

Dealing with Yeasts and Molds

2007 Winter DTNs



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Yeasts and Molds

- Are types of fungi
- Are strict aerobes (their activity is minimized w/o O₂)
- Use sugars, organic acids and other easily metabolized carbon sources
- Reproduce through spores that are in soil and plant debris
- Spores infect the growing plant or propagate during storage
- Germinate at 45°F, with rapid growth at 75 to 90° F
- Require humidity for germination
- Spores can survive anaerobic conditions



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Molds

- Molds
 - Cause destruction of nutrients and decreased palatability
 - Decreased DMI
 - Can cause disease (mycosis)
 - HBS (Aspergillus fumigatus)
 - Produce mycotoxins that cause disease (mycotoxicosis)
 - Symptoms are often non-specific, difficult diagnosis
 - Suppressed immune function, opportunistic diseases



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Yeasts

- Yeasts ???
 - No data showing yeast by itself to cause disorders
 - Field observations indicate acidosis-like symptoms:
 - Loose, bubbly manure
 - Decreased butterfat test
 - Anaerobic instability in fermented feeds
 - Decreased DMI, milk production and/or growth commonly cited



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Aerobic instability

- High endemic yeast populations are ensiled
- Moderate growth occurs during fermentation until O₂ is expired
- Yeast are re-exposed to O₂ during feedout
- Yeast growth becomes exponential and lactic acid is consumed
- Heating occurs, silage acids are volatilized
- Silage pH rises
- Molds invade the silage
- Aerobic instability



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Prevention

- Proper ensiling procedures
 - Harvesting
 - Rapid filling
 - Cover
 - Pack, pack, pack!
- Use of silage inoculants
 - Crop-N-Rich
 - Crop-N-Rich Buchneri 40788 and Crop-N-Rich Stage2
 - Acetic acid inhibits growth of yeasts or less lactic acid for yeasts to grow on?
 - Yeast and mold counts in treated silage are lower at feedout
 - Yeast and mold counts in treated silage do not increase as rapidly when exposed to air



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Signs of Moldy Feed

- Dustiness
- Caking
- Poor feed flow
- Feed refusal by animals, decreased palatability
- Inconsistent manure
- Poor reproductive performance
- Increased somatic cells/mastitis
- Any amount of heating in feeds or grains
- Darkening of feed and grain
- Slight off-smell of feed grains



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Yeast Counts

Yeast count	Guidelines
< 1,000,000	OK for hay, dry corn and grain
≤ 4,000,000 to 5,000,000	OK for corn silage and haylage
≤ 20,000,000	OK for HMSC
>1,000,000	On fermented feeds may indicate unstable feed



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Mold Counts

Mold count	Guidelines
10 to 10,000	Relatively Safe
10,000 to 100,000	Transition Zone
100,000 to 10,000,000	Caution Advised: Dilute the feedstuff
> 10,000,000	Feeding may not be recommended



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Mold IDs

Mold	Color	Toxin Producer	Comments
Penicillium	Green to green blue	Yes – OCHRA, Citrinin, Patulin	Most common toxin producer in silage
Aspergillus	Yellow to yellow green	Yes – AFLA, OCHRA	Found in drought, heat-stressed conditions or insect infested fields
Fusarium	White to pinkish white	Yes – ZEA, DON, T2-toxin, Fumonisin	Common in cold, wet seasons
Claviceps	Brown to black	Yes – Ergot alkaloids	Most common in grasses (wheat, rye and barley)
Mucor	White/gray	No	Common soil and manure contaminant
Rhizopus	Black/white	No	Requires high moisture and an advanced decay mold

Adapted from Dairyland Labs.



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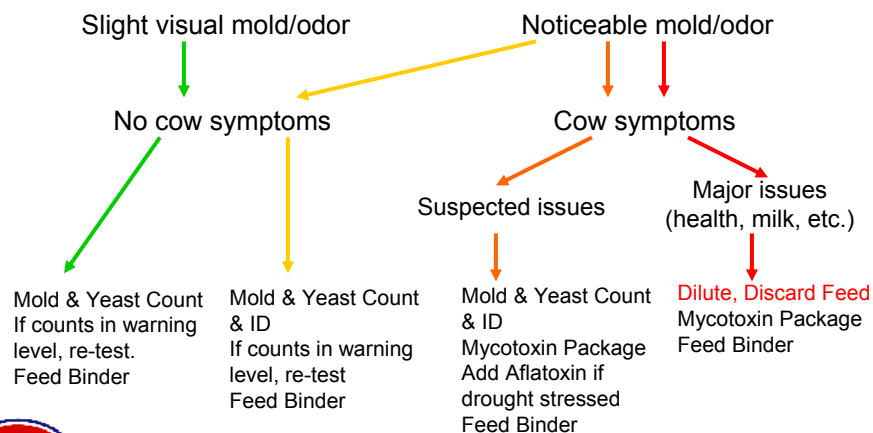
What can we do when we have contaminated feed?

