AIS SPORTS SUPPLEMENT FRAMEWORK
ABCD CLASSIFICATION SYSTEM

PHOSPHATE

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	Phosphorus is a non-metallic essential nutrient, with about 11–14 g phosphorus per kg of fat-free mass (FFM) stored in the human body. Of which ~85% is located in the skeletal system. Comes in three forms, including sodium, calcium & potassium phosphate. However, most research is on sodium phosphate.
Current AIS Supplement Framework Classification	Group B - Other
Agreed AIS Supplement Framework Classification	Group C
Description of Product	Phosphorus is a non-metallic essential nutrient, with about 11–14 g phosphorus per kg of fat-free mass (FFM) stored in the human body. Of which ~85% is located in the skeletal system.
Proposed benefit(s)	Current investigations of phosphate supplementation have focused on the physiological and performance-related outcomes of laboratory protocols including graded exercise tests to exhaustion, the 30-s Wingate test, 6 × 20 m (~3–4 s) repeat sprint efforts, and TT situations ranging in duration from 3–60 min. Overall, there is equivocal evidence of performance enhancement from phosphate supplementation[1]. Proposed benefits include: 1. Increased aerobic capacity 2. Increased peak power output 3. Increased anaerobic threshold 4. Improved myocardial and cardiovascular responses to exercise.
Proposed mechanism of action(s)	The proposed mechanisms underpinning these benefits include an enhanced rate of ATP and PCr resynthesis; improved buffering capacity to support high rates of anaerobic glycolysis; improvement of myocardial contractility leading to increased cardiac efficiency; and an increased erythrocyte 2,3 diphosphoglycerate (2,3 DPG) concentration, leading to a reduced affinity of oxygen with haemoglobin and a greater unloading of oxygen to the peripheral tissues.
Summary of supporting evidence	In some instances, phosphate has been shown to enhance VO_{2max}[2, 3], anaerobic threshold[3], and cycling TT performance.[4] However, in the case of repeated sprints, the magnitude of benefit has been shown to be varied and unclear.[5] Finally, there is also a large amount of contrary evidence from the same physiological and performance measures that suggests phosphate supplementation (in isolation, or in combination with other buffer agents) has no impact on exercise capacity or performance outcomes.[6, 7, 8, 9]
Limitations to current science	Current evidence regarding the efficacy of phosphate supplementation remains unclear, since there exists no evidence to suggest an accumulation of this supplement in the muscle, where a number of the reported mechanism are suggested to take effect.
Final consensus	Typically, phosphate supplementation is achieved over a 3–6 day period, with a total daily dose of ~50 mg/kg of fat-free mass (~3–5 g/ day) consumed in single or split doses throughout the day. This is often associated with GI distress[2, 9]. However, tolerance is improved by concurrent consumption with ~300 ml of a carbohydrate-rich fluid[10]. The use of this supplement for enhanced athletic performance is likely questionable, with further research needed to fully explore its true effect.

REFERENCES

1. Peeling, Binnie, Goods, Sim & Burke. Evidence based supplements for the enhancement of athletic performance. Int J Sport Nutr Exerc Metab. 28: 178-87, 2018.
2. Cade, Conte, Zauner, Mars, Peterson,, Lunne, & Packer. Effects of phosphate loading on 2, 3-diphosphoglycerate and maximal oxygen uptake. Med Sci Sports Exerc. 16: 263-268, 1984.
3. Kreider, Miller, Williams, Somma, & Nasser. Effects of phosphate loading on oxygen uptake, ventilatory anaerobic threshold, and run performance. Medicine & Science in Sports & Exercise, 22(2), 250–256, 1990.
4. Folland, Stern & Brickley. Sodium phosphate loading improves laboratory cycling time-trial performance in trained cyclists. J Sci Med Sport. 11: 464–468, 2008.
5. Kopec, Dawson, Buck & Wallman. Effects of sodium phosphate and caffeine ingestion on repeated-sprint ability in male athletes. J Sci Med Sport. 19: 272-276, 2016.
6. Brewer, Dawson, Wallman & Guelfi. Effect of sodium phosphate supplementation on cycling time trial performance and V02 1 and 8 days post loading. J Sports Sci Med. 13: 529–534, 2014.
7. Goss, Robertson, Riechman, Zoeller, Dabayebeh, Moyna & Metz. Effect of potassium phosphate supplementation on perceptual and physiological responses to maximal graded exercise. Int J Sport Nutr Exer Metab. 11: 53–62, 2001.
8. Kraemer, Gordon, Lynch, Pop & Clark. Effects of multibuffer supplementation on acid-base balance and 2, 3-diphosphoglycerate following repetitive anaerobic exercise. Int J Sports Nutr. 5: 300–314, 1995.
9. West, Ayton, Wallman & Guelfi. The effect of 6 days of sodium phosphate supplementation on appetite, energy intake, and aerobic capacity in trained men and women. Int J Sport Nutr Exerc Metab. 22: 422-429, 2012.
10. Brewer, Dawson, Wallman & Guelfi. Effect of repeated sodium phosphate loading on cycling time-trial performance and V02peak. Int J Sport Nutr Exerc Metab. 23: 187-194, 2013.

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**).

Last updated March 2021