CAPOLAC® MM-0525

MILK MINERALS FOR BONE HEALTH

Arla Foods Ingredients

Discovering the wonders of whey

Calcium is an essential nutrient needed for bone growth and health. It is the most abundant mineral element in the body, with 99% of the body calcium contained within bone and teeth. Calcium is obtained solely through dietary sources, and optimal calcium intake is especially relevant during childhood, adolescence and senior years. Milk is a rich dietary source of calcium and other compounds, (e.g. proteins, minerals and vitamins) which benefit bone development and health.

Capolac® a natural milk mineral concentrate

Capolac® MM-0525 is a natural milk mineral concentrate containing calcium, phosphorus and zinc – in a composition similar to bone and teeth. Capolac® is suitable for calcium fortification of infant formula, child nutritional products and functional food and beverages.
Capolac® contains 24% calcium as the major mineral and additionally has a high content of phosphorus and zinc relative to milk. The mineral composition of Capolac® MM-0525 is compared with skimmed milk per milligram of calcium in table 1.
In table 2, the content of milk minerals in Capolac® MM-0525 are listed in relation to the Dietary Recommended Intake if the serving size is equivalent to 200 mg of calcium.

Bioavailability of calcium – comparing milk calcium with inorganic milk

Numerous studies have compared the bioavailability of calcium from milk and dairy products with that of inorganic calcium sources, and the evidence shows that the bioavailability of milk calcium is as good as that from other calcium sources.

Bioavailability of calcium from skimmed milk fortified with either calcium carbonate or milk calcium was compared in a rat study by measurements of bone mineral density, bone calcium content, and bone breaking strength. No significant differences between groups were observed in any of these parameters (1), indicating similar bioavailability.

When healthy fasting subjects in a human study ingested a 500 mg dose of calcium from either of five calcium salts, calcium lactate, calcium acetate, calcium gluconate, calcium citrate, calcium carbonate, or from whole milk, no significant difference was found in absorption. The mean calcium absorption from the various sources was 32% (2). When comparing the calcium absorption from whole milk, chocolate milk, yoghurt, imitation milk, cheese and calcium carbonate, the mean absorption values were between 21 and 26% with none of the sources being significantly different from the others (3).

TABLE 1

Nutritional comparison of Capolac® MM-0525 and skimmed milk. Nutrients per milligram of calcium.

	SKIMMED MILK	Capolac® MM-0525
Calcium - Ca	1.00 mg	1.00 mg
Potassium - K	1.3 mg	0.03 mg
Phosphorous - P	0.8 mg	0.52 mg
Magnesium - Mg	0.1 mg	0.03 mg

Comparison of the fractional calcium absorption from a calcium- and sulphate-rich mineral water, containing 467 mg Ca/L, with that from milk showed no significant difference (4). In a study using urinary calcium excretion as a qualitative measure for the bioavailability of calcium, only supplementation with calcium carbonate plus vitamin D compared with supplementation with milk showed a significantly higher urinary calcium excretion (5). Taken together, all these studies indicate that bioavailability of milk calcium is just as good as other calcium sources.

Milk calcium and bone health

The beneficial effect of milk calcium, which makes it superior to other calcium sources, becomes apparent when comparing the effects on bone mass accretion. The bioavailability of calcium from a food source is best evaluated by measuring its effect on changes in bone mass over time.

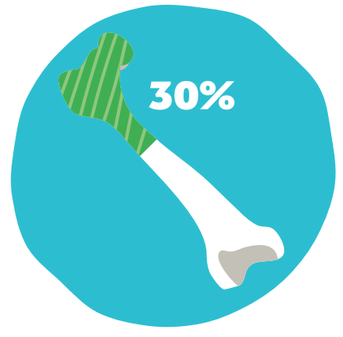
Studies have shown that the gain in bone mass density obtained by supplementation with milk calcium is still present years after the supplementation has ended (6). This is opposed to supplementing with inorganic calcium, where the gain in bone mass density is reversed after withdrawal of the supplementation (7-9). A study in which prepubertal girls consumed milk-derived calcium fortified foods for 12 months showed significant increases in bone mass density compared to the non-supplemented controls (10). A follow-up study of the same girls showed that the increase in bone mass density in the calcium supplemented girls obtained during the intervention was still present more than 3 years after the cessation of the calcium supplementation (6). These findings are supported by a 2-year intervention study of dairy food supplementation in teenage girls. One year after the supplementation had ended, the bone mineral density of the girls was re-examined, and results showed that the significant difference between the supplemented girls and controls was still maintained (11).

