

# PROCESS INNOVATION

*Supporting NPD*

Dr. John Tuohy



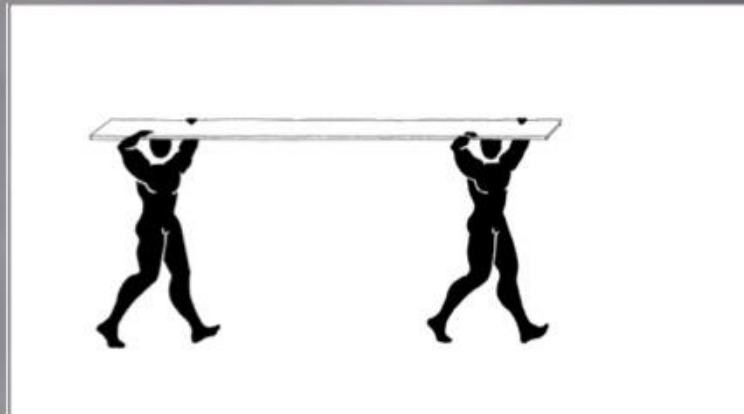
**SDT** Society of  
Dairy Technology  
Passion for Dairy

2e<sup>td</sup>



Technical  
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# RESEARCH & TECHNOLOGY OUTSOURCING & OPEN INNOVATION FACILITATING



*Two heads are better than One*



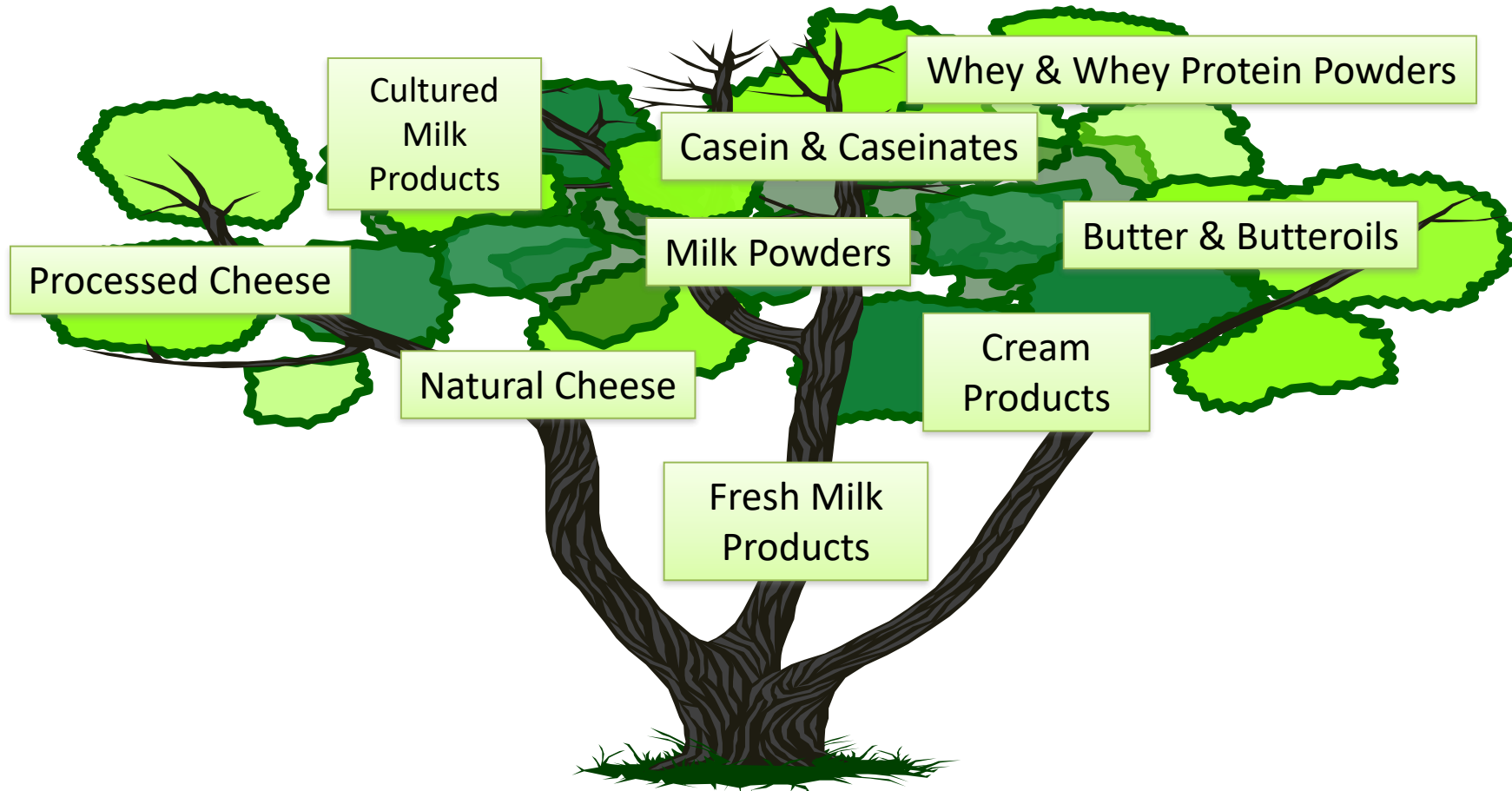
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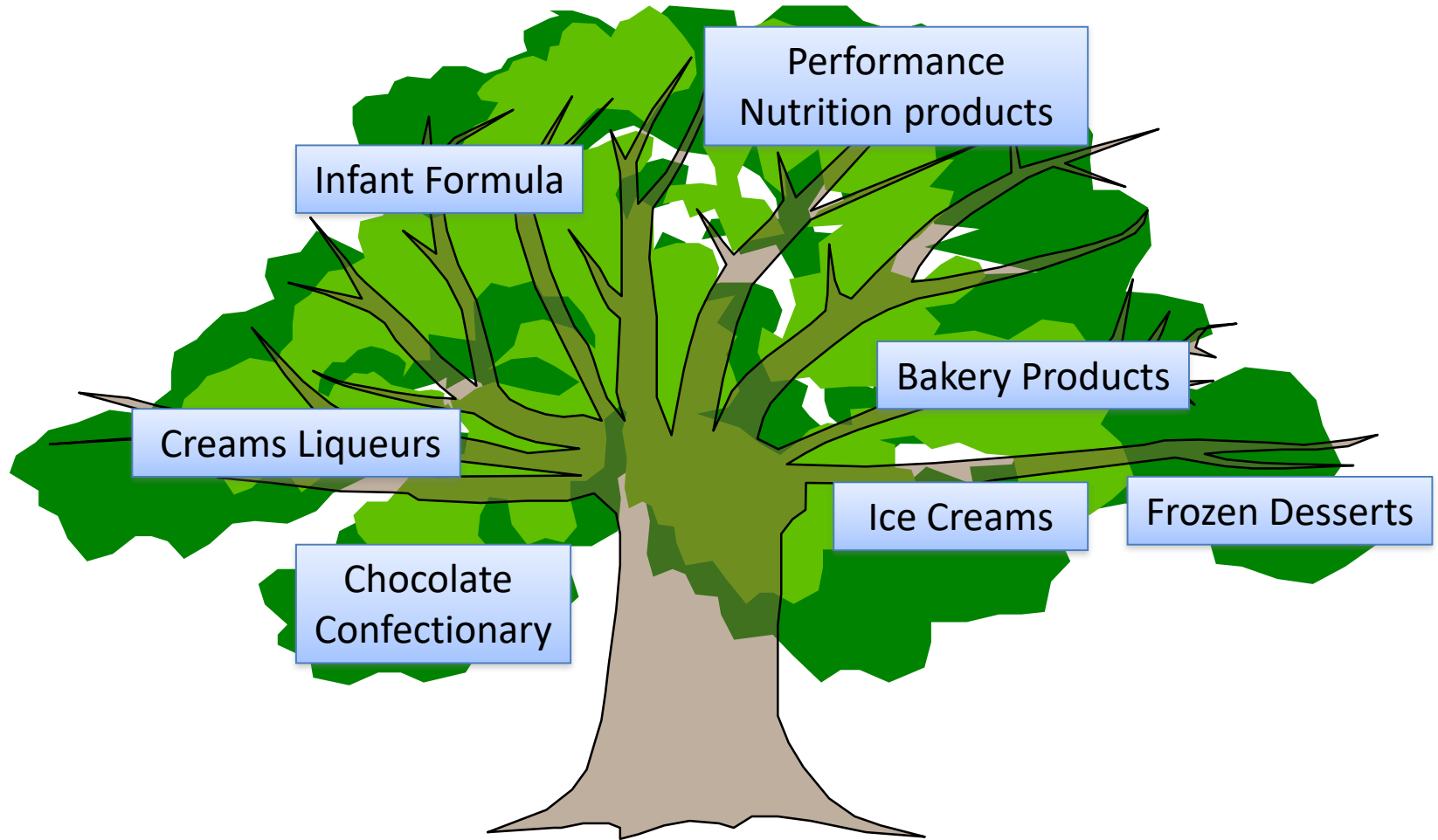
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# DAIRY PRODUCTS TREE



