

Study The Effect Of Zingiber Officinale Extract On The Serum Lipids In Rabbits

Baha'a A. Abdul-Hussein

Abstract: The increasing in serum lipids and also the persistent hyperlipidemia concerned the main reason for many problems especially to the heart and arteries like atherosclerosis. Ginger or ginger root is the rhizome of the plant *Zingiber officinale*, consumed as a delicacy, medicine, or spice. Ginger has a cholesterol lowering properties. Aim of the study its to evaluate the lipid lowering activity of ginger, and to compare the effect with the most known lipid regulating drug; atrovastatin. Materials and methods A group of eleven New Zealand male rabbit (*Oryctolagus cuniculus*) were subdivided into 3 groups each group included 4 rabbits; Group 1 were received atrovastatin orally (1ml) for 10 days. Group 2 were received zengiber (ginger) extract orally (1ml) for 10 days. Group 3 was control and received DW only, for 10 days. After the first 10 days; the fat was added to the diet (to induce increasing in blood cholesterol) and persisted to add daily for another 10 days, with continuation of atrovastatin and zengiber administration. Results Ginger extract caused highly significant reduction in cholesterol and level was 91.1 ± 0.02 at 10th day. Also ginger highly significantly reduced the triglycerides and level was 95.2 ± 0.01 , the LDL was reduced by ginger highly significantly 51.1 ± 0.01 , the VLDL also reduced by ginger significantly 18.2 ± 0.02 , while the HDL level was kept by ginger extract, on the other hand the ginger extract was more efficient than atrovastatin in the lowering of lipids.

Keywords: Atrovastatin, Cholesterol, Ginger, Hyperlipidemia, HDL, LDL, TG, VLDL.

1 INTRODUCTION

Ginger or ginger root is the rhizome of the plant *Zingiber officinale*, consumed as a delicacy, medicine, or spice. It lends its name to its genus and family (Zingiberaceae). Other notable members of this plant family are turmeric, cardamom, and galangal. The distantly related dicots in the *Asarum* genus have the common name wild ginger because of their similar taste [1]. In limited studies, ginger was found to be more effective than placebo for treating nausea caused by seasickness, morning sickness and chemotherapy, [2][3][4][5] although ginger was not found superior to placebo for pre-emptively treating post-operative nausea. Some studies advise against taking ginger during pregnancy, [3] suggesting that ginger is mutagenic, though some other studies have reported antimutagenic effects. [3] Other preliminary studies showed that ginger may affect arthritis pain or have blood thinning and cholesterol lowering properties, but these effects remain unconfirmed [6].

1.1 Atrovastatin; is one of a structural analogs of HMG-CoA (3-hydroxy-3-methylglutaryl-coenzyme A, lipid regulating drugs, They are well known effective in reducing cholesterol [7]

1-2 Aim of the study It's to investigate the lipid lowering effect of ginger extract, and to compare with atrovastatin, as a standard lipid regulating drug.

2 Materials and methods

2.1 Animals and housing

A group of eleven New Zealand male rabbit (*Oryctolagus cuniculus*) were subdivided into 3 groups each group included 4 rabbits, the animals were kept in the same conditions of light, temperature, and the diet and water provided persistently.

2.2 Extraction of zengiber (ginger)

An amount of 1 kilogram of fresh zengiber roots had been prepared for extraction, by cutting it into thin parts, then dried under sunlight, and then crushed to produce powder, this powder was put in the Soxhlet extractor apparatus (Bavco – Co. - Italy) with a suitable amount of distilled water for watery extraction. And then evaporate the access water by rotary evaporator (Bavco – Co. – Italy), (each 1ml of extract contain 2mg of dried extract of ginger) [8].

2.3 Preparation of atrovastatin solution

A pure powder (200 mg) of atrovastatin (Micro labs-Co- India) was dissolved in 100 ml of distilled water to obtain atrovastatin solution (0.2%w/v) [9]. The groups and parameters In the beginning, the blood samples of rabbits were sent to lab to measure the serum lipids, to record the normal levels before using any drug. At the next day the administration of treatment started and as the following;

Group 1 were received atrovastatin orally (1ml) for 10 days.
Group 2 were received zengiber (ginger) extract orally (1ml) for 10 days.
Group 3 was control and received DW only, for 10 days.

