One Health Integrated Surveillance of AMU & AMR in Animals From Global Standards to National Implementation: The Role of Veterinary Services in Greece

The Role of Veterinary Services in the One Health Approach

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Antimicrobial Resistance: A Shared Global Threat

Understanding the impact, drivers, and One Health approach

Antimicrobial resistance (AMR) develops when bacteria evolve and no longer respond to antibiotics that were once

In 2019, AMR caused approximately **1.27 million deaths worldwide** and over **35,000 deaths annually in the**

Key drivers of AMR include: Misuse and overuse of antibiotics in human healthcare. Extensive antibiotic use in livestock and food production industries. Release of antimicrobial residues into environmental media such as wastewater, soil, and aquatic ecosystems

Due to intimate links among humans, animals, and the environment, AMR exemplifies a One Health challenge.

Effective AMR control requires **integrated actions across human, animal, and environmental sectors**

Why Animals Are a Critical Focus

Resistant bacteria and genes disseminate via multiple pathways

- Antimicrobials are indispensable for treating infections and controlling disease outbreaks in both food-producing and companion animals, ensuring animal welfare.
- However, inappropriate practices—such as incorrect dosing, prolonged treatments, prophylactic and metaphylactic uses, and the use of critically important antibiotics—exert strong selective pressure fostering resistant bacteria .
- Resistant bacteria and resistance genes can disseminate through:

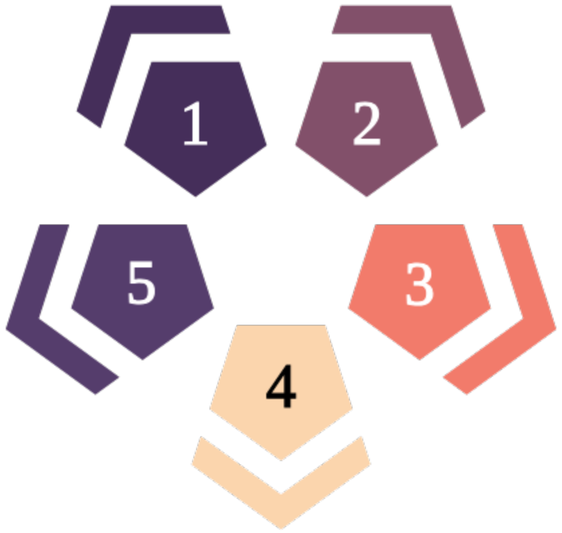
1. The food chain (meat, milk, eggs, fish).
2. Direct contact between animals and humans (farmers, veterinarians, pet owners).
3. Environmental pathways (manure, slurry, effluents, contaminated water).

- Hence, monitoring antimicrobial use (AMU) and resistance (AMR) in animals is vital to safeguard both animal and public health.

Coordinated AMR/AMU Surveillance in a One Health Framework

What Is Integrated Surveillance?

Integrated surveillance involves the systematic, coordinated monitoring of antimicrobial use &lparenthesis;AMU&rparenthesis; and antimicrobial resistance &lparenthesis;AMR&rparenthesis; across



In Europe, this requires harmonization of:

Human AMR data &lparenthesis;e.g., EARS-Net, CAESAR systems&rparenthesis;.

Animal and foodborne AMR data through harmonized monitoring by

Benefits of integrated surveillance include:

Early detection of emerging resistance threats.Improved risk assessment and prioritization of interventions.Assessment of the effectiveness of policies, stewardship, and regulatory measures.

The EU Farm-to-Fork Strategy aims to reduce veterinary antimicrobial sales by 50% by 2030, tracking progress through integrated surveillance indicators [European Environment Agency](undefined).

