Samspillet mellem proces og produktegenskaber : Mælkeproteiner som ingrediens i fødevarer

Mejeriforskningens dag 2017

Connie Benfeldt, Arla Foods Ingredients

Agenda

- “The story of whey – and of AFI” – in short
- Examples - use of whey proteins as food ingredients
  - Nutritional properties
  - Functional properties

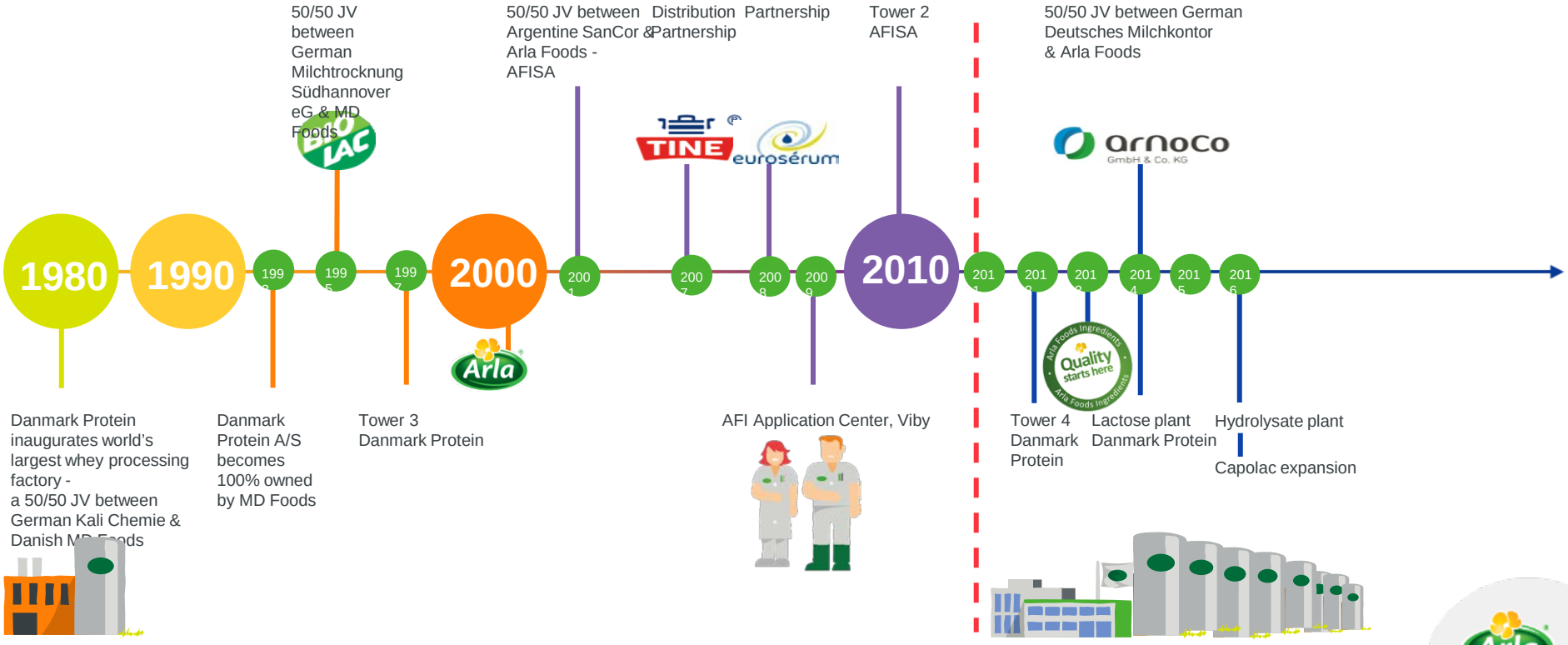
”The story of whey – and of AFI

Evolution in the whey industry

We are at the beginning of a new era.....

	1980	1990	2015
	By-product from cheese making	By-product from cheese making	Product/Ingredient in its own right
Main use	FEED	FOOD/IF	IF/FOOD
Infrastructure/ plant	FEED standards	Upgrading to FOOD	Building to IF/high quality food ingredients
Raw material	”Anything goes…”	Selection of acceptable qualities	Whey before cheese!

