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Swine Facility Location and Odor Dispersion

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Although some odor occurs on every livestock facility, its production and impacts to adjacent land users can be controlled by:
- Good site location.
- Proper design, construction, management, and maintenance of appropriate manure collection, storage, treatment and transport systems.
- Appropriate land application or disposal systems.

This presentation covers general site selection factors that affect dispersion of odors after they are produced.

What is odor?
Odor is that characteristic of a substance that makes it perceptible to the sense of smell. Odors can be pleasant or unpleasant, but most people consider odors from livestock facilities, especially manure, as unpleasant.

What causes odor?
While ammonia releases constitute the largest source, there are many other compounds that contribute to manure odor. Many of these compounds are produced by microbial organisms that break down manure when it is handled or while it is in storage.

How are odors characterized?
- Quality - comparison with a specific type of odor, pleasant or unpleasant.
- Strength - amount of fresh air needed to dilute odorous air to threshold odor level.
- Occurrence - frequency of and duration of odor.
- Concentration - amount of odorous material in air expressed as lb. per cubic foot.

What is threshold odor level and unit?
The lowest odor level that can be detected by 50 percent of people is called threshold odor level and is defined as one threshold odor unit. It is assumed that the group consists of people with an average sense of smell and sensitivity to livestock and manure odors.

How are odors from livestock facilities eliminated?
While odor from livestock facilities may exceed threshold levels, it can be controlled to less than 1,000 odor units, with properly designed and maintained facilities, including the manure handling system. Odors can be reduced to threshold or acceptable levels by dilution and dispersion with clean air. Proper separation distances allow sufficient dilution to drop odors below a specified level.

What factors determine minimum separation distance?
- Odor strength, occurrence, and emission rate at source.
- Maximum odor level permitted at adjacent land uses.
- Land topography where livestock facility is located.
- Amount and type of vegetation around livestock facility.
- Atmospheric conditions: wind direction, wind speed, air stability.

What conditions maximize odor impacts?
These conditions minimize dilution and dispersion of odors and provide the greatest potential for odor impacts on adjacent land uses:
- Flat, open terrain without trees.
- Light wind speed less than 2 mph.
- Clear sky.
- Stable air condition.

How are adequate separation distances determined?
Historically, decision makers have relied on experience with livestock operations located in their community plus "judgment." Research underway in many states is providing information on odor production including odor levels and computer models to describe odor dispersion. Although based on scientific principles, these models should be used to estimate approximate separation distances and various scenarios since the models are not designed to distinguish small separation differences.

How do site selection and facility design and management contribute to controlling odor impact?
- Distances to and direction of neighbors, towns, and non-ag uses are most important.
Separation distances are based on science and facts, including climatic conditions that affect air mixing and dispersion processes that dilute odors to acceptable levels.

Landscaping livestock facilities with large trees encourages air mixing and reduces the downwind length of odor plumes.

Spreading manure on land on hot, calm, humid days causes greater odor problems.

Spreading manure on land during warm, sunny days prior to weekends and holidays, when neighbors are likely to be engaged in outdoor recreation, increases the likelihood of complaints about odors.

Applying manure to land with manure injection equipment reduces odor production.

Properly designed and managed manure lagoons produce little odor.

Adding odor-controlling materials to manure pits stimulates microbial breakdown or inhibits microbial production of odorous compounds.

Properly designed, managed, and maintained livestock facilities and manure handling systems generally produce less odor.