

# South Shore Equine Clinic & Diagnostic Center

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## Regenerative Medicine

Regenerative Medicine is the process of creating living & functional tissue to repair or replace tissue or organ function. Uses include injury, age, disease, and congenital defects. Examples of uses in humans include: Heart muscle (heart attack), skin for burn victims, spinal cord injury (restoration of movement), and musculoskeletal (OA, tendonitis, desmitis, fractures). In horses, use is primarily restricted to musculoskeletal cases and laminitis.

Available modern therapies in horses include **Platelet Rich Plasma (PRP)**, **Interleukin-1 Receptor Antagonist Protein (IRAP)** and **Stem cells (Bone marrow derived, Fat derived, Umbilical cord blood/ tissue)**.

### **PLATELET RICH PLASMA (PRP)**

The benefits include the ability to “Jump” starts healing; act as a scaffold for healing, and improvement in hemostasis and clotting factors. PRP is also anti-inflammatory, and antimicrobial. PRP can be used in bone healing, tendon and ligament healing, and can also be combined with other regenerative therapies.

PRP acts by releasing release growth factors, Specifically TGF- $\beta$ , PDGF, and VEGF. These factors stimulate healing within the body. Blood samples are taken, spun down, and prepared for immediate use in areas of injury.

### **Interleukin-1 Receptor Antagonist Protein (IRAP)**

Interleukin-1 is one of the most potent inflammatory elements (cytokines) in the body. High levels can be found in joints that are suffering from trauma or degenerative arthritis. The body also manufactures the antagonist (IL-1Ra ) to keep things in check. These two elements are balanced in NORMAL joints. In osteoarthritis situations, there is not enough IL-1Ra to block destructive effects of increased IL-1. This results in inflammation, joint pain, and cartilage destruction.

IL-1Ra, or IRAP, is often used in diagnosed cases of synovitis and capsulitis, joints that have been previously treated with HA and/or corticosteroids, after arthroscopic surgery in joints with focal articular cartilage disease. IRAP is also now being used in some cases involving tendon sheath injuries or bursitis (navicular bursa).

Blood is incubated with specially impregnated beads for 24 hours and then centrifuged so the serum containing high levels of IL-1Ra can be harvested. The treatment protocol is typically 3

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treatments 7 days apart; a therapeutic effect is often seen within days of the first injection, after the third treatment with advanced disease. A fourth treatment is also recommended 4– 6 months after the initial series.

## STEM CELLS

Stem cells function to stimulate tissue healing, evade the immune system, produce desired tissue, and have an anti-inflammatory action. Current sources of stem cells in horse include **Fat tissue (ADSC), and Bone marrow (BMSC)**. Stem cells use in horses is typically reserved for tendon and ligament cases, although use in bone repair is possible.

Fat Tissue derived Stem Cells are harvested from the gluteal fat adjacent to the tail. One or two incisions are made, depending on the age of the horse. Younger horses have more stem cells per volume of fat than older horses. The fat is then sent out for processing and returned within 3 days for ultrasound guided injection into the injured site.

Bone Marrow Stem Cells can be harvested from the hip (tuber coxae) of horses under 4 or 5 years of age, and also from the chest (sternum) of older horses. The BMSC can be processed through a filter and centrifuge and then directly injected into the patient using ultrasound guidance within 20 minutes. You can also send out the bone marrow for culture expansion and then inject 3-4 weeks later.

Stem cells appear to be more effective if used soon after injury. One of the key factors found is the maximum time between injury and implantation should be less than 44 days. Immediate therapy should center on anti-inflammatory care: cold-hosing/icing, Bute or Banamine, or Surpass. Re-injury occurred in cases where implantation occurred over 80 days after injury; most likely due to fibrosis within the healing tendon.

Injecting stem cells 1-3 weeks post injury is ideal. BMSC includes some PRP, whereas ADSC should have PRP added. A follow-up 3-4 weeks later with an ultrasound exam will establish the degree of healing. If necessary, another dose of PRP can be injected to continue healing. The jury is still out on whether to do an additional stem cell injection.

## FUTURE

The future may involve banking stem cells at an early age of potential equine athletes for future use. In addition, studies are ongoing comparing the different systems and preparation techniques to ensure minimum dosages of PRP and Stem Cells will be used. IRAP appears to be a great joint saving agent and pain reliever to those patients who do not respond well or cannot handle repeated doses of corticosteroids. Stay tuned for future advances in this exciting arena!