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THAILAND*

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P16

The Effect of Strawberry Extract Added (*Fragaria chiloensis L*) in Cholesterol-Lowering of the Hypercholesterolemic Albino Rats (*Rattus norvegicus*)

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ABSTRACT

The search of *hypolipidemic* medicine especially come from nature is very actived to do because aside cheap and easy to be gotten also has small side-effect, so relatively safe if to be compared to the synthesis medicine, this is caused also has the phytochemical compounds. Several phytochemical compounds are met in strawberry including anthocyanin, ellagict acid, lycopene, katekin, kuaerferin and kaemferol which functions as antioxidant in the body so that it can be prevent the occurance of atherosclerosis. This research aims to provide information about the effect of strawberry juice as a functional food againts the change of lipid fraction in the case *hypercholesterolemic*. The research used is experimental to a draft pretest and posted randomized control design. This design is used to measure the effect of the treatment on the experimental group by way of comparing the group with control group. The reasearch is done four months in the laboratory of biomedic andalas university faculty of medicine. To see the effect of treatment , used murine albino male rattus norvegicus tested in UPDT . (health laboratory province west of sumatra). Lipid fraction includes the total cholesterol, HDL cholesterol and LDL cholesterol then analysed by the method of WI-M-KK 2-SB (Clinical Chemistry Autoanalyzer) using selectra e autoanalyzer in uptd .(health laboratory province west of sumatra). To find out the effect of granting strawberry juice against lipid fraction includes total cholesterol, LDL and HDL blood serum of albino rats, one way anova test is carried out using spss for windows version 17 and and to distinguish inter the treatment done a test of DMRT on degrees of trust 95 % ($p < 0,05$).

Keywords: strawberry extract; total cholesterol; HDL cholesterol; LDL cholesterol; albino rats

INTRODUCTION

Cardiovascular disease threats to look more real, it is seen from the risk of death from coronary heart disease (PJK) is high and the tendency of the age of the patients are getting younger. The cause of coronary heart disease is atherosclerosis. The most important complication of atherosclerosis is coronary heart disease, disorders of cerebral and peripheral blood vessels (Gunawan, 2007). Someone has a high risk of coronary heart disease if exposed to concentrations of total cholesterol greater than 240mg/dl, the value of plasma LDL (low density lipoprotein) is greater than 160mg/dl and cholesterol HDL (high-density lipoprotein) is smaller than 35mg/dl (Hatma, 2003).

A decrease in cholesterol levels can be done with diet, exercise, and hypolipidemic medicines. The price of hypolipidemic medicines are expensive, not everyone can reach it. The use of synthesis medicine

often creates side effects and contraindications of specific diseases are also suffered by people with atherosclerosis, so not everyone can use it. Therefore, the search of *hypolipidemic* medicine especially come from nature is very actived to do because aside cheap and easy to be gotten also has small side-effect so relatively safe if to be compared to the synthesis medicine. On top of that, natural fruits like strawberry can be classified on functional food because it has phytochemicals compounds.

Strawberry (*fragaria chiloensis*) is a herbaceous plant fruit on average have 200 small seeds per fruit. Several phytochemical compounds are met in strawberry including anthocyanin, ellagic acid, lycopene, catecin cuareferin and caemferol which functions as antioxidant in the body so that it can be prevent the occurance of atherosclerosis (Gunawan, 2007). Anthocyanin and lycopene work process of inhibiting the aterogenesis by oxidizing LDL in the

body . Anthocyanin and lycopene also protects the integrity endothelial cells lining the walls of blood vessels so that no damage exists. Damage endothelial cells is the beginning the formation of atherosclerosis so as to be avoided. Besides anthocyanin also relaxation blood vessels to prevent atherosclerosis and cardiovascular diseases other (J . D houghton , 1995)

Research and development potential of strawberry as functional food-lowering cholesterol needs to be done to support public health. This research aims to provide scientific information about the effects of strawberry juice as a functional food against the changes of lipid fraction in the case of hypercholesterolemic. This research can also be relied upon the use of a dose of strawberry juice as an alternative therapy choice for lowering cholesterol levels.