Veterinary Roles in Antimicrobial Resistance Control

Regulation, surveillance, stewardship, promotion, and capacity building

- Regulatory & policy enforcement: implementing EU and national antimicrobial legislation,reporting sales and usage data to EMA (ESVAC) and international organizations (WOAH)
- Surveillance coordination: organizing sampling and laboratory testing for AMR in food-producing animals and food products according to EU harmonized protocols
- Data management: collecting and analyzing species-specific AMU data by production type and antimicrobial classes
- Stewardship leadership: developing, communicating, and promoting guidelines for prudent antimicrobial use in animals
- Promoting alternatives: advocating vaccination, biosecurity measures, and improved husbandry practices to minimize unnecessary antimicrobial use
- Capacity building & communication: educating veterinarians, farmers, and animal owners on AMR risks and responsible prescribing, contributing to One Health governance and crisis response
- Operate e-prescribing and AMU data flows in line with **EU 2019/6, 2021/578, 2022/209**; implement **2020/1729** AMR monitoring.

From Global Standards to National ImplementationVeterinary Services Actions on Antimicrobial Use (AMU)

Translating international and EU standards into national policy

Implementation of the EU regulatory framework on veterinary medicinal products, medicated feed and residues, and alignment with WHO, OIE/WOAH and FAO recommendations on AMR.

Strengthening prescription and distribution control

Mandatory veterinary prescription, progressive introduction of electronic prescribing and strict regulation of wholesale and distance retail of veterinary antimicrobials to ensure control and traceability of AMU.

Promoting prudent use based on antimicrobial categorisation

Restriction of critically important antimicrobials for human medicine (e.g. fluoroquinolones, 3rd–4th generation cephalosporins, polymyxins) and prioritisation of first-line agents with lower public health impact.

Prioritising prevention over treatment in animal production

Enforcement of biosecurity standards, improvement of husbandry and welfare conditions, vaccination programmes and good farming practices to reduce infection pressure and the need for antimicrobial treatment.

Education and culture change among veterinarians and farmers/ Monitoring, indicators and accountability

Integration of AMR/AMU topics into undergraduate veterinary curricula, continuing professional development for veterinarians, and targeted training and awareness activities for farmers and producers. Use quantitative indicators (antimicrobial use, resistance levels, training coverage, guideline compliance) to assess implementation of the National Action Plan in the veterinary sector and report progress nationally and at EU level.

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Key national actions, systems and One Health collaborations

1 National One Health governanceVeterinary Services contribute to a coordinated One Health structure linking human, animal and environmental health within the National Action Plan on Antimicrobial Resistance (AMR).

2 Integrated AMR surveillance in animals and foodOperation of a laboratory and surveillance network for systematic monitoring of antimicrobial resistance in food-producing animals and products of animal origin, aligned with EU requirements.

3 Targeted sampling and risk-based monitoringCollection and analysis of data on resistance in key bacterial pathogens (e.g. Salmonella, Campylobacter, E. coli) to detect emerging resistance patterns and support risk assessment and intervention planning.

4 Surveillance of antimicrobial use (AMU)Compilation and analysis of sales and use data for veterinary antimicrobials in food-producing animals, with reporting to European surveillance systems and tracking of progress towards reduction targets.

5 Official veterinary controls at farm levelInspections in livestock holdings and aquaculture units focusing on animal health, biosecurity, prudent use of antimicrobials and manure/waste management to limit dissemination of resistant microorganisms.

6 Integration of animal data in the national One Health pictureAMR and AMU data from the animal sector feed into national One Health analyses and support joint policy decisions across human, animal and environmental health authorities.

Barriers to Achieving Full One Health Integration

Key challenges limiting integrated surveillance and necessary actions

Fragmented Data SystemsDifferent Databases And Recording Formats Across Human, Veterinary, And Environmental Sectors

Limited InteroperabilityDifficulty Linking AMU (sales/use) With AMR Outcomes By Species, Region, And Time.

