

Coconut Oil and Medium-Chain Triglycerides

by Bruce Fife, N.D.

All fats and oils are composed of fat molecules called fatty acids. There are two methods of classifying fatty acids. The one you are most familiar is based on saturation. You have saturated fatty acids, monounsaturated fatty acids, and polyunsaturated fatty acids. The second method of classification is based on molecular size or length of the carbon chain in the fatty acid. You have short-chain fatty acids (SCFA), medium-chain fatty acids (MCFA), and long-chain fatty acids (LCFA). Another term you will often see in reference to fatty acids is triglyceride. Three fatty acids joined together make a triglyceride, so you may have short-chain triglycerides (SCT), medium-chain triglycerides (MCT), or long-chain triglycerides (LCT).

The vast majority of the fats and oils you eat, whether they are saturated or unsaturated or come from an animal or a plant, are composed of long-chain triglycerides. Probably 98 to 100% of all the fats we eat consist of LCT. Coconut oil is unique because it is composed predominately of MCT. The size of the fatty acid is extremely important because physiological effects of medium-chain fatty acids in coconut oil are distinctly different from the long-chain fatty acids more commonly found in our diet. It's the MCT in coconut oil that make it different from all other fats and for the most part gives it its unique character and healing properties. Almost all of the medium-chain triglycerides used in research, medicine, and food products come from coconut oil.

Have you or someone you know ever been in a serious car accident? I mean serious enough that you had to be rushed to the hospital and spend time in the intensive care unit. Or maybe you've come down with a life-threatening illness. Or perhaps due to age you've been hospitalized to treat some degenerative condition. In any of these situations, whether you lived or died depended on the care you received in the hospital. Often this required you to be fed intravenously or through a tube. In the intensive care unit there would be others, some suffering from complications from genetic diseases such as cystic fibrosis or epilepsy and perhaps even premature infants struggling to survive their first few weeks of life. In each of these cases you and these other patients can give some of the credit for your recovery to coconut oil. Yes, in one form or another, coconut oil was part of your treatment.

Regardless of the condition, recovery requires good nutrition. Food scientists have long noted the nutritional benefits of medium-chain triglycerides. MCT from coconut oil are used in hospital formulas to feed the very young, the critically ill, and those who have

digestive problems. It makes up a vital part of the solutions fed to patients intravenously or through a tube inserted down the throat. If you were ever given formula as a baby you took advantage of the health-promoting properties of coconut oil. MCT from coconut oil have been added to baby formula for decades.

MCT are easily digested, absorbed, and put to use nourishing the body. Unlike other fats, they put little strain on the digestive system and provide a quick source of energy necessary to promote healing. This is important for patients who are using every ounce of strength they have to overcome serious illness or injury. It's no wonder why MCT are added to infant formulas. Actually, whether you were breast or formula fed as an infant you consumed MCT. Why? Because MCT are not only found in coconut oil but are natural and vital components of human breast milk. MCT are considered essential nutrients for infants as well as for people with serious digestive problems like cystic fibrosis. Like other essential nutrients, you must get them directly from the diet.

One of the first scientifically recognized benefits of MCT is the unique manner in which they are digested and utilized by the body. These fats provide nutritional benefits that can improve overall health of both the sick and the well, the young and the old. Even athletes are now using them to boost performance and control weight. Unfortunately, few foods nowadays contain MCT; the best source is coconut oil. By adding coconut oil to your diet you can literally eat your way to better health.

Digestion and Nutrient Absorption

For at least five decades researchers have recognized that the MCT were digested differently than other fats. This difference has had important applications in the treatment of many digestive and metabolic health conditions and since that time MCT have been routinely used in hospital and baby formulas.

The digestive health advantages of MCT) over LCT are due to the differences in the way our bodies metabolize these fats. Because the MCT molecules are smaller, they require less energy and fewer enzymes to break them down for digestion. They are digested and absorbed quickly and with minimal effort.

