

Lauric Acid as Potential Natural Product in the Treatment of Cardiovascular Disease: A Review

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Introduction

According to World Health Organization (2010), cardiovascular diseases are the major cause for death throughout the world. Cardiovascular diseases include various kinds of diseases of the heart like coronary heart and peripheral artery diseases, hypertension, rheumatic heart disease, congenital heart disease and heart failure. The diet-heart hypothesis suggests that quality of dietary fat plays an important role in the development of cardiovascular diseases. Several studies reported that saturated and trans-fatty acids have increased the cardiovascular risk. Fatty acids are known to enhance cholesterol in the blood circulation, which can lead to blocking and thickening of the blood-vessels. Atherosclerosis one of the leading cause for heart attacks, or ischemic stroke. Lauric acid, a fatty acid and a component of triglycerides is recognized to produce the largest increase in total cholesterol of all the fatty acids, but this increase is so-called 'good' cholesterol. The Lauric Acid in coconut reduces the chances of getting heart diseases. In the present essay, an attempt is made to discuss the role of Lauric Acid in cardiovascular diseases.

Prevalence of Cardiovascular Disease at Global level and New Zealand

According to World Health Organization [1] 17.3 million people died from CVDs in 2008. It is also observed that more than 80% of cardiovascular disease deaths take place in low- and middle-income countries of the world. WHO [1] also projected that more than 23 million people will die annually by 2030 due to cardiovascular diseases. An unequal distribution of CVD mortality is mapped in (Figure 1). The minimum age-adjusted mortality rates are observed in the developed and industrialized countries and parts of Latin America (Table 1). On overall, WHO [3] described that higher age-adjusted CVD death rate in low and middle income countries than in developed countries of the world (Table 2). Leeder et al. [4] reported that higher percentage

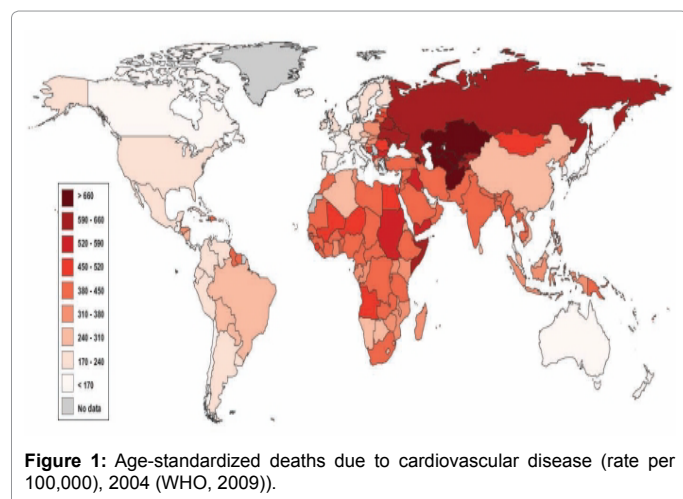


Figure 1: Age-standardized deaths due to cardiovascular disease (rate per 100,000), 2004 (WHO, 2009).

of cardiovascular deaths was in younger generation in the developing countries than in developed countries of the world.

According to New Zealand Ministry of Health Mortality data [5], there are about 40% of deaths annually due to cardiovascular disease and also one New Zealander die from coronary heart disease in every 90 minutes. New Zealand Ministry of Health. [6] reported that one in eighteen adults have been identified with coronary heart disease.

Cardiovascular Disease

Cardio Vascular Disease (CVD) is a disease of the heart or blood vessels. This develops due to various reasons like thrombosis that stop the blood flow and may lead to heart attack or stroke. CVD can also be due to Atherosclerosis that build-up fatty deposits called plaque that lead to the hardening and narrowing of artery and making it difficult for blood to flow through it. Worldwide the mortality rate of cardiovascular diseases is about 17 million people per year. The major risk of heart diseases are tobacco consumption, smoking, physical inactivity and unhealthy eating habits leading to obesity.

