# Important Biomarkers and Nutrition Considerations in the Clinical Management of PTSD: The Role of Trauma Nutrition and Integrative Care

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## Background

Post Traumatic Stress Disorder (PTSD) is considered a neuropsychiatric anxiety disorder based on the DSM-IV classification which includes symptoms associated with psychological and physical trauma in addition to increased avoidance, detachment, dissociative, suicidal, irritability, and hypervigilance behaviors along with various physical symptoms (Aaseth et al, 2019; Gandubert et al, 2016; Glover et al, 2015; Levine et al, 2014; Kolassa et al, 2007). PTSD has been shown to mimic Metabolic Syndrome (MetS) while significantly increasing the risk for diabetes and cardiovascular disease (Aeseth et al, 2019; Michopoulous et al, 2016; Rao et al, 2014). Functional and clinical nutrition approaches for PTSD can help to alleviate symptoms and attempt to reduce the risk for comorbid conditions while reducing impacts on healthcare systems, job forces, mortality, and relationships.

## Research Objectives

The purpose of this research review is to tie together the multi-disciplinary research showing the psychological, metabolic, and neurological aspects of PTSD while also introducing evidence based functional clinical nutrition solutions for the many symptoms and comorbid conditions of PTSD.

## Methods

Literature review searches were conducted on the topic of PTSD in PubMed, Google Scholar, and with outside experts between 2020 and 2021. Search terms included, “PTSD, inflammation, nutrition, biomarkers, diet, thyroid, cardiovascular disease, vitamin, mineral, HPA axis, probiotics, urine pH, neurological, metabolic” and other related terms to find original and supportive research. Focus was maintained on randomized controlled trials, systematic reviews, meta-analysis, cohort studies, reviews, and support literature that would lead to original research. Human and animal studies were considered, but significant results with repeatability in a human population held precedence for making associations.

## Results

The most significant discovery in this research is the strengthened association between PTSD and metabolic syndrome (MetS), where researchers have indicated that PTSD “mimics” many of the facets of MetS including increased insulin and leptin resistance, glucose dysregulation, metabolic acidosis concerns, mitochondrial dysfunction, chronic inflammation, sympathetic nervous system dysfunction, and HPA axis dysregulation (Michopoulos et al, 2016; Mellon et al, 2018). Tables 1, 2, and 3 help to show the co-morbid conditions, biomarkers, nutrition interventions, and integrative therapies that are associated with PTSD and improvements in this condition.

**Table 1: PTSD & Associated Comorbid Conditions**

| PTSD Comorbid Conditions | Citation |
|---|---|
| IBS | Gradus et al, 2017; Iorio et al, 2014; Menon et al, 2013; The Gut Reaction to PTSD—Gallipoli, 2017; Fadgyas-Stanculete et al, 2014; Savas et al, 2009 |
| Psoriasis | Pietzak et al, 2017; Oglodek, 2011 |
| Autoimmune Diseases | Ilchmann-Diounou and Menard, 2020; Neigh and Ali, 2016 |
| Metabolic Syndrome | Blessing et al, 2017; Michopoulos et al , 2016; Wolf et al, 2016; Rosenbaum et al, 2015; Weiss et al, 2011 |
| Cardiovascular Disease | Michopoulos et al , 2016; Aaseth et al, 2019; Rosenbaum et al, 2015; von Kanel et al, 2010 |
| Obesity | Michopoulos et al , 2016; Smith et al, 2015; Pagoto et al, 2012 |
| Type 2 Diabetes | Rao et al, 2014; Aaseth et al, 2019 |
| Dyslipidemia | Talbot et al, 2015; Aaseth et al, 2019 |
| Anxiety, Depression, HPA Axis dysfunction, Suicide | Michopoulos et al , 2016 |
| Chronic Inflammation | Michopoulos et al , 2016 |
| Substance Abuse | Michopoulos et al , 2016 |
| Stomach ulcers | Gradus et al, 2017; The Gut Reaction to PTSD—Gallipoli, 2017 |
| Intestinal Permeability | Ilchmann-Diounou and Menard, 2020 |
| Dysbiosis of the Microbiome | Hemmings et al, 2017 |
| Dyspepsia, indigestion, GERD, Abdominal pain | Menon et al, 2013; Savas et al, 2009 |
| Hypothyroidism | Jung et al, 2019 |
| Cognitive Decline | Wolf et al, 2016 |

## Conclusion & Limitations

This review is extensive yet not complete in its full scope at looking at PTSD, its comorbid conditions, associated biomarkers, and best therapeutic intervention planning, but it does offer a significant starting point for assessing PTSD patients or those who are showing symptoms of PTSD and its psychological, metabolic, and neurological symptoms It is hopeful that future study with case reports, cohort studies, and randomized controlled treatment designs can be done to determine the levels of effectiveness of specific nutritional and integrative care protocols.

## References

References are available by using your smart phone to scan the code to your right here. If you have any further questions, please reach out to Jennifer Coomes at jcoomes@muih.edu or Jennifer@essencehealthandresearch.com.

