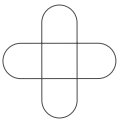




OptMSM<sup>®</sup>

# MSM Sports Nutrition Science Brief



## Exercise, oxidative stress and MSM

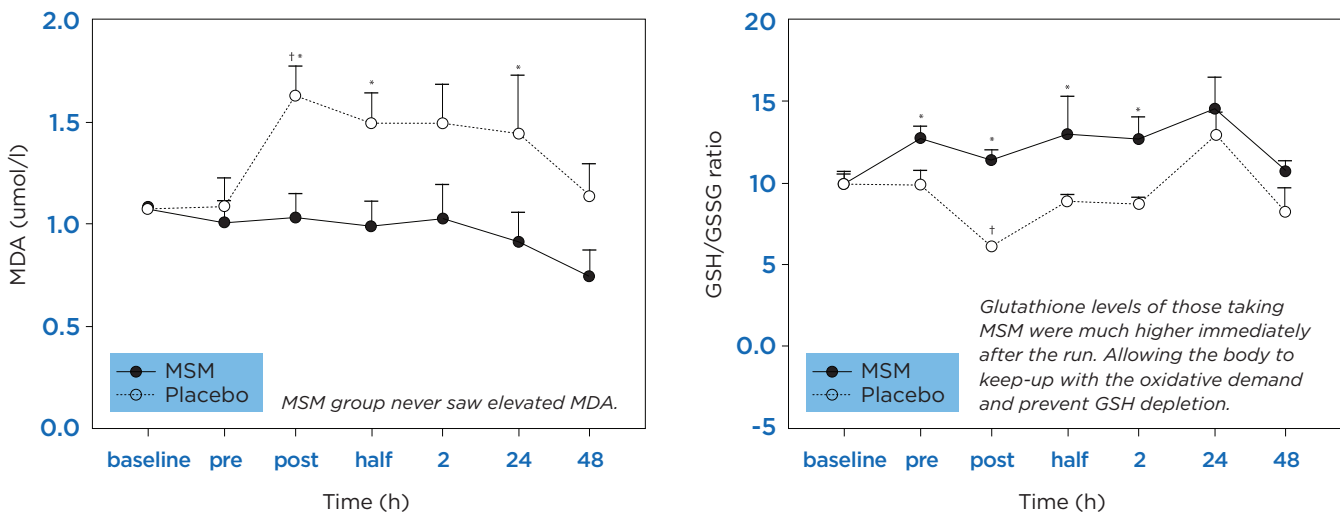
Heavy and sustained exercise generates large quantities of free radicals, which exceed your natural antioxidant defenses, causing oxidative stress. Regardless of what kind of sport you are involved with, strength training, running, cycling, CrossFit, swimming, football, tennis or soccer, if your training is challenging it will cause significant oxidative stress, inflammation and muscle damage, resulting in increased fatigue and reduced performance. However, in order to increase performance, your training must be challenging.

MSM (methylsulfonylmethane) is a well-known, research-backed dietary supplement ingredient that's been shown to mitigate oxidative stress from exercise, and help support exercise recovery and performance.

## MSM reduces exercise-induced oxidative stress and increases anti-oxidative capacity

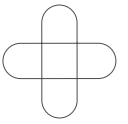
Endurance exercise significantly increases oxidative stress in athletes. Runners participating in a 14 km run showed increased levels of oxidative markers (serum malondialdehyde (MDA), protein carbonyl (PC) and plasma oxidized glutathione (GSSG)). 10 days of MSM supplementation prior to the run not only reduced the levels of the oxidative markers, it even increased plasma anti-oxidative capacity (Nakhostin-Roohi et al., 2011).