Some types of cardiovascular disease

Coronary heart disease: This is due to narrowed coronary blood vessels. The cause of Atherosclerosis is due to the formation of plaques and plugs that result in hardening and narrowing of coronary arteries of the heart. This may also occur due to risk factors like high blood pressure and cholesterol, tobacco consumption, obesity, unhealthy diet and eating habits, physical inactivity, diabetes, old age and, inherited disposition of fat.

Congenital heart disease: This occurs due to the malformation or abnormal formations of the structures of the heart at birth. It may be an inherited disease or due to other reasons like holes in the heart, and

S.no	Age-standardized mortality rates	Countries
1	More than 500 per 100,000	Russia and Egypt
2	Between 400 and 450 per 100,000	South Africa, India and Saudi Arabia
3	Between 100 and 200 per 100,000	Australia, Japan, France, and the United States

Table 1: Age-standardized mortality rates for CVD (WHO, 2008b).

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S.no	Age group	Percentage	Countries
1	35 to 64 years	41%	South Africa
2	35 to 64 years	35%	India
3	35 to 64 years	28%	Brazil
4	35 to 64 years	12%	United States
5	35 to 64 years	9%	Portugal

Table 2: Age-adjusted CVD death rates [4].

abnormality of chambers. The risk factors for congenital heart defects include mothers taking drugs, alcohol, with infections like rubella or with poor vital nutrients at the time of pregnancy.

Stroke or Cerebrovascular accident (CVA): This occurs when blood supply stops to a part of the brain due to a blockage or rupture of a blood vessel in the brain. Risk factors include escalating blood pressure and blood cholesterol, rhythm disorders of the heart and metabolic disease like diabetes.

Congestive heart failure: This results when the myocardial cell become progressively incapable to pump blood into the blood vessels. Risk factors are escalating blood pressure, heart attacks and over weight.

Peripheral arterial disease or peripheral vascular diseases: Peripheral arterial disease or peripheral vascular diseases: affects the arteries that supply blood to the arms and legs.

Deep Venous Thrombosis (DVT) and pulmonary embolism: These are blood clots formed in the leg veins. These clots may extricate and migrate to the heart and lead to serious problem. Risk factors include obesity, cancers, childbirth, use of oral contraceptive and hormone replacement therapy. Other cardiovascular diseases are tumors of the heart and, blood vessel or ballooning of the blood vessels of the brain, cardiomyopathy, heart valve diseases, disorders of the lining of the heart or pericarditis, aortic aneurysm etc.

Etiology of Cardiovascular Disease: Diet and Life Styles

There are many causes like alcohol, smoking, hypertension, dietary habits and other factors that contribute to the development of cardiovascular disease. Vanhecke et al. [7] described that atherosclerosis is the main precedent for cardiovascular disease and reported that intimal lesions appear in all the artery of heart and more frequently in right coronary arteries of children aged between 7-9 years.

Generally, Children eating behavior patterns during infancy is the basis for the pupil's eating patterns at the later stages and is influenced by several factors like parental food preferences, exposure and availability of a wide variety of foods, color, cost, and taste of foods, genetic predispositions for preferences for taste influence the eating behaviour patterns [8]. The individual differences in eating patterns may result in both underweight and overweight. Dehghan et al. [9] described that individuals with a childhood obesity history will become obese individual in later age. Childhood obesity increases the risk of Maturity Onset Diabetes in the Young (MODY), high blood pressure metabolic syndrome and cardiovascular disease.

Guthold et al. [10] studied the physical activity and sedentary behavior in school children among 34 countries and found that 24 percent of boys and 15% of girls were exhibiting moderate to vigorous physical activity per day. Al-Hazzaa et al. [11] conducted a study on 2,906 adolescents of 1,400 males and 1,506 females and observed that about fifty percent of the boys and higher than seventy five percent of the girls did not meet sixty minutes of daily physical activity. They also found that physical inactivity patterns are observed more among

females. TV watching time is one of the important factors influencing physical inactivity and increases the consumption of excessive food and unhealthy junk food results in developing overweight/obesity in children. Dietary habits, physical activity and sedentary life are important factors in developing in Obesity and cardiovascular disease.