MCT are broken down almost immediately by enzymes in the saliva and gastric juices so that pancreatic fat-digesting enzymes are not even essential.¹ Therefore, there is less strain on the pancreas and digestive system. This has important implications for patients who suffer from digestive and metabolic problems. Premature and ill infants especially whose digestive organs are underdeveloped, are able to absorb MCT with relative ease, while other fats pass through their systems pretty much undigested. People who suffer from malabsorption problems such as cystic fibrosis, and have difficulty digesting or absorbing fats and fat soluble vitamins, benefit greatly from MCT. They can also be of importance to people suffering from diabetes, obesity, gallbladder disease, pancreatitis Crohn's disease, pancreatic insufficiency, and some forms of cancer.

As we get older our bodies don't function as well as they did in earlier years. The

pancreas doesn't make as many digestive enzymes, our intestines don't absorb nutrients as well, the whole process of digestion and elimination moves at a lower rate of efficiency. As a result, older people often suffer from vitamin and mineral deficiencies. Because MCT are easy to digest and improve vitamin and mineral absorption they should be included in the meals of older people. This is easy to do if the meals are prepared with coconut oil.

In the digestive system MCT are broken down into individual fatty acids (MCFA). Unlike other fatty acids, MCFA are absorbed directly from the intestines into the portal vein and sent straight to the liver where they are, for the most part, burned as fuel much like a carbohydrate. In this respect they act more like carbohydrates than like fats.²

Other fats require pancreatic enzymes to break them into smaller units. They are then absorbed into the intestinal wall and packaged into bundles of fat (lipid) and protein called lipoproteins. These lipoproteins are carried by the lymphatic system, bypassing the liver, and then dumped into the bloodstream, where they are circulated throughout the body. As they circulate in the blood, their fatty components are distributed to all the tissues of the body. The lipoproteins get smaller and smaller, until there is little left of them. At this time they are picked up by the liver, broken apart, and used to produce energy or, if needed, repackaged into other lipoproteins and sent back into the bloodstream to be distributed throughout the body. Cholesterol, saturated fat, monounsaturated fat, and polyunsaturated fat are all packaged together into lipoproteins and carried throughout the body in this way. In contrast, medium-chain fatty acids are not packaged into lipoproteins but go to the liver where they are converted into energy. Ordinarily they are not stored to any significant degree as body fat. Medium-chain fatty acids produce energy. Other dietary fats produce body fat.

Because of the above advantages, coconut oil has been a lifesaver for many people, particularly the very young and the very old. It is used medicinally in special food preparations for those who suffer digestive disorders and have trouble digesting fats. For the same reason, it is also used in infant formula for the treatment of malnutrition. Since it is rapidly absorbed, it can deliver quick nourishment without putting excessive strain on the digestive and enzyme systems and help conserve the body's energy that would normally be expended in digesting other fats. Medium-chain triglycerides comprise a major ingredient in most infant formulas commonly used today.

Metabolism and Energy

Eating foods containing MCT is like putting high octane fuel into your car. The car runs smoother and gets better gas mileage. Likewise, with MCT your body performs better because it has more energy and greater endurance. Because MCFA are funneled directly to the liver and converted into energy, the body gets a boost of energy. And because MCFA are easily absorbed by the energy-producing organelles of the cells, metabolism increases. This burst of energy has a stimulating effect on the entire body.

The fact that MCT digest immediately to produce energy and stimulate metabolism has

led athletes to use them as a means to enhance exercise performance. Studies indicate this may be true. In one study, for example, investigators tested the physical endurance of mice who were given MCT in their daily diet against those that weren't. The study extended over a six-week period. The mice were subjected to a swimming endurance test every other day. They were placed in a pool of water with a constant current. The total swimming time until exhaustion was measured. While at first there was little difference between the groups of mice, those fed MCT quickly began to out-perform the others and continued to improve throughout the testing period.³ Tests such as this demonstrated that MCT had the ability to enhance endurance and exercise performance, at least in mice.

