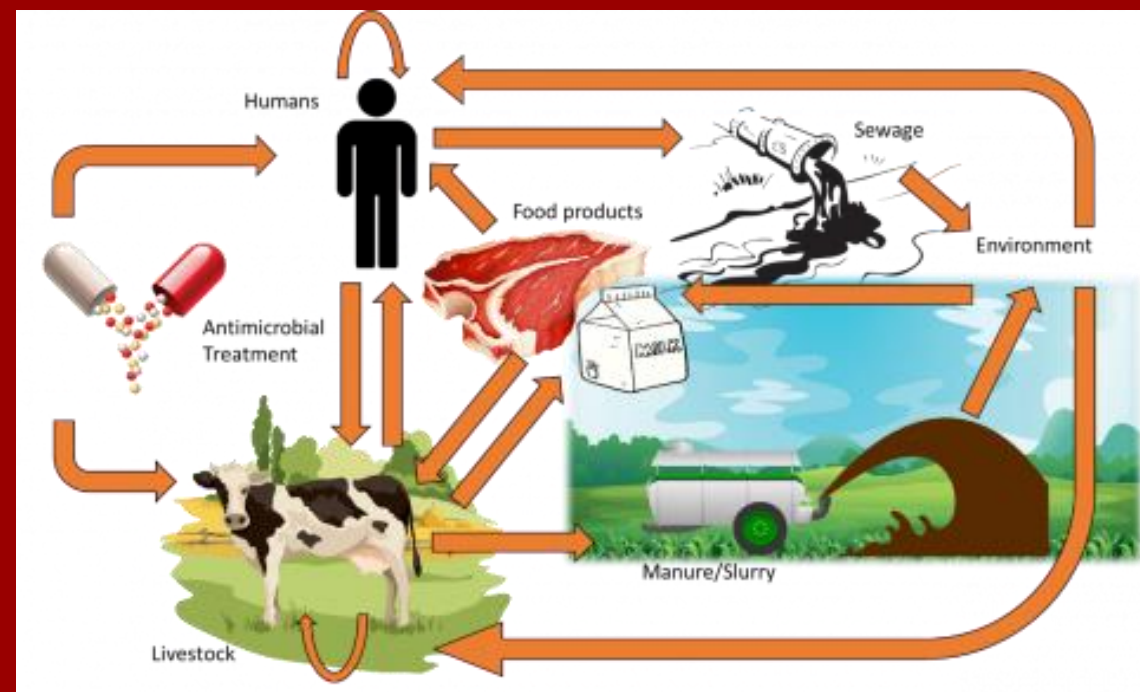


# Surveillance of AMR in food producing environments

Sub-session III - Improving preparedness for AMR

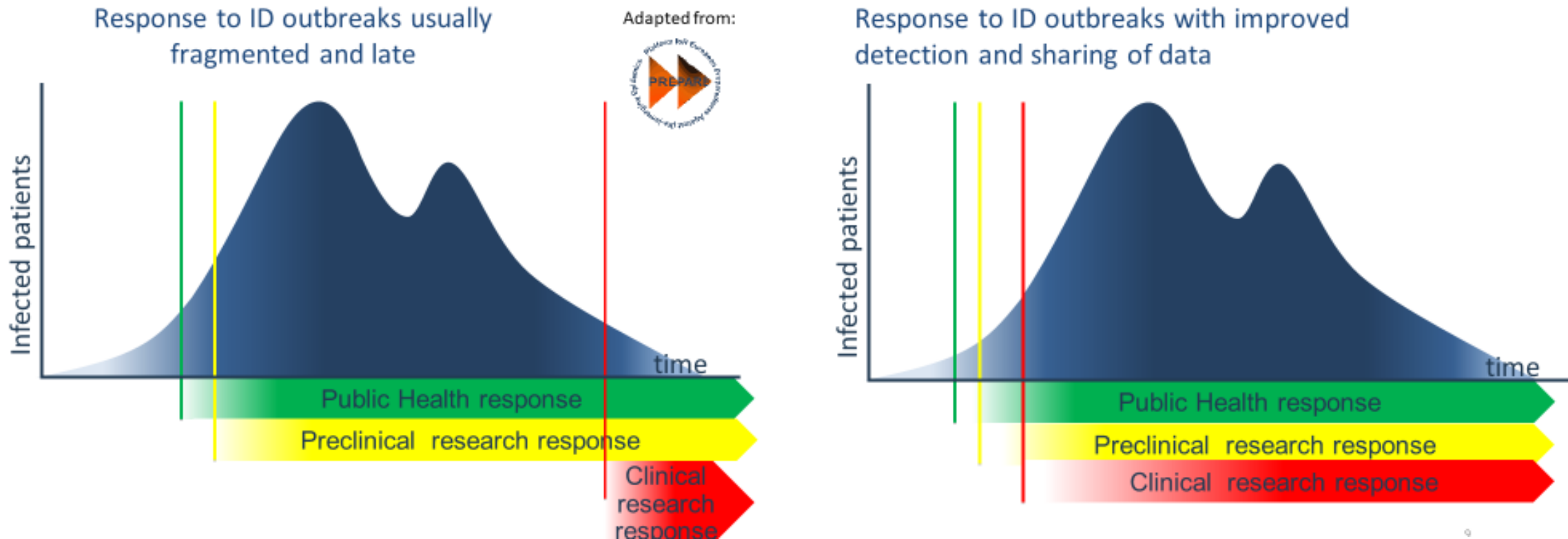
Prof. Rene S. Hendriksen, PhD  
National Food Institute, Technical University of Denmark  
(DTU FOOD)

ONE “Health, Environment & Society” Conference 2022  
23<sup>st</sup> June 2022  
16:15 -16:25 CET- Virtual



