

Feed Molds & Mycotoxins

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Terminology.....

Myco

**Mold, Fungi
Mycology**

Toxin

Poison

Mycotoxiosis

**Acute or Chronic Disease
via Mold Fungi**

Mycotoxins e.g.

- Aflatoxin

- Deoxynivalenol

- Zearalenone

- Ergot

- Fumonisin

- Slaframine

*** Note 300-500 known mycotoxins**

Feed Mold/Mycotoxin Quiz.....

(True or False)

- 1. Feeds that are visibly moldy are at high risk for mycotoxin contamination?*
- 2. Feeds that contain no visible mold are seldom contaminated with mycotoxins?*
- 3. Silage that heats during feedout has a high risk of mycotoxin contamination?*
- 4. Knowing the species of mold is a good indicator of mycotoxin contamination potential?*
- 5. The color of molds on crops is a good indicator of mycotoxin contamination potential?*
- 6. Molds that do not produce mycotoxins are harmless to dairy cattle?*

Feed Mold/Mycotoxin Quiz.....

(True or False)

1. Feeds that are visibly moldy are at high risk for mycotoxin contamination? False

2. Feeds that contain no visible mold are seldom contaminated with mycotoxins? False

3. Silage that heats during feedout has a high risk of mycotoxin contamination? False

4. Knowing the species of mold is a good indicator of mycotoxin contamination potential? False

5. The color of molds on crops is a good indicator of mycotoxin contamination potential? False

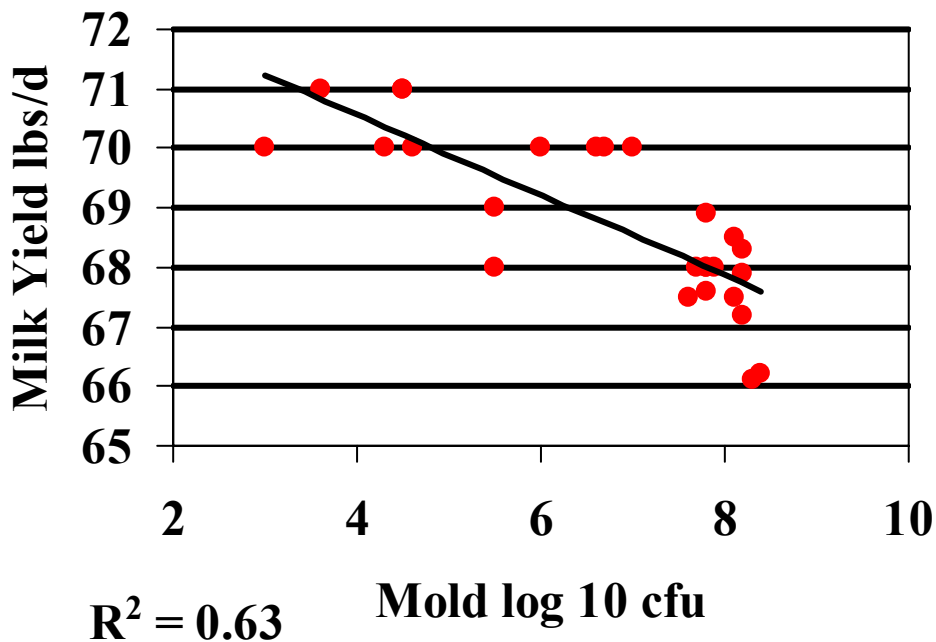
6. Molds that do not produce mycotoxins are harmless to dairy cattle? False

Moldy Feed..... No Mycotoxins

Genus	Conditions	Comments
<i>Mucor</i>	Storage	Very common, silages, HMC, low O2 needed
<i>Cladosporium</i>	Field	Corn after frost
<i>Epicoccum</i>	Field/Storage	Common
<i>Nigrospora</i>	Field	Ear Rot
<i>Ostilago</i>	Field	Smut
<i>Rhizopus</i>	Storage	Decay Mold
<i>Yeast</i>	Storage	Very common, fast, rapid heating, feed energy reduction

Moldy Feed No Mycotoxins

- *Hoffman et al 1995*
- *Moldy HMC*
- *Exposed to Oxygen*
- *Aerobically Unstable*
- *Fed to Lactating Cows 14 d*
- *TMR*
- *No Intake Depression*