- Dilute or discard feed
- Antifungal (organic acids)
 - Bunklife (buffered propionic acid)
 - Mold inhibitor for TMRs and manufactured blended feeds
 - Aids in control of yeast and molds at feedout
 - 1.5 – 2 lbs per wet ton of TMR
- Feed additives
 - Toxin Binder
 - Yeast Fortifier
 - Combination of live yeast and yeast culture
 - Improves feed utilization
 - Buffer??



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Strategies for Sampling and Analysis



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How to take a sample?

- Pre-blend several hundred pounds in the TMR mix
- Collect 15 – 20 grab samples while the mixer is unloading
- Mix the grab samples in a clean plastic bucket and sub sample to obtain a 1 – 2 qt sample
- Place sample in a zip lock bag and remove as much air as possible from the bag
- If sample is being submitted for mold and yeast counts do NOT freeze, but keep it cold. Packaging with ice packs is recommended
- If sample is being submitted for mycotoxin analysis it is highly recommended that it is frozen prior to shipping



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Molds and Yeasts can double every hour!

Example 100,000 cfu/gm at sampling

@ 1 h 200,000 cfu/gm

@ 2 h 400,000 cfu/gm

@ 3 h 800,000 cfu/gm

@ 4 h 1,600,000 cfu/gm

@ 8 h 25,600,000 cfu/gm

**Ship samples preferably on Mon, Tues or Wed.
DON'T SHIP on FRIDAYS!**



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Tests, Labs and Cost

	Mold and Yeast Count	Mold and Yeast Count and ID	Mycotoxin Screen	AFLA and individual
Dairyland Labs	\$14.40	\$30.60	\$80.10 ¹	\$40.50 ³
Rock River Lab.	\$12.90	\$41.40	\$80.00 ²	\$45.00 ³
Vet. Diagnostic Lab, NDSU			\$90.00	\$30.00

¹Uses Romer Labs methodology and takes 4 to 6 days.

²It is sent out and takes 7 to 10 days.

³Both labs use Elisa and TLC methodology



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The screenshot shows the VPNet website interface. At the top, there is a navigation bar with links for "Vita Libraries", "Daily", "Swine", "Beef", "Forage", "Hot Links", "Calendar", "Ask Us", "VP Staff", and "Partners". Below this, a "Welcome to VPNet" banner is displayed. The main content area features a "Forage Stacks" section with a sub-header "Molds & Mycotoxins". This section is organized into a grid of links and lists:

- Home**: [Mycotoxins: Occurrence in Feeds, Effects on Dairy Cattle, Prevention & Treatment](#) by Lon Whitlow, et al., North Carolina State University, 1999
- Products**:
 - Mold growth & mycotoxin formation
 - Storage of grain & forages
 - Mycotoxin occurrence
 - Mycotoxin effects
 - Safe levels of mycotoxins
 - Mycotoxin testing
- Tools**:
 - Effects of moldy feed & mycotoxin
 - Testing for mycotoxins
 - Types of tests
 - Interpretation of test results
 - Abatement of mold & mycotoxin problems
 - Prevention of mold-related problems
- Equipment**:
 - [Mold in Silage](#): Vita Plus Corporation, June 2000
 - [Mycotoxins in Corn Produced by Fusarium Fungi](#): University of Kentucky, Cooperative Extension Service
- Storage**:
 - [Mold in Silage](#): Vita Plus Corporation, June 2000
 - [Silage Management: Three Important Practices](#): from Keith Bolzer, NDSU, January 2001
 - [Two Ways to Prevent Feeding Spoiled Silage](#): Vita Plus Corporation, January 2001
- Management**:
 - [Mold & Mycotoxins in Corn Silage & HMC Part 1: Managing for Aerobic Stability Part 2: Aerobic Considerations](#): University of Wisconsin, December 2001
 - [Mold & Mycotoxin Problems in Livestock Feeding](#): by Richard Adams, Kenneth Keppert, Virginia Isler, Lawrence Mulcaison & Gregory Roth, Penn State
 - [Mycotoxins in Corn Produced by Fusarium Fungi](#): University of Kentucky, Cooperative Extension Service
 - [Mycotoxin \(DON\)](#)
 - [Zearalenone](#)
 - [Sampling & Detection](#)

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