Stem Cell Therapy

Vet Services

BY HEATHER SMITH THOMAS

STEM CELL THERAPY has been utilized in horses to help heal tendon, ligament, and joint injuries for two decades. At this point there are basically two sources of stem cells for clinical use—from bone marrow and from fat tissue. Cells harvested from bone marrow are usually cultured and expanded, putting them back into the horse some weeks later. Cells harvested from fat can be collected and utilized within a much shorter time.

"We use autologous cells—from the patient's own body," says Dr. Scott McClure, owner of Midwest Equine Surgery & Sports Medicine in central Iowa.

Allogenic stem cells, from another (donor) horse, and preserved cells, such as from umbilical cord blood from newborn foals, are not commonly used.

"The primary and most common applications for stem cells are in treating ligament and tendon injuries," he said.

Continues to be an option for treating injured horses

"Stem cells are also used fairly frequently in osteoarthritis cases, but they don't work quite as well as we'd hoped.

"Meniscal injuries in the stifle joint are one area where we often tend to use stem cells. There have definitely been some positive outcomes associated with stem cells in meniscal injuries. This depends on case selection, however; some of these injuries will respond better than others. You need to have a stable joint for good results. If there is meniscal injury and additional ligamentous injuries, stem cells are not going to solve that entire problem."

There has been a lot of discussion regarding the best source of stem cells.

PHOTOS COURTESY HEATHER SMITH THOMAS

It is important to work with a veterinarian who understands stem cell therapies

"Some people use the bone marrow cultured stem cells, and others use the adipose (fat) stem cells," McClure said. "There are other things on the market that pop up from time to time, that people are calling stem cells, but there are actually very few to no stem cells in some of these products. Horse owners need to discuss these things with a veterinarian who understands the difference before using them.

"The ways we can use a large number of stem cells are either to utilize harvested bone marrow (and cultured cells) that are sent to a lab to culture and produce a high number of stem cells, or the adipose stem cells that are processed on the spot, to get a large number of stem cells out of the fat," he said. "The cells from fat have the advantage that you can do this on site; you can liposuction fat from the horse, process, and reinject those cells. You don't have to wait for culturing. There are 500-1,000 times the number of stem cells in adipose than there is in bone marrow."

There are some other therapies, such as bone marrow concentrate, that have some stem cells and growth factors but relatively few stem cells. This extract contains a mix of things that might be helpful, but the actual number of stem cells is very low.

"There are also therapies such as amnion that have benefits but are not actually true stem cell therapy," McClure said. "It is important to be working with a veterinarian who understands the differences and has experience with these."

HISTORY OF STEM CELL USE IN HORSES

Dr. Troy Herthel, a surgeon for the Alamo Pintado Equine Medical Center in Los Olivos, Calif., has worked with stem cells for a number of years. His father, Dr.

Congratulations JUSTIFY

2018 TRIPLE CROWN WINNER

Real Clients. *Real Results.*

A History of Racing Success with Platinum:

JUSTIFY
2018 Kentucky Derby
2018 Preakness Stakes
2018 Belmont Stakes

EXAGGERATOR
2016 Preakness Stakes

NYQUIST
2016 Kentucky Derby

AMERICAN PHAROAH
2015 Kentucky Derby
2015 Preakness Stakes
2015 Belmont Stakes
2015 Breeders Cup Classic

WIGGLE IT JIGGLEIT
2015 Little Brown Jug
2015 US Harness Horse of the Year

WISE DAN
2012 & 2013 Eclipse Horse of the Year
2012 & 2013 Breeders' Cup Mile

I'LL HAVE ANOTHER
2012 Kentucky Derby
2012 Preakness Stakes

OCHOA
2011 All-American Futurity
2012 All-American Derby
QH Racing's All-Time Leading Money Earner

WELL ARMED
2008 G1 Goodward at Del Mar
2009 Dubai World Cup

ZENYATTA
2009 Breeders Cup Classic
2010 Eclipse Horse of the Year
Winner of 19 Consecutive Races

DEWEYCHEATUMNHOWE
2008 Hambletonian Stakes
Won 22 of 25 Races

PEPPERS PRIDE
Undefeated in 19 races
Overachiever of the Year 2008 Insider Award

COLONEL JOHN
2008 G1 Travers Stakes
2008 Santa Anita Derby

MINE THAT BIRD
2008 Kentucky Derby

LAVA MAN
Winner of 17 Races
Stable Pony to Ill Have Another

FUSAICHI PEGASUS
2000 Kentucky Derby

JUSTIFY *2018 Triple Crown Winner*

For the Health & Performance of the Horse

We believe that when you give a horse the very best, anything is possible. That's why for two decades, we have been researching, formulating, testing and manufacturing nutritional formulas to the highest standards. Whether you are keeping a healthy horse healthy, a performance horse competing at the top of their game, or supporting a horse in recovery, see the difference Platinum Performance® can make in every horse.

