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Coconut

Nature's goodness Good for your heart



Coconut and coconut oil has been the subject of controversy for nearly four decades. It seems to be a never ending process. The recent release of the Presidential Advisory from the American Heart Association (AHA) on Dietary Fats and Cardiovascular Diseases is the subject of latest controversy. The old wine is again being brought in a new bottle. The release of AHA on Dietary Fats and Cardiovascular Diseases strongly advocates against the use of coconut oil.

In spite of the propaganda against coconut oil, it still holds the status of a premium edible oil. It was in 1956, that some studies in USA found that there are saturated fatty acids in coconut oil. They concluded that all saturated fatty acids are not good for health. Later on it was revealed that these studies were funded by the association of soybean producers. Unfortunately this negative publicity against coconut oil linking its consumption with Coronary Artery Disease (CAD) in human beings got over attention of the media. This negative propaganda not only discouraged new users but also weaned away traditional users of coconut oil. This in turn impacted the demand of coconut oil and adversely affected the crop to a certain extent.

American nutritionists like Dr. Mary G. Enig and Dr. John J. Kabara have proved that coconut oil even though contains saturated fatty acids, they are medium chain fatty acids and not adding to cholesterol in human body. The medium chain fatty acids in coconut oil are similar to fatty acids in mother's milk and have similar nutraceutical effects. Many renowned doctors from India also have proved that the mispropaganda against coconut oil is baseless. Researches done by Dr. Rajamohan, Head of the Department of Biochemistry of University of Kerala

have revealed the beneficial effects of coconut oil and these results are published in many scientific journals.

Study by Sri Chithira Thirunal Institute for Medical Sciences and Technology, Thiruvanthapuram analysed whether coconut oil is influencing cholesterol level in CAD patients and controls. No difference was noticed in the mean levels of total cholesterol or LDL cholesterol (the bad cholesterol). At the same time the mean triglyceride level was lower in exclusive coconut oil users. This indicates that the habitual consumption of coconut oil along with normal diet did not elevate the cholesterol level or LDL. Study undertaken by Amritha Institute of medical Sciences, Kochi under Dr. M. Vasudevan analysed serum from persons, consuming coconut oil or sunflower oil. No statistically significant difference was observed in the cholesterol, HDL or LDL levels in coconut oil consuming population versus sunflower oil consuming population. Thus plasma fatty acid composition reflected no changes with dietary fat source.

In 1970's negative propaganda on the use of CNO cropped up in India and CNO was cornered in most of the kitchens and replaced by palm oil. Dr. Mary Enig, a famous US nutritionist visited India in 1994 and many hitherto unknown facts were brought to the limelight. According to Dr. Mary Enig, over the past 40 years, the American diet had undergone major changes – involving more fats and oils. There had been an increasing supply of the partially hydrogenated trans fatty acid-containing vegetable oils and a decreasing amount of the lauric acid-containing oils. As a result, there has been an increased consumption of trans fatty acids and linoleic acid and a decrease in the consumption of lauric acid. This type of change in diet has an effect on the fatty acids the body has available

for metabolic activities. Revelations of Dr. Mary Enig opened up serious and widespread debate and discussions among medical doctors in India, more particularly in Kerala.

USA which had initialized the propaganda against coconut oil is now the largest importer of coconut oil.. The major portion of the coconut oil imported to USA are used by the baby food and bakery industries. It is also being used for producing ingredients of anti fungal medicines.

Coconut and coconut related products help in maintaining wellness with a range of health benefits. There are an array of medicines, creams and ayurvedic oils which are made with coconut oil as basic medium. Virgin Coconut Oil (VCO) contains lots of vitamins, minerals and anti oxidants. VCO is a major source of lauric acid and Vitamin E. Coconut is a good source of dietary fibre known to be valuable in digestive function. Desiccated coconut contains the highest percentage of dietary fibre and due to this there is increasing demand for the desiccated coconut in many developed countries.

Coconut oil is accepted by medical practitioners, scientists and experts world over as the best oil for human health. This is made possible through the research work and clinical studies undertaken by eminent doctors, nutritionists and scientists from various countries for scientifically establishing the positive attributes of coconut and coconut oil. Their untiring efforts for promoting the infinite goodness of coconut and its products have now brought out its health and nutritional benefits.

Positive attributes of any useful product cannot be kept hidden for long through negative propaganda by forces with vested interest. Whether it is a food product or agriculture product or cooking oil, scientific truth will come out and if it is having beneficial effects on human health and nutrition, no one can keep it away from public attention. The scientific studies and clinical research have clearly brought out the good properties, health and nutritional benefits of coconut.

However the researchers in health and nutrition from many countries, both developed and developing, after realising the potential benefits of coconut and its products, have started advocating its positive effects in human health, nutrition and wellness.

As coconut is a rich source of many minerals it may be positioned at a prominent place in the daily diet. Wellness is a status where diseases are cured, good health is maintained and good immunity is retained. We have case studies from many parts of the world wherein many diseases are cured with the use of coconut and its various products. It was believed that



there is no cure for Alzheimer's disease. But doctors from USA have certified the beneficial effects of Virgin Coconut Oil (VCO) in treating Alzheimer's patients. This is one of the reasons for the increasing trend in the import of VCO to USA.

Based on the research work done to date, most of the claims of of AHA have been proven to be erroneous, false and misleading. The Asian and Pacific Coconut Community (APCC) is taking a bold stand against such harmful publicity in respect of the socio economic welfare of stakeholders in coconut sector. APCC states that as a result of reputable research work concluded and other ongoing studies by credible and eminent nutritionists and clinical scientists world over, the coconut industry is making the best ever comeback that is termed as the 'coconut revolution' and product wise the 'coconut craze' in many countries and consumer destinations. ■

The American Heart Association in its recent Presidential Advisory on dietary fats and CVD reviews and discusses the scientific evidence, including the most recent studies, on the effects of dietary saturated fat intake and its replacement by other types of fats and carbohydrates on CVD. The AHA in its Presidential Advisory concluded strongly that lowering intake of saturated fat and replacing it with unsaturated fats, especially polyunsaturated fats, will lower the incidence of CVD. In response to the report, various media reports that coconut oil is on par or as unhealthy as beef and butter. The Asian and Pacific Coconut Community (APCC) issued a rejoinder against this report and points out that coconut oil is healthy for human consumption.

**Rejoinder issued by
Executive Director, APCC***

APCC finds this AHA report totally false and misleading whilst allegedly to be representing the commercial vested interest of its sponsors who are telling the same old story that Saturated Fats contribute to high cholesterol levels which is a misleading information. The myths by the same people have since been 'busted' therefore there is no longer basis to continue such falsified misleading statements.

In simple language, as in the words of Dr. Bruce Fife, a USA Certified Nutritionist and Doctor

Dietary Fats & Cardiovascular Disease



of Naturopathy Medicine, "You cannot say LDL is bad and HDL is good. It is more complex than that. There are actually two types of LDL: one small and dense the other large and soft. The large LDL is a good cholesterol the type used to make bile, hormones, and vitamin D—it is essential to life! The small dense LDL is the type that becomes oxidized and can be harmful, as all oxidized lipids can be. Eating coconut oil (and other saturated fats) increases both HDL and the "good" LDL, thus lowering the risk of heart disease. This is one of the reasons why populations that eat a lot of coconut oil have the lowest heart disease rates in the world."

As a result of reputable research work concluded and other ongoing studies by credible and eminent nutritionists and clinical scientists world over, the coconut industry is making the best ever comeback that is termed as the 'coconut revolution' and product wise the 'coconut craze' in many countries and consumer destinations.

Higher value products are experiencing unprecedented growth in volume of export and value especially in the last 5-7 years. This magnitude of growth would obviously be taking market share away from some of competitor vegetable oils products. APCC is convinced that this good news for the coconut growers is causing old stories to reappear from its critics with its bad science.

The traditional consumer of coconut will not be deterred whilst the recently introduced consumers would by now be convinced of the true nutritional and health benefits of coconut to also not be deterred.

APCC reassures the consumer of healthy coconut products such as Coconut Oil, Virgin Coconut Oil, Coconut Water, Coconut Sugar, and many more that these products are safe and healthy for human consumption.

The Coconut Community condemns the highly unethical and unprofessional attempt by the American Heart Association to discredit and damage the coconut industry. On behalf of 18 member countries of APCC the Secretariat calls on AHA to immediately cease any further false and misleading claims.

* *The Asian and Pacific Coconut Community (APCC) is an intergovernmental organization*

established in 1969 under the auspices of the UNESCAP (United Nations Economic and Social Commission for Asia and the Pacific) with current membership of 18 countries and growing. It is charged with the responsibility over the welfare of coconut farmers who in most countries are 90% small holder family units numbering up to 30 million households dependent on the coconut sector.



Uron N Salum

The Warning on Saturated Fat

From Defective Experiments to Defective Guidelines**

Coconut oil has been adversely affected by the current dietary guidelines that advocate a lowering of total fat and the replacement of saturated fat with polyunsaturated fat. This recommendation has its origins in the saturated fat-cholesterol-heart disease hypothesis that Ancel Keys first proposed in 1957. This hypothesis became an official recommendation with the publication of the Dietary Guidelines for Americans in 1980 and has been adopted by many other countries and international agencies. The dietary recommendations also warn against coconut oil. Recently, the American Heart Association re-issued this warning in its 2017 Presidential Advisory. However, a critical review of the experiments that Keys conducted has revealed experimental errors and biases that cast serious doubt on the correctness of his hypothesis and the warnings against coconut oil. Further, the recommendation to decrease saturated fat recommendation effectively means an increase in unsaturated fat in the diet. The actual result has been an increase in omega-6 fats and a high omega-6 to omega-3 fat ratio. This unhealthy ratio has been linked to heart disease, the very disease that the AHA wants to target, as well as cancer and inflammatory diseases. Defective experiments have led to defective guidelines.

****APCC Rebuttal Document against AHA Warning on Saturated Fat Intake. Dr. Fabian M. Dayrit Professor, Ateneo de Manila University, Philippines Chairman, Scientific Advisory Committee for Health, Asian and Pacific Coconut Community (Source: www.apccsec.org)**

Consume COCONUT

If not, you miss out the most amazing gift of nature



Deepthi Nair S

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Controversies seem to be never dying and we find old controversies buried earlier being dug up again. And this is very much true in the case of coconut and its varied products, especially coconut oil. This issue of the Indian Coconut Journal with Health as its main theme comes at a very critical time when coconut products, especially coconut oil is again being targeted.

The release of the Presidential Advisory from the American Heart Association on Dietary Fats and Cardiovascular Diseases during the second week of June strongly advises against the use of coconut oil. The release of this advisory has manifold impacts. For the coconut sector across the globe and the 30 million coconut farmers depending on coconut for their livelihood, coconut oil constitutes about two third of the trade of coconut products in the international market and the issue is a matter of serious concern, affecting their livelihoods. In India, it impacts the livelihoods of over 12 million farmers, who are predominantly small holders. For the consuming world which took a 360° turn in favour of consumption of coconut oil inspite of all the negative propaganda that started in the 1970's, its another confusion created.

The tropical coconut growing countries have since

Coconut and Cardiovascular diseases

This is the major talk of all times and debates on whether saturated fat is good, impact of cholesterol, HDL and LDL etc is ongoing and seem to be never ending. Coconut oil has been consumed by populations in South Asia, South East Asia and the Pacific. In countries like Thailand, Indonesia and the Pacific, rice is often cooked in coconut milk. Population studies in major coconut consuming countries like India, Sri Lanka, Indonesia, Philippines and among the Polynesians have not been able to find any evidence that coconut oil causes heart diseases in humans. When these populations consume a traditional diet in which coconut and its products form an integral part, don't these results hold true or do we really need to go after population studies done decades back, that too in non coconut consuming populations which only aim to disprove the beneficial effects of coconut?

time immemorial depended on coconut as a food crop. Coconut possess many nutritional and health attributes, traditional medicine and local folk medicine in most of the coconut growing countries have put to use many of the health and medicinal benefits of coconut, which have further been established in modern science through conclusive research. Coconut and coconut products are being referred to as super foods, celebrities are endorsing its nutritional and health benefits, and infinite success stories are being shared in the social media on the medicinal benefits of coconut with mixed response from around the world. A vast majority of the consumer world is moving ahead with their choice of coconut products based on these evidences, though there is still a skeptical group who feel that all this news is too good to be true. And this skeptical group becomes the target of all controversy makers.

True that coconut is a poor man's crop with coconut cultivation undertaken by small holder farmers. Coconut lacks a strong tradist or pharmaceutical lobbies to back it in its endeavour to establish its goodness. But none of that could nullify the beneficial effects of this commodity on human health.

The MCT effect

Coconut oil is composed of 65% medium chain fatty acids (Lauric acid 50%, caprylic acid 8% and capric acid 7%) and 35% long chain fatty acids. Studies by eminent researchers and clinicians have found that the medium chain triglycerides or MCTs are converted to ketones in the liver which could serve as alternate sources of energy to the brain cells. This is particularly relevant as energy source in the case of diseases like Alzheimer's and dementia where it compensates for the deficiency in glucose metabolism. (Dr. Mary Newport from USA, Dr. Ralph Martin from Australia).

Also MCTs are found to be absorbed directly into portal circulation and transported to liver for rapid oxidation, so no extensive uptake into adipose tissue takes place. Studies have shown that coconut oil or virgin coconut oil doesnot contribute to abdominal obesity. VCO is even found to induce waist circumference reduction. This characteristic could be beneficial for obesity, dyslipidaemia, insulin resistance etc.