Resource Limitations: Insufficient Specialized Labs And Trained Personnel For Consistent AMR Surveillance In Animals

Governance & Coordination Existing One Health Platforms Need More Stable Mechanisms For:
shared Prioritisation,
accountability,
long-term Funding

Building a Functional One Health Surveillance Network

Solutions to Strengthen Surveillance

Standardize Data Collection

Developing harmonized AMU/AMR indicators and interoperable IT systems for cross-sector data sharing

Expand Granular AMU Data

Expanding AMU data collection down to farm and species level, aligned with new EU regulations

Enhance Laboratory Capacity

Strengthening laboratory capacity, installing SOPs, and joining EU pilot networks like EARS-Vet

Implement Targeted Stewardship

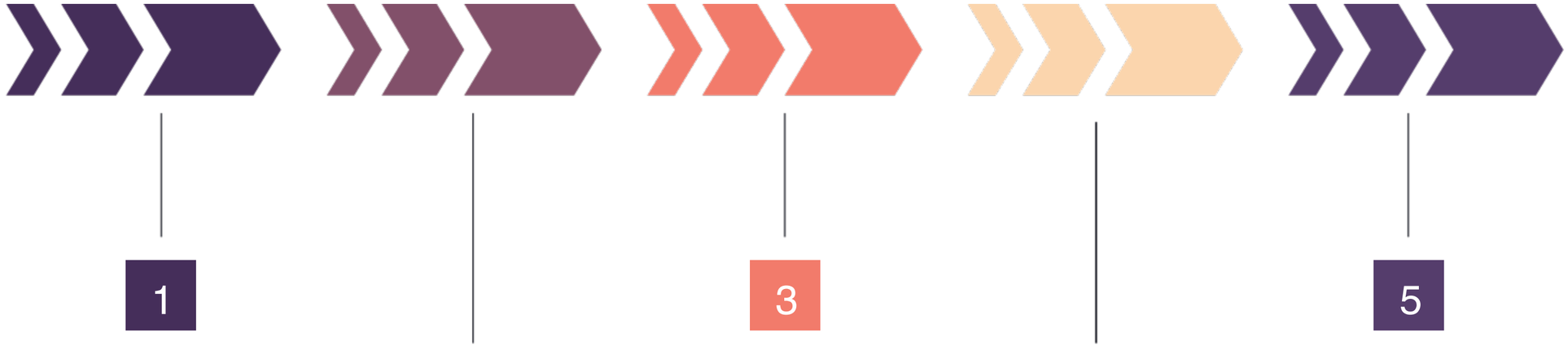
Implementing targeted stewardship in sectors with high antimicrobial use (e.g., intensive pig farming, poultry, aquaculture)

Mobilize Funding and Support

Leveraging EU and national funding sources such as the Recovery and Resilience Plan for digitization, training, and infrastructure development

Making One Health Operational: Collaboration in Practice

One Health Collaboration: From Concept to Practice



1

Governance Committees

Establishing cross-sector governance committees with clear roles and mandates involving human health, veterinary, environment, and academia academic stakeholders.

2

Joint AMU/AMR Reporting

Producing joint annual AMU/AMR surveillance reports integrating data from all sectors with actionable recommendations

3

Timely Surveillance Feedback

Providing timely feedback of surveillance results to clinicians and veterinarians to inform prescribing decisions

4

Coordinated Public Communication

Coordinating public communication campaigns on responsible antibiotic use, food safety, and environmental AMR risks

5

Active Collaboration Outcomes

One Health collaboration turns surveillance from passive data collection into an active tool for policy and behaviour change.

Key Takeaways on AMR and Veterinary Roles

Conclusion

AMR is among the greatest health threats globally with significant human, animal, economic, and societal impacts

Integrated AMU/AMR surveillance in animals allows: Early detection of resistance trends. Targeted interventions. Evaluation of policies and stewardship.

Veterinary services are central to: Data collection and analysis. Regulation and oversight of antimicrobial use. Education of professionals and producers about AMR risks.

Greece has established a strong One Health national action plan and is developing an emerging surveillance network, the key ongoing challenge remains to scale up integrate and sustain these efforts.

Investing in One Health partnerships, high-quality data systems, and veterinary capabilities is essential to preserve antimicrobial efficacy for future generations.

Thank you

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