

Post-traumatic Stress Disorder (PTSD)

January 9, 2011

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Definition (Encyclopedia of mental disorders)

Post-traumatic stress disorder, often abbreviated as PTSD, is a complex disorder in which the affected person's memory, emotional responses, intellectual processes, and nervous system have all been disrupted by one or more traumatic experiences. It is sometimes summarized as "a normal reaction to abnormal events." The *DSM-IV-TR* (the professional's diagnostic manual) classifies PTSD as an anxiety disorder.

Demographics

General United States population

PTSD is much more widespread in the general population than was thought when it was first introduced as a diagnostic category. The National Comorbidity Survey, a major epidemiological study conducted between 1990 and 1992, estimates that the lifetime prevalence among adult Americans is 7.8%, with women (10.4%) twice as likely as men (5%) to be diagnosed with PTSD at some point in their lives. These figures represent only a small proportion of adults who have experienced at least one traumatic event—60.7% of men and 51.2% of women respectively. More than 10% of the men and 6% of the women reported experiencing four or more types of trauma in their lives. The most frequently mentioned traumas are:

- witnessing someone being badly hurt or killed
- involvement in a fire, flood, earthquake, severe hurricane, or other natural disaster
- involvement in a life-threatening accident (workplace explosion or transportation accident)
- military combat

The traumatic events most frequently mentioned by men diagnosed with PTSD are rape, combat exposure, childhood neglect and childhood physical abuse. For women diagnosed with PTSD, the most common traumas are rape, sexual molestation, physical attack, being threatened with a weapon, and childhood physical abuse.

High-risk populations

Some subpopulations in the United States are at greater risk of developing PTSD. The lifetime prevalence of PTSD among persons living in depressed urban areas or on Native American reservations is estimated at 23%. For victims of violent crimes, the estimated rate is 58%.

Military veterans

Information about PTSD in veterans of the Vietnam era is derived from the National Vietnam Veterans Readjustment Survey (NVVRS), conducted between 1986 and 1988. The estimated lifetime prevalence of PTSD among American veterans of this war is 30.9% for men and 26.9% for women. An additional 22.5% of the men and 21.2% of the women have been diagnosed with partial PTSD at some point in their lives. The lifetime prevalence of PTSD among veterans of World War II and the Korean War is estimated at 20%.

Causation Theories

The science explaining the biological mechanisms behind PTSD is in its infancy but recent evidence suggests that other health care problems are linked to PTSD, including but not limited to – heart disease, chronic pain, fatigue, metabolic/bowel disorders, and dementia. Several recent scientific articles have suggested that there are associated endocrine and immune function changes in people with PTSD, and especially those with associated chronic depression. A common causative link to many if not all of the physiologic disorders associated with PTSD is inflammation. Inflammation is defined as – a response of body tissues to injury or irritation; characterized by pain, swelling, redness, and heat. The body produces inflammatory molecules, called free radicals that trigger oxidative stress and inflammation. A recent paper published by two University of California, San Diego school of Medicine researchers present a new theory that depression is linked to chronic brain inflammation (Karen Wager-Smith, Athina Markou).

Depression: A repair response to stress-induced neuronal microdamage that can grade into a chronic neuroinflammatory condition? *Neuroscience & Biobehavioral Reviews*, 2010; DOI: [10.1016/j.neubiorev.2010.09.010](https://doi.org/10.1016/j.neubiorev.2010.09.010).

“According to the new theory, severe stress and adverse life events, such as losing a job or family member, prompt neurobiological processes that physically alter the brain. Neurons change shape and connections. Some die, but others sprout as the brain rewires itself. This neural remodeling employs basic wound-healing mechanisms, which means it can be painful and occasionally incapacitating, even when it's going well.”

The fact that PTSD and chronic depression can be a neuroinflammatory condition opens up the possibility that anti-inflammatory treatments could alleviate symptoms associated with these disorders. The terms inflammation, free radicals, reactive oxygen species (ROS) and oxidative stress are almost interchangeable and a clear understanding of the interactive processes has uncovered new approaches to prevention and amelioration of this condition. What are free radicals/ROS? Free radicals or ROS can be defined as a chemical species, an atom or a molecule that has one or more unpaired electrons in its valence shell and is capable of existing independently. Free radicals

contain an odd number of electrons which makes them unstable, short lived and highly reactive; therefore they react quickly with other compounds in order to capture the needed electron to gain stability. Free radicals cause tissue damage. In normal physiology, the endogenous free radicals produced in the body are neutralized by endogenous antioxidants. In inflammatory diseases like PTSD and chronic depression free radicals may perpetuate tissue damage. Free radicals can come in various chemical forms and many are also used as biologic markers of inflammatory conditions. Medical/scientific names for free radicals include but are not limited to – Cytokines such as IL-2, TNF-alpha, nitric oxide, hydrogen peroxide, heat shock protein, etc.