TABLE 2

Coverage of DRI* of selected minerals with a serving of 0.8 g Capolac® MM-0525 corresponding to 200 mg of calcium

		DRI (EAR mg/day)		APPROX. % COVERAGE OF DRI*	
Content of one serving of Capolac® MM-0525		Males (19-50)	Females (19-50)	Males	Females
Calcium	200 mg	800	800	25%	25%
Phosphorus	104 mg	580	580	18%	18%
Magnesium	6 mg	330-350	255-265	1.8%	2.4%

**Dietary Reference Intakes. IOM. USDA.*



240mg CALCIUM covers 30% of the average requirements for adults*

1 g of Capolac® MM-0525 provides 240mg of calcium

A glass (200 ml) of whole milk provides **243mg** of calcium

A glass (200ml) of skimmed milk provides **258mg** of calcium

A glass (200 ml) of semi-skimmed milk provides **247mg** of calcium

**Dietary Reference Intakes. IOM 2011.*
Estimated Average Requirement (EAR) for Calcium; males and females 19-50 years 800 mg/day

When comparing the effect of calcium supplementation on bone mineralization in growing pigs fed a diet providing calcium either as milk, calcium sulphate or calcium carbonate, the diet containing milk led to greater bone mineral content, bone mineral density and breaking strength (12).

In conclusion, the studies of bioavailability of calcium from milk and dairy products compared to that of inorganic calcium have shown that the absorption of milk calcium is as good as that of other calcium sources. It is in relation to the effects on increasing bone mass that milk calcium proves itself to be superior to inorganic calcium sources. This becomes evident in studies showing that an acquired gain in bone mass obtained by supplementing with milk calcium is still present years after the supplementation has ceased. In opposition to this, bone mass increments obtained by supplementing with inorganic calcium have been shown to reverse to baseline when supplementation with calcium was withdrawn.

Studies with Capolac® MM-0525 as test material

Studies, in which Capolac® has been applied as the source of milk calcium to study calcium bioavailability or effects on bone metabolism, are limited. One such published study is the aforementioned by Bonjour et al, in which bone mineral density was measured in girls supplemented with Capolac® or placebo (10). In a research project performed at the KVL Department of Human Nutrition, Denmark, Capolac® was compared to calcium carbonate with respect to bioavailability and influence on iron absorption. No significant difference in bioavailability was shown in the animal model. In the human model, the bio availability of calcium from Capolac® was significantly lower compared to that of calcium carbonate enriched bread. Intake of Capolac® showed no influence on iron absorption. (13).

In an animal study also conducted at the Department of Human Nutrition, Capolac® and calcium carbonate were supplemented in a rat diet to compare the bioavailability of the calcium. Although not significantly different, supplementation with Capolac® showed a slight tendency to a better bioavailability of calcium than from calcium carbonate supplementation, which was shown in an increased bone mass (14).

Phosphorus and bone health

The phosphorus in Capolac® is of nutritional advantage for people who have low phosphorus intakes. See table3 on this page for comparison of phosphorus content in different calcium sources.

Today, the most widely used calcium supplement is calcium carbonate, which does not contain any phosphorus. Capolac® contains 520 mg phosphorus per 1000 mg calcium. This makes Capolac® an excellent source of both calcium and phosphorus. In comparison, skimmed milk contains 1300 mg phosphorus per 1000 mg of calcium.