MATERIAS AND METHODS

DESIGN OF RESEARCH

Design research used is experimental to a draft pretest and posted randomized control design. This design used to measure the effect of treatment of a group of experiments by means of comparing the group to the control group (Zainuddin , 2000). The reasearch is done four months in the laboratory of biomedic andalas university faculty of medicine. To see the effect of treatment, used murine albino male rattus norvegicus tested in UPDT (health laboratory province west of sumatra). The experiment mouse obtained from animal development units airlangga university and to be caged in the laboratory pharmaceutical andalas university

POPULATION AND SAMPLE

The population of this research is all albino male murine wistar strains type rattus norvegicus of the unit of animal development airlangga university are eight weeks with a weight about 200 gram . The research sample is 20 albino male rats are selected by simple random techniques. The samples are grouped to be four groups, one group of positive control, one group of negative control and two groups of treatment.

DATA COLLECTION METHOD

The fraction of lipids covering cholesterol total, HDL and LDL cholesterol analysed by the method of WI-M-KK 2 BLK-SB (clinical chemistry autoanalyzer) using tool selectra e autoanalyzer on uptd. Laboratory of health of West Sumatra province.

ANALYTIC METHOD DATA

To find out the effect of giving strawberry extract to the lipid fraction includes total cholesterol, LDL cholesterol and HDL cholesterol in blood serum of albino rats, one way anova test is carried out using spss for windows version 17 to distinguish inter the treatment done a test of dmrt on degrees of trust 95 % ($p < 05$) .

RESULTS AND DISCUSSION

CHANGES OF LIPID FRACTION

Research was carried on 20 albino male rats wistar strain (rattus norvegicus) 8 weeks of age with weight around 200 gr.normal mouse randomly taken 5 tails and serve as a negative control are only given feed standards and albino water adlibitum. Fifteen other rats are given feed hypercholesterolemic. Hypercholesterolemic condition reached with feeding hypercholesterolemic for 30 days, mice given strawberry juice for 30 days. This treatment gives the real effect of the decrease in total cholesterol levels in albino mice.

Total cholesterol levels in blood serum of albino rats before, after and at the end of treatment between groups

After giving strawberry extract for 30 days occurred changes in the lipid fraction of total cholesterol levels in albino rats, as is shown in table 1.

TABLE 1 Average total cholesterol levels on early, before and after the treatment between groups

Treatment	Beginning cholesterol (mg/dl)	Before treatment cholesterol (mg/dl)	After treatment cholesterol (mg/dl)
K+	51.75	99.27	134.10
Kp1	43.98	87.11	54.46
Kp2	44.04	87.21	53.48
K-	43.75	42.25	45.75

$P < 0,05$

Description: (k+) = positive control given feed hypercholesterolemic, (kp1) = treatment group 1 are given 2 ml of strawberry juice (kp2) = treatment group 2 given 3 ml of strawberry juice = (k) = given the feed standards.

Granting of strawberry extract gives effect to mice, a decrease in cholesterol levels differ markedly between before and end of treatment. But if it is seen to before the treatment compared with the end of the treatment, decreased total cholesterol levels is not yet approaching the normal mice when cholesterol levels before treatment.

LDL cholesterol levels in blood of mice early, before and after treatment

LDL cholesterol levels (mg/dl) rate before and after treatment of albino rats by giving strawberry extract with different dosage on each group's treatment decreased the real compared to the positive control (k+). Decrease LDL cholesterol are shown in table 2. It can be seen that the effect of granting the same strawberry extract gives the effect of a decrease in LDL which among different groups of treatment are not real. This provides evidence that the granting of strawberry extract with different dosages give influence on the albino rat LDL.

Increased levels of cholesterol in rats before the treatment caused the feed hypercholesterolemic, where the feed it will encourage the formation of excessive cholesterol that can affect increased levels of blood cholesterol (Hasler, 1994). Goat fat obtained by way of frying is a product of fat oxidized. Products oxidation of fats in the body and be in lipoprotein blood as cholesterol becomes oxidized. Low density Lipoprotein (LDL) carries cholesterol is already oxidized in the form of genetically modified-LDL. Increased cholesterol in the study due to an increase in cholesterol becomes oxidized contained in LDL.

