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"Bridging The Gap In The Advancement Of Sport Sciences And Technology Implementation Among South East Asia Countries"

The Deputy Asistant of Sport Science and Technology Division
Deputy Minister of Elite Sports Enhancement
Ministry of Youth and Sports

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Assalamu'alaikum warrahmatullahi wabarakatuh

May we first made our highest praise and thank to Allah SWT, for His bless we able to gathered here on the prestigious occasion Asean Forum And International Conference On Sport Science And Technology (AFICSST) under the theme, "Bridging The Gap In The Advancement Of Sport Sciences And Technology Implementation Among South East Asia Countries". It is expected this event will create a venue for ASEAN sport scientists to learn, and understand each other's heterogeneous level of expertise and special feature in the area of sport sciences theories, their praxis, and in the seriousness level of their implementation.

This conference which hold by The Deputy Assistant of Sport Science and Technology Division Ministry of Youth and Sports, The Republic of Indonesia, it's also expected to become arena for exchange experiences and expertise and at least information regarding the best practices in the area of sport sciences and technology, to learn together from the experience of other advance countries who also gather in the event of conference in the respected sport disciplines, and to initiate a concrete cooperation and synergy between and among university academicians and students in the area of sport sciences and technology researches.

I would like to deliver our highest respect and appreciation to Minister of Youth and Sport of Republic of Indonesia and to all those who have helped bring this event, and it is my great pleasant to express my deep gratitude to our honourable guests, Dr. Bart Crum Retired Professor from the Free University, Amsterdam Netherlands; Mr. Randall L. Wilber, Ph.D., FACSM, Senior Sport Physiologist from USOC; Prof. Gareth Stratton, Ph.D. from Swansea University, United Kingdom; Prof. Martin Lames from Faculty for Sport and Health Science Technical University Munich, Germany; Mr. Kevin Ball, Ph.D. Biomechanist from ISEAL, Victoria University Australia; Prof. Hideaki Soya, Ph.D. from University of Tsukuba Japan; Assoc Prof, Ma Xindong, Ph.D. from Tsinghua University, Beijing, China; Prof. Hyo Jeong Kim, Ph.D. from KNSU, Seoul, Korea; Prof. Suebsai Boonveerabut, Ph.D. from Srinakharinwirot University, Thailand; Assoc Prof. Mohd Salleh Aman, Ph.D. from University of Malaya, Malaysia; and last but not least to Prof. Toho Cholik Mutohir, Ph.D. from State University of Surabaya Indonesia. I really expect that this meeting will be beneficial for all of us and have direct to the development of the sports.

Allow me to express my thank to the participants and audiences from Indonesia and other foreign countries who are enthusiastic to attending this precious conference. I do hope that all audiences will gain important values and colaborate it into our own fields and make crucials changes in the future. Beside that, I also convey thank to all of organizing committes who has gave their oustanding commitment for presenting this International conference.

Wassalamu'alaikum warrahmatullahi wabarakatuh

Sincerely yours,

Prof. Dr. Djoko Pekik Irianto, M.Kes., AIFO.

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CONTENS

THE EFFECT OF FEEDING WITH DIFFERENT GLYCEMIC INDEXES ON OXIDATIVE STRESS OF COLLEGE ATHLETES

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ABSTRACT

This study aims to analyze the effect of feeding with different glycemic indexes on the level of oxidative stress of college athletes. The study design is a randomized controlled experiment. The number of subjects involved in the study are 14 persons consisting of 7 within high-IG group and 7 within low IG group. The treatment given is high IG and low IG food. The intervention food contains 1000 calories consisting of 70% carbohydrates, 15% protein and 15% fats. The study findings show increased MDA serum level after 5 km running both in high-IG group and low IG group. The average increase in MDA serum level in high-IG group is higher than that of the low IG group. There is an effect of glycemic index on the MDA serum level on day 1 measurement of intervention.

Keywords: glycemic index, MDA serum, oxidative stress.

