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Regenerative Therapy Trends and Techniques in Horses

Regenerative therapies are no longer a futuristic fantasy. Today's equine practitioners are equipped to obtain, process, and administer regenerative therapies in every day practice. Mainstays include:

- Adipose- (fat), bone marrow-, and dental pulp-derived stem cells;
- Cultured stem cells;
- IRAP (interleukin-1 receptor antagonist protein); and
- Platelet-rich plasma (PRP).

Some practitioners are also experimenting with newer therapies, such as nanofiber technology for tendons—a synthetic three-dimensional "scaffold" that, once placed at the target site, promotes cellular growth.

Veterinarians shared their experiences using regenerative therapies in the field during the 2015 American Association of Equine Practitioners Convention, held Dec. 5-9 in Las Vegas. Ron Redding, DVM, MS, Dipl. ACVS, clinical professor of equine surgery at North Carolina State College of Veterinary Medicine, and Ashlee Watts, DVM, PhD, Dipl. ACVS, of Texas A&M College of Veterinary Medicine's Department of Veterinary Medicine & Biomedical Sciences, moderated this Table Topic discussion.

First, a quick audience poll revealed that PRP and fat-derived stem cell therapy are among the most popular regenerative modalities in the field. These are primarily used for injuries to tendons and ligaments, such as high suspensory damage. The optimal way to use these therapies to treat injured horses, however, remains unclear, largely due to the lack of clinical trials.

Then Watts briefly reviewed the different types of stem cell therapies. She reminded veterinarians that stem cells obtained from adipose tissue and bone marrow do not have the same composition, and that even bone marrow-derived stem cells that are processed in-house and used later the same day don't have the same properties as bone marrow-derived stem cells that are sent to a laboratory to be cultured.

Specifically, stem cells derived from bone marrow that are filtered/centrifuged are not "pure" stem cells like those produced via culturing. Instead, stem cells processed in-house are simply products that are rich (concentrated) in stem cells; only 1-10% of the total nucleated cells are actual stem cells. The estimated total cell dose administered to the horse in the prior case is 100,000-150,000, whereas culturing stem cells results in millions of stem cells. Unfortunately, culturing takes several weeks, potentially leaving the patient untreated in the meantime.

"When we say 'stem cell therapy,' we need to be clear about what we mean—fat, bone marrow, cultured, or dental pulp? Otherwise we aren't comparing apples to apples, making this conversation difficult," said Watts.

To address the lag time between stem cell collection and treating the patient after culturing, Watts posed the question of whether it is useful to combine regenerative therapies.

Many practitioners indicated that they have sent bone-marrow samples to be cultured but kept some behind, processing the remaining in-house and administering them into the lesion while waiting for the cultures to return. Other clinicians indicated that they use PRP and stem cells together, with the theory being that PRP serves as a type of scaffolding for stem cells to perch on (PRP clots once administered).

The group also discussed administration routes. Many practitioners indicated they inject regenerative products directly into the lesion. This prompted Watts to muse, "But what if there isn't a place to put the stem cells, like in the case of laminitis?"

Several veterinarians then described using regional limb perfusion, both arterial and venous, to deliver stem cells to "hard-to-reach" places such as the hoof. Others suggested that local infiltration, such as coronary band injections, might be a useful delivery system. Intravenous injections via the jugular vein—popular in small animal practice—was mentioned as a way to deliver stem cells to where they need to be. However, attendees agreed that this approach is not likely feasible in horses due to the large dose that might be required.

"Now that we have the stem cells where they need to be, does anyone know what happens to them?" quizzed Watts.

Citing a 2010 research article in which researchers suggested that many stem cells die immediately after injection, Watts asked, "Do they need to be alive, or is the function of the injected stem cells simply to impact the environment in the injured/damaged area or even signal nearby resident cells to do a better job repairing the injury?"

Although these questions were largely rhetorical due to the dearth of published data in this field, the veterinarians seized the opportunity to share information with each other on how they are currently using these therapies to benefit horses in the meantime. Watts wrapped up the discussion by encouraging veterinarians to publish their results, the type of lesion (acute vs. chronic), the exact type of regenerative therapies used, including cell numbers wherever possible, and patient outcomes.

"The only way we are going to make any clinical advancement using regenerative therapies in the field to keep horses sound is with careful science and reporting so we can figure out what works and what doesn't," concluded Watts.