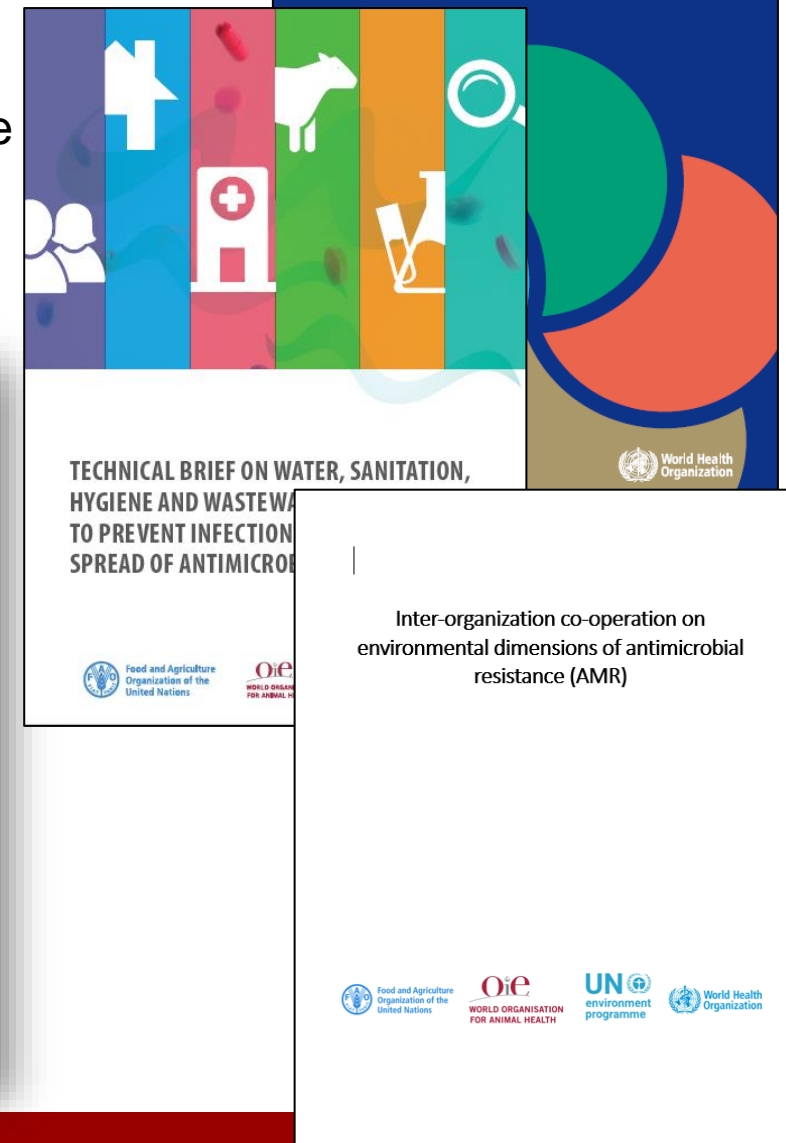
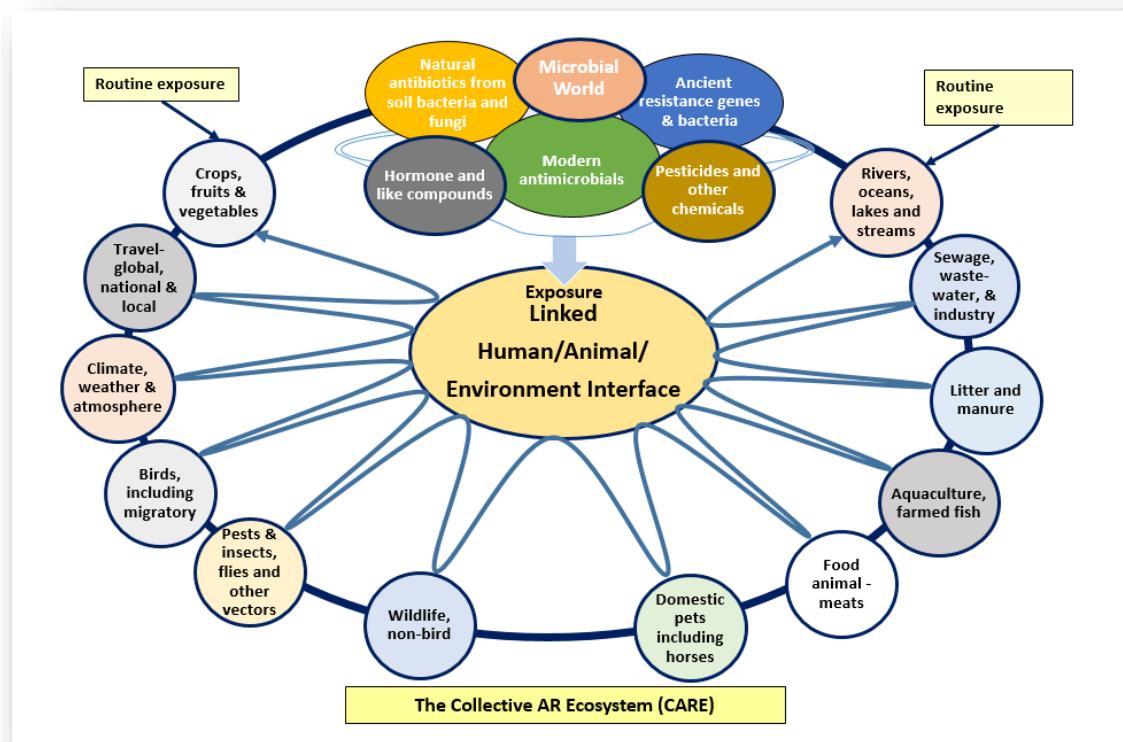
