

Food Of



CHOCOLATE

The Gods

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heobroma Cacao. Food of the gods.

The Latin name, Theobroma Cacao, was given to chocolate many centuries ago and still appropriately describes the strong attachment people worldwide have with this wonderful food today. When ancient Indians of Central America first crushed cocoa beans and mixed them with water more than 2000 years ago, it would have been impossible to imagine the many ways we now enjoy this favorite food.

Americans consistently name chocolate as their favorite flavor for desserts and sweet snacks. American-made chocolate and cocoa products number in the thousands and are enjoyed by millions of consumers every day. All of these delicious products — ranging from fancy boxed chocolates to chocolate bars, baking chocolate to cocoa powder — share a fascinating story. This story begins in the tropical regions of the world where cocoa beans are grown and culminates with each tasty bite or sip of chocolate in any of its many forms.

The Story of Chocolate is an introduction to this wonderful food — where it comes from, how it has been enjoyed through the ages, how cocoa beans are grown and turned into chocolate bars and other delicious products and how chocolate and cocoa relate to nutrition and health. C

HISTORY OF CHOCOLATE

The story of chocolate, as far back as we know it, begins more than 2000 years ago in equatorial Central America where the Mayan Indians held cocoa beans in high regard. Images of cocoa pods were carved into the walls of their elaborate stone temples, and Mayan writings refer to cacao as "food of the gods." It was the Mayans who first created a beverage from crushed cocoa beans which was enjoyed by royalty and shared at sacred ceremonies.

Chocolate's importance in the Aztec Empire also is clearly recorded. The Aztecs called the prized drink they made from cocoa beans "chocolatl," which means "warm liquid." Like the earlier Mayans, the Aztecs drank the unsweetened beverage during special ceremonies. Montezuma II, a royal monarch of the Aztecs, maintained great storehouses filled with cocoa beans and reportedly consumed 50 or more portions of chocolatl daily from a golden goblet. Cocoa beans, however, weren't only consumed. They also were used as a form of currency. According to records of the time, a rabbit could be purchased for four cocoa beans.

Europe was first introduced to the principal ingredient of chocolate when Christopher Columbus brought a handful of the dark, almond-shaped beans back to Spain from his last voyage to the Caribbean islands in 1502. He presented many strange and wonderful objects from the lands he explored to King Ferdinand and Queen Isabella. Included among them were cocoa beans,



HISTORY OF CHOCOLATE

placed before royalty as little more than a curiosity. They appeared most unpromising. The King and Queen of Spain never dreamed how important cocoa beans would become. It remained for Hernando Cortes, the Spanish explorer, to grasp the commercial possibilities of cocoa beans.

Chocolate Travels to Spain

When Cortes arrived in what is now known as Mexico in 1519, the Aztecs mistakenly believed that he was the reincarnation of a former god-king who had been exiled from the land. They did not realize that Cortes was seeking Aztec gold which was rumored to exist. Montezuma greeted the Spanish explorers with a large banquet which included cups of a bitter chocolate drink. By the time the Aztecs realized their mistake, the Spanish had begun to overpower them. Within three years, Cortes and his followers brought about the fall of the Aztec empire.



During this time, Cortes realized the economic potential for cocoa beans. He experimented with chocolatl, adding cane sugar to make it more agreeable to Spanish tastes. He also established additional cacao plantings in the Caribbean region before returning to Spain.

Back in Spain, the new version of chocolatl found favor with the wealthy, and continued to undergo flavor refinements. Newly imported spices, such as cinnamon and vanilla, were added to the drink. Ultimately, someone decided the drink would taste better if served steaming hot, creating the first hot chocolate, which quickly won followers among the Spanish aristocracy. Spain proceeded to plant more cacao trees in its overseas colonies in Ecuador,

Venezuela, Peru and Jamaica to ensure an ample supply of cocoa beans. Remarkably, the Spanish were able to keep their ventures in cocoa cultivation and their creation of early cocoa drinks a secret from the rest of Europe for nearly one hundred years.

Chocolate Spreads Across Europe

Spanish monks were assigned the task of processing the cocoa beans. It may have been these monks who let out the secret by discussing cocoa with their French counterparts. Then, in 1580, the first cocoa processing plant was established in Spain. It did not take long before chocolate was acclaimed throughout Europe as a delicious, health-giving drink. For a while it reigned as the chosen beverage at the fashionable Court of France. Chocolate drinking spread across the English Channel to Great Britain, and in 1657 the first of many famous English Chocolate Houses appeared.

