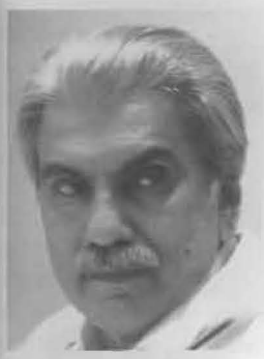

Cardio-protective properties of Coconut Oil & Virgin Coconut Oil

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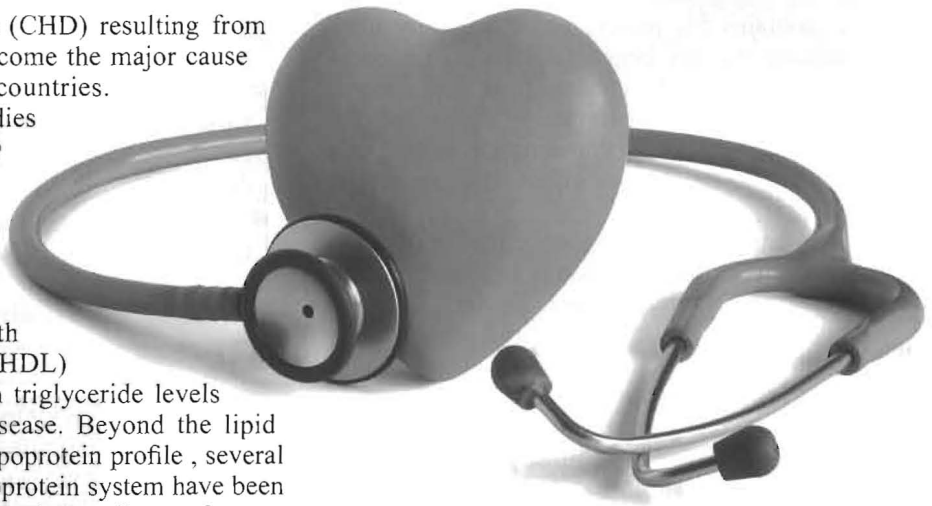

Coronary heart disease (CHD) resulting from atherosclerosis has become the major cause of death in many countries. Several epidemiological studies showed that the risk of CHD raises progressively with high concentrations of total cholesterol or low density lipoprotein (LDL) cholesterol, but there is an inverse correlation with high density lipoprotein (HDL) cholesterol. In addition, high triglyceride levels are associated with heart disease. Beyond the lipid parameters provided by the lipoprotein profile , several additional components of lipoprotein system have been identified. It is well established that dietary factors, particularly dietary fat have a significant effect on serum lipids and cardiovascular disease.

Coconut and its extracted oil are important dietary factors in many parts of the world. From time immemorial, people of Kerala have been using coconut oil for cooking apart from the use of coconut kernel. But, being a saturated fatty acid rich oil it is unfortunately maligned as hypercholesterolemic compared with polyunsaturated fatty acid rich oils. Infact, the habitual consumption of coconut oil has no specific role in the occurance of CHD, because the nature of fatty acids present in dietary oils have a role in modulating hepatic lipid metabolism. Among the saturated fatty acids, coconut oil stands out for having one of the highest saturated fatty acid contents (92%). Fatty acids undergo different metabolic fates depending on the chain length and degree of saturation. It is important to note that, saturated fatty acids present in coconut oil are mostly composed of medium chain fatty acids, mainly lauric acid (C12:0). Nearly 62% of the fatty acids are composed of medium chain saturated fatty acids (C8:0, C10:0 and C12:0). About 30% is composed of long chain saturated fatty acids and 8% is composed of long chain unsaturated fatty acids. There are studies which suggest that fatty acids of 12 carbon or less enter the mitochondria independently of the carnitine system and undergo preferential oxidation by both mitochondrial and peroxisomal pathways compared to monounsaturated and polyunsaturated fatty acids. The result of this accelerated metabolic conversion is that instead of being stored as fat, the calories contained in medium chain triglycerides are very efficiently converted into fuel for immediate use by organs and tissues. This observation suggest the possibility that the consumption of medium chain triglyceride rich coconut oil could be useful for controlling body weight and fat deposition (obesity). It has been reported that obesity raises cholesterol and triglyceride levels, lowers HDL cholesterol, and raises blood pressure in many people .

