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The Effect Of Purple Sweet Potato (Ipoema Batatas L) Extract On Levels Of Lipoprotein-Associated Phospolipase A2 (Lppla2) Male White Rats (Rattus Norvegicus Strain Wistar) Atherosclerosis Model

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ABSTRACT

Atherosclerosis is the primary etiology of coronary heart disease and can be detected by marker of LpPLA2. There is a unique phenomenon in Papua: patients of CHD in Papua are the lowest amount in Indonesia, although they consume a lot of cholesterol from pigs. This is expected because the Papuans consume purple sweet potato that contains antioxidants to prevent atherosclerosis. The objective of this experiment is to prove that the Purple Sweet Potato Extract (Ipoema Batatas L.) has a significant effect on Lp-PLA2 in the White Male Rats (Rattus novergicus Wistar strain) Model of Atherosclerosis. This study applied experimental research using Post Test Only Control Group Design with a large sample of 35 rats divided into five groups with the inclusion criteria. Variables taken for this experiment are LpPLA2 's levels of positive control, negative control, and the treatment from groups 1,2 and 3. Methods of assessment LpPLA2 levels by Elisa-kit. Analysis of the test data using one-way ANOVA, post-hoc, and correlations. The higher the dose of the extract of purple sweet potato is given, the lower the levels of LpPLA2 mice. The effect of extract of purple sweet potato (Ipoema batatas) can reduce levels of LpPLA2 white male rats (Rattus novergicus Wistar strain) model of atherosclerosis.

Keywords : atherosclerosis, LpPLA2, purple sweet potato.

INTRODUCTION

Atherosclerosis is an inflammatory process initiated by endothelial dysfunction due to free radicals which cause oxidative stress. Lipoprotein-associated phospholipase A2 (Lp-PLA2) is a marker to determine plaque destabilization before arterial plaque rupture, ischemia, infarction, or myocardial necrosis occurs. Increased plasma Lp-PLA2 is a parameter considered a more appropriate biomarker of atherogenesis because it is closely related to oxidative stress, endothelial dysfunction, and inflammation (Jenny, NS in Immanuel, S and T, Agustyas, 2010).

Narrowing caused by atherosclerosis in a.coronaria can be focal and tends to occur in arterial branches; narrowing does not interfere with blood flow unless it has exceeded 70% of the arterial lumen. Myocardial blood flow comes from two coronary arteries originating from the aorta. Usually, the right coronary artery supplies most of the right ventricle, and the left coronary artery mainly supplies the left ventricle. The characteristic of coronary heart disease (CHD) is a decrease in coronary reserve, with the leading cause of narrowing of the coronary arteries due to atherosclerosis (Daniel, SR.2008).

CHD is one of Indonesia's highest causes of death (Pusdatin RI Ministry of Health in 2013). The highest number of coronary heart disease sufferers in Indonesia alone is in East Java Province, with 375,127 people. CHD can be prevented earlier by preventing atherosclerosis. Several risk factors can cause atherosclerosis, including smoking, dyslipidemia, and hypertension (Kasper DL et al. l in Harrison Internal Medicine, 2016). So, CHD can be inhibited by inhibiting atherosclerosis, which can cause CHD with antioxidants.

There is a unique phenomenon in West Papua Province. CHD sufferers are at least found in West Papua Province, which is around 1.2% of the Republic of Indonesia's population (Data and Information Center of the Republic of Indonesia Ministry of Health, 2014) even though Papuans make pork a staple food, where pigs are animals that contain high cholesterol (LIPI, 2009). High cholesterol causes dyslipidemia, namely increased LDL cholesterol and low HDL levels, which can potentially cause coronary heart disease and stroke (Fodor, G.2011). In addition, the authors obtained data that Papuans also eat purple sweet potatoes, which have high antioxidants, as their primary food.

Purple sweet potato has a lot of antioxidant content. Antioxidants can prevent oxidative stress that causes the emergence of Lp-PLA2. One of the antioxidants is flavonoids, substances contained in purple sweet potatoes called anthocyanins (Furuta et al. in Ginting et al. 2011. Anthocyanins are natural antioxidants because they can capture free radicals by giving electrons, inhibiting the activity of these oxidant compounds (Fardiaz in Natali, L.2013). Anthocyanins can inhibit lipid peroxidation, the leading cause of damage to cells associated with aging and degenerative diseases (Cevallos-Casals dan CisnerosZevallos 2002; Suda et al. 2013).

Purple sweet potato also has antioxidant compounds other than anthocyanins, which are the largest when compared to other sweet potatoes, namely ascorbic acid (Yaningsih, H.2013). This research is new because most study conducted to prevent CHD early on used the markers HDL, LDL, IL-6, and Hs-CRP, while researchers chose LpPLA2 as the dependent variable.

