

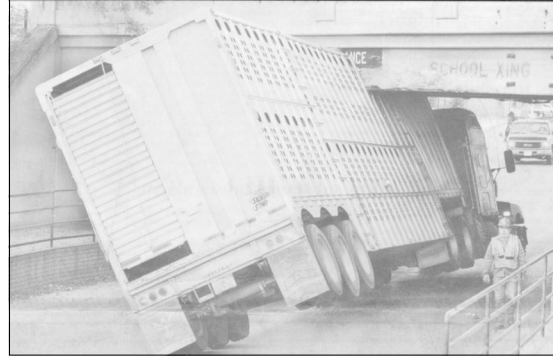
Using Ethanol Byproducts in Beef Cattle Diets

Dr. Greg Lardy

Prepared for the
NCBA Cattlemen's College
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O'Toole's Law!!



Outline

- Dry corn milling procedures
- Byproduct characteristics
- Feeding recommendations
- Cautions

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Dry Corn Milling



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Corn Composition



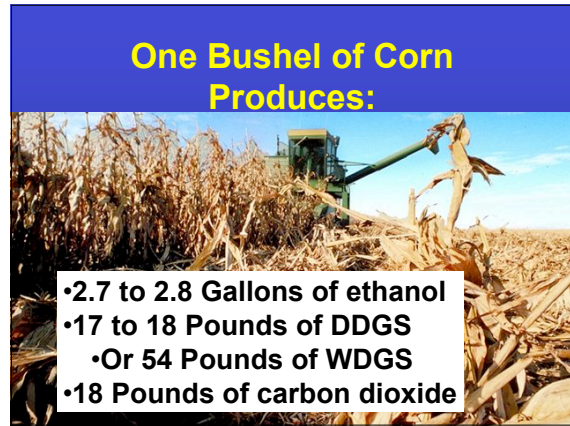
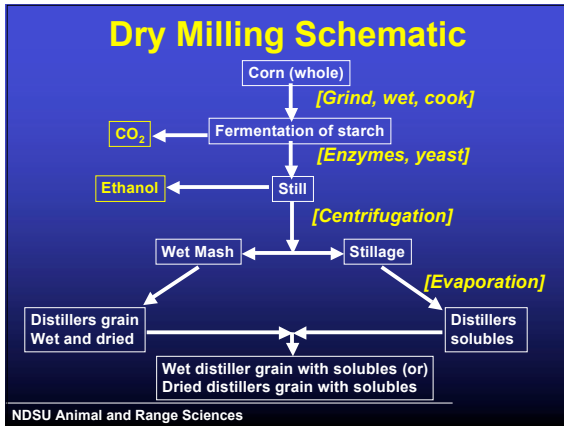
- 13% Water
- 9% CP
- 62% Starch
- 18% Fiber (NDF)
- 4% Fat
- 2% Ash

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Corn Milling Procedures

- Dry milling
 - Corn is hammer milled without prior soaking in water
 - End products
 - Food grade: Corn grits, hominy, alcohol
 - Industrial grade: Ethanol, alcohol

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Average Composition of Corn and Distillers Grains

	Corn Grain	Distillers Grains
CP	9.4	30
NDF	9.5	40
Starch	70	4
Crude Fat	4.2	12
Phosphorus	0.3	0.8

Weiss, et al. Ohio State

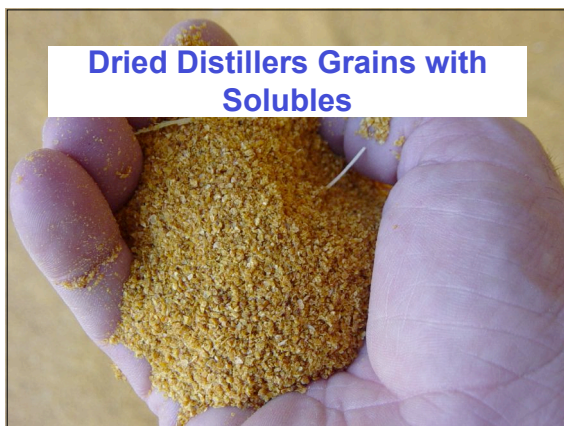
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Variation in Nutrient Composition of DDGS