Coconut products could also be part of a ketogenic diet which is now followed in sports nutrition by athletes who concentrate on controlled weight and increased performance. A ketogenic diet is even recommended for cancer patients.

The Lauric effect

The lauric oils in coconut is similar to the fats in mothers milk (Dr. Kabara from USA) and when consumed, the lauric acid in coconut oil is used by the body to make the same disease fighting fatty acid derivative monolaurin, that babies make from the lauric acid they get from mothers milk (Dr.Mary Enig from USA). The monoglyceride monolaurin is the substance that keeps infants from getting viral or bacterial or protozoal infections.

The Antimicrobial effect

High content of lauric, caprylic and capric components in coconut oil finds its relevance in their effectiveness against a large spectrum of bacteria and fungi. This high antimicrobial activity is all the more significant at a stage when we are experiencing high antibiotic resistance. Studies by researchers have also proved effectiveness against acne, atopic, contact dermatitis and rosacea lesions, psoriasis and its co-morbidities (Dr. Rowell from Philippines)

Antiviral action

Studies have revealed that virgin coconut oil is found to have a positive viral action which is beneficial against HIV/AIDS since it is found to reduce viral load and increase the CD4 counts. The antiviral properties may also find applications in lipid coated viruses like herpes, cytomegalovirus etc.



Anti cancer properties

Coconut oil is found to be effective and possess therapeutic potential for treatment and prevention of oral cancer. Studies have found that the Lauric acid, β -sitosterol, oleic and palmitic acid in coconut oil can target almost 20 cancer associated proteins. Studies in Sri Lanka have shown that coconut milk has an anti-ulcerogenic effect.

Multitude of health benefits of coconut water

Coconut water is accepted as a rehydration fluid with its high mineral or electrolyte content. Traditionally it has been used as home treatment to cure dehydration. Coconut water contains the same major electrolytes as those in human body fluids (Bruce Fife, USA). The use of tender coconut water intravenously by the Japanese in Sumatra, Indonesia during World War I and by Pradera et al for paediatric patients in Havana, Cuba. Coconut water is also used in treating renal disorders and in reducing or dissolving all kinds of kidney stones. Studies have also shown the effectiveness of coconut water as antidote for mineral poisoning.



Cosmeceutical benefits

One of the fastest growing market of coconut products is the Health and Beauty care segment. Coconut contains a number of growth factors which mainly contribute to the varied benefits. Various formulations, mainly from virgin coconut oil have been developed which include facial creams, lip balms, deodorant sticks, moisturizers, anti ageing creams, dermatological formulations with antimicrobial effects etc.

Coconut & hair

Coconut oil is found to be good for healthy hair and prevents hair damage. The science behind this is the fact that coconut oil is having high affinity for hair protein and due to its low molecular weight and linear chain, it is able to penetrate into the hair shaft. Coconut milk has been traditionally used to nourish the scalp and prevent hair loss.

Polyphenols and antioxidants

High content of polyphenols and other antioxidants is found to give beneficial antidiabetic effects and also potential for preventing bone loss in osteoporosis, especially post menopausal osteoporosis. The major studies on the medicinal and health benefits of coconut and its products could be accessed from the website of the Asian and Pacific Coconut Community at www.apccsec.org

With the multitude of health benefits, a time may come soon in the near future, when a tropical diet with emphasis on coconut oil and lauric acid will be recommended by nutritionists in the way the Mediterranean diet gained prominence in the past (with emphasis on olive oil). This concept was also shared by the participants of the last APCC COCOTECH Conference in Bali, Indonesia, during September 2016, when responding to a query from the industry representatives on the vision for coconut oil and virgin coconut oil in another ten years, the panel of technical experts, mostly medical doctors researching on coconut gave a very simple answer : "Much above Olive Oil".

Yes, coconut and coconut products have indeed a multitude of health and medicinal attributes, many of which have been conclusively proven through studies and some to be proven scientifically. Consumers and traditional medicine in coconut growing regions will continue consuming coconut products for a healthy living. The controversies that are generated against coconut products are mostly achieved by cherry picking and selective interpretation of evidence. It is here that the first rule of the Hippocratic oath which says "do no harm" assumes relevance. With the surmounting evidence through research and clinical studies on the health and medicinal attributes of coconut products and the history of coconut as an integral part of the diet in the South, South East Asian and Pacific that dates back to early years of the Christian Era, coconut

products have multifaceted uses to human health and do not cause any harm to humans. In fact they could play the role of nutraceuticals in maintaining human health, if not a drug. If humanity is prevented from using coconut products, they are definitely missing out one of nature's most amazing health products.

The controversies surrounding coconut products, that had started in the 1970s were more or less put to an end, until the emergence of the very recent debate with the Presidential Advisory of the American Heart Association. There is an urgent need for the coconut industry to be united and take up the challenge to establish the goodness of coconut oil and coconut products through the scientific explanations and conclusive scientific research that modern science needs. As the biblical story goes, "We have crossed the Red Sea, but the promised land is still ahead". We have to row through the endless list of controversies surrounding coconut products and finally put an end to them, for the benefit of the millions of coconut farmers across the globe. ■

Drink your way to health

Tender coconut water is undoubtedly the world's safest natural soft drink according to Ayurveda. Popularly known as ilaneer in South India, this drink is considered the best for its cooling properties. Rich in vitamins and minerals, this thirst quencher rejuvenate the body and mind.

One of the richest sources of electrolytes and high in chlorides and potassium, coconut water enables nerves and muscles to function properly and regulates fluid levels within the cells. It is the most natural way to stay hydrated and increase energy and vigour.

Coconut water is a drink for all age groups and for the entire family too. It is a sure cure for dehydration among children and adults alike. When your kids are thirsty, give them ample coconut water – this drink for all times and ages is truly delicious! It can also help infants suffering from intestinal problems. Make tender coconut water your daily drink. It is the most refreshing, nutritious, cooling and therapeutic drink – the water of life.

Moreover, tender coconut contains the delicious, soft kernal which is tasty to eat and does not contain fat.



Why your
body loves
Tender
Coconut Water

Drink tender coconut water. Your healthy, tasty energizer. Because it is naturally sweet and fat free, no preservatives or added sugars and just naturally packed goodness!

The delicate aroma, pure and fresh taste and the health benefits of this drink make every sip truly heavenly.





Health benefits of coconut oil

Recent evidences

Dr. D.M. Vasudevan, MD, FRCPath

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The health and nutritional benefits of coconut oil have been recognized for centuries. However, in recent decades, many health organizations advise against the consumption of high amounts of coconut oil due to its high levels of saturated fat. In the 1980s, a conspiracy has been made to convince the public that coconut oil contributed to the increase in the rate of coronary heart disease (McNamara, 2010). However, recent evidences point out that coconut oil is not harmful to health.

Coconut oil contains medium chain fatty acids (MCFA)

Increased risk for cardiovascular disease is attributed to elevated levels of serum cholesterol, which in turn is due to increased intake of saturated fats. About 60 years back, it was found out that coconut oil contains saturated fatty acids. It was also experimentally proved that saturated fats will lead to atherosclerosis. So, people equated coconut oil with heart diseases. However, about 25 years back, it was proved that coconut oil, although contains saturated fatty acids, it is of a special variety called medium chain fatty acids (MCFA). After consumption, the medium chain fatty acids (present in coconut oil) directly enter into the blood stream and are metabolized immediately. On the other hand, long-chain fatty acids (LCFA) (of other oils) require the help of lipoproteins, which are eventually deposited

into various organs, including heart vessels. Medium chain fatty acids are metabolized rapidly by the body for energy requirements (Guillot et al, 1993).

Coconut oil boosts immune system

Lauric acid has immune-boosting properties as evidenced by feeding coconut oil to laboratory animals (inhibition of interleukin-1). Both coconut oil and monolaurin were effective in significantly lowering the viral load for several patients. The microbial killing ability of monolaurin has been established. (Bergsson et al, 2001). Coconut oil has been found to inhibit Gram positive bacteria such as Streptococcus, Staphylococcus, Corynebacterium, Listeria and Clostridium.

Coconut oil reduces obesity and reduce appetite

In one study, rats were fed with either long chain or medium chain fats. The rats fed the medium chain fats gained 20% less weight. (Geliebter, 1983). One important property of coconut oil is that it is "thermogenic", that is, consuming it tends to increase energy expenditure compared to the same amount of calories from other fats (St-Onge, 2003). In another study, 15-30 grams of medium chain fats per day increased energy expenditure by 5%. (Dulloo et al, 1996). Many studies show that, compared to the same amount of calories from other fats, medium chain fatty acids increase feelings of fullness and lead to a reduction in calorie intake. (St-Onge, 2002). In another study of healthy men, eating a high amount of MCTs caused them to automatically eat fewer calories per day. (Van Wymelbeke et al, 1998). So coconut oil boosts fat burning (increases "calories out") and it also reduces the appetite (reduces "calories in"). It is important to keep in mind that coconut oil is fat. Fat has

9 calories per gram and coconut oil is no exception. Therefore, if someone eating a fixed amount of calories and then add coconut oil on top of that, then it is likely to gain and not lose weight. Thus it is not adding fat calories to diet, it is to replace some of other cooking fats with coconut oil. (Tsuji et al, 2001).

Coconut oil as an anti-oxidant

The effect of feeding rats with fish oil or coconut oil diets was studied. Synthetic diets containing 15% (w/v) fish oil or coconut oil were used. The fish oil containing diet produced significant increase in lipid peroxidation products. But coconut oil was found to have antioxidants. (D'aquino et al, 1991). The virgin coconut oil (VCO) had the strongest scavenging effect on 1,1-diphenyl-2-picrylhydrazyl and the highest antioxidant activity based on the beta-carotene-linoleate bleaching method. (Marina et al, 2009). The anti-stress effect of VCO (dose of 10 ml/kg body weight) was evaluated. VCO was able to reduce immobility time and restore oxidative stress in mice post-swim test. Furthermore, mice treated with VCO were found to exhibit higher levels of brain antioxidants, lower levels of brain 5-hydroxytryptamine and reduced weight of the adrenal glands. Consequently, the serum cholesterol, triglyceride, glucose and corticosterone levels were also lower in VCO-treated mice. (Yeap, 2015).

Coconut oil enhanced tissue uptake of tomato carotenoids to a greater degree than safflower oil. (Conlon et al, 2012). Increased activities of catalase, superoxide dismutase, glutathione peroxidase and glutathione reductase in the liver, heart and kidneys were increased by VCO consumption. (Arunima et al, 2013).

Coconut oil is good for kidneys

One study was carried out to evaluate the remedial effects of virgin coconut oil (VCO) on renal dysfunction in diabetic rats. VCO was found to be effective in preventing renal damage in diabetic patients. (Akinnuga et al, 2014).

Lipid profile in normal persons consuming coconut oil

Continuing these previous observations by other research workers, at Amrita Institute of Medical Sciences, Kochi, we have analysed serum from persons, consuming coconut oil or sunflower oil. 70 normal, healthy subjects were taken as controls and 70 subjects with Type 2 diabetes were recruited in patient group. Each group was further subdivided into two subgroups of 35 subjects each, consuming coconut

oil and sunflower oil respectively as cooking medium. Triglycerides, LDL and VLDL cholesterol levels were high in the diabetic subjects compared to the controls. But, no pronounced changes for these parameters were observed between the subgroups (coconut oil vs. sunflower oil) (Sabitha et al 2009). This study was extended to analyse serum from 302 normal healthy persons, out of which 152 were consuming coconut oil and 150 were using sunflower oil for the past 2 years or more. There was no statistically significant difference in the cholesterol, HDL or LDL levels in coconut oil consuming population versus sunflower oil consuming population. Thus plasma fatty acid composition reflected no changes with dietary fat source.

Lipid profile in coconut oil consumers with heart disease

At Amrita Institute of Medical Sciences, lipid profile was analysed in 76 coronary artery disease patients, out of which 41 were used to take coconut oil and 35 were used to take sunflower oil. There was no statistically significant difference in the cholesterol, HDL or LDL levels in coconut oil consuming patients versus sunflower oil consuming patients. Plasma fatty acid composition reflected no changes with dietary fat source. (Sabitha et al, 2009). *It is also shown that coconut oil consumption does not alter the HDL /LDL ratio of cholesterol in human beings (Sabitha et al, 2014).*

Coconut oil and lipid Oxidative stress

Serum lipid values did not show significant variation between animals fed coconut oil or sunflower oil. Lipid peroxidation was found to be higher in sunflower oil fed rabbits, compared to controls or coconut oil fed rabbits. Coconut oil intake did not cause hyper cholesterolemia or oxidative stress in rabbits (Sabitha et al, 2010).

Fatty acid composition of atheromatous plaques

In another study conducted at Amrita Institute of Medical Sciences, 71 samples of plaques (from diseased coronary arteries) were analysed. Out of these patients, 48 persons were using coconut oil and 23 persons were using sunflower oil routinely. Surprisingly, the fatty acid content of the plaque did not show any difference between coconut oil consumers versus sunflower oil consumers. In both coconut oil consumers and sunflower oil consumers, the major substances present in the plaques were saturated fatty acids; palmitic acid (46%) and stearic acid (33%)



Coconut oil, within normal limits, neither decrease nor increase cholesterol levels. Coconut oil does not affect serum cholesterol, it produces very little free radicals, is rapidly absorbed, rapidly oxidized, is not deposited and helps in resisting invading micro-organisms.

of total lipids. Lauric acid (fatty acid present in coconut oil) was only 3.5% of the total content of plaques in both coconut oil consumers and sunflower oil consumers. (Palazhi et al, 2012). Thus the causation for plaques in coronary artery is not intake of coconut oil. This clearly shows that coconut oil does not have an effect to produce plaque or heart disease.