TABLE 2 Rate of LDL cholesterol levels early, before, and after treatment between groups.

Treatment	LDL Before (mg/dl)	LDL After (mg/dl)	LDL End (mg/dl)
K+	41.50	123.20	156.38
Kp1	45.62	123.15	12.30
Kp2	46.32	135.33	12.66
K-	44.75	43.50	44.50

P < 0,05

Description: (k+) = positive control given feed hypercholesterolemic, (kp1) = treatment 1 strawberry extract 2 ml, (p2) = treatment 2 starwberry extract 3 ml = (k-) = given the feed standards.

The value of blood cholesterol of rats in Group KP1 and KP2 gives very real different results compared to the K+. This is because in the strawberry extract contained anthocyanin and lycopene that serves as an antioxidant in the body so as to prevent the occurrence of atherosclerosis, a disease that blockage of blood vessels. Anthocyanin working with aterogenesis hamper oxidize cholesterol (LDL). Anthocyanin also protect the integrity of the endothelial cells that line the walls of the blood vessels so that the damage does not occur. Endothelial cell damage is the beginning of the

formation of atherosclerosis and so should be avoided. In addition to anthocyanin, in the strawberry has high enough vitamin C role in improving HDL levels that will sweep the LDL cholesterol that increases the rate of, thrown in the form of bile acids, prevents oxidation of LDL which can help prevent the formation of plaque in the blood vessels of the heart blood vessels cause bias clogged, and serves as a laxative so improve sewage where it also lowers the absorption back bile acids and convert into cholesterol (Kurowska, 2002).

Decrease cholesterol levels in rats fed strawberry extract likely played by anthocyanin and lycopene, which have the ability to bind bile acids are excreted with the stool. Binding bile acids cause the absorption of cholesterol levels in plasma reduced so decreasing (Rifki, 2004).

Increased intracellular cholesterol due to a diet high in cholesterol and saturated fatty acids will be saved as an ester of cholesterol, the formation of cholesterol in the cells to be decreased, occurs inhibition of LDL receptor gene transcription, consequently decreasing LDL receptor synthesis and LDL levels in circulation will increase. LDL receptor-binding function, which is a lipoprotein LDL transport cholesterol to the networking/peripheral. The LDL receptors are found in all cells, but the most important is the liver cells where most of the cholesterol LDL in metabolism. The numbers of LDL receptors are low due to nutritional factors and genetic, causes increased levels of LDL in plasma as a result, the risk of the occurrence of atherosclerosis is also increasing.

The results of this research are almost the same as research Wilkinson (2009), where the awarding of strawberries can lower LDL cholesterol levels after 2 weeks, and after 4 weeks lowered LDL which is more and more. Strawberry juice thinks giving significantly inhibits the proven free radicals and lowering LDL cholesterol levels HDL cholesterol but his has not changed significantly. However, in this research a decrease in LDL cholesterol levels when compared with the end of the treatment before treatment is declining sharply. Decrease in LDL levels are very sharp this might be due in addition to the anthocyanin and vitamin C as an antioxidant, there are still other antioxidant and lycopene ellagic acid. Vitamin C is a water-soluble vitamin that is only capable of eliminating free radicals in liquid media. Vitamin C has the ability to suppress free radicals will attack the lipids. As a scavenger of free radicals, this vitamin can directly react with superoxide and the hydroxyl anion, as well as various lipid hydroperoxide. His role as an antioxidant chain breaker, vitamin C can do regenerate the form of vitamin E reduced.

