



Milk Products
The Milk Replacer Source™
An ISO 9001:2008 Certified Company

INNOVATION • QUALITY
PERFORMANCE

**MILK-BASED
INGREDIENTS AND
MARKETS:**
PAST, PRESENT & FUTURE
Dave Kuehnelt,
President, Milk Products



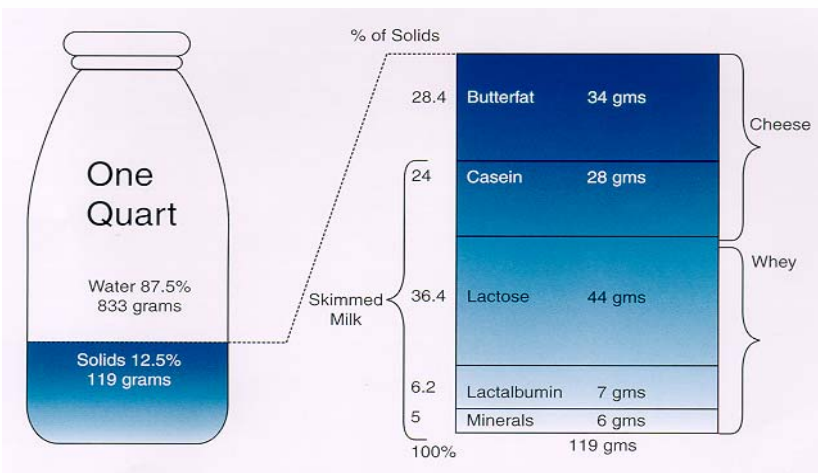
Along the whey - where have we come from?

- Historical perspective
 - From dumping in ditches to nutraceuticals, whey has come a long way
 - Only approved for use in human food products since the '80's



Milk-based Ingredients

Where do they come from?



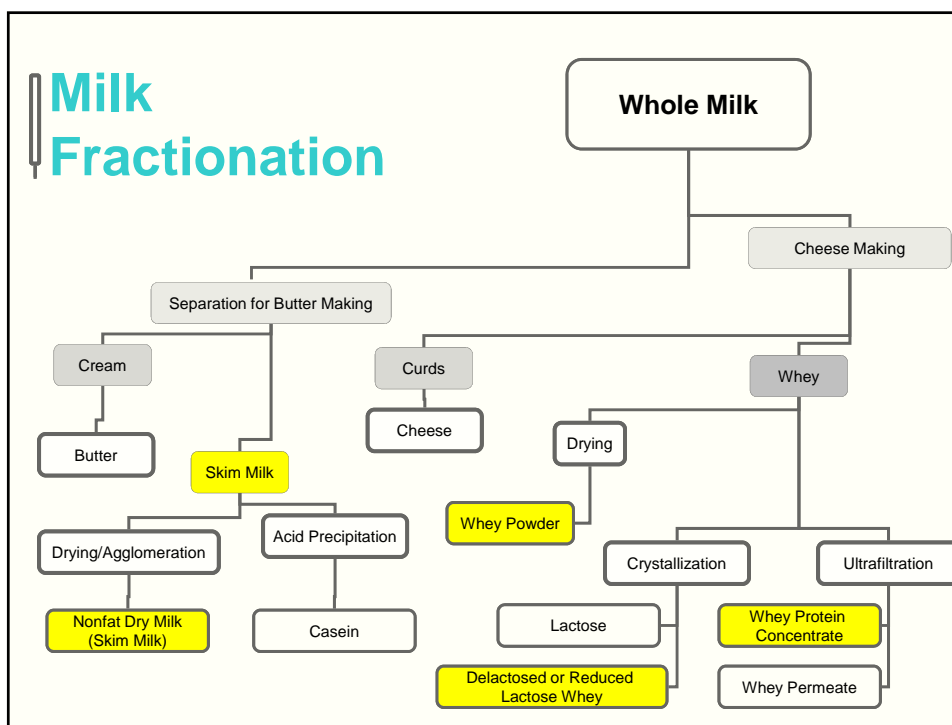
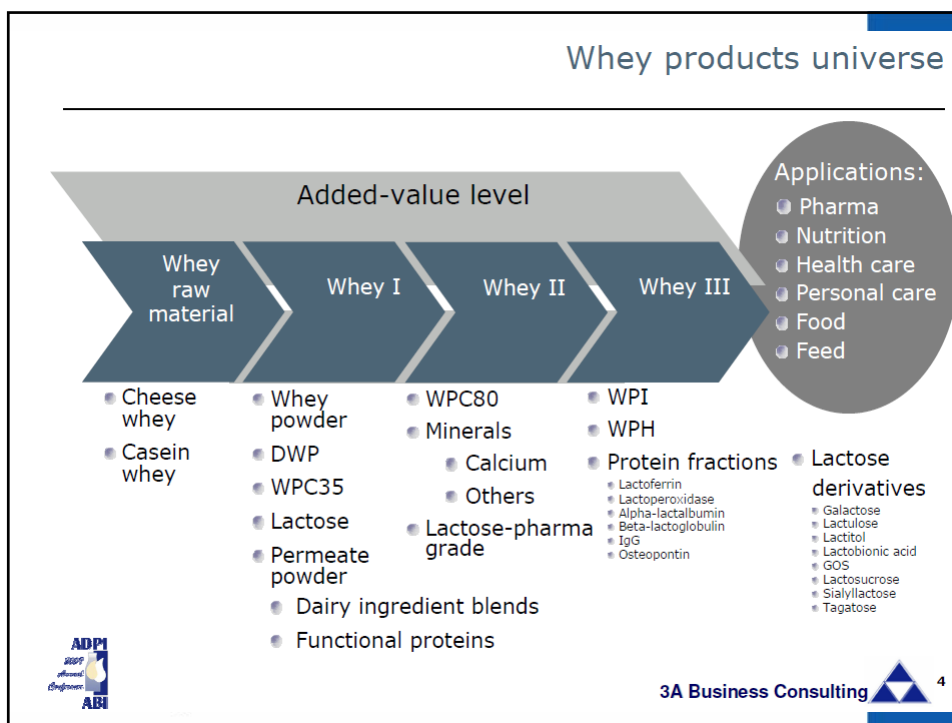
Whey Fractionation

