The CLA Network

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Harvesting the health promise of conjugated linoleic acid

Exploring the inner frontier

Animal Mechanisms research is spawning new strategies to enhance natural CLA levels in dairy and beef products.

Many a dairy or beef producer would like the idea of a "cattle mechanic."

Cow not producing enough milk? Steer gobbling too much feed for what it produces? No problem, just take it in for a tune up.

That may still remain far-fetched, but in reality the study of "animal mechanisms" – in essence, the mechanics of how cattle work and how they produce what they produce – is playing a major, increasingly important role in creating a bright future for dairy and beef industries and for consumers who enjoy those products.

"There's great potential," says Dr. Erasmus Okine, a leading researcher and educator in ruminant nutrition. "To use the car analogy, it's a matter of looking more under the hood – in this case, inside the rumen and other key parts of the animal – to see how things work and look for ways to support or fine tune important processes."

Today, much of Okine's work involves using the animal mechanisms approach to examine how cattle produce conjugated linoleic acid (CLA).

This may not yet be a question on the tongue tips of producers and industry leaders, but its answer could mean hundreds of millions dollars annually for Canada's dairy and beef industries, along with new health-boosting food options for consumers.

CLA is a type of beneficial fat produced by ruminant animals that is found naturally in dairy and beef products. Though little has been known about CLA and its effects, early animal studies, primarily over the past decade, have indicated this unique food component has considerable potential for a range of human health benefits related to cancer, heart disease, obesity, diabetes, kidney disease and bone density.

"The more we understand about how CLA is produced in the animal, the better we can develop strategies to optimize and enhance the level of CLA that is transferred to dairy and beef products," explains Okine, Chair of the Department of Agricultural, Food and Nutritional Science at the University of Alberta. "It's a very important area to help open the door to new marketing opportunities based on natural CLA, as well as to generate potential for increased production efficiencies."

Generating natural benefits

Okine is one of many leading researchers aiming to identify and take advantage of CLA opportunities, as part of the CLA Network. Founded in Canada in 2001, the CLA Network is a collaborative team from academia, industry and government, including representatives from many areas of expertise such as research, food industry, health and communications. Together, they are working to harvest the expanding health potential of CLA in dairy and beef products.

Okine leads the CLA Network's Animal Mechanisms module, one of six modules in the network. Other modules include Human Health, Dairy Production and Product Development, Beef Production and Product Development, Product Development and Market Research, and Communications.

"Understanding the animal processes behind CLA is key to capturing market potential."

"The Animal Mechanisms Module is focused on learning more about the physiological processes that produce and influence CLA," says Okine.

Key knowledge gained

A key area for the module is learning more about how CLA is produced in the rumen. Though the rumen structure is relatively basic, it contains billions of bacteria and other microorganisms.

In the case of CLA, the advantages of the rumen come in to play when the animal digests plant material to release linoleic acid - a beneficial fatty acid that facilitates a number of basic biological processes in humans. The microorganism activity in the rumen alters linoleic acid, which results in the creation of CLA as well as CLA precursors.

Okine and colleagues have made substantial progress on several fronts.

Understanding two key forms. Through a combination of several Animal Mechanism studies, researchers have come a long way in identifying the process by which these microbes take linoleic acid and move it into the two forms of CLA currently of greatest interest – CLA 9,11 and CLA 10,12.

"We've made strong progress in understanding the mechanisms related to these two forms," says Okine. "A key priority for us now is to understand why different feedstuffs tend to influence the amount of CLA these microbes can form."

The role of dairy enzymes. In one specific study with dairy animals, researchers identified an enzyme in the mammary gland that takes the fatty acid 11;18, 1 (vaccenic acid) and transforms it into CLA. Learning more about this mechanism will support the development of strategies to optimize CLA levels in dairy products and to maximize related market opportunities.

Examining backfat connection. In a third series of studies, researchers examined the effect of CLA formation within the animal and how that affects the amount of backfat the animal produces. The result was dramatic – they confirmed that undesirable backfat is reduced when CLA increases within the animal, and this happens without affecting the amount of desirable marbling fat. The potential implications of this finding are great, with close to $4 billion annually spent on getting rid of excess backfat in the North American beef industry.

"If we can reduce backfat, we can save money that will create greater margins for producers," says Okine. "What we'd also like to do is channel that energy that would normally to into backfat, into increased desirable marbling fat. That would make a great double success story."

With favourable results in hand, Okine and collegues are already further exploring this opportunity, with a major new study. For now, they are focusing on a particular CLA isomer that appears to reduce the number of fat cells under the skin, while not affecting the number of fat cells in marbling fat. The researchers hope to identify mechanisms that channel the unused energy that produces backfat into positive energy that produces marbling fat.

Since well-marbled beef typically commands higher prices, progress in this area could pay major dividends at the retail level, filtering back to all segments of the beef industry.

Role of small intestine. As another next step, Okine and colleagues are investigating the role of the small intestine in CLA transfer.

By understanding what happens to the CLA as it leaves the rumen into the small intestine, and is then transferred into eventual dairy and beef products, scientists hope to identify production strategies for optimizing and enhancing the CLA levels in those products.

Teamwork drives progress

For the animal mechanisms module, the major long-term focus is to continually learn more about how CLA is produced and transferred into dairy and beef products, and how that process may be enhanced.

"A key emphasis will be continued integration of the module with other CLA Network modules to carry forward and maximize progress," says Okine. "We achieve our greatest success by working closely together."

For more information on the CLA Network, visit www.CLAnetwork.com or email: CLAnetwork@gov.ab.ca.

Visit www.CLAnetwork.com for more articles on activity and progress.

The CLA Network
Email: CLAnetwork@gov.ab.ca
Web: www.CLAnetwork.com

Vince Ohama, CLA Network Manager
Alberta Agriculture,
Food and Rural Development
Tel: (403) 340-5545 Fax: (403) 340-4896

Bruce Beattie,
CLA Network Chair
Cell: (403) 638-7896