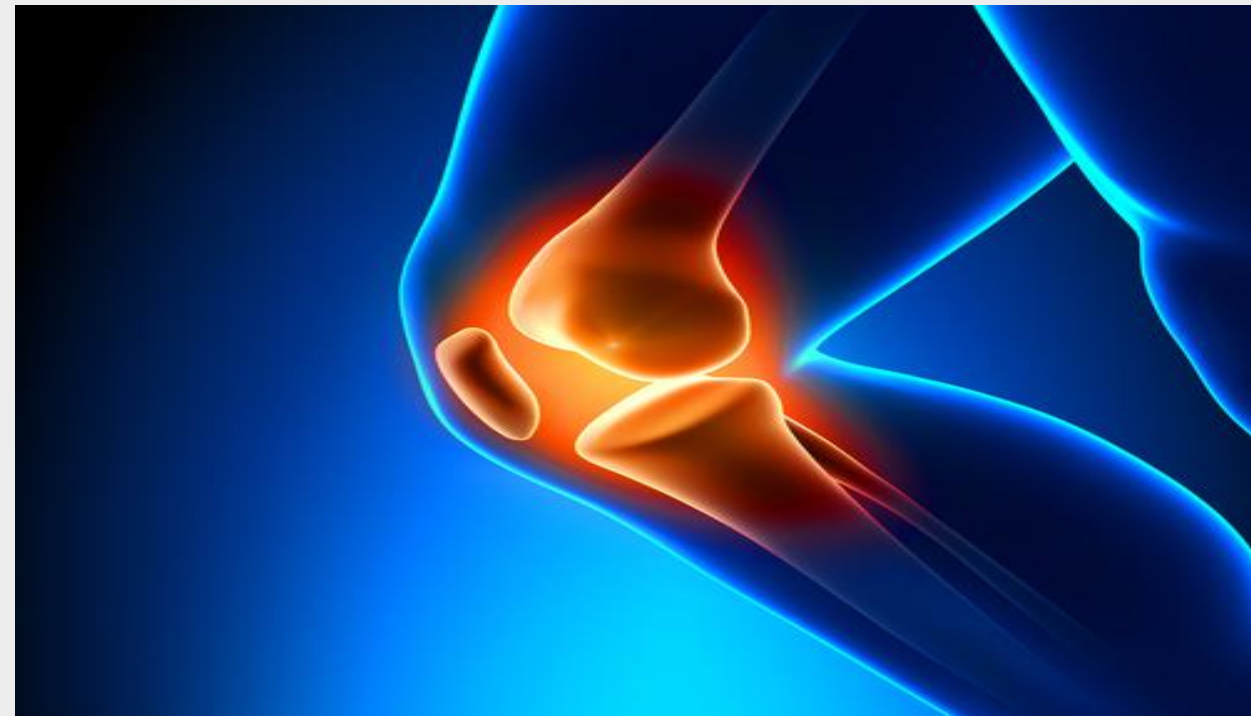


Nutritional Interventions to Support Optimum Healing for Sports Injuries

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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(1). Although any part of the body can be injured, sporting injuries usually occur within the musculoskeletal system which can result in a period of immobilization(2). The recovery period can be a frustrating time for any athlete, usually accompanied by physical inactivity with expected losses in strength and muscle mass (1). Although nutrition has an important role to play during recovery it is often overlooked (3), in fact a poor nutritional status, particularly deficits in energy and protein, have been identified to impede recovery and exacerbate inflammation(4). Therefore the diet during the rehabilitation and healing phase is crucial to enhance a speedier recovery process for client.

The recovery process involves organised physiological stages each bringing with them their own set of nutritional requirements. The 1st phase of tissue repair, Immobilization and Atrophy constitutes an initial inflammatory response lasting up to ~4 days post recovery followed by proliferation, from 4 to 21 days and finally remodelling over an extended period(4). The 2nd stage is rehabilitation and muscle hypertrophy where the shift is from repair to muscle growth and increasing strength (1)

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 repair. It is believed that during the healing process energy requirements increase by ~20% (5) and additional requirements are needed to support adequate protein synthesis and mobility such as walking with crutches (1).

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 ~5-6g.kg.bm , ~65% 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 (9). 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 destruction (10). 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 (11) 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 15-20:1 and above. It is hard to determine the optimal ratio as there is conflicting evidence but an observed ratio of 2-3:1 suppressed inflammation in patients with rheumatoid arthritis and general recommendations are between 1:1 and 5:1 (11). 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(1).

In athletes the tendency is to have very low levels of fat due to fat restricted diets which can have a serious effect on overall health. Given this it is likely that athletes will limit fat intake during the recovery period to avoid weigh 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 reduce inflammatory promoting substances 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 studied in large populations 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 is believed, to be unlikely that protein interventions at this stage would prevent muscle breakdown(1). There is however a correlation between impeded wound healing and increases in inflammation from insufficient protein intake(4). In fact, BCAA's in particular leucine, have been shown to have an anabolic affect within the muscle both in resting and recovery periods after exercise, mediated by the activation of enzymes responsible for protein synthesis(9). In this phase of immobilization there is a resistance by 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(1).

