Food Systems and Antimicrobial Resistance
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Antimicrobial Resistance (AMR) – the ‘Silent Pandemic’ unlike Covid-19

• **Antibiotics are becoming ineffective** to treat even common infections and saving lives. Treatment options are reducing. **Those considered last-resort are also failing.**

• **This is due a phenomena called AMR – in particular antibiotic resistance, which is growing across the world, but silently.** Therefore, people are less aware despite being affected; despite the grave threat it poses to humanity. **That’s why – this awareness week!**

• Antibiotic resistance mainly happens because of use of antibiotics. Bacteria can become resistant when exposed to antibiotics. **Therefore, the more antibiotics we use, the more we lose. They are a global ‘public good’ but continually misused and overused** and are responsible for steep rise in resistance.

• Resistant bacteria can pass between and among humans, animals, plants and environment. **Impact therefore is much beyond just human-health. It is about health of animals, plants and therefore impacts food productivity, livelihood, economy and development.**
Estimated 10 million lives per year at risk by 2050, if no action taken; About 90 per cent in Asia and Africa

- Presently - **700,000** deaths globally every year estimated due to resistant infections

Source: Review on AMR, 2016
High estimated losses to economy and development; low-income countries to be impacted most

In a high-impact scenario

- The world will lose **3.8 percent of its annual GDP by 2050**, with an annual shortfall of $3.4 trillion by 2030
- **Livestock production** in low-income countries would decline the most, with a possible **11 percent loss** by 2050
- An additional **24 million people** would be forced into **extreme poverty** by 2030. Most of the increase would occur in low-income countries

The same analysis shows that the recommended investments made to contain AMR **will yield high returns**

Source: Drug-Resistant Infections: A Threat to Our Economic Future, World Bank Group
AMR can derail attainment of several SDGs, including those linked with food

Source: No time to wait: Securing the future from drug-resistant infections, IACG Report, 2019
Food systems, its elements and interactions

- Food systems encompass the entire range of actors and their interlinked value-adding activities involved in the production, aggregation, processing, distribution, consumption and disposal of food products that originate from agriculture, forestry or fisheries, and parts of the broader economic, societal and natural environments in which they are embedded.

- It is composed of sub-systems (e.g. farming system, waste management system, input supply system, etc.) and interacts with other key systems (e.g. energy system, trade system, health system, etc.).
Food production systems – key driver for AMR

Animal health and food from animals

Key sectors
- Poultry farming for meat
- Aquaculture for fish meat
- Pig farming for meat
- Sheep farming for meat
- Beef cattle for meat

Human health

Crops

Waste and Environment

Key sectors
- Poultry farming for eggs
- Dairy farming for milk
- Bee-keeping for honey
- Crop agriculture (rice, wheat, pulses, fruits etc.)
- Farming for animal feed
Indiscriminate antibiotic use in food animals; critically important antibiotic for humans commonly used in animals

PROPHYLAXIS/PREVENTION
- Antimicrobials administered to an individual or group of animals with no clinical sign of a disease
- Often done routinely/intermittently

METAPHYLAXIS/CONTROL
- Antimicrobials administered in therapeutic doses to a group of animals wherein one or more animals are infected but others do not show clinical signs.
- Acts as a treatment for those who are ill but preventive for others

GROWTH PROMOTION
- Use of antimicrobials to increase the rate of weight gain or efficiency of feed utilization
- Routinely used at a mass scale through feed at sub-therapeutic doses

Disease prevention
- Prophylaxis/prevention
- Metaphylaxis/control

TREATMENT
Use of antimicrobials at therapeutic dose to treat an infectious disease having clinical signs and/or symptoms

CRITICALLY IMPORTANT ANTIMICROBIALS
Growth promotion
Treatment
Antibiotic misuse/overuse use fuels intensification which accelerates AMR through multiple pathways; big proportion of antibiotics used in food-animals

Antibiotic use allows:
- High stocking density
- Chemical-based disease prevention and control; limited focus on biosecurity, animal husbandry
- Productivity due to non-nutritive means

A big proportion of total antibiotics used in food-animals (huge animal population, big mass, cheap and easy substitute)

AMR determinants across pathways include antibiotics, resistant bacteria and genes that can confer resistance

Source: CSE analysis
Drivers and characteristics of intensive animal farming

• Growing food demand (protein, animal protein)
• Growing population
• Growing incomes / purchasing power
• Urbanization
• Changing food/diet habits, evolving taste
• Less people, land to grow food
• Political mandate - for exports, livelihood opportunities
• Availability of inputs - machines, feed, drugs and chemicals

