Current Applications of Equine Regenerative Medicine

Dr. Laurie Goodrich opened her presentation by emphasizing the importance of regenerative medicine in the treatment of equine musculoskeletal injuries. She noted that while the field is still developing, promising results have been achieved with various regenerative therapies.

**Stem Cells**

Goodrich explained that stem cells are a key component of regenerative medicine. They are capable of differentiating into various cell types, making them a versatile tool for tissue repair. There are three main types of stem cells discussed: bone marrow-derived cells, adipose-derived cells, and embryonic stem cells.

- **Bone Marrow-Derived Cells**: These cells are harvested from bone marrow aspirates and can differentiate into various cell types, including cartilage and bone. Goodrich cautioned that this method can be prohibitive for some owners due to the cost.
- **Adipose-Derived Cells**: These cells are obtained from liposuction and offer a more cost-effective alternative to bone marrow-derived cells. They are particularly useful for treatment of tendinopathies and ligament injuries.
- **Embryonic Stem Cells**: While still relatively new, embryonic stem cells show promise for treating a variety of injuries, including damaged cartilage, fractures, and desmitis (ligament inflammation). Goodrich noted that these cells can survive for a long time and are capable of differentiating into various cell types.

**Platelet-Rich Plasma (PRP)**

Goodrich turned her attention to PRP, a popular regenerative therapy that involves collecting and concentrating the small blood cells, specifically platelets, which are responsible for blood clotting. When combined with other substances like growth factors, PRP can be administered to promote tissue healing.

- **Function**: Goodrich explained that PRP works as a high concentration of platelets that release growth factors at the site of injury, promoting healing and improving vascularity. Researchers have determined PRP's effects on regeneration, such as increasing the healing of collagen, vascularity, cellular metabolism, and histologic outcome.
- **Dosing**: Goodrich cautioned against the "if a little is good, more must be better" theory when it comes to PRP dosing. A study showed that the dose of platelets didn't improve collagen healing over smaller doses.
- **Comparison to Other Therapies**: Despite the existing laboratory research, there aren't many published clinical trials of PRP. Goodrich noted that while studies have shown some improvement in racing success following PRP, caution is advised. One showed that horses treated with PRP healed significantly better than those not treated, while another showed no difference in racing success following PRP or other treatments.

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

Goodrich also discussed IRAP, a new therapy that involves administering interleukin-1 (IL-1) receptor antagonist protein. IRAP might also have benefits when used in injured tendons, according to Goodrich.

- **Benefits**: Goodrich added that while IRAP might also have benefits when used in injured tendons, there are horses at risk of developing laminitis following traditional intramuscular IL-1β administration. Goodrich noted that when IL-1β administration decreased both inflammation and lameness while increasing transforming growth factor β (TGF-β) levels. Veterinarians have used both of these substances to promote cartilage and tendon healing.
- **IRAP Production**: When the IRAP has reached the desired level, veterinarians can administer it to promote healing.

**Embryonic Stem Cells**

Goodrich noted that embryonic stem cells also carry a hefty price tag, making them cost-prohibitive for some owners. She cautioned, however, that the "if a little is good, more must be better" theory doesn't apply to PRP; administering a higher dose of platelets didn't improve collagen healing over smaller doses, she said.

**Conclusion**

Goodrich concluded by emphasizing the importance of ongoing research in the field of equine regenerative medicine. She noted that while PRP is safe and could help improve healing in soft tissue injuries, more evidence is needed to support its effectiveness. Despite the existing laboratory research, there aren't many published clinical trials of PRP, she cautioned. One showed that horses treated with PRP healed significantly better than those not treated, while another showed no difference in racing success following PRP or other treatments.

Goodrich said IRAP has the ability to block interleukin-1 (IL-1) receptor antagonist protein (IRAP) production. When the IRAP has reached the desired level, veterinarians can administer it to promote healing.

Goodrich said IRAP is made from white cells in the horse's bloodstream. Veterinarians collect a small amount of blood from the horse, centrifuge it to remove red and white blood cells, and concentrate the platelets in the form of blood plasma to a lesion, increasing the amount of growth factor at the site, to help the injury heal. The plasma is created by spinning whole blood down in a centrifuge, eliminating the red and white blood cells and leaving behind a high concentration of platelets.

Goodrich explained that platelets are the first responders to any injury. Essentially, PRP therapy delivers a high concentration of platelets to a lesion, increasing the amount of growth factors at the site, to help the injury heal. The plasma is created by spinning whole blood down in a centrifuge, eliminating the red and white blood cells and leaving behind a high concentration of platelets.