Total Nutraceutical Solutions, Inc (TNS)

The answer being developed at our company, TNS, focuses on the application of whole natural mushroom-based supplements to nutritionally support the body and alleviate inflammation or oxidative stress. The mushroom is a unique food that contains some of the most potent antioxidants and bionutrients in nature. These very potent nutrients, such as Ergothioneine and Vitamin D2, have the potential to neutralize free radicals and prevent chronic inflammation. Well-known medical institutions, such as Johns Hopkins School of Medicine, Mayo clinic, and Oxford University, to name a few, are emphasizing the important roles played by these potent natural antioxidants in prevention and control of inflammation and associated medical conditions.

TNS is formulating and developing natural whole food mushroom-based products with the potential to suppress chronic inflammation. Our company is data and research driven and prior to manufacturing any product, TNS designs and performs applicable preclinical and clinical studies.

Research Results Applicable to Treatment of PTSD Inflammatory Disorders

Equine inflammatory gum disease study

Elderly horses with inflammatory gum were treated with a mushroom-based formulation, 10 grams per day, for 30-60 days. The study was organized with the assistance of Tony Basile, Equine Dental Technician at UC Davis School of Veterinary Medicine. Similar results were also obtained by Manfred Stoll, DVM, Hohenstein – Breithardt, Germany. Horses showed dramatic improvement in the severity of the gum disease within 30-60 days. **See Addendum A & D.**

Prevention and/or suppression of Paraquat induced death from oxidative stress

The study focused on the control of Paraquat induced oxidative stress/biologic death. Paraquat is a very potent oxidative stress inducing chemical and causes death in animals and plants by the toxicity of released free radicals. Highly significant results showed that Vitamin D2, produced naturally by mushrooms, was active only when present within the parent whole food; Vitamin D2 and Vitamin D3 by themselves had no beneficial effect. Oxidative or inflammatory stress was dramatically induced in the Drosophila fruit fly model by the toxic agent, Paraquat, and the end-point of death was evaluated. This model is a very well established paradigm to evaluate oxidative stress. The proprietary mushroom formula was stimulated with Ultraviolet-B light to produce a specific amount of increased natural Vitamin D2. This TNS investigator double-blinded study

conducted in collaboration with Model Biosystems Inc, a California-based biotech company, showed D2 was able to counteract and/or neutralize the oxidative stress effect and resulted in a 30% increase in survival. Also intriguing was the finding that pure Vitamin D2 and Vitamin D3 by itself had no effect on survival. **See Addendum B.**

Prevention and/or suppression of death in a mutant Alzheimer's disease (AD) model

This study evaluated the ability of edible specialty mushrooms under proprietary development (patent pending), with and without naturally enhanced levels of organic Vitamin D2, to extend the lifespan of the Alzheimer's disease mutant fruit fly. TNS showed the ability of a proprietary whole food mushroom with naturally enhanced vitamin D2 to dramatically decrease death by 27%. Statistically significant findings also revealed a physiologic difference between activity of synthetic forms of Vitamin D2 and Vitamin D3 in this neurodegenerative disease model. Study results suggest that neurons may have both Vitamin D2 and Vitamin D3 receptors and that these neuronal cell receptors may be more responsive to Vitamin D2 as compared to Vitamin D3. **See Addendum C.** This study is quite applicable to treatment of PTSD in view of the fact that death of nerve cells in AD is due to oxidative stress and inflammation.

Proposal

Total Nutraceutical Solutions (TNS) will formulate and manufacture **D-Traum™**, a natural dietary health supplement containing potent anti-inflammatory substances, such as L-Ergothioneine (Ergo), Vitamin D2, Beta-glucans, and other potent antioxidants and bioactive enzymes. This proprietary product will be based on TNS formulations that have been shown to have potent anti-inflammatory activity.

A clinical protocol to treat PTSD will be designed and implemented in appropriate medical clinics to be identified.