• Large-scale units with high stocking density of animals/birds/fish
• Genetically selected similar breeds for productivity (not disease resilience)
• Kept under confined conditions and in close proximity; limited focus on animal husbandry
• Dependence on commercial feed, inputs (also known as animal feeding operations, factory farms)
• Often geographically concentrated; vertically integrated by large players; involves contract farming
• Industrial systems but considered agriculture; can bypass required regulatory attention
But intensive food systems are not sustainable; negatively impact health, livelihood and environment and climate

**Health and Nutrition**
- Zoonosis
- Amplification of pathogens
- Loss of disease resilience
- Pandemics (viral and AMR)
- Food-borne illnesses/ Drug-resistant infections
- Nutritional deficiencies
- Food safety, toxicity, quality issues
- Loss of food/dietary diversity
- Animal welfare compromised

**Intensive food systems (animal/crops)**
- Monoculture/loss of biodiversity
- Natural resource degradation
- GHG intensive processes
- Eco-toxicity
- Vulnerability to climate crisis
- Ground water depletion and overall degradation

**Livelihood**
- Small holder farmer livelihood compromised
- Increased farmer input cost
- Increased farmer distress

**Environment and climate**
Global momentum building up on the importance of transforming food systems/transition to sustainable food and agriculture in view of SDGs (and containing AMR)

Statement on antimicrobial use in food systems by the One-health Global Leaders Group on AMR (2021)

Secretary-General’s Chair Summary and Statement of Action on the UN Food Systems Summit (2021)

Policy action agenda for transition to sustainable food and agriculture, COP26 2021
In summary...

- **Intensive food systems are chemical-dependent.** Antibiotics (and other chemicals) have played a **big role in fueling food-animal systems**

- **Food production (with increasing proportion from intensive / industrial systems) has grown substantially** over decades; the need to continue this steep growth is further highlighted to **feed the growing population** (~10 billion by 2050)

- **But it is also clear that such systems are not sustainable.** They have helped on productivity but their negative impacts on public health/nutrition, livelihood, environment and climate crisis are evident.

- **So, the status quo if persists will be detrimental overall.** Clearly, the world will have to find sustainable ways to produce food. **The food systems need to be transformed.**
The Big task is to produce more with less chemicals, less resources and how it could be done (in different parts of the world)

But there are several questions as well...

- Despite such high food production, a big part of the world is still under-nourished, starving or overweight. How much of this is also about the quality of food, about nutrition security?

- How much of the problem is really about food production? A big part of food produced is wasted. What about problems in food distribution? And about a holistic response focusing on livelihood of small farmers and protection of environment?

- Is the demand for proteins real or created? And how much from animals?

- How much of the chemical/antibiotic use is unnecessary at its first place or which can be avoided with basic prevention and stewardship approaches?
More questions…

• What about consumption? How much can be addressed by just making slight shifts in consumption (by geographies/people with higher per capita meat consumption)?

• Is the solution more about going back to basics (agro-ecological practices) or use of innovation and technology or both? What is sustainable intensification?

• Different countries are at a different levels of intensification. Aren't those with less of overall food production from intensive systems (such as India), stand a better chance to unlearn and move towards sustainable production practices and yet produce enough good quality food?
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CSE’s work on food systems and environment in India

Antibiotics in honey, 2010
Antibiotic use in poultry, 2014
Antibiotic use in aquaculture, 2016
AMR in poultry environment, 2017
Antibiotic use in fast food supply chain, 2017
Disposal of pharma manufacturing waste, 2017
Disposal of unwanted drugs, 2019
Antibiotic use in crops, 2019
Antibiotic use in feed, 2020
Antibiotic use in fast food supply chain, 2020
Antibiotic use in dairy, 2020
Body Burden, 2020
Use of ethnoveterinary medicines in dairy sector, 2021
CSE’s global work on food systems and environment

- Strategic guidance for NAP for developing countries, 2016
- Prioritized NAP-AMR (Zambia, 2019)
- Baseline information for Integrated AMR surveillance (Zambia, 2020)
- Framework for Integrated AMR surveillance (Zambia, 2020)
- Roadmap to phase out antibiotic misuse in food-animals (Zambia, 2020)
- Framework for drug take-back and EPR (Zambia, 2021)
- Prioritized NAP-AMR (Zimbabwe, 2021)
- Containing the silent pandemic of AMR (2021)
- Conserving the use of critically important antimicrobials (2021)