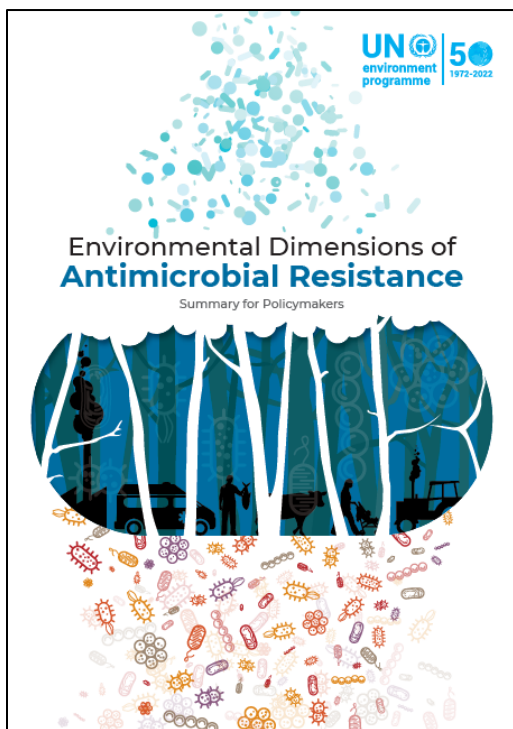
# No lack of evidence – lack of action

