

The Future of Milk Utilization

If the dairy industry is to utilize all the milk it is capable of producing, the U.S. will need to expand its export market," said Dr. Lloyd Metzger, director of The Midwest Dairy Foods Research Center and an associate professor at South Dakota State University.

Though cheese has driven dairy product consumption over the past two decades, new markets will need to be developed to fully utilize a domestic milk supply which has grown by 273 pounds of milk per cow per year since 1960 and represents an additional 2.5 billion pounds of milk each year, he noted.

"One of the ways the U.S. dairy industry can become competitive in the next 10-20 years is to fractionate milk into new products—especially dairy-based ingredients—that can be exported," commented Metzger, whose presentation on the future of milk processing kicked off the recent Annual Meetings of the American Jersey Cattle Association and National All-Jersey Inc.

He explained how technologies, like ultra-filtration and micro-filtration, can help dairy processors isolate key components in milk—fat, protein, lactose, minerals and water—and develop new uses for milk ingredients.

The Global Market

Now, as never before, the U.S. dairy industry is poised to capitalize on its ability to deliver high-quality, safe milk and dairy products to the world.

"If you'd have asked me five years ago if we could be competitive in a global market for dairy products, I'd have said, 'not in a million years,'" Metzger told his audience in Sioux Falls, S.D. "But some odd things happened in 2006."

Between March and June, milk production exceeded demand, so the United States Department of Agriculture purchased 63 million pounds of nonfat dry milk (NFDM).

Subsequently, there was an increase in world demand for NFDM, a decrease in the value of the U.S. dollar and the removal of European subsidies.

"All these factors together caused the world price of NFDM and the price of

NFDM produced in the U.S. to come to equilibrium," said Metzger. "For the first time in numerous years, the U.S. became a major exporter of NFDM without the aid of subsidies."



Lloyd Metzger

"In the short term, there is no one else in the world market that can increase their milk supply as much as the U.S.," continued Metzger. "New Zealand is a pasture-based system and can't increase milk production without changing their entire economic model. Europe has had subsidies taken off and can't compete

without them."

"That is why milk prices have gone so high," summed Metzger.

World Demand for Protein

"If we want this situation to continue, we have to figure out which components are the most valuable and how to economically fractionate them into products we can sell domestically and internationally," Metzger said.

"In my opinion, protein is the most valuable component in milk," said Metzger. "World demand for protein currently exceeds supply and will continue to do so for the next decade."

An added bonus for dairy producers is that protein from milk is more valuable than protein from other sources, Metzger told his audience.

This is because milk protein is comprised of casein and whey. Casein is a phospho protein, which means that it has a phosphate group attached to its protein chain.

"Milk protein is essentially a packaging system for calcium and phosphate," Metzger explained. "It was designed to entrap calcium and phosphate and put it in a little package inside the protein."

"You won't find any other major proteins in nature that have

phosphate groups attached to their protein chain. Wheat doesn't have it. Soybeans don't have it."

"That is what gives milk protein the extra value and makes it so special."

A New Revolution

So how do we isolate, or fractionate, milk protein and offer it to the world?

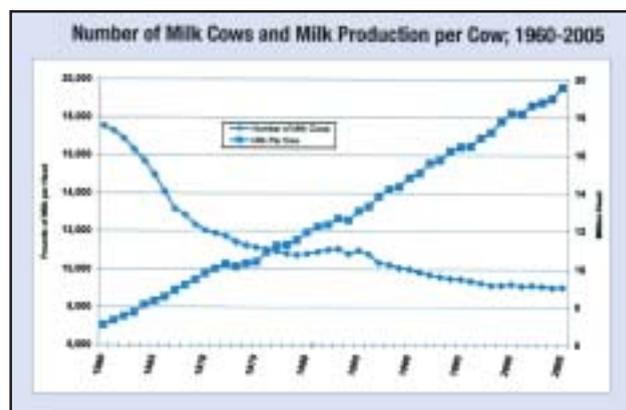
Currently, this process is accomplished through the manufacture of cheese. Two of the hottest-selling dietary ingredients, whey protein concentrate and whey protein isolate, are generated from whey—the byproduct that is left over after cheese is manufactured.

Whey protein concentrate (35% protein) and whey protein isolate (>90% protein) are used as ingredients in products like infant formula, meal replacement beverages, protein bars and sports drinks and are marketed both domestically and internationally for a premium price. Production of whey protein concentrates and isolates has increased from nothing in 1970 to more than 300 million pounds last year.

The production of these two milk-based ingredients was made possible by the use of ultra-filtration, explained Metzger, which isolates the protein-only portion of whey by passing it over a semi-permeable membrane.

"The membranes allow us to separate protein from other components in whey based on the size of protein relative to the

(continued to page xx)



The graph above shows the U.S. cow population and milk production per cow from 1960-2005. While cow numbers have stabilized at about 9.1 million since 1998, milk production continues to increase at a rate of 273 lbs. per cow per year. The gradual increase in the U.S. domestic population will only utilize a portion of the milk supply, stressing the need to develop export markets. Source: USDA, National Agricultural Statistics Service.

Future of Milk Utilization

(continued from page xx)

size of lactose and other contaminants in whey.”

“We make the membranes a certain size, so that some components pass through and others are retained,” he added. “Water and lactose molecules pass through the membrane since they are smaller and protein is retained since it is larger. We end up with a concentrate that is high in protein.”

“So what is going to happen in the future?” Metzger posed.

“We went through the cheese revolution, where we increased milk utilization by converting it to cheese. Then we went through the whey revolution where we better utilized whey.”

“It is my opinion that we’ll have another revolution that deals with a process called micro-filtration,” Metzger said. “This can be used in combination with ultra-filtration to separate casein from whey protein without going through the cheese-making process.”

“Think of all the uses you have for milk if you can isolate that calcium-phosphate system from milk and sell it as a value-added ingredient,” he commented. “Nowhere else in nature is this available.”

The potential to fractionate and market this and other milk-based ingredient is a focus of South Dakota State University.

The university plans to break ground on new milk-processing facilities in the spring of 2008 and become operational later that fall. The plant will use membrane-based processing (filtration), evaporation and driers to separate, concentrate and dry milk based ingredients. A goal is to conduct economic-feasibility studies that show commercial operators how they can produce milk-based ingredients for profit.

While no one knows what the future holds long range and what ingredients will be in demand in the next century, we can concentrate on developing markets for something we know now—protein is in demand.

“That is good news for Jersey producers since there is more protein in Jersey milk to start,” Metzger summed.