How does the science of antibiotic resistance and use get applied in veterinary and farming practices?

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- **Objective 1:** Improve awareness and understanding of antimicrobial resistance through effective communication, education and training

- **Objective 2:** Strengthen the knowledge and evidence base through surveillance and research

- **Objective 3:** Reduce the incidence of infection through effective sanitation, hygiene and infection prevention measures

- **Objective 4:** Optimize the use of antimicrobial medicines in human and animal health

- **Objective 5:** Develop the economic case for sustainable investment that takes account of the needs of all countries, and increase investment in new medicines, diagnostic tools, vaccines and other interventions

http://www.who.int/drugresistance/global_action_plan/en
National Action Plan: USA

The goals of the National Action Plan include:

1. Slow the Emergence of Resistant Bacteria and Prevent the Spread of Resistant Infections.


The key dilemma...

• “The bacterial problem has no technical solution; it requires a fundamental extension in morality”

  – One sentence abstract
  • Science, December 13, 1968
  • Cited 34,641 times as of October 1

www.garretthardinsociety.org
...a fundamental extension of morality...

• "To preserve the effectiveness [of antibiotics], we simply must use them as judiciously as possible"

• “Preserving antimicrobial effectiveness in the future through ethical practices today”

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Guidance for Industry

The Judicious Use of Medically Important Antimicrobial Drugs in Food-Producing Animals
Antibiotic stewardship: clinical (human) medicine

• IDSA: “…antimicrobial stewards seek to achieve optimal clinical outcomes related to antimicrobial use, minimize …adverse events, reduce the costs of health care for infections, and limit the selection for antimicrobial resistant strains.”

Photo credits: CDC and MS Clip Art
Stewardship in veterinary medicine and production agriculture

• **Target bacterial pathogens**
  - Bovine respiratory disease complex
    - *Mannheimia haemolytica*, *Pasteurella multocida*, *Histophilus somnus*

• **Non-target bacterial pathogens and commensals**
  - Enteric bacteria
    - *Salmonella*, *E. coli*, *Campylobacter*
Which antibiogram should motivate cattle stewardship framework?

*No ceftiofur resistance reported among these isolates (KSVDL data)

Ceftiofur resistance prevalent among cattle Salmonella isolates (USDA-ARS data)
Stewardship in veterinary medicine and production agriculture?

Figure 2: Release assessment schematic: avoiding release of resistance from the farm
Stewardship in veterinary medicine and production agriculture?

Figure 3(a): Treatment of single dairy cow 2-dose CCFA
Effects of CCFA treatment on CFU of E. coli (2-dose dairy cow)
Plain versus ceftiofur (8 ug/ml) MacConkey Agar

Figure 3(b): Metaphylaxis pen of steers 1-dose CCFA
Effects of CCFA treatment on CFU of E. coli (1-dose beef steer)
Plain versus ceftiofur (8 ug/ml) MacConkey agar

Data courtesy: Norby, Loneragan, Scott, Halbert
DPSIR Framework (after EEA)

POLICY FORUM

Antimicrobial resistance: The complex challenge of measurement to inform policy and the public

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