

THE IMPORTANCE OF HONEY IN THE PRESENT ALIMENTATION

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1. The Present Situation of the Alimentation

The opinion that, in the Federal Republic of Germany, the diseases and the deficiencies caused by alimentation no longer exist has almost become a common place. But the reality is different!

On one hand, the Germans eat too much, too fat, too sweet and far too much meat; on the other hand, they eat too few vitamins, minerals and fibrous foods. The question is how did this wrong alimentation become so popular?

One reason would be the industrial processing of many aliments. Over 60% of the aliments offered are industrially finite products. The daily necessary of energy is ensured – at present – in a percentage of 75-80%, by overprocessed foods, such as the meats, the margarine, the extraction flour, etc.

While, in the private households, the aliments are usually only washed, cut and boiled, the alimentary industry often makes use of solvents and chemical acids, in order to decompose the natural raw materials into their components and thus to make new products. The more complicated was the processing of an aliment, the lower is its vitamins and natural minerals content and the higher is the danger of the formation of certain harmful substances during the elaboration of the respective aliment. Very often, the quantity of supplementary substances which are added to, aliments is also large enough. Such manipulations serve health only in very rare cases.

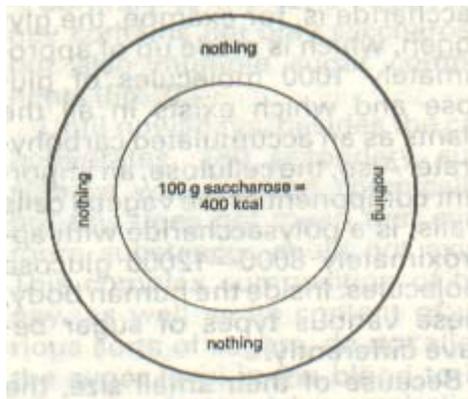


Figure 1 – Table Sugar

2. The Carbohydrates

2.1. The common (consumption) sugar

An example of how harmful a nutritive substance may be, when it is taken out of its natural context of aliment, is the sugar.

At present, the sugar is mainly obtained from the sugar cane. During the production, all the non-sacchariferous components of the plant are removed, thus resulting the disaccharide saccharose. Practically, the vitamins and the mineral substances no longer exist, and, besides the calories, the table sugar actually does not contain anything. Hence, the name of "empty calories bearer" which is given to common sugar.

2.2. The metabolism of the carbohydrates

From the chemical point of view, there are mono-, di- and polysaccharides. The glucose and fructose are monosaccharides. Both are made up of one single unit. Besides the consumption sugar (the saccharose), the maltose is also a disaccharide. As their names also prove, these carbohydrates are made up of two sugar units. A polysaccharide is, for example, the glycogen, which is made up of approximately 1000 molecules of glucose and which exists in all the plants as an accumulated carbohydrate. Also, the cellulose, an important component of the vegetal cells walls, is a polysaccharide with approximately 8000-12000 glucose molecules. Inside the human body these various types of sugar behave differently.

Because of their small size, the monosaccharides are the most rapidly undertaken by the blood, from the intestine. 10% of the glucose already pass from the stomach into the blood. The most part of it is re-absorbed by the small intestine and thus almost nothing reaches the large intestine.

In the intestine, the disaccharides are decomposed into monosaccharides, process which also takes place very fast. And they also are at the disposal of the organism after a very short while.

As the mono- and the disaccharides get so fast in the blood, the sugar level in the blood increases abruptly right after the consumption of these carbohydrates. As a consequence, the pancreas releases the insulin hormone, which decomposes the sugar and, thus, the level of the sugar in the blood decreases again. But thus, at approximately 60-90 minutes after an abrupt decrease of the sugar in the blood, the danger of a sublevel of sugar appears. Because, the higher the sugar level in the blood is, the more insulin is released.

A high level of insulin produces an increased transformation of the sugar into fat and strengthens the sensation of hunger. If larger quantities of isolated sugar are consumed more often, the metabolism is marked and the overponderability may install itself, as well as the manifestation of a saccharous diabetes) of the type II) (3, 5, 6).

