In this edition of our newsletter, we discuss Matrix Gla-Protein, which is a calcification inhibitor which requires adequate levels of Vitamin K to function properly.

We will also review some of the diverse benefits of Vitamin K, its impact on overall longevity and a number of related topics including some information which discusses whether existing vascular calcification can be reversed.

The source content for this article was compiled from two Life Extension Foundation articles:

**The Surprising Longevity Benefits of Vitamin K**

**Matrix Gla-Protein: The Calcification Inhibitor In Need Of Vitamin K**

First let’s list some of the many benefits of Vitamin K, including a recent study citation which indicated that adequate Vitamin K levels can impact positively on cognitive function:

- For Healthy Bones
- For Heart Health
- For Oral Health
- To Reduce Varicose Veins
- To Reduce Cancer Risks
- For Brain Health***
- Longevity
- Synthesis of Other Nutrients
- Skin Health & Anti-Aging
- Blood Clotting
- Excessive Menstrual flow
- Internal Bleeding
- Menstrual pain
- Pregnant Women: Pregnant women suffering from vomiting and nausea are often deficient in Vitamin K
- Hemorrhaging in Babies
- Biliary Obtrusion
- Healthy Digestive/Immune Systems
- Regulation of Blood Sugar
- To increase the flow of urine
- To enhance the functioning of the liver
Vitamin K status and cognitive function in healthy older adults

- Nancy Presse\textsuperscript{a,b}, Sylvie Belleville\textsuperscript{c}, Pierrette Gaudreau\textsuperscript{a,c}, Carol E. Greenwood, Marie-Jeanne Kergoat\textsuperscript{a,c}, Jose A. Morais\textsuperscript{a}, Hélène Payette\textsuperscript{a}, Bryna Shatenstein\textsuperscript{a,c}, Guylaine Ferland\textsuperscript{a,b}.

Increased blood levels of vitamin K1 are associated with improved episodic memory in healthy older adults, says a new study that provides support for vitamin K and brain health.

Here is an overview of Matrix Gla-Protein, a calcification inhibitor:

**WHAT IS MATRIX GLA-PROTEIN?**

Early forms of life emanated from calcium-rich oceans, which required primitive organisms to develop mechanisms to prevent widespread calcium crystallization of living soft tissues.\textsuperscript{77}

A prominent calcium-blocking mechanism is through activation of a protein called matrix gamma-carboxyglutamic acid, more commonly referred to as matrix Gla-protein or matrix Gla.\textsuperscript{78}

The key to how matrix Gla-protein functions lies with its \textit{“carboxyl”} group. Matrix Gla must be carboxylated to function properly.\textsuperscript{74}

In the presence of vitamin K2, matrix Gla-protein becomes \textit{“carboxylated,”} which means it’s being turned \textit{“on”} to repel calcium infiltration.\textsuperscript{74}

Insufficient vitamin K2 results in matrix Gla being \textit{inadequately} carboxylated or turned \textit{“off,”} which means it’s unable to inhibit calcium infiltration into soft tissues.

To keep our natural calcium inhibitor matrix Gla continuously carboxylated, we need to provide it with a steady supply of vitamin K2. This is easy to do with one-per-day dosing of the proper forms of vitamin K.
With *optimal* levels of vitamin K, matrix Gla-protein becomes activated to shield calcium from entering arteries, heart valves, and other soft tissues.

Said differently, vitamin K functions as a control switch. When matrix Gla-protein is turned “on” by vitamin K, it blocks calcium from entering soft tissues. In the absence of adequate vitamin K, the matrix Gla-protein switch is turned “off” and calcium quickly infiltrates into soft tissues.

