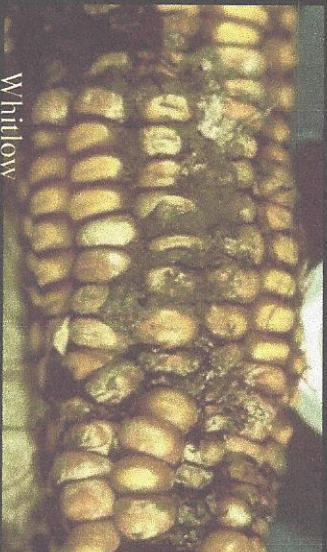


# Examples of toxigenic molds

*Aspergillus*

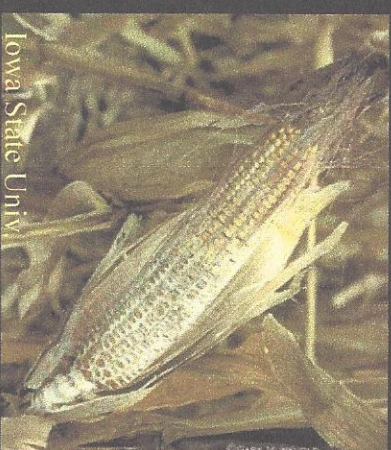


*Penicillium*

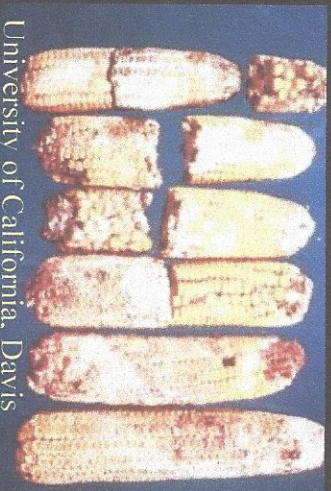


Iowa State University

*Diplodia*

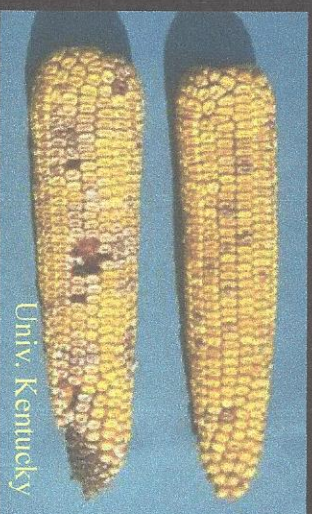


*Fusarium sporotrichoides*



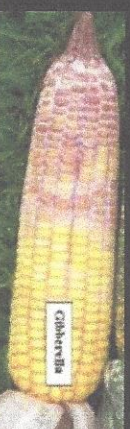
University of California, Davis

*Fusarium verticillioides*

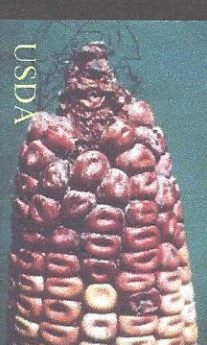


Univ. Kentucky

*Gibberella*  
(*Fusarium*)



<http://fcn.agronomy.psu.edu/2009/fcn0930.cfm>



# Primary Toxicogenic Molds and Mycotoxins

\* Those Thought Most Prevalent and Toxic to Dairy Cattle

## Fusarium

- \* Deoxynivalenol
- \* Zearalenone
- \* T-2 Toxin
- \* Fumonisin
- Moniliformin
- Nivalenol
- Diacetoxyscirpenol
- Butenolide
- Neosolaniol
- Fusaric Acid
- Fusarochromanone
- Wortmannin

## Aspergillus

- \* Aflatoxin
- Ochratoxin
- Sterigmatocystin
- Fumitremorgens
- Fumigaclavines
- Fumitoxins
- Cyclopiazonic Acid
- Gliotoxin



## Penicillium

- Ochratoxin
- \* PR Toxin
- Patulin
- Mycophenolic Acid
- Roquefortine C
- Penicillic Acid
- Citrinin
- Penetrem
- Cyclopiazonic Acid

## Stachybotrys

Stachybotryotoxin



## Ergots

Slobber Syndrome

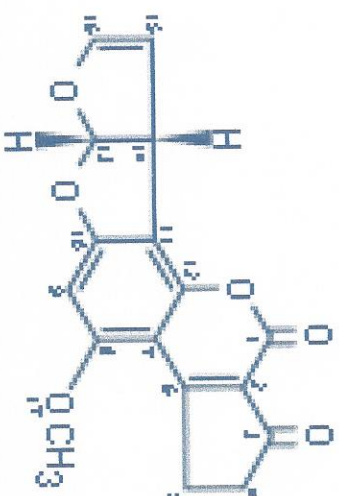
*Claviceps* slaframine

Fescue Alkaloids Lupinosis



*Aspergillus flavus* &  
*A. paraciticus*  
produce aflatoxin

- Liver damage
- Hemorrhage
- Decreased performance
- Immune suppression
- Cancer
- Milk residues (1.7% of consumption)



