# Assignment 11: Stem Cells

## Cell and Tissue Engineering

## Problems

1. Please identify which stem cell type or type_s_ (embryonic, somatic, or iPS) fit each of the following descriptions. Some have 1 answer, some have more than 1 answer.
   a. Derivation requires informed consent
   b. Has forced expression of several transcription factors
   c. Includes mesenchymal stem cells
   d. Totipotent
   e. Low efficiency in creation
   f. Limited quantities in the body
   g. Used in the Advanced Cell Technology clinical trial
   h. Self renews and differentiates

2. Understanding the three models of stem cell proliferation please discuss which model a tissue engineer would hope is correct and why?

3. As we saw this week in lecture, there are a limited number of clinical trials using embryonic stem cells. One company, Geron, which pioneered clinical use of hESCs stopped their trial. Begin by reading the article from ScienceMag about Geron. Please explain why Geron halted their clinical trial utilizing hESC-derived oligodendrocytes to treat spinal cord injuries? And second, explain why they stopped pursuits of stem cell research entirely? Does this surprise you?

4. The following review article discusses how chromatic regulation and structure is involved in stem cell creation (iPSCs), pluripotency and differentiation. At the beginning of this semester, we started a discussion on epigenetics - how chromatin compaction can regulate protein expression. In reading this article, you will continue that discussion. After reading, please provide a critical review of no more than 400 words. This review should include the following points:
   - how histone acetylation and methylation regulate gene expression
   - the differences in chromatin structure between stem and differentiated cells
   - the model of nuclear compartmentalization

Article: Serrano, L., Vazquez, B.D., and Tischfield, J. *Chromatin Structure, pluripotency and differentiation.* Experimental Biology and Medicine. 238: 259-270. 2013.

# Rubric

| Question | Component | Total Point Value |
|---|---|---|
| 1 | A | 1.5 |
| | B | 1.5 |
| | C | 1.5 |
| | D | 1.5 |
| | E | 1.5 |
| | F | 1.5 |
| | G | 1.5 |
| | H | 1.5 |
| 2 | | 5 |
| 3 | | 5 |
| 4 | | 8 |
| **Total** | | **30** |