Major historical events - Arla Foods Ingredients

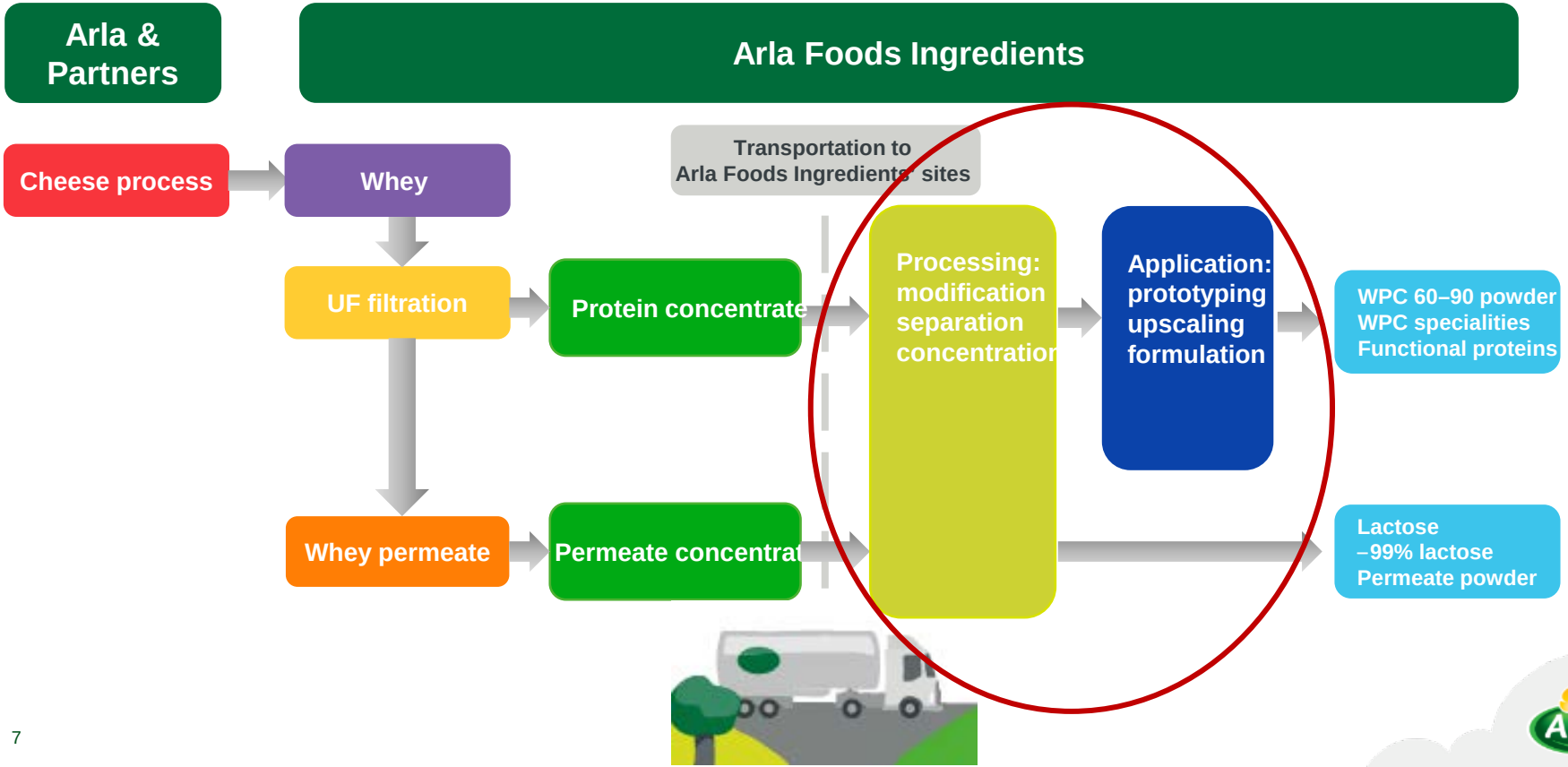


A global leader in whey processing

- Revenue: **EUR 392 million** (2015)*
- Revenue growth rate of 13% p.a. (2011-2015)
- Expected revenue **growth rate of 9% p.a**. (from 2015 towards 2020)
- **Global market leader** in **whey proteins and lactose**
- Global sales network and supply chain
- 576 employees (2015)*
- Arla Foods Ingredients is fully owned by Arla Foods Amba

* Excl. Joint Ventures

Current business model in Arla Foods Ingredients



To help fulfill our ambition

Continue the journey of increasing the proportion of value-added sales

- Our ambition is supported by a EUR 200+ million CAPEX programme which is in process of implementation
- More than 15% of our employees in Denmark work with R&D and Application Development