INTRODUCTION

Recently we saw frequent deaths happened to former athletes or people who used to be active in sports. Cases of death in the majority of elite long distance runners from coronary heart disease during their productive age have attracted the attention of experts. They suspect that there is a connection between the cases of illness and death with long-term oxidative stress events experienced by the athletes (Harjanto, 2004). This indicates that, beyond its benefit for health, sports can also have detrimental and even fatal effects on the health. To gain the proper benefit of sports and to achieve optimal fitness, the American College of Sports Medicine (ACSM) recommends that sports can be done three to five days a week with each exercise time at least 15 minutes. The time for each exercise can be increased to 30 to 60 minutes at appropriate intensity in order to obtain better results (de Vries et al. 1994). Moderate physical activity on a regular basis can effectively prevent chronic diseases such as heart disease, diabetes, cancer, hypertension, obesity, depression and osteoporosis (Warburton et al. 2006). In contrast, excessive physical activity will trigger free radicals. This phenomenon is consistent with the Hormesis theory stating that low dose of substances could enhance good effect whereas high dose would otherwise have inhibitory effect. Moderate exercise is good for health, but excessive amount of exercise will lower its benefits (Hayes 2008). Radak et al. (2005) extends the theory of Hormesis to the good effects of physical exercise (sports) performed regularly on the production of reactive oxygen species (ROS).

Oxidative stress will happen when there is an imbalance in the formation of reactive oxygen species exceeding the body's ability to neutralize it. This imbalance is caused by a lack of natural antioxidant defenses in the body, lack of antioxidants intake from food and excessive free radical production due to environmental pollutants, excessive nutrient intake, and over training. According to Clarkson (2000), strenuous physical activity can increase the oxygen consumption 10 to 15 higher than the resting state to meet energy needs. The increasing oxygen consumption will result in oxidative stress which plays a role in the production of free radicals and lipid peroxides. Direct evidence of the study findings in normal subjects and those with diabetes shows that hyperglycemia or food intake accompanied by increased glucose can cause oxidative stress and lower antioxidant resistance, and increased oxidative stress is significantly

greater after consuming food which produces a greater degree of hyperglycemia (Ceriello et al. 1999).

Oxidative stress is associated with increased pathological processes of disease, nitric oxide turnover and muscle damage after exercise (McAnulty et al., 2007). Augustin et al (2002) describes that consuming food with high glycemic index in the long-term can trigger the incidence of some diseases such as diabetes, coronary heart disease, breast cancer, colon cancer, prostate cancer and obesity. The alleged risks of consuming food with high glycemic index in the long term associated with the incidence of degenerative diseases have encouraged a research to prove these allegations. This study aims to analyze the effect of feeding with different glycemic indexes on the level of oxidative stress of college athletes after 5 km running.

METHODS

Design

The study design is a randomized, controlled experiment which studies the effect of IG on the level of oxidative stress in athletes. The research subjects are male college athletes between the ages of 18-22 years who are active in sports training. The number of subjects chosen are 14 people, randomized into three treatment groups. They are high IG group (7 persons) and low IG group (7 persons). The data taken in this study are the subjects' characteristics such as age, weight, height, and BMI; venous blood samples are taken for examination of MDA serum level. Intervention food with high and low IG containing 1000 calories consisting of 70% carbohydrates, 15% protein and 15% fat for one meal is administered 3 times daily for two weeks.

Material

The materials used to test the MDA level is the thiobarbituric acid (TBA), 1,1,3,3-tetraethoxy propane (TEP), trichloroacetic acid (TCA) solvent ions. The tools used during the study are treadmills, spectrophotometers, ELISA reader, water bath, micro centrifuge tube effendorf, vortek, micro glass pipette and a set of glass tools. The high IG food consists of *Mekongga* rice, chicken, carrots and watermelon and low IG food consists of *Cisokan* rice, chicken, oranges and carrots.

Experimental Procedure

On day 1 and day 15 of the intervention, blood samples are taken after fasting and 5 km running. The 5 km running is done on a treadmill with the intensity of 65-75% maximal pulse at the IPB Physical Fitness Center Bogor. Examination of MDA serum is determined using a spectrophotometer carried out in the Biochemistry Laboratory of Brawijaya University Malang. Test of antioxidant activity is done using DPPH method (Bloise et al. in Molyneux 2004), carried out in the Laboratory of Food Biochemistry, Department of Community Nutrition IPB Bogor. The study protocol has obtained ethical approval from the Ethics Committee of Research and Development Center of the Ministry of Health with a decree number KE.01.07/EC/433/2011 dated July 24, 2011.

Statistical Analysis

The study findings are presented in the form of mean and standard deviation ($x \pm sd$). The effect of glycemic index on the performance of MDA serum is tested with t-test. The reliability level used for the overall analysis is 95%.

