

History of Chocolate



Chocolate Craving Has Ancient Roots

Archaeologists find traces of the sweet in pottery more than 3,000 years old

FRIDAY, Nov. 16 (HealthDay News) -- Archaeologists say they've found one of the oldest traces ever of human chocolate consumption in pottery vessels more than 3,000 years old.

The jugs -- thought to have contained a fermented chocolate concoction -- date from 1150 B.C. and were used by Mesoamerican people in what is now Puerto Escondido, Honduras.

'It appears to have been used in a beverage, which was made from the pulp of the chocolate fruit. Later, they started to focus on the bean itself,' said researcher Patrick McGovern, a senior research scientist and associate professor of anthropology at the Museum Applied Science Center for Archaeology, University of Pennsylvania Museum.

The cacao drink appears to have been fermented and was mildly alcoholic, containing about 5 percent alcohol, McGovern said. These ancient peoples apparently domesticated the cacao (chocolate) tree to produce these drinks, commonly consumed in ceremonies that marked weddings and births.

The findings were published in this week's *Proceedings of the National Academy of Sciences*.

While McGovern's team claimed the find represented the 'earliest cacao beverages' found, not everyone agreed.

'Chocolate is incredibly old in that part of the world [Mesoamerica],' said Michael D. Coe, the emeritus professor of anthropology at Yale University and co-author of *The True History of Chocolate*.

Newer studies have found even older chocolate on the Pacific coast of Mexico, Coe said. 'The earliest sample is 1,200 years older than what this team reports. It looks like chocolate is almost 4,000 years old in that part of the world,' Coe added.

Study lead author John S. Henderson, a professor of anthropology at Cornell University in Ithaca, N.Y., said that while he wasn't aware of the new data Coe cites, 'it is very possible' that an older use of cacao had been found.

McGovern's team based their conclusion on finding traces of the chemical theobromine, a chemical found only in cacao plants, in pottery vessels used to hold liquids.

It is not clear what the drink looked like or how it tasted, McGovern said. But it would have had a sweet chocolate taste, he said. 'Later, when the drink was being made from the bean, other things such as chilies, honey, and flowers and spices were added,' he said.

Chocolate drinks made from the cacao bean were later used by the Mayans and Aztecs, McGovern noted.

Henderson said the findings pointed to the haphazard way customs developed and changed over time.

He argued that it was significant that the first use of chocolate was sourced and fermented from the plant's pulp. If this is true, then the way the Aztecs and others used chocolate, as well as the modern chocolate industry, 'becomes an accident. An unintended consequence of early beer brewing,' he noted.

'It makes a nice example that important developments are not self-consciously done by intended result,' Henderson added.

McGovern said his team had also found the oldest known alcoholic beverage in the world. It came from China and dates from 7000 B.C., he said. The drink was made from rice, honey and hawthorn, or wild grape.

It appears that 'humans are interested in finding anything that will ferment,' McGovern said.

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Chocolate: Healthy Decadence

The average American eats almost 12 pounds of chocolate a year. Long presented to loved ones in heart-shaped boxes on Valentine's Day and in bunny form at Easter, chocolate dates back much further than people think. And its longtime appeal wasn't just because of its mouthwatering taste.

In 1981, a team of archaeologists, including Terry Powis, an archaeologist at the University of Texas at Austin with an interest in ancient teapots and drinking vessels, excavated a site in northern Belize known to be inhabited at one time by the ancient Mayan civilization. The archeologists unearthed 14 spouted drinking vessels used by the ancient Mayan civilization dating from about 900 B.C. to A.D. 1300. Powis scraped residue from the vessels and sent it to a Pennsylvania analytical biochemical lab.

The lab analyzed the samples with high-performance liquid chromatography coupled with atmospheric-pressure chemical-ionization mass spectrometry. The first separates the mixture's components and the second measures their molecular weight. Of the 14 samples analyzed, three were positive for theobromine, the chemical marker of cacao, and their age was pegged at about 2,500 years old. The find excited Powis because spouted vessels are distinct from other Mayan ceramics, typically associated with burial of the elite and quite rare. The study's findings appeared in the July 18, 2002, issue of the journal *Nature*.

