Nutritional Interventions to Support Optimal Healing for Sports Injuries

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INTRODUCTION

All Athletes regardless of their level of sporting participation, elite or recreational, are exposed to the risk of developing an injury. Although any part of the body can be injured, sporting injuries usually occur within the musculoskeletal system which can result in a period of immobilisation. The recovery period can be a frustrating time for any athlete, usually accompanied by physical inactivity with expected losses in strength and muscle mass. Although nutrition has an important role to play during recovery it is often overlooked (1), in fact a poor nutritional status, particularly deficits in energy and protein, have been identified to impede recovery and exacerbate inflammation (2). Therefore the diet during the rehabilitation and healing phase is crucial to enhance a speedy recovery process for client.

The recovery process involves organised physiological stages each bringing with them their own set of nutritional requirements. The first phase of tissue repair, immobilization and atrophy constitutes an initial inflammatory response lasting up to ~4 days post injury followed by proliferation, from 4 to 21 days and finally remodelling over an extended period (3). The 2nd stage is rehabilitation and muscle hypertrophy where the shift is from repair to muscle growth and increasing strength (4).

NUTRITIONAL RECOMMENDATIONS - PHASE 1

CARBOHYDRATES

It has been observed that athletes generally reduce their overall energy intake after an injury, partially due to a loss of appetite or fear of increasing body mass (1). Although the overall energy requirements are less than when active it is important to ensure that the diet contains sufficient energy to support the repair process. It is important to ensure that during the healing process energy requirements increase by ~25% (5) and additional requirements are needed to support adequate protein synthesis and mobility such as walking with crutches (6).

Therefore the first and most important step when supporting an injured athlete nutritionally is to establish their present nutritional status and estimate individual energy requirements (6). Although there is no set recommendations for carbohydrate during the recovery period an intake of ~5.5-6g.kg.bm. ~45% of daily total is advised (7). The quality and type of carbohydrates is also important, the emphasis should be on complex carbohydrates which provide more nutrients with a slower and more sustained release of energy.

ESSENTIAL FATTY ACIDS

The most commonly prescribed medications during recovery are NSAID’s which work by blocking the Cox-2 enzyme and it’s formation of inflammatory prostaglandins in the arachidonic acid pathway thus reducing pain and inflammation (8). However there are many associated side effects with taking NSAID’s, including headaches, dizziness, nausea, vomiting, diarrhoea and intestinal bleeding and can also inhibit cartilage synthesis and accelerate degradation (9). It is therefore important to reduce the dependency of these drugs by supporting the diet through foods that are high in anti-inflammatory properties.

Although inflammation is an essential part of post injury healing, sustained excessive inflammation may indeed impede the recovery process. The conversion of Omega 6 and Omega 3 to form prostaglandins holds the key to their anti-inflammatory properties and manipulating the type of dietary fats consumed can be extremely powerful in the treatment of inflammation (9). It is however, the ratio of Omega 6:3 that is important, at present traditional western diets contain excessive Omega 6 with ratios as high as 15:1 and above. It is hard to determine the optimal ratio as there is conflicting evidence but an observed ratio of <2:1 suppressed inflammation in patients with rheumatoid arthritis and general recommendations are between 1.5 and 5:1 (10). Some recent research has also suggested that fish oils may halt the process of muscle loss however it has yet to be established in humans but offers a potential area for future research (11).

In athletes the tendency is to have very low levels of fat due to fat restricted diets which have serious effect on overall health. Given this it is likely that athletes will limit fat intake during the recovery period to avoid weight gain. It is therefore important to establish the present dietary practices and attitudes of the athlete along with a complete nutritional and anthropometrical assessment.

Overall fat intake is recommended at ~25% of daily total, it is important to remove and replace inflammatory substrates such as trans-fats, saturated fats and processed foods from the diet. Recommending a Mediterranean diet which is high in beneficial omega 3 fats, nuts, olive oil and vegetables has been shown to have large statistical reductions and has been shown to decrease inflammation by lowering the levels of inflammatory compounds measured in the blood, such as CRP, IL-6, TNF-alpha and homocysteine (12). Key foods as part of Mediterranean diet are cold water fish rich in omega 3 (Salmon, mackerel and sardines), walnuts and almonds, good quality olive oil, plenty of fruits and vegetables, olives, chicken and beans.

