Eating For Injury Recovery

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To most sport and exercise professionals, the idea that nutrition can play a powerful role in injury recovery makes perfect sense. However, when injury strikes, very few individuals know just how to put nutrition to work for their clients and athletes. So, in today's article we'll review the best practices for using nutrition to dramatically speed up the injury recovery process.

Injury Recovery – Step By Step

Although injuries can feel disorganized and chaotic, the body's road to recovery represents a highly organized and well-coordinated physiological process. And, by understanding the steps in the recovery process, nutritional targets can more easily be identified.

> **Step 1 – Inflammation [lasts up to 4 days post-injury]**
> Immediately after injury strikes, the earliest response is inflammation. Damage has occurred. Injured tissues are deprived of their normal flow of oxygen and nutrient-rich blood. And cell death is initiated. Of course, during this phase, pain, swelling, redness and heat are common.
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> **Step 2 – Proliferation [lasts from 4 days to 21 days post-injury]**
> Once inflammation is dampened down, the damaged tissues are removed and new vasculature is developed. Further, scar tissue is laid down to support the site of injury.
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> **Step 3 – Remodeling [lasts from 21 days to 2 years post-injury]**
> The scar tissue that formed several days after the injury is degraded and replaced with stronger connective tissue. With appropriate therapeutic and nutritional intervention, this area can be as strong as the original, un-injured tissue or even stronger.

Dietary Fat and Inflammation

As the first step in the recovery process is the inflammatory stage, let's begin with a discussion of the nutritional management of inflammation.

It's well known that trans-fats, omega 6 fats, and saturated fats promote inflammation in the body, while monounsaturated fats and omega 3 fats inhibits inflammation. This means that during injury recovery, it's important to achieve a better balance of omega 6 to omega 3 fatty acids. By eating fewer omega 6s and more omega 3s, excessive inflammation is dialed down and collagen production is better supported. An ideal ratio is about two or three omega 6 fats to every omega 3 fat consumed. Unfortunately, the typically North American gets about ten to fifteen omega 6 fats to every omega 3 fat consumed.

Rather than getting out your calculator to determine the ideal fatty acid balance, it's actually best to focus on specific food choices. To this end, it's important to increase the intake of: olive oil, mixed nuts, avocados, flax oil, ground flax, and other seeds. It's also important to supplement

with 3-9 grams of fish oil per day. Finally, it's a great idea to decrease the intake of corn oil, sunflower oil, safflower oil, cottonseed oil, soybean oil, and other oils high in omega 6 fats.

Dietary Herbs, Spices & Flavonoids for Inflammation

Herbs can also be valuable in the management of inflammation, especially during the first stage of recovery, reducing dependence on anti-inflammatory pharmaceuticals like NSAIDs. The following are useful anti-inflammatory agents for the first few weeks post-injury.

> **Curry powder/turmeric** – this member of the ginger family has long been used as an anti-inflammatory and for wound healing. The active ingredient, curcumin, is likely responsible for the effects. Adding curry in the diet is good, but a turmeric supplement might be more effective since the dose is concentrated. Aim for 7tsp per day of the powder or 400-600mg per day of the supplemental form.
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> **Garlic** – has been shown to inhibit inflammatory enzymes and increase the function of macrophages. Adding it to the diet is helpful, but a supplement might be even better. Aim for 2-4 garlic cloves each day or 600 to 1,200 mg of aged garlic extract.
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> **Pineapple** – contains bromelain, another anti-inflammatory plant extract that's great for digestion and for inflammation/pain relief. Aim for 2 cups of pineapple per day or 500-1,000 mg in supplemental form.
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> **Cocoa, tea and berries** – these help manage inflammation through antioxidant activity and influence cell growth/new capillary development during tissue regeneration. While eating more flavonoid rich foods would likely be of benefit during times of acute injury, nutritional supplements containing blueberry or grape extracts, green tea extracts, citrus extracts (hesperedin, naringin, etc), and bioflavonoid supplements containing quercetin/dihydroquercetin and rutin may lead to more marked anti-inflammatory effects.

With all of these supplements, it's important to remember that we don't necessarily want a full suppression of inflammation. Indeed, an appropriate inflammatory response guarantees a better recovery response. However, sometimes the response can get too aggressive, damaging surrounding tissues. And that's why we're looking for inflammatory control instead of suppression.

Energy, Macronutrients and Remodeling

Let's now move onto the next stage of injury recovery – proliferation and remodeling. Whenever tissue remodeling and repair are taking place, there is an extra demand on the body.

During injury repair, metabolic rate can increase anywhere from 15-50%. While this sounds high, calorie demands will actually be lower than required during sport training. Here is an example of the energy demands of an 24 year old male who's 5'9" and 180 pounds

Basal Metabolic Rate:
1,826 kcal/day

Energy needs when sedentary:
2,191 kcal/day

Energy needs with daily training:
3,104 kcal/day

Energy needs post-injury:
2,629 kcal/day

Eating too few calories during the recovery period can prevent full and adequate healing. And, unfortunately, the drastic reduction in physical activity during injury periods can lead to a natural reduction in appetite and food intake. So it's important to make your athletes aware of sound eating habits and patterns in order to provide enough total energy for proper repair.

