

Electrolyte replacement supplements

Supplement Overview

- > Electrolyte replacements are powders, tablets or ready to drink products which allow targeted replacement of the electrolytes (in particular, sodium and potassium) lost through sweat. May be used during exercise to address high electrolyte loss and/or after exercise to allow restoration of fluid balance.
- > Used as an alternative to standard sports drinks (10–25 mmol/L sodium and 3–5 mmol/L potassium) when these drinks are not adequate to replace large electrolyte losses during and after exercise. May also be used by athletes to restore fluid/electrolyte deficits caused by other factors such as the dehydration techniques undertaken to “make weight” for competition or gastrointestinal upsets (vomiting/diarrhea etc)
- > Although plasma sodium concentrations are typically tightly regulated at ~ 135–150 mmol/L, mild hyponatremia (<135 mmol/L) can occur in some sports, often without overt symptoms. Risk factors include:
 - An overall fluid gain over exercise – i.e. when the athlete consumes fluid at a rate that is higher than their sweat losses and/or
 - An overall sodium loss during prolonged exercise – i.e. when the athlete replaces fluid losses with low sodium beverages (e.g. water and soft drinks) or meets fuel needs with low sodium foods (e.g. fruit, lollies, some sports gels and bars)
- > Severe hyponatremia (plasma sodium < 130 mmol/L) is associated with confusion, nausea, headaches and the potentially fatal outcome of cerebral oedema. It is comparatively rare in sport and occurs when an athlete consumes fluid at a rate that is substantially higher than actual sweat losses, and particularly, the rate of urine excretion. This condition may be exacerbated in individuals who have inappropriate responses of the renal hormone that reduces urine production (vasopressin or ADH) and attenuated by the replacement of sodium during exercise. **Nevertheless, problematic hyponatremia is essentially a problem caused by excessive fluid intake.**
- > Guidelines for the optimal sodium intake during endurance exercise (> 1 hour) are still unclear. General recommendations include 0.5–0.7 g per litre of fluid (21–30 mmol/L) [American College of Sports Medicine 1996] however it is important to note individual differences when making recommendations. However, there are suggestions that in situations of large sweat sodium losses e.g. ultra-endurance exercise, individuals who have “salty” sweat or combination of these factors; a more proactive approach to sodium intake during exercise may be needed
 - Exercise associated muscle cramps may be caused by multiple factors, with primary risk factors including fatigue due to unaccustomed volume/intensity of exercise and previous history of cramps. There is some evidence, although controversial, that whole body sodium depletion may be a cause of specific types of cramps in some individuals. Electrolyte supplementation may be beneficial in these athletes.
- > During post-exercise rehydration, the replacement of electrolyte losses, particularly sodium, must occur to fully restore fluid balance. Rehydrating with fluids low in electrolytes (e.g. water) can lower plasma sodium levels causing a reduced thirst and increased urine output resulting in decreased voluntary fluid intake and inadequate fluid retention.
- > Although sodium can be replaced by eating salty foods (e.g. bread, breakfast cereal, cheese & crackers, Vegemite™) or adding salt to meals, electrolyte supplements or sports drinks with higher sodium content can be useful for rapidly restoring fluids and electrolytes with a more targeted approach.

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Products and protocols

- Pharmaceutical Oral Rehydration Solutions (ORS) and sports-related Electrolyte Replacement Supplements are available in ready to drink and powdered forms. Products come in a wide range of flavours and vary according to the their carbohydrate (CHO) and electrolyte content as well as the addition of other ingredients
- In general, ORS are manufactured according to the World Health Organisation guidelines for the treatment and prevention of dehydration associated with diarrhoea and gastroenteritis. ORS are focused on electrolyte/fluid replacement; the low-moderate carbohydrate content is present to contribute to intestinal sodium/fluid absorption.
- Sports-related electrolyte supplements include:
 - electrolyte-only powders and tablets which can be added to fluids varying in carbohydrate content according to the athlete's needs.
 - sports drinks with high electrolyte concentrations (i.e. electrolytes + carbohydrate) **[see also Sports Drinks Fact sheet]**.

Electrolyte Replacement Product	Presentation	Composition		Flavours
		Carb g/100 ml	Sodium mmol/L	
Gastrolyte	Ready to Drink (250 ml/1L)	1.6	60	Strawberry, Orange
Gastrolyte	Effervescent tablets: 2 tablets added to 200 ml fluid	1.6	60	Blackcurrant, Lemon, Raspberry
Gastrolyte	Powder: 1 sachet added to 200 ml fluid	1.6	60	Orange
Hydralyte	Ready to Drink	1.4	45	Orange, Apple-Blackcurrant
Hydralyte	Effervescent Powder (1 sachet added to 200 ml fluid) and Tablets (2 tablets added to 200 ml fluid)	1.5-1.6	15	Orange, Apple-Blackcurrant
Hydralyte	Ice blocks	1.6	43	Orange, Apple-Blackcurrant
Hydralyte Sports	Sachets (1 sachet added to 600 ml fluid)	2	50	Orange, Lemon
Restore ORS	Powder: 1 sachet added to 200 ml fluid	1.6	60	Orange
Sports Products				
Shots Electrolyte (E Shots)	Effervescent tablet: 1 tablet added to 500mL fluid	-	37	Lemon, Vanilla Orange
Gu Brew Electrolyte Tablets	Effervescent tablet: 1 tablet added to 500mL fluid	-	29	Lemon Lime, Pink Grapefruit, Orange, Peach Tea
High 5 Zero Electrolyte Tablets	Effervescent tablet: 1 tablet added to 750mL fluid	-	15	Citrus, Berry, Cherry-Orange, Neutral, Pink Grapefruit
High 5 Zero X'Treme Electrolyte Tablets	Effervescent Tablet (contains 65mg caffeine per tablet)	-	15	Berry, Pink Grapefruit
Nunn	Effervescent tablet: 1 tablet added to 500mL fluid	-	31	Cherry Limeade, Lemonade, Watermelon, Lemon-Lime, Tri-Berry, Strawberry Lemonade, Grape, Orange, Fruit Punch, Kona Cola, Citrus Fruit, Lemon Tea, Tropical, Banana