Moldy Feed No Mycotoxins

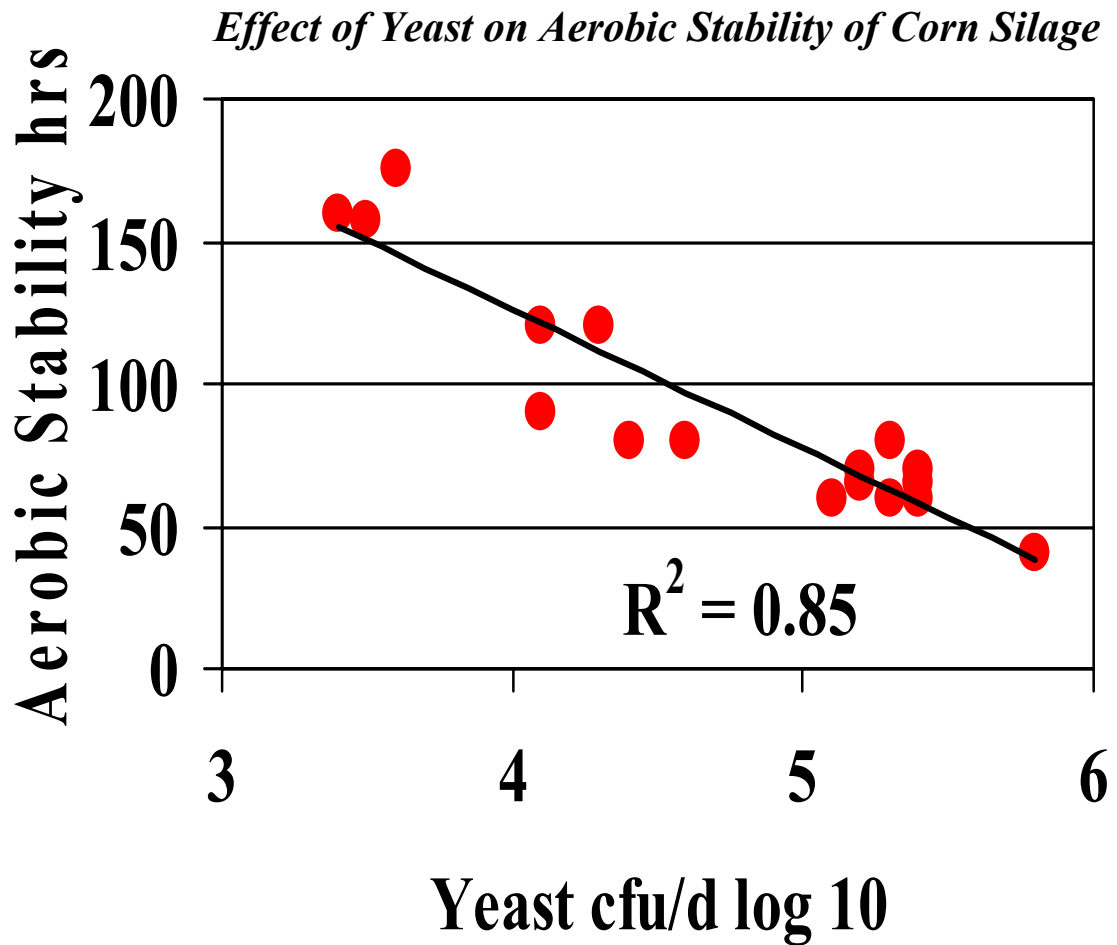
Yeast

- <i>Cryptococcus</i>	Non fermenter
- <i>Rhadorala</i>	Non fermenter
- <i>Sporobolomyces</i>	Non fermenter
- <i>Sacchromyces</i>	Ferments Sugars
- <i>Candida</i>	Lactic Acid
- <i>Hansula</i>	Lactic Acid

- Endemic Populations
- Explosive Growth Potential 1-3 days
- Low Oxygen Req for Growth
- Require > 60 F for Rapid Growth
- Cause Heating
- Increase pH at Silo Surface
- Reduce DMI?
- Parasitic Effect on Feed Energy
- Chronic Milk Loss

