Academic Sciences International Journal of Pharmacy and Pharmaceutical Sciences

ISSN- 0975-1491 Vol 5, Suppl 2, 2013

Research Article

MYTHS AND FACTS ABOUT CONSUMPTION OF GHEE IN RELATION TO HEART PROBLEMS - A COMPARATIVE RESEARCH STUDY

A.MANOHAR REDDY*, V.SATISH, M.NAGAMOUNICA, M.MANOJ KUMAR

Sir.C.R.Reddy College of Pharmaceutical Sciences, Eluru, Andhra Pradesh. Email: alavalamanohar@Gmail.Com

Received: 26 Mar 2013, Revised and Accepted: 12 May 2013

ABSTRACT

Objective In ancient India ghee was used as vehicle in many Ayurveda preparations. Oral consumption of ghee is like offering finest of fuels into the fires of digestion. Ghee makes all body organs soft and builds up internal juices, which are diminished by aging. But science says that increase in intake of saturated fats and trans fats raises the level of cholesterol. There is a general consideration in public that consumption of "ghee "results in rise of serum cholesterol levels when compared to edible oil. The main objective of our study is to establish facts in this general consideration of public.

Method We fed two groups of rats one with "oil" and another with "ghee"mixed in deoiled rice bran. The third group of rats is fed with deoiled rice bran and taken as control. We noted initial serum cholesterol, HDL, LDL, triglycerides levels. After 40days of feeding again serum cholesterol, HDL, LDL and triglyceride levels are noted.

Results Consumption of "ghee" did not result in much rise in LDL and other serum cholesterol level when compared to "peanut oil". In contrast, slightly decrease in LDL levels is noted in rats consuming ghee.

Conclusion The results obtained reveal that ghee is not as harmful as the people feel. Use of ghee as cooking oil probably decreases the probability of getting cardiovascular disease as it causes increase in HDL cholesterol levels. Results also indicate that ghee is relatively safer when compared to peanut oil.

INTRODUCTION

Lipid is the scientific term forthe word"fat" in blood. At proper levels, Lipids perform important functions in your body, but can cause health problems if they are present in excess. Hyperlipidemia is a heterogeneous group disorder characterized by elevated lipid levels in blood stream than normal. There is an increased risk of atherogenesis and coronary artery disease with hyperlipidemia. Lipids do not dissolve in water. Being water insoluble, plasma lipids are transported in blood as several classes of lipoproteins[1].

Different classes of lipoproteins are

- Chylomicrons
- Very low density lipoproteins (VLDL)
- Low density lipoproteins (LDL)
- Intermediate density lipoproteins (IDL)
- High density lipoproteins (HDL)

Lipoproteins contain a non-polar core of triglycerides and cholesterol esters surrounded by a polar coat made up of phospholipids,i.e., unesterified cholesterol and Apoproteins. The lipidsin chylomicrons and VLDL was mostly triglycerides on the other hand lipids in LDL was mostly cholesterol. A high plasma level of LDL (Cholesterol) is called as hypercholesterolemia. It is considered to be atherogenic whereas elevated levels of HDL(Over 60mg/dl) have protective effect. Elevated levels of Chylomicrons and VLDL i.e., triglycerides is called as hypertriglyceridemia [2]. To what extent hypertriglyceridemia is an independent risk factor for atherosclerosis is not clearly known. But, extreme elevation of plasma triglycerides can lead to pancreatitis. An elevated level of lipoproteins in blood stream is called as hyperlipoproteinemia. Hyperlipoproteinemias can be broadly classified in to three classes [8,15].

They are

- Familial lipoproteinemia
- Acquired lipoproteinemia
- Idiopathic lipoproteinemia

Familial lipoproteinemia is due to genetic reasons. Acquired lipoproteinemia is due to abnormal diet, use of certain drugs and presence of certain diseases. Consumption of diet containing saturated fats and trans fats is considered as probable reason for development of dietary acquired lipoproteinemia.

Idiopathic lipoproteinemia is due an unknown reason.

