

Forage Diets Produce Healthier Meat

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Bison researchers at the University of Saskatchewan have found that bison finished on high forage diets yield healthier meat products than those on high concentrate or grain based diets. Tyler Turner, a U of S animal science graduate student sponsored by the Saskatchewan Agriculture and Food Development Fund (ADF) and the Canada-Saskatchewan Agri-Food Innovation Fund (AFIF) recently completed work looking at the effects of finishing diets on fatty acid profiles of bison fat and muscle. Previous work done by other researchers in this area indicated that grass finished bison meat is generally lower in total fat than meat from grain fed bison. In humans, diets with low fat content and containing lean meat have been associated with a decreased incidence of heart disease and cancer. Turner's investigations also found that in addition to having less total fat, forage fed bison have a more favourable fatty acid profile than their feedlot finished counterparts.

What does having a favourable fatty acid profile mean? In humans dietary fats are actually necessary for a balanced diet and good health but too much fat or excesses of the wrong kinds of fat can lead to problems like high cholesterol and coronary blood vessel disease. There are "good" and "bad" fats in red meat. Omega-6 and omega-3 fatty acids are essential polyunsaturated fatty acids. Essential fatty acids (EFAs) are fats necessary for health that humans cannot synthesize, and must be obtained through dietary sources. EFAs are long-chain polyunsaturated fatty acids derived from linolenic, linoleic, and oleic acids. These are considered "good" fats. Omega-6 and omega-3 fatty acids are best consumed in a ratio of 4 to 10:1 (four to ten omega-6 to one omega-3), but many Western diets contain between 10 and 20 to 1 in favour of omega-6, which is not healthy. We eat too much omega-6 fat and not enough omega-3 fat, and experts say our current consumption of omega-6 has doubled from what it was 50 years ago. By comparison, our intake of omega 3 fatty acids has shrunk. These omega fatty acids will only maintain their status as "good" fats if they are consumed in relatively balanced amounts. On the other hand, consumption of saturated fatty acids has been linked with several human medical conditions and these are considered "bad" fats.

Research has demonstrated that bison meat is leaner than other meats and contains more favourable ratios of omega fatty acids. The work done by the University of Saskatchewan was aimed at determining which of several different feed finishing programs might maximize these bison meat characteristics, and in a separate study, compared the fatty acid profile of bison meat to those from other ruminant species on similar finishing programs.

In 2001 Western Canadian bison producers were surveyed to determine common feeding and finishing practices. As luck would have it, there was a severe drought occurring at the time and forage or grass finished bison were difficult to find. However, four general management classifications for finishing bison were determined and subsequently used in this study. They were defined as follows:

X Forage fed (n=4 farms) - bison remained on some type of forage, grass or legume throughout the finishing period. Nineteen bison ranging in age from 16 to 28 months at slaughter were

sampled.

- X Grain fed less than 90 days (n=3 farms) - bison were fed on pasture, and then switched to a high grain diet for less than 90 days prior to slaughter. Nine bison ranging in age from 19 to 28 months at slaughter were sampled.
- X 50:50 Forage:Grain (n=5 farms) - bison spent the entire finishing period on pasture, but had free choice access to concentrates during that period. Twenty bison, ages from 22 to 32 months at slaughter were sampled
- X Feedlot finished (n=4 farms) - bison were fed and housed under similar conditions as found in traditional North American beef feedlot operations. Feeding consisted of high-energy concentrate diets with free-choice hay. Twelve bison, ages from 16 to 25 months at slaughter were sampled.

Pasture types included a mixture of native prairie, legume or grass varieties, usually in a rotational grazing combination. Primary ingredients of the high concentrate diets reported by bison producers included barley, oat, and cereal grain screening pellets. The one exception was a feedlot producer who fed a total mixed ration containing cereal grain, pulse crop, and oil seed screenings along with cereal silage. No two producers fed identical diets although they were selected from predefined categories. Samples of muscle and fat tissue from the selected study farm animals were collected at slaughter over a period of two years and came from all over the Canadian prairies from Winnipeg, Manitoba, to Grand Prairie, Alberta. Tissues were processed and analyzed at the University of Saskatchewan for their content of 30 different saturated and unsaturated fatty acids.

General observations resulting from Tyler Turner's research are as follows:

- X There was no difference between dietary groups in the total saturated fatty acid content of muscle tissue (meat).
- X The total polyunsaturated fatty acid content of meat from Forage fed and 50:50 Forage:Grain fed bison was greater than bison fed grain less than 90 days or feedlot finished, resulting in a more favourable polyunsaturated to saturated fatty acid ratio for the Forage Fed and 50:50 Forage:Grain treatments.
- X The forage fed treatment had the greatest content of long chain omega-3 polyunsaturated fatty acids in muscle tissue.
- X Short term concentrate feeding, as with bison fed grain less than 90 day, was sufficient to reduce the content of the longer chained polyunsaturated fatty acids derived from γ -linolenic acid.
- X Although bison in the 50:50 Forage:Grain group had access to forage, the concentrate available in the diet was sufficient to reduce the long chain polyunsaturated fatty acid content in muscle compared to the forage fed group, though not to the same extent as found in the bison fed grain less than 90 days.
- X Forage fed bison had the greatest content of conjugated linoleic acid (CLA) in muscle tissue and feedlot finished bison had the least. The purported benefits of CLA to human health when taken as a food supplement include an increase in metabolic rate and a decrease of abdominal fat with enhancement of muscle growth and lowering of cholesterol and triglycerides. CLA has been said to lower insulin resistance and reduce food induced allergies through improved immune system function.
- X Omega-6 fatty acid content of muscle in bison in the group fed 50:50 Forage:Grain and the forage fed bison was greater than in bison finished on grain less than 90 days and those that were feedlot finished.

X Concentrate feeding such as with the feedlot finishing treatment, actually limited the amount in muscle of some of the most beneficial fatty acids to human health.

More research is warranted into studying the effects of different concentrates and different feeding regimens on the fatty acid profile of bison meat. From a human health perspective, results obtained from this study suggest the overall effect of diet on tissue fatty acid composition favours forage based diets. Forage fed bison maximized the content of beneficial fatty acids in muscle, when compared to grain or concentrate based feedlot finishing. To maximize the desirable fatty acid composition of bison meat, producers will benefit from maximizing the forage available to the bison throughout the finishing period.