How is this done, and what products do we get along the trail?



- Whole whey
- Reduced- whey products
 - Reduced lactose
 - Reduced minerals
 - Hydrolyzed
- Protein-concentration products
 - 34-80% whey protein concentrate
 - 90% Whey protein isolate
 - Whey-cream or pro-cream byproducts
- Nutraceutical products
 - Immunoglobulin concentration
 - Lactoferrin
 - Alpha-lactalbumin
 - Beta-lactoglobulin
 - Glycomacropptide
 - Milk mineral complex
 - Whey phospholipid fractions
 - **Lots** of new product interest



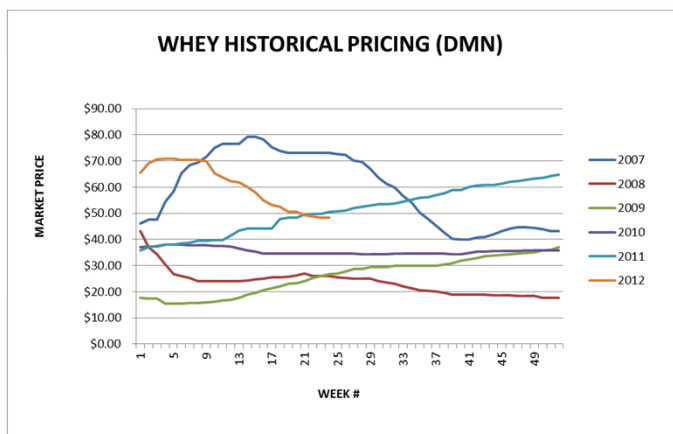


More on whey fractions

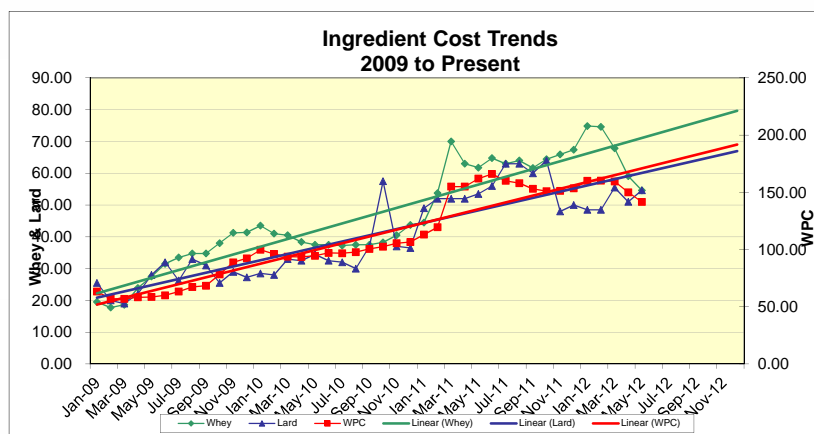
- End-products, co-products, by-products
- Where is the value?
 - (What are they trying to get vs. what's left)
- Overall global whey market is about 4 million tons
- Global market for whey protein products is about 1 million tons
- Global market for lactose is nearly double that
- US and EU are largest exporters



How have whey products compared to the cost of other protein sources over the past few years?



What have major milk replacer ingredients done the past few years?



No whey!?! They're that different??



Whey processing differences

- Differences between sources
 - Different types of cheese
 - Cheddar/Colby
 - Mozzarella or provolone
 - Swiss
 - Parmesan or Romano
 - Cream cheese
- Whey can be as different as the cheese it comes from
 - Different pH values, different drying properties, different flavors, colors, textures



When is whey not whey?

- Solubles or permeates combined to meet an existing definition, but not really
- Higher than normal product in ash, MPN/NPN, or other less desirable nutrient
- New co-product streams trying to find their application/market
- Whey product that has had something removed that is not mentioned in specifications
