Antimicrobial Resistance (AMR)
Containment: Country Response

Dr. Lata Kapoor
Joint Director, Microbiology Division,
National Centre for Disease Control
4 December 2017
“It is not the strongest in the species that survive or the most intelligent.. but the ones most responsive to change”
Natural Selection

Resistant bacteria

Antibiotics

Population of mainly susceptible bacteria

Population of mainly resistant bacteria
Antibiotic Selection for Resistant Bacteria

- Spontaneous AB-resistant bacterial mutant
  - Antibiotic present
    - AB-sensitive bacteria die
    - AB-resistant bacterium survives
  - Antibiotic absent
    - Spontaneous AB-sensitive bacterial mutant

2 generations later

1 generation later
Antibiotic deployment

Antibiotic resistance observed
AMR: Global Trends
Percentage of carbapenem-resistant *Klebsiella pneumoniae*, by country (most recent year, 2011–2014)
<table>
<thead>
<tr>
<th>Phase of Dev</th>
<th>Timeline</th>
<th>Probability of Success</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preclinical</td>
<td>1-6 Yrs</td>
<td></td>
</tr>
<tr>
<td>Clinical</td>
<td>6-11 Yrs</td>
<td></td>
</tr>
<tr>
<td>Phase 1</td>
<td>2-2.5 Yrs</td>
<td>30%</td>
</tr>
<tr>
<td>Phase 2</td>
<td>2.2-3 Yrs</td>
<td>14%</td>
</tr>
<tr>
<td>Phase 3</td>
<td>2.6 yrs</td>
<td>9%</td>
</tr>
<tr>
<td>Approval New Drug Application</td>
<td>1-2 yrs</td>
<td>8%</td>
</tr>
<tr>
<td>Phase 4(Post Marketing Surv)</td>
<td>10-14 yrs</td>
<td></td>
</tr>
</tbody>
</table>
AMR Contributory Factors

➢ Inappropriate use (overuse, underuse and misuse) of antimicrobials in
  ❖ Clinical medicine
  ❖ Veterinary medicine & Farm animals
  ❖ Industrial practices (Environmental pollution)

➢ Poor infection prevention and control in health care settings.

➢ Use /availability of poor quality Abs.
AMR challenges: India

- India has a high burden of bacterial infections, an estimated 410,000 children aged under five years die from pneumonia in India annually,
- Inadequately regulated use of antibiotics (human as well as veterinary sector), At $12.9 \times 10^9$ units of antibiotics consumed in 2010, India was the largest consumer of antibiotics for human health
- Use of antibiotics as growth promoters in animals, India accounted for 3% (4th largest) of Global consumption of antibiotics in food animals behind China(23%), USA (13%) and Brazil(9%)
- Availability of poor quality antibiotics
AMR challenges: India cont...

- Inadequate implementation of regulations (Schedule H-1 for human use)
- Limited regulations for food animals (but no regulations in non-food animals)
- Big Pharma industry including for antibiotics, Inadequate effluent treatment
- Inadequate interaction among clinicians & laboratory experts, Veterinarians, environmentalists
Use of antibiotics: Animals

- Antibiotics are used in food/non-food animals
- Used for both therapeutic and non-therapeutic purpose
- Even reserve antibiotics such as colistin are used (which are critically important for human beings)
- Increasing use as Animal growth promoters specially in Poultry feed
- Collectively, in BRICS countries, this consumption is estimated to increase by 99 percent by 2030
Antibiotics used in Animals

- Augmentin
- Cephalexin
- Enrofloxacin, Tetracycline

Containing 90% Streptomycin
CSE Study 2014 : Antibiotics in Chicken Meat : Percentage of Samples Positive for Antibiotics Residues

# Neomycin was not detected in any sample
AMR as a Food safety problem

- Food products of animal origin often contaminated with bacteria, likely to constitute the main route of transmitting resistance bacteria and resistance genes from food animals to people
- Direct contact with animals or animal environment
- Foods as fruits & vegetables contaminated by animal waste or contaminated water
India’s response – containment of AMR

2010 National Task Force

2011 National Policy for Containment of AMR

Sept 2011 Jaipur Declaration

2012 National Programme on containment of AMR
The National Policy for Containment of Antimicrobial Resistance

- National task force set up in 2010 under the chairpersonship of the DGHS to review AMR situation in the country and formulate a strategy for containment.
- The National Policy for AMR containment formulated in 2011 with following objectives:
  2. Initiate studies documenting prescriptions patterns & establish a Monitoring System for the same.
  3. Enforce and enhance regulatory provisions for use of antibiotics in human, veterinary and industrial use.
  4. Recommend specific intervention measures such as rationale use of antibiotics, infection prevention and control practices in hospitals which can be implemented as early as possible.
National Guidelines for use of antimicrobials

- National **Guidelines for antimicrobial use** in infectious diseases have been developed (**Released by HFM in Feb 2016**) and uploaded on NCDC website ([www.ncdc.nic.in](http://www.ncdc.nic.in)). It would serve as a guide to all the health care facilities to formulate their own guidelines.

