

The effects of wet distillers grains with  
solubles in diets for growing and  
finishing cattle on levels and prevalence  
of *Escherichia coli* O157:H7 in feces  
and on hides

USDA/ARS

U. S. Meat Animal Research Center

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The Beef Checkoff

# Experimental Design

After weaning, 605 USMARC steers identified and sorted into pen groups.

- 2 treatments (+ or - WDGS)

- 4 pens per treatment

- 75-77 animals per pen

- ~300 animals per treatment

Study was performed at USMARC feedlot

October 2007 - June 2008

245 days on study

# Experimental Design

Growing phase: day 0 -77 (Oct-Jan).

Diets were with **0%** or **14%** WDGS (DM basis)

Sampled on days 0, 29, 49, and 77

Finishing phase was from day 78-245 (Jan-June)

Diets were with **0%** or **40%** WDGS (DM basis)

Sampled on days 105, 133, 161, 189, 217, and  
245

# Sample Collection and Processing

From each animal on each sample day:

Fecal sample collected by rectal grab.

Hide sample collected by sponge.

*E. coli* O157:H7 was enumerated in each sample by direct plating method.

*E. coli* O157:H7 was detected in each sample by enrichment/IMS method.

All *E. coli* O157:H7 were confirmed by PCR.

# Sample Collection and Processing

For growing phase

Collected and analyzed 1808 fecal and 1808 hide samples.

For finishing phase

Collected and analyzed 3291 fecal and 3291 hide samples.

At the end of the study, fecal samples were processed for generic *E. coli*, and measured for fecal pH and L-lactate concentrations.

# Results - Pretreatment

The percentage (%) of samples with *E. coli* O157:H7 on day 0 of study.

	Control	WDGS
Hide Enumerable	9.78	11.57
Hide Prevalence	55.25	54.53
Fecal Enumerable	6.39	4.01
Fecal Prevalence	6.73	4.99

$P > 0.1$  with pen as experimental unit

# Results - Growing Phase

The percentage (%) of samples with enumerable *E. coli* O157:H7 during growing phase.

	Control	WDGS
Hide Enumerable	1.68	7.40
Fecal Enumerable	2.02	3.59

$P > 0.1$  with pen as experimental unit

# Results - Growing Phase

The percentage (%) of samples with  
*E. coli* O157:H7  
during growing phase.

	Control	WDGS
Hide Prevalence	42.78	58.51*
Fecal Prevalence	8.75	17.75***

\* $P < 0.1$ , \*\*\*  $P < 0.01$  with pen as experimental unit

# Results - Finishing Phase

The percentage (%) of samples with enumerable *E. coli* O157:H7 during finishing phase.

	Control	WDGS
Hide Enumerable	0.00	5.84*
Fecal Enumerable	0.09	2.67***

\* $P < 0.1$ , \*\*\* $P < 0.01$  with pen as experimental unit

# Results - Finishing Phase

The percentage (%) of samples with  
*E. coli* O157:H7  
during finishing phase.

	Control	WDGS
Hide Prevalence	9.20	32.83***
Fecal Prevalence	1.50	14.91***

\*\*\*  $P < 0.01$  with pen as experimental unit

# Results - Finishing Phase

Pen results for percentage (%)  
of hide samples  
with *E. coli* O157:H7 enumerables.

	Control	WDGS
Pen 1	0.00	20.21
Pen 2	0.00	0.83
Pen 3	0.00	0.22
Pen 4	0.00	0.66

# Results - Finishing Phase

Pen results for percentage (%)  
of fecal samples  
with *E. coli* O157:H7 enumerables.

	Control	WDGS
Pen 1	0.00	3.72
Pen 2	0.00	0.28
Pen 3	0.22	1.09
Pen 4	0.22	3.29

# Results - Finishing Phase

Pen results for percentage (%)  
of hide samples  
with *E. coli* O157:H7.

	Control	WDGS
Pen 1	13.24	56.91
Pen 2	14.52	22.50
Pen 3	2.90	22.83
Pen 4	2.90	20.61