But based on a variety of evidence, Michael Coe, co-author of *The True History of Chocolate*, believes the roots of chocolate go further back, to the great Olmec civilization, which preceded the Maya in the region. The Olmec, whose name means "rubber people," are thought to be the first civilization in the Western Hemisphere to savor chocolate and, based on symbols dating between 900 B.C. and 650 B.C., the first in the hemisphere to develop a writing system.

From Spanish accounts, archaeologists knew the Maya drank liquid chocolate. They had assumed the teapots were used for pouring it. But there was no proof until the archeological excavation. Coe said the find provided hard chemical evidence that the Mayans were drinking chocolate in 500 B.C. This means the cacao tree was cultivated before the Maya civilization, which flourished in southern Mexico, Yucatan and the highlands of Belize between 500 B.C. and A.D. 1500. He believes the cacao dates back to the Olmecs.

"The Maya derived a lot of their high culture from the Olmec," writes Coe, professor emeritus of anthropology at Yale University. "Even the word *cacao* is not a native Mayan word – it's Olmec." The Olmec lived near the southern Gulf of Mexico between 1500 B.C. and 500 B.C., and their influence extended to Guatemala, Honduras, Belize, Costa Rica and El Salvador.

The scientific name for the cacao tree is *Theobroma cacao* – "food of the gods," and hieroglyphs found on Mayan murals and ceramics depict chocolate being poured for gods and rulers. But despite its lofty status, cocoa was the beverage of everyday people.

Drink of the Day, Every Day

When the Spanish discovered the Maya in the 1500s, they noted everyone drank

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chocolate. Powis says the Spaniards found the Mayans consuming a drink very different from what we commonly refer to as hot chocolate. According to Spanish accounts – many of which come from Bishop Diego de Landa, whose descriptions of Maya culture and language are the primary tools used to translate Mayan glyphs – the Maya enjoyed their hot chocolate thick and foamy.

While standing, Maya poured the chocolate drink from the vessel they held to another one on the ground. The drop, together with the fatty cacao butter, produced a thick head of rich, dark, chocolate foam – the most coveted part of the drink.

It wasn't just the flavor that attracted the ancients. Cocoa was believed to have medicinal qualities, anti-aging compounds and mood enhancers. As it turns out, the Olmecs, Mayans and other civilizations in the region, along with the Aztecs, were on to something.

Chocolate is made from the seeds of the *Theobroma cacao* tree, which are swaddled in gooey white flesh inside green-yellow pods. The seeds and the pulp are scooped out of the pod and allowed to ferment until the seeds turn a rich, dark brown. The seeds are then dried and roasted before being ground to produce a thick chocolate paste.

The Aztecs ground the seeds, partially roasted them and mixed them with water, corn, chilies and spices to make a bitter, sacred drink. Chocolate and chiles are still used together in Mexican cooking. Europeans added sweeteners, created the solid confection and eventually added milk solids to create milk chocolate.

The cocoa seeds from which chocolate is made contain a number of interesting compounds. These include cocoa butter, theobromine, caffeine and a red plant color (cacao-red). Theobromine is a chemical related to caffeine. Today, the terms cocoa and chocolate are used interchangeably.

In the Mood

One reason we like chocolate is that it releases endorphins, hormone-like natural substances that produce a feeling of pleasure. Chocolate also contains a mild stimulant and diuretic called theobromine, a building block of the neurotransmitter that produces pleasure, and other mood-altering compounds. It also contains antioxidants, which have been associated with anti-aging and other health benefits.

Dark chocolate contains magnesium, which is necessary for muscle relaxation, nerve conduction, energy production, and bone and teeth development. It also contains iron. Magnesium and iron deficiencies can aggravate premenstrual syndrome (PMS), so some of its symptoms can be alleviated by the magnesium in chocolate.

Chocolate also contains tryptophan, one of the building blocks the body uses to produce serotonin. Serotonin is a neurochemical associated in the brain with the sensation of pleasure. Neurotransmitters are the chemical messengers that bridge the gap between nerve cells and either stimulate or inhibit the nerve's receptors. In high levels, serotonin can produce a feeling of pleasure, even ecstasy.

