Antimicrobial Resistance and Intensive Food Production

Pandemics and Industrial Food Animal Farming
CSE Webinar
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Antimicrobial Resistance (AMR):

- Antimicrobial resistance happens when microorganisms (such as bacteria, fungi, viruses, and parasites) change when they are exposed to antimicrobial drugs (such as antibiotics, antifungals, antivirals, antimalarials, and anthelmintics) (WHO)

- Antibiotic resistance happens when germs like bacteria develop the ability to defeat the drugs designed to kill them. That means the germs are not killed and continue to grow. (CDC)

Pandemic:

- A pandemic is the worldwide spread of a new disease (WHO)

- Viral pandemics – such as of influenza virus and corona virus

AMR - a chronic pandemic of huge cumulative damage

Impact of AMR is huge and goes beyond health

- Existing **antibiotics are becoming ineffective** leading to:
  - Increased **morbidity** and **mortality** in humans and animals
  - **Longer hospital stays** and expensive treatments - higher healthcare expenditures
- Can also cause productivity loss, food security and livelihood issues
- Make attainment of **sustainable development goals** difficult. Such as:
  - No poverty (SDG 1)
  - Zero hunger (SDG 2)
  - Good health and well being (SDG 3)
  - Clean water and sanitation (SDG 6)
  - Responsible consumption and production (SDG 12)
- **USD 100 trillion** – cumulative cost to global economic output by **2050**

High annual deaths due to AMR leading to huge cumulative damage vis-à-vis viral pandemics of the 21st century (which are acute crisis of a limited duration)

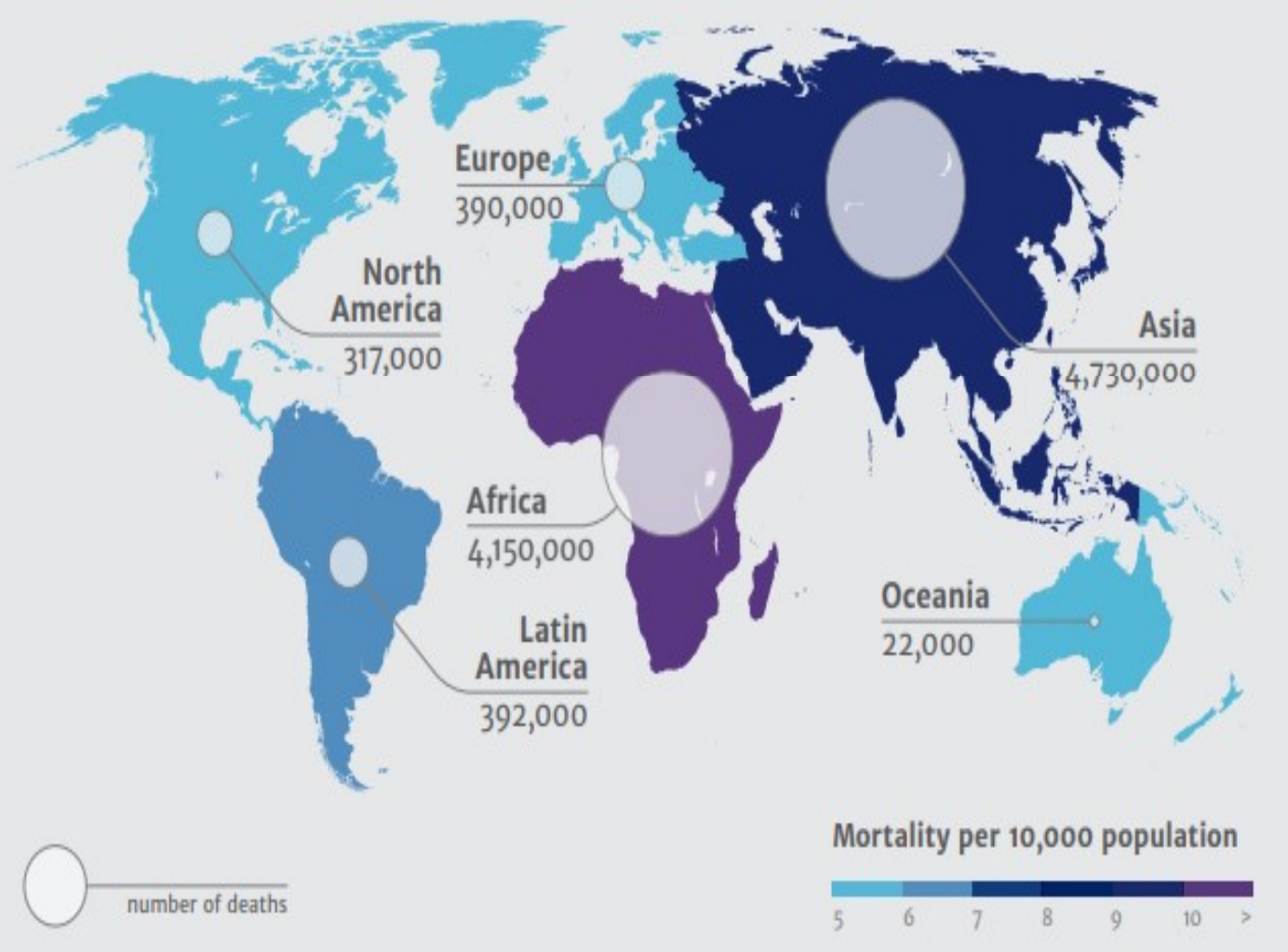
- **700,000** deaths globally every year estimated due to resistant infections (Review on AMR, 2016)
- **2,30,000** deaths globally in 2017 due to **MDR/RR-TB**; most cases and deaths in India and China (WHO, 2018)
- **> 35,000** deaths each year in the **U.S.** (CDC, 2019)
- **~33,000** deaths estimated each year in the **EU** (Lancet 2019)
- **>56000 neonatal deaths** estimated due to sepsis by drug-resistance to first-line antibiotics each year in **India** (Lancet 2016)

