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# Influence of Feeding Wet Distillers Grains on Fatty Acid Composition of Beef

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## Summary

*Ribeye slices* (M. Longissimus thoracis) *were obtained from 94 calf-fed, crossbred steers. Animals were randomly allocated into three groups and finished for 133 days with corn-based diets and varying levels of wet distillers grains plus solubles (0%, 15% or 30%, DM Basis). No treatment differences were found for total lipid, unsaturated, and saturated fatty acids. However, values of 18:2 9t,12t, total polyunsaturated fatty acids, total amount of trans fatty acids, conjugated linoleic acid and the omega 6: omega 3 ratio were elevated. It appears that wet distillers grains plus solubles finishing diets alters the fatty acid profile of beef.*

## Introduction

Fatty acid composition of beef is important due to potential effects on quality. High levels of polyunsaturated fatty acids (**PUFA**) are associated with higher values of oxidation and compromised beef color. Also, oxidation of fatty acids results in ketones and aldehydes which affect beef flavor. Thus, alterations of the fatty acid profile may affect quality attributes such as flavor, color, and lipid oxidation capacity.

Negative correlations between beef flavor and PUFA lead to lower consumer acceptance as PUFA content increases. Little research has been conducted on the effects of distillers grains on beef fatty acid profile of beef. Therefore, the aim of this work was to determine the effects of feeding WDGS on fatty acid profile in beef.

## Procedure

Ninety-four calf-fed, crossbred steers were allocated to three different treatments (0%, 15% or 30% WDGS, DM basis) and fed for 133 days. After grading, a one-quarter inch thick ribeye slice (*M. Longissimus thoracis*) was excised from each carcass at the 12th/13th rib and transferred to the Meat Laboratory at the University of Nebraska under refrigeration. The ribeye slices were trimmed, submerged in liquid N, pulverized and stored at -112°F. Total lipid was extracted with chloroform: methanol (2:1, v/v) mixture. An extract containing 25 mg of lipid was converted to fatty acid methyl esters and separated by Gas Chromatography (GC) using a capillary column. Column oven temperature was programmed at 284° to 428°F at 3.6°F/minute and held at 428°F for 20 minutes. Injector and detector temperature was maintained at 518° and 572°F, respectively, and helium was the carrier. Individual fatty acids were identified by comparison of retention times with known standards.

## Results

Results of this study are presented in Table 1 and Table 2. Diets did not significantly influence total lipid content ($P = 0.19$), total unsaturated fatty acids (**UFA**) ($P = 0.76$) or total

**Table 1. Weight percentage of fatty acids[1] and fat content of ribeye slices (*M. Longissimus thoracis*) from steers fed with WDGS finishing diets.**

| | Dietary treatments[2] | | | |
|---|---|---|---|---|
| Fatty acids | 0% | 15% | 30% | *P*-value |
| Fat% | 5.44 | 5.91 | 5.94 | 0.19 |
| 14:0 | 2.94 | 2.96 | 2.84 | 0.50 |
| 14:1(n-5) | 0.64[a] | 0.63[a] | 0.54[b] | 0.03 |
| 15:0 | 0.54[b] | 0.57[a] | 0.49[b] | 0.02 |
| iso16:0 | 0.93 | 0.90 | 0.81 | 0.22 |
| 16:0 | 26.35[a] | 25.83[ab] | 25.12[b] | <0.01 |
| 16:1(n-7) | 3.50[a] | 3.23[b] | 2.90[c] | <0.01 |
| 17:0 | 1.43[b] | 1.66[a] | 1.43[b] | 0.01 |
| iso18:0 | 0.66 | 0.73 | 0.64 | 0.24 |
| 17:1(n-7) | 1.08[ab] | 1.17[a] | 0.98[b] | 0.03 |
| 18:0 | 13.76[b] | 14.13[b] | 15.03[a] | 0.02 |
| 18:1Δ6-11*t* | 2.28[b] | 2.61[b] | 3.76[a] | <0.01 |
| 18:1(n-9) | 36.14[a] | 34.66[b] | 34.02[b] | <0.01 |
| *cis*-vaccenic [C18:1, n7] | 3.20[a] | 2.77[b] | 2.41[c] | <0.01 |
| 18:1Δ13*t* | 0.10[c] | 0.51[b] | 0.64[a] | <0.01 |
| 18:1Δ14*t* | 0.49 | 0.48 | 0.43 | 0.06 |
| 19:0 | 0.02 | 0.01 | 0.04 | 0.26 |
| 18:2 9*t*, 12*t* | 0.003[b] | 0.01[b] | 0.03[a] | 0.01 |
| 18:2(n-6) | 3.27[b] | 4.22[a] | 4.50[a] | <0.01 |
| 20:0 | 0.005[b] | 0.007[b] | 0.03[a] | 0.02 |
| 18:3(n-3) | 0.07 | 0.09 | 0.06 | 0.51 |
| 20:1(n-9) | 0.15 | 0.16 | 0.20 | 0.06 |
| CLA *cis-9,trans-11* | 0.21[b] | 0.22[ab] | 0.27[a] | 0.04 |
| 20:3(n-6) | 0.29[b] | 0.33[ab] | 0.35[a] | 0.05 |
| 20:4(n-6) | 1.06 | 1.02 | 1.03 | 0.92 |
| Others | 0.93 | 1.07 | 1.49 | 0.06 |

