Elucidation of amplification, proliferation, and differentiation mechanisms of hematopoietic stem cells

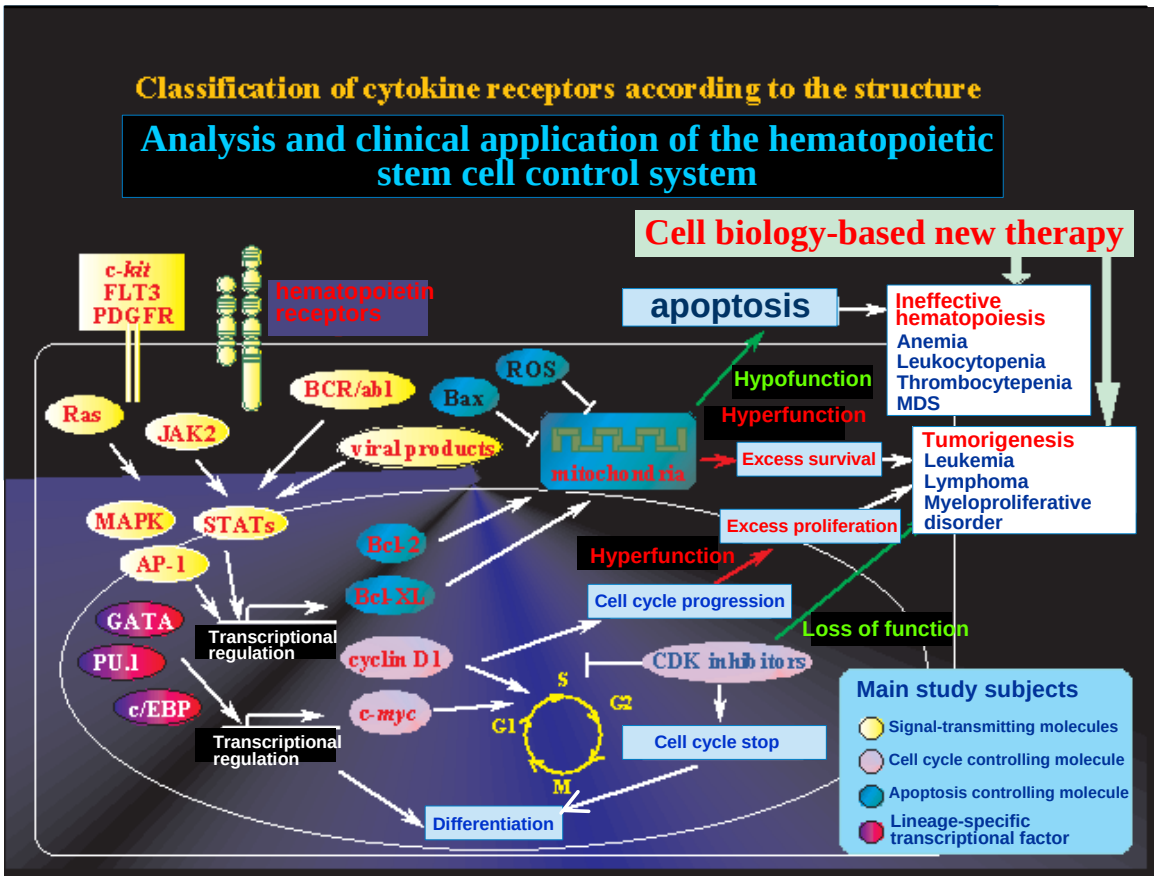
Hematopoietic stem cells, Proliferation/differentiation, Transplantation, Signaling, In vitro amplification

Representative researcher : Yuzuru Kanakura (professor)
Molecular pathological internal medicine (hematology/tumor internal medicine), Molecular Pathology, Medical Research, Osaka University Graduate School / Medical Center for Translational Research, Hospital of Osaka University School of Medicine

1 Analysis and clinical application of the hematopoietic stem cell control system

We aim at elucidation of the proliferation, differentiation, and survival mechanism of hematopoietic cells at a molecular level and its application for treatment of various intractable diseases. We will perform analysis of the factors below to elucidate the amplification, proliferation, and differentiation mechanisms, and develop a hematopoietic cell control method.

