

ANTIMICROBIAL RESISTANCE

Past, present, and future
implications

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Overview

- Jargon
- Brief History: The coevolution
- Why is it a concern?
- Causes of AMR
- Use in animals
- The environment
- Legislation and guidelines
 - Europe
 - U.S.
- Future implications

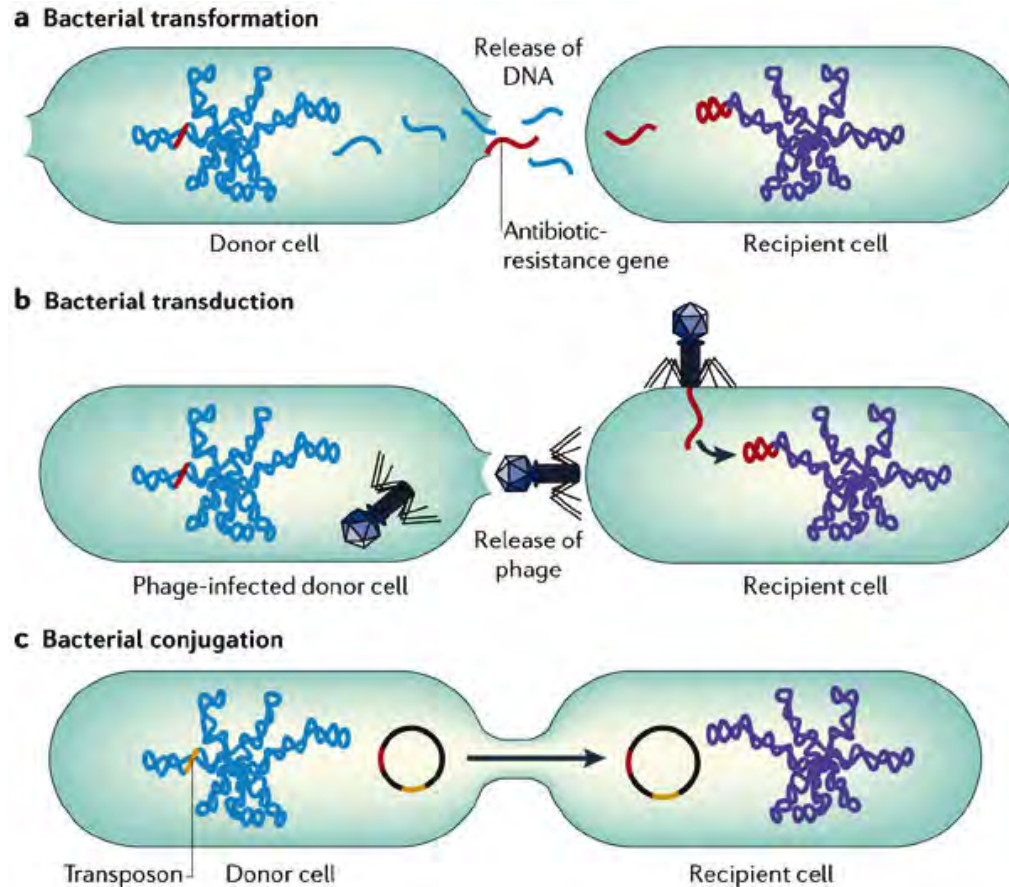
Jargon

- Antimicrobial agent
 - Drug, chemical, or other substance that kill/slow the growth of microbes
 - Antibacterial, antiviral, antifungal, and antiparasitic drugs
- Antibiotic
 - Type of antimicrobial agent derived from mold/bacterium that kills bacteria
 - Broad-range/narrow-range
- Antimicrobial Resistance (AMR)
 - Microbial change resulting in reduced effectiveness of antimicrobial agents



(CDC, 2011)

Figure 2 Horizontal gene transfer between bacteria.



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(Furuya & Lowy, 2006)

Brief history: The coevolution

- Discovery!
- Introduction of penicillin and widespread use
- Development of resistance to penicillin & penicillin derivatives



Image: <http://www.pbs.org/wgbh/aso/databank/entries/dm28pe.html>

Why is it a concern?

