

**Welcome to the U of IL  
“Wet Corn Webinar”**

- **Today’s program**
  - Introduction –Mike Hutjens
  - Plant pathology—Carl Bradley
  - Field Update—Brian Steinlicht—Dairyland Lab
  - Dairy guidelines—Mike Hutjens
  - Beef guidelines—Dan Faulkner
  - Swine guideline—Hans Stein
  - Storage—Ted Funk and Jim Morrison
- **Available on line:** Jim Morrison, agronomist and Dick Wallace, veterinarian
- **Your questions and concerns**

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**How We Got Here Today**

- Late wet spring, cool summer, and late fall harvest with lots of rain has delayed harvest
- Appearance of Diplodia ear rot and other molds raise concerns
- Elevators can not dry corn fast enough
- Discounts for mold and moisture at elevators make wet corn attractive for livestock producers to lower feed costs
- Livestock managers are concerned about harvesting too wet and mycotoxins

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**Plant Pathology  
Update**

**Carl Bradley**  
**carlbrad@illinois.edu**  
**217-244-7415**

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### Corn Ear Rot Diseases

- Most common in 2009:
  - Diplodia ear rot
  - Gibberella ear rot
  - Fusarium ear rot
  - Penicillium ear rot
  - Opportunistic fungi

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### Diplodia ear rot



- White mold on ears, usually beginning at the base
- Speck-size black fungal fruiting bodies on the sides of kernels
- No mycotoxins known to be produced by the fungus in the U.S., but other mycotoxin-producing fungi can colonize Diplodia-affected ears

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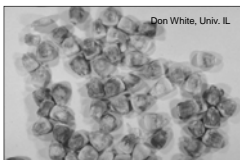
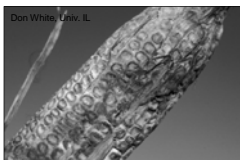
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### Gibberella ear rot



- Pink to red fungal growth on kernels, generally beginning at the tip
- Can be associated with damage caused by insects, birds, hail, etc.
- Can produce the mycotoxins deoxynivalenol (DON, vomitoxin) and zearalenone

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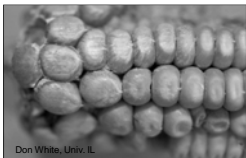
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### Fusarium ear rot



- Individual or small groups of kernels with white-pink fungal growth
- Affected kernels may have “starburst” symptom
- The fungi that cause Fusarium ear rot may produce fumonisin mycotoxin

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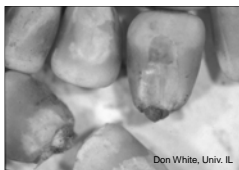
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### Penicillium ear rot



- Blue-green fungal growth on and between kernels
- Often associated with ears that have been damaged by birds, insects, hail, etc.
- Kernel embryos may have a blue discoloration known as a “blue eye”
- Can produce ochratoxin mycotoxins

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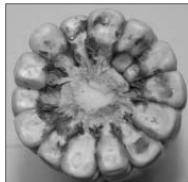
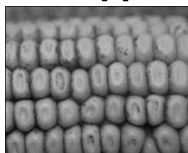
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### Opportunistic fungi



- A number of opportunistic fungi are present in corn fields, and are more prevalent during wet weather
- Corn that has been killed prematurely by frost or stressed by other factors may be more susceptible to invasion
- Cladosporium ear rot has been reported in IL to some degree in 2009  
*(images courtesy North Dakota State Univ.)*

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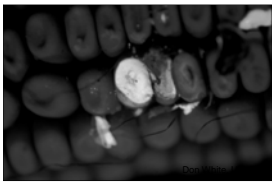
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## Aspergillus ear rot



- Grayish-green powdery mold
- Affect kernels fluoresce under a black light
- Most prevalent under hot, dry conditions – NOT OBSERVED IN ILLINOIS IN 2009
- Can also cause a storage rot, and can invade kernels with moisture content as low as 14%
- Produces aflatoxin mycotoxin

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## Field Update

Brian Steinlicht  
Dairyland Lab

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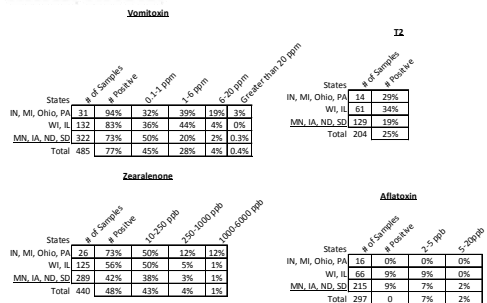
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## CORN GRAIN

Dairyland Laboratories, Inc.



