

A pile of almonds is shown in the top left corner, and several slices of red, yellow, and orange bell peppers are arranged in the middle left. White chalk-like lines and arrows are drawn around these items, pointing towards the title and the sub-headline.

NUTRITION FOR INJURY RECOVERY & REHABILITATION

How to make sure your patients are receiving optimal fueling

BY KATIE KNAPPENBERGER, MS, RD, CSSD, ATC

After an injury occurs, patients trust that an athletic trainer is working quickly to design a comprehensive rehabilitation plan that will produce a complete recovery in the shortest time frame possible. Research continues to emerge as to how nutrition fits into this recovery plan.

Optimal nutrition can play a key role in controlling inflammation, providing key nutrients for rebuilding injured tissue, minimizing muscle atrophy and supporting strength preservation and gain. The following will help you integrate nutrition into your rehabilitation programs and start discussions with patients about when and how nutrition can make an impact.

THE FIRST 48 HOURS

Depending on the severity of the injury, there could be a lot of action in the first 48 hours – from briefing parents and learning how to ambulate to scheduling imaging and preparing for surgery. If you can only impart a few nutrition sound bites to your athletes, let it be these five:

1. Fuel the Healing Process: Under-fueling during this period is common due to busyness of adapting to an unexpected situation and the misconception that because an athlete is not training, they do not need to fuel. Trauma or surgery may require up to 20 percent more calories.² Additionally, crutching requires two to three times more energy than walking. Insufficient energy intake (80 percent of

total requirements) for 10 days can reduce muscle protein synthesis by 20 percent, thus impacting rate of complete recovery.

2. Manage Surgery Side Effects:

Early nutrition is key to the recovery process, but postoperative nausea can present a barrier. Nauseous athletes should try bland foods (banana, rice, applesauce, toast), smaller and more frequent meals and nutrient-dense liquids (smoothies). Constipation is also common after surgery. Increasing fluid and fiber intake often improves these symptoms. If this is not effective, athletes might try adding a small amount of prune juice to their day.

Postsurgical antibiotics are critical for preventing infection, but unfortunately they also kill some of beneficial gut bacterial involved in our digestive and immune health. Restore the beneficial bacteria by including prebiotic and probiotic rich foods. Probiotics are live, good bacteria that contribute to a healthy gut environment. Probiotic rich foods include yogurt, kombucha, sauerkraut, miso soup and kimchi. Prebiotics are plant fiber that feed the good, probiotic bacteria. Prebiotic rich foods include jicama, onion, garlic, asparagus, oats, wheat, barley and mushrooms.

3. Battle Anabolic Resistance with Protein and Leucine:

Immobilization decreases the ability of myofibrillar proteins to respond to amino acid stimuli. This phenomenon is called anabolic resistance, which makes the muscle building

SAMPLE MEAL PLAN FOR ATHELETE WITH TENDON / LIGAMENT INJURY

TIME	MEAL/ACTIVITY	ITEMS
8 a.m.	Breakfast	Oatmeal with peanut butter, banana, chia seeds, milk
8:15 a.m.	Rehab Pre-Fuel	15 grams of gelatin mixed with 8 ounces of orange juice
9:15 a.m.	Rehab	Water
11 a.m.	Rehab Fuel	High-protein milk, tart cherry juice
Noon	Lunch	Turkey sandwich on wheat bread with tomato and spinach; Greek yogurt with raspberries and cashew granola; water
3 p.m.	Snack	Smoothie made with milk, mango, pineapple, spinach
6 p.m.	Dinner	Grilled chicken topped with avocado, zucchini, brown rice, water
9 p.m.	Snack	High-fiber cereal with milk, blueberries

process more difficult. In order to overcome this, researchers have established higher protein recommendations (1.6-2.5 g/kg/d) and emphasize consuming leucine-rich foods.⁶ The amino acid leucine has been named “the anabolic trigger” as it has the power to stimulate muscle protein synthesis faster than other amino acids. Leucine from food sources may have the ability to aid in injury recovery. Leucine rich foods include cheese (Swiss, fontina, provolone, Colby, mozzarella), meat (pork chops, chicken), fish (tuna, trout, salmon), nuts and seeds (soybeans, pumpkin, peanuts, almonds) and tempeh.

For best results, consume 20 to 35 grams of leucine-rich protein every three hours during the day and before bed. Casein-rich foods (milk and dairy products) before bed provide a competitive healing edge as they take longer to digest and are slowly released into the blood stream. This provides a slow and steady supply of amino

acids that can be used to build muscle while catching some Zzzs.