We enjoy close cooperation with **facility suppliers** and **customers** and with several **leading research institutes**, including

- Aarhus University
- Copenhagen University
- University of Wisconsin at Madison
- University of California at Davis

We expand our whey pool globally through partnerships – and we add value to our products

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Examples

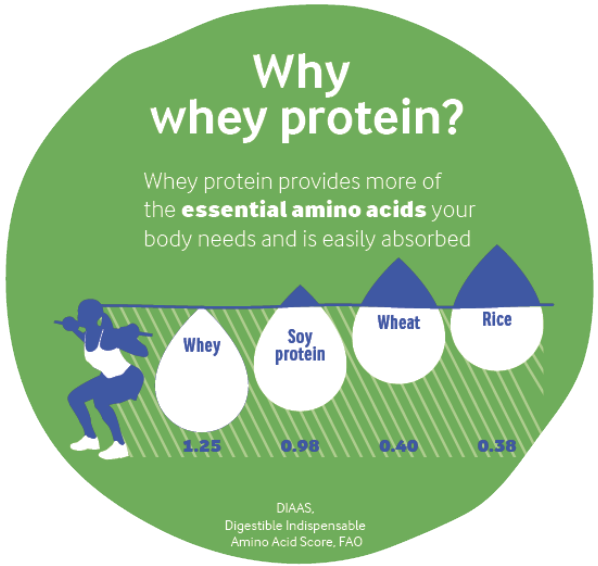
- Nutritional properties – Infant, Health & Sports Nutrition
- Functional properties – Dairy & Bakery

Examples

- Nutritional properties – Infant, Health & Sports Nutrition

Whey proteins for nutritional enrichment

Studies show that whey protein's amino acid composition and digestibility is higher than other protein sources



Whey proteins contain a high level of branched chain amino acids (~26%) that are taken up directly by skeletal muscles during extensive exercise, rather than first being metabolized through the liver like other amino acids.

http://www.nationaldairycouncil.org/SiteCollectionDocuments/education_materials/whey_protein/WheySports.pdf

Whey proteins for nutritional enrichment

Widely used for various types of applications :

- Infant nutrition
- Clinical and medical nutrition
- Sports nutrition

Specific fractions also allow enrichment of infant formula t obtain a proven positive impact on :

- Cognitive development
- Immune health
- Gut health
- Allergy
- Metabolic programming

Whey proteins for sports nutrition

- Whey proteins and milk minerals are among the key nutrients that might help to maintain a young body age by building and maintaining muscle mass and function, helping reduce body fat mass, and developing dense and strong bones
- Superior nutritional quality and provide a high content of all the essential amino acids (EAA)
- Provide leucine, that directly stimulates muscle growth and regeneration
- Leads to fast recovery after exercise if available as hydrolysate

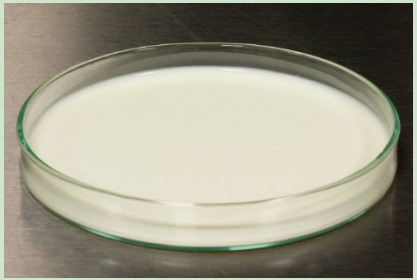
Examples

- Functional properties – Dairy & Bakery

Functional ingredients for Fresh Dairy Products

Depending on the selection and combination of ingredients several options are possible :

- Manufacture of FDP with very high protein content
- Manufacture of FDP with very low protein content
- Manufacture of FDP including only whey proteins and hence very good nutritional properties

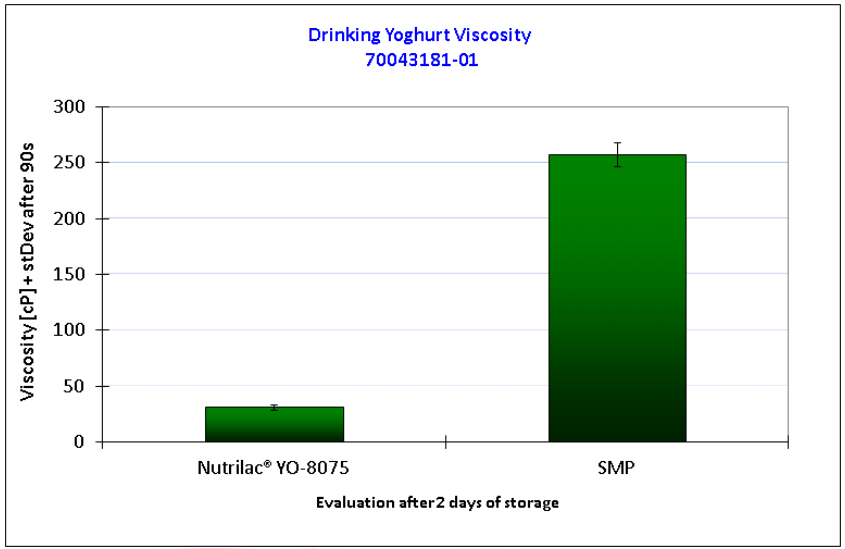
WPC80	Nutrilac® YO-8015	Nutrilac® YO-8075
		

