


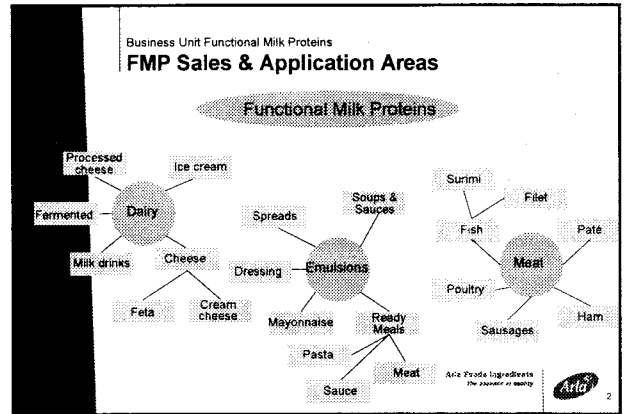
Application of Whey Protein for Meat and Poultry Industry


Mr. Jimmy Larsen


Arla Foods Ingredient, Denmark

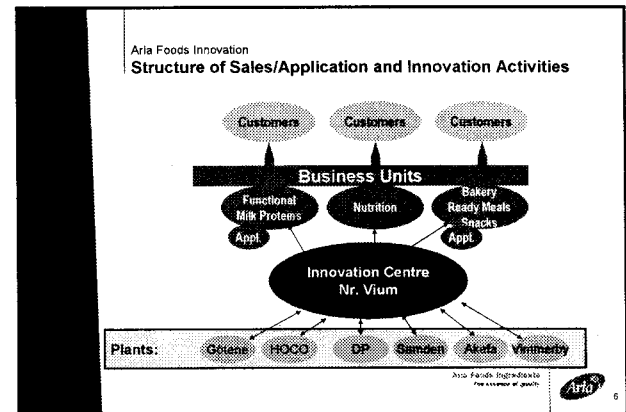
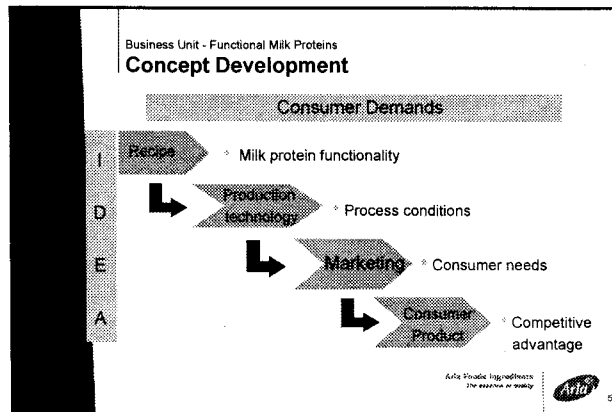
Business Unit Functional Milk Proteins

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- Business Unit Functional Milk Proteins
- Generate know-how**
- **Functionality**
 - whey protein concentrates
 - milk proteins in general
 - **Technology**
 - specific application areas in the international dairy industry
- Customer Service**
- Technical solutions (today)
 - Ideas for new product generations (the day after tomorrow)
 - Establish close cooperation (secrecy agreements possible)
- Aria Foods Ingredients
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- 

- Business Unit Functional Milk Proteins
- **Recipe development**
 - **Physical adjustments**
 - Viscosity
 - Stability
 - Texture
 - **Organoleptic variations**
 - Fat simulation
 - Structure
 - Mouthfeel
 - **Nutritional aspects**
 - Fat free
 - Protein balanced
 - Health
 - Low carb (Atkins)
 - Weight Management
 - Pro- & Prebiotic
- Aria Foods Ingredients
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- 



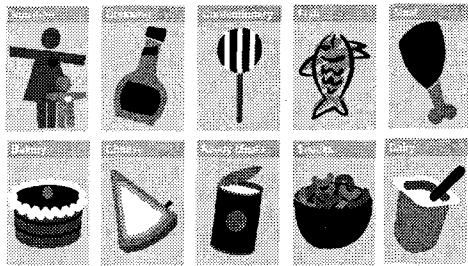
Business Unit Functional Milk Proteins
Trouble Shooting

- Trouble Shooting**
- Immediate technical advice (24h service)
 - Technician available within 48h
 - Experience exchange
 - culture
 - stabilizers
 - fruit preparation
 - equipment
- Pilot Plant**
- available for customer trials all year round