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**Table 2: Biomarker Relationships in PTSD**

| Vitals/Biomarker | Action in PTSD | Citation |
|---|---|---|
| Blood Pressure | INCREASED | Edmondson et al, 2018; Farr et al, 2014; Gandubert et al, 2016; Rosenbaum et al, 2015 |
| Heart Rate | INCREASED | Shalev et al, 1998; Bryant et al, 2008; Blessing et al, 2017; Bedi and Arora, 2007 |
| Respiratory Rate | INCREASED | Bryant et al, 2008 |
| Heart Rate Variability | DECREASED | Shah et al, 2013 |
| IL-1ß (pro-inflammatory cytokine) | INCREASED | Kim et al, 2020; Neigh and Ali, 2016; Gola et al, 2013 |
| IL-4 (anti-inflammatory cytokine) | INCREASED | Kim et al, 2020; de Oliveira et al, 2018 |
| IL-6 (pro-inflammatory cytokine) | INCREASED | Leclercq et al, 2016; Newton et al, 2014; de Oliveira et al, 2018; Kim et al, 2020; Neigh and Ali, 2016; Gola et al, 2013 |
| IL-10 (anti-inflammatory cytokine) *IL-10 suppresses IL-1ß | INCREASED | de Oliveira et al, 2018; Kim et al, 2020 |
| IL-12 | INCREASED | Neigh and Ali, 2016 |
| TNF-alpha (pro-inflammatory cytokine) | INCREASED | Kim et al, 2020; Neigh and Ali, 2016; Gola et al, 2013 |
| INF-y (interferon gamma) | INCREASED | Kim et al, 2020 |
| CRP | INCREASED | Kim et al, 2020; Neigh and Ali, 2016; Michopoulos et al, 2015; Aaseth et al, 2019 |
| BMI | INCREASED | Gandubert et al, 2016; Farr et al, 2014 |
| VAT (Visceral Adipose Tissue) | INCREASED | Aaseth et al, 2019; Rosenbaum et al, 2015 |
| HbA1c | INCREASED | Gandubert et al, 2016 |
| Glucose, Fasting Plasma Glucose | INCREASED | Rosenbaum et al, 2015; Nowotny et al, 2010 |
| Insulin | INCREASED *affected also by increased fat, alcohol, and sugar consumption | Nowotny et al, 2010; Rao et al, 2014; Aaseth et al, 2019 |
| HOMA-IR (Insulin Resistance) | INCREASED | Blessing et al, 2017 |
| Total Cholesterol | INCREASED | Rosenbaum et al, 2015; Talbot et al, 2015 |
| LDL | INCREASED | Talbot et al, 2015 |
| HDL | Decreased | Rosenbaum et al, 2015 |
| VLDL | INCREASED | Talbot et al, 2015 |
| Triglycerides | INCREASED | Rosenbaum et al, 2015; Talbot et al, 2015 |
| Cholesterol/HDL Ratio | INCREASED | Talbot et al, 2015 |
| Fibrinogen | INCREASED | Aaseth et al, 2019; von Kanel et al, 2010 |
| Leptin Resistance | INCREASED | Aaseth et al, 2019 |
| Estrogen | DECREASED levels increase fear signal activation while higher levels are more protective to reduce fear activation | Glover et al, 2015; Glover et al, 2012 |
| Testosterone | DECREASED | Deuter et al, 2021; Mulchahey et al, 2001; Josephs et al, 2017 |
| Cortisol | DECREASED | Gandubert et al, 2016; Michopoulos et al, 2017; Kolassa et al, 2007; de Kloet et al, 2008; Wingenfeld et al, 2015; Pan et al, 2020 |
| Cortisol | INCREASED | Bedi and Arora, 2007 |
| BDNF | INCREASED | Blessing et al, 2017 |
| Norepinephrine | INCREASED | Bedi and Arora, 2007; Gandubert et al, 2016; Michopoulos et al, 2016; Geracioti et al, 2001; Pan et al, 2018; Wingenfeld et al, 2015 |
| TSH | INCREASED *PTSD is significantly associated with hypothyroidism, ie. increased TSH | Jung et al, 2019 |
| T3 (Free and Total) | INCREASED | Wang and Mason, 1999; Wang et al, 1995; Friedman et al, 2005; Toloza et al, 2020 |
| Homocysteine | INCREASED | De Vries et al, 2015 |