- “Solubles” products – continual separation yields material that is hard to define and deal with, but may have application in feedlot supplements, for example.
- System flush material from processors – low solids, but may be valuable as feed



What does it mean for the ingredient buyer or the calf?

- Solubility
 - Bakery or confection buyers may not care
 - Soluble applications need to be very careful, as solubility is not part of ADPI standards
 - May look fine as a powder, but cause settle-out issues once reconstituted
- Separation
 - Again, soluble applications care, and can affect emulsions as well as aqueous solutions
 - Can make solutions look thin or less opaque, like skim milk
- Flocculation
 - Visual indicator of protein quality, indicating product which has had considerable pH adjustment or heat damage
 - You can “cover up” with more agitation, but you can’t reverse the protein changes which have taken place



What about other milk replacer or extender ingredients which influence costs?



- Fats - Sources
 - [Deodorized] Edible lard or fancy tallow rendered only from (human) edible beef or pork trim
 - Palm & coconut oil
 - Choice white grease
 - Hardly “choice,” hardly “white” – rendered from bone & inedible trim “stuff”
 - Differences between inedible greases and edible grade fats
 - Source of materials and handling along the way
 - Free fatty acid content much higher in feed grade fats
 - Resulting shelf life better in higher-quality fats
 - Aroma markedly better in edible-grade material
 - What drives their costs?
 - Very close connections between fats & vegetable oils and oil market



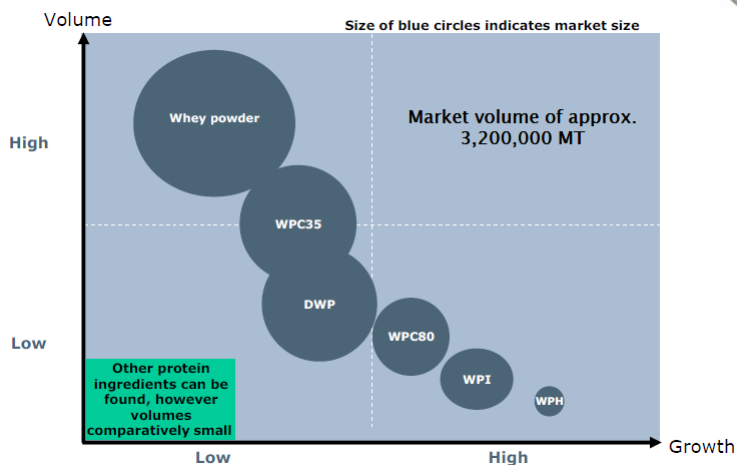
What about other milk replacer or extender ingredients which influence costs?