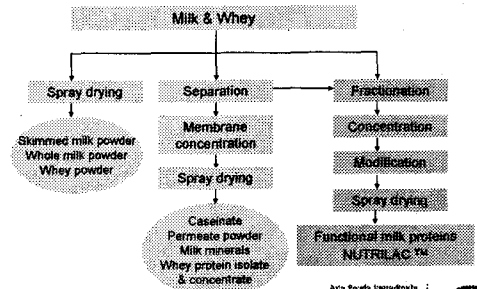
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Close Cooperation

- Individual developments
- Exclusivity
- Long-term relation
- Agreements
- Mutual benefits

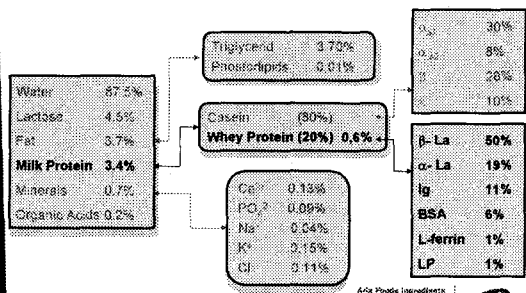
Key application areas



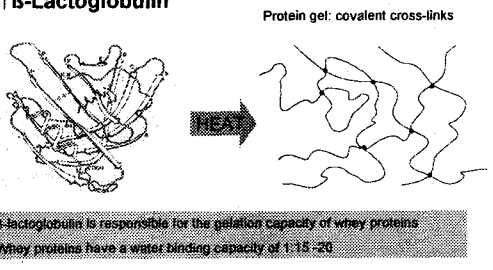
Process Technology of Functional Milk Proteins



Milk Composition – Fractions in milk




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β-Lactoglobulin



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Gelification of Milk Proteins

Commercial Names	Powder/salt (NaCl) in %	Gelification at 20°C with salt	Gelification at 20°C without salt	Gelification at 75°C with salt	Gelification at 75°C without salt
Lacprodan 80	15 / 2	-	-	+	+
Nutrillac HA-7570	15 / 2	-	-	+	+
Nutrillac PO-7730	10 / 2	+	-	+	-

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Business Unit Functional Milk Proteins
Application of Milk Proteins in the Meat Industry

Water binding capacity

1:15 – 1:20 → - Lower cost
- Higher juiciness

Emulsifying capacity


1:4 Cold → -Texture
1:20.25 Warm → -Mouth feel
-Appearance

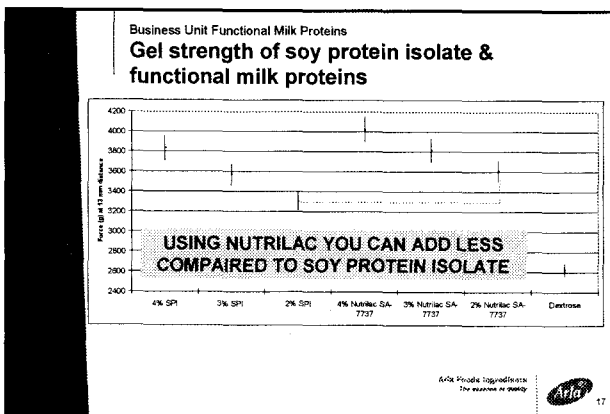
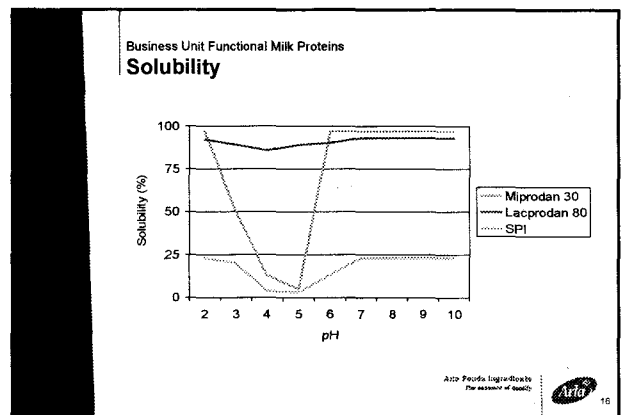
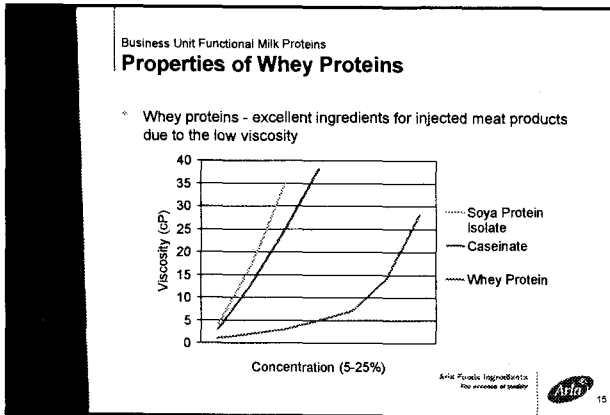
Positive impact on the final product