# DAIRY INGREDIENT BASED FOOD & BEVERAGE PRODUCTS TREE



# Heat Treated Milk Categories

| Type of milks    | Cold chain | Shelf Life | Heat Treatment                      |
|------------------|------------|------------|-------------------------------------|
| UHT Milk         | No         | 90 D       | UHT Sterilization                   |
| ESL Milk         | Yes        | 30 to 90 D | Ultra and high pasteurization       |
| Pasteurized Milk | Yes        | 7 à 29 D   | Pasteurization                      |
| Sterilized milk  | No         | 150 D      | Sterilization of milk after filling |

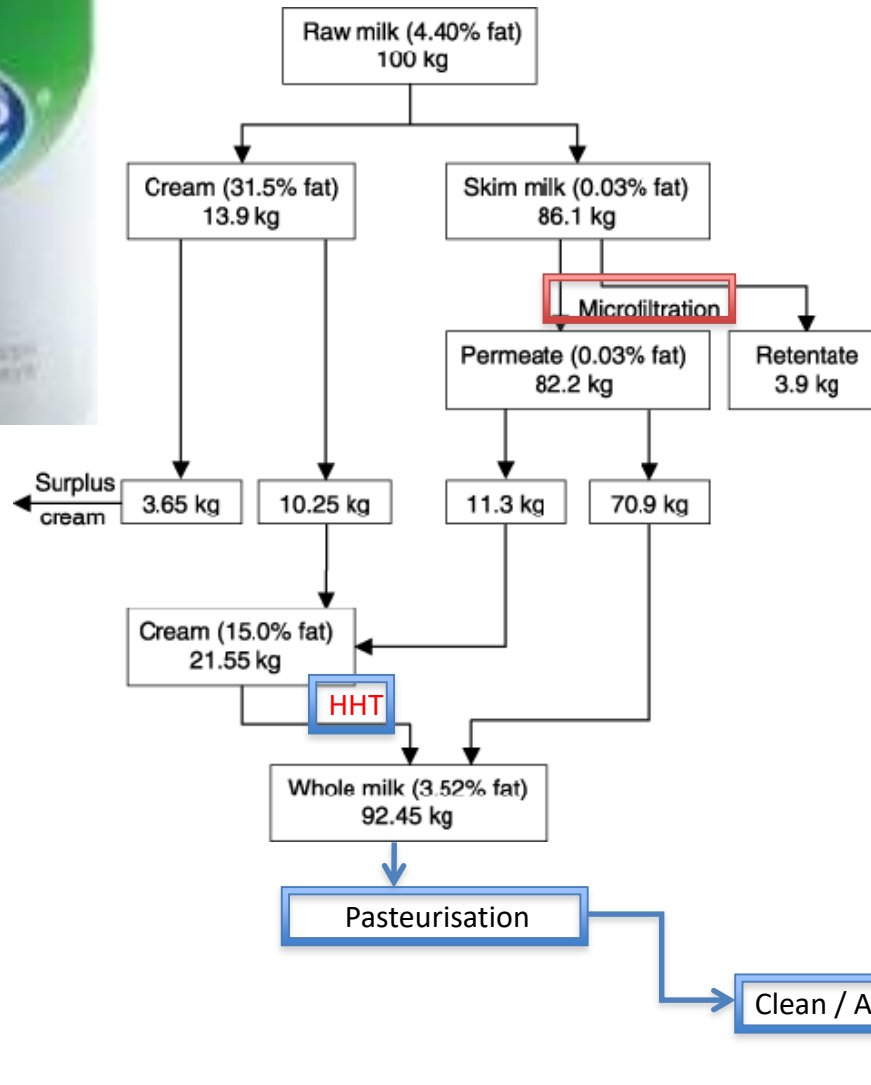
## Process Technology; effect on spore reduction, whey protein denaturation, and rough estimate of Shelf-life

| Process               | Log. Reduction<br>Aerobic<br>Psycrotropic<br>spores | Expected<br>Shelf-life<br>Max 6°C<br>Storage | Expected<br>Shelf-life<br>Max 10°C<br>storage | β-LG (mg/L) |
|-----------------------|---|--|---|-------------|
| Pasteurisation        | 0   | 10–12 days                                   | 3–4 days                                      | 4225        |
| Centrifugation        | 1   | 14 days                                      | 4–5 days                                      | >4000       |
| Microfiltration       | 2–3   | 30 days                                      | 6–7 days                                      | >3500       |
| Pure-Lac<br>ESL past. | 8   | Over<br>45 days                              | Up to<br>45 days<br>(**)                      | >3000       |
| Infusion UHT          | 8 (*)   | 180 days                                     | 180 days<br>at 25°C<br>(**)                   | >1400       |
| High Heat<br>Process  | 40  | 180 days                                     |   | >250        |

\* Thermophilic Spores

\*\* Depending on filling solution

## Extended Shelf Life milk (using Microfiltration)





# Modified Milk

## Double-the-price US premium Fairlife milk brand will 'rain money': Coca-Cola



By Mark Astley+

25-Nov-2014

Last updated on 25-Nov-2014 at 15:20 GMT

5 comments



Related tags: Fairlife, Coca-Cola, Milk, Protein, Calcium, Lactose-free, US

Coca-Cola is confident its premium Fairlife milk brand, due to launch across the US next month, will "rain money" once established in the market.



