uniting dairy excellence & ambition

Factsheet

November 2021

Q&A: Milk VS Plant-based beverages

Why are milk and dairy so important in our diet?

- **Milk is a naturally nutrient-rich food**.
- Dairy foods are natural sources of **high-quality protein, essential vitamins B2, B12 and minerals** such as calcium, phosphorus, potassium and iodine *(1)*.
- Dairy nutrients play an **important role in maintaining good health during all stages of life**. They especially have an impact on **bone health, muscle growth, nutrition and are beneficial for weight management and non-communicable diseases**, such as type 2 diabetes, cardiovascular disease, hypertension, osteoporosis and colorectal cancer *(2)*.
- The milk matrix provides a **naturally nutrient-rich package** in comparison to formulated plant-based beverages (PBB).

Do plant-based beverages (PBB) provide the same nutritional benefits as milk?

- The milk matrix is a naturally nutrient-rich package. For example, **calcium in milk is an integral part of the milk matrix** and it actively interacts with other milk nutrients to create unique biological interactions inside the body. **PBB do not contain natural calcium, it is added artificially.**
- PBB are fortified drinks, formulated to imitate the nutritional composition of milk, however **there is no PBB product available that can deliver the full nutritional benefits that milk provides naturally**. PBB cannot be therefore considered as nutritionally equivalent to milk *(3)*.
- Calcium that is naturally associated with caseins in milk have particular advantages when compared with the fortification of calcium (and other micronutrients) in plant-based drinks.
  Studies *(2)* indicate that **sedimentation of added calcium on the bottom of the container** remains a problem for plant-based drinks.

Thus, although most fortified plant-based drinks are fortified with an equivalent amount of calcium content of milk, due to settling and poor solubility, and the very high variability of solubility associated with shaking between beverages, it is uncertain if PBB contain equivalent levels of bioavailable calcium compared with milk.

- **Animal sourced proteins such as milk proteins, are of a 10-30% higher biological quality than plant sourced proteins** *(4)*. This has been acknowledged by EFSA in the "Scientific Opinion on Dietary Reference Values for protein" (2012) *(5)*. This means that **dairy protein provides all the essential amino acids that the human body requires and is not able to synthesise itself**. Plant proteins, on the other hand, often do not contain the right proportions or sometimes even lack certain essential amino acids needed by humans. The correct combination and often larger amounts of different plant protein sources are thus needed to fulfil daily needs.
- **Addition of nutrients found in milk to PBB does not guarantee the same health benefits**. For example, studies on the effects of calcium supplements on health showed that effects of calcium supplementation are different to health effects of calcium present in dairy *(6, 7)*.
- In general, the lower protein content, calcium availability, higher glycaemic index (GI) values, and potential presence of anti-nutritional factors (e.g., phytates, oxalates, lectins, and saponins which are bioactive components present in plants that impact absorption of nutrients), make plant-based beverages nutritionally inferior to milk *(7)*. Furthermore, differences in beverage formulations between brands *(see Table 3)* results in a high degree of variability in the nutrient composition of plant-based milk alternatives, even between beverages made with the same plant base.

Do PBB guarantee the health benefits of milk?

- Studies show that **milk has many health benefits** *(8)*. However, there is currently little scientific evidence supporting the health benefits of PBB.
- **Many PBB contain added sugar to help with taste, whereas milk only contains lactose which is a naturally occurring sugar**. Studies *(9)* comparing the GI of PBB and milk found that **most plant based drinks have a higher glycaemic index (GI) than milk** (milk has a GI of 46.93 whereas PBBs range from 47.53 to 99.96). The American Diabetes Association (2014) *(10)* recommended consumption of low (<55 GI) and medium (56-69 GI) foods for diabetics and other individuals looking to control blood sugar levels. **Milk meets the criteria for a low GI food and would be suitable for consumption in individuals aiming to keep blood sugar low**, while it is possible that some plant-based drinks may not meet criteria for low GI food.
- **PBB tend to be lower in protein content and quality of protein** (except for soy beverages which are similar in protein content but still not equivalent in protein quality) *(see Table 3)*.
- **PBB do not have the benefit of the milk matrix, because the nutrients in PBB are isolated and individually added**. Milk matrix allows for the complex interaction of all natural components of milk.
- A serving of a highly processed PBB is not nutritionally equivalent to that same serving of the raw plant and does not possess the same health benefits.

