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TENDON AND LIGAMENT INJURIES?

HOW REGENERATIVE THERAPIES CAN HELP YOUR HORSE!

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Tendon and ligament injuries, suffered by performance horses, are often an all too familiar condition to owners and trainers. Conformation, age, training, conditioning, and footing all have potential roles to play towards in increasing risk of injury. Sometimes, no matter the pre-cautions we take, injury may still occur. These sorts of soft tissue injuries may be threatening to a horse's competitive career, as healing often results in scarring. Scars are not as flexible, or as strong, as the types of collagen fibres that make up tendons and ligaments. Regenerative therapies may be an option in some cases to help initiate and regulate healing, with the hopes of returning function to the injured structures.

Form and Function

Tendons and Ligaments are both very important anatomical structures for locomotion. Tendons serve to attach muscle to bone, resulting in a joint flexion or extension based on which muscles contract. Tendons also absorb energy created from the force of the hoof making contact with the ground; this energy is then released to help propel the leg forward. Think of it a little bit like a rubber band which has been stretched and then released. This function decreases the amount of muscle contraction necessary to move a limb. Ligaments on the other hand, attach bone to bone, supporting joints and preventing them from moving in an inappropriate manner.

Both structures are largely composed of collagen fibres. These collagen fibres are very specialized for their function, but lack an effective adaptation for healing. There is a low blood supply to these areas, which makes it more difficult for cells associated with healing to gain access to the site of injury, as well as to remove waste products as healing occurs. Often scarring is seen rather than regeneration of collagen fibres, which leads to the loss of normal function of the structure. Because of the high stress and forces that tendons and ligaments undergo, the weaker and less flexible scar tissue may prevent a horse from performing as it once had, as well as putting them at higher risk for further breakdown and re-injury. It is important to remember that tendons and ligaments require 10-12 months for the scar tissue to build and mature, and that it will be weaker in comparison to the surrounding tendon or ligament collagen fibres.

Understanding How Regenerative Therapies Work

Regenerative therapies have been around for many years – Pin Firing and Freeze Firing are two of the earlier modalities which date back to the 1900's, and can still be seen today, especially in race horses. No matter which modality is used, regenerative therapies serve to stimulate the body's own healing processes in some manner. After treatment, there is often a period of inflammation to increase blood flow to the area. Increased blood flow promotes the influx of rebuilding molecules to the site of injury. Other effects of regenerative therapies include a decrease in pain due to reduced inflammation (after the necessary initial inflammatory phase), and to encourage strengthening and increased elasticity of collagen fibres. The ultimate goal in using regenerative therapies is to minimize pain, and to restore function to the injured soft tissue structures. Some structures still have a poor prognosis, upon injury, for return to high level competition, and in those cases these therapies are aimed at improving quality of life.

Some Types of Regenerative Therapies

Prolotherapy

Prolotherapy is a combination of Dextrose, B12, Procaine, and Adenosine Monophosphate. "Prolo" is mildly irritating, and when injected into a tendon, ligament, muscle, or scar causes an inflammatory response. The increase in blood flow brings nutrients and reparative cells to the site of injury in order to encourage healing, and the laying of new collagen fibres. Ligament repair occurs for up to six weeks, and often at this time we will do another treatment in a series Prolo injections. In some cases we may do up to 5 or 6 treatments every 4 to 6 weeks. It is thought that tendons and ligaments will achieve maximum strength within one year after Prolotherapy is completed.

Platelet Rich Plasma (PRP)

Platelet Rich Plasma (PRP) is a concentration of the platelets found in whole blood. We separate out other factors such as the white blood cells, and red blood cells to where we are left with just a concentrate of platelets. Known for their role in stopping bleeding, platelets also secrete a large number of what are known as, protein growth factors. When stimulated by bleeding and exposed collagen fibres (as you would see with a tendon or ligament injury), these "factors" play many roles in initiating, supporting, and regulating the healing and inflammation process. Some of these roles include anti-fibrosis (scarring), new blood vessel growth, and increased cell migration. It is also suggested that injured tendons treated with PRP show improved strength and loading capacity, when compared to injured tendons which were not treated. To our current knowledge, it is the actions of these growth factors that we are after when using PRP.

Mesenchymal Stem Cells

Stem cells are cells that have the ability to turn into different types of tissues. Not all stem cells can turn into any structure - they are specialized based on their location in the body. Mesenchymal Stem Cells originate from connective tissue, and therefore, usually regenerate into connective tissues (this may include tendon and ligament fibres). Most commonly we collect these cells from one of two places, either from the bone marrow, or from adipose (fat) tissue. There is a great debate as to which is better to use, and both sources come with their own benefits. Which one to use may come down to availability and preference by your veterinarian until more research is completed. There are a number of ways that stem cells may assist in the healing of an injury. One feature is that stem cells have a homing effect. The cells are stimulated by the body to travel to the site of an injury, and often we inject the stem cells directly into that site. This helps to encourage a high concentration in the area that is in need of healing. Stem cells also have the ability to support cells around them to help prevent cell death, and also encourage other cells to help with healing – promoting some similar effects to those seen with PRP administration. Perhaps the most recognized feature is that stem cells have some capacity to differentiate into different cells in order to encourage healing.

Extra-Corporeal Shockwave Therapy (Shockwave)

Originally used for breaking up kidney stones in humans, Shockwave therapy has since been adapted as a treatment for musculoskeletal conditions. Exactly how the high energy sound waves affect these injuries is debated and is not fully understood. It is thought that mechanical pressure placed on the tissue stimulates healing and repair mechanisms such as encouraging new blood vessel formation, cell homing, bone remodelling, local analgesia (pain reduction), and breaking down mineralizations. It is important to not treat new injuries with Shockwave until the initial inflammatory phase is completed.

Shockwave has the potential to be used prior to administration of Stem Cells, with the goal being to affect the tissues in such a way that we encourage the Stem Cells to stay in the area and aid in healing.

Interleukin-1 Receptor Antagonist Protein (IRAP)

Chronic inflammation can cause pain, as well as the release of specific molecules that can continue to cause further damage to inflamed tissue. Interleukin is one of the major inflammatory factors in horses that cause further degradation of inflamed structures. IRAP blocks the receptor site where Interleukin must attach to in order to function, effectively decreasing the local inflammation and pain, as well as the damage that the two can cause.

We collect IRAP by drawing blood from the horse's jugular, and transferring it into a tube with specialized glass beads. This tube is then incubated for 24 hours. During this time, white blood cells are encouraged to produce and release the interleukin antagonist protein by the glass beads. After we filter all red blood cells and white blood cells from the IRAP we are then able to inject it into the desired site.

So What Does It All Mean?

Regenerative therapies give Veterinarians new and exciting options to treat tendon and ligament injuries. With accurate diagnostics, we can target these injuries with different treatment modalities in the aim of improving quality of healing, and increasing chances for return to previous level of performance.

Not every case may be a candidate for the therapies described above, and many factors go into the choice of regenerative therapy(ies) for each horse. We encourage you to discuss your horse's individual case with your Veterinarian. Gillis, C.L. (1997) Rehabilitation of tendon and ligament injuries. Proc. Am. Ass.

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