WHO model for Integrated Surveillance on AMR

The ESBL Ec Tricycle protocol

Jorge Matheu
AMR division-WHO HQ
29 September 2021
GAP Implementation: 5 strategic objectives

1. Improve awareness and understanding
2. Strengthen the knowledge through surveillance and research
3. Reduce the incidence of infection
4. Optimize the use of antimicrobial medicines
5. Ensure sustainable investment
**Complexity of Antimicrobial Resistance**

**Bacteria**

*Salmonella* >2500 serotypes  
*Campylobacter* spp  
*Vibrio*  
*Clostridium*  
*Staphylococcus aureus*

**Indicators**

*Escherichia coli*  
*Enterococcus* spp

**Laboratory Capacity and well trained staff**
Resistance to erythromycin follows the consumption

Macrolides are one group of antimicrobial agents that the World Health Organization has indicated as critically important antimicrobial agents for human therapy. The consumption of macrolides in pigs has decreased over the past 15 years, but it is still used. The resistance to one of the macrolides, erythromycin, has followed the decrease in the total consumption of macrolides, showing an association between consumption and resistance.

DANMAP - Data for action
WHO Integrated Surveillance Guidance 2017

1. Monitoring/Surveillance of resistance
2. Monitoring/Surveillance of use
3. Towards fully integrated analysis and reporting
WHO ADVISORY GROUP ON INTEGRATED SURVEILLANCE OF AMR
-AGISAR-

LESSONS LEARNED 2010-2019
16 AGISAR projects on integrated surveillance of AMR 2017–2019

42 AGISAR projects 2010-2016

Country Projects

- Argentina
- Ecuador
- Palestine
- Suriname
- Chad
- Albania
- Bhutan
- Japan
- Philippines
- Tanzania
- Zambia
- Zimbabwe
- Ecuador
- South Africa
- Thailand
- Ethiopia
- Chad
<table>
<thead>
<tr>
<th>Country</th>
<th>Title of the project</th>
<th>Sector</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bangladesh</td>
<td>Do foodborne pathogens Shigella and Salmonella spp. Share transferring AMR with commensal E. coli in patients with diarrhoea in Bangladesh?</td>
<td></td>
</tr>
<tr>
<td>Ghana</td>
<td>Characterization and Antibiotic Susceptibility Test of E. coli and Shiga-Toxin Producing E. coli (STEC) from Street Foods and Raw Beef in the Tamale Metropolis of Ghana</td>
<td></td>
</tr>
<tr>
<td>Kenya</td>
<td>Prevalence and molecular characteristics of extended spectrum beta-lactamase (ESBL)-Escherichia coli isolated from the gut of healthy food animals, environment and humans in East Africa Region: Kenya</td>
<td></td>
</tr>
<tr>
<td>Rwanda</td>
<td>Prevalence and molecular characteristics of extended spectrum beta-lactamase (ESBL)-Escherichia coli isolated from the gut of healthy food animals, environment and humans in East Africa Region: Rwanda</td>
<td></td>
</tr>
<tr>
<td>Tanzania</td>
<td>Prevalence and Molecular Characteristics of Extended Spectrum Beta-lactamase (ESBL)-Escherichia coli Isolated from Food Animals, Tanzania</td>
<td></td>
</tr>
<tr>
<td>Lebanon</td>
<td>Assessment of the risk of transmission of zoonotic microorganisms Campylobacter and Salmonella to humans by the broiler food chain and impart on public health in North Lebanon</td>
<td></td>
</tr>
<tr>
<td>Peru</td>
<td>Antimicrobial resistance profile of Enterobacteriaceae isolated from children under 2 years of age in peri-urban Lima, Peru</td>
<td></td>
</tr>
<tr>
<td>Uganda</td>
<td>Movement Pathways of Antimicrobial Agents and Occurrence of Antimicrobial Resistance in Humans, Food Producing Animals and Retail Foods in Uganda</td>
<td></td>
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<tr>
<td>Togo</td>
<td>Sentinel Surveillance of ESBL Enterobacteriaceae among children under 5 years old hospitalized for acute febrile gastroenteritis</td>
<td></td>
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<tr>
<td>Gambia</td>
<td>Prevalence and risk factors of faecal carriage of Extended Spectrum β-Lactamase producing Enterobacteriacea amongst food handlers in Lower Basic Schools in West Coast region of The Gambia.</td>
<td></td>
</tr>
<tr>
<td>Uzbekistan</td>
<td>Survey on Salmonella and Campylobacter in humans and poultry and their Antimicrobial Resistance</td>
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</tbody>
</table>
HOW TO ESTABLISH A GLOBAL MODEL FOR INTEGRATED SURVEILLANCE ON AMR WITH ONE HEALTH APPROACH?
6th AGISAR meeting

