Manitoba Forage Council
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Fact Sheet

September 2006

GROWING BEEF FOR THE HEALTH FOOD MARKET

Media hype and strong consumer demand has sparked intense interest in food products that are deemed "healthy for you". More and more consumers are now facing health issues due to aging and obesity, and as a result, are looking for products that can maintain or improve their health. In response, many food companies, and even some primary producers, have developed new products and/or modified their product or production method to meet the demand. Products such as Omega-3 enriched eggs, and cholesterol reducing margarines and cereals, are just a few of the foods marketed today that have ingredients that are beneficial to consumers' diets. This growing trend towards healthier foods presents an excellent opportunity for beef producers.

A Niche Opportunity for Manitoba Beef Producers

Manitoba's wealth of good quality pasture and abundant livestock supply provides a sturdy foundation for those interested in developing and marketing a "healthy beef" product.

A recent study completed by Dr. Shannon Scott and her co-workers, Dr. Paul McCaughey and Dr. Katherine Buckley, of Agriculture and Agri-Food Canada, Brandon, MB, has generated some very exciting results. The study determined that cattle raised on pasture and short-finished with a mixture of barley, hay, and black oil sunflower seeds (14% of diet dry matter) produce beef with a relatively high conjugated linoleic acid (CLA) level as compared to cattle finished only on barley and hay. These results are very promising since CLA isomers have been shown to affect numerous biological processes, including the suppression of cancerous tumours. In addition to anti-cancer properties, CLA's have also been shown to moderate body weight, body composition, glucose metabolism and the immune system.

This study presents a unique opportunity for beef producers interested in going the extra mile. Just as the egg producers have developed Omega-3 eggs, beef producers have an opportunity to produce a more nutritious beef product — "CLA beef". Now that more ranchers are using extended grazing, here's a way to utilize those practices, incorporate sunflower seeds in the diet and provide an alternative product for consumers interested in meat with improved health properties.

Background Information

Fats and Fatty Acids

Fats belong to a group of compounds called lipids. They are a very important part of all cells as they assist with membrane behaviour and all cell functions.

Triglycerides are a major component found in food fats. These triglycerides contain three fatty acids which are classified as saturated, monounsaturated or polyunsaturated. Generally, saturated fats occur in a solid form and unsaturated fats in a liquid form.

Essential fatty acids belong to the class of polyunsaturated fatty acids (PUFAs). Omega-3 fatty acids are found in oily fish like salmon, flaxseed, canola oil, and grass-fed beef, whereas omega-6 fatty acids are specifically found in sunflower, corn and safflower oils, and meat from grain-fed livestock. →

This project received support from the: Beef Cattle Research Council, Manitoba Rural Adaptation Council, Manitoba Cattle Producers Association, Agriculture and Agri-Food Canada, Brandon, MB, Matching Investment Initiative, Lonza, Prairie Sun Seeds and the Manitoba Forage Council.

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These polyunsaturated fatty acids are required for regulating metabolism, maintaining bone health, stimulating skin and hair growth, and maintaining reproductive capability. Omega-6 and omega-3 fatty acids play a vital role in normal growth and development and brain function. However, an excess amount of the omega-6 linoleic acid in the body promotes inflammation. The omega-3 fatty acid counters the inflammation, indicating that a proper balance between the two types of essential fatty acids is very important. Studies have shown that a ratio of less than 5:1 (omega-6 to omega-3) is recommended for optimum health (Simopoulos, 1999, Prostaglandins, Leukotrienes & Essential Fatty Acids 60: 421-9). North American diets tend to contain a much higher ratio of omega-6 to omega-3 – *from 11 to 30 times higher* than the optimum ratio of 5:1 or less. This can lead to heart disease, cancer, depression, arthritis and asthma.

Conjugated Linoleic Acids – CLA's

A conjugated linoleic acid (CLA) is a derivative of linoleic acid. CLA is produced as a result of the metabolism of linoleic acid during the rumination process in cattle, sheep, and goats. It is also found in dairy products such as whole milk, cheddar cheese, yogurt and butter. There are many CLA isomers in beef and dairy products but the predominant isomer is the *cis*-9, *trans*-11-CLA – the focus of Dr. Scott's study.

Animal studies have shown notable health benefits from the consumption of CLA's, namely:

- Anti-cancer properties found for beef extracts (Pariza et al. 1979;1985);
- Inhibition of cancer cell growth by CLA found in milk fat (Parodi 1997);
- Enhanced immune function (Albers et al. 2003);
- Reduced body fat mass (Blankson et al 2000); and;
- Decreased blood cholesterol (Nicolosi et al. 1997).

Research Project

Effect of Diet and Time on Feed on the CLA Level in Beef

September 2003 to December 2005

Summary

Previous studies have shown that wild game contains a high level of CLA's and such is the case with cattle slaughtered directly off pasture. The downside of slaughtering cattle directly off pasture, however, is the resulting lower carcass grade and the "wild" taste some consumers find unpalatable. On the flip side, when cattle are finished solely on grain, the CLA level in the meat drops significantly.

The objective of Dr. Scott's research project →

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was to develop a feeding regime that would maintain the CLA nutritional attributes of pasture-fed beef and have the carcass grade at the same level as cattle finished with grain.

The study evaluated the lipid fatty acid profiles of the beef after they were fed four different diets. The cattle were all pasture fed throughout the summer and then slaughtered or placed into the feedlot for finishing for one to three months on the diets indicated below. The study used black sunflower seeds (SFS), a good source of polyunsaturated fatty acids (Mir et al. 2000), and L-carnitine (CAR), a vitamin-like compound shown to increase fat deposition and marbling in cattle, (Greenwood et al. 2001) in the experimental diets.

