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Forté Joint™

Science-based Targeted Nutritional Support for Superior Joint Health

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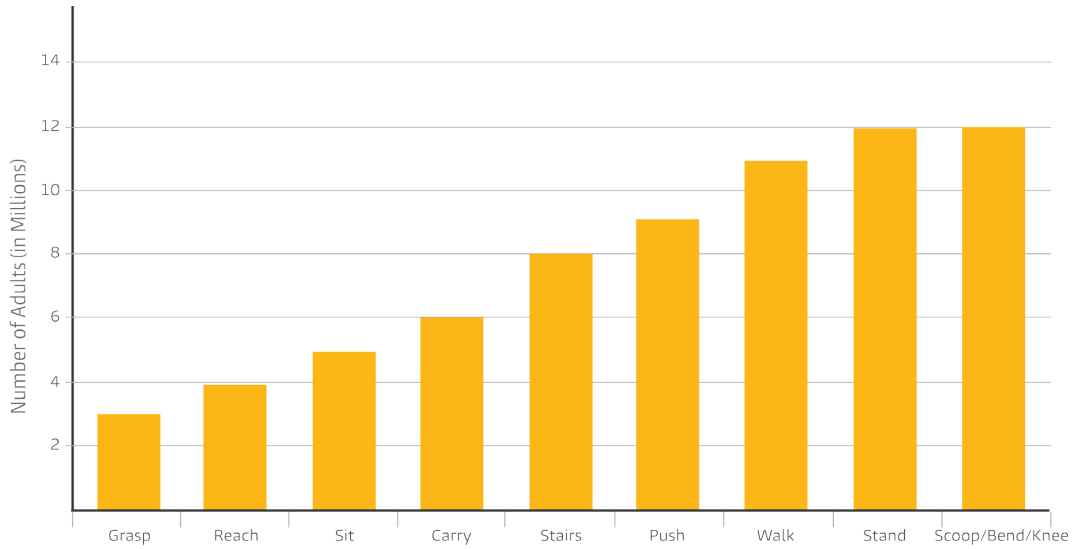
Key Nutrients and Their Impact on Joint Health and Osteoarthritis

As people age, they may experience discomfort from natural wear and tear on their joints. Arthritis, of which osteoarthritis (OA) is the most common type, is the most frequent cause of disability among adults in the United States.[1] In 2013, one in five adult Americans reported having a clinical diagnosis of arthritis, including almost 50 percent of adults aged 65 and older. Nearly 23 million Americans reported arthritis-attributable activity limitation (AAAL), interfering with their ability to work, care for their family, and function in the community.[2]

Osteoarthritis is the fourth most common cause of hospitalization among U.S. adults and the leading indication for joint replacement surgery. In 2009, 905,000 knee and hip replacements were performed at a cost of $42.3 billion.[3] Knee osteoarthritis is the most common type of osteoarthritis in the U.S., with an estimated 12.1 percent of adults suffering from pain and functional limitations.[4] Community-based surveys have shown that the incidence and prevalence of symptomatic hand, hip, and knee osteoarthritis increases two- to 10-fold from age 30 to age 65, with further increases thereafter.[5]

Figure 1. Arthritis-Attributable Activity Limitations[6]



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Currently, there is no cure for osteoarthritis and treatment modalities are primarily aimed at reducing pain and improving joint function via non-specific symptomatic agents. These agents –including the newest non-steroidal anti-inflammatory drugs (NSAIDs), the cyclooxygenase-2 (COX-2) selective inhibitors–have not been shown to significantly modify the natural progression of osteoarthritis in terms of joint structure changes. However, a growing body of research suggests that appropriate nutrient supplementation may help to slow osteoarthritis progression, reduce joint pain, limit long-term disability, and improve joint health to delay or even prevent joint disease.