Studies on patients having coronary artery disease

A clinical study was conducted to investigate the impact of cooking oil media (coconut oil and sunflower oil) in patients with established coronary artery disease (CAD). Patients with stable CAD on standard medical care were assigned to receive coconut oil (Group I) or sunflower oil (Group II) as cooking media for 2 years. Serum, lipids, Lipoprotein a, apo B/A-1 ratio, antioxidants, flow-mediated vasodilation, and cardiovascular events were assessed at 3 months,

6 months, 1 year, and 2 years. Hundred patients in each arm completed 2 years with 98% follow-up. There was no statistically significant difference in the biochemical, vascular function and in cardiovascular events after 2 years. Thus, coconut oil did not change the lipid-related cardiovascular risk factors and events in those receiving standard medical care. (Vijayakumar et al, 2016).

Coconut Oil is removed from the Naughty List

The US government has finally accepted that “cholesterol” is not a nutrient of concern. Cholesterol and coconut oil were now removed from their warnings to stay away to avoid heart disease and clogged arteries.

This means eggs, butter, nuts, coconut oil etc. have now been classified as “safe” and have been officially removed from the “nutrients of concern” list.

The US Department of Agriculture, stated in its findings for 2015: “Previously, the Dietary Guidelines for Americans recommended that cholesterol intake be limited to no more than 300 mg/day. The 2015 official version will not bring forward this recommendation because available evidence shows no appreciable relationship between consumption of dietary cholesterol and serum (blood) cholesterol.

Summary

The general advice given by physicians against the use of coconut oil needs re-evaluation. This misinformation arose, when long chain saturated fatty acids (LCSFA) were shown to increase cholesterol level. Since coconut oil also contains saturated fatty acids, people equated them with LCSFA. Now it is known that coconut oil contains medium chain fatty acids (MCFA). Metabolisms of LCFA and MCFA are drastically different. Coconut oil, within normal limits,

neither decrease nor increase cholesterol levels. The advantages of coconut oil are: it does not affect serum cholesterol (neutral); it produces very little free radicals, as opposed to other oils (beneficial); it is rapidly absorbed, rapidly oxidized and is not deposited (beneficial) and it helps in resisting invading micro-organisms.

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Coconut Oil and Cholesterol

Coconut oil is mainly composed of medium - chain fatty acids (63%). Medium chain fatty acids are burned almost immediately for energy production, and so they are not converted into body fat or cholesterol to the degree other fats are.

Coconut oil, with very low content of polyunsaturated fatty acid, is very stable and resistant to oxidation, and is an excellent cooking oil. It does not release free radicals. On the other hand, the polyunsaturated fats easily generate free radicals, which damage our cells. Since coconut oil is naturally saturated (>90%), it does not need hydrogenation. Hence products have no trans fatty acids, which are formed by partial hydrogenation of polyunsaturated fats, which lead to high blood cholesterol, high low - density lipoproteins (LDL) and low high - density lipoproteins (HDL). The ratio of good to bad cholesterol [HDL (High Density Lipoprotein) / LDL (Low density Lipoprotein)] is universally accepted as an accurate indicator of heart disease risk.

Natural, non hydrogenated coconut oil tends to increase HDL and therefore protects the heart.



Coconut oil in a Nuts shell

- Edible in raw form
- High resistance to oxidative rancidity
- Effective heart transfer agent in frying
- Ideal for deep frying
- Carrier and protective agent for fat - soluble vitamins.
- Easily digestible
- Ideal energy source in baby foods.
- Contains Vitamin E
- Increases the friendly HDL.
- Reduces fat accumulation in the body
- Easily metabolized
- Helps maintain healthy ratio of omega 6 to omega 3 fatty acids when consumed as a part of diet.
- Inhibitory effect against certain chemical carcinogens.

One of the major health problems we face at present is cardiovascular disease. Lot of money and time has been spend both on the management and prevention of coronary artery disease (block in the blood vessels supplying the heart muscles). There are multiple risk factors leading to development of coronary artery disease like presence of diabetes mellitus, hypertension, smoking, physical inactivity, age and variation in cholesterol levels. High cholesterol levels resulting from genetic factors, diet containing high fats and low physical activity are the major issues. The type

and amount of oil used by the society is influenced by the availability, tradition, income and to a certain extend health awareness. Oils containing high levels of saturated fatty acid increases the cholesterol levels. Coconut oil is classified under saturated fat even though the major content lauric acid is a medium chain fatty acid.

In the state of Kerala compared to other states the incidence of coronary artery disease is high. There are so many reasons like food habits, sedentary lifestyle and consumption of food containing large amount of carbohydrate apart from the genetic reasons. Coconut oil has been used for

cooking for centuries in these state. Coconut oil is considered not heart friendly due to its high content of saturated fatty acids. Many organizations across the globe recommends to reduce or avoid the use of coconut oil in order to maintain the heart health. As far as this state is concerned coconut is one of the major source of agro economy and source of dietary oil for the society. One of the frequent questions we often come across in the clinical practice is about the continuation of coconut oil after the development of a heart attack. It is the responsibility of the scientific community to explore the facts about this important dietary source of oil, hence we

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Coconut oil and
the heart health

conducted few preclinical and clinical studies at Amrita Institute of Medical Sciences, Kochi.

Large population in Asia Pacific region also uses coconut oil as source of dietary fat and their agro economy depends on the cultivation of coconut. As of now there is no quality data to prove the link between the coconut oil and cardiovascular health. There are multiple epidemiological and interventional studies on coconut oil but none of them are conclusive because of many confounding factors.

In this context, Amrita Institute of Medical Sciences conducted few studies to assess the role of coconut oil and cardiovascular risk factors. In the first study we have harvested the inner layer of blood vessels that supplying the heart muscles in those undergoing bypass surgery. The fats deposited were subjected for chemical analysis to find out whether there is any difference among the patients using coconut oil or other oils. There was no difference in the fatty acid contents of material deposited in blood vessels of patients using different dietary oils.

In the second study we estimated the cholesterol content and few parameters on oxidative state and diabetic control in different sets of patients using different kind of oils. In this study we found that there is no statically significant difference in the cholesterol and other parameters in those patients using coconut oil compared to other oils.

The third study was an animal study where few Newzeland white rabbits were fed with diet rich in coconut oil butter and normal food. After four weeks we analysed the cholesterol levels in these rabbits and found that there was no difference in lipid profile

These above mentioned studies were not adequate to answer the clinical dilemma of continuation of coconut oil after the heart attack hence we decided to conduct a study involving patients who had heart attack in the past.

For this study we selected patients who had heart attack, angioplasty

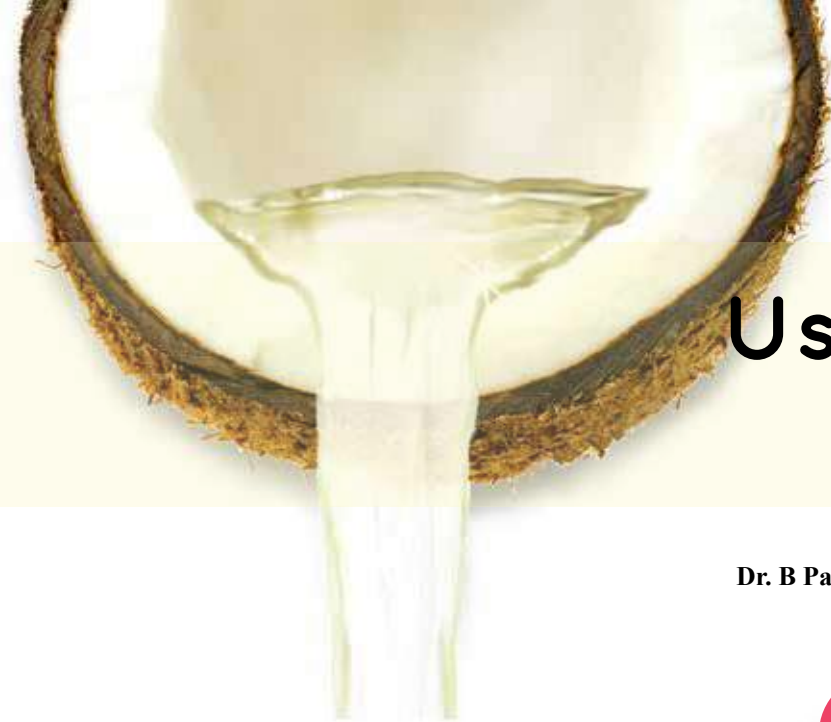


Coconut oil as a cooking oil media doesn't affect the serum cholesterol and associated risk factors in coronary artery disease patients along with standard medications.

or Bypass surgery in the past. These patients were categorized into two groups containing hundred patients each. Initially we estimated all the cholesterol related parameters, exercise test and a special test called vascular response. One group of patients were advised to take coconut oil at the same time sunflower oil were allocated to the other group and advised them to continue the particular oil for two years. These patients were called at regular intervals and their symptoms, blood cholesterol, cholesterol carrying proteins in the blood, blood sugar control, exercise level, the dose of statin medication to control cholesterol and blood vessel response were studied. At the end of two years and there was no difference between these two groups as far as there cholesterol levels and other parameters are concerned. There was no need to change the dose cholesterol controlling pills in coconut oil when compared to sunflower oil arm. This was the first long term study involving such a large number of patients.

This study has shown that continuation of coconut oil after cardiac event while on medication is safe.

This study conducted on patients receiving cardiac drugs and they had consistent check-up hence could not extrapolate the outcome when used in community living people not on any medication. To overcome this limitation we are planning a large study involving the subjects living in the community from different countries to assess the effect of coconut oil on heart health. ■



Use coconut oil moderately

Dr. B Padmakumar, Prof. and Head, Department of Medicine,
Government Medical College, Kollam

It is impossible for us to think of preparing food without oil. The type of oil we use differs from place to place. Coconut oil is the most preferred oil for Keralities. Due to the wide spread occurrence of life style diseases like diabetes, coronary artery diseases and cholesterol, people are confused about using coconut oil. But the judicious use of coconut oil in moderate quantity is not in any way harmful to health. Moreover coconut oil contains many nutrients that are beneficial for good health.

Saturated fat

Coconut oil contains saturated fatty acids. One table spoon of coconut oil contains 12gm saturated fats, 0.8% mono unsaturated fats and 0.2gm poly unsaturated fats. The medium chain fatty acid content is the greatest advantage of coconut oil. Medium chain fatty acids are metabolized rapidly by the body for energy requirements. Medium chain fatty acids are more available for oxidation and they provide a rapid source of energy and are not deposited as fat in the body.

Saturated fat increases the cholesterol level. This is the greatest limitation of using coconut oil. These issues can be managed to a certain extent through the judicious and moderate usage of coconut oil. It is ideal for a person to limit the usage of coconut oil not above 15 gm per day.

Presence of lauric acid

Lauric acid which is rarely found in food products is present in coconut oil. Lauric acid on reaching the body converts into mono laurin. Mono laurin can effectively act against bacteria, virus or protozoa



Saturated fat increases the cholesterol level. This is the greatest limitation of using coconut oil. These issues can be managed to a certain extent through the judicious and moderate usage of coconut oil. It is ideal for a person to limit the usage of coconut oil not above 15 gm per day.

attack. The capric and caprylic acid present in coconut oil also got similar qualities

Diabetes and coconut oil usage

Usage of coconut oil in moderate quantity is having many advantages in diabetic patients. The medium chain fatty acids in coconut oil help to reduce body weight, which in turn boosts the functioning of insulin. Anti oxidants present in coconut oil like vitamin A and E is beneficial in protecting from nephropathy, retinopathy, neuropathy etc.

The saturated fatty acids present in coconut oil leads to rise in blood cholesterol. Hence it is wise to avoid food items fried in coconut oil. Coconut oil is a natural saturated fat and is not harmful like trans fats that are saturated through hydrogenation. In fact trans fats are the real villain in increasing the cholesterol level and also causes heart diseases. ■

Coconut & its benefits

Susan Itty, Chief Clinical Nutritionist, Aster Medcity, Cochin

Coconut plays a unique role in the diet of mankind because it is a source of important physiologically functional components and is classified as a highly nutritious 'functional food'. It is rich in dietary fibre, vitamins and minerals. Evidence is mounting to support the concept that coconut may be beneficial in the treatment of obesity, dyslipidaemia, elevated LDL, insulin resistance and hypertension. In addition, phenolic compounds and hormones (cytokinins) found in coconut may assist in preventing the aggregation of amyloid- β peptide, potentially inhibiting a key step in the pathogenesis of Alzheimer's diseases.

Coconut has been recently proved to be a source of saturated fat that would not elevate the lipid profile in the body, except HighDensity Lipoprotein (HDL), which is good for health. Coconut is a highly valued ingredient in our daily diet for its enormous medicinal benefits. However, due to its high lipid and saturated fat content it is discouraged in the diet of patients suffering from cardiovascular ailments and hypertension.