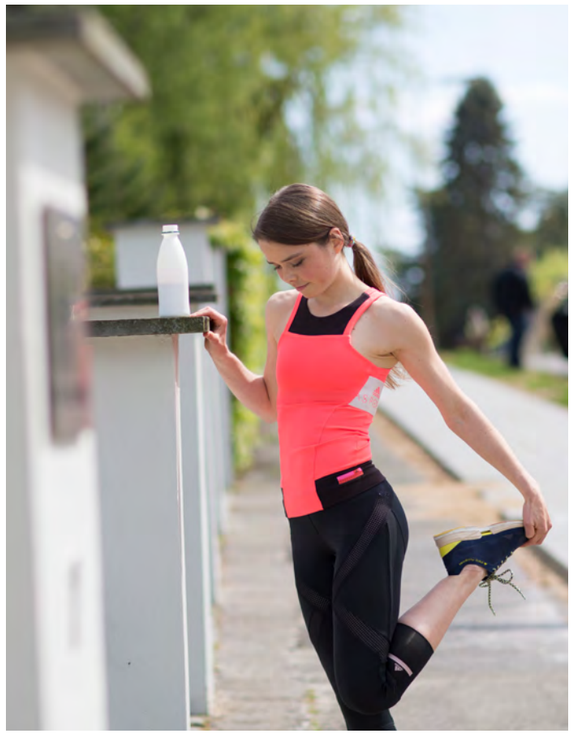
TABLE 3

Phosphorus and other minerals (per mg calcium) in skimmed milk , Capolac® MM-0525 and calcium salts

	Skimmed milk	Capolac® MM-0525	Calcium Carbonate	Calcium PhosphateDibasic ($CaH_4O_8P_2$)	Calcium PhosphateMonobasic ($CaHO_4P$)
Calcium, mg	1.0	1.0	1.0	1.0	1.0
Potassium, mg	1.3	0.03	–	–	–
Phosphorus, mg	0.8	0.52	–	1.5	0.8
Magnesium, mg	0.1	0.03	–	–	–
Zink, mg	0.003	0.002	–	–	–

Studies regarding phosphorus and bone health

Bone minerals consist of calcium phosphate, and phosphorus is as important as calcium in supporting bone augmentation and maintenance. Although typical adult diets contain abundant phosphorus, some groups of the population may have phosphorus intakes lower than recommended (e.g. vegetarians, people on weight loss diets and the elderly), and for those people high calcium intakes from supplements without any phosphorus may have negative effects on bone health (15). Among elderly women in US, 10-15% have phosphorus intakes of less than 70% of the recommended daily allowance (15). Regarding growth, a recent animal study has documented the codependence of calcium and phosphorus for growth and development. Shapiro and Heaney (16) conclude the following: “If the diet is low in phosphorus, calcium supplementation alone will be inadequate and may even aggravate the deficiency. In these circumstances, optimal total nutrition, but at the very least a phosphorus calcium source, would be preferable to a supplement providing calcium alone”.



It has often been suggested that diets with relatively high phosphorus intakes may increase the risk of osteoporosis, but these ideas have never been documented. Many new studies show a protective effect on bone health of diets with relatively high contents of animal protein and phosphorus (17-20).

Protein and bone health

Protein also contributes to maintain normal bones and is needed for normal growth and development of bone in children (24). Evidence shows that sufficient intakes of both animal protein and calcium are important to maintain bone mass, especially in elderly (17). The former hypothesis, which suggested that high protein diets lead to increased bone loss, only seems relevant when calcium intakes are low. With sufficient calcium intakes protein helps to maintain bone mass (21).

Several recent epidemiological studies show increased bone loss in individuals habitually consuming low-protein diets (22). Also data from calcium supplementation studies show that calcium supplemented individuals with the highest protein intakes gain bone, whereas those with the lowest intakes loose bone mass (23). Promislow et al. (18) found a significant positive association between intake of animal protein and bone mass density in women. Intake of vegetable protein was negatively associated with bone mass density in both sexes.

Product description

Capolac® MM-0525 is a natural milk mineral concentrate for calcium fortification of infant formula, child nutritional products and functional foods, and beverages. The Calcium phosphate in Capolac® is similar to the composition of teeth and bone.

Properties

100% Natural milk minerals
24% calcium
12.5% Phosphorous
8% lactose
3% Milk protein
Clear in solution at pH below 4

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24.Commission Regulation (EU) 432/2012 of 16/05/2012
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WHY CHOOSE ARLA FOODS INGREDIENTS?

R&D in our DNA
- More than 16% of our employees work with research, innovation and application development
- Collaboration with top universities worldwide
- Clinical and scientific documentation

Superior quality
- Premium quality ingredients
- Kosher and Halal certification

Your trusted business partner
- Application support
- Business development support
- In-depth nutrition research and formulation support

Security of supply
- Producing whey proteins since 1980
- Leading supplier of whey proteins, whey protein hydrolysates, whey fractions and lactose
- Continuous investment in production capacity to meet the growing volume needs of global customers
- Reliable supplies from three production sites

Arla Foods Ingredients

Discovering the wonders of whey

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