Orthobiologics and regenerative medicine are terms used somewhat interchangeably. Clinician opinion, based on the appropriate regenerative treatment chosen, varies greatly. However, the basics of evaluation and diagnosing lameness and performance injuries in the horse remain crucial to a successful outcome regardless of treatment option. Most regenerative options, and the decision to choose one, originate from a performance or lameness concern. The examiner must be certain to perform a thorough physical examination and lameness evaluation. Discussed below briefly include platelet-rich plasma (PRP), autologous protein solution (Pro-Stride®), mesenchymal stem cells (MSCs), equine amniotic allograft (RenoVo®), alpha-2 macroglobulin (α2M), and polyacrylamide hydrogels (PAAG; Noltrex Vet®, Arthramid Vet®).

PRP is a blood-derived therapy known to contain and release many important factors such as platelet-derived growth factor (PDGF), transforming growth factor beta (TGF-beta), insulin-like growth factor (IGF-1), and vascular endothelial growth factor (VEGF), among others. These substances play key roles in repair mainly through effects on cellular proliferation, cell migration, and the synthesis of collagen. PRP is used to stimulate healing of tendon/ligament demopathies, in non-septic arthritis, cartilage degradation/tears, and has been used and studied in wound healing. PRP is widely administered intra-articularly with positive results both in human and veterinary medicine. Single et al. (2017) compared steroid versus PRP in human chronic lower back pain/sacroiliac joint disease. In this study, PRP injections were more effective than steroid injections for sacroiliac joint pain with 90% of patients after PRP experiencing significant pain relief compared to only 25% of patients after the steroid injection. Injecting PRP into the sacroiliac joint ligaments led to significant improvement in pain scores (Ko 2017; Single et al 2017). This author routinely uses PRP for intralesional soft tissue desmopathies and intra-articularly for the treatment of osteoarthritis as well as in arthroscopic surgery aftercare.

Autologous protein solution (Pro-Stride®) is a product that combines PRP and IRAP (interleukin-1 receptor antagonist protein) into one injection. Studied by Bertone et al. (2014), this product promotes “normal” healing of cartilage and intra-articular structures. It features the combination of effects produced by PRP and IRAP. It is a blood-derived product that undergoes similar preparation and processing as PRP but differs in that it requires a two-step centrifugation process with two separate centrifugation tubes specific to the product to isolate the IRAP and PRP portions from the blood sample. It is best used for the treatment of osteoarthritis in horses. In this author’s opinion, its efficacy is greatest when used younger horses or horses within the early stages of the arthritic process.

Mesenchymal Stem Cells (MSCs) can be harvested from bone marrow, fat (adipose), joint fluid, and umbilical samples (among others). For this discussion, bone marrow-derived MSCs are described. Although stem cells do have pluripotency, this is not believed to be the benefit of their actions to improve healing. Like PRP, their effect on the local environment (immunomodulatory) at the site of injury and the potential recruitment of beneficial cytokines and growth factors is believed to be their mode of action. MSC therapy may provide a “better” repair through improved fiber alignment, more organized collagen, and less scarring (Godwin et al. 2012). Following intra-articular administration of MSCs after stifle arthroscopy for meniscal injury, Ferris et al. (2014) found a 75% return to athletic
function in the treatment group versus 60-63% with surgery alone. MSCs are used for the treatment of tendon/ligament desmopathies, cartilage defects, meniscal injuries (intra-articular), laminitis, and wound healing. This author occasionally uses MSCs for intra-articular administration and mainly in the stifle joint with concurrent intra-articular soft tissue damage.

Equine amniotic allograft (RenoVo®) uses amnion to create a material that can be injected into a soft tissue defect, used topically on healing wounds, and injected into joints. Equine amnion is known to contain many different types of collagen (I, III, IV, V, and VII), tissue inhibitors of metalloproteinases, laminin, fibronectin, proteoglycans, and hyaluronic acid (Fowler et al. 2019). This product’s aim is to improve the efficiency and quality of healing. This author does not use this product intra-articularly.

Alpha-2 macroglobulin (α2M) is a device that was originally used for disc-related back pain in human medicine. Alpha-2 macroglobulin is an acute phase protein that is primarily produced by the liver but is also produced in smaller amounts by the articular cartilage, synoviocytes, and macrophages. It’s mechanism of action is via gene regulation, non-specific protease inhibition, and cytokine and growth factor modulation. This is also a blood-derived protein found in the plasma. It allows one blood draw that produces multiple doses that can be frozen and administered later per the attending veterinarian’s protocol. This device is typically administered in the joint but can be administered into soft tissue defects. This author has used this product with mixed results.

Polyacrylamide hydrogels (PAAG) are extremely viscous, stable, large, biocompatible molecules that have good tissue integration. They have viscoelastic properties that attempt to replicate the normal properties of healthy synovial fluid. To this author’s knowledge, there are only two PAAGs currently available on the equine market (Noltrex Vet®, Arthramid Vet®). Christensen et al. (2016) showed that the hydrogel incorporates into the synovium at approximately 4 weeks post-injection, but prior to incorporation, it lines the synovium. PAAG causes synoviocyte hyperplasia and hypertrophy, angiogenesis, and collagen deposition in the surrounding tissues. The hydrogel tissue integration has a stabilizing effect on the synovium and joint capsule with a consequent increase in tensile strength and elasticity (Tnibar et al. 2017). There is still speculation regarding the mechanism of action. One perspective details that the PAAG causes a decreased exposure to pro-inflammatory cytokines via covering the inflamed synovium. Another proposed mechanism of action details that hydrogel tissue integration produces a reduction in nociceptor and mechanoreceptor activation of neural pathways. This is believed to reduce joint hypersensitivity, a common feature of osteoarthritis. These products were originally marketed and recommended for use in severe or chronic osteoarthritic joints refractory to other treatments. But this treatment option, for many veterinarians including this author, is now evolving as the primary or first-line joint therapy utilized in arthritic joints. This veterinarian routinely uses PAAGs in acute and chronic joints with good results.
References: