



Silk Almond Milk



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Historical Overview

- Silk is an American brand that creates alternative dairy products such as milk and yogurt.
- Founded in 1977 in Boulder, CO and originally focused on soy and tofu products
- Plant-based alternative milk products
- Great source of calcium and vitamin D
- Multiple flavors
- Easy to buy



1996

First product was released: soymilk



2010

Company released first non-soy product: silk pure almond



TODAY

Silk released more varieties of almond milk and other alternative dairy milks

Nutrition and Health



Nutrition Facts	
About 8 servings per container	
Serving size 1 cup (240mL)	
Amount per serving	
Calories	60
% Daily Value*	
Total Fat 2.5g	3%
Saturated Fat 0g	0%
Trans Fat 0g	
Polyunsaturated Fat 0.5g	
Monounsaturated Fat 1.5g	
Cholesterol 0mg	0%
Sodium 150mg	7%
Total Carbohydrate 8g	3%
Dietary Fiber 0g	0%
Total Sugars 7g	
Includes 7g Added Sugars	14%
Protein 1g	
Vitamin D 2.5mcg 10% • Calcium 450mg 30%	
Iron 0.5mg 2% • Potassium 0mg 0%	
Vitamin A 150mcg 15% • Vitamin E 4mg 25%	
Magnesium 15mg 2%	
*The % Daily Value (DV) tells you how much a nutrient in a serving of food contributes to a daily diet. 2,000 calories a day is used for general nutrition advice.	

INGREDIENTS: Almondmilk (Filtered Water, Almonds), Cane Sugar, **Vitamin and Mineral Blend** (Calcium Carbonate, Vitamin E Acetate, Vitamin A Palmitate, Vitamin D2), Sea Salt, Gellan Gum, Sunflower Lecithin, Locust Bean Gum, Ascorbic Acid (to protect freshness), Natural Flavor.

Fortified with Calcium, Vitamin E, Vitamin A, and Vitamin D

CALCIUM TO SUPPORT
STRONG BONES

FREE FROM:

- ✓ DAIRY
- ✓ GLUTEN
- ✓ CARRAGEENAN
- ✓ CHOLESTEROL
- ✓ SOY
- ✓ ARTIFICIAL COLORS & FLAVORS

Health Controversies / Pros and Cons

- Can be very harmful and deadly for someone looking for a lactose free milk if they have any nut allergies.
- Thyroid gland issues have arrived since almonds are a goitrogenic food
- Almonds have been found to promote gut issues and digestive issue if you consume an excess amount

Pros:

- Lactose Free
- Low In calories (60 calories)
- Low in fat (2.5g)
- High in Calcium (450mg)

Cons:

- Low in Protein (1g)
- Most of the vitamins and minerals are added in and do not come from the almonds themselves.
- There is a lot of Added sugar (7g)
- Unrealistic for people with nut allergies



Composition & Chemistry

Functional Ingredients:

- **Filtered Water:** softens almonds to be able to blend and is one of the bases of the product
- **Almonds:** provides nutritive value and is the base of the product
- **Cane sugar:** aids in flavor and helps with thickness
- **Calcium Carbonate:** provides calcium and preserves mouthfeel
- **Sea Salt:** enhances flavor and helps with preservation
- **Gellan Gum:** thickens milk
- **Sunflower Lecithin:** keeps fat (oil) from almonds suspended in water for smoother milk texture
- **Locust Bean Gum:** works to thicken milk
- **Ascorbic Acid:** protects freshness

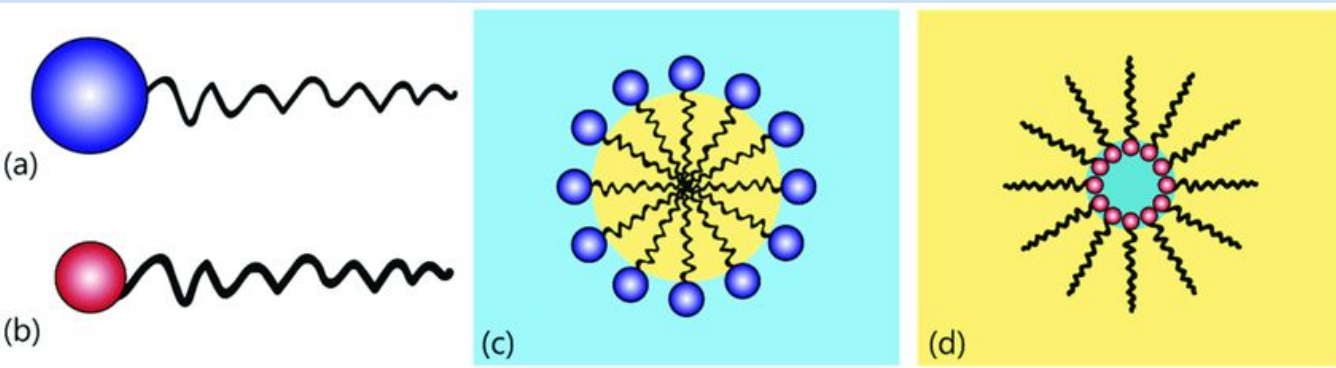
*All are food additives except cane sugar which is a carbohydrate and sea salt which is a mineral

