Concentrated Animal Feeding Operations and Human Health in Wisconsin

Robert Thiboldeaux, PhD
Bureau of Environmental and Occupational Health

November 14, 2017

Wisconsin Department of Health Services

Topics

- Concentrated Animal Feeding Operations (CAFO)
  - Definitions
  - Roles of Government Agencies in managing CAFOs
  - Public health concerns
- Discuss activities of the University of Wisconsin-Extension *Understanding Manure Irrigation* workgroup.

What is a CAFO?

- Animal Feeding Operations (AFOs): animals are kept and raised in confined situations.
  - Feed, waste, animals and production operations on a small land area.
  - Animals confined at least 45 days in a 12-month period
  - No grass or other vegetation in the confinement area
- Concentrated Animal Feeding Operations (CAFOs)
  - AFOs that meet EPA regulatory definitions: number of animals; waste handling

Ref: ***U.S. EPA http://www.epa.gov/region7/water/cafo/index.htm***

Key message

- CAFOs not inherently good or bad
- When livestock feeding and housing becomes concentrated, waste also becomes concentrated
  - The proper or improper management of livestock waste has environmental and public health consequences
  - Waste management at CAFOs is heavily regulated
  - Regulations are reviewed and revised to keep up with evolving agricultural techniques and operations of increasing size

Production, storage, treatment, and land spreading of livestock waste- important feature of CAFOs

- Livestock waste removed from confinement to storage tanks or ponds
  - 6 months storage capacity
- Dairy vs. human waste:
  - Total Solids Output: 1:37-44
  - Total Solids & Wastewater: ~3:1 (total volume cows:people)
  - Nutrient basis- relevant to calculating land spreading and nutrient management.

Wisconsin
Department of Health Services

Wisconsin
Department of Health Services

Other considerations with CAFO livestock waste

- Waste hauling and spreading
  - Increased heavy truck traffic and road maintenance
  - Proper calibration of nutrient application to crop, soil type, rainfall
  - Spills from stored or transported manure slurry
- The amount of land available for manure spreading limits operation size and siting

Role of DHS

- *No formal regulatory role*
- DHS environmental health scientists assist state and local agencies, at their request, with legislatively assigned roles
  - Invited participation in expert workgroups for review of Ag-related topics
  - Consult with agencies involved in site-specific incidents
  - Assist local health departments in ensuring that citizens have safe, clean drinking water

Roles of other agencies

- Understanding Local and State Regulations for New and Expanding Livestock Facilities
  - Many state laws administered by DATCP and DNR that regulate
    - Livestock siting
    - Manure management
    - Nutrient Management
    - High-capacity well rules
    - Storm water and erosion control
  - Local zoning laws, permits
  - Reference: Wisconsin Department of Agriculture and Consumer Protection (DATCP) factsheet: https://datcp.wi.gov/Documents/LSLawsForLivestockFacilities.pdf

What does DHS hear from the public about CAFOs?

- Odor complaints
- Complaints about runoff, spills
  - DHS responds in concert with other agencies where appropriate
  - Reports of well water impacts
    - DHS supports Local Health and DNR in conducting well water investigations
- Concerns about emerging agricultural practices
  - New or expanding installations
  - Manure spray irrigation

Wisconsin Department of Health Services

What does DHS hear from the public about CAFOs?

- Concerns about emerging agricultural practices
  - New or expanding installations
  - Manure spray irrigation

Manure Irrigation

- In this process, manure is liquefied by mixing the materials with water so that it can be applied to field through irrigation systems
  - Traveling gun
  - Drag line
  - Central pivot with drop nozzle
  - Central pivot with drop nozzle and end gun