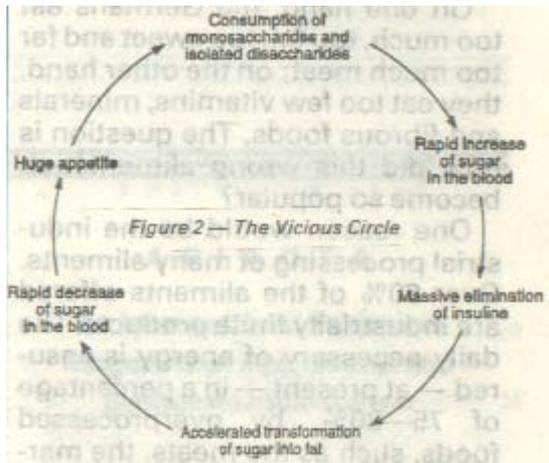


Figure 2 – The Vicious Circle

In order to decompose the carbohydrates, the human organism needs vitamin B₁. As this vitamin is no longer contained by the isolated sugar, the organism's resources are used. If the alimentation is unilateral for a long period of time, a deficiency of vitamin B₁ appears.

In the organism, the polysaccharides, such as the glycogen and the cellulose are decomposed into monosaccharides, and this process takes place even before they enter the blood circulation. As this process requires a longer time, the level of sugar in the blood increases more slowly and more uniformly than after the consumption of sugars with short catenae. The metabolism is not overworked and, therefore, there is no danger of a sublevel of the sugar in the blood. The energy obtained from the decomposition of the polysaccharides remains longer at the disposal of the organism.

3. The Components of Honey and Their Importance for the Physiology of Alimentation

Very often, honey and sugar are “put in the same pot” and it is stated that honey is as harmful as the sugar is. As honey is not an isolated aliment and it differs very much from the table sugar by its chemical composition, it would have different effects on the human organism.

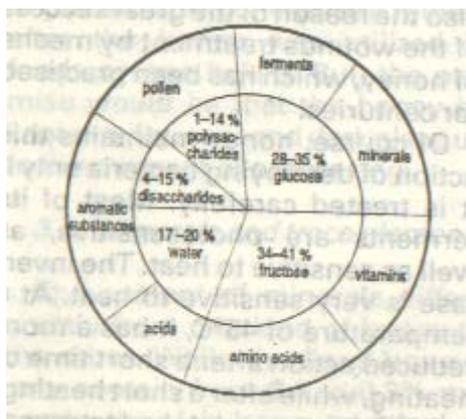


Figure 3 – Honey Components

3.1. Sugar compounds

Honey may contain up to thirty different sugar compounds. This is possible because, by means of certain substances – the ferments – the bees transform the sugar in the nectar or in the honeydew into other sugar components. Partially, these components are still active after encapsulation.

The fructose content of honey differs from one type of honey to the other and oscillates between 34 and 41%. In the organism, the fructose goes through different processes, in comparison to glucose. It is decomposed independently of the insulin and is transformed – mainly by the liver – into glycogen, an accumulated carbohydrate.

Contrary to the cane sugar, honey contains not only saccharose, but also multiple sugar components (fig. 3).

Until nowadays, besides the carbohydrates, 180 secondary substances were proved chemically; but this does not mean that even more substances could not exist. This complex composition of honey, as well as its content of various sorts of sugars, do not allow the sugar level in the blood to increase too fast and the metabolism to be overworked, after the consumption of a quantity of honey equivalent to one of sugar.

According to the most recent American researches, the fear which exists in Europe regarding the administration of honey in the case of the saccharous diabetes type II ("the adults' diabetes") is groundless. But the person who consumes honey and suffers from diabetes must try this thing carefully and under medical supervision. It is too risky to advise a diabetic patient to consume honey in unlimited quantities.

3.2. Ferments

In the past, new substances, which even in small quantities fulfill important tasks in the human organism, were discovered all the time. Many times, people only heard of them when they became ill because they lacked certain substances. The ferments may also be included in these so-called "secondary vegetal substances".

Up to the present, twelve different ferments – among which the invertase, the diastase and the glucoxydase – were found in honey. Each ferment may induce only a certain chemical reaction. Thus, the invertase decomposes the saccharose into fructose and glucose, the diastase decomposes the glycogen into more reduced sugar components, and the glucoxydase decomposes the glucose.

The glucoxydase transforms a small part of the glucose into gluconic acid, which makes honey slightly sour and thus prevents the appearance and the spreading of many bacteria. Also, many yeasts are sensitive to sourness. Even the *Clostridium botulinum* bacteria, which may cause the most dangerous alimentary intoxications, cannot reproduce in the acidulated environment of honey.

