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# Marketing Information

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Soy Milk and Soy products Fortification with Calcium

***TCC-M5/TCC-M2***

***TCP-M3/TCP-LD***

***GadoPhit***

## ***Why Calcium?***

Calcium is the most abundant mineral in our body. It makes up about 2% of the body-weight and about 39% of the total body minerals.

Plays an essential role in

- Building bone mass and preventing osteoporosis
- Critical in the homeostatic maintenance of nerve, muscle and other tissue activity.
- Proper kidney function
- Regulation of blood pressure and blood cholesterol levels
- Essential for a wide range of fundamental cellular reactions.
- Known to activate more than 300 enzymes.

*Although soymilk is recognized as a nutritious beverage, it contains much less calcium than cowmilk (20-30 mg/100 ml vs. 120 mg/100 ml), so fortification is essential!*

## ***Why Phosphorous?***

Phosphorous is one of the most common substances in our environment, naturally occurring in our food, our water, and our bodies.

Phosphorous is a nutrient vital to human, animal, and plant life. In our body, phosphorus is present in genes, teeth, and bones – even muscles work because of phosphorus. It makes up about 0.65-1.1% of the adult body-weight from which 85% is in bone.

Phosphorus plays an essential role in:

- Building bone mass and preventing osteoporosis
- As phospholipids in the red blood:
  - Buffering of acid or alkali excesses, maintaining normal PH
  - Temporary storage and transfer of energy derived from metabolic fuels.
  - Activation of many catalytic proteins.

## ***Calcium/Phosphorous combination***

While awareness to the importance of Calcium to the bone health, Phosphorus, an important nutrient that is often overlooked. Dr. Robert Heaney, professor, Creighton University, Omaha, NE, and one of the leading researchers on the calcium/phosphorus connection, said both nutrients are needed to build strong bone and the reason this has been ignored is that, unlike calcium, the human diet is generally rich in phosphorus. Thus he has, demonstrated both the co-dependence of calcium and phosphorus in bone development and the importance of providing both minerals to support soft tissue and bone growth.

Phosphorus - Calcium Balance:

There is an optimal Calcium / Phosphorus ratio for bones building. In his article " The preferred calcium salt for the prevention of age-associated bone loss" Dr. S. Edelstein suggest that this ratio should be at least ***one part calcium to one part phosphorus***.

Many people consume an excess of phosphorus because it occurs naturally in foods and is added to many processed foods, breads and drinks. Estimates of the individual daily consumption of phosphorus from these sources vary from 400 to 1800 mg.

Phosphorus supplements are usually not recommended as there is an adequate amount in the diet.

Laboratory animals when fed a diet high in phosphorus but low in calcium developed secondary hyperparathyroidism, which is associated with a loss of calcium and demineralization of bone.

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## Optimal Calcium/Phosphorous intake

<i>Age</i>	<i>Calcium RDA mg/day</i>	<i>Phosphorous RDA mg/day</i>
<i>Less than 6 months</i>	400	100
<i>6-12 months</i>	600	275
<i>1-3 years</i>	800	380
<i>4-8 years</i>	800-1200	500
<i>9-13 years</i>	1200-1500	1250
<i>14-18 years</i>	1200-1500	1250
<i>19-30</i>	1000	700
<i>31-50 years</i>	1000	700
<i>51-70 years</i>	1000	700
<i>&gt;70 years</i>	1500	700
<i>Women Pregnancy or breast feeding</i>	1200-1500	700

Based on the RDA values of Calcium and Phosphorous optimal Ca/P ratio will be:

***1.5-2 parts of Calcium per 1 part of Phosphorous.***

## ***How to choose the most suitable Calcium source?***

Properties to be considered:

- Bioavailability
- Calcium content
- Solubility
- Organoleptical characteristics
- Effect on the stomach
- Effect on kidney stone formation
- Interaction with other ingredients