When it comes to the macronutrients, generally, during injury recovery, protein intake should be maintained in the 1g/lb range. About 1/3 of one's dietary fat should come from each type of fat (i.e. 1/3 from saturated fat, 1/3 from monounsaturated fat, and 1/3 from polyunsaturated fat). And, although there's no requirement for carbohydrate during recovery, it's important to include enough carbohydrate to support brain function and provide adequate micronutrient intake.

Micronutrients and Remodeling
Vitamins and minerals are nutrients required by the body in small amounts for a host of metabolic reactions. And since the injury recovery process relies on many metabolic reactions to proceed, vitamins and minerals can play a key role. The main players in proliferation and remodeling are:

Vitamin A - enhances and supports early inflammation during injury, reverses post-injury immune suppression, and assists in collagen formation. Supplementation with 10,000IU daily for the first 2-4 weeks post-injury is likely a safe approach, although beyond that, the supplement should be removed to avoid toxicity.

Vitamin C - enhances neutrophil and lymphocyte activity during phase 1 of acute injury. Plays an important role in collagen synthesis. Supplementing 1g-2g/day during the first 2-4 weeks post injury is recommended.

Copper - assists in the formation of red blood cells and acts in concert with vitamin C to form elastin and to strengthen connective tissue. Supplementing 2-4mg/day during the first 2-4 weeks post injury is recommended.

Zinc - plays a critical role in tissue regeneration and a deficiency has been associated with poor wound healing. Supplementing 15-30mg/day during the first 2-4 weeks post injury is recommended.

Super-Recovery Nutrients
Keeping with the theme of supporting proliferation and remodeling, there are a host of recovery nutrients that have been shown to have excellent restorative effects during injury recovery. They are:

Arginine - this may stimulate insulin release and growth factors which assist in protein synthesis and connective tissue deposition. Its role in stimulating nitric oxide production may increase blood flow to the injured area and activate macrophages for tissue clean-up. Arginine may also promote the conversion of ornithine to proline. Human doses range from 15-30g per day.

Ornithine - this can improve protein metabolism, shorten healing time, increase healing strength, and increase nitrogen retention. Also, ornithine can be converted to proline, which is essential in collagen deposition. Dosing has been in the 20-30g per day range (10g 2-3x per day).

Glutamine - this is essential for the metabolism of cells that have rapid turnover, such as lymphocytes and enterocytes. During times of stress glutamine needs increase. It's been speculated that glutamine may help speed up wound healing.

HMB - this metabolite of leucine has been shown to inhibit muscle protein breakdown and increase protein balance, leading to potential increases in muscle. HMB may also increase collagen deposition and improve nitrogen balance.

14g arginine, 3g HMB, and 14g glutamine in two divided doses (two doses of 7g arginine, 1.5g HMB, 7g glutamine per day) has been shown to improve recovery time and we recommending including these three nutrients during injury recover.

Of course, all supplements should be purchased from companies that regularly screen for contamination with banned substances. Products that have been screened using NSF (USA) and HFL (UK) technologies have the highest likelihood of being free of banned substances.

Nutrition During Injury – Best Practices
Of course, it's always better to focus our nutrition advice on practical habits vs. impossible to follow mathematical calculations. To this end, and as a summary, here's a list of best practices for your injured clients and athletes.

1. **Eating frequency -** During injury recovery, it's best to eat every three hours or so.

2. **Protein foods -** Each meal should contain protein foods, including lean meats, beans, eggs, soy, and/or a protein supplement. For men, the amount would be two protein portions and for women the amount would be one protein portion. In general, a protein portion is about the size of your palm.

3. **Vegetables & fruit -** Each meal should contain one to two servings of vegetables and/or fruit. In general, a veggie/fruit serving is between ½ - 1 cup of fruit or vegetable.

4. **Whole grains -** Minimally processed sources like whole oats, whole grain rice, sprouted grain breads and quinoa are best during injury recovery. Generally, we recommend more carbohydrates while training and fewer while not training.

5. **Nuts/seeds/oils -** To achieve a better fat balance, every day, include olive oil, mixed nuts, avocados, flax oil, ground flax, and other seeds. Supplemental fish oil should also be included at a dose of 3-9g per day. It's also best to cut back on corn oil, sunflower oil, safflower oil, cottonseed oil, soybean oil.

6. **Herbs and Phytochemicals** – For the first 2-4 weeks post-injury, the inclusion of turmeric, garlic, bromelain, and flavanoids from cocoa, tea, and blueberries can help manage inflammation.

7. **Vitamins and Minerals** – For the first 2-4 weeks post-injury, the inclusion of vitamin A, vitamin C, copper, and zinc can assist in the proliferation and remodeling stages of recovery.

8. **Super-Nutrients** – The inclusion of arginine, HMB, and glutamine can also help during the proliferation and remodeling stages. Just be careful with nutritional supplements, using products that are guaranteed free of banned substances.

By putting these nutritional strategies to work for you and your athletes, not only will you see speedier returns to function, you'll also see more complete healing and less frequent injury recurrence.

About The Authors

John Berardi and Ryan Andrews are part of the world-renowned Precision Nutrition team. And their work is responsible for bringing elite-level nutrition advice to both high-level athletes and recreational exercisers around the globe. For more great nutrition from Dr Berardi and Ryan Andrews, visit www.precisionnutrition.com.