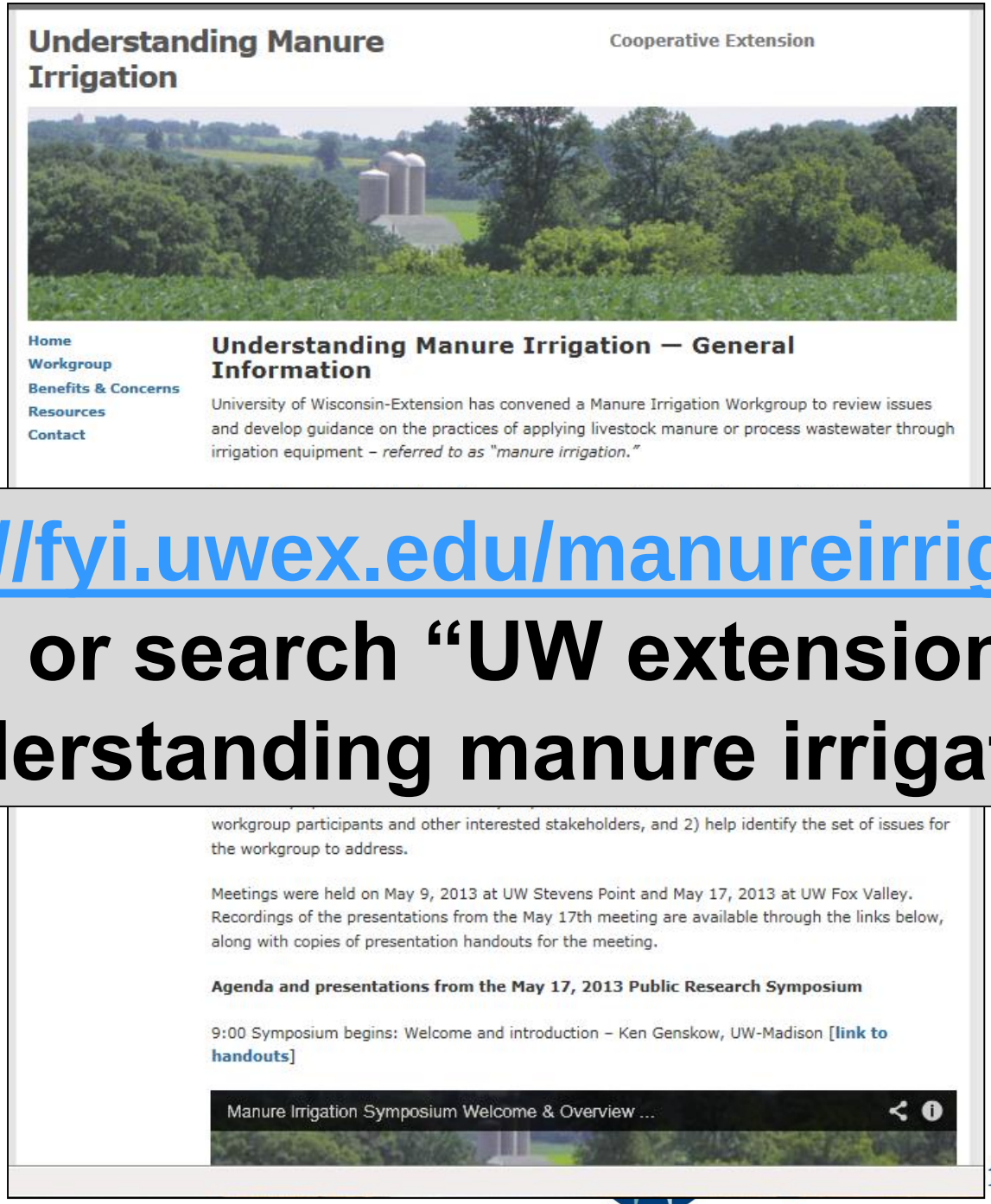
Public health concerns over manure irrigation

- Can manure spraying cause pathogens within the manure to become airborne and be transported to neighboring yards?
- Scientific Risk Assessment approach to answering health questions about manure irrigation

Understanding Manure Irrigation **workgroup**

- The University of Wisconsin-Extension ***Understanding Manure Irrigation*** workgroup has been established to address technical and health related questions and further develop best management practices for CAFOs
- Representatives from:
  - DNR
  - DHS
  - DATCP
  - Local health departments
  - UW Madison
  - Local farmers, and
  - Other stakeholders