Another component of chocolate is phenylethylamine. This neurotransmitter stimulates the body's pleasure centers. High levels of this substance are associated with feelings of excitement, attraction and sexual pleasure. Anandamide is another neurotransmitter in chocolate. This neurotransmitter targets the same brain structures

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as the active ingredient in marijuana, THC. But the levels of all these substances are small and two other chemicals in chocolate may play a more important role. These two substances inhibit the breakdown of anandamide, which prolongs its pleasurable effect.

It's a Different World

While ancient civilizations knew the food, they put in their bodies helped determine how they felt and functioned, they probably didn't understand why. Today, we do. Modern scientific studies show that the increase in fat intake, the decrease in fruit and vegetable intake, lack of exercise, and exposure to smoking and environmental hazards contribute to chronic illnesses and, indirectly, aging.

Research is also showing that we can possibly slow down the onset of wrinkles, mental confusion, tooth decay, arthritis and reduce elevated blood pressures and cholesterol levels, perhaps even aging, by eating the right foods. Functional foods – foods that promote health and fight disease – need to be consumed to battle the increasing assault by chronic illnesses.

To understand how we can limit the damage from chronic illnesses and aging, we need to understand how some chronic illnesses develop. Cardiovascular or heart disease is a leading cause of death in our society. Everyone has some degree of heart-vessel disease or damage. The vessels that bring blood to heart muscles become damaged by fat from our diet, which becomes hard and blocks the blood flow. This so-called hardening of the arteries is atherosclerosis (also spelled arteriosclerosis). The main theory of how this happens holds it occurs through the oxidation of bad cholesterol (LDL-C.)

The cells in our body need oxygen for energy and to function. Oxidization occurs when oxygen is converted into energy. When oxygen mixes with other molecules, unstable and highly reactive molecules called free radicals result. The body's atoms and molecules prefer an even numbers of electrons, but when oxygen mixes with another molecule, it becomes an unstable free radical with an odd number of electrons.

This process can also be initiated by outside influences, including smoking, radiation, pollution, hypertension, a high-fat diet and elevated blood sugar levels. These environmental and dietary factors can cause cells to form free radicals. Free radicals can also form from infections or chronic inflammation, when they are formed to fight the infection and reproduce too many of themselves. Even strenuous exercise can increase free radical production.

As the unstable free radicals try to even their number of electrons, a chain reaction takes place. These unstable molecules commonly damage the cell membranes, weaken blood vessel walls, affect immune cells, modify protective enzymes and hinder cell functioning. Free radicals can also damage cell proteins and can alter cell DNA.

It's been estimated that the trillion-plus cells in the human body generate between 1 billion and 3 billion free radicals per cell each day. No wonder there is evidence that more than 200 diseases are caused by free radical damage. Blindness, arthritis, kidney disease, cardiovascular disease, diabetes, arthritis, dementia and even aging can be the result of free radical damage. Like blueberries, wine and other densely

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colored plant foods, chocolate contains polyphenols – chemicals that act as antioxidants.

Affairs of the Heart

Heart disease can be caused when bad cholesterol (LDL-C) is turned into a destructive free radical. Oxidized LDL-C causes immune cells inside the heart-muscle arteries to release chemicals that start this chain reaction of damage, turning monocytes (infection-fighting white cells) into foam cells. The foam cells attract more free radicals and other damaging molecules, harden and form plaques inside the artery. Since arteries are already hard, they can't expand like they need and our blood pressure increases. As our blood pressure rises it causes more damage to our heart and the damage accelerates.

The damaged arteries also attract blood clotting cells known as platelets. The platelets form clots where the plaques are and cause the clots to become larger. They can become so big they close the vessel (blood thrombus) and damage the area downstream. This is what causes some heart attacks. Sometime blood clots break loose and travel along a vessel until it reaches an area too small to pass through. If the clot is in the heart, it causes a heart attack. If it is in the artery of the brain, it causes a stroke. If it is inside the lung, it causes pulmonary embolism.

