Nutritional Interventions for Muscle Cramps

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Abstract

A cramp is a painful, involuntary contraction or spasm of a muscle or group of muscles. Cramps occur more commonly in the muscles of the legs and feet than in other parts of the body and happen most often at night or while a person is at rest. Older people are affected more frequently than younger individuals; as many as 70% of elderly people (an age delineation undefined by the literature) have experienced nocturnal leg cramps at some time. The cause of muscle spasms is not well understood, but certain risk factors have been identified, including dehydration, electrolyte imbalances, diabetes, and pregnancy.

The conventional approach to preventing leg cramps and other muscle spasms includes staying well hydrated and doing stretching exercises regularly. The drug quinine sulfate is effective for preventing leg cramps in some cases, but it can cause tinnitus and other adverse effects.

This article reviews dietary and nutritional factors found to be beneficial for preventing and treating muscle cramps (other than leg cramps of pregnancy). Heat cramps are discussed separately at the end of the article.

Reactive Hypoglycemia

Of 131 patients with reactive hypoglycemia seen in 1 doctor’s practice, 55% experienced leg cramps. This symptom usually improved following dietary modifications designed to stabilize blood glucose levels. Nutritional treatments of reactive hypoglycemia include avoiding refined carbohydrates, caffeine, and alcohol; eating small, frequent meals; consuming adequate amounts of protein; and supplementing with chromium, B vitamins, magnesium, and other nutrients.

Magnesium

Hypomagnesemia, which is usually indicative of relatively severe magnesium deficiency, is a recognized cause of muscle cramps. In case reports, hypomagnesemia was detected in 3 patients with recurrent cramps. In each case, the symptoms improved following magnesium supplementation. The presumed cause of magnesium deficiency was excessive exercise in 2 patients and diuretic use in the third.

Magnesium deficiency not severe enough to cause hypomagnesemia appears to be relatively common in Western societies. Magnesium supplementation was shown to improve muscle cramps in 2 double-blind trials and 1 uncontrolled trial, explained below.

In a double-blind study, 64 patients (aged 18-65 years) with chronic, frequent muscle cramps and paresthesias (another sign of possible magnesium deficiency) were randomly assigned to receive 366 mg/day of magnesium or placebo for 4 weeks. Symptomatic improvement was reported by 75% of the patients receiving magnesium and by 32% of those receiving placebo (P < .01). In another trial, 46 volunteers suffering from recurrent leg cramps were randomly assigned to receive, in double-blind fashion, 300 mg of magnesium or placebo each night for 6 weeks, and then the other treatment for an additional 6 weeks. The number of cramps was assessed in the final 4 weeks of each treatment period. There was a trend toward fewer cramps with magnesium than with placebo (P = .07). Significantly more subjects experienced improvement during magnesium treatment than during placebo treatment (78% vs 54%; P = .03).

Fourteen trained swimmers who experienced muscle cramps when swimming received 65 mg of magnesium, from either magnesium ascorbate or magnesium aspartate, on 3 consecutive days, just before starting their swimming workout. The frequency of muscle cramps was reduced by 86% in the group receiving magnesium ascorbate and 44% in the group receiving magnesium aspartate. Both treatments reduced the severity of symptoms.

Potassium

Hypokalemia, usually indicative of relatively severe potassium deficiency, can also cause muscle cramps. Hypokalemia may occur in patients using potassium-depleting diuretics or in association with persistent diarrhea or certain disease states. Potassium deficiency not severe enough to cause hypokalemia is probably common in Western societies as a result of inadequate intake of fruits and vegetables. Suboptimal potassium status may be a contributing factor in some cases of muscle cramps.

Case report: A 76-year-old man presented with a multi-year history of recurrent spasms in the calf muscles, which recently had become more severe. Serum potassium and magnesium levels were normal. He was advised to take 2 g/day of potassium magnesium aspartate (a preparation containing 50% potassium aspartate and 50% magnesium aspartate). This form of potassium and magnesium was recommended because of evidence that aspartate enhances intracellular uptake of potassium and magnesium. The patient’s leg cramps disappeared within 36 hours and did not return over a 5-month follow-up period, during which he continued to take potassium magnesium aspartate.