So the title of the 2008 study is quite revealing in that matrix Gla-protein is clearly a “*calcification inhibitor in need of vitamin K.*”

In these articles, the authors document how adequate Vitamin K levels can actually impact on longevity:

**Vitamin K Promotes Longevity**

- Once thought to be exclusively concerned with blood coagulation, vitamin K is now known to affect at least 16 Gla-proteins in the body.
- These include proteins involved in protecting arteries from calcification, those protecting bones from losing calcium, and ones that help prevent against diabetes and cancer.
- A new study demonstrated that people with higher vitamin K intakes are less likely to die from all causes, lending new urgency to the issue of supplementation.
- A multitude of studies now point to the fact that adequate vitamin K intake, including supplementation, can offer prevention against atherosclerosis, osteoporosis, diabetes, and cancer.
- Assure that your vitamin K intake is adequate by adopting a daily vitamin K supplement that provides both K₁ and K₂ for optimum coverage.

One of the other intriguing components of this article addressed the consideration as to whether calcification can be reversed by supplementation with mega doses of Vitamin K:

**Can Calcification Be Reversed?**

Most adults probably suffer some degree of calcification, as intake of vitamin K in Western societies remains at epidemic low levels.

Some of us are severely calcified because of medical disorders requiring dialysis or the drug warfarin, or we allowed blood levels of homocysteine, LDL, or glucose to remain too high for too long.
So the question begs is there anything we can do now to reverse the accumulation of calcium in our arteries, heart valves, glands, and other soft tissues? We found one animal study published in 2007 suggesting that high-dose vitamin K might work. The authors of the study wrote: 99

“Given that arterial calcifications are predictive of cardiovascular events, regression of arterial calcification may help to reduce the risk of death in people with chronic kidney disease and coronary artery disease.”

The study involved four groups of rats who were all initially fed a six-week diet that contained warfarin to induce calcium buildup in the blood vessels. This diet also included a low-dose (normal) vitamin K1 to ensure the animals were not vitamin K deficient. The rats were divided into several groups, of which the following four groups comprised the main part of the experiment:

Group 1: Continue the warfarin plus normal K1 diet;
Group 2: Stop warfarin, but continue with normal dose of vitamin K1;
Group 3: Stop warfarin, but use a high-dose of vitamin K1;
Group 4: Stop warfarin, but add high-dose of MK-4 form of vitamin K2.

During the initial six weeks of warfarin plus normal K1, all animals showed a significant increase in arterial calcification.

In the groups receiving high-dose vitamin K1 or K2 (MK-4), not only was there no further arterial calcium accumulation, but there was a greater than 37% reduction of previously accumulated arterial calcification after six weeks. After 12 weeks, there was a 53% reduction in accumulated arterial calcium deposits.

The groups receiving the high-dose vitamin K1 and K2 also showed a reversal in carotid artery stiffness. 99 This study provides intriguing evidence that warfarin-induced calcification may be reversible by high vitamin K intake.

An estimate of the human equivalent dose given to the rats whose arterial calcification was reversed is difficult to precisely calculate because of many variables involved. Our calculations based on estimates of food consumption and animal body weight suggest that the human equivalent dose of the vitamin K2 (MK-4) used in this study is in the range of approximately 52,000 mcg to 97,000 mcg per day (i.e. 52 mg to 97 mg per day).
Since the RDA for vitamin K is only 90 to 120 mcg, the dose of vitamin K used in this rat study may seem extremely high. Yet in Japan, the MK-4 form of vitamin K2 is approved as a drug to treat osteoporosis in humans, and the daily dose is 45,000 mcg (45 mg), which has not been reported to have any toxic effects.120-123

These are high doses compared to dietary supplement industry standards, and one could postulate that taking these daily doses over an extended time period might induce a *regression* of arterial calcification, but more human research is needed to establish this. Some members are taking higher doses of vitamin K now with the objective of reversing accumulated soft tissue calcification.

To optimize one’s health, it can be suggested that one needs to optimize their level of key endogenous compounds, such as vitamins and minerals. Research continues to redefine what these optimum levels might be.

The research documented in this article suggests that optimizing Vitamin K levels can certainly be considered a key component of health optimization.