# Hemorrhagic bowel syndrome associated with *Aspergillus fumigatus*



Sameeh et al., 2005

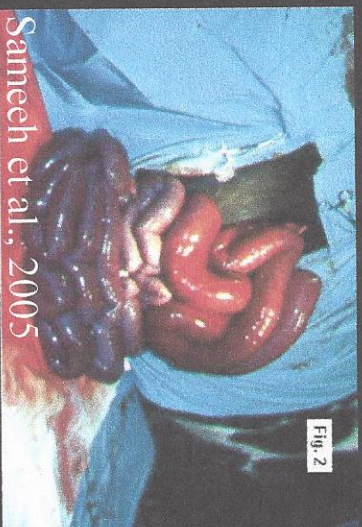
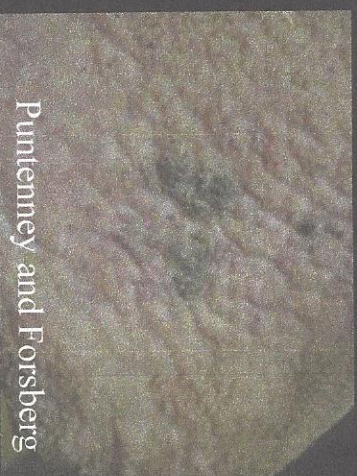


Fig. 2

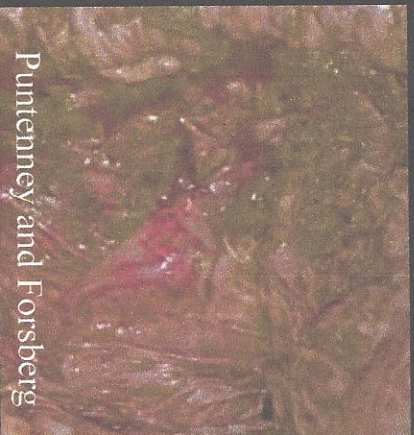
Sameeh et al., 2005

*Aspergillus fumigatus*  
Infection in the rumen, ...



Puntenney and Forsberg

Hemorrhage in the abomasum ... also in the jejunum.....

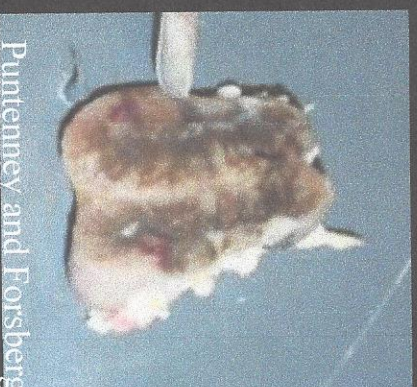


Puntenney and Forsberg



Puntenney and Forsberg

and lymph nodes



Puntenney and Forsberg

# *Fusarium*

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Fumonisin

Deoxynivalenol (vomitoxin)

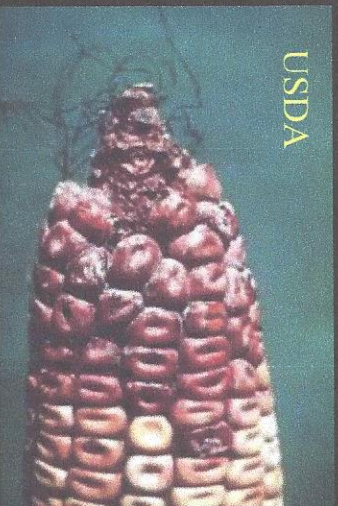
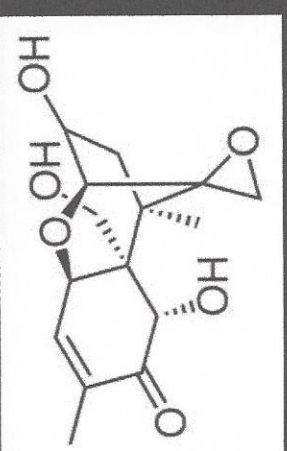
Zearalenone