**Regular/Organic  
Whole Milk  
per 8oz**

**VS.**

**fairlife® whole  
per 8oz**

8g

**PROTEIN**

13g

280mg

**CALCIUM**

370mg

12g

**SUGAR**

6g

NO

**LACTOSE  
FREE**

YES

150

**CALORIES**

150

8g

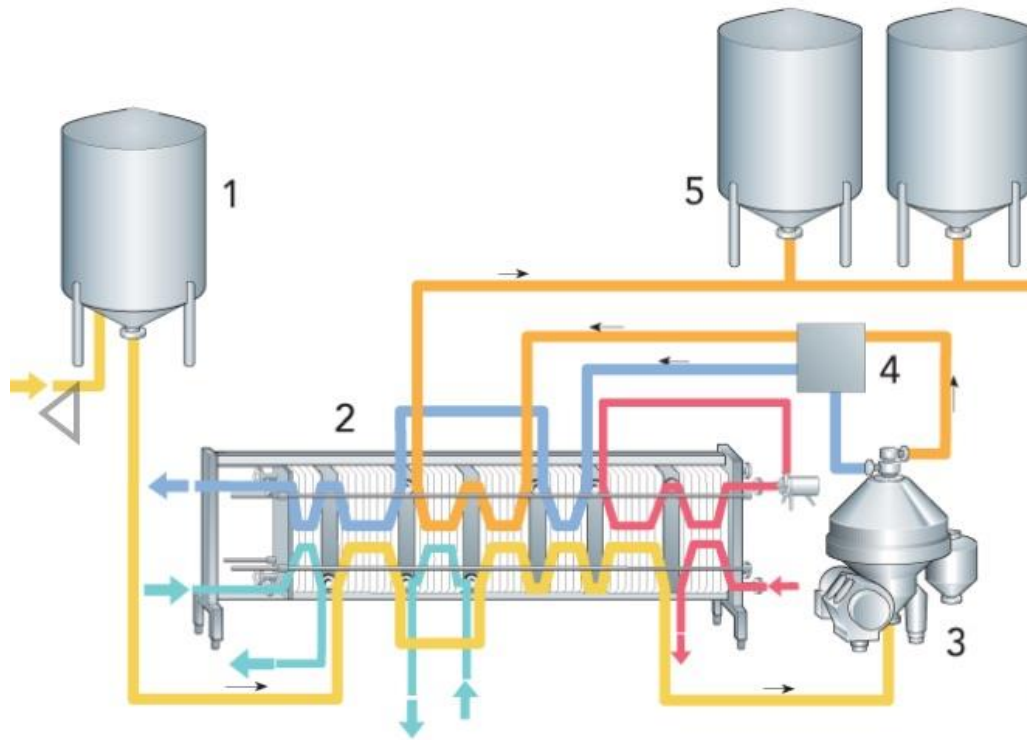
**FAT**

8g



| Fat content % | Milk fat products             | Mixed fat products                | Margarine products           |
|---------------|-------------------------------|-----------------------------------|------------------------------|
| 80 – 95       | Butter*                       | Blend                             | Margarine*                   |
| > 62 – < 80   | Dairy spread                  | Blended spread                    | Fat spread                   |
| 60 – 62       | 3/4 fat or reduced fat butter | 3/4 fat or reduced fat blend      | 3/4 fat or reduced margarine |
| > 41 – < 60   | Reduced fat dairy spread      | Reduced fat blended spread        | Reduced fat spread           |
| 39 – 41       | 1/2 or low fat butter         | 1/2 or low fat blend margarine or | 1/2 or low fat Minarine*     |
| < 39          | Low fat dairy spread          | Low fat blended spread            | Low fat spread               |

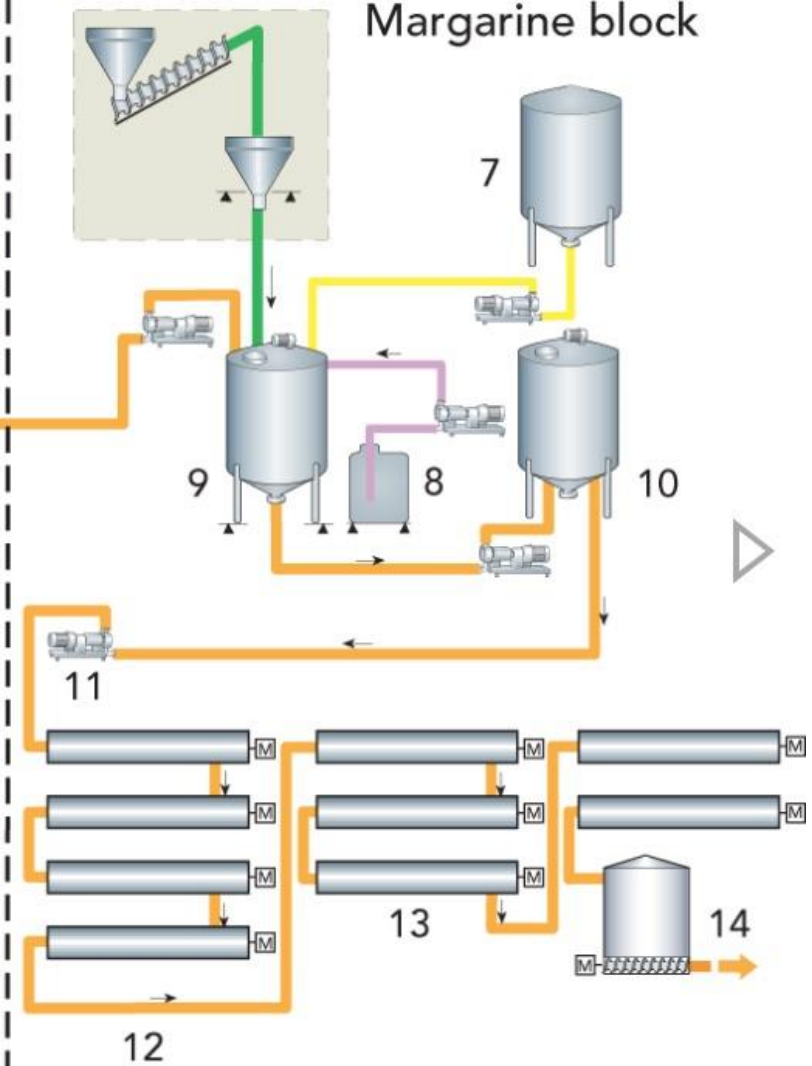
## Dairy block



— Cream, 35 - 40 %  
— Cream, 80 %  
— Buttermilk  
— Vegetable oil

— Aroma  
— Salt  
— Heating media  
— Cooling media

## Margarine block



12

13

14

# State of the industry: How Greek yogurt keeps customers coming back

By Beth Newhart [✉](#)