- Meat like texture
- Good taste & juiciness

Easy to work with

- High solubility
- Low viscosity


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Business Unit Functional Milk Proteins
Application Areas – Meat & Fish Industry


Ham, Chicken, Fish, Sausages, Bacon, Pork, Fermented sausage

TAILOR MADE SOLUTIONS THAT FIT YOUR NEEDS

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Business Unit Functional Milk Proteins


Properties of Milk Proteins



	Whey Proteins	Caseinates
Gelation	high	none
Emulsification	medium	high
Viscosity	low	high
Solubility	high	low
Wettability	high	low
Taste	neutral	neutral

NB 1 The functionality of whey proteins differs significantly from the functionality of caseinates

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Concepts

- Restructured products
 - Phosphate free Chicken Burgers 20%
- Increased products
 - Chicken breast filet 25%
 - Ham 40%
 - Ham 52%
 - Bacon 40%




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Business Unit Functional Milk Proteins

Phosphate Free Chicken Burgers



Ingredients	End product (%)	
	Dextrose	PO-7730
Chicken breast without skin	77.50	77.50
Water	20.00	20.00
Nutrilac PO-7730		1.00
Dextrose	1.00	
Vacuum salt	1.00	1.00
Seasoning	0.50	0.50
Total	100.00	100.00


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Phosphate Free Chicken Burgers



- Chicken breast is minced on a kidney plate
- Chicken breast, PO-7730 and water are mixed on a Hobart mixer
- Salt and seasonings are added to the Hobart mixer
- Meat is formed to burgers (80 gr.)
- Burgers are put into the freezer
- After 24 hours, the burgers are fried in the oven (180°C for 22 min.)


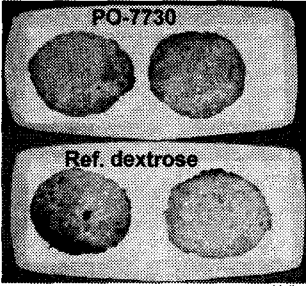
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Phosphate Free Chicken Burgers


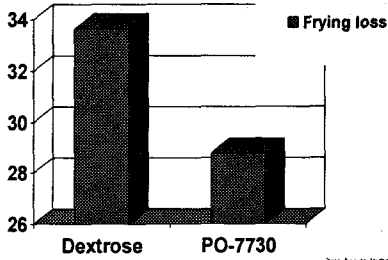
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Phosphate Free Chicken Burgers

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Business Unit Functional Milk Proteins

Benefits of using Whey Protein in Burgers

- ✧ Improved yield
- ✧ Meat replacement & water binding
- ✧ Better form stability & texture improvement
- ✧ Good product appearance
- ✧ Easy to solubilize
- ✧ No off taste
- ✧ No discolouration

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Business Area Functional Milk Proteins

Nutrillac solutions for Injection and Tumbling in Poultry

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Business Area Functional Milk Proteins

Chicken Carbonade

Ingredients	(25%)
Chicken breast without skin	80.00
Water	15.65
PSMD 129	0.80
Vacuum salt	2.00
Sodium ascorbate	0.05
Calcium carbonate	0.10
Natrium citrate	0.25
Spices	0.80
Total	100.00

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Business Area Functional Milk Proteins