Sometimes the plaques can cause the vessel to spasm, which in turn stops the blood flow. It is a dangerous cycle: High blood pressure damages the vessels, which form more plaques, which make the vessel harder and increases blood pressure. It is easy to see how high blood pressure, heart attacks and strokes occur from free radical damage. A diet high in saturated fats and trans-fatty acids – the bad types of fat – contribute to high LDL-C cholesterol levels and increase the number free radicals.

Good Fat, Bad Fat

With its main fatty acids stearic and palmitic (saturated fats), oleic fatty acid (the one in olive oil and monounsaturated fatty acid) and linoleic acid (polyunsaturated), cocoa butter accounts for 50 percent of a cocoa bean's weight. Although we are taught that saturated fats are harmful to the cardiovascular system, the stearic acid fat does not elevate blood cholesterol like other saturated fatty acids. This particular fat in chocolate isn't absorbed well by the intestinal tract. It also has been shown that these cocoa fatty acids may modify LDL-C, making it more resistant to oxidation.

The cocoa bean also has fiber, which helps lower cholesterol levels. Fiber has been shown as beneficial in lowering colon cancer rates, improving sugar metabolism and preventing constipation. The cocoa bean contains several useful vitamins and minerals, including high levels of potassium.

Researchers have known for nearly two decades that the polyphenols in dark chocolate lower blood pressure and have other beneficial effects on blood flow. Chocolate's polyphenols include flavonoids, phenolic acids, stilbenes and lignans. Flavonoids are associated with plant pigments that give plants their intense color. Based on weight, chocolate has the highest concentration of flavonoids of any food. The flavonoids in cocoa are the flavan-3-ols, flavanols (catechin and epicatechin and

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procyanides), and proanthocyanidins. There is a scientific test that helps determine the level of antioxidant properties called the ORAC or oxygen radical absorbance capacity test. Cocoa rates as one of the highest foods on the ORAC scale.

Early in 2006, an international team of scientists pinpointed epicatechin as a chemical -compound responsible, in part, for the heart-healthy benefits of certain cocoas and some chocolate products. The study focused on the Kuna Indians, who live on the San Blas Islands off the coast of Panama. It showed that epicatechin, one of a group of chemicals known as flavanols, was directly linked to improved circulation and other benchmarks of cardiovascular health. Findings of the study are reported in the Jan. 16, 2006, online issue of the *Proceedings of the National Academy of Sciences*.

“Although previous studies strongly indicated that some flavanol-rich foods, such as wine, tea and cocoa, can offer cardiovascular health benefits, we have been able to demonstrate a direct relationship between the intake of certain flavanols present in cocoa, their absorption into the circulation and their effects on cardiovascular function in humans,” wrote University of California, Davis, biochemist Hagen Schroeter, who co-authored the paper along with cardiologist Christian Heiss of Heinrich-Heine University.

“The results of this study provide direct proof that epicatechin is, at least in part, responsible for the beneficial vascular effects that are observed after the consumption of certain flavanol-rich cocoas,” Schroeter said.

There’s more. A recent study from Johns Hopkins University, presented Nov. 14, 2006, at the American Heart Association’s annual Scientific Sessions in Chicago, identified the effect of normal, everyday doses of chocolate found in ordinary foods. Earlier studies found decreased platelet activity only at impractically high doses of flavonoids, equivalent to eating several pounds of chocolate a day.

“Eating a little bit of chocolate or having a drink of hot cocoa as part of a regular diet is probably good for personal health, so long as people don’t eat too much of it, and too much of the kind with lots of butter and sugar,” says Diane Becker, M.P.H., Sc.D., who participated in the research and is a professor at The Johns Hopkins University School of Medicine and Bloomberg School of Public Health.

Becker warns that her work is not intended as a prescription to gobble up large amounts of chocolate candy, which often contains diet-busting amounts of sugar, butter and cream. But as little as 2 tablespoons a day of dark chocolate – the purest form of the candy made from the dried extract of roasted cocoa beans – may be heart healthy.

