

## How to Choose a Stem Cell Therapeutic:

1. **Characterization:** Of the stem cell populations that are under consideration for applications to regenerative medicine, bone marrow derived mesenchymal stem cells (BMMSC) are the most studied and best characterized (Smith 2008).
2. **Multipotent differentiation:** In laboratory studies, stem cells from several tissues have been shown to be capable of differentiation along numerous lineages. BMMSCs have demonstrated the ability to differentiate into bone, cartilage, tendon, ligament, meniscus, intervertebral disc, fat, muscle and nerve cells (Muschler et al 2004).
3. **Musculoskeletal tissue differentiation:** When compared in laboratory studies, BMMSC clearly outperformed adipose derived mesenchymal stem cells in models of cartilage (Winter et al, 2003; Im et al, 2005; Kisiday et al, 2008; Noel et al, 2008; Vidal et al, 2008) and bone (Im et al, 2005; Noel et al, 2008) differentiation.
4. **Cell numbers:** Bone marrow is known to contain fewer stem cells per volume of tissue relative to adipose tissue (Muschler et al, 2004), although the practice of culture expansion of BMMSCs for clinical applications yields a highly homogenous population numbering in the millions. Estimated yields for current adipose derived practices in which culture expansion is not conducted are hundreds of thousands of stem cells (Frisbie and Smith 2010).
5. **Long-term follow-up:** Multicenter, long term clinical follow-up data is available for bone marrow derived stem cell therapies (Ferris et al, 2009; Godwin et al, 2011).
6. **Rates of re-injury:** The following has been reported for BMMSC treatments:
  - A. Relative to standard treatment methods for superficial digital flexor tendon (SDFT) tendinopathy, the rate of reinjury was significantly lowered (18% (n=71) vs. 54% (n=208) ) in BMMSC treated National Hunt Horses after two years (Fortier and Smith 2008; Dyson 2004; Godwin et al, 2011).
  - B. In a 2007 study following race horses that were treated for superficial digital flexor tendon (SDFT) injuries, those that were given conventional treatments resulted in a reinjury rate of 100% within 12 months (n=15). Horses treated with BMMSCs resulted in a reinjury rate of 18% (n=11) after 12 months. Of the 9 horses that received BMMSCs and returned to racing, all had improved ultrasound images at 6 months and produced good-optimal racing performances within one year (Pacini et al, 2007).

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