PROTEIN

There is a lack of scientific evidence to support increasing protein during the initial phases of repair, as it believed to be unlikely that protein interventions at this stage would prevent muscle breakdown (13). There is however a correlation between impeded wound healing and increases in inflammatory proteins in insufficient protein intake (14). In fact, BCAKs in particular leucine, have shown to have an anabolic effect within the muscle both in resting and recovery periods after exercise, mediated by the activity of the enzyme responsible for protein synthesis (15). In this phase of immobilization there is a resistance to the immobilized muscle to nutrients providing anabolic stimulation which may in part be counteracted by supplying adequate dietary leucine but this needs to be confirmed by further human studies (16).

Although it is still unclear if the benefits of increasing protein above recommended amounts is important to ensure an adequate daily intake of ~1.2-1.5g BM during this period (8). The quality and type of protein should be considered with the emphasis on lean and leucine rich sources. It is also important to ensure the consumption of protein is spread throughout the day and taken with every meal.

ANTIOXIDANTS

Antioxidant nutrients have been identified to influence cell growth and metabolism during this period (8) and also counteract any oxidative and free radical damage (17).

• Turmeric: Anti-Inflammatory and anti-oxidant, works directly by inhibiting the formation of thromboxane and leukotrienes. Stimulates the release of adrenal corticosteroids, prevents the breakdown of corticosteroids and sensitizes corticosteroid receptors (16).

• Ginger: the essential oil in ginger contains the anti-inflammatory compound called gingerol. ginger can also reduce the duration of inflammation, eat pineapple 2 pieces of Dark Chocolate (~1.0 ounce) 4 times per day and sprinkle cinnamon over meals (18).

Flavonoids decrease blood vessel permeability and thus the influx of inflammatory intruders into damaged areas and inhibit enzymes that break down collagen. Sources include; apples, apricots, blueberries, pears, raspberries, strawberries, black beans, cabbage, onions, parsley, tomatoes and chillies (19).

The ORAC scale contains 17 foods that have the highest antioxidant power, if consumed together these foods are intended to eat 4 or 5 per day, the chart above shows ratings of 20 different foods, each serving contains 2,000 units (Oxygen Radical Capacity of Selected Foods, US, Department of Agriculture nutrition.gov.)

1. Pomegranate
2. Raisins
3. Blackberries
4. Pecan Nuts
5. Blueberries
6. Walnuts
7. Elderberries
8. Cranberries
9. Spinach
10. Broccoli
11. Blueberries
12. Pears
13. ½ cup of Blackberries, Strawberries or Raspberries
14. ½ cup of diced Melons
15. ½ cup of pineapple
16. ½ cup of Kidney Beans
17. ½ cup of broccoli
18. 4 pieces of Dark Chocolate (70%)
19. ½ cup of cooked Lentils
20. ½ cup of Broccoli

REFERENCES


2. REHABILITATION AND HYPERMETABOLISM

The primary nutritional goal in this phase is to support muscle growth and recovery across the spectrum (20). Although increasing amino acid intake should help, the amount is much less than people believe and 1-2g kg BM should be sufficient in this time. Research has shown that ingesting high amounts of protein in extreme diets are neither necessary nor beneficial as excess dietary protein does not have an anabolic effect and will simply be oxidised for energy (8). Indicators are that the timing of protein may be just as important as total protein intake and combining it with carbohydrate may also argument an anabolic response (14) Spreading protein throughout the day helps keep optimal amino acid levels in the blood stimulating muscle growth (8).

Creatine has been promoted to enhance recovery however the evidence is equivocal and it is believed that the length of immobilisation may indeed impede the effect of creatine (19).

In conclusion, biochemical individuality dictates the importance of an individualised nutritional approach. A well balanced diet that meets energy requirements is fundamental to support a speedy recovery. Increasing daily intakes of whole grains, essential fats, lean proteins and fruit and vegetable intake will ensure the athlete receives optimal levels of all micronutrients needed for the recovery and healing process such as; zinc, sulphur, Iron, Vitamin C, D, E, A, copper and calcium amongst others.

Although many are quick to recommend the use of dietary supplements such as glucosamine, SAMM, glutamine and arginine the claims behind these substances are equivocal. There is however potential behind these products and future clinical trials will be needed to determine their efficacy and safety within the recovery period and sporting events. In the interests of our clients, clinical practice must support an evidence based approach before implementing any nutritional interventions that may result in negative interactions or harm to individuals.