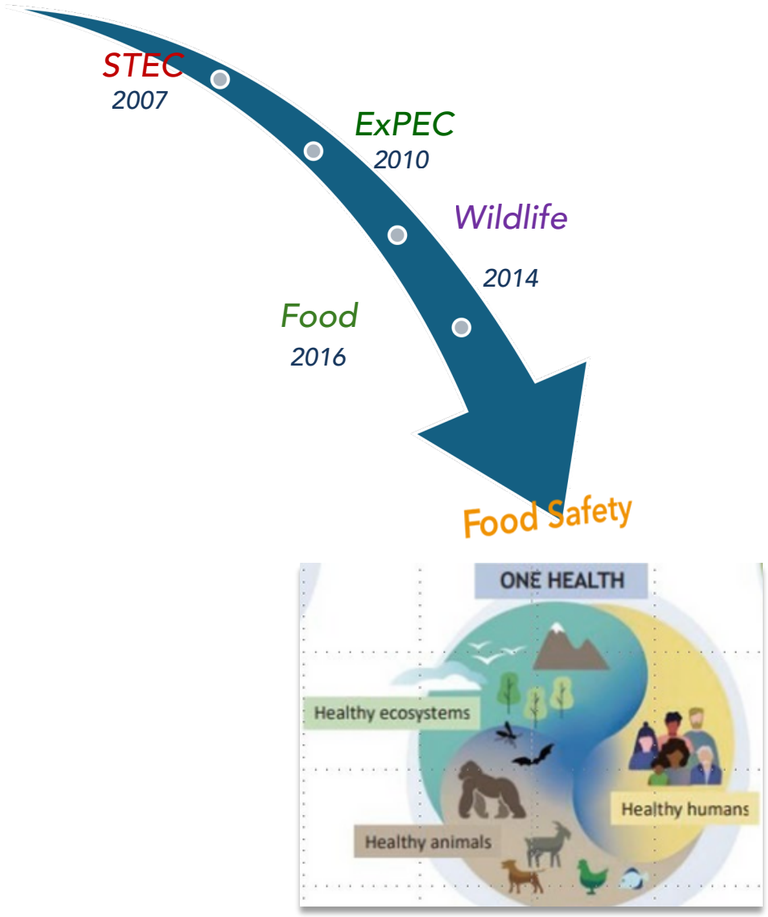
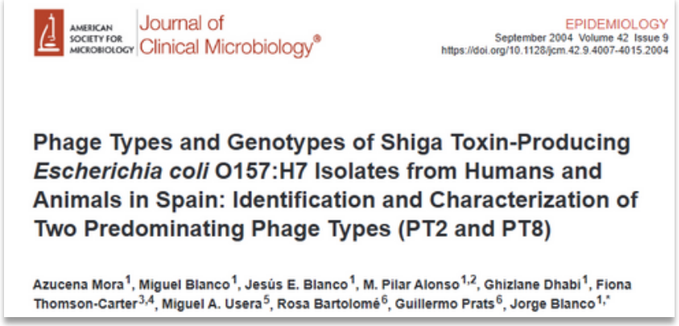
#EAAD #EAAD2025 #WAAW #WAAW2025 #WorldAMRWeek #AMRWeek

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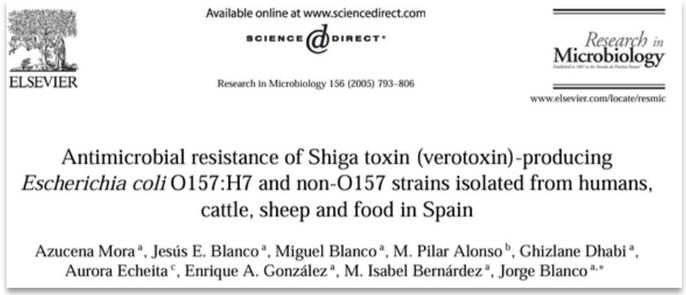
September 2004 Volume 42 Issue 9
https://doi.org/10.1128/jcm.42.9.4007-4015.2004

Phage Types and Genotypes of Shiga Toxin-Producing *Escherichia coli* O157:H7 Isolates from Humans and Animals in Spain: Identification and Characterization of Two Predominating Phage Types (PT2 and PT8)

Azucena Mora[1], Miguel Blanco[1], Jesús E. Blanco[1], M. Pilar Alonso[1,2], Ghizlane Dhabi[1], Fiona Thomson-Carter[3,4], Miguel A. Usera[5], Rosa Bartolomé[6], Guillermo Prats[6], Jorge Blanco[1,*]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Research in Microbiology 156 (2005) 793–806
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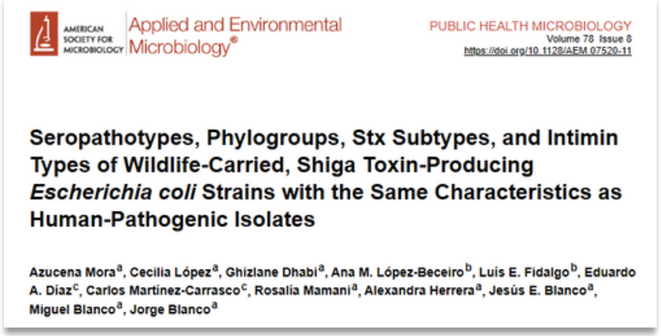
Antimicrobial resistance of Shiga toxin (verotoxin)-producing *Escherichia coli* O157:H7 and non-O157 strains isolated from humans, cattle, sheep and food in Spain

Azucena Mora[a], Jesús E. Blanco[a], Miguel Blanco[a], M. Pilar Alonso[b], Ghizlane Dhabi[a], Aurora Echeita[c], Enrique A. González[a], M. Isabel Bernárdez[a], Jorge Blanco[a,*]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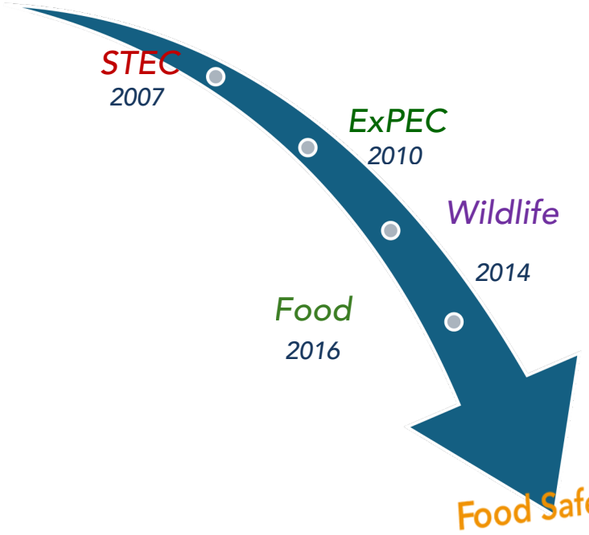
PUBLIC HEALTH MICROBIOLOGY
Volume 78 Issue 8
https://doi.org/10.1128/AEM.07520-11