Several animal and human studies indicate that due to the specific composition of the saturated fatty acids, coconut oil consumption does not affect blood cholesterol negatively, but it affects them positively. Studies carried out by us in the Department of Biochemistry, University of Kerala during 1992-1995 as part of a research project funded by Coconut Development Board, Government of India revealed that consumption of coconut oil does not unfavourably alter blood cholesterol levels. A total number of 258 human volunteers (163 females and 95 males) ranging in age from 18-65 years participated in this study. Average daily consumption of coconut kernel

of these subjects was 55.8g/head/day. The average free oil consumption was 15.4g/head/day. Thus the average coconut oil consumption (free oil + oil derived from kernel) was 38g/head/day. The results of the human study indicate that consumption of coconut oil did not elevate blood total cholesterol or LDL cholesterol. It did not elevate the LDL cholesterol / HDL cholesterol ratio and lowered the triglyceride levels. Consumption of coconut kernel along with coconut oil, as is the invariable practice in the Kerala population produced lower total cholesterol and higher HDL cholesterol, lowered the LDLcholesterol/HDL cholesterol ratio and decreased the triglyceride levels. Apart from coconut oil, kernel contains 5% protein and 7% dietary fiber. Studies indicate that the beneficial effects of coconut kernel is mainly due to the coconut fiber and coconut protein present in it. These observations clearly indicate that coconut and coconut oil consumption as part of a normal diet has no deleterious effect with respect to serum lipids.

There has been growing evidence that in addition to hyperlipidemia, lipid oxidation is an important risk factor for cardiovascular disease. Dietary oxidised oils increase the concentration of lipid peroxidation products and reduce the antioxidant status. Lipid peroxidation products namely malondialdehyde (MDA), conjugated dienes and hydroperoxides are markers to assess the rate of lipid oxidation . It is well established that saturated fatty acids are less susceptible to lipid peroxidation when compared to unsaturated fatty acids. The resistance of edible oils and fats against oxidation depends on their fatty acid pattern and on the composition of the unsaponifiable matter. Unsaponifiable components present in edible oils include tocopherols, polyphenols, carotenes , phytosterols ,hydrocarbons and other minor components. Animal and human studies indicate that consumption of coconut oil causes less lipid oxidation and higher antioxidant protection.Human studies carried out by us revealed that compared to groundnut oil consumption, coconut oil consumption results in lower levels of lipid peroxidation products (MDA and conjugated dienes) and higher levels of antioxidants (beta - Carotene, Vitamin A and Vitamin C). Oxidised lipids may have atherogenic properties which promotes oxidation of LDL cholesterol. Recent investigations suggest that oxidation of LDL in the artery wall increases its atherogenecity. Antioxidants such as Vitamin A, beta- Carotene and Vitamin C help to control oxidative damage. Dietary oils used for cooking are always heated in air and this results in oxidative changes. The temperature and duration of heating, the extent of aeration, degree of unsaturation of oil, all influence the extent to which the changes takes place. As part of a modern life style, increased consumption of fried foods has dramatically increased in recent years. The frying conditions including elevated temperature as well as repeated heating that prevail in restaurants have added to the ill effects of the fried foods. During frying, oil is heated to elevated temperatures. When oils are heated to elevated temperatures in presence of air, the oil undergoes chemical reactions such as hydrolysis, oxidation and polymerisation. There are reports that the dietary ingestion of thermally oxidised Polyunsaturated fatty acid rich cooking oils promotes the induction, development and progression of cardiovascular diseases. Since, coconut oil is composed of mostly saturated fatty acids, it is less susceptible to heat induced oxidative decomposition. The adverse effects of oxidized dietary oils in humans and experimental animals include increased blood clotting, elevation of total cholesterol and free fatty acids, thrombocytopenia and enhanced platelet aggregation. It is important to note that, dietary consumption of saturated fats has been regularly cited as major factor in the pathogenesis of atherosclerosis and coronary heart disease. However,it is now generally

Health benefits of coconut oil

- Coconut oil is proven to be good for a wide variety of health problems such as treatment of burns, malabsorption syndrome, obesity and skin disease.
- Coconut oil has been reported to have anti-infective and anti-inflammatory properties.

Misconception about coconut oil

- There are people who believe that consumption of coconut oil will increase blood cholesterol and thus promote heart disease
- The misconception that coconut oil will increase blood cholesterol came from the fact that, it is made up of 92% saturated fatty acids.
- It is generally believed that saturated fatty acids increase blood cholesterol.