03-Dec-2018 - Last updated on 03-Dec-2018 at 11:19 GMT



Packaging and product innovations are allowing for a longer shelf life and healthy products to be sold in convenience channels. Pic: ©GettyImages/DmitriMaruta

## REVIEW

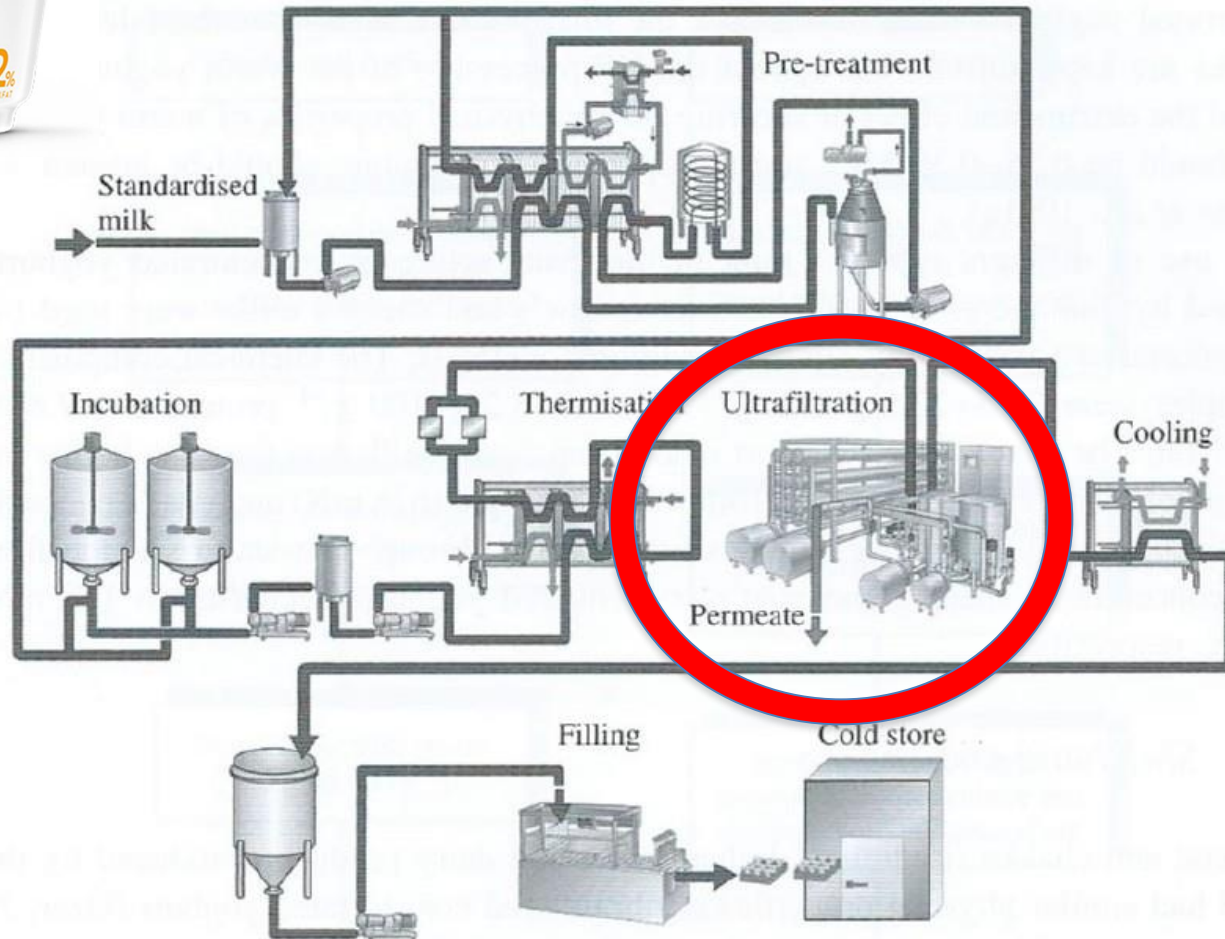
## Strained fermented milks – A review of existing legislative provisions, survey of nutritional labelling of commercial products in selected markets and terminology of products in some selected countries

ADNAN Y TAMIME,<sup>1\*</sup> MICHAEL HICKEY<sup>2</sup> and DAVID D MUIR<sup>3</sup>

<sup>1</sup>*Dairy Science and Technology Consultant, 24 Queens Terrace, Ayr KA7 1DX, UK,* <sup>2</sup>*Michael Hickey Associates, Derryreigh, Creggane, Charleville, Co.Cork, Ireland, and* <sup>3</sup>*D D Muir Consultants, 26 Pennyvenie Way, Griddle Toll, Irvine KA11 1QQ, UK*



# Concentrated Yoghurt





THANKS TO ALL THE  
VOLUNTEERS,  
COMPETITORS, SPONSORS,  
JUDGES, STEWARDS,  
CATERERS AND EVERYONE  
ELSE THAT HELPED MAKE  
THE 2018 SHOW ONE OF  
OUR BEST SHOWS EVER.



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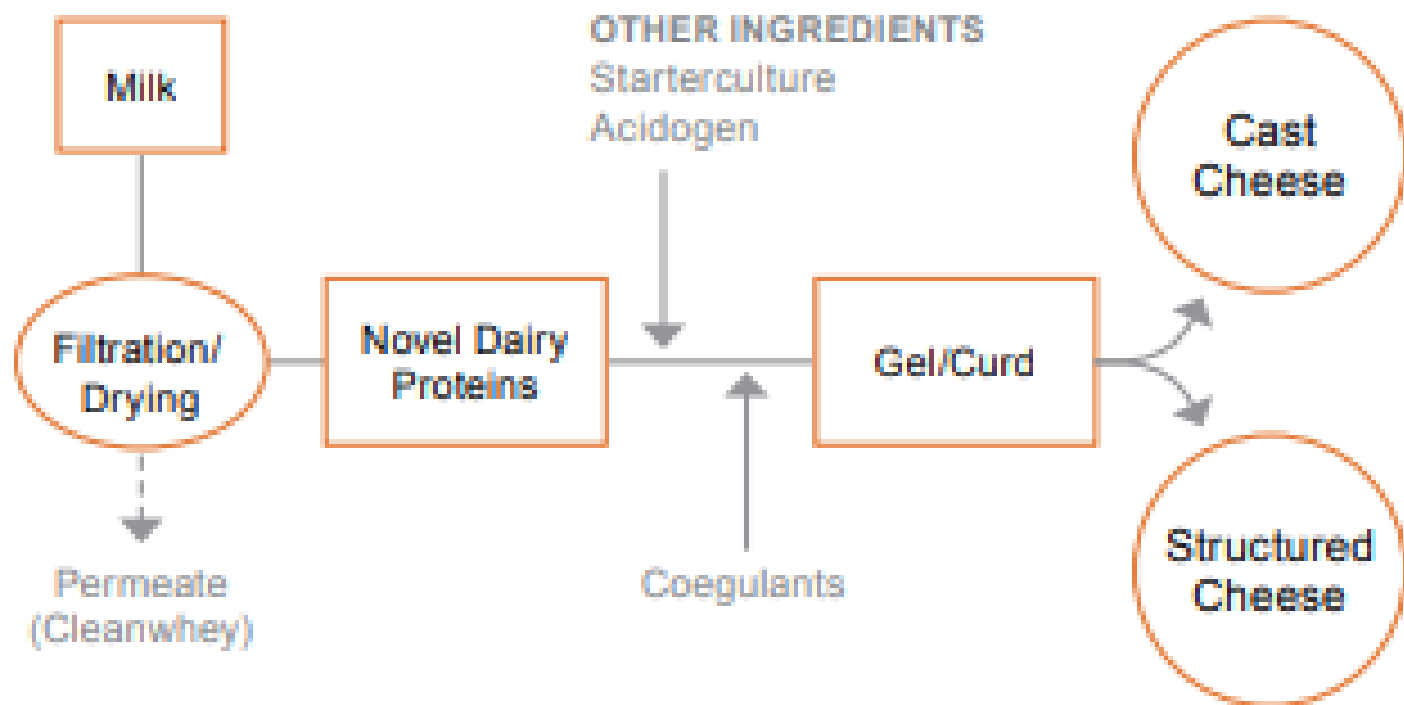