Calcium

Calcium supplementation has been used with some success to treat leg cramps during pregnancy. While calcium supplementation has not been studied as a treatment for other types of muscle cramps, it would be prudent to ensure that any patient experiencing cramps is consuming adequate amounts of calcium.
Vitamin E

Several investigators have reported that vitamin E is an effective treatment for nocturnal leg cramps and other types of cramps.10,14

Of 125 patients with nocturnal leg cramps treated with vitamin E (d-alpha-tocopheryl acetate), 103 had complete or nearly complete symptom relief, an additional 13 had a moderate or good response, and 2 did not improve. Half of the patients responded to 300 IU/day or less, and half required 400 IU/day or more. Symptoms usually improved within a week of starting vitamin E but recurred when treatment was stopped.11

In a study of about 100 patients, vitamin E at a dose of 300 IU/day relieved leg cramps in almost all cases, whereas lower doses were frequently ineffective. Some patients who discontinued vitamin E experienced leg cramps that were more severe than usual for several days.10

In another study, approximately 50 patients with muscle cramps were treated with vitamin E. A dose of 300 IU/day was sufficient to control most cramps, whereas lower doses were only partially effective. Cramps usually recurred as soon as vitamin E was discontinued.9

In a small double-blind trial, vitamin E given at a dose of 800 IU per day for 4 weeks was not significantly more effective than a placebo in patients with nocturnal leg cramps.15 However, a large proportion of the patients in that study had medical conditions that are associated with magnesium deficiency (diabetes, 70%; coronary artery disease, 41%; hypertension, 52%), and 37% of the patients were taking diuretics, which can deplete magnesium and potassium. Vitamin E would not be expected to be an effective treatment for cramps caused primarily by magnesium or potassium deficiency.

Leg cramps are a common occurrence in people with hepatic cirrhosis. In a study of cirrhotic patients, the mean serum vitamin E concentration was significantly lower in those with leg cramps than in those without cramps (6.3 µg/ml vs 11.5 µg/ml). Among those who experienced leg cramps, vitamin E at a dose of 600 IU per day reduced the frequency and duration of cramps. Patients with subnormal vitamin E levels seemed to benefit most from treatment.16

Vitamin B₁₂ and Vitamin B Complex

One practitioner reported that 16 consecutive elderly patients had dramatic relief of nocturnal cramps for 4 to 6 weeks or longer after a single injection of 500 µg of vitamin B₁₂.17 In a study of vitamin B₁₂ as a treatment for migraine, 1 woman experienced a resolution of leg cramps while receiving 1,000 µg per day of hydroxocobalamin (a form of vitamin B₁₂) intranasally. The cramps returned after treatment was discontinued.18

In a double-blind trial, supplementation with a vitamin B-complex preparation produced substantial improvement in nocturnal leg cramps in a group of elderly hypertensive patients. Twenty-eight patients older than age 65 with hypertension (controlled on medication) and severe nocturnal leg cramps were randomly assigned to receive, in double-blind fashion, 1 capsule of a vitamin B-complex preparation 3 times per day or placebo for 3 months. Each capsule contained 50 mg of fursultiamine (a thiamine derivative), 250 µg of hydroxocobalamin, 30 mg of pyridoxal phosphate, and 5 mg of riboflavin (vitamin B₂). At the start of the study, none of the patients had evidence of electrolyte abnormalities.

The severity of leg cramps was assessed on a 10-point visual analogue scale, with 10 indicating intolerable cramps and 0 indicating no cramps. In the placebo group, the mean score increased from 7.9 at baseline to 8.2 after 3 months. In the vitamin group, the mean score decreased from 7.9 at baseline to 2.6 after 3 months (P < .01 compared with baseline and compared with the change in the placebo group). The difference between groups became significant after 4 weeks of treatment. Among patients taking the vitamins, 28% reported almost complete remission of leg cramps, and an additional 57% reported significant improvement.19

Further research is needed to determine whether the beneficial effect of this vitamin preparation was due entirely to the vitamin B₁₂ or to some combination of vitamins.

Taurine

Muscle cramps are common in patients with cirrhosis of the liver. Cirrhotic patients with muscle cramps have been found to have significantly lower plasma taurine concentrations than cirrhotic patients without muscle cramps.20 Since taurine is a membrane stabilizer, taurine depletion might increase membrane hyperexcitability, resulting in muscle cramps. In uncontrolled trials, taurine at a dose of 3 g per day in 1 study and 18 g per day in another study relieved muscle cramps in patients with cirrhosis.

Thirty-five patients with cirrhosis and recurrent painful muscle cramps received 3 g per day of taurine for 4 weeks. Marked improvement was seen in 71.4% of the patients, including complete disappearance of cramps in 37.1%. Improvement was seen after as little as 3 days in some cases. Cramps returned after taurine was discontinued.21

Twelve nonalcoholic patients with muscle cramps associated with cirrhosis received taurine for 6 months at a dose of 6 g 3 times per day after meals. After 1 month, the cramps had disappeared almost completely in 8 patients and were improved in the other 4 patients. No significant side effects were seen. The improvement was maintained during the 6-month treatment period, but symptoms recurred in 1 patient when taurine was temporarily discontinued.22

While taurine did not cause any significant side effects in these studies, long-term treatment with high doses of taurine could conceivably cause amino acid imbalance, an abnormality to which patients with liver disease are particularly susceptible. Therefore, in patients with muscle cramps associated with cirrhosis, the lowest effective dose of taurine should be used.