4. Control Inflammation by Making Simple Fat Swaps:

Anti-inflammatory fats are found in olive oil, avocado, fish, flax, nuts and seeds. Pro-inflammatory fats are found in fried and greasy foods, processed meats (pepperoni, salami, bologna, hot dogs) and vegetable oils. During the initial inflammatory stage of healing, swapping a greasy hamburger for a turkey burger with avocado would support healing. Instead of snacking on fried potato chips, encourage your athlete to grab some almonds and dried tart cherries to help control their inflammation and move him/her closer to meeting his/her rehab goals.

5. Speaking of Fruits and Vegetables:

Antioxidant-rich fruits and vegetables also help control inflammation, which can speed healing. Some of the highest sources of antioxidants include goji berries, blueberries, tart cherries, dark chocolate, pecans, artichoke, elderberries, kidney beans, cranberries, blackberries and green tea. Pineapple, turmeric, garlic and ginger have also been shown to have beneficial anti-inflammatory properties.

An athlete may try to start his/her their morning with a cup of green tea, cooking up a curry (turmeric) dish for dinner or whipping up an anti-inflammatory smoothie for a snack (see Anti-Inflammatory Tart Cherry Smoothie recipe).

CONTINUED RECOVERY

After your patients have integrated the previous tips into their lifestyles, and the inflammatory stage of healing has come to an end, you may want to reinforce these four facts:

1. Continue to Fuel the Healing Process:

It is very easy for athletes to under-fuel, and this is probably the most common way athletes negatively impact the healing process. It's becoming more common for athletes to reduce carbohydrate intake in order to control body weight, but whole grains provide many nutrients that fuel and support rehabilitation and healing. Now that the dust has settled, if an athlete is struggling with how much and what to eat, it's time to refer to a board certified specialist in sports dietetics (CSSD) so he/she can receive individualized nutrition recommendations and feel confident in his/her recovery plan.

2. Continue to Focus on Protein and Leucine:

Ensure that protein is consumed every three hours during the day, after rehabilitation sessions and before bed.

3. Monitor Alcohol Intake:

Excessive alcohol intake has been shown to exacerbate muscle loss during immobilization, impair muscle building and contribute to inflammation. In addition, alcohol opens up the door for evening and weekend re-injury. Athletic trainers often have great relationships with their patients and a great ability to start conversations about alcohol intake.

4. Consider Injury Specific Nutrition Interventions:

Concussion: Early nutrition is key in concussion recovery. As soon as the decision has been made to remove the athlete from play, provide a protein rich snack (granola bar with 10 to 20 grams of protein, shelf-stable chocolate milk). A study completed with military personnel showed that when patients received at least 50 percent of their total energy expenditure and 1 to 1.5g/kg protein, outcomes were better than when they received less calories.⁷ Bonus: Omega 3s may also play a role in building muscle mass and strength as the athlete returns to full participation.^{9,10} Encourage the athlete to increase their intake of Omega 3-rich foods (salmon, mackerel, flaxseeds). Many athletes consider taking a fish oil supplement at this time. Consult a CSSD to determine an optimal fish oil dose and source for your athlete.

ANTI-INFLAMMATORY TART CHERRY SMOOTHIE

BY DANA ANGELO WHITE, MS, RD, ATC

INGREDIENTS

3/4 cup tart cherry juice
1 cup frozen pineapple
1/2 cup baby spinach
1/2 cup nonfat Greek yogurt

PREPARATION

1. Place tart cherry juice in a blender, followed by pineapple, spinach, and yogurt.
2. Blend until smooth.

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ORO-FACIAL INJURY FOOD RECOMMENDATIONS

FOOD GROUP	PUREE/BLENDED	SOFT FOODS	AVOID
PROTEIN	Milk Kefir Greek Yogurt Cottage Cheese Nut butters Dry non-fat milk powder Condensed milk Hummus Refried beans	Stewed meats Pulled pork/chicken Eggs Tofu Flaky fish Ground beef or turkey Soft meatballs w/ gravy Soft cheese	Fried Crunchy Breaded Poultry with skin
FRUITS AND VEGETABLES	Fresh, frozen or canned fruits/vegetables blended until smooth without any chunks Smoothies Juice	Ripe bananas Canned fruit All vegetables cooked until soft and beyond fork tender	Unripe Crunchy Tough skins or membranes
WHOLE GRAINS	Cream of wheat Oatmeal Grits	Soft bread Pancakes Waffles French toast Rice, pasta, quinoa, barley cooked until tender	Hard crusts Chewy breads/grains
HEALTHY FATS	Avocados Olive oil Nut butters Coconut oil		Seeds or nuts