**Figure 1. Pre-workout supplementation with MSM reduces oxidative stress (left), and increases antioxidant capacity.**

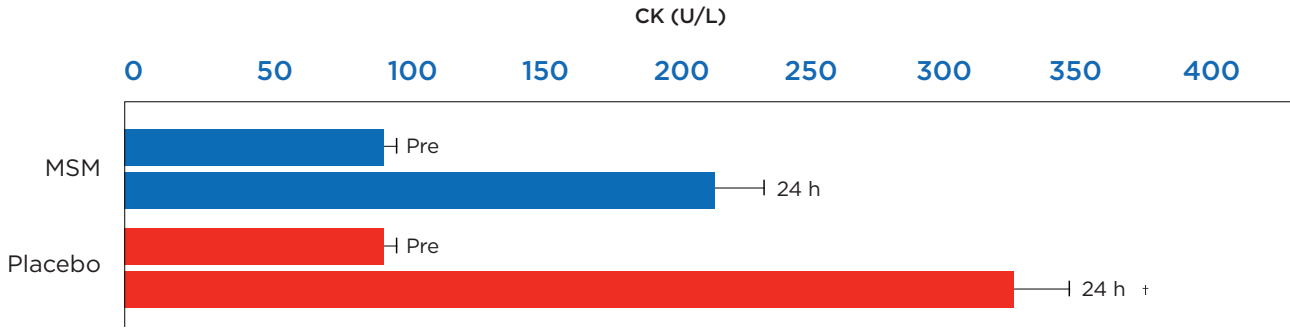


## MSM reduces resistance and endurance exercise-induced muscle damage and improves recovery

MSM can help to protect muscles from exercise-induced damage and aids recovery in endurance (Barmaki et al., 2012) and resistance exercise (Kalman et al., 2013). Faster recovery allows athletes to return to training more quickly and to train at a level where it will prove to be most productive. Faster recovery results in faster gains. Endurance exercise, a 14k run, significantly increased creatine kinase (CK) levels, a marker of muscle damage, in healthy, active young men. However, 10 days of supplementation with MSM prior to exercise significantly reduced muscle damage (Barmaki et al., 2012). See figure 2 next page



**Figure 2. MSM supplementation prior to strenuous exercise significantly reduced exercise-induced muscle damage**

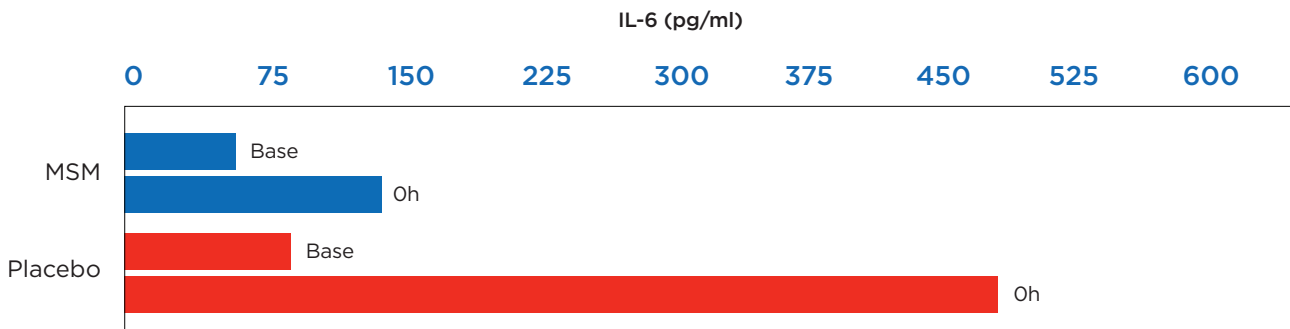


Administration of 3 grams of OptiMSM® per day for 14-days prior to a leg extension exercise to muscle failure resulted in significantly lower muscle discomfort ( $1.55 \pm 0.82$  vs.  $3.75 \pm 2.58$   $p=0.012$ ) 2 hours post-exercise when compared placebo (Kalman et al., 2013). 3 grams of OptiMSM for 21 days prior to a half-marathon attenuated post-exercise muscle discomfort (Wither et al., 2015). Administration of 3 grams of OptiMSM per day for 28-days prior to 18 sets of muscle damaging knee extension exercise favorably improved markers of exercise recovery (Kalman et al., 2012).

## MSM improves inflammatory response to exercise

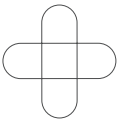
OptiMSM has been shown to improve the inflammatory response following exercise (Benjamin et al., 2015). A single bout of acute exercise (10 sets of 10 repetitions of eccentric knee extensions) increased systemic levels of inflammatory cytokines (IL-6) immediately after exercise. However 28 days of OptiMSM supplementation prior to the exercise bouts did not only reduce the levels of pro-inflammatory markers (IL-6), OptiMSM additionally increased anti-inflammatory markers (IL-10).