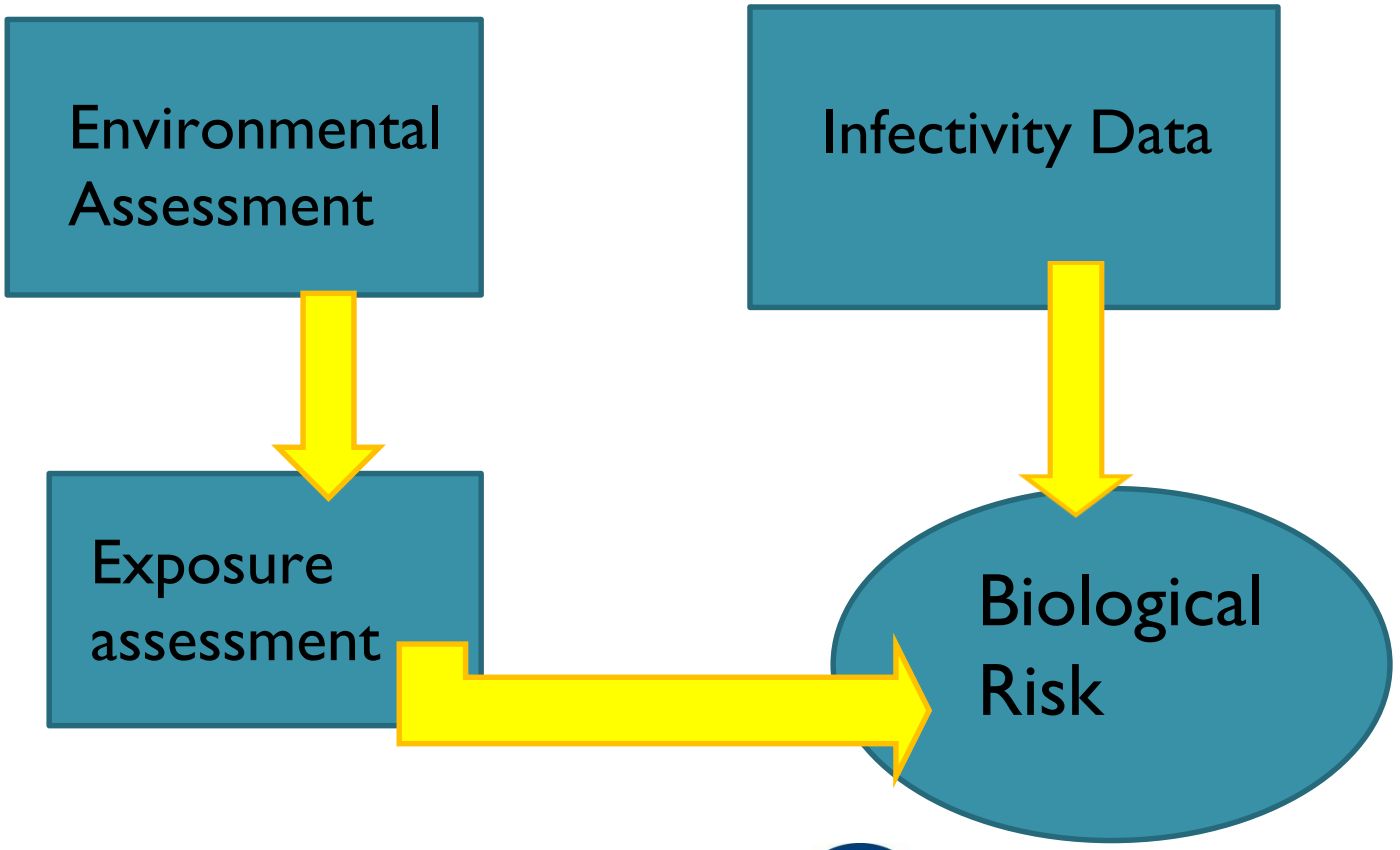
Wisconsin Department of Health Services



http://fyi.uwex.edu/manureirrigation/

or search "UW extension understanding manure irrigation"

A Quantitative Microbial Risk Assessment (QRMA) is central to the *Understanding Manure Irrigation* workgroup recommendations