Does dairy production negatively affect the environment?

- **The dairy sector is continuously working hard to implement best practices, as well as to develop, innovate and research new technologies to reduce its impact, to better care for the environment.**
- The green house emission per litre of milk has been reduced globally by 11% between 2005 and 2015 *(11)*.
- **It is important to consider the ecological footprint as a function of nutrient content rather than total mass produced - for the same nutritional density less dairy is required, compared to PBB**.
- The dairy sector provides a wide range of benefits such as **biodiversity, biomass, rural vitality, traditional landscape, grassland**, in comparison to mono-culture plant production as needed for PBB.
- There is a better understanding of the impact of the dairy life cycle, from production to utilization, which is used to find new ways to improve and optimise the production chain to better benefit the environment. For example, there is a **higher waste processing in the dairy sector** *(11)*.

Are PBB better for the environment?

- The environmental impacts of PBB may generally look better per kg of product, but **milk could perform better when the impacts are expressed per nutritional value**.
- There is a lack of scientific evidence supporting the environmental benefits of various PBB.
- The food system needs a multidimensional approach, as plants and animals work best as an integrated system.
- PBB produce large amounts of waste and hard-to-dispose by-products while the dairy sector valorises its waste successfully.

How does dairy benefit our societies and cultures?

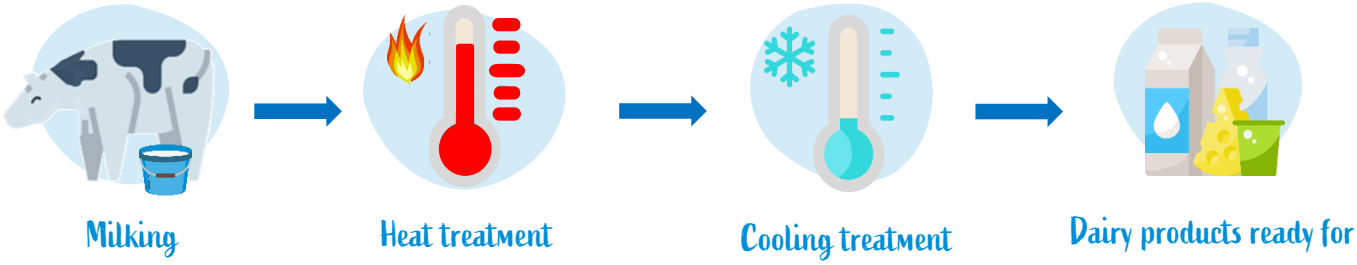
- Economic assessments show the **dairy industry and development has an impact on the reduction of poverty worldwide, every year**.
- FAO studies show that the collection and distribution of milk generated a considerable amount of direct and indirect employment. There was even more **generation of employment** when they looked at processing and retail, depending on the product types being created *(13)*.
- **Dairy is a vital part of many cultures**, with products such as feta, parmesan, manchego and quark, being fundamental to a national identity and pride to share with others, as well as a joint European identity. **To maintain the diversity and protect the cultural richness of food products, the European Union has developed the geographical indication (GI) labels**. These labels are **part of the EU's quality scheme** and are a strong asset for producers, consumers and for the promotion of European culture and history. **Over 300 cheeses and dairy products are registered as GIs in Europe.**

Why are PBB much more processed than milk?

- **Milk is a natural product with minimal to no processing needed**. It can be consumed directly after milking but goes through processing to sanitise and increase hygiene, as well as to increase the shelf life with no additives/preservatives added *(see Figure 1)*.
- **In comparison, oat beverages take on average 14 production steps, almond beverages take 15 steps and soy beverages 13 steps** *(see Annex 1 below for the full diagrams)*.

Figure 1: The processing steps for dairy milk and the processing steps for almond beverage *(14)*

Processing steps for milk



Processing steps for almond beverages

Do PBB contain many additives?

- As PBB are formulated drinks, there is a need for several additives to attempt to mimic the nutritional profile of milk as well as additives for taste and product stability.
- Whilst milk is only one ingredient, PBB is made of several ingredients including additives *(see Figure 2)*.
- Figure 3 compares nutrients of milk with various PBB from main producers of plant based drinks on the EU market *(15)*.