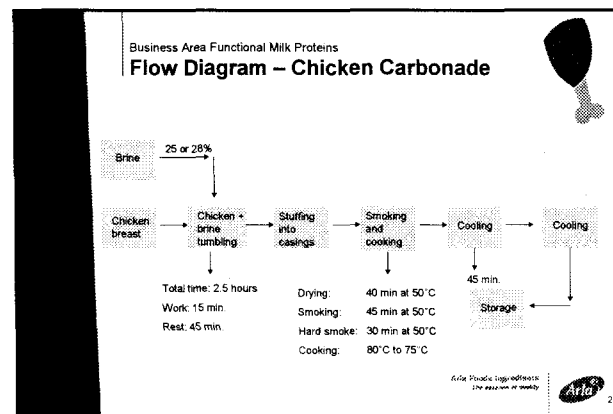
Chicken Carbonade

Ingredients	Brine (25%)
Water	80.00
PSMD 129	4.00
Vacuum salt	10.00
Sodium ascorbate	0.25
Calcium Carbonate	0.50
Natrium Citrate	1.25
Spices	4.00
Total	100.00

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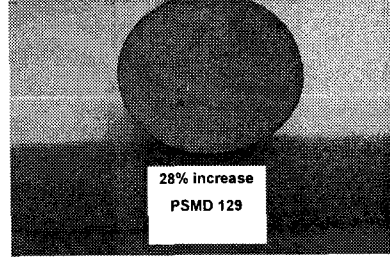


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Business Area Functional Milk Proteins

Phosphate Free Chicken Carbonade

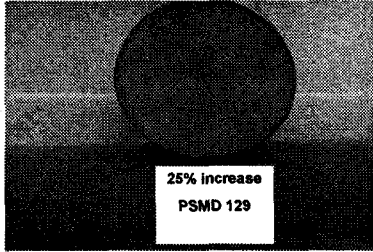


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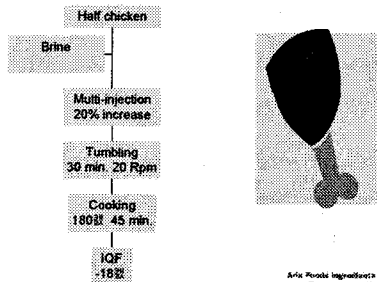
Business Area Functional Milk Proteins
Phosphate Free Chicken Carbonade



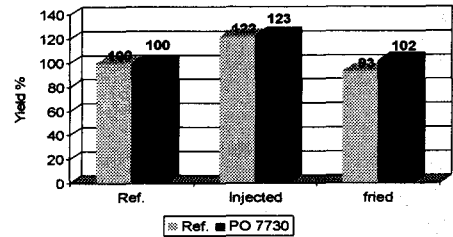
Business Area Functional Milk Proteins
Conclusion

- Cost reduction at unchanged quality
- Improved yield
- Water binding
- Texture improvement
- More juicy product
- Easy to dissolve
- No off-taste
- No discoloration

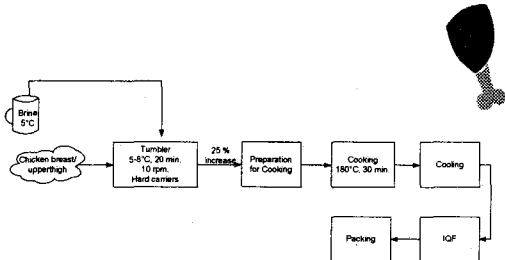
Business Unit Functional Milk Proteins
Flowchart - Injected and Tumbled Chicken



Business Unit Functional Milk Proteins
Yield of Roasted Chicken (n=10)



Business Unit Functional Milk Proteins
Flow Diagram - Tumbled Chicken Breast / Upper Thigh



Business Unit Functional Milk Proteins
Chicken Breast Filet 25% increase

Ingredients	End product (%)	Brine (%)
Chicken breast without skin	80.00	-
Sodium tripolyphosphate	0.30	1.50
Water	16.95	84.75
Nutrilac PO-7730	0.75	3.75
Dextrose	0.50	2.50
Vacuum salt	0.50	2.50
Seasoning	1.00	5.00
Total	100.00	100.00

Business Unit Functional Milk Proteins
Processing of Chicken Breast 25% Increase

```

    graph TD
      A[Prepare the brine and leave it at 3-5°C] --> B[Raw Chicken Breast/Chicken wings]
      B --> C[Tumbling]
      C --> D[Flavouring]
      D --> E[Frying]
      E --> F[Evaluation]
  
