

What is Oxidative Stress?

Oxidative stress is a fancy term being thrown around in the human and veterinary medical community. It is a complicated inflammatory reaction or cascade of events that is worthy of some attention. In cases of inflammation, whether it is direct trauma or secondary to an infection, cells of the immune system release what is termed free radicals into the bloodstream. Free radicals or reactive oxygen species (ROS), are also released secondary to normal daily events such as breathing, consumption of various food products as well as associated with various medications we consume. Free radicals are essentially unstable oxygen derivatives with an unpaired electron(s) in the outer orbit. Given this, they are very unstable molecules. Their overall purpose or intended purpose in the body is to oxidize or toxify invading bacteria, viruses or abnormal cells... essentially designed to protect the body. However, this function is intended for short term use only and usually the levels of free radicals decrease as an infection resolves or injured tissue is healed. If the free radical levels persist for extended periods of time, then they can begin to act on normal tissue, altering its cellular function and even leading to cell death. Along with elevated levels of free radicals, there is an associated inflammatory response by the immune system, leading to the release of a multitude of pro-inflammatory proteins such as PGE-2, MMP-9 and IL-1. These proteins signal other cells to invade the area, signify the perception of pain as well as alter blood circulation throughout the body.

The body has a natural checks and balances type of system in place that is supposed to protect normal cells from damage due to free radicals and keep them under control. This natural defense mechanism is called antioxidants. There are naturally occurring antioxidants that the body produces, such as SOD, GSx and Catalase, and there are also antioxidants that are consumed in the diet such as vitamin E, vitamin C and selenium. Many herbs are also secondary antioxidants by nature, such as curcumin, green tea, cat's claw and many others. Antioxidants serve the primary function of neutralizing free radicals by donating an electron and making them stable. The problem comes is that in today's society, our eating habits are poor and we fail to consume adequate levels of natural antioxidants in relation to the amount of free radicals that we are exposed to. This potentially leads to disease and breakdown in the body. Horses are no different. It has been noted that processed foods in today's society lack nutrients and essentially have empty calories. In many cases, the various fats utilized in the preparation of those processed foods actually contribute to free radical formation in our body. Grains are no different and in many cases are considered processed feeds. The hays or pasture that our horses consume don't provide the levels of natural antioxidants that they used to and over time, many fields have become

deficient in vitamin E and selenium. So, when you couple an intact of processed foods with a decreased intake of antioxidants....trouble begins to develop. Too much bad and not enough good leads to a bad situation health wise.

Chronic elevated free radicals (ROS) are not only associated with poor eating habits, but are also associated with many debilitating conditions such as arthritis, insulin resistance, laminitis, navicular disease, long term infections, chronic obstructive pulmonary disease and many others. Let's take for example a horse that is heavily used in barrel racing. This horse over time will increasingly stress his joints leading to inflammation. This inflammation leads to free radical production. Given the syndrome continues for many years, the free radical levels continue to build and lead to tissue damage and more inflammatory protein release. Inflammatory proteins such as PGE-2 trigger pain in the animal and alters blood flow, MMP-9 is associated with cartilage degradation which then leads to arthritis. All of this, if allowed to continue unabated, will lead to degeneration of the joint, lameness and potentially loss of athletic function. Now, this horse may be on the best diet in the world with high antioxidant levels, but this will only help the animal if the level of antioxidants in the diet are enough to neutralize the amount of free radicals being produced.

Oxidative stress is a very important issue. Free radical production is a necessary evil in short term situations and helps to protect our bodies as well as those of our horses against disease and allow us to heal. The problem comes when the levels get too high for persistent periods of time. This is what leads to damage and affects the overall health of the person or animal. When horses exhibiting orthopedic disease such as arthritis, navicular and laminitis are evaluated using the FRAS-4 device, the majority of them exhibit elevated levels of d-ROM (free radicals) as well as a decreased BAP (antioxidant potential). This implies that they are undergoing oxidative stress which is affecting their overall health. In trials at Timbercreek Veterinary Hospital, PC, many of these horses were placed on Cur-OST® and exhibited improved lameness scores and overall health in a short period of time due to restoring their antioxidant levels as well as reducing levels of free radicals.