Taking the Mystery out of White Line Disease. (Download PDF)

By Dr. Richard Shakalis & Dr. John Pautienis

Researchers have spent a great deal of time trying to find the single organism that causes the destruction of hoof at the stratum medium, referred to as white line disease. The hope is that the discovery of the elusive bacteria or fungus will result in a definitive cure. Unfortunately, this approach is too simplistic for the complex biological even is actually taking place. White line disease is caused by two different types of opportunistic microorganisms that e in a symbiotic relationship. Together they produce enzymes and exotoxins that break down the protein and collag the hoof wall. This dynamic colony of microorganisms consists of at least one type of destructive bacteria and at l one fungus.

This information explains quite a bit. First, because it is not caused by a single organism, white line disease may appear different from horse to horse, depending on the particular makeup of the colony of microorganisms preser For example, if there is a very aggressive fungus present mixed in with a virulent bacterium, a fast-growing, hard treat case will result. Conversely, if a slow-growing, less invasive fungus is paired with a more benign bacterium, case can be treated more easily. There may be two or more destructive bacteria or fungi present in the same hoo can begin to understand that an infinite number of combinations can result. This also explains why a certain treat may work effectively in one case and fail miserably on the next. To add another variable to the mix, these colonie dynamic and grow faster when the environment is wet and warm, and slower when it is cold and dry.

In white line disease, bacteria and fungi live within the confines of the hoof wall in a symbiotic relationship. That i they can live independently, but mutually benefit by each other's presence. Each organism breaks down the hoof different manner while providing metabolites for the other. The fungi can be heterotrophs, obtaining their food frc nonliving organic matter, or saprophytes, feeding as parasites on living hosts. They become deeply imbedded witl the hoof wall and send out threadlike filaments called hyphae that absorb nutrients much like roots of a plant. The bacterium reproduces more quickly by dividing, but the fungus can produce spores that makes it harder to kill. Treating for bacteria or fungus alone is useless because when one is eliminated, the other will continue to grow unabated. You must control both simultaneously.

These microorganisms are opportunistic in nature. That is, they ordinarily will not attack perfectly healthy hoof tis but will enter into a small crack, nail hole, or fissure at the white line. These problems commonly occur at the stra medium because this is where the horny laminae interlocks with the sensitive laminae. There is a rich blood suppl here, and wherever blood is present in nature, there is a possibility of infection. Obviously a quick is an open invit for infection. Another one is a case of laminitis that causes a split in the laminae. Even subclinical cases of laminit although not severe enough to cause lameness, could result in small tears at the stratum medium. Even bruising area can lead to problems. Any trace of dried blood from the bruise makes a perfect nutrient for growth of these microorganisms. Be suspicious of any injury in the area of the white line, however subtle. It is best to treat white disease aggressively and early.

Let's examine a typical case of white line disease found in the Northeast (*Figure 1*). The colony of organisms found here are unique to this particular horse and may be entirely different from the ones you are fighting, but remember what all cases have in common: there will be at least one destructive bacteria along with at least one destructive fungus found in the culture.

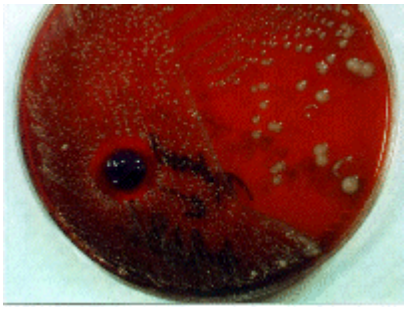
We used sterile culture containers provided free of charge by a commercial medical laboratory to gather our hoof samples.

Note the probe is pushed up deep into the hoof wall before more sound hoof structures are felt. This soft area indicates diseased hoof material.

We scooped out some soft, diseased hoof material with a clean instrument and gave the culture container to the laboratory (*Figure 2*). In our case we wanted to retest the effectiveness of an over-the-counter product specifically designed to treat white line disease, as well as identify all the bacteria and fungus present. The over-the-counter product we supplied to the laboratory technician was Sav-A-Hoof Gel by SBS Equine Products.

The laboratory technicians took the samples of diseased hoof wall and spread it on a blood agar plate and then placed it in an incubator. A mixed culture of organisms, just like what was found in the hoof, resulted (Figure 3). Each separate colony was then placed on their own agar plates, some in the presence of oxygen and some without, and the fungal samples were placed in small jars. This resulted in pure cultures for six different bacteria and a fungus, which were then identified by the technician (see Table at end of this page).