- Public health and clinical response depend on global capacity for disease surveillance
  - Real time data sharing, comparison and analysis of data from multiple sources and using multiple methodologies



# Current state of play

- WHO, FAO, UNEP, OIE, EFSA and the EC, all emphasized the importance of addressing the risks of AMR transmission in the environment and to integrate the area in future monitoring programs



# Current state of play

## SCIENTIFIC REPORT



APPROVED: 30 April 2019

doi: 10.2903/j.efsa.2019.5709

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

European Food Safety Authority (EFSA),  
Marc Aerts, Antonio Battisti, René Hendriksen, Isabelle Kempf, Christopher Teale\*,  
Bernd-Alois Tenhagen, Kees Veldman, Dariusz Wasyl, Beatriz Guerra, Ernesto Liébana,

**Proposal:** To carry out a baseline survey on AMR in bacteria from domestically produced shellfish that may address simultaneously consumer exposure via shellfish and environmental exposure of shellfish to resistant bacteria from, e.g. wastewater. It is envisaged that the detailed harmonised protocol of that specific baseline survey would be designed at a later stage, considering the most recent data, once a clear agreement to carry out such surveys had been reached.

It is considered that additional interesting data on AMR in the environment might be available from testing bacteria gathered from the monitoring programs on bathing water quality within the framework of the EU 'Bathing Water' Directive 2006/7/EC,<sup>22</sup> although these are not considered within the realm of this document.

I  
(Legislative acts)

## DIRECTIVES

DIRECTIVE (EU) 2020/2184 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL  
of 16 December 2020  
on the quality of water intended for human consumption  
(recast)  
(Text with EEA relevance)

L 177/32

EN

Official Journal of the European Union

5.6.2020

REGULATION (EU) 2020/741 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL  
of 25 May 2020  
on minimum requirements for water reuse  
(Text with EEA relevance)