# ***Which is preferable? Organic Calcium or Inorganic Calcium?***

## **Bioavailability**

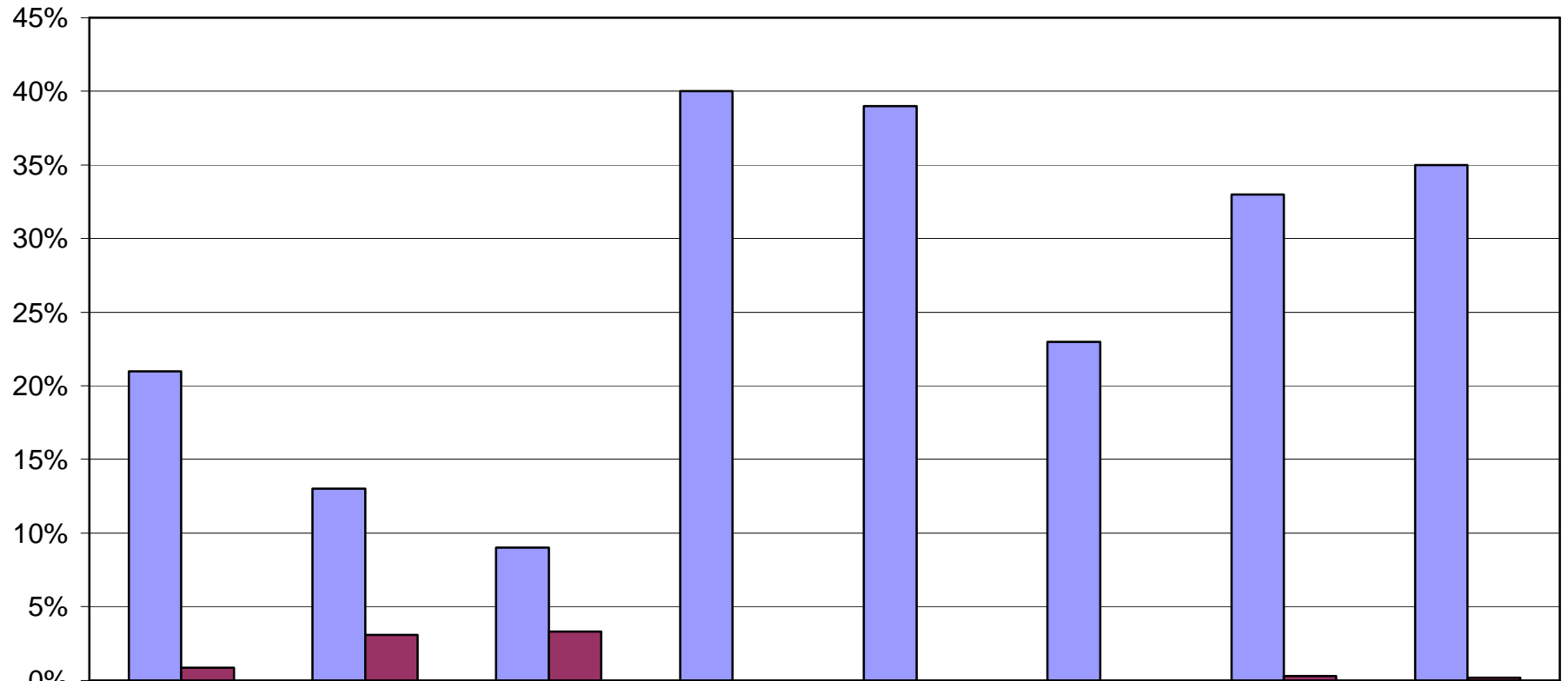
It is generally agreed that the bioavailability of Organic Calcium is be much higher than Inorganic Calcium. From the literature it appears that the bioavailability of Organic Calcium is **2 to 5 times** higher that of Calcium Carbonate.

On the other hand, the various organic calcium shows more or less the same bioavailability with slight advantage to Calcium Citrate.

## **Calcium Content & solubility**

<b>Organic Calcium</b>	<b>Calcium</b>	<b>Solubility</b>
Calcium Citrate	21%	0.85%
Calcium Lactate	13%	3.1%
Calcium Gluconate	9%	3.3%
<b>Inorganic Calcium</b>		
Calcium Carbonate	40%	0.001%
Tri Calcium Phosphate	39%	0.002%
Di Calcium Phosphate	23%	0.007%
<b>A Combination</b>		
GadoPhit C35	33%	0.299%
GadoPhit C20	35%	0.172%

## Ca-content and Solubility of Organic vs Inorganic sources



■ Ca-content	21%	13%	9%	40%	39%	23%	33%	35%
■ Solubility	0.85%	3.1%	3.3%	0.001%	0.002%	0.007%	0.30%	0.17%

## **Mouth-feel & Taste**

### **Organic Calcium**

Calcium Citrate	Neutral
Calcium Lactate	Slightly bitter
Calcium Gluconate	Dry & Slightly bitter, Bland

### **Inorganic Calcium**

Calcium Carbonate	Chalky & soapy
Tri Calcium Phosphate	Sandy, Bland
Di Calcium Phosphate	Sandy

### **A Combination**

GadoPhit C35	Neutral, Bland
GadoPhit C20	Neutral, Bland

***Conclusion: Organic calcium sources have a better bioavailability, solubility and organoleptical characteristics. However, a combination between TriCalcium Citrate and TriCalcium Phosphate provide relatively good levels of bioavailability, calcium content and organoleptical characteristics.***