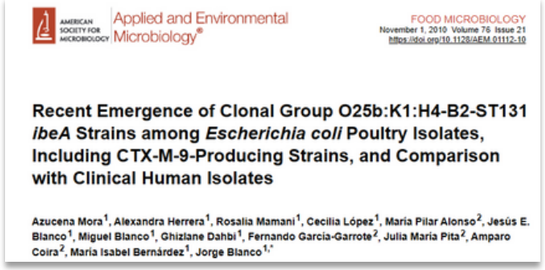
Seropathotypes, Phylogroups, Stx Subtypes, and Intimin Types of Wildlife-Carried, Shiga Toxin-Producing *Escherichia coli* Strains with the Same Characteristics as Human-Pathogenic Isolates

Azucena Mora[a], Cecilia López[a], Ghizlane Dhabi[a], Ana M. López-Beceiro[b], Luis E. Fidalgo[b], Eduardo A. Díaz[c], Carlos Martínez-Carrasco[c], Rosalía Mamani[a], Alexandra Herrera[a], Jesús E. Blanco[a], Miguel Blanco[a], Jorge Blanco[a]

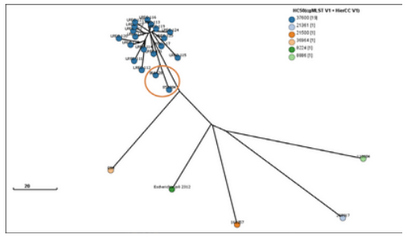
Integrated monitoring of *antibioresistance* and intervention targets *fromtheenvironment, to the farm and to the table*

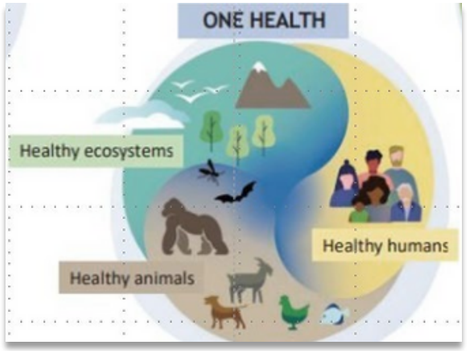
Azucena Mora USC UNIVERSIDADE DE SANTIAGO DE COMPOSTELA



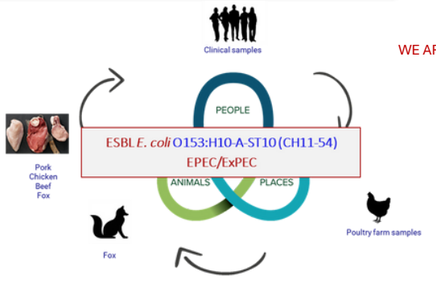


"from farm to fork to environment"





Integrated monitoring of *antibioresistance* and intervention targets *fromtheenvironment, to the farm and to the table*



WE ARE STILL RECOVERING THIS HYBRID
*E. COLI*CLONEINMEAT

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FOOD as THE One Health link par excellence


Food Control 123 (2021) 107713

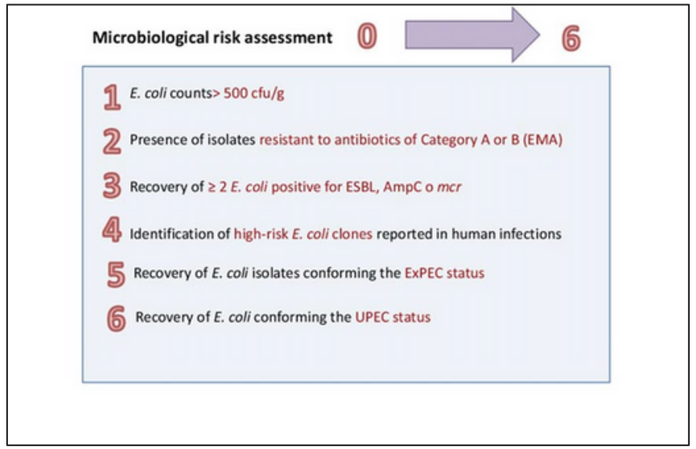
Contents lists available at ScienceDirect

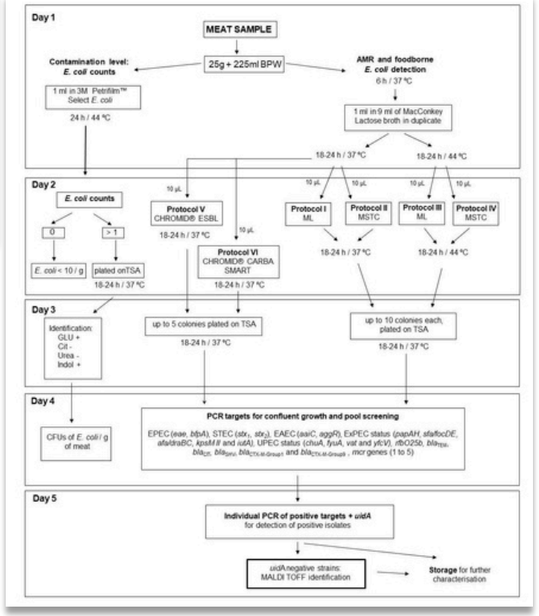
Food Control

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

Microbiological risk assessment of Turkey and chicken meat for consumer: Significant differences regarding multidrug resistance, *mcr* or presence of hybrid aEPEC/ExPEC pathotypes of *E. coli*

Dafne Díaz-Jiménez [a,b], Isidro García-Meniño [a,b], Alexandra Herrera [a,c], Luz Lestón [a,b], Azucena Mora [a,b,*]






International Journal of Food Microbiology 331 (2020) 108750

Contents lists available at ScienceDirect

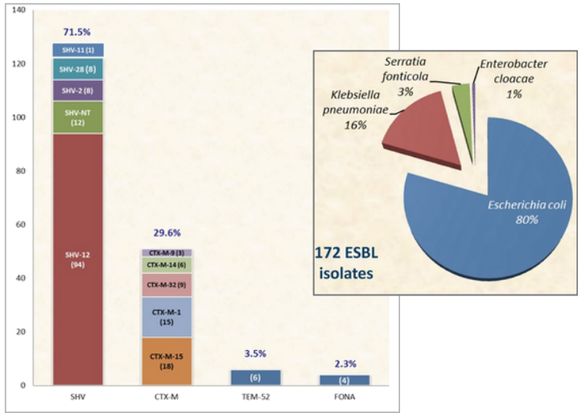
International Journal of Food Microbiology