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Questions about Composition and Chemistry

- 1) Why does Almond Milk contain emulsifiers?
- 2) How is the composition different from cow's milk?
- 3) What is the purpose of calcium carbonate in the product?



Physical and Stability Properties

Physical Properties:

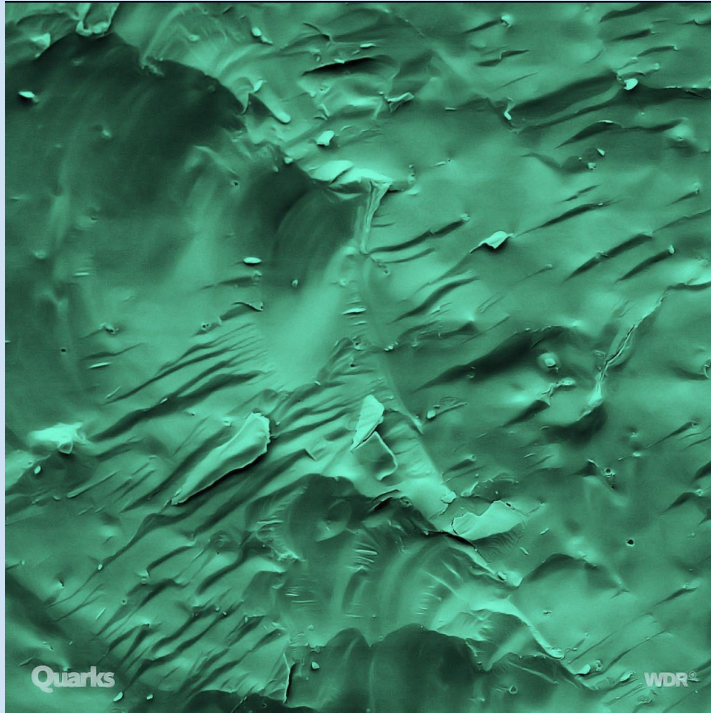
- The pH value of almond milk is around 6.0 (dairy milk has a pH of 6.7-6.9)
- Almond milk is more acidic than dairy milk
- The moisture content of silk almond milk is 98%.
- The water activity level (a_w) of silk almond milk is 0.988

Stability:

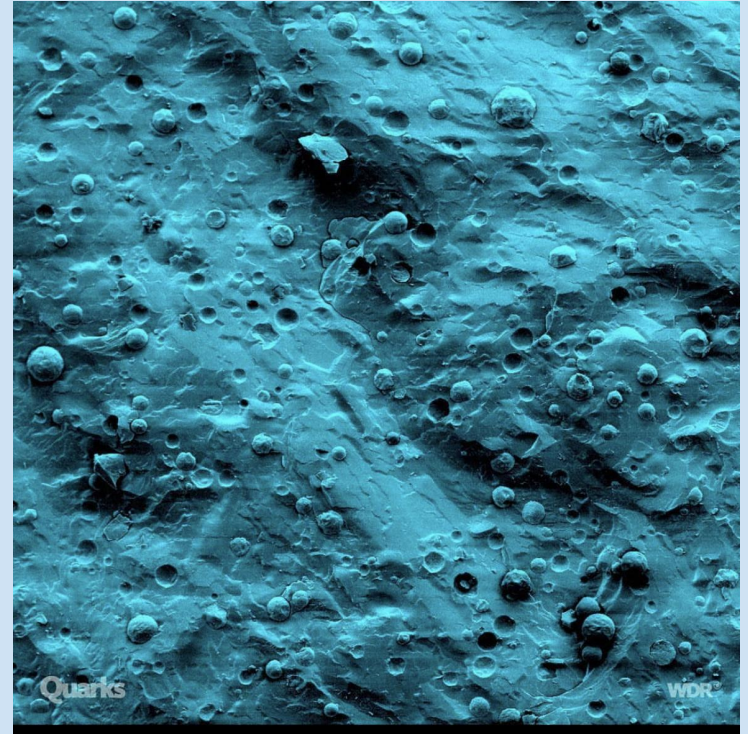
- Region III stability (low stability)
- Carton keeps out air which preserves nutrients
- Has special packaging that blocks out light making it shelf stable
- Unopened packaging → 10 month shelf life
- Opened packaging → must be refrigerated and can withstand around 7-10 days before it spoils



