Lorraine Barry-Figueroa
Instructor: Dr. Steel

Personal Research Paper: Saturated Fatty Acids alters embryonic cortical neurogenesis through modulation of gene expression in neural stem cells

Exploring what could affect an individual's future even before they have a say in it is fascinating to me. For this reason, I chose a research article that looks at what can have an effect on embryonic cells, specifically, saturated fatty acids as an influencer on embryonic cortical neurogenesis.

The research study took human embryonic stem cells and treated them with palmitic acid in varying amounts. The specific effects the study tested for were cell proliferation, cell differentiation, and cortical neurogenesis. These effects were measured using associated genes such as Beta-Tubulin III, Reln, and Bdnf and epigenetics.

Red oil staining was used to measure the amount of lipids absorbed into the cells. Through the use of immunostaining, "the use of specific antibodies to detect a single target protein," researchers tracked the expression of specific genes at three stages throughout the cells exposure to varying concentrations of palmitic acid (Maity et al, 2013). In the detection of the effects on cortical neurogenesis, the gene Beta Tubulin III, "a neuronal specific marker," was found to have significantly increased expression as shown by the western blot figure in figure 3E (Ardah et al, 2018). This indicates an increase in differentiation of the cell. Two other genes, Reln and Bdnf, were found to have differing expression as a result of prolonged exposure to palmitate. Reln had a significant increase in expression where Bdnf was significantly reduced as seen by figure 3G which portrayed graphs of mRNA expression of the genes over 70 days. Both Reln and Bdnf are negatively associated with neurodevelopment, reduced expression of Bdnf in particular is associated with Autism, Schizophrenia, ect. In order to test for influences of palmitate on epigenetics, the study targeted histones and long-non coding RNA, lncRNA, involved in the expression of the previously mentioned genes. Histone acetylation was identified as a target for analysis due to its effect on chromatin structure since "chromatin remodeling complex may play an important role in cell fate decision (Cao, 2014)." This would make histone acetylation an epigenetic mechanism. Histone acetylation was tested through western blotting and while there was an overall increase in specific histone acetylation there was not enough correlation to indicate palmitate as the cause of this. Because of this uncertainty involving histone acetylation, the researchers looked at another epigenetic mechanism, lncRNA, using PCR arrays. Multiple lncRNAs were found to be either up or down regulated when exposed to palmitate with a list of the top 25 lncRNAs listed in figure 5A. The results indicate an increase in cell differentiation and a potentially harmful change in gene expression possibly due to epigenetic factors.

The research subject specifically involves cells and investigates possible influencers of how cells function during early stages of life. The influencer this article focuses on is that of saturated fatty acids and the article uses gene expression as an indicator of cell functionality. This is further investigated through epigenetic mechanisms which attempts to explain how the saturated fatty acids may be influencing the cells gene expression. The amount of chemical and biological factors that play a role in an individual's life on a cellular level is staggering especially how little is known about these factors. This accentuates the need for research such as the study done in this article that explores how the cell functions in response to its surroundings.

Works cited

Ardah, M., Parween, S., Varghese, D., Emerald, B. and Ansari, S. (2018). Saturated fatty acid alters embryonic cortical neurogenesis through modulation of gene expression in neural stem cells. *The Journal of Nutritional Biochemistry*, 62, pp.230-246.

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