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Editorial

Nutrition Recommendations for A Stage in Altitude

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Altitude training is a common practice for elite endurance athletes. Usually, athletes do altitude training several times during the season, in 2-4-week stages. Altitude training (1600-2400 metres) is a method to improve performance that appeared for the first time at 1968 Olympic Games. Under those circumstances athletes suffer hypoxia, that leads to a bunch of compensatory mechanisms that can help athletes to improve his performance in future competitions. The most important mechanism is the EPO mediated increase in red blood cells number. Athletes increase their training load in this period and it´s obvious that nutritional requirements are going to change as well, and maybe adapt your nutrition before the stage starts could be a useful strategy.

It´s common for athletes undergoing this type of training to travel long distances to get to the stage location and it´s possible that jetlag appears in those athletes. To avoid that, it´s important to start that travel well rested, with appropriate good sources available and with an optimal level of hydration. Having snacks on board, drinking water in a regular basis and a correct personal hygiene is the best way to enter the stage in an optimal status. At the arrival some hypoxia related compensatory mechanisms are going to take place, including hyperventilation, difficult to sleep, some gastrointestinal problems or headache during the first days of the stage. One of the key points to avoid those problems is to train slow during the first 3-5 days and continuously monitoring the athlete's rest, level of hydration, hunger and body weight.

Body composition

A body weight reduction (muscle mass loss especially) has been saw at altitudes > 4000 metres due to a decrease in hunger. However, at this point in time there is no clear evidence that this reduction occurs in stages 1600-2400 metres and more research in this area is needed.

Energy availability

One of the rising stars in sports nutrition is the energy availability, that could be defined as the remaining energy to complete physiological processes after subtract energy used for training. Given the hypoxia conditions and the high training loads, it´s clear that energy availability is one the most important factors in these stages. It is known that low energy availability can impair performance and health in these athletes. Until now it´s no clear evidence that altitude training leads to low energy availability, but it seems that an optimal energy availability plays a key role to achieve training adaptations due to the relationship between energy availability and iron status, which it´s important to achieve an increase in haemoglobin levels.

Carbohydrates

It´s been said that altitude training increases the carbohydrates oxidation during exercise, but the truth is that those results were only saw at altitudes > 4000 metres. So, until more research is made, athletes should follow carbohydrates guidelines for training at sea level, 6-8g/kg for endurance athletes and can increase to 12g/kg for training sessions lasting 4-6 hours. Sometimes it´s difficult to reach that amount, so athletes should use sports drinks, gels, gums, smoothies, fruit juices and carbohydrates bars not just for training but during the day.

Hydration

For some locations it´s normal to have low humidity conditions besides hypoxia, so fluid losses are increased during training and at rest, so therefore the risk of dehydration is higher than the risk at sea level. To avoid that to happen it´s important to monitor hydration status using tools like body weight, urine colour or thirsty and calculate the new fluid needs. Athletes should be pushed to hydrate not only during training but at rest as well.

Iron

Iron requirements are increased in altitude to optimize haemoglobin related adaptations, especially in endurance athletes due to the key role of haemoglobin for aerobic power. Besides, endurance athletes have more iron losses because of sweat, urine, gastrointestinal diseases or haemolysis. That´s the reason why those athletes must have his serum iron status monitored 4-6 weeks before the start of the stage. At that point, ferritin levels must be > 30 ng/ml for woman and > 40 ng/ml for man for the hypoxia related adaptations to be optimal. If ferritin levels are inferior than that, athletes should supplement to get to the stage with an optimal iron status. During the stage, supplementation it´s still a useful strategy because the maximum haemoglobin related adaptations are achieved with 100-200 mg elemental iron a day, especially in the form of salt, and consumed in a single dose (although it can cause gastrointestinal problems in the first 2 weeks). The best time of the day for the supplementation is in the morning, before the training season, when hepcidin levels are low. Iron supplementation could be periodized, with higher dosages the rest days or the low training days and lower the high train days.

Antioxidants

In the last few years, positive data regarding the use of antioxidant supplementation have appeared, because exercise at this altitude increase ROS (Reactive Oxygen Species) production that can impair the antioxidant capacity of the human organism and finally produce oxidative stress, which can lead to an impair of the immune system and post exercise recovery. This situation can last until 2 weeks after the stage is over. For this reason, it´s fair to say that antioxidant rich foods and antioxidant supplements are necessary because they can neutralise ROS production and oxidative stress. However, investigation on this regard has shown little to no benefit. Besides, there is not enough research about the effects of this antioxidant supplements on training adaptations and we know that ROS have positive effects on aerobic training adaptations and high antioxidants dosages inhibit or reduce those adaptations. Increase antioxidant content of the diet doesn´t impair training adaptations in elite endurance athletes. To sum up, there is not enough evidence to recommend antioxidant supplementation to reduce oxidative stress, but there is enough evidence to recommend increase intake of rich antioxidant foods because there is no impairment of this adaptations and can add some extra health benefits.

There is a supplement to enhance altitude training adaptations?

There is almost no research in this issue. We can use caffeine in the same way in altitude training than at sea level but there is no evidence than any other supplement can enhance altitude training adaptations in those stages. Sodium bicarbonate couldn´t reduce the impairment of anaerobic performance and high intensity training. Another ergogenic aid that has been proposed to support this training are dietary nitrates, however, until now there is not enough evidence to use them to enhance altitude training adaptations [1-4].

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