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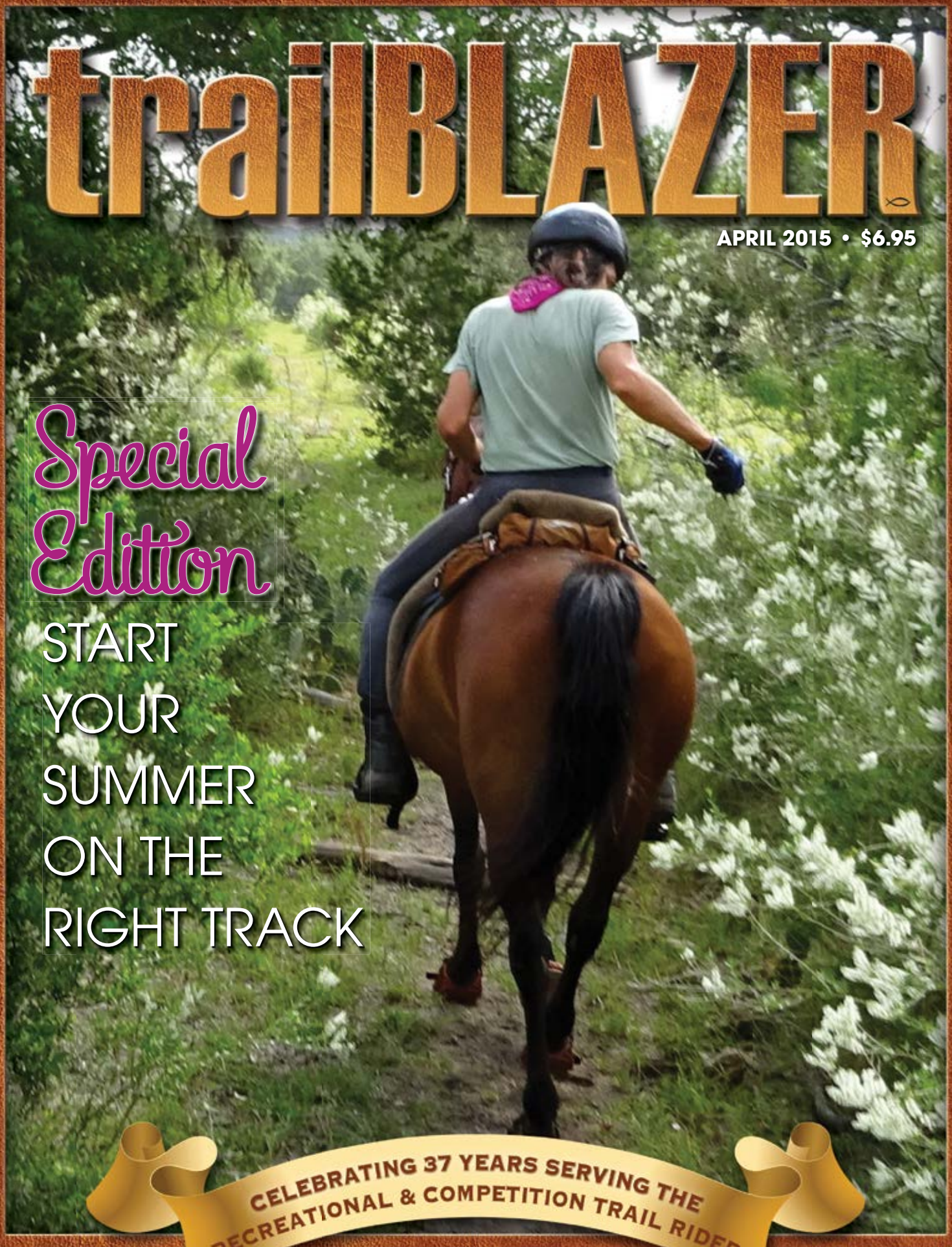

## Special Edition

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# THE WONDERS OF THE HORSE'S Immune System