Figure 2: Ingredient list for cow's milk vs almond beverage

Dairy Milk	Milk
Almond based beverage	Water, Almond (2.3%), Sugar, Calcium (Tri-Calcium, phosphate), Sea salt, Stabilisers (Locust bean gum, Gellan gum), Emulsifier (Lecithins (Sunflower)), Natural flavouring, Vitamins (B2, B12, E, D2)

- The most common additives found in PBB include (but are not limited to):
- Tricalcium Phosphate (E 341 (iii), Dipotassium Phosphate (E340), Potassium Citrate (E332), Vitamine E Acetate, High Oleic Sunflower Oil, Folic Acid, Zinc Oxide, Vitamin B-12, Riboflavin (B2), Vitamin A Palmitate, Ergocalciferol, Salt/ Sea Salt, Calcium Carbonate (E170), D-alpha tocopherol (vitamin E), Magnesium Phosphate (E 343), Acacia Gum (E414), Xantham Gum (E415), Guar Gum (E412), Natural colours, Natural Flavours, Tapioca Starch, Soy Lecithin (E 322), Sunflower Lecithin (E322), Locust Bean Gum (E410) *(18)*.

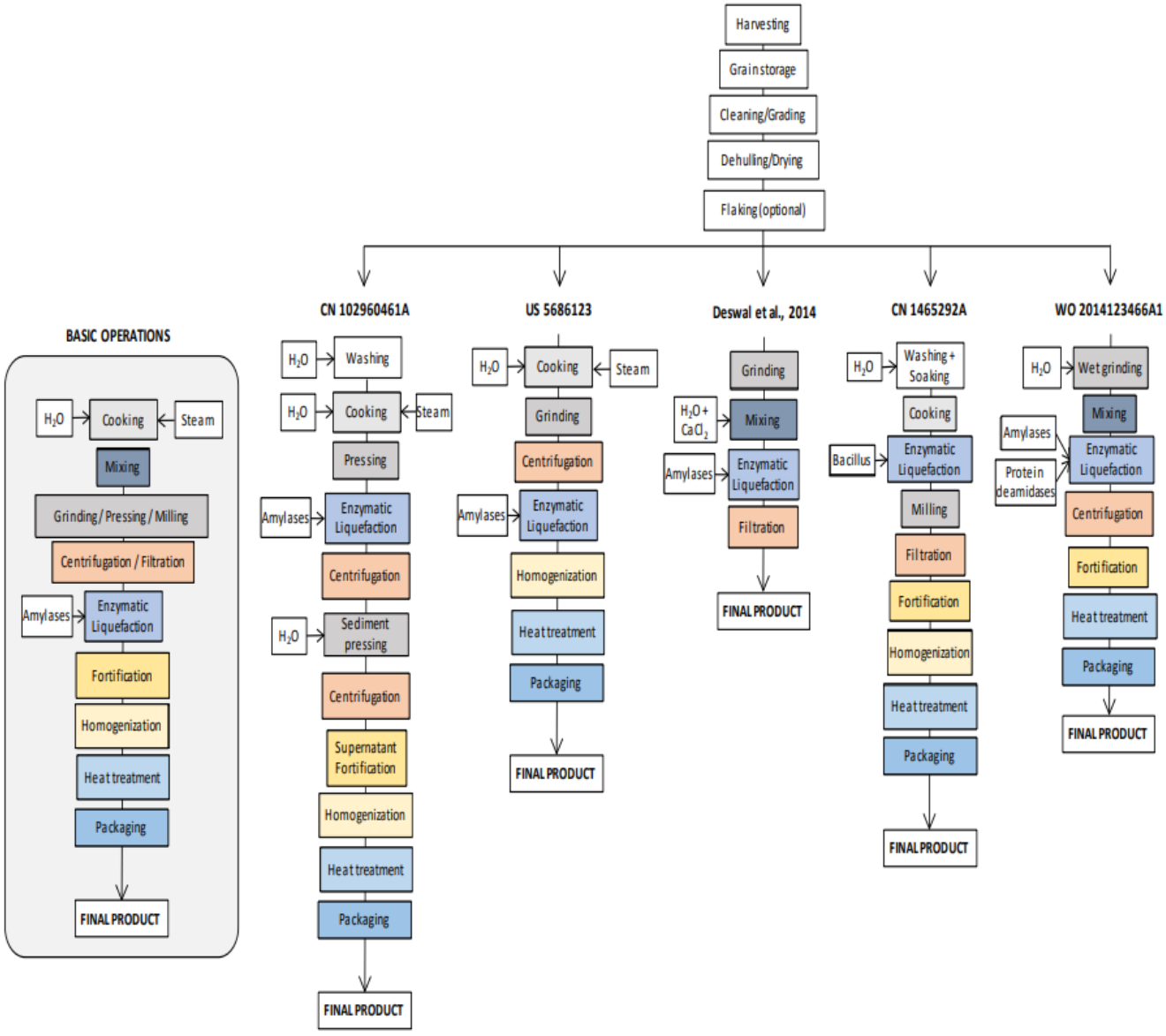
Figure 3: Nutrient table of different types of milk and PBBs *(15)*

