

## Brain Injury Considerations

Four biological processes that are occurring simultaneously in brain injuries and neurological dysfunction.

- 1) Oxidative stress (OS) due to free radicals
- 2) Excitotoxicity (ET)
- 3) Inflammation (I)
- 4) Increased energy demands, mitochondrial support (MS)

Energy requirements for the brain increase with injury but available energy decreases. Since glucose transport and utilization is compromised, the secondary source of fuel for the brain is ketones. So medium chain triglycerides like MCT oil or coconut oil as well as longer chain fatty acids like EPA/DHA are very therapeutic. Dr. Haltiwanger said the research is so strong he would give as much EPA/DHA as the patient could handle taking them right to the point prior to diarrhea.

Supporting energy pathways means supporting mitochondrial health. The best product in the Biotics line which supports mitochondrial health is VasculoSirt. Dr. Mark Houston developed VasculoSirt to support endothelial blood vessel repair but it has all the nutrients that support mitochondrial health. To be effective in neurological therapies we want to use nutrients that cross the blood brain barrier. We want to get the foods and nutrients as close to the injury as possible. Some of the nutrients that Dr. Haltiwanger suggested which cross the blood brain barrier are: acetyl-L-carnitine, lipothiamine, (a fat soluble form of B1), lipoic acid, vitamin C, oxaloacetate, (a Krebs' cycle intermediate), curcumin, EPA/DHA, choline, dimethylglycine, magnesium, vitamin B6 as P-5-P, and coenzyme Q10. Interestingly, many of those substances are in VasculoSirt.

Here are some of Dr. Haltiwanger's ideas with Biotics conversions on a form below. There are more options available and refinements will be obviously made with further testing. Remember, as you formulate your own program, start as soon as you can to address the four biological processes that are occurring: oxidative stress, excitotoxicity, inflammation and the increased energy demands with mitochondrial and fatty acid support.

Note: Many of the following nutrients when given in excess can cause diarrhea. Each patient is different and the doses will need to be titrated accordingly. Diarrhea is one way the body disposes of toxins however long-term diarrhea is obviously counterproductive. A loose but formed stool is the goal.

**Biomega-3 Liquid** (OD, I, MS) Each tablespoon contains 4,200 mg of EPA and DHA. Use as much as the patient will tolerate.

**Bio-MCT** (MS) A source of ketones used for energy. One tablespoon contains 14g of 100% caprylic triglycerides. Use 1 teaspoon - 1 tablespoon mixed on food 3 times a day.

**VasculoSirt** (I, MS, OS) Contains the nutrients and phytochemicals needed for mitochondrial support such as CoQ, acetyl-L-carnitine, methylated B vitamins, lipoic acid, vitamin D etc. 5 capsules, twice a day.

**Mg-Zyme** (ET) Multiple sources of magnesium, 3 to 6 capsules at bedtime.

**Bio-C Plus 1000** (I, OS) one tablet, three times a day.

**KappArest** (I, OS) A source of curcumin and other phyto-nutrients to reduce systemic inflammation, 3 capsules, twice a day.

**Lipoic Acid** (I, OS, MS) 100-300 mg, three times a day.

**Phosphatidylcholine** for phospholipid support 2 capsules, three times a day.

**B12-2000 Lozenges** (MS) 1 lozenge, twice a day.

**Melatonin** (OS, I) 3-6 mg at bedtime.

Other nutrients to support the Krebs cycle and mitochondrial support should be considered at least for the first 3 months

**Methylfolate Plus** 1 tablet, twice a day.

**B6/B1 Plus Zinc** 1 capsule, twice a day.

**Bio-B3 Plus 250** 1 tablet, twice a day.