

# Public Health Impacts of Concentrated Animal Feeding Operations (CAFOs)

## Part I: Infectious Diseases

### Introduction

The CAFO model is the predominant U.S. food animal agriculture system. Proponents justify intensive livestock production using an economy-of-scale argument and claim an obligation to “feed the world.” They also laud the supposed socio-economic benefits to rural communities.<sup>1</sup> There is increasing awareness regarding the high environmental costs of CAFOs and their significant contribution to environmental injustice. However, despite a wealth of credible incriminating evidence, regulatory processes do not adequately consider the public health impacts of CAFOs (Table 1). Official oversight by public health experts is woefully deficient.<sup>2, 3</sup> Local public health ordinances restricting CAFOs adopted by some counties have been successfully challenged by the industry using a right-to-farm defense.<sup>4, 5</sup> The right to operate a CAFO seems to trump the right to health and wellbeing.

<p><b>I. INFECTIOUS DISEASES</b></p> <ul style="list-style-type: none"><li>• <b>Pathogens (bacteria, parasites, &amp; viruses):</b> Recreational water illnesses, foodborne illnesses (“food poisoning”), zoonoses (infections transmitted to humans from animals)</li><li>• <b>Antibiotic resistance:</b> Emergence and spread</li><li>• <b>Pandemic potential:</b> Influenza A and coronaviruses</li></ul> <p><b>II. CONTAMINATION OF DRINKING WATER SOURCES (surface waters and groundwater)</b></p> <ul style="list-style-type: none"><li>• <b>Nitrate-nitrogen:</b> Methemoglobinemia (“blue baby syndrome”), pregnancy complications, cancer</li><li>• <b>Pathogens and other contaminants:</b> (growth hormones, antibiotics, chemicals, heavy metals)</li></ul> <p><b>III. NUTRIENT WATER POLLUTION (nitrogen and phosphorus)</b></p> <ul style="list-style-type: none"><li>• <b>Harmful algal blooms (HAB):</b> Cyanotoxin production (toxic to the liver, kidney, and nervous tissue)</li><li>• <b>Eutrophication:</b> Detrimental to aquatic plant and animal life (dead zones, fish kills)</li></ul> <p><b>IV. BEYOND ODOR: HARMFUL AIR EMISSIONS</b></p> <ul style="list-style-type: none"><li>• <b>Directly harmful to humans (workers and neighbors/residents):</b> Toxic emissions, respiratory tract irritants, particulate matter (PM) pollution, and bioaerosols (including airborne pathogens and endotoxin)</li><li>• <b>Harmful to the planet/detrimental to humans:</b> Greenhouse gases (methane, nitrous oxide, carbon dioxide), ozone depletion (nitrous oxide), and water pollution (deposition of nitrogen emissions)</li></ul>
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Table 1: Adverse public health and environmental effects of CAFOs

### INFECTIOUS DISEASES

Manure can contain as many pathogens (disease-causing microbes, including bacteria, parasites, and viruses) as human waste.<sup>6</sup> Salmonella, Campylobacter, Yersinia, Giardia, and Cryptosporidium species and a specific strain of E. coli (E. coli O157:H7) are amongst the clinically most important microorganisms found in manure. Unlike human sewage, manure does not require treatment to reduce pathogen levels before land application. The use or disposal of sewage sludge, including for beneficial use (class A or B biosolids land applied as fertilizer or a soil amendment), is stringently regulated by the U.S. Environmental Protection Agency (EPA) under the Clean Water Act (40 CFR, Part 503).<sup>7</sup> The land application of manure is regulated differently. The U.S. Department of Agriculture (USDA) provides guidelines (National Resource Conservation Service Conservation Practice Standard Code 590) but defers to individual state laws, which are not always consistently and adequately enforced.<sup>8</sup>

Escherichia coli (“E. coli”) are bacteria normally found in the intestines of animals and humans. There are many E. coli strains and most are harmless. High E. coli levels in recreational waterbodies and drinking water sources are an indicator of contamination with feces and likely unsafe numbers of pathogens. Other sources of fecal contamination besides livestock manure include wildlife, domestic pets, leaking septic systems, combined sewer overflows, and land-applied class B biosolids, which undergo a treatment process to only partially reduce pathogens. However, in rural agricultural areas, E. coli contamination due to manure runoff from farm fields is a significant and predominant concern.<sup>9</sup>

Contamination of drinking water sources with manure pathogens is covered in Part II.

