

Before The Bite

A Nutraceutical Approach to West Nile Virus
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Editor's note: Though the paper was written for a horse audience, nonetheless, the concepts and strategies are applicable to all animals and birds.

"Fallen blossoms do not return to branches; a broken mirror does not again reflect." This Japanese proverb illustrates the wisdom needed in dealing with the effects of viral infestations (West Nile Virus, WNV) and other challenges to a horse's immune response.

The best time to support the immune system is prior to a challenge. Too much damage can be done too quickly during a viral challenge, especially to an immune system that has not been optimized in effectiveness.

The immune system is an amazingly intricate and elusive defense network which scientists still do not completely understand. Whereas the circulatory system is powered by the heart, the nervous systems by the brain, the immune system has no particular organ as its focal point. The lymph nodes, bone marrow, thymus, spleen, tonsils and peyer's patches on the small intestine, all produce or store a variety of specialized immune cells, which are deployed as needed.

What is common to the function of all immune resources is their dependence on the optimization of normal cellular activities. Leading the defense strategy against the destruction of normal cellular activities is the proper nurturing and feeding of the immune system, which is ultimately accomplished through proper diets and diet presentation. Worldwide, the most common cause of immunodeficiency is malnutrition. Nutritional status not only can impair immune responses, it also can cause a virus to mutate from a benign to a pathogenic form. This process was studied by Beck et al, 1995, with a RNA virus, Coxsackie's virus. Concerning mutations of the viral genome, these researchers have two hypotheses. The first is that oxidative damage induces a different "consensus sequence", causing the virulent form of the virus to be selected over the benign form. A second hypothesis is that specific regions on the viral RNA could be directly damaged.

Since the WNV is a Flavivirus, which is a RNA virus, optimized antioxidant activity in all cells would seem the logical approach to help prevent the WNV from having the opportunity to establish a "beach-head" and start an all out war.

Many researchers have demonstrated the advantages of maintaining optimized antioxidant function within cells, specifically Glutathione levels (GSH), as an effective method of counteracting

or diminishing the results of viral investigation (Bounous et al, 1993; Baruchel et al, 1996; Baruchel et al, 1994; Dröege et al, 1994; Dröege and Holm, 1997; Meister, 1994; Kalebic et al, 1991; Kameoka et al, 1996; Palamara et al, 1996; Roederer et al, 1993.)

Intercellular GSH has been shown to play an important role in aspects of T-cell function, including the binding, internalization, and degradation of interleukin-2, as well as DNA synthesis (WuD et al, 1994). In particular, GSH and sulfhydryl compounds are known to augment the activation of cytotoxic T-cells in mixed lymphocyte cultures, T-cell proliferation in response to mitogens, and the differentiation of T and B lymphocytes (Buhl et al, 1989). It should be noted that T-cell lymphocytes are often considered the body's frontline defense against infection.

Lymphocytes fall into two different classes, each of which controls one of the two types of immune response. Cell-mediated immunity; cellular response (direct killing action of cells); involves a type of lymphocyte that originates in the thymus and is thus called a T-cell. Humoral immunity; antibody mediated immunity (in the blood); occurs through the action of antibodies, which are produced by the lymphocytes known as B-cells that form in the bone marrow.

T-cells and B-cells differ not only in their function but in the way they locate a foreign invader. T-cells and antibodies make perfect partners. Antibodies respond swiftly to toxin molecules and to the outer surface of microbes; T-Cells discover the antigens of hidden inner pathogens, which makes them particularly effective at tracking down infectious agents (Nossal, 1993). Thus by maximizing the function of T-cells by use of GSH precursors (GlutaSyn™), their ability to neutralize virus invasions is increased. Gutman and Schettini, 1998 report that GSH plays a central role in the functioning of immune cells, in particular its creation and maintenance of T-cell lymphocytes.

Lymphocyte GSH levels and immune responsiveness can be influenced by feeding the rate limiting precursor of GSH, Bounous et al, 1989. their studies show that the administration of cysteine in the form of a proprietary WPI mixture (GlutaSyn™) was far more effective than when administering the rate limiting precursor of GSH as free cysteine.

The use of these GSH precursors (GlutaSyn®) in maintaining high intracellular GSH levels

is not only important for the minimization of general oxidative damage caused by reactive oxygen derived molecules (ROM). ROM's are produced in the body continually as part of normal metabolic processes of oxidation – in which the food the animal eats is broken down into critical absorbable substances—or through pollutants, radiation, and certain medications, where oxygen molecules can lose an electron and become unstable particles (Pusillo, 1999). An animal in a “state of stress” is more vulnerable to damage from ROM. The state of stress is being defined as an animal undergoing strain in order to cope with adverse aspects of its environment (Pusillo, 1986). Strain is any adaptive, functional, structural, or behavior reaction to an environmental stimulus (Pusillo, 1986).