Microscopic Images



Almond Milk



Cow Milk

Magnification 1000x

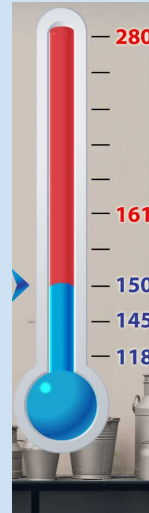
Food Microbiology & Processing

How Almond Milk is Made?



Harvesting, shelling, blanching, roasting,
almond butter → almond milk

Shelf-Life (Physical Methods)



Ultra-High
Pasteurization



Aseptic
Processing



Refrigeration

End of Shelf-Life

Growth of spoilage
MOs

Becomes
thicker

Curdling due
to proteins
separating
from each
other



Color change:
opaque white →
transparent

Sour smell and
taste due to fat
content turning
rancid

Likelihood of
spoilage
increases 7 days
after being
opened and
stored in fridge

The Good, The Bad, and The Ugly Microorganisms

Combating the Bad and the Ugly

- The UHT (ultra high pasteurization) method is used to pasteurize and destroy pathogenic bacteria, mold, and viruses



Benefits of the Good

- In the gut microbiome, almond milk helps produce
 - Bacteroidetes- boost metabolism and reduce inflammation
 - Firmicutes- keep our colons and immune systems healthy



Consumer Safety & Satisfaction

HACCP/HARPC

- There is **NO** official standard of identity
- HACCP principle: **Establishing critical limits for critical control points**
 - Almond milk is at its highest quality with a pH around 6

Chemical Properties:

- The almonds that make up the milk is important for the almond milk because it is a substitute milk for people with dairy allergies.

Physical Properties:

- The density of the almond milk is important for quality assurance.
 - Almond milk: 1.1 g/mL
 - Cow Milk: 1.25 g/mL



Sensory Aspects of Product

- Our senses play a part in understanding and analyzing the products we consume.
- Our sense of taste and smell are most involved when drinking Silk Almond Milk.
- It tastes slightly nutty and has a creamy texture.
- The product has no significant smell as it is unflavored.

Consumer Survey:

- 56% preferred dairy over almond milk
- Taste (acceptance): Dairy > Almond milk
- Health reasons is the leading contributor to consumption of almond milk
- Overall positive reviews from those who consume the product



Position of Manufacturer (Danone)

Innovation: uses 64% less water for production than regular dairy milk, promotes plant-based diet for better health

Culture: part of B Corp™ which aims to reduce inequality and poverty, foster healthier working environments, and create jobs of high-quality

Ethics: partnered with *Non-GMO Project* to ensure products meet the highest standards

Sustainability: conserves water, recyclable packaging, acreage for almond milk supply supports various wildlife



Main References

Adhamy, A. (2020, April 17). *Head to head: Cow's milk vs almond milk*. BBC Science Focus Magazine. Retrieved December 11, 2022, from <https://www.sciencefocus.com/science/head-to-head-cows-milk-vs-almond-milk/>

Cakebread, J., Wallence, O., Henderson, H. (2022, May 10). "The Impacts of bovine milk, soy beverage, or almond milk beverage on the growing rat microbiome" National Library of Medicine. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9104089/>

Chen, S. (2022, December 5). *Does almond milk go bad? shelf life of Almond Milk, spoilage signs, and proper storage tips*. StreetSmart Kitchen. Retrieved December 9, 2022, from <https://www.streetsmartkitchen.com/does-almond-milk-go-bad/>

Danone North America. (2022). *About silk®*. Silk. Retrieved December 9, 2022, from <https://silk.com/about-us/>

Davis, N. (2019). *Silk Almond Milk is a great alternative to Dairy Milk | Livestrong*. LIVESTRONG.COM. Retrieved December 9, 2022, from <https://www.livestrong.com/article/440734-is-silk-almond-milk-good-for-you/>

Momaya, A. (2022, July 6). *Almond milk - health benefits, precautions and ways to use*. HealthifyMe. Retrieved December 11, 2022, from <https://www.healthifyme.com/blog/almond-milk-benefits/>

