Investigation of Zymosan Induced Bladder Pain in Adult Female Mice

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Introduction

- Urologic Chronic Pelvic Pain Syndromes (UCPPS) affect 5-10 million people in the United States alone. Women are predominantly affected.
- Symptoms include severe bladder pain, abdominal pain, anxiety, depression, stress, urinary incontinence, and recurring urinary tract infections.
- Zymosan is a protein compound sourced from yeast cell walls that reportedly produces an inflammatory response if injected into the bladders of adult female mice.
- This study piloted the use of zymosan as a method of inducing chronic inflammation in order to provide a mouse model that is more comparable to the human condition.

Hypothesis

- Zymosan injections into the bladder at 2 weeks and 7 weeks will produce an inflammatory response 7 days after the last treatment that will evoke bladder pain.

Methods: Pilot (Preliminary) Experiment
2 Groups of Treatment

- Control n=5 (no anesthesia and no fluid injection)
- Zymosan n=7 (30 minutes of anesthesia and 1% zymosan injection)

Methods: Full Experiment
2 Groups of Treatment

- Control n=4 (no anesthesia and no fluid injection)
- Zymosan n=4 (30 minutes of anesthesia and 1% zymosan injection)

Methods: Experimental Data Timeline

- Birth
- Testing: 14 hours later
- Treatment
- Experiment: days 14, 15, 16

Results - Zymosan Causes No Effect on Visceromotor Response

- Figure 1: Preliminary Data: Average Visceromotor Response to Urinary Bladder Distention. This figure shows the preliminary data collected using the acute model of zymosan. It features the average visceromotor responses (VMRs) to urinary bladder distention. (Two-Way ANOVA: treatment p=0.0333, pressure p=0.0403, interaction p=0.6433)

- Figure 2: Experimental Data: Average Visceromotor Response to Urinary Bladder Distention. This figure shows the experimental data collected using the chronic model of zymosan. It features the average visceromotor responses (VMRs) to urinary bladder distention. (Two-Way ANOVA: treatment p=0.2573, pressure p=0.1161, interaction p=0.4640)

Summary of Results:

- Figure 1 shows the preliminary data collected to ensure the efficacy of zymosan as a method of inflammation induction.
- Figure 2 highlights the contrast between the VMR output of the control animals vs. the treatment animals.
- Figure 3 highlights the lack of contrast between the bladder weights of the control animals vs. the treatment animals.

Conclusions:

- In the experimental data, it appears that zymosan has no effect on the intensity of VMR output. The contrast in VMR output could be the result of numerous factors such as body temperature fluctuations.
- Zymosan appears to have no effect on bladder weight. Both the control and zymosan animals appear to have similar bladder weights. This likely is due to a lack of inflammation or an equivalent amount of inflammation.
- We found no significant effect of zymosan on inflammatory bladder pain. While the preliminary data appears to show a trend of difference in inflammatory responses, this likely is due to either the immediate effect of treatment or residual effects of the procedure itself.

Future Directions

- Repeat the experiment using a mathematically determined statistically fully-powered n.
- Perform immunohistochemical staining in order to track the secretion and trafficking of neuropeptides of interest such as calcitonin gene related peptide (CGRP) in bladder sensory neurons.

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References