Coconuts are highly nutritious and rich in fibre, vitamins C, E, B1, B3, B5 and B6 and minerals including iron, selenium, sodium, calcium, magnesium and phosphorous. Unlike cow's milk, coconut milk is lactose free so can be used as a milk substitute by those with lactose intolerance.

Coconut Milk, Water, Flesh, and Oil

Tender coconut water is the most health enhancing of the two. The water in the young coconut is one of the highest sources of electrolytes. Electrolytes are responsible for keeping the body properly hydrated so the muscles and nerves can function appropriately.



Coconuts are highly nutritious and rich in fibre, vitamins and minerals. Unlike cow's milk, coconut milk is lactose free so can be used as a milk substitute by those with lactose intolerance.

Therefore it is more beneficial to drink the water from a young coconut after an intense workout rather than the commercial sports drinks.

Coconut water is also low in calories, carbohydrates, sugars and almost completely fat-free. In addition, it is high in ascorbic acid, B vitamins, and proteins. The soft meat, or flesh, inside coconut helps to restore oxidative tissue damage and contains a source of healthy fats, proteins, and various vitamins and minerals.

Although coconut oil is a saturated fat it is unlike the high calorie, cholesterol-soaked, long chain saturated fats. It is rich in medium-chain fatty acid which can help boost metabolism and aid in fat loss. It is metabolized quickly and instead of fat sticking to your belly, it gets burned off as energy. It also helps detoxify the human body and balances digestive tract.

Coconut oil is one of the most stable oils while cooking in high heat, and does not form harmful by-





Top 10 Health Benefits of Coconuts

10



- Supports immune system health: it is anti-viral, anti-bacterial, anti-fungal, and anti-parasite
- Provides a natural source of quick energy and enhances physical and athletic performance
- Improves digestion and absorption of nutrients, vitamins, and minerals
- Improves insulin secretion and symptoms associated with diabetes
- Helps protect the body from cancers due to insulin reduction, removal of free radicals that cause premature aging and degenerative disease
- Reduces risk of heart health and improves good cholesterol (HDL)
- Restores and supports thyroid function
- Helps protect against kidney disease and bladder infection
- Promotes weight loss
- Helps keep hair and skin healthy and youthful, prevents wrinkles, sagging skin, age spots and provides sun protection

products when heated to normal cooking temperature like other vegetable oils. In addition, it can be used as a spread for baking and for making delicious raw, vegan desserts.

To date, there are over 1,500 studies proving coconut oil to be one of the healthiest foods on the planet. Coconut oil benefits and uses go beyond what most people realize. Research has finally uncovered the secrets of this amazing fruit; namely healthy fats called medium-chain fatty acids (MCFAs), these unique fats include, Caprylic acid, Lauric acid and Capric acid. Around 62% of the oils in coconut are made up of these 3 healthy fatty acids and 91% of the fat in coconut oil is healthy saturated fat.

Most of the fats that we consume take longer time to digest, but MCFAs found in coconut oil provide the perfect source of energy because they only have to go through a 3 step process to be turned into fuel vs. other fats which go through a 26 step process!

Unlike long-chain fatty acids (LCFAs) found in plant based oils, MCFAs are easier to digest, not readily stored as fat, anti-microbial and anti-fungal, smaller in size, allowing easier cell permeability for immediate energy and is processed by the liver, which means that it can immediately be converted to energy instead of being stored as fat.

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Cardioprotective properties of 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 occurrence of CHD, because the nature of fatty acids present in dietary oils have a role in modulating hepatic lipid metabolism. Among

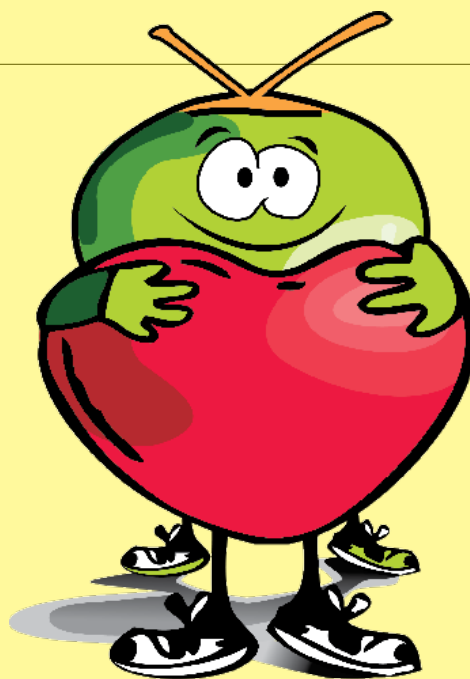
Several animal and human studies indicate that due to the specific composition of the saturated fatty acids, coconut oil consumption does not affect blood cholesterol negatively, but it affects them positively.

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



GOOD SATURATED FATS
GOOD FOR THE HEART

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 atherogenicity. 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 and the degree of unsaturation of oil 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 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°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. ■

BENEFITS of COCONUT MILK

1

IMPROVES HEART HEALTH

Coconuts are one of the best sources of lauric acid — 50 percent of the fat in coconuts is lauric acid — a protective type of fatty acid linked with improved cholesterol levels and heart health. Coconut fat helps promote a decrease in (bad) LDL cholesterol and rise in (good) HDL cholesterol. Also, coconut milk helps lower blood pressure and keep blood vessels flexible, elastic and free from plaque buildup.

2

BUILDS MUSCLE AND HELPS LOSE FAT

Medium-chain triglycerides (MCT) fatty acids found in coconut milk increase energy expenditure and help enhance physical performance. Because coconut milk is high in healthy fats, it also helps fill you up and prevent overeating or snacking throughout the day.

3

PROVIDES ELECTROLYTES AND PREVENTS FATIGUE

Although coconut water is a higher source of electrolytes, coconut milk also provides important minerals needed to maintain blood volume, regulate heart health, and prevent dehydration or diarrhea. Coconut milk also contains the types of MCTs that are easily used by your brain for energy.

4

HELPFUL FOR LOSING WEIGHT

According to a study, consumption of a diet rich in MCTs results in greater loss of fat compared with long-chain fatty acids, perhaps due to increased energy expenditure and fat oxidation observed with MCT intake.

5

HELPS IMPROVE DIGESTION AND RELIEVE CONSTIPATION

Coconut milk nourishes the digestive lining due to its electrolytes and healthy fats, improving gut health and preventing conditions like IBS.

Dr. Axe
FOOD IS MEDICINE



Neera is a delicious health drink getting popularity worldwide due to its astounding medical advantages. Though neera is commercialized in Kerala and is widely promoted as a health drink, there is lack of scientific data showing its health benefits. Therefore CDB under Technology Mission on Coconut (TMOC) initiated a study with Amrita School of Pharmacy, Amrita University on nutritional and medicinal properties of neera and selected neera products through various in vitro and in vivo assays.

Nutritive facts estimation

Findings on nutritional fact reveal that neera sugar is dominant in nutritive composition, followed by neera honey, than neera. From evaluation and comparison of element composition it was observed that the different macro elements (Na, K & Mg) present in neera products were acceptable as per the daily recommended limits by Food and Drug Regulation authority (FDR). Potassium was predominantly found in neera followed by neera honey. Regarding the micro minerals (Fe, Zn, Cu, S & Mn), neera honey was found to be rich with Fe. Ni found in the samples was within the permissible limit. The trace elements (Pb and Hg) were also analyzed and found to be below the detectable limit.

Quantitative estimation of Antioxidants

The major antioxidants estimated quantitatively are vitamin C, phenols, flavonoids and tannins and results revealed the presence of Vit C and total phenolic content in much greater quantity than others. Antioxidants have been reported to inhibit the propagation of free radical reactions and protect the human body from diseases. Vitamin C is one of the most important antioxidant and an essential constituent in food with specific and vital functions in the body. Among different fruit juices available in the global market, orange and citrus fruit juices acquired more attention due to the presence of high level of vitamin C (50mg/100g) and contribute health benefits, especially as high power antioxidants. Considering problems with the routine consumption of highly acidic juices, less acidic neera can be a valuable alternative with rich level of vitamin C.

Anti-diabetic assays

Anti-diabetic activity of samples was assessed in vitro by α -amylase and α -glucosidase inhibition assay. It is seen that neera sugar is having anti-diabetic activity comparable with reference standard acarbose. This result has significant clinical importance as diabetes is a common life style disease and by replacing the

Nutritional and Medicinal properties of Neera and Neera products

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common sugar with neera sugar it may be possible to control the disease.

Immuno modulatory effect

Immunomodulators are agents that modify immune response or function of the immune system by stimulation of antibody formation or by inhibition of white blood cell activity. The immune system primarily is responsible for the recognition and abolition of pathogens and foreign substances. The immunomodulatory potential of the samples were measured by undertaking two major tests. The study evidences strong immunostimulant activity of test products, as demonstrated by enhancement of HA titre and paw oedema and can be inferred as the potential of the test products to defence against parasites and bacteria.

Diuretic activity

The in vivo diuretic activity of neera and its products. Data demonstrate that diuretic index is significantly high in neera (2.32) with high urinary output (3.58 ± 0.76 mL) and urine pH (6.45 ± 0.42) up to first 5 h, compared to control group. Neera revealed its potential diuretic effect through higher urine volume and pH with moderate ion excretion up to first 5 h compared to reference standard. Natriuretic effect of neera was revealed from the non-significant elevation of chloride ion excretion.

Haematinic activity

By considering the high prevalence of anaemia (haemolytic and iron deficiency anaemia) worldwide, we conducted haematinic activity study to assess the effect of neera and its products on haematological parameters. Administration of samples and standard significantly improved the altered haematological parameters at the end of first treatment week (day 7), whereas anaemic control group did not show such progression at this period. Higher activity exhibited by neera honey will be due to the high iron content in the product. The spleen histology further confirms it with normal splenic histology of control animals having red pulp and white pulp. Whereas, anaemic control rats revealed distorted red pulp with relative attenuation in white pulp proportion. Administration of standard and samples showed splenic sections with improved red pulp and well defined splenic nodules in white pulp. Neera honey exhibited maximum erythroid hyperplasia compared to other groups and this increased number of erythroblastic islands will be the reason behind the maximum effects observed in hematological analysis in this group.



Biochemical analysis

Biochemical parameters- the bio markers for considering the vital organ functions; especially liver and kidney, were evaluated. Neera and its products significantly decreased liver function panel such as AST and ALP, with insignificant reduction in ALT and bilirubin level after two weeks of peroral treatment. The noticeable reduction of these enzymes in treated animals to that of normal rats insight into the potential therapeutic property of neera and its products in liver conditions with elevated enzyme levels. The insignificant variation observed with plasma bilirubin in testers compared to control group endorses the absence of cholestasis, further confirms the safety of excretory functions of liver with neera products.

The kidney function parameters- serum urea and creatinine exposed statistically insignificant reduction at the study period. Moreover, the absence of significant variation in kidney markers; urea and creatinine, testimonies the safety of neera products in this vital organ. The histological findings on liver, heart and kidney reveals the absence of cytoarchitectural distortion as compared to that of control organs, further established the safety of the products.

Conclusion

By considering the high Vitamin C content and antioxidant potential, neera can beat the unhealthy carbonated beverages and neera honey might be a good alternative over normal honey due to its high iron content. In addition neera sugar can be a healthy option particularly for diabetic patients. Beyond this, neera exhibited significant immune modulatory activity, natural diuretic activity without much saluretic effect and good haematinic activity in vivo. The major findings of the various in vitro and in vivo studies conducted are reported in this write up. In an era like this when we often hear about the health hazards of various artificial drinks, it is important to understand the health benefits of the natural drink neera, especially its effect on enhancing the immune power. Its use should be promoted widely across the country and also in Kerala, a state that is known in the name of coconut trees. ■

Coconut in Ayurveda

Dr. P. Ram Manohar

Director of Research, AVT Institute
for Advanced Research, Coimbatore



A critical evaluation of the health benefits of coconut has been attempted several centuries ago in India through the Ayurvedic system of medicine. The situation seems to be ripe to corroborate this ancient wisdom with the latest scientific research findings in our attempt to place coconut once again on the high pedestal of health promoting agents that nature has benevolently gifted for human beings.

The usage of coconut for health seems to have been promoted mainly through the regional expression of Ayurveda in Kerala. In fact, most of the Ayurvedic texts describe coconut as the plant of the Southern region – dakshinatya. This situation is true even in modern times. The four states of Kerala, Tamil Nadu, Karnataka and Andhra account for more than 90 per cent of the production of coconut in India with Kerala contributing the lion's share. It is not surprising therefore, that the Ayurvedic physicians of Kerala took the initiative to discover and apply the medicinal properties of coconut for health. However, the usage of coconut products spread across the length and breadth of the country not only for medicinal but also for religious purposes.

