EFSA’s activities on Antimicrobial resistance in the food chain

Dr. Ernesto Liebana
Head of BIOCONTAM Unit. EFSA
The reference body for risk assessment of food and feed in the European Union. Its work covers the entire food chain – from field to fork.

One of the number of bodies that are responsible for food safety in Europe.
WHAT EFSA DOES

Provides independent scientific advice and support for EU risk managers and policy makers on food and feed safety.

Provides independent, timely risk communication.

Promotes scientific cooperation.
The BIOHAZ and BIOMO Teams and the Panel on Biological Hazards (BIOHAZ) support monitoring activities and provide scientific advice on biological hazards in relation to food-borne diseases, food hygiene, **antimicrobial resistance**, transmissible spongiform encephalopathies, and processing of animal by-products.
EFSA is the EU agency responsible for **risk assessment on** food and feed safety

EFSA provides:

- **Independent scientific advice**
  Scientific Opinions on AMR

- **Scientific and technical support**
  Technical specifications on AMR-monitoring
  Data collection on AMR at EU-level
  Baseline surveys (e.g. MRSA in pig production)

- **Clear communication** on existing and emerging risks
HOT ISSUES IN AMR: EFSA’S RISK ASSESSMENTS

- MRSA
- ESBLs/AMPCs
- Carbapenemases
- Colistin
- Alternatives to antimicrobials
AMR monitoring

- **Monitoring** of AMR in food-producing animals and food
AMR MONITORING – WHY?

➢ To detect **emergence**, and to understand **dissemination** of AMR

➢ To provide data relevant for **risk assessment**

➢ To plan **interventions** and measure their effects.
HARMONIZED MONITORING OF AMR

Commission Implementing Decision 2013/652/EU of 12 November 2013

Animal/Food
- Poultry
  - Laying hens
  - Broilers
  - Turkeys*
- Pigs
- Calves*< 1year of age

Food
- Meat
  - Beef, Pork, Broiler meat

Zoonotic Bacteria
- \textit{Salmonella} spp.
- \textit{C. jejuni} / \textit{C. coli}
- ESBL-/AmpC-/Carbapenemase-producing \textit{Salmonella}

Indicator Bacteria
- \textit{E. coli}
- \textit{E. faecalis} / \textit{E. faecium}
- ESBL-/AmpC-/Carbapenemase-producing \textit{E. Coli}
NEW PROVISIONS OF THE LEGISLATION

Sampling rotation system

2020 → 2014*

2018 → 2016

2019

2017

2015**

*: No ESBL/AmpC/CP testing in 2014

**: No CP in 2015
RESISTANCE IN SALMONELLA IN FOOD PRODUCING ANIMALS (2015-2016)

- Important resistance levels
- Marked variation between MSs
- Impact of the distribution of serovars

![Graph showing occurrence of resistance in Salmonella spp. between 2015 and 2016. The graph compares different strains (AMP, SMX, TET) across various species (Broiler flocks, Laying Hen Flocks, Turkey flocks, Pig Carcases) with marked variation in resistance levels.]

Source: European Food Safety Authority
Important resistance to fluoroquinolones (CIP) in Broilers and Turkeys

Very low resistance to C3G (CTX)

Very low to no co-resistance to CIAs
RESISTANCE IN INDICATOR *E. COLI* IN FOOD PRODUCING ANIMALS

Occurrence of resistance / indicator *E. coli* / 2015-2016

- Broilers, 27 MSs, 2016
- Turkeys, 11 MSs, 2016
- Pigs, 27 MSs, 2015
- Calves, 10 MSs, 2015

% 'microbiological' resistance

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AMP

SMX

TET
RESISTANCE TO CIAS IN INDICATOR E. COLI

- Important resistance to fluoroquinolones (CIP) in Broilers and Turkeys
- Very low resistance to C3G (CTX)
- Very low co-resistance to CIAs: There are outliers for Broilers!
Important resistance to fluoroquinolones (CIP)

Low resistance to Macrolides (ERY)

Low combined resistance to CIAs in poultry: there are outliers for broilers!
North-South gradient
**3rd-GENERATION CEPHALOSPORIN RESISTANCE**

**Indicator *E. coli* 2015 - 2016**

- Presumptive ESBL/AmpC producing *E. coli*

![Occurrence of presumptive ESBL-/AmpC-producing E. coli 2015-2016](image-url)

- **Broilers** (N=8,530) (2016):
  - ESBL: 1.3
  - AmpC: 0.2
  - ESBL + AmpC: 1.5

- **Turkeys** (N=1,714) (2016):
  - ESBL: 2.6
  - AmpC: 0.1
  - ESBL + AmpC: 2.7

- **Pigs** (N=4,268) (2015):
  - ESBL: 1
  - AmpC: 0.3
  - ESBL + AmpC: 1.3

- **Veal Calves** (N=1,734) (2015):
  - ESBL: 1.4
  - AmpC: 0.02
  - ESBL + AmpC: 1.42
**SPECIFIC MONITORING OF ...**