Pandemic	Causative organism	Worldwide deaths
Spanish Flu (1918-19)	Influenza A (H1N1) virus	20-50 million
Asian Flu (1957-58)	Influenza A (H2N2) virus	1.1 million
Hong Kong Flu (1968)	Influenza A (H3N2) virus	1 million
After 2000		
SARS (2003)	SARS CoV virus	916 (Nov 2002- Aug 2003)
Swine Flu (2009)	Influenza A (H1N1) virus	0.15-0.57 million (during first year)
MERS (2012)	MERS-CoV virus	858 (since Sept 2012)
Ebola (2014-16)	Ebola virus	11, 310
Covid19 (2019-20 ongoing)	SARS-CoV2 virus	>0.4 million (as on June 10, 2020)

Data sourced from the WHO and the Centers for Disease Control and Prevention

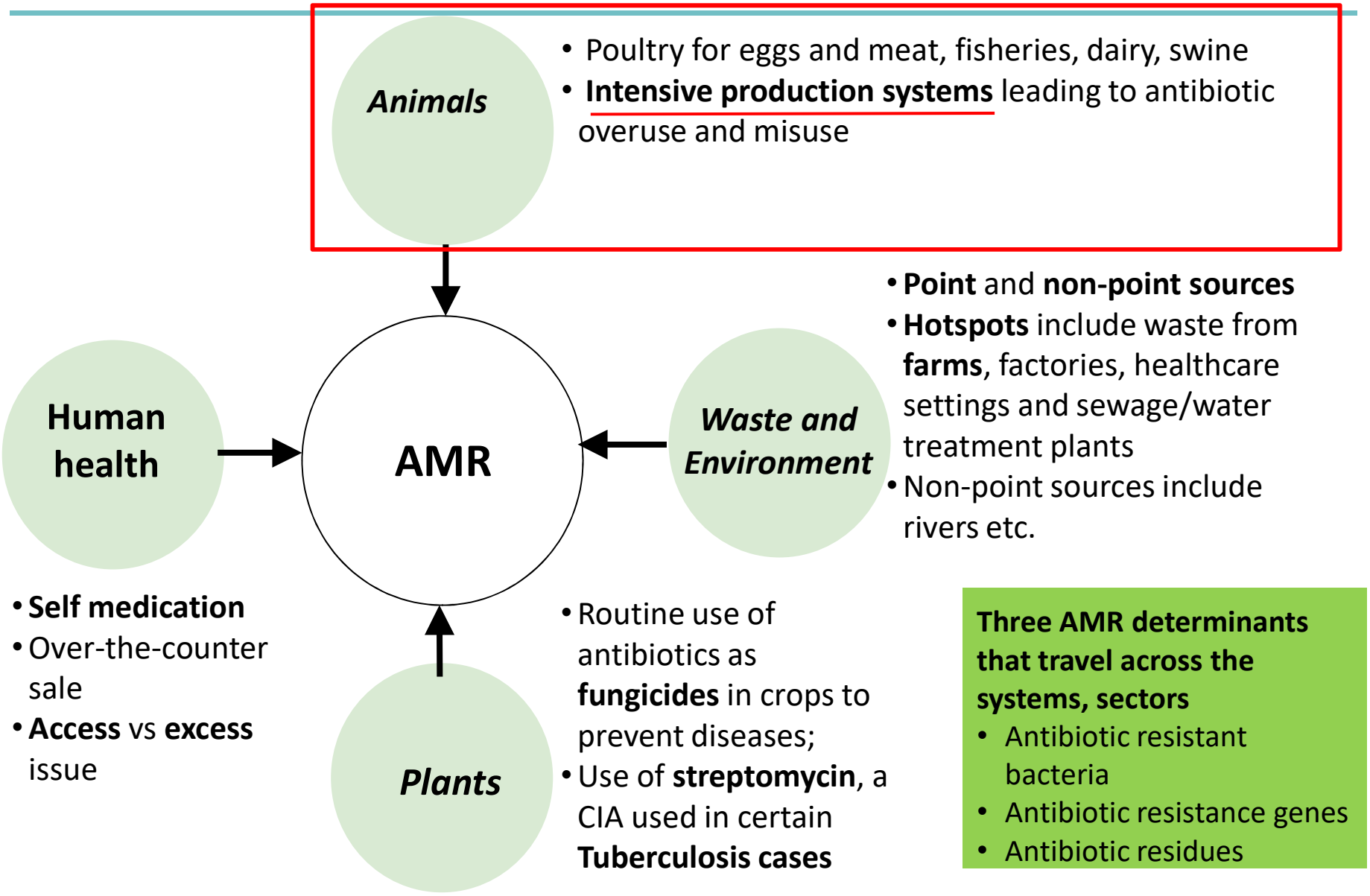
Estimated 10 million lives in a year at risk by 2050, if no action taken; About 90 per cent to be in Asia and Africa

Deaths attributable to AMR every year by 2050



Source- AMR: Tackling a crisis for the health and wealth of nations

AMR has strong linkages with food and environment



Intensive animal farming systems – confined settings and high density

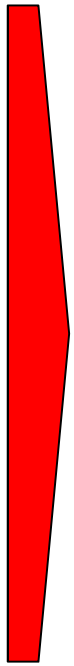
More food is now grown in intensive settings; the very nature of such industrial production can create crisis

Food that we eat is increasingly being produced in intensive/industrial systems

- In **high income countries**, most of food from animals is grown in intensive settings
- In **low and middle income countries** intensification is growing due **to animal protein demand** (from 2000 to 2030 poultry meat demand in India estimated to grow >8 times)