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

Chicken and turkey meat: Consumer exposure to multidrug-resistant Enterobacteriaceae including *mcr*-carriers, uropathogenic *E. coli* and high-risk lineages such as ST131

Dafne Díaz-Jiménez [a,b,1], Isidro García-Meniño [a,b,1], Javier Fernández [c], Vanesa García [a,b,d], Azucena Mora [a,b,*]

8 Spanish supermarkets (2016-2017)



82% samples positive for ESBL-producing Enterobacteriaceae

27% samples positive for ESBL-producingK. pneumoniae(includingST147& ST307)

17% samples positive for potentially uropathogenic E. coli (UPEC)

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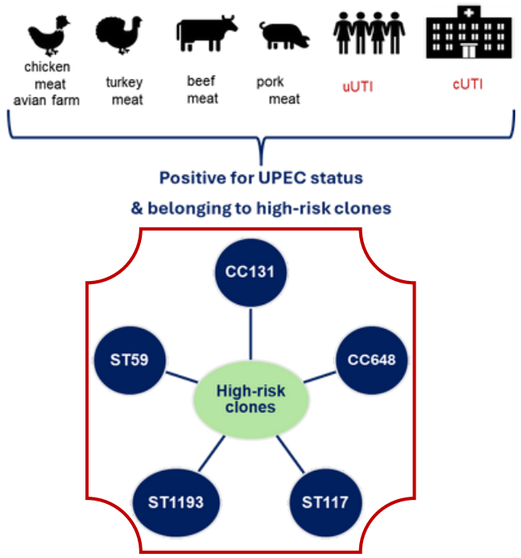
Uropathogenic capability of animal-derived isolates?

comparison with those of clinical origin



Highlights

- Food-borne transmission of uropathogenic *E. coli* (UPEC).
- High-risk *E. coli* clones from food-producing animals are able to infect bladder cells.
- Bladder-cell infection assays, combined with genomics, might predict uropathogenicity.

One Health 16 (2023) 100558

Contents lists available at ScienceDirect

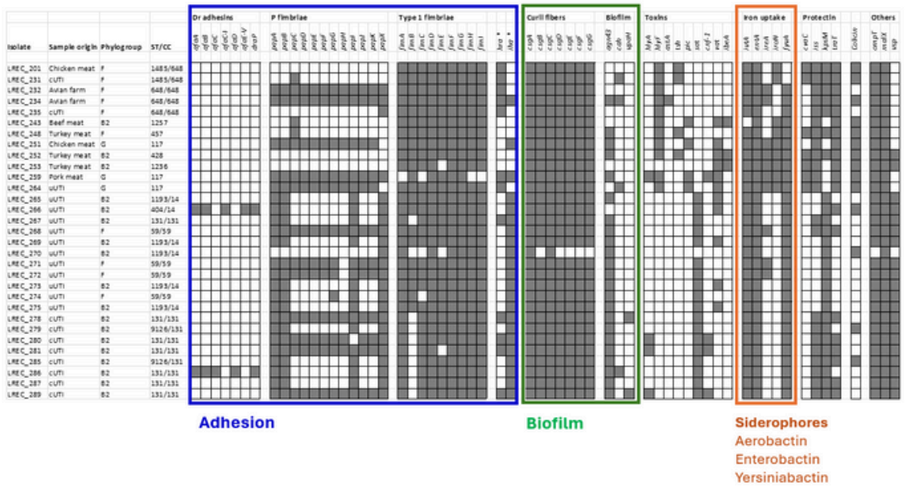
One Health

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

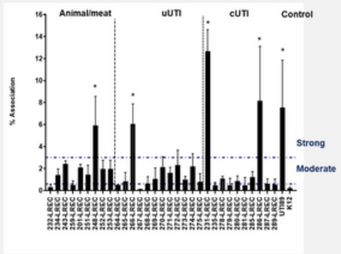
Genomics, biofilm formation and infection of bladder epithelial cells in potentially uropathogenic *Escherichia coli* (UPEC) from animal sources and human urinary tract infections (UTIs) further support food-borne transmission

Vanesa García [a,b], Luz Lestón [a], Ana Parga [c], Isidro García-Meniño [a,b,d], Javier Fernández [e,f,g,h], Ana Otero [c], John E. Olsen [i], Ana Herrero-Fresno [i,1], Azucena Mora [a,b,*]

Virulome: genomic similarities of UPEC virulence-associated genes



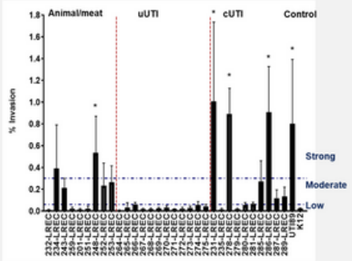
Infection human bladder epithelial J82cells



Association

Moderate to strong association:
uUTI isolates = 83%
cUTI isolates = 60%
animal-derived isolates = 77.8%

All poultry meat isolates: moderate or strong association



Invasion

Moderate to strong invasion:
uUTI isolates = 0%
cUTI isolates = 70%
animal-derived isolates = 55.5%

60% poultry meat isolates: moderate and strong invasion
100% uUTI isolates showed low invasion

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#EAAD #EAAD2025 #WAAW #WAAW2025 #WorldAMRWeek #AMRWeek

"Porcine" news: impressively rapid disappearance of *mcr* in *E. coli* due to near-total reduction in colistin consumption, but still multidrug-resistance (MDR) and lack of standards

(2005-2017) 50 Spanish farms

Pathogenic

MDR

87% ≥ 3 antibiotic categories

56% ≥ **6** antibiotic categories

9% ESBL producers

77% COLISTIN RESISTANCE- *mcr*

(2020-2022) 74 Spanish farms

Pathogenic	***E. coli* COMMENSAL**
MDR	**MDR**
79.7% ≥ 3 antibiotic categories	**76.2%** ≥ 3 antibiotic categories
48.4% ≥ **6** antibiotic categories	**28.6%** ≥ **6** antibiotic categories
15.6% ESBL producers	**31% ESBL producers**
18.8% COLISTIN RESISTANCE - *mcr*	**0% COLISTIN RESISTANCE - *mcr***

Plan Nacional Resistencia Antibióticos

Barcelona, Spain 27 – 30 April 2024

34th ECCMID EUROPEAN CONGRESS OF CLINICAL MICROBIOLOGY AND INFECTIOUS DISEASES

Azucena Mora USC

Results. Swine colibacilosis last 2 YEARS (2022-2024)