## ***Which organic calcium is preferable?***

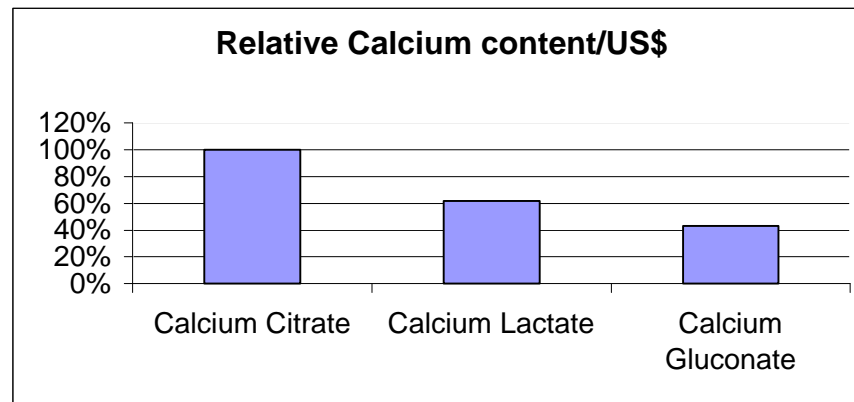
	<b>Cal. Content</b>	<b>Solubility</b>	<b>Mouth feel &amp; Taste</b>
Citrate	21%	0.85%	Neutral
Lactate	13%	3.1%	Slightly bitter
Gluconate	9%	3.3%	Dry & Slightly bitter

***Tri Calcium Citrate is the best choice for the fortification of soy beverages due to its lowest solubility contributing to the prevention of protein precipitation.***

## Cost Considerations

For the same amount of money one will get 100% amount of Calcium as Citrate or 62% of that amount of Calcium as Lactate or only 43% of that amount Calcium as Gluconate.

Calcium Citrate is by far a more cost effective source than any other Organic Calcium source.



A combination between Calcium Citrate and TriCalcium phosphate enable enjoying the benefits of highly bioavailable organic calcium and yet achieving cost savings per calcium unit.

***Conclusion: TriCalcium Citrate will be the most suitable and most cost effective among organic calcium sources.***

***However, a combination between TriCalcium Citrate and TriCalcium phosphate may help achieving cost savings per calcium unit.***

## **Calcium sources for Soy Milk**

*The most suitable products for enrichment of soymilk with Calcium are:*

*TCC-M5 or TCC-M2*

*TCP-M3 or TCP-LD*

*GadoPhit Series – TCC/TCP combination*

*The physical characteristics of the a.m. products are specifically designed to create a stable suspension without the problem of having a gritty mouth feel and to significantly decrease sedimentations.*

*Each of the products can be added to reach a level of 300 mg per serving (250ml ~ 8oz.) which is approximately 30% of the RDA of calcium.*

*To achieve such a stable suspension and to prevent any sedimentation it is suggested that a natural fiber or hydrocolloid be added.*

*The exact ratio of calcium source: natural fiber or hydrocolloid : soy milk should be adjusted as per customer's specific formulation.*

*Fortification with TCC-M5 or TCC-M2 has the following advantages:*

- 1. Reduces calcium sedimentation.*
- 2. No chalky or soapy mouth feel.*
- 3. High bioavailability*
- 4. Can offer Added Value : calcium, natural fibers and optionally vitamins (A, D).*
- 5. Can offer **a premium product** and expand product line – present innovation to the market.*

*TCC-M5 and TCC-M2 are currently available, packed in 10 kg paper bags.*

*Fortification with TCP-M3 or TCP-LD has the following advantages:*

- 1. Reduces calcium sedimentation.*
- 2. Contain both Calcium and Phosphorous.*
- 3. No chalky mouth feel.*
- 4. Cost effective product.*

*TCP-LD is currently available, packed in 20 kg or 50 lbs paper bags.*

*TCP-M3 is produced to order, packed in 10 kg paper bags.*

*Fortification with GadoPhit has the following advantages:*

- 1. Reduces calcium sedimentation.*
- 2. Contain both Calcium and Phosphorous.*
- 3. Basic product will contain calcium/phosphorous at the optimal ratio of **2.5 to 1** however GadoPhit can be tailored to meet any specific Calcium/Phosphorous ratio per customer request.*
- 4. No chalky mouth feel.*
- 5. Provide relatively high bioavailability*
- 6. Can offer Added Value : calcium, natural fibers and optionally vitamins (A, D) – in comparison to only calcium when an inorganic source is used.*
- 7. Can offer **a premium product** and expand product line – present innovation to the market and yet remain a Cost effective product.*

*GadoPhit is produced to order, packed in 10 kg paper bags.*

*The following is a demonstration of suspension of TCC-M5 in water in combination with hydrocolloid.*