## How an intricate, miraculous defense keeps your horse healthy

BY JOSEPH THOMAS, PHD
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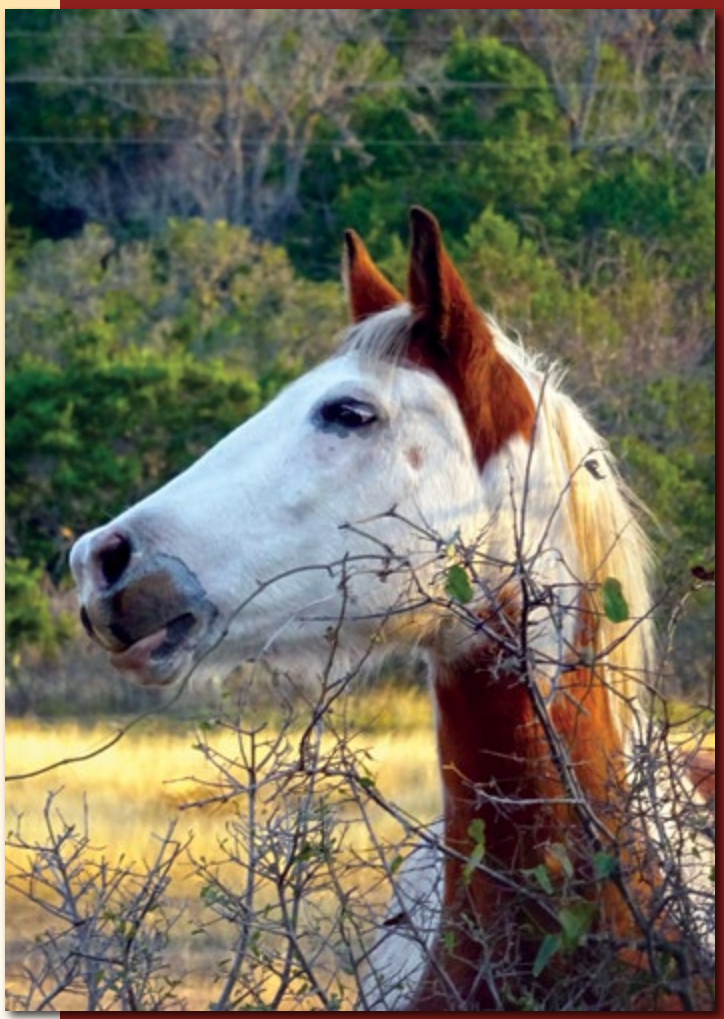
PHOTOS BY
BOBBIE JO WEBER

**One** of the most effective measures we can take to ensure our horse's health is to care for their immune system. The function of the immune system is to protect the horse from harmful organisms and substances. This miraculous protective organizational system of cells and molecules has evolved over millions of years into two intricately interactive systems known as the *innate* and *adaptive* immune systems. When healthy, these two systems work in concert to efficiently remove virulent antigens (anything that the body detects as harmful such as toxins, foreign particles and viruses) from the horse's body through the action of the white blood cells (*leukocytes*).



## INNATE IMMUNE SYSTEM

The "older" of the two systems, the innate immune system, has developed over time an extensive range of protective responses. These responses have evolved as a defense against viruses and toxic invasion. When any of these substances are present, the innate immune system activates the initial immune response—inflammation. The purpose of this inflammatory response is to rapidly "surround" the antigen or injury and contain it, until the immune system can bring in the next response. This next response comes from the white blood cells.

Once the white blood cells (leukocytes) of the innate system detect an antigen, they will either "ingest" and destroy them or activate a series of actions to slow down the harmful effects. Given a situation such as a "new" antigen invading the immune system (perhaps a virus unfamiliar to a particular horse's immune system) or a particularly difficult strain of virus, the innate system has to call upon the adaptive immune system for help. In horses with a weak and deficient immune system, where the leukocytes of the innate immune system are particularly depleted or immature, the adaptive immune system must carry the burden of defense.