An essential factor causing atherosclerosis is the high cholesterol concentration in the blood plasma in the form of low-density lipoprotein (LDL). The plasma concentration of low-density lipoprotein high in cholesterol is increased by several factors, including high saturated fat in the daily diet, obesity, and lack of physical activity (Guyton, 2012). Thus, the positive control of this study was the rat group with a high-cholesterol diet. Providing a hypercholesterolemia diet for eight weeks,

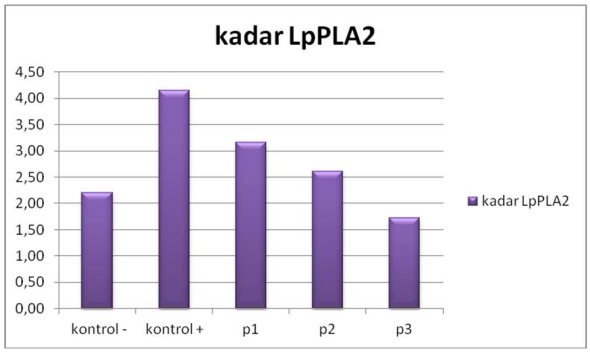
namely giving a high cholesterol diet (hypercholesterolemia induced) containing 2% cholesterol, 0.2% cholic acid, and 5% goat oil.

Lp-PLA2 is an enzyme produced by macrophages, lymphocytes, and mast cells and is a subtype of the phospholipase A2 superfamily, a group of enzymes that hydrolyze phospholipids. Atherosclerotic plaques consist primarily of a lipid core and macrophages within the fibrous capsule of the lesion, which later rupture and express Lp-PLA2. Therefore, Lp-PLA2 can be used as a marker of stabilized atherosclerotic plaque before arterial plaque rupture. Most of Lp-PLA2 can bind to apo-B from LDL; the main activity of this enzyme is in small, dense LDL. At the same time, the rest binds to HDL and VLDL. (Immanuel, S , Tjiptaningrum, A. 2010). Lp-PLA2 will attach to apo-B from LDL and sdLDL. Lp-PLA2, LDL, and sdLDL will enter the tunica intima of arteries that experience endothelial dysfunction. Low-density lipoprotein will undergo oxidation to become oxLDL. The Lp-PLA2 receptor is on oxLDL, and Lp-PLA2 will bind to the receptor and then hydrolyze the short acyl group at the sn-2 phospholipid position of oxLDL and form 2 bioactive lipid mediators, namely lysophosphatidylcholine (LysoPC) and oxidized fatty acids (oxFA). Plasma Lp-PLA2 is considered a more appropriate biomarker of atherogenesis because it is closely related to oxidative stress, endothelial dysfunction, and inflammation (Sargowo, Djanggan, et al. 2012).

This study was an experimental study using the Post Test Control Group Design method and was housed in the Biomedical Laboratory for eight weeks. The population and samples used were male white rats of the Wistar strain (Rattus norvegicus strain Wistar) weighing 200-250 grams and aged 2-3 months with healthy conditions characterized by active movements and clear eyes. The researcher determined that the treatment group consisted of 5 groups: one regular control group, negative control, treatment 1, treatment 2, and treatment 3, with each group having five rats plus two spare mice. The research procedure was initiated with an acclimatization process for seven days by giving BR-1 standard feed plus drinking water ad libitum. Furthermore, in the control + group and treatment 1, treatment two and treatment three were given a hypercholesterolemia diet. Giving purple sweet potato extract in treatment 1, treatment 2, and treatment three, each dose of 120mg/kg bb, 240mg/kg bb, and 480mg/kg bb. The rats were then dissected and examined for LpPLA2 levels in the blood using an Elisa kit with the sandwich method. After obtaining the data, an analysis was carried out using the one-way ANOVA test.

RESULTS AND DISCUSSION

The effect of purple sweet potato extract on the three treatment groups and the comparison with the negative and positive control groups can be seen in the following table.



The results of data analysis begin with the normality test and homogeneity test. The normality test results were declared significant, namely 0.425, or p> 0.05. It can be concluded that the data distribution of LPPLA2 levels in the serum of experimental animals is normal. Then, a homogeneity test was carried out to find out whether the variant data on LpPLA2 levels in the serum of the experimental animals was homogeneous or not. The significant result is 0.119, namely p > 0.05. It can be concluded that the variance of LpPLA2 data in the serum of experimental animals is homogeneous. The test was continued with a one-way ANOVA test to see whether purple sweet potato extract affected LpPLA2 serum levels of experimental animals; a significance of 0.00 was obtained, i.e., p <0.05. It can be concluded that purple sweet potato extract can affect LpPLA2 levels in the serum of experimental animals. Furthermore, to find out how significant the effect of the extract was by using the PostHoc Tukey test, it was found that there was a significant difference in LpPLA2 levels between the positive control group and the P2 group (dose 240 mg/day), there was a substantial difference in LpPLA2 levels between the positive control group and P3 (amount of 480 mg/dL). In addition, there was a significant difference in the LpPLA2 levels in the P1 group (dose 120 mg/dl) and P3 (dose 480 mg/day).