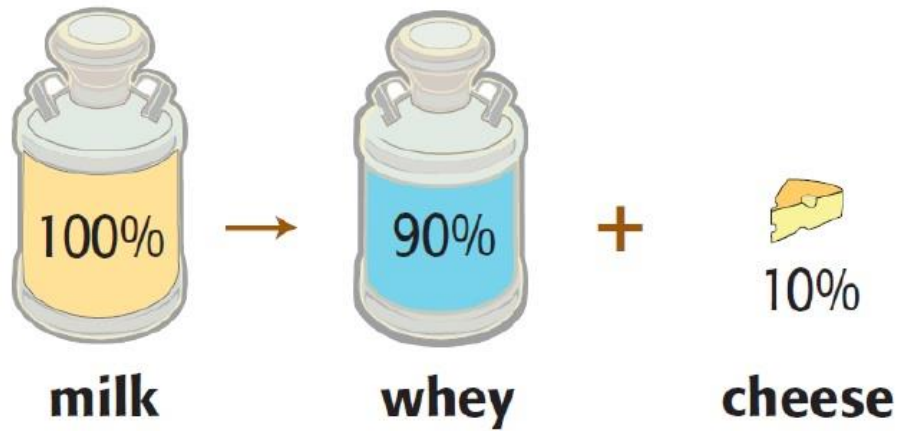
2018 PHOTO GALLERY

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## LOW-FAT CHEESE QUALITY

| Attribute | Process Variable   |
|-----------|--|
| Flavour   | Starter Cultures (slower acid / )<br>Adjunct Cultures (NSLAB / Attenuated)<br>Lactose level & pH   |
| Texture   | Moisture content of curd<br>Homogenisation ( milk /cream)<br>Fat Mimetics ( Microparticulated WPC) |
|           |  |





| SOLIDS        | MILK | WHEY |
|---------------|------|------|
| Fat           | 3.5  | 0.3  |
| Protein       | 3.3  | 0.8  |
| Lactose       | 4.8  | 4.9  |
| Min.Salt<br>s | 0.8  | 0.5  |
| TOTAL         | 12.4 | 6.5  |



# Nutritional Products

**A broad range of products are available for multiple nutritional requirements**

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## Maternal Nutrition

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- During pregnancy or lactation
- Complimentary or, supplementary nutrition

## Infant Formula (0-6 months)

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- Sole source of nutrition
- Whey protein or, casein dominant
- Hydrolysed protein

## Follow-on Formula (6-18 months)

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- Weaning

## Growing Up Milks (1 year +)

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- Complimentary or, supplementary nutrition
- Flavoured milks

## Pre-term Nutrition

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- Low birth weight
- Human milk fortifier
- Post discharge formula

## Special Medical Needs

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- Elemental diets
- Metabolic conditions (e.g. PKU)
- Extensively hydrolysed protein

## Mild to Moderate Feeding Intolerances

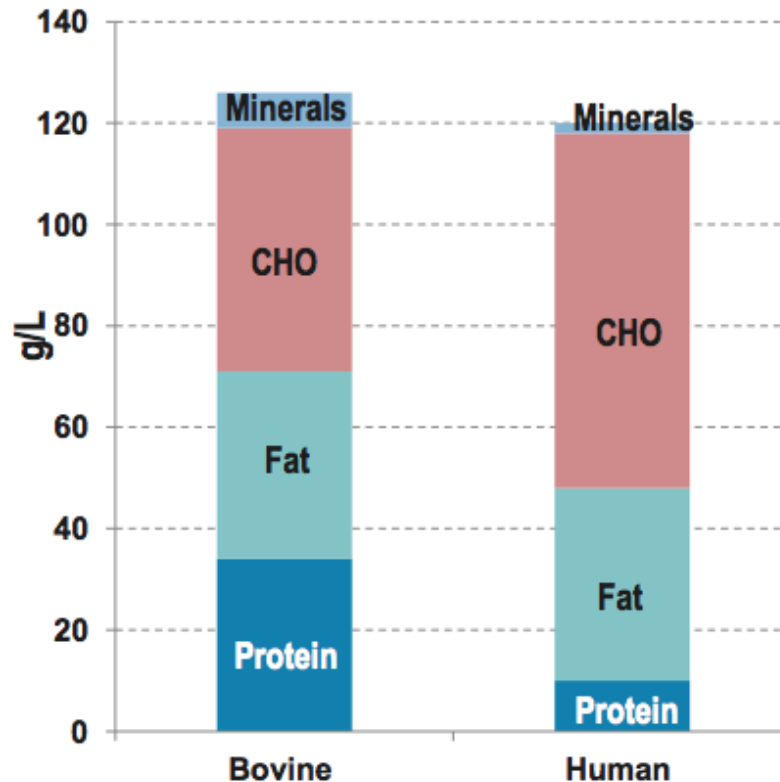
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- Lactose-free
- Reduced lactose
- Soy protein
- Partially hydrolyzed protein
- Anti-regurgitation
- *Picky eaters*