Biotics offers a number of products which include Vitamin K:

The following two products are not currently available in Canada (due to dosages that exceed those acceptable to Health Canada) however we can arrange to have them shipped to a U.S. address.

If having a Vitamin K mulsion product from Biotics Canada would be of interest, (at 85 mcg’s/drop per Health Canada regulations), please respond to this email by letting us know your estimated order volume.

*Bio-K Forte Caps®*

*Bio-K-Mulsion®*

*Colon Plus Caps*

*Colon Plus Powder*
Osteo-B II

Cellular Metabolism, Female Support, Folic Acid, Musculoskeletal-Support, Osteo Support

Osteo-B-Plus w-D,K,Boron

Female Support, Folic Acid, Musculoskeletal Support, Osteo Support

VasculoSirt ACTIVATES AMPK

Anti-Aging, Anti-inflammatory, Antioxidants, Cardiovascular-Support, Cholesterol-Reduction, Folic-Acid, Glucose-Balancing

Pro-Multi Plus ACTIVATES AMPK

Potent Multi Vitamin/Mineral Supplement

BioProtect ACTIVATES AMPK

Anti-Inflammatory, Antioxidants, Athletic, Immune Support, Respiratory

Chlorella Caps

Bio-Multi Plus

Indications:

Broad-spectrum multiple vitamin, mineral, vegetable culture trace element, amino acid, bioflavonoid formula in an antioxidant enzyme-rich vegetable culture base for long-term, general preventive support, and as a synergist for specific protocols

Bio-Cardiozyme Forte ACTIVATES AMPK

Adrenal Support, Cardiovascular Support, Folic Acid, Glandulars, NPN, Neonatal Glandulars, Vitamins / Minerals

Below are additional components of the two Life Extension Foundation articles.

Regards,

Rob Lamberton
Dr. Bruce Ames is one of the world’s leading authorities on aging and nutrition. Four years ago, Dr. Ames published research indicating that optimum intake of vitamin K plays an important role in longevity.\(^1\)

A new 2014 study on vitamin K confirms that ample vitamin K intake can indeed help you live longer.\(^2\) In a group of more than 7,000 people at high risk for cardiovascular disease, people
with the *highest* intake of vitamin K were 36% less likely to die from *any cause at all*, compared with those having the lowest intake.

This protection even extended to those with initially low vitamin K intake who boosted their consumption during the course of the study—demonstrating that it’s never too late to start gaining the benefits of vitamin K supplementation. Increasing intake conferred protection against cardiovascular death as well.²

Vitamin K is capable of opposing many of the leading causes of death in modern-day Americans—including atherosclerosis,³ osteoporosis,⁴ diabetes,⁵,⁶ and cancer²,⁷—because it has the unique ability to activate proteins involved in these conditions.

In this article, we will review a host of new studies that detail the impact of vitamin K supplementation on preventing these and other major age-related diseases.