**Figure 3. MSM inhibit IL-6 secretion immediately after acute exercise**



## MSM might improve performance after damaging exercise

OptiMSM supplementation has been shown to improve knee joint kinetics during running following eccentric knee extensor damage (Peel et al., 2015). Knee extensor maximal isometric force (MIF) returned to baseline values in the OptiMSM group at 72 hours but remained 8% lower than baseline in the placebo group. This finding suggests that OptiMSM may speed up MIF return to baseline, suggesting that individuals may be able to return to regular training more quickly with OptiMSM supplementation following knee extensor damage.



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## Human studies in resistance and endurance athletes suggest that OptiMSM®:

- Helps to combat exercise-induced oxidative stress (Nakhostin-Roohi et al., 2011)\*
- Reduces exercise-induced pro-inflammatory (IL-6) and increases anti-inflammatory markers (IL-10) (Benjamin et al., 2015)\*
- Reduces muscle damage (creatinase kinase) (Barmaki et al., 2012)\*
- Reduces muscle soreness/discomfort (Kalman et al., 2013; and Withee et al., 2015)\*
- Improves recovery (Kalman et al., 2012)\*
- Might improve performance (maximal isometric force) (Peel et al., 2015)\*

Add MSM to your pre-workout formula to boost post-workout recovery.

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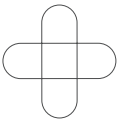
## About OptiMSM®

OptiMSM is the world's premier MSM and the only GRAS-affirmed source available in the world. Manufactured exclusively by Bergstrom Nutrition at a dedicated facility in Vancouver, Washington, OptiMSM is the result of a proprietary distillation process that guarantees an ultra-pure product. Bergstrom's stringent quality control ensures batch-to-batch consistency, a fully traceable production process, and includes independent third-party validation of identity and purity.

### OptiMSM is:

- The only U.S. made MSM
- GRAS-affirmed with FDA Notification and Letter of "No Objection"
- Kosher and Halal certified, Non-GMO, Non-BSE, gluten-free, allergen free, non-shellfish derived, and vegan
- Backed by extensive toxicology data and ongoing research
- Extremely safe; LD-50 > 17,000mg/kg BW
- Distributed internationally
- Backed by unmatched technical/manufacturing support

For more information and science updates, visit us at [www.bergstromnutrition.com](http://www.bergstromnutrition.com)



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## References

Barmaki S, Bohlooli S, Khoshkharesh F, Nakhostin-Roohi B. Effect of methylsulfonylmethane supplementation on exercise-induced muscle damage and total antioxidant capacity. *J Sports Med Phys Fitness* 2012, 52:170-174.

Benjamin R, Godwin S, Bloomer RJ, van der Merwe M. MSM enhances LPS-induced inflammatory response after exercise. *J Int Soc Sports Nutr* 2015, in press.

Kalman DS, Feldman S, Samson A, Krieger D. A randomized Double Blind Placebo Controlled Evaluation of MSM for Exercise Induced Discomfort/Pain. *FASEB J* 2013, 27:1076.7.

Kalman DS, Feldman S, Scheinberg AR, Krieger DR, Bloomer RJ. Influence of methylsulfonylmethane on markers of exercise recovery and performance in healthy men: a pilot study. *J Int Soc Sports Nutr* 2012, 9:46

Nakhostin-Roohi B, Barmaki S, Khoshkharesh F, Bohlooli S. Effect of chronic supplementation with methylsulfonylmethane on oxidative stress following acute exercise in untrained healthy men. *J Pharm Pharmacol*. 2011, 63(10):1290-1294.

Peel SA, Melcher DA, Schilling BK, Bloomer RJ, Paquette MR. The Effects of MSM Supplementation on Knee Kinetics during Running, Muscle Strength, and Muscle Soreness following Eccentric Exercise-Induced Quadriceps Damage. in press.

Withee ED, Tippens KM, Dehen R, Hanes D. Effects of MSM on Exercise-Induced Muscle and Joint Pain. *J Int Soc Sports Nutr* 2015, in press.

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