THE EUROPEAN PARLIAMENT AND THE COUNCIL OF THE EUROPEAN UNION,

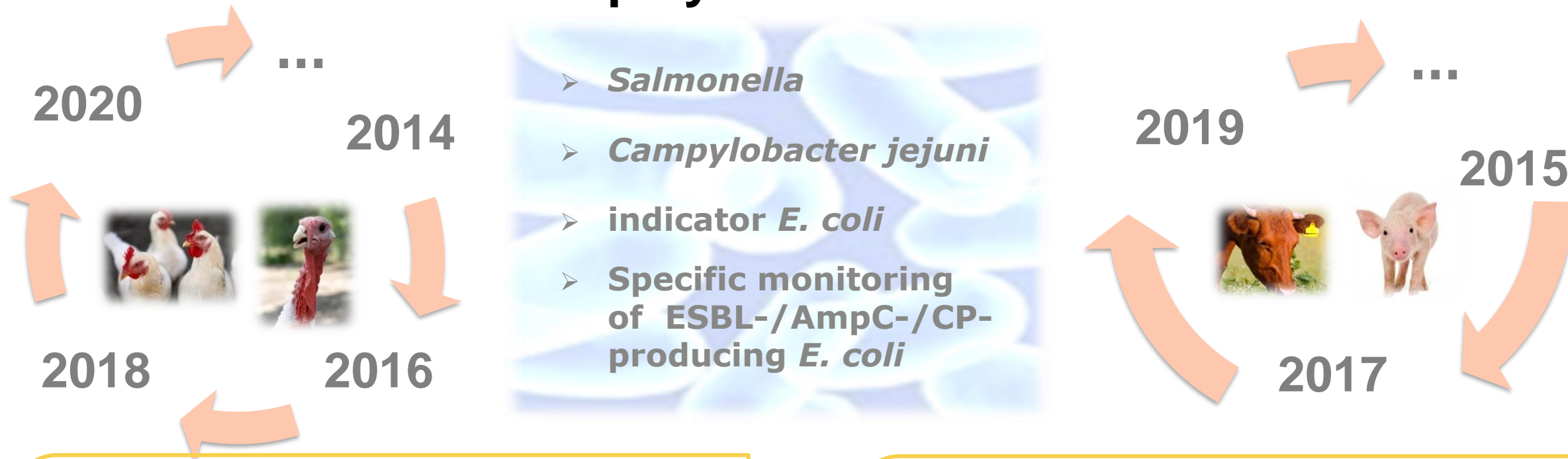
Having regard to the Treaty on the Functioning of the European Union, and in particular Article 192(1) thereof,

Having regard to the proposal from the European Commission,

ittee (1),

ler pressure, leading to water scarcity and a  
predictable weather patterns and drought are  
shwater, arising from urban development and

# Current state of play



## ➔ Harmonisation

- Susceptibility Testing: **microdilution**
- Set of **substances** tested and dilution ranges
- Interpretative criteria of resistance: **ECOFFs**
- Representative **sampling designs**

- In 2021 onwards, AMR monitoring in bacteria **from imported fresh meat** from third countries

## ➔ EQA System by EURL-AR

- Regular **trainings** of NRLs
- Yearly **Proficiency Test Trials**
- Yearly **Confirmatory Testing** exercise

- Yearly EU Summary Report on AMR




# Current state of play

- **One Health-based integrated studies and harmonised environmental AMR monitoring/ surveillance strategies.**
  - Priority:
    - to optimise suitable **sensitive and standardized methodologies** for detection of important ARB/ARGs,
    - To **define sampling strategies** for the different producing environments.
- **Long-term longitudinal cohort studies** (using **quantitative** microbiology, metagenomics).
  - Priority:
    - **Emerging highest priority ARBs/ARGs**