<u>But the very nature of such production systems can create crisis</u>

- **Large-scale units** with **high stocking density** of animals/birds/fish
- **Genetically selected breeds** for productivity (not disease resilience)
- Confined conditions; **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; do not get required **regulatory attention**



- High use of **chemicals and drugs** (easy/economical substitute):
  - **Routine** antibiotic use to promote faster **growth** and **prevent diseases** despite no clinical sign
  - Use of medically important antibiotics including **critically important** and last-resort

Intensive food production is strongly linked to several pandemics

Antimicrobial Resistance

- Antibiotic use favors resistance; **misuse accelerates it**
- **Low/sub-therapeutic doses creates selection pressure** in the gut bacteria of the animal/bird
- **Resistant** bacteria survives and spreads through food, contact and waste; **Un-metabolised antibiotics in feces, antibiotic residues** in food add to problem

Intensive food animal production

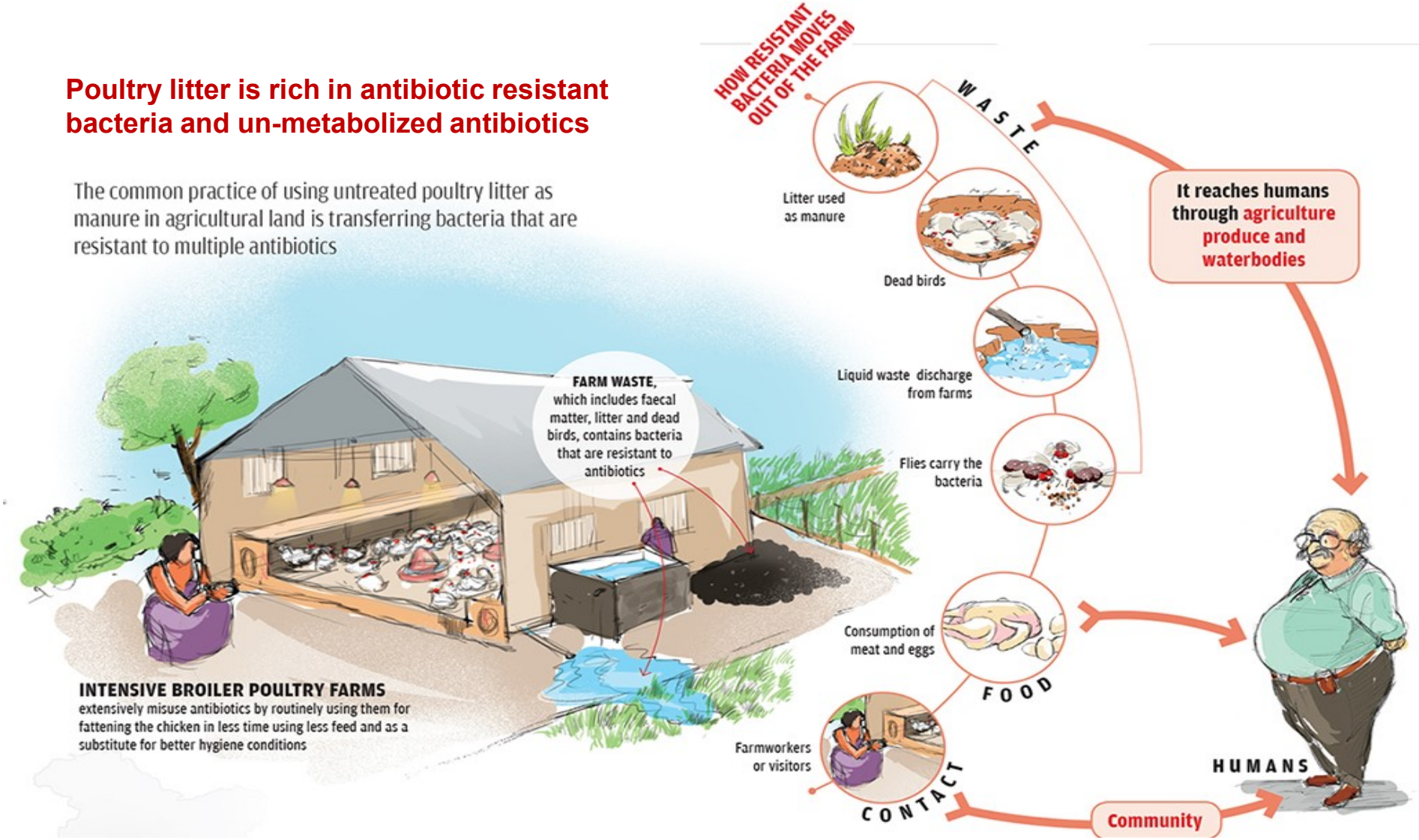
- About **60 per cent** of all infectious diseases in humans are **zoonotic diseases**; many originate in wildlife, livestock often serve as an **epidemiological bridge**
- Intensive conditions reflect **'monoculture effect'**, a vulnerability due to more **contact opportunities** among those who lack genetic diversity; can help viruses **amplify** and **attain higher virulence**; Avian Influenza linked to intensive poultry and Swine flu linked to pig farming
- **Agriculture expansion** for **animal feed crops** (e.g. soy) and intensification entering into **forests** and **natural habitats** diffuses boundaries; Ebola outbreak in West Africa was a result of forest losses; pathogens of Ebola, MERS, SARS and SARS CoV2 are believed to have wild-life reservoirs as long-term hosts

