

# ALPHA LIPOIC ACID (ALA)

## 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

<p><b>Name/ Formulation &amp; description</b></p>	<p>Alpha lipoic acid (ALA) is synthesised enzymatically in the mitochondria from octanoic acid and plays a critical role in mitochondrial energy metabolism. ALA presents as two enantiomers: the R-[+] enantiomer, which is widely present in nature and is biologically active, and the S-[-] enantiomer, which is often included in synthetic-based ALA supplements but is believed to have limited biological activity.<sup>1</sup></p> <p>Formulations includes:</p> <ul style="list-style-type: none"> <li>&gt; R-alpha lipoic acid capsules, tablets, powders or drops</li> <li>&gt; Racemic mixture of R- and S- alpha lipoic acid enantiomers in capsules, tablets, powders or drops</li> <li>&gt; Intravenous administration of R-alpha lipoic acid</li> </ul>
<p><b>Current AIS Supplement Framework Classification</b></p>	<p>C</p>
<p><b>Agreed AIS Supplement Framework Classification</b></p>	<p>C</p>
<p><b>Proposed benefit(s)</b></p>	<ul style="list-style-type: none"> <li>&gt; Antioxidant</li> <li>&gt; Diabetes control*</li> <li>&gt; Weight loss</li> </ul> <p>*approved for treatment of diabetic neuropathies in Germany<sup>2</sup></p>
<p><b>Proposed mechanism of action(s)</b></p>	<p><b>Antioxidant:</b> ALA acts as an antioxidant through free radical scavenging in vitro.<sup>3;4</sup> However, since ALA only transiently accumulates in tissues in vivo, the significance of direct free radical scavenging activity by ALA in vivo is questionable.<sup>5</sup> It is more likely that ALA acts as an indirect antioxidant in vivo that induces or maintains endogenous antioxidant levels.<sup>5</sup> ALA can increase glutathione levels within cells.<sup>6;7</sup> ALA can also regenerate reduced vitamin C and vitamin E from their respective oxidized vitamin forms. A pro-oxidant effect of ALA has also been described in experimental studies when relatively high concentrations of ALA are achieved. However, this pro-oxidant effect is believed to occur at levels typically higher than those observed in human studies using oral or intravenous infusion of ALA.<sup>8</sup></p> <p><b>Diabetic control:</b> Studies that investigated the effects of ALA on diabetes control related to its role in inhibiting glycation reactions and the antioxidant mechanisms of action.</p> <p><b>Weight loss:</b> ALA may promote body weight and fat mass reduction via decreasing food intake and enhancing energy expenditure, possibly via suppression of hypothalamic AMP-activated protein kinase (AMPK) activity.<sup>9;10</sup></p>

<b>Summary of supporting evidence</b>	<p><b>Sporting/exercise applications:</b> Limited studies in humans show improvements in systemic markers of oxidative stress and antioxidant capacity following muscle-damaging exercise with short-term ALA supplementation<sup>11</sup>. Evidence from animal studies shows inconclusive effects on skeletal muscle oxidative stress, antioxidant enzymes, mitochondrial biogenesis, and endurance performance.<sup>11</sup> Some studies conducted in humans have investigated markers of muscle damage during recovery following an intense muscle-damaging exercise bout with supplementation with ALA (600 mg/day) for 8-10 days.<sup>12, 13</sup> Zembron-Lacny et al.<sup>13</sup> reported significantly lower creatine kinase following combined submaximal endurance exercise and a muscle damaging eccentric downhill treadmill run, while Zembron-Lacny et al.<sup>12</sup> reported no significant effect of ALA supplementation on either creatine kinase or lactate dehydrogenase levels following muscle damaging eccentric resistance exercise.</p> <p><b>Diabetes:</b> ALA has been found to reduce micro- and macro-vascular diabetic complications in rodents<sup>14, 15</sup> and improve neuropathic pain in rodents<sup>16</sup> and humans.<sup>2</sup> ALA has also been shown to improve insulin sensitivity in rodents<sup>1</sup> and humans<sup>17</sup> with diabetes.</p> <p><b>Weight loss:</b> a recent meta-analysis of RCTs found a small but significant mean weight loss of 1.27 (95% CI -2.29 to -0.25) kg in clinical patients across studies using doses of 300-1800 mg LA per day for between 8-52 weeks.<sup>18</sup></p>
<b>Limitations to current science</b>	<p>There is an overall lack of studies in humans investigating sporting/exercise-related outcomes, and no conclusive evidence to currently support ALA supplementation for benefits on endurance performance or muscle recovery from intense exercise.</p> <p>Studies in diabetes are promising, however evidence is mainly limited to rodent data and small, short-term studies in patients with diabetes.</p> <p>Evidence for weight loss benefits suggest only small weight loss benefits that are arguably not of clinical significance for overweight/obese individuals.</p>
<b>Final consensus</b>	Lacking evidence for improved health or performance in athlete populations.

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## FURTHER READING

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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](http://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](http://www.sportintegrity.gov.au/what-we-do/supplements-sport)).

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