Orchard Road Veterinary Surgery, Inc
A Mobile Small Animal Veterinary Surgical Service

Stem Cell Therapy in Small Animals

What is a "Stem Cell"? : A stem cell is a cell that has the ability to differentiate into a variety of mature cells that make up an organism. **Embryonic stem cells** are found in the embryo and generally have to ability to differentiate into an entire organism (pluripotent). **Adult stem cells (ASC)** occur in the post-natal animal and have the ability to differentiate into different tissue from a germ layer (pluripotent) or an even more restricted number of cell types (multipotent). The purpose of the ASC is to differentiate into the adult organisms tissues, as well as to replace and to repair itself. It is this ability to repair and renew that is of interest to the patient.

What kind of Stem cells are used in Veterinary Medicine? Currently the most common use of stem cell therapy in veterinary medicine utilizes **Mesenchymal Adult Stem Cells (MSC)** derived from tissues such as bone marrow or adipose (fat) tissue. Bone Marrow provides higher number of MSC per volume compared to adipose tissue which is less cellular overall. Conversely the MSC from adipose have a faster doubling rate compared to bone marrow when grown in culture media for processing. So you can achieve more cells with bone marrow but it usually takes longer than using adipose tissue.

Which type of Stem Cell is more effective; Bone marrow or Adipose derived?
There still needs to be much more research to determine the correct answer to this question. Or it may be that each type has its own benefits or disadvantages. To date few head to head studies have been performed. Most have occurred in the lab cell cultures (in vitro) and not as many in live animals (in vivo) . Scientists have shown that BM-MSC appear to have better ability to generate bone and cartilage compared to AD-MSC, but this has been in cell cultures. Until studies can be completed using both types of MSC and then compared in randomized controlled studies in animals the debate will go on. However MSCs do appear to show promise in the repair of damaged tissues.

How do Stem cells treat inflammation and repair tissue? MSC secrete substances (cytokines, growth factors) that may reduce inflammation, prevent further inflammation from occurring, promote formation of blood vessels (angiogenesis), reduce programmed cell death (anti-apoptosis) and finally they may be able to differentiate into specific tissue type to repair and replace damaged tissue) . Experimental studies have shown these cells have been able to mature into cartilage and bone as well as other tissues in cell cultures and some lab animals such as mice and rabbits. What is not known yet is if MSCs can actually repair tissue when injected into an already damaged joint in a patient. ***The anti-inflammatory benefits may be the key factor at this time in why a patient responds positively to Stem Cell Therapy.***

ORVS, Inc 7041 Parker Hill Drive Madison, WI 53719
Phone: 608-234-8655 Fax: 608-497-1109 E-mail: mgobrienwi@gmail.com