

# Cocoa and chocolate: nutritious or not?

### **Scientific studies challenge negative image.**

- Chocolate, and its possibly beneficial nutritional effects, have long been the subject of conjecture: is it a nutritious food, a cause of acne, migraine and tooth decay, or beneficial for the stomach and digestion?
- A thorough search of the literature reveals however that none of these claims, positive or negative, is supported by scientific evidence. Their origin seems to be rather more emotional than scientific.
- Scientific research into the nutritional value of chocolate and cocoa is more complete than ever before. The studies reveal the following facts:

### **Cocoa and chocolate: sources of energy and wellbeing.**

- Cocoa and chocolate are important sources of energy: with their concentration of calories in a small volume, cocoa and chocolate are among the most concentrated vegetable energy suppliers.
- Chocolate contains a combination of sugars and fats which can produce a positive psychological effect during and after consumption. The relevant scientific studies showed increased feelings of satisfaction among the majority of experimental subjects.
- Cocoa and chocolate are often consumed after heavy physical or mental effort by workers, sportsmen and so on, as a compensation for the energy expended during their exertions.

### **The macronutrients: fats, carbohydrates and proteins.**

#### *Fats, and the effect of cocoa and chocolate on cholesterol*

- Cocoa and dark chocolate contain no cholesterol. Milk chocolate and white chocolate contain only minimal quantities due to the added milk fats.
- Cocoa and chocolate contain stearic acid. According to recent studies (see bibliography) this unique saturated fatty acid has a neutral effect on the production of LDL or “bad” cholesterol, even with daily moderate consumption. The same studies show that the stearic acid in chocolate can promote the production of moderate quantities of “good” cholesterol in some test subjects.
- The relevant studies conclude from this that regular moderate consumption of chocolate, provided it is in the context of a varied and balanced diet and a healthy lifestyle, should hold no risks of any heart and blood vessel problems.

### *The carbohydrates*

- Sugars
  - Cocoa beans used in cocoa and chocolate production naturally contain very low levels of sugar (0.8 – 1.73%).
  - Chocolate however contains between 30 and 55% added sugars (sucrose and lactose), which are needed to neutralise the bitter taste of cocoa and also act as bulking agents, producing high-quality chocolate with a perfect texture.
  - According to scientific research the sugars present in chocolate cause only a moderate rise in blood sugar levels at moderate levels of consumption. Scientists are also convinced (in studies carried out on behalf of the WHO) that sugar consumption in itself is not a direct cause of chronic illness like obesity, cardiovascular disease or cancer. Instead, a combination of various unhealthy habits (over-eating, monotonous diet, lack of exercise...) are thought to be the relevant causes.
- Fibre
  - Cocoa mass contains around 15% soluble and insoluble dietary fibre. Dietary fibre has an important function in supporting the passage of food through the gut and keep the gut and stomach walls clean.

### *Proteins*

- Cocoa and dark chocolate contain very little digestible protein. However, science points to their potential role in improving the taste of protein rich drinks like (soya) milk and other dairy products. These may provide the primary source of protein and calcium for children and the elderly. A single 200ml glass of milk can provide around 13% of the RDA (Recommended Daily Allowance) of protein and 30% of the RDA for calcium. However, milk is declining in popularity among large numbers of growing children and adults. According to scientists, the use of chocolate and cocoa as flavourings can play a role in countering this shift.
- Milk chocolate and white chocolate are also regarded as important sources of calcium and proteins. Barry Callebaut's milk and white chocolates contain around 14 – 30% milk solids. This equates to 4 – 8g of protein per 100g of chocolate, or 15% of the RDA.

## **The micronutrients: vitamins, minerals and polyphenols.**

### *Polyphenols and flavonoids*

- Cocoa is rich in polyphenols, a subject currently of major interest to many centres of scientific study. The possible role of polyphenols in the prevention of blood clotting in the blood vessels is under scrutiny. Experimental results show that the substance may be comparable to aspirin in its effects. The potential significance of cocoa polyphenols and their influence on the functions of the human body are still to be confirmed by future scientific research.

