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Effect of VCO and olive oil on HDL, LDL, and cholesterol level of hyperglycemic *Rattus Rattus Norvegicus*

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Abstract. Virgin coconut oil (VCO) and olive oil are edible oil containing an antioxidant that can prevent free radicals in *Rattus rattus norvegicus* hypoglycemic due to the damage of pancreatic beta cell after alloxan injection. Virgin coconut oil and olive oil are fatty acids when being consumed will affect lipid metabolism particularly HDL, LDL and cholesterol in serum. This research aims to determine the effect of VCO and Olive oil on cholesterol levels in hyperglycemic rats. Research materials were twenty male *Rattus rattus norvegicus*. Randomized Factorial Design was used in four treatment groups including P1(control), P2 (mice injected with alloxan), P3 (mice injected with alloxan plus 0.1 ml/BW of each VCO and vitamin E) and P4 (mice injected with alloxan plus 0.1 ml/BW of each olive oil and vitamin E). Each treatment was replicated 5 times. Feed and water were provided adlibitum for four weeks. The result showed that there was no significant difference in the level of HDL serum across the treatments, but P4 had a significantly higher LDL than the other treatments. Moreover, total cholesterol was significantly increased in P4 compared to the other groups. It can be concluded that olive oil could increase the level of cholesterol and LDL in serum, while VCO did not increase the level of cholesterol and LDL so VCO more potential to maintain cholesterol in hyperglycemic *Rattus rattus norvegicus*.

Keyword: LDL, HDL, Hyperglycemic, VCO, Olive oil.

1. Introduction

Observation of the efficacy of various herbal medicines on the ill condition will greatly determine the successful use of such herbal medicines. Virgin coconut oil is an herbal remedy that can show an increase in macrophage phagocytosis activity [12] and also increase the number of lymphocytes [11] Virgin Coconut oil also contains antioxidants [6] while olive oil is thought to also act as an antioxidant [8]. Diabetes mellitus is one of the degenerative diseases triggered by carbohydrate, fat and protein metabolism. Metabolic disorders are associated with the occurrence of insulin hormone deficiency or reduced action of the hormone insulin [5]. The hormone insulin is secreted by the pancreatic Langerhans beta-insula cells. Beta cell damage can cause insulin hormone deficiency [9]. Antioxidants are capable of repairing damaged cellular insula cells caused by free radicals, which are indicated by the cell response to pancreatic beta cells [1,9] Hyperglycemic conditions can cause an increase in blood cholesterol. These conditions can occur because of the increase in blood glucose levels cause low glucose levels in the cell, resulting in decreased glucose oxidation and decreased energy production. The decrease in the energy produced by the cells will lead to an increase in lipid catabolism [3]. Increased lipid catabolism will lead to an increase in cholesterol synthesis, so it should

be investigated further, whether the provision of VCO and olive oil in hyperglycemic rats will increase LDL cholesterol and HDL in the blood.

2. Materials and Methods

This study used twenty rats of male *Rattus rattus noevigicus*. Test animals were fasted for 12 hours to measure blood glucose levels during fasting. Alloxan injection of 150 mg / kg BW in intraperitoneal [10]. After three days for three consecutive days, the blood glucose level was checked to make sure alloxan was functional, and the glucose level was stable. The hyperglycemic effect test began with the administration of VCO oil and Olive oil mixed with Vitamin E, each of 0.1 mL per body weight. The treatments were divided into four groups, each of which P1 was a control group, P2 alloxan injected control group, P3 was an alloxan group given a mixture of VCO and vitamin E, P4 was an alloxan group given a mixture of olive oil and vitamin E. This research was conducted in a biology laboratory, each treatment group repeated five times. Treatment was performed for four weeks and at the end of the study examined the effect of VCO and Olive oil on cholesterol, LDL, and HDL. The reduction of cholesterol, LDL, HDL was analyzed by ANOVA used a complete randomized design.

3. Results and Discussion

The results showed that blood cholesterol levels in the group treated with a mixture of olive oil with vitamin E were significantly higher than in the control group and the group fed the VCO mixture with vitamin E (figure 1).

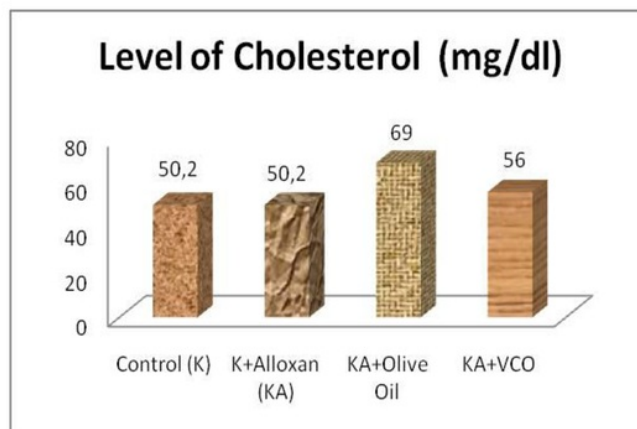


Figure 1. Hyperglycemic rat cholesterol levels after administration of a mixture of VCO with Vitamin also Olive oil with Vitamin E.

