References

1. Iowa State University and University of Iowa Study Group. (2002). Iowa concentrated animal feeding operations air quality study. Iowa City, IA: University of Iowa Printing Service. www.public-health.uiowa.edu/ehsrc. (319) 335-9647.

2. www.jhsph.edu/environment/CLF_Activities/Spira-IAParticles.html

3. (2001). Generic Environmental Impact Statement on Animal Agriculture, Minnesota Environmental Quality Board. www.mnplan.state.mn.us/eqb/geis

4. National Research Council (2002). The scientific basis for estimating air emissions from animal feeding operations: Interim report. Washington, DC: National Academy Press. www.nap.edu/catalog/10391.html

5. Thu, K. M., et al. (Eds.) Proceedings, Understanding the impacts of large-scale swine production, June 29-30, 1995, Des Moines, IA. Iowa City, IA: University of Iowa Printing Service. www.public-health.uiowa.edu/icash

6. Halverson, M. (2000). The price we pay for corporate hogs. Minneapolis, MN: Institute for Agriculture and Trade Policy. www.iatp.org/hogreport

7. www.factoryfarm.org; www.iatp.org; www.iowacci.org; www.farmweb.org; www.hogwatch.org; www.sierraclub.org/factoryfarms

8. Donham, K. J. (2000). The concentration of swine production: Effects on swine health, productivity, human health, and the environment. Veterinary Clinics of North America: Food Animal Practice, 16, 559-597.

9. Thu, K., et al. (1997). A control study of the physical and mental health of residents living near a large-scale swine operation. Journal of Agricultural Safety and Health, 3, 13-26.

10. Wing, S., & Wolf, S. (2000). Intensive livestock operations, health and quality of life among East North Carolina residents. Environmental Health Perspectives, 108, 233-238.

11. Keller, K. H., & Ball, R. W. (2000). A retrospective study of diarrheal and respiratory illness incidence rates in Milford, Utah, 1992-1998. Environmental Epidemiology Program, Bureau of Epidemiology, Utah Department of Health.

12. Kilburn, K. H. (1999). Evaluating health effects from exposures to hydrogen sulfide: Central nervous system dysfunction. Environmental Epidemiology and Toxicology, 1, 207-216.

13. Minnesota Department of Health, Memo from Kathy Norlien to Greg Ruff (Feb. 15, 2000). Review of Hydrogen Sulfide Data ValAdCo.

14. Schiffman, S. S., Miller, E. A. S., Suggs, M. S., & Graham, B. G. (1995). The effect of environmental odors emanating from commercial swine operations on the mood of nearby residents. Brain Research Bulletin, 37, 369-375.

15. Schiffman, S. (1998). Livestock odors: Implications for human health and well-being. Journal of Animal Science, 76, 1343-1355.

16. Schusterman, D. (1992). Critical review: The health significance of environmental odor pollution. Archives of Environmental Health, 4, 76-87.

17. Jackson, L. L., Keeney, D. R., & Gilbert, E. M. (2000). Swine manure management plans in north-central Iowa: Nutrient loading and policy implications. Journal of Soil and Water Conservation, 2nd qtr., 205-212.

18. Abu-Ashour, J., & Lee, H. (2000). Transport of bacteria on sloping soil surfaces by runoff. Environmental Toxicology, 15, 149-153.

19. Chee-Sanford, J. C., Aminov, R. I., Krapac, I. J., Garrigues-JeanJean, N, & Mackie, R. I. (2001). Occurrence and diversity of tetracycline resistance genes in lagoons and groundwater underlying two swine production facilities. Applied and Environmental Microbiology, 67, 1494-1502.

20. Barza, M., & Gorbach, S. L. (Eds.) (2002). The need to improve antimicrobial use in agriculture: Ecological and human health consequences. Clinical Infectious Diseases, 34, S71-S144. www.journals.uchicago.edu/CID/journal/contents/v34nS3.text.html

21. Mellon, M., Benbrook, C., & Benbrook, K. (2000). Hogging it: Estimates of antimicrobial abuse in livestock. Cambrdige, MA: Union of Concerned Scientists. www.ucsusa.org/agriculture

22. North Central Regional Center for Rural Development. (1999). Bringing home the bacon? The myth of the role of corporate hog farming in rural revitalization. Report to Kerr Center for Sustainable Agriculture, Poteau, OK 1-67. www.kerrcenter.com/RDPP/hog%20report1.pdf.