The initiative to develop a standard protocol was born

Concept note


Contributors: Awa Aidara-Kane (WHO), Antoine Andremont (University of Paris-Diderot Medical School), Mark D. Sobsey (Gillings School of Global Public Health, University of North Carolina), H. Morgan Scott (Texas A&M University)

WHO Integrated Global Survey on ESBL-producing E. coli using a "One Health" approach, "The Tricycle Project"

1st Meeting for ESBL E. coli Project Protocol Development

North Carolina, October 18-19, 2016
ESBL Ec Tricycle protocol: Principles

• Simple
  – One indicator: Extended Spectrum Beta Lactamase (ESBL) producing *Escherichia coli*

• Feasible
  – Allow many countries the implementation
  – **Multisectoral engagement** (Governance)
  – Require few resources (Laboratory capacity, training)
  – Data management (WHONET)

• Standardized
  – **Standard** laboratory methodology
Aim

To provide Member States with a common, simplified, and integrated multisectoral surveillance system to detect, and then estimate the prevalence of a microorganism indicator with a specific resistance mechanism, ESBL producing *E. coli* in three sectors.
WP1: Surveillance in humans
- Hospitals: Bloodstream infections
- Community (carriage): pregnant women

WP2: Surveillance in the food chain:
- Chicken caeca from the live bird open markets in major cities

WP3: Surveillance in the environment:
- River (Upstream)
- River (Downstream)
- Animal slaughter wastewater
- Human community wastewater

WP4: Molecular characterization

WP5: Epidemiology design and analysis

WP6: Management
- Country level
- Regional level
- Global level

WP7: Linkage with GLASS

WP8: Links with AMC/U surveillance systems WHO and OIE

WP: Working package
Followed the implementation of the core surveillance protocol, 
• Links with other UN proposed surveillance systems in the field of AMR; and 
• Opportunities to add satellite surveillance and research project protocols on AMR.

CPE: Carbapenem producing Enterobacteriaceae
FB: Foodborne
WGS: Whole Genome Sequencing
# Core sites and samples

<table>
<thead>
<tr>
<th>Sector</th>
<th>Sites</th>
<th>Sample subject</th>
<th>Sample</th>
<th>No. of samples</th>
<th>Links</th>
</tr>
</thead>
<tbody>
<tr>
<td>Human</td>
<td>Hospital</td>
<td>Inpatient</td>
<td>Bacteremias</td>
<td>5000 blood cultures/year</td>
<td>GLASS specimen sample</td>
</tr>
<tr>
<td></td>
<td>Community</td>
<td>Pregnant women</td>
<td>stool/rectal swab</td>
<td>100</td>
<td>Minimal number</td>
</tr>
<tr>
<td>Animal</td>
<td>Market</td>
<td>Chicken</td>
<td>Cecal</td>
<td>240/year 20/month</td>
<td>Most common food animal in countries</td>
</tr>
<tr>
<td>Environment</td>
<td>Capital or biggest city</td>
<td>Communal sewage</td>
<td>Waste water</td>
<td>8-12 rounds per year 4 samples per round 2 cities (suggested)</td>
<td>Suggested 1 round per month. River samples: AMR related with environment</td>
</tr>
<tr>
<td></td>
<td>Market sewage</td>
<td>Waste water</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>River Downstream</td>
<td>Water</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>River Upstream</td>
<td>Water</td>
<td></td>
<td></td>
<td>Waste water: AMR related with community</td>
</tr>
</tbody>
</table>
### Implementation in countries

<table>
<thead>
<tr>
<th>Region</th>
<th>Country</th>
</tr>
</thead>
<tbody>
<tr>
<td>Africa</td>
<td>Ghana, Madagascar, Senegal</td>
</tr>
<tr>
<td>Eastern Mediterranean</td>
<td>Pakistan, Jordan</td>
</tr>
<tr>
<td>South East Asia</td>
<td>Indonesia, India, Nepal</td>
</tr>
<tr>
<td>Western Pacific Asia</td>
<td>Malaysia</td>
</tr>
</tbody>
</table>

### Countries implementing in 2021

<table>
<thead>
<tr>
<th>Region</th>
<th>Country</th>
</tr>
</thead>
<tbody>
<tr>
<td>Africa</td>
<td>Cameroon, Nigeria, Zambia, Zimbabwe, Burkina Faso</td>
</tr>
<tr>
<td>Eastern Mediterranean</td>
<td>Iran, Morocco, Sudan</td>
</tr>
</tbody>
</table>
WHO integrated global surveillance on ESBL-producing *E. coli* using a “One Health” approach: Implementation and opportunities

THANK YOU