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Important molecule discovered for the self-renewal of blood stem cells

Blood stem cells constitute the only lifelong source for the billions of new blood cells produced every day in our body. Since their number is rather very small, maintencance of these stem cells by their capacity to self-renew represents a vital prerequisite for a functional blood and immune system. Unfortunately, the molecular mechanisms of stem cell self-renewal remain elusive, although a great therapeutical need exists for these cells to be used in stem cell transplantations to treat cancer and blood diseases. This need could be covered by effective expansion of blood stem cells in cell culture, while preserving their full stem cell capacity.

The groups of Martin Zörnig at the Georg-Speyer-Haus in Frankfurt and Michael Rieger at the University Clinic Frankfurt (LOEWE Center for Cell and Gene Therapy and Department of Hematology/Oncology) joined forces and identified the molecule FUSE Binding Protein 1 (FUBP1) as an essential factor for the self-renewal of blood stem cells in a close collaboration. FUBP1 functions as a transcriptional regulator, which binds to its single-stranded target DNA sequence FUSE upstream of target genes that are activated or repressed upon FUBP1 binding. As a consequence, a whole network of genes is controlled by FUBP1. Among others, FUBP1 represses the cell cycle inhibitor p21 and the cell death-inducing molecule Noxa, thereby supporting the survival and expansion of the stem cells. Interestingly, FUBP1 is absolutely essential for both, the expansion of blood stem cells during early embryonic development and for their lifelong production in the adult organism. The results of this study are now published in the internationally recognized journal "Cell Reports" (see link below).

Future studies address the question which molecular signal transduction pathways in stem cells are regulated by FUBP1, and how they can be manipulated to improve an efficient blood stem cell expansion in cell culture for therapeutic stem cell transplantations. In additon, the GSH researchers started to investigate whether FUBP1 represents a promising target molecule for cancer therapy to inhibit the fatal self-renewal of cancer stem cells.

Publication:
Rabenhorst, U.*, Thalheimer, F.B.*, Gerlach, K.*, Kijonka, M., Böhm, S., Krause, D., Vauti, F., Arnold, HH., Schroeder, T., Schnütgen, F., von Melchner, H., Rieger, M.A.#, and Zörnig, M.# "Single-stranded DNA-binding transcriptional regulator FUBP1 is essential for fetal and adult hematopoietic stem cell self-renewal."
Cell Reports 11:1-9 (2015)
* equal first authors
# shared senior authorship

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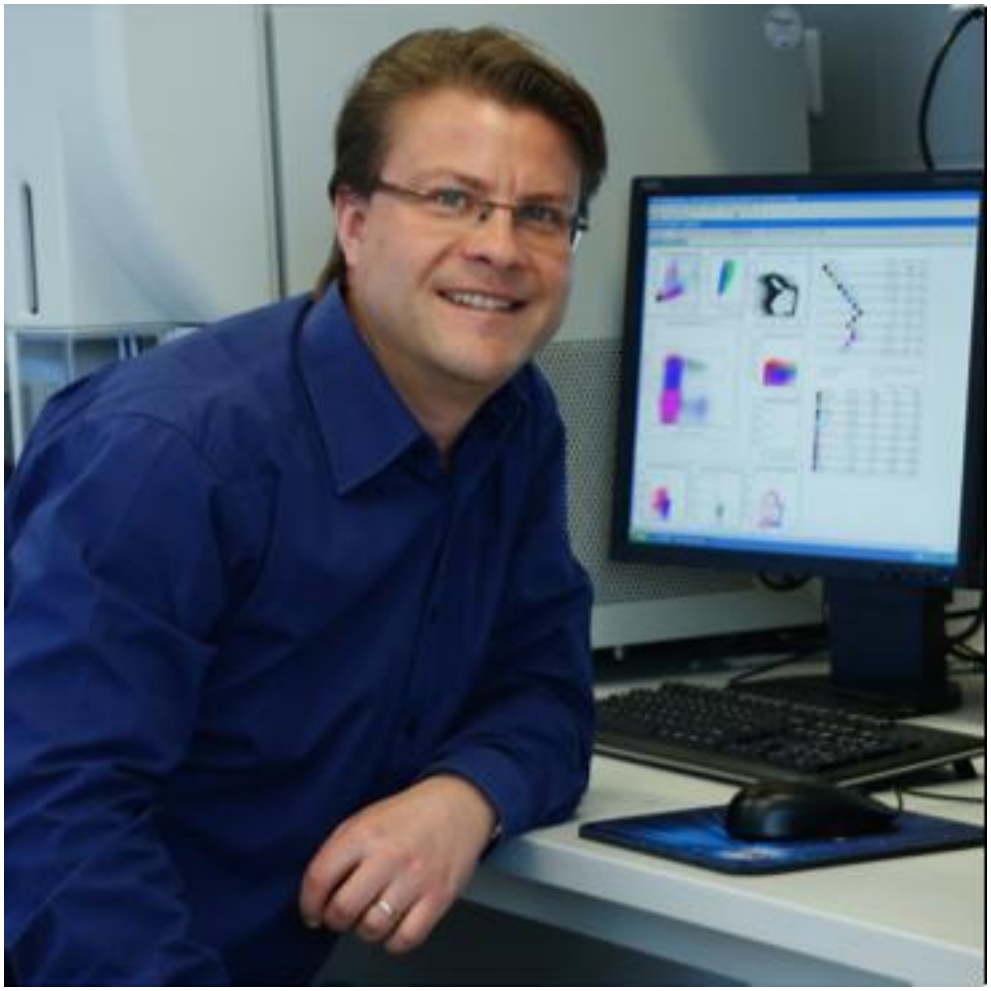
URL zur Pressemitteilung: http://www.cell.com/cell-reports/abstract/S2211-1247(15)00610-5

Prof. Martin Zörnig, Georg-Speyer-Haus Frankfurt, Germany, together with Ms. Katharina Gerlach, one of the first authors of this study.



Prof. Michael Rieger, University Clinic Frankfurt (LOEWE Center for Cell and Gene Therapy and Department of Hematology/Oncology)