In another study using humans, conditioned cyclists were used. The cyclists pedaled for three hours. During the last hour they were each given a beverage to drink. Those who received beverages containing MCT out performed the others. Because of studies like these many of the sports drinks and energy bars sold at health food stores contain MCT to provide a quick source of energy.

It's easy to see why athletes would be interested in gaining greater endurance and energy, but what about non-athletes? MCT can do the same for them. If eaten regularly MCT can provide a boost in energy and performance of daily activities. Would you like to increase your energy level throughout the day? If you get tired in the middle of the day or feel you lack energy, adding coconut oil to your daily diet may provide you with a much needed boost to help carry you through.

Besides increasing your energy level, there are other very important benefits that results from boosting your metabolic rate: it helps protect you from illness and speeds healing. When metabolism is increased, cells function at a higher rate of efficiency. They heal injuries quicker, old and diseased cells are replaced faster, and young, new cells are generated at an increased rate to replace worn-out ones. Even the immune system functions better.

Several health problems such as obesity, heart disease, and osteoporosis are more prevalent in those people who have slow metabolism. Any health condition is made worse if the metabolic rate is slower than normal, because cells can't heal and repair themselves as quickly. Increasing metabolic rate, therefore, provides an increased degree of protection from both degenerative and infectious illnesses.

Nature's Perfect Food

Among all the foods in nature there is one that stands head and shoulders above all the rest. That food is mothers' milk. Milk was designed by nature to supply all the nutrients a baby needs for the first year or so of life. It contains a perfect blend of vitamins, minerals, proteins, and fats for optimal growth and development. Without question breast milk is one of the wonders of nature.

Children who are breastfed not only take in important nutrients from the milk, but they also receive antibodies and other substances necessary to protect them against childhood

illnesses such as ear infections, later in life. Breastfed children are healthier than those who are not. They have better teeth and jaw formation, they are less prone to allergies, have better digestive function, and are better able to fight off infectious disease. Research suggests that breastfed children may even develop higher intelligence. Recognizing the superiority of nature, scientists have attempted to make baby formula match mother's milk as closely as possible.

An important component of breast milk is medium-chain fatty acids, principally lauric acid. Lauric acid is also the primary saturated fatty acid found in coconut oil. Apparently nature thought it essential to the baby's health to include it. Nature has a reason for everything it does. It doesn't do things, such as putting MCT in milk, just for the fun of it.

Some of the important reasons medium-chain fatty acids are included in milk are improved nutrient absorption and digestive function. As noted earlier, pancreatic enzymes aren't even necessary to digest them. They also help to regulate blood sugar levels. Another very important function is that medium-chain fatty acids protect the baby from harmful microorganisms. The baby's immature immune system is supported by the antibacterial, anti-viral, anti-fungal, and anti-parasitic properties of these vital fatty acids. In fact, without these unique saturated fats, the baby would probably not survive long. It would become malnourished and highly susceptible to a myriad of infectious diseases.

Milk Quality and MCT

Milk that is rich in medium-chain fatty acids is vital for the healthy growth and development of the child. For this reason, MCT are added to most, if not all, baby formulas. Yet, these fatty acids are not exactly the same as those found naturally in mother's milk.

Just as the fatty acid content and quality of formula can be altered, so can human breast milk. Breast milk is, without question, the best choice of food for babies. Not all breast milk is the same however. The quality of the milk is influenced by the mother's health and diet. Breast milk is made from the nutrients the mother consumes. If she doesn't eat the right amount of nutrients, her body will pull them out of her own tissues. If the mother is deficient in these vital nutrients herself, then the milk she produces will also be deficient. Similarly, if she eats foods containing toxins (such as trans fatty acids) her milk may contain them as well. Eating wisely is very important for pregnant and nursing women and their babies.

