What Does Agriculture Have to Do with Public Health?

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Section A

Modern Agriculture
Two Quotes

- “Let food be thy medicine and medicine be thy food.”
  - Hippocrates

- “Health is the capacity of the land for self-renewal.”
  - Aldo Leopold
“Modern agriculture has become highly industrialized in order to reliably produce the largest amount of plant and animal product possible while minimizing labor inputs. Through the incorporation of numerous components manufactured externally to the farm, including fertilizers, pesticides, and technology, the modern system manipulates the land to make it amenable to industrial processes. Typically, crops are produced as large-hectarage mono-cultures consisting of a single genotype planted across an entire field. Most farms using modern agriculture methods cultivate only a few crops grown in simple rotations such as wheat-fallow or maize-soybean. ...”
“... Similarly, most animals are grown in feedlots or climate-controlled buildings in order to closely monitor feed efficiency and to guarantee uniform meat, egg, or milk products. Cycling nutrients is not a major consideration of most industrial agricultural systems because the addition of externally derived fertilizers is cheaper and simpler than collecting, storing, and using manure.”

Soybean Field

Photo source: blakefacey via flickr.com. Some rights reserved.
Cornfield

Photo source: Lone Black Rider via flickr.com. Some rights reserved.
Photo Source: [Wikimedia Commons](https://commons.wikimedia.org)
Poultry

Photo Source: USDA
Hogs

Photo Source: USDA
A few of the negative effects of specialized industrial agriculture ...
Not Soil Conservation

Photo source: Gasper. USDA Natural Resources Conservation Service.
Soil Erosion

Photo source: Gasper. USDA Natural Resources Conservation Service.
2005 United Nations Report

- Millennium Ecosystem Assessment Synthesis Report, 2005
  - Developed by 1,360 leading scientists from 95 countries
  - Core finding
    - “Over the last half century, humans have polluted or over-exploited two-thirds of the earth’s ecological systems on which life depends, dramatically increasing the potential for unprecedented and abrupt ecological collapses. Approximately 60% of the ecosystem services evaluated are being degraded or used unsustainably. Most ecosystem changes were the direct or indirect result of changes made to meet growing demands for ecosystem services—in particular the growing demands for food, water, timber, fiber, and fuel. ...”
Millennium Report Continued...

- *Millennium Ecosystem Assessment Synthesis Report, 2005*
  
  “... Solutions will be complex: There is no simple fix to these problems since they arise from the interaction of many recognized challenges including climate change, biodiversity loss, and land degradation. Furthermore, the loss of species and genetic diversity decreases the resilience of ecosystems—the level of disturbance that an ecosystem can undergo without crossing a threshold to a different structure or functioning. More challenges on the way: At the same time, it is anticipated that during the next 50 years demand for food crops will grow by 70-85% and demand for water by between 30% and 85.”
Manure Lagoon

Photo Source: USDA
Fish Kill

Photo Source: Iowa Department of Natural Resources
“The trend in animal ecology shows, with increasing clarity, that all animal behavior patterns, as well as most environmental and social relationships, are conditioned and controlled by density ... I have studied animal populations for twenty years, and I have yet to find a species devoid of maximum density controls ... in all species one is impressed by one common character: If one means of reduction fails, another takes over.”

— Aldo Leopold, 1946, The Land-Health Concept of Conservation
“The principles of ecology, epidemiology, evolution, microbiology and soil science operate in agro-ecosystems as well as in natural ecosystems. Although the owners of the businesses were probably shocked, I doubt if epidemiologists were surprised that Hong Kong chicken operations, housing up to a million genetically similar chickens, were susceptible to a rapid and devastating outbreak of disease last year [1997] ...”
“... When those running massive livestock operations realize that chronic disease and catastrophic epidemics are the expected result of high densities and low diversity, and when society restricts the release of pollutants from such operations, it may again be profitable for individual farms, or neighborhood consortia, to have mixed cropping and livestock operations tied together in a system that gives an efficient, sustainable, locally closed nitrogen cycle.”

— David Tilman, November 19, 1998

“Greening the Green Revolutions.” Nature
Without effective action, treatments for common infections “will become increasingly limited and expensive—and, in some cases, nonexistent”

Source: CDC. The Interagency Task Force on Antimicrobial Resistance and A public health action plan to combat antimicrobial resistance.
United States Antibiotic Use

Routes of Human Exposure to Resistant Bacteria

Antibiotics

Animals

- Via FOOD
  Slaughter, handling, consumption
  (undercooked meat, cross-contamination)

- Via WORKERS
  Handling of feed, manure; transfer to family, community

- Via ENVIRONMENT
  Contamination of ground and surface water, sprayfields by resistant bacteria AND undigested antibiotics from manure

HUMANS
  (general populace)
Foodborne Illnesses in U.S.

- >75 million cases yearly
- 325,000 require hospital care
- 5,000 deaths yearly
- One-third are from tainted meat
“... Medical historians describe the last few decades as the age of ‘the emerging plagues.’ Overpopulation, poverty, ecological devastation and global climate change, chemical pollution, and industrial agriculture—all of these factors conspire to create the conditions for unprecedented death by infectious disease.”

— Ronald J. Glaser, MD, July 2004
Harpers Magazine