After the first 10 days; the fat was added to the diet (to induce increasing in blood lipids) and persisted to add daily for another 10 days, with continuation of atrovastatin and zengiber administration. The measurement of serum lipids was done at 1st, 5th, 10th day pre and post addition of fat to the diet. The blood samples were taken at the morning (fasting time) and the sent to the lab, the testing was done with the Reflotron system -Roche co. Germany [10][11]. The serum lipids which were measured ; HDL, LDL, VLDL, TG, and Cholesterol.

2-4 Statistical analysis after the data were collected they represented as (Mean \pm SE), and the ANOVA test were used to detect the differences, results were considered statistically significant when (P < 0.05) [12].

3 Results

The normal values of serum lipids of rabbits and the those post addition of fat without treatment were represented in table 1

- Baha'a A. Abdul-Hussein; V. MB. Ch. B, MSc, PhD (Pharmacology) \ Lecturer in Pharmacology. Dept. of Pharmacology, College of Veterinary Medicine, University of Al - Qadissiya, Al-Qadissiya - Iraq.
Email: bahaa_pharma@yahoo.com

3.1 Atrovastatin group

The serum lipids levels pre and post addition of fat to feeding and with continuation of administration of atrovastatin were as illustrated in table 2.

3.2 Zengiber group

The serum lipids levels pre and post addition of fat to feeding and with continuation of administration of zengiber were as illustrated in table 3. Comparing with control group, after addition of fat to feeding, the serum lipid of atrovastatin and zengiber group were less than control group and there was a highly significant difference ($p < 0.01$), while the HDL was more than control group and there was significant difference ($0.01 < p < 0.05$).

4 Discussion

The increasing in serum lipids and also the persistent hyperlipidemia concerned the main reason for many problems especially to the heart and arteries like atherosclerosis, increased viscosity of blood, and occlusion of coronary artery, which resulted in myocardial infarction, and heart failure^{[11][13]}. So it's necessary to find the treatment which in turn must to be most effective and less harmful. The using of herbs to prophylaxis and treatment of the diseases it is effective and with less adverse effect on the body^[14]. The effect of ginger extract on level of serum lipids in prevention and treatment in rabbits was noticeable, that it caused reduction in cholesterol level pre addition of fat to feeding, and also post addition of fat to feeding and prevented it to reach to the expected increasing which noticed in control group, and the cholesterol level was 91.1 ± 0.02 in ginger group, while in control group was 125.4 ± 0.03 and there was highly significant difference. Also the ginger extract was more effective than atrovastatin and there was a significant difference, these result its agree with that recorded by Abd-Elraheem 2009 which obtained the same effect on rats^[15]. Also the ginger extract was effective in prevention and reduction of triglycerides pre and post addition of fat to the feeding, and its caused a highly significant reduction on the 10th day, and the level of triglycerides 95.2 ± 0.01 , while in control group was 132.4 ± 0.02 , also the ginger was more effective than atrovastatin and level was 100.2 ± 0.01 and there was a significant difference, and these result agree with that of Omega 2007,^[16]. The HDL which considered the more important to the body due to its protective effect against LDL and cholesterol. The ginger extract was effective keeping the HDL in normal level and prevented it from reduction especially post addition of fat to feeding and there was no difference comparing to the normal level, and this also agreed with Abd-Elraheem 2009^[15]. The ginger was more beneficial than atrovastatin in preserving of HDL and there was a significant difference especially at 1st, and 5th day post addition of fat. The preservation of HDL level and prevented it to decrease it's a good benefit and the agent which able to do that considered a good agent like ginger extract. On the other hand the ginger extract reduced and prevented LDL to increased pre and post addition of fat to feeding, and the level was 46.1 ± 0.02 , while in control group 83.1 ± 0.03 there was highly significant difference. While in atrovastatin group was 50.2 ± 0.02 , also the ginger was more effective than atrovastatin and there was significant difference. The effect of ginger on VLDL was noticeable and reduced the level pre addition of fat, and prevented it to increase post addition of fat to the feeding, and the level was 19.1 ± 0.01 ,

