Effects of Giving Red Fruit Oil on Creatinine and Urea Levels of Rats (Rattus Novergicus) on Maximal Physical Activity

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Abstract. Maximal physical activity can produce an imbalance between reactive oxygen species (ROS) and antioxidants which is possibly related to fatigue and tissue injury.This study investigated the effect of red fruit oil on serum creatinine and urea level in maximal physical activity.This study used posttest-only control group design. Twenty four rats were divided into 4 groups. The control group (I) was administered with 1.5 ml distilled water, intervention groups (II), (III) and (IV) were administered with different doses of Red Fruit Oil (0.15 ml, 0.3 ml, and 0.6 ml/kgBW, respectively for 30 day). All groups were trained to swim for 4 weeks and then were forced to swim without a load until being exhausted. The serum creatinine and urea levels were measured in all groups.The results showed that creatinine and urea level obtained was decreasing significantly (p=0.000) in the intervention groups. The results suggest that red fruit oil can obviously reduce creatinine and urea level induced by maximal physical activity in rat.

Keywords: Red fruit oil, creatinine, urea, maximal physical activity.

1 Introduction

Heavy physical activity causes oxidative stress due to the production of free radicals that exceeds the total antioxidant in the body (Daniel et al, 2010; Urso, 2003). Oxidative stress from the training can cause brain damage and affect other tissues including the heart, kidneys, liver, brain and erythrocytes (Kocer et al, 2008).

During physical activity, several organs like the heart, kidneys, and other organ are in hypoxia and ischemia as oxygen is higher at the contracted muscles. This disturbs the metabolism and cell homeostasis also causes damaged in the tissue (Radak et al, 2013). After the exercise, the blood quickly flows back into the kidneys. Along with that, a big oxidant is released which can damage kidney cells and activate leucocyte. Therefore, the kidneys will severely damaged (Daniel et al, 2010). Progressive damage in the kidneys can be measured clinically by measuring serum creatinine and urea level (Verdiansah, 2016).

Several studies have been conducted to see the effect of physical activity on kidney function. Foranet al., (2003) found that the short-term effects of marathon training increased creatinine and blood urea nitrogen (BUN). According to Warburton et al., (2002) concentrations of urea and creatinine increased after prolonged strenuous exercise in which

AISTSSE 2018, October 18-19, Medan, Indonesia

DOI 10.4108/eai.18-10-2018.2287348

this increase was associated with decreased renal blood flow and glomerular filtration rate, increased protein catabolism and creatinine release due to muscle work.

In the body, there is endogenous antioxidant or anti free radicals. The free radical formed is neutralized by elaboration of defense system between enzymatic and non-enzymatic antioxidant (Christopher,2004; Urso, 2003). One of the natural resources known to contain antioxidant is red fruit Pandanusconoideus Lam, found in Papua. Red fruit contains high nutrients and active compounds such as beta carotene, tocopherol and fatty acid (Budi, 2005; Alam Syah, 2005).

The results show that red fruit is able to reduce malondialdehyde (MDA) level in rats which did maximum physical activity (Sinaga, 2015).The study is very interesting. Therefore the effect of red fruit to kidney function in rats which have done maximum physical activities need to be done.

2 Methods

2.1 Design, Place and Time

This is a true experiment with posttest-only control group design. The research was conducted in Pharmacology Laboratory in Pharmacy Faculty Universitas Sumatera Utara from March to April 2018.

2.2 Sample Retrieval Type and Method

The sample used in the study was 2-month old male Wistar rats, weighed ±200g from Pharmacology Laboratory in Pharmacy Faculty Universitas Sumatera Utara. Total sample was 32 rats which were divided into 4 groups with Group I as control group, Group II, III and IV as experimental groups with different treatments. The equipment used was cage, feed container, aquarium as pool for swimming practice, digital scale, creatinine and urea testing equipment. Feed for rats, Comfeed AD II, and red fruit oil were obtained from a drugstore.

Tables. All included tables must be referred to in the main text and the table title and caption are to be positioned above the table.The captions need to be written in Times New Roman, 9pt.

2.3 Research Stages

32 rats were made adapted for 7 days and they were given standard feed, Comfeed AD II, aquadest and libitum. Next, rats were weighed and given maximum physical activities by letting them swim to drown. The duration of the swim was used to determine the time for exercise program, which is 70% from maximum physical activity. Next, all subjects went through training program, 3 times a week for 30 days. During the program, three experimental groups were given Pandanusconoideus Lam oil as much as 0.15 ml/kgBW, 0.3 ml/kgBW and 0.6 ml/kgBW, while control group was given 2 ml of aquadest. The next step was to reweigh each of the subjects and followed by maximum swimming exercise. The duration of activity was recorded. Blood sample was taken and creatinine and urea levels were measured using spectrophotometry.

2.4 Data Processing and Analysis

Data of research result determined homogeneity and normality to determine statistical analysis used. Data were analyzed using one-way ANOVA test to determine the mean difference between treatments using SPPS 19.0 program. If there is a significant difference, further proceed with the Tukey test to determine the differences value between treatment groups. Based on the significance value, $p<0.05$ is considered statistically significant.

3 Result And Discussion

The average weight of rats in the research can be seen in Table 1.

Table 1. Average weight of rats (g) before and after the administration of red fruit oil.