T-2 toxin

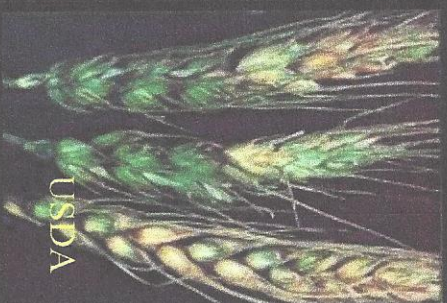
Ipomeanol

# Deoxynivalenol (DON) or vomitoxin

*Fusarium graminearum*  
and also labeled *Gibberillium*



Pink Ear Rot

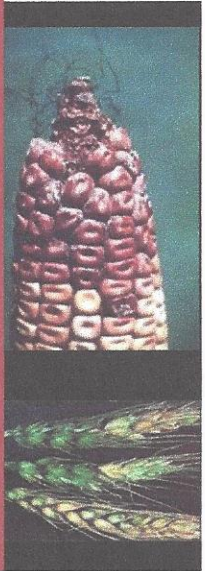
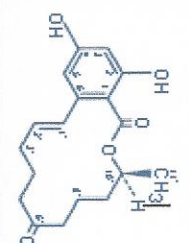


Scab on Wheat

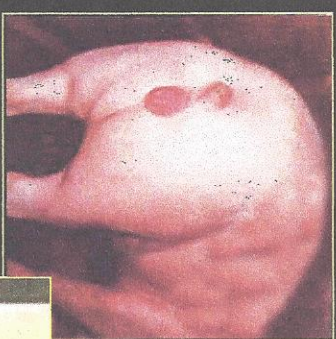
## Animal Symptoms

- Change in feed intake
- Digestive disorders
- Diarrhea
- Reduced performance
- Weight loss
- Aberrant Immune Response

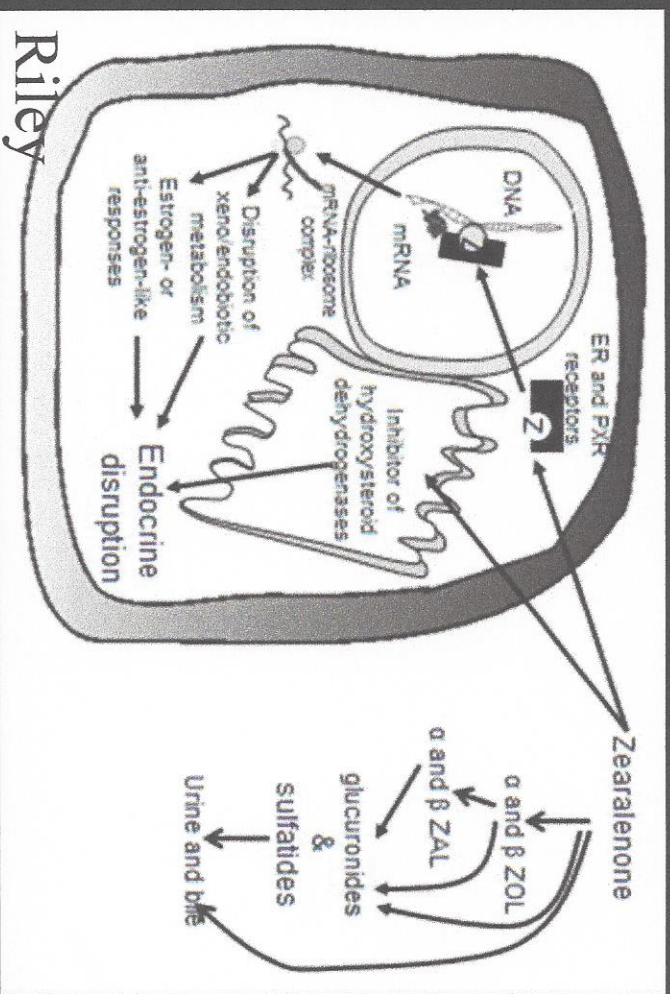
# Zearalenone



Estrogenic effects



(Whitlow, NC State)

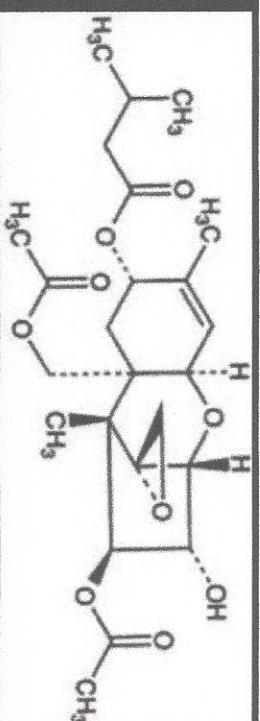


Zearalenone (Z) binds with the cytosolic estrogen receptor producing hormonal mimicry. Estrogenic responses are produced via gene activation which produces mRNAs that code for proteins that are normally expressed by receptor-estrogen complex binding. (Riley, 1998)