A careful perusal of the classical Ayurvedic texts help us to understand that Ayurveda has gained deep

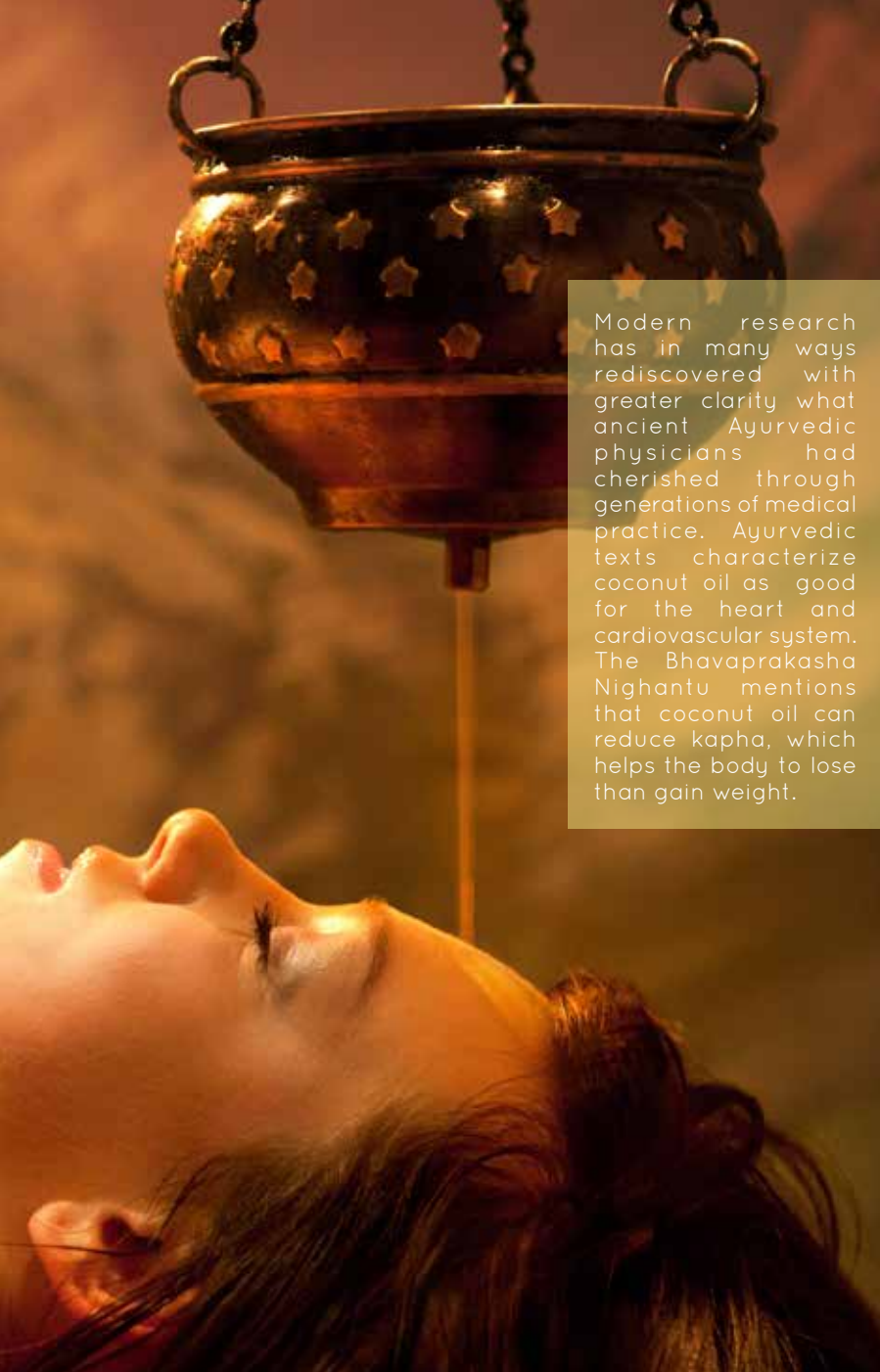
insights into the medicinal properties of coconut that is in tune with the scientific findings of today. Modern research has in many ways rediscovered with greater clarity what ancient Ayurvedic physicians had cherished through generations of medical practice. Let us take the issue of the effect of coconut on the cardiovascular system for instance. Coconut oil was condemned a few decades ago for its high percentage of saturated fats that could damage the blood vessels and cause coronary heart disease. It is only in recent times that it has been discovered that the saturated fat in

Coconut is heavy, oily, pacifies heat, sweet and cool. It improves musculature, maintains cardiovascular health, promotes growth and cleanses the urinary bladder.

(Sushruta Samhita)

Coconut oil is aphrodisiac, heavy, nourishes depleted tissues, pacifies heat and exhaustion and is useful in treating diseases like diabetes, asthma, cough, wasting and injuries.

(Saligrama Nighantu)



Modern research has in many ways rediscovered with greater clarity what ancient Ayurvedic physicians had cherished through generations of medical practice. Ayurvedic texts characterize coconut oil as good for the heart and cardiovascular system. The Bhavaprakasha Nighantu mentions that coconut oil can reduce kapha, which helps the body to lose than gain weight.

in the management of a wide range of skin diseases including the infectious type. It is said to tone the digestive system and enhance the immunity of the individual. Interestingly enough, the Shaligrama Nighantu points out that coconut oil is useful for the management of the disease known as yakshma, a condition that resembles AIDS in many ways.

Ayurvedic texts describe the medicinal properties of coconut meat, tender coconut water, coconut milk, coconut ghee, coconut oil, coconut sugar, coconut flowers, fleshy top of stem, coconut root as well as toddy. Coconut fruit is classified into the tender, green, ripe dry and sprouted types and their medicinal properties are differentiated and described.

An appraisal of the medicinal properties of coconut as documented in the classical Ayurvedic literature assumes significance in the context of promoting its use for health care in the light of scientific research. It would indeed be an interesting exercise to corroborate ancient wisdom and modern knowledge to substantiate the beneficial effects of coconut for health, discover new areas for research and to rediscover less known applications of coconut that has been preserved by tradition for posterity. ■

coconut is the medium chain fatty acid (MCFA) type, which is metabolized quite differently from the way long chain fatty acids are metabolized. By promoting thyroid activity and providing instant energy, MCFA in coconut actually helps the body to reduce fat and thin down. It maintains cardiovascular health. Ayurvedic texts like the Kayyadeva Nighantu, Bhavaprakasha Nighantu and Raja Nighantu characterize coconut oil as hridyam or good for the heart and cardiovascular system. The Bhavaprakasha Nighantu mentions that coconut oil can reduce kapha, which actually helps the body to lose than gain weight.

The beneficial effects of coconut oil on skin were also well known to the ancient physicians. Coconut oil is said to be useful



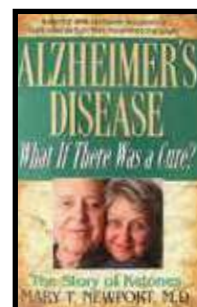


Coconut Oil and Alzheimer's

It has been identified that insulin deficiency and insulin resistance in the brain (now termed as Type 3 diabetes) are important hallmarks of Alzheimer's disease (AD). Glucose utilisation is greatly reduced in areas of the brain affected by AD, however ketone uptake is normal in the affected areas. Ketones are known to serve as an alternative fuel to the brain and other organs, except the liver. Medium Chain Triglyceride (MCT) oil is partly converted to ketones in the liver resulting in mild ketosis. Studies using MCT oil demonstrate improved cognition in nearly half of the people with mild cognitive impairment or AD and coconut oil is about 50% MCT.¹



Dr. Mary T. Newport, a physician and neonatologist in USA found that with daily consumption of measured doses of coconut oil for over 10 months, her husband Steve Newport, a 58 year old man with early onset of AD experienced improvement in the assessment scales of Cognitive Score, Daily Living score, Mini mental status exam and clock drawing. Even the MRI was reported as stable with no further atrophy. In addition, caregivers reported improvements in 184 persons with dementia or other memory impairment in areas of memory/cognition, social interaction, behaviour or mood, speech/conversation, resumption of lost activities, physical symptoms, sleep, appetite and vision. Clinical studies are being undertaken for confirming usefulness of coconut oil in prevention and treatment of AD and other conditions such as parkinson's disease, multiple sclerosis, amyotrophic lateral sclerosis and autism which are also characterised by decreased glucose utilisation in brain and/or nerve cells.



Foods with Medium Chain Triglycerides (maybe near Alzheimers case)

Food	Grams
Coconut oil	8.4 grams per 15 ml
Palm kernel oil	8 gm per 15 ml
Goat butter	2.4 gm per 15 ml
Cow butter	1.6 gm per 15 ml
Goat milk	1.7 gm per 240 ml
Infant formula	1 gm per 240 ml
Cow milk (full fat)	0.9 gm per 240 ml
Human breast milk	0.78 gm per 240 ml
Goat cheese	2 gm per 30 gm
Feta cheese	1.4 gm per 30 gm
Heavy cream	1.3 gm per 30 gm
American cheese	0.78 gm per 30 gm

Source : USDA National Nutrient Database
(www.ars.usda.gov/nutrientdata)

Coconut Oil and Alzheimers

The results of the study on Coconut Oil attenuates the effects of Amyloid β on cortical neurons in vitro indicate that neuron survival in cultures co-treated with coconut oil and A β is rescued compared to cultures exposed only to A β . Coconut oil co-treatment also attenuates A β -induced mitochondrial alterations".

Source : Coconut Oil attenuates the effects of Amyloid β on cortical neurons in vitro by Firoozeh Nafar and Karen M. Mearow – Journal of Alzheimer's Disease 2014;39:233

A study on the effect of ketone bodies in Alzheimer's disease in relation to neural hypometabolism, β -amyloid toxicity and astrocyte function showed that "Much lower doses of ketone bodies can have therapeutic effect in Alzheimer's disease by different mechanisms. Enabling ketone bodies to supply a fraction of the needed ATP may partly compensate for the deficiency in glucose metabolism in Alzheimer's patients".²

1.Effects of ketone bodies in Alzheimer's disease in relation to neural hypometabolism, β -amyloid toxicity and astrocyte function by Leif Hertz, Ye Chen and Helle S. Waagepetersen – Journal of Neurochemistry 2015;134:7-20

2.Excerpt from the invited paper : "Coconut Oil and Oil : Ketones as Alternative Fuel for Alzheimer's disease and other disorders" presented by Dr. Mary T. Newport ,MD, Spring Hill, FL, USA at the 2nd International Conference on Coconut Oil 2017, Bangkok, Thailand during 15-18 March 2017

Coconut MCT and its effect on health, cognition, quality of life and AD-related biomarkers

Coconut oil is rich in medium chain fatty acids (MCFA) unlike most other dietary fats that are rich in long chain fatty acids. MCFA are transported to the liver via the portal vein and are more readily converted to ketone bodies. Since decreased sugar metabolism is a key hallmark of AD, ketone bodies are being considered beneficial for individuals developing (or with) memory impairment as ketone bodies serve as an important alternative energy source in the brain. Additionally mounting evidence also support the concept that coconut may be beneficial in the treatment of the common

risk factors associated with cardiovascular disease, type-2 diabetes and AD such as obesity, dyslipidaemia, elevated LDL, insulin resistance and hypertension. Phenolic compounds present in coconut may potentially inhibit a key step in AD pathogenesis via their beta amyloid anti-aggregation properties.

Source : Excerpt from the invited paper : "Role of Coconut Oil in Neuroprotection and evaluation of CocomMCT for the prevention of AD" presented by Dr. Ralph N Martins, Department of Biomedical Sciences, Macquarie University, Sydney, Australia at the 2nd International Conference on Coconut Oil 2017, Bangkok, Thailand during 15-18 March 2017.

Effect of Virgin coconut oil on diabetic patients

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*Department of Nutrition, Faculty of Medicine, Universitas Indonesia,

**Department of Medical Nutrition, Faculty of Medicine, Universitas Padjadjaran.

Virgin coconut oil (VCO), a source of medium chain fatty acid, has been postulated to improve blood glucose and lipid profile of type 2 diabetics, due to its readiness to provide energy to body cells. A study was conducted to investigate the effects of VCO, integrated in type 2 diabetic dietary regimen, on fasting serum glucose, insulin, triglyceride and ketone concentrations.