**ESBL-/AmpC-producing *E. coli* - 2016**

- Prevalence (in %)

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<tr>
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<th>ESBL</th>
<th>AmpC</th>
<th>ESBL + AmpC</th>
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<tbody>
<tr>
<td>Meat from broilers (27 MSs)</td>
<td>35.9</td>
<td>26.8</td>
<td>2.0</td>
</tr>
<tr>
<td>Broilers (27 MSs)</td>
<td>35.4</td>
<td>24.4</td>
<td>2.6</td>
</tr>
<tr>
<td>Fattening turkeys (11 MSs)</td>
<td>36.6</td>
<td>7.2</td>
<td>1.7</td>
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</tbody>
</table>
ESBL PREVALENCE IN BROILERS (2016)
Specific monitoring of carbapenemase-producing *E. coli*

- Meat from pigs: 8 MSs – 1,833 samples
- Fattening pigs: 10 MSs – 2,584 samples
- Meat from bovines: 8 MSs - 1,818 samples
- Bovine animals: 3 MSs – 682 samples
- Calves: 2 MSs – 516 samples

- No positive results detected

Other (routine) monitoring

- 2 carbapenemase-producing *E. coli* detected
- in the pig sector in **2 MSs** in 2015
15 carbapenemase producers from poultry and its meat in 3 MSs

Routine monitoring of resistance

- Cyprus: 1 isolate from broilers

Specific monitoring: ESBL-/AmpC-/carbapenemase producing E. coli

- Cyprus: 8 isolates from meat from broilers
- the Netherlands: 1 isolate from meat from broilers

Voluntary specific monitoring of carbapenem-producing E. coli

- Romania: 2 isolates from broilers and 1 isolate from broiler meat
- Cyprus: 1 isolate from broiler meat, and 1 isolate from broiler.
New legislation successfully implemented by MSs
- Enlarged scope of AMR monitoring
- Frequent resistance to Fluoroquinolones observed
- Low resistance to other Critically Important Antimicrobials
- Low occurrence of ESBL/AmpC producers
- Prevalence of ESBL/AmpC-producing *E. coli* assessed in 2016
- Carbapenemase producers detected in broiler sector in 2016

Continually evolving threat from emerging AMR: There is a need to review the data collected, interpret the findings and assess trends.
Infographic

Antimicrobial resistance in Europe

New EC mandate on AMR monitoring: Background

Directive 2003/99/EC
Art. 7(3) and 9(1) + Annexes II (B) IV

Decision 2013/652/EU
2014 - 2020

New Decision
2021 - ...

2012
2014
2019

EFSA Tech. Spec. on the harmonised monitoring and reporting of AMR in Salmonella, Campylobacter, indicator commensal E. coli and Enterococcus spp. transmitted through food

EFSA Tech. Spec. on the harmonised monitoring and reporting of MRSA in food-producing animals and food

EFSA Tech. Spec. on randomised sampling for harmonised monitoring of AMR in zoonotic and commensal bacteria

New EFSA Tech. Spec. on the harmonised monitoring of AMR in bacteria transmitted through food
by March 2019

2019-2020: Drafting of the legislation by the EC

2020: Negotiation EC - MSs

2011-2016 Action Plan against the rising threats of AMR

June 2017 The European ‘One Health’ Action Plan against AMR

2016 - 2017 Audits of implementation in the MSs performed by Dir. F of the EC
JIACRA: ANALYSIS OF ANTIMICROBIAL USE AND RESISTANCE

- Interagency collaboration
- Analysis of the relationships, in humans/animals, between Antimicrobial Consumption (AMC) and Antimicrobial Resistance (AMR)
- JIACRA I published in January 2015. JIACRA II published in June 2017
Total AMC in 2014
(in mg/kg of estimated biomass)

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<tr>
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<th>In Humans</th>
<th>In Animals</th>
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<tr>
<td>124 mg/kg</td>
<td>152 mg/kg</td>
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<tr>
<td>range: 50 – 182 mg/kg</td>
<td>range: 3 – 419 mg/kg</td>
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- In 18 of 28 countries included in the analysis, AMC was lower or much lower in food-producing animals than in humans
- In 2 countries, AMC was similar
- In the 8 remaining countries, AMC was higher or much higher in food-producing animals than in humans
CONSIDERABLE VARIATIONS IN CONSUMPTION BETWEEN COUNTRIES WITHIN THE ANIMAL AND HUMAN SECTORS, RESPECTIVELY

Consumption of antibacterials for systemic use (ATC group J01) in the community and hospitals, EU/EEA countries, 2015, expressed as DDD per 1,000 inhabitants and per day

Spatial distribution of overall sales of all antimicrobials for food-producing animals, in mg/PCU, for 30 countries, 2015

» Indicates that there is an obvious potential for reduction in other countries, particularly among the highest users.