PTSD patient symptoms will be evaluated by non-invasive techniques including but not limited to – neurologic and psychologic intake forms, physical examination, digital thermal imaging and measurement of blood inflammatory biomarkers. Paradigms comparing these biomarkers will be created to assess patient response to treatment.

Addendum A

Chronic Gum Disease Study

Condition of equine gums
prior to nutritional, whole-food
mushroom supplementation



Condition of equine gums
60 days after nutritional, whole-
food mushroom supplementation



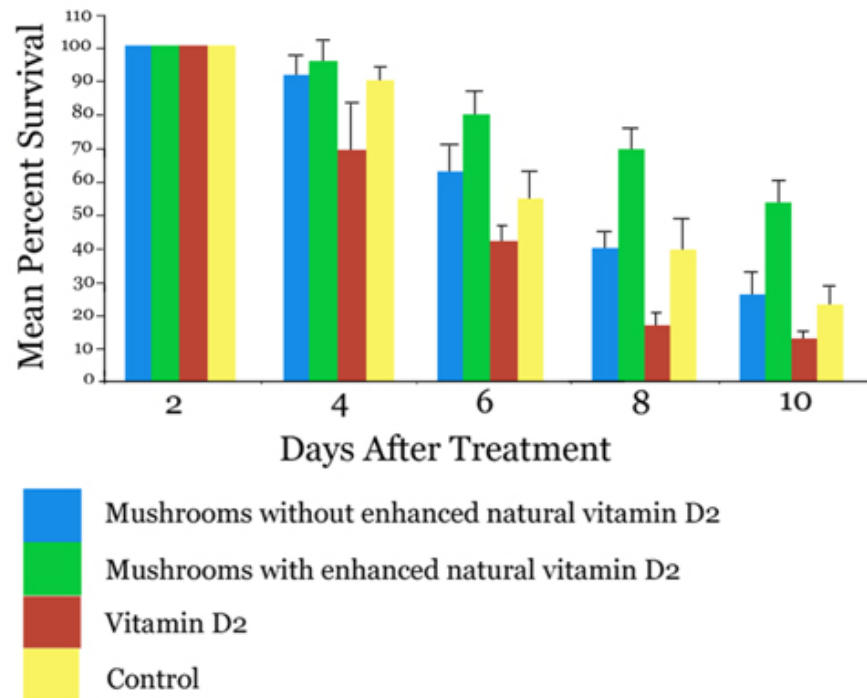
A Revolutionary Approach to Nutrition
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TOTAL
NUTRACEUTICAL
SOLUTIONS

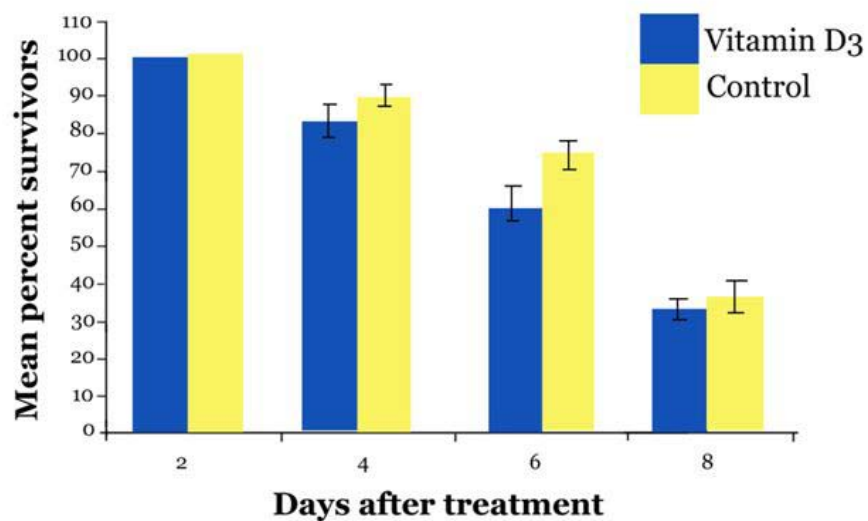
Addendum B

Prevention of Paraquat-induced oxidative stress/biologic death by mushrooms with natural Vitamin D2