PLATINUM PERFORMANCE®

Nourish Your Passion™

1-800-553-2400
PlatinumPerformance.com

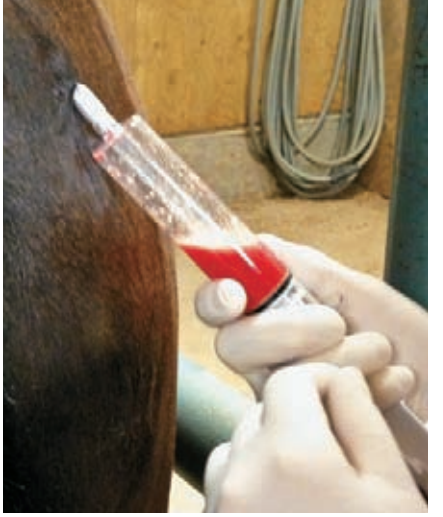
Doug Herthel, pioneered the early use of stem cells from bone marrow in treating injured tendons and ligaments. Alamo Pintado has utilized stem cell therapy on more than 4,000 patients over the past 23 years.

"The first stem cell procedures in equine athletes were done in the mid-1990s with direct bone-marrow injections," Herthel said. "We harvested bone marrow from the sternum of the horse and injected it directly into the lesion we wanted to treat—which at that time was primarily suspensory ligament injuries. That was one of the original uses and beginnings of regenerative medicine for equine athletes.

"Then we progressed to using bone marrow concentrate, a further refinement of using native or unprocessed bone marrow," he continued. "In this procedure we harvest bone marrow and centrifuge it in a special apparatus to concentrate some of the stem cells as well as a lot of the growth factors and some of the other components we are looking for that can help stimulate healing.

"That use evolved into actually expanding and growing stem cells. When we do the expansion and grow stem cells from the original bone marrow source, it takes about two-to-three weeks to obtain the number of cells we feel would be adequate for the appropriate dose for a typical bowed tendon or suspensory ligament injury. We typically harvest 20-30 million cells, to be injected into the lesion, often via ultrasound guidance.

"We started out primarily treating soft tissue injuries and then progressed to treating joints. Some people started to treat laminitis with stem cells—and it blossomed from there. That's where we are now, and because there's been such an expansion of stem cell therapy in veterinary medicine in the past 15-plus years, the Food and Drug Administration is trying to make sure this use is regulated and that this kind of therapy isn't used inappropriately," he explained.



Adding stem cells stimulates the patient to send more local stem cells into the lesion

As stem cell therapy was expanding its role in regenerative medicine, other techniques were also becoming popular, such as autologous condition serums, and components such as PRP (platelet rich plasma). These modalities are often vet-

BREATHE EASY

Ask your veterinarian for the ONLY liquid FDA-approved oral antibiotic for treatment of equine respiratory tract infections

Equisul-SDT®
(sulfadiazine/trimethoprim)

- Clinically proven safe and highly effective
- Unique packaging lets you easily treat your horse at home
- Has a refreshing apple-flavor your horse will love and readily consume – No bitter-tasting pills or pastes
- Sold exclusively through your trusted equine veterinarian
- Available in convenient 135 mL, 280 mL and 560 mL bottles

"Our equine practice has switched totally to Equisul-SDT® when we diagnose respiratory infections. Because of the proven safety and efficacy, the client can easily administer the apple-flavored product at home without the need to crush pills or force-feed bitter paste products. The beneficiary is the equine patient who is getting a strong, well absorbed antibiotic specifically designed for horses. The assurance of using an FDA-approved drug like Equisul-SDT meets the standard of care which cannot be overstated."

- Dr. John Bennett
Equine Services, LLC
Shelbyville, Tennessee

Equisul-SDT®
(sulfadiazine/trimethoprim)

aurora PHARMACEUTICAL®

MANUFACTURED IN THE USA
ad000045 06/2018

www.aurorapharmaceutical.com

Federal law restricts this product to use by or on the order of a licensed veterinarian.
EQUISUL-SDT is contraindicated in horses with a known allergy to sulfadiazine, sulfonamide class antimicrobials, or trimethoprim. The safe use of EQUISUL-SDT has not been evaluated in breeding, pregnant, or lactating horses. Potentiated sulfonamides should only be used in pregnant or lactating mares when the benefits to the mare justify the risks to the fetus. Do not use in horses intended for human consumption. Not use in humans. For animal use only. Keep this and all drugs out the reach of children. Refer to the package insert in this issue or visit www.aurorapharmaceutical.com for complete product information.

erinarian-specific, in terms of how each veterinarian prefers to treat certain injuries and which regenerative therapy is utilized.