# T-2 Toxin

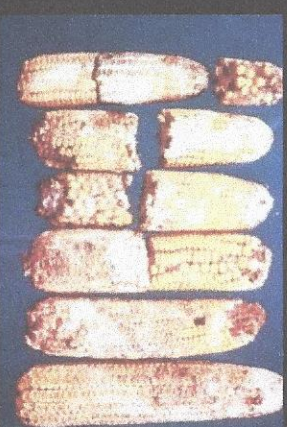
One of the most potent of the trichothecene mycotoxins, but less prevalent  
Interferes with protein synthesis  
Often occurs with other *Fusarium* mycotoxins

Causes a well-documented toxicosis in a variety of animals after both experimental and natural exposures. The toxicosis, which is associated with cellular injury in multiple organ systems, causes an assortment of clinical signs. This toxin and its metabolites have been reported as possible constituents of "yellow rain," a chemical biological warfare agent exploited in South East Asia



*Fusarium sporotrichoides*

Photo: UC Davis



Wei, et al., 1972. Applied Microbiology 23:1029.

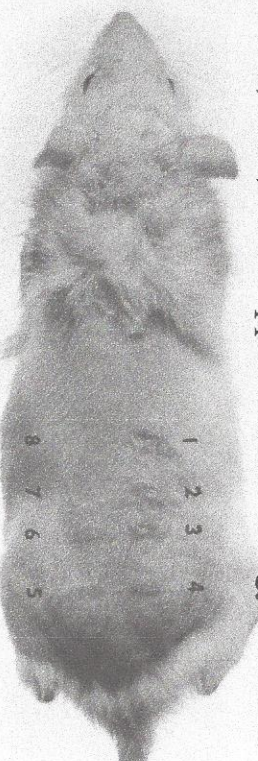
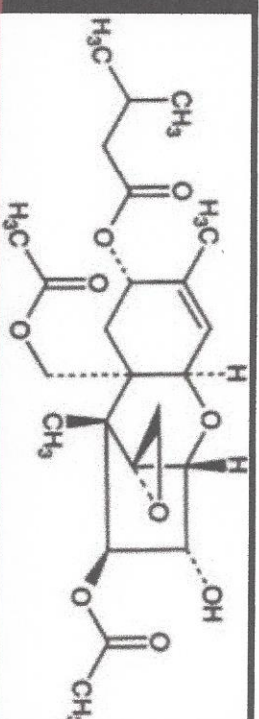


Fig. 2. Rat skin response to graded doses of T-2 toxin. Amounts applied at spots 1-8 were 5, 2, 1, 0.5, 0.1, 0.05, 0.025, and 0 µg, respectively. Photographed 24 hr after application. Responses to the different concentrations were as described in the text.

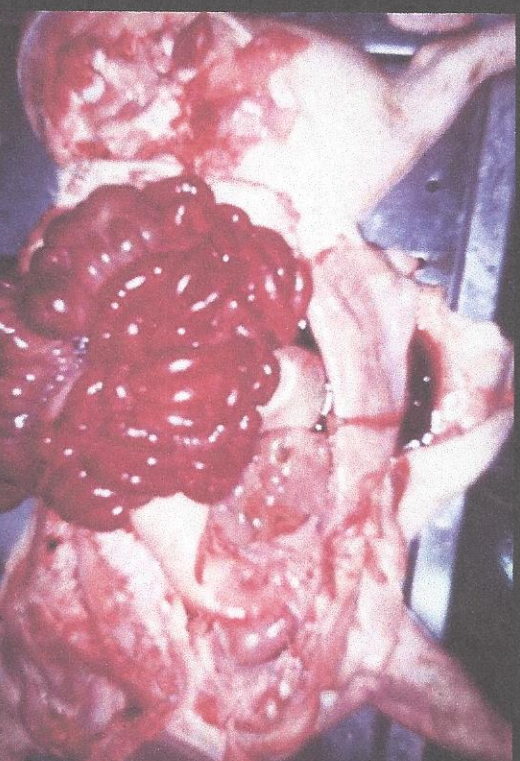


# T-2 Toxin



Symptoms in dairy cattle are severe –

- immune suppression
- intestinal irritation
- diarrhea
- hemorrhagic bowel
- internal hemorrhages – heart & lung
- neurological effects
- poor fresh cow transition
- low feed consumption
- low production
- increased disease
- death



“Hemorrhagic bowel syndrome”  
associated with T-2 toxin

Concern level > 100 ppb

# Selected *Penicillium* Mycotoxins

- PR Toxin - Related to reduced intake, rumen stasis, intestinal irritation, abortion and retained placenta in dairy cattle. A marker for problem silages (Seglar)
- Roquefortine C - Implicated in toxic silage
- Mycophenolic Acid - Implicated in toxic silage
- Patulin - A common mycotoxin in silage. Affects ruminal fermentation. Has been implicated in deaths of cows (Lacey), but has received limited study.
- Ochratoxin - Kidney toxin, toxic to calves, but less toxic to mature (functional) ruminants, but implicated in deaths.



Iowa State Univ.