**Table 3: Nutrition, Integrative Therapy, & Lifestyle Interventions for PTSD**

| Dietary, Supplement, or Therapy Intervention | Results | Citation |
|---|---|---|
| Multi-mineral supplement with Potassium (600mg), Calcium (500mg), Magnesium (200mg), Sodium (200mg), Copper (1mg), Zinc (5mg), Iron (5 mg), Chromium (60 µg), Molybdenum (80 µg), Selenium (30 µg) | Significant improvements in both blood and urine pH resulted from intake of a full spectrum alkaline multimineral supplement twice a day with no major changes in diet. This would help improve metabolic and urine acidosis concerns with metabolic syndrome, diabetes, and PTSD. | König et al., 2009 |
| Alkaline Diet | Eating a diet rich in acid producing foods produces a chronic low grade state of metabolic acidosis which shows up in blood and urine, increasing risk for metabolic disease such as T2D, which is a high risk factor of PTSD. PTSD mimics metabolic syndrome. Alkaline foods help to reduce this risk. | Carnuba et al, 2017; Souto et al, 2011; Michopoulos et al, 2016 |
| Vitamin B1 | Thiamine is a critical vitamin involved in glucose metabolism, brain and mitochondrial function, and psychological stability. Deficiency is related to both lactic acidosis and metabolic acidosis conditions associated with metabolic disorders and could be deficient in those with PTSD | Dhir et al, 2019 |
| Magnesium L Threonate | Magnesium L Threonate (MgT) has enhanced ability to improve fear extinction in the brain. | Mickley et al, 2013; Albumaria et al, 2011 |
| Omega 3 Fatty Acids | Omega 3 fatty acids were attributed to reducing memory impairment in response to PTSD stressors in a rat model. | Alqurraan et al, 2019 |
| Hydration | Increased mineral water intake was shown to have beneficial effects on blood pressure, triglycerides, glucose, and HDL cholesterol which can have a beneficial effect in reducing the acidic state produced in metabolic syndrome | Costa-Vieira et al, 2019 |
| Physical Therapy | PTSD is associated with increased risk for chronic pain. Physical therapy techniques combined with Cognitive Behavior Therapy (CBT) can help patient unlearn pain cycles and rebuild nervous system responses to fear and pain. | Sueki et al, 2014 |
| Gluten Free Diet | Gluten free diet helps to reduce symptoms of psoriasis and increased intestinal permeability associated with PTSD | Pietrzak et al, 2017 |
| Vitamin B6 | Needed to help form GABA. GABA increases cortisol, which is helpful for those with low cortisol in PTSD | Stachowicz and Lebiedzinska, 2016 |
| Herb: Hibiscus | Hibiscus sabdariffa (sour tea) has had beneficial effects in reducing blood pressure and normalizing cholesterol and triglycerides with those diagnosed with diabetes and metabolic syndrome. Given that PTSD mimics metabolic syndrome, this herb would be beneficial for cardiovascular related symptoms. | Hudson, 2011 |
| Low Carb Diet | High total and starchy carbohydrate intakes were associated with hyperlipidemia and metabolic syndrome (MetS) where a low carb diet could help reduce PTSD metabolic symptoms | Feng et al, 2015 |
| Vitamin E, Tocotrienols | Vitamin E is protective against hypercholesterolemia and cardiovascular disease while also serving as an antioxidant. This vitamin can be helpful to reduce risk of comorbid conditions associated with PTSD. | Musa, 2021; Catagol and Ozer, 2012 |
| CoQ10 | CoQ10 is cardioprotective and can help reduce hyperlipidemia in diabetic patients. This can be helpful with PTSD patients since they are at a higher risk for both metabolic syndrome and diabetes. | Zozina et al, 2018 Raizner, 2019 Dludla et al, 2020 |
| Adequate dietary protein | Helps to normalize cortisol levels, especially after exercise | Stachowicz and Lebiedzinska, 2016 |
| Exercise | Helps to increase and normalize cortisol (helpful for those with PTSD with low cortisol) | Stachowicz and Lebiedzinska, 2016; Hegberg et al., 2019 |
| Vitamin D | Vitamin D deficiency is found in those with IBS and supplementation is recommended based on levels from Serum Vitamin D testing. Vitamin D helps to improve intestinal lining integrity while reducing CRP levels. Vitamin D is recommended at 2000 IU/day/minimum. | Khayyat and Attar, 2015; Farre et al, 2020 |
| Higher Fiber Diet | Higher fiber foods (2-3 servings daily) helps to reduce risk and incidence of PTSD. | Davison et al, 2021 |
| Curcumin | Curcumin is helpful in reducing pro- inflammatory cytokine, IL-1ß, associated with IBS. | Khan et al, 2017 |
| FODMAP Diet | Reduction of short chain fermentable carbohydrates through a low FODMAP diet helps to improve inflammatory symptoms in IBS. The low FODMAP diet REDUCES Bifidobacterium bacteria, so dosing of this probiotic species will need to be at a higher dose if this diet is prescribed for PTSD- IBS patients. | Algera et al, 2019; Staudacher and Whelan, 2016 |
| Vitamin A | Vitamin A helps to improve intestinal lining integrity while reducing CRP levels. | Farre et al, 2020 |
| Digestive Enzymes | Digestive enzymes will help with macronutrient absorption while also reducing intestinal permeability to enable better vitamin and mineral absorption. | Resnick, 2010 |
| Probiotics | Increase of Bifidobacterium bacteria (spp, longus, animalis subsp Lactis) and Lactobacillus (spp, helveticus) probiotic species to help modulate PTSD symptoms and reduce dysbiosis. | Lui, 2017 |