**Identification of Diverse Astrocyte Populations in the Human Brain and Their Roles in Neurological Disease**

The human brain is an incredibly complex and intricate organ that is not well understood. Like all other organs, cellular heterogeneity is a necessary component of proper organ function, as a diversity of cell populations working in concert enable the variety of physiological activities organs carry out. The mammalian brain is composed of a multitude of cell types – including neurons, glial cells, oligodendrocytes, and astrocytes – that are required for proper brain function. Even within each cell type, subpopulations can exist. Several studies have found hundreds of molecularly and functionally distinct neuronal cell types in the human brain[1,2]. The diversity of other cell types – including astrocytes – however, has not been extensively studied.

Astrocytes, the most abundant cell type in the brain, are critical to brain function, and serve a variety of important roles. The fact that astrocytes demonstrate such functional diversity indicates that, like neurons, astrocytes must exhibit a variety of cell subtypes. While several astrocyte subpopulations have been identified, much about astrocyte heterogeneity and function remains unknown. A recent study by Lin et. Al. identified five unique, diverse astrocyte subpopulations and correlated changes in the abundancies of such subpopulations with the development of neurological diseases[3].

Each subpopulation identified in their study was found to be molecularly diverse. Furthermore, analysis of the migratory and proliferative properties of each of the astrocyte types in the developing cortex showed that the five subtypes each serve different developmental functions. Using mouse models, the group assessed whether the emergence of specific astrocyte subpopulations in the human brain was correlated with the development of neurological disorders – namely, brain tumors and gliomas. Seizures are a key feature of gliomas and are (in part) brought about by an imbalance of synaptic activity. One of the five identified astrocyte subtypes was found to be associated with the promotion of synaptogenesis, or the formation of neuronal synapses. Progressive increases in the abundance of this subtype were found to be directly correlated with the onset of seizures. The emergence of the other subtypes were found to be correlated with other features of tumor progression as well, ultimately indicating that the subpopulations execute different functions associated with tumor progression[3]. Their findings ultimately provide further insight into our knowledge brain gliomas and suggest plausible mechanisms by which such gliomas might be treated.

References

[1] Jiang, X. et. Al. (2015). “Principles of connectivity among morphologically defined cell types in adult neocortex.” *Science* (350).

[2] Kepecs, A. & Fishell, G. (2014) “Interneuron cell types are fit to function. *Nature* (505): 318-326.

[3] Lin, et. Al. (2016). “Identification of Diverse Astrocyte Populations and Their Malignant Analogs.” *Nature Neuroscience 20.3:* 396-405