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By Sherman O. Canapp Jr., DVM, MS, Diplomate ACVS  
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# Stem Cell Therapy for the Canine Athlete



Soft tissue injuries and osteoarthritis are common conditions afflicting canine athletes due to the forces placed on their joints and the repetitive nature of agility. Microtrauma to tendons, ligaments, and articular surfaces of joints can occur and can create an environment for osteoarthritic changes. Once the degenerative cascade of this condition is initiated, its progression can be insidious. Therapies have focused on treating the symptoms or slowing the progression of this debilitating disease. Stem cell therapy may not only treat symptoms and slow the disease, but it also could help to induce repair of the underlying damage that initiated the cascade. Regenerative stem cell technology gives new hope for extending the careers and improving the quality of life of the canine athlete.

## A Brief History of Regenerative Therapy Research

Veterinary research into the use of regenerative cells and adult stem cell therapy began just this decade. Roger Smith of the Royal Veterinary College in England helped pioneer the movement by developing a technique in 2002 for extracting equine stem cells from the horse's own bone marrow, growing them in a laboratory for about three weeks, and then injecting them into the injured limb. Meanwhile, in the U.S., veterinarian Robert Harman was also developing a therapy for equine orthopedics, using regenerative cells and stem cells extracted from the fat tissue of the horse. Vet-Stem, his company based in Poway, California, has been offering the treatment since 2003. Since then more than 3,000 horses have had therapy with cells processed by Vet-Stem. Conditions treated include tendon and ligament injuries, both acute and chronic, osteochondral defects, and osteoarthritis. Multiple studies confirmed efficacy with a majority of horses treated returning to full performance level following treatment. In 2005, Vet-Stem and selected clinics began treating dogs with tendon and ligament injuries and osteoarthritis. Results of the first peer-reviewed, double-blind, multicenter study for canine osteoarthritis using regenerative and stem cells, sponsored by Vet-Stem, appeared in *Veterinary Therapeutics* Winter 2007 (Vol. 9, #4) and demonstrated decreased discomfort and improved function in patients that received Vet-Stem regenerative cell therapy.

## What Are Stem Cells and How Do They Work?

A stem cell is characterized by its ability to divide and create another cell like itself and by its potential to become many different types of cells. Cells that have already committed to becoming muscle, bone, or any other tissue are unchangeable. Stem cells, by contrast, retain change possibility. There are two broad types of mammalian stem cells:

- **Embryonic stem cells:** Found in a developing embryo, embryonic stem cells are intended to form a whole animal and have unlimited potential of development into any type of tissue.
- **Adult stem cells:** Found in most adult tissues, adult stem cells act as a repair system for the body, replenishing specialized cells and maintaining the normal turnover of regenerative organs, such as blood, skin, or intestinal tissues. Adult stem cells are also multipotent, meaning the cells have the potential to differentiate themselves to become various types of cells. These adult cells are believed, however, to be limited to developing only into cell types related to the tissue from which the stem cell originated. In human medicine, ethical and legal debates surround the use of embryonic stem cells for research and therapy; such controversy does not exist with the use of adult stem cells. Adult stem cells have been used for years to successfully treat leukemia and related bone and blood cancers through bone marrow transplants.

Almost all veterinary research and use has focused on adult stem cells, specifically mesenchymal stem cells, derived from bone marrow or adipose tissue (fat). Mesenchymal stem cells have the potential to form a variety of cells including fat, cartilage, bone, tendon and ligament, and muscle. Another property of mesenchymal stem cells is that they can be banked and frozen for future use. Mesenchymal stem cells maintain their functionality when thawed, which allows for future use. The cells can also be cultured, meaning they can be grown within a medium.




Dr. Canapp performs a fluoroscopic-guided hip injection of stem and regenerative cells for a patient with hip arthritis.

## Obtaining Canine Stem Cells

In dogs, the stem cells and other regenerative cells are obtained from subcutaneous adipose tissues. Adipose tissue is a preferred source in dogs over bone marrow for several reasons including ease of access, high-yielding mesenchymal stem cell count as compared to bone marrow, and the fact that fat is a renewable source. The stem cells along with a mix of other regenerative cells within the adipose tissue are isolated and then injected directly into the injured tissue, joint and/or intravenously. These cells are always obtained from the intended recipient (autograft), eliminating the risk of rejection and disease transmission.

The mechanisms by which these regenerative and stem cells initiate change within the body is complex. Chemical signals and pathways are created when an injury occurs that lead stem cells to the area of trauma. Mesenchymal stem cells release growth factors and cytokines and stimulate resident tissue stem cells. These cells have the ability to decrease pro-inflammatory mediators, increase anti-inflammatory mediators, reduce and/or reverse scar tissue formation, improve vascularity to the tissues, and block cell death. Further investigation is in process in both veterinary and human medicine to evaluate the use of adult stem cells for a variety of diseases, including, liver, kidney, heart, neurologic, and immune-mediated diseases. Results to date have been promising.

VOSM along with Vet-Stem is proud to offer Vet-Stem Regenerative Medicine as a therapeutic option for the treatment of osteoarthritis. To learn more about regenerative veterinary medicine, please visit [www.vosm.org](http://www.vosm.org) and [www.vet-stem.com](http://www.vet-stem.com). 

*Dr. Canapp, a Diplomate of the American College of Veterinary Surgeons, completed a combined DVM/MS at Kansas State University, an internship in small animal medicine and surgery at the University of Missouri, a three-year residency in small animal surgery at the University of Florida, and training in canine rehabilitation by the Canine Rehabilitation Institute. Dr. Canapp currently practices orthopedic surgery and sports medicine at the Veterinary Orthopedic & Sports Medicine Group (VOSM) in Ellicott City, Maryland, and acts as a consultant to local zoos, police K-9 units, agility, flyball, and disc competition dogs. See additional information about Dr. Canapp at [www.vetsportsmedicine.com](http://www.vetsportsmedicine.com).*

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