

Benefit of Ribose in a Patient with Fibromyalgia

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Ribose was added to the existing treatment regimen of a woman with fibromyalgia, resulting in a decrease in symptoms. It has been postulated that patients with fibromyalgia may have an alteration in muscle adenine nucleotide metabolism, leading to depleted energy reserves and an imbalance in cellular adenosine 5'-triphosphate:adenosine 5'-diphosphate:adenosine 5'-monophosphate (ATP:ADP:AMP) ratios with an abnormal energy charge. As a key component in adenine nucleotide synthesis, ribose supplementation may be useful in such patients.

Key Words: ribose, fibromyalgia, adenosine 5'-triphosphate, ATP.
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Fibromyalgia is a syndrome that is manifested by generalized muscle pain and additional systemic symptoms of fatigue, tenderness and stiffness in multiple joints, sleep disturbance, and alterations in bowel activity. The specific etiology is unknown; however, changes in muscle histology, energy metabolism, oxygen utilization, and the neuroendocrine stress-response system have been postulated to play a role in the development and persistence of this disorder.¹ Low levels of muscle adenine nucleotides, reflected in depleted energy reserves and an imbalance in cellular adenosine 5'-triphosphate:adenosine 5'-diphosphate:adenosine 5'-monophosphate (ATP:ADP:AMP) ratios with an abnormal energy charge, have been reported.^{2–4} The unknown cause and varying presenting symptoms make fibromyalgia a therapeutic challenge for practitioners.^{5–7}

The management of patients with fibromyalgia requires the integration of both pharmacologic and nonpharmacologic approaches. Pharmacologic options have included tricyclic antidepressants, selective serotonin receptor antagonists, analgesics, benzodiazepines, antiinflammatory agents, and corticosteroids.^{5, 6, 8} Routine daily exercise programs, dietary modifications,

alternative therapies such as biofeedback and hypnotherapy, and nutraceuticals such as S-adenosyl-L-methionine (SAME) have also been explored.⁹ Unfortunately, less than 50% of patients achieve any meaningful relief of their symptoms with use of those therapies.⁵

We describe the case of a patient with fibromyalgia who had symptomatic relief when ribose was added to her existing treatment regimen. There have been anecdotal reports on the benefits of ribose in patients with fibromyalgia in whom conventional therapies have failed; however, to our knowledge, this is the first published case of use of ribose for this syndrome.

Case Report

A 37-year-old woman had daily episodes of intense musculoskeletal pain and stiffness, mental “cloudiness,” bouts of diarrhea, and sleep disturbance. As she was a surgeon, these symptoms compromised the skills necessary to perform her daily duties in the operating room. She was diagnosed with fibromyalgia by exclusion of other diseases and syndromes and in accordance with the American College of Rheumatology criteria.¹⁰

The patient was treated with ibuprofen 800 mg twice/day, valdecoxib 10 mg once/day, diphenhydramine 50 mg–acetaminophen 1000 mg at bedtime, and physical therapy once/day. She stated that this therapeutic regimen had limited benefit and that the adverse effects from these drugs further impaired her ability to perform her

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operative duties.

Approximately 7 months later, in addition to her regular drug therapy, the patient began taking CORvalen (Bioenergy, Inc., Ham Lake, MN), a ribose-based product. She took 5 g of CORvalen mixed in water twice/day. She experienced no adverse effects, and after 14 days she reported a decrease in her symptoms. Specifically, she noted an improvement in sleep, mental alertness, a marked decrease in joint pain, and normal stools. This trend continued, and after an additional month of CORvalen therapy she reported near-normal functioning with a major reduction in her symptoms.

After another month of taking CORvalen and feeling "normal," the patient elected to discontinue the drug. Within 7 days, she regressed to her initial fibromyalgia state, as reflected in joint pain, sleep disturbance, morning stiffness, trigger-point flares, and diarrhea. She resumed taking CORvalen, at the same dosage as before, and a major reduction in her symptoms again occurred within 14 days. She noted continual benefit for the next month while taking CORvalen. She stopped taking the drug for a second time after this additional 30-day period, and once again she experienced a reemergence of symptoms. When CORvalen was restarted for a third time, the patient's symptoms again subsided.