N = 251 samples → **78.9%** (198) positive for diarrheagenic *E. coli*

PREVALENCE / VIRULENCE GENES (PCR)
N = 198 POSITIVE SAMPLES

- ↑ESBLEC: 18.5% → (**4%** *ctx-m/mcr*)
- ↓COLISTIN resistance (*mcr*): 7.0%

mcr-1 *(4.5%);* ***mcr-5*** *(2.5%);* ***mcr-4*** *(1.9%)*

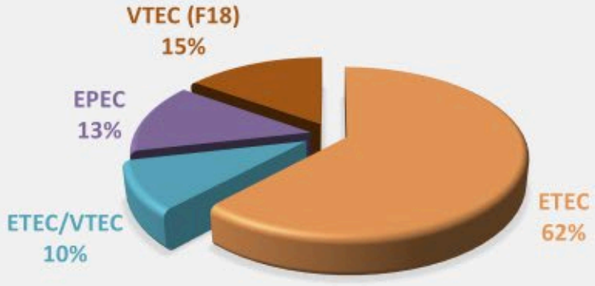
157 pathogenic *E. coli colonies* (from **110** samples)

↓

14.5% of 110 samples, carriers of > 1 pathotype

↓

E. COLI **PATHOTYPES (N = 110 SAMPLES)**



157 colonies: Phylogenetic distribution

A	B1	C	D	E
43.3%	23.6%	5.7%	14.0%	13.4%

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34th ECCMID EUROPEAN CONGRESS OF CLINICAL MICROBIOLOGY AND INFECTIOUS DISEASES
Barcelona, Spain
27 – 30 April 2024

EMERGING ExPEC & HYBRID PATHOTYPES of *E. coli* in swine ??? 2023-2025

CAUTION

Barcelona, Spain
27 – 30 April 2024

34th ECCMID EUROPEAN CONGRESS OF CLINICAL MICROBIOLOGY AND INFECTIOUS DISEASES

Cases associated with **extraintestinal isolation**

- Lactation
- Transition
- Fattening

- Meningitis
- Arthritis
- Respiratory and neurological clinical signs/symptoms
- Sudden death

VTEC/ExPEC
ETEC/ExPEC
ETEC/VTEC
ExPEC

- A
- B1
- C
- D
- E
- F

- MDR ≥3 categories = 65%
- ESBL = 8.5% including bla_{CTX-M} *mcr-1* (3.4%)

iutA iroN iss hlyF

vt2e F18 KpsM-K5

iutA

papAH iutA iroN iss hlyF

vt2e F18 KpsMII-K5 hlyA

Sta Stb vt2e F18 hlyA

iroN hlyA

sfa/focDE iutA iroN iss hlyF

sfa/focDE papAH iutA iroN iss hlyA hlyF cnf1

sfa/focDE papAH iutA iroN iss hlyF

sfa/focDE iutA hlyF

Azucena Mora USC

Spain, 2023-2025

Key elements

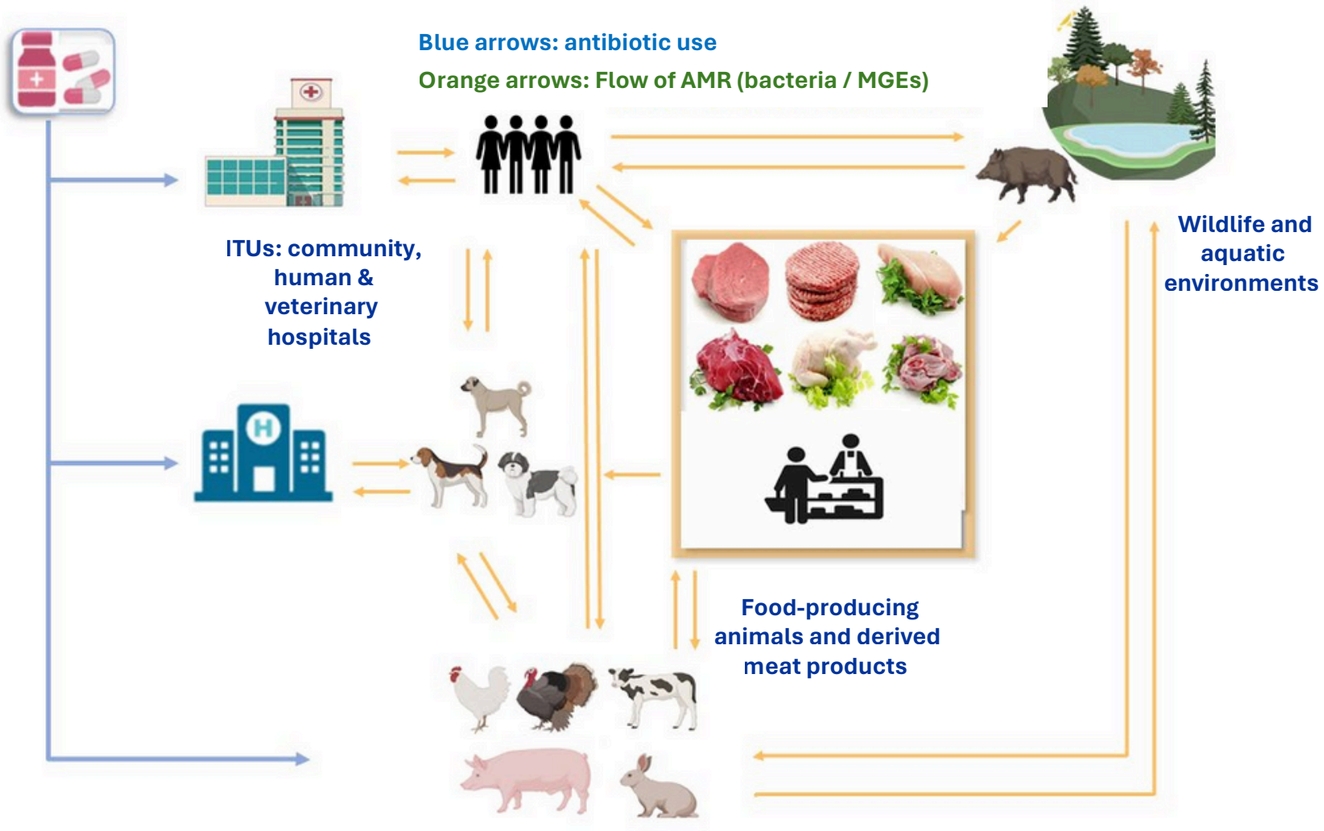
- MDR commensal & pathogenic *E. coli*
- MDR *K. pneumoniae*
- Farm animals
- Meat samples (Pork, Beef, turkey, chicken, rabbit)
- Human UTIs
- Companion animal UTIs
- Wild boar (faecal swabs, meat)
- Water from WWTP

Methods

- Conventional Microbiology
- WGS (Illumina, ONT)
- *In vitro*: celular infections / biofilm
- *In vivo* virulence: mouse / pig models

Interventions

- One Health vaccines
- Phage alternatives



Plan Nacional Resistencia Antibióticos

MINISTERIO DE CIENCIA E INNOVACIÓN
UNIÓN EUROPEA
ProyectoNacional RETOS**PID2022-143041OB-100**

Azucena Mora USC UNIVERSIDADE DE SANTIAGO DE COMPOSTELA

From Farm to Fork: Mitigating Antimicrobial Resistance

Highly similar ESBL/Carba/AmpC genomes.