- Certain polyphenols in cocoa are suspected to have an anti-oxidant effect. Studies on this are proceeding apace. We can report the following factual findings:
  - The naturally present cocoa polyphenols protect dark and milk chocolate from oxidation for long periods. They are natural preservatives.
  - The flavonoids present in cocoa may counteract the oxidation which turns good cholesterol (HDL) into bad cholesterol (LDL). This transformation is suspected of causing diseases of the heart and blood vessels. Little is yet known about the effect of these so-called cocoa flavonoids in normal consumption doses. Scientists do predict, on the basis of recent research, that cocoa flavonoids will be found to have a stronger anti-oxidant effect than the flavonoids found in red wine.
  - Cocoa polyphenols may protect the body against substances which damage the immune system, causing rheumatism and arthritis. Many of these studies were carried out in Japan, and additional in vivo research will be needed before definitive statements can be made.
  - Scientific studies show that certain polyphenols in cocoa may render harmless the free radicals which affect DNA in body cells. In addition, they may neutralise other free radicals which cause cancer. Cocoa polyphenol (epicatechin) may also have an inhibitory effect on the development of certain cancers.

Only further research will lead to certainty about these scientific indications.

## Vitamins

- Depending on the type and the recipe, Barry Callebaut chocolates may contain several vitamins which are significant in obtaining the recommended daily allowance. The following are the most important:

NAME	QUANTITY IN 100 G CHOCOLATE	% OF THE RDA PER 100 G CHOCOLATE	IN WHICH CHOCOLATE TYPES?	FUNCTIONS?
VITAMINE A	16-73 mg	2-9,1%	- Mostly found in milk and white chocolate, and to a lesser extent in dark chocolate.	- Necessary to build up resistance. - Promotes vision. - Helps in balanced growth - Plays a role in maintaining the healthy condition of the skin, the surface of the eye, the gums and the hair.
VITAMINE B-COMPLEX	B1: 0,1 mg B2: 0,2-0,4 mg B3: 0,2-1,1 mg B5: 0,5-0,7 mg B11: 15-17 mg B12: 0-1 mg	B1: 7% B2: 12-25% B3: 1-6% B5: 8-11% B11: 7-8% B12: 0-100%	- Cocoa and dark chocolate contain vitamins B1, B2, B3, B5 and B11 (also known as M or folic acid). - Milk- and white chocolate contain a small amount of vitamin B5 and an exceptionally large amount of B12. Vitamins B5 and B12 come from the addition of milk powders to the recipe.	- Ensure, in combination with other vitamins, the release of energy from food and the formation of the body's building blocks.
VITAMINE D	±1,6-1,8 mg	±32-36%	In dark, milk and white chocolate.	- Necessary to build and maintain strong teeth and bones. - Promotes the uptake of calcium and phosphorus in the body. - Plays a role in maintaining the immune system.
VITAMINE E	±2,5-3,1 mg	±25-32%	In dark, milk and white chocolate.	- Necessary in the production of red blood cells and in building muscle and other tissue. - Has anti-oxidant properties: protects poly-unsaturated fatty acids against oxidation. - Protects cell walls.

## Minerals

- Cocoa and chocolate contain a host of minerals. Often working in conjunction with vitamins, these are indispensable for proper operation of physical functions. Cocoa and chocolate are particularly important sources of certain minerals. The most significant of these are:

