

# CAFOs and Water Quality

## ***A Compilation of Facts from: [Concentrating on Clean Water: The Challenge of Concentrated Animal Feeding Operations](#) by Carol J. Hodne, Ph.D.***

Full report: [http://www.iowapolicyproject.org/2005\\_reports\\_press\\_releases/050406-cafo-fullx.pdf](http://www.iowapolicyproject.org/2005_reports_press_releases/050406-cafo-fullx.pdf)

- As Cooperband and Good (2002, p. 5075) observed, “Intensively managed livestock production systems have exacerbated conditions where manure use in crop production is more akin to waste disposal than beneficial fertilization.” (Hodne, 2005, p. 6)
- ...the processes used in siting CAFOs inadequately consider water quality issues at regional and watershed levels (Jackson, Keeney, & Gilbert, 2000). (Hodne, 2005, p. 7)
- Contract producers compared to independent producers, have narrower options for manure management and other practices that affect water quality (e.g., Morrison, 1998). (Hodne, 2005, p. 4)

### **Manure Application / Runoff**

- Manure runoff to surface waters is increased by manure application to: flood plains; steep land slopes; and soil that is frozen, snow covered, saturated, or of low porosity (Mulla, et al., 1999). (Hodne, 2005, p. 13)
- Manure application near waterways, natural drainage paths and surface waters increases runoff (Crane, et al., 1983; U.S. E.P.A., 1998). (Hodne, 2005, p. 13)
- The Centers for Disease Control and Prevention (CDCP, 1998) studied lagoon, surface water and ground water samples from farm sites in Iowa counties with high densities of swine CAFOs. ...The results generally suggested the possibility that pollutants and pathogens can move through the soil and away from the point of higher pollution (i.e., lagoons) and by overland flow from the area of manure application. (Hodne, 2005, p. 18)
- Water contamination may increase with poorly planned CAFO siting that ignores issues such as regional and watershed water quality, sandy soils, shallow groundwater and flood plains (Jackson, et al., 2000). (Hodne, 2005, p. 14)

### **Manure Lagoon Seepage**

- Earthen manure storage lagoons (that are soil lined or clay lined) allow seepage of wastewater, creating a source of potential groundwater contamination (Ham & DeSutter, 2000). (Hodne, 2005, p. 11)
- With or without liners, lagoons are at risk for seepage due to freezing and thawing, burrowing animals, roots, and cracking from drying walls following pumpout (Jackson, 1998). (Hodne, 2005, p. 12)

### **Water Pollutants Emitted by Factory Farms**

- The main components of CAFO manure that may cause water pollution are nutrients, (i.e. nitrogen, phosphorous, and potassium), ammonia, pathogens, (e.g., bacteria), feed additives (e.g. antibiotics, hormones), salts and trace elements, organic matter, and solids (U.S. EPA, 1998). (Hodne, 2005, p. 7)

#### ***Antibiotics***

- Antibiotics are used in CAFO animals to treat disease, prevent the spread of disease, promote growth and enhance feed efficiency (Cole, Hill, Humenik, & Sobsey, 1999; McEwan & Fedorka-Cray, 2002). ...Depending on the source, 40 percent (Nawaz, et al., 2002) to 70 percent (Mellon, et al., 2000) of antibiotics used in the United States are fed to livestock to promote growth, treat disease and minimize the risks of confinement (e.g., stress from crowding). (Hodne, 2005, p. 8.)
- Of antibiotics given to CAFO livestock, 25-75 percent pass unchanged into manure waste and may contaminate soil and water through transmission through surface water and ground water (Chee-Sanford, Aminov, Krapac, Garrigues, & Mackie, 2001). (Hodne, 2005, p. 18)

- The use of antibiotics, including subtherapeutic use as growth promoters, in CAFOs has been associated with the selection and spread of antibiotic resistance among populations of bacteria in animals. Resistant organisms may spread through infected carrier animals, feed, wildlife, or clothing. (Addis, et al., 1999; Cole, et al., 1999; McEwan & Fedorka-Cray, 2002). (*Hodne, 2005, p. 19*)
- Methods of transmission of antibiotic resistance to humans include direct contact, animal manure and contaminated food (Gorbach, 2001; McEwan & Fedorka-Cray, 2002). (*Hodne, 2005, p. 19*)

### **Hormones**

- Synthetic estrogen and testosterone, which are used in livestock feed to stimulate growth, increase feed efficiency and increase productivity, end up in animal manure (Mulla, et al., 1999). (*Hodne, 2005, p. 8.*)
- Estrogen and Testosterone are typically transferred to surface waters by runoff and leaching, respectively (Shore, Correll, & Chakraborty, 1995). (*Hodne, 2005, p. 19*)

### **Nutrients**

- The application of manure at a nitrogen-based agronomic rate leads to significant overapplication of P [Phosphorus], relative to crop needs (Cooperband & Good, 2002; Sims, 1995). (*Hodne, 2005, p. 13*)
- High nutrient concentrations have been found in Iowa surface water in river basins with denser concentrations of CAFOs. (*Hodne, 2005, p. 14*)

### **Pathogens**

- Pathogens are microorganisms (e.g., bacteria, viruses, parasites) that can cause disease. Animal waste may carry infectious organisms including those that cause food-borne illness in humans, such as *Campylobacter*, *Escherichia coli* (*E.coli*) and *Salmonella*. Animal manure can carry protozoa, including *Cryptosporidium parvum* and *Giardia* species. (Addis, et al., 1999; Mulla, et al., 1999; U.S. EPA, 2001). (*Hodne, 2005, p. 8.*)
- The settling of fecal coliform to sediments represents a latent human health threat. This is because natural or human disturbances may cause the contaminated sediments to become resuspended (i.e., released into the water again), thereby, becoming a source of contaminated water for humans (Burkholder, et al., 1997). (*Hodne, 2005, p. 10*)

### **Salts and Trace Elements**

- Undigested feed that passes through animals contains sodium and potassium. Trace elements in manure include those that are often added to feed as growth stimulants and biocides – arsenic, copper, selenium and zinc. (*Hodne, 2005, p. 8*)
- Salts and trace elements from discharges from feedlots and land-applied manure, especially when applied excessively and repeatedly, can accumulate, as they persist in the environment, and can ultimately harm soil quality and plant growth. (*Hodne, 2005, p. 20*)
- Increased salts and trace elements may cause environmental imbalances in fresh waters and on agricultural lands, harming birds and reducing yields. (*Hodne, 2005, p. 20*)
- The Iowa CDCP (1998) study found trace metals and common ions in water affected by large-scale swine CAFOs, especially in earthen manure lagoons, but also in drainage ditches and wells, tile line inlets and outlets, and an adjacent river. (*Hodne, 2005, p. 20*)
- Excessive amounts of copper and zinc have been found in creek sediment and wetlands, in association with cattle CAFO and swine CAFOs, respectively (U.S.EPA, 2001). (*Hodne, 2005, p. 20*)

All information included in this factsheet was obtained from:

Hodne, Carol J. [Concentrating on Clean Water: The Challenge of Concentrated Animal Feeding Operations](http://www.iowapolicyproject.org/2005_reports_press_releases/050406-cafo-fullx.pdf). The Iowa Policy Project. 2005. Full report: [http://www.iowapolicyproject.org/2005\\_reports\\_press\\_releases/050406-cafo-fullx.pdf](http://www.iowapolicyproject.org/2005_reports_press_releases/050406-cafo-fullx.pdf)