Mass production of cocoa became possible with the introduction of a perfected steam engine, which mechanized the cocoa grinding process. By 1730, cocoa had dropped in price from three dollars or more per pound to within financial reach of all.

The invention of the cocoa press in 1828 was another major breakthrough in cocoa production. This not only helped reduce prices even further, but more importantly, improved the quality of the beverage by squeezing out about half of the cocoa butter (the fat that occurs naturally in cocoa beans) from the ground-up beans, leaving behind a cake-like residue that could be further processed into a fine powder. From then on, chocolate drinks had more of the smooth consistency and the recognizable flavor of those enjoyed today.



HISTORY OF CHOCOLATE

The 19th Century witnessed two more revolutionary developments in the history of chocolate. In 1847, an English company introduced the first solid eating chocolate made by combining melted cocoa butter with sugar and cocoa powder. This chocolate had a smooth, velvety texture and quickly replaced the old coarse-grained chocolate which formerly dominated the world market. The second development occurred in 1876 in Vevey, Switzerland, when Daniel Peter devised a way of adding milk to chocolate, creating the product we enjoy today known as milk chocolate.

Chocolate Comes to America

In the United States of America, the production of chocolate proceeded at a faster pace than anywhere else in the world. It was in pre-revolutionary New England — 1765, to be exact — that the first chocolate factory was established in this country.

During World War II, the U.S. government recognized chocolate's role in the nourishment and group spirit of the Allied Armed Forces, so much so that it allocated valuable shipping space for the importation of cocoa beans. Many soldiers were thankful for the chocolate bars, which gave them the energy to carry on until more food rations could be obtained. Today, the U.S. Army's Meals Ready to Eat contain chocolate bars and chocolate candies, and chocolate has been taken into space as part of the diet of U.S. astronauts. C



GROWING COCOA BEANS

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ll chocolate begins with cocoa beans, the fruit of the cacao tree (also called a cocoa tree). Scientists know that the cacao tree originated somewhere in South or Central America. Some say the first trees grew in the Amazon basin of Brazil, while others place its origin in the Orinoco Valley of Venezuela. Wherever its first home, we know the cacao tree is strictly a tropical plant thriving only in hot, rainy climates. Cocoa can only be cultivated within 20 degrees north or south of the equator.



Growing Region

The Need for Shelter

The cacao tree is quite delicate. It needs protection from direct sun and wind, requiring a canopy of shade to thrive. Cacao seedlings often are planted in the shelter of taller mother trees such as banana, plantain, coconut and rubber which provide the necessary shade while also producing other important crops. Once the cacao trees are established, they can tolerate much more sunlight, but they grow best on small plots of land in partial shade, tended regularly.

As a general rule, cacao trees get their start in a nursery bed where seeds from high yielding trees are planted in fiber baskets or plastic bags. The seedlings grow so fast that in a few months they are ready for transplanting.



GROWING COCOA BEANS

The World Cocoa Foundation, sponsored by the chocolate and related industries, supports sustainable cocoa growing in its mission to improve the standard of living of cocoa farmers around the world. The Foundation provides programs that teach cocoa farmers efficient methods to produce quality cocoa in a sustainable, environmentally friendly manner.

A Closer Look at the Cacao Tree

Everything about the cacao tree is just as colorful as its history. An evergreen, the cacao tree has large glossy leaves that are red when young and green when mature. At maturity, the cultivated cacao tree stands 15-to-25 feet tall, though the tree in its wild state may reach 50 feet or more. Cacao trees have been known to live 200 years in their natural environment, but they are most productive for about 25 years.

Moss clings to the cacao tree's trunk, sometimes alongside colorful lichens. In some areas, small orchids grow on its branches. Throughout the year, the tree trunk and major branches sprout




clusters of tiny, waxy pink or white five-petaled blossoms. Of the thousands of flowers that grow on a single tree, only 3-to-10 percent are pollinated by tiny flies and other insects. The pollinated flowers develop into mature fruit about six months later — the pods that contain cocoa beans.

The cocoa pods are a rather unusual site, growing directly from the trees trunk and major branches. The pods are oval, or football-shaped, ranging from 7-to-14 inches long. At first, the pods are green or maroon in color. The green pods generally ripen to a bright yellow-gold and the maroon pods become orange or yellow-orange.