Hypercholesterolemia is asymptomatic can be known only after biochemical examination of blood for lipid profile. Though hyperlipidemias are often genetically determined, diet determined hyperlipidemias are also common[2,3]. There are some common beliefs and some scientific beliefs regarding this. People scientifically says that consumption of oils containing more saturated fats and trans fats rise plasma cholesterol levels at a higher extent. Common believe that consumption of Ghee and vanaspathi may cause Ischaemic heart disease. Off course, they believe that consumption oil too raises the risk of having Coronary artery disease . There is a general consideration that Consumption of ghee results in rise of plasma cholesterol levels to a large extent when compared to that of edible oil[4,5].

In ancient India ghee was used as a vehicle in many Ayurveda medicinal preparations. Oral consumption of ghee through food is nothing but offering a finest fuel in to the fires of digestion. Ghee cools the body and prevents overheat. Ghee makes internal body organs smooth and soft and also increases secretion of internal juices, which are diminished by aging. Ghee improves intelligence and intellect. It also acts as a lubricant over the walls of GIT and facilitates easy egestion. Ghee is also better in wound healing. Ghee can be used as bath oil and also as moisturizer. Despite of all these considerations mentioned in Ayurveda and ancient Indian medical systems, now public have an inhibition to consume ghee. This is due to belief that ghee raises serum cholesterol levels. Composition of ghee also supports their belief [6].

Table 1: List of various types of fat levels in ghee and peanut oil [7]

Lipid	Total fat	Saturated fat	Monounsaturated fat	Polyunsaturated fat
Ghee	100g	62g	29g	4g
Peanut oil	100g	17g	46g	32g

Peanut oil which is also known as groundnut oil is a vegetable oil obtained from dried seeds of Arachis hypogea a leguminous plant. It contains approximately 75% unsaturated fat. This is useful as cooking oil. Peanut oil can also be used as massage oil. Scientific considerations say that possibly due to presence of high monounsaturated fatty acid content, peanut oil is associated with reduced levels of plasma cholesterol and triglycerides.

According to above general and scientific considerations peanut oil looks good and superior to ghee in aspect of avoiding angiogenesis and development of coronary artery disease. Our study aimed to evaluate myths and facts of these considerations [8,9].

MATERIALS

Albino rats, Cages for rats, Ghee, peanut oil, Ensure biotech calorimeter, Serum cholesterol regents, HDL reagents, LDL reagents, Triglycerides reagents, Weight balance.

METHOD

Fifteen number of albino rats were taken and divided into three groups each containing five rats. The initial weights of rats were measured and noted. Blood was collected from median orbital plexus. The initial serum cholesterol levels were estimated calorimetrically by 'Ensure biotech' colorimeter. The rats were fed with deoiled bran pellets and their Weight and serum cholesterol levels were measured for every 20 days. This step was continued till the steady serum cholesterol levels were obtained. Then rats were weighed and again serum cholesterol levels like total cholesterol, HDL, LDL, Triglyceride levels were estimated and noted for three groups. These values were taken as initial values. Later one group of rats was fed with bran pellets which are mixed with ghee to 10% weight of feed. Another group was fed with bran pellets which are mixed with peanut oil to 10% weight of feed. The third group was fed with plain bran pellets and considered as control. This was continued for 40 days. The rats were weighed and the values were noted. Then blood was collected again by inserting a capillary tube into median orbital plexus. Then serum cholesterol levels like total cholesterol, HDL, LDL, Triglyceride levels were estimated calorimetrically. Then the results obtained were used for comparison between cholesterol levels of ghee and oil group rats.

RESULTS

The results obtained from the colorimetric analysis before and at the end of the experiment are tabulated accordingly for each group. Difference in initial to final values and percentage difference were calculated and finally average values in body weight, serum cholesterol, HDL, LDL, triglycerides were calculated and tabulated.