### **Recreational Water Illnesses (RWI)**

- RWIs, most commonly diarrheal syndromes, are usually self-limited. However, severe illness can occur, especially in vulnerable populations. Toxin-producing E. coli (e.g., E. coli O157:H7) can cause bloody diarrhea, kidney failure, and death even in younger healthy people.
- "Safe" E. coli counts for total body contact (e.g., swimming) or partial body contact (e.g., fishing) do not equate with zero risk. "Safe" translates into what EPA considers an "acceptable" rate of RWI—32 (or 36—a state can choose either numeric concentration threshold) gastrointestinal infections per 1000 exposures. The risk is higher in children, the elderly, pregnant women, and immunocompromised persons. Multiple, more intense, and prolonged exposures also increase the odds of infection. High E. coli counts necessitating beach closures are never welcome news on hot days. Not all beaches are monitored—what one does not know could hurt them.

### **Foodborne Illnesses (“Food Poisoning”)**

- Every year 1 in 6 Americans develops food poisoning.<sup>10</sup> Many are hospitalized, and some die. Routes of transmission include eating (and handling) meat and dairy products tainted with waste and fresh fruits and vegetables irrigated with water contaminated with CAFO waste.
- The U.S. industrial food system is partly culpable, but the extent to which CAFOs are implicated is unknown. FDA investigators cannot confirm the origin of outbreaks traced to CAFOs because they are denied access to get microbial samples—no proof, no culpability. A bill introduced in the Senate in 2019 allowing the FDA to request access to CAFOs to conduct microbial sampling died.<sup>11</sup>

### **Antibiotic-resistance: The Rise of "Superbugs"**

- Every year, approximately 3 million Americans contract antibiotic-resistant infections for which no effective therapy exists—approximately 35,000 die.<sup>12</sup> Superbugs are a significant and growing threat to human health.
- Intensive livestock production plays a substantial role in the development and spread of superbugs. Based on sales data reported to the U.S. Food and Drug Administration (FDA), a whopping 70% of antibiotics important to human medicine sold in the U.S. are used "on the farm," mainly on CAFO animals, because of their sheer numbers and greater susceptibility to infections due to stress and overcrowding.<sup>13</sup>

- Resistance can emerge any time bacteria are exposed to antibiotics, even when treatment is appropriate. Since 2017, medically important antibiotics incorporated into animal feed or drinking water in the U.S. have required veterinary approval and cannot be given to promote growth in healthy animals.<sup>14</sup> However, the restriction can be circumvented by prescribing antibiotics for disease prevention.
- Transparency is another issue. The animal agriculture industry is not required to reveal antibiotic usage details, including the indications for therapy, which makes ensuring the appropriateness of use and combating antibiotic resistance more challenging.

**The Threat of Viral Pandemics:** The next pandemic virus might emerge not in one of China’s wet markets but a CAFO. Some animal and human viruses can swap gene segments (recombination), creating new (“novel” or “variant”) potentially dangerous strains. Crowding creates opportunities for viruses to mingle and exchange genetic material and fosters the transmission of infectious diseases in humans and animals alike. Contagion can spread like wildfire through military barracks, cruise ships, prisons, and CAFOs. A detailed discussion of this subject can be found in [‘Concentrated Animal Feeding Operations \(CAFOs\): Pandemic Potential.’](#)

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<sup>1</sup> Ikerd, J. (2021, April 12). *Twenty Responses to Defenders of CAFOs*. John Ikerd. Question #6.

