JOHNS HOPKINS
CENTER *for* A LIVABLE FUTURE

February 14, 2023

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RE: Public Health Implications of Industrial-Scale Animal Production

Dear Ms. Saun,

We are researchers at The Johns Hopkins Center for a Livable Future, based at the Bloomberg School of Public Health in the Department of Environmental Health and Engineering. The Center engages in research, policy analysis, education, and other activities guided by an ecologic perspective that diet, food production, the environment, and public health are interwoven elements of a complex system. We recognize the prominent role that food animal production plays regarding a wide range of public health issues surrounding that system.

After reviewing extensive evidence of the public health, environmental and community negative impacts of industrial-scale food animal production (IFAP) also referred to as Concentrated Animal Feeding Operations (CAFO), the American Public Health Association adopted a "Precautionary Moratorium on New and Expanding Concentrated Animal Feeding Operations" (APHA, 2019). This document outlines the negative effects of the enormous amounts of manure and waste produced by large-scale animal production, as well as the injustices experienced by workers and communities that are influenced by these facilities. Of considerable importance is the influence large-scale animal operations have on the proliferation of antimicrobial resistance and considering the recent COVID-19 outbreak, the potential for species-to-species transfer of emergent diseases. APHA believes that the externalized costs are likely to mount in coming years, as growing evidence indicate that CAFOs pose health and environmental risks and negative impacts. The resolution outlines 12 legislative and regulatory steps that need to be taken to mitigate the public health threats before establishing new or expanding existing CAFOs. CAFO regulations and their enforcement have failed to adequately protect human health and the environment. Excluding oversight by local and state government and public health departments only enhances the potential for these negative consequences in the absence of robust Federal regulation.

We provide a summary of this information and referenced research articles which we believe to be highly relevant to local communities, policymakers and other interested parties related to the large-scale animal production.

Summary of Public Health Concerns Associated with IFAP

Inherent in these industrial agricultural complexes are the concentration of processes, animal crowding, production wastes and physical infrastructure. The primary human health concerns related to IFAP include: infections resulting from transmission of harmful microorganisms from animal operations to nearby residents; respiratory effects from increased exposure to air pollution from animal operations; and multiple negative health impacts due to increased exposure to soil, ground and/or surface waters that can be contaminated by manure from animal operations. These factors have implications for both workers, animals, and the communities that are proximal and that interact with these industries. These concerns are described in more detail below.

<u>Disease Transmission</u>
The poor conditions, including crowding, characteristic of industrial animal operations present opportunities for disease transmission among animals, and between animals and humans (Gomes, 2014, Rostagno, 2009). Communities in near these facilities, may have an increased risk to a variety of hazardous airborne, waterborne, and particulate matter (dust) exposures (Williams 2011, De Rooij 2019, Gržinić 2022). One concern is the biological exposures from the transmission of harmful microorganisms from the processing, handling, storage and spreading of liquid and fecal wastes or transmission through the associated contamination of air, soil and water with pathogenic organisms or via flies (Baykov 1999, Graczyk 2001, Spencer 2004, Burgos 2005, Sapkota 2007, Price, 2007, Rule, 2008, Graham 2008, Graham 2009, Balderrama-Carmona 2014, Jahne 2015, de Matos 2020, Leaman 2022). Recent studies have evaluated human enteric disease patterns of the pathogenic organisms, *Cryptosporidia* and *Campylobacter* and found higher incidence of these diseases based on proximity to IFAP (Grout 2022). A growing body of evidence has implicated large-scale animal production in the spread of microbes that can cause infectious diseases, including antibiotic-resistant strains such as MRSA, *E.coli*, *Campylobacter* (Sapkota 2007, Price 2007, Casey, 2013, Wichmann 2014, Poulsen 2018, Amato 2020).

Of additional concern is community and worker exposure to pathogens that are resistant to antibiotics used in human medicine. The common practice of administering antibiotics to animals at levels too low to treat disease (non-therapeutic use) in IFAP, fosters the proliferation of antibiotic-resistant pathogens. Resistant infections in humans are more difficult and expensive to treat (Roberts 2009) and more often fatal (Filice, 2010) than infections with non-resistant strains. A growing body of evidence provides support that antibiotic-resistant pathogens are found on animal operations that administer antibiotics for non-therapeutic purposes (Price, 2007, Schulz 2012) and are also found in the environment in and around production facilities, (Schulz 2012, Burgos 2005, Sapkota 2007, Graham 2008) specifically in the manure,(Graham 2008, Wichmann 2014, USEPA 2013, Amato, 2020, Buta 2021) air, (Schulz 2012) and flies (Graham 2009). Proximity to IFAP has been associated with increased health care encounters (van Dijk 2016, Rasmussen 2017), hospitalizations, use of corticosteroids (Rasmussen 2017) and antibiotic use (Roof 2021).

Zoonotic transfer of illness from animal to human is a concern. Recently an outbreak of avian flu H5N8 was reported in Russian poultry workers who were exposed by direct contact with infected flocks. While this outbreak did not spread from human to human, it was the first time this strain has infected humans illustrating the increased risk for future outbreaks and epidemics (Devitt 2021).

Of critical importance, research suggests that the infectious agent for COVID-19, SARS-CoV-2, may have originated from an animal as a zoonotic illness that was transferred to humans. It has been shown that zoonotic transmission of disease agents is a common process for emerging human illness (Mackenzie 2013, Opriessnig 2020). Once introduced, these diseases can then transfer from person-to-person.

