Odor Mitigation for Concentrated Animal Feeding Operations

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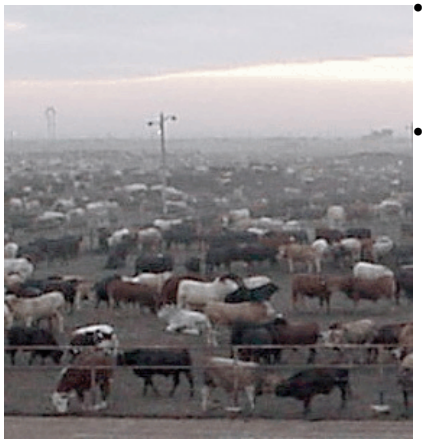
Funding provided by USDA-Cooperative States Research, Education, and Extension Service and the National Center for Manure & Animal Waste Management

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 gases in trace concentrations.
- Odorous gases of primary concern often include: hydrogen sulfide (H_2S) 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 to develop accurate emission factors for odorous gases (VOCs, H_2S, etc.) representing CAFOs in the U.S. 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 have addressed water quality protection from point sources under the federal Clean Water Act and equivalent state statues; 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 Measurements and Assessment

- Develop accurate standardized measurement technologies for odor and odorants of principal concern and ensure these systems become available for research, demonstration and regulatory efforts.
- Direct future monitoring efforts at determining odorous gases most correlated with odor 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 U.S.
- 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 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.