recognized that the replacement of saturated fatty acids by vegetable oils containing high levels of unsaturated fatty acids may also render individuals susceptible to cardiovascular disease. Studies using repeatedly heated culinary oils showed that there was significant alteration in platelet functions in cholesterol fed rats. (Chinu Chacko and Rajamohan, 2011). Coconut oil, mustard oil and sunflower oil, each representative of saturated, monounsaturated and polyunsaturated fatty acid rich oils were used for this study. Test oils were heated at 210^0 C for 15 hrs (3hrs/day for 5 days). Rats were fed 15% fresh/heated oils and 1% cholesterol along with the synthetic diet for 6 weeks. Chemical analysis revealed that the degree of oxidative deterioration is more in heated oils compared to unheated oils, but the effects were lower in heated coconut oil. Heated coconut oil fed group showed lower tendency towards hyperlipidemia, lipid peroxidation, platelet function alterations and blood clotting among heated oil fed groups. From these observations, it is clear that dietary oils repeatedly heated at elevated temperature results in significant alterations in platelet function compared to unheated oils and the deleterious effects were less in heated coconut oil compared to heated mustard oil and sunflower oil.

Coconut oil is usually extracted by drying coconut kernel (Copra), that has been exposed to very high temperature or sunlight to remove moisture. Extraction of coconut oil directly from coconut milk by wet processing gives better quality of oil generally called " Virgin coconut oil" which contains several biologically active non- saponifiable components like polyphenols, tocopherols, beta - carotene and phytosterols. These non-saponifiable components rich in antioxidants have a role in atherosclerosis. Antioxidants may protect against free- radical initiated damage and protect LDL cholesterol from oxidation. Since oxidized LDL Cholesterol is involved in the arterial injury and the formation of fibrous plaque, protection by antioxidants has great potential in the prevention of CHD. There are reports that polyphenols and tocopherols can improve the antioxidant status and can prevent oxidative stress. Beta- carotene, a precursor of vitamin A act as scavengers of singlet oxygen and free radicals, this could reduce atherosclerosis progression. Investigations show that phytosterols have cholesterol lowerig effect, inhibiting cholesterol absorption in the small intestine. Animal studies revealed that virgin coconut oil is superior in cardioprotective properties than copra oil, groundnut oil, olive oil and sunflower oil. Improved lipid profile, lower free radical formation, higher antioxidant protection, reduced lipogenesis and increased fatty acid oxidation and reduced thrombotic tendency were observed in virgin coconut oil fed animals. Feeding virgin coconut oil have significant effects on lipid parameters and in vitro LDLoxidation. In vitro studies showed that the polyphenols isolated from virgin coconut oil was more beneficial than polyphenols isolated from copra oil and groundnut oil in preventing the copper- induced oxidation of LDL. Polyphenols have been reported to excert a variety of biological actions such as free radical scavenging, metal chelation and modulation of enzyme activity. These compounds are capable of decreasing the total and LDL cholesterol in serum and tissues. Investigations carried out to evaluate comparative effects of virgin coconut oil with copra oil, olive oil and sunflower oil indicate that virgin coconut oil has beneficial effect on lipid parameters ,antioxidant status, lipogenesis, fatty acid oxidation and blood clotting than the other oil fed groups. Lower levels of serum lipids and tissue lipid peroxides and increased activities of antioxidant enzymes namely Superoxide dismutase (SOD), Catalase (CAT), Glutathione reductase (GR) and Glutathione peroxidase (GPx) were observed in rats fed virgin coconut oil. Antioxidant enzymes SOD, CAT, GR and GPx constitute a mutually supportive team of defense against reactive oxygen spicies (ROS) and preventing lipid peroxidation. Feeding virgin coconut oil reduces the risk for CHD by beneficially modulating the synthesis and degradation of fatty acids. Another important finding with the virgin coconut oil feeding is that it decreases the Apo B secretion and increases the Apo A1 secretion. Apolipoproteins are particles of protein that are mostly formed in the liver and intestine. They play important role in the production and transport of cholesterol around the body. Decreased levels of apoB are associated with lower risk of heart disease,as it is the main protein in LDL. In contrast, high levels of apo A1 can protect against the occurance of heart disease. Apo A1 is the major protein in the more protective HDL Cholesterol. Also, virgin coconut oil excert antithrombotic effects by means of inhibiting platelet aggregation. Feeding virgin coconut oil decreased the coagulation factors namely thromboxane B2, fibrin and fibrinogen levels in plasma compared to other oil fed groups. Thromboxanes are substances produced from arachidonic acid by cyclooxygenase which stimulate platelet aggregation. It also causes the blood vessels to narrow (vasoconstriction) and reduces the supply of blood. Fibrin is a plasma protein normally present in the blood in its inactive form fibrinogen, which is essential for blood clotting. Thus the decreased levels of coagulation factors observed in virgin coconut fed rats reflects reduced thrombotic risk. In conclusion, these findings clearly shows that coconut oil possess significant cardioprotective properties. Compared to Copra oil, the beneficial effects were more with Virgin coconut oil. ■