

There is more to injury management than ice ...

While ice, rest and physical therapy are significant in the treatment of injuries, researchers are discovering that what an athlete consumes after being injured and during treatment can either delay healing or promote recovery.

The healing response is illustrated in three stages:

1. Inflammation starts at the time of injury and continues for 4 – 6 days and is in place to clear out injured tissue debris.
2. Proliferation starts 3 – 4 days post injury and lasts up to 2 weeks. During this stage there is synthesis of epithelial cells and collagen to form temporary replacement tissues.
3. Remodelling starts in the second or third week and can continue for over a year. During this stage there is formation of new tissues nearly as strong as the original tissues.

By understanding the process of injury and injury repair, different nutritional angles can be implemented to support injury recovery as follows:

1. Nutritional strategies that promote, yet manage, **acute inflammation and pain**.
2. Nutritional strategies for supporting **immune function**.
3. Nutritional strategies that support long term **tissue healing and regeneration**.

Deficiencies of key nutrients will impair the above mentioned critical healing functions, e.g.

- **Vitamin C** and collagen formation
- **Vitamin A** and epithelialization
- **Zinc** and cell proliferation
- Mild **protein** deficiency impairs healing process

Nutrition applied to sports injury and rehabilitation

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NUTRIENTS INVOLVED IN HEALING

ENERGY

Tissue repair requires cellular functions of protein synthesis, macromolecule synthesis and nucleic acid synthesis. For all of these processes the provision of energy is essential and a steady supply of raw material is required for cellular energy production. Energy intake also triggers hormonal responses, especially insulin, glucagon, somatotropin and intestinal neuropeptides which all play a role in the healing process as well as homeostasis.

Major injury alters an individual's nutritional requirements. Studies suggest, for example that athletes who have broken their femur may experience an increase in resting energy requirement of around 20 per cent. Comparatively speaking, an athlete will have to eat less during injury recovery than during training and competition. Yet the recommended intake during injury will still be higher than the resting energy recommendation as illustrated in the table below.

	Male athlete 14 years old 168 cm 63.6 kg
Calculated Basal Metabolic Rate	6 770 kJ
Energy needs when Sedentary	8 100 kJ
Energy needs with Daily Training / Competition	11 500 kJ
Energy needs during Injury Recovery	9 700 kJ
Although energy need during injury is less than during training, it is still more than when sedentary	

PROTEIN

One of the metabolic responses after injury or surgery is a net loss of body protein. The duration of protein loss is 3 to 6 weeks when protein intakes are usual (0.8 g/kg/day). Thus, it is important to ensure adequate protein intake during times of stress or injury. Amino acids, the breakdown constituents of protein, are basic building blocks for the construction of proteins, especially collagen, elastin, proteoglycan core proteins and non-collagenous matrix proteins. Other proteins with specific effects on musculoskeletal healing include hormones and amino acid neurotransmitters that regulate hormone synthesis and release.

Protein depletion appears to delay wound healing by:

- Prolonging the inflammatory phase
- By inhibiting fibroblast, collagen and proteoglycan synthesis
- Inhibiting wound remodelling

FAT

Apart from its function as energy substrate, fats are dietary and metabolic precursors for steroid hormones and eicosanoids.

Eicosanoids are powerful hormones that mediate many cellular and tissue functions. Much has been said about omega-3 fatty acids and the role it plays in musculoskeletal healing. The rationale for the use of fatty acids is to modulate eicosanoid synthesis to enhance production of anti-inflammatory eicosanoids and reduce production of pro-inflammatory eicosanoids. Therefore, a diet high in trans-fats, omega-6 rich vegetable oils, and saturated fat will be pro-inflammatory whilst a diet high in monounsaturated

fats and omega-3 fats will be anti-inflammatory. To achieve a diet with optimal fat balance, increase the intake of olive oil, mixed nuts, avocados, flax oil, ground flax and other seeds to include some of these fats daily. Add 3 – 9 g of fish oil each day whilst reducing omega-6 fats, e.g. vegetable oils, corn oil, sunflower oil, safflower oil, soybean oil, etc. Even if the modulation of eicosanoids is a possibility, the slow turnover of cell membrane phospholipid fatty acids will delay clinical responses and therefore the make the use of fat modulation in short-lived or acute situations unsuccessful.

CARBOHYDRATE

Carbohydrates are critical in sports injuries for their caloric value - supplying the energy needed to support healing - and the micronutrients they bring with them in food sources. They although do not usually directly repair tissues, as they are not part of the structures of cells the way proteins and fats are. However, carbohydrates are the preferred fuel source used during exercise.

MICRONUTRIENTS

When it comes to injury, vitamins A, B, C, and D as well as calcium, copper, iron, magnesium, manganese and zinc can all play important roles. Vitamin E may slow the healing process and therefore it is not recommended to take vitamin E supplements during injury. Vitamin A support epithelial and bone tissue development and stimulate the immune response. Vitamin C plays a critical role in collagen formation and acts as an anti-oxidant. Zinc is essential for DNA synthesis, cell division and protein synthesis, all

necessary events for tissue repair. Magnesium plays a key role in protein synthesis and amino acid metabolism. Manganese is extremely important for the synthesis of proteoglycans, which are essential for the repair of connective tissue.

PRACTICAL TIPS FOR ATHLETES NURTURING INJURIES

- Maintain adequate energy intake
- Decrease the intake of highly refined or processed foods
- Increase the intake of fresh fruits, fresh vegetables, whole grains
- Avoid fried and greasy foods
- Maintain protein intake of 1 – 1.5 g/kg body weight/day
- Take a multivitamin and mineral supplement every day
- Maintain a good hydration status
- Try to get back on a regular eating schedule as soon as possible
- When you are up to it, try to achieve:

