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Clinical potential of stem cells in human amniotic fluid

Amniotic fluid cells from second trimester amniocentesis (hAFSC) have been found to be a source of multipotent stem cells which might overcome the limitations of expansion, histocompatibility, tumorigenesis and ethical issues associated with the use of human embryonic cells. Previous work by others demonstrated pluripotency and growth patterns in c-Kit selected cells. We sought to perform a more comprehensive investigation of their pluripotency and the culture characteristics and distribution of stem cell markers in c-Kit selected cells compared to c-Kit negative cells. Using MACS and FACS we found less than 5% of HAFSC were c-Kit positive. However, when cultured, between 15-90% of the c-Kit negative cells expressed CD90, SSEA4 or TRA-1-60, in varying amounts. There was persistence of stem cell markers including expression of SSEA4, TRA-1-60, CD90 *in vitro* through multiple passages and subpopulations in a high percentage of cells. There was increased Oct4, Nanog and Sox2 mRNA expression in cells derived from 15-17 gestation week amniotic fluid samples versus longer gestational ages. Double and triple labeled cell populations were identified by MACS. 5.5% of c-Kit negative cells were triple positive for SSEA4, TRA-1-60 and CD90 expression. This may be a more efficient method than c-kit selection of hAFSC because stem cell markers expression was equal to or exceeded by the c-Kit negative cells in our results. Differentiation of amniotic fluid cells was successfully induced for neural, bone and cartilage lineages using specific induction media as demonstrated by morphologic staining and fluorescent histochemistry. The occurrence of triple-labeled cell populations poses the intriguing possibility of cells with a closer resemblance to embryonic stem cells. Our results confirm that hAFSC maintain pluripotency markers in culture over enough passages to provide sufficient numbers of cells for clinical use. Current studies with serum-free media offer therapeutic promise.

Biography

Bruce K Young has completed his Graduation from Princeton University and New York University School of Medicine. He is internationally known as a Leader and Innovator in Obstetrics and Gynecology. His 122 peer-reviewed publications report various fetal heart rate patterns and their relationship with fetal acid base metabolism and adverse neonatal outcome, referred in the major obstetrics textbooks, estriol conjugates in amniotic fluid as a marker of fetal kidney function, fetoscopic surgery, risk assessment for high risk pregnancies, incompetent cervix, recurrent miscarriage, the fetal immune system, maternal-fetal immunologic cross-talk, and currently, human amniotic fluid derived stem cells. He has edited two books on Maternal-Fetal Medicine and written two books for the general reader. He is a Member of the Helen Kimmel Stem Cell Research Center, Emeritus Director of the New York University-Langone Medical Center Division of Maternal-Fetal Medicine and presently directs the Pregnancy Loss Prevention Center there.

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