

Biological and Biochemical Characteristics of Human Umbilical Cord Mesenchymal Cells

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Abstract

Introduction: Stem-cell therapy has recently been proposed as a useful technique in the treatment of various illnesses, particularly degenerative diseases. Human Umbilical Cord Mesenchymal cells (hUCM) are among the stem cells which have received more attention in recent years. The current study was designed to investigate the culture conditions of these cells and to study some biological and biochemical properties of these cells, such as alkaline phosphatase activity, colony formation properties in hanging drops culture and the growth rate in various cell concentrations.

Materials and Methods: Human umbilical cord was collected following a healthy cesarean section at the operation room of Afzalipour Educational Hospital. Matrix fragments were cultured by organ explant method. The attached cells at confluence of >80% were sub-cultured in new culture dishes and were seeded at a 1×10^6 density for morphologic evaluations. Upon colony formation of the cells, they were further stained to detect alkaline phosphatase enzyme activity. Furthermore, cells at a 1×10^5 density were cultured in hanging drops for 48 hours and subsequently alkaline phosphatase activity was evaluated in the resultant colonies. In addition, cells were seeded at various densities in 96-well culture plates and cell activity was measured by Wst-1 cell proliferation assay kit following 48 hours of culture incubation.

Results: HUCM cells formed alkaline phosphatase positive colonies in culture, as well as in hanging drops. Cell activity was correlated with cell population at the start of cell cultivation. Increased concentration of cells at the beginning of culture led to increased cell activity upon 48 hours of incubation.

Conclusion: HUCM cells expressed alkaline phosphatase enzyme *in vitro* and constituted colonies in hanging drops. In addition, hUCM cells showed higher activity when cultured in larger populations. It seems that hUCM cells resemble both embryonic and some adult stem cells. Therefore, further study on the characteristics of these cells could provide a basis for their application in regenerative medicine.

Key Words: Alkaline phosphatase, Cell proliferation, Cell therapy, Mesenchymal stem cells, Pluripotent stem cells, Umbilical cord.

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