



ENRICHING PORK WITH OMEGA-3 FATS

A new value added marketing trend is increasing the omega-3 fatty acid content in food products aimed to improve cardiovascular health. Omega-3 fatty acids are not only associated with heart health, but may also improve the immune system and reduce the risk of developing some cancers. Eggs, meat and dairy products enriched with omega-3 fatty acids are now available to the Canadian consumer. These products are enriched by feeding animals flax seed or canola, which are sources of omega-3 fatty acids in the form of alpha-linolenic acid (ALA).

Scientists at Agriculture and Agri-Food Canada (AAFC) are helping the industry evaluate and develop new systems to enrich food products with omega-3 fats. Drs. Mike Dugan and Jennifer Aalhus, AAFC scientists at the Lacombe Research Centre in Alberta are collaborating with Dr. Ruurd Zijlstra at the University of Alberta and Drs. John Patience and Denise Beaulieu at the Prairie Swine Centre in Saskatoon, Saskatchewan on a series of four projects feeding flaxseed to pigs to enrich pork with omega-3 fatty acids. This research is funded by the Saskatchewan Agriculture Development Fund and Flax 2015.

"Flaxseed contains about 40 percent oil and is one of nature's richest oilseed sources of omega-3 fatty acids," explains Dr. Dugan. "Our first experiment was conducted at the University of Alberta where a technique of co-processing flaxseed with field peas was developed to maximize the availability of omega-3 fatty acids fed

to pigs. Now our focus is on developing a successful flaxseed feeding program to enrich pork with omega-3 fatty acids and evaluating the quality and acceptability of pork end products."

Ultimately the overall goal of the research is to develop a system which consistently produces high quality pork with a verifiably enhanced fatty acid profile. However feeding the flaxseed mixture to pigs is not a straightforward process.

"There are limits to the level and duration that flax can be fed before it negatively impacts animal growth and feed utilization," emphasizes Dr. Dugan. "Our second experiment, conducted at the Prairie Swine Centre, indicates flax can represent up to at least 15% of the diet when processed with field peas. In addition, similar levels of omega-3 fatty acids in backfat can be attained by either feeding a high flaxseed diet for a short period or a lower flax diet for a longer period. But feeding a lower flaxseed diet for a longer period appears to reduce the variation between animals."

While feeding flaxseed to pigs enriches omega-3 fatty acids in pork, levels of omega-3 fatty acids can differ from tissue to tissue and higher levels can lead to problems with pork processing and can negatively affect pork quality, palatability and oxidative stability. The third animal trial was conducted at the Prairie Swine Centre to establish best feeding practices to enrich pork cuts with targeted levels of omega-3 fatty acids required

to claim an omega-3 enrichment (i.e. 300 mg per 100 g of pork). These analyses are currently ongoing and involve the use of specialized facilities for slaughter and intensive meat quality, palatability and fatty acid analyses at AAFC's Lacombe Research Centre.

Based on the results of the first three trials, a fourth animal trial will be conducted in the fall of 2008 to establish the optimal start and finish weights for pigs to achieve desired levels of omega-3 fatty acids.

In a similar study, Drs. Jon Meadus and Bethany Uttaro, fellow AAFC scientists at the Lacombe Research Centre, are collaborating with Drs. Dugan and Aalhus to examine ways to enrich long chain omega-3 fatty acids in pork by feeding pigs algae or algae derived DHA (Docosahexaenoic fatty acid) or alternatively, by injecting a brine solution of food grade DHA into pork loins. The goal is to reach 100 mg DHA per serving dose of a 100 g chop.

Their research has established that bacon made from pigs fed up to 20 g of DHA per day is acceptable according to a limited Home Use Test (HUT) survey for flavour and odour scores. Also acceptable were pork loins injected with 100 mg DHA in a brine solution as compared with loins injected with sunflower oil. However future work is needed on improving the oxidative stability of these products.

"In reality, much of the fish long chain omega-3 fats are due to their consumption of marine microalgae," states Dr. Meadus. "It is this microalgae that industry is actually using to produce pure DHA for use in human infant formula. Human nutrition research has found that the longer chain omega-3 fatty acids (derived from fish) are more effective after the short-chain omega-3 dietary fat levels (derived from plants) are balanced."

Research at AAFC's Lacombe Research Centre will continue to test the effect of the dietary DHA lipids on the genetic response in the pigs using selected biomarkers for fat metabolism, fat synthesis and disease inflammation. Future work will compare the pure DHA with the mixture of omega-3 oils from fish extracts and various anti-oxidants.

"We are what we eat" exclaims Dr. Meadus.

"Our research will continue to find innovative ways to integrate omega-3 fatty acids into the food we eat for the benefit of Canadians."

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