Oct 1 - Dec 3, 2009

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### CORN SILAGE

*Dairyland Laboratories, Inc.*

Vomitoxin

States	# of Samples	# Positive		
		5-6 ppm	6-20 ppm	Greater than 20 ppm
IN, MI, Ohio, PA	39	33%	33%	0%
WI, IL	22	91%	82%	9%
MN, IA, ND, SD	30	73%	50%	23%
<b>Total</b>	<b>91</b>	<b>60%</b>	<b>53%</b>	<b>0%</b>

States	# of Samples	# Positive		
		5 ppm	20 ppb	Greater than 20 ppb
IN, MI, Ohio, PA	1	0%	0%	0%
WI, IL	12	0%	0%	0%
MN, IA, ND, SD	18	0%	0%	0%
<b>Total</b>	<b>31</b>	<b>0%</b>	<b>0%</b>	<b>0%</b>

Zearalenone

States	# of Samples	# Positive		
		500 ppb - 1000 ppb	Greater than 1000 ppb	
IN, MI, Ohio, PA	2	50%	50%	0%
WI, IL	21	33%	24%	10%
MN, IA, ND, SD	29	34%	17%	17%
<b>Total</b>	<b>52</b>	<b>35%</b>	<b>21%</b>	<b>13%</b>

Aflatoxin

States	# of Samples	# Positive		
		5 ppb - 20 ppb	Greater than 20 ppb	
IN, MI, Ohio, PA	3	0%	0%	0%
WI, IL	14	14%	14%	0%
MN, IA, ND, SD	27	4%	4%	0%
<b>Total</b>	<b>44</b>	<b>7%</b>	<b>7%</b>	<b>0%</b>

Oct 1 - Dec 3, 2009

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### MOLD IDENTIFICATION

*Dairyland Laboratories, Inc.*

Forage: Shell Corn

Dairyland Labs Oct-Dec 3

Total # of Samples tested: 1275

Molds	Number of Samples	% of Total Samples
Penicillium	140	10.98%
Aspergillus	110	8.63%
Mucor	199	15.61%
Rhizopus	86	6.75%
Fusarium	403	31.61%
Cladosporium	267	20.94%
Other	70	5.49%

Forage: Corn Silage

Dairyland Labs Oct-Dec 3

Total # of Samples tested: 468

Molds	Number of Samples	% of Total Samples
Penicillium	61	13.03%
Aspergillus	58	12.39%
Mucor	131	27.99%
Rhizopus	26	5.56%
Fusarium	117	25.00%
Cladosporium	61	13.03%
Other	14	2.99%

Oct 1 - Dec 3, 2009

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**Dairy Update**

**Mike Hutjens**

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### Immature Corn Guidelines

- Target optimal moisture for storage
  - High moisture shelled corn: 25 to 30% DM
  - High moisture ear corn: 30 to 34% DM
  - Snaplage: 35 to 40% DM
- Adjust for moisture differences (price per pound of DM)
- Adjust for less starch/more NDF with ear corn and snaplage

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### Signs of Mycotoxin

- Immune suppression (cattle do not respond to disease challenges)
- Rumen disorders
- Loose fecal discharges
- Reduced dry matter intake (over two pounds per cow)
- Hormonal-like changes (udder development and reduced fertility)

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### Mycotoxin Levels

- DON (vomitoxin) < 6.0 ppm  
(parts per million)
- Fumonisin < 25 ppm
- Aflatoxin < 20 ppb  
(parts per billion)
- T-2 toxin < 100 ppb
- Zearalenone < 300 ppb

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### Mycotoxin Binders

- Clay-based compounds such as bentonite, zeolite, and calcium aluminosilicate (50 to 225 gram / cow / day) for aflatoxins
- Yeast cell wall extracts (also call MOS and glucomannans) are effective when dealing with T-2 toxins, DON, and zearalenone (10 grams / cow / day)
- Doubling the level of binder may be helpful

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Summary (Positive Responses/Trial Observations)

Mycotoxin	Carbon	Glucan	Clay	Zeolite	Chol	PVP	Bacteria	Clay/Enzy
AF	6/8	7/9	35/35	11/16		1/2		
STG			1/1					
CPA			0/2	0/1				
DON			0/1					
ZEN	1/1	0/1	1/2	2/3				
T-2	3/3	1/1	0/5	0/1				
DAS			0/1					1/1
FB	0/1	0/1	0/1		1/1			
MON		0/1						
AU		1/1						
"Fusarium"		5/9	1/2	0/1				0/2
AF + "Fusar."		2/2	1/1				1/1	
OA	1/2	0/3	0/5	0/1	0/1			
OA + AF			0/1					
Ergot		2/2	2/2	2/2				
SW			0/1					

Source: Whitlow, NCSU

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### Storage Concerns

- Adding propionic acid (10 to 20 lb per ton) depending on moisture and storage time
- Remove corn fines improves quality
- Feeding corn fines can be risky
- Distillers grains could be risky
- Adding an inoculant can improve fermentation pattern and time

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**Table 2.** Recommended application rates of propionic acid to preserve high moisture corn

Corn moisture %	Lbs. propionic acid to apply per 1000 lbs. wet corn <sup>1</sup>		
	Months corn to be stored		
	6	9	12
20	3.3 - 5.0	4.0 - 6.0	5.0 - 7.5
25	5.0 - 6.5	6.0 - 8.5	7.5 - 10.0
30	6.5 - 8.5	8.5 - 11.0	10.0 - 12.5
35-40	8.5 - 10.5	11.0 - 14.0	12.5 - 15.0

<sup>1</sup>Use lower rate for well-mixed corn and higher rate if acid and grain cannot be well-mixed.