# Human Milk v Bovine Milk

Macro-composition of bovine and human milk



| Component        | Unit | Bovine | Human |
|------------------|------|--------|-------|
| Carbohydrate     | g/L  | 48     | 70    |
| Lactose          | g/L  | 48     | 60    |
| Oligosaccharides | g/L  | Trace  | 8-15  |

| Component              | Unit | Bovine             | Human                  |
|------------------------|------|--------------------|------------------------|
| Whey : casein          | --   | 20/80              | 60/40                  |
| NPN, as % TN           | %    | 5-6                | 20-25                  |
| $\beta$ -lactoglobulin | g/L  | 3.2 <sup>1</sup>   | Absent                 |
| $\alpha$ -lactalbumin  | g/L  | 11.2               | 2-3 <sup>3</sup>       |
| Serum albumin          | g/L  | 0.4 <sup>1</sup>   | 0.9 <sup>4</sup>       |
| Lactoferrin            | g/L  | 0.1 <sup>1</sup>   | 2-4 <sup>3</sup>       |
| Lysozyme               | g/L  | Trace <sup>2</sup> | 0.04-0.09 <sup>3</sup> |
| Lactoperoxidase        | %    | 0.03 <sup>2</sup>  | Trace                  |
| Immunoglobulins        | g/L  | 0.8 <sup>1</sup>   | 1 <sup>2</sup>         |

<sup>1</sup>Walstra et al (1999), <sup>2</sup>Renner et al (1989), <sup>3</sup>Harzer & Haschke (1989),

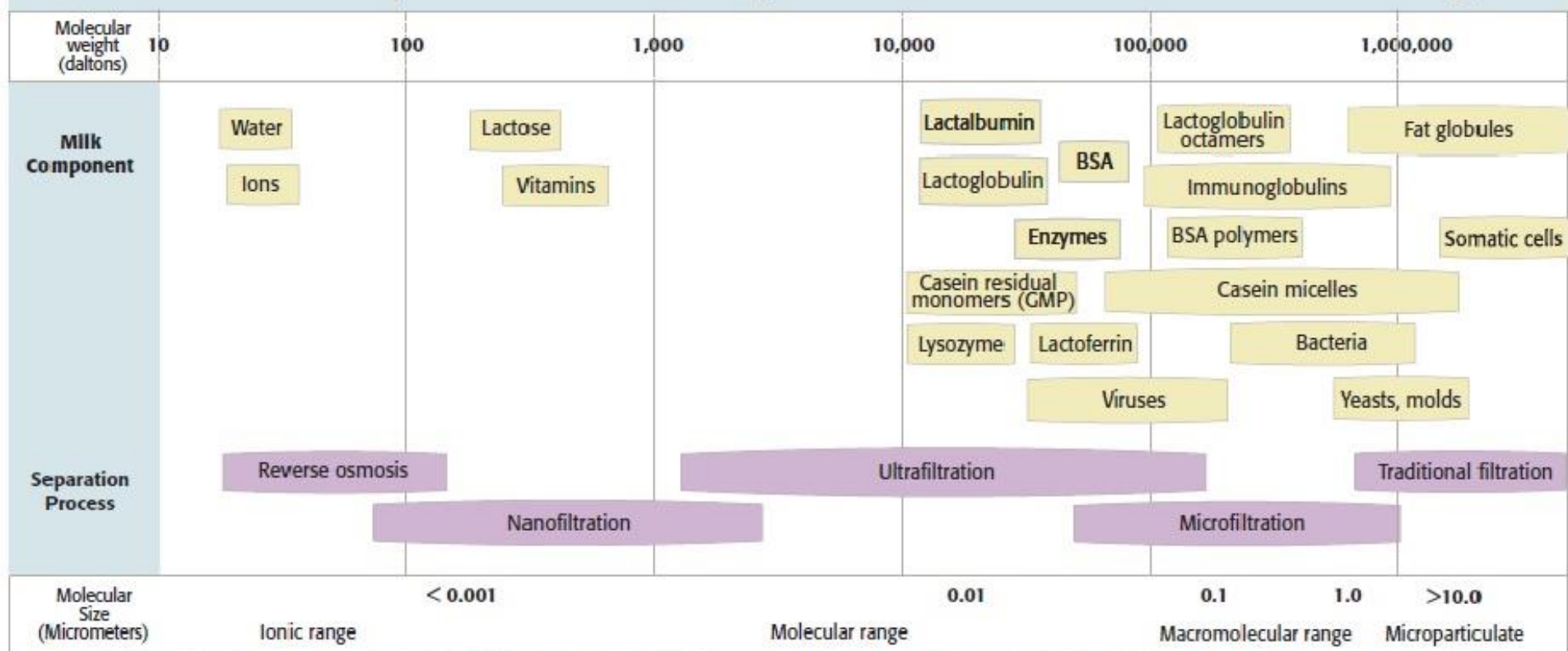
<sup>4</sup>Sanchez-Pozo et al (1986)



## Milk-derived ingredients used in infant formula

| Ingredient                          | Application  |
|-------------------------------------|--|
| Skimmed Milk                        | Casein source  |
| Demineralized Whey                  | Whey protein source  |
| Whey Protein Concentrate            | Whey protein source  |
| Alpha Lac - enriched WPC            | $\alpha$ -lac enriched whey-dominant formulas                |
| Lactose                             | Carbohydrate source  |
| Partially Hydrolysed Whey Protein   | Formulas for infants with mild-moderate feeding intolerances |
| Extensively Hydrolysed Whey Protein | Formulas for infants allergic to cow's milk protein          |
| Milk Protein Isolate                | Low Lactose formulas   |
| Lactose free WPC                    | Lactose-free formulas  |
| Galactooligosaccharides             | Prebiotic containing formulas                                |
| Lactoferrin                         | Immune system boosting formulae                              |

# Relative Milk Component Sizes in Comparison with Membrane Pore Size Ranges



| Process            | Reverse Osmosis (RO)   | Nanofiltration (NF)  | Ultrafiltration (UF)  | Microfiltration (MF)                      |
|--------------------|--|--|---|---|
| Operating pressure | 200 - 1,200 psig   | 150 - 400 psig   | 30 - 150 psig   | 10 - 100 psig                             |
| Retentate          | All solutes of stream  | All solutes of stream except for monovalent ions   | Fat and proteins  | Fat, particles and very large proteins    |
| Permeate           | Water only   | Monovalent ions  | Minerals, NPN and lactose   | Lactose, minerals and small proteins      |
| Separation method  | Ability of compound to mimic tetrahedral structure of water determines ability to permeate | Diffusion & flow through pores controlled by mass transfer, diffusion characteristics and charge | Shape, charge, flexibility and molecular weight determine ability to cross membrane | Size determines ability to cross membrane |