MDR *K. pneumoniae* •ST147 (Human ITU, WW) •ST307 (Human ITU, game meat) •ST392 (Human ITU, pet ITU •ST469 (Human ITU, WW) **MDR *E. coli*** •ST131 (Human ITU, game meat, WW) •ST20, ST24 (game meat) •ST34 (Human ITU, WW) •ST73 (Human ITU, pet ITU, game meat) •ST93 (Human ITU, faecal wild boar, WW) •ST117 (Human ITU, game meat, WW) •ST127 (Human ITU, pet ITU, faecal wild boar) •ST162 (Human ITU, game meat) •ST372 (pet ITU, WW) •ST410 (Human ITU, WW) •ST744 (game meat, WW) •ST1236 (Human ITU, faecal wild boar, game meat) •ST1431 (pet ITU, game meat)


International Journal of Food Microbiology 413 (2024) 110605

Contents lists available at ScienceDirect

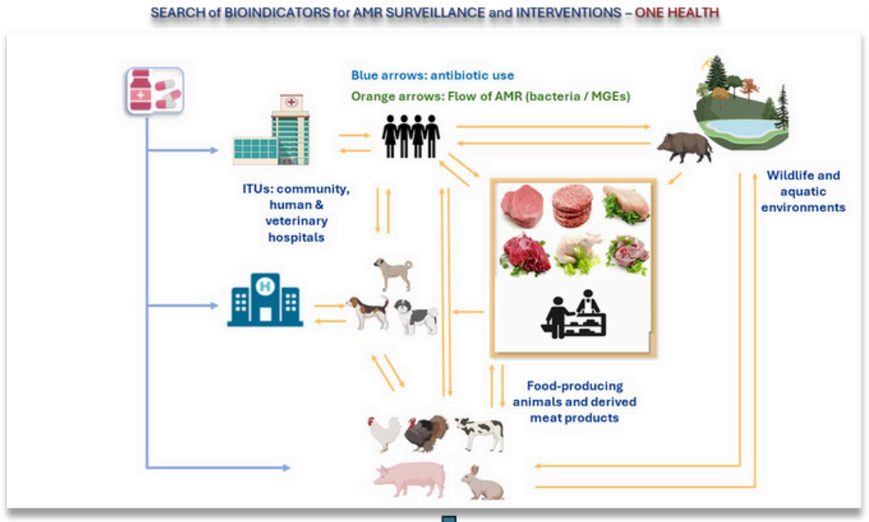
International Journal of Food Microbiology

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

ELSEVIER

Comparative analysis of multidrug-resistant *Klebsiella pneumoniae* strains of food and human origin reveals overlapping populations

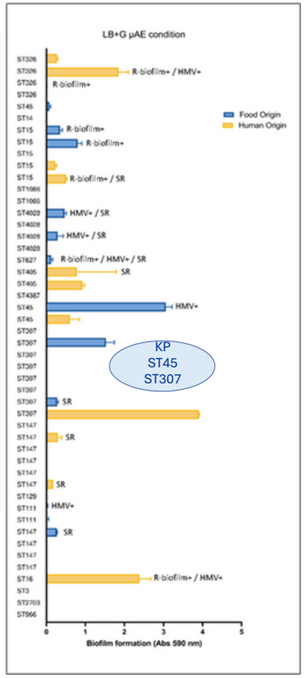
Sergio Silva-Bea [a], Manuel Romero [a], Ana Parga [a], Javier Fernández [b,c,d], Azucena Mora [e,f,1]

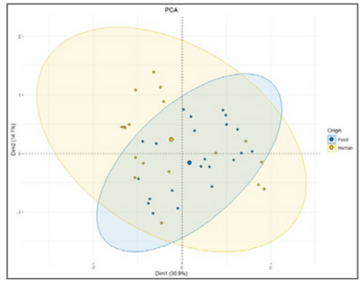


Common targets for:

- diagnosis,
- prevention,
- the reduction of AMR spread

Plan Nacional Resistencia Antibióticos





Principalcomponentanalysis(PCA) performed on the AMR profile antibiogram datashowingthatbothpopulationsoverlap

Azucena Mora USC UNIVERSIDADE DE SANTIAGO DE COMPOSTELA

OUR TAKE-HOME MESSAGE *Tackling AMR requires a Transversal Strategy centered on key indicators*

STRATEGIC PILLAR → **TRANSVERSAL ACTION ACROSS HUMAN, ANIMAL, & ENVIRONMENTAL HEALTH**

SURVEILLANCE — Robust, gene-based AMR monitoring to track resistance flow across all sectors.

HARMONIZATION — Aligning global and regional policies, data collection, and regulatory standards to ensure a coordinated response.

PREVENTION — Prioritizing measures to achieve **NO INFECTION** and reduce the selective pressure on antimicrobials.

ALTERNATIVES — Investing in new tools, such as diagnostics, enhanced biosecurity, and **VACCINATION** strategies GLOBALLY.

COMUNICACIÓN & EDUCACIÓN — Fostering integrated knowledge sharing and accountability across governments, industry, and the public to drive behavioral change.

Azucena Mora USC UNIVERSIDADE DE SANTIAGO DE COMPOSTELA

Thank you!