<table>
<thead>
<tr>
<th>Condition</th>
<th>Vitamin K Form</th>
<th>Risk Reduction</th>
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<tbody>
<tr>
<td>All-Cause Mortality</td>
<td>K₂</td>
<td>26% (Highest vs. Lowest Intake)³</td>
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<tr>
<td>All-Cause Mortality</td>
<td>K₁</td>
<td>36% (Highest vs. Lowest Intake)²</td>
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<td>Cancer</td>
<td>K₁</td>
<td>46% (Highest vs. Lowest Intake)²</td>
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<td>Cancer, Advanced Prostate</td>
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<td>63% (Highest vs. Lowest Intake)⁷</td>
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<tr>
<td>Cancer Death</td>
<td>K₂</td>
<td>28% (Highest vs. Lowest Intake)⁵⁴</td>
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<tr>
<td>Coronary Artery Calcification</td>
<td>K₂</td>
<td>20% (Highest vs. Lowest Intake)³⁰</td>
</tr>
<tr>
<td>Coronary Heart Disease</td>
<td>K₁</td>
<td>21% (Highest vs. Lowest Intake)⁶⁶</td>
</tr>
<tr>
<td>Coronary Heart Disease</td>
<td>K₂</td>
<td>9% lower risk for each <strong>10 microgram/d</strong> increased intake⁶⁷</td>
</tr>
<tr>
<td>Coronary Heart Disease Mortality</td>
<td>K₂</td>
<td>57% (Highest vs. Lowest Intake)³</td>
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</table>
| Metabolic Syndrome | K₁ | 27% for having low HDL-cholesterol*  
|                   |    | 49% for having elevated triglycerides*  
|                   |    | 82% for having high blood sugar*  
|                   |    | (All Highest vs. Lowest Intake)⁶⁸  
| Type II Diabetes  | K₂ | 7% lower risk for each 10 microgram/d increased intake⁵  
| Type II Diabetes  | K₁ | 17% reduction for each 100 microgram/d increased intake⁶  
| Type II Diabetes  | K₁ | 51% with increased K₁ intake vs. decreased or no change in intake⁶  
|                   |    | *Based off of odds ratios  

**TYPES OF VITAMIN K**

It is clear that vitamin K affects specific and vital proteins throughout the body, well beyond the blood-clotting functions originally described for the vitamin. Less clear, at least for now, are differences in impact on the human body of several different types of vitamin K.

Phylloquinone, or K₁, is the predominant source of vitamin K in the diet,⁵⁵ but it becomes converted to menaquinone, or K₂, in animals, including humans.⁵⁶ Vitamin K₂ itself has several different subtypes, based on molecular structure variations. The subtype MK-4, or menaquinone-4, predominates in animal tissues; it is the natural product of K₁ modification in the gastrointestinal tract.⁵⁷

It is likely that both K₁ and K₂ are necessary for overall normal vitamin K function, and it appears that supplementation with both is useful, especially for the mounting number of biological tissues other than blood clotting that rely upon adequate vitamin K. The subtype of K₂ called MK-7, menaquinone-7 has recently been shown to be more bioavailable than MK-4.⁵⁸

As we age, our soft tissues harden as a result of calcium infiltration. This calcification process is a major contributor to degenerative disease. Vitamin K functions to keep calcium out of soft tissues. New findings reveal that a vitamin K deficit creates more vascular calcification than initially thought.

A recent study showed when women were given a drug that blocks vitamin K, there was a 50% greater prevalence of arterial calcification compared to women not taking this drug.
(warfarin). This pathological effect occurred in as little as one month.\textsuperscript{1} This study showed that longer term use of warfarin was associated with even greater arterial calcification prevalence.

Kidney dialysis patients suffer severe arterial calcification with cardiovascular disease accounting for almost half of all their deaths.\textsuperscript{2} A clinical study examined vitamin K levels in dialysis patients. The results showed that 93\% of the patients were at risk for arterial calcification. This risk was shown to be reduced with vitamin K\textsubscript{2} supplementation.\textsuperscript{3} The quotation on the right side of this page comes from a report published by the American Heart Association.\textsuperscript{4} Despite this indisputable data, doctors today typically do nothing to protect their aging patients from the devastating impact of vascular calcification.

This article briefly describes how proper use of vitamin K can markedly protect our soft tissues against calcification.

\textit{“Most individuals aged over 60 years have progressively enlarging deposits of calcium mineral in their major arteries.”\textsuperscript{5} This vascular calcification reduces aortic and arterial elastance, which impairs cardiovascular hemodynamics, resulting in substantial morbidity and mortality\textsuperscript{6-8} in the form of hypertension, aortic stenosis, cardiac hypertrophy, myocardial and lower-limb ischemia, congestive heart failure, and compromised structural integrity.\textsuperscript{9} The severity and extent of mineralization reflect atherosclerotic plaque burden\textsuperscript{10-12} and strongly and independently predict cardiovascular morbidity and mortality.”}\textsuperscript{13}

Source: American Heart Association

A search of the National Library of Medicine data base using the term “vascular calcification” at the time of this writing turns up the following numbers of published scientific articles:

\textbf{Year New Articles}

1982 16
1994 53
2004 214
2008 373
2014 700+
The total number of articles that discuss arterial calcification in the National Library of Medicine as of April, 2015, is over 6,400.

