Stem Cell Therapy for Rheumatoid Arthritis

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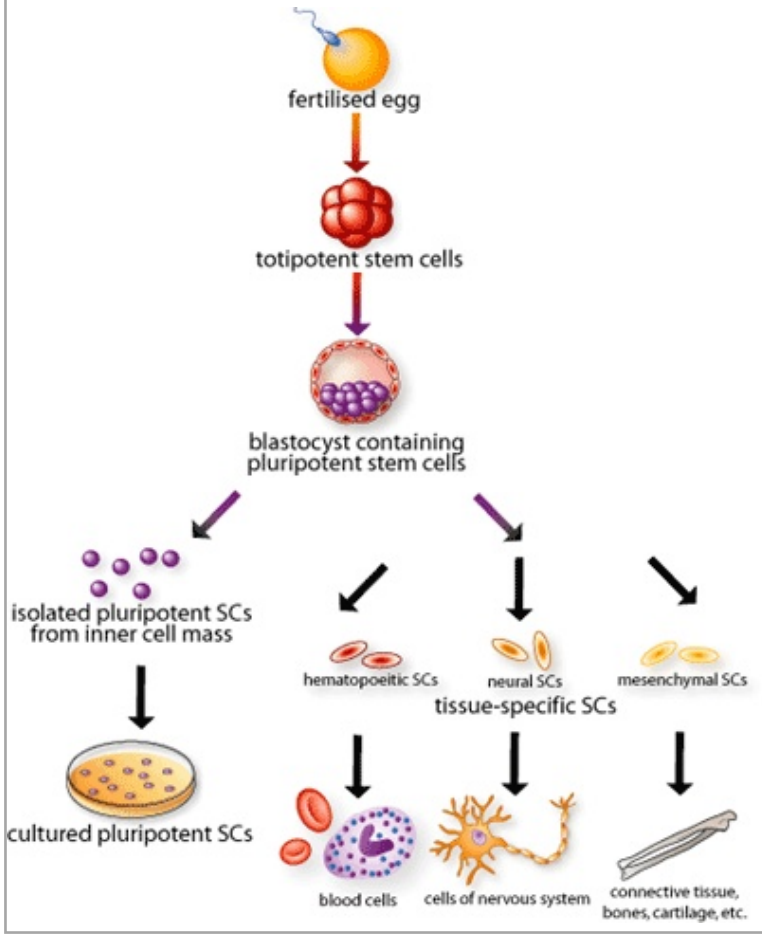
Background of RA

- 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

Genetics and Diagnosis of RA

- 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

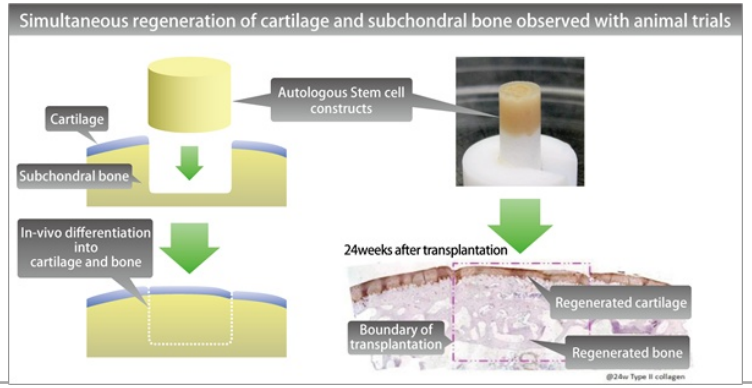
Stem Cells

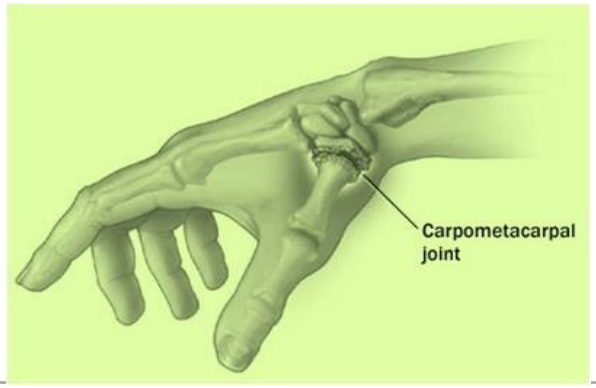


- Can be harvested from embryos, Bone marrow, fetus, fat
- Totipotent, pluripotent, multipotent, oligopotent, unipotent
- Reprogramming
- *Ex vivo* vs. *in vivo*

Treating the Symptoms

- 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

- Its 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

Stem Cells vs Gene Therapy

- 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

Bibliography

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