After the decomposition of glucose, the hydrogen peroxide, which is a substance with an extremely high capacity of destroying bacteria, is formed, as a secondary product. If to a nutritive medium we add a 17% concentration of unheated honey, then, a series of dangerous bacteria can no longer grow. Even such an aggressive representative as the *Staphylococcus aureus*, which mainly attacks the aliments which are rich in carbohydrates and albumines and which causes serious states of vomiting, can no longer spread if a "nutritive honey medium" is inoculated seven times. The honeydew honeys may partially destroy or stop the germs from developing even in dilutions of 1:64. The substances contained by honey and which do not allow the growth of bacteria or which destroy them are also called "inhibines" (4). In the 50s, the glucoxydase under the form of "penicillin B" was isolated from mildew fungi. The antibacterial action of honey was demonstrated without problems. Therefore, the old home remedy: "hot milk with honey", which was recommended for the so-called "colds" is, indeed, useful. Of course, the milk may very well be replaced by the hot tea.

The inhibines are not only the explanation for the good preservation of honey and for its beneficent action in the case of infections of the superior respiratory tracts, but also the reason of the great success of the wounds treatment by means of honey, which has been practised for centuries.

Of course, honey maintains this action of destroying bacteria only if it is treated carefully. Most of its ferments are photosensitive, as well as sensitive to heat. The invertase is very sensitive to heat. At a temperature of 45 °C, it has a more reduced action after a short time of heating, while after a short heating, at 70 °C, it is completely destroyed. The action of light also has negative effects on many ferments.

The following table indicates the influence of the storage and processing temperatures on the preservation of the active substances in honey.

Also, the time after which only half of the ferments still exist is indicated. It is clearly reflected that there is not such a temperature up to which honey could be heated as many times or as long as one would want, without being degraded.

The Influence of the Temperatures on the Preservation of the Ferments in Honey*

Temperature, °C	The Halving Time	
	Diastase	Saccharase
10	12.600 days	9.600 days
20	1.480 days	820 days
35	78 days	28 days
50	15,4 days	1,3 days
71	4,5 hours	40 minutes
80	1,2 hours	8,6 minutes

* Table according to Maurizio (bibliography 9)

But, there are also active substances which are stable to heat, such as the “pinocembrine flavonoid”, which is also capable of destroying the germs. A part of the important components still remain after the honey was utilized in foods or was baked. But, the premise would be that the honey be kept in a dry, cool and dark place up to the moment of processing.

3.3. Minerals and trace elements

The content of minerals differs greatly from one kind of honey to the other. While the floral honeys may contain from 0.1 to 0.3% minerals; the plain honey and the honeydew honey contain up to 1% minerals.

The various sorts of honey contain: sodium, potassium, magnesium, calcium and phosphor, as well as trace elements of iron, copper, manganese and chromium.

The minerals and the trace elements direct the biological processes and are indispensable to the perfect functioning of the human metabolism. Thus, sodium, for example, regulates the water content in the organism and it is necessary for the formation of chlorhydric acid in the stomach.

Potassium is responsible for the normal irritation of the muscles and the nerves, but also for the activity of the intestinal muscles. In case of a potassium deficiency, which is usually the case of diarrhea and of greater losses of liquids, the movements of the intestine decrease and there appears the danger of an intestinal paralysis and of functional derangements of the heart.

Together with potassium, magnesium is the one that directs the functions of the muscles and of the heart, both these elements being responsible for the regulation of the arterial pressure. There are indices for the fact that, in case of a magnesium deficiency, the sensitivity of man to noise increases. Also, arrhythmias of the cardiac rhythm and an extremely severe irritability were noticed in the case of the magnesium deficiency.

The trace elements exist in the human organism only in small quantities, but this does not mean that they are not important. Iron has a special importance. Iron is necessary for the production of the red colorant of the blood, the haemoglobin, which quantity needs to be replaced daily, up to a certain extent. Many times, the iron supply, by means of food, is not satisfactory, because iron exists in aliments under a form which would rarely be used by the organism. In honey, because of the simultaneous existence of vitamin C, the iron will take a well utilizable form. Honeys generally contain 1.3 to 2 mg iron/100 g. In comparison to other aliments, the iron content in honey is quite high. Thus, for example, the veal muscle supplies approximately 1.9 mg/100 g, and the pork – 1 mg/100 g. Of course, it is much easier for one to eat large quantities of meat, instead of honey, but honey, as a supplementary source of iron must not be minimized.