**SCIENTIFIC OPINION**

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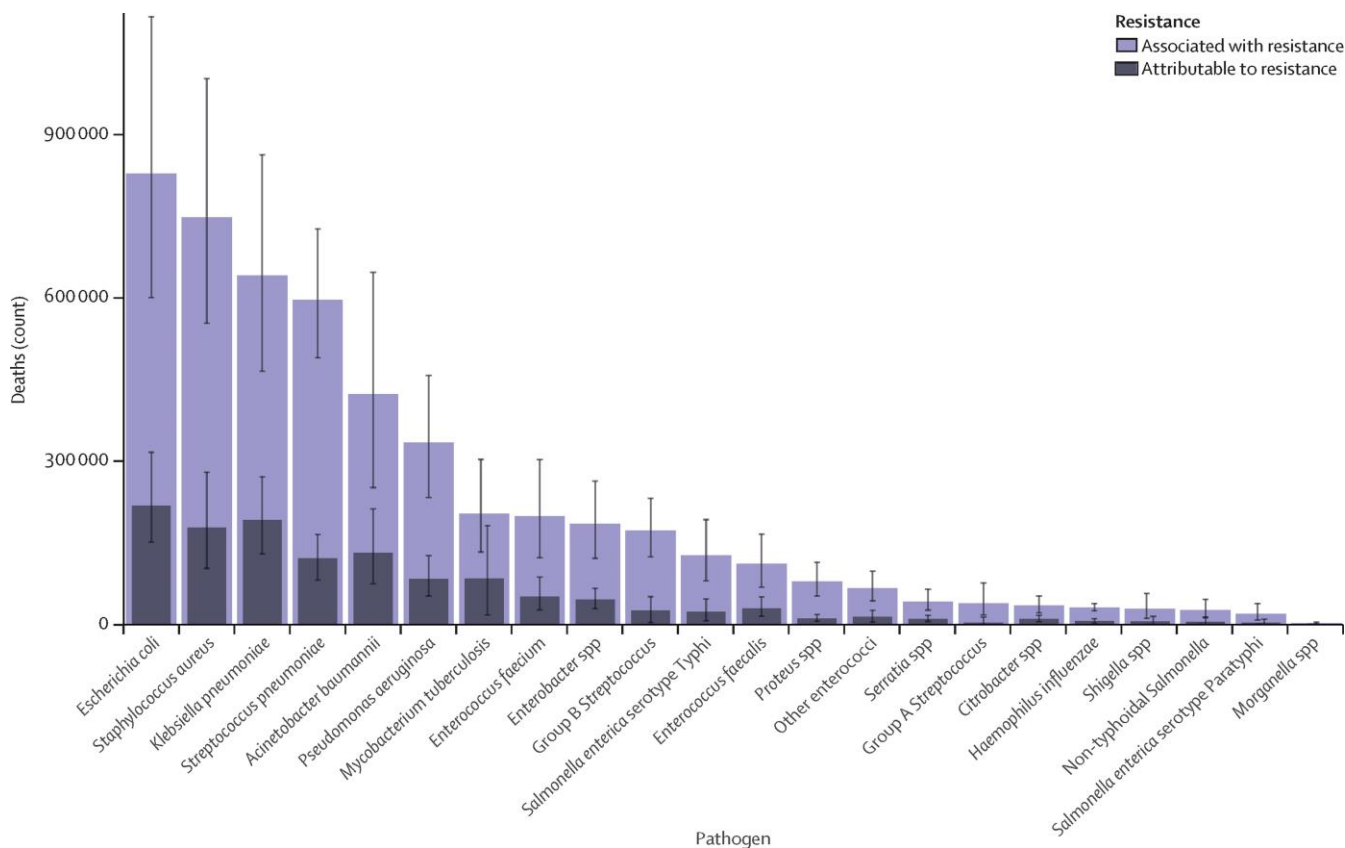
ADOPTED: 29 April 2021  
doi: 10.2903/j.efsa.2021.6651



