Modifying Fatty Acid Levels in Beef

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Project Title:

Modifying and Controlling the trans Fatty Acid Profile in Beef

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Background

Any doubts that there is widespread consumer interest in "healthy" fats and "bad" fats can be put to rest by trying to count the number of omega-3 enriched and trans-fat free products in the nearest grocery store. The potential health attributes of dietary fatty acids, such as saturated, mono- and poly-unsaturates, trans-fats, omega-3's, and conjugated linoleic acid (CLA), has led to considerable media focus, consumer confusion, marketing opportunities for food companies, and very strong recommendations from the Federal Minister of Health.

In fact, Health Canada has recommended that the trans fat content of pre-packaged foods and food service menu items not exceed 5% of total fat content. Fresh retail beef and other ruminant products are not included in this recommendation, primarily because trans-fats are naturally occurring in fresh beef and milk. As well, the trans fats found in ruminant products (e.g. CLA) may actually benefit human health. However, a great deal is still unknown about the health effects of individual trans fatty acids and how these can be incorporated into lean beef to provide additional nutritional benefits.

In monogastrics like humans, swine and poultry, fatty acids from the diet are absorbed "as-is" by the digestive system. If the diet contains more omega-3 or polyunsaturated fat, there will be more omega-3 or polyunsaturated fat in the animals' meat or eggs. If the diet contains no trans fats, there will be no trans fat in the meat or eggs.

Simply adjusting the fatty acid content of the diet will not have the same effect in cattle and other ruminants. The energy content of the diet affects which microbes are most prevalent in the rumen. Grain-based diets contain a lot of highly digestible starch. The microbes that digest starch produce volatile fatty acids that cause the rumen pH to drop. On the other hand, high-fiber forage-based diets are digested more gradually, and rumen pH does not change as much. Some studies have shown that forage-fed cattle have a slightly higher proportion of omega-3 and CLA than grain-fed cattle. This has led to suspicions that rumen pH is one of the factors determining omega-3 and CLA levels in beef.

Because Western Canadian cattle are fed barley-based finishing diets, there has been interest in developing a cost-effective way to alter the fatty acid composition of grain-fed beef.

Objectives

To determine whether the fatty acid composition of feedlot cattle finished on a typical barley diet could be altered by adding a pH buffer to barley diets or by replacing barley grain with wheat distillers' dried grains (DDGS).

What they did

Two feedlot trials were conducted. In trial 1, calves were fed a barley grain-based diet, with or without a rumen buffer (1.5% sodium sequicarbonate). Performance, carcass, meat composition, and taste panel data was recorded, and fatty acid composition of the backfat and the ribeye was determined. In trial 2, calves were fed one of four diets: 85% barley control (no wheat DDGS), 65% barley (20% DDGS), 45% barley (40% DDGS), or 25% barley (60% DDGS) for a 133 day finishing period. Fatty acid composition was evaluated in the brisket and diaphragm.

What they learned

In trial 1, the buffer did not affect animal performance, carcass measurements, meat color or flavour, nor the total amounts of saturated fat, poly-unsaturated fat, omega-3, trans fat or CLA in the marbling or backfat. Cattle fed the buffered diet had a lower omega-6:omega-3 ratio, which is thought to be good from a human health perspective. However, the beneficial impacts of the buffer were most obvious early in the feeding period. Fatty acid composition of the beef did not differ between the buffer and non-buffered diets after the first 50-60 days of feeding.

In trial 2, increasing the DDGS inclusion rate from 0 to 60% increased total fat levels in the diets from 1.9 to 3.7%. Feeding wheat DDGS did not significantly affect the total amounts of saturated fat, omega-3, or trans fats in either the brisket or diaphragm. Feeding wheat DDGS increased the proportion of poly-unsaturated fatty acids, the omega-6:omega-3 ratio, improved the trans fatty acid profile in the brisket and diaphragm, and enhanced the CLA profile in the diaphragm.

The approaches used in this experiment had relatively small impacts on the proportions of the different fatty acids found in beef. However, these researchers felt that optimal combinations of dietary buffer, DDGS and sunflower seed or flax supplements may further enhance the fatty acid composition of beef.

What it means

Understanding how the ruminant diet affects the fatty acid composition of beef will support efforts to develop and market beef products with specific nutrient attributes.

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