Wisconsin Department of Health Services

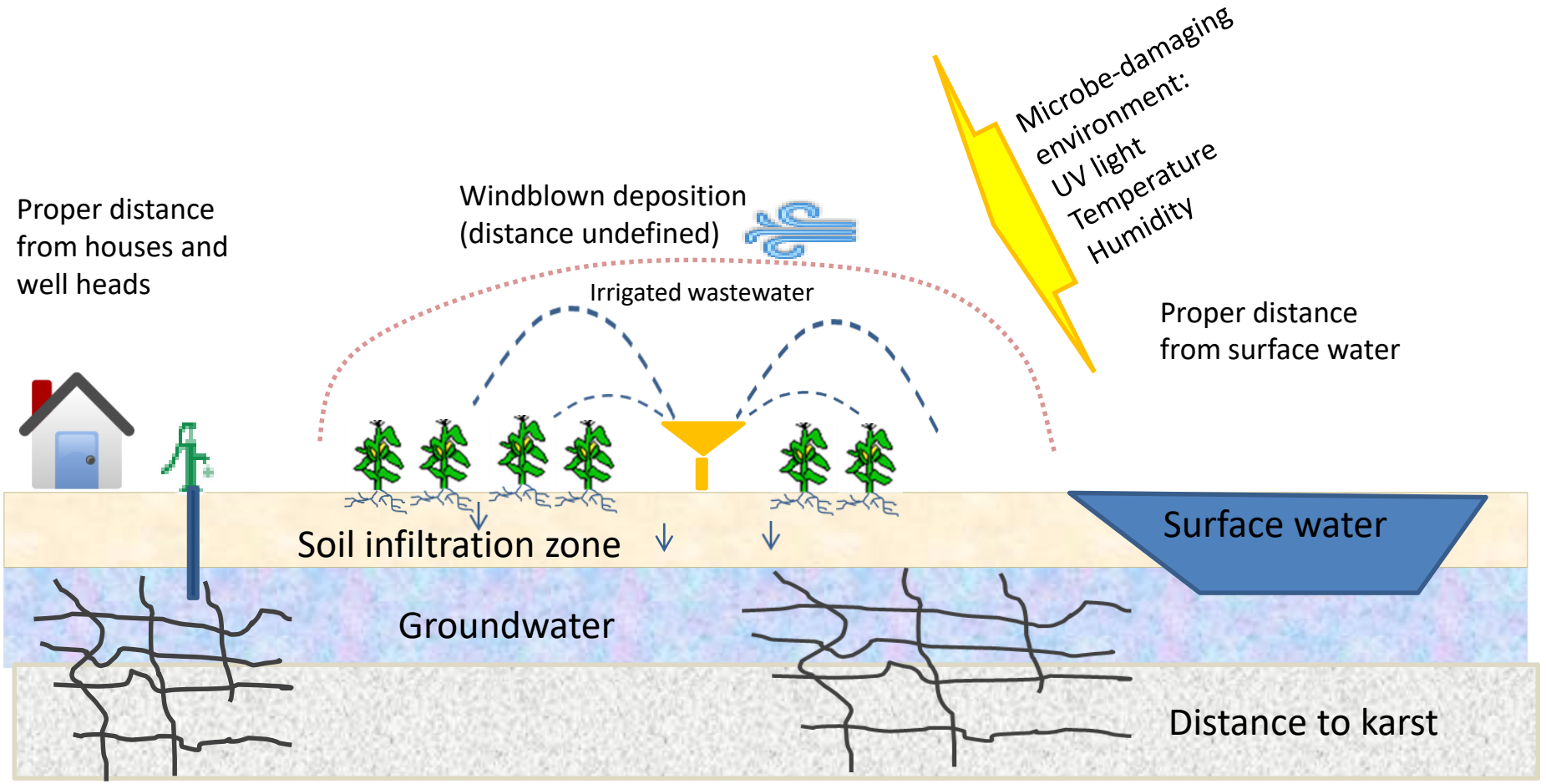
The QMRA requires understanding of the composition of livestock waste

- Chemical and microbial composition
  - Varies with livestock source
  - Key microbes in dairy operations: *Camplyobacter spp., E.coli, non-typhoid Salmonella, Crytosporidium spp.*
- Storage, handling, and processing affect waste characteristics
  - Methods to control odors
- Dominant air pollutants are hydrogen sulfide and ammonia
  - Many minor chemicals contribute to odor

Odor-producing chemicals found in manure

- **Hydrogen Sulfide**
- Methane
- Nitrogen Heterocycles
- Mercaptans
  - Methyl-, Ethyl-, Propyl-
- Volatile Fatty Acids, Alcohols, & Aldehydes
- Organic acids
  - Proprionic, Butyric, Isovaleric, Isobutyric
- **Ammonia**
- Amines
  - Methyl-, Ethyl-, Dimethyl-
- Carbon dioxide
- Phenolics
- Sulfides
  - Dimethyl-, Diethyl-

Understanding fate and transport is key to QRMA



Thiboldeaux 2015

Contents of Manure Irrigation Workgroup Report
(released in 2016)

- Associated benefits and concerns
- Manure management and application overview
- Risk and public policy
- Considerations for practice: drift, odor, water quality, air quality, airborne pathogens, timing of application, road safety and damage, farm management
- Workgroup response and recommendations to Considerations, with tables and commentary

Key management variables identified by Workgroup

- Application - time of day
- Setbacks
- Spray technology
- Pre-treatment of materials to reduce microbial load
- Spray droplet size
- Operational weather considerations
- Practices to reduce air impacts

Summary

- CAFOs are heavily regulated under various state and local agencies
- Land spreading of livestock waste from CAFOs poses technical and environmental challenges; emerging technologies present opportunities for pollution control
- The *Understanding Manure Irrigation* workgroup has been established in Wisconsin to address technical and health related questions and develop best management practices

Contact Information

- Wisconsin Department of Health Services
  - Robert Thiboldeaux PhD. *robert.thiboldeaux@wi.gov*
- Local Health Department
  - See: http://www.co.wood.wi.us/Departments/Health/
- Department of Natural Resources
  - See: http://dnr.wi.gov/topic/AgBusiness/CAFO/Contacts.html
- Department of Agriculture, Trade, and Consumer Protection
  - See: http://datcp.wi.gov/Farms/Nutrient_Management/index.aspx

Wisconsin Department of Health Services