"From the farm to the fork, antimicrobial resistance connects animals, food, and people: Safeguarding One means protecting All"

Reference Laboratory of E. coli (LREC)
Facultad de Veterinaria de Lugo, USC

Azucena Mora Gutiérrez, DVM, PhD
Full Professor

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iARCUS Aquatic One Health Research Center
Member of the Scientific Committee of AESAN

Education officer of EFWISG from ESCMID

European University for Well-Being

#EAAD #EAAD2025 #WAAW #WAAW2025 #WorldAMRWeek #AMRWeek

Presentation

Wannes Vanderhaeghen
Head of Data Analysis Unit at AntiMicrobial Consumption and Resistance in Animals

#EAAD #EAAD2025 #WAAW #WAAW2025 #WorldAMRWeek #AMRWeek

Wannes Vanderhaeghen

data Science and analysis unit

https://amcra.be/en/home/

Wannes.vanderhaeghen@amcra.be

info@amcra.be

AMCRA
IMPROVE HEALTH, REDUCE RESISTANCE

About AMCRA

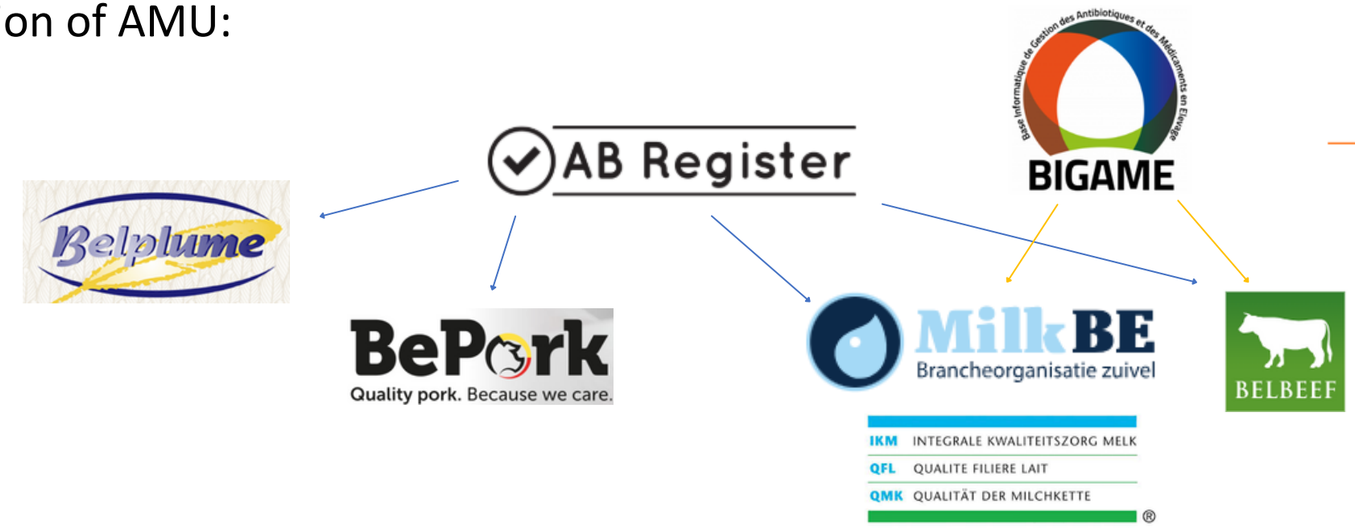
- Non-profit organisation founded in 2012
- Board of directors: scientists, veterinarians, farmers, industry

- Steering committee: government

#EAAD #EAAD2025 #WAAW #WAAW2025 #WorldAMRWeek #AMRWeek

Approach to tackling AMR in the veterinary sector in Belgium

- AMCRA central in bottom-up approach
  - Technical working groups, advising, communication, sensibilisation
    - Science-based discussed supported by different stakeholders involved
- Sector and government initiatives
  - Private data-collection of AMU:

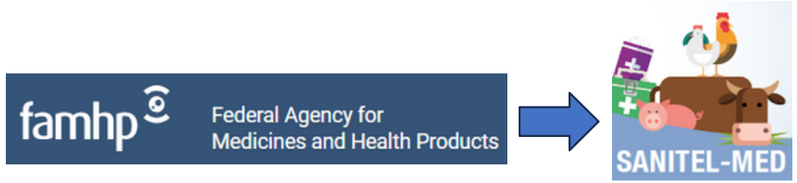


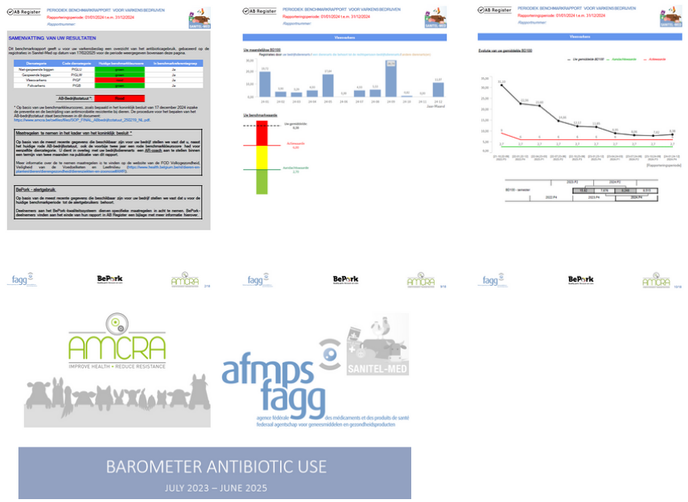
SGS (Veal calves)

Approach to tackling AMR in the veterinary sector in Belgium

- Mix of sector- and government initiatives
  - Private data-collection of AMU
  - Governemental data-collection of AMU:

- AMCRA data science and analysis
  - Scientific, concerted and uniform approach for analysis, benchmarking and reporting of AMU in food producing animals
    - Farm-level benchmarking reports
    - National level





Approach to tackling AMR in the veterinary sector in Belgium


BelVet-SAC

BELGIAN VETERINARY SURVEILLANCE OF ANTIBACTERIAL CONSUMPTION

NATIONAL REPORT ON SALES AND USE OF ANTIBACTERIAL VETERINARY MEDICINAL PRODUCTS

2024

Publication: 20 June 2025

afmps fagg

AMCRA

https://www.fagg-afmps.be/nl/DIERGENEESKUNDIG_gebruik/geneesmiddelen/geneesmiddelen/goed_gebruik/Antibiotica_0

Approach to tackling AMR in the veterinary sector in Belgium

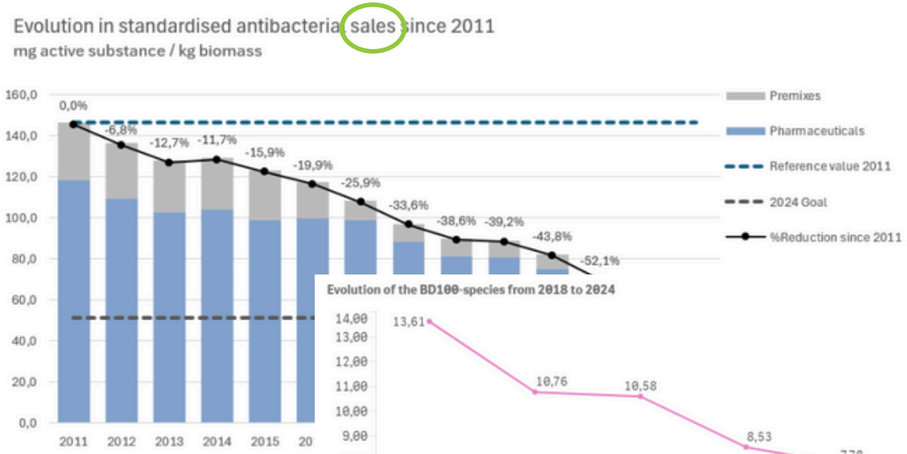


Figure 38. Year-to-year results of tota
as a reference year.