**Hospital Infection Prevention & Control guidelines**

- An **interim concise guideline** on infection control has been uploaded on NCDC website as a ready reference for the hospitals to start implementing infection control practices in their settings.
- Detailed National Infection control guidelines have been drafted and are in the process of finalization
Treatment Guidelines: The Highlights

Therapy of Common Infections: Syndrome wise

- Gastro-intestinal system
- Central Nervous System
- Cardio-vascular system
- Skin and Soft tissue
- Respiratory tract
- Genitourinary tract
- Pediatric and Neonatal infections
- Obstetrics & Gynecological infections
- Ophthalmic Infections
- Infections of Ear, Nose & Throat
Regulatory Strengthening

Schedule H-1.

About 24 antimicrobials belonging to 3rd, 4th Generation Cephalosporins and Carbapenems are covered in the schedule, These antimicrobials cannot be sold without a proper medical prescription and these drug packaging are required to be labeled with the following text along with red border. “SCHEDULE H1 DRUG –

WARNING: It is dangerous to take the drug except in accordance with medical advice, Not to be sold by retail without the prescription of a Registered medical practitioner”,

A separate register has to be maintained by the pharmacist giving details of the prescriber, the patient as well as the drug sold.
IEC Activities

- **CME programmes:** NCDC, Delhi has conducted a series of on rational use of antibiotics for General practitioners as well as specialist doctors of Delhi.

- **Antibiotic awareness week 2017 (13-19 Nov):**
  - Awareness campaigns in Schools
  - Public lecture held at AIIMS
  - Television programmes
  - AMSP workshop in LHMC on 18th November
National Action Plan (NAP-AMR)

- National Action plan endorsed by different stakeholder ministries in interministerial meeting chaired by Hon’ble HFM dated 19th April 2017
  - Goal: Effectively combat antimicrobial resistance in India and contribute towards the global efforts to tackle this public health threat.
  - Operational plan being developed for implementation

Enrolment in GLASS

- NCDC Notified National Coordinating Centre for AMR Surveillance
- India enrolled on Global Antimicrobial Surveillance System (GLASS) in July 2017
National Action Plan - AMR
Strategic priorities

1. Awareness & understanding
   - Communication & IEC
   - Education, training

2. Knowledge & evidence
   - Surveillance of AMR – human, animal, environment
   - Laboratories

3. Infection prevention & control
   - Healthcare, HAI
   - Animal health
   - Community & environment

4. Optimise use
   - Regulation, access, AM use
   - Antimicrobial stewardship - human
   - AMS - animals, agriculture

5. Innovations, R&D
   - New medicines
   - Innovations
   - Financing

6. Leadership
   - International collaborations
   - National collaborations
   - State level collaborations
Integrated One Health approach

- Surveillance of AMR and antimicrobial use in all sectors – human, veterinary, food and environment
- IEC activities for raising awareness about AMR
- Strengthen sanitation, hygiene, infection prevention and biosecurity
- Promote rational use of antibiotics
- Stop use of antibiotics for growth promotion and prophylaxis in animals
- Strengthen regulations in humans; and establish regulations for use of antibiotics in veterinary and food sector; and for effluent treatment to safeguard the environment
- Promote development of newer drugs, vaccines and diagnostics
National Programme on Containment of Antimicrobial Resistance

- As per National Policy, National Programme on AMR was developed and approved for implementation during 12th Five Year Plan.
- NCDC, Delhi is identified as the nodal institution for this activity.