```

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 For success in quality

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Business Unit Functional Milk Proteins
Result of using Nutrilac PO-7730 in Chicken Breast Filet

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Aria 38

Business Unit Functional Milk Proteins
Benefits of using Whey Protein in Chicken products

- ◊ Cost reduction at unchanged quality
- ◊ Improved yield
- ◊ Water binding
- ◊ Texture improvement
- ◊ Easy to solubilize
- ◊ No off taste
- ◊ No discoloration

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Business Unit Functional Milk Proteins
CHICKEN NUGGETS

Chicken breast	60,80 %	55,41 %
Chicken thigh	17,60 %	17,60 %
Chicken skin	8,80 %	7,60 %
Water	10,00 %	16,60 %
Salt	0,80 %	3,80 %
Soy protein isolate	2,00 %	-
Nutrilac PO-7730	-	2,00 %

Conclusion
 Using soy protein isolate resulted a soft texture, had off taste and the final product had a dull appearance
 Using Nutrilac PO-7730 resulted in a product with a firm bite and a white product appearance
 Lower cooking loss was obtained when using Nutrilac PO-7730 compared to soy protein isolate

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Business Unit Functional Milk Proteins
Ham 52%

A. 1% Soy protein conc. & 0,3% carrageenan
 B. 0,7% Nutrilac HA-7570 & 0,3% carrageenan

	A	B
Ham		65,79%
Water		29,14%
Maltodextrine	0,60%	0,90%
Sodium mono glutamate		0,12%
Sodium ascorbate		0,05%
Nutrilac HA-7570		0,7%
Soy protein conc.	1,0%	
Carrageenan	0,3%	0,3%
Phosphate (STP)		0,50%
Salt		1,25%
Nitrit salt		1,25%
Cost index	100	100

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Aria 41

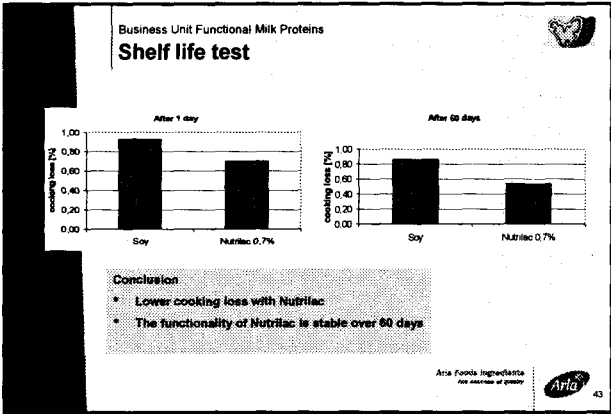
Business Unit Functional Milk Proteins
Ham 52%

Pilot plant procedure

- ◊ Prepare the brine & leave it at 3-5 °C
- ◊ Inject the meat – 35 strokes per min. at 2 bar
- ◊ Tenderize the meat using a roller tenderizer
- ◊ Put the meat into the tumbler and add the remaining brine until an increase of 52% is obtained
- ◊ Tumble the meat under vacuum for 5 hours at 12 r.p.m
- ◊ Take the meat out of the tumbler and let it rest for 19 hours
- ◊ Tumble the meat under vacuum for 30 min. at 12 r.p.m
- ◊ Stuff the meat into cook-in-casings
- ◊ Cook at a temperature of 80 °C until a core temperature of 72 °C is achieved
- ◊ The product is cooled and stored at 5 °C

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Business Unit Functional Milk Proteins
Benefits of using Nutrilac

- Good alternative to soy proteins
- Cost equal to soy
- No soy taste
- More enhanced meat texture and taste
- The functionality of Nutrilac is stable over 60 days
- GMO-free