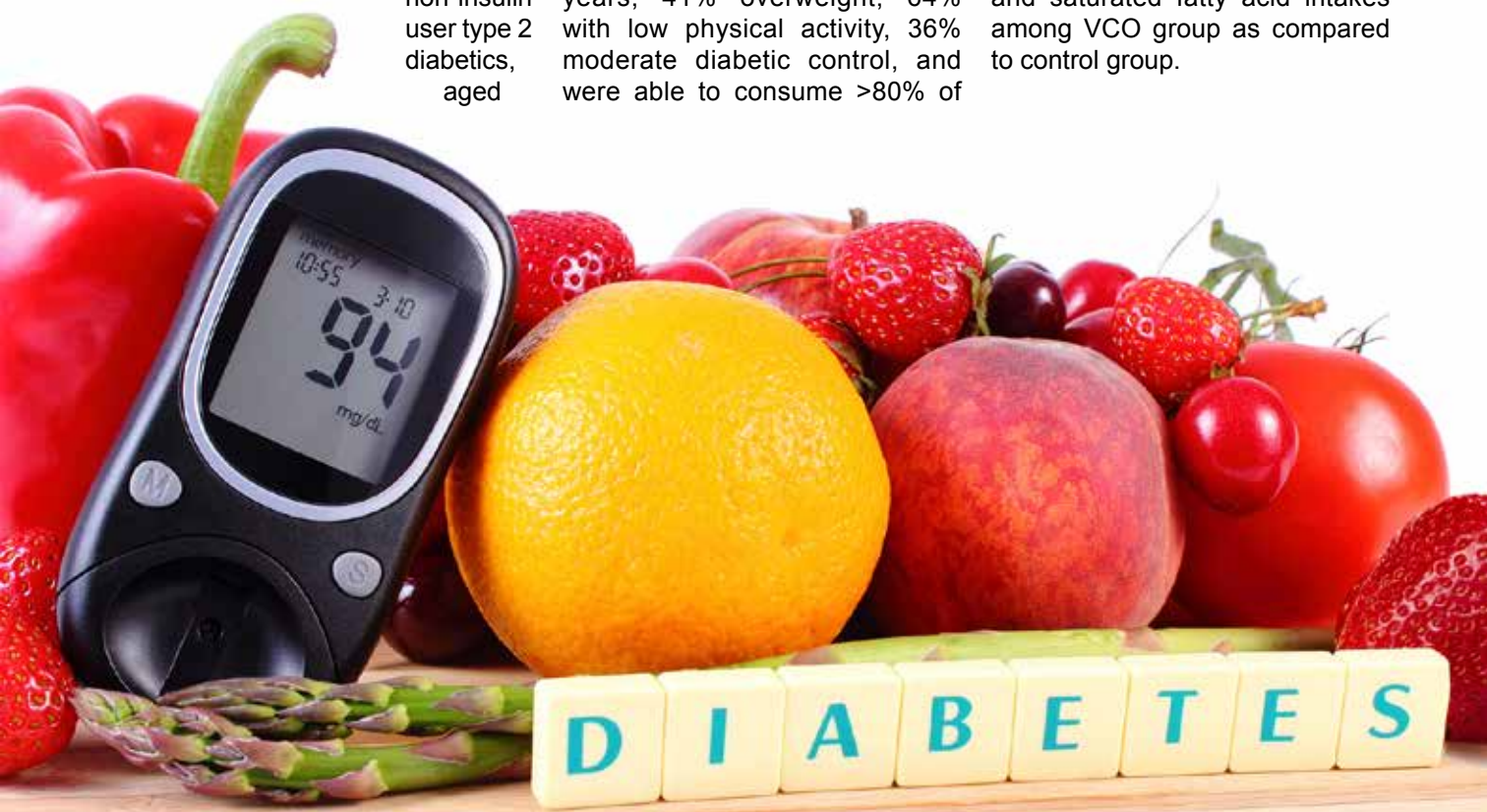
A randomized cross-over design study was conducted among 21 out-patient diabetics. Non-obese non insulin user type 2 diabetics, aged

<65 years old, with normal liver and renal functions, and good to moderate diabetic control were recruited. Every subject underwent two treatments for three weeks with one week wash out: control group received only diabetic regimen, while treatment group received 3x10mL/day VCO integrated in their diabetic regimen. Data included age, physical activity, body mass index (BMI), food intake using estimated food record method, fasting serum glucose, insulin, triglyceride and ketones concentrations before and after treatment, were assessed.

Subjects' age ranged 40–64 years, 41% overweight, 64% with low physical activity, 36% moderate diabetic control, and were able to consume >80% of

VCO regimen. Gastro-intestinal symptoms, especially soft stool and nausea, were experienced by 64% subjects. Majority of subjects consumed less energy, fiber and sucrose compared to dietary recommendation. Treatment group consumed higher energy, fat and saturated fatty acid as compared to control group. No difference of BMI, fasting serum glucose, insulin, triglyceride and ketone concentrations after integration of VCO in diabetic dietary regimen.

VCO did not change BMI, fasting serum glucose, insulin, triglyceride and ketone concentrations in type 2 diabetics, despite higher energy and saturated fatty acid intakes among VCO group as compared to control group.



Diabetes mellitus is a condition characterised by high blood glucose due to insulin resistance. Dietary regimen is one important component of diabetic management. Virgin coconut oil, a source of medium chain fatty acid, has been postulated to improve blood glucose and lipid profile of non-insulin dependent diabetics, due to its readiness to provide energy to body cells. The study investigated the effects of integrated VCO in diabetic regiment diet, on fasting serum glucose, insulin, ketone and triglyceride concentrations. Majority of subjects consumed less energy,

fibre and sucrose compared to dietary recommendation. Treatment group consumed higher energy, fat and saturated fatty acids as compared to control group. No difference was observed in BMI, fasting serum glucose, insulin, ketone and triglyceride concentrations after integration of VCO in dietary regimen.¹

Results of a study of Anti-diabetic effects of cold and hot extracted virgin coconut oil revealed that "the beneficial effects may be attributed to increased polyphenolic and other antioxidants content present in hot extracted VCO".²

¹Excerpt from the invited paper : "The Effects of Virgin Coconut Oil on Fasting Serum Glucose, Insulin, Ketone and Tri-glyceride concentrations among Indonesian non-insulin dependent diabetics" presented by Dr. Drupadi H.S. Dhillon, Department of Nutrition, Faculty of Medicine, University of Indonesia at the 47th APCC COCOTECH Conference 2016 at Bali, Indonesia during 26-30 September 2016 .

² Anti-diabetic effects of cold and hot extracted virgin coconut oil by Mahadevappa Siddalingaswamy, Arunchand Rayaorth and Farhath Khanum – Journal of Diabetes Mellitus 2011; Vol 1(4) 118-123.

Coconut oil and the diet/heart hypothesis

For the past several decades you have heard about animal and human studies feeding coconut oil that purportedly showed increased indices for cardiovascular risk. Blackburn et al (1988) have reviewed the published literature of "coconut oil's effect on serum cholesterol and atherogenesis" and have concluded that when "...[coconut oil is] fed physiologically with other fats or adequately supplemented with linoleic acid, coconut oil is a neutral fat in terms of atherogenicity." The question then is, how did coconut oil get such a negative reputation. The answer quite simply is, initially, the significance of those changes that occurred during animal feeding studies were misunderstood. The wrong interpretation was then repeated until ultimately the misinformation and disinformation took on a life of its own.



The problems for coconut oil started four decades ago when researchers fed animals hydrogenated coconut oil that was purposefully altered to make it completely devoid of any essential fatty acids. The hydrogenated coconut oil was selected instead of hydrogenated cottonseed, corn or soybean oil because it was a soft enough fat for blending into diets due to the presence of the lower melting medium chain saturated fatty acids. The same functionality could not be obtained from the cottonseed, corn or soybean oils if they were made totally saturated, since all their fatty acids were long chain and high melting and could not be easily blended nor were they as readily digestible. The animals fed the hydrogenated coconut oil (as the only fat source) naturally became essential fatty acid deficient; their serum cholesterol levels increased. Diets that cause an essential fatty acid deficiency always produce an increase in serum cholesterol levels as well as an increase in the atherosclerotic indices. The same effect has also been seen when other essential fatty acid deficient, highly hydrogenated oils such as cottonseed, soybean or corn oils have been fed; so, it is clearly a function of the hydrogenated product, either because the oil is essential fatty acid (EFA) deficient or because of trans fatty acids (TFA).

Mary G. Enig, Ph.D., F.A.C.N. (USA)

Efficacy of coconut oil for the treatment and prevention of oral cancer



Anti oral cancer potential of different coconut oil compounds as well as their target protein and pathways were explored. Compounds from coconut oil like lauric acid, β -sitosterol, oleic and palmitic acid can target almost 20 cancer associated proteins. In enriched pathways analysis, it has been evident that all of them are the part of different cancer associated pathways. Results from the microarray of oral cancer cells vs normal cells reveals that some of the above selected protein differentially expressed in oral cancer indicating that coconut oil may have therapeutic potential for the treatment and prevention of oral cancer.¹

Results of a study on Metabolic management of brain cancer—“We provide information on a

new alternative approach to brain cancer management using restricted ketogenic diets. This therapeutic approach is based on the principles of evolutionary biology, metabolic control theory and the Warburg theory of cancer”²

Results of a study on the Effects of a ketogenic diet on the quality of life in 16 patients with advanced cancer : A pilot trial – “These pilot data suggest that a ketogenic diet is suitable for even advanced cancer patients. It has no severe side effects and might improve aspects of quality of life and blood parameters in some patients with advanced metastatic tumors”³.

1.Excerpt from the contributed paper : “Efficacy of coconut oil for the treatment and prevention of oral cancer” by Dr. Amit Ghosh,

Assistant Profssor, Department of Physiology, All India Institute of Medical Sciences, Bhubaneswar, India at the 2nd International Conference on Coconut Oil 2017, Bangkok, Thailand during 15-18 March 2017.

2.Metabolic management of brain cancer by Thomas N. Seyfried, Michael A. Kiebish, Jeremy Marsh, Laura M. Shelton, Leanne C. Huysentruyt and Purna Mukherjee - , *Biochimica et Biophysica Acta* 1807(2011) 577-594.

3.Source : Effects of a ketogenic diet on the quality of life in 16 patients with advanced cancer : A pilot trial by Melanie Schmidt, Nadja Pfedzer, Michael Schwab, Ingrid Strauss and Ulrike Kammerer –*Nutrition and Metabolism* 201;8:54.

In a published lab study, lauric acid (coconut oil is about 50% lauric acid) killed over 93% of human colon cancer cells (Caco-2) after 48 hours of treatment. Intriguingly, the lauric acid poisoned the cancer cells by simultaneously unleashing profound oxidative stress while strongly reducing their levels of glutathione (which is exactly what the cancer cells needed to protect themselves from the increased oxidative stress).

Many health benefits of coconut oil have already been well established through medical research. It naturally kills multiple viruses, bacteria, fungi and parasites. It aids in digestion and liver metabolism, reduces inflammation, and promotes healthier skin and faster wound healing when applied topically. It

Coconut Oil Kills Colon Cancer Cells

may also be an effective aid for diabetes. It has been shown to raise levels of the beneficial cholesterol HDL in women, improve their LDL: lassHDL ratio, and resulted in superior weight loss and abdominal loss compared to soybean oil.

Coconut oil is now being used in clinical trials for improving cholesterol in patients with chronic heart disease, in fighting Alzheimer's, and for improving blood pressure and blood sugar levels. Coconut oil

is unique in that it is about 50% lauric acid, a medium-chained triglyceride that is otherwise very hard to find in our diets (palm kernel oil is also about 50% lauric acid). Interestingly, lauric acid makes up about 2% of the fat in cow's milk but 6% of the fat in human milk, implying that humans may have a naturally higher need for this fatty acid.

These studies don't necessarily mean coconut is the panacea of cancer. What it means is that nature has provided many

natural ways to combat disease. The more research we can do and the more information we can share with others gives us opportunities to possibly find cures and preventive measures using Mother Nature instead of simply putting our faith in the medical communities singular approach to disease.

Fauser, J. K., Matthews, G. M., Cummins, A. G., & Howarth, G. S. (2013, December). Induction of apoptosis by the medium-chain length fatty acid lauric acid in colon cancer cells due to induction of oxidative stress. Retrieved from <http://www.ncbi.nlm.nih.gov/pubmed/24356281>



Virgin Coconut Oil and HIV

HIV/Aids is a global crisis affecting many aspects of life. HIV mainly destroys the immune system causing decreased quantity and quality of lymphocyte T cells, especially CD4. Progressiveness of the disease will depend mainly on the host immune response which is measured by the amount of CD4 in the body (CD4 count). Therefore CD4 count is the base of HIV infection classification.

Coconut oil has unique features, where it is not only a source of medium chain fatty acids which are easier to absorb and utilise by cells, it also contains lauric acid and capric acid, which have antimicrobial effects. These substances can destroy bacteria and virus which have lipid layer on their cell membrane. The experimental study conducted at the Special Health Centre, Dharmas Cancer Hospital in Jakarta studied the effects of VCO supplementation at 3X15 ml/day for 6 weeks on 40 HIV subjects. The CD4+ T lymphocyte count was used to indicate HIV disease progression, because HIV bind to this receptor in human body resulting in destruction and decline of CD4+ T lymphocyte count. It was found that VCO supplementation significantly increased CD4+ T lymphocyte concentration in HIV patients. The

antiviral ability of the lauric and capric acid in VCO could destruct the lipid capsule layer of virus more effectively than long chain fatty acids like oleic and linoleic acids.¹

Results of a study on Coconut Oil in Health and disease and its monolaurin's potential as cure for HIV/AIDS revealed that "this first clinical trial on HIV infected patients confirmed the anecdotal reports that coconut oil has an antiviral effect and can beneficially reduce the viral load of HIV patients. The positive viral action was seen not only with monolaurin acid but with coconut oil itself. Weight gain, decreasing viral counts and increasing CD4 counts were noticed."²

1.Excerpt from Invited Paper on "Role of Virgin Coconut Oil on HIV" presented by Dr. Kadek Dharma Widhiarta, Faculty of Medicine, University of Jember, Indonesia, at the 1st International Symposium on Quality Coconut Oil for Nutrition and Health, New Delhi, India during 28-29 September 2015

2.Coconut Oil in Health and disease : its and monolaurin's potential as cure for HIV/AIDS by Dr. Conrado S. Dayrit, Paper presented at the 37th APCC COCOTECH Meeting, Chennai, India July 25, 2000.

Virgin Coconut Oil and antimicrobial activity



Lipids naturally found in human skin are part of the body's innate immunity for first line antimicrobial defense. Initial studies on lipid antimicrobials (LAMs) were pursued in the 1930s but with the emergence of penicillin and synthetic antibiotics, studies were discontinued. Now with the emergence of antibiotic resistance and toxic and allergic reactions, interest has been revived in LAMs. Pioneering studies by Dr. Kabara that measured bacterial growth inhibition by virtue of chain length and degree of saturation of fatty acids demonstrated broad spectrum activity against bacteria, fungi and viruses.