- Functional analysis of signal-transmitting molecules in cytokine-induced proliferation and differentiation of hematopoietic cells and BCR/ABL oncogenes
- Analysis of the molecular mechanism of the cell cycle in the developmental process (proliferation and differentiation) of blood cells and the self-replication and resting stages of hematopoietic cells
- Analysis of apoptosis-regulating molecules including Bcl-2 in the survival and death of hematopoietic cells and the role of redox control



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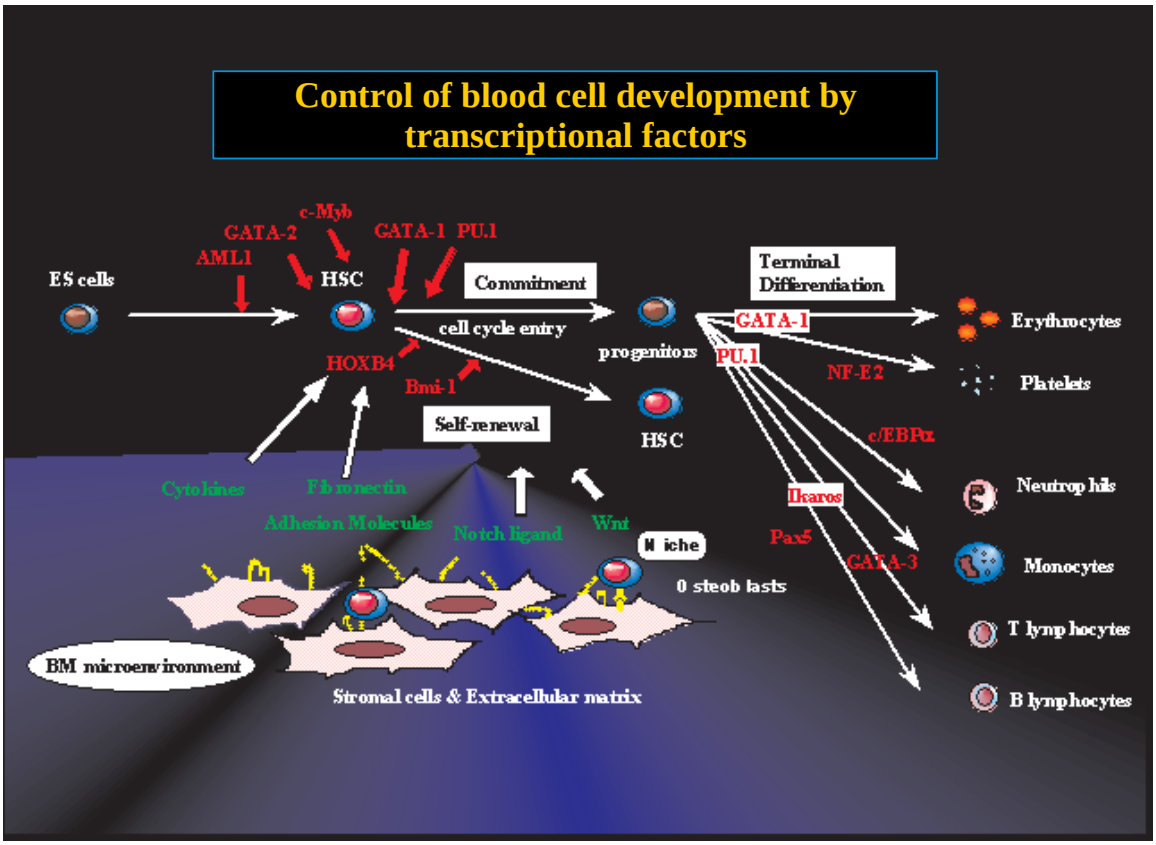
2 Developmental control of blood cells by transcriptional factors

We will perform functional analysis of Notch in maintenance of the undifferentiated state of hematopoietic cells, and functional analysis of lineage-specific transcriptional factors such as GATA-1 and PU.1. Applying these results, we will attempt in vitro amplification of hematopoietic stem cells by gene transduction, induction of differentiation of blood cells of a specific lineage, and mass production of blood cells from ES cells.



