Stem Cell Therapy for Rheumatoid Arthritis

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Background of RA

- Autoimmune disease
- Occurs more often in adults and females
- Often targets the fingers, wrists, knees, ankles, and feet.
- Causes pain, restricted movement, and deformation in affected joints.
- In more severe cases nodules can appear under the skin
SNP assays have made it easy to find genes correlated with RA.

Tumor Necrosis Factor is known to cause the inflammation.

TRAF-C4 and STAT4 are necessary for proper function of immune cells.

Most common genetic marker = Human Leukocyte Antigen.

Simple blood test for levels of Rheumatoid Factor are given to distinguish between types of arthritis and are true positive about 80% of the time.
Stem Cells

- Can be harvested from embryos, Bone marrow, fetus, fat
- Totipotent, pluripotent, multipotent, oligopotent, unipotent
- Reprogramming
- *Ex vivo vs. in vivo*
- Cartilage is limited in its ability to repair itself when damaged
- Induced Pluripotent stem cells or mesenchymal stem cells can be used to grow cartilage
- Both the stem cells and the grown cartilage can be transplanted into the patient
Treating the Cause

- Rheumatoid Arthritis is caused by the immune system attacking the tissue in the joints

- Hematopoietic stem cell transplant from family member donor
  - Pre-treated with a large amounts of chemotherapy to eliminate the patient’s immune system

- Graft stem cells regenerate a healthy immune system

- This is currently in a clinical trial, the study began in 2002 and is expected to complete in 2013 at Northwestern University
Risks and Costs

- It's hard to find good matches for Hematopoietic stem cell transplants
  - Donors also have their cells scanned for many genes and diseases, most notably HIV and cancer
  - Transplant rejection and/or graft vs. host

- Stem Cell transplants can cost over $100k
  - Not all insurance companies will cover it
For RA, not all genetic causes are known, and it is also caused by environmental changes or pathogens.

If marker genes are found to be mutated, gene therapy may a better treatment.

In a preclinical trial, there was success using autologous rheumatoid arthritis synovial fibroblasts (RASF) transfected with IL-1Ra retrovirus.

- Genetic engineered cells can also be tagged to monitor if the cells are in the right places.
- A suicide gene can also be added to the vector to kill oversecreted or transformed cells.

Gene therapy may have long term side effects.
Burt, Richard, MD. *Stem Cell Support in Patients with Rheumatoid Arthritis.* Sept 2002
http://ClinicalTrials.gov/ct2/show/NCT00282412?term=stem+cell+rheumatoid+arthritis&rank=3


http://www.nature.com/gt/journal/v12/n21/full/3302606a.html