## ADAPTIVE IMMUNE SYSTEM

Both the innate and adaptive immune systems consist of white blood cells or leukocytes, each with very specific functions, that work together interdependently with magnificent precision. Leukocytes from the innate immune system enlist the help of the leukocytes from the adaptive immune system, called lymphocytes, when they are incapable of eliminating an antigen by themselves. Lymphocytes are the body's primary defense against viral and bacterial infections.

A most amazing quality of lymphocytes is their ability to "remember" a "new" antigen so that when this particular antigen appears again as a threat to your horse, it already has developed the specific immunologic response needed. This results in a quicker, more potent immunologic response to that antigen.

The lymphocyte's remarkable immunologic "memory" is the basis of the development of vaccinations; that is, by introducing a minute quantity of a particular antigen to your horse, the lymphocytes rally their defenses and learn how to handle the vaccination's specific "disease," which is a "surrogate" identical disease.

It is the rapid response of the innate immune system and the forceful response of the lymphocytes along with their immunologic memory of the adaptive immune system working together that makes the immune system your horse's best "natural" protection from invading pathogens.

## IMMUNE DEFICIENCY

There is a disturbing pattern of immune weakness

Keeping your horse's delicate and complex immune system operating at a high level requires intensity of purpose and attention to detail on your part.

"There is a disturbing pattern of immune weakness increasing in horses. In my research alone on the blood work of over 300 horses with insulin resistance, I have found that virtually every horse in this group had a deficiency in leukocytes."

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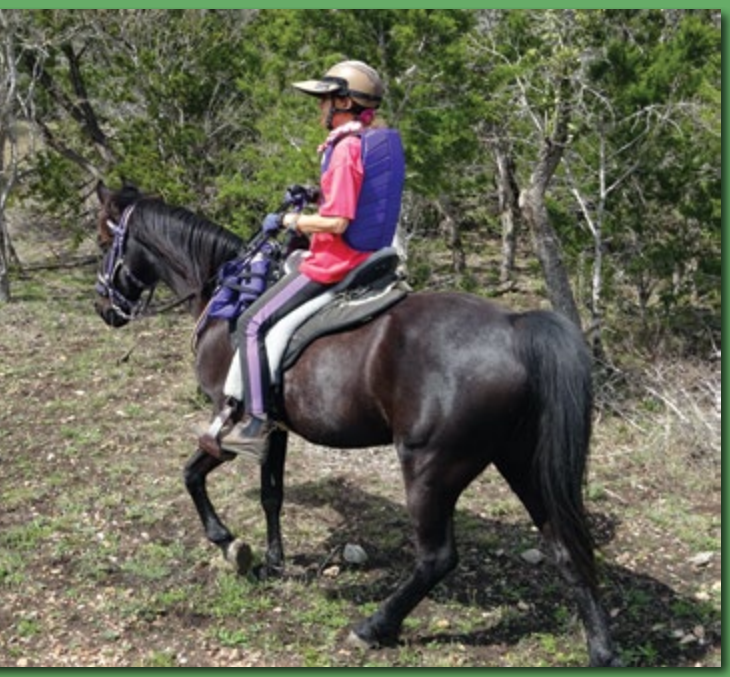


It is the rapid response of the innate immune system and the forceful response of the lymphocytes along with their immunologic memory of the adaptive immune system working together that makes the immune system your horse's best "natural" protection from invading pathogens. Photo by Kenny Weber

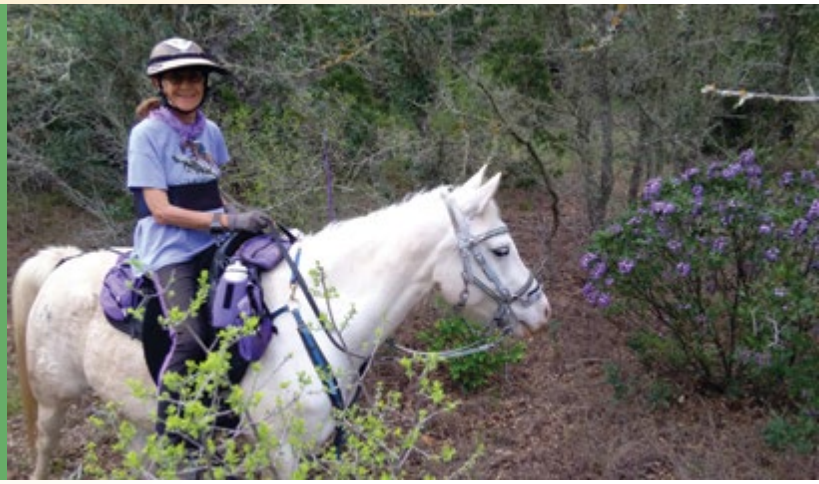
increasing in horses. In my research alone on the blood work of over 300 horses with insulin resistance, I have found that virtually every horse in this group had a deficiency in leukocytes. Within my investigation of the intestinal malabsorption syndrome where, very briefly, the horse's digestive system is incapable of assimilating food into essential nutrients, I have also found horses with weakened immune systems.

