

ODOR MITIGATION FOR CONCENTRATED ANIMAL FEEDING OPERATIONS

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Current Status

Odor from Concentrated Animal Feeding Operations (CAFOs)

- CAFOs affect air quality through emissions of odor, specific odorous gases (odorants), odor-carrying particulates (including organic, inorganic and biological particulate matter), and volatile organic compounds (VOCs).
- Odor from CAFO sources as experienced by humans is the composite of 170 or more specific gases in trace concentrations.
- Odorous gases of primary concern often include: hydrogen sulfide (H₂S) and VOCs, including volatile fatty acids.
- Odor research in the field and laboratory has largely focused on measuring concentrations in terms of dilutions to threshold (odor units per

cubic meter) and odor intensity based on category or reference scaling

Emission Characteristics

- Data on odor/odorant emission rates, flux and emission factors are seriously lacking.
- Systematic efforts have not yet been initiated to develop accurate emission factors for odorous gases (VOCs, H₂S, etc.) that properly represent CAFOs in the United States. These factors are needed to develop science-based permitting and abatement policies.

Human Response

- Odor from CAFOs can cause physiological or psychological health responses with regard to (a) frequently exposed neighbors at high concentrations and (b) certain people with particular sensitivities for whom the health effects are of greater concern.

Current Federal and State Policies

- ❑ Federal and State policies regarding CAFOs primarily have addressed water quality protection from point sources under the federal Clean Water Act and equivalent state statutes; however, only in a few cases have these policies addressed odor and odorants.

Integrated Mitigation Programs

- ❑ Approaches to control odor and odorants include: ration/diet modification, manure treatment, capture/treatment of emitted gases, and enhanced dispersion. Each of these mitigation approaches includes several specific technologies.
- ❑ A particular CAFO may require implementation of one, two or more approaches in order to meet the environmental quality demands of the area in which it is located.

Research and Technology Transfer Needs and Opportunities

Odor Measurement and Assessment

- ❑ Develop accurate standardized measurement technologies for odor and odorants of principal concern and ensure these systems become widely available for research, demonstration and regulatory efforts.
- ❑ Direct future monitoring efforts toward determining those odorous gases that most closely correlate with odor as perceived by humans.
- ❑ Develop electronic measurement devices that eventually may be correlated with human perception of odor.

Odor Emissions

- ❑ Develop accurate and broadly applicable odor/odorant emission rates, flux and emission factors applicable to CAFOs in the United States.
- ❑ Define odor/odorant emission rates as a function of diurnal, seasonal and climatic variations as well as design and management practices.

Odor Control

- ❑ Identify kinetic release mechanisms for odorants and odor from principal manure sources

and target the development of control technologies accordingly.

- ❑ Determine relationships among odor, odorants and particulates.
- ❑ Develop effective, practical and economically feasible odor control technologies for confined animal facilities, manure and wastewater treatment, and land application systems.
- ❑ Develop innovative air treatment processes for confinement building exhausts and treatment systems (e.g., lagoon surfaces).

Odor Dispersion

- ❑ Develop accurate dispersion models for odor, odorants and PM appropriate to specific types of CAFOs, addressing the inherent problems of Gaussian models, in order to characterize odor intensities, concentration, frequency and/or duration as a function of distance from CAFOs.

Technology Development and Transfer to Producers

- ❑ Develop and implement interagency programs of research, education and technical assistance to address odor and other air quality issues from CAFOs.
- ❑ Develop and deliver effective, reliable and economically viable odor control/mitigation technologies to CAFO producers.
- ❑ Implement cooperative industry/agency/university programs for practical-scale scientific evaluation of innovative technologies or new products for producers' consideration and adoption.

Odor and Potential Health Concerns

- ❑ Assess potential relationships between odor, odorants, constituent concentrations, emission flux, emission factors, downwind distribution and potential health indicators and devise appropriate mitigation strategies accordingly.
- ❑ Identify potential health concerns associated with odor/odorants from CAFOs, and develop suitable acceptability criteria for community-level exposure to odor and specific associated gases.

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