

Behavioral analysis of euthanasia strategies for neonatal male layer chicks

A. Milby*¹, X. Wang¹, D. Zhao¹, S. Gurung¹, G. Archer¹, E. Peebles², and M. Farnell¹

¹Texas A&M AgriLife Research; ²Mississippi State University



INTRODUCTION

Male layer chicks have no agronomic value and are euthanized on day of hatch. Eight percent of broiler chicks must also be killed due to failure to pip or lethal deformities (Cobb, 2018). Instantaneous mechanical destruction is the predominant euthanasia method used in poultry hatcheries (Vizzier-Thaxton, 2016). While the technique has been approved by the American Veterinary Medical Association (AVMA) as quick and humane, the consumer would like for alternatives to be considered (Vizzier-Thaxton, 2016). Gas asphyxiation by carbon dioxide and nitrogen are AVMA approved euthanasia methods and may provide industry alternatives (2013). Hypoxia may also be induced by use of a vacuum chamber, such as the low atmospheric pressure stunning system (LAPS™), which has been successfully used for market aged poultry at commercial processing plants (McKeegan, 2013). While peer reviewed publications evaluating methods of chick euthanasia are available, no information has been found for LAPS™ or a commercial/large scale test (Gurung, 2018). This project will evaluate CO₂, N₂ and LAPS™ as alternative euthanasia methods for neonatal chickens.

HYPOTHESIS: We hypothesized that gas asphyxiation and low atmospheric pressure stunning (LAPS™) are humane and feasible alternative euthanasia methods for neonatal chickens.

OBJECTIVE: The objective of this study was to evaluate the effects of different euthanasia methods on the behavioral responses of neonatal chickens.

MATERIALS AND METHODS

Treatments:

Breathing Air Followed by Decapitation (Control); 4 reps/trt
Carbon Dioxide (CO ₂); 4 reps/trt
Nitrogen Gas (N ₂); 4 reps/trt
Low Atmospheric Pressure Stunning (LAPS™); 4 reps/trt



TechnoCatch
LAPS™
Chamber

Measurements:

- Ataxia:** birds that fail to maintain body balance; birds exhibit this behavior when signs of swaying, inability to stand, and flipping were observed.
- Loss of Posture:** birds that are unable to control body posture; birds that cannot maintain a sitting position; and birds that lay down with extended necks.
- Convulsive Behavior:** birds that are unable to control body movement; birds exhibit this behavior when signs of flapping wings, jumping, flipping, muscle twitching/spasms, and straightening of the legs were observed.
- Cessation of Vocalizations:** this behavior was observed when all noise from the birds concluded.
- Cessation of Movement:** birds that exhibited no signs of movement

Experimental Design:

A total of 480 day-of-hatch male layer chicks were randomly assigned to 4 treatments with 4 replicates/treatment and 30 chicks/replicate over a two-day period. Chicks received the corresponding treatments in a commercial vacuum chamber (TechnoCatch LLC; Kosciusko, MS). A vent was removed to allow air to escape as CO₂ or N₂ was added and to prevent pressurization of the vessel. A 300-gallon (1.135 m³) storage tank was pressurized to 90 PSI (620,528 Pa) before each treatment. The volume of the chamber was 1,025 gallons (3.880 m³) and the tank released approximately 1,818 gallons (6.882 m³) of stored gas at atmospheric pressure into the chamber. Over the course of the two days, the treatments filled the chamber and chick behaviors were recorded by an infrared camera system. The video segments included all events from the moment that the gas was introduced into the chamber until 2 minutes (120 sec) after cessation of movement. Results were recorded in seconds. Research was conducted under an approved Texas A&M Institutional Animal Care and Use Committee protocol (IACUC 2016-0200).

