

IMMUNITY - Part 2

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A horse owner can greatly influence immune capacity of a horse by means of proper management strategies. As mentioned previously (in Immunity – Part 1), by genetics, your horse has a certain level of immune capacity. Obviously you can't change that. It's the template you need to work with. However, by means of proper management strategies you can strive to get the maximum out of it, and to do so, there are some ground rules that need to be respected. It all starts at birth, where a proper transfer needs to take place of antibodies from the mother towards the foal. Secondly, horses need to be vaccinated on a regular basis. Thirdly, in stressful situations, such as intense competition, chronic disease, etc., the immune status deserves extra attention. Proper nutrition is key. High parasitic burdens are an energy drainer for the immune system. And last, but not least, as mentioned previously, young horses, old horses and pregnant mares are the most vulnerable horses on one hand, but also often the group of horses that tend to maintain infections within a mixed horse population. Therefore, proper grouping and housing of horses is an effective way to control infection pressure and thus unnecessary energy draining of the immune system. Let's take a closer look at these ground rules.

It all starts in the early days of life, when the horse is born. Unlike in humans, the antibodies of the mare do not pass through the placenta into the blood of the foal. The whole transfer of antibodies from the mother to the foal takes place after birth, when the foal drinks the first milk of the mare, called the colostrum. The colostrum is produced by the mare during the first 24 hours after birth and is extremely rich in antibodies. Throughout pregnancy, the mare has directed all these antibodies towards her udder, and all of these become available in the colostrum. Therefore, it is essential that the foal drinks this high quality colostrum within the first 24 hours after birth, since these colostrum antibodies are of vital importance to protect the foal during the first months of life. If the foal doesn't drink the colostrum within these 24 hours, it will function as an HIV patient, and thus will be an easy target for any type of microbe. Ninety percent of all pathologies seen in foals are related to a mishap in the transfer of the mother's antibodies to the foal in these first 24 hours. Examples are navel cord infections, joint infections, lung infections,

diarrhea, etc.; a long list of pathologies of all sorts.

It is also important to realize that in order to be able to pick up these mother's antibodies right out of the intestine directly into the bloodstream of the foal, the foal turns off its intestinal first line barrier function. This is essential; otherwise, the antibodies can't pass the intestinal barrier. Of course, mother nature doesn't switch off this barrier function too long, because the foal is vulnerable during that period. After all, an intestinal barrier that is switched off can also easily be penetrated by microbes. So, 24 hours after birth, mother nature "closes the door," and the intestinal barrier is again a top quality closed defense line. This means that, once the intestinal barrier closes, antibodies will no longer reach the bloodstream of the foal, regardless of the quality of the colostrum. So, if for any reason the 24-hour time frame has passed, the only way to provide antibodies to the foal is by administering them intravenously by means of an infusion of hyper immune serum. So, in a nutshell: the mare needs to produce ENOUGH colostrum, of HIGH QUALITY, and the foal needs to drink it within 24 hours and needs a healthy intestine to properly absorb these antibodies. Immature foals, for example, can show aberrant suckling behavior or an

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immature intestine, which favors occurrence of mishaps with the immune transfer from mother to foal. If the foal doesn't suckle correctly, your veterinarian can tube the stomach in order to directly give the mare's colostrum to the foal. This should happen within 24 hours after birth. Some brood mares tend to produce low quality colostrum at the birth of each foal, and the fact that they do so is not always clear to the owner. This is because the situation can be very misleading. Such a

mare can produce the first milk in large quantities, so the horse owner thinks, "This is great: lots of colostrum and the foal drinks perfectly." But actually, the foal isn't drinking 'Champagne' quality colostrum at that point, but 'water' quality colostrum. Typically these mares have a breeding history of foals dying from the most obscure conditions such as sudden overwhelming infections. The quality of the colostrum of these mares



can easily be checked with a densitometer. This is basically the same instrument used in vineyards to check the density of the juice of the grapes. If you breed foals on a regular basis, always tap off 150 ml of colostrum at each birth and keep it in the freezer, so you have a fall back scenario when you encounter a mare that produces low quality colostrum. Up until now, no manufacturer can produce artificial equine colostrum, and bovine colostrum, obviously, is filled with antibodies directed against bovine diseases, which don't protect the foal against equine diseases. Last but not least, some mares lose milk during pregnancy. The foals of those mares need special attention. In many of these cases, the mare has released her antibodies in that milk, so no colostrum will be available at birth. You can always let your veterinarian check the immune status of your foal by tapping blood from the foal 12 hours after the first suckle. There are stall side tests available, like the SNAP foal test, which can immediately be performed at home to guarantee or warn about the successfulness of the immune transfer from mare to foal. If you take into account what the cost is of a sick foal, such a test actually should be performed by each horse owner after each birth.