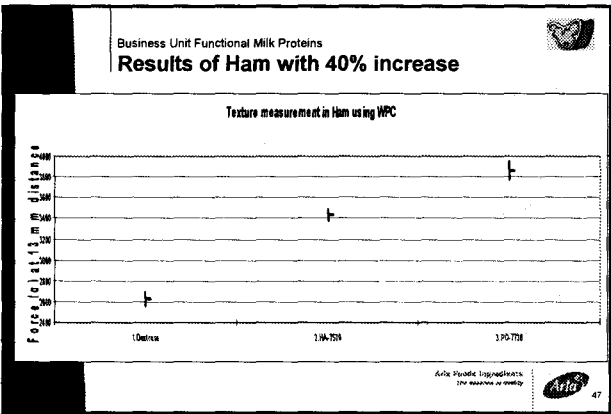
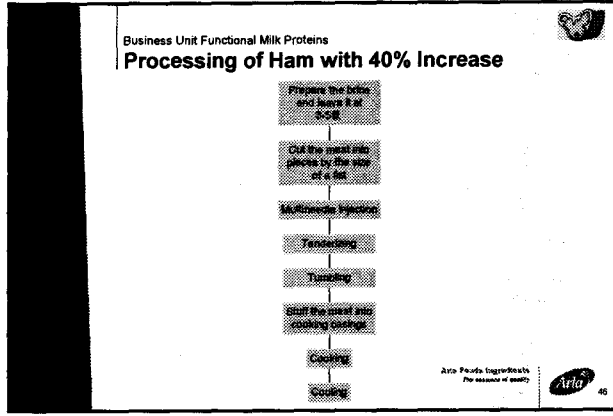
BETTER QUALITY
COST EQUAL

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Business Unit Functional Milk Proteins
Ham with 40% Increase

Ingredients	End product (%)	Brine (%)
Ham muscles	62.50	-
Sodium tripolyphosphate	0.40	1.07
Water	32.56	86.83
Nutrilac HA-7570	0.80	2.13
Variolac	1.70	4.53
Nitrite salt	2.00	5.33
So. ascorbate	0.04	0.11
Total	100.00	100.00

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Business Unit Functional Milk Proteins
Benefits of using Whey Protein in Ham

- Cost reduction at unchanged quality
- Improved yield
- Water binding
- Texture improvement & better sliceability
- Easy to solubilize
- No off taste
- No discoloration


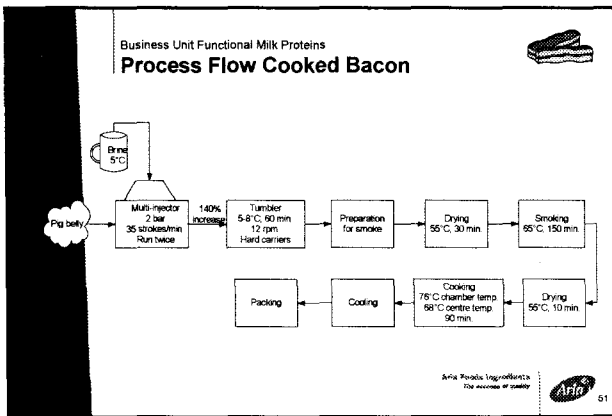
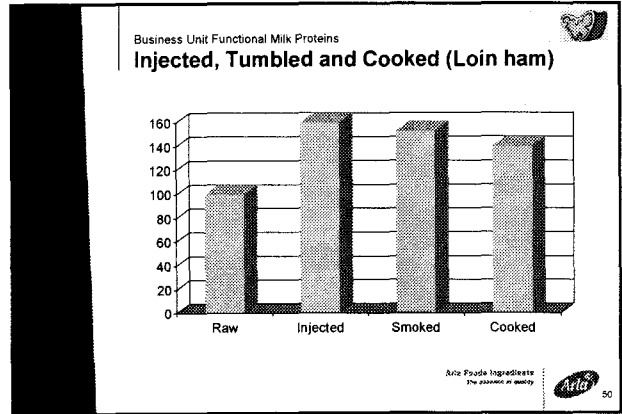
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Business Unit Functional Milk Proteins

Recipe – Loin Ham

* Pigilet without fat and bone	62.50%	100.00%
* Water	32.56%	52.10%
* Curing salt	2.00%	3.20%
* Variolac-992	1.70%	2.70%
* Nutrilac HA-7570	0.80%	1.30%
* Phosphate	0.40%	0.64%
* Sodium Ascorbate	0.04%	0.06%
Total	100.00%	160.00%

