Lipid Regulation in Myelination

The Hartley Lab studies the role of lipids in neurological diseases using an interdisciplinary approach combining chemical biology and bioanalytical chemistry.[1, 2] Current research is focused on myelin, which is the lipid-rich sheath that surrounds axons and promotes efficient neuronal signaling. Damage to myelin occurs in many neurological diseases including multiple sclerosis. How lipids change during myelin damage and subsequent repair is not well understood. Elucidation of lipid pathways that are critical for myelination could lead to new therapeutic targets.

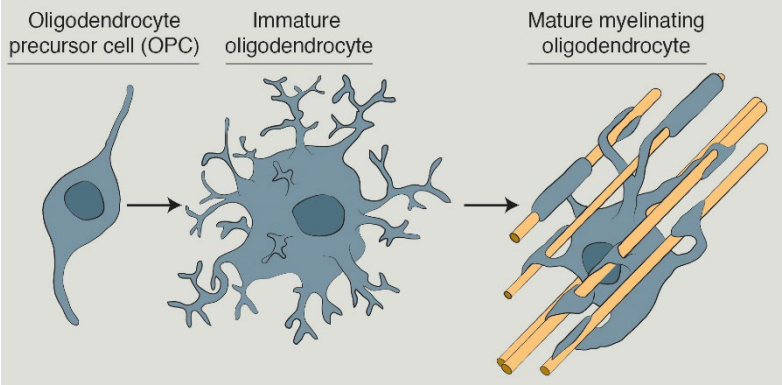

Figure 1: Myelination is formed by oligodendrocytes which are derived from oligodendrocyte precursor cells (OPCs).

REU students would use isolated oligodendrocyte precursor cells (OPCs) as a cellular model of myelination[3] to assist with one of several projects: (1) chemically modified lipids will be used to study of how a specific lipid interacts with myelinating cells, (2) mass spectrometry will enable the student to measure how specific lipids change as OPCs transform into myelinating cells, and (3) fluorescence microscopy and related techniques including labeling, imaging, and analysis will be implemented to study cellular myelination.

REU students would gain experience with isolating and culturing primary mammalian cells, as well as experience in one or more related bioanalytical techniques.

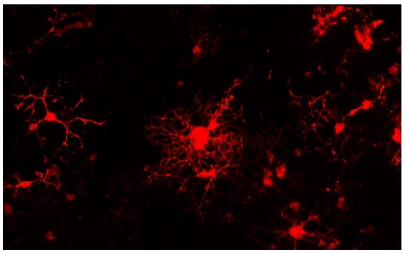

Figure 2: Isolated oligodendrocytes stained with a fluorescent antibody for myelin basic protein (MBP).

References

1. Hartley, M. D.; Shokat, M. D.; DeBell, M. J.; Banerji, T.; Kirkemo, L. L.; Scanlan, T. S., Pharmacological Complementation Remedies an Inborn Error of Lipid Metabolism. *Cell Chem Biol* **2020,** *27* (5), 551-559 e4.
2. Hartley, M. D.; Banerji, T.; Tagge, I. J.; Kirkemo, L. L.; Chaudhary, P.; Calkins, E.; Galipeau, D.; Shokat, M. D.; DeBell, M. J.; Van Leuven, S.; Miller, H.; Marracci, G.; Pocius, E.; Banerji, T.; Ferrara, S. J.; Meinig, J. M.; Emery, B.; Bourdette, D.; Scanlan, T. S., Myelin repair stimulated by CNS-selective thyroid hormone action. *JCI Insight* **2019,** *4* (8).
3. Dugas, J. C.; Emery, B., Purification of oligodendrocyte precursor cells from rat cortices by immunopanning. *Cold Spring Harb. Protoc.* **2013,** *2013* (8), 745-58.