Per 100 ml	Milk full fat [3 brands]	Milk semi-skimmed [3 brands]	Soy drink, sugar added [4 brands]	Oat drink [3 brands]	Almond drink, sugar added [5 brands]	Rice drink [3 brands]	Coconut drink [2 brands]	Hazelnut drink, sugar added [2 brands]	Cashew drink [3 brands]
Calories	66 kcal	46-48 kcal	39-62 kcal	44-48 kcal	22-43 kcal	47-68 kcal	20 - 24 kcal	29-69 kcal	16-28 kcal
Protein	3.2-3.5 g	3.2-3.6 g	3.0-3.6 g	0.3-1.2g	0.4-0.8 g	0.1-0.3 g	<0.5	0.4-1.0 g	0.4-0.9g
Carbohydrates (sugars)	4.7-4.8 g (lactose)	4.7-4.8 g (lactose)	1.6-2.5 g * (0.8-2.5 g)	6.6-8.4 g (3.3-5,5) g	2.4-4.8 g* (2.4-4.8 g)	9.5–14 g (3.3-6.9 g)	2.4-2.7 g* (1.9-2.1 g)	3.2-5.5g* (3.2-4.0 g)	1.4-2.7g (0.2-2g)
Fats (saturated)	3.6-3.8 g (2.2-2.6 g)	1.5-1.6 (0.9-1.1 g)	1.8-4.4 g (0.6-0.3 g)	0.9-1.5 g (0.1-0.2 g)	1.1-2.2 g (0.1-0.2 g)	1-1.2g (0.1-0.2 g)	0.9-1.6 g (0.9-1.4 g)	1.6-4.5g (0.2-0.4g)	0.9-2.1g (0.2-0.4g)
Vitamin B2	0.14 mg	0.14 mg	0-0.21 mg*	0-0.21 mg*	0-0.21 mg*	0-0.21 mg*	NA	0-0.21 mg*	0-0.21 mg*
Vitamin B12	0.25 µg	0.39 µg	0-0.38 µg*	0-0.38 µg*	0-0.38 µg*	0-0.38 µg*	0-0.38 µg*	0-0.38 µg*	0-0.38 µg*
Potassium	150 mg	150 mg	NA	NA	NA	NA	NA	NA	NA
Phosphorous	100 mg	100 mg	NA	NA	NA	NA	NA	NA	NA
Calcium	120 mg	120 mg	0-144mg*	0-120 mg*	0-120 mg*	0-120 mg*	0-120 mg*	0-120 mg*	0-120 mg*

