

Analyses of proliferation and differentiation mechanisms of human embryonic stem cells and discovery of basic technology for clinical setting

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【Outline of survey】

Embryonic stem (ES) cells possess both capabilities of self-renew and differentiation into all of the cells in our body. These characteristics attract many interests to establish regenerative medicine. But sometime they might become disadvantages. For example, tumor formation or undesired lineage differentiation. To escape these concerns, strictly controlled procedures need to be developed, in which desired tissue-specific stem cells are induced, In this study, we intended to characterize and isolate various tissue-specific stem cells such as neural, mesenchymal, hematopoietic, hepatic, cardio-myocytic stem cells and hemangioblast from human ES cells using different kinds of stromal cells and various combination of growth factors. To examine the changes of expression of cell surface-antigens and gene profile during proliferation and differentiation of human ES cells provides valuable information into not only discovery of novel regenerative medicine using ES cells but molecular analysis of cell development.

【Expected results】

ES cells have both capabilities of self-renew and multi-lineage differentiation. Establishment of an inducing system of desired tissue-specific stem cells from ES cells may provides a significant insight into the development of regenerative medicine with safety and efficiency. Information about the changes of cell surface-antigens and gene profile during differentiation from ES cells into various tissue-specific stem cells is also useful to understand human embryonic development.

【References by the principal investigator】

- Hiramatsu H., Ito M., Nakahata T.: Complete reconstitution of human lymphocytes from cord blood CD34+ cells using NOD/SCID/ γ_c^{null} mice model. Blood 102:873-880, 2003.
- Umeda K., Heike T., Nakahata T. : Development of primitive and definitive hemayopoiesis from nonhuman primate embryonic stem cells in vitro. Development 131:1869-1879,2004.
- Kato T., Heike T., Nakahata T.: A neurosphere-derived factor(NDF), Cystatin C, supports differentiation of ES cells into neural stem cells. Proc Natl Acad Sci. USA 103:6019-6024,2006.
- Shinoda, G., Umeda, K., Heike T., Nakahata, T.: $\alpha 4$ -integrin+ endothelium derived from primate embryonic stem cells generates primitive and definitive hematopoietic cells. Blood 109:2406-2415, 2007.

【Term of project】 FY2007– 2009

【Budget allocation】 39,200,000 yen

(2007 direct cost)

【Homepage address】

http://www.kuhp.kyoto-u.ac.jp/~pediatrics/prof_message_english.html