[1]Weight percentage values are relative proportions of all peaks observed by GC.
[2]Wet distillers grains plus solubles.
[a,b,c]Means in the same row having different superscripts are significant at $P \leq 0.05$ level.

**Table 2. Weight percentage of total fatty acids[1] of ribeye slices (*M. Longissimus thoracis)* from steers fed with WDGS finishing diets.**

| | Dietary treatments[2] | | | |
|---|---|---|---|---|
| Fatty acids | 0% | 15% | 30% | *P*-value |
| Trans | 2.87[c] | 3.61[b] | 4.86[a] | <0.01 |
| UFA | 52.47 | 52.15 | 52.10 | 0.76 |
| PUFA | 4.90[b] | 5.91[a] | 6.23[a] | <0.01 |
| SFA | 46.60 | 46.79 | 46.42 | 0.79 |
| UFA:SFA | 1.13 | 1.12 | 1.13 | 0.84 |
| Omega 3 | 0.07 | 0.09 | 0.06 | 0.51 |
| Omega 6 | 4.62[b] | 5.60[a] | 5.86[a] | <0.01 |
| Omega 6: Omega 3 | 26.72[c] | 33.64[b] | 41.75[a] | <0.01 |

[1]Weight percentage values are relative proportions of all peaks observed by GC.
[2]Wet distillers grains plus solubles.
[a,b,c]Means in the same row having different superscripts are significant at P ≤ 0.05 level.

saturated fatty acids (**SFA**) ($P = 0.79$). As WDGS in finishing diets increased, higher concentrations of 18:0 ($P = 0.02$), 18:1Δ6-11*t* ($P < 0.01$), 18:1Δ13*t* ($P < 0.01$), 20:3 (n-6) ($P = 0.05$), 18:2 9*t*,12*t* ($P = 0.01$), and total trans ($P < 0.01$) were observed. Values of 18:2 (n-6), polyunsaturated (**PUFA**) and omega 6 fatty acids were significantly higher ($P < 0.01$, $P < 0.01$ and $P < 0.01$ respectively) in ribeyes from cattle fed 15% and 30%. As WDGS increased in finishing diets the values of 14:1 (n-5), 15:0, 16:0, 16:1 and *cis*-vaccenic [18:1, n-7] fatty acids decreased ($P = 0.03$, $P = 0.02$, $P < 0.01$, $P <0 .01$ and $P < 0.01$, respectively). Research suggests that consumption of conjugated linoleic acid (**CLA**) *cis-9 trans-11* may have human health benefits. This study shows that WDGS in the diet increased CLA *cis-9 trans-11* content and omega 6:omega 3 ratio, ($P = 0.04$ and $P < 0.01$, respectively).

These data suggest feeding distillers grains alters the fatty acid profile of beef. Higher values of PUFA could support greater oxidation, reduction in color stability and possibly impact flavor. Further work is needed to clarify these relationships.

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