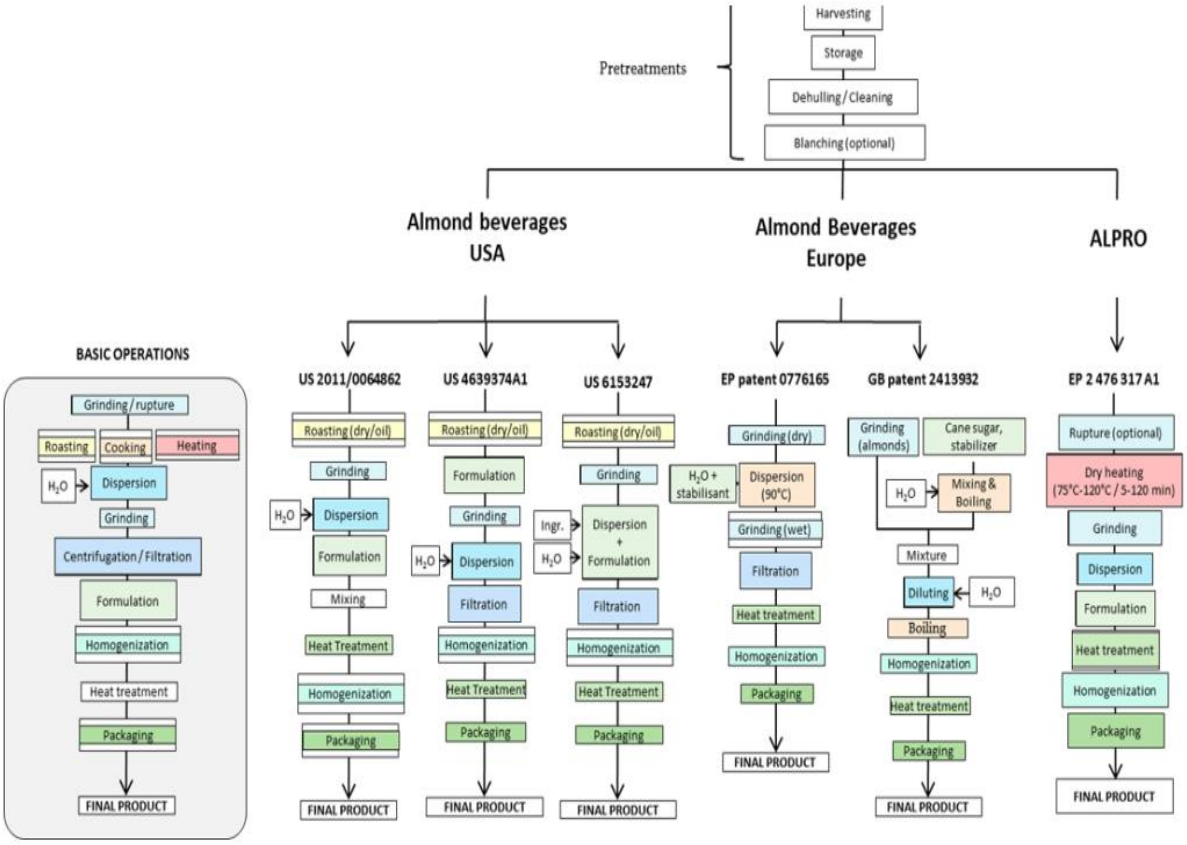
* added / partially added

Annex 1*(14)*

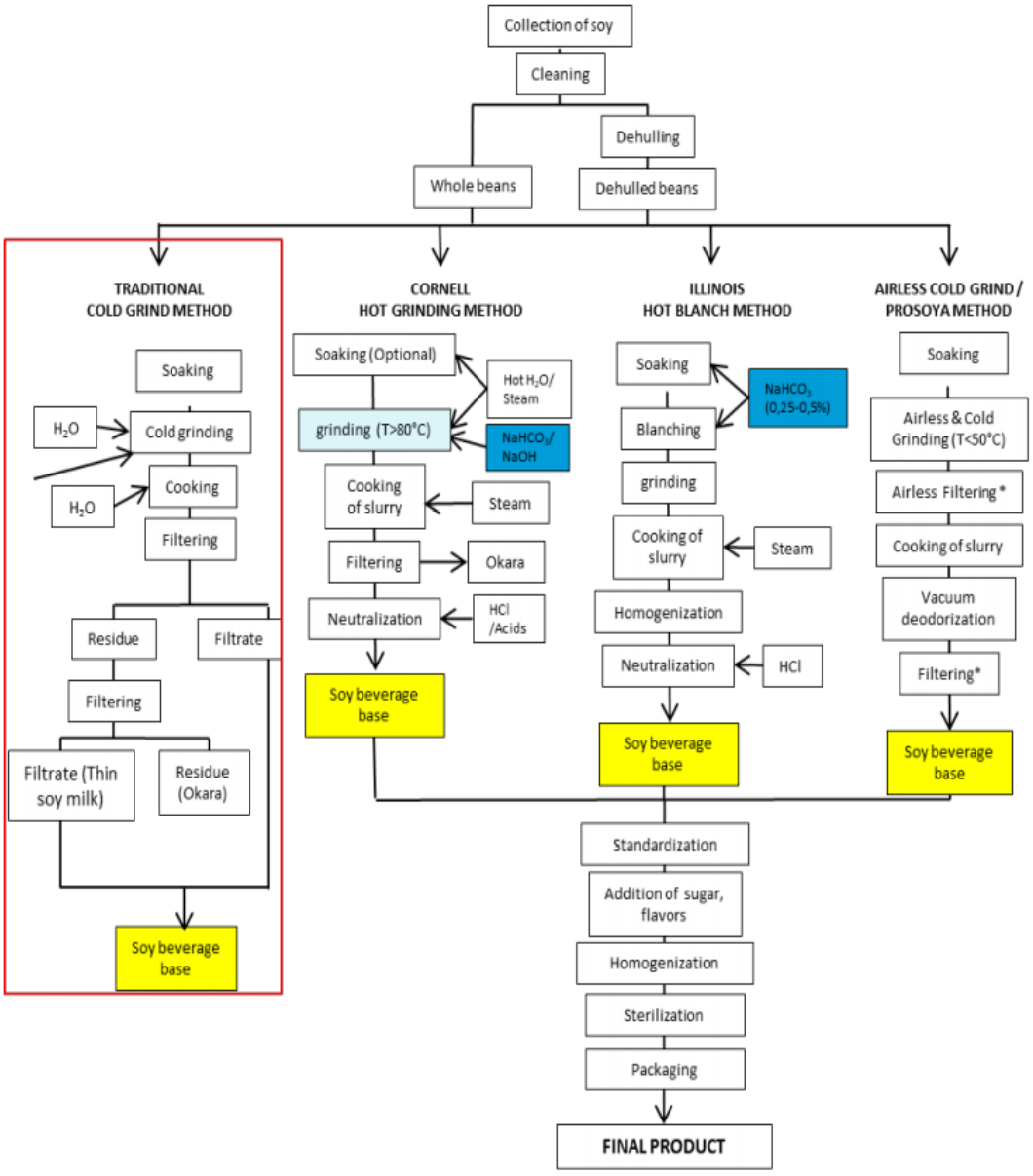
PROCESSING STEPS FOR OAT BEVERAGE



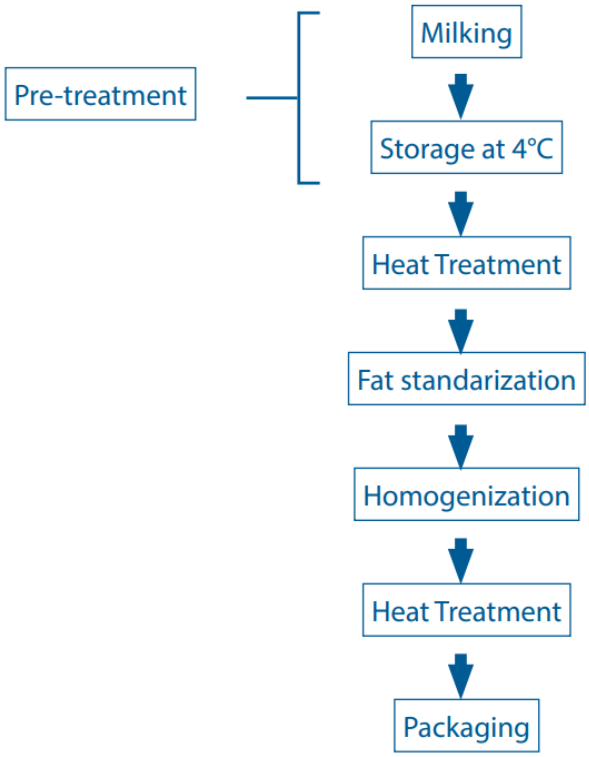
PROCESSING STEPS FOR ALMOND BEVERAGE



PROCESSING STEPS FOR SOY BEVERAGE



PROCESSING STEP FOR MILK



References and further reading

Note: EDA Q&A on Milk vs Plant Based Beverages is adapted from the International Dairy Federation report "Data comparison of milk and plant based beverages" published in 2020.

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2. EDA Factsheet: The Role of Dairy in Helping to Prevent Lifestyle Diseases
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13. International Dairy Federation, 2020. *Data Comparison of Milk and Plant-Based Beverages*. Page 15
14. International Dairy Federation, 2020. *Data Comparison of Milk and Plant-Based Beverages*. Page 16, 17, 18
15. Data from several retailers including Delhaize, Carrefour, Tesco and websites of main producers of plant-based drinks in the EU [accessed in September 2021]
16. International Dairy Federation, 2020. *Data Comparison of Milk and Plant-Based Beverages*. Page 18