Pakistan J. Pharm. Sci. 1(2): 113-116, 1988.

HYPOCHOLESTEROLEMIC EFFECTS OF GARLIC IN CHOLESTEROL FED RABBITS

M.T. RAHMANI, A.A. SIDDIQUI and H.S.A. ATHAR

Department of Biochemistry
University of Karachi, Karachi-75270, Pakistan

ABSTRACT

Healthy male rabbits weighing about 1 Kg to 1.5 Kg were divided into 4 groups. Group-I fed on normal stock and 50 mg cholesterol per day. Blood cholesterol levels in different groups of male rabbits (controls, crude garlic treated, petroleum ether extract treated and ethanol extract treated) show a significant inhibitory effect on the rise of serum cholesterol level. Thus, it was found that the extracted oils which were believed to be present in solvent extracts and crude garlic effectively prevent rise in serum cholesterol level. The crude garlic is more effective than petroleum ether and ethanol extracts. Ethanol extract was least effective in supressing serum cholesterol concentration.

Introduction

Cholesterol is a key intermediate in the biosynthesis of related sterols such as bile acids, adrenocortical hormones, androgens and estrogens. It exists both in free and ester forms; normally about two-third of total serum cholesterol is esterified.

Sixty to seventy-five percent of the serum cholesterol is transported by low density liporetein (LDL); a small but significant amount 15-25% is bound by high density lipoprotein (HDL). After a meal containing high amounts of fat, the serum lipids begin to rise within two hours reaching a maximum concentration in approximately four to five hours, then again returning to basal level. The serum cholesterol concentration is influenced by the type as well as by the amount of dietary fat. The observation that cholesterol is a constituent of the atherosclerotic plaque is over a century old. Early studies showed that the cholesterol content of atherosclerotic aortas was considerably greater than that of normal ones, both free and esterified cholesterol approximated that found in the blood (Schoenheimer, 1958). The consistent observation that human athero-sclerosis is prominent in clinical states accompanied by hypercholesterolemia have further implicated cholesterol as an important etiological agent in the development of atherosclerosis (Bordia, et al., 1975). Nephrosis is another disease in which hypercholesterolemia and atherosclerosis go together. Scrum cholesterol tends to increase in cases of biliary obstruction, cirrhosis with jaundice and viral hepatitis. Thannhuser and Schabe (1926) suggested that a decrease in esterified serum cholesterol in many liver diseases was due to the inability of the injured hepatic tissue to esterify cholesterol. A drop in human esterase in liver disease

has been reported (Turner, et al., 1953), but no confirmation for the Thaunhauser's suggestion has *yet* been reported. A series of aryloxyisobutyric acids are effective in reducing plasma total lipid and cholesterol concentrations (Howard, 1975), the compound which is most effective and less toxic is clofibrate. It disappears from the plasma with an average half-life of 12 hours and appears in the urine as the glucuronide. Cholestrylamine is effective in reducing the concentration of low-density lipoproteins and serum cholesterol, in patients with familial hypercholesterolemia-II (Howard, 1975). Some other substances which were found to cause a decrease in serum cholesterol levels are aspirin, atropine, cathartics, heparin, heroin, olive leaf preparation, urea and paminosalicylic acid. The first great civilization in Greece occurred in Bronze age (2800 B.C. to 1100). Garlic (Allium sativum), onion, poppy and saffron were apparently considered to have medicinal properties, they are mentioned frequently in the old medicinal books (Warren, 1970). Throughout the centuries man has put garlic to a great variety of uses. Man has used the seed, the bulb or the leaf of garlic. The Spanish Pharmacopeia of 1954 listed garlic among the drugs (Hindjo et al., 1968). Garlic acts as vermifuge expelling round worms. Its oil is a powerful anti-septic, while garlic juice mixed with 3 or 4 parts of ordinary or distilled water has been used as a lotion for washing wounds and foul ulcers. Bordia et al., (1975) determined the effect of garlic juice on serum cholesterol, plasma fibrinogen, whole blood coagulation time, and fibrinolytic activity in healthy subjects, another group was given ether-soluble essential oil fraction. This study shows that garlic has a very significant protective action against hyperlipemia and blood coagulation changes. Sainani et al., (1979), have found that the individuals who totally avoid taking garlic and onion have significantly high level of serum cholesterol, triglycerides, bola-lipoproteins and phospholipids, and those consuming small amounts of garlic and onion were better protected.

Material and Methods

New Zealand white male rabbits weighing I to 1.5 Kg., were used in this study. Cholesterol was estimated by modified form of Lieberman-Burchard method in which extraction and deproteinization are avoided. Outer skins of all garlic cloves were removed before mincing in electric blender. After minicing extractions were carried out as follows.

A. Preparation of Ethanol Extract:

300 gm of wet minced garlic was kept in a two litre flask containing one litre pure ethanol for 48 hours. During this period the flask was shaken occasionally to ensure thorough extraction. After this pe*ri*od the solvent (ethanol) was removed on a rotatory evaporator at a temperature of 40°C under vacuum and oily extract remaining in the flask was made moisture free and kept in a dessicator at 4°C.