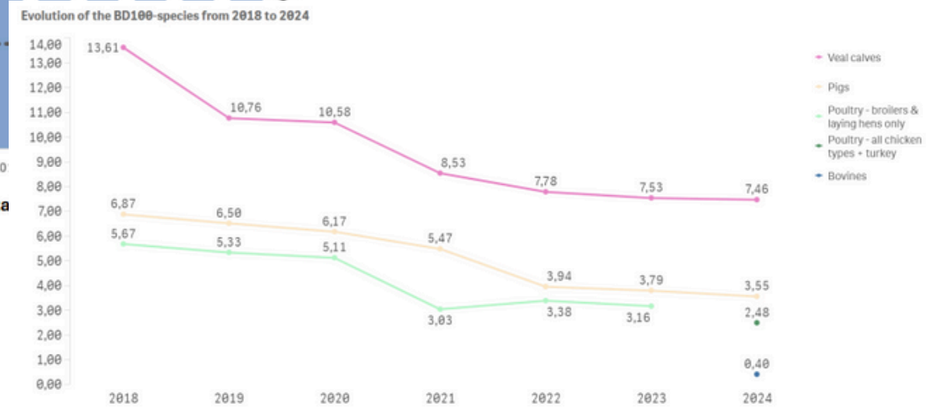


Figure 14. Antibacterial use (BD_{100}-species) from 2018 to 2024 in pigs, poultry and veal calves, and in dairy and beef cattle in 2024.

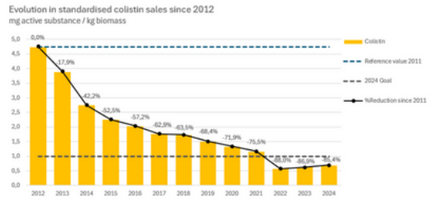


Figure 41. Evolution of colistin sales (mg active substance/kg biomass) and current progress regarding the 2024 reduction target of 1 mg colistin/kg biomass.

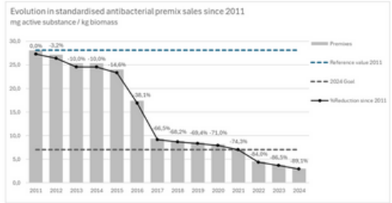


Figure 42. Evolution of antibacterial premix sales (mg active substance/kg biomass) and current progress regarding the 2024 reduction target of 75 % reduction since the reference year 2011.

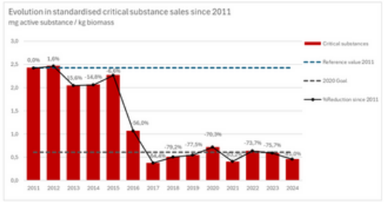


Figure 43. Evolution of the sales of CIAs (quinolones and 3rd and 4th generation cephalosporines) in mg active substance/kg biomass since the reference year 2011.

Approach to tackling AMR in the veterinary sector in Belgium

AMCRA Vision 2020

2016: 1st Antibiotics Convention

AMCRA Vision 2024

2021: 2nd Antibiotics Convention

AMCRA Vision 2030

2026: 3rd Antibiotics Convention

Autoregulation since 2012

Co-regulation since 2016

Royal Decree:
- Conditions for using CIA's
- Obligatory registration of AMU in Sanitel-Med

2021: 1st NAP One-Health AMR

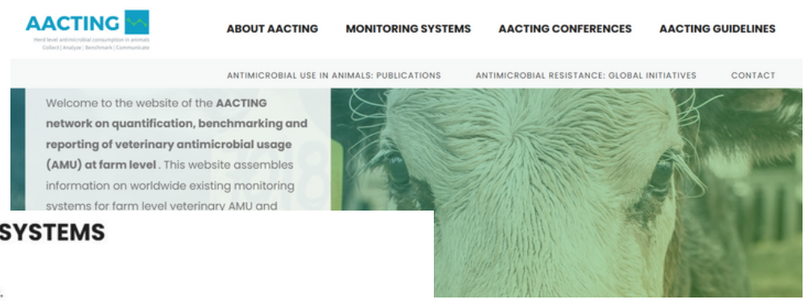
Royal Decree :
- Conditions for using CIA's for all animals
- Expansion of Sanitel-Med species (cattle, turkeys, ..)

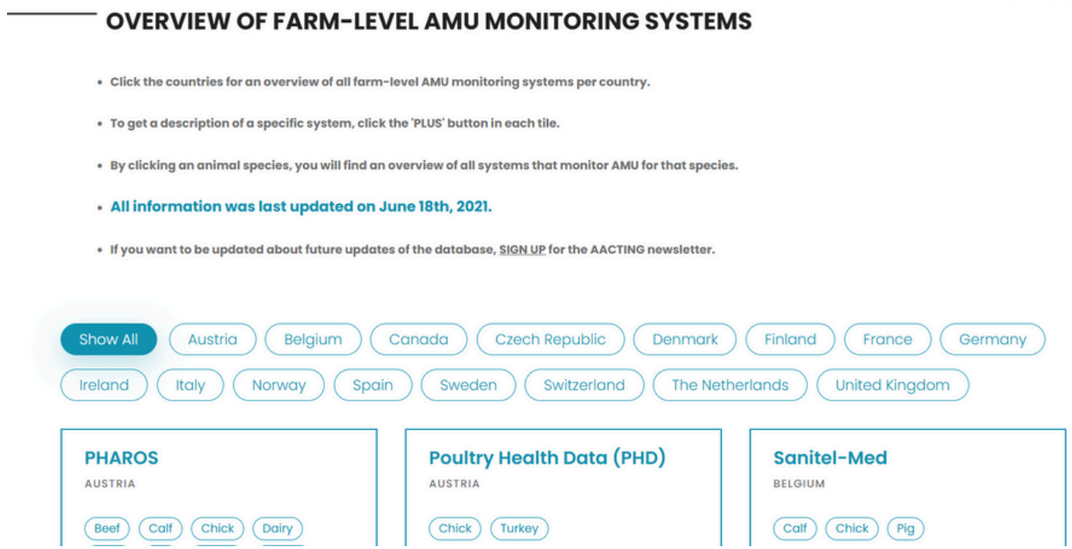
Royal Decree 'Prevention and fighting AMR'
- 'AR coaching'
- Measures for farms with high AMU

