

Research Review of Air Quality Health Impacts Associated with Concentrated Animal Feeding Operations (CAFOs)

By: Cameron France

As Earth's population continues to increase and the push to develop more farmland grows, demand for agriculture to become more heavily industrialized intensifies. This trend includes a reduction in the total number of farms and an increase in the size of individual farms. Livestock operations have also changed. The total number of individual swine farms in the U.S. dropped from one million in the 1960s to 67,000 by 2005 though overall production has increased with a move toward concentrated animal feeding operations (CAFOs) (Donham et al., 2007).

What are CAFOs?

As defined by the Environmental Protection Agency (EPA), a CAFO is an agricultural operation where livestock is kept and raised in confinement under the following conditions (US EPA, 2018):

- Animals have been, are or will be stabled or confined and fed or maintained for a total of 45 days or more in any 12-month period
- Crops, vegetation, forage growth or post-harvest residues are not sustained in the normal growing season over any portion of the lot or facility.

CAFOs today are integral to the growth of the animal product market. Cattle, swine, and poultry CAFOs and related facilities generated more than \$120 billion in 2004 and the industry has continued to grow (Aneja et al., 2006). However, this revenue does not reflect the negative health impacts CAFOs have on surrounding communities.

North Carolina has become a popular location for swine CAFOs. In 2016, more than 6,500 swine, cattle and poultry operations were operating in the state (Waterkeepers Alliance, 2016). The operation of a swine farm includes confinement buildings, manure

holding pits and land application of waste, all of which release toxic air pollution that affects the surrounding community (Heederik et al., 2007).

What are the major health outcomes related to CAFOs?

CAFOs release multiple pollutants into the air. Over 331 different volatile organic compounds (VOCs) and fixed gases are released from North Carolina swine facilities (Schiffman et al., 2001). The most studied pollutants include hydrogen sulfide, ammonia, malodorous gases and particulate matter. These major pollutants can cause both short and long-term health effects and can lower the quality of life in nearby communities. Malodor is the prominent concern in most communities surrounding CAFOs and has been linked to psychophysiological changes from exposure (Thu et al., 1997).

In a study done by the University of North Carolina at Chapel Hill, researchers found that air pollutants released from swine can cause acute physical symptoms such as a cough or irritation of the skin, eyes, nose or throat (Schinasi et al., 2011). In this study, hydrogen sulfide and odor were associated with elevated irritation in all of these areas, while particulate matter was only associated with irritation of the eyes and skin (Schinasi et al., 2011).

These short-term symptoms can lead to more lasting effects. Research suggests that a number of swine farmers suffer from acute respiratory symptoms that put them out of work early in their career. For CAFO workers, at least 25 percent suffer from respiratory diseases such as bronchitis, mucus membrane irritation, asthma and acute respiratory distress syndrome (Mitloehner et al., 2007).

Who is affected by CAFO pollution?

In North Carolina, there are more than 4,100 manure pits, almost half of which are located in Duplin and Sampson Counties (Waterkeepers Alliance, 2018). Vulnerable populations, such as low socioeconomic communities and populations that experience discrimination based on race or ethnicity, have higher susceptibilities to CAFO impacts due to poor housing, low income, poor health status, and lack of access to medical care (Ogneva-Himmelberger, 2015). Mirabelli et al. found a correlation between CAFO location and the prominent race in the area (Mirabelli et al., 2006). The study looked at 339 public schools across North Carolina and found that schools with large concentrations of vulnerable populations, such as low socioeconomic status and ethnic or racial minorities, were more likely to report that odor from swine operations was noticeable around and within their schools (Mirabelli et al., 2006).

Low incomes affect the amount of resources available to individuals and families for upgraded housing. Communities near swine farms with poor or old housing conditions are more likely to have poorer indoor air quality due to a lack of insulation and air conditioning (Ogneva-Himmelberger, 2015). With higher exposure rates in these vulnerable populations, there is a greater need for access to healthcare, which is not always available (Donham et al., 2007). High rates of disease and cost of care put vulnerable populations at greater risk of developing chronic and potentially life-threatening respiratory diseases.

What are the next steps?

The World Health Organization defines health as, “a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity,” (WHO, 2016). This definition must also be applied to rural communities. In 2002, nearly 30 percent of land in North Carolina was being used for agricultural purposes (Mirabelli et al., 2006).

CAFOs are permitted through the National Pollutant Discharge Elimination System (NPDES) and are regulated by North Carolina’s Department of Environmental Quality (NC DEQ, n.d.). According to the NC DEQ, North Carolina has the strongest permit program for concentrated animal feeding operations in the country related to water and is one of the only states that requires annual inspections of every facility (NC DEQ, n.d.). However, recent evidence of poorly done inspections has negated this fact (NC DEQ, 2018).

Despite the large number of lawsuits and settlements CAFOs have faced over the past few years, a very limited number of laws have been put in place to protect the adjacent communities. There has been work to improve this. In May 2018 NC DEQ reached a settlement with a coalition of community-based environmental groups to improve inspections and better protect surrounding communities (NC DEQ, 2018). This will include the improvement of general CAFO permits and a study on air quality in Duplin County.

The state has a responsibility to protect the health of communities located near polluting industries and agricultural operations. A more stringent process for issuing permits must be put in place to limit the number of animals confined in a certain area and to monitor the air emissions. Stricter controls are also needed on where, how and how much animal waste is spread on land which can impact nearby residents.

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