Cardiovascular Drugs in the Treatment of Cardiovascular Disease

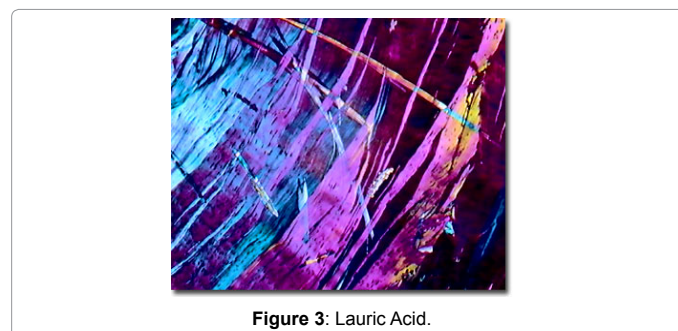
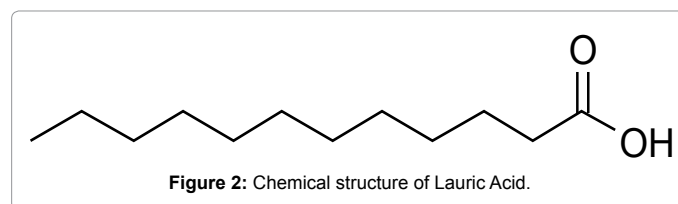
Cardiovascular Drug Therapy includes a number of medications that are used for the treatment of cardiovascular diseases. It encompasses a complex group of drugs used for many heart conditions. Some drugs like Digoxin, procainamide, Propranolol, Hydrochlorothiazide are used for treatment of Congestive Heart Failure (CHF), arrhythmias, angina and blood pressure respectively. Their adverse effects include toxicity, anorexia, nausea, vomiting, Bradycardia, headache, weakness, Hypokalemia and, hyperuricemia. Statins drugs like Atorvastatin, Lovastatin, Rosuvastatin, Simvastatin, are used in the lowering of plasma cholesterol levels in cardiovascular patients. They are used as first line of treatment for patients suffering with high cholesterol problem. These drugs decrease the production of cholesterol by blocking enzymes in the liver and lower the LDL, the bad" cholesterol. Like other pharmacological drugs, Statins also have adverse effects on muscular system, hepatic function, and renal function [12]. While lauric acid does not show any adverse effects on any system of the body.

Lauric acid

Chemically Lauric acid is known as *n*-Dodecanoic acid, Dodecyclic acid, Dodecoic acid; Laurostearic acid, Vulvic acid, 1-Undecanecarboxylic acid and Duodecyclic acid. It is a saturated fatty acid and major component of triglycerides. Lauric acid is a important ingredient in coconut oil. Lauric acid constitutes about half of the fatty acid content in coconut oil, laurel oil, and palm kernel oil [13,14]. The molecular formula for lauric acid is $C_{12}H_{24}O_2$ (Figures 2 and 3).

Lauric Acid and Cardiovascular Disease

Normally, many health care practitioners recommend diet and lifestyle management advices to clients who are at risk of cardiovascular disease and health problems. The risk of cardiovascular disease can be partially prevented or reduced through dietary and lifestyle-



Calories	117 kcal
Total Fat	13.6 g
Saturated Fatty Acid	11.8 g
Monounsaturated Fatty Acid	0.8 g
Polyunsaturated Fatty Acid	0.2 g
Lauric Acid	6.1 g
Myristic Acid	2.3 g
Palmitic Acid	1.1 g
Stearic Acid	0.4 g
Other Saturated Fatty Acids	0.8 g

Table 3: Nutritional composition of coconut oil (per one table spoon) (Natalie DigateMuth (n.d).

based interventions, for the individuals at risk [15,16]. Nutritional experts emphasize on self-directed care and counseling to patients with cardiovascular disease. Coconut oil is rich in lauric acid and its composition can be depicted in the following (Table 3).

It is believed that lauric acid lowers the total HDL cholesterol ratio more than any other fatty acid, either saturated or unsaturated therefore, consuming coconuts may indeed reduce the risk of getting heart disease but, it has to be yet proven accurately. Coconut oil is relatively cheap and has a long shelf-life, non-toxic and safe to handle. Lauric acid has antimicrobial properties, the monoglyceride derivative like *monolaurin*, is effective in antimicrobial properties against lipid-coated RNA and DNA viruses, various pathogenic gram-positive bacteria, and numerous pathogenic protozoa [17].

