COLORADO STATE UNIVERSITY
ENGAGEMENT AND EXTENSION

Feed and Forage Testing After a Wastewater Spill

Best practice: Test your feed or forage for potential contaminants.

There are several labs that can test for potential contamination from a wastewater spill, including sewage. The following list of labs can test various potential contaminants. Contact the lab prior to sampling to determine sampling procedures and contaminants to be evaluated.

- Waters Agricultural Laboratories
- Warren Analytical Laboratory
- Midwest Laboratories

- At a minimum, forage or feed samples should be tested for *E. coli* and total coliforms to evaluate potential contamination.

- If feed sample tests positive for potential contamination, further testing for specific pathogens may be needed.
  - Additional pathogens to test for regarding animal feeding concerns:
    - Salmonella
    - Listeria
    - Mold and yeast
    - Enterococci (pathogen specific to human waste)
    - Consider testing for cryptosporidium in the animal if young livestock are experiencing diarrhea

Best Practice: When cutting feed or forage, cut higher than normal to reduce possible exposure to contaminants.

Cutting silage higher than 12” inches also reduces the potential for high nitrate.

Best Practice: Consult a veterinarian or nutritionist to determine the safety of feed sources for your livestock.

If feeds have the presence of microbial contamination, a risk assessment with your veterinarian or nutritionist should be performed to determine if the feed is safe for the class of livestock being fed. There are no safety ranges for the above-mentioned pathogens in feed. Lab detection indicates the presence or absence of pathogens only.

Best Practice: If animals consuming potentially contaminated feed show signs of illness, consult your veterinarian for further animal diagnostics.

- Human risks associated with potential pathogens in wastewater are not animal dependent.
- The risk associated with potential contamination of feed crops can be dependent on cultural practices.
  - There is a higher risk of contamination with overhead sprinklers. Risk goes down with flood irrigation and is even lower with drip irrigation.
    - Rainfall events can increase exposure to contaminants from splashing off the soil surface.
  - Types of harvesting activities and their potential risks:
    - Green chopping results in the highest risk because plant material is not allowed to dry down. This creates an environment conducive to pathogen maintenance and/or growth.
    - Swathing forage and allowing to dry can reduce some pathogen incidence, but testing of forage is still recommended if exposed to contaminated water.
    - Corn grown for grain would also have a lower risk of contamination because of distance from soil and covering of ear by the husk. Testing is still recommended if grain was exposed to wastewater.
    - Ensiling or silage production poses the lowest risk because of the environment that is created. Most pathogens are eliminated in the ensiling process if done properly. Refer to the table and references below for guidance on ensiling decisions.

Relative survival in dry or poorly fermented silage	**Human pathogen group**	**Why**
Longest	Spore-formers: *Clostridium* spp., including *C. botulinum*, and *Bacillus cereus*	Spores are highly resistant survival forms and can persist through harsh conditions. Whether they grow is a separate issue and depends on moisture, pH, anaerobic conditions, and spoilage.
High concern in dry/high pH/aerobically spoiled silage	*Listeria monocytogenes*	This is probably the most important non-spore-forming human pathogen for dry or spoiled silage. High dry matter can restrict fermentation, maintain higher pH, and allow *Listeria* survival or growth.
Moderate persistence	*Salmonella* spp.	*Salmonella* is hardy and can survive drying, but good silage fermentation should reduce survival. Concern increases in dry, poorly fermented, contaminated, or aerobically exposed feed.
Usually lower in well-fermented silage	STEC, including *E. coli* O157:H7, O26, O103, O111, O145	Studies show pathogenic *E. coli* declines rapidly during good ensiling, but survival is more plausible in poorly fermented or aerobically spoiled silage.
Generally shorter survival in dry aerobic conditions	*Campylobacter*	Usually less competitive in dry, oxygen-exposed environments, so it is not typically the main long-survival concern in dry silage.

In dry or high dry-matter silage, the longest persistence concern is bacterial spores, followed by *Listeria monocytogenes* under high-pH or aerobically spoiled conditions. *Salmonella* may persist under dry conditions, while STEC generally declines during proper fermentation but can persist when fermentation is poor, or silage is exposed to oxygen. The main issue here is that drier forage can ferment less completely, generate less acid, and remain at a higher pH; allowing these microorganisms to survive and persist in silage.

Important Information and Disclaimer:

This guidance summarizes the best available scientific, Extension, regulatory, agricultural water-quality, and public health information available at the time of publication to support decision-making after a sewage release. It is provided for

educational and best-management-practice purposes only and should not be interpreted as a guarantee that any water source, crop, irrigation system, ditch, canal, well, field, or operation is free of microbial, chemical, or other hazards. Conditions vary by site, water source, crop, exposure pathway, treatment system, and management practice, and users remain responsible for evaluating their own operations in consultation with appropriate water providers, certified laboratories, public health officials, regulatory agencies, and other qualified professionals. This guidance does not replace applicable federal, state, or local requirements, or current EPA-registered product labels for sanitizers, disinfectants, pesticides, or antimicrobial products. Colorado State University, CSU Extension, and contributing partners do not warrant or guarantee the effectiveness of any specific testing strategy, treatment, interpretation, or management decision for an individual operation.

Additional References and Resources:

Feed, forage, flooding, and wastewater exposure

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Pathogen background and zoonotic context

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