- Increased morbidity & mortality
- Decreased effectiveness of drugs
- Nosocomial infections
 - Increased costs to health care (Roberts, 2009)
- Zoonotic potential
- Globalization → Pandemic

Causes of AMR

- Inappropriate medical use
 - Liberal prescription (empirical use)
 - Lack of patient compliance
 - Prescription based on patient's wishes
- Widespread use in agriculture and veterinary medicine
- Underlying societal factors
 - Inadequate surveillance and monitoring systems
 - Poor infection control and lack of preventive measures
 - Decreasing supply of adequate medicines, vaccines, and diagnostic methods

(WHO, 2011)

Use in animals

- Agricultural uses (AVMA, 2011)
 - Growth promotion/feed efficiency
 - Prevention of disease
 - Control of disease Treatment of disease
- Zoonotic transfer (Gilchrist et al., 2006)
 - Undercooked meat
 - Direct contact
 - Livestock
 - Domestic animals

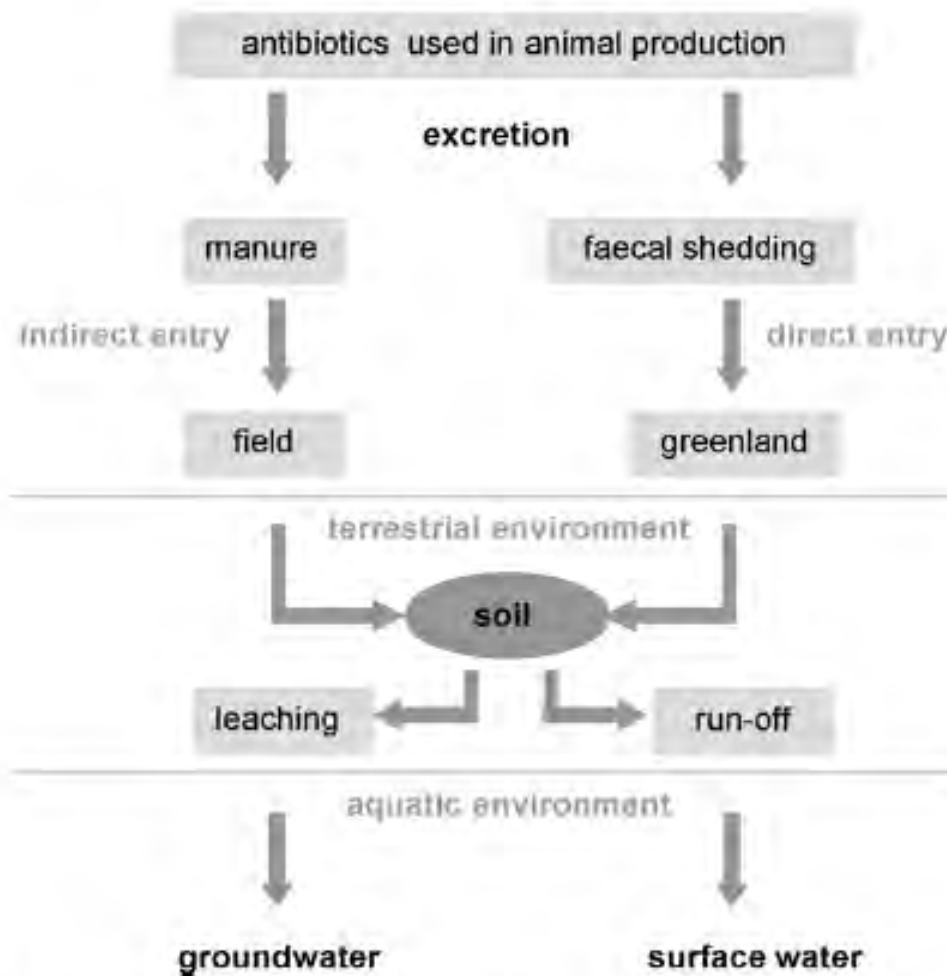


Fig. 1 – Veterinary antibiotics in the environment: anticipated exposure pathways.

The Environment

- Sources
 - Agricultural runoff
 - Wastewater treatment plant
- Dependent on:
 - Type of drug and amount used
 - Animal husbandry practices
 - Metabolism
 - Manure management



(Kemper, 2007)

AMR in Europe

- Elimination of AM for growth promotant use
 - Sweden – 1986
- Avoparcin Ban
 - All EU member states - 1997
- Ban on antimicrobial drugs for growth-promotant/prophylactic use
 - Denmark – 2000
 - Productivity/health results
 - Positive in poultry
 - Negative in swine

(Dibner & Richards, 2005)

AMR in the U.S.

- Legislation
 - Public Health Service Act amendment
 - PAMTA bill
- Surveillance
 - NARMS
 - FoodNet



The Future of AMR

- Emphasis on prudent/judicious use
 - WHO, OIE, FAO, EU Commission, WVA, IFAP, ACVIM, AVMA, etc.
- AMR: Emphasis of World Health Day 2011





World Health Day 2011

“Policy Package to Combat Antimicrobial Resistance”

- Commit to a comprehensive, financed national plan with accountability and civil society engagement
- Strengthen surveillance and laboratory capacity
- Ensure uninterrupted access to essential medicines of assured quality
- Regulate and promote rational use of medicines, including in animal husbandry, and ensure proper patient care
- Enhance infection prevention and control (IPC)
- Foster innovations and research & development for new tools

(WHO, 2011)

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