Plant-based diet: Silk®. Silk. (n.d.). Retrieved December 11, 2022, from <https://silk.com/about-us/plant-based-diet/>

Schmitt, J. (2020, August 20). *Non-dairy milks: How nutritious are they?* Trinity Health. Retrieved December 9, 2022, from <https://www.trinityhealth.org/non-dairy-milks-how-nutritious-are-they/>

Silk Almond Milk is a great alternative to Dairy Milk | Livestrong. (n.d.). Retrieved December 11, 2022, from <https://www.livestrong.com/article/440734-is-silk-almond-milk-good-for-you/>

Image Sources

Research Gate . Retrieved December 11, 2022, from <https://www.researchgate.net/publication/353091911/figure/fig/3/AS:1043330389532675@1625760757581/illustration-of-the-surfactant-molecules-arrangement-in-single-emulsions-a.png>

@beautyquarks(2020, June 23). Instagram. Retrieved from <https://www.instagram.com/beautyquarks/>

Almond allergy. (n.d.). Emerald Coast Urgent Care. https://emeraldcoasturgentcare.com/wp-content/uploads/2018/04/image_1-1.jpeg

Amazon. (n.d.). *Amazon*. Retrieved December 11, 2022, from <https://www.google.com/url?sa=i&url=https%3A%2F%2Fwww.amazon.com%2FSilk-Original-32-Ounce-Aseptic-Cartons%2Fdp%2FB004L17GHO&psig=AOvVaw0pi3cTy9LwFYnC7OX9XqzO&ust=1670886985662000&source=images&cd=vfe&ved=0CA8QJRxqFwoTCPCl3pyZ8vsCFOAAAAAdAAABAE>.

D, A. (2013). The Heritage Farm. photograph. Retrieved 2022, from <https://theheritagefarm.files.wordpress.com/2013/04/milkpasteurization-chart.jpg>.

Deposit Photos. (2022). Deposit Photos. photograph. Retrieved 2022, from https://st.depositphotos.com/1177973/4390/i/600/depositphotos_43900983-stock-photo-almond-milk-is-poured-into.jpg.

eVitamins. (2022). eVitamins. Retrieved December 11, 2022, from https://cdn1.evitatins.com/images/products/Now_Foods/13242/1400/13242_front2021.jpg.

Flynn, C. (2021, May 13). We tasted 7 almond milks & this is the best one. Retrieved December 11, 2022, from <https://www.eatthis.com/best-tasting-almond-milk/>

Food Land. (2022). Food Land. photograph. Retrieved 2022, from <https://storage.googleapis.com/images-fol-prd-83dd8b8.fol.prd.v8.commerce.mil9cloud.com/product-images/detail/2529300149-3.jpg>.

Good microorganisms(n.d.) Shutterstock <https://www.shutterstock.com/image-vector/cute-vector-illustrations-good-bad-bacteria-1118976797>

Haccp vs Harcp. (2016). Foodsafetynbrazil.org. Retrieved December 11, 2022, from <https://foodsafetynbrazil.org/wp-content/uploads/2016/02/haccp-ppt-3-2-728.jpg>.

H-E-B (Ed.). (2022). H-E-B. photograph. Retrieved 2022, from <https://images.heb.com/is/image/HEBGrocery/001360532>.

Nut Machines. (2022). *500 Kg/H Almond Milk Production Line Processing Machine*. Longer Food Machinery . Retrieved December 11, 2022, from <https://www.nutmachines.com/uploads/allimg/210402/4-210402153623.jpg>.

Silk Almond Milk. (n.d.). Silk. <https://silk.com/wp-content/uploads/2019/02/silk-original-almondmilk-6.png>

Silk Almond Milk(n.d.) Silk <https://silk.com/plant-based-products/almondmilk/unsweet-almondmilk/>

Silk Almond Milk(n.d.) Silk <https://silk.com/wp-content/themes/silk/img/slider-almondmilk.png>

Silk Shelf-stable almond milk, unsweetened vanilla, dairy-free, vegan,. (n.d.). Retrieved December 11, 2022, from <https://www.petesgrocerygourmet.com/products/silk-shelf-stable-almond-milk-unsweetened-vanilla-dairy-free-vegan-non-gmo-project-verified-1-quart-pack-of-6>

Silk Soy Milk(n.d.) Silk <https://silk.com/wp-content/themes/silk/img/slider-soymilk.png>

Spoiled Almond Milk. (n.d.). YouTube. <https://www.youtube.com/watch?v=L-ttQc578Bo&themeRefresh=1>