The surge from a mere 16 articles in 1982 to over 6,400 today is a reflection of the exponential increase in knowledge about this widespread pathological process. The problem is that this lifesaving data is not being translated into clinical medical practice where it is urgently needed to protect aging humans against a host of cardio-vascular disorders.

**Calcification And Hypertension**

When arteries are soft and elastic, they readily expand and contract with each heartbeat. As arteries harden (calcify) and lose youthful elasticity, there is a progressive elevation in blood pressure.\(^{14}\)

This happens because the heart is forced to beat stronger to force blood into the increasingly rigid arterial system. Calcification of the large artery exiting the heart (the aorta) helps explain why blood pressure elevates as people age.

A hallmark sign of long-term hypertension is enlargement of the heart’s left ventricle,\(^{15}\) which is the chamber of the heart that pushes blood into the aorta from where it is then distributed throughout the body.

The increase in cardiac workload caused by aortic rigidity (calcification) contributes to heart failure that afflicts over 5 million Americans.\(^{16,17}\)

**Aortic Valve Stenosis**

A dilemma faced by elderly persons is progressive dysfunction of the valve between their heart and aorta that opens and closes with each heartbeat.

When the aortic valve fails to completely close, blood regurgitates back into the left ventricle of the heart.\(^{18,19}\) Without surgical replacement/repair of the aortic valve, death from congestive heart failure often occurs.\(^{20}\)

Elderly persons are challenged to fully recover from aortic valve replacement, though newer *intra-arterial* techniques are becoming available whereby an artificial valve is threaded through the aorta and sewn into place.\(^{21}\) Those with successful mechanical valve replacements usually require anticoagulant drug therapy for life, which poses its own complicated set of side effects.\(^{22}\)
It used to be thought that *aortic stenosis* was caused by a lifetime of “wear and tear.” It is now clear that calcification of the aortic valve leaflets is a cause of aortic valve failure, along with chronic inflammation, elevated glucose, high homocysteine, and low magnesium.

**Coronary Artery Calcification**

Blockage of the coronary arteries that feed the heart muscle necessitates enormous amounts of hospital expenditures each year in the form of open heart coronary bypass surgeries and intra-arterial “stenting” procedures.

Interestingly, when open heart surgery is performed to replace a calcified aortic valve, the surgeon will often also bypass blocked coronary arteries in the same patient. This is not surprising since coronary atherosclerosis and aortic valve stenosis have similar underlying causes such as elevated homocysteine, chronic inflammation, and calcification.

Calcification plays a significant role in accelerating the formation of the atherosclerotic plaque that narrows the coronary arteries of aging humans. In patients with coronary artery disease, calcification is present in 90% of cases.

Clinically, vascular calcification is now accepted as a valuable predictor of coronary heart disease. Yet most cardiologists use it only as a diagnostic marker (the coronary calcium score test) as opposed to directly treating the underlying calcification pathology.

**What Causes Arteries To Calcify?**

Many of the known risk factors that underlie atherosclerosis have been shown to promote arterial calcification. These include elevated LDL cholesterol, elevated homocysteine, diabetes, kidney failure, chronic inflammation, and oxidative stress.

Additional calcification contributors include low magnesium (a natural calcium channel blocker), hormone imbalance, and excess blood calcium (caused by hyperparathyroidism).

An underappreciated, major reason our vascular system turns to stone (calcifies) as we age, however, is inadequate intake of vitamin K.