Viral Pandemics

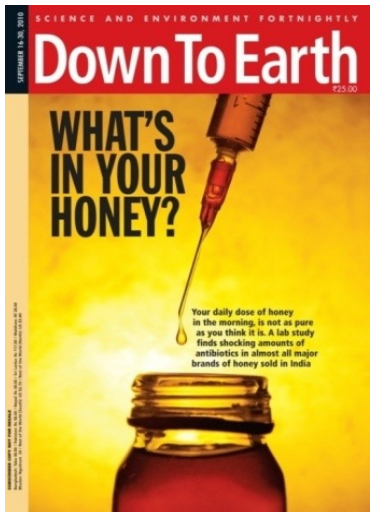
Intensive poultry farm and AMR linkages: food, contact and waste

Poultry litter is rich in antibiotic resistant bacteria and un-metabolized antibiotics

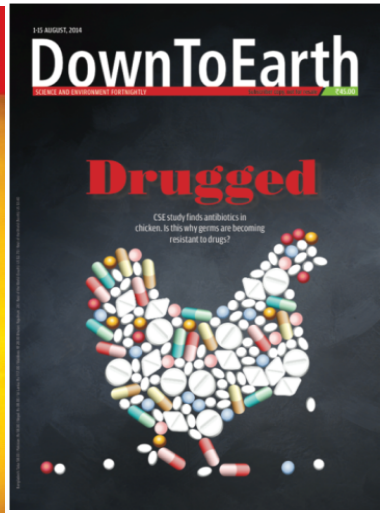
The common practice of using untreated poultry litter as manure in agricultural land is transferring bacteria that are resistant to multiple antibiotics



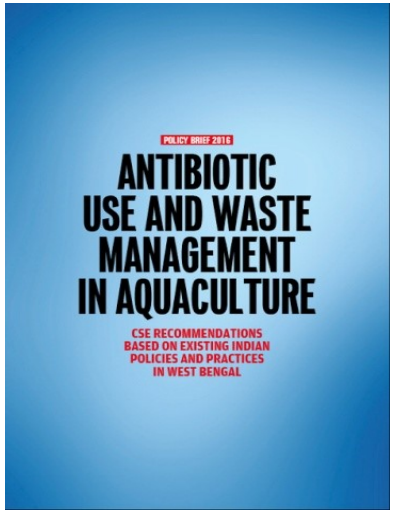
CSE's work to help contain antibiotic misuse and AMR: examples of studies and reports



