**Nutritional Considerations for Treating Patients with Neuromusculoskeletal Disorders** Carolyn Dolan, MS, DPT, PT and Grant Glass, DPT, PT (Abstracted from:

"Food should be our medicine and our medicine should be our food." Hippocrates

Nutrition affects all of our body systems, including but not limited to cardiovascular, neurological, muscular, skeletal, endocrine, pulmonary, dermatological, reproductive, genitourinary and gastrointestinal. Each system works in a unique, yet complimentary way and none of our systems operate in isolation. The effects of inflammation, from mechanical disruption, physiological abnormalities or disease will produce a response in all systems. A positive healing environment, both internally and externally, requires a good foundation of nutrition. Patient motivation, exercise, tissue mobility, joint flexibility, hydration and good cardiopulmonary function also positively impact healing. Poor nutrition can negatively impact the healing process.

Cumulative research suggests the lack of proper nutrition may lead to chronic inflammatory processes, compromised healing, limited recovery and reduced potential for rehabilitation. For example, musculoskeletal injuries may be exacerbated in the face of low levels of Vitamin D. Interestingly, food components, like antioxidants, resveratrol, whey protein, chlorogenic acid, omega 3 fatty acids, cherry extract, Vitamen C and AloeVera have been linked to increased muscle strength, decreased oxidative stress post exercise, decreased protein cross-linking, and decreased inflammatory markers.

In controlled animal trials, fructose-rich diets have been associated with metabolic syndromes which decrease osteogenic potentiation (e.g. impairing bone growth). Medications, intended to improve recovery and decrease inflammation, may, in fact, impair musculoskeletal recovery and decrease tissue strength (eg non-steroidal anti-inflammatory), specifically 10-20 days post surgically repaired rotator cuff tendons. Statin drugs for controlling cholesterol, can produce an imbalance of the extracellular matrix of tendons and produce micro-damage. These nutritional impairments in the musculoskeletal system are also integrated into the neurological system, specifically 10-20 days post surgically repaired rotator cuff tendons. Statin drugs for controlling cholesterol, can produce an imbalance of the extracellular matrix of tendons and produce micro-damage. These nutritional impairments in the musculoskeletal system are also integrated into the neurological system.

Psychological factors can also have a direct impact on gut permeability (Gut-Brain Axis). This connection may explain why increased gluten sensitivity has been reported in patients with schizophrenia, acute mania and bipolar disorders, and more specifically in patients with inflammatory disease such as Rheumatoid Arthritis and Irritable Bowel Syndrome.

**Nutritional Recommendations for the Management of Patient’s with Chronic Inflammation**

"If we could give every individual the right amount of nourishment and exercise, not too little and not too much, we would have found the safest way to health.” Hippocrates

In addition to different modes of exercise to facilitate healing, remodeling and decreased inflammation, nutritional strategies could help facilitate healing by decreasing competitive systemic responses such as intermittent fasting (extending the interval between meals). Intermittent fasting is defined as extending the interval between meals. For example, in aging men, mood, depression and nutritional status improved in those who were fasting with calorie restriction with no ill effects. Intermittent calorie restriction has even been used as an effective dietary treatment for drug resistant epilepsy, attenuation of proinflammatory cytokines, and peripheral nerve health. However, this strategy must be cautiously implemented with females because of the monthly ovulatory cycle which is very sensitive to external stress. Thus, rather than intermittent fasting, females should implement a narrowed eating window strategy. For example, this might include eating meals during the hours of 9 AM -7 PM (10 hours) allowing more natural fasting 7 PM – 9 AM (14 hours) during sleeping hours.

Another more common nutritional management tool is specific avoidance of inflammatory foods and specific inclusion of anti-inflammatory and nutrient rich whole foods in the diet. Based on a review of the literature, Table 1 summarizes foods, which have been associated with inflammation or inhibition of healing and should be avoided. Table 2 lists whole food items that incorporate the nutrient components as reviewed in recent research. If there is a clear positive effect on well being and healing, then the habits of specific avoidance and specific inclusion should be maintained for a lifetime (“Triple R” strategy- Remove. Replace, Recover) (See Table 3)
**Summary**

“The natural healing force within each of us is the greatest force in getting well.” Hippocrates

There is no single nutritional recipe for perfect health. Natural foods are better than supplements. In patients with challenging chronic neuromusculoskeletal injuries, it may be helpful to facilitate collaboration between traditional and functional medicine professionals along with specially trained dieticians or nutritionists. Physical Therapists have the opportunity and foundation of knowledge to work with patients across the life span to remediate movement dysfunction through education, exercise, learning based behaviors and attention to nutritional behaviors. When practicing in California, however, physical therapists and other professionals must post a disclaimer that they are not licensed dietitians.