Objectives of the programme:

1. Establish a laboratory based **AMR surveillance** system in the country to generate quality data on antimicrobial resistance
2. Strengthen **infection control practices**
3. Conduct **surveillance of antimicrobial usage** and **Antimicrobial stewardship activities (AMSP)** in health care settings to promote rational use of antimicrobials
4. **Generate awareness** amongst health care providers and community on Antimicrobial resistance and rational use of Antimicrobials.
AMR Surveillance (NCDC Network)

- State medical colleges to be strengthened in phased manner to carry out surveillance.
- Ten labs selected in the first phase (2015) in different geographical regions, five more being added in 2017, total of 25 labs to be strengthened by 2020
- Pathogens identified – initially 4, seven in 2017
- Surveillance SoP for data collection finalized and uploaded on website
  - Clinical samples- blood, aspirated pus and other body fluids
  - Limited panel of antibiotics
    Salmonella enterica serotype Typhi and Paratyphi
- AST methodology finalised based on CLSI guidelines
- Data analysis tools identified as WHONET, training imparted
AMR Surveillance Laboratory Network

Network labs for AMR surveillance in Phase 1 and 2

1. VMMC and Safdarjung Hospital
2. Dr. RML Hospital
3. LHMC
4. GMC, Chandigarh
5. GSVM College, Kanpur
6. SMS Medical College, Jaipur
7. BJ Medical College, Ahmedabad
8. BJ Medical College, Pune
9. Mysore Medical College, Mysore
10. IG Medical College and Hospital, Shimla
11. Guwahati Medical College, Guwahati
12. NEIGRIHMS, Shillong
13. MGM Medical College, Indore
14. K.A.P. Viswanatham Govt. Medical College, Tiruchirapalli
15. GMC, Thiruvananthapuram

Labs included in Phase 1:
Labs included in Phase 2:
AMR is a Food Safety Issue

- AMR in foodborne pathogens linked to overuse and misuse of antimicrobial agents in food producing animals
- Food serves as a transmission route from animals to humans
- Food safety systems play an important role in tackling AMR in the food chain
Safe Food Production and Containment of AMR

- Optimise use of Antibiotics in food producing animals to protect public health
- Strengthen food safety policy and legal frameworks – Ban on use of selective critical antibiotics based on their importance to human medicine – Ban on use of growth promoters
- Use alternatives to antibiotics, i.e. prophylactic vaccination
- Good farming practices, promoting animal health on animal farms
Regulations : Food animals

- **FSSAI:**
  - Tolerance limits for antibiotics for limited foods under the Food Safety and Standards (contaminants, toxins and residues) Regulations, 2011 (sea foods including shrimps, prawns or any other variety of fish and fishery products)
  - Tolerance limit for antibiotics in honey (amendment 2014)
  - 2017: Draft available for comments to fix tolerance limit of antibiotics and veterinary drugs in meat and meat products. Maximum permissible limits of various antibiotics included.
Role of Food Safety in tackling AMR

1. Awareness & understanding
   - Communication & IEC
   - Education, training

2. Knowledge & evidence
   - Surveillance of AMR – human, animal, environment
   - Laboratories

3. Infection prevention & control
   - Healthcare, HAI
   - Animal health
   - Community & environment

4. Optimise use
   - Regulations, access, AM use
   - Antimicrobial stewardship - human
   - AMS - animals, agriculture

5. Innovations, R&D
   - New medicines
   - Innovations
   - Financing

6. Leadership
   - International collaborations
   - National collaborations
   - State level collaborations
Urgent need for action for AMR Containment

- **One health approach** with effective coordination of action and exchange of information among various sectors (agriculture, food, veterinary and health sectors)

- **Regulation** on use of antibiotics in food, use of antimicrobials critical to human medicine only when justified

- **Reduction in need of antimicrobials** by improving animal health: Better management of animal farms, good hygienic practices, effective vaccination

- Surveillance of antimicrobial usage in farm animals, AMR in selected food borne bacteria
Urgent need for action for AMR Containment cont..

- **Raising awareness** of antimicrobial resistance from a food safety perspective and prompt action that prevents its development and spread in food chain

- **Training and Capacity Building**: Veterinary, agriculture and food authorities together develop guidelines on prudent use of antibiotics in food animals, impart training on how to use these guidelines
Key Messages

- AMR is an important food safety problem and an increasing threat to public health
- Use of antimicrobials in food animals for treatment, disease prevention or growth promotion allows resistant bacteria and resistant genes to spread from food animals to humans through the food chain
- Urgent action is required for prevention and containment of AMR in food chain
- Need for National Coordination and International Cooperation including regulations and reduction in use of antimicrobials in food animals,
- Integrated food surveillance can help guide food safety risk management on AMR in the food chain
THANK YOU