Another important management factor to favor and boost immune status is vaccination. Foals can be vaccinated as soon as the level of mother's antibodies in their blood is declining - this is from 4 months of age. It's important to realize that foals are not protected from the first vaccination onwards. In most cases a repeat vaccination is necessary a short time later in order to install the hard disk of the B-lymphocytes.

In adult horses, as mentioned previously, it is important to repeat vaccinations as prescribed by the manufacturer in order to boost the immunity each time to create a sufficient pool of antibodies. Therefore, the success rate of vaccines is based on the formation and preservation of memory of the immune system. However, what's also important to keep in mind is that the amount of memory that is built up after vaccination depends on the activity of the immune system itself. In other words, you can inject the perfect vaccine at the right time, yet the vaccination may not be effective due to other factors. For example, a horse treated with corticosteroids to treat

Be aware that transfer of immunity from mother to foal can fail in immature foals.



Friesian foal with severe infectious arthritis due to failure of immune transfer.

dust allergies will have a suppressed immune system. So it is better not to vaccinate a horse while it receives the anti-allergy medication cortisone.

Not only medication, but other factors such as shortcomings in the diet or a bad management of the environment of the horse can cause suppression of the immune system. This means that some measures can be taken to strengthen the immunity and to avoid excessive exposure to pathogens.

Stress is an important energy drainer for the immune system. Stress can be due to regrouping young horses after weaning, changing owners, moving the horses to another training address, subjecting horses suddenly to intensive training or intensive competitions, etc. Stress is also caused by repetitive and profound parasitic infections, which, unfortunately even in 2018, remains a frequently encountered problem in horses. Especially in breeding farms where young horses are grouped together to grow up, infection burdens can be enormous.

sometimes unnoticed by the horse owner. The reason for this is the combination of the less robust immune system in young horses and the increasing manifestation of resistance of these parasites against deworming products. Your veterinarian can help you with smart advice on how to properly deworm your herd. The time that we used to say: "the more deworming product you give, the better the result" is long gone. Nowadays you need to deworm smartly and swiftly. If you have enough knowledge about the life cycle of these parasites, you can do so in a very effective way, with a minimum of deworming product, thereby not stimulating development of deworming product resistance at your farm. As always, knowledge is key.

Infectious diseases are another important factor that influences the immunity of horses: certain infectious agents can seriously suppress the immune system of the horse. EHV 2 and EHV 5 receive a lot of attention in that respect over the last few years. Other chronic diseases require so much effort from the immune system that it gets exhausted, which means that the horse will not be able to fight off other microbes in the environment. In such a situation, a chronically ill horse can die from an initially banal infection. Another recurring problem involves a bacterial infection following soon after a viral infection. For example, a horse may get the flu, and the influenza virus then causes the immune system to work at maximum capacity. If a bacterial infection in the environment chooses that moment to strike, there will not be much energy left to fight it off. What you get then is a horse that first has the flu and all of a sudden develops bacterial pneumonia. All of these situations can be prevented with proper management and anticipation of such a sequence of infections.



Unilateral purulent discharge in a Friesian horse with strangles.

An Important Management Factor: Strategic Separation of Horse Groups

An important management factor to suppress the infection burden of a group of horses and thus reduce pressure on their immune systems is "strategic separation." To better understand this concept, you need to understand three terms: "carrier status," "latent infection," and "incubation period."

"Carrier status" describes the condition of a horse that has gone through an infection and has stopped showing any symptoms (sometimes the horse hasn't even shown symptoms despite ongoing infection), but the horse is still "carrying" and shedding the microbe, posing a threat towards herd mates. Carrier status may lead to terrible consequences when "strangles" are involved. You can buy a horse that seems perfectly healthy but still carries strangles bacteria within the guttural pouches. Chances are high that, when you introduce such a horse into your herd, you will have a strangles outbreak all of a sudden, seemingly coming "out of the blue." To prevent such an outbreak, you can have your veterinarian check for "carrier status," and you can put any new horse into quarantine before introducing the new horse into your herd. This means housing the horse in a separate stable, making sure the horse has no nose to nose contact with other horses, and providing the horse separate turn out on a separate paddock for at least two to three weeks.

