

Probiotics

Supplement Overview

- >> Probiotics are live microbial food supplements that can have beneficial effects on health and in particular intestinal microbial balance. The two main commercially used species are *Lactobacillus acidophilus* and *Bifidobacterium bifidum*.
- >> Microbes have been used for many years in food and alcoholic fermentations. In recent years a number of different probiotics have been scrutinised in scientific research (primarily in infants) to examine their purported health benefits.
- >> There is evidence of the following (likely) beneficial effects of probiotics: improved intestinal tract health, enhanced immune system, greater bioavailability of nutrients, reduced lactose intolerance, lower prevalence of allergy in susceptible individuals, and lower risk of certain types of cancers.
- >> Mechanisms of action are largely unknown, but may involve modifying gut pH (acidity), producing antimicrobial compounds, modulating gut permeability, stimulating immunomodulatory cells, preventing pathogen infection through 'competitive exclusion' or limiting the GI tract surface area available for colonisation.
- >> Probiotics can be obtained from foods, primarily dairy products (e.g. yoghurt and milk) and commercial supplements. Foods are a good choice due to the synergistic effects between food compounds and probiotic cultures.
- >> Most studies report effective dosages of 10^9 - 10^{10} organisms per day (i.e. – 1-10 billion bacteria). This concentration corresponds to about one litre of acidophilus milk (formulated at 2×10^6 colony forming units/millilitre (cfu/ml)). Some commercial preparations available in 2015 have up to 25 – 50 billion bacteria per dosage. Studies and clinical experience at the AIS have shown that most athletes will safely tolerate dosages of up to 35 – 50 billion in the commercial preparations that are currently available. Lower levels may benefit some individuals. Daily consumption is recommended as probiotics will pass through the intestine.
- >> The shelf-life of most probiotic products is about 3 – 6 weeks when kept at 4°C. The shelf-life of dried supplements is about 12 months, but levels of probiotics may drop significantly over this time. The concentration of bacteria in food products varies substantially and some research indicates that commercially available products contain no live bacteria.
- >> Problems with dosage, viability of probiotic strains, lack of industry standardisation and potential safety issues, are being addressed in research studies. Applications of probiotics in sports nutrition and medicine are still emerging.
- >> The AIS has conducted several probiotic supplementation studies over the last decade:
 - A study on *Lactobacillus fermentum* in highly trained distance runners (Cox et al. 2010). A significant favourable reduction in the number of symptom days was observed in the probiotic group compared with placebo treatment, although the underlying immunological control mechanisms were not clearly established.
 - Probiotic supplementation appears beneficial for fatigued athletes with an identifiable immune deficiency (Clancy et al. 2006), but its efficacy for healthy well performing athletes remains to be established.
 - The AIS conducted a follow-up clinical study with 64 competitive cyclists showing that *Lactobacillus fermentum* supplementation reduced the severity of gastrointestinal

symptoms, and illness load (severity and duration) of lower respiratory tract symptoms by 30% in male athletes (West et al. 2011).

- A large study of 465 healthy active adult males and females taking probiotic supplements (or a control) for 5 months showed that the risk of an upper respiratory illness episode was 27% lower in those consuming *Bifidobacterium animalis* subsp. *lactis* BI-04 (West et al. 2014).

Situations for Use in Sport

- >> Athletes with a prior history of gastrointestinal problems during periods of heavy training or around the time of competition might benefit from a course of probiotics.
- >> The AIS research on probiotics points to benefits in reducing the effects of respiratory illness (Pyne et al. 2015). Given the reasonable likelihood of athletes experiencing symptoms of respiratory illness at some point in a training and competitive season a prophylactic approach before specific periods of training or major competition could be useful.
- >> Irrespective of whether the application is targeted or prophylactic an individual needs to commence daily supplementation approximately 14 days before domestic or international travel, competition or elevated training load, to allow for colonisation of bacteria in the gut.

AIS Supplement Framework Protocols

- >> The AIS Sports Supplement Framework has identified the following probiotic formulations containing bacterial species with evidence-based efficacy in athletic groups.
 - Inner Health Plus Dairy Free (*Lactobacillus acidophilus*)
 - Howaru premium probiotics (*Bifidobacterium lactis*)
 - Swisse Ultiboost Inner Balance (*Bifidobacterium lactis*)
 - Yakult (*Lactobacillus casei* - shirota strain)
- >> Sports Supplement Panels, represented by Sports Physicians, Scientists and Dietitians should prepare a specific protocol for use of probiotic supplements depending on the intended goals of use.

Concerns Associated with Supplement Use

- >> Athletes should be advised that some individuals report mild symptoms of stomach rumbles, increased gas or changes in the stool, during the first week of supplementation as the gut microflora changes to accommodate the newly introduced species.
- >> Commercially available probiotic species should be introduced gradually into the diet, building up to the recommended daily levels over a period of one to two weeks.
- >> Occasional reports of bacteraemias and endocarditis in severely immunocompromised individuals have occurred.
- >> Epidemiological studies report no evidence of probiotic supplementation assisting with protection against infections: benefits may be highly specific to individuals and situations.
- >> Individuals with a prior history of gastrointestinal tract problems such as coeliac disease or irritable bowel syndrome may be at greater risk of know side effects such as an upset stomach or bowel problems.

>> There may be a difference in effect of supplementation between males and females

Further Reading

Clancy RL, Gleeson M, Cox A, Callister R, Dorrington M, D'Este C, Pang G, Pyne D, Fricker P, Henriksson A. Reversal in fatigued athletes of a defect in interferon gamma secretion after administration of *Lactobacillus acidophilus*. *Br J Sports Med*. 2006; 40(4):351-4.

Cox AJ, Pyne DB, Saunders PU, Fricker PA. Oral administration of the probiotic *Lactobacillus fermentum* VRI-003 and mucosal immunity in endurance athletes. *Br J Sports Med*. 2010 44(4):222-6.

Hao Q, Dong BR, Wu T. Probiotics for preventing acute upper respiratory tract infections. *Cochrane Database Syst Rev*. 2015 7;(9):CD006895.

Pyne DB, West NP, Cox AJ, Cripps AW. Probiotics supplementation for athletes - clinical and physiological effects. *Eur J Sport Sci*. 2015;15(1):63-72.

West NP, Pyne DB, Peake JM, Cripps AW. Probiotics, immunity and exercise: a review. *Exerc Immunol Rev*. 2009; 15:107-26.

West NP, Pyne DB, Hopkins WG, Jairath A, Fricker PA, Eskesen DC, Cripps AW. Supplementation with *Lactobacillus fermentum* VRI (PCC) reduces lower respiratory illness in athletes and moderates exercise-induced immune perturbations. *Nutrition J* 2011 10:30.

West NP, Horn PL, Pyne DB, Gebiski VJ, Lahtinen SL, Fricker PA, Cripps AW. Probiotic supplementation for respiratory and gastrointestinal illness symptoms in healthy physically active individuals, *Clinical Nutrition*. 2014. 30: 581-587.

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