Although it is still unclear if the benefits of increasing protein above daily recommendations, it is important to ensure an adequate daily intake of ~1.0-1.2g.kg.BM during this period (8). The quality and types 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 new capillary development during tissue regeneration (3) and also counteract any oxidative and free radical damage (13).

- Turmeric: Anti-inflammatory and anti-oxidant, works directly by inhibiting the formation of thromboxanes and leukotrienes. Stimulates the release of adrenal corticosteroids, prevents the breakdown of cortisone and sensitizes cortisone receptor sites (11)
- Ginger: inhibits formation of inflammatory mediators, exerts powerful antioxidant actions and contains a protease compound that breaks down fibrin. 8-10 grams of fresh ginger daily (11)
- Bromelain: Enzymes found in pineapple which are effective in reducing inflammation, eat pineapple 2-3 times weekly (11)

Flavonoids decrease blood vessel permeability and thus the influx of inflammatory mediators into areas of damage and inhibit enzymes that break down collagen. Sources include; apples, apricots, blueberries, pears, raspberries, strawberries, black beans, cabbage, onions, parsley, pinto beans, and tomatoes (11). The ORAC scale seen below lists the foods that have the highest anti-oxidant potential Recommended is to eat 6,000 ORAC's 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, 2007).

1	½ tsp of ground Cinnamon	11	7 Walnut Halves
2	½ tsp of dried Oregano	12	8 Pecan Halves
3	½ tsp of ground Turmeric	13	¼ cup of Pistachio Nuts
4	1 heaped tsp of Mustard	14	½ cup of cooked Lentils
5	½ cup of Blueberries	15	1 Cup of Kidney Beans
6	Half a Pear, Grapefruit or Plum	16	½ Avocado
7	½ cup of Blackberries, Strawberries or Raspberries	17	½ cop of Red Cabbage
8	½ cup of Cherries or a shot of Cherry Active concentrate	18	2 cups of Broccoli
9	An Orange of Apple	19	1 Med Artichoke or 8 spears of Asparagus
1	4 pieces of Dark Chocolate (70%)	20	Medium glass of Red Wine
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REHABILITATION AND HYPERTROPHY

The primary nutritional goal in this phase is to support muscle growth and increase strength (1). Although increasing amino acid intake should help, the amount is much less than people believe and 1.2-1.4g.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). Indications 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 immobilization may affect the impact of creatine (1).



CONCLUSION

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 vegetables will ensure the athlete receives optimal levels of all micronutrients needed for the recovery and healing process such as; zinc, sulphur, iron, Vitamins C, D, E & A, copper and calcium amongst others.

Although many are quick to recommend the use of dietary supplements such as glucosamine, HMB, glutamine and arginine the claims behind these substances are equivocal. There is however potential behind these products and future clinical trials will allow us to determine their efficacy and safety within the recovery period and sporting populations. 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.

REFERENCES

1. Tipton, K. (2010) Nutrition for Acute Exercise Induced Injury. *Journal of Nutrition and Metabolism*, 57(2), 43-53.
2. U.S Department of Health and Human Services (2009) Sports Injuries Hand-out. Accessed online www.niams.nih.gov
3. Bernardi, J., Andrews, R. (2012) Eating for Injury Recovery. Accessed online www.precisionnutrition.com.
4. Demling, R.H.(2009) Nutrition, Anabolism and the Wound Healing Process: An Overview. *Eplasty* 9, e9.
5. Frankenfiels, D. (2006) Energy Expenditure and Protein Requirements After Traumatic Injury. *Nutrition in Clinical Practice*, 21, 430-437.
6. Burke L., Loucks A., Broad N. (2006) 'Energy and Carbohydrate for Training and Recovery'. *Journal of Sports Sciences* 24(7), 675-685
7. ACSM – Joint position Stand (2009) ' Nutrition and Athletic Performance'. *The American College of Sports Medicine* 709-731
8. Burke, L., Deakin, V. (2006) *Clinical Sports Nutrition*. 3rd edn. Australia :McGraw-Hill
9. Bales P (2008) *Osteoarthritis, Preventing and Healing Without Drugs*. 1st edn., New York, Prometheus Books.
10. Pizzorno L, Pizzorno J, Murray M (2002) *Natural Medicine Instructions for Patients*. London, Elsevier Science Ltd.
11. Murray M, Pizzorno J, Pizzorno L (2006) *The Encyclopedia of Healing Foods*. 1st edn., London, Time Warner Books.
12. Chrysohoou C et al, (2004) Adherence to the Mediterranean diet attenuates inflammation and coagulation process in healthy adults: The Attica study. *Journal of the American College of Cardiology*, 44:152-158
13. Holford P (2009) *Say No To Arthritis*. 2nd edn., London, Piatkus.
14. Phillips SM, Moore DR, Tang J. A critical examination of dietary protein requirements, benefits, and excess in athletes. *Int J Sports Nutr Exer Metab*. 2007a; 17: 558-576