B. Preparation of Petroleum Ether Extract

Method was essentially the same as described for ethanol except that petroleum ether was removed at a temperature of 25T. Ethanolic extract yielded 46.9 mg oil per gram garlic, while in case of petroleum extract the yield was 1.13 mg oil per gram garlic.

Treatment of Animals:

Animals were divided into 4 groups, each group contained four animals, treatment of each group is given below:

Group-I (Control group): Fed only 50 mg cholesterol per day.

Group-II (Crude garlic group): Was fed on 50 mg cholesterol per day alongwith 1 gram crude garlic/kg body weight per day.

Group-III (Ethanol extract group):- Fed on 50 mg cholesterol per day alongwith 0.1 g extract per kg body weight per day in l ml olive oil.

Group-IV (Petroleum Ether Extract): Fed on 50 mg cholesterol per day alongwith 0.1 g extract per kg *body* weight per day in 1 ml olive oil. All of these extracts, crude garlic and cholesterol were fed 10 days alongwith daily collection of blood samples by the help of scalp vein set attached to a 5 ml syringe. Blood was collected from the marginal vein present on the ear of rabbit.

Results and Discussion

Effects of crude garlic or its ethanolic and pet. ethereal extracts on serum cholesterol levels of rabbits are shown in Table-l. Animals fed on 50 mg cholesterol/day attained a maximal cholesterol level of 234.16% on 6th day of the treatment, thereafter the level stablized to 164.16 mg %. Treatment with garlic (1 g/Kg/day) showed a slight decrease in cholesterol level on 6th day, while the drop was significant on 10th day of garlic treatment. The level had dropped to 95%. Treatment with ethanolic extract or ether extract showed similar results. The decrease was significant after 10 days treatment.

The above findings suggest that the garlic in crude form is distinctly more potent in lowering or stabilizing if not lowering or supressing serum cholesterol level than ethanol and petroleum ether extracts in this context. Furthermore, it is also indicated that factor(s) responsible for lowering of blood cholesterol levels are either water soluble or *they* are very volatile so that they are not extractable in organic solvents used in this study.

These results are in good agreement with many other workers who have used similar conditions for extraction of oils and water soluble fractions. Bordia et al. (1975), showed that aqueous extract of garlic is more affective in keeping the blood cholesterol levels down as compared to other extracts. Similarly Augusti and Mathew (1973) observed that total blood lipid levels decreased significantly when rats were fed upon extracts of garlic and onion for considerably long periods. Further support to our findings comes from the

results obtained by Dushan et al (1979), using adult human subjects, who never had garlic in their food. They found that raw garlic lowers blood cholesterol levels even though its level was within the normal range.

Table 1: Effect of garlic/garlic extract on Cholesterol level

Treatment/Day	1	6	10
A. Cholesterol	111±44.8	234.16	164.16
50 mg/day		± 62.46	±34.12
B. (i) Chol. 50 mg/day	116.25	196.25	95.0
(ii) garlic lg/kg/day	± 7.5	± 14.36	±17.5
C. (i) Chol. 50 mg/day	133.5	158.75	108.6
(ii) Eth. extract	± 9.9	± 5.3	± 17.7
D. (i) Cholesterol	123.3	145.0	133.33
(ii) Pet. ether extract	± 35		± 10

The values indicate seem cholesterol levels (mg/di) in rabbits following different treatments on days 1, 6 and 10.

References

Augusti, K.T. and Mathew, P.T. (1973). 'Indian J. Expt. Biol.', 11131, 239-241.
Bordia, A., Arora, S.K., Kothari, L.K., Jain, K.C., Rathore, B.S., Rathore, AS., Dube, M.K and Bhu, N. (1975). Atherosclerosis, 22, 103.
Dushan et al., (1979). 'Indian J. Physiol. Pharmacol.' 23(3): 211-214.
"Directions for use Clinical Chemistry", E. Merck, P.B. 4119, D-6100, Darmstedt 1, (1981/82).
Hindjo, Pilar Herrero and France, M.C. (1968). Biol. Soc. Espan. Hist. Farm, 19 (73).
Howard, A.E. (1975). The Pharmacological Basis of Therapeutic', 5th Ed., by Goodman Gillman.
Schoenheimer, R, 177, 143 (1958). "Cited in Kriwhersky, D. Cholesterol", John Wiley & Sons, Inc., (1958).
Sainani, G.S. and Pesai, D.B. (1979). 'Indian J. Med. Res.', 776-780, Vol. 7 Thannhuser, S.J. and Schaber, H. (1926). 'Klin-Wochschr.', 5, 252.
Turner, K.B., McCormack, Jr. G.H. and Richard, A (1953). J. Clin. Invest 32, 801.
Warren, C.P.W. (1970). J. Med. Hist., 14: (4), 369-377.