Kung et al 1998

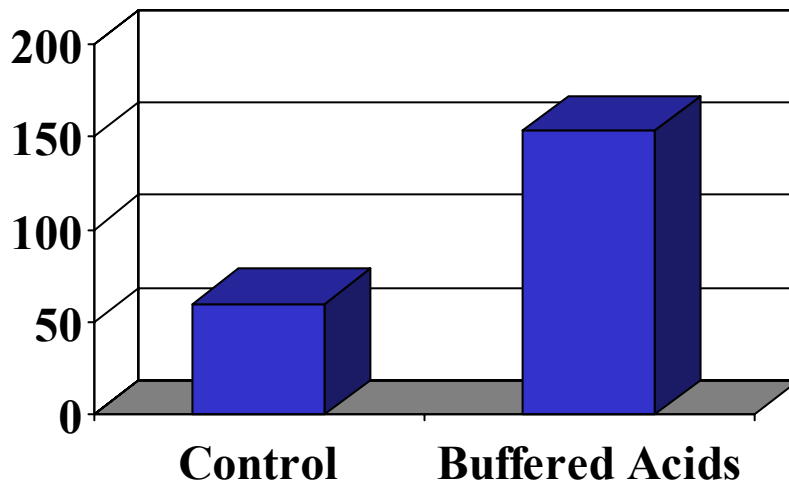
- Corn Silage
- Aerobic Stability Study



Kung et al 1998 (Organic Acid Stabilization)

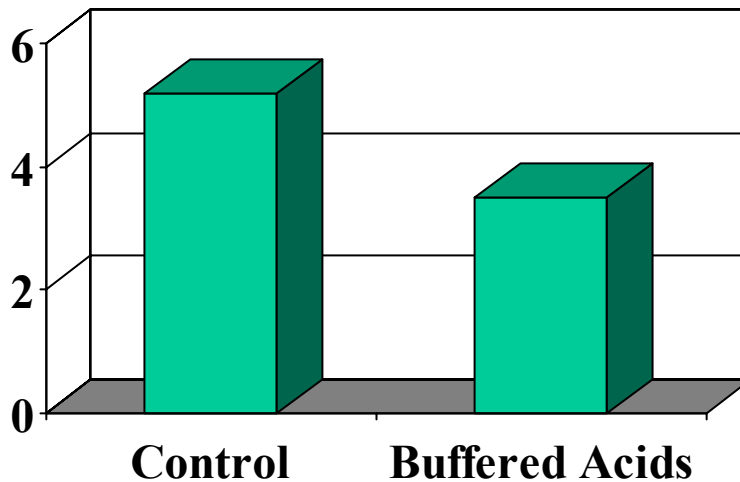
- Corn Silage
- Aerobic Stability Study
- LIR Organic Acids (4 lbs/ton)

Bunklife hrs



■ Bunklife

Yeast cfu/g log 10



■ Yeast

Common Mycotoxins

Genus	Mycotoxin	Comments
Fusarium	DON (Vomitoxin) Fumonisin T-2 HT-2 Zearalenone	Common
Aspergillus	Aflatoxin	High Temps
Penicillium	PR Toxin Citrinin Ochratoxin	
Claviceps	Ergot	Small Grains

- Typically invade corn and small grains
- Fusarium toxins are most common
- Perennial forages (silages) have very low incidence

Mycotoxins (DON-Vomitoxin)

- Normal Corn Silage 1998,1999
- Levels = 1-4 ppm
- Excellent Growing Conditions
- Testing Labs Credible
- Presence Verified 1998, 1999

Courtesy of Nutrition Professionals, 1999

**Normal Corn
Silage**



Fond du Lac	1.7 ppm
Fond du Lac	13.8 ppm
Fond du Lac	5.8 ppm
Winnebago	3.0 ppm
Calumet	5.2 ppm
Brown	6.2 ppm

Why?