These are just two health problems, although serious ones, that display significantly deficient immune systems in horses. The implications are disturbing; e.g., these horses do not have adequate defenses to fight off infections, viral and/or bacterial; the range of harmful possibilities within these two categories is staggering. Even with mildly weakened immune systems, a horse can be lethargic, have an unhealthy looking coat, be susceptible to a variety of allergic skin reactions, coughs, etc. Hoof abscesses, for example, since they are bacterial infections, can be difficult to recover from with even mild immune deficiencies. Given a very weak immune function, hoof abscesses can cause serious damage to internal structures such as the laminae and even to the integrity of the coffin bone. This is, of course, not a complete list of possible consequences from immune deficiencies.

## HOW YOU CAN HELP

In considering how best to support your horse's immune system, it is important that you remember to nourish the development of the white blood cells (leukocytes) of both the adaptive and innate immune systems. If you choose an immune supplement or "booster," be sure that it genuinely supports the development of these white blood cells and doesn't just give a "lift" to your horse's energy. The effective help that is needed to bring about immune recovery must come from assisting the horse's intrinsic immune system to produce mature and sufficient quantities of white blood cells (leukocytes). In this way, the horse's inherent capabilities of self-protection can return and regenerate in its own natural course and time.

"Both the innate and adaptive immune systems consist of white blood cells or leukocytes, each with very specific functions, that work together interdependently with magnificent precision."



In considering how best to support your horse's immune system, it is important that you remember to nourish the development of the white blood cells (leukocytes) of both the adaptive and innate immune systems. Photo by Kenny Weber

## GLOSSARY OF TERMS

**Antigen:** any substance, such as toxins or foreign particles, bacteria and tissue cells, capable of inducing an immune response.

**Eosinophils:** a type of leukocyte whose major function is to dampen inflammatory responses and to ingest and kill microorganisms.

**Inflammatory response:** a natural, initial protective response of the innate immune system elicited by an injury or destruction of tissue. This response serves to localize the injurious agent and the injured tissue. Leukocytes can then digest and remove the antigen and dead tissue. The inflammation is an early defensive measure by the innate immune system and is held in check primarily by eosinophils and macrophages.

**Leukocytes:** white blood cells, the primary cells of the innate and the adaptive immune systems, that work against infection and tissue damage.

**Lymphocyte:** a type of leukocyte found in the lymph nodes, spleen, and other lymphoid organs that has 'memory' for specific recognition of antigens; its primary role is fighting chronic bacterial and acute viral infections and it has the capacity to destroy and remove antigen particles quickly and robustly.

**Macrophage:** a monocyte that has settled and matured in tissue where it defends against microorganisms and removes dead tissue and debris by ingesting them. Macrophages also control the progression and time duration of the inflammatory response to keep this immune response from spilling over into a pathological inflammation with increasing heat and fluid swelling. They are responsible for the recruitment of lymphocytes from the adaptive immune system to provide more effective protection against infection.

**Monocyte:** a type of leukocyte that is transported by the blood into tissues where it transforms into a macrophage through the process known as monocyte-macrophage differentiation.

**Neutrophil:** a type of leukocyte whose primary function is ingesting and killing bacterial microorganisms as well as playing an important role in the defense against viral infections.

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