Focus areas w.r.t Antimicrobial Resistance

AMR: a One Health issue

- Policy research and lab studies
- NAP implementation support (India, Zambia)
- SAP implementation support (Kerala, MP, Delhi)
- Advocacy – national and international (tripartite and IACG)

Human

Animal

Environment

Agriculture
Studies on AMR

- 2010: Down To Earth, What’s in your honey?
- 2014: Down To Earth, Drugged
- 2016: Integrated AMR Surveillance Framework
- 2016-17: Strategic and operational guidance on animal and environmental aspects
- 2017: Bitter medicine
- 2017: Antibiotic resistance in poultry environment
- 2017: Double standards
- 2017-18: National action plans on antimicrobial resistance
Environmental dimension of AMR needs to be prioritized

- Environment is at the receiving end of what we do (sink)
  - It is a big pool of AMR determinants: antibiotic resistant bacteria, antibiotic resistance genes and antibiotic residues

- But it also a source
  - Poultry litter used as manure in agricultural farms and also in fish farms
  - Treated effluent from CETP/STP into rivers become input water in fish farms/fields

- However, limited focus on management of waste (such as from farms, factories, households and healthcare settings)
  - Even the effectiveness of waste treatment plants is now being questioned

- Limited guidance on how to go about environmental surveillance and setting discharge limits of AMR determinants in waste

- Environment possibly a big contributor to AMR in India. Largely unsanitary conditions, high bacterial growth; are among top producers of dairy, fish, poultry and antibiotics. But on the other hand we cook our meat.

AMR-centric approach in waste management required; antibiotics residues & resistant bacteria/genes in environment should be “hazardous”.
## Status in India

| Standards not aimed to address AMR | • General wastewater and industrial effluent standards confined to parameters like **BOD, COD, suspended solids** etc.  
|                                  | • **Draft standards** for residual antibiotics in pharma industry developed; yet to be notified by the MOEFCC |
| Waste from farms not on radar    | • Farms considered agriculture; **regulator’s mandate** is trade/industrial effluents  
|                                  | • Poultry and hatchery categorized ‘**green**’; aquaculture not categorized at all – in pollution-causing potential classification  
|                                  | • Slaughter house as ‘**red**’, fish processing as ‘**orange**’ – **But not due to AMR** |
| Limited awareness – environmental policymakers and regulators | • **Historic focus** on pesticides, heavy metals etc.  
|                                          | • Understanding **limited to antibiotic residues** in pharma waste – but more as an industrial waste; no standards and monitoring though  
|                                          | • Limited laboratory preparedness on **microbiology-related** aspects |

India’s NAP-AMR aims to address the environmental dimension at a broad level; momentum yet to be seen
MANAGING AMR IN ENVIRONMENT

- Integrated framework for policy, systems and tools
- Integrated AMR Surveillance Framework
Managing AMR in the environment – Framework for policy, systems and tools

Responsible Antibiotic Use in Food Animals

<table>
<thead>
<tr>
<th>THEMATIC AREAS</th>
<th>Supply of antibiotics</th>
<th>Production Systems</th>
<th>Consumers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduce need for antibiotics</td>
<td>Veterinarians and veterinary services</td>
<td>Farms and farmers</td>
<td></td>
</tr>
</tbody>
</table>

Surveillance of Antibiotic Use, Residues and Resistance

<table>
<thead>
<tr>
<th>THEMATIC AREAS</th>
<th>Antibiotic use in food animals</th>
<th>Antibiotic resistance in animals and food from animals</th>
<th>Antibiotic residues in food from animals</th>
<th>Environmental surveillance of residues and resistance</th>
</tr>
</thead>
</table>

Environment Management to Contain Antimicrobial Resistance

<table>
<thead>
<tr>
<th>THEMATIC AREAS</th>
<th>Registration/licensing (based on environment risk assessment)</th>
<th>Biosecurity/sanitation and hygiene/good manufacturing Practices</th>
<th>Waste management</th>
<th>Research</th>
</tr>
</thead>
</table>

Short-term (S): <1 yr; Medium-term (M): 1-3 yrs; Long term (L): 3-5 yrs; Continues throughout: (S-M-L)

**INTERVENTION AREAS**

<table>
<thead>
<tr>
<th>Policy/law/ regulations/ standards/ programmes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Implementation tools-Infrastructure/capacity/systems/resources</td>
</tr>
<tr>
<td>Advocacy/ awareness and education/training/curriculum</td>
</tr>
<tr>
<td>Record keeping/database generation/collation/dissemination and research/survey</td>
</tr>
<tr>
<td>Review/monitoring/feedback</td>
</tr>
</tbody>
</table>
### Managing AMR in the environment – broad structure for surveillance

#### Point Sources

<table>
<thead>
<tr>
<th>Farms</th>
<th>Factories</th>
<th>Households</th>
<th>Healthcare Settings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Waste from:</td>
<td>Effluents from:</td>
<td>Effluents from:</td>
<td>Hospital sewage</td>
</tr>
<tr>
<td>Animal farms</td>
<td>Animal farms – poultry, dairy, pig, fish etc.</td>
<td>Pharma manufacturing</td>
<td>Waste from veterinary care settings</td>
</tr>
<tr>
<td>Agriculture</td>
<td>Feed mills</td>
<td>Slaughter houses</td>
<td></td>
</tr>
<tr>
<td>farms</td>
<td>Common effluent treatment plants (CETPs)</td>
<td>Processing units (meat, dairy)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Common effluent treatment plants (CETPs)</td>
<td></td>
</tr>
</tbody>
</table>

#### Non-point Sources

- Rivers, Reservoirs
- Groundwater
- Agricultural soil

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**Surveillance of antibiotic resistant bacteria, antibiotic resistance genes and antibiotic residues**
Elements of successful surveillance programme

- Convergence and supplementation
  - Coordination and integration of available infrastructure and resources and filling the gaps

- Progressive and phased approach
  - Ambitious in view of the complexity and burden of the problem, which is gradually scaled-up in view of local constraints and realities in India

- Specific and comprehensive
  - Roles, accountability, timelines
Managing AMR in the environment

Approach for surveillance

1. Identify target bacteria and antibiotics

2. Identify sampling location, sample type, sample size, collector

3. Standardize and harmonize testing method(s)

4. Develop and operationalise laboratory network(s)

5. Harmonized data analysis and period reporting, available in public domain
Thank you!

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