while in control was 32.1 ± 0.02 , there was highly significant difference, while in atrovastatin group 22.1 ± 0.03 , also ginger was more efficient than atrovastatin $p < 0.05$. From these data and results, its important to say that ginger extract effective to protect against hyperlipidemia, because it reduced the serum lipids and prevented them to increase even post addition of fat to feeding, and there was non significant difference comparing to the normal levels, and at the same time the ginger was more efficient than atrovastatin, the expected mechanism by which the ginger act, is the ability of ginger to prevent the lipid peroxidation and the antioxidant activity of ginger^{[17][18]}.

5 Conclusions

the ginger extract was more effective in lowering of serum lipids in rabbits, and it was safe and there was no any undesirable reaction in rabbits.

6 Acknowledgment

special thanks for the physiology lab stuff in vet. Medicine college for their kind assistance in establishment of the present work.

7 References

- [1] Ginger wikipedia, free encyclopedia (2014).
- [2] Ginger as an antiemetic in nausea and vomiting induced by chemotherapy; a randomized, cross-over, doubleblind study. Medind. Retrieved 2013-7-21
- [3] Ernst, E.; & Pittler, M.H. (2000). "Efficacy of ginger for nausea and vomiting: a systematic review of randomized clinical trials" (PDF). *British Journal of Anesthesia* 84 (3): 367–371. doi:10.1093/oxfordjournals.bja.a013442.PMID 10793599. Retrieved 6 September 2006.
- [4] Wood, C.; Pittler, MH (2000). "Comparison of efficacy of ginger with various antimotion sickness drugs". *British journal of anaesthesia* 84 (3): 367–71. PMID 10793599.
- [5] Grøntved, A.; Pittler, MH (2000). "Ginger root against seasickness. A controlled trial on the open sea". *British journal of anaesthesia* 84 (3): 367–71. PMID 10793599.
- [6] University of Maryland Medical Centre (2006). "Ginger". Retrieved 2 August 2007.
- [7] Malloy MJ. , and Kane JP. (2007): Agents used in Hyperlipidemia. In: Katzung B.G. Basic and Clinical Pharmacology. 9th ed. McGraw Hill. Boston Pp; 560-572.
- [8] Soxhlet extractor, principles, From Wikipedia, the free encyclopedia (2014).
- [9] British Pharmacopoeia. London, Her Masjesty's Stationary office (2004): Vol. I.
- [10] Zomrawi W., Abdel Atti K., Dousa B., and Mahala A. (2012). The effect of ginger root powder (zingiber officinale) supplementation on broiler chicks performance, blood and serum constituents. *Online Journal of Animal and Feed Research*. 1, (6): 457-460.