Diseased hoof material was remo
deep from within the hoof wall, a
the leading edge of the infected a
and placed in sterile culture contai
Then these samples went to th
laboratory technicians for analys



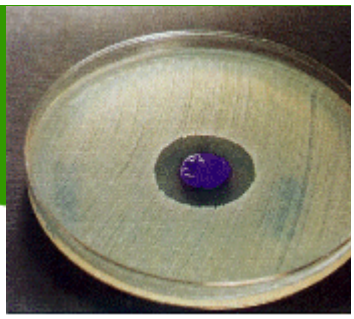
Note separate microorganism colonies growing across the blood agar culture plate after being removed from the incubator. This plate provides nutrients for the organisms to grow on. The anaerobes, including the fungus, were grown in oxygen-free jars along with a rich growth medium.

So what did we find from this mixed bag culture of micro-organisms? We ran the gamut, as one would expect, from very harmful to relatively benign bacteria, as well as a stubborn fungus in our sample. In every case, the over-the-counter product we tested - Sav-A-Hoof Gel - worked extremely well at killing both bacteria and fungus (*Figures 4 & 5*).

Of the six bacteria present, Providencia rettgeri, Klebsiella pneumoniae and Bacillus subtilis, although sometimes pathogenic in man (see Table on page 91), are not causing much destruction of hoof wall tissue here. They are simply taking advantage of a warm, dark environment to thrive in.

The next grouping of bacteria, the Staphylococcus and Pseudomonas, are capable of producing enzymes destructive to the hoof wall. The Staphylococcus prefers blood and can thus elaborate many powerful toxins and enzymes through the blood.

By far the main destructive bacteria found was Clostridium difficiles. The Clostridia found here has some particularly nasty first cousins that are responsible for tetanus, botulism and gas gangrene. Clostridium is capable of producing spores and extra-cellular products such as powerful proteinases and collagenases, substances very destructive to the hoof wall. It is an anaerobe, which means it lives only when there is no oxygen present. It can produce a whole host of destructive enzymes such as fibrinolysins, collagenase, lecithinase and cytolysins. It is one nasty bacteria.



The bacteria are growing on the e agar plate except in the darker, c area surrounding the purple Sav Hoof Gel sample. This area is bac free and represents the very effe kill zone. The bacteria are unabl grow or survive in this zone.

The special culture pictured in the jar isolated the fungus Geotrichum. This fungus is an aggressive saprophyte that grows vigorously on organic matter. It is commonly found in sewage treatment plants and is a spore former, which means it is difficult to eliminate. As shown in Figure 5, the Sav-A-Hoof Gel effectively killed this fungus, as well.

The best way to treat white line disease is first to recognize it early and then treat it with a product that is a broad-spectrum bactericide as well as a fungicide. You must remember that dry, cool conditions are your ally and that warm, wet ones are your enemy. Because some of the different organisms present are capable of producing spores, you must choose a product that is powerful and stays active for a long time. It takes time and patience to treat these infections once they gain a foothold. Even if you don't kill all the organisms initially, you may kill enough of them to slow the advancement of the disease to the point that it may grow out with successive trimmings.

Note the fungus is unable to gro survive within the clear area surrounding the Sav-A-Hoof G sample. Even with ideal growt conditions, with no oxygen and a growth medium, this area is fun free and again represents the effe kill zone.

VIRULENCE OF ORGANISMS IN HOOF AND IN MAN

Organism	Virulence In Hoof	Virulence In Man
Klebsiella pneumoniae	Minimal	Bacterial pneumonia and other localized infections su as cholecystitis, cholangitis, sinusitis mastoiditis and meningitis and endocarditis
Providencia rettgeri	Minimal	Wound infections
Bacillis subtilis	Minimal	Gastrointestinal infections
Staphlylococcus	Produces powerful enzymes and toxins that break down blood and fibrin found in the hoof wall	Pus-producing infections of the skin and less frequen lungs, kidneys, and bone
Pseudomonas	Produces enzymes that can break down collagen	Can cause antibiotic-resistant disease in persons of weakened resistance
Clostridia difficiles	Powerful enzymes break down protein and collagen of the hoof wall	Can produce extremly potent exotoxins, Examples of Clostridialm infections in man: tetanus, botulism and gangrene
Geotrichum (Fungus)	Breaks down hoof wall already damaged by bacterial enzymes	Geotrichosis - an acute, subacute or chronic disease enters oral cavity or lung, resulting in a chronic coug and bronchitis