NAME	QUANTITY IN 100 G CHOCOLATE	% OF THE RDA PER 100 G CHOCOLATE	IN WHICH CHOCOLATE TYPES?	FUNCTIONS?
CALCIUM	30-300 mg	3-40%	- Mostly found in milk and white chocolate, and to a lesser extent in dark chocolate.	- Needed for the formation and maintenance of bones and teeth. - Together with vitamin A, aids coagulation of blood (with wounds or haemorrhage). - Plays a role in muscular function.
MAGNESIUM	20-170 mg	6-60%	- The strongest concentrations are found in dark chocolate.	- Collaborates in the maintenance of a strong skeletal system. - Primarily active in the promotion of the function of the memory and the brain and in preventing depression.
COPPER	0-2 mg Along with curry powder, cocoa is one of the richest vegetable sources of copper.	0-60%	- Mostly found in dark chocolate, and to a lesser extent in milk chocolate.	- Probably has a role in countering cardiovascular disease.
IRON	0,3-5 mg	2-35%	- Mostly found in dark chocolate.	- Active in the transport of oxygen to all body tissues.
PHOSPHORUS	200-270 mg	25-35%	- Only in milk and dark chocolate.	- Involved in the maintenance of a strong skeletal system. - Has a role in the utilisation of energy arising from food.

<b>NAME</b>	<b>QUANTITY IN 100 G CHOCOLATE</b>	<b>% OF THE RDA PER 100 G CHOCOLATE</b>	<b>IN WHICH CHOCOLATE TYPES?</b>	<b>FUNCTIONS?</b>
ZINC	1-3 mg	7-17%	- The highest concentrations are found in dark chocolate.	- An important role in the take-up of nutritional elements from macro-nutrients. - Involved in cell growth and the repair of tissue in the human body.
MANGANESE	0-3 mg	0-100%	- The highest concentrations are found in dark chocolate, and to a lesser extent in milk chocolate.	- Helps in the functioning of the nervous system.

## **Theobromine and caffeine**

- Cocoa and chocolate contain minimal quantities of caffeine and theobromine. Scientists believe these substances have a stimulating effect on the operation of the central nervous system, the heart muscles, the production of urine and the relaxation of the respiratory muscles.
- In cocoa mass, theobromine is found in the greatest concentrations (1.89 – 2.69 %) while caffeine is present to a far lesser degree (0.16 – 0.31%). A comparison with the amount of caffeine in coffee (between 1 and 2.5%) shows that these amounts, and any effects, are relatively small. In view of the minimal quantities in cocoa and chocolate, most scientific studies point towards a minor or virtually unmeasurable effect.
- Many test subjects experience positive effects from the moderate consumption of these substances, such as elevation of mood and improved concentration.
- There is very little consistency in scientific findings on the possible negative effects of caffeine. Frequent coffee drinkers also appear to become accustomed to negative symptoms such as nervousness, palpitations or sleeping difficulties.
- Research into the consumption of caffeine in cocoa and chocolate by children shows no change whatever in the child's physiological or cognitive status or behaviour.

## **Some myths**

- Chocolate and obesity
  - After hundreds of scientific studies there is still no direct evidence that chocolate is an immediate cause of obesity.
  - The total number of calories consumed, the digestion of those calories and the balance in the consumption of proteins, carbohydrates and fats play the predominant role in the prevention of obesity.
  - Studies show that chocolate, consumed in moderation and as part of a balanced diet, is not a direct cause of obesity.
- Chocolate and tooth decay
  - Scientific analyses of cocoa and chocolate indicate very small concentrations of substances which cause caries or carry out an acidic attack on the tooth enamel.
  - Cocoa naturally contains substances that combat oral bacteria. Further, when nuts and/or dairy products are added to chocolate, the time taken for salivary enzymes to neutralise oral bacteria decreases.



- Chocolate and acne
  - No study has found evidence for chocolate as a cause of acne. While science is still groping in the dark for the precise cause of acne, indications are that this will be found in hormonal changes and bacterial effects.
  - The American Dietary Association and the American Academy of Dermatology currently discount any link between chocolate and acne.

### **Conclusions**

- Cocoa and chocolate contain valuable nutritional elements and may, with regular and moderate consumption, form part of a healthy and balanced diet.
- Neither is in reality the villain or the forbidden fruit portrayed by public opinion. Many of these prejudices belong in the past, or are the result of inexact scientific studies.
- Alongside its role as a source of energy and minerals, its taste and its fat/carbohydrate ratio means that chocolate offers positive psychological effects to such an extent that these effects are among its most significant.

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