2nd NAP One-Health AMR in 2026

Other approaches are possible…

- … and successful
- AACTING project/consortium

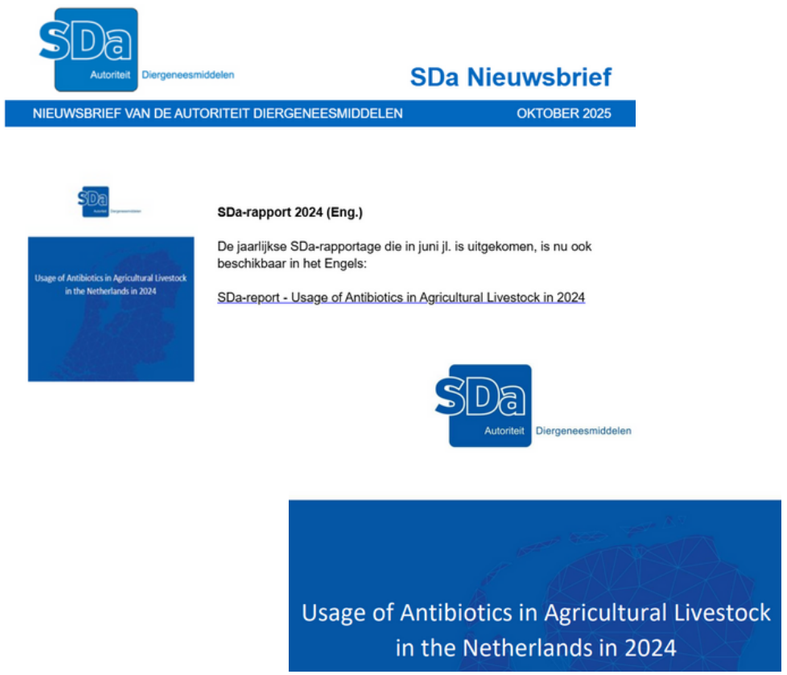


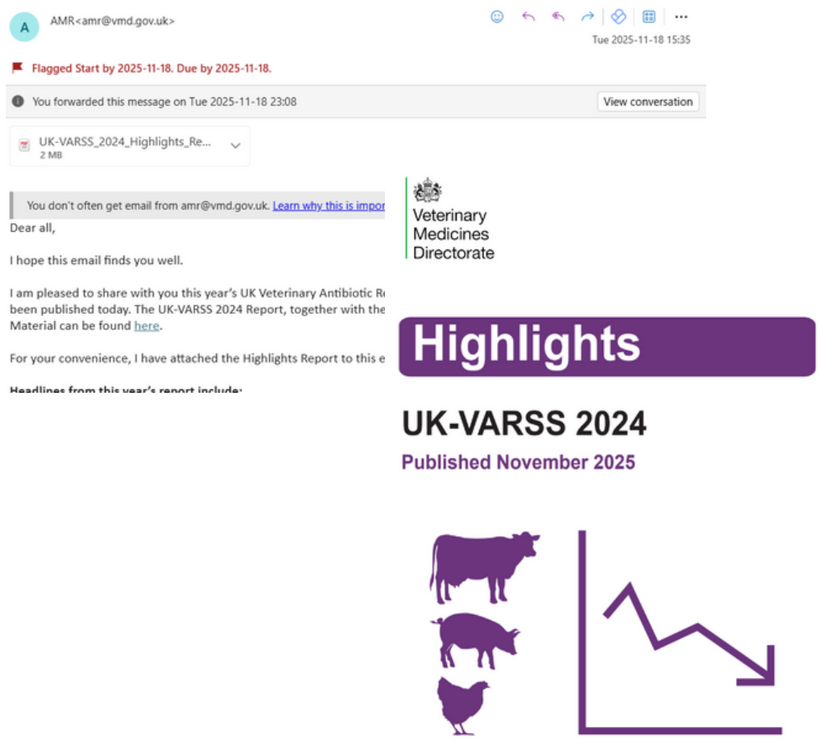


- Connect
- Inform
- Learn

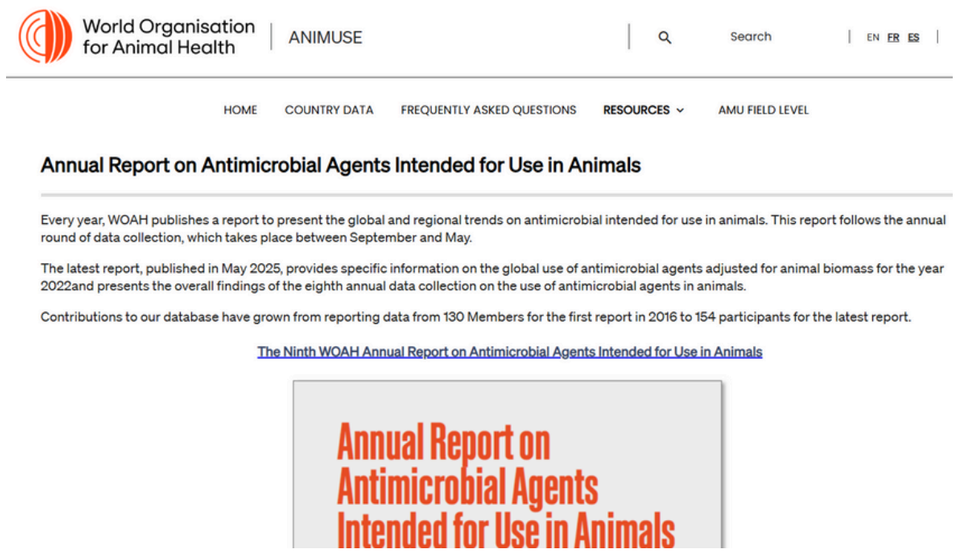
Other national reports on antibacterial sales and/or use in animals

- Recently:





International reports on antibacterial sales and/or use in animals



(Inter)national reports from One-Health perspective

https://letstalkantibiotics.be/belmap-report/

Closing remarks

15:55 – 16:00

Jaisalmer de Frutos Lucas
Policy Manager at EPHA

#EAAD #EAAD2025 #WAAW #WAAW2025 #WorldAMRWeek #AMRWeek

Tackling Antimicrobial Resistance in Food Production: A One Health Perspective

Thank you for attending!

#EAAD #EAAD2025 #WAAW #WAAW2025
#WorldAMRWeek #AMRWeek

epha european public health alliance

una europa