As you’ll read next, a low blood level of vitamin K2 causes a protein in the vascular wall to bind calcium to arteries, heart valves, and other soft tissues.
A Calcium Inhibitor In Need Of Vitamin K

Matrix Gla-protein is a vitamin K-dependent protein, and it must be carboxylated to function properly. Poor vitamin K status leads to inactive uncarboxylated matrix Gla, which enables calcium to accumulate in soft tissues.\textsuperscript{67-69}

Failure to optimally carboxylate matrix Gla-protein is a risk factor for atherosclerosis, coronary heart attack, and kidney disease.\textsuperscript{70-74} The title of a 2008 study that examined the impact of cardiovascular calcification is: “Matrix GlA-Protein: The Calcification Inhibitor In Need Of Vitamin K.”\textsuperscript{75,76}

Matrix Gla-protein lines our vascular system and its function is governed by the quantity of vitamin K in our bloodstream.

When vitamin K levels are less than optimal, matrix Gla-protein allows calcium to infiltrate into our soft tissues similar to the way calcium absorbs into bone. When you hear the term “hardening of the arteries,” this can literally mean one’s previously flexible blood vessels are turning into rigid (calcified) bony structures.

With optimal levels of vitamin K, matrix Gla-protein becomes activated to shield calcium from entering arteries, heart valves, and other soft tissues.

Said differently, vitamin K functions as a control switch. When matrix Gla-protein is turned “on” by vitamin K, it blocks calcium from entering soft tissues. In the absence of adequate vitamin K, the matrix Gla-protein switch is turned “off” and calcium quickly infiltrates into soft tissues.

So the title of the 2008 study is quite revealing in that matrix Gla-protein is clearly a “calcification inhibitor in need of vitamin K.”

What Happens When Vitamin K Is Acutely Withdrawn?

A recent study provided real-world evidence of what happens to aging humans who are deprived of vitamin K.

Warfarin is an anticoagulant drug that functions by antagonizing the effects of vitamin K in the body.\textsuperscript{79} This drug has been sold under the trade name Coumadin® for many decades.
Scientists were long ago aware that warfarin users suffered accelerated arterial calcification, but until recently, there was no alternative to protect high-risk patients from a thrombotic (arterial clotting) event, such as an ischemic stroke.

A study published in 2015 evaluated 451 women using mammograms to measure arterial calcification. After just one month or more of warfarin drug therapy, the prevalence of arterial calcification increased by an astounding 50% compared to that in untreated women. When these women were evaluated again after five years, the prevalence of arterial calcification increased almost 3-fold.¹

This new human trial provides stark evidence of rapid calcification occurring in response to vitamin K withdrawal caused by warfarin (a vitamin K antagonist drug.) We discuss the pros and cons of anticoagulant drugs that may be used in place of warfarin in this month’s issue of Life Extension® magazine.

What Happens When Vitamin K Is Introduced To Deficient Patients?

Kidney failure patients are kept alive by thrice weekly dialysis treatments. While the advent of hemodialysis has added countless human life years, it produces devastating side effects over the longer term. Over 50% of hemodialysis patients have vascular calcification, a major cause of cardiovascular disease. Cardiovascular disease accounts for about 50% of all deaths in these patients.⁸⁰-⁸²

A study was done to evaluate the effects of varying doses of the MK-7 form of vitamin K2 on markers of arterial calcification including carboxylation (activation) of matrix Gla-proteins.⁸³

MK-7 (menaquinone-7) is a unique form of vitamin K2 because it remains active in the body for 24 hours and longer.⁸⁴ At baseline, hemodialysis patients had a 4.5-fold higher level of uncarboxylated matrix Gla compared to controls.⁸³ Daily doses of MK-7 of 45 mcg, 135 mcg, and 360 mcg were then administered over a six-week period.