Antioxidants serve to stabilize ROM's thereby maintaining the structural and functional integrity of cells (Pusillo, 1999). Oxidative stress occurs when the balance between free radical generation and antioxidant defense is upset (Baruchel et al, 1994). If a horse's diet lacks certain nutrients, or if their body experiences excessive oxidative stress and increased ROM production, individual cells become vulnerable to damage. Oxidative stress and ROM formation can lead to increased lipid peroxidation and modification in cell membrane fluidity (Carson et al, 1986). This damages cell walls and effectively weakens the body's ability to prevent viral infection, since viruses invade by binding to certain surface molecules and by penetrating the membranes. Additionally, the absence of a proper antioxidant system, the DNA repair capacity of the cells may be altered and the functionality of the cell destroyed or impaired (Ameises and Capran, 1991; Arends and Wyllie, 1991). It should be noted that once within a cell, the viruses then use many components of the cell to replicate themselves. Cytopathic viruses damage and sometimes kill their cellular hosts through these processes.

Many of the pathologic aspects of disease in horses with WNV may not be caused directly by the virus infection, but may be due to secondary effects caused by the host response to infection. Perhaps it is this area that immunomodulation, supportive therapy and strategic nutrition has its most unique beneficial effects.

Since the GSH antioxidant system is foremost among the endogenous protective systems, it is extremely important to maintain GSH levels in the body at optimal levels for optimized health and quality of life. By maintaining GSH at optimal levels the body is better prepared to respond to homeostatic challenges, such as disease, injury and strain.

GSH's metabolic functions include the following (Gutman, 1998; Lomaestro and Malone, 1995; Somersall and Bounous, 1999):

- Enhancement of immune systems function
- DNA synthesis and repair
- Prostaglandin synthesis
- Protein Synthesis
- Elimination of toxins
- Elimination of carcinogens
- Antioxidant cell protection
- Amino acid transport
- Leukotriene synthesis
- Enzyme activation and regulation
- Protection against ionizing radiation

One can easily see that from the many functions of GSH, its enhancement in the body will aid the body in its defense against the detrimental effects of viral infections, such as WNV. The precursors of GSH found in GlutaSyn™ along with strategic nutrition and a professionally balanced diet will help support both the constitutive and induced defenses inherent to all horses. Constitutive defenses of the body such as physical barriers (skin and mucous membranes) are highly effected by proper nutrition. Since the WNV is an arbor virus, a virus spread by the bite of infected mesquites, it makes great sense that horse owners do everything possible to ensure that the best skin integrity is maintained on their horses. This can be done with proper bio available zinc, vitamin E, vitamin A, vitamin C, essential fatty acids, amino acids, selenium and a consistent balanced supply of B-vitamins. Prevention of being bitten by infected mosquitoes by external repellent is highly recommended in addition to proper maintenance of skin nutrition inputs.

In addition to GSH precursors found in GlutaSyn™, this author highly recommends the use of bovine colostrum that has been properly prepared for use in horses.

At the first signs of these potential WNV symptoms:

High fever	Incoordination
Anorexia	staggering gait
Depression	stumbling gait
Increased heart rate	convulsions
Mental depression	progressive stiffness
Lethargy	involuntary movements

Contact your local Veterinarian immediately.

In cooperation with the Veterinarians professional recommendations, be sure to provide the infected horse with the dietary components necessary to maintain a dynamic balance which promotes the natural process in the horse that compliments and enhances its ability to maintain homeostasis.

The best way to prevent the detrimental effects of WNV is to provide those dietary components necessary to foster healing, balance and optimization of the horses innate mechanisms of self-repair and homeostasis, by planning ahead before a horse becomes infected. The best way to plan ahead is to feed GlutaSyn™, colostrum and a professionally balanced diet each day. In addition, make sure you remove or decrease as much as possible all sources of increased ROM development. This includes poor diet components such as commercial feed containing detrimental byproducts and heavy metal containing minerals, radiation, excessive drug usage, pollutants, and mental stressors.

It is often too late once the blossoms fall and the mirror is broken to restore what was intake, back to its original status. Thus, by planning ahead and providing those preventative measures describe previously, and can confidently aid a horses natural ability to combat health robbing situations.

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