Aid for Diabetics

Dark chocolate improves the body’s ability to use insulin and stops the resistance problem that leads to diabetes. Cocoa can increase nitric oxide levels, which help the insulin-stimulated uptake of blood sugars. The increase in nitric oxide also improved the health of the blood vessels, limiting the damage to the small vessels by diabetes.

Another type of flavonoid-anthocyanins is the hypoglycemic agents that lower blood sugar levels and help the body use sugars effectively. By lowering sugar loads and using antioxidant properties, they can stop free radical damage to the eyes and extremities, where diabetes likes to attack. Flavonoid-anthocyanins not only help

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prevent damage to small blood vessels, they also help clean up and repair it. They can also help stop eye damage caused by leaks in small blood vessels and can help repair that damage when it happens. They also are effective histamine blockers and can stop the inflammation associated with allergies, cardiovascular disease, arthritis and stomach ulcers.

Cancer-Fighting Booster

While there are many factors contributing to cancer formation, it has been estimated that 50 percent of them are influenced by diet in causing cancer, promoting cancer or helping cure it. There are many theories, but an important theory again involves the formation of free radicals that attack the body and can change the DNA, which can start the cancerous process. There is growing evidence that oxidation is one of the main initiators of many cancers.

Flavonoids have been found to inhibit the growth of cancer cells in the breast, colon, prostate and lungs, largely because of their antioxidants. In 2003, Cornell University food scientists found that cocoa has nearly twice the antioxidants of red wine and up to three times the amount in green tea. Their findings, published in the *American Chemical Society's Journal of Agriculture and Food Chemistry*, discovered 611 milligrams of the phenolic compound gallic acid equivalents (GAE) and 564 milligrams of the flavonoid epicatechin equivalents (ECE) in a single serving of cocoa. Examining a glass of red wine, the researchers found 340 milligrams of GAE and 163 milligrams of ECE. In a cup of green tea, they found 165 milligrams of GAE and 47 milligrams of ECE.

"If I had made a prediction before conducting the tests, I would have picked green tea as having the most antioxidant activity," lead researcher Chang Yong Lee, Ph.D., says. "When we compared one serving of each beverage, the cocoa turned out to be the highest in antioxidant activity, and that was surprising to me." Phenolic compounds protect plants against insects and pathogens, and they remain active even after food processing. A decade ago "food scientists did not know that phenolics had an important role in human health," Lee says.

A Healthy Treat

Research has pinpointed even more benefits of flavonoids. They can help increase energy levels, lower blood pressure and decrease Parkinson's disease symptoms. They can help stop nerve deterioration and help improve cognition, memory function and dementia.

Flavonoids have been found to help with allergies through decreasing inflammation and improve stomach ulcers. Flavonoids also have anti-microbial actions that help prevent dental cavities, oral diseases and other infections.

Flavonoids can also inhibit COX-2 enzymes in the body. This is a strong anti-inflammatory action that many prescription drugs have. By blocking COX-2 enzymes, the immune system works better, decreases joint pain and stops further free radical production. Cocoa has been found to help repair liver cells after damage from alcohol. Also, dark cocoa is a rich source of copper, which is part of many of the body's

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chemical processes.

The small amount of fat in chocolate also helps curb our appetites for fats and decrease our fat intake. Cocoa by itself can decrease the appetite. The carbohydrates in chocolate provide an energy source. The theobromine stimulates the CNS system and gives additional energy. Theobromine, a cousin of theophylline, is used to open up the lungs and improve breathing and is used as a cough medicine. A recent study thought that chocolate could improve low libido in women.

In elderly patients, cocoa has been found increase their appetite, may help in increasing their weight (not weight gain from fat) and provide nutrients needed for their bodies to function. It may even slow the aging process by interfering with cell destruction by free radicals.

Cocoa Qualifies

What you take into your body determines how your body will function. Cocoa or chocolate is a functional food that provides our bodies needed phytonutrients, minerals, vitamins, fiber, essential fatty acids and even protein to improve our quality of life. While the Olmecs, Mayans and Aztecs may not have understood the science behind cocoa's benefits, archeologists have found they thought it important enough to drink every day. **BIH**