It can be concluded that the administration of the extract in treatment three at a dose of 480 mg/Kgbb/day prevented an increase in serum LpPLA2 levels of experimental animals to close to normal levels. Furthermore, a correlation test was carried out to see how strong the effect of purple sweet potato extract was on LPPLA2 levels in the serum of experimental rats. The strength results obtained in the Pearson correlation test obtained sig (2-tailed) = -0.808 <p (0.01). This shows that the correlation between treatment and LpPLA2 levels is significant. The Pearson correlation value = -0.808 indicates a muscular correlation strength and is inversely proportional, so increasing the purple sweet potato extract dose causes lower LpPLA2 levels. Then, a regression test was carried out to show that the equation used to determine the relationship between the amount of purple sweet potato extract and serum LPPLA2 levels of white male rats with an atherosclerosis model. The higher the f purple sweet potato extracts t given, the lower the LpPLA2 level of white rats = 0.65). Giving purple sweet potato extract (Ipomoea batatas) to LpPLA2 levels in male Wistar rats was 65%. In comparison, 35% of the diversity of LpPLA2 was influenced by factors other than the dose of purple sweet potato extract (Ipomoea batatas).

This study has proven that giving purple sweet potato extract (Ipoema batatas) can affect LpPLA2 levels of male white rats (Rattus novergicus Strain Wistar) model of atherosclerosis. Purple sweet potato

contains several antioxidants, including anthocyanin, beta-glucan, and vitamin C. The antioxidant function of purple sweet potato is closely related to the presence of phenolic compounds, including anthocyanins and phenolic acids (Furuta et al. in Ginting et al. 2011). The antioxidant content inhibits the process of macrophages oxidizing LDL, while Lp-PLA2 is an enzyme produced by macrophages, lymphocytes, and mast cells. If the oxidation process is hindered by purple sweet potato extract, the production of Lp-PLA2 will decrease. This can be proven by examining the mass of Lp-PLA2 using the ELISA method. (Immanuel, S , Tjiptaningrum, A. 2010).

There was a significant difference between the positive control group and the 240 mg/day treatment group, but not significantly different from the 120 mg/day treatment group. This is because the purple sweet potato extract has not had much effect at a dose of 120 mg/day. However, the graph shows a decrease in LpPLA2 levels but not yet close to LpPLA2 levels in the negative control group. Then, it can be seen in the chart that there is also a significant difference between the positive control group and the 480mg/hr treatment group, but the LpPLA2 level in the 480mg.hr treatment is too low, even lower than the negative control group. This could be material for further research to determine the maximum purple sweet potato extract dose so that LpPLA2 levels are not below average.

This study has limitations; researchers have not found the maximum dose, so the treatment dose of 480 mg/day has an effect that is too strong so that LpPLA levels are below normal..

Based on the research results and the analysis in the previous chapter, it can be concluded that the administration of purple sweet potato extract is proven to reduce LpPLA2 levels in atherosclerotic rat models. The effect of purple sweet potato extract in reducing LpPLA2 levels can be shown by the high doses of purple sweet potato extract, which will further reduce LpPLA2 in mice when compared to LpPLA2 levels in the group with lower doses and the positive control group. This is also reinforced by the regression test results showing that -0.65 has a significant correlation ($p < 0.05$) with a negative correlation direction. This indicates that increasing the purple sweet potato extract dose leads to lower LpPLA2 levels. The resulting value of -0.65 means that 65% of the chemical content in purple sweet potato extract can affect decreasing LpPLA2 levels in white rats. The remaining 35% is due to the presence of intervening factors from the presence of primary antioxidants such as superoxide dismutase (SOD), reduced glutathione (GSH), and catalase, which directly inhibit the formation of free radicals..

The hypothesis about the effect of purple sweet potato extract (Ipoema batatas) on LpPLA2 levels was proven by decreasing LpPLA2 levels of male Wistar strain white rats (Rattus novergicus Wistar Strain).

CONCLUSION

The conclusions that can be drawn based on the results and discussion in this study are:

1. Giving purple sweet potato extract (Ipoema batatas) can reduce LpPLA2 levels in male white rats (Rattus novergicus Wistar Strain), a model of atherosclerosis..

2. Purple sweet potato extract (Ipoema batatas) at a dose of 240 mg/day has an antioxidant effect that can reduce LpPLA2 levels so that they approach normal levels of LpPLA2 in male white rats (Rattus novergicus Wistar strain) atherosclerosis model.
3. Purple sweet potato extract (Ipoema batatas) has a strong and inverse relationship with LpPLA2 levels in male white rats (Rattus novergicus Wistar strain), a model of atherosclerosis..

Suggestions from the conclusions that have been put forward, recommendations can be given for improvements in the future, namely as follows.:

1. Researching the effect of purple sweet potato (Ipoema batatas) variations on anthocyanin levels is necessary so that people can consume purple sweet potato and get the maximum antioxidant effect.
2. Further research is needed to determine the range of therapeutic doses and the maximum dose of purple sweet potato extract in finding the optimal effect for reducing LpPLA2 levels in male white rats (Rattus novergicus Wistar strain) atherosclerosis model..
3. Further research is needed on the active substance in purple sweet potato extract (Ipoema batatas)

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