Paraquat is a very potent oxidative stress inducing chemical and causes death

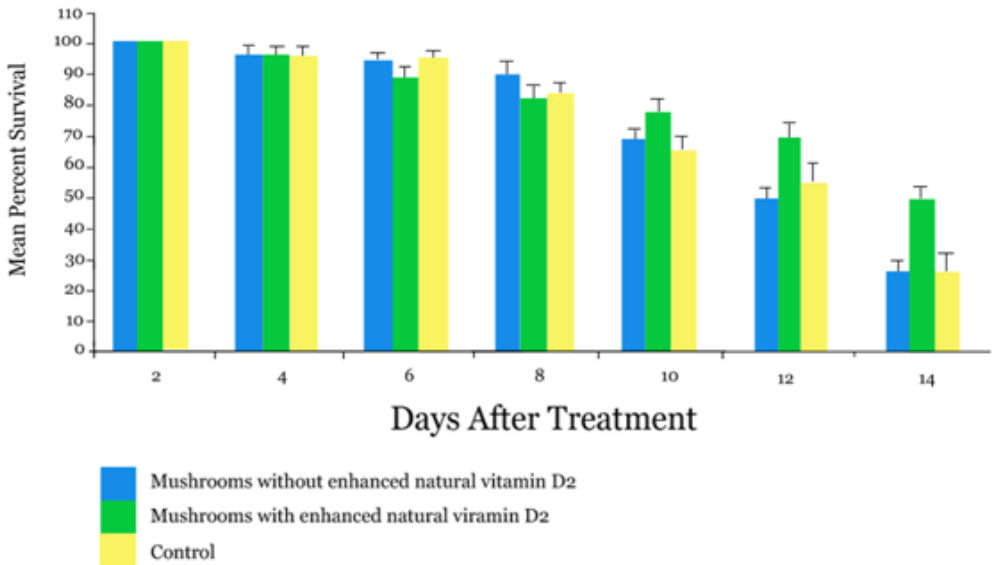


Vitamin D3 does not prevent Paraquat-induced oxidative stress/biologic death



Addendum C

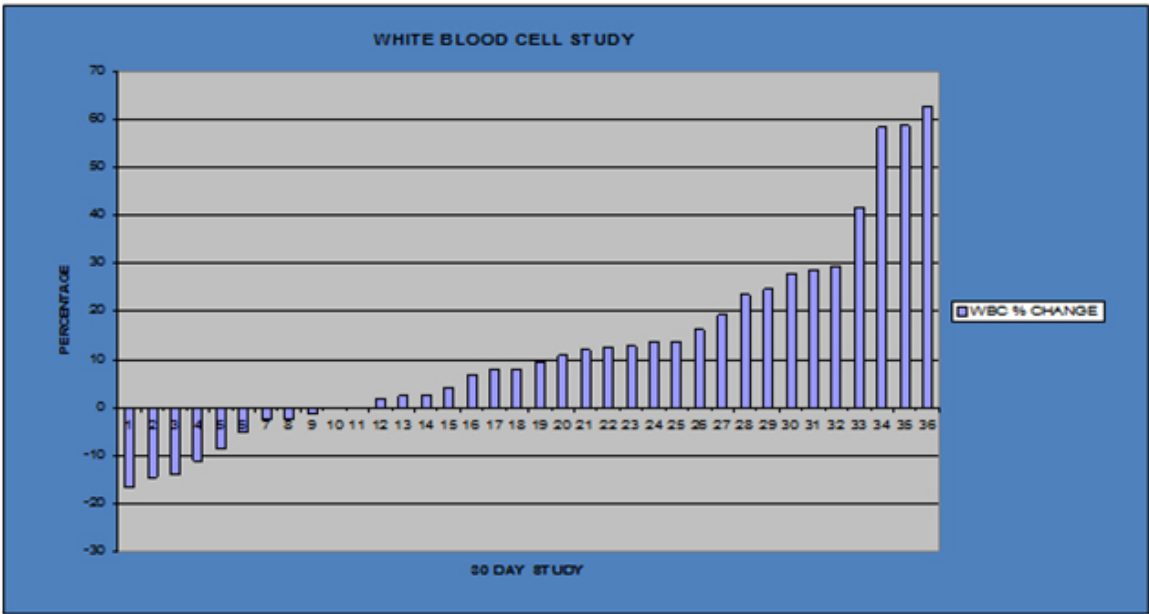
A. blazei naturally enriched with vitamin D2 significantly improves the survival rate of *Drosophila* Alzheimer's Disease (AD) flies



Addendum D

White Blood Cell Results in 36 Horses

These percentage increases in total numbers of white blood cells could help explain the chronic gum disease response. The mean response amongst all horses was 12%.



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