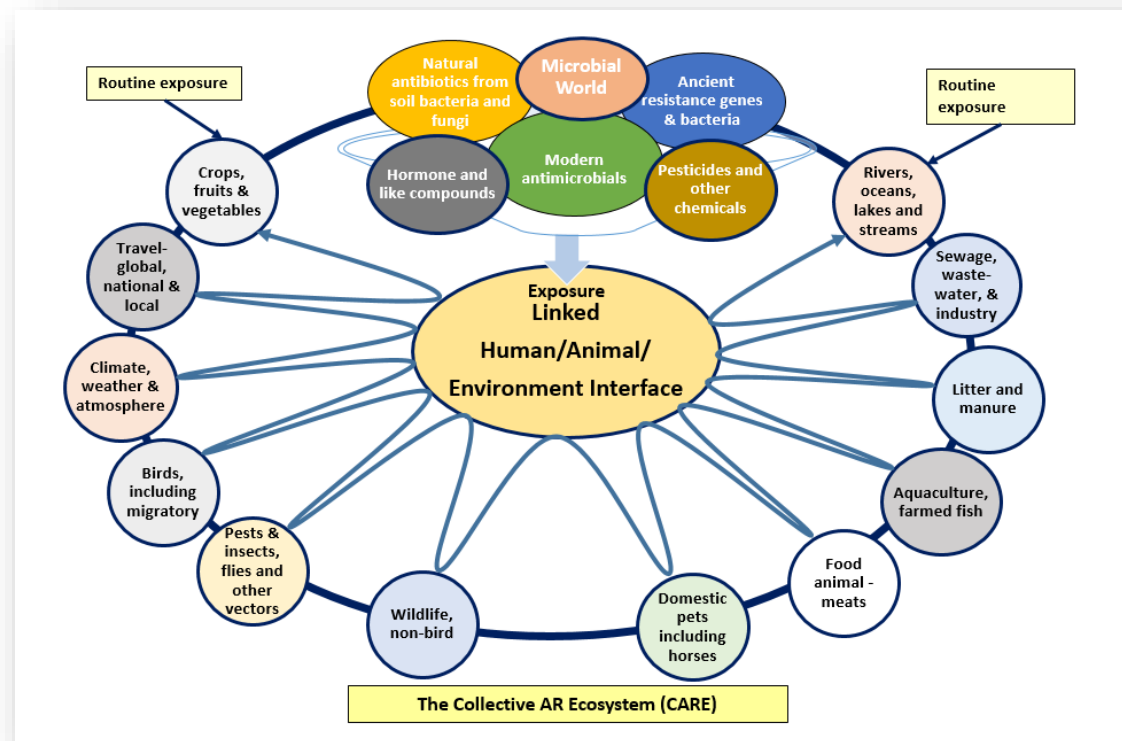
**Role played by the environment in the emergence and spread of antimicrobial resistance (AMR) through the food chain**

EFSA Panel on Biological Hazards (BIOHAZ),  
Konstantinos Koutsoumanis, Ana Allende, Avelino Álvarez-Ordóñez, 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, Héctor Argüello, Thomas Berendonk,  
Lina Maria Cavaco, William Gaze, Heike Schmitt, Ed Topp, Beatriz Guerra, Ernesto Liébana,  
Pietro Stella and Luisa Peixe

# Improving preparedness for AMR - What, Where & How?

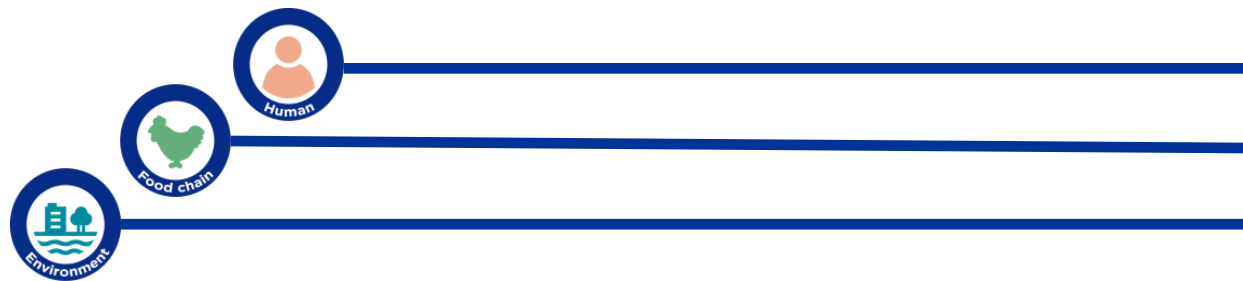


The Lancet 2022 399629-655DOI: (10.1016/S0140-6736(21)02724-0)



