



MAGNESIUM

SUMMARY REPORT: CONSIDERATION FOR CLASSIFICATION OF A SUPPLEMENT INGREDIENT

The ABCD Classification system ranks sports foods and supplement ingredients into four groups according to scientific evidence and other practical considerations that determine whether a product is safe, permitted, and effective in improving sports performance. The classification of supplements and sports foods is made via the consideration of the AIS Sports Supplement Framework Committee and evolves according to new knowledge plus the informed direction of our key stakeholders. This report summarises decisions made regarding the addition or reclassification of a substance within the System, based on evidence provided by the applicant and assessed (and potentially augmented) by the Framework Committee.

SUMMARY REPORT FOLLOWING CONSIDERATION OF ADDITION/ALTERATION OF SUPPLEMENT INGREDIENT

Name/ Formulation & description	Magnesium (Mg ²⁺) - as in Magnesium Oxide
Current AIS Supplement Framework Classification	Group C
Agreed AIS Supplement Framework Classification	Group C
Proposed benefit(s)	<p>Magnesium supplementation may be relevant to athletes as daily requirements increase in response to accelerated metabolic situations including exercise. Furthermore, athletes incur increased magnesium sweat losses during prolonged physical exercise and increased urinary losses in response to anaerobic exercise. The proposed benefits of magnesium supplementations include:</p> <ol style="list-style-type: none"> 1. Anti-inflammatory - Attenuation of the inflammatory IL-6 response¹ 2. Smooth Muscle Relaxant - Reduced blood pressure in the post exercise state², bronchodilator effects in Asthma through intravenous or inhaled routes only³ 3. Neuromuscular strength may be influenced by a higher dose and duration of magnesium supplementation with training intensity⁴ 4. Mood – Magnesium deficiency is thought to contribute to a HPA axis disbalance and associated mood disorders¹ 5. Support bone health – Bone contains more than half of the body’s store of magnesium. Magnesium deficiency has been linked to lower bone mineral density. Magnesium is important for both osteoblasts and osteoclasts and indirectly impacts vitamin D and calcium which influence PTH secretion and activity. Conversely, high magnesium levels have been associated with bone mineralisation defects⁵. 6. Sleep – Magnesium may regulate neuroendocrine hormones (i.e., melatonin, cortisol) and acts as a GABA agonist, thus improving overall sleep quality⁶.
Proposed mechanism of action(s)	<p>Magnesium plays an important role in many functions in the body. Under normal conditions, dietary intake and gastrointestinal function, the human body is able to absorb and maintain magnesium at homeostatic levels. However, evidence suggests that athletes’ magnesium requirements exceed those of the general population by 10-20%⁶. While magnesium is found in a variety of foods such as fruits and vegetables (i.e., green leafy vegetables), dairy, fish, nuts and seeds, in some circumstances, restriction of overall caloric intake in athletes competing in weight category sports or those aiming to reduce body weight or body fat levels in weight important sports may result in inadequate magnesium intakes^{7,8,9,10,11}.</p> <p>Magnesium plays a vital role in both aerobic and anaerobic energy production, either as an enzyme activator or binding to Adenosine Triphosphate (ATP) to form Magnesium Adenosine Triphosphate (MgATP)¹⁰. Magnesium is also a catalyst for over 300 enzymatic reactions including protein synthesis, nerve transmission, muscle contraction, cardiac excitability, and blood pressure regulation^{12,13,14,15,16}.</p> <p>Magnesium supplementation has been proposed as a modulator for stress¹⁷ as deficiencies are thought to contribute to a HPA axis disbalance and associated mood disorders.¹</p>

Proposed mechanism of action(s)	<p>Supplementation has also been associated with improvements in blood pressure, due to the role of magnesium in muscle contraction and subsequently, the ability to assist in blood vessel contraction¹⁸. It has also been suggested that magnesium supplementation may improve physical endurance¹⁹, enhancing muscle functioning through energy metabolism, and maintaining regular muscle contraction and relaxation¹⁷.</p> <p>Evidence also suggests that magnesium supplementation may reduce sleep disturbances and assist in reducing the prevalence of muscle cramps due to its fundamental involvement in neural transmission and central nervous system excitability⁶.</p>
Summary of supporting evidence	<p>The effects of Mg supplementation on functional performance outcomes and related measures in general appear inconsistent. Current evidence suggests magnesium supplementation does not offer a performance benefit to trained athletes with adequate dietary intake. Further exploration of whether any benefit is due to suboptimal baseline magnesium levels is needed, as well as larger sample sizes and studies being conducted in both men and women.</p> <p>While studies conducted in older individuals and pregnant women (populations at greater risk of magnesium deficiency) have reported beneficial outcomes on sleep, mood and muscle cramps following magnesium supplementation, it is unclear as to whether supplementation in individuals with adequate magnesium intakes would elicit any benefits.</p> <p>Even with consideration for those with suboptimal dietary intake (due to restrictive diets to elicit a change in body weight/composition, poor dietary habits or higher fibre diets which decrease magnesium absorption) diet manipulation likely remains the preferred strategy for correction of inadequate magnesium intake.</p> <p>Theoretical side effects of toxicity - include hypotension, muscle weakness, respiratory fatigue and apnoea.</p>
Limitations to current science	<p>Larger scale studies with standardized supplement dosing protocols and consideration of baseline magnesium status are needed to explore the potential endurance and strength performance benefits of magnesium supplementation.</p> <p>Quality of literature is substandard for practitioners to make informed recommendations on magnesium supplementation for athletes.</p>
Final consensus	<p>Where nutritional intake is adequate, and no pre-existing bony injury, ingestion of additional magnesium is unlikely to benefit athletes. The consensus of the group was to maintain classification as Group C supplement. It may be included in a "bone pack" in conjunction with Calcium and Vitamin D, to complement bone healing in athletes with traumatic or stress fractures.⁵</p>

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The Australian Institute of Sport (AIS) Supplement Framework is an initiative of the Australian High Performance Sport System. The AIS acknowledges the support of members of the National Institute Network (NIN) and National Sporting Organisations (NSO) and their staff in delivering content expertise. This information is intended to help athletes, coaches and scientists make evidence-based decisions about the use of supplements and sports foods. Before engaging in supplement use, we recommend that each individual refer to the specific supplement policies of their sporting organisation, sports institute or parent body, and seek appropriate professional advice from an accredited sports dietitian (www.sportsdietitians.com.au).

Athletes should be aware that the use of supplements may have doping implications. Athletes are reminded that they are responsible for all substances that enter their body under the 'strict liability' rules of the World Anti-Doping Code. Some supplements are riskier than others. The Sport Integrity Australia (SIA) app is a useful resource to help mitigate the risk of inadvertent doping by helping to identify supplements that have been batch-tested. The SIA App provides a list of more than 11,000 batch-tested products. We recommend that all athletes consult the educational resources of SIA regarding the risks associated with supplements and sports foods. While batch-tested products have the lowest risk of a product containing prohibited substances, they cannot offer you a guarantee that they are not contaminated (www.sportintegrity.gov.au/what-we-do/supplements-sport).

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