Varieties of Cacao

There are two main species of cocoa: Criollo and Forastero. **Criollo** is sometimes called the prince of cacaos because it is a very high quality grade of cocoa with exceptional flavor and aroma. Less than 15 percent of the world's cocoa is Criollo, grown mainly in Central America and the Caribbean. **Forastero** is a much more plentiful variety of high quality cocoa, representing most of the cocoa grown in the world. Grown mainly in Brazil and Africa, it is hardier, more productive (higher yielding) and easier to cultivate than Criollo and is used in just about every blend of chocolate that is made.

A third type of cocoa also deserves mention. **Trinitario**, a hybrid or cross between strains of the other two types, originated in Trinidad nearly 300 years ago. It possesses a good, aromatic flavor and the trees are particularly suitable for cultivation.

Within these main types, there are several varieties of cocoa, each with distinct qualities. Chocolate makers purchase different varieties of beans and blend them to create their chocolate products. 

THE COCOA BEAN HARVEST



Cocoa pods are harvested by hand, one by one. Each pod is carefully cut from the tree with a machete or sharp knife. Pods that grow on the tallest branches are harvested with knives attached to long poles. On small family-owned farms, the entire family may participate in the harvest of cocoa pods as well as other crops.

It requires training and experience to know by appearance which cocoa pods are ripe and ready to be picked. Ripe pods are found on trees at all times of the year since the growing season in the tropics is continuous. For most cocoa-growing regions, there is a main harvest and a secondary harvest about six months later. Climatic differences cause wide variations in harvest times with frequent fluctuations from year to year even within the same region.



What Happens After Picking

The pods cut from the trees are collected in piles in an open area not far from the cacao trees. Here the woody pods are opened with one or two lengthwise taps from a well-wielded machete. A good breaker can open 500 pods an hour. Inside the pod, 20-to-50 cocoa beans are hidden in a moist, cream-colored pulp. The beans are scooped from the pod and the outer shell and inner membrane are discarded. If you tasted a bean at this point you would notice a sweet, lemon-like flavor from the pulp. The bean itself would be too bitter and hard to eat.

Once all of the beans are scooped from the pods, they are placed in sacks and carried to the area where they will be fermented and then dried as the next steps in their many days of processing.



Fermenting and Drying

Fermenting is a simple “yeasting” process in which the sugars contained in the beans are converted to acid, primarily lactic and acetic acids. The fermentation process takes from two-to-eight days, depending upon the cacao variety (Criollo beans ferment more quickly than Forestero). The beans are placed in large shallow wooden boxes or, on smaller farms, are left in piles and covered with banana leaves.

The fermentation process generates temperatures as high as 125 degrees Fahrenheit, activating enzymes in the beans that break down bitter substances and begin to develop the more familiar flavor and aroma of chocolate. When fermentation is completed, the result is a fully developed cocoa bean with a rich brown color, a sign that it is now ready for drying.

THE COCOA BEAN HARVEST

Like any moisture-filled fruit, the beans must be dried if they are to be preserved. In some countries, drying is accomplished simply by laying the beans on trays or bamboo matting and leaving them to bask in the sun. When moist climate conditions interfere with sun-drying, the beans can be dried inside a covered structure. Blowers circulating hot air may also be used.



The drying process takes several days. Farmers or workers turn the beans frequently and use this opportunity to pick through them, removing foreign matter and flat, broken or germinated beans. During drying, beans lose nearly all their moisture and more than half their weight. When the beans are dried, they are ready to be shipped to chocolate factories around the world.

Farmers take the fermented and dried beans to collection sites where they are mixed with beans from surrounding farms. The beans will be loaded into 130-to-200 pound sacks and transported to shipping centers.

Marketing For Export

Cocoa buyers sample the quality of the crop by cutting open a number of beans to see that they are properly fermented. The beans should have a brown center and be aromatic. If the crop is found satisfactory, the grower is paid at the current market price. The market price depends not only on the abundance of the worldwide crop and the quality of the beans, but also on a number of economic conditions throughout the world. There are Cocoa Exchanges, similar to stock exchanges, in major cities such as New York, London, Hamburg and Amsterdam. *C*

FROM BEAN TO CHOCOLATE

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e now come to the remarkable art of chocolate-making. The manufacturing process requires much time and painstaking care. Making an individual-size chocolate bar, for instance, takes at least two-to-four days.





The pressed cocoa cake that remains after the cocoa butter is removed can be cooled, pulverized and sifted into cocoa powder. The powder is packaged for sale in grocery stores and in large quantities for commercial use as a flavor ingredient by dairies, bakeries and confectionery manufacturers. Some companies use what is called the Dutch process to further process their cocoa powder. This involves treating the cocoa with an alkali, which develops a slightly lighter flavor and darker color and makes the cocoa powder easier to mix with water.