Source: Rankin, 2009

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## Beef Update

Dan Faulkner

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### Mycotoxin Levels for Feedlot Cattle

- **DON (vomitoxin)** < 10.0 ppm (parts per million)
- **Fumonisin** < 30 ppm
- **Aflatoxin** < 300 ppb (parts per billion)
- **T-2 toxin** < 100 ppb
- **Zearalenone** < 300 ppb

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**Mycotoxin Levels for Cows**

- **DON (vomitoxin)** < 5.0 ppm  
(parts per million)
- **Fumonisin** < 25 ppm
- **Aflatoxin** < 100 ppb  
(parts per billion)
- **T-2 toxin** < 100 ppb
- **Zearalenone** < 250 ppb

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**Swine Update**

Hans Stein

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**Mycotoxins in Swine Diets**

Hans H. Stein  
Univ. of Illinois

H. H. Stein

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### Vomitoxin

- Also known as Deoxynivalenol or DON
- Reduces feed intake and weight gain in pigs at levels of 2 to 3 ppm.
- Results in vomiting and sometimes also in diarrhea
- Recommendation: Wheat and wheat by-products: Max 4 ppm
- Complete diets: Max 1 ppm.

H. H. Stein

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### T-2 Toxin

- Pigs are very sensitive to T-2
- Reduces daily gain and daily feed intake
- Impairs the immune system of pigs
- May also result in skin injury on snout and behind the ears.
  
- Recommendations: Max 0.5 ppm in complete diet

H. H. Stein

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### Zearalenon

- Estrogenic compounds
- Pigs most sensitive to Zearalenon
- Feeding 1.5 – 2 ppm for 1 week to pre-pupertal gilts results in swollen vulva
- Feeding > 10 ppm to sows results in increased wean to mating intervals, delayed returns, increased embryo mortality
- Recommendation: Do not feed infected grain to breeding herd – growing-finishing pigs may tolerate up to 2 ppm

H. H. Stein

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### Fumonisin

- 7 different compounds
- May result in damage to liver, lungs, and pancreas
- Max level allowed in complete feed is 10 ppm
  
- Recommendation: Max 12 to 15 ppm in grain and max 10 ppm in complete diet

H. H. Stein

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### Ochratoxin

- Can be produced in relatively cold conditions (12 to 37°C)
- Cool grain to less than 45 F if possible.
- Acute toxicity at 1 to 6 mg/kg BW
- Reduced performance at 1.4 ppm in grain
  
- Recommendation: Final diet needs to contain less than 1 ppm ochratoxin

H. H. Stein

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### Diplodia ear rot

- Not toxic to pigs
- Results in low test weight
- Sometimes feed intake is reduced
- Energy value is probably lower than in normal corn
  
- Recommendation: Clean and blend down

H. H. Stein

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**General recommendations**

- Clean and dry grain very carefully.
- Store at temperatures less than 50F (45 F) if ochratoxin in grain)
- Blend with non-contaminated grain if possible
- If Zearalenon, don't feed to breeding herd

H. H. Stein

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**Drying and Storage Options**

**Ted Funk and  
Jim Morrison**

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**Preparing grain for storage**

- Clean grain stores better – consider screening out broken kernels & fine material
- Natural-air drying is hard to accomplish in late season. You'll probably have to use heated-air drying after mid-November

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**Preparing grain for storage**

- Don't mix wet and dry corn, hoping they will blend and store well.
- Wet kernels will mold and spoil everything.
- Segregate dry, wet, moldy and treat each appropriately.

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**Drying options**

- Recommended storage moisture for clean grain is <15%.
- Or: Dry to 18% moisture, hold at < 50 deg. over winter
- Finish drying to below 15% m.c. in the spring if not fed

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**Drying options**

- Storage at 20% or above is very risky – allowable storage time for 20% corn at 50 deg. is only about two months, and that's for undamaged kernels
- Every 10 deg. increase in grain average temperature cuts allowable storage time in half! Conversely, cool grain stores safe longer.

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**More information**

- MidWest Plan Service: [www.mwps.org](http://www.mwps.org)
- NDSU post-harvest website:  
<http://www.ag.ndsu.nodak.edu/abeng/postharvest.htm>

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