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Situations for Use in Sport

- Situations may occur in sport where focussed replacement of electrolytes is warranted including:
 - Rapid rehydration following moderate-large fluid deficits incurred during exercise or other dehydrating activities (e.g. “making weight”).
 - Replacement of large sodium losses during ultra-endurance activities.
 - Replacement of large electrolyte losses during exercise in certain individuals with high rates of sweat loss and/or high sweat content of electrolytes.
 - Replacement of large electrolyte losses due to environmental conditions.
 - For situations when electrolyte replacement is required without carbohydrate intake (e.g. train low protocol)
- Rapid rehydration following moderate-large fluid deficits incurred during exercise or other dehydrating activities (e.g. “making weight”).
 - The athlete with a moderate-large fluid deficit should follow a rehydration plan tailored to meet their estimated fluid loss. Specifically, over 2–4 hours the athlete should consume a volume of fluid equal to ~ 1.2–1.5 times their estimated fluid deficit.
 - When the rehydration period prior to an exercise bout is less than 1–2 hours (e.g. weigh-in prior to competition, recovery between repeated training or competition sessions), gastrointestinal discomfort may prevent the athlete from achieving this fluid intake target. In this situation the athlete should consume the greatest volume of their target intake that can be comfortably tolerated.
 - Fluid intake should be accompanied by electrolyte replacement, particularly sodium, to optimise fluid retention. When an athlete has a restricted food intake or is limited to low-sodium sports foods and snacks, it can be useful to consume sports drinks with higher sodium content, ORS electrolyte supplements to ensure sodium replacement
 - A higher sodium level reduces the palatability of most drinks. If the palatability of the drink is reduced, the athlete should be reminded to meet a fluid intake target rather than rely on voluntary intake. Many athletes may prefer to slightly dilute ORS rather than follow the manufacturer’s instructions.
 - The carbohydrate content of ORS and some sports electrolyte supplements is negligible and will not contribute substantially to the athlete’s refueling goals.
- Replacement of large sodium losses during ultra-endurance activities or for individuals with high sweat rates and/or high sweat sodium concentration.
 - Individualised recommendations for sodium supplementation during exercise should be made under the supervision of a Sports Dietitian or Physician. It may include the use of higher sodium sports drinks, the addition of electrolyte supplements to other fluids and the use of salt-rich everyday foods and drinks (e.g. vegemite sandwiches, stock cubes, instant potato, chicken noodle soup).
 - Education that promotes individualised hydration practices before and during exercise should be provided to athletes to reduce excessive fluid intake and the risk of hyponatremia through over-hydration.
- Prevention and treatment of dehydration during diarrhoea and gastro-enteritis.
 - Guidance for use of electrolyte supplements during illness should be provided by a Sports Physician.
 - ORS are recommended in the treatment or prevention of dehydration associated with diarrhoea and gastro-enteritis. The priority for athletes suffering from gastrointestinal upset is rehydration, rather than refueling.

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Concerns Associated with Supplement Use

- There is no consensus regarding the value of sodium replacement during exercise.
- In some situations, excessive salt supplementation during exercise may lead to gastrointestinal problems or cause further impairment of fluid balance.
- Excessive fluid intake during exercise (substantially greater than sweat losses) is the major cause of serious cases of hyponatremia in susceptible people. Sodium replacement during exercise does not address this problem and may provide a false sense of security.
- Increasing the sodium content of a drink generally reduces the drink palatability and may interfere with the voluntary consumption of fluid.
- The Dietary Guidelines for Australians promote a reduction in sodium/salt intake by the community, due to the link between salt intake and hypertension in susceptible people. Electrolyte replacement during and after sport may be considered as a special situation for a specific sub-group of the population, however, general guidelines for healthy eating should not be overlooked.

Further Reading

Bergeron M. Exertional heat cramps: Recovery and return to play. *J Sport Rehabil* 2007; 16:190-196.

Schwellnus MP. Cause of exercise associated muscle cramps (EAMC) – altered neuromuscular control, dehydration or electrolyte depletion? *BJ Sports Med* 2009; 43:401-408.

Sawka M, Burke L, Eichner R, Maughan R, Montain S, Stachenfeld N. Exercise and Fluid Replacement. Position Stand. *Med Sci Sports Exerc* 2007; 39:377-390.

This Fact Sheet was prepared by AIS Sports Nutrition as part of the Sports Supplement Framework (www.ausport.gov.au/ais/nutrition/supplements). Note that a Fact Sheet with additional information on this topic is available for Members of the Sports Supplement Framework via the Clearinghouse.

The Sports Supplement Framework has been designed to provide a framework for NSO athletes and specific Sports Supplement Programs may be available to NSO athletes through their NSO. All attempts are made to stay abreast of scientific knowledge and of WADA issues related to anti-doping. It is recommended that other athletes and groups should seek independent advice before using any supplement, and that all athletes consult the WADA List of Prohibited Substances and Methods before making decisions about the use of supplement products.

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