Pathophysiology of Osteoarthritis

Osteoarthritis, or degenerative joint disease, is primarily a disease of cartilage destruction. The extracellular matrix of cartilage–comprised predominantly of type II collagen and proteoglycans –imparts the unique viscoelastic and compressive properties of healthy joints. Under normal conditions, the cartilage matrix undergoes a dynamic remodelling process in which low levels of anabolic and catabolic enzymes are delicately balanced to maintain cartilage volume. In osteoarthritis, the catabolic enzymes (primarily matrix metalloproteinases) are overexpressed, resulting in a net loss of collagen and proteoglycans from the cartilage matrix.[1]

Although the initiating events that trigger the development of osteoarthritis have not been fully delineated, it has been commonly hypothesized that mechanical stress on the joints may lead to accumulation of free radicals and subsequent degradation of articular cartilage, resulting in joint pain swelling and loss of motion.[2] Primary osteoarthritis is primarily related to aging, as cartilage degenerates and repetitive use of the joints results in cartilage damage. Osteoarthritis may also be triggered by injury or trauma to a joint, and in some cases, it may be caused by hereditary defects in collagen. Obesity increases the mechanical stress on cartilage, and next to aging, obesity is the most powerful risk factor for osteoarthritis of the knees.

Lifetime Risk of Symptomatic Osteoarthritis

- Nearly 1 in 2 people may develop symptomatic knee osteoarthritis by age 85.[3]
- 2 in 3 people who are obese may develop symptomatic knee osteoarthritis in their lifetime.[4]
- 1 in 4 people may develop painful hip arthritis in his/her lifetime.[4]

Nutritional Needs in Osteoarthritis

Nutrient supplementation for joint health and prevention or delayed progression of osteoarthritis must take into account the pathophysiology of joint disease, as well as typical dietary intake, in order to provide appropriate nutritional support.

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Antioxidants

Free radicals are unstable, reactive molecules with unpaired electrons that are created primarily via aerobic metabolism and the antigenic immune response. In the absence of sufficient antioxidants, free radicals can cause cytotoxicity and cellular damage to neighboring cells.[1] Damage caused by free radicals plays an important role in the progression of osteoarthritis.[2] Research has demonstrated the oxidative stress caused by free radicals induces genomic instability and dysfunction of chondrocytes in cartilage.[3]

Antioxidants—including vitamin A (or β -carotene and other carotenoids), vitamin C, vitamin E and selenium—may prevent or minimize the occurrence of oxidative cartilage damage and have been shown to reduce the incidence of radiographic knee osteoarthritis.[4,5]

Glucosamine

Glucosamine, a naturally occurring aminomonosaccharide, is a constituent of the glycosaminoglycans found in the cartilage matrix and synovial fluid.[6] As such, it can be considered a basic building block for healthy joint cartilage. Research has shown that glucosamine supplementation may delay the long-term progression of knee osteoarthritis in terms of joint structure changes, as well as symptoms.[7] Experimental studies have shed light on the mechanism of action of glucosamine in osteoarthritis. After oral administration, glucosamine is bioavailable and reaches the articular cartilage, where it is preferentially incorporated into glycosaminoglycan chains in intact cartilage, stimulates proteoglycan synthesis, and inhibits the activity of catabolic enzymes, including matrix metalloproteases.[8,9,10] The mechanism of action of glucosamine supports the safety of the compound, which has been shown to be comparable to placebo and significantly better than conventional NSAIDs.[11]

In a randomized, placebo-controlled, double-blind study, long-term supplementation with 1500 mg/day of glucosamine sulfate in patients with mild to moderate knee osteoarthritis for three years resulted in less joint space narrowing and a significant improvement in pain and function limitation compared to placebo.[12] These results positioned glucosamine as the first agent to meet the requirements to be classified as a symptom- and structure-modifying drug in osteoarthritis, according to the definitions of scientific organizations, as recognized by regulatory agencies.[13,14]

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Chondroitin

Like glucosamine, chondroitin is an important structural component of cartilage. A recent systemic review of its use as a dietary supplement revealed clinically meaningful benefit in improving pain among patients with osteoarthritis, without significant side effects.[1] In a randomized, double-blind, placebo-controlled trial, daily supplementation with 800 milligrams of chondroitin in patients with symptomatic knee osteoarthritis resulted in a 43 percent reduction in joint pain, compared to only three percent with placebo.[2]

In the Glucosamine/chondroitin Arthritis Intervention Trial (GAIT), treatment with chondroitin sulfate was associated with a significant decrease in the incidence of joint swelling, joint effusion or both among patients with symptomatic knee osteoarthritis. In this same study, combined supplementation with 1500 milligrams of glucosamine and 1200 milligrams of chrondroitin on a daily basis significantly decreased osteoarthritis-related knee pain among patients with moderate-to-severe pain.[3]

