Evaluating the Migration of Glioblastoma Stem Cells in vitro Towards a Chemoattractant Gradient

Copple, Helen (School: Barrington High School)
Singh, Shaswat (School: Barrington High School)

Glioblastoma Multiforme (GBM) is one of the most lethal and aggressive brain cancers in humans. This project investigated the efficacy of a potential therapy for GBM-The Gliatrap. The Gliatrap is a cutting-edge therapy, still in development, that essentially lures Glioblastoma Stem Cells (GSCs), cells on the outside of a GBM tumor, and localizes them. The GSCs are then eliminated by drugs, removing the possibility of recurrence. The researchers investigated the mechanism, known as chemotaxis, of the Gliatrap, which uses CXCL12 (a chemoattractant) to induce the migration of GSCs.The researchers performed a Western Blot on three different GSC cell lines and quantified the expression of CXCR4, a receptor protein in GSCs. CXCR4 was found to be expressed in all 3 GSCs cell lines, indicating a common expression of CXCR4 in GSCs and supporting the viability of the chemotaxis mechanism. The researchers performed a chemotaxis assay to determine if CXCL12 induces migration of CXCR4 expressing GSCs towards it. Results supported that CXCL12 induced a statistically significant migration of GSCs compared to the control group. A siRNA knockdown of CXCR4 in GSCs was conducted to determine if CXCR4 was responsible for the detection of CXCL12. The GSCs with an inhibited expression of CXCR4 showed a substantially lower migration towards the chemoattractant, confirming the role of CXCR4 in the detection of CXCL12. The researchers worked with a 3D model by utilizing a GSC sphere, extracellular matrix, and miniaturized device. Results showed that CXCL12 could attract GSCs that diffuse away from a sphere in ECM, which is more similar to one in-vivo. The researchers' findings yielded promising results supporting the efficacy of the Gliatrap as a potential therapy for GBM.

Awards Won:
Fourth Award of $500