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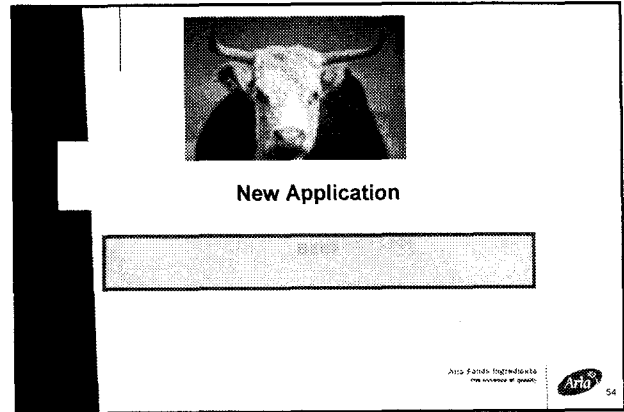
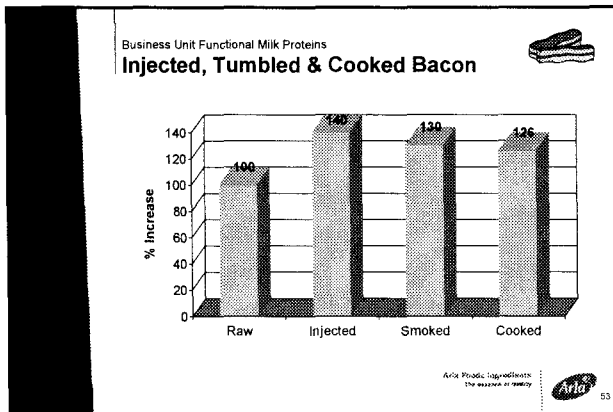



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Recipe for bacon with a 40 % increase

Brine	%	Final product	%
Water	84.00	Pig belly	71.43
Phosphate NTP	1.05	Water	24.00
Dextrose	6.02	Phosphate NTP	0.30
Nutrilac HA-7570	1.75	Dextrose	1.72
Curing salt	7.00	Nutrilac HA-7570	0.50
Sodium ascorbate	0.18	Curing salt	2.00
		Sodium ascorbate	0.05
Total	100.00	Total	100.00

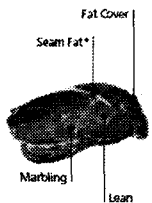
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Beef Quality


Quality of beef refers to characteristics associated with the palatability of the meat

- tenderness,
- juiciness,
- flavour
- appearance
 - colour
 - amount of marbling
 - fat cover



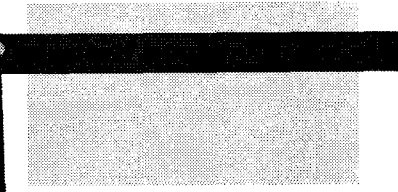
Fat Cover
Seam Fat
Marbling
Lean

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One new concept for fresh beef cuts




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Injection of meat




Why inject ?

- To add value to your product – in terms of juiciness - customer satisfaction
- Cost saving

Challenge of injection

- What you inject must also stay inside the product and make the final product juicy
- Product appearance must be good

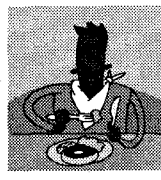
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Cooking process of meat

- When cooking meat – the meat fibres will undergo a contraction and cell membranes will be destroyed. When destroying the cell membranes the intracellular meat juice will be liberated.
- The more you cook the meat the more meat juice will be set free and the drier the meat.



- 64 °C Red
- 66 °C Medium
- 68 °C Well done


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Nutrilac solutions for beef meat



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Unique functionality of Nutrilac solution capable of gelification in a cold state

Two step gelification process


1-Step

- Once injected into the meat the viscosity of the brine will increase due to the cold gelification properties – low dripping when stored fresh

