

# Creatine Monohydrate in Duchenne Muscular Dystrophy

## Clinician resource

### Background

Duchenne muscular dystrophy (DMD) is one of the most common muscle diseases, affecting around 1 in 5000 boys [1]. Best-practice standards of care for DMD include treatment of muscle weakness with corticosteroids [2, 3]. Studies looking at other medications and supplements have struggled to demonstrate clear benefit in DMD, but a recent Cochrane review and meta-analysis of dietary supplementation in DMD with creatine monohydrate have provided high-quality evidence of improved muscle strength, performance of activities of daily living, and patient/parent perceptions of health in the short- and intermediate-term [4]. No significant side-effects of creatine therapy have been reported [4]. While the benefits of long-term creatine use are less certain, there is ample evidence supporting the short-term safety and potential benefits of creatine use in DMD.

### Creatine

Creatine is a naturally occurring compound involved in energy production in cells, particularly in tissues with high energy requirements such as brain and skeletal muscle, through ATP formation. It is made endogenously in the liver and kidneys, and absorbed through the diet [5]. In healthy controls, creatine monohydrate supplementation increases muscle force output by approximately 10% [6]. When compared to control subjects, people with neuromuscular disorders have lower skeletal muscle total creatine and phosphocreatine concentrations [4]. There are several theories of how creatine monohydrate supplementation might improve muscle function in patients with neuromuscular disorders, including direct effects on muscle force, effects on energy metabolism and reduction in apoptosis through intracellular calcium effects or by preventing oxidative stress [7].

### How much benefit?

Benefit from creatine supplementation has been measured in different ways, but objective findings, including an improvement in time to walk 10 metres (-1.0s with 95% CI -1.60 to -0.34), and time to climb 4 stairs (-3.4s with 95% CI -6.18 to -0.56), have been demonstrated in double-blinded placebo-controlled trials. Increases in both muscle strength and lean body mass have also been demonstrated (strength: 8.47%, 95% CI 3.55 to 13.38; lean body mass 0.63kg, 95% CI 0.02 to 1.25). Both patients, and parents of patients, report a global assessment of improvement, compared to placebo (RR 4.71 with a 95% CI 2.33 to 8.74), following a short period of treatment with creatine monohydrate. The trials have not looked at effects beyond 6 months, so long-term benefits of creatine monohydrate are unknown.

### When should creatine monohydrate be started?

Clear guidelines for when creatine monohydrate should be started have not been established. However, due to the significant improvement in muscle strength and the lack of side-effects or adverse events, dietary supplementation with creatine monohydrate can be considered for patients with DMD at any stage of their illness.

## What dose?

A variety of dosing regimens have been used, either with or without loading doses. The rationale for use of a loading dose is that patients with neuromuscular disorders are relatively depleted in intramuscular and plasma creatine at baseline [8]. Use of lower doses can achieve the same levels over time [9]. Doses as low as 0.04g/kg/day have been used, but we recommend a loading dose of 0.2g/kg/day for 1 month, followed by a maintenance dose of 0.1g/kg/day [10]. For ease of use, the tables below round the recommended doses to the nearest 2.5g (= half teaspoon) (Table 1).

**Table 1. Recommendations for daily dosing of creatine**

Weight (kg)	Loading (1 month)			Maintenance		
	Calculated 0.2g/kg/day	Actual (g/day)	Teaspoons	Calculated 0.1g/kg/day	Actual (g)	Teaspoons
15-25	3 - 5 g	5	1	1.5 - 2.5g	2.5	0.5
26-35	5.2 - 7g	7.5	1.5	2.6 - 3.5g	5	1
36-45	7.2 - 9g	10	2	3.6 - 4.5g	5	1
46-55	9.2 - 11g	10	2	4.6 - 5.5g	7.5	1.5
56-65	11.2 - 13g	12.5	2.5	5.6 - 6.5g	7.5	1.5
66-75	13.2 - 15g	15	3	6.6 - 7.5g	7.5	1.5
76-85	15.2 - 17g	17.5	3.5	7.6 - 8.5g	10	2

## References

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