During the COVID-19 pandemic there have been reported outbreaks among workers in industrial-animal production facilities as well as animal processing facilities. Investigating the contributing factors associated with these outbreaks have highlighted crowded working conditions, long hours of work and poor COVID safety protocols. These production facilities and the health of the workers in those facilities directly influence community health and transmission of the disease (Waltenberg 2020).

A recent analysis of data collected by the National Institutes of Health's Agriculture Health Study determined that proximity of residents to intensive animal production facilities, was associated with risk for non-Hodgkin Lymphoma and leukemia. (Fisher, 2020) While this study did not specify number or type of animal facilities, these findings accounted for other occupational exposures to animals and pesticides, thus supporting evidence of additional long-term and chronic effects of exposures by living near industrial-scale animal production.

<u>Air Pollution</u>

Community members living near industrial-scale animal operations face increased exposure to air pollution. Air emissions include particulate matter, endotoxins, volatile organic compounds, and gases such as nitrous oxide, hydrogen sulfide, and ammonia (Cambra-López 2010, Hribar 2010, Trabue 2010, Schinasi 2011, Williams 2011). These pollutants can potentially cause or exacerbate respiratory conditions including asthma (Mirabelli 2006, Heederik 2007, Cambra-López 2010, Rasmussen 2017, Loftus 2015, Loftus 2020), COPD (Borlée 2015, Van Kersen

2020); pneumonia (Smit 2012, Poulsen 2018) affect lung function (Soukup 2001, Radon 2007, Schinasi 2011, Loftus 2015, Borlée 2017, Schultz 2019, Wyer 2022); eye irritation, difficulty breathing, wheezing, sore throat, chest tightness, nausea (Heederik 2007) and bronchitis and allergic reactions (Cambra-López 2010, Schultz 2019).

Odors associated with air pollutants from large-scale animal operations have been shown to interfere with daily activities, quality of life, social gatherings, property values, and community cohesion (Heederik 2007, Donham 2007, Wing 2000, Horton 2009, Van Kersen 2020) and contribute to stress and acute increased blood pressure (Horton 2009, Wing 2013).

Potent greenhouse gases are associated with agriculture, such as methane, nitrous oxides, and carbon dioxide. It is estimated that the food system is responsible for approximately 21 to 37% of global emissions (IPCC 2019, Gržinić 2022) with 14.5% being attributed to animal agriculture production (Gerber 2013). Sejian et al., estimated that 80% of the associated food system methane emissions and 75% of nitrous oxide emissions are from the production of animal products (Sejian 2016). Food system change and the remediation of GHG emissions from animal agriculture is critical to prevent the cascading negative effects of climate change and its implications for community as well as global public health.

Contaminated Ground and Surface Water

The increased concentration and density of food animals in confined animal feeding operations over several decades has resulted in the concentration of animal waste over small geographic areas (USEPA 2013). Although animal manure is an invaluable fertilizer, waste composition and the magnitude of waste produced by IFAP operations represent a public health and ecological hazard through waste management and distribution practices resulting in the degradation of surface and ground water resources (USEPA 2013).

Manure from these operations contaminate ground and surface waters with nitrogen, phosphorus, nitrates, heavy metals, drug residues, and other chemical hazards (Spencer 2004, Showers 2008, Graham 2010, USEPA 2012, Liu 2020, Buta 2021). Studies have demonstrated that humans can be exposed to these waterborne contaminants from livestock and poultry operations through the recreational use of contaminated surface water and the ingestion of contaminated drinking water (Spencer 2004, Burkholder 2007, USEPA 2013, Graham 2010, Showers 2008, USEPA 2012). Exposure to elevated levels of nitrates in drinking water is associated with adverse health effects, including cancer (Gulis 2002, Chiu 2007, Ward, 2009, Ward 2010, Fisher 2021), birth defects and other reproductive problems (Burkholder 2007, Ward 2009, Manassaram 2006, Brender 2013), thyroid problems (Burkholder 2007, Ward 2010), and methemoglobinemia (Knobeloch 2000, Burkholder 2007).

Manure runoff from IFAP operations may introduce harmful microorganisms and antimicrobial resistant organisms into nearby surface and groundwater sources (Heaney 2015, Cao 2021). Land application of manure presents an opportunity for pathogens contained in the manure to leach into the groundwater or run off into recreational water and drinking water sources, potentially causing waterborne disease outbreaks (USEPA 2013). This is of particular concern as many residents rely on private wells for drinking water and household use and private wells are not monitored by government agencies to ensure safe levels of chemical agents or pathogens.

Nutrient runoff (including nitrogen and phosphorus) has also been implicated in the growth of harmful algal blooms (HAB) (Heisler 2008, USEPA 2013), which have been increasing in frequency due to agricultural practices (Fraker, 2023). These HABs pose economic costs and health risks for people who live near surface water, swim or fish in recreational waters, or who consume contaminated fish and shellfish (Kouakou 2019). Exposure to algal toxins has been linked to neurological impairments, liver damage, gastrointestinal illness, severe dermatitis, and other adverse health effects (Carmichael 2001, Paerl 2001).

We hope that this description of public health concerns associated with IFAP is helpful. Through our research, we also know that communities and governmental agencies can face many barriers in addressing issues surrounding IFAP due to ineffective, absent or narrow regulations as well as due to limited resources needed to implement and monitor programs (Fry 2013, Fry 2014). Please do not hesitate to contact us if you have any questions.

Sincerely,

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