Table 2: List of Body weight, Total cholesterol, HDL, LDL and Triglycerides levels of the control group

Control group	Body weight				Total cholesterol				HDL				LDL				Triglycerides			
	Initial	Final	Diff	%diff	Initial	Final	Diff	%diff	Initial	Final	Diff	%diff	Initial	Final	Diff	%diff	Initial	Final	Diff	%diff
Rat - 1	130	137	7	5.38	166	172	6	3.61	22	24	2	9.09	68	72	4	5.88	62	63	1	1.61
Rat - 2	131	139	8	6.10	158	166	8	5.06	18	18	0	0	66	72	6	9.09	58	59	1	1.72
Rat - 3	154	162	8	5.19	170	174	4	2.35	24	27	3	12.5	69	69	0	0	58	61	3	5.17
Rat - 4	107	116	9	8.41	154	160	6	3.89	19	20	1	5.26	68	74	6	8.82	57	59	2	3.5
Rat - 5	121	129	8	6.61	153	159	6	3.92	17	20	3	17.6	62	66	4	6.45	53	55	2	3.77
Average	128.6	136.6	8	6.33 4.90	160.2	166.2	6	3.76 1.07	20.2	21.6	1.8	8.89 6.74	67.8	69.4	4 3.66	6.04	57.8	59.2	1.8	3.15 1.5

Percentage increase in average weight of the control group rats was found to be 6.33in the period of 40 days. Serum cholesterol levels were increased by 3.76%. Percentage increase in average HDL levels was found and noted as 8.89. Average serum levels of LDL cholesterol were found to increase by 4%. Increase in average serum triglyceride level was noted as 3.15%. The above results indicate that after 40 days the increase in body weight, total cholesterol, HDL, LDL and triglycerides did not result in considerable increase. The finial values are almost same as initial values.

Table 3: List of Body weight, Total cholesterol, HDL, LDL and Triglycerides levels of the ghee group

Ghee group	Body weight				Total cholesterol				HDL				LDL				Triglycerides			
	Initial	Final	Diff	%diff	Initial	Final	Diff	%diff	Initial	Final	Diff	%diff	Initial	Final	Diff	%diff	Initial	Final	Diff	%diff
Rat - 1	138	172	34	24.6	159	240	81	50.9	22	47	25	113.6	69	93	24	34.78	55	85	30	54.54
Rat - 2	123	166	43	34.9	166	241	75	45.1	21	44	23	109.5	67	91	24	35.82	61	95	34	55.73
Rat - 3	109	154	45	41.2	169	251	82	48.5	25	50	25	100	75	104	29	38.66	59	100	41	69.49
Rat - 4	127	180	53	41.7	162	238	76	46.9	19	39	20	105.26	63	90	27	42.85	58	90	32	55.17
Rat - 5	130	161	31	23.8	151	232	81	53.6	16	34	18	112.5	61	88	27	44.26	58	92	34	58.62
Average	125.4	166.6	41.2	32.8	161.4	240.4	79	48.9	20.6	42.6	22	108.17	67	93.2	26.2	39.27	58.2	92.4	34.2	58.7
St.Dev				8.68				3.34				5.69				4.18				6.27

Percentage increase in average weight of the ghee group rats was found to be 32.8 this indicates drastic increase in weight just in the period of 40 days. Same thing was observed with serum cholesterol levels also. Just in the period of 40 days treatment average serum cholesterol levels were increased by 48.9%. Serum HDL levels were noted more than double to initial values. Percentage increase in average cholesterol levels was found and noted as108.17. Serum levels of LDL cholesterol were found to increase by 39.27%. Increase in average serum triglyceride level was noted as 58.7%. Though they did not exceed normal limits values are considerably increased.

Table 4: List of Body weight, Total cholesterol, HDL, LDL and Triglycerides levels of the peanut group

Peanut oil group	Body weight				Total cholesterol				HDL				LDL				Triglycerides			
	Initial	Final	Diff	%diff	Initial	Final	Diff	%diff	Initial	Final	Diff	%diff	Initial	Final	Diff	%diff	Initial	Final	Diff	%diff
Rat - 1	132	145	13	9.84	162	260	98	60.5	17	34	17	100	70	106	36	51.42	59	98	39	66.1
Rat - 2	130	144	14	10.77	161	246	85	52.8	21	40	19	90.47	69	101	32	46.3	56	89	33	58.92
Rat - 3	105	117	12	11.43	172	284	112	65.11	23	44	21	91.3	72	108	36	50	62	104	42	67.74
Rat - 4	150	164	14	9.33	152	248	96	63.16	18	35	17	94.44	63	95	32	50.79	55	89	34	61.8
Rat - 5	125	138	13	10.4	154	239	85	55.2	19	37	18	94.73	64	96	32	50	56	88	32	57.14
Average	128.4	141.4	12.4	9.657	161.8	255.4	95.2	59.35	19.6	38	18.4	94.19	67.6	101.2	33.6	49.7	57.6	93.6	36	62.34
St.Dev				1.62				5.22				3.75				1.99				4.53