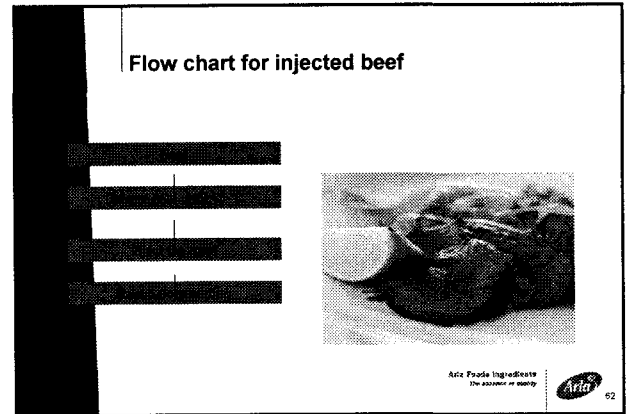
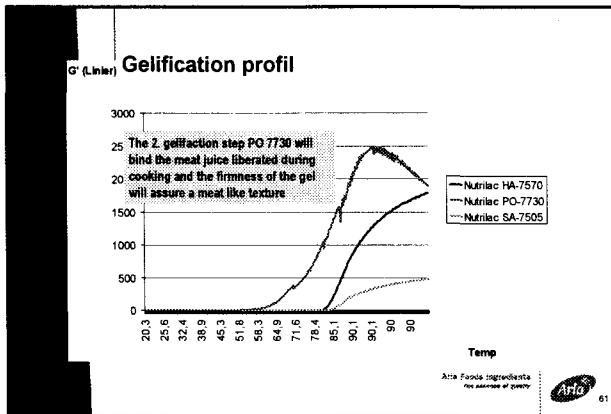
2-Step

- When cooking the meat – the heat will provoke a contraction of the meat fibres and meat juice will be liberated. The gelifying capacity of whey proteins will help retain this free meat juice and assure a juicy and tender product.
- The firmness of the gel formed has a very meat like structure.

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Recipe - Injected Beef 18%

Ingredients	End product (%)	Brine %
Beef meat	84,75	
Water	14,14	92,72
Nutrilac PO-7730	0,36	2,36
Phosphate	0,30	1,97
Salt	0,45	2,95
Total	100,00	100,00

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Benefits

- ◊ Add value to beef product in terms of juiciness, taste and tenderness
- ◊ Good product appearance
- ◊ Cost saving
- ◊ No off - taste
- ◊ No discolouration

Acta Foods Ingredients
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Business Unit Functional Milk Proteins Application Plant - Denmark

- ◊ 11 technicians
- ◊ Flexible setup of equipment
- ◊ 400 square meters/4300 square feet

Acta Foods Ingredients
The essence of quality

Business Unit Functional Milk Proteins Meat Laboratory

Application facilities in Denmark – Nr. Vium

Acta Foods Ingredients
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Business Unit Functional Milk Proteins
Meat & Fish Plant

- ◊ Bowl chopper
- ◊ Vacuum tumbler
- ◊ Multi needle injector
- ◊ Smoke oven
- ◊ Convection oven
- ◊ Sausage stuffer
- ◊ Roller tenderizer
- ◊ Capacity: Up to 10 trials a day



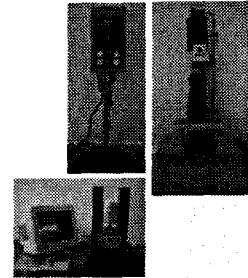
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Business Unit Functional Milk Proteins
Application Plant, Evaluation Equipment - Denmark

- ◊ Flow viscosity
- ◊ Brookfield
- ◊ Haake
- ◊ Texture analyser
- ◊ pH
- ◊ Oscillation measurement
- ◊ Microscope



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Business Unit Functional Milk Proteins
Equipment

- ◊ Multi needle injector
- ◊ Vacuum tumbler (3 compartments)
- ◊ Roller tenderizer
- ◊ Needle tenderizer
- ◊ Grinder (Wolf)
- ◊ Bowl chopper
- ◊ Vacuum filling machine
- ◊ Smoke house
- ◊ TA-XT2 texture analyser
- ◊ Closing
- ◊ Band saw



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Business Unit Functional Milk Proteins
Why chose Arla Foods Ingredients ?

SIMPLY BECAUSE

- ◊ We develop products that fit your needs
- ◊ We help you optimise your recipes
 - price competitiveness
 - add value to your product
- ◊ We help you innovate



Arla Foods Ingredients



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Internet Homepages



- ◊ Arla Foods <http://www.arlafoods.com>
- ◊ Arla Foods Ingredients <http://www.arlafoodsingredients.com>
 - Welcome
 - Company presentation
 - Ingredients for industrial use
 - Consumer products
 - Contract manufacturing
 - News

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