The Effects of Sago Supplementation for Exercise in a Warm-Humid Environment

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ABSTRACT

Whilst carbohydrate (CHO) ingestion during exercise with heat stress theoretically has some benefits for performance there is a lack of evidence on the effects of complex-CHO on exercise and recovery in warm-humid (tropical) conditions. The aims of this thesis were to investigate the effects of sago feeding on exercise performance, some physiological parameters, substrate metabolism, and thermoregulatory responses in the condition of exercise with thermal stress. The initial experimental study investigated the reliability of two novel laboratory-based cycling protocols in the presence of significant thermal stress. These protocols would then be employed in the second part of this thesis. The data indicate that the 15 min time-trial pre-loaded with 45 min fixed-intensity (**Chapter 5**, *Study A*) and 15 min time-trial pre-loaded with 15 min incremental warm-up (**Chapter 5**, *Study B*) were highly reliable when using trained, familiarized males under warm-humid environmental conditions. The second part of this thesis describes experiments which investigated the efficacy of an alternative Malaysian-based CHO, sago, on exercise in conditions which replicate the Malaysian environment (warm and humid). **Chapter 6** describes a study investigating the effect of sago supplementation before and during exercise in a warm-humid environment. The data collected from this study revealed that pre- and during-sago feeding has no differential effects on exercise performance though sago feeding produced a higher glycaemic response during the hour prior to exercise. However, feeding sago before exercise attenuated the rise in core temperature during exercise compared to the control condition, whilst there was a smaller reduction in plasma volume found when consuming sago during steady-state exercise through reduced whole-body sweating, with a concomitant higher plasma sodium concentration. Heart rate was also higher when sago was ingested either before or during exercise compared to control. Then, **Chapter 7** further investigated the utility of sago ingestion as a recovery meal on a

subsequent exercise bout in a warm-humid environment. In terms of performance, sago ingestion during short-term recovery seemed to sustain time-trial performance on the second bout of exercise compared to a control condition (no food) where exercise performance degraded. However, no attenuation of physiological, metabolic and thermoregulatory responses was apparent.

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LIST OF ABBREVIATIONS

A

ANOVA	Analysis of variance

B

Bpm	Beats per minutes

C

CBF	cerebral blood flow
^{o}C	Degrees Celsius
CHO	CHO
CO_2	Carbon dioxide
CNS	Central nervous system
CV	Coefficient of Variation

D

E

EMG	Electromyogram
E_{max}	Maximal evaporative capacity of the environment

G

g	Gram
GE	Gross energy
g/min	Gram per minute
GI	Glycaemic index

H

h	Hour
Hb	Haemoglobin
HR_{max}	Maximum heart rate

I

ICC	Intraclass correlation

K

Kg	Kilogram
kJ	Kilojoule
km	Kilometre
km/h	Kilometre per hour

L

L	Litre
L/min	Litre per minute
LF	Linear factor
LOA	Limit of agreement

M

m	Metre
min	Minute
ml	Millilitre
ml/kg	Millilitre per kilogram
ml/kg/min	Mililitre per kilogram per minute
mmol	Millimole
mmol/L	Millimole per litre
MCA V_{mean}	Middle cerebral artery mean blood velocity

O

O_2	Oxygen

R

r	Correlation coefficient
RPE	Rating of perceived exertion
RPM	Revolutions per minute

S

SD	Standard deviation

T

T_{bicep}	Skin temperature at the bicep
T_{calf}	Skin temperature at the calf
T_{chest}	Skin temperature at the chest
T_{core}	Core temperature
T_{SK}	Mean skin temperature
T_{skin}	Skin temperature
T_{thigh}	Skin temperature at the thigh
TDF	Total dietary fibre

V

VCO_2	Volume of carbon dioxide production
V_E	Minute ventilation
VO_2	Volume of oxygen uptake
VO_2max	Maximal oxygen uptake
VO_2peak	Peak of oxygen uptake
% VO_2peak	Percentage of the peak rate of oxygen uptake

W

W	Watt
WBGT	Wet bulb globe temperature
W_{max}	Watt maximum

X

$\overline{x}$	mean

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