Results of a study on the Antimicrobial agents derived from fatty acids revealed that "In general, lauroyl derivatives are the most effective. The safety and efficacy of fatty acid esters as potential germicides offer new and expanded roles for oleochemicals".¹

The most antimicrobial are coconut lauric and capric saturated fatty acids and their monoacyl glycerides. The hydrocarbon tails of these saturated fatty acids insert into the lipid bilayer of bacterial cell membranes to cause destabilisation and eventual dysfunction, that too within minutes. This precise targeted mechanistic activity deters bacteria to resist since to mutate its own cell membranes is low or nil. Multiple functions plus wide availability, renewability and relatively low cost of Coconut saturated fatty acids serve as attractions to develop them further. To enhance patentable modes of delivery, promising bench research using nanotechnology now bestows the promise of translation to wider clinical applications for LAMs.²



Lauric acid and capric acid present in virgin coconut oil is responsible for the antimicrobial activity. Lauric acid is converted to monolaurin and capric acid to monocaprin in the body during digestion. Monolaurin and monocaprin are the antiviral, antibacterial, antiprotozoal monoglyceride which destroys the microbes in the body.

1. Antimicrobial agents derived from fatty acids by John J. Kabara – JAOCS February 1984; Vol 61(2) (Put Kabara study first since he was the pioneer, Dr. Rowell continued inspired from his study)

2. Excerpt from the invited paper: "Lipid Antimicrobials Revisited in the Age of Antibiotic Resistance" presented by Dr. Vermon M. Verallo-Rowell, Director, VSRC Clinical Research Testing and Product Development, Philippines at the 2nd International Conference on Coconut Oil 2017, Bangkok, Thailand during 15-18 March 2017

Dermatological Studies on Coconut

Lauric monoglyceride or monolaurin possess uniquely potent anti-bacterial, -fungal, -viral and -protozoal properties which were explained by Dr. John J Kabara in the 1970s and further confirmed in the 1990s. Evidence based clinical trials were undertaken on the hypothesis that monolaurin is as effective and safe as isopropyl alcohol in a hand gel. The hypothesis could be proved through two randomised double blind clinical trials (RCTs). Further RCTs were published on coconut oil itself having excellent anti-microbial properties (like its monolaurin) and at the same time a quantified emollient. VCO is being used since 2000 at the VMV Skin Research Centre +Clinics (VSRC) for patients with dry and often microbially colonised psoriasis, acne, atopic, contact dermatitis and rosacea lesions. It was found that VCO moisturised skin looks and feels better than equally moisturised skin from other moisturiser types. Studies now recognise psoriasis as a T cell mediated chronic inflammatory disease. Similarly recognised as inflammatory are diabetes, obesity, hypertension and some neurodegenerative diseases that occur frequently in moderate to severe psoriasis and are called its co-morbidities. The chemical profile of coconut oil that may affect inflammation was reviewed and compared with other seed oils commonly used in cooking.*

* Excerpt from Invited Paper on "Dermatological Studies

on Coconut : Topical, Oral, an anti inflammatory food" presented by Dr. Vermen M. Verallo-Rowell, Director, VSRC Clinical Research Testing and Product Development, Philippines at the 1st International Symposium on Quality Coconut Oil for Nutrition and Health, New Delhi, India during 28-29 September 2015

Antimicrobial effects of Coconut oil

In Vitro antimicrobial properties of coconut oil on Candida species in Ibadan, Nigeria revealed that "Coconut Oil was active against species of Candida at 100% concentration compared to fluconazole. Coconut oil should be used in the treatment of fungal infections in view of emerging drug resistant Candida species".¹

In vitro killing of Candida albicans by fatty acids and monoglycerides showed that capric acid, a 10-carbon saturated fatty acid, causes the fastest and most effective killing of all three strains of C. albicans tested, leaving the cytoplasm disorganized and shrunken because of a disrupted or disintegrated plasma membrane. Lauric acid, a 12-carbon saturated fatty acid, was the most active at lower concentrations and after a longer incubation time.²

Virgin Coconut Oil (VCO) Enriched with Zn as Immunostimulator for Vaginal Candidiasis Patient - Vaginal candidiasis is a pathologic condition marked

by excessive production of mucus from vaginal vulva. Disturbance on the immune system and deficiency of Zn are two factors which often trigger vaginal candidiasis. The study showed that on the treatment to vaginal candidiasis patients, the VCO enriched with Zn was potential as immunostimulator. However, it is recommended for vaginal candidiasis patient to consume the VCO enriched with Zn with a dosage of 1 tablespoon each day to optimise the immune status.³

1. In Vitro antimicrobial properties of coconut oil on Candida species in Ibadan, Nigeria by D.O. Ogbolu, A.A. Oni, O.A. Daini and A.P. Oloko – J Med Food 2007;10(2), 384-387.

2. In vitro killing of Candida albicans by fatty acids and monoglycerides by Bergsson G, Arnfinnsson J, Steingrimsdottir O and Thormar H - Antimicrob Agents Chemother. 2001 Nov;45(11):3209-12.

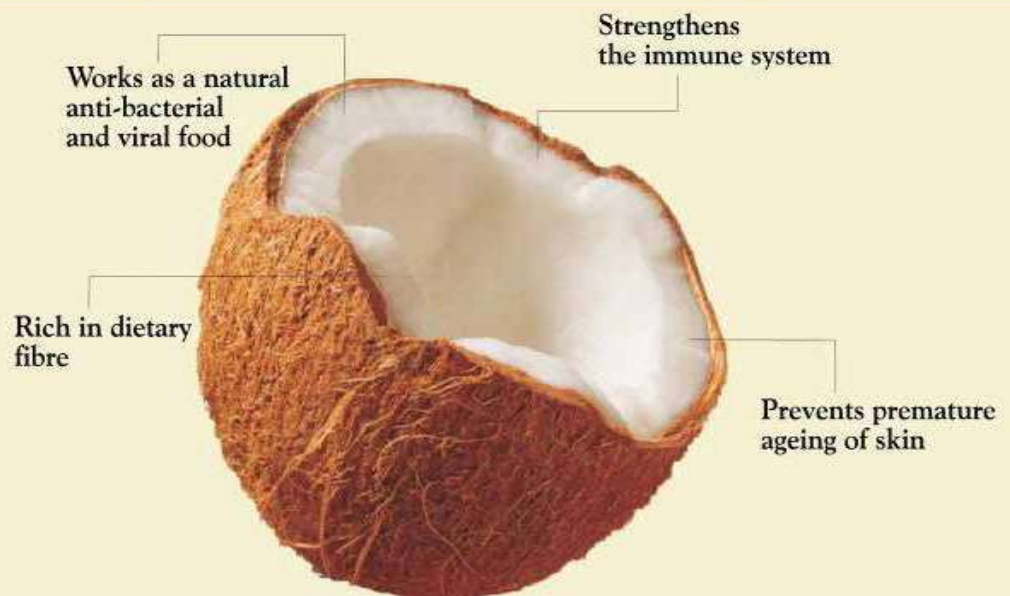
3. Virgin Coconut Oil (VCO) Enriched with Zn as Immunostimulator for Vaginal Candidiasis Patient by Nery Winarsi, Hernayanti and Agus Purwanto - HAYATI Journal of Biosciences, December 2008, p 135-139 Vol. 15, No. 4 ISSN: 1978-3019

Clinical Studies in Sri Lanka on consumption of **coconut oil**

Studies in Sri Lanka on dietary intervention where a supplement of coconut milk porridge was compared with soya milk porridge showed that Coconut Milk porridge produced a significant fall in LDL and rise in HDL cholesterol. A hospital based prospective control study of patients with acute coronary syndrome or cerebrovascular event (stroke) demonstrated that the use of coconut had a protective effect on the incidence of cardiovascular disease. Coconut and coconut oil consumption correlated negatively with cardiovascular deaths in Sri Lanka over a 45 year period from 1961 to 2006 where CVD death rates correlated positively with per capita GDP. Animal studies have shown that a mixture of scraped coconut and white coconut oil or virgin coconut oil fed to Wistar rats for 36 weeks caused a significant reduction in fasting blood glucose compared to baseline levels and tended to lower total cholesterol and elevate HDL. The ability of galactomannans from kernel and coconut fibre is also shown to have lipid lowering properties which may also have accounted for the beneficial effects of grated coconut. More work need to be undertaken in this area.

Source : Excerpt from Invited Paper on "Clinical Studies in Sri Lanka related to consumption of coconut oil" presented by Dr. Asoka Dissanayake, Co-Chair of the CRI-University of Kelaniya Research Group and Former Professor of Physiology, Faculty of Medicine, University of Kelaniya, Sri Lanka at the 1st International Symposium on Quality Coconut Oil for Nutrition and Health, New Delhi, India during 28-29 September 2015

Regular use of Coconut can change your life



Coconut oil & hair care

A study on the effect of mineral oil, sunflower oil, and coconut oil on prevention of hair damage showed that Coconut oil, being a triglyceride of lauric acid (principal fatty acid), has a high affinity for hair proteins and, because of its low molecular weight and straight linear chain, is able to penetrate inside the hair shaft. Mineral oil, being a hydrocarbon, has no affinity for proteins and therefore is not able to penetrate and yield better results. In the case of sunflower oil, although it is a triglyceride of linoleic acid, because of its bulky structure due to the presence of double bonds, it does not penetrate the fiber, consequently resulting in no favorable impact on protein loss.¹

A study on the secondary ion mass spectrometric investigation of penetration of coconut and mineral oils into human hair fibers: relevance to hair damage showed that coconut oil penetrates the hair shaft while mineral oil does not. The difference may be due to the polarity of the coconut oil compared to the nonpolar nature of the mineral oil. The affinity of the penetrant to the protein seems to be the cause for this difference in their behavior. This study also indicates that the swelling of hair is limited by the presence oil. Since the process of swelling and deswelling of hair is one of the causes of hair damage by hygral fatigue, coconut oil, which is a better penetrant than mineral oil, may provide better protection from damage by hygral fatigue.²

1. Effect of mineral oil, sunflower oil, and coconut oil on prevention of hair damage by Rele A. S and Mohile R. B - J Cosmet Sci. 2003 Mar-Apr;54(2):175-92.

2. Secondary ion mass spectrometric investigation of penetration of coconut and mineral oils into human hair fibers: relevance to hair damage by Ruetsch S. B, Kamath Y. K, Rele A. S and Mohile R.B - J Cosmet Sci. 2001 May-Jun;52(3):169-84.



Coconut Oil & obesity

Results of a study on effects of Dietary Coconut Oil on the Biochemical and Anthropometric Profiles of Women Presenting Abdominal Obesity showed that dietetic supplementation with coconut oil does not cause dyslipidemia and seems to promote a reduction in abdominal obesity.¹

Results of a study on the Physiological effects of Medium Chain Triglycerides : Potential Agents in the Prevention of Obesity revealed that "Fats varying in fatty acid chain lengths are metabolised differently. MCT containing 6-12 carbon fatty acids differ from LCT(which have fatty acids of >12 carbon), in that they are absorbed directly into the portal circulation and transported to the liver for rapid oxidation. LCT

however are transported via chylomicrons into the lymphatic system, allowing for extensive uptake into adipose tissue"²

Results of an Open-Label Pilot Study to Assess the Efficacy and Safety of Virgin Coconut Oil on reducing visceral adiposity revealed that "VCO is efficacious for waist circumference reduction especially in males and it is safe for use in humans".³

1. Effects of Dietary Coconut Oil on the Biochemical and Anthropometric Profiles of Women Presenting Abdominal Obesity by Monica L. Assunção, Haroldo S. Ferreira, Aldenir F. dos Santos, Cyro R. Cabral Jr and Telma M. M. T. Florêncio – Lipids; 2009; 44(7) 593-601

2. Physiological effects of Medium Chain Triglycerides : Potential Agents in the Prevention of Obesity by Marie-Pierre St-Onge and Peter J. H. Jones – J Nutr 2002;132:329-332

3. An Open-Label Pilot Study to Assess the Efficacy and Safety of Virgin Coconut Oil on reducing visceral adiposity by Kai Ming Liao, Yeong Teh Lee, Chee Keong, Chen and Aida Hanuman G. Rasool – ISRN Pharmacology 2011.

Market review – May 2017

Domestic price



Coconut Oil

During May 2017 the price of coconut oil opened at Rs. 13300 per quintal at Kochi and Alappuzha market and Rs.14300 per quintal at Kozhikode market and expressed slightly fluctuating trend during the month. During the first week, a decline in prices was observed at all three markets. However from the second week onwards, prices expressed an upward trend and continued till the end of the month.

The price of coconut oil closed at Rs.13600 per quintal at Kochi market and Alappuzha market and Rs.14600 per quintal at Kozhikode market with a net gain of Rs.300 at all three markets.

The price of coconut oil at Kangayam market in Tamilnadu, which opened at Rs.11533 per quintal, expressed an erratic trend and closed at Rs.11533 per quintal without any change.



Table1: Weekly price of coconut oil at major markets Rs/Quintal)

	Kochi	Alappuzha	Kozhikode	Kangayam
01.05.2017	13300	13300	14300	11533
07.05.2017	12800	12800	14100	11000
14.05.2017	13200	13100	14200	12000
21.05.2017	13400	13400	14400	11733
28.05.2017	13500	13500	14500	11667
31.05.2017	13600	13600	14600	11533

Milling copra

The price of milling copra at major markets moved in tune with the prices of coconut oil. During the month, the price of milling copra opened at Rs.8700 per quintal at Kochi and Alappuzha market and Rs.9050 per quintal at Kozhikode market and expressed slightly fluctuating trend during the month. During the

first week of the month prices expressed a declining trend. However from the second week onwards, prices expressed an upward trend and continued till the end of the month.