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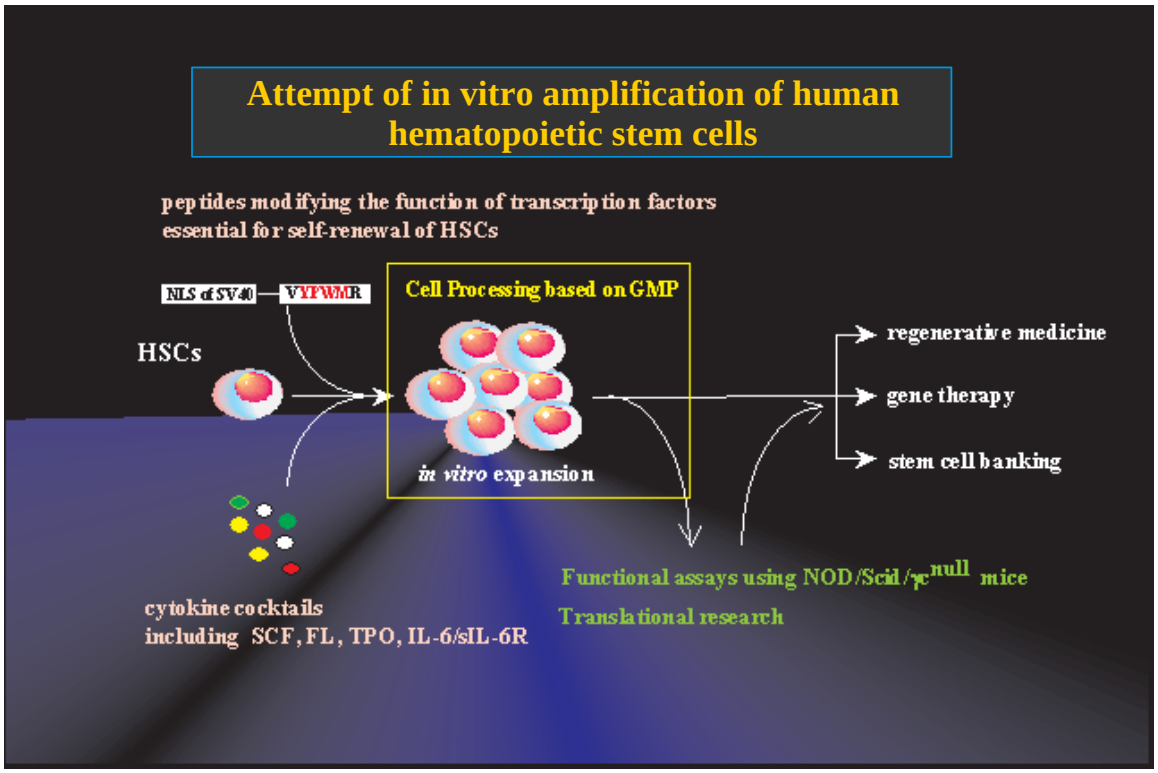
3 Attempt of in vitro amplification of human hematopoietic stem cells

Cord blood has been attracting attention as a source of hematopoietic cell transplantation. We will synthesize peptides modifying various signals and transcriptions, introduce the peptides into human cord blood hematopoietic cells, amplify the cells in vitro, and analyze the functions.



Other study contents of Kanakura laboratory

- Analysis of hematopoietic tumor pathology and the development of therapy
- Analysis and application of the lymphocyte support system
- Functional analysis of the novel anti-apoptotic molecule, Anamorsin
- Analysis of molecular mechanisms of thrombus and hemostasis
- Identification and pathological analysis of molecular abnormality in platelet dysfunction
- Cause and pathology of paroxysmal nocturnal hemoglobinuria (PNH)