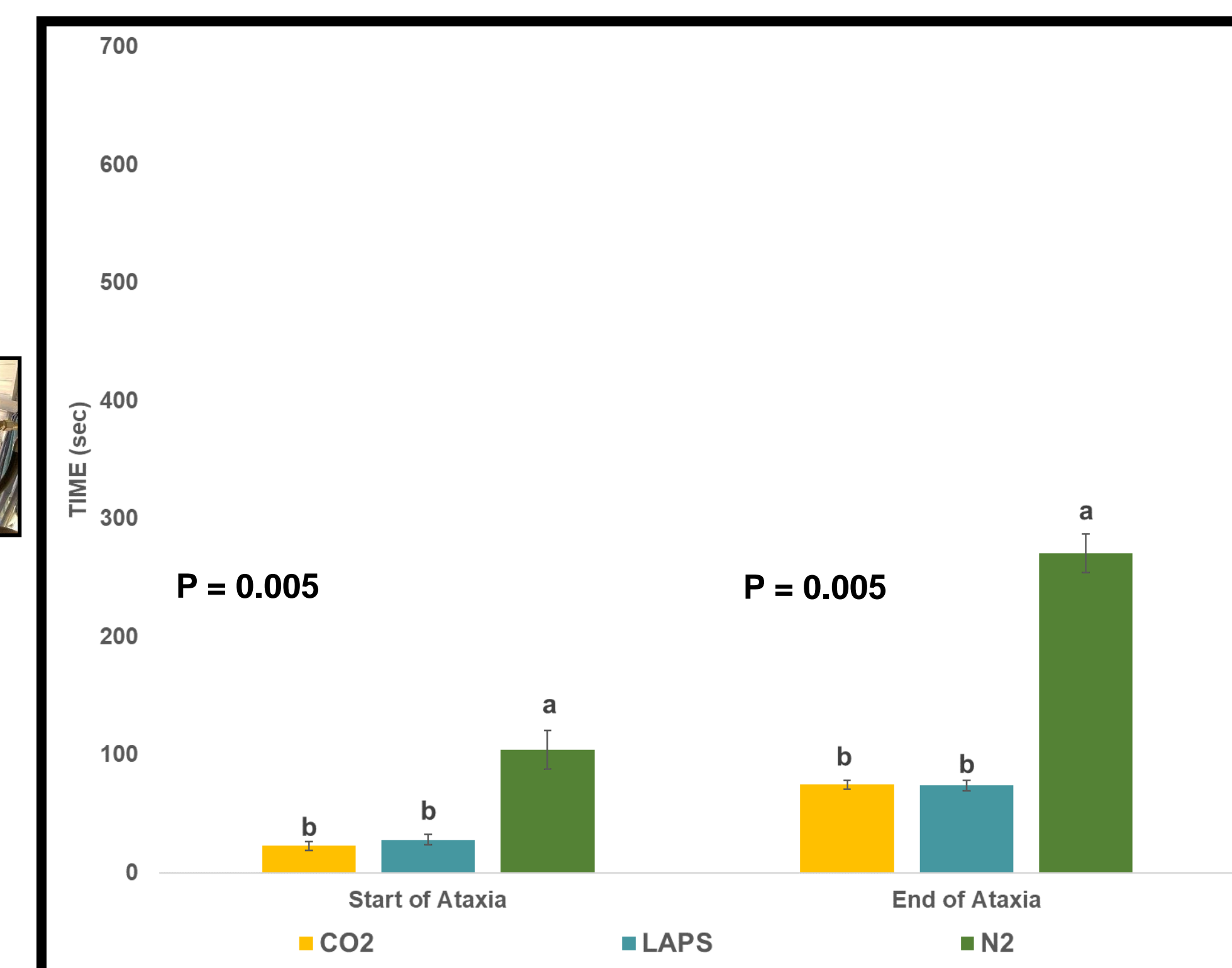
