Module 4

Industrial Food Animal Production (IFAP): Public Health and Environmental Impacts
What We Know and What We Need to Know about the Risks of Food Animal Production

Ellen K. Silbergeld, PhD
Johns Hopkins University
Ellen Silbergeld

- Professor of EHS (with joint appointments in Epidemiology and in Health Policy and Management)

- PhD from the Whiting School of Engineering at JHU, with postdoctoral training in EHS at JHSPH

- Has held scientific positions at NIH, the Environmental Defense Fund, and the University of Maryland Medical School

- Consultant and expert advisory committees for the U.S. EPA, CDC, National Research Council, NIH, WHO, ILO, OECD, the World Bank, UNEP, and UNDP
Topics

- What is modern industrial food animal production?
- What are the critical issues?
- What information do we need?
- What information do we have?
Modern Food Animal Production

- Intensive
- Confined
- Regionally localized
- High throughput
- Engineered feeds/environments
- Product standardization
- Outsourcing problems
Changes in Food Animal Production

- Factory farms—integrated production model
- Concentrated, high-volume housing and processing
- Broad integration of food production and distribution

Image source: USDA.
Broiler Production in the United States, 1975-1995

- Broiler production (in pounds) and number of farms (in thousands) in the U.S., 1975-1995

Source: USDA/NASS and Census of Agriculture, various years.
Broiler Production by States

BROILER PRODUCTION BY STATES
NUMBER RAISED (000), 2000

U.S. total: 8.26 billion head
- 6.94 billion head, 84% U.S. total
- All other production states

USDA/NASS
04/25/01
Dipasena, South Sumatra

- Dipasena, South Sumatra
  - 4,500 ha
  - 20,000 tons per year

JHSPH OpenCourseWare has removed this image because license for its use could not be secured
Growth in World Food Production

Data Source: Food and Agriculture Organization
What Are The Critical Issues?

- Food safety
- Animal welfare
- Sustainability
- Ecological impacts
- Health impacts
  - Focus on human, but zoonoses also important!
Produce Contamination and Human Illness

- 76 million cases of foodborne illness in the U.S. per year (Mead et al., 1999)

- Foodborne illness associated with produce is increasing over time
Epidemiology: Why Don’t We Know More?

- Reported antimicrobial-resistant (AMR) infections are the tip of the iceberg

- The U.S. National Anti-microbial Resistance Monitoring System (NARMS), etc., assume food-borne route, do not fully explore other pathways
Engineered Feeds and Environments

- **Feeds**
  - Recycling animals → animals
  - Nutrients
  - Additives
    ‣ Drugs

- **Environments**
  - Controlled illumination
  - Restricted movement
FDA-approved antimicrobials for growth promotion and prophylaxis in poultry

- Bacitracin
- Bambermycin
- Carbadox
- Roxarsone, arsinilic acid
- Chlortetracycline
- Enrofloxacin
- Erythromycin
- Laidlomycin
- Lasalocin
- Lincomycin
- Monensin
- Oxytetracycline
- Penicillin
- Tiamulin
- Tylosin
- Virginiamycin

Source: CDC.
Antibiotic use in food animal production—United States, 2002

- Growth Promotion
  - 3.1 million lbs/yr (AHI)
  - 27.6 million lbs/yr (UCS)

- “Prophylaxis” and disease treatment
  - 14.7 million lbs/yr (AHI)
  - 2.0 million lbs/yr (UCS)

- Compared to human uses
  - 32.3 million lbs/yr (AHI)
  - 4.5 million/lbs/yr (UCS)
Antibiotics, Animals, and Biosolids: A Nexus of Concern

- All uses of antibiotics inevitably select for resistance
- Antibiotic-resistant infections are an increasingly serious clinical problem
- The same classes of drugs are used in food animal production as in clinical medicine
Conditions Promoting Resistance in Agriculture

A. Failure of infection control
   - Crowding
   - Often sub-optimal hygiene

B. Exposure to antibiotics
   - Widespread
   - Prolonged
   - Sub-lethal doses
   - Often little dose control

C. Stress reaction
   - Increases bacterial shedding
Quinolone-Resistance

- Quinolone-resistance in human isolates of C. jejuni/coli in Spain

The Other Product of CAFOs

- The other product of concentrated animal feeding operations (CAFOs)

Image Source: USDA
Delmarva’s Other Product

- Poultry production in Delaware, Maryland, and Virginia’s Delmarva Peninsula produces another product
  - More than 1,000,000 tons of manure produced by 900 million chickens
  - Integrators own the birds
  - Growers own the waste
    - Largely land applied
Why Are We Concerned?

- More biosolids applied than land can handle

- Contributes to surface and groundwater contamination

- Increased nutrient runoff into surface waters

- Detectable presence of drugs and resistance determinants in groundwater
This photo has been inserted to replace an image for which JHSPH OCW could not secure license to use.
Tilapia Farm

JHSPH OpenCourseWare has removed this image because license for its use could not be secured
Geographic Focus of Farmed Shrimp Production

Data Source: Commonwealth Scientific and Industrial Research Organisation.
Shrimp Farming

JHSPH OpenCourseWare has removed these images because license for their use could not be secured
World Farmed Shrimp Production

Source: Commonwealth Scientific and Industrial Research Organisation.