	Average	CV
CP	30.2	6.4
Fat	10.9	7.8
Ash	5.8	14.7
ADF	16.2	28.4
NDF	42.1	14.3
Phosphorus	0.89	11.7
Sulfur	0.47	37.1

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Spiehs et al., 2002



- ### Dried Distillers Grains Plus Solubles
- Contain:
 - 25 to 32% CP
 - 47 to 57% UIP
 - 68 to 70 NE_g (Mcal/100 lbs)
 - 8 to 10% fat
 - 0.4 to 0.8% P
 - 0.87 to 1.33 K
 - 0.37 to 0.46 S (typically closer to 0.9 to 1.0%)
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Dried Distillers Grains Plus Solubles

- Feed at 10 to 15% of the diet as a source of supplemental protein
- Feed at higher levels as an energy source
 - Economics determine appropriate level
 - Typical inclusion 15 to 25% of the diet
- Maximum recommended level = 40% of the diet
 - N and P will be above requirements and could cause nutrient management problems
 - Sulfur issues

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Ration Mixing

- Ration mixing is important in forage based TMR's
- Separation of DDGS from forages increases likelihood of sulfur related problems

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Handling DDGS

- Doesn't pellet well
- If you want to try pelleting
 - Add wheat midds, soybean hulls or other byproducts
 - 40% or more of the pellet?
- Storage
 - Will bridge and cause problems with conventional storage
 - Flat storage works best

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Commodity Bay Storage



Wet Distillers Grains Plus Solubles



Wet Distillers Grains Plus Solubles

- Contain 25-35% DM (65-75% moisture)
- Contain 30 to 35% CP on a DM basis
- 70 to 80 Mcal NEg/cwt
 - 100 to 115% value of corn
- 8 to 12% fat
- 0.5 to 0.8% P

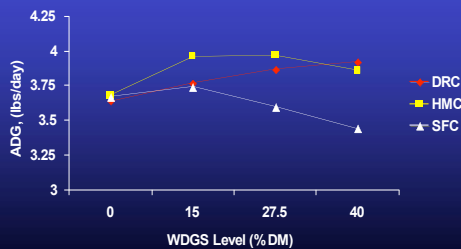
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Wet Distillers Grains Plus Solubles

- Most common use is in backgrounding and finishing rations
- 10 to 30% of the diet (DM basis)
- Replacing corn and protein supplement
- Gains typically improve with inclusion (depending on what you are replacing)

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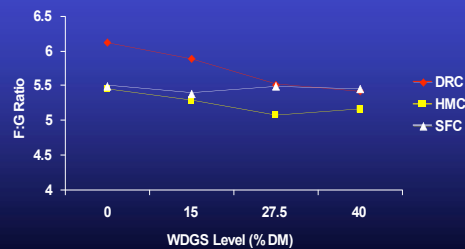
Interaction Between Corn Processing Method and WDGS



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Corrigan et al., 2007

Interaction Between Corn Processing Method and WDGS



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Corrigan et al., 2007



Wet ethanol co-products

WDG



MWDG



- Wet corn distillers grains with solubles (30 to 35% DM)

- Modified wet corn distillers grains with solubles (45 to 50% DM)

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Modified Wet Distillers Plus Solubles

- Approximately 50% DM
- Use at levels similar to wet distillers
- Variation in how plants are producing this product
 - Some are blending wet and dry DGS
 - Most are partially drying the byproduct

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Challenges of WDG use



- Freezes in the winter
 - Chunks make mixing difficult
- Diet less consistent
- Losses due to spoilage
 - Molds rapidly – less than 7 days

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Covered piles



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Corn Condensed Distillers Solubles

- Also referred to as 'corn syrup'
 - Feed industry = CCDS
- Highly variable nutritional content
 - DM
 - CP
 - Fat
 - Energy
 - Minerals
- Occasionally given away if freight is paid