Peak sports  
performance



Health and  
wellness



Independent  
living

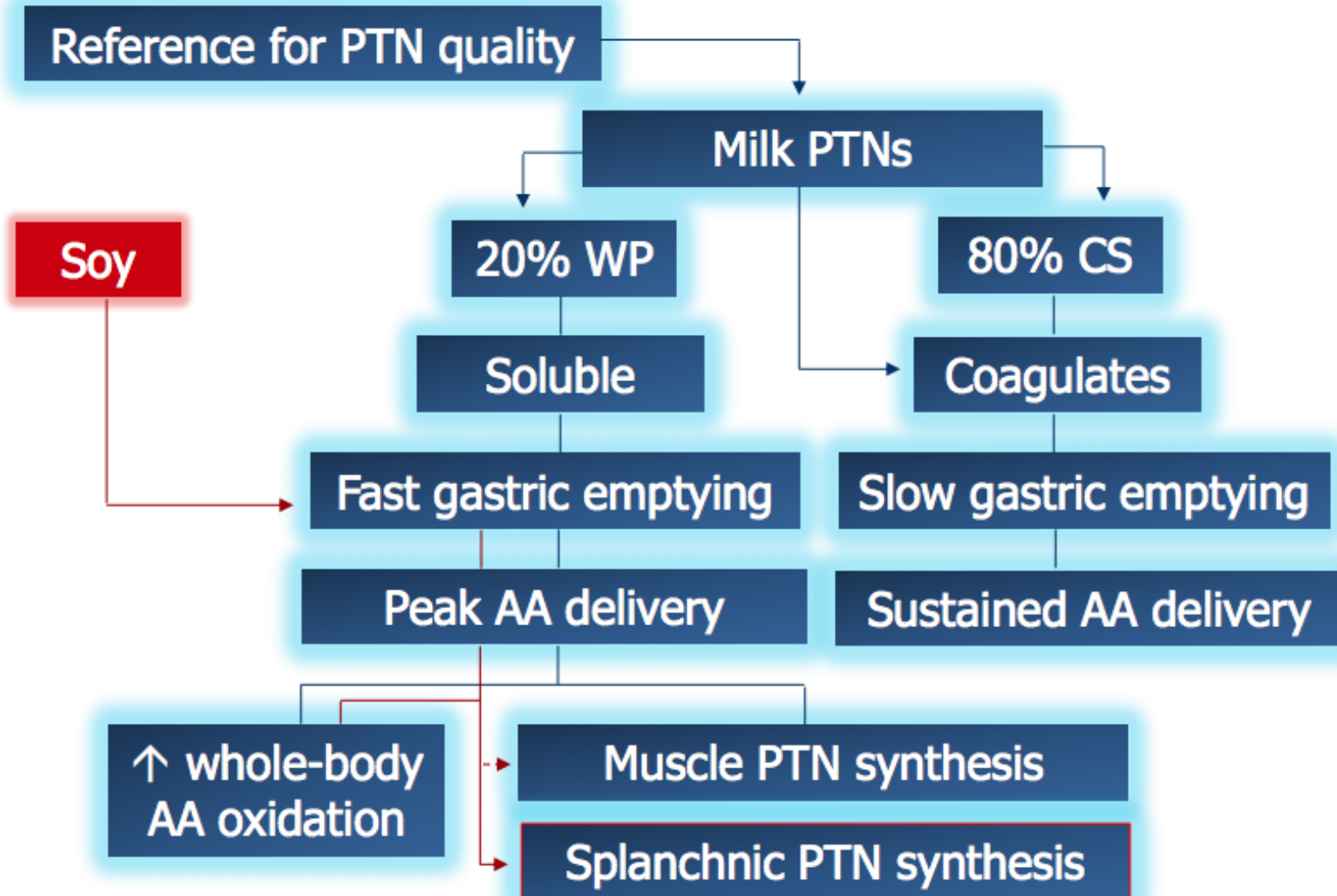


Quality of life





# The role of protein quality





## WHEY20



High quality protein in an easy to consume format that you can carry around in your bag with ease - WHEY20 is the biggest innovation in the protein industry in years. We're incredibly proud of WHEY20 - it tastes similar to a flavoured yogurt, but you don't need to keep it in the fridge and it's packed full of high quality protein - 6g of BCAAs, 20g protein and low in calories. If you haven't tried it yet, it's time to give it a go and see what all the fuss is about!



# LAUNCH OF NEW IRISH CREAM . . .

Mr. David Dool, Chairman of R. & A. Bailey & Co. Ltd, recently introduced Baileys Irish Cream to the national and trade press, the Committee members of various trade organisations including Hotels Federation, Licensed Visitors Association, Irish Restaurant Owners Association and the OFFICE division of R.G.D.A.A.

From ancient times cream was always highly prized in Ireland. At Baileys they use it as the base for Baileys Irish Cream. Pure Irish cream blended with a subtle hint of chocolate,

Irish whiskey and pure spirit are the basis for this versatile drink.

A new company, R. & A. Bailey Ltd, has been set up to market Baileys Irish Cream on the international market. D.J. Dool is Chairman of R. & A. Bailey Ltd, with Tom Kennedy as Sales Director and Keith MacCarthy Murrigh as Marketing Director.

The introduction of Baileys Irish Cream to the Irish market marks the beginning of a corporate marketing objective to introduce Baileys to world wide markets.

*Baileys Irish Drink*



▲ Baileys Love tops up the glasses of Owen Fox and Eugene McGovern at Tadmor Hall, Dublin.



The real story behind  
Baileys Irish Cream and  
other great drinks brands

# **“That s\*it will never sell!”**

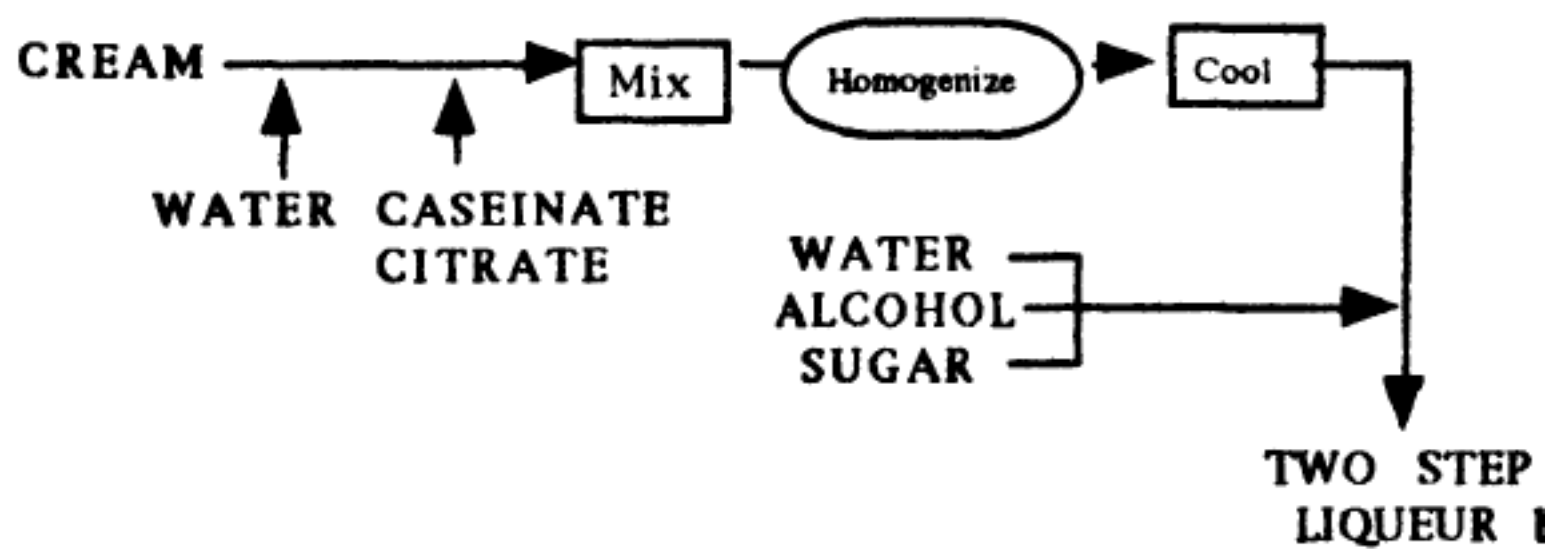
A book about ideas by  
the person who had them

