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**File: ■ Cocoa/Chocolate (*Theobroma cacao*)
■ Health Benefits**

HC 041321-472

Date: May 15, 2013

RE: Review of the Health Benefits of Cocoa and Chocolate

Latif R. Chocolate/cocoa and human health: a review. *Neth J Med*. March 2013;71(2):63-68.

While for years chocolate had been considered an unhealthy food because of its fat content and association with acne, high blood pressure, and other conditions, it is now recognized as a beneficial substance, high in valuable phytochemicals. The last decade has seen a flowering of research on the health benefits of cocoa (*Theobroma cacao*) and chocolate, which has yielded contradictory results. This review seeks to interpret the science to help health professionals and the public to understand the current state of knowledge.

Cocoa was originally cultivated and processed by the Mayas, Incas, and Aztecs, and was brought to Europe in the 16th century. Cocoa is currently grown primarily in West Africa, Indonesia, and Sri Lanka. The beans are called cacao; after roasting, it is called cocoa; and when the roasted beans are made into food (e.g., sometimes with sugar and milk), it is called chocolate.

One part of cocoa is a fraction called cocoa butter, which refers to the fat content. The fat consists of 33% oleic acid (monounsaturated), 25% palmitic acid (saturated), and 33% stearic acid (saturated). Even though it is a saturated fat, stearic acid seems not to adversely affect the lipid profile. Cocoa also contains the flavonoid catechins epicatechin, catechin, and procyanidin, at levels higher than those found in tea (*Camellia sinensis*) and red wine (from grapes; *Vitis vinifera*). Because of its higher cocoa content, dark chocolate contains more of these compounds than milk chocolate. The methylxanthines theobromine and caffeine are also found in cocoa, along with several minerals, including potassium, phosphorus, copper, iron, zinc, and magnesium.

The first indication of cocoa's health benefits came from an examination of the unusual pattern of low blood pressure among the Kuna Indians of Panama, whose sole beverage was cacao beans boiled in water. When the Indians moved to the city and their beverage consumption changed, high blood pressure became apparent. Epidemiological studies have supported this phenomenon by showing an inverse relationship between cocoa consumption and high blood pressure.

These studies were paralleled with investigations into the particular benefits of cocoa and chocolate.

Being that chocolate is high in antioxidants (it is the third-highest source of antioxidants for Americans) and therefore can reduce oxidative stress could be a boon; however, one study has shown that the large increase in plasma antioxidant capacity following chocolate consumption is probably due to an increase in uric acid from fructose consumption, negating the theory.

The examination of chocolate's effects on blood pressure has shown conflicting results, which may relate to study design issues such as the use of small, normotensive populations, different intake levels and forms, and short intake durations. There is strong evidence for the mechanism that may be involved, which is an increase in nitric oxide (NO) via upregulation of vascular endothelial NO synthase, and inhibition of NO destruction.

There is also good evidence for an effect of chocolate intake on platelets, involving both a decrease in platelet aggregation and a reduction in platelet adhesion.

Effects of chocolate on glucose metabolism have been elucidated, including a reduction in insulin resistance (via improved NO levels), glucose levels, and insulin response.

One study showed that chocolate helps to alleviate stress by increasing the production of the calming neurotransmitter, serotonin. Another study showed that chocolate consumption decreased body weight by reducing the gene activity that governs fat synthesis and increasing the gene activity that controls fat burning. Chocolate consumption has also been shown to increase blood flow to the brain and was associated with a reduced risk of stroke. Effects on tumor growth are preliminary and ambiguous. It has been shown that chocolate intake may improve exercise recovery times and help maintain glucose levels during exercise.

The adverse effects of chocolate are mild and include heartburn and allergic reactions, though these are rare. The sugar and triglyceride content of chocolate calls for an alteration of diet or exercise when consuming chocolate daily; as a result, flavonoid-rich cocoa products may be a better alternative to take advantage of its benefits.

—*Risa Schulman, PhD*

Referenced article can be found at <http://www.njmonline.nl/getpdf.php?id=10000925>.

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