Expression profiles of cancer stem cell markers in colorectal cancer cell lines

S. Bünger¹, T. Vollbrandt², S. Danner³, H.-P. Bruch¹, C. Kruse³, U.J. Roblick⁴,¹, J.K. Habermann⁴,¹

¹University of Lübeck, Dept. of Surgery, Laboratory for Surgical Research, Lübeck, Germany, Germany
²University of Lübeck, Campus Core Facility Cytomics, Lübeck, Germany, Germany
³Fraunhofer Branch Marine Biotechnology (EMBT), Campus Lübeck, Lübeck, Germany, Germany
⁴Karolinska Institute, Department of Medical Biochemistry and Biophysics, Stockholm, Sweden, Germany

Published on 23 Oct 2010

Background: Cancer stem cells (CSCs) are thought to be responsible for tumor progression and therapy resistance. They have been identified in a variety of human tumors as well as in cancer cell lines. Cell lines might therefore serve as an attractive source for CSC in vitro research. We investigated to which extent colorectal cancer cell lines contain CSC-like cells and if their expression profiles correlate with clinical measures.

Methods: Altogether, 12 colorectal cancer cell lines of carcinomas and metastases were analyzed by flow cytometry using a panel of six CSC surface markers (CD326, CD133, CD44, CD166, Msi-1 and Gpr49). Expression frequency of CSC markers was divided into four categories with high (> 70% of cells), moderate (≤ 70% and ≥ 30%), low (< 30% and ≥ 1%), and absent (< 1%) expression.

Results: All cell lines but one (HT29) showed a stable expression pattern throughout all four replicates. HT29 showed an increased expression for CD133 and CD166 over time and was thus excluded from further analyses. The majority (91%) of cell lines showed high expression for CD326. About half to one third of the cell lines expressed at high frequency CD44 and CD166 (in 45%) and CD133 (in 36%). In contrast, most cell lines expressed Msi1 and Gpr49 at low frequency. Since CD326, Msi1, and Gpr49 did not show any major expression differences in between the various cell lines, we checked for potential correlation of CD44, CD133 and CD166 expression differences with clinical parameters. However, we could not observe any significant correlation.

Conclusion: Colorectal cancer cell lines do harbour to a substantial amount CSCs. The frequency of such shows a distinct variability among different cell lines particularly for CD44, CD133, and CD166. This might be due to different clinical properties such as tumor progression and metastasizing as reported previously. In our study, case numbers were too small to validate such reports. Interestingly, the frequency of CSC remained considerably stable over multiple passages within the individual cell line, except for HT29. We suggest excluding HT29 from in vitro analyses. In contrast, the remaining 11 cell lines seem to represent stable models of distinct CSC expression profiles and thus can serve for functional, molecular characterization of marker specific expression profiles.