World Academy of Science, Engineering and Technology
International Journal of Biotechnology and Bioengineering
Vol:16, No:08, 2022

Evaluation of Important Transcription Factors and Kinases in Regulating the Signaling Pathways of Cancer Stem Cells With Low and High Proliferation Rate Derived From Colorectal Cancer

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Abstract : Colorectal cancer is the third leading cause of cancer-related death in the world. Colorectal cancer screening, early detection, and treatment programs could benefit from the most up-to-date information on the disease's burden, given the present worldwide trend of increasing colorectal cancer incidence. Tumor recurrence and resistance are exacerbated by the presence of chemotherapy-resistant cancer stem cells that can generate rapidly proliferating tumor cells. In addition, tumor cells can evolve chemoresistance through adaptation mechanisms. In this work, we used in silico analysis to select suitable GEO datasets. In this study, we compared slow-growing cancer stem cells with high-growth colorectal cancer-derived cancer stem cells. We then evaluated the signal pathways, transcription factors, and kinases associated with these two types of cancer stem cells. A total of 980 upregulated genes and 870 downregulated genes were clustered. MAPK signaling pathway, AGE-RAGE signaling pathway in diabetic complications, Fc gamma R-mediated phagocytosis, and Steroid biosynthesis signaling pathways were observed in upregulated genes. Also, caffeine metabolism, amino sugar and nucleotide sugar metabolism, TNF signaling pathway, and cytosolic DNA-sensing pathway were involved in downregulated genes. In the next step, we evaluated the best transcription factors and kinases in two types of cancer stem cells. In this regard, NR2F2, ZEB2, HEY1, and HDGF as transcription factors and PRDM5, SMAD, CBP, and KDM2B as critical kinases in upregulated genes. On the other hand, IRF1, SPDEF, NCOA1, and STAT1 transcription factors and CTNNB1 and CDH7 kinases were regulated low expression genes. Using bioinformatics analysis in the present study, we conducted an in-depth study of colorectal cancer stem cells at low and high growth rates so that we could take further steps to detect and even target these cells. Naturally, more additional tests are needed in this direction.

Keywords : colorectal cancer, bioinformatics analysis, transcription factor, kinases, cancer stem cells
Conference Title : ICBCBBE 2022 : International Conference on Bioinformatics, Computational Biology and Biomedical Engineering
Conference Location : Amsterdam, Netherlands
Conference Dates : August 08-09, 2022