# Surveillance of AMR in food producing environments

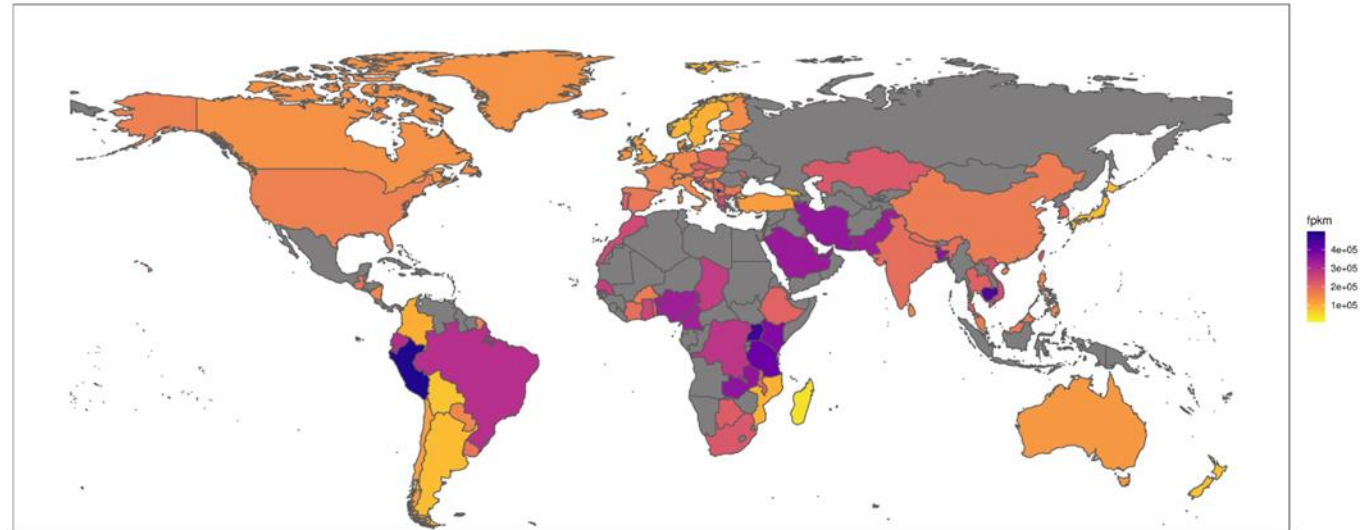
- Despite the intentions to include the environment official harmonized monitoring of AMR, this has only been piloted by the Tripartite study “Tricycle” by WHO, FAO, and OIE focusing on monitoring one indicator, single isolates of ESBL producing *E. coli* across the human, animal and environmental sectors
  - The Tricycle study collects among others samples of sewage waste water of which a subsets of the collected isolates from all sectors are being analysed using comparative genomics by whole genome sequencing to detect AMR determinants and clonal relatedness.





# Surveillance of AMR in food producing environments

- The matrix of sewage waste water/ manure/ animal faeces has also been used in other AMR surveillance attempts using a metagenomic approach.
- This has also shown promising results detecting all AMR determinants in the complex samples and will likely be the genomic approach for the future.



Average 2016-2018

105 countries, 258 cities, 670 sample

# Take home

- Current state of play
  - Readiness! – “Better late than never”
- Improving preparedness for AMR - What, Where & How
  - What constitutes the risks, Where should be measured, How to measure
- Surveillance of AMR in food producing environments
  - Might be worth to consider the direction by the Tripartite study “Tricycle” focusing on a single indicator, ESBL producing E. coli across the human, animal and environmental sectors
    - Including the possibility to embark on metagenomics in the future by storing collected sewage samples after culturing
      - When metagenomics have been proper harmonized and validated

# READINESS HARMONIZATION

# Thank you for your attention



Prof. Rene S. Hendriksen, PhD

Head of Research Group Global Capacity Building  
WHO Collaborating Centre for Antimicrobial Resistance in Food borne Pathogens and Genomics  
European Union Reference Laboratory for Antimicrobial Resistance  
FAO Reference Laboratory for Antimicrobial Resistance  
National Food Institute, Technical University of Denmark  
[rshe@food.dtu.dk](mailto:rshe@food.dtu.dk)



FAO Reference Laboratory  
for Antimicrobial Resistance