For Austria, Czech Republic, Germany, Iceland and Spain, only community data were reported.

» Several countries have reduced their consumption substantially, in particular in the animal sector.
OVERALL LINK AMC - COMPLETE SUSCEPTIBILITY INDICATOR *E. coli* – FOOD-PRODUCING ANIMALS

- Statistically-significant negative association between total AMC and complete susceptibility in food-producing animals
  - Prudent use should concern all antimicrobial classes consumed
  - Complete susceptibility: a potential candidate for an epidemiological indicator (wide ranges in AMC and CS)
SUMMARY JIACRA II

“Overall, this report confirms the positive association between AMC and AMR in both humans and food-producing animals and underlines the need to ensure prudent use so as to reduce the consumption of antimicrobials in both food-producing animals and humans”

**Important differences** exist in the amounts of antibiotics people and animals consume in different EU countries.

An increase in antibiotics use = increase in resistant bacteria.
INDICATORS FOR MEASURING PROGRESS MADE IN IMPLEMENTATION OF ACTION PLANS AGAINST AMR

- We pool the latest data on antibiotic resistance from across Europe.
- Our work supports action plans to combat antibiotic resistance in Europe and worldwide.
- We monitor how many antibiotics people and animals consume.
Set of indicators to assist Member States in assessing their progress in reducing the use of antimicrobials and antimicrobial resistance

Addressing both humans and food-producing animals

Based on data collected through existing EU monitoring networks
PROPOSED PRIMARY INDICATORS

Primary indicator
• Overall sales of veterinary antimicrobials (in mg/PCU)

Primary indicator
• Proportion of *E. coli* completely susceptible to antimicrobials tested in the EU monitoring

Primary indicator
• Proportion of meticillin-resistant *Staphylococcus aureus* (MRSA) and
• 3rd-generation cephalosporin resistant *E. coli* (3GCR *E. coli*).
INDICATORS OF AMR IN FOOD-PRODUCING ANIMALS

**Primary indicator**
- Proportion of *E. coli* completely susceptible to antimicrobials tested in the EU monitoring*

**Secondary indicators**
- Proportion of samples containing ESBL-/AmpC-producing *E. coli**
- Proportion of *E. coli* resistant to three or more antimicrobial classes*
- Proportion of *E. coli* resistant to fluoroquinolones*

*All indicators are weighted for all food-producing animals (broilers, turkeys, pigs, calves)*

**E. coli** as general indicator/
/all species considered, weighted by PCU
Susceptibility to entire panel measuring AMR in relation to total use of AMs

use of information from specific monitoring on prev. of samples with ESBL-/AmpC-producing *E. coli*

measures MDR (different classes) relevant to monitor effect of reduced use, useful when prop. fully susceptible is very low

ciprofloxacin on WHO list highest priority CIAs resistance to FQ correlates consistently with usage
ADDED VALUES

- Based on data already collected
- Summarising overall situation
- Tool for Member States to assess their progress
- Possible tool to set targets

SOME LIMITATIONS

- Summarising = losing some information
- Need to analyse underlying data

RECOMMENDATIONS

- To be reconsidered at least every five years
CONCLUSIONS

◆ Added value of linking AMC and AMR data

◆ Added value of a synthetic view of the AMC and AMR situation through limited number of consistent indicators to follow up the situation over time

◆ Higher is the AMC, higher is the risk of AMR!
HOW TO REDUCE CONSUMPTION?

Measure consumption

Implementation of management measures

Measure impact of measures - indicators necessary

**COMMISSION NOTICE**

Guidelines for the prudent use of antimicrobials in veterinary medicine

(2015/C 299/04)

**COMMISSION NOTICE**

EU Guidelines for the prudent use of antimicrobials in human health

(2017/C 212/01)

**SCIENTIFIC OPINION**

EMA and EFSA Joint Scientific Opinion on measures to reduce the need to use antimicrobial agents in animal husbandry in the European Union, and the resulting impacts on food safety (RONAFA)

How antimicrobial consumption and resistance data fusion increases knowledge and situational awareness
RONAFA RECOMMENDATIONS

What can we do?

- reduce the use of antimicrobials
- set targets
- increase responsibility of veterinarians
- use antimicrobials only when needed
RONAFA RECOMMENDATIONS

What can we do?

- Consider alternatives.
- Research new alternatives.
- Replace antimicrobials with alternative treatments.
- Develop a EU legal framework.
RONAFA RECOMMENDATIONS

What can we do?

- Improve prevention and control of diseases in animals
- Consider alternative farming systems.
- Offer education
- Rethink the livestock production system
THANK YOU FOR YOUR ATTENTION!

- Acknowledgements: BIOCONTAM Staff, BIOHAZ Panel, WGs, EMA, ECDC

- Documents presented available at
  - www.efsa.europa.eu

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