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What Are We Feeding Food Animals?
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- Antimicrobials/antibiotics and synthetic hormones
- By-products of slaughtered animals and “rendered” animals
- Animal waste
- Waste from industrial processes

Source: FDA
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## How Much Waste?

<table>
<thead>
<tr>
<th></th>
<th>(Treated)</th>
<th>(Untreated)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Human waste</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Generated per year</td>
<td>6.9 million dry tons</td>
<td></td>
</tr>
<tr>
<td>Applied to land per year</td>
<td>3.9 million dry tons</td>
<td>&gt;270 million dry tons</td>
</tr>
<tr>
<td><strong>Animal waste</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Generated per year</td>
<td>287 million dry tons</td>
<td></td>
</tr>
<tr>
<td>Applied to land per year</td>
<td>&gt;270 million dry tons</td>
<td></td>
</tr>
</tbody>
</table>

Approximately one dry ton of animal waste generated for every US citizen.
What’s in Animal Waste?

- Bacteria
- Protozoa
- Viruses
- Animal dander
- Pharmaceuticals
- Heavy metals
- Hormones
- Nutrients

Photo source: SRA Project.
What Happens to the Waste?

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From Waste to Water, Air, and Soil

- Land application of waste
- Failed storage systems
- Waste incineration
- Animal-house ventilation
- Direct (illegal) releases into surface waters

Groundwater constitutes 40 percent of public water supplies and 97 percent of rural water supplies
Other Transport Mechanisms

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Occupational Exposures

- 5,000,000 workers
- No federal oversight
- Personal protective equipment
- Decontamination facilities
- Workers and families
Air Quality Concerns

- Releases of airborne contamination from production sites
  - Gases
    - Ammonia, hydrogen sulfide
    - Volatile organic compounds
      - Poultry houses—mixture of about 60 unique VOCs (Traube, 2010)
      - Swine production facilities—330 unique VOCs (Schiffman, 2001)
  - Particulates
  - Microorganisms
  - Endotoxins
  - Animal dander
Air Quality Concerns

- Health relevance of some is established—less clear for others
- Single pollutant exposure versus mixtures
Community Exposures and Effects

- Increased exposure to IFAP operation-borne contaminants
  - Asthma prevalence, hospitalizations
  - Allergy and eye, nose, and throat irritation
  - Mental health endpoints

- Odors
  - Compromised quality of life

- Economic effects
  - Direct property damage
  - Housing values
Challenges in Characterizing PH Impact

- Characterization of cumulative effects of stressors
  - Chemical, microbial, social, economic

- Multiple, diverse exposed populations
  - Workers, fence line and surrounding communities, consumers
  - Relating adverse effects to exposures
Challenges in Characterizing PH Impact

- Integrated nature of animal production
  - Gaps in current state of knowledge are extremely difficult to fill

- No clear answers!
  - Though burden is borne by the public—externalities to production process
  - Disproportionate burden on rural communities