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Effect of Palmitic Acid on B2 Receptor Expression In Airway Smooth Muscle Cells

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Effect of Palmitic and Oleic Acids on B2 Receptor Expression In Airway Smooth Muscle Cells

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Introduction

- Obese people are more likely to have asthma[1] and nearly 60% of adults with asthma are obese. [2] B2 agonists are often used as a rescue treatment when symptomatic. Obese patients are far more likely to be hospitalized for symptoms that are unable to be controlled by this rescue treatment. [3]
- The project is an attempt to understand how exposure to fatty acids will affect expression of the B2 receptor in airway smooth muscle cells with the goal of improving the primary rescue treatment of asthma in obese patients.

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Objectives & Hypothesis

- Research Question
  - How do B2 receptor expression levels in airway smooth muscle cells exposed to Palmitic Acid and Oleic Acid compare to airway smooth muscle cells that are Untreated?
- Hypothesis
  - B2 receptor expression will decrease in airway smooth muscle cells exposed to Palmitic acid compared to Untreated airway smooth muscle cells.
    - B2 receptor expression will not change in airway smooth muscle cells exposed to Oleic Acid compared to Untreated airway smooth muscle cells.

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Approach & Results

- The study was a Basic Science Cell Study design using airway smooth muscle cells.
- Interventions included cell treatments with fatty acids at varying concentrations.
- Airway smooth muscle cells were plated into six well dishes and treated according to the table below:

Untreated	Palmitic Acid 100uM	Oleic Acid 100uM
BSA Only	Palmitic Acid 200uM	Oleic Acid 200uM

Note: BSA is agent used to dissolve Palmitic Acid for treatments and serves as our Untreated control for Palmitic Acid conditions

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Approach & Results

- Cells were lysed and RNA was harvested at 24 and 48 hours.
- Primers (B2, GAPDH) were used to expand selected RNA with PCR.
- RT PCR was used to quantify B2 and GAPDH expression, which served as an expression control for B2.
- This approach allowed for easy access to measuring B2 receptor RNA expression levels at precise fatty acid concentrations to see if these levels differed significantly from their controls.

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Approach & Results

- Analysis
  - An unpaired T test was performed to assess for statistical difference in each condition compared to its control. No p value was less than .05 so none of the conditions varied significantly from its control.

Conditions	dCqs of Means	P Values For Each Condition
Control 24	16.51977044	
BSA 24	15.72458217	
P100 24	15.25812426	0.464354253
P200 24	15.60435946	0.866620192
O100 24	16.20325983	0.53839965
O200 24	16.49306651	0.96214382
Control 48	16.75581912	
BSA 48	16.16316445	
P100 48	15.16216097	0.143074353
O100 48	15.48294556	0.184299933
O200 48	16.64999384	0.824403539

Note: dCq= RT PCR cycles to reach threshold for B2- RT PCR cycles to reach threshold for GAPDH. P200 48 condition was excluded due to cell death.

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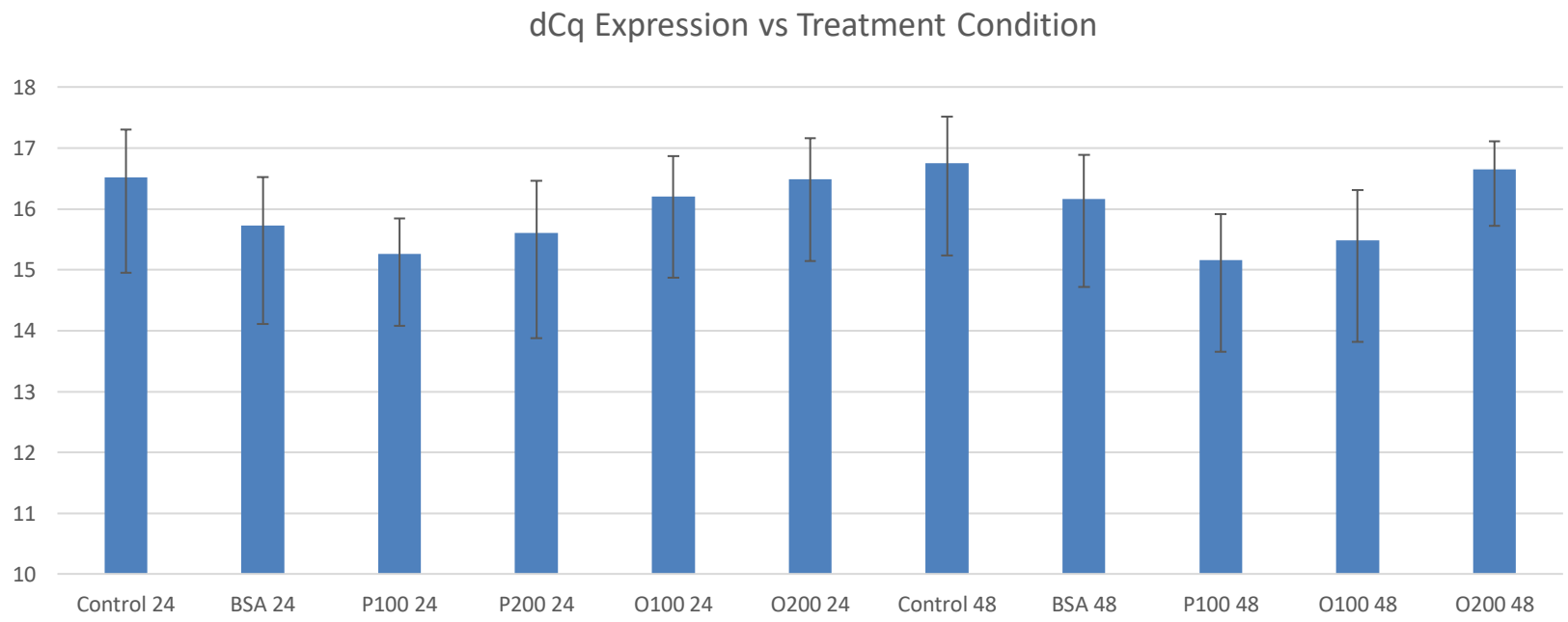
Approach & Results



This graph shows the difference in cycle numbers to reach threshold of B2 and GAPDH for the means of each condition. The black bars indicate the standard deviation of each value.

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Conclusions

- None of the conditions differed significantly from their controls.
- This data does not support our main hypothesis that B2 receptor expression will decrease in cells exposed to Palmitic Acid.
- Our secondary hypothesis that B2 receptor expression would be unchanged in cells treated with Oleic Acid is supported by our data.
- There is no current literature involving B2 expression in fatty acid exposed cells, so this is a new area for study with our data showing no significant decrease in expression for cells treated with Palmitic or Oleic Acids.
- There is further need for research into understanding the mechanism causing decreased efficacy of B2 agonists rescue treatments in obese patients.

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Future Directions

- Further Clinical and Basic Science research into the mechanism of decreased efficacy of B2 agonists in obese patients is necessary.
- The next step for our team is a literature review to look for other possible mechanisms that may include changes in membrane fluidity due to fatty acid composition or changes in how B2 agonists interacts with receptors in these patients.

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