Percentage increase in average weight of the ghee group rats was found to be 9.657in the period of 40 days. This is very low when compared to that of ghee group. The values observed serum cholesterol levels are different. Just in the period of 40 days treatment serum cholesterol levels were increased by 59.35%. Serum HDL levels were noted almost double to initial values. Percentage increase in average HDL levels was found and noted as 94.19. Serum levels of LDL cholesterol were found to increase by 49.7%. Increase in average serum triglyceride level was noted as 62.34%. Though they did not exceed normal limits values are considerably increased.

Table 5: List of % differences in Body weight, Total cholesterol, HDL, LDL and Triglycerides levels of the ghee, peanut and control groups

	% diff in body weight	% diff in total cholesterol	% diff in HDL	% diff in LDL	% diff in Triglycerides
Ghee group (A)	32.8	48.9	108.17	39.27	58.7
Peanut oil group (B)	9.657	59.35	94.19	49.7	62.34
Control group (C)	6.33	3.76	8.89	6.04	3.15
A-C	26.47	45.14	99.28	33.23	55.55
B-C	3.327	55.59	85.3	43.66	59.19
A-B	23.143	-10.45	13.98	-10.43	-3.64

From the above it is known that increase in body weight of ghee group rats is higher when compared to that of Peanut oil group rats. Increase in average body weight is 23.143% more in ghee group rats. Average serum HDL cholesterol level is 13.98% more in ghee group when compared to that of peanut oil group. In contrast increase in total cholesterol, LDL cholesterol, triglycerides levels in ghee group rats were noted lesser than that of peanut oil group rats. Though peanut oil contains more monounsaturated fatty acids average increase in serum cholesterol level was found to be 10.45% less in ghee group when compared with peanut oil group. Similarly average increase in LDL cholesterol level was found to be 10.43% less in ghee group than in peanut oil group. Difference in increase in triglyceride concentration is so less (3.64%) between peanut oil group and ghee group rats. Though it is less in ghee group, as it is so less the comparative value cannot be taken into account. So it is neglected.

DISCUSSION

The results obtained in this study reveal that feeding the rats with food supplemented with 10%w/w ghee produced considerably lesser Percentage increase in average serum cholesterol (10.45% less) and average serum LDL levels (10.43%) less when compared with the rats those fed with food supplemented with 10%w/w peanut oil. In contrast percentage difference in increase in body weight (23.143%) and serum HDL level (13.98) were noted in ghee group when compared with peanut oil group.

According to theoretical considerations ghee contains approximately 62% saturated fatty acids. Just 33% consists of unsaturated fatty acids. On the other hand peanut oil is composed of 78% unsaturated fatty acids and 17% saturated fatty acid[7]. Theoretically the compound with high saturated fatty acid content should result in more increase in serum lipid profiles . According to that as peanut oil contains less saturated fatty acids it should produce less increase in serum cholesterol than ghee. But the results obtained are in contrast with theoretical considerations. Ghee group rats produced increase in body weight and increase in HDL cholesterol levels more than peanut oil. HDL cholesterol is considered as good cholesterol as its increase does not contribute to atherogenesis [9,10].

Ghee comprises of mainly saturated fatty acids which are often referred as unhealthy fat. Excess saturated fatty acids in diet causes buildup of plaques in blood vessels resulting hardening of arteries or atherosclerosis [11,12]. This is a risk factor for heart diseases and stroke. However, not all saturated fatty acids are harmful. Only long chain saturated fatty acids increase the risk of blood clotting and also in the development of cancer [13,14]. In fact short chain saturated fatty acids help to strengthen and develop cell membranes. This might be the reason for weight gain of ghee group rats. Ghee is a good source of short chain saturated fatty acids which are easier to digest[15]. Ghee also increases the excretion of dietary cholesterol and bile acids from gastrointestinal tract. This might be the reason for less increase of serum cholesterol and LDL cholesterol levels in ghee group rats [16].