**Table 1: Nutritional components found to exacerbate inflammation and foods to avoid.**

<table>
<thead>
<tr>
<th>Dietary limitations/avoidance</th>
<th>Food in which Found</th>
<th>Beneficial Dietary Component</th>
<th>Food in which Found</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbohydrates 15,54-57</td>
<td>Candies, desserts, flour-derived baked or processed foods, pastas, cereals, granola, fruit juice, beans/legumes, dried fruits (especially if sweetened), anything with added sugars</td>
<td>Probiotics 39-41,66</td>
<td>Naturally fermented vegetables and dairy (pickles, sauerkraut, kimchi, yogurt, kefir)</td>
</tr>
<tr>
<td>Fructose 16,20,58</td>
<td>Agave syrup, honey, dates, raisins, dried fruit, molasses, green grapes, canned fruit in syrup, fruit juice</td>
<td>Prebiotics 66</td>
<td>Resistant starch (potato, plantain, inulin)</td>
</tr>
<tr>
<td>Aspartame 59</td>
<td>Nutrasweet, Equal, a potential additive in sweet-tasting “sugar-free” foods</td>
<td>Leucine-rich diet 67</td>
<td>Eggs, spirulina, cheese, beef, pork</td>
</tr>
<tr>
<td>Ethanol 60</td>
<td>Beer, wine, spirits, mixed adult beverages</td>
<td>Olive oil 68,69</td>
<td>100% pure olive oil</td>
</tr>
<tr>
<td>Monosodium Glutamate 61,62</td>
<td>MSG, may be present in an ingredient list as “flavoring”, processed packaged foods, restaurant foods</td>
<td>Aloe Vera 70</td>
<td>Aloe Vera (juice or capsules)</td>
</tr>
<tr>
<td>Gliadin(Gluten protein) 36,63</td>
<td>Wheat, oats, barley (anything containing gluten)</td>
<td>Gelatin/Collagen 70,71</td>
<td>Pure gelatin or collagen hydrolysate, bone broth</td>
</tr>
<tr>
<td>Statins 12</td>
<td>Consult physician about short-term hold of medication during healing of RSI</td>
<td>Chinese herbal formula (Sini Tang) 23</td>
<td>(Recommend consultation with an herbalist)</td>
</tr>
<tr>
<td>NSAIDs 11</td>
<td>Consult physician about short-term hold of medication during healing of RSI</td>
<td>Antioxidants 3,72-76</td>
<td>Anthocyanins (Blue, red and purple berries, cherries, purple grapes, red cabbage), Betalains (beets, cactus)</td>
</tr>
<tr>
<td>Trans fats 64</td>
<td>Vegetable and seed oils (Canola, rape seed, soybean, safflower, partially hydrogenated fat/oil)</td>
<td>Biotin 77</td>
<td>Green leafy vegetables, liver</td>
</tr>
<tr>
<td>Advanced glycation end products 65</td>
<td>Charred meats, high dietary sugar/carbohydrate intake</td>
<td>Bovine colostrum 78</td>
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</tr>
</tbody>
</table>

**Table 2: Nutritional components found to support healing and/or anti-inflammatory mechanism.**

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</tbody>
</table>

**Table 3**

"Triple R" strategy for patient education regarding nutritional recovery

<table>
<thead>
<tr>
<th>Food in which Found</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brazil nuts 79</td>
</tr>
</tbody>
</table>

2
<table>
<thead>
<tr>
<th>REMOVE</th>
<th>Remove refined grains, refined sugars, refined vegetable oils, processed foods/drinks</th>
<th>Green coffee bean extract</th>
<th>Green coffee bean extract, prunes (*also called Chlorogenic acid)</th>
</tr>
</thead>
<tbody>
<tr>
<td>REPLACE</td>
<td>Replace processed foods with whole organic produce, wild caught fish, grass-fed grass-finished</td>
<td>Resveratrol</td>
<td>Purple grapes, Bilberries, Blueberries</td>
</tr>
<tr>
<td>RESTORE</td>
<td>Maintain healthy eating for a minimum of 30 days to restore health and a lifetime for continued health</td>
<td>Curcumin (Turmeric)</td>
<td>Turmeric</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Docosahexenoic acid (DHA)</td>
<td>Oily fish (salmon, tuna, sardines, mackerel, and trout)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Cocoa</td>
<td>100% chocolate</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Glycoaminoglycans</td>
<td>Glucosamine/chondroitin sulfate supplements *also called Glucosamine</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Vitamin D</td>
<td>Liver, grass-fed dairy, fermented cod liver oil, fish, portabella mushrooms, egg yolk</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Spirulina</td>
<td>Spirulina, raw or dried</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Lean Red Meat</td>
<td>Lean Red Meat; beef, wild game</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Vitamin C</td>
<td>Citrus, peppers, kale</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Whey protein (if diabetic)</td>
<td>Whey protein powder</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Vitamin E</td>
<td>Nuts (Almonds, hazelnuts, pine nuts), nut oils</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Yeast Hydrolysate</td>
<td>Yeast extract</td>
</tr>
</tbody>
</table>

Above referenced foods found on government website [http://ndb.nal.usda.gov/].
References (go on the CPTA Website)