<https://www.johnikerd.com/post/twenty-responses-to-defenders-of-cafos>

<sup>2</sup> *CAFOs: What We Don’t Know Is Hurting Us*. (n.d.). NRDC. Retrieved August 20, 2022, from

<https://www.nrdc.org/resources/cafos-what-we-dont-know-hurting-us>

<sup>3</sup> *Precautionary Moratorium on New and Expanding Concentrated Animal Feeding Operations*.

(n.d.). Retrieved August 20, 2022, from [https://www.apha.org/Policies-and-Advocacy/Public-](https://www.apha.org/Policies-and-Advocacy/Public-Health-Policy-Statements/Policy-Database/2020/01/13/Precautionary-Moratorium-on-New-and-Expanding-Concentrated-Animal-Feeding-Operations)

[Health-Policy-Statements/Policy-Database/2020/01/13/Precautionary-Moratorium-on-New-and-Expanding-Concentrated-Animal-Feeding-Operations](https://www.apha.org/Policies-and-Advocacy/Public-Health-Policy-Statements/Policy-Database/2020/01/13/Precautionary-Moratorium-on-New-and-Expanding-Concentrated-Animal-Feeding-Operations)

<sup>4</sup> Donham, K. J., Wing, S., Osterberg, D., Flora, J. L., Hodne, C., Thu, K. M., & Thorne, P. S.

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- <sup>6</sup> Sobsey, M. D., Khatib, L. A., Hill, V. R., Alocilja, E., and Pillai, S. (2006). “Pathogens in animal wastes and the impacts of waste management practices on their survival, transport and fate” in *Animal agriculture and the environment: National Center for manure and animal waste management white papers*. eds. J. M. Rice, D. F. Caldwell, and F. J. Humenik (St. Joseph, MI: ASABE), 609–666. <https://doi.org/10.13031/2013.20268>
- <sup>7</sup> US EPA, O. (2020, March 2). *Biosolids Laws and Regulations* [Other Policies and Guidance]. <https://www.epa.gov/biosolids/biosolids-laws-and-regulations>
- <sup>8</sup> *Conservation Practices / NRCS*. (n.d.). Retrieved June 20, 2022, from [https://www.nrcs.usda.gov/wps/portal/nrcs/detailfull/national/technical/cp/neps/?cid=nrcs143\\_026849](https://www.nrcs.usda.gov/wps/portal/nrcs/detailfull/national/technical/cp/neps/?cid=nrcs143_026849)
- <sup>9</sup> Oun, A., Kumar, A., Harrigan, T., Angelakis, A., & Xagorarakis, I. (2014). Effects of Biosolids and Manure Application on Microbial Water Quality in Rural Areas in the US. *Water*, 6(12), 3701–3723. <https://doi.org/10.3390/w6123701>
- <sup>10</sup> CDC. (2020, March 18). *Foodborne Illnesses and Germs*. Centers for Disease Control and Prevention. <https://www.cdc.gov/foodsafety/foodborne-germs.html>
- <sup>11</sup> Gillibrand, K. E. (2019, November 21). *S.2958 - 116th Congress (2019-2020): Expanded Food Safety Investigation Act of 2019* [Legislation]. <http://www.congress.gov/>
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<sup>13</sup> *Antibiotics and Animal Agriculture: A Primer*. (n.d.). Retrieved September 23, 2022, from <http://pew.org/2hGq4y4>

<sup>14</sup> Medicine, C. for V. (n.d.). *CVM Updates - FDA Announces Implementation of GFI #213, Outlines Continuing Efforts to Address Antimicrobial Resistance* [WebContent]. Retrieved September 23, 2022, from <https://wayback.archive-it.org/7993/20190423131636/https://www.fda.gov/AnimalVeterinary/NewsEvents/CVMUpdates/ucm535154.htm>