23. Gomez, M. I, & Zhang, L. Impacts of concentration in hog production on economic growth in rural Illinois: An econometric analysis. July 31-August 2, 2000, American Agricultural Economics Association, Tampa, FL.

24. Palmquist, R. B., Roka, F. M., & Vukina, T. (1997). Hog operations, environmental effects, and residential property values. Land Economics, 73, 114-124.

25. Wilson, S. M., Howell, F., Wing, S., & Sobsey, M. (2002). Environmental injustice and the Mississippi hog industry. Environmental Health Perspectives, 110, Supp. 2, 195-201.

26. Thu, K. M., & Durrenberger, P. (1998). Pigs, profits, and rural communities. Albany, NY: SUNY Press.

27. Ikerd, J. (1998). Sustainable agriculture: An alternative model for future pork producers. In J. S. Royer & R. T. Rogers (Eds.). The industrialization of agriculture (pp. 265-291). Ashgate Publishing Co.: Brookfield, VT.

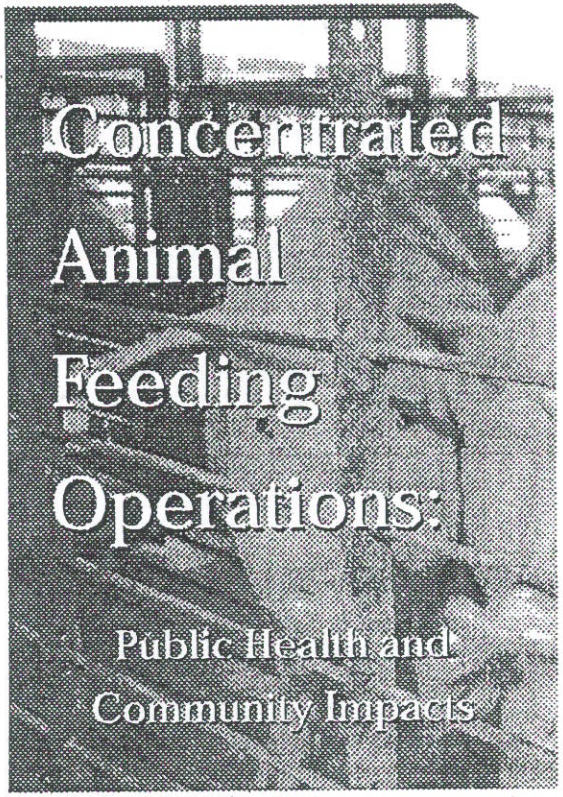
28. Horrigan, L., Lawrence, R.S., & Walker, P. (2002). How sustainable agriculture can address the environmental and human health harms of industrial agriculture, Environmental Health Perspectives, 110, 445-456. www.jhsph.edu/environment/CLF_Activities/WhitePaper.PDF

Iowa's Center for Agricultural Safety and Health
100 Oakdale Campus—124 IREH
University of Iowa, Iowa City, IA 52242
(319) 335-4438
www.public-health.uiowa.edu/icash

Institute for Agriculture and Trade Policy
2105 First Ave. S., Minneapolis, MN 55404
(612) 870-0453
www.iatp.org

Local contact:

Hog Watch Manitoba, Inc.
2 – 70 Albert Street, Winnipeg, Manitoba R3C 1E7
tel. 204.926.1914 fax. 204.989.8476
www.hogwatchmanitoba.org



Concentrated Animal Feeding Operations:

Public Health and Community Impacts

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Citizens continue to express concerns about health and socioeconomic problems linked to large-scale concentrated animal feeding operations (CAFOs). This guide summarizes related research and offers information sources. Online reports describe CAFO issues in depth and provide access to related groups (1-7).

Iowa's Center for Agricultural Safety and Health

The University of Iowa

Institute for Agriculture and Trade Policy

Respiratory and Other Illnesses

More than 25 studies of CAFO workers show that 25-30% of them report serious respiratory problems (5,8), some of which are due to toxins (e.g., endotoxin, glucans) from inhaled microbes. CAFO air emissions may also be a public health hazard (1). Iowans living within a two-mile radius of a 4,000-hog unit reported more respiratory and other symptoms than did people not living near a CAFO (9). North Carolina residents near a 6,000-feeder pig unit reported more symptoms (respiratory, diarrhea, headaches, burning eyes) than did residents in a non-livestock area (10). Utah residents near a large hog unit had more respiratory and diarrhea illnesses than did people in comparison areas and Utah as a whole (11).