Virgin coconut oil acquired by wet process is useful in reducing total cholesterol, triglycerides, phospholipids, and LDL. In the blood and tissues Very Low Density Lipoprotein (VLDL) cholesterol levels were lowered and HDL cholesterol was elevated. The polyphenol present in the coconut oil also seems to prevent in vitro LDL oxidation. This is due to effective polyphenol components present in the coconut oil [18].

Conclusions

Cardiovascular diseases are one of the leading cause for deaths throughout the world. It is observed from various studies that saturated and trans fatty acids have increased the cardiovascular risk. The risk of heart diseases are tobacco consumption, smoking, physical inactivity and unhealthy eating habits leading to obesity and Cardiovascular diseases. Lauric acid is describing as 'good' cholesterol' and a major component in coconut oil. Consumption of coconut oil (Lauric acid, a component) enhances in High-Density Lipoprotein (HDL) and decreases the total/HDL cholesterol ratio which results in a decrease in risk of cardiovascular diseases (atherosclerosis).

References

1. World Health Organization (2013) Cardiovascular diseases (CVDs).
2. Thijssen MA, Mensink RP (2005) Fatty Acids and Atherosclerotic Riskin Arnold von Eckardstein. Atherosclerosis: Diet and Drugs. Springer: 171-172.

3. World Health Organization (2008) The global burden of disease: 2010 update, Geneva.
4. Leeder S, Raymond S, Greenberg H (2004) A race against time: The challenge of cardiovascular disease in developing economics. Columbia University, New York.
5. Ministry of Health (2010) Ministry of Health Mortality data.
6. Ministry of Health (2013) Mortality and Demographic Data 2010. Wellington: Ministry of Health.
7. Vanhecke TE, Miller WM, Franklin BA, Weber JE, McCullough PA (2006) Awareness, knowledge, and perception of heart disease among adolescents. Eur J Cardiovasc Prev Rehabil 13: 718-723.
8. Centre for Community Child Health, (2006) Eating Behaviour Problems.
9. Dehghan M, Danesh N, Merchant A (2005) Childhood obesity, prevalence and prevention. Nutrition Journal 4:24.
10. Guthold R, Cowan MJ, Autenrieth CS, Kann L, Riley LM (2010) Physical activity and sedentary behavior among schoolchildren: a 34-country comparison. J Pediatr 157: 43-49.
11. Al-Hazzaa HM (2007) Prevalence and trends in obesity among school boys in Central Saudi Arabia between 1988 and 2005. Saudi Med J 28: 1569-1574.
12. Lolwa B, Amin J, Bener A, Zuby B, Mahmoud Zirie (2013) Comparison of Efficacy and Safety of Rosuvastatin, Atorvastatin and Pravastatin among Dyslipidemic Diabetic Patients. ISRN Pharmacology.
13. Beare Rogers J, Dieffenbacher A, Holm JV (2001) Lexicon of lipid nutrition (IUPAC Technical Report). Pure and Applied Chemistry 73 (4): 685-744.
14. David JA, Sabine B, Ralf C, Georg F, Udo S, et al. (2006) Fatty Acids. Ullmann's Encyclopedia of Industrial Chemistry.
15. Roblin D, Diseker RA, Orenstein D (2004) Delivery of outpatient cardiac rehabilitation in a managed care organization. J Cardiopulm Rehabil 24:157-64.
16. Suaya JA, Shepard DS, Normand SL, Ades PA, Pruttas J, Stason WB, et al. (2007) Use of cardiac rehabilitation by Medicare beneficiaries after myocardial infarction or coronary bypass surgery. Circulation 116:1653-1662.
17. Michael T Murray, Lara P, Joseph P (2005) Encyclopedia of Healing Foods. Published by Simon and Schuster Adult Publishing.
18. Debasis B, Harry GP (2007) Obesity: Epidemiology, Pathophysiology, and Prevention, Second Edition.