How To Make Eating Chocolate

While cocoa butter is removed to make cocoa powder, it must be added to make chocolate. This holds true of all eating chocolate, whether it is dark, bittersweet or milk chocolate. Besides enhancing flavor, the added cocoa butter makes the chocolate more fluid.

One example of eating chocolate is sweet chocolate, a combination of unsweetened chocolate, sugar, cocoa butter and perhaps a little vanilla. Making it entails melting and combining the ingredients in a large mixing machine until the mass has the consistency of dough. Milk chocolate, the most common form of eating chocolate, goes through essentially the same mixing process except that it involves using less unsweetened chocolate and adding milk.

Whatever ingredients are used, the mixture then travels through a series of heavy rollers set one atop the other. These rollers press against the ingredients until the mixture is refined to a smooth paste ready for "conching."

What Is Conching?

Conching is a flavor development process which puts the chocolate through a "kneading" action. It takes its name from the conch shell-like shape of the containers originally used for this process. The "conches," as the machines are known, are equipped with heavy rollers that plow back and forth through the chocolate mass anywhere from a few hours to up to seven days. At this stage, flavorings are added if called for in the recipe. Conching develops the complex flavors and makes the chocolate velvety smooth.

In some manufacturing setups, there is an emulsifying operation that either takes the place of conching or else supplements it. In this operation, a machine that works like an eggbeater breaks up sugar crystals and other particles in the chocolate mixture, creating a fine-grained, extremely smooth chocolate.




After conching, the mixture is "tempered" — a process of carefully cooling the mixture while continually stirring it. Finally, the liquid chocolate is ready to be poured into molds shaped like the final product. The molds may be in any shape and size ranging from your favorite chocolate bar to a chocolate bunny to a ten-pound block of solid chocolate destined for use by others in the confectionery industry.

The liquid chocolate also is used to enrobe (coat on all sides) certain chocolate bars such as those with whipped nougat centers and boxed chocolates which contain a variety of centers made from cream, fruit, nuts, and other ingredients. The liquid chocolate is pumped into an enrobing machine where it is stirred and kept warm. The already-formed centers travel through the enrobing machine on a conveyor belt where they are coated with chocolate and then cooled.

Ready For Shipment

The molded or enrobed chocolate products are carefully cooled in a cooling chamber and then are ready to be wrapped or packaged. If the product is a chocolate bar, for example, it will travel through an automated wrapping machine that precisely wraps it and then sends it down the production line to be placed in cases for shipment to distributors and retail stores throughout the country.

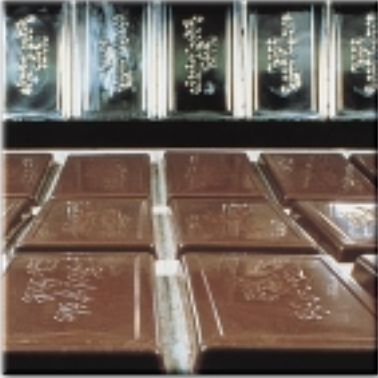
For convenience, chocolate is frequently shipped in a liquid state when intended for use by other food manufacturers. Whether solid or liquid, chocolate provides candy, cookie and ice cream manufacturers with the most popular flavor for their products. Additionally, chocolate is used for coatings, powders and flavorings that add delicious flavor to many foods in a thousand different ways. 

INSIDE A CHOCOLATE FACTORY

The chocolate factory is an amazing environment where science, technology and art combine to create many delightful products. Every step in the making of chocolate in the modern chocolate factory is carefully controlled from the moment the sacks of cocoa beans arrive until the finished products are carefully wrapped, boxed and shipped to retailers nationwide.

Computers control the entire manufacturing process in many factories. They regulate temperatures, stabilize the moisture content of the air and control the carefully timed intervals of each manufacturing operation. This exacting control helps the company achieve precise, quality results with every batch of chocolate made.






Creating Safe and Wholesome Products

Only the purest, high-quality ingredients are used to make chocolate. Raw materials such as milk, nuts, and flavorings are carefully tested for safety and purity before they are accepted as ingredients. Throughout the chocolate production process, samples are taken

and tested to ensure the products meet or exceed safety and quality standards.

Cleanliness also is stressed in the chocolate factory. Stringent daily sanitation programs include thoroughly cleaning the equipment and manufacturing environment.