Body Weight (g)	Group				p*
	I	II	III	IV	
Before treatment	204,33	204,66	203,50	204,66	0,201
After treatment	225,33	225,83	225,16	226,00	0,753

Normality and homogeneity tests data show that the average weight of rats before and after the administration of red fruit oil is normal and homogenous ($p>0.05$). Based on statistical test with one way ANOVA test, there is no significant difference in weight of rats before and after treatment intervention ($p>0.05$). This result shows that the use of experimental animals in the research has met the ethical standard for animal welfare. Following 3-R principle; Replacement, Reduction and Refinement, in the animal welfare ethical standard is mandatory.

The measurement of urea and creatinine in Wistar rats after maximum physical activity can be seen in Figure 1 and Figure 2 respectively.

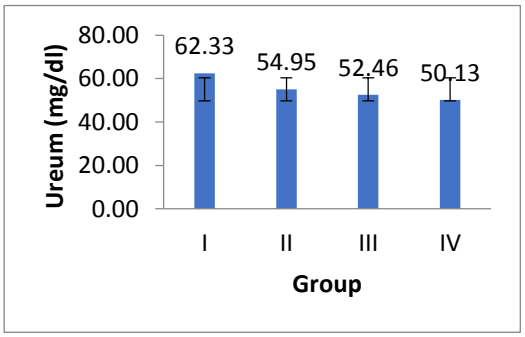

Fig. 1. Average rats urea level after maximum physical activity. Value are mean ± SD of 8 animal in each group. I, control group; II, 0,15ml/ kgBW red fruit oil, III, 0,3ml/ kgBW red fruit oil, IV, 0,6ml/kgBW red fruit oil.

Normality and homogeneity data gave p>0.05 which shows that data is distributed normally and homogenously. ANOVA test gave p=0.000 (p<0.05)which tells that Pandanus conoideus Lam oil intake for 1 month during the training program is able to reduce urea and creatinine level at maximum physical activity. To see the influence of each Pandanusconoideus Lam oil dosage to urea and creatinine level, Turkey HSD test was conducted and p=0.000 (p<0.05) result was obtained. This shows that red fruit oil dosage significantly affect urea and creatinine levels. The higher the dosage given, the lower urea and creatinine levels are.

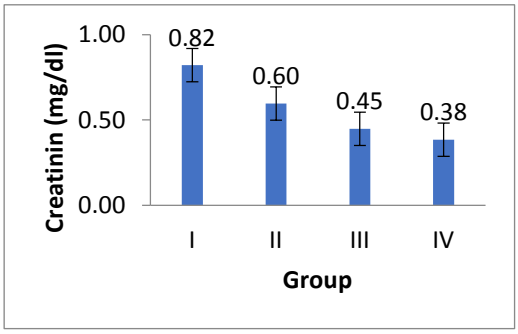

Fig.2. Average rats creatinin level after maximum physical activity. Value are mean ± SD of 8 animal in each group. I, control group; II, 0,15ml/ kgBW red fruit oil, III, 0,3ml/ kgBW red fruit oil, IV, 0,6ml/ kgBW red fruit oil.

In this study, the urea level in rats after maximum physical activity was reported as 62.33 mg/dl while the creatinine level was 0.82 mg/dl. The high urea and creatinine levels in this study were caused by maximum physical activity where the kidneys are in hypoxia state due to most blood flows to contracted muscles. Then after the physical activity has stopped, blood quickly flows back to kidney and along with that a big amount of oxidant is released (Daniel et al, 2010). Oxidant damages the kidneys and activates the leucocyte. This worsen the damages in the kidneys which is shown by the increase level of urea and creatinine.

The effect of red fruit oil administration in this study shows that it can reduce urea and creatinine levels produced by maximum physical activity. Antioxidant content in Pandanusconoideus Lam oil, such as beta carotene and tocopherol, is known to be very high (Budi, 2005). As one of the plants that contain antioxidant, the activity of this fruit has been tested invitro by Rohman et al (2010) and Widowati et al (2008). Then carotenoid bioavailability test was conducted by Roreng et al (2014). Tocopherol is a potential inhibitor to lipid peroxidation. It can easily donate hydrogen atom to hydroxyl functional group (OH), from ringstructures to unreactive free radicals (Silalahi, 2006).

β-carotene is a color pigment in Pandanusconoideus Lam which is converted by the body to become vitamin A. It functions as antioxidant that works as defense mechanism to highly reactive oxygen (Alamsyah, 2005). The study done by Sandhiutami (2010) concluded that Pandanusconoideus Lam oil has IC5O value of 451.51 µg/ml at in vivo analysis. In in vivo test, 0.15, 0.3 and 0.6 ml/kg weight dosages are able to reduce MDA level in the blood sample from rats given maximum physical activity (Sandhiutami, 2010; Sinaga, 2015). The antioxidant potential in red fruit oil has also been reported to increase Glutathione Peroxidase (GPx) antioxidant level (Sinaga, 2018). Furthermore, it can decrease creatine kinase (CK) level in rats given maximum physical exercise (Sinaga, 2017).

4 Conclusions

The administration of Pandanusconoideus Lam oil during the exercise program can reduce the urea and creatinine levels in rats due to maximum physical activities.

5 Acknowledgements

The authors thank to Directorate for Higher Education, The National Education Ministry of Republic Indonesia for for Research Grant of Hibah Fundamental for financial support.

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