Results were measured by the reduction of uncarboxylated matrix Gla and other measures of systemic calcification. Recall that when matrix Gla is under-carboxylated, it enables calcification of its surrounding tissue.
Supplementation with the MK-7 form of vitamin K2 reduced uncarboxylated matrix Gla by 36.7% in the 135 mcg dose group and 61.1% in the 360 mcg dose group. In the group given 360 mcg per day of MK-7, the favorable response rate was a remarkable 93%.83

When vitamin K2 supplementation was ceased in these dialysis patients, plasma levels of uncarboxylated matrix Gla-protein increased significantly, which indicated these high-risk individuals were once again vulnerable to severe vascular calcification.

THREE FORMS OF VITAMIN K

Based on the totality of evidence and low cost, it is prudent to take a supplement that contains multiple forms of vitamin K. The three forms of vitamin K most applicable to human health are:

- Vitamin K1. Vitamin K1, also known as phylloquinone, is found in plants and some of it converts to vitamin K2 in the body.85 This form is considered the least effective because it depends on conversion into activated K2 to confer significant protection against calcification. There are nonetheless published studies showing disease risk reduction in response to ingestion of vitamin K1.86-90

- Vitamin K2 (MK-4). MK-4 is found in meat, eggs, and dairy products.91 It is the most studied form of vitamin K to preserve bone health. It is rapidly absorbed and rapidly metabolized by the body.92-96

- Vitamin K2 (MK-7). MK-7 is found in fermented soybeans and fermented cheeses.97,98 What makes this form so special is that it remains active in the body for more than 24 hours.84 This is critical when protecting against calcification since matrix Gla-proteins quickly inactivate in the absence of vitamin K2.99

The federal government says that adults only need 90 to 120 mcg per day of vitamin K.100-102 While this is enough to enable proper blood clotting, current research suggests it falls below levels needed to protect against vascular calcification.99,103-106

Importance Of Adequate Calcium Intake

Calcium serves numerous life-sustaining processes, the most important of which is to maintain the electrolyte balance needed for proper rhythmic heart beats.107 If one were to deplete their bloodstream of calcium, they could die from a heart attack caused by an acute arrhythmic disorder.
In a healthy body, 99% of all calcium is stored in bone where it provides structural support.\textsuperscript{108} The amount of calcium that is allowed in the bloodstream is tightly controlled by the parathyroid glands.\textsuperscript{109}

In bone, vitamin K2 \textit{activates} proteins that bind calcium.\textsuperscript{110} Populations with high dietary intake of vitamin K2 have lower rates of osteoporosis.\textsuperscript{111-114}

People need around 1,200 mg per day of calcium from diet and supplements to maintain bone density. We suggest around 700 mg per day of supplemental calcium for women and around 500 mg per day for men. Most people can rely on their diet for the balance of their calcium needs.\textsuperscript{115}

Supplementing with moderate daily doses of calcium will not accelerate arterial calcification.\textsuperscript{116,117} One reason is that calcium blood levels are tightly regulated in the body and most ingested calcium will be stored in one’s bones. Your bloodstream has top priority when it comes to getting the calcium it needs, which means that if you intentionally deprive yourself of calcium from food and supplements, your parathyroid glands will rob calcium from your bones to maintain a constant calcium blood level to ensure \textit{electrolyte} balance.\textsuperscript{118}

Vitamin K is a calcium-regulating nutrient. When properly supplemented, vitamin K2 activates matrix Gla-proteins in soft tissues to keep calcium out. On the flip side, vitamin K2 activates calcium binding proteins in bone to maintain skeletal density.

In the absence of vitamin K, bony structures form in soft tissues. Early pathologists were perplexed to find arteries that were supposed to be soft and pliable instead had literally \textit{turned to stone}. In 1863, Rudolf Virchow, known as the “father of pathology,” described vascular changes he observed as \textit{“ossification, not mere calcification, occurring by the same mechanism by which an osteophyte forms on the surface of bone.”} \textsuperscript{119}

These observations confirmed by modern findings clearly demonstrate the power of vitamin K, or lack thereof, to control whether we maintain strong bone density and soft pliable tissues, or develop osteoporosis together with vascular calcification.
Can Calcification Be Reversed?