Methylsulfonylmethane

Methylsulfonylmethane (MSM) is an organosulfur molecule which has been associated with chemopreventive properties, anti-inflammatory activities, anti-atherosclerotic action, inhibition of prostacyclin production, and free radical scavenging.[4,5,6] MSM is naturally present in the human body as a metabolite of ingested dimethylsulfoxide (DMSO). Supplementation with MSM has been shown to reduce pain and improve physical function in patients with osteoarthritis of the knee.[7,8] In a recent study, supplementation of knee osteoarthritis patients with 3.375 grams/day of MSM for 12 weeks resulted in a 5.5 percent decrease in pain on the Visual Analog Scale (VAS) and a significant improvement in function on the Western Ontario & McMaster Universities Osteoarthritis Index (WOMAC) compared to placebo, with no adverse events or side effects recorded.[9] Although the efficacy of MSM may be modest in comparison to the efficacy of standard analgesics used to treat osteoarthritis, MSM is not associated with the serious risks associated with COX-2 inhibitors.[10,11]

Other Nutrients

- In addition to its antioxidant capacity, vitamin C plays an important role in the synthesis of type II collagen and glycosaminoglycans, both of which are critical to cartilage and bone health. As depletion of proteoglycans from the articular cartilage extracellular matrix is one of the earliest expressions of osteoarthritic joint disease, vitamin C deficiency may be a risk factor in the development of osteoarthritis.[12]

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Studies have shown that vitamin C supplementation may be beneficial in preventing knee osteoarthritis, as well as reducing the risk of cartilage loss and disease for people with osteoarthritis.[1,2,3] In the Framingham Osteoarthritis Cohort Study, intake of 120–200 milligrams per day of vitamin C resulted in a threefold lower risk of osteoarthritis progression.[4] Vitamin C supplementation has also been associated with a reduction in osteoarthritis knee pain.[4,5]

Although classic signs of inflammation—such as neutrophils in synovial fluid—are absent in osteoarthritis, there is significant evidence that pro-inflammatory cytokines may be important mediators in the osteoarthritis disease pathway.[6,7] As a potent anti-inflammatory molecule, vitamin C may prove to be a powerful tool in the primary or secondary prevention of osteoarthritis.

- Vitamin D influences the state of multiple articular structures, including cartilage, subchondral bone and periarticular muscle. These biological functions may impact the progression of joint disease, including knee osteoarthritis. In fact, vitamin D deficiency has been linked to an increased risk of progression of knee osteoarthritis and may be an important factor in the development and progression of autoimmune rheumatic diseases.[8,9] Of note, the vitamin D threshold associated with increased risk of osteoarthritis progression varies, with serum concentrations of 25-hydroxyvitamin D [25(OH)D] ranging from 15-30 µgm/L, depending on the study.[10] Among those individuals with osteoarthritis and low vitamin D status, supplementation with vitamin D may be beneficial in preventing progression of joint disease.
- Vitamin B12 (cobalamin) deficiency is more common among older adults than many health care practitioners realize, affecting one in every 31 adults aged 51 and older In a study of adults with idiopathic osteoarthritis of the hands, supplementation with 20 µgm of vitamin B12 improved grip strength and reduced the number of tender hand joints, compared to use of prescribed NSAIDs.
- Magnesium, one of the most important micronutrients for human health, is strongly associated with immune responses.[11] Studies have shown that magnesium deficiency is associated with an elevated level of pro-inflammatory cytokines, which may play a role in the onset of osteoarthritis.[12,13] Research has demonstrated a modest threshold association between magnesium intake and the development of knee osteoarthritis in Caucasians.[14]