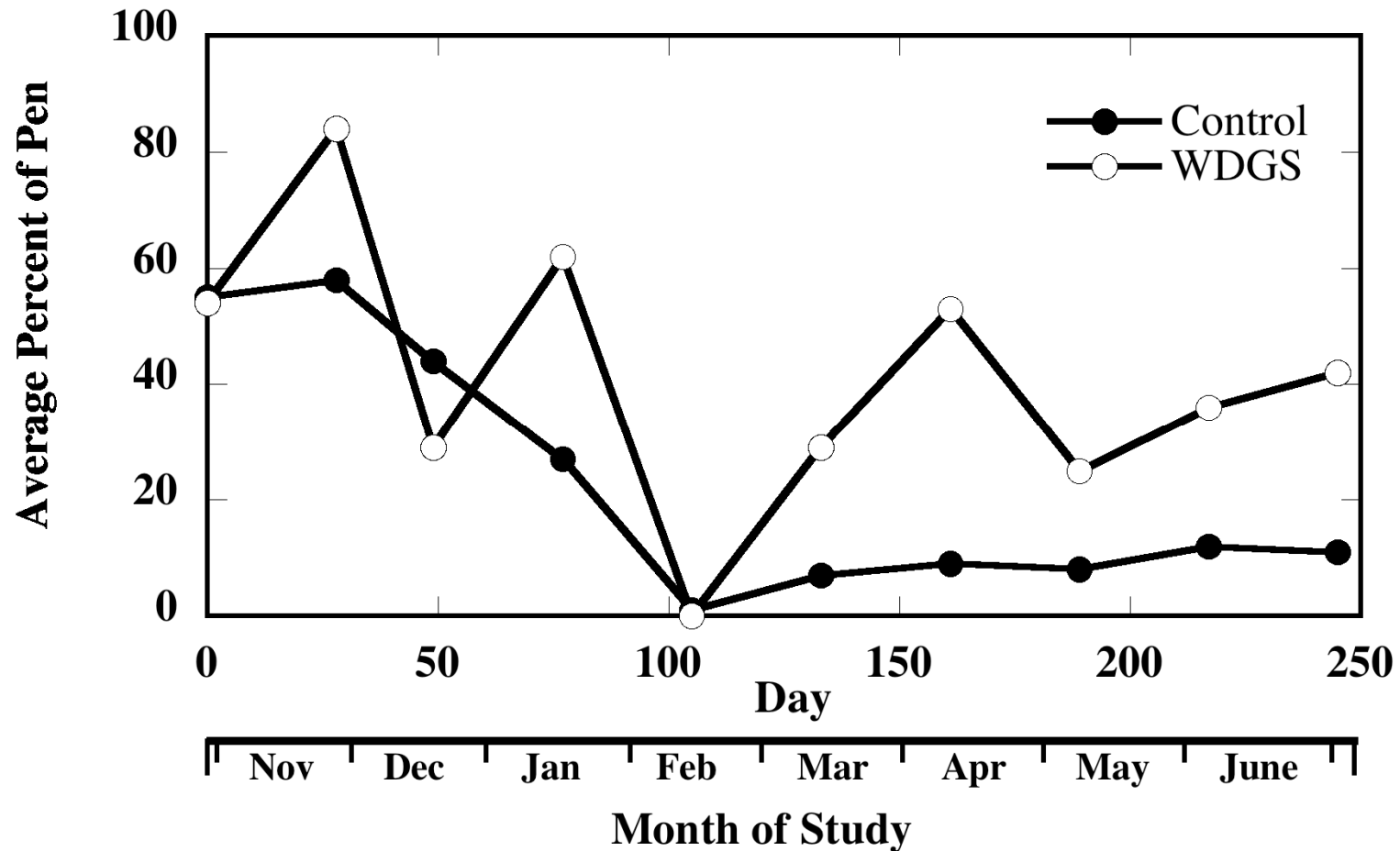
# Results - Finishing Phase

Pen results for percentage (%)  
of fecal samples  
with *E. coli* O157:H7.