All chocolate manufacturers also must meet standards set by the U.S. Food and Drug Administration. These regulations govern manufacturing formulas. For example, the FDA specifies the minimum content of ingredients such as milk and chocolate liquor in chocolate products. The FDA also imposes strict rules regarding the flavorings and other ingredients that may be used in chocolate products.

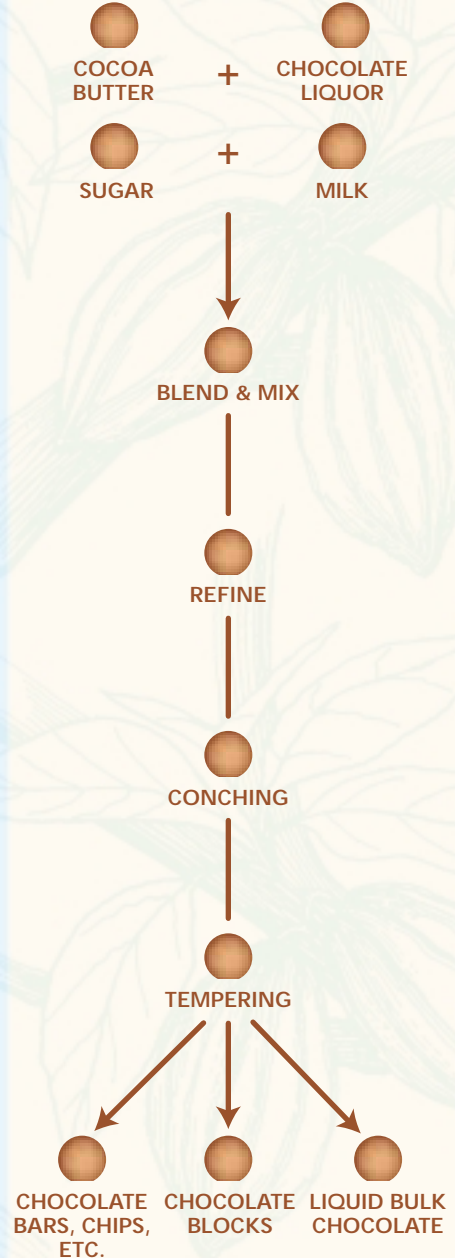
As part of their laboratories, many chocolate factories have pilot plants — a small plant within the main facility that contains miniature equipment that duplicates what is found in the main plant. Here, new processes are tested and new products developed to further tantalize the taste buds of chocolate lovers. 

CHOCOLATE MANUFACTURE

COCOA BEAN PROCESSING



CHOCOLATE-MAKING



CHOCOLATE FITS ANY LIFESTYLE



Chocolate can be a fun and delicious part of any healthy, active lifestyle. Just keep in mind that the goal for good nutrition is to eat a variety of foods based on the USDA Food Guide Pyramid, and to balance the amount eaten with the number of calories used to maintain a healthy weight. This will allow you to include your favorite chocolate selections in your eating plan.

When it comes to chocolate and health, many old myths about chocolate have been replaced with scientific facts that provide balanced, accurate information on this favorite food. Here is a look at the facts behind some important chocolate nutrition topics.

Fact: Chocolate Does Not Cause Acne

Neither chocolate nor any other food causes acne. According to the American Academy of Dermatology, acne is a skin condition caused by the over-activity of oil glands in the skin.

Fact: Chocolate Contains Beneficial Antioxidants

Some types of cocoa powder and chocolate (especially dark chocolate) are rich sources of substances called polyphenol antioxidants — beneficial compounds that may reduce the risk of developing cardiovascular disease. The amount of these substances will vary from one type of cocoa or chocolate to the next, depending on such factors as how the product was processed. In general, cocoa powder and dark chocolate contain a high amount of these antioxidant compounds — more than most antioxidant-rich fruits and vegetables.



in contact with the teeth. Some dental research studies suggest that chocolate may be less apt to promote tooth decay than some other foods because it contains cocoa butter, a naturally occurring vegetable fat, which helps the chocolate clear the mouth quickly (*Journal of Dental Research*, 1991;70:1314-1319).

Fact: Chocolate Is Not a Significant Cause of Migraine Headaches

While some foods may be associated with the onset of migraine headaches, one recent study suggests that chocolate is not a significant cause of migraines. The study, conducted at the Pittsburgh State University, placed 63 women prone to get migraines on diets that included chocolate or the chocolate substitute, carob. Chocolate proved to be no more likely than carob to trigger a headache (*Cephalgia*, 1997;17:855-862). The cause of migraines appears to be linked to hormone levels, and scientists continue to study its causes.