But, copper is also necessary for the formation of haemoglobin. And it is also contained by honey. Copper helps the formation of haemoglobin and plays a special part in controlling the infections.

As a component of the active substances, the manganese also regulates the development of many metabolic processes. Essential for honey is the fact that manganese improves the utilization of vitamin B₁.

Another example of the great importance of even the smallest quantities of trace elements is chromium, which was discovered in honey and which is called “the glucose tolerance factor”. It is necessary for the utilization of the glucose in the organism, as it helps the insulin to fully develop its action on the cell. According to more recent data, it seems that chromium has an action of reducing the sugar level in the blood. In the case of certain adult diabetic patients, the disease could be meliorated by supplementary doses of chromium. In the Western developed countries, many times, the chromium supply is insufficient, because, in the production of certain aliments, such as the extraction flour and the isolated sugar, the natural content of chromium of the respective aliments is almost entirely destroyed. Probably, besides other factors, the relatively high content of chromium in honey is the one that determines a more favourable metabolism of honey, in comparison to the sugar extracted from the sugar cane. (5).

3.4. Vitamins

The various sorts of honey contain small quantities of vitamins. In minimal quantities, there are: vitamin C, vitamin B, vitamin B₂ and vitamin B₆. But all the liposolube vitamins do not exist. Therefore, honey is not a source of vitamins. But vitamin C contained in honey has a substantial contribution to the improvement of turning iron to a good account.

As we have already mentioned, in paragraph 2.2, the human organism needs vitamin B₁, in order to turn sugar to a good account. While the table sugar does not contain vitamin B₁ at all, honey contains it in very small quantities. The action of this vitamin is improved by the simultaneous presence of manganese.

In comparison to the isolated sugar, honey does not supply only carbohydrates, but, at the same time, it also provides the substances which are necessary for the utilization of sugar by the organism. Honey is an example for the fact that the nutritive substances are best utilized and turned to a good account when they are in a natural association of aliments and when they are consumed in this form.

3.5. Aminoacids

The bases of the proteins are the aminoacids. The protein content of honey is similar to that of vitamins: with a protein content of 0.3-0.8%, therefore, honey – as a daily food – is not an adequate source of proteins. But honey contains nitrogen components which may be important even in small quantities. Thus, acetylcholine was found in the sweet liquid.

This substance is used in medicine, under an isolated form, and is intravenously injected in the heart. It reduces the heart beats and, therefore, diminishes the blood pressure, enlarges the coronary vessels of the heart and has a favourable influence in the case of cardiac arrhythmias. It was experimentally demonstrated that acetylcholine reaches the heart after the honey consumption and that it has favourable actions in the case of the deficitary coronary irrigation, arrhythmias, heart inflammation, heart damages after an infarct and high blood pressure. Honey cannot replace any drug for the heart, but it may be an adjuvant of the therapy applied. In these cases, it is recommended that one consumes a (table) spoon of honey at least twice a day.

Honey also has an extraordinarily good action in the hepatic affections. This action is determined, on one hand, by the large quantities of fructose, and on the other hand, by the existence of another component: the choline. In the case of certain hepatic affections or of overworking of the liver due to certain severe diseases, the glycogen provisions of the liver are diminished so that a glycogen penury will be formed. Glycogen is not only an energy resource for the organism, but is also strengthens the resistance of the hepatic cell. Choline increases the capacity of utilization of the sugar and favours the incorporation of fructose in the glycogen of the liver. After the consumption of honey, 68% more hepatic glycogen is formed than after the consumption of the same quantity of saccharose. As choline regulates not only the metabolism of the carbohydrates, but also that of the lipids in the liver, at the same time, it prevents an adiposity of the liver.

Choline must be taken from aliments, as the organism cannot produce this substance by itself. Two to three grams of choline per day are necessary for this.