- Antioxidants
 - BHA, BHT, ethoxyquin, and citric acid most effective combination for animal fats
 - Would need to adjust if our market moved to vegetable/plant fats & oils as Europe has
- Emulsifiers
 - Fairly costly, but essential component for product/emulsion stability
 - Cleanup a problem in poorly-emulsified products
 - Can certainly impact digestibility – just stand behind a row of calves receiving inadequately emulsified/homogenized fats

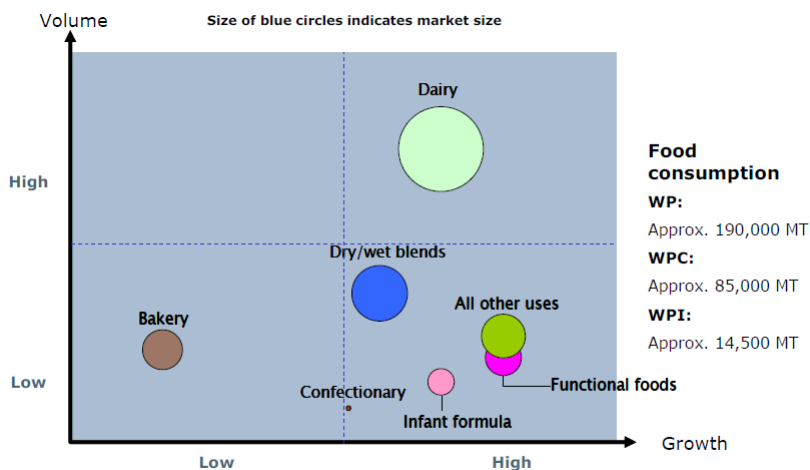


Global whey ingredients market

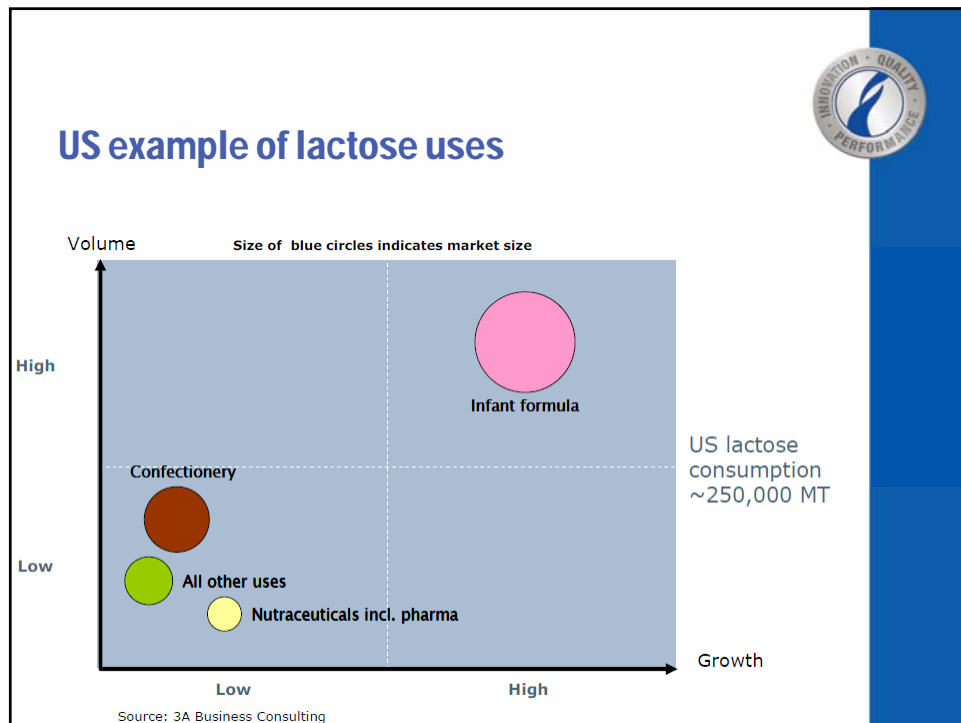
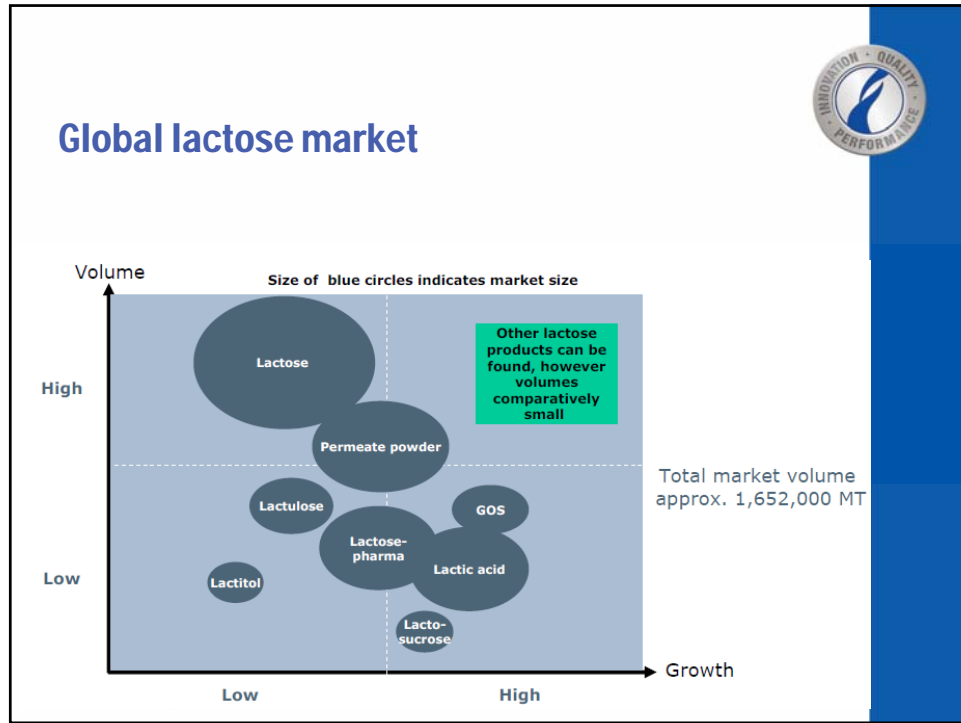


Globally, whey ingredients are about a \$4 – 4.5 Billion market

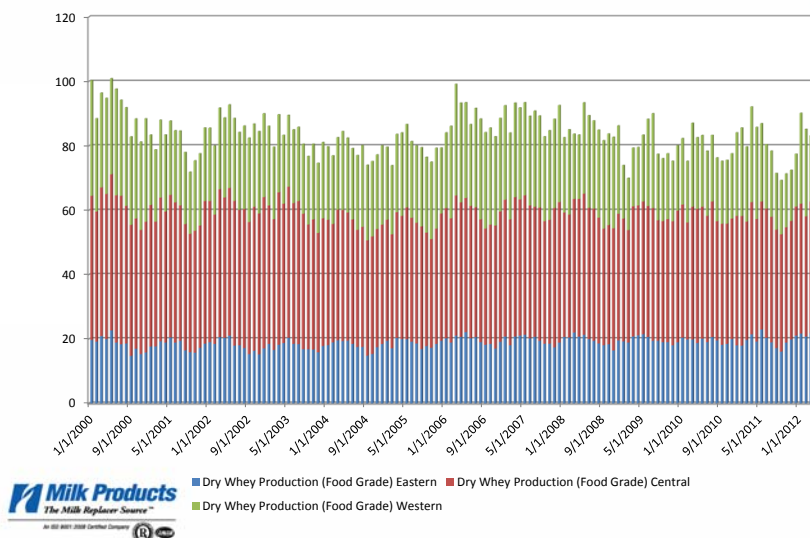
Usage of whey proteins in major end-use sectors



Source: 3A Business Consulting



Who will make the whey needs of the future?



What do we see down the whey... the future?