	Control	WDGS
Pen 1	0.54	24.47
Pen 2	0.27	1.94
Pen 3	1.79	6.30
Pen 4	2.00	15.35

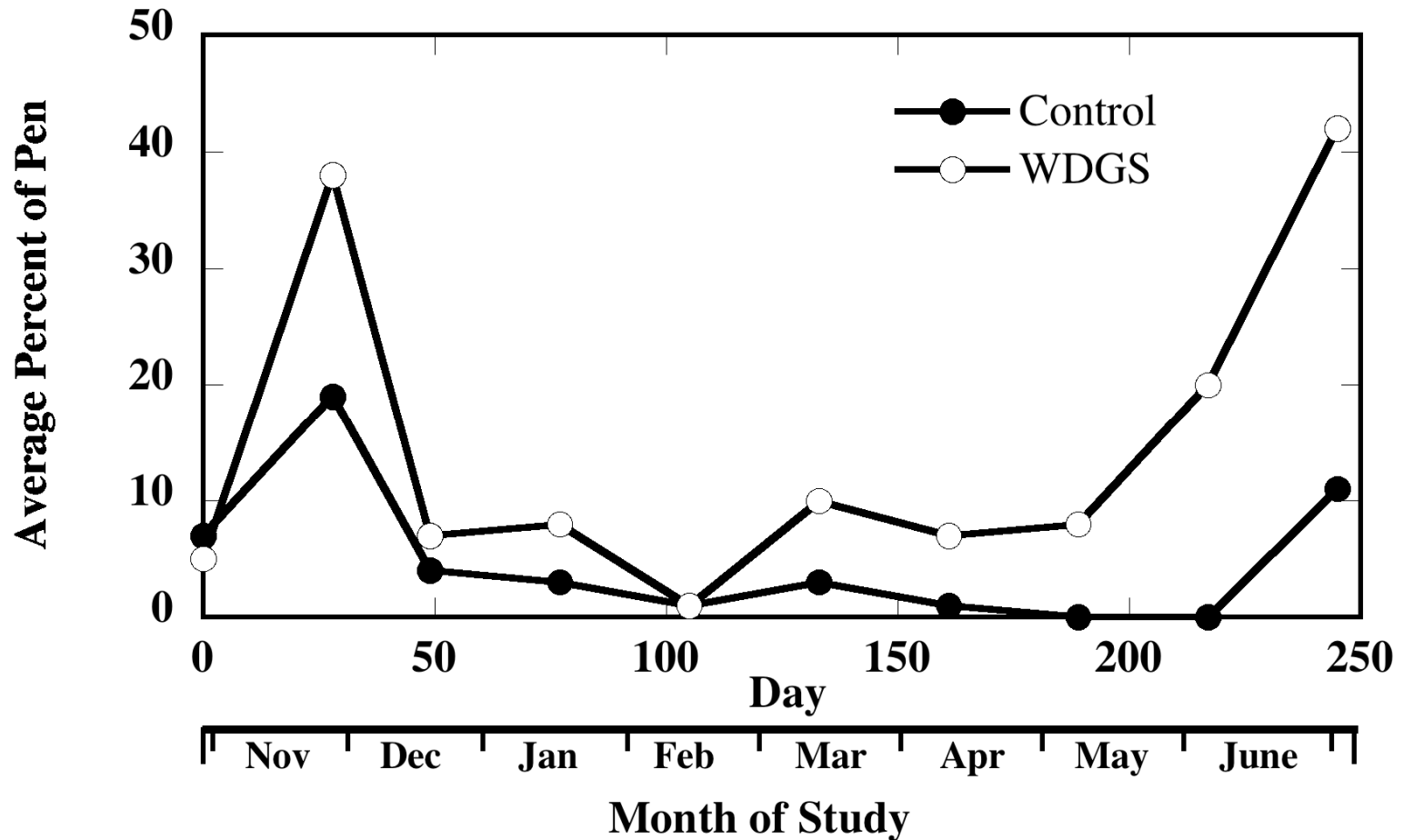
# Results

*E. coli* O157:H7 hide prevalence over time



# Results

## *E. coli* O157:H7 fecal prevalence over time



# Results - Finishing Phase

Effects of WDGS in diet on fecal parameters at end of study.

	Control	WDGS
<i>E. coli</i> O157:H7 Prev (%)	3.26	27.82***
Fecal pH	5.72	6.14***
Fecal L-lactate (mM)	3.76	1.52***
Generic <i>E. coli</i> (log <sub>10</sub> /g)	6.74	7.02***

\*\*\* $P < 0.01$  with pen as experimental unit

# Conclusions

Growing phase, 14 % (DM basis) WDGS in diet:

↑ Fecal *E. coli* O157:H7 prevalence.

Finishing phase, 40 % (DM basis) WDGS in diet:

↑ Fecal *E. coli* O157:H7 enumerables.

↑ Fecal *E. coli* O157:H7 prevalence.

↑ Hide *E. coli* O157:H7 prevalence.

# Conclusions

But all measures for *E. coli* O157:H7 were unexpectedly low for the 0% WDGS diet.

One of four WDGS pens had much higher *E. coli* O157:H7.

Thus, the magnitude of the WDGS effect may be inflated in this study.

# Conclusions

Changes in fecal characteristics from 40% WDGS in the diet may facilitate elevated *E. coli* O157:H7.

# Impact

Feeding 40% WDGS may increase *E. coli* O157:H7 in feces and on hides thus, increasing the risk of carcass contamination at harvest, but...

The impact of this effect during peak prevalence season has yet to be determined.