"There has been a lot of clinical research as well as research at the microscopic level, looking at stem cell therapy, trying to determine what is truly going on in that horse when we use those cells," Herthel explained. "It was once believed that stem cells would develop into whatever tissue type they are injected into. Now we realize it is more likely that these cells are a composite mixture and have many effects other than just the pure cells themselves. Their presence stimulates the patient to send more local stem cells into the lesion. It is a complex biologic process. Stem cells are like paramedics that rush in to give assistance and provide multiple factors that improve the healing process."

ADVANCES IN HARVESTING STEM CELLS FROM FAT

Dr. Michael Coleman (former president and CEO and now on the scientific advisory board of InGeneron in Houston, Texas) says that in the past dozen years scientists have found that all body tissues have a pool of regenerative cells (stem cells).

"These cells are located on the outside of small blood vessels," he said. "We can obtain these cells from many different tissues, but it's easiest and less traumatic for the patient to harvest them from fat, and there are lots of blood vessels in fat.

Stem cell infusion

"These cells, in the matrix of the tissue, are frequently called stromal cells. They can have a regenerative effect on different tissues in the musculoskeletal system, for example, such as tendons and ligaments, even though we got them from fat. When cultured, they can actually be differentiated into bone, cartilage, or tenocytes (tendon cells)."

These cells are good at becoming whatever tissue they are placed into, to aid the healing of that tissue.

"I liken it to putting a plant in different soils," Coleman said. "Stem cells, when put into the context of a tendon or a bone, they don't make fat; they secrete soluble factors—mostly proteins—called growth factors. These help the neighboring cells and have a nursing effect on the damaged tissue. On their own they can actually form new tissue. In an injured tendon or bone, these are the two main ways they have an effect. They can have a bystander nursing effect and a direct regenerative effect by forming new tissue.

Needle for bone marrow aspiration

"In arthritis these cells can actually reprogram the body's immune cells within the inflamed joint to reduce the level of inflammation and slow the progression of the disease," he continued. "This strategy is used in horses, dogs, and humans.

"In the early days of stem cell processing, fat tissue was obtained from the horse by making an incision and dissecting out a piece of fat. This is fine for obtaining good stem cells but leaves a scar, and horse owners didn't like that. Now we use liposuction, just like in humans. We can take a small amount of fat from the horse and leave no visible evidence."

There is only a small incision into the tissue.

"The tube we use is very small in diameter, no larger than a big needle," Coleman said. "This is minimally invasive. The horse is mildly sedated and local anesthesia is used in the area where we harvest the fat."

Once the fat tissue is removed with liposuction, cells from that fat can be isolated in about an hour and then re-adminis-

tered into the injury. The horse only has to be at the veterinary clinic or hospital for a short time. The veterinarian only has to see the horse once, rather than waiting more than a day for the sample to be sent to a lab, processed, and sent back—necessitating having the horse brought in again for administration of the processed cells.

PROCESSING THE REGENERATIVE CELLS

"We, as a company, have created a small machine (portable, if desired), comprised of a processing unit that looks and functions such as a centrifuge but also has several other functions," Coleman said. "The spinning force of the centrifuge sends the heavier material to the outside.

"For this processing step, when the inner tubes are fixed in inverted position, the outside is a little higher than the inside. When centrifugal force is applied and everything goes to the outside, it travels upward because the tube is a little inverted. When it stops and there is no more force to push the contents of the tube to the outside, gravity causes the material to fall—and it gently falls back to the center.

"In the processing steps, rather than needing multiple pieces of equipment to accomplish the separation of these cells from the fat tissue, our one piece of equipment has multiple functions, and this is one of the key functions," Coleman said.

"We can accomplish the whole process for a horse in about an hour—collecting and processing the fat to harvest the cells. For a dog it might take a little longer because the fat from a dog is more dense.

"We now have a portable unit. For instance, one of our veterinarian customers sees a lot of horses in the Ocala, Fla., area and travels with this device. We supply a sterile drape and other items that can be used, and the veterinarian can do the procedure at the horse farm."

The portable unit was road tested in the back of an SUV to make sure it wouldn't be damaged by the movement and jostling of travel. Veterinarians can put it in their truck and take it to their patients.

"It weighs about 48 pounds and can be run off a DC converter and powered from the veterinarian's vehicle," Coleman said. "It draws about the same amount of power as a desktop computer, but can be readily operated out of the vehicle."

With some injuries, such as a tendon injury, it's best to treat them at a specific time, such as just after the inflammation subsides. The veterinarian can monitor the patient and then collect and process stem cells to inject them at the most optimum time.

"This process enables the veterinarian to use the cells on demand," Coleman said. "When he/she determines the best time to treat, the fat can be harvested and the cells processed and available. This provides more flexibility in a treatment schedule." BH

Heather Smith Thomas is a freelance writer based in Idaho.