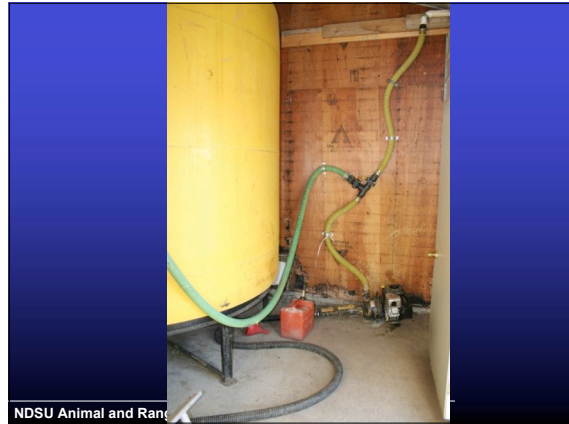
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Corn Condensed Distillers Solubles

- Contains (DM basis):
 - 20 to 30% CP
 - 20% UIP (highly degradable)
 - 80 to 93 NE_g (Mcal/100 lbs)
 - 9 to 15% fat
 - 1.30 to 1.45% P
 - 1.75 to 2.25% K
 - 0.37 to 0.95% S

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Feed Security Issues

- Work with a reputable trucking company
 - Know what they are backhauling
- If the product doesn't look right
 - Don't feed it
- Get a nutrient analysis

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Feeding Limitations

- Concern of sulfur level and incidence of 'PEM' or 'polio'
- PEM
 - Central nervous system disorder
 - Blindness, incoordination, staggering, and seizures
 - Conclusive diagnosis requires diagnosis by a vet diagnostic lab
 - Brain lesions

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Polioencephalomalacia

- Can be caused by sulfur toxicity (among others)
- Excess sulfur results in production of hydrogen sulfide
 - Interferes with cellular energy production

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Polioencephalomalacia

- Maximum recommended sulfur level
 - High concentrate diets
 - 0.40% (water and dietary sources)
 - Forage based diets
 - 0.5% (water and dietary sources)

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Polioencephalomalacia

- Treatment
 - Remove sulfur sources from the diet
 - Supplemental thiamin, steroids, and other anti-inflammatory drugs
 - Reduce brain swelling

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The Future of Distillers Byproducts

- Plants are exploring the production of biodiesel from corn oil
 - Will change nutrient content of DDGS and WDGS
- May allow the use of higher levels in some rations

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The Future for Distillers Byproducts

- Corn milling processes will change
 - Starch fractionation
 - Ferment only starch
 - Corn fiber and proteins as well as solubles combined in a byproduct
- Nutrient content will depend on process method

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Effects of Distillers Byproducts on Meat Quality

- Roeber et al., 2005 J. Anim. Sci
- Tested steaks from steers fed diets containing from 0 to 50% distillers grains
 - Exp. 1; 0, 12.5, 25, 50% DDGS, 25% and 50% WDGS
 - Exp. 2; 0, 10, 20, 40% WDGS or DDGS

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Effects of Distillers Byproducts on Meat Quality

- No effects of increasing level of dry or wet DGS on shear force ($P = 0.20$ and 0.33)
- No differences ($P = 0.224$ and 0.487) in taste panel ratings of:
 - Tenderness
 - Beef flavor
 - Juiciness

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Feeding Dried Distillers Grains on the Ground

- Concern
 - Feed waste
- Fat content may prevent some blowing when fed in meal form
- Feeding on used conveyor belts may be an option

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Feeding on Grass



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Summary

- Ethanol coproduct availability will continue to increase
- Ethanol coproducts are good sources of nutrients for beef cattle
- Pay attention to nutrient analysis and variability
- Transportation economics are important

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Free Electronic Newsletter

- The Ranch Hand
 - Monthly newsletter
- Send an email to:
 - Gregory.lardy@ndsu.edu
 - Name and address in the body of the email

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Questions?

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