Bone Injury: Athletes who are recovering from a fracture should aim for 1,500 milligrams of calcium each day. At this recommendation, an athlete could consume the following in one day: 8 ounces of milk, 6 ounces of yogurt, half cup of kale, 4 ounces of salmon, 1 ounce of cheese and half a cup of broccoli. If vitamin D levels are not already optimized, now is a good time to ask about ordering labs and correct any deficiency that arises. Vitamin K2 also plays a critical role in bone healing. When vitamin K2 is activated, it allows osteocalcin to draw calcium into the bones. Food sources of vitamin K2 include hard cheeses made with whole milk, egg yolk, chicken and beef. Athletes should also ensure adequate intake of phosphorus (milk, cheese, yogurt, nuts, oatmeal, sardines) and magnesium (peanuts, tofu, broccoli, spinach, Swiss chard, nuts, seeds, edamame).

Tendon and Ligament Injury: It has recently been shown that the following protocol may positively impact tendon and ligament health: Consume 15 grams of gelatin and 50 milligrams

of vitamin C one hour before training.⁸ This can be achieved by combining two food grade gelatin packets with 8 ounces of vitamin C-rich juice. Copper is also a key nutrient for tendon health and can be found in cashews and kale. (See the Sample Meal Plan on p. 15)

Oro-Facial Injury/Surgery: Oro-facial injuries may require the athlete to alter the texture of their foods to make them easier to eat. Under-fueling and weight loss is common with these injuries as it is easy to accidentally eliminate food groups and nutrients that are key for healing. Use the Oro-Facial Injury Food Recommendations chart above to coach athletes to eat from each group.

Most athletic trainers have witnessed what happens when an athlete does not fuel in line with his/her rehabilitation goals. Our hope is that you can use the information presented in this article to show your patients why nutrition is key during injury recovery and motivate them to make small changes in their fueling to make a big impact on their return to play. If your athletes need more nutrition support or

an individualized fueling plan, refer them to a Board Certified Specialist in Sports Dietetics. Visit www.scandpg.org/search-rd to find a sports dietitian in your area. §

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FIGHT INJURY WITH MICRONUTRIENTS

Proper nutrition is vital to athletic performance. Not only will eating well assist in overall health, certain micronutrients can also aid in injury recovery.

CALCIUM & VITAMIN D

Essential for bone health and growth, calcium also helps reduce the risk of stress fractures. Don't forget about vitamin D – it is needed to maintain calcium levels in the body, develop healthy bones and the function of skeletal muscles.

ASSISTS WITH:

Stress fractures, sprains, tears and broken bones

FOODS HIGH IN VITAMIN D:

Fatty fish, egg yolk, sundried mushrooms, fortified milk, yogurt, margarine, cereals and fruit juices

FOODS HIGH IN CALCIUM:

Dairy products



IRON

Iron plays a role in transferring oxygen from the lungs to tissue and is critical for respiration and energy metabolism. Because iron influences endurance and performance, it is an important micronutrient to athletes.

ASSISTS WITH:

Extreme fatigue, decreased energy, inability to finish activity and overall decline in athletic performance

FOODS HIGH IN IRON:

Animal products such as meats, fish and eggs; lentils; tofu; quinoa; nuts and seeds; and some fortified cereals



ELECTROLYTES

Electrolytes, such as sodium, potassium and chloride, are vital for maintenance of hydration, generating energy and contracting muscles, and are lost through sweat.

ASSISTS WITH:

Muscle cramping, headache, extreme fatigue and muscle soreness

FOODS HIGH IN ELECTROLYTES:

Mixed nuts, pretzels, lunch meat, sauces, sports drinks, potatoes and most fruit and vegetables



VITAMIN C

Vitamin C plays a major role in tissue growth and repair, wound healing and bone maintenance and repair. Consuming adequate vitamin C will aid athletes in staying healthy and ready for game day.

ASSISTS WITH:

Coughing, sneezing, aches, sore muscles and decline in athletic performance

FOODS HIGH IN VITAMIN C:

Oranges, strawberries, broccoli, peppers, kale, Brussel sprouts, tomatoes, spinach and other fruits and vegetables



Sources: SCAN, Clinical Sports Nutrition, National Institutes of Health Office of Dietary Supplements, Sports Dietitians Australia, National Research Council

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