The cattle in the feedlot were fed one of the following experimental diets:

1. Control diet (-SFS-CAR): 80% barley, 20% hay, minerals and vitamins.
2. Sunflower seeds plus carnitine (+SFS+CAR): Whole black sunflower seeds (replaced barley to a level of 14% of diet dry matter)* and 200 mg supplemental L-carnitine (Carnipass®, Lonza, Inc., USA) per kg of diet dry matter.
3. Sunflower seeds (+SFS-CAR): Whole black sunflower seeds (replaced barley to a level of 14% of diet dry matter) and no supplemental L-carnitine.
4. Carnitine (-SFS+CAR): No sunflower seeds and 200 mg supplemental L-Carnitine per kg feed dry matter.

* 14% of diet dry matter (DM) - (if steers ingest 10 kg of DM, they will eat 1.4 kg of SFS DM; therefore, if SFS are 96% DM, then the steers will eat 1.5 kg of SFS).

Methodology

- 64 steers grazed 11 paddocks (94.4% grass, 4.6% alfalfa) from May 13 to September 2, 2003.
- 16 steers (503.1 ± 34.9 kg) were slaughtered off pasture and carcass data and ribeye steaks were obtained.
- The remaining 48 steers were finished with the four different diets outlined above.
- Blood was sampled every 14 days for analysis of plasma carnitine.
- Feed intake was measured every 7 days; feed was sampled for nutrient, fatty acid and carnitine analysis.
- Steers were weighed every 14 days to calculate average daily gain in bodyweight.
- One group of 16 steers was slaughtered every 28 days (3 groups in total) at approximately 500 kg body weight (BW) and 4 mm backfat. The cattle were slaughtered on days 28, 56 and 84.
- Carcass data and ribeye steaks were obtained.
- One steak per animal was analysed for meat quality.
- One steak per animal was analysed for moisture, crude fat and protein.
- Lipid was extracted and analyzed for fatty acids.

Results

Trial results indicate that cattle finished strictly on barley and hay had their CLA level drop to almost half the level found in steers slaughtered directly off pasture. However, the addition of sunflower seeds to the finishing diets of pasture-fed steers doubled the level of the *cis*-9, *trans*-11 CLA as compared to diets without sunflower seeds. Adding sunflower seeds to the steers' diet had →

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Results Continued

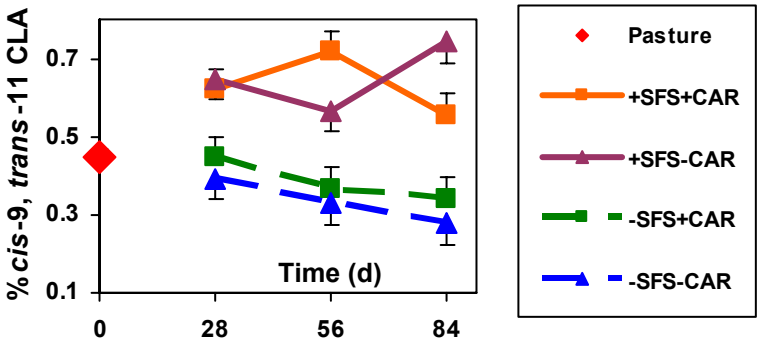
no adverse impact on carcass grade and adding L-carnitine to the diet produced no significant change to either grade or CLA level. The sunflower seeds significantly increased the omega-6 to omega-3 ratio; however, it stayed, on average, below the desired ratio of 5:1.

These two graphs illustrate the trial results.

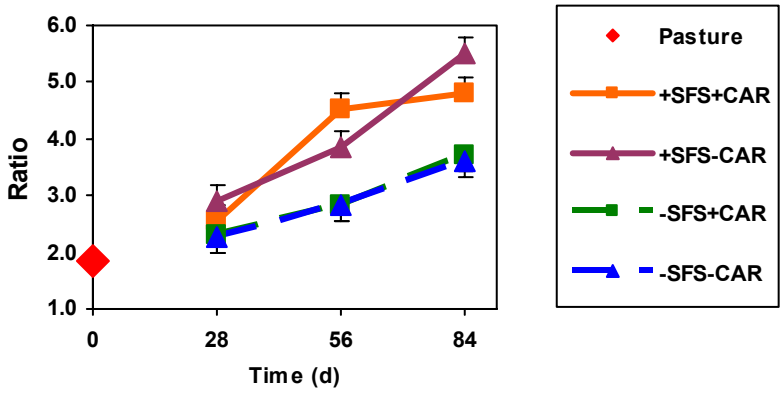
Fat extracted from whole ribeye steaks from steers fed diets containing sunflower seeds (i.e. +SFS+CAR and +SFS-CAR diets) had a significantly higher *cis-9, trans-11* CLA level than those steers fed diets without sunflower seeds (i.e. -SFS+CAR and -SFS-CAR diets).

CLA levels decreased significantly with longer feeding periods, especially in the steers fed diets without sunflower seeds.

Effect of diet and time on the *cis-9, trans-11* level in whole ribeye steaks



Effect of diet and time on the omega-6 to omega-3 ratio in whole steaks



Fat extracted from ribeye steaks from steers fed diets containing sunflower seeds (i.e., +SFS+CAR and +SFS-CAR) had a significantly higher ratio of omega-6 to omega-3 than steaks from steers fed diets without sunflower seeds (i.e. -SFS+CAR and -SFS-CAR).

The ratio also increased with a longer time on feed. However, on average, the ratio remained under the healthy threshold of 5:1.

For more information on this project contact:
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