Fact: Chocolate Does Not Cause Obesity

Neither chocolate nor any other food causes obesity. When calorie intake exceeds calories burned through activity, a person gains weight. Studies conducted on the calorie contribution of foods found that chocolate contributes only 0.7-to1.4 percent of calories to the average American diet (*Am. Journal of Clinical Nutrition*, 1994;60:S1060-S1067).



NUTRITION PROFILES OF SELECTED CHOCOLATES

| | Weight g | Calories | Calories from Fat | Total Fat g | %DV |
|---|-------------|----------|----------------------|----------------|-----|
| Milk Chocolate Bar (1.4 oz) | 40 | 210 | 120 | 13 | 20 |
| Dark Chocolate Bar (1.4 oz) | 40 | 200 | 100 | 11 | 17 |
| Milk Chocolate Almond Bar (1.4 oz) | 40 | 210 | 130 | 14 | 22 |
| Semi-Sweet Chocolate Chips (80 pieces) | 40 | 190 | 110 | 12 | 18 |
| Milk Chocolate Covered Peanuts (16 pieces) | 40 | 210 | 120 | 13 | 20 |
| Milk Chocolate Covered Raisins (35 pieces) | 40 | 160 | 50 | 6 | 9 |
| Chocolate Covered Cherries (6 pieces) | 40 | 150 | 30 | 3 | 5 |
| Milk Chocolate Malted Milk Balls (17 pieces) | 40 | 180 | 50 | 6 | 9 |
| Dark Chocolate Covered Coconut (3 pieces) | 40 | 160 | 60 | 7 | 10 |
| Milk Chocolate Covered Caramels (7 pieces) | 40 | 190 | 80 | 9 | 13 |
| Chocolate Covered Peppermint (4 pieces) | 40 | 150 | 30 | 3.5 | 6 |
| Candy Coated Milk Chocolate Morsels (57 pieces) | 40 | 190 | 80 | 9 | 12 |

* insignificant amount

| Calories | | Cholesterol | | Sodium | | Total Carbo | | Protein | Calcium |
|----------|-----|-------------|-----|--------|-----|-------------|-----|---------|---------|
| g | %DV | mg | %DV | mg | %DV | g | %DV | g | %DV |
| 7 | 35 | 10 | 4 | 35 | 2 | 23 | 8 | 3 | 10 |
| 7 | 35 | * | 0 | * | 0 | 25 | 8 | 1 | 0 |
| 7 | 35 | 5 | 2 | 30 | 2 | 21 | 7 | 4 | 8 |
| 7 | 35 | * | 0 | 5 | 1 | 25 | 8 | 2 | 2 |
| 4 | 20 | 2 | 1 | 15 | 1 | 21 | 7 | 6 | 6 |
| 3.5 | 18 | 2 | 1 | 15 | 1 | 27 | 9 | 1 | 4 |
| 1.5 | 9 | 2 | 1 | 55 | 2 | 28 | 9 | 0 | 6 |
| 3 | 15 | 2 | 1 | 55 | 2 | 28 | 9 | 0 | 6 |
| 5 | 25 | * | 0 | 65 | 3 | 26 | 8 | 1 | 0 |
| 5 | 25 | 9 | 3 | 68 | 3 | 28 | 9 | 2 | 7 |
| 2 | 10 | * | 0 | 10 | 1 | 32 | 10 | 1 | 0 |
| 5 | 25 | 5 | 2 | 40 | 2 | 27 | 9 | 3 | 8 |

CHOCOLATE FITS ANY LIFESTYLE

Fact: Chocolate Contains Nutrients Everyone Needs

Chocolate not only tastes great, it also contains some important nutrients. A 1.4 ounce milk chocolate bar contains protein, 15 percent of the daily requirement for the B vitamin riboflavin, 9 percent of the daily requirement for calcium and 7 percent of the Daily Value for iron. It also is an excellent source of copper. Chocolate with almonds or peanuts boosts its nutritional value, especially for protein.

Chocolate milk is an excellent source of many nutrients. Low-fat chocolate milk (2 percent fat) contains less fat than whole milk while providing more zinc, potassium, niacin and riboflavin than whole milk or plain 2 percent milk. For other nutrients, plain milk and chocolate milk are about the same. *C*