The mammary glands produce small amounts of all the medium-chain fatty acids, vital components in human breast milk. They are there because they are easy for an infant's immature digestive system to absorb and utilize. They help give the baby the nutrients and energy it needs to grow and develop properly. Because they also have antimicrobial properties they give the infant some degree of protection against viruses such as HIV and herpes, bacteria such as chlamydia and H. pylori, fungi such as Candida and protozoa such as giardia.

Both animal and human studies have shown MCT to be an important component in mother's milk for the proper growth and development of their offspring. For example, when pregnant and lactating pigs were fed diets containing either long-chain fatty acids (vegetable oil) or medium-chain fatty acids (coconut oil) there was a pronounced difference in the survival and growth rates. The piglets whose mothers received the MCT grew faster and healthier and had a survival rate of 68% compared to 32%. This was particularly true with piglets which were born underweight.⁵

The same thing appears to happen in humans. For example, coconut oil was added to the formula of 46 very low-birthweight babies to see if supplementation was capable of enhancing their weight gain. The group with the coconut oil gained weight quicker. The weight gain was due to physical growth and not fat storage.⁶ The babies gained more weight and grew better with the coconut oil because their bodies were able to digest it easily. The vegetable oils, to a great extent, passed through their digestive tracts undigested and thus deprived them of the fat calories they needed for proper development. MCT not only allow infants to absorb needed fats but they improve the absorption of fat-soluble vitamins, minerals, and protein.^{7,8}

Human milk fat has a unique fatty acid composition. The primary fat is saturated, comprising about 45-50 percent of the total fat content. The next most abundant fat is monounsaturated which makes up about 35 percent of the milk fat. Polyunsaturated fat comprises only 15-20 percent of the total. A significant portion of the saturated fat in human breast milk can be in the form of MCT. Sadly, many mothers produce very little. This can have dramatic consequences on the health of their children.

If breast milk does not contain enough MCT, an infant can suffer from nutritional deficiency and become vulnerable to infectious illness. Therefore, it is important that mother's milk contain as much MCT as nature will allow. This can be done with diet. Given an ample supply of food containing medium-chain fatty acids, a nursing mother will produce a milk rich in these health-promoting nutrients.⁹ While cow's milk and other dairy products contain small amounts, the foods richest in medium-chain fatty acids are the tropical oils, principally coconut oil.

The levels of these antimicrobial fatty acids can be as low as 3 to 4 percent, but when nursing mothers eat coconut products (shredded coconut, coconut milk, coconut oil, etc.) the levels of MCT in their milk increase significantly. For instance, eating 40 grams (about 3 tablespoons worth) of coconut oil in one meal can temporarily increase the lauric acid in the milk of a nursing mother from 3.9% to 9.6% after 14 hours.¹⁰ The content of caprylic and capric acids are also increased. "This gives an important benefit," says Mary G. Enig, Ph.D. an expert in lipid chemistry and Fellow of the American College of Nutrition. "The milk has increased amounts of the protective antimicrobials lauric acid and capric acid, which gives even greater protection to the infant." If the mother consumes coconut oil every day while nursing, the medium-chain fatty acid content will be even greater.

Preparation by the mother should start before the baby is born. Pregnant women store fat

to be used later in making their milk. After the baby is born the fatty acids stored in the mother's body and supplied by her daily diet are used in the production of her milk. If she has eaten and continues to eat foods which supply ample amounts of MCFA, particularly lauric acid and capric acid (the two most important antimicrobial medium-chain fatty acids), her milk will provide maximum benefit to her baby. These mothers can have as much as 18 percent of the saturated fatty acids in their milk in the form of lauric and capric acids.

If the mother did not eat foods containing MCT and does not eat them while nursing, her mammary glands will only be capable of producing about 3 percent lauric acid and 1 percent capric acid. Her child will lose a great deal of the nutritional benefits as well as the antimicrobial protection the infant could have otherwise had.