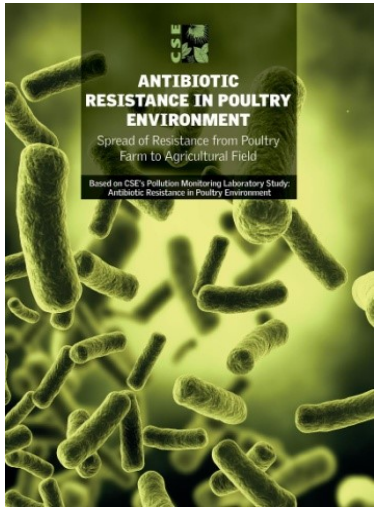
2010 (Honey)



2014 (Poultry)



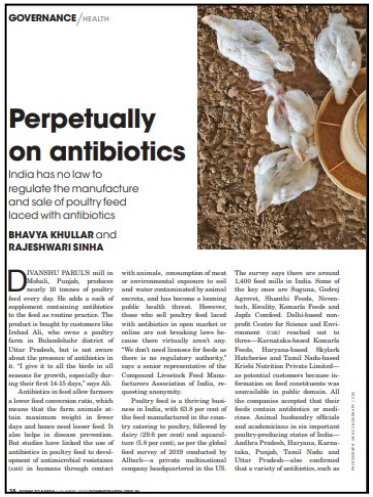
2016 (Fish)



2017 (Poultry farms)

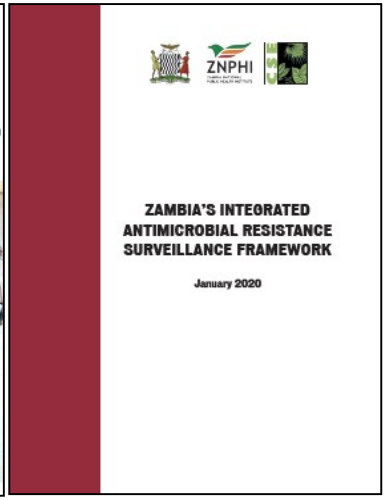
2017 (Fast food)

2019 (Crops)

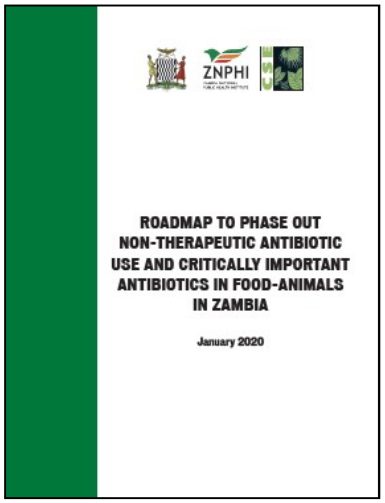


2020 (Feed)

2020 (Fast food)



2020 (Zambia-AMR surveillance)



2020 (Zambia-Roadmap to eliminate antibiotic misuse)

Time to change the way we grow our food; re-think our relationship – how it is produced and its overall impact

- **Urgent steps:**
  - Ban antibiotic use for **growth promotion**; regulate feed well – antibiotics not to be allowed
  - Restrict **mass disease prevention** (i.e. group preventative use); regualte over-the-counter antibiotics sold without prescription
  - Limit use of **critically important antibiotics**; preserve those with **highest priority** for human use (quinolones, macrolides, 3rd,4th, 5th gen cephalosporins, polymyxins, glycopeptides)
  - In parallel - **reduce need for chemicals** by focusing on animal husbandry, bio-security, alternatives, diagnostics, and veterinary extension systems

- **For mid and long-term:**
  - Limit the **environmental spread** of AMR determinants:
    - Adopt AMR-centric approach to manage waste from farms; make standards, monitor and manage waste/effluents, litter, manure
  - **Reduce dependence** on intensive systems; grow more food in other settings

Thank you

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