At the time of this writing, the patient was continuing to take CORvalen and was satisfied that her symptoms had abated.

Discussion

Ribose is a simple carbohydrate that plays a role in high-energy phosphate and nucleic acid synthesis. After ischemia or hypoxia, myocytes have decreased levels of ATP and total adenine nucleotides. Several days are required for their recovery once normoxia has been reestablished.¹¹⁻¹³ In patients with chronic hypoxic conditions, the cellular energy charge may never be fully regained.¹⁴ These cells have the capacity to regenerate ATP; however, the pentose phosphate pathway of glucose metabolism utilized in the formation of the ribose that is needed to drive the regenerative process is slow in both heart and skeletal muscle cells due to poor expression of specific rate-limiting enzymes. Supplemental ribose has been shown to enhance the synthesis of adenine nucleotides, rebuilding depressed energy pools in both the heart and skeletal muscle after an ischemic or hypoxic insult.^{11, 12} Ribose bypasses the rate-limiting enzymatic steps

of the pentose phosphate pathway and accelerates the formation of ATP and subsequent tissue recovery.¹⁵

Supplemental ribose is initially converted to ribose-5-phosphate, subsequently forming 5-phosphoribosyl-1-pyrophosphate, a molecule key to the synthesis of ATP through the *de novo* purine nucleotide pathway.

The safety of ribose has been investigated in standard laboratory and animal toxicology models and in human studies both subjectively and objectively. Investigators have concluded that ribose is well tolerated at dosages of up to 60 g/day, with no significant adverse effects.¹⁶

Ribose has been shown to improve the energy recovery time in skeletal muscle and to relieve fatigue, soreness, and stiffness after intense exercise.^{12, 13, 17} It also has been reported to have a beneficial effect after high-intensity exercise in sports medicine. One study concluded that ribose accelerated the replenishment of ATP after intense muscle contractions,¹⁸ and bodybuilders and sprinters have reported subjective and objective benefits during exercise after the administration of ribose.¹⁸⁻²⁰ However, other reports have shown inconsistent results for ribose in relation to improving short-term anaerobic exercise performance, muscle strength, endurance, or body composition during cycling or resistance training.^{20, 21}

Ribose has also been investigated for its potential medical efficacy in both animal studies and human clinical trials. To date, the most promising data have been reported in connection with the application of ribose in cardiovascular disease. Both short-term and long-term animal studies found that the use of ribose after myocardial ischemia resulted in enhanced recovery of ATP along with improved diastolic functional parameters.^{22, 23} Clinical benefits have also been observed. Patients with coronary artery disease or heart failure have decreased myocardial ATP levels. Daily supplemental ribose has been shown to improve cardiac function, increase exercise tolerance, and enhance quality of life in this population.²⁴

Patients with fibromyalgia may experience an alteration in physiologic muscle metabolism. It has been found that they reach the anaerobic threshold in their muscles earlier, thereby using less of the available energy-rich phosphate metabolites at maximal work capacity.²⁵ In another study, patients with fibromyalgia were reported to have a potential abnormality in high-energy phosphate metabolism, as evidenced by

significantly lower levels of ATP and ADP in affected muscles as compared with patients without the disease.²

Theoretically, the effect of ribose on increasing the muscle energy pool could reduce the metabolic strain in affected muscles and allow patients to assume a more active lifestyle. Considering the known musculoskeletal symptomatology in this syndrome and the reported benefits of ribose in skeletal muscle metabolism and physiology, supplemental ribose appears to have aided our patient in improving her quality of life.

Conclusion

Fibromyalgia presents a continuing therapeutic challenge. Ribose is a naturally occurring carbohydrate with documented medical benefits in patients with cardiovascular disease. To our knowledge, this is the first report to suggest its potential benefit in a patient with fibromyalgia, who had had suboptimal results with conventional therapies. We are designing a trial using objective outcome measures to further evaluate the effectiveness of this product in patients with fibromyalgia.

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