- Who will make the whey needs of the future?
 - Midwest U.S.?
 - Lots of processors of whey products based here, and the industry infrastructure to support production is here
 - Northeast U.S.?
 - Some, but not on the scale we have here in the Midwest
 - West? On the Coast or inland?
 - California government/business climate may dictate transportation, but for now, usage will continue to expand to absorb western whey
 - Market spread between Midwest and West seems to balance itself, preventing large movement of whey from one market to the other
 - Idaho production continues to grow
 - HUGE plant being built in Greeley, CO – elsewhere also?
 - Water availability and policy may dictate western markets' growth



What do we see down the whey... the future?



- Who will make the whey needs of the future?
 - Oceania (Australia/New Zealand)?
 - China getting much more heavily involved in the NZ dairy arena
 - If they own the dairies (cows and processing), why would they want to buy our whey products?
 - Europe?
 - Strong for both production and consumption
 - Freight always a factor for product that crosses the Atlantic in either direction
 - Containers from Rotterdam to Hong Kong - a few hundred \$\$.
 - That same container from Wisconsin would cost north of \$5000
 - Big backhaul imbalance to get containers back to Asia
 - Currency exchange rate perhaps the biggest factor balancing movement of large quantities – “weak dollar” makes the U.S. a great place for the world to shop



Future uses (competitors) for whey supplies



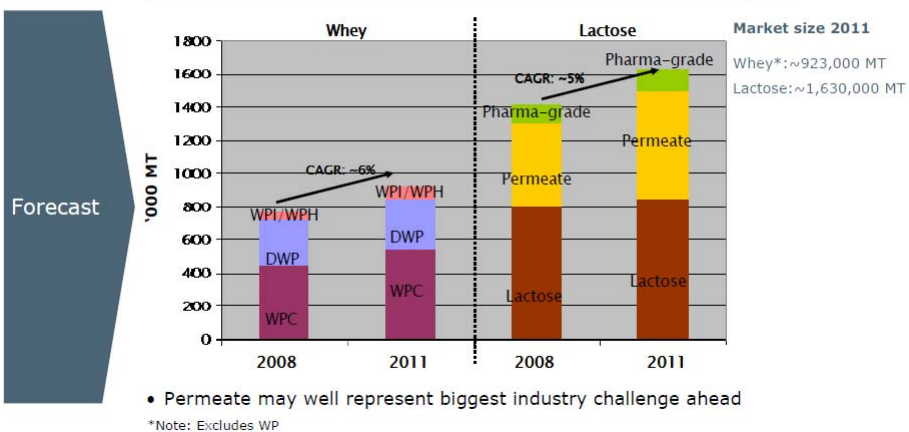
- Who will use or take more in the future?
 - Sports nutrition/health & wellness
 - Functional beverages
 - Infant formula
 - Snack bars
 - Weight management – appetite management, not calorie restriction
 - Clinical nutrition – aging & immune system focus (people **and** pets)
- How much will they need?
- What's being worked on to further add value to whey? (i.e. more competition for us lowly animal feed users)
 - Specialty dietary supplements now selling for \$25-37 PER POUND!
- What is being looked at to potentially replace whey products if they become too expensive for use in milk replacers?



Will the whey market continue to grow?



- The market for whey & lactose ingredients will continue to grow both in food and nutrition applications



Market trend possibilities

What's happening in the futures market?



Market trend possibilities



- What if whey is \$2/lb and WPC is \$4/lb?
 - At \$0.60/lb, the whey component of USDA Class III milk price formula contributed ~\$2.35/cwt this spring
 - What if the whey component becomes worth more than the cheese part in the price of milk? Huh?
 - Probably won't happen, but if the processor can make the whey part the profit-generating part, they may do the cheese part to cover costs, while focusing more and more investment in developing higher-value whey products
 - What if smaller cheese manufacturers have to pay for the whey value (through the Class III milk price formula), but don't harvest the benefit because they lack sophisticated whey fractionation equipment?



Bottom Line



The value of whey, and more importantly, whey fractions, cannot to be ignored as a major contributor of value for cheese processors, and ultimately, for dairy producers.

Whether you sit on a Board of Directors for your cheesemaker, or simply sell your milk to someone who makes some kind of cheese, what they do with their whey should be something you keep an eye on.