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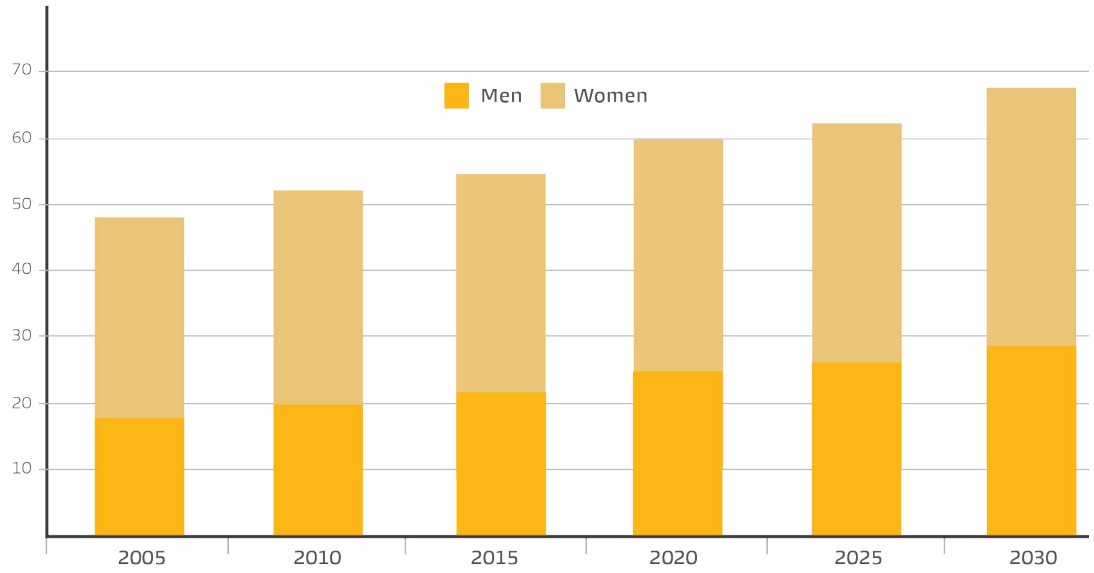
While the recommended dietary allowance for magnesium is 320–420 milligrams per day, but more than half of the U.S. population has insufficient magnesium consumption at less than 245 milligrams per day. Consequently, modest supplementation of magnesium may be reasonable for supporting joint health.[1]

Supporting Joint Health with Targeted Multi-Nutrient Supplementation

With the aging and increased longevity of the U.S. population, the prevalence of arthritis is expected to increase in the coming decades. By 2030, an estimated 67 million adults aged 18 and older—accounting for 25 percent of the projected adult population—will have clinically diagnosed arthritis.[2] Two-thirds of those with arthritis will be women. In addition, by 2030, an estimated 25 million adults will report limitations in their activities of daily life due to arthritis, but this estimate may be conservative as it does not account for current trends in obesity.

Figure 2. The Future of Arthritis in the U.S.[51]



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The Forté Elements Joint supplement supports joint health with vitamins, minerals, and other nutrients that have been shown to reduce the incidence of joint disease, the progression of osteoarthritis and/or osteoarthritis-related pain. Beyond anti-oxidant vitamins and trace minerals, the Forté Elements Joint supplement contains a proprietary blend of micronutrients to support joint health. In addition to glucosamine, chondroitin and MSM, this proprietary blend includes:

- Bromelain—A pineapple enzyme with analgesic and anti-inflammatory properties, bromelain has been found to be effective reducing joint pain in patients with both acute and chronic osteoarthritis pain, when given in combination with turmeric and devil's claw.[1] Given on its own, bromelain has been shown to ameliorate mild knee pain in otherwise healthy adults.[2]
- Quercetin—A plant flavonoid with antioxidant and anti-inflammatory properties, quercetin has been found to decrease the intensity of knee osteoarthritis-related symptoms when given in combination with glucosamine and chondroitin.[3]
- Hyaluronic Acid—A nonsulfated glycosaminoglycan, hyaluronic acid is an important component of articular cartilage, where it coats each chondrocyte and is responsible for the resistance of cartilage to compression. Hyaluronic acid is approved for the management of osteoarthritis based on its properties as a viscoelastic agent that improves the lubrication and mechanics of the knee joint.[4]

Supplement Facts

Serving Size 1 Pack (5 Tablets)
Servings Per Container 60

Amount Per Serving	% Daily Value*
Vitamin C (Ascorbic Acid) 250mg	417%
Vitamin D (Cholecalciferol) 500 IU	125%
Vitamin B12 (Cyanocobalamin) 50mcg	833%
Calcium (Phosphate) 250mg	25%
Phosphorus (Calcium Phosphate) 196mg	20%
Magnesium (Oxide) 100mg	25%
Zinc (Sulfate) 10mg	67%
Manganese (Sulfate) 2.5	125%
Proprietary Blend 1225mg	**

Strontium Citrate, Glucosamine, MSM, Chondroitin, Quercetin, Bromelain, SAM-e, Orthosilicic Acid, Hyaluronic Acid and Boron.