Most adults probably suffer some degree of calcification, as intake of vitamin K in Western societies remains at epidemic low levels.

Some of us are severely calcified because of medical disorders requiring dialysis or the drug warfarin, or we allowed blood levels of homocysteine, LDL, or glucose to remain too high for too long.

So the question begs is there anything we can do now to reverse the accumulation of calcium in our arteries, heart valves, glands, and other soft tissues? We found one animal study published in 2007 suggesting that high-dose vitamin K might work. The authors of the study wrote: 99

“Given that arterial calcifications are predictive of cardiovascular events, regression of arterial calcification may help to reduce the risk of death in people with chronic kidney disease and coronary artery disease.”

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These are high doses compared to dietary supplement industry standards, and one could postulate that taking these daily doses over an extended time period might induce a \textit{regression} of arterial calcification, but more human research is needed to establish this. Some members are taking higher doses of vitamin K now with the objective of reversing accumulated soft tissue calcification.

**Systemic Calcification**

Cardiovascular tissues are particularly prone to calcium infiltration.
The calcification process, however, is also commonly observed in the skin, kidney, tendons, glands, and other soft tissues as a result of disease, and/or aging.\textsuperscript{124-132}

**How To Properly Supplement With Vitamin K**

A review of the published scientific literature provides a rationale for aging people to supplement with all three vitamin K forms, i.e. vitamin K1, vitamin K2 (MK-4), and vitamin K2 (MK-7).

Since vitamin K is fat-soluble, taking it with the fattiest meal of the day will greatly augment \textit{absorption} into one’s bloodstream.
A lot of members ask why they cannot take just the MK-7 form of vitamin K2 since this has long-acting effects in the body and has demonstrated powerful calcium blocking properties. Our response is that vitamin K1 and MK-4 have demonstrated impressive results in other studies, so it is best to take a formula that contains all three forms of vitamin K. As mentioned already, the MK-4 form of vitamin K2 has been used in high doses as a prescription drug in Japan to treat osteoporosis.

Since vitamin K1 and MK-4 are inexpensive, it makes sense to include them with the long-acting MK-7 form of vitamin K2 to inhibit and possibly reverse as much vascular calcification as possible, while providing support for strong bones.

**Why Doctors Are Apprehensive About Vitamin K**

In 1999, one of our scientific advisors recommended to me that aging people supplement with vitamin K.

Vitamin K is known as the "coagulation vitamin" because of the critical role it plays in essential blood clotting.

I was initially apprehensive because abnormal clotting inside blood vessels (thrombosis) is a leading cause of death in the elderly. Thrombosis is a frequent underlying cause of coronary occlusion heart attacks and ischemic strokes.

One might think that taking higher amounts of vitamin K would increase thrombotic risk. This concern, however, has no basis in reality. The reason is that only small amounts of vitamin K are required to fully saturate coagulation proteins.

Once coagulation proteins are fully saturated by vitamin K, then there is no increased thrombotic risk in response to additional vitamin K intake.

The misconception about the role vitamin K plays in coagulation is contributing to the epidemic of diseases caused by vascular calcification. A plethora of published studies indicate that the most common degenerative diseases afflicting aging humans could be prevented by taking the proper doses of vitamin K.
What mainstream doctors still don’t understand is vitamin K’s critical role of blocking the calcification of heart valves, arterial linings, and other soft tissues, while helping to keep calcium in bone where it is needed.

Eye-opening recent studies shed light on the importance for people to optimize their intake of vitamin K to protect against soft tissue calcification.

An urgent need exists to convey this information to the medical community. This may not happen any time soon because vitamin K is sold as a low-cost dietary supplement and not an expensive prescription drug.

References


References


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