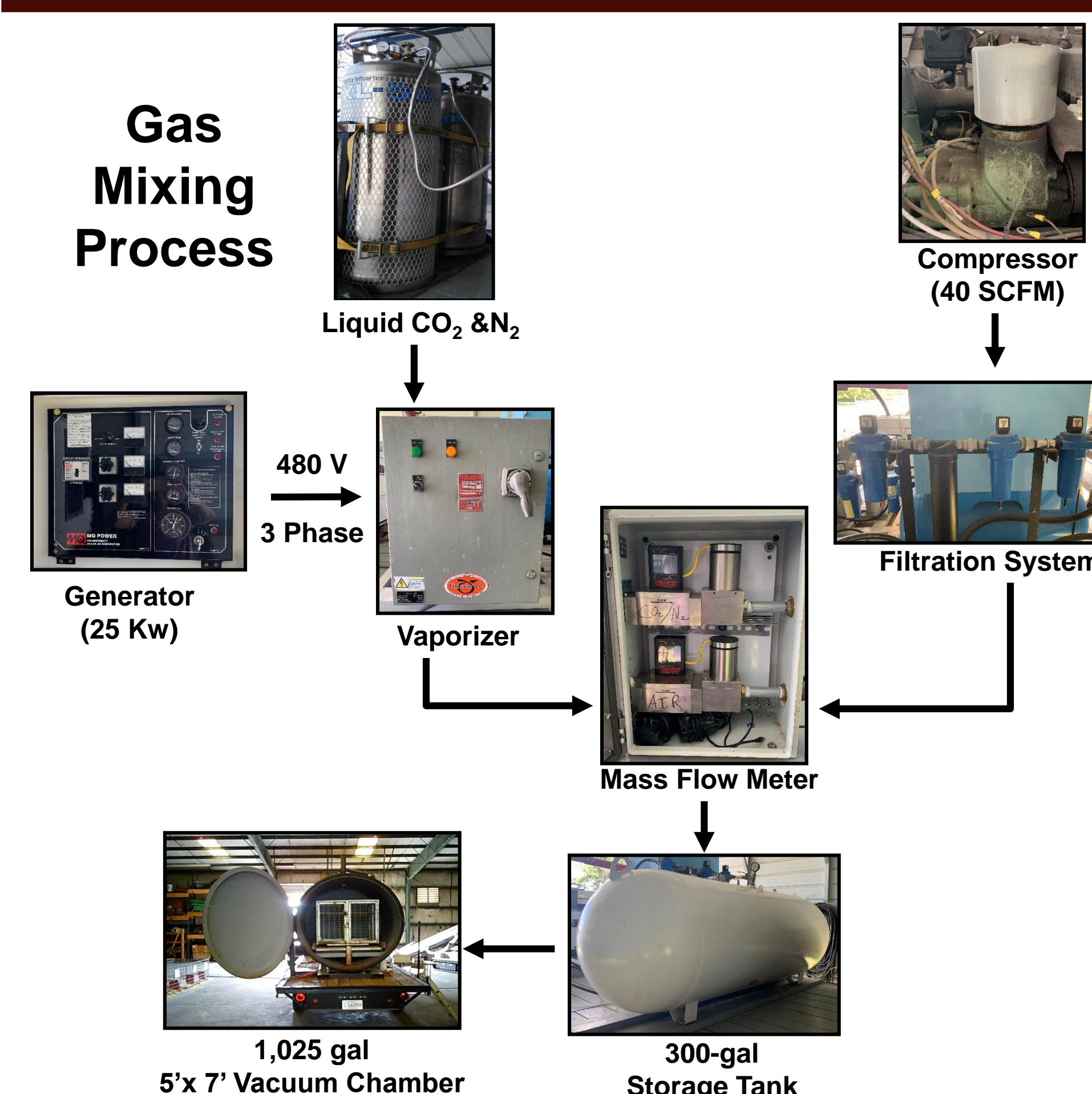
Statistical Analysis:

A randomized design was applied to study four methods on a commercial scale. Data was analyzed via a one-way ANOVA analysis which exhibited the effectiveness of each treatment with significant differences found at P < 0.05.

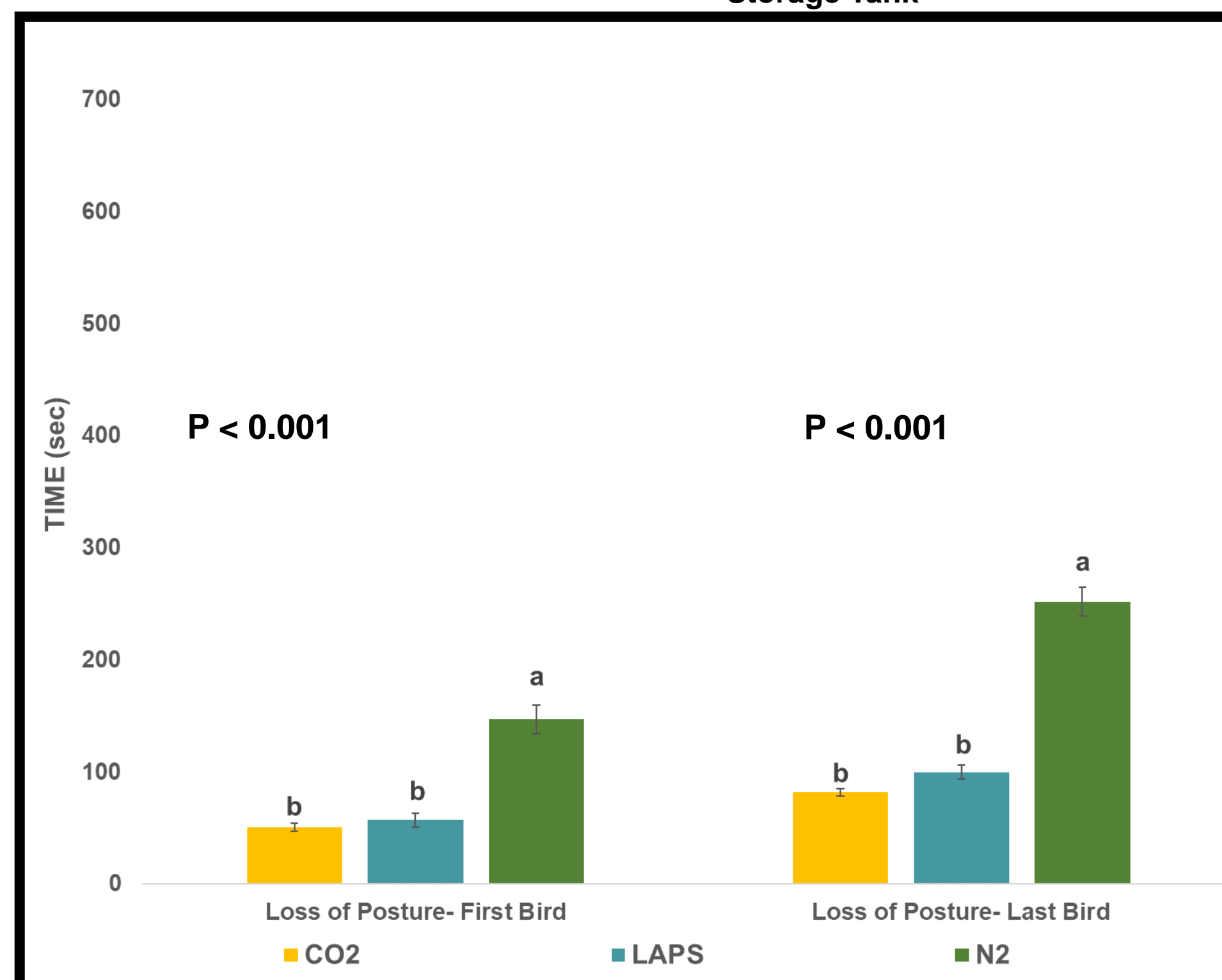
KEY WORDS

Behavior, Carbon Dioxide, Euthanasia, Low Atmospheric Pressure Stunning System, Nitrogen