Neurological and Mood Problems

The brain and nervous system help regulate human sensory and thought processes, moods, and behavior. Air emissions from hog CAFOs include hydrogen sulfide (H_2S), an irritant and toxin to this system. Workers exposed to 5 parts per million (ppm) or more of H_2S are likely to have accelerated deterioration of neurobehavioral function (12). Low levels of H_2S may be more harmful than previously thought (12). People exposed to .1-1 ppm of H_2S at home revealed neurobehavioral dysfunction, including abnormal balance, grip strength, and delays in verbal recall (12). Generally, H_2S odors only become noticeable and detectable at slightly lower levels of .025-.1 ppm (12). H_2S monitoring at a medium-sized CAFO in Minnesota revealed regular emissions high enough to cause nausea, headaches, and diminished quality of life among neighbors (13). North Carolina hog CAFO neighbors reported more confusion, tension, depression, and fatigue than did others not exposed (10).

Odor Pollution

Numerous CAFO wastes contribute to odor pollution (14), which, even at low concentrations, can cause gastrointestinal, stress-related, and respiratory symptoms, including by interacting with the brain and organ systems (15,16). Compared to people in areas of dairies or no livestock, neighbors of swine CAFOs were less often able to go outside or open windows in nice weather (10).



Swine in CAFO USDA, Ken Hammond

Water Quality

Water contamination from CAFOs, from nitrogen, phosphorus, microbes, and antibiotics, may increase with concentration of livestock and liquid manure storage and spreading. Contamination risk may decrease with less livestock concentration, proper waste management, and well-planned CAFO siting that considers regional water quality and avoids sandy soils, shallow groundwater, and flood plains (17).

Manure contains high levels of nitrogen (N) and phosphorus (P). N is: 1) emitted to air as ammonia vapor, 2) incorporated into soil where plants absorb it, and 3) transported into water where microorganisms metabolize it. Microbial breakdown of N in manure forms nitrates, which contaminate many private wells in some rural areas. Elevated nitrates in drinking water can cause blue baby syndrome, which harms infants by reducing the oxygen carried by blood. Nitrates may combine with amino acids in the human gut to form nitrosamines, suspected carcinogens.

N emitted to air can precipitate, leading to contaminated surface water, decline of native plants, and overgrowth of undesirable species. P from manure often exceeds ecological capacity and may reduce oxygen in water, enhancing growth of algae and the organism *Pfiesteria piscida*. These problems can diminish the usability of waterways, including for recreation, and impair human health and quality of life.

Animal waste may carry infectious organisms including *Campylobacter*, *Escherichia coli (E coli)*, and *Salmonella*, significant causes of food-borne illness in humans. *E coli* bacteria have been carried downstream by surface runoff and can survive semi-arid conditions (18). Tetracycline-resistant genes have been found in lagoons and groundwater underlying swine CAFOs (19). 25-75% of antimicrobials given to CAFO livestock pass unchanged into manure waste and may contaminate soil and water (19).

Antimicrobial Resistance

CAFOs' widespread use of antimicrobials in animal feed contributes to increasing bacterial resistance, which is transmitted to humans typically, but not only, via contaminated food (20). The majority of these antimicrobials are identical or nearly so to drugs used in human medicine (21). More and more humans are infected with bacteria that respond poorly or not at all to treatment with those same antimicrobials or closely related drugs (20). An estimated 70% of antimicrobials used in the US are fed to livestock, in the absence of disease, to promote growth and compensate for the stress and health risks of confinement (21).

Community Impacts

As large-scale CAFOs concentrate in an area, rural communities often experience related declines in local business purchases, physical infrastructure, and population (1,22,23). Sales values of real estate and homes tend to decline with proximity to CAFOs (24). Decreases in neighborliness, social cohesion, and democratic values are documented (1,22). CAFOs in North Carolina and Mississippi are often sited in poor and African American rural communities, causing disproportionate adverse health and socioeconomic impacts (25).

Many farmers and rural residents are concerned that large-scale, vertically-integrated CAFOs are undermining the socioeconomic structures supporting family farms and rural communities (2,6,7,26). They question the government policies of tax incentives, cheap grain, subsidization of manure management, and non-competitive markets that favor vertically-integrated CAFOs over family farm producers (2,7,22,26). Sustainable alternatives in livestock production, processing, marketing, and related public policies are being developed in many states and nations (27,28).