Recipes
Low Cal Drinking Yoghurt

Recipe	
NUTRILAC® YO-8015	2.00%
VARIOLAC® 836	0.48%
Skimmed milk	19.00%
Water	73.52%
Blueberry fruit preparation, Döhler	5.00%

Nutritive values	
	PER 100G
Energy	80kJ/19kcal
Protein	2.3%
Fat	0.1%
Carbohydrates	2.1%
Total Solids	4.1%

Recipes
High Protein Drinking Yoghurt



Recipe	
NUTRILAC® YO-8075	9.48%
Sugar	4.60%
Cream 38% fat	2.30%
Skimmed milk	75.62%
Strawberry fruit preparation	8.00%

Nutritive values	
	PER 100G
Energy	454 kJ/107 kcal
Protein	10.2%
Carbohydrate	13.4%
Fat	1.5%
Total Solids	26.5%

Challenges when reducing fat

In soft ripened cheeses as Camembert & Brie

Quality reduction:

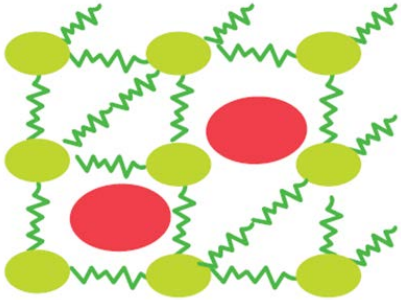
- Hard and rubbery texture
- Pale/transparrent colour
- Bland taste

Manufacturing challenges:

- Lower yield (compared to full fat)
- Problems achiving the desired moisture level

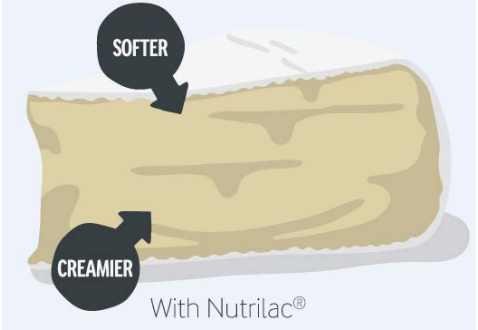
Advantages when using Nutrilac CH-4560

1. Simulates fat and improves creaminess



2. Binds water and improves yield

3. Faster softening of the cheese



Case study – Low fat stabilised Brie

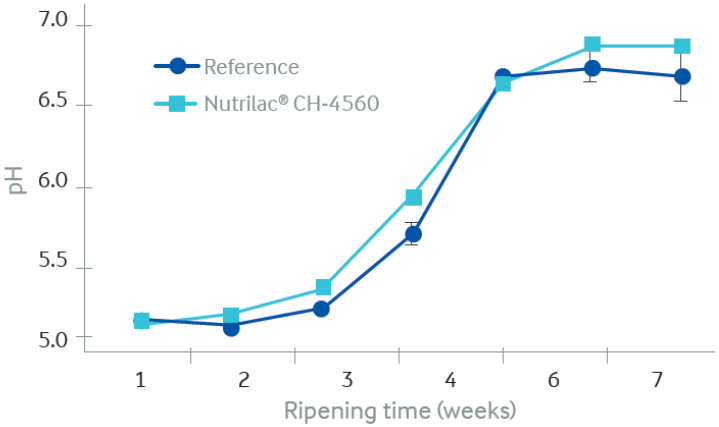
Results (Texture development)

