Levels of antimicrobial resistance in humans, food and animals

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AMR MONITORING – WHY?

• To identify emerging resistance patterns
• To support risk assessment
• To monitor and assess temporal trends in AMR and AMC
• To plan targeted interventions
• To contribute assessing the impact of antimicrobial use on resistance
• To measure the effects of such interventions
Every 2nd year on a rotating basis

- EU Member States
- Other European countries

Human cases of food-borne infection:
  - Salmonella
  - Campylobacter

Zoonotic bacteria:
  - Salmonella
  - Campylobacter

Indicator bacteria:
  - E. coli (non-pathogenic)
  - E. faecium, E. faecalis

Other bacteria:
  - MRSA

EU Summary Report on AMR

European Union Summary Report on AMR (annually)
Successful implementation of the new EU legislation

Enlarged scope of AMR monitoring

Improved comparability with AMR data in humans

Enhanced representativeness and reliability of AMR data

Human cases of food-borne infection:
- Salmonella
- Campylobacter

Bacteria:
- E. coli (non-pathogenic)
- E. faecium, E. faecalis

Other bacteria:
- MRSA

Every 2\textsuperscript{nd} year on a rotating basis

RANDONMISED SAMPLING: STRATIFIED SAMPLING WITH PROPORTIONAL ALLOCATION

**Two-stage stratified sampling**

1\textsuperscript{st} stage (strata)
- Proportional allocation

2\textsuperscript{nd} stage (strata)
- Sample
- Over-time sample collection

**Caeca at slaughter**

- Slaughterhouses (60\% of national throughput)
- Sample size proportionate to the SH throughput
- Slaughter batches
- Caecal sample(s) from distinct batches
- Even sampling every quarter of the year

**Meat samples at retail**

- NUTS 3 area
- Sample size proportionate to the area population
- Retailers
- 1 meat sample per retailer
- Even sampling every quarter of the year
RESISTANCE IN SALMONELLA SPP. IN FOOD-PRODUCING ANIMALS

- Important resistance
- Marked variation between MSs
- Impact of the distribution of serovars
Important resistance to fluoroquinolones (CIP) in Broilers and Turkeys

Very low resistance to C3G (CTX)

Very low to no co-resistance to CIAs

RESISTANCE TO CIAs IN SALMONELLA SPP.
- *C. coli* is considered in pigs
- Important resistance to fluoroquinolones (CIP)
- Low resistance to macrolides (ERY)
- Low co-resistance to CIAs in poultry: there are outliers for broilers!
All three antimicrobials (CIP, ERY, TET) are used for treatment of *Campylobacter* infections.
RESISTANCE IN INDICATOR *E. COLI* IN FOOD PRODUCING ANIMALS

![Graph showing occurrence of resistance in indicator *E. coli* from 2014-2015.](chart.png)
Important resistance to fluoroquinolones (CIP) in Broilers and Turkeys

Very low resistance to 3rd-Gen. Ceph. (CTX)

Very low co-resistance to CIAs: there are outliers for Broilers!
**TRENDS**

- **Indicator** *E. coli* from fattening pigs

- **Decreasing trends** in AMR observed in MSs where control programme is in place
- North-South gradient

- Indirectly, it embraces the full resistance

- To be compared with overall AMC data
ESBL-/AmpC-producing *E. coli* - 2015

<table>
<thead>
<tr>
<th>Animal Type</th>
<th>ESBL (%)</th>
<th>AmpC (%)</th>
<th>ESBL + AmpC (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fattening pigs</td>
<td>31.9</td>
<td>9.7</td>
<td>1.5</td>
</tr>
<tr>
<td>Veal Calves</td>
<td>36.8</td>
<td>4.8</td>
<td>2.0</td>
</tr>
<tr>
<td>Pork</td>
<td>7.0</td>
<td>2.3</td>
<td>0.4</td>
</tr>
<tr>
<td>Meat from bovines</td>
<td>5.0</td>
<td>1.8</td>
<td>0.3</td>
</tr>
</tbody>
</table>

**Prevalence (in %)**
ESBL PREVALENCE IN PIGS
ESBL PREVALENCE IN MEAT FROM PIGS
## 3rd-Generation Cephalosporin Resistance

### Indicator *E. coli* 2014 - 2015

- Presumptive ESBL/AmpC producers

### Occurrence of Presumptive ESBL-/AmpC-producing *E. coli* 2014-2015

<table>
<thead>
<tr>
<th>Animal Group</th>
<th>% Occurrence</th>
<th>(N)</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Broilers</td>
<td>3.6</td>
<td>4,179</td>
<td>2014</td>
</tr>
<tr>
<td>Turkeys</td>
<td>1.7</td>
<td>1,457</td>
<td>2014</td>
</tr>
<tr>
<td>Pigs</td>
<td>2.1</td>
<td>2,956</td>
<td>2015</td>
</tr>
<tr>
<td>Veal Calves</td>
<td>2.2</td>
<td>1,113</td>
<td>2015</td>
</tr>
</tbody>
</table>
RESISTANCE TO CARBAPENEMS

- **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 monitoring**
  - Two single isolates carbapenemase-producing *E. coli* detected in the pig sector in 2 MSs in 2015
New legislation successfully implemented by MSs
- Enlarged scope of AMR monitoring
- More comparable and reliable data
- 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 2015
- Carbapenemase producers detected in pig sector in 2015

Continually evolving threat from emerging AMR:
There is a need to review the data collected, interpret the findings and assess trends.
CONTENTS OF THE 2ND JIACRA REPORT

• Description of existing monitoring/surveillance systems
• Analysis of surveillance data referring to 2013, 2014 and 2015 from the EU MSs, IS, NO and CH to assess the relationship between antimicrobial consumption (AMC) and antimicrobial resistance (AMR) in animals and humans
• Conclusions and recommendations based on the results of logistic regression and multivariate analysis
POTENTIAL RELATIONSHIPS INVESTIGATED

Antimicrobial consumption in animals

Antimicrobial resistance in animals

Antimicrobial consumption in humans

Antimicrobial resistance in humans

Joint Interagency Antimicrobial Consumption and Resistance Analysis (JIACRA)
• Any questions?

• The 2015 EUSR on AMR is available on EFSA and ECDC websites