Results of LDL cholesterol also showed that the provision of Olive oil significantly increased LDL levels in blood compared to VCO (Figure 2). Low-density lipoprotein (LDL) is a lipoprotein that contains lots of cholesterol, thereby contributing to the presence of cholesterol in the blood.

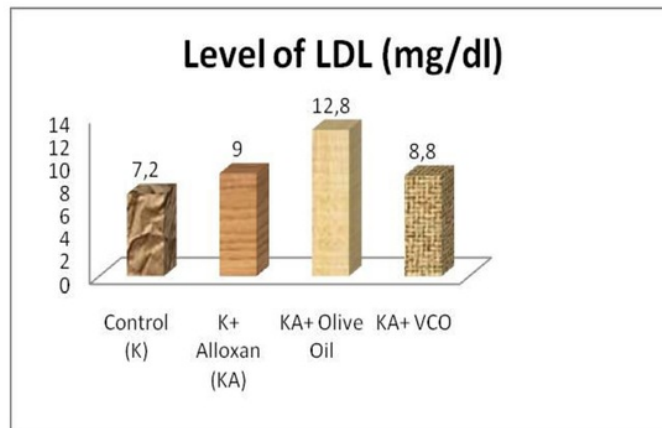


Figure 2. Hyperglycemic rat LDL cholesterol levels after administration of a mixture of VCO with Vitamin E also Olive oil with Vitamin E.

One of the problems in hyperglycemic patients is high glucose levels in the blood because glucose can not enter the cells, so the cells lack raw materials to produce energy. This lack of energy production forces the body to perform lipid catabolism increasing the release of cholesterol into the blood [3].

Virgin coconut oil is pure coconut oil which is more than 50% its component is lauric acid. Lauric acid is a medium chain fatty acid that can be absorbed directly into the cells making it easy to produce energy. Oxidation of lauric acid is shorter than unsaturated fatty acids such as olive oil, so VCO is more accessible to produce energy. The recirculation of lauric acid into the liver via hepatic arteria will release additional energy [4]. Additional energy from the VCO is then suspected VCO group did not seek the addition of energy through lipid catabolism that will increase cholesterol levels and LDL levels in the group. Olive oil in this study has the highest cholesterol levels, allegedly due to do more lipid catabolism to increase cholesterol levels.

Results of HDL showed no significant differences between treatments. Nevin and Rajamohan, 2004, suggest that an increase in LDL will decrease HDL, whereas an increase in LDL will decrease HDL (Figure 3).

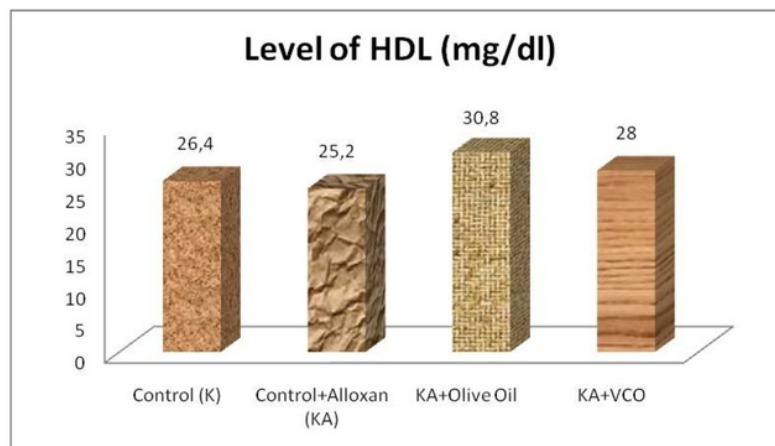


Figure 3. Hyperglycemic rat HDL cholesterol levels after administration of a mixture of VCO with Vitamin E and Olive oil with Vitamin E.

High-density lipoprotein has a higher lipoprotein ratio than cholesterol and is required as a cell membrane structure component, a major component of bile, as well as a component of steroid hormones [3]. The insignificant levels of HDL in this study showed that high LDL in the administration of Olive oil can still be offset by the rise in HDL. Enzyme β -Hydroxy- β -MethylGlutaril-Co-A (HMG-Co-A) reductase is an enzyme that plays a role in the formation of cholesterol. The presence of polyphenols and tocotrienols in the VCO will inhibit the activity of Enzym β -Hydroxy- β -MethylGlutaril-Co-A reductase so that cholesterol synthesis becomes inhibited and decreases more than that of Olive oil [2].

4. Conclusion

Virgin coconut oil has better potential than olive oil to maintain cholesterol in hyperglycemic *Rattus rattus norvegicus*.

Acknowledgment

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