Each disease has its own "incubation period" during which invading microbes take time to adapt to their new environment and start to multiply. After the incubation period, the infected horse should begin to show signs of disease. Placing a new horse in quarantine for two to three weeks will prevent the horse from infecting other horses during this incubation period. Be aware that horses that leave the stable to go elsewhere (for example to show competitions) can be infected with a virus when they return home even if they don't show any signs of disease yet. At that point, they already are able to transmit the disease to their home herd mates. Thus, your competition horse may return home and seem perfectly healthy yet start to show signs of illness days to weeks later. In most cases, this occurs within two to three weeks. Because infection may be brewing during this time, it is best to quarantine for two to three weeks competition horses and other horses that have traveled away from home. If a horse regularly competes away from home, that horse should ideally be kept separate at all times. As mentioned previously, the most sensitive horse categories are foals, pregnant mares, and elderly horses.

Secondly, when new horses arrive in the stables, keep them in quarantine for two to three weeks to make sure they are healthy. From a practical point of view, it is not always easy to do so, but this is an important measure to prevent unnecessary disease outbreaks in a home herd.

A "latent infection" means that the horse is infected, but the infection remains "hidden from the immune system" inside the body. A classic example of such an infection is a herpes virus infection. Herpes viruses can hide inside the body, and the immune system is not able to recognize and destroy them. Even after healing, each time the horse is subjected to a stressful period, the multiplication of the virus will start again

and the horse can then transmit the virus to other herd mates and make them sick. Horses with "latent infections" don't show symptoms - that's very important to realize. A lot of research is focused on studying the effect of herpes viruses on the immune system. There are many types of herpes viruses. The Equine Herpes Virus 4 (EHV 4) is notoriously known for its ability to cause respiratory infections in horses. The EHV 1 virus on the other hand can cause much more important problems such as abortion and neurological symptoms (ataxia) in horses. As mentioned previously, EHV 2 and EHV 5 are thought to suppress immunity in horses, rendering them much more vulnerable to other microbes in the environment.

Unfortunately, herpes viruses are endemic, which means that horses that go out for competition or for leisure riding with horses from other horse owners are very likely to come into contact with herpes viruses. If you have precious pregnant brood mares at home and you don't separate them from competition horses coming home and possibly carrying the EHV 1 virus, the mares may abort a few weeks later. These unnecessary events can be prevented with proper vaccination, proper separation, and proper attention to the immune system. A first important measure to take is to group the horses by age and keep them separate from other categories: foals together, pregnant mares together, competition horses together, older horses together, newly introduced horses in quarantine.

In addition to maintaining quarantine at home and grouping horses strategically, it is important to avoid nose-to-nose contact between your horses and "foreign" horses. Nose-to-nose contact is a very important way of transmitting

infections between horses. Strangles, a feared disease because of its highly contagious nature, is transmitted by nose-to-nose contact. Keeping this in mind, don't let horses drink from a common trough or bucket at competition: use one bucket for each horse and disinfect it on a regular basis.

Diet is also important to prevent diseases and optimize immunity. It is important that horses receive a balanced diet, adapted to their morphology and their training. For example, vitamins E and A are very important for the immune system. Probiotics and prebiotics have found their way to the equine feed market. Though there is still need for scientific proof of their effectiveness in many cases, for some of these products scientific proof is becoming more and more available.

Last but not least, avoid putting stress on your horse as much as you can. When a horse is subjected to stress, that is "negative stress," it produces a lot of corticosteroids, and these suppress the immune system. Chronic stress is a showstopper for the immune system. Intense competition, international transportation on a regular basis, and even issues among horses within a herd hierarchy are all classic examples of chronic stress factors. Be aware that horses cherish regularity and predictability. What may be a "party" for you as a horse owner can be a nightmare for your horse. Always build up your training protocol with small steps, introduce management changes progressively, and don't change times of feeding and turn out unless absolutely necessary.

As you can see, we can do a lot to support the immune system of our horses. The secret of success is to understand the physiology behind it.

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Field	Life Sciences	Subject	Veterinary Sciences	Mathematics
World Rank	1	2	3	4
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2	Utrecht University	368.6	68.1	
3	The Royal Veterinary College	345.3	77.9	
4	The University of Edinburgh	323.8	66.8	
5	University of California, Davis	321.3	68	
6	University of Liverpool	307.7	60.4	
7	University of Zurich	280.4	71	
8	University of Veterinary Medicine Vienna	267.3	76.7	
9	Autonomous University of Barcelona	261.9	87.1	

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