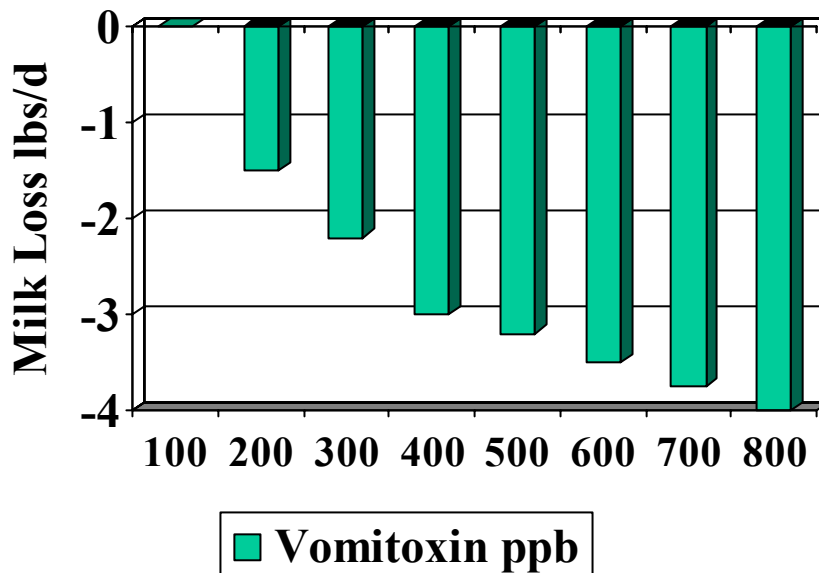
- Field History
- Insect Damage (Corn Borer)
- Leaf Disease
- Susceptible Varieties

Mycotoxins (DON-Vomitoxin)

Question.... Is vomitoxin a serious problem in dairy cattle?

North Carolina State University

Milk Losses Associated with Vomitoxin Contamination. Whitlow et al...



Mycotoxins (DON-Vomitoxin)

Question.... Is vomitoxin a serious problem in dairy cattle?

Vomitoxin is “**very**” common in Corn Silage

Lab	% Corn Silage > 1 ppm (Vomitoxin)
Dairyland	46.0 %
North Carolina	75.0 % *
North Dakota	40.0 %

* > 40 ppb of DON

Mycotoxins (DON-Vomitoxin)

Question.... Is vomitoxin a serious problem in dairy cattle?

??????????????

Trial	Animals	Dietary DON ppm	Result
Canada	Lactating	6.4	no effect
Manitoba	Lactating	8.4	no effect
Minnesota	Steers	18.0	no effect
North Dakota	Steers	12.0	no effect
North Dakota	Beef Heifers	10.0	no effect
Manitoba	Ewes	12.0	no effect
Minnesota	Ewes	7.0	no effect

Mycotoxiosis..... Dairy Cattle

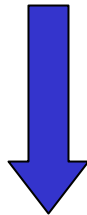
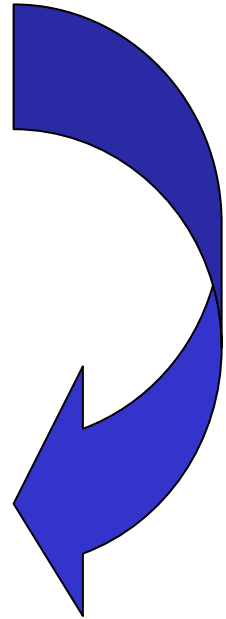
- **Chronic or Acute**
- **Herd Problem (Not Individual Animals)**
- **Mimics other Disease**

- **Unthrifty Appearance etc**
- **Milk Loss**
- **Diminished Reproductive Performance**
- **Reduced Intake**
- **Depressed Immune Function**
- **Lesions**
- **Diarrhea**

Mycotoxin Binding Agents

- **Bentonite (Clays)**
- **Aluminosilicates**
- **Yeast Cell Wall**
- **L-Form Bacteria**

- *Limited Data*
- *Vague Claims*
- *Positive Field Experience*
- *Do not Universally Bind All Mycotoxins*



	<u>Alumniosilicate Binding Capacity</u>	
	Product A	Product B
Aflatoxin	100	89
DON	3	14

% Mycotoxin absorbed in aqueous solution

Practical Approaches

Mold Yeast Prevention

- **Maintain Excellent Feed Preservation Practices**
- **Use Inoculants when Appropriate**
- **Consider Organic Acid Stabilizers**

Mycotoxin Management

- **Observe Herd Performance**
- **Note Sudden Changes in Herd Performance**
- **Evaluate All Possible Causes**
- **Test Feeds for Mycotoxins**
 - * **Use Labs that Specialize in Mycotoxins**
 - * **Test for Multiple Mycotoxins**
- **If Mycotoxins are Suspected**
 - * **Try a Binding Agent**
 - * **Dilute Diet**
 - * **Monitor Animal Performance**
 - * **Discard Feed**