Comparison of Oral Calcium Salts

Calcium supplementation is commonly used for the prevention of osteoporosis. There are several calcium salts and formulations available on the market. Many calcium supplement formulations contain additional ingredients such as vitamin K and/or magnesium. Determining which formulation is best can be difficult. This document provides a brief discussion on the rationale for combining calcium with vitamin K or magnesium. A chart summarizing the differences among different oral calcium salts is also included.

### Comparison of Oral Calcium Salts:

<table>
<thead>
<tr>
<th>Formulations</th>
<th>Brand Names*</th>
<th>% Elemental Calcium (W/W)³</th>
<th>Dosage Forms**</th>
<th>Comments</th>
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</thead>
</table>
| Calcium Acetate | PhosLo (Rx only) | 25 | Gelcaps | • Formulation of choice in patients with hyperphosphatemia in chronic renal failure due to good phosphate binding ability.¹²  
• Eighty percent of the elemental calcium is bound to phosphorus in the body and excreted.¹⁶ |
| Calcium Carbonate | Tums, Rolaid, Caltrate, OsCal, Viactiv, etc. | 40 | Tablets Capsules Chewable Suspension Lozenges Powder | • Provides the highest amount of elemental calcium per weight.  
• Well absorbed and well-tolerated especially when taken with a meal.¹  
• Limited solubility and absorption in patients with high gastric pH.¹,²  
• Formulation of choice in patients with hyperphosphatemia in chronic renal failure due to good phosphate binding ability.¹² |
| Calcium Citrate | Citracal, etc. | 21 | Tablets Capsules Chewable Effervescent | • Better absorption than calcium carbonate, especially in patients with higher gastric pH.³  
• Recommend for those on H2-blocker or PPI, those suspected with achlorhydria, inflammatory bowel disease, or absorption disorders.³  
• May be taken on empty stomach.  
• More doses needed to get the equivalent elemental calcium compared to calcium carbonate.  
• Formulation of choice in patients with achlorhydria.³  
• Can enhance intestinal absorption of aluminum. Avoid in patients with end-stage renal disease.¹⁷ |
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| Calcium Gluconate  | Generics              | 9                            | Tablets Chewable Liquid Powder | • Multiple doses need to be taken to get sufficient amount of elemental calcium.  
                         |                       |                              |                             | • More soluble than calcium citrate.$^{13}$                           |
| Calcium Phosphates | Posture, etc. (U.S.)  | 31-38                        | Tablets Liquid Powder | • Low solubility compared to calcium carbonate.                             |
|                    | Cal-Phos, etc. (Canada)|                             |                |                             |                                                                         |
| Calcium Lactate    | Generics              | 13                           | Tablets Liquid Powder | • Multiple doses need to be taken to get sufficient amount of elemental calcium.  
                         |                       |                              |                             | • Similar solubility as calcium gluconate.$^{13}$                     |
| Calcium Glucarate  | Ca D-glucarate, etc. (U.S. only) | 12$^{14}$                | Tablets | • Multiple doses need to be taken to get sufficient amount of elemental calcium.$^{14}$  
                         |                       |                              |                             | • Promoted to rid body of toxins.                                    
                         |                       |                              |                             | • Calcium D-glucarate is thought to decrease estrogen levels by affecting estrogen’s elimination.$^{14}$ |
|                    |                       |                              |                |                             | • Though there is interest in using calcium D-glucarate for preventing estrogen-related cancer such as breast cancer and other hormone-related cancers, there is not enough evidence to support its use for this purpose.$^{14}$ |
| Calcium Glubionate$^{14}$ | Neo-Calglucon (U.S. only) | 6.5                          | Syrup          | • Multiple doses need to be taken to get sufficient amount of elemental calcium. |

* Some of the listed brands may contain other ingredients in addition to calcium (e.g., vitamin D, vitamin K, etc).

** Available formulations may differ by country (i.e., U.S. vs Canada).

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Commentary

Calcium is commonly used for the prevention of osteoporosis. The recommended daily calcium intake is 1000 mg for adult males and females <50 years of age and 1200 mg for those >50 years of age per the Institute of Medicine. The daily calcium intake recommendation by the National Institutes of Health for women are: 1000 mg for premenopausal aged 25 to 50 years and postmenopausal <65 years of age using estrogen; 1500 mg for postmenopausal women not using estrogen and all women ≥65 years of age. The Canadian recommended total daily calcium intake is 1000 mg for men up to age 50 and premenopausal women and 1500 mg for men over 50 and postmenopausal women.

When recommending calcium supplements, the presence of achlorhydria, use of H2 blockers or proton pump inhibitors, number of tablets needed to achieve the desired dose, size of the tablet, formulation, and the cost should all be considered. Optimal calcium absorption may require supplemental vitamin D for those with inadequate vitamin D intake, inadequate sun exposure, or those with impaired renal activation of the vitamin. Calcium carbonate and calcium citrate are the two main forms of calcium supplementation. In most cases, calcium carbonate (Caltrate, Tums, etc) is still the most cost-effective form of calcium supplementation, and it provides the most elemental calcium by weight. In patients with low gastric acidity such as the elderly or patients on H2 blockers or proton-pump inhibitors (PPI), calcium citrate is a better choice as it is better absorbed in these cases. Calcium citrate is also better absorbed on an empty stomach compared to calcium carbonate.

Calcium products containing magnesium and vitamin K are becoming more popular. Vitamin K is increasingly thought to have a role in bone health. It’s thought to promote bone formation and reduce calcium excretion. Preliminary studies suggest that low vitamin K levels are related to fracture risk. Most combination calcium/vitamin K products contain 40 mcg of vitamin K per dose (10 mcg to 500 mcg), some require multiple doses per day to provide enough elemental calcium. Some vitamin K-containing products in the U.S. include Viactiv and Total Cal Plus Vitamin K. Some vitamin K-containing products in Canada are Adora Calcium and Calcium Soft Chews with Vit D & K. Most clinicians agree that in most cases patients taking warfarin do not have to avoid calcium supplements containing vitamin K as long as the patient takes the supplement consistently and informs the healthcare professional managing their warfarin. However, it’s important to closely monitor INR when starting or stopping calcium supplements containing vitamin K.

There is evidence that magnesium deficiency increases the formation and activity of osteoclasts. Preliminary research also suggests that magnesium might improve bone mineral density and may theoretically be beneficial for osteoporosis. Contrary to common belief, magnesium does not increase calcium absorption. However, the laxative effect of magnesium might prevent constipation due to calcium ingestion.

Some calcium supplements are derived from natural sources such as coral, dolomite (a type of limestone), bone meal, and oyster shell. Coral calcium (calcium carbonate matrix) is derived from coral exoskeletons. It contains primarily calcium carbonate (20%) and magnesium (10%). It’s been promoted to be better absorbed and provide health benefits in patients with Alzheimer’s disease, arthritis, cancer, diabetes, eczema, fibromyalgia, etc. However, none of these claims have been substantiated. Calcium from a coral source has not been proven to be better than calcium from other sources. There is also concern that some coral calcium products contain excess lead. Dolomite supplements may also contain unsafe amounts of lead and other heavy metals. The lead content of oyster shell and refined calcium products is considered to be a clinically insignificant amount.

Conclusion

There is no proof that vitamin K reduces fractures or that magnesium improves bone density. Recommend single-ingredient calcium products for most patients. For patients who don’t get enough vitamin D, a calcium/vitamin D combination product can be recommended.

More . .
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References

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