CONCLUSION

The results obtained reveal that ghee is not as harmful as the people feel. They can use ghee as a cooking oil instead of vegetable oils. Use of ghee probably decreases the probability of getting cardiovascular disease as it causes increase in HDL cholesterol levels. As ghee causes excretion of dietary cholesterol and bile acids it did not result in much increase in serum cholesterol and LDL cholesterol when compared to the levels of peanut oil group. The results show that lipid profile of ghee fed rats is comparable with peanut oil fed rats. Results also indicate that ghee is relatively safer when compared to peanut oil. However further research work is to be carried out to come to final conclusion.

REFERENCES

1. H.P.rang,M.M.Dale,J.M.Ritter,R.J.Flower. Range and dale's Pharmacology.7th edition;Elsevier publications;p.285-289
2. Richard A.Harvey, Pamela C.Champe.Lippincott's illustrated review's,Pharmacology 2nd edition p.251-255
3. Caron MF, White CM. Evaluation of the antihyperlipidemic properties of dietary Supplements. Pharmacotherapy 2001;21:481–7.
4. Acharya KT. Ghee, vanaspati, and special fats in India. In: Gunstone FD, Padley FB, editors. Lipid Technologies and Applications. New York: Marcel Dekker Inc; 1997. pp .369–90.
5. The lipid research clinics coronary primary prevention trial results I. Reduction in incidence of coronary heart disease. JAMA 1984;251:351–64.
6. Dwivedi C, Crosser AE, Mistry VV, Sharma HM. Effects of dietary ghee (clarified butter) on serum lipids in rats. J ApplNutr. 2002;52:65–8.
7. Ajay.kr.gupta.Mordern technology of oils, fats and its derivatives. Asia pacific business press1995 p. 91-92
8. Augusti KT, NarayanaAswathy, Lekhespillai, Razia S, Beneficial effects of garlic (allium sativum LMN) on rats fed with diets containing cholesterol and either of the oil seeds coconuts (or) groundnuts, Indian J Exp Biol.2001;39: 660.
9. EBM Reviews. ACP Journal Club [database online]. Soy protein intake decreases total And LDL cholesterol and triglyceride levels. March nuts (or) groundnuts, Indian J ExpBiol.2001;39: 660
10. Cressman, MD, Heyka, RJ, Paganini, EP, et al. Lipoprotein (a) is an independent risk and risk factors for cardiovascular disease. Am J Kidney Dis 1993; 22:135
11. Jacobson MS. Cholesterol oxides in Indian Ghee: possible causes of unexplained high risk of Risk of atherosclerosis in Indian immigrant populations. Lancet. 1987; 8560-8656
12. Kumar MV, Sambaiah K, Lokesh BR. Hypocholesterolemic effect of anhydrous milk fat ghee is mediated by increasing the secretion of biliary lipids. JNutr Biochem. 2000;11:69–75
13. Boman H,Hazzard WR, AlbersJJ, et ah Frequency of monogenic forms Of hyperlipidemia in a normal population. AmJ ttum Genet 27:19A, 1975
14. "Acquired hyperlipidemia (secondary dyslipoproteinemias)". E ndocrinol. Metab. Clin. North Am. 19 (2): 259–78. PMID 2192873
15. GL, Toto, RD, Grundy, SM. Metabolism of low density lipoproteins in nephritic dyslipidemia: Comparison of hypercholesterolemia alone and combined hyperlipidemia . Kidney Int 1995; 47:579
16. Radhakrishnan, J, Appel, AS, Valeri, A, Appel, GB. The nephrotic syndrome, lipids, and risk factors for cardiovascular disease. Am J Kidney Dis 1993; 22:135
17. Mozaffarian D, Katan MB, Ascherio A, Stampfer MJ, Willett WC. Trans fatty acids and cardiovascular disease. N Engl J Med. 2006;354:1601–13.