

## Improved Type 2 Diabetes Management With Creatine Supplementation

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Studies conducted over the past two decades have shown that supplementation [with creatine](#) increases strength, explosive power, speed, endurance and lean mass gains in athletes of all ages. Creatine supplementation has also been shown to preserve strength and lean mass in aging persons, helping to keep them more functional. Other medical uses for creatine supplementation include improving strength and functionality in patients with multiple sclerosis, other neurodegenerative diseases, and chronic heart failure. Creatine supplementation has also been shown to minimize atrophy of immobilized limbs, as would occur when a limb is put in a cast to heal a bone fracture.<sup>1</sup>

### Creatine and Type 2 Diabetes Management

An important study by Gualano, et al.,<sup>2</sup> demonstrated that creatine supplementation may also benefit type 2 diabetic patients. This randomized, double-blind, placebo-controlled study involved 25 patients with type 2 diabetes. All patients were provided with an exercise regime. A subgroup of patients were also administered creatine supplementation at a dosage of 5 gm (5,000 mg) per day for a period of 12 weeks.

Compared to the placebo group, diabetic patients supplemented with creatine showed improvement in a number of important parameters related to [glucose control](#) and other prognostic indicators of long-term diabetes management related to secondary co-morbidity problems (diabetic retinopathy, diabetic nephropathy, cardiovascular complications, etc.). The subgroup ingesting daily doses of creatine showed a significant reduction in glycoslated hemoglobin (HbA1c), decreased postprandial glucose 0, 30, and 60 minutes during a meal tolerance test, and increased glucose transporter type 4 (GLUT-4) translocation.

GLUT-4 is the insulin-regulated glucose transporter receptor found in adipose tissues, as well as skeletal and cardiac muscle that is responsible for insulin-regulated glucose translocation into the cell. Increased GLUT-4 translocation results in improved clearance of glucose from the circulation with resulting lower glycemic values.

The authors of this study concluded, "Creatine supplementation combined with an exercise program improves glycemic control in type 2 diabetic patients. The underlying mechanism seems to be related to an increase in GLUT-4 recruitment to the sarcolemma."<sup>2</sup>

### Potential Mechanism of Action

Until recently, creatine was known primarily as a supplement that can increase muscle and nerve concentrations of phosphocreatine, and thus enable these cells to generate ATP energy more rapidly and efficiently. Phosphocreatine can anaerobically donate a phosphate group to ADP to form ATP during the first 2-7 seconds following an intense muscular or neuronal effort. It is the release of the high-energy phosphate group from ATP that provides sufficient energy to power

most biological events in our cells.

Once the phosphate group is released from ATP to generate cellular energy, ATP must be re-synthesized by the addition of a phosphate group to ADP (forming ATP), in order for the cell to have sufficient energy to keep performing biological work. Creatinephosphate provides an immediately available phosphate group, which it donates to ADP in the synthesis of ATP.

Creatine supplementation has been shown to increase intracellular concentrations of phosphocreatine by up to 40 percent, providing the cell with an expanded reservoir from which the cell can more rapidly synthesize ATP and thus, perform biological work more effectively. This largely explains the increased strength and power gains seen in athletes, aging persons, individuals with neurodegenerative diseases and [congestive heart failure](#) patients supplemented with creatine monohydrate.<sup>1</sup>

The study by Gualano, et al., suggests that creatine supplementation may also benefit diabetic patients via mechanisms unrelated to its role of expanding phosphocreatine stores. The authors showed that creatine supplementation improves the function of the GLUT-4 transporter (receptor) in much the same way as some diabetic drugs that are classified as insulin sensitizers (e.g., Metformin). Increased activity of the GLUT-4 transporter is a critically important aspect of maintaining normal glucose levels, the management of glucose control in diabetics, as well as reduction of risk factors involving diabetic complications.

As such, creatine supplementation should be considered as an additional intervention to be included in the comprehensive, evidence-based management of type 2 diabetics by practitioners advising patients on these matters.

### *References*

1. Meschino J. "Sports Supplements That Actually Work." *Dynamic Chiropractic*, Jan. 1, 2012.
2. Gualano B, DE Salles, Pannelli V, et al. Creatine in type 2 diabetes: a randomized, double-blind, placebo-controlled trial. *Med Sci Sports Exerc*, 2011;43(5):770-778.

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