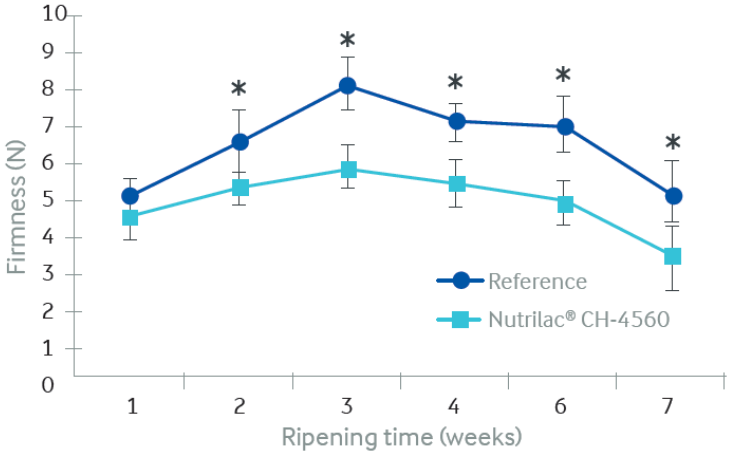
	Week 1	Week 2	Week 4	Week 5	Week 7
Reference					
Nutrilac® CH-4560					

(Cheeses taken from cooler (5°C) and kept at room temperature (22°C) for 30 minuts before being fotografed)

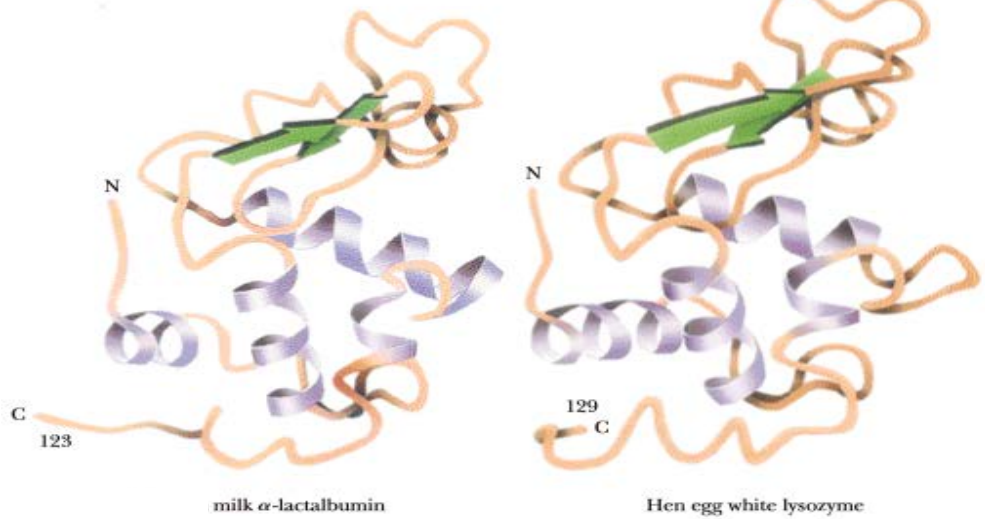
Case study – Low fat stabilised Brie

Results (pH & Texture development)





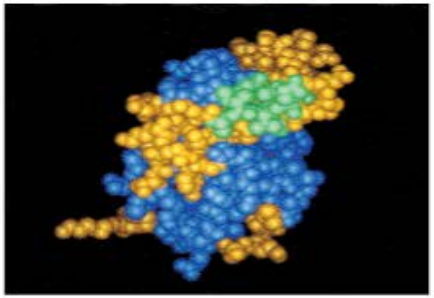
How do egg and milk proteins compare?



milk α-lactalbumin

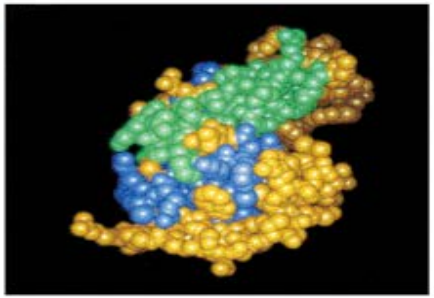
Hen egg white lysozyme

Milk **Egg**



α-Lactalbumin

Milk



Lysozyme

Egg

What does Nutrilac® contribute to baked goods?

Without Protein

- ✘ Volume
- ✘ **Emulsification**
- ✘ **Batter viscosity**
- ✘ Structure
- ✘ Eating quality
- ✘ **Whipping ability**
- ✘ Elasticity
- ✘ **Gel strength**

With Nutrilac®

- ✓ Volume
- ✓ **Emulsification**
- ✓ **Batter viscosity**
- ✓ Structure
- ✓ Eating quality
- ✓ **Whipping ability**
- ✓ Elasticity
- ✓ **Gel strength**


Thank you for your attention !