Vitamin C and Hesperidin

In an uncontrolled trial, a combination of vitamin C and hesperidin (a citrus flavonoid) relieved nocturnal leg cramps in a group of postmenopausal women. Fourteen postmenopausal women with nocturnal leg cramps were treated with 200 mg each of vitamin C and hesperidin 4 times per day for 2 weeks,
Muscle Cramps

MINIMIZE OBSTACLES TO HEALING

Avoid: refined carbohydrates, caffeine, alcohol
Diet: low glycemic index; whole organic plant foods; small, frequent meals; adequate protein
Supplement: creatine, B-complex, magnesium, etc., as needed

TAILOR NATURAL INTERVENTIONS TO PATIENT NEEDS

The elderly, a person on potassium-depleting diuretics or with a history of coronary heart disease, hypertension, chronic diarrhea, or persistent stress.

Magnesium

Potassium

Calcium

Pregnancy or indications of calcium deficiency

Nocturnal leg cramps

Elderly: IM Vitamin B12, oral B-complex
Postmenopause: Vitamin C, hesperidin

Taurine: minimum effective dose

Vitamin E

Hydration

Sodium, potassium, magnesium, calcium

Liver cirrhosis

Figure. Muscle Cramps Treatment Protocol
Diagram provided by Herb Joyner-Bey, ND

followed by 100 mg of each 4 times per day for at least 4 weeks. All women experienced a resolution of leg cramps within 2 to 12 weeks. In some but not all cases, continued treatment was necessary to maintain the benefit.23

Heat Cramps

Heat cramps are muscle spasms that occur during or after vigorous activity in a hot environment. They appear to be due to the loss of electrolytes, primarily sodium chloride (table salt), that results from excessive sweating. Rehydrating with water or with other fluids that contain insufficient amounts of sodium chloride may lead to hyponatremia, which can cause muscle cramps. Heat cramps can often be prevented by remaining well-hydrated and increasing sodium chloride intake.24,25

While sodium chloride deficiency is a key factor in the etiology of heat cramps, the importance of potassium, magnesium,
and calcium deficiency should not be overlooked, particularly because Western diets are often low in these minerals. Profuse sweating can cause substantial losses of each of these minerals, as much as 6 g per day for potassium and 1 g per day for calcium. Long-term heat exposure may exacerbate sweating-induced potassium and magnesium depletion, because acclimatization to heat is accompanied by increased aldosterone secretion, which increases urinary losses of these minerals. In addition, ingestion of large amounts of sodium chloride to compensate for losses in sweat may increase urinary excretion of potassium, calcium, and possibly magnesium.

There is one case report of a 24-year-old woman who engaged in 6 hours of tennis daily and suffered bouts of post-exercise carpopedal spasm. She was found to have hypomagnesemia, potentially magnesium, because when hyperalimentation of Conn's syndrome. J Am Diet Assoc. 1998;92(3):347-348.


Other than that report, there is little published research on potassium, magnesium, and calcium deficiency as factors in the etiology of heat cramps. Nevertheless, it is reasonable to recommend a higher intake of these nutrients for people who are sweating a great deal or who are susceptible to heat cramps.

**Conclusion**

Nutritional interventions are frequently beneficial for patients with muscle cramps. Potentially effective therapies include identifying and treating reactive hypoglycemia and supplementing with magnesium, potassium, vitamin E, vitamin B12, vitamin B complex, and vitamin C plus citrus flavonoids.

Magnesium and potassium supplementation should be considered as first-line therapy for patients who are at risk of deficiency for one or both of these minerals. These include patients taking diuretics, elderly individuals, and those with diabetes, coronary heart disease, hypertension, chronic diarrhea, or persistent stress. Taurine and vitamin E may be effective for patients with muscle cramps associated with cirrhosis of the liver. For patients with heat cramps, effective prophylaxis and treatment include staying well hydrated and supplementing with sodium chloride and possibly potassium, magnesium, and calcium. Vitamin B12, vitamin B complex, and vitamin C plus citrus flavonoids have been found to relieve nocturnal leg cramps.

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Alan R. Gaby received his MD from the University of Maryland. He was in private practice for 17 years, specializing in nutritional medicine, and is past-president of the American Holistic Medical Association. Dr Gaby also served as a professor of nutrition and a member of the clinical faculty at Bastyr University in Kenmore, Wash, and gave expert testimony to the White House Commission on Complementary and Alternative Medicine on the cost-effectiveness of nutritional supplements. Currently he is an author and researcher and has developed a computerized database of more than 25,000 individually chosen medical-journal articles related to the field of natural medicine. Dr Gaby is the author of Preventing and Reversing Osteoporosis (Prima, 1994) and The Doctor's Guide to Vitamin B6 (Rodale Press, 1984), and the coauthor of The Patient's Book of Natural Healing (Prima, 1999).

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**References**


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