The prices closed at Rs.9000 at Kochi and Alappuzha market and Rs.9400 at Kozhikode markets with a net gain of Rs.300 per quintal at Kochi market and Alappuzha market and Rs.350 at Kozhikode market.

At Kangayam market in Tamilnadu, the prices expressed a similar trend as that of the Kerala markets. The prices opened at Rs.8100 and closed at Rs. 8200 per quintal with a net loss of Rs.100 per quintal.

Table2: Weekly price of Milling Copra at major markets (Rs/Quintal)

	Kochi	Alappuzha (Rasi Copra)	Kozhikode	Kangayam
01.05.2017	8700	8700	9050	8100
07.05.2017	8350	8450	8900	7900
14.05.2017	8700	8650	9050	8000
21.05.2017	8900	8900	9200	8100
28.05.2017	9000	8950	9350	8200
31.05.2017	9000	9000	9400	8200

Edible copra

The price of Rajapur copra at Kozhikode market which opened at Rs.8900 per quintal expressed an erratic trend during the month. The prices closed at Rs.9100 per quintal with a net gain of Rs.200 per quintal.

Table3 :Weekly price of edible copra at Kozhikode market (Rs/Quintal)

01.05.2017	8900
07.05.2017	8600
14.05.2017	9050
21.05.2017	9000
28.05.2017	9100
31.05.2017	9100

Ball copra

The price of ball copra at Tiptur market which opened at Rs.8000 per quintal, expressed an erratic trend during the month and closed at Rs.8100 with a net gain of Rs.100 per quintal.

Table 4 : Weekly price of Ball copra at major markets in Karnataka (Rs/Quintal)

	Tiptur
01.05.2017	8000
07.05.2017	7800
14.05.2017	8166
21.05.2017	8000
28.05.2017	8100
31.05.2017	8100



Dry coconut

At Kozhikode market, the price of dry coconut opened at Rs.6500 per quintal. The price expressed an upward trend during the first fortnight of the month and thereafter declined during the third week. However from the fourth week onwards prices expressed an upward trend and closed at Rs.8100 with a net gain of Rs.1600 per thousand nuts.

Table5 : Weekly price of Dry Coconut at Kozhikode market (Rs/1000 coconuts)

01.05.2017	6500
07.05.2017	7800
14.05.2017	8166
21.05.2017	8000
28.05.2017	8100
31.05.2017	8100

Coconut

At Nedumangad market the price of partially dehusked opened at Rs. 15000 and closed at

Rs.14000 per thousand nuts with a net loss of Rs.1000 per thousand nuts. At Bangalore APMC, price of partially dehusked of opened at Rs.20000 per thousand nuts and closed at same price. At Mangalore APMC market the price of partially dehusked coconut of grade-I quality opened at Rs.21000 per thousand nuts and closed at Rs.20000 per thousand nuts with a net loss of Rs.1000 per thousand nuts.

Table 6: Weekly price of coconut at major markets (Rs /1000 coconuts)

	Nedumangad	Banglore	Mangalore (Grade-1)
01.05.2017	15000	20000	21000
07.05.2017	15000	20000	20000
14.05.2017	14000	20000	20000
21.05.2017	14000	20000	20000
28.05.2017	14000	20000	20000
31.05.2017	14000	20000	20000

Tender coconut

The price of tender coconut at Maddur APMC market in Karnataka opened at Rs.10000 per thousand nuts and remained the same level throughout the month.

Table7 : Weekly price of tender coconut at Maddur market (Rs/1000 coconuts)

01.05.2017	10000
07.05.2017	10000
14.05.2017	10000
21.05.2017	10000
28.05.2017	10000
31.05.2017	10000



International price

Coconut oil

The international (CIF Rotterdam) and domestic price of coconut oil at Philippines and Indonesia declined during the second week of the month and thereafter expressed an upward trend. The price of coconut oil quoted at different international/ domestic markets is given below.

Table 8: Weekly price of coconut oil in major coconut oil producing countries during May 2017

	International Price(US\$/MT)	Domestic Price(US\$/MT)		
	Philippines/ Indonesia (CIF Europe)	Philippines	Indonesia	India*
6/5/2017	1710	n.q.	1825	1993
13/05/2017	1564	n.q.	1372	2048
20/05/2017	1622	1600	1683	2083
27/05/2017	1775	1710	1686	2088

* Kochi Market

Copra

The domestic price of copra at Philippines, Indonesia and Srilanka expressed a fluctuating trend during the month. Price of copra in and India expressed a slight upward trend.

Table 9: Weekly price of copra in major copra producing countries during May 2017

	Domestic Price(US\$/MT)			
	Philippines	Indonesia	Srilanka	India*
6/5/2017	1056	902	1451	1300
13/05/2017	1051	864	1450	1350
20/05/2017	1025	946	1532	1383
27/05/2017	1042	993	1467	1392

* Kochi Market



Desiccated coconut

The FOB price of desiccated coconut in India during the month of May was competitive compared to the international prices of major DC exporting countries.

Table 10: Weekly price of desiccated coconut during May 2017

	Domestic Price (US\$/MT)			
	Philippines	Indonesia	Srilanka	India*
6/5/2017	2673	2350	3028	2233
13/05/2017	2646	2350	3060	2232
20/05/2017	2640	2330	2784	2264
27/05/2017	2640	2350	2936	2040

*FOB

Coconut

Among major coconut producing countries, the price of coconut at Philippines and Srilanka expressed a declining trend. At Indonesia a slight increase in the prices of dehusked coconut was observed during the month. The domestic price of dehusked coconut in India expressed an erratic trend during the month.

Table 11: Weekly price of dehusked coconut with water during May 2017

Date	Domestic Price (US\$/MT)			
	Philippines	Indonesia	Srilanka	India*
6/5/2017	241	248	302	397
13/05/2017	239	248	302	411
20/05/2017	238	248	294	404
27/05/2017	227	263	292	410

*Pollachi market

Coconut shell charcoal

The domestic price of coconut shell charcoal in India expressed an erratic trend during the month.

Table 12: Weekly price of coconut shell charcoal during May 2017

Date	Domestic Price(US\$/MT)			
	Philippines	Indonesia	Srilanka	India
6/5/2017	386	470	441	405
13/05/2017	386	459	441	403
20/05/2017	386	473	472	404
27/05/2017	386	473	482	402

*Kangayam



Monthly operations in the coconut gardens- July

Andaman & Nicobar Islands: Open basins around palms of a radius of 2m from the base of the palm. Apply 25 to 50 kg of cattle manure or compost and 10-20 kg of ash per tree and cover the basins with soil. Remove the weeds in the nursery.

Andhra Pradesh : Continue manure application if not done during June. Plant seedlings in the main field. As a prophylactic measure against the infestation of rhinoceros beetle, fill the youngest three leaf axils with a mixture of 250g powdered marrotti/ neem cake with equal volume of sand or place naphthalene balls(12g/ palm) and cover them with sand thrice a year. If the attack of the mite is noticed, spray neem oil - garlic – soap emulsion 2 percent (20 ml neem oil + 20 g garlic emulsion + 5 g soap in 1 litre water) or commercial botanical pesticides containing azadirachtin 0.004 per cent @ 4ml per litre on bunches, especially on the perianth region of buttons and affected nuts or root feed neem formulations containing azadirachtin 5 per cent @ 7.5 ml with equal quantity of water.

Assam : Do not allow rain water to accumulate in the pits of transplanted seedlings. Clean the crowns of the palms. If stem bleeding disease is noticed, (1) remove the affected tissues of the stem and apply 5 percent calixin on the wound. When this is dry apply warm coal tar (2) root feed the affected palm with 5 ml calixin in 100 ml water per palm at quarterly intervals (3) apply 5 kg neem cake per palm per year along with the organic manure during the post monsoon period (4) regulate field regime by providing proper drainage during rains and irrigating the palms during summer.

If bud rot disease is noticed, remove and clean the infected tissues and apply Bordeaux paste on the affected portion. The treated portion should be given a protective covering to prevent washing out of the paste during rains. Spray the neighbouring plants with one percent bordeaux mixture. Adopt plant protection measures when the weather is clear. Remove the weeds from the nursery.

Bihar / Madhya Pradesh/ Chhattisgarh : Provide proper drainage. Do not allow rain water to accumulate for a long time in the pits. Transplant selected good quality seedlings in the already prepared and half filled pits. Drench the basins of transplanted seedlings with 0.05 percent chlorpyrifos twice at 20 to 25 days interval against the attack of termites. Apply 2 kg bone meal or single superphosphate in the pit before planting. Open the basins around the palm of a radius of 2m upto a depth of 15-20 cm, and apply manures and fertilizers and cover with soil.

During this month apply 30-50 kg farmyard manure/ compost per palm in the basin before the application of fertilizers. In irrigated and well maintained gardens apply the fertilizers @ 275g of urea, 500g single super phosphate and 500g muriate of potash. In rain fed gardens apply the first dose (1/3 of the recommended dose) of fertilizers i.e. 250g urea, 350g single superphosphate and 400 g muriate of potash, per adult palm and cover with soil. The gaps caused by the death of seedlings (previous year's planting) should be filled up, preferably with polybag seedlings. Similarly, remove all unhealthy and defective seedlings and

replant with healthy seedlings. Check the palms for bud rot. If bud rot is found, remove the affected parts and apply bordeaux paste. Spray the neighbouring palms/ seedlings with 1 per cent bordeaux mixture.

Karnataka : Open circular basins around the palm, of a radius of 2m. Take appropriate control measures if attacks of rhinoceros beetle and red palm weevil are noticed. Keep the garden free of weeds. Give a prophylactic spray with 1 per cent bordeaux mixture if not given during the last month. Seedlings can be planted during this month. If the attack of the mite is noticed, spray neem oil - garlic – soap emulsion 2 percent (20 ml neem oil + 20g garlic emulsion + 5g soap in 1 litre water) or commercial botanical pesticides containing azadirachtin 0.004 per cent @ 4ml per litre on bunches, especially on the perianth region of buttons and affected nuts or root feed neem formulations containing azadirachtin 5 per cent @ 7.5 ml with equal quantity of water.

Kerala/Lakshadweep : Open basins around the palms, of a radius of 2 m and fill them with green manure cuttings or green leaves @ 25kg per palm or bulky organic manures like cowdung, compost, etc.@ 50kg per adult palm and close the basins partially, if not done in June. Clean the pits in which seedlings have been planted. Search the crowns of trees for rhinoceros beetle, red palm weevil and also for bud rot disease. Take steps to check them. Clean the crown of the palm. If the attack of the mite is noticed, spray neem oil - garlic - soap emulsion 2 percent (20 ml neem oil + 20g garlic emulsion + 5g soap in 1 litre water) or commercial botanical pesticides containing azadirachtin 0.004 per cent @ 4ml per litre on bunches, especially on the perianth region of buttons and affected nuts or root feed neem formulations containing azadirachtin 5 per cent @ 7.5 ml with equal quantity of water. Remove the weeds from the nursery.

Maharashtra/ Goa/ Gujarat : Bury husk in trenches between palms with concave side up. A



prophylactic spray with 1 per cent bordeaux mixture may be given against fungal diseases.

Orissa : As a prophylactic measure against the infestation of rhinoceros beetle, fill the youngest three leaf axils with a mixture of 250g powdered marrotti/ neem cake with equal volume of sand or place naphthalene balls(12g/palm) and cover them with sand thrice a year. Hook out the rhinoceros beetles. Manure vegetables and other crops. Give a prophylactic spray with 1 per cent bordeaux mixture against fungal diseases.

Tamil Nadu/ Puducherry : Open basins around the palms. Keep the garden free of weeds. Give the palms a prophylactic spray with one per cent bordeaux mixture to prevent bud rot and other fungal diseases. Apply the first dose of fertilizers i.e. 300g urea, 500g single superphosphate and 500 g muriate of potash per adult palm if not applied during last month. Search for rhinoceros beetle on the crowns of the palms with the beetle hook and kill the beetles. As a prophylactic measure against the infestation of rhinoceros beetle, fill the youngest three leaf axils with a mixture of 250g powdered marrotti/ neem cake with equal volume of sand or place naphthalene balls (12g/ palm) and cover them with sand thrice a year. Planting of seedlings in the main field can be done during this month. Search palms affected by Thanjavur wilt and take appropriate management practices. If the attack of the mite is noticed, spray neem oil - garlic - soap emulsion 2 percent (20 ml neem oil + 20g garlic emulsion + 5g soap in 1 litre water) or commercial botanical pesticides containing azadirachtin 0.004 per cent @ 4ml per litre on bunches, especially on the perianth region of buttons and affected nuts or root feed neem formulations containing azadirachtin 5 per cent @ 7.5 ml with equal quantity of water.

Tripura : Basin around the palm should be cleaned by removing the weeds. Green manure crops sown in May if any, should be ploughed and incorporated during the month. As a prophylactic measure against the infestation of rhinoceros beetle, fill the youngest three leaf axils with a mixture of 250g powdered marrotti/ neem cake with equal volume of sand or place naphthalene balls(12g/ palm) and cover them with sand thrice a year. Collected seed nuts may be sown in seed beds without delay by taking advantage of the rain.

West Bengal : Apply green manure at the rate of 25 kg per palm. Keep the garden free of weeds. Start planting of seedlings in the main field. A prophylactic spray of 1 percent bordeaux mixture against fungal diseases may be given. ■