One Health and Antimicrobial Resistance (AMR)

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Presentation Outline

• What is Antimicrobial Resistance or AMR, and its potential impact
• The One Health (OH) nature of AMR
  ➢ (One Health= Interconnectedness between humans, animals and the environment)
• What can be done to protect antibiotics/antimicrobials?
• The challenges for antimicrobial/antibiotic stewardship in OH
AMR: Different types of disease causing organisms can protect themselves against different antimicrobials

Antimicrobials:
- Drugs which treat infections caused by microbes
  - Antibiotics e.g. penicillin
  - Antivirals e.g. acyclovir
  - Antifungals e.g. clotrimazole
  - Antiparasitics e.g. artemisinin

ASIA-EUROPE ENVIRONMENT FORUM
ON CIRCULAR FOOD SYSTEMS SOLUTIONS TO REVERSE CLIMATE CHANGE
ANTIBIOTIC resistance is of greatest concern (amongst other antimicrobials) because...

- Large global burden of infectious diseases, especially in children (Lancet 2020)
- Can be easily treated by antibiotics
- But common disease causing bacteria are becoming increasingly resistant to antibiotics.

\[ \text{e.g. E. coli (organisms causing gastrointestinal infections)} \]

Resistance to cephalosporins varies from

- 11% (United Kingdom)
- 23% (South Africa)
- 77% (India)

(CDDEP Resistance Maps 20210)
No new classes of antibiotics in the pipeline since 1990s

- Ancient Egyptians using mouldy bread to treat infections (~ 2000 BC)
- Fleming’s discovery of Penicillin (1928)
- ‘Golden Age’ of antibiotic discovery (60s)
- Lipopeptides - Last class of antibiotics to be discovered (1987)
- ? (1950s-2000s)
Impact of AMR by 2050

- 10 million deaths annually, more than from cancer
- 7.5% reduction in livestock production (World Bank 2017)
- 3.5% reduction in GDP
- Increased costs of treatment, prolonged hospital stays
- Other treatments become complicated:
  - C-sections,
  - Knee/hip replacements & transplants,
  - Cancer treatments
The physical ‘spaces’ within which AMR exists & is transmitted are interconnected.

One Health
Antibiotic residues travel between species and the environment

Another aspect of One Health
The multiple One Health causes of AMR (by levels of evidence)

Antibiotic misuse across humans, animals, environment

HUMANS
• Self medication and outpatient care
  ➢ 30% - 50% AB use unnecessary, sub-optimal
• Inpatient care in hospitals
  ➢ Lack of microbiological testing and high use of last resort antibiotics

ANIMALS
• Used for treatment and prevention of disease, and for growth promotion (high use in commercial farming)
• Use of human antibiotics/formulations in animals

ENVIRONMENT
• Control plant diseases e.g. citrus greening
• Antibiotic residues in Pharmaceutical effluent

OH Antibiotic stewardship

- Decreasing overall use and misuse
- Increasing optimal use
Challenges to establishing antibiotic stewardship

- Perception of antibiotics as a quick and easy cure and preventive tool
- Overly restrictive antibiotic regulations (only medical professionals can prescribe) mis-aligned with health system inadequacies in low/middle income countries.
- Economic incentives – direct (profits on sales), indirect (need to satisfy patients)
- Commercial – pharmaceutical industry’s revenues from existing antibiotics, leading to aggressive marketing practices
- Tension between health and environmental protection and trade policies
THANK YOU

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