

A*Star scientists find growth behaviour of brain cancer cells

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Singapore: Researchers at the Institute of Bioengineering and Nanotechnology (IBN) of A*STAR have demonstrated that the cell microenvironment plays an essential role in the growth of brain cancer cells. This discovery could lead to a possible breakthrough in fighting glioblastoma, a deadly form of brain cancer.

Stem cells found in the tumors are responsible for making glioblastoma hard to treat because they are drug-resistant and self-renewing. IBN's study is the first to focus on how the extracellular matrix surrounding the tumor affects the development of cancer stem-like cells in a 3D microenvironment.

"There is currently no cure for glioblastoma, and it is important to eradicate the tumor-initiating cells in order to treat this cancer successfully. By focusing on how the extracellular matrix promotes the development of brain cancer cells, we hope to provide a fresh approach towards tackling the problem, and develop new and more effective therapies," said Professor Jackie Y Ying, executive director, IBN.

Led by IBN Team Leader and Principal Research Scientist, Dr Andrew Wan, the researchers studied the growth of glioblastoma cells in a 3D model using a scaffold of electrospun fibers, and in 2D using conventional tissue culture polystyrene plates. The gene and protein expression results showed that the 3D microenvironment promoted the development of brain cancer stem-like cells, when compared with the 2D microenvironment.

In particular, the IBN researchers found evidence that two specific types of molecules on the surface of glioblastoma cells, called integrin alpha-6 and integrin beta-4, interacted with a specific group of laminin proteins in the extracellular matrix, to promote the development of cancer stem-like cells. This finding was supported by their collaborators at the National Neuroscience Institute using computational approaches to analyze patient tumor and molecular information, which confirmed that these same integrins and laminins were associated with more aggressive brain tumors, in particular, grade IV glioblastoma.

"We are excited to have successfully demonstrated that the extracellular matrix and 3D microenvironment work together to affect the stem-like properties in glioblastoma cells. Our finding may also apply to other cell types besides glioblastoma cells, and be used to develop more accurate cancer disease models for drug testing and development. We will conduct further studies with clinical samples from the National Neuroscience Institute, with the goal of improving brain cancer treatment," said Dr Andrew Wan.