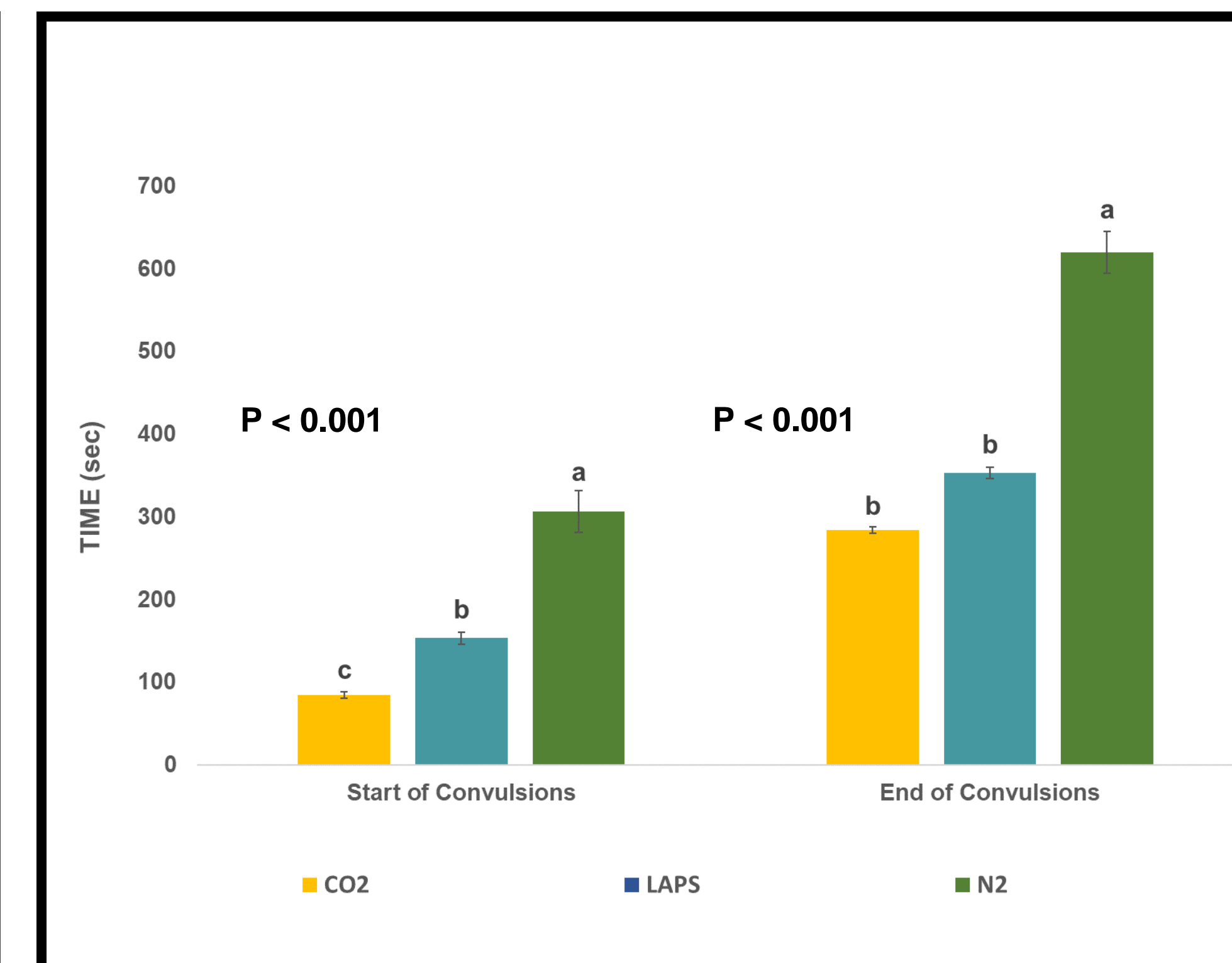
RESULTS



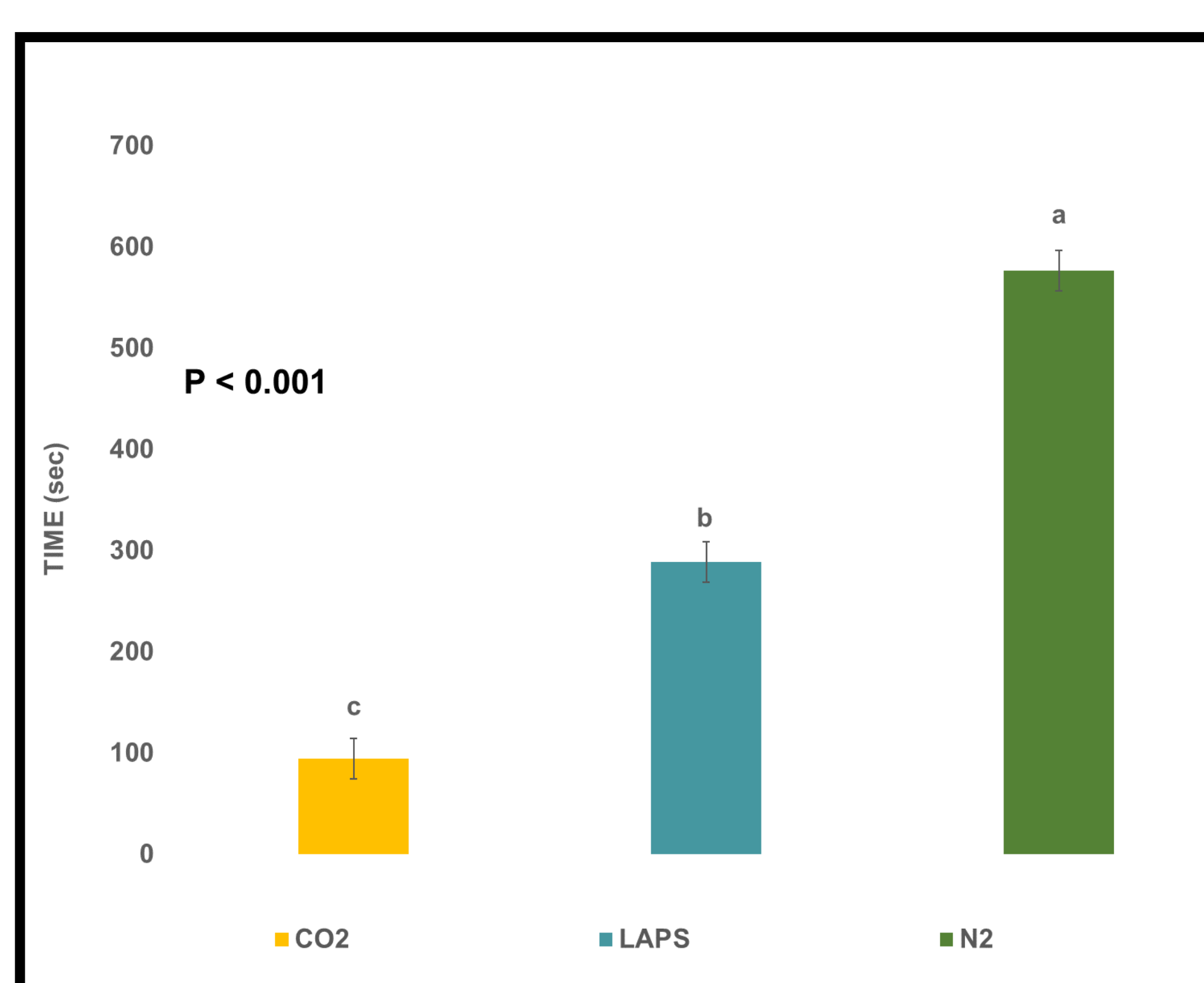
Ataxia – Onset and cessation of the symptom in all treatments.