Protection from Illness

One of the major characteristics of human breast milk is its ability to protect infants from a myriad of infectious illnesses during a time when their immune systems are immature and incapable of adequately defending themselves. The protective antimicrobial substances in milk that protect the child from a world teeming with infectious germs and parasites are the MCFA. There are some illnesses that even an adult with a healthy immune system may have difficulty fighting off. If the baby is not protected with an adequate amount of MCT in his or her milk, exposure to such an infection could result in serious illness.

When a nursing mother is infected with such an illness, her child is also vulnerable. Mothers infected by certain viruses can pass the infection on to their infants through breastfeeding. In these cases breastfeeding is not recommended. This is particularly true when the mother is infected with a dangerous virus such as HIV. Recent research has shown that mothers who include a source of lauric acid, such as coconut oil, in their diets have lower risk of infecting their nursing infants. The presence of the MCT in the milk lowers the level of the virus in the milk and thus helps lower the risk of transmission of the disease.

While HIV-infected mothers are usually advised not to breastfeed their young for fear that the virus may be transferred, there is no feasible option in some parts of the world. Many women in resource-poor areas do not have the financial means to buy infant formula. Breastfeeding is really their only option. Adding coconut products and coconut oil to the mother's diet is the only practical defense these women have against passing the AIDS virus to their children.

It has been recommended that HIV-infected mothers who are breastfeeding consume 24-28 grams/day of lauric acid and 3-4 grams/day of capric acid to prevent the transfer of the virus. Since coconut oil is nearly 48 percent lauric acid and 7 percent capric acid, this requirement would be met if the mother ate about 50-55 grams of coconut oil each day. A tablespoon is equivalent to 14 grams. So 3 1/2 tablespoons of coconut oil a day would provide the recommended amount of both lauric and capric acids.

Other viral infections such as those that cause measles, herpes, mononucleosis, and such are also a threat to nursing infants. Pregnant women and nursing mothers can help protect their children by eating an abundant amount of coconut oil or products that contain coconut oil, such as shredded coconut or coconut milk.

Any mother or expectant mother who desires a healthy, well-developed baby should consider adding coconut oil to her diet. She will not only assure better health for her children but will benefit greatly herself.

MCFA are vital nutrients and protectors found naturally in human milk. They are deadly enough to kill the AIDS virus yet gentle enough to nourish a premature infant to health. As we grow to adulthood and beyond, our bodies begin to wear down. MCFA can help nourish and protect us, as it does infants, from infectious and degenerative disease. It appears that coconut oil provides many health benefits to those who are very young and those who are very old and all those in between!

References:

1. Thampan, P.K. 1994. Facts and Fallacies About Coconut Oil. Asian and Pacific Coconut Community, p.8
2. Kiyasu G.Y., et al. 1952. The portal transport of absorbed fatty acids. Journal of Biological Chemistry 199:415
3. Fushiki, T. and Matsumoto, K. 1995, Swimming endurance capacity of mice is increased by chronic consumption of medium-chain triglycerides. Journal of Nutrition 125:531
4. Applegate, L. 1996. Nutrition. Runner's World 31:26
5. Azain, M.J., 1993. Effects of adding medium-chain triglycerides to sow diets during late gestation and early lactation on litter performance. J. Anim. Sci. 71(11):3011
6. Vaidya, U.V., et al. 1992 Vegetable oil fortified feeds in the nutrition of very low birthweight babies. Indian Pediatr. 29(12):1519
7. Tantibhedhyangkul, P. and Hashim, S.A., 1978. Medium-chain triglyceride feeding in premature infants: effects on calcium and magnesium absorption. Pediatrics 61(4):537
8. Jiang, Z.M., Et al. 1993. A comparison of medium-chain and long-chain triglycerides in surgical patients. Ann. Surg. 217(2):175
9. Francois, C.A., et al. 1998. Acute effects of dietary fatty acids on the fatty acids of human milk. Am. J. Clin. Nutr. 67:301
10. Ibid

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