**David Gluckman**



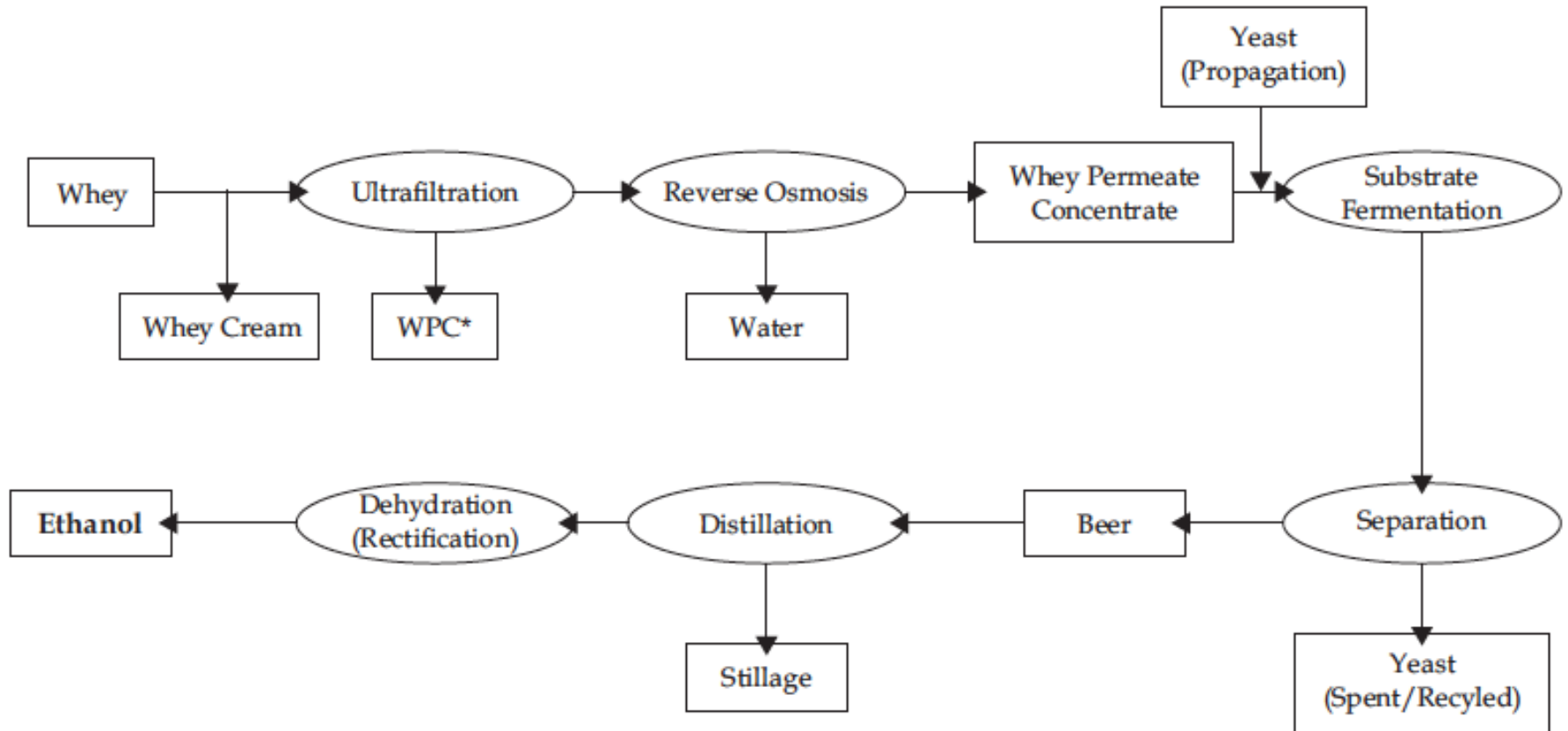
**Table 2.2.4 Typical recipe for cream emulsion and alcohol syrup used in the production of cream liqueur by two step process 2-Sb.**

| <b>Ingredient</b>   | <b>% w/w</b> |
|---|--------------|
| <i>Cream emulsion (e.g. 50% w/w inclusion)</i>              |              |
| Cream (48 % fat) <sup>1</sup>                               | 67.0         |
| Sodium caseinate  | 5.5          |
| 30 % w/w trisodium citrate.. 2H <sub>2</sub> O <sup>2</sup> | 1.2          |
| Water   | 26.3         |
| <i>Alcohol syrup (e.g. 50 w/w addition)</i>                 |              |
| Sugar   | 38.0         |
| 94 % w/w alcohol  | 27.0         |
| Caramel   | 1.0          |
| Water   | 34.0         |



| TECHNICAL ISSUES          | NATURE                | CONTROL             |
|---------------------------|-----------------------|---------------------|
| Creaming                  | FG Particle Size      | Emulsification      |
| Age Thickening / Gelation | Aggregation           | Ionic Ca            |
| Neck plugs                | Emulsion Inversion    | Emulsification      |
| Granular sediments        | Ca & citrate crystals | [Trisodium Citrate] |

# LACTOSE FERMENTATIONS







*Dairy Farmers of America's ethanol-from-whey plant in Corona, California. (Photograph courtesy of Dairy Farmers of America)*

**Table 1 - Names and end uses of ethanol grades**

| <b>Name</b> | <b>Origin of name</b>      | <b>Industrial uses</b>  |
|-------------|----------------------------|---|
| EA95        | ethyl alcohol 95%          | industrial solvent and coloured methylated spirits  |
| 95WS        | 95% white spirit           | industrial solvent; white vinegar; medicines; surgical spirit; food colourings; food flavourings          |
| CTWS        |                            | higher quality deodorants, perfumes and cosmetics; food colourings; food flavourings; alcoholic beverages |
| NCS         |                            | alcoholic beverages; top quality deodorants and perfumes  |
| EA99        | ethyl alcohol 99%          | paint, printing ink and packaging industries; industrial solvents   |
| AA          | anhydrous alcohol          | some aerosol products; hospital applications; pharmaceuticals   |
| HGAA        | high grade aerosol alcohol | aerosols - especially hair care products; pharmaceutical cosmetics  |

# TURBULANCE EXPECTED