*Percent Daily Values are based on a 2,000 calorie diet. Your Daily Values may be higher or lower depending on your calorie needs.
**Daily Value not established.

OTHER INGREDIENTS: DEXTROSE, VEGETABLE LUBRICANTS, MAGNESIUM STEARATE AND SILICA. **CONTAINS**: FISH.

Supplement Facts

Serving Size 2 Softgel
Servings Per Container 60

Amount Per Serving	% Daily Value*
Calories 20	1%
Calories from Fat 20	
Total Fat 2g	3%
Polyunsaturated Fat 0.5g	**
Vitamin E 1.1 IU (d-Alpha Tocopherol plus d-Alpha, d-Beta, d-Gamma, & d-Delta)	4%
Fish Oil 2,000mg	**
EPA (Eicosapentaenoic Acid) 360mg	**
DHA (Docosahexaenoic Acid) 240mg	**

*Percent Daily Values are based on a 2,000 calorie diet. Your Daily Values may be higher or lower depending on your calorie needs.
**Daily Value not established.

OTHER INGREDIENTS: GELATIN AND GLYCERIN

THIS STATEMENT HAS NOT BEEN EVALUATED BY THE FDA. THIS PRODUCT IS NOT INTENDED TO DIAGNOSE, TREAT, CURE, OR PREVENT ANY DISEASE

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Urgent Need for Nutritional Intervention

The prevalence of arthritis and AAAL among people with certain chronic conditions is higher than among the general population (See Figure 3).[1]

Figure 3. Prevalence of Arthritis and Arthritis-Attributable Activity Limitation in Chronic Conditions

	Prevalence of Arthritis	Prevalence of AAAL
Heart Disease	49.0%	26.8%
Diabetes	47.3%	25.7%
Obesity	31%	15.2%

This increased prevalence emphasizes the importance of physical activity and proper nutrition to support joint health. Even modest weight loss can reduce the risk of developing arthritis and improve pain and function among those living with arthritis.[2] And yet, 24 percent of adults with clinically diagnosed arthritis report no leisure time physical activity, placing them at further risk of inactivity-associated health conditions such as cardiovascular disease, diabetes, obesity, and functional limitations.

Along with an increase in physical activity, supplementation with the Forté Elements Joint supplement can help to improve joint—as well as overall—health, enhance quality of life among older adults and reduce the personal and societal burden of arthritis.

Forté Elements Joint Supplement

Unlike dietary supplements marketed for joint health, the Forté Elements Joint supplement is a Mediceutical, an emerging category of nutritional support that is subject to stringent standards of manufacture and evidence-based research. As the pioneer of the Mediceutical industry, Forté Elements has developed strict criteria for its physician-formulated nutrient supplementation systems. In order to qualify as a Mediceutical, a supplement must:

1. Be formulated to support a specific health condition or situation
2. Contain only non-synthetic, pharmaceutical-grade ingredients that are Generally Recognized as Safe (GRAS)
3. Contain elements that have been validated by clinical research for the specific health condition or situation, as published in peer-reviewed journals
4. Conform to pharmaceutical-grade dosage standards for the specific health condition or situation
5. Be produced in FDA-compliant manufacturing facilities using pharmaceutical-grade manufacturing practices
6. Product has a Certificate of Analysis available confirming that product ingredients meet the Mediceutical standard and are as listed on the product label.

These rigorous standards ensure that all Forté Elements Mediceutical supplements provide the right nutrients at the right dose for the specific clinical need.

1– Centers for Disease Control and Prevention (CDC). Prevalence of doctor-diagnosed arthritis and arthritis-attributable activity limitation – United States, 2010-2012. MMWR Morb Mortal Wkl Rep 2013;62(44);869-873. Available at http://www.cdc.gov/mmwr/preview/mmwrhtml/mm6244a1.htm?s_cid=mm6244a1_w.
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