Introduction

Iron deficiency is a common nutrient disorder, affecting nearly 2 billion individuals globally, including 30% of women and their offspring. Iron is a nutrient with a vital role in proper mitochondrial function. This is important in developing neurons; lack of proper amounts of iron can lead to impaired memory and learning functions as well as social deficits. When supplemented early enough, iron supplements may reverse these effects. However, this time frame is very narrow and by the time iron deficiency is detectable in newborns, this window has passed.

Methylene blue is a drug that acts as an alternative electron carrier in the electron transport change. This drug improves mitochondrial function and enhances memory in some cases. Thus, this would be an ideal option to test to reverse the effects of prenatal and early postnatal iron deficiency in newborns as well as other individuals later in life.

The hypothesis for this experiment is that treatment with methylene blue alone will not yield any significant changes from iron deficient neurons and treatment with iron and methylene blue together will improve dendrite complexity to be similar to control neurons.

Methods

**Chronic Iron Deficiency and Treatment of Primary Hippocampal Cultures**

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<td><strong>DFO</strong> = Deferoxamine (Iron Chelator)</td>
<td><strong>DIV</strong> = Days In Vitro</td>
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**Analyses**

Dendrite complexity (branching and length) was determined through dendrite tracing and sholl analysis.

**Statistics**

Statistical significance was determined using a one-way and two-way ANOVA tests. Asterisks represent a significant difference between that treatment group and the control. The same letter above bars on the graphs represent no significant difference between the groups.

Results

The DFO treatment group results were in line with results from previous experiments. In none of the groups was the treatment group of MB treated DFO and MB plus iron treated DFO neurons statistically similar to the control group while being statistically significant from the DFO and DFOR groups. This means the MB treatment did not work as expected, and in some cases made the groups worse. This is likely due to the dosage amount of MB used. In testing done since the data collection from this experiment, it has been shown that there is only a very narrow range in which MB treatment will be helpful in aiding mitochondrial function and that in some cases too much MB can be harmful. This experiment would need to be repeated with a smaller MB dosage amount in order to come to a more accurate conclusion about the viability of MB as a treatment option for reversing the effects of prenatal and early postnatal iron deficiency.

Acknowledgements

We have no conflicts of interest to disclose. We thank the members of the Georgieff and Lanier labs for their technical assistance. We also thank the office of the Undergraduate Research Opportunities Program for financial assistance.

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