- [11] Fuhrman, B.; Roseblate, M.; Hayek, T.; Coleman, R. and Aviram, M. (2000). Ginger Extract Consumption Reduces Plasma Cholesterol, Inhibits LDL Oxidation and Attenuates Development of Atherosclerosis in Atherosclerotic, Apolipoprotein E-Deficient Mice. *J. Nutr.* 130: 1124-1131.
- [12] Hill A.B. (1991): Brodford Hill's Principles of Medical Statistics. 12thed. Hodder and Stoughton. London. Pp. 78-84.
- [13] Boon NA, Cumming AD, and John G (2007): Davidson,s principles and practice of medicine. (Cardiovascular disorders\ Atherosclerosis). 20th . ed. Elsevier Inc. Pp; 578-581.
- [14] Joerg Gruenwald, Thomas Brendler, Christof Jaenicke. (2000): PDR for herbal medicine.
- [15] Abd-Elraheem A. Elshater, Muhammad M. A. Salman and Mahrous M. A. Moussa (2009).Effect of Ginger Extract Consumption on levels of blood Glucose, Lipid Profile and Kidney Functions in Alloxan Induced-Diabetic Rats. *Egypt. Acad. J. biolog. Sci.*, 2 (1): 153-162.
- [16] Oimage J, Onimisi P, Adegbite E, and Agunbiade M. (2007). The Effect of Ginger (*Zingiber officinale* Roscoe) Waste Meal on Growth Performance, Carcass Characteristics, Serum Lipid and Serum Cholesterol Profiles of Rabbit. *Pakistan Journal of Nutrition* 6 (4): 359-362.
- [17] STOILOVA I., KRASTANOV A., STOYANOVA A. (2007): ANTIOXIDANT ACTIVITY OF A GINGER EXTRACT (*ZINGIBER OFFICINALE*). *FOOD CHEMISTRY. ELSEVIER.* 102. Pp; 764-770.
- [18] Maralla, Swaroopa, Kesireddy, Sathyavelu Reddy, Wudayagiri, Rajendra (2012): Effect of ginger consumption on serum makers of general metabolism, liver and kidney functions and lipid profiles in ethanol induced withdrawal rats. *Journal of Pharmacy Research.* 5; p485.

Tables

Table (1). The normal values of serum lipids of rabbits and those post addition of fat to feeding were represented.

	cholesterol	TG	HDL	LDL	VLDL
normal	98.5±0.01	115.7±0.01	16.2±0.02	60.2±0.01	22.7±0.01
post addition of fat	125.4±0.03	132.4±0.02	13.3±0.02	83.1±0.03	32.1±0.02

Table (2). Represent the serum lipids levels of rabbits treated with atrovastatin pre and post addition of fat to feeding, comparing with normal levels, (p value<0.05).

	cholesterol	TG	HDL	LDL	VLDL
Pre addition of fat					
Day1	96.4±0.03 NS	106.3±0.02 S	16.6±0.01 NS	59.2±0.02 NS	21.3±0.03
NS					
Day5	93.2±0.03 S	104.2±0.01 S	16.8±0.01 NS	56.2±0.02 S	20.2±0.01
S					
Day10	90.2±0.01 HS	98.2±0.01 HS	16.8±0.02 NS	48.2±0.02 HS	18.2±0.02 S
Post addition of fat					
Day1	95.3±0.02 S	101.3±0.03 HS	15.9±0.03 NS	50.3±0.03 HS	21.3±0.03
NS					
Day5	95.1±0.02 S	98.3±0.03 HS	15.9±0.02 NS	46.1±0.02 HS	20.2±0.03
S					
Day10	91.1±0.02 HS	95.2±0.01 HS	16.2±0.02 NS	46.1±0.02 HS	19.1±0.01
HS					

NS= non significant difference (P>0.05), S= significant difference (P≤0.05), HS= highly significant difference (P≤0.01).

Table (3). Represent the serum lipids levels of rabbits treated with zengiber pre and post addition of fat to feeding, comparing with normal levels, (p value<0.05).

	cholesterol	TG	HDL	LDL	VLDL
Pre addition of fat					
Day1	96.4±0.03 NS	106.3±0.02 S	16.6±0.01 NS	59.2±0.02 NS	21.3±0.03
NS					
Day5	93.2±0.03 S	104.2±0.01 S	16.8±0.01 NS	56.2±0.02 S	20.2±0.01
S					
Day10	90.2±0.01 HS	98.2±0.01 HS	16.8±0.02 NS	48.2±0.02 HS	18.2±0.02
S					
Post addition of fat					
Day1	95.3±0.02 S	101.3±0.03 HS	15.9±0.03 NS	50.3±0.03 HS	21.3±0.03
NS					
Day5	95.1±0.02 S	98.3±0.03 HS	15.9±0.02 NS	46.1±0.02 HS	20.2±0.03
S					
Day10	91.1±0.02 HS	95.2±0.01 HS	16.2±0.02 NS	46.1±0.02 HS	19.1±0.01
HS					

NS= non significant difference (P>0.05), S= significant difference (P≤0.05), HS= highly significant difference (P≤0.01).