Update on Regenerative Therapies for Equine Lameness

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 Over the last decade the popularity of a variety of regenerative therapies used as treatments for musculoskeletal injuries has increased substantially. Currently the terms “regenerative therapy” or “biologic therapy” are common buzz words used to refer to a plethora of treatment options. What is a regenerative therapy? Tissue regeneration refers to the return of an injured tissue to its normal pre-injury state. Bone and the liver are examples of tissues capable of regenerating normal tissue, while the cartilage found in joints and nerve tissue have little regenerative capacity. Many tissues heal with abnormal scar tissue which predisposes to re-injury in the case of tendons and ligaments, or simply does not function as well as normal tissue in the case of joint cartilage. Tissue regeneration requires 3 components to be present; cells, growth factors, and a scaffold. Tissue cells produce a substance called “matrix” which is unique to each tissue type. Growth factors keep the cells alive and stimulate them to produce a particular type of matrix. Finally, the scaffold provides a structure for the cells and the matrix to attach to, giving the tissue its structure. Most regenerative therapies only have one or two of these qualities, thus therapies may be combined to meet all of the criteria of the regenerative therapy triad.

 Regenerative therapy options include stem cells, platelet rich plasma (PRP), bone marrow aspirate concentrate (BMAC), and autologous conditioned serum (ACS or IRAP). Stem cells meet only the criteria for cells. There are 3 major types of stem cells; embryonic stem cells, adult derived stem cells, and induced pluripotent stem cells (iPS). To date, equine embryonic stem cells have not been isolated successfully. Adult derived stem cells have been isolated from a variety of tissues with bone marrow and fat derived cells being the most common. For musculoskeletal treatments, bone marrow stem cells appear to be more appropriate. iPS cells are mature adult cells (ie. skin cells) that have been manipulated back to an embryonic state. The potential benefits of these cells are greater plasticity (ability to regenerate different tissues) than adult stem cells without having to obtain the cells from embryos. Equine iPS cells are in development but not yet in clinical use. Stem cells have been evaluated for injection into tendons, ligaments, and joints. While tissue regeneration has not yet been fully achieved the cells do seem to positively influence the healing process and may have an anti-inflammatory effect. PRP is a blood product that contains higher platelet concentrations than in blood. Platelets contain many growth factors and plasma contains proteins required to form a scaffold, thus all PRP is missing is the cells to form tissue. PRP has been used for tendon and ligament lesions, as well as joint injection. Importantly, PRP is only useful in tendon/ligament tears or core lesions. Joint injection is a newer use and more research is needed, however evidence in human clinical literature suggests PRP may be beneficial compared to hyaluronic acid. Many companies have manufactured PRP systems, however there is massive variability in products. Current evidence indicates that a low white blood cell PRP may be best for tendon/ligament repair. Furthermore, activated PRP may cause more joint inflammation that resting PRP when injected into joints. Research is currently underway to determine the best PRP product. BMAC can be described as PRP made from bone marrow. It contains all 3 components of the regenerative triad, however it also tends to be more variable than PRP and contains fewer stem cells than can be injected after stem cell culture. Nevertheless, BMAC improved cartilage healing in an experimental study. IRAP, like PRP is made from the horse’s own blood. Unlike PRP it contains only growth factors, but no scaffold. The rationale for the use of IRAP in joints is that it blocks one of the major inflammatory proteins in osteoarthritis. Currently IRAP is used most often when horses are no longer responsive to steroid injection. There is no evidence at this time to support the use of IRAP in tendons or ligaments.

 Regenerative therapies represent an exciting new frontier in medicine and treatment of orthopedic diseases. With further advancements we may one day be able to return tendons and ligaments to their normal function, and halt or reverse the process of osteoarthritis. However there is much work to be done. Promising results have been achieved in clinical cases, but with so many options, complex terminology and rapidly changing research, treatment choices can be overwhelming. A veterinarian who is up to date on current research and experienced in the use of regenerative therapies can help you navigate this ever changing field when making treatment decisions for your horse with lameness and orthopedic disease.