RESULTS AND DISCUSSION

Increased oxygen consumption will produce oxidative stress which plays a role in the formation of free radicals and lipid peroxides. Resistance system of free radicals minimizes the radical damage (Clarkson 1995). One way to detect the level of oxidative

stress can be from the MDA parameters in the blood. The study results show average increase in MDA serum level in both groups on day 1 after consuming intervention food and after 5 km running, the increase in MDA level of the high IG group is higher than that of the low IG group. There are differences in the average level of MDA after a significant running in both treatment groups ($p<0.05$). The 15th day of the measurement shows that there is also an increasing trend of the average level of MDA after running in both treatment groups and the increase of MDA level in high IG group is relatively higher than that of the low IG group. There is no any significant difference in the average level of MDA in both treatment groups. Distribution of median MDA level of the subjects according to the treatment given can be seen in Table 1.

Table 1. Distribution of median MDA Level (ppm) of The Subjects in Low IG Group and High IG Group

Parameter	Time	Blood Sampling	Group		p value
			Low IG I	High IG	
MDA (ppm)	Day 1	Fasting	0.445±0.064	0.586±0.199	0.101
		After Running	0.469±0.086	0.705±0.116	0.001*
		p value	0.278	0.289	
		Difference	0.024±0.053	0.118±0.269	0.381
	Day 15	Fasting	0.760±0.205	0.764±0.439	0.982
		After Running	0.839±0.196	0.919±0.429	0.662
		p value	0.268	0.545	
		Difference	0.078±0.170	0.154±0.637	0.767

These findings show that there is a tendency of increased MDA level after exercise both in the low IG and high IG groups. This is in line with the research of Bloomer et al. (2005) that there is an increase in the oxidative stress marker (MDA) after acute aerobic and anaerobic exercise performed for 30 minutes. Increased MDA level is higher in the group with acute anaerobic exercise. In this study it appears that there is a trend increase in MDA level in the high-IG group which is higher than that of the low IG group, both on day 1 and day 15 measurement. This finding is in line with the study results of Hu et al. (2006) who examined the association of glycemic index with oxidative stress markers in population study in which the concentration of MDA increased from 0.55 into 0.73 µmol/L from the lowest IG quartile to the highest IG quartile, positive relation between IG and the MDA level will look stronger in the BMI < 26.5 kg/m2. Furthermore Hu et al (2006) concluded that the consumption of high-IG food plays a role in the increase of chronic oxidative stress. Presumably higher increased MDA level in the high IG group is caused by high blood glucose level after eating which triggers oxidative stress. According to Ceriello et al. (1997), acute increase in blood glucose concentration produce free radicals through nonenzymatic glycation and imbalance of the NADH to NAD ratio in the cell. The results of this study demonstrate that the administration of food with different glycemic index affect MDA level as the oxidative stress parameters. The food with high glycemic index turns out to cause higher blood's MDA level than the food with low glycemic index.

In general, the research data show an increase in MDA level after 5 km running in both treatment groups. This study's findings are consistent with the results of the study of Fauzi et al. (2007) in subjects who exercise skipping rope for 20 minutes with intensity of 65-75% VO_{2max}. He concluded that the blood MDA level had increased which was tested immediately after exercise. It is also in line with the findings of Guzel et al. (1997) who concluded that the MDA level increased immediately after the subjects conducted resistance exercise both in the group of high responders and low

responders. The research of Akkus (2011) also proved a significant increase in thiobarbituric acid-reactive substances (TBARS) after acute exercise both in male and female subjects. On the other hand, acute exercise also increases the level of antioxidant enzymes such as glutathione (GSH) and superoxide dismutase (SOD). There is an effect of exercise intensity on the level of MDA. The highest level of MDA after exercise is detected in the group with high-intensity exercise (80% VO_{2max}) (Mohlefi et al. 2012). Both aerobic and anaerobic exercises are potential to generate reactive nitrogen or oxygen species and subsequently produce oxidative stress in both human and animal models (Fisher-Wellman and Bloomer 2009).

CONCLUSION

The MDA level increases after 5 km running both in low IG and high-IG groups. A significant increase in MDA level is seen in the high IG group. There is an effect of feeding with different glycemic indexes on the MDA serum level on day 1 intervention. However there is no effect of the glycemic index on the increase of MDA serum level after 5 km running on day 15 of the intervention. Composition of low IG food with relatively high antioxidant activity will be able to reduce the level of MDA better in the athletes after 5 km running.

It is advisable for those responsible for providing athletes' meal to consider glycemic indexes and composition of antioxidants in the athletes' diet. It is recommended for those who are active in sports to consume low IG food with higher antioxidant composition. This will be able to improve endurance and performance and to prevent exercise-induced oxidative stress.

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