According to Wilkinson, 2008 in the strawberry also contained lycopene. Directly, lycopene contained in Strawberry fruit will also affect the LDL cholesterol levels. Foodstuffs containing antioxidants may slow progresivitas aterosklerosis was believed to be due to its ability in inhibiting the damage caused by oxidative processes. Lycopene as antioxidants have the ability to protect the body's cells cell damage caused by free radicals in the blood flow by reducing the effects of toxic reactive oxygen species (ROS). In addition, the carriage of lycopene in the plasma bound to lipoproteins (especially LDL) causes increased resistance against LDL oxidation process. Lycopene holds an important role in reactive and bind off oxygen radicals peroxidases. Of a research note that the daily intake by as much as 40 mg of lycopene can lower LDL oxidation.

Invitro studies have shown that lycopene has highest antioxidant ability than other carotenoids. Role of lycopene in the metabolism of cholesterol setting, i.e. With the enzyme work HMG-coa reductase, which play a role in the synthesis of cholesterol in the liver, so the anesthetic hipokolesterolemi. In addition, lycopene can raise LDL-cholesterol so that degradation of the functioning lowering levels of LDL blood plasma. The process of atherosclerosis is a dynamic process, in which progresivitasnya can be slowed down if concentrations of lipoproteins (LDL) serum aterogenik can be derived.

The existence of other antioxidants such as ellagic Acid in strawberries adds strengthening work in lowering LDL cholesterol. This acid is included into the Group of polyphenols in fenolat acid component which is the second-largest component in a group of polyphenols are also capable in oxidize LDL.

Dalimarta (2002), stated that the incidence of atherosclerosis begins as high LDL cholesterol levels due to the lack of formation of LDL receptor as a result of genetic abnormalities such as hypercholesterolemic familial or LDL saturated receptor with respect to consumption of foods that contain too much high cholesterol. Enhancement levels of LDL cholesterol in the blood will lead to cholesterol metabolism is impaired, leading to the formation of a layer of fat (Fatty streak). This layer of fat before is thin, not clog blood vessels. Next is the process of proliferative so that the crust formed fibrous or fibrous plaques.

Considering the dangers of cholesterol so exaggerated and requires effort to lower cholesterol levels by consuming strawberry extract. Because, according to this research result the mice are given strawberry extract with a different dosages so effective in lowering LDL cholesterol.

HDL cholesterol levels on early, before and after treatment

HDL cholesterol levels after the granting of the strawberry juice on albino rats presented in table 3.

TABLE 3 Average cholesterol levels HDL early, before and after the treatment Between Groups

Treatment	HDL Before (mg/dl)	HDL After (mg/dl)	HDL End (mg/dl)
K+	39.00	61.05	73.60
KP1	43.67	51.34	60.37
KP2	44.41	61.88	65.76
K-	42.00	40.25	44.25

P > 0,05

Description: (K+) =Positive control given feed hypercholesterolemic, (KP1) = Treatment 1 given strawberry extract 2 ml, (P2) = Treatment 2 given strawberry extract 3 ml = (K-) = given the feed standards.

HDL cholesterol levels utilized albino rat a little bit increasing, where treatment increased in each group shows no different than real. HDL cholesterol levels utilized albino rat a little bit increasing, where treatment increased in each group shows no different than real. The new paradigm of food with functional food to achieve synergy combines food, can try to consume Strawberry juice is considered a perfect example of the concept of the antioxidant network.

According to Hasler, 1994, a native of the Mediterranean region on the island of Crete has a diet that is rich in vegetable food like vegetables, fruits. The result inhabitant of the island of crete very infrequently exposed to cancer and heart disease. In line with this concept of functional food strawberry extract will be able to serve as one of the alternatives in preventing atherosclerosis. So based on this research to benefit the most from the food healthy, Strawberry juice consumption each day can lower total blood cholesterol levels, LDL cholesterol of albino mice.

CONCLUSION

Lipid profile including total cholesterol levels, LDL cholesterol decreased significantly after the mouse giving strawberry extract with 2 ml dose and dose 3 ml/day, while HDL cholesterol is a albino rat real change does not occur. In line with this concept of functional food strawberry extract can serve as one alternative in preventing atherosclerosis. Based on this research to benefit the most from the food healthy,

Strawberry juice consumption each day can lower total blood cholesterol levels, LDL cholesterol.

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