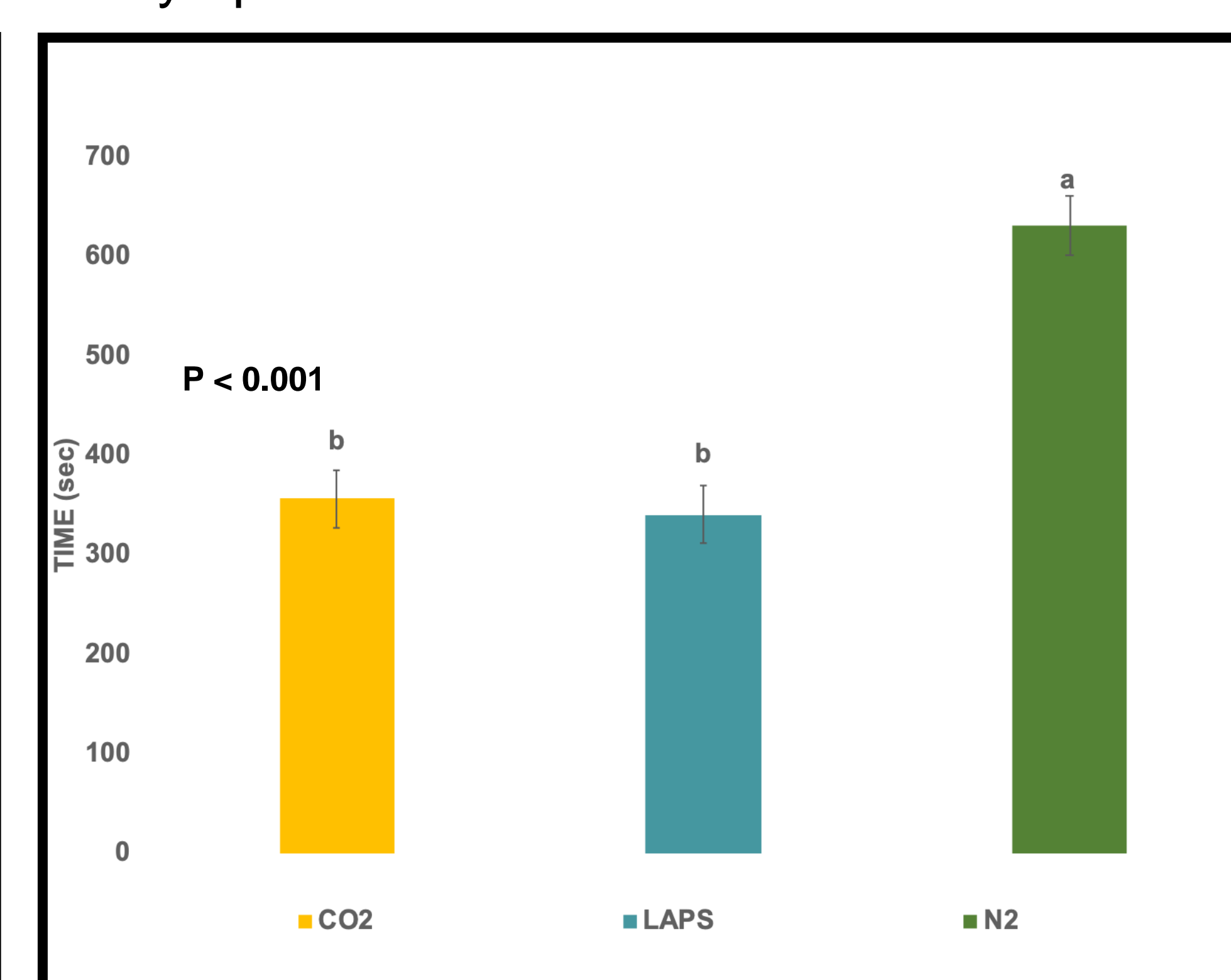
Loss of Posture – Onset of symptom in the first and last bird in all treatments.



Convulsions- Onset and cessation of symptom in all treatments.



Cessation of Vocalizations- Cessation of sound in all treatments.



Cessation of Movement- Cessation of movement in all treatments.

CONCLUSIONS

- The CO₂ treatment resulted in the fastest onset of ataxia, loss of posture, convulsive behaviors, and cessation of vocalizations.
- The LAPS™ treatment was similar in time to CO₂ in the behaviors of ataxia, loss of posture, and cessation of movement. This treatment was slower than CO₂ in convulsive behavior and cessation of vocalizations.
- The N₂ treatment took the longest in each parameter. We believe this is due to the fact that nitrogen accounts for 78% of air; therefore, it took longer to achieve a lethal concentration.

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