UNIVERSITI TEKNOLOGI MARA

THE INFLUENCE OF POLYSULPHIDE-ENHANCED GARLIC INTAKE ON GASOTRANSMITTERS PROFILES AND SELECTED PHYSIOLOGICAL RESPONSES TO HIGH-INTENSITY CONSTANT LOAD EXERCISE

MUHAMMAD ALIF NAZRIN BIN JUMAT

MSc

June 2021

AUTHOR'S DECLARATION

I declare that the work in this thesis was carried out in accordance with the regulations of Universiti Teknologi MARA. It is original and is the results of my own work, unless otherwise indicated or acknowledged as referenced work. This thesis has not been submitted to any other academic institution or non-academic institution for any degree or qualification.

I, hereby, acknowledge that I have been supplied with the Academic Rules and Regulations for Post Graduate, Universiti Teknologi MARA, regulating the conduct of my study and research.

Name of Student	:	Muhammad Alif Nazrin Bin Jumat
Student I.D. No.	:	2019712023
Programme	:	Master of Science (Sports Science and Recreation) – SR750
Faculty	:	Sports Science and Recreation
Thesis Title	:	The Influence of Polysulfide-enhanced Garlic Intake on Gasotransmitters Profiles and Selected Physiological Responses to High-intensity Constant Load Exercise
Signature of Student	:	 ……..
Date	:	June 2021

ABSTRACT

A new study has shown that moderately boiled garlic can enhance polysulphides, a known potent donor of essential gasotransmitters (hydrogen sulphide, H_2S and nitric oxide, NO) in humans. However, the dose response relationship of polysulphide-enhanced garlic (PEG) on exhaled gasotransmitter profiles as well as the physiological responses to high-intensity constant load exercise tolerance have yet to be investigated. In a randomised, double-blinded, placebo–controlled crossover design trial, 12 healthy men ingested 2 g, 4 g and 6 g of PEG or placebo (PLA) to establish the effects of PEG on eH_2S, FeNO and MAP over a 24-hour period. Subsequently, 12 collegiate-level male athletes completed high-intensity constant load exercise 3-hour after orally consuming 4 g of either PEG or PLA with a washout period of 14 days separating each trial. Compared to PLA, eH_2S was significantly elevated during two of the highest dosages of PEG, with no additional increase after 6 g PEG ingestion compared to 4 g (both $p < 0.001$), however no changes in FeNO ($p > 0.05$). Additionally, MAP decreased in a dose-dependent manner for the highest dosage of 6 g PEG ($p < 0.001$), with peak changes (Δ) in MAP and eH_2S occurred at 3 to 5 hours relative to the baseline ($p < 0.05$). A negative correlation has been observed between the changes in MAP and the changes in eH_2S for PEG and PLA ($r = -0.37$, $p < 0.001$). In the subsequent phase, resting eH_2S was ~49% greater, while the systolic BP and MAP were lower by ~3% and ~2% in PEG compared to PLA ($p < 0.05$), respectively. Although PEG did not significantly alter time-to-exhaustion in intense constant load exercise ($p = 0.06$), the results indicate substantial improvements (~6%) in 8 out of 12 participants. Blood [glucose] was lower during constant load exercise ($p < 0.05$) but no changes in blood [lactate]. The current study suggests that the dose-dependent PEG supplementation could lower several BP indices likely via enhanced bioavailability of H_2S, but not NO. This study further demonstrates that short-term PEG supplementation (i.e., 4 g) could enhance high-intensity exercise tolerance, with the effects were highly variable between participants.

ACKNOWLEDGEMENT

In the name of Allah SWT, the most Gracious and the most Merciful, and "*selawat*" and "*salam*" to Prophet Muhammad SAW. Throughout the process, I am extremely thankful to the number colleagues, friends and family who have been very supportive in my M.Sc. journey.

First and foremost, I would like to express my deepest gratitude and special thanks to my main supervisor, Adam Linoby. Mr. Ad, as he is more commonly known, played a monumental role in providing his unfailing support throughout my research and I cannot think of any expression or words adequate enough to show how much I appreciate his guidance. You have always been patient and professional throughout my M.Sc. journey, and your productivity and attention to detail has been, and will always be, a major inspiration for me. No matter which hour of the day, you always found time to immediately respond to my questions – and this, I believe, was the major factor that allowed me to complete this thesis 'on time'. I appreciate your unique supervision approach and unwavering commitment that guided me in the right direction, especially during difficult times when the entire country is facing the Covid-19 pandemic. I will forever be thankful and indebted to you. I hope your future students will realise how fortunate they are to be in the 'Ad Team' – because I certainly do!

My sincere appreciation and thanks also go to Dr. Ang Geik Yong and Mrs. Nurul Ain Abu Kasim who have been a very supportive co-supervisor. The encouragement and valuable counsel that they provided was an essential for me to complete this thesis. I am also indebted to guidance provided by Mrs. Sharifah Maimunah Syed Mud Puad who have been supportive since my undergraduate years. A special thanks must also go to Dr. Suhaidi Ariffin and Dr. Noor Hidayah Pungot from Faculty of Applied Sciences, UiTM for the help with laboratory analysis which is an important part of this thesis. The laboratory skill that I have learned from them will be proven to be essential in my future career.

I am also very grateful to all my colleagues and friends who have been directly and indirectly involved with this thesis project. Integral to the successful completion of my data collection in this thesis was Mr. Ahmad Safwanudin Nordin, who I have been in close friendship with since our undergraduate years. Without assistance from all my post-graduate colleagues, the research will never be accomplished – thank you for all the good times!

I would like to thank all the participants of this research for their helped and contributed with this research. The research in this thesis was funded by Fundamental Research Grant Scheme (FRGS/1/2018/WAB13/UITM/03/1), Ministry of Higher Education, Malaysia.

TABLE OF CONTENTS