3.6 Acids

Honey contains a multitude of organic acids, which, to a small extent, come from plants and, to a large extent, from the thoracic gland of the bee. Acids are formed during the fermentative transformation of sugar and they are: the formic acid, the succinic acid, the butyric acid, the acetic acid, the glucuronic acid, the citric acid, and so on (see 3.2.). These acids have a determining influence on the aroma and the flavour of the various sorts of honey and they act positively on the appetite and the digestion. But, it seems that not only acids are responsible for the beneficent action of honey, but also other components of honey, as well. Thus, the acetylcholine is known to improve the activity of the intestinal muscles. Also, potassium is responsible for a good intestinal peristalsis (see 3.3.). A tea spoon of honey, taken in the evening before the sleep, may solve certain problems of defecation, which do not have an anatomical origin. As there are great differences as regards the acids content, it is recommended that many sorts of honey be tried.

3.7. Pollen

The unfiltered honey contains tiny quantities of pollen. The often-present argument that the active substances exist in honey in much too small quantities to be capable of determining a physiological action may easily be opposed by using the example of pollen. In the persons who allergically react to pollen, many times, the quantities contained by honey are sufficient to cause the feared reactions, such as the hay disease or the asthma. But these tiny quantities of pollen do not cause only undesired reactions, but also physiological ones. Thus, it was noticed that the hay pollen acts brilliantly in the case of prostate diseases and is very successfully used in medicine.

The researches in the Witten University discovered that the floral pollen helps the irrigation with blood of the mucous membrane in the small intestine. Twenty minutes after pollen reaches the intestine, substances which, in their turn, activate the immunity system of the intestinal wall, are released. At the same time, the degree of blood irrigation of the intestine increases. These reactions also explain the good action of honey on the digestion (see fig. 3.6.).

The American allergologists recommended the patients who were allergic to pollen to consume – daily – at least a tea spoon of honey, in order to gradually get used to the allergies-causing substance. But these recommendations are successful only when the honey comes from the neighborhood (a diameter of approximately 16 km around the city of residence) and if it has not been heated and filtered.

3.8. The flavour and aroma substances

By means of gaseous chromatography, over fifty aromatic substances were discovered in honey and many of them have already been chemically identified. Depending on the origin of honey, these substances exist in various quantities and compositions and this is why we speak of honeys and not of honey, like in the case of wine. Nowadays, the existence of natural aromatic substances in aliments is very rare. There are over 3000 synthetical aromatic substances which are added to aliments.

Since the most ancient of times, the volatile oils, such as the menthol or the eucalyptus oil, were used for colds of the respiratory tracts, in order to liquefy the mucosity and to weaken the bronchial spasm. The volatile oils in honey also act in this respect, fact which explains the good action of honey in the case of certain maladies of the respiratory tracts, action which is emphasized by the inhibines in honey.

It was demonstrated that the volatile oils in honey dilate the blood vessels of the kidneys and favour the diuresis.

4. The Acceptability of Honey

Honey is easy to be digested and, therefore, easily accepted. It is accepted even in the cases when anything else is vomited, such as in the case of the vomiting states in pregnant women and of infections. When because of the vomiting and the diarrhea a lot of liquid is lost, the potassium content in honey is very important, (3.3.).

According to some reports of the pediatric departments in the various university clinics, honey may also be used for feeding the newborn children. The rape honey is the most accepted and the best for the stomach, as it contains few acids.

5. The Honey Content of Harmful Substances

Honey is one of the aliments which have the lowest content of harmful substances. This thing is owed to the filtration systems in the bee and the plants, which retain many toxic substances from the environment. Only a small part of the toxic substances passes through the roots into the plants, and even this part will reach the nectar in tiny quantities. An even smaller quantity of toxic substances will be found in honey, as the bees are very sensitive to pollution and very easily die because of it.

A honey which has been extracted according to the standards will not contain chemical additions.

6. The Utilization of Honey for Cooking

Its naturalness, the tiny amounts of toxic substances and its rich content of natural active substances, make honey an ideal aliment for the daily healthy alimentation and a valuable component of the alimentation in general. As the concentrated cane sugar juice, the maple-tree syrup and the apples and pears juice contain over 90% saccharose, in the process of concentration, they will lose many valuable components. And then, honey is the only alternative for sugar. In the daily alimentation of the people who have a healthy metabolism, sweet substances must not exist, as a cancerigenous action of these substances might not be excluded from discussion.

There is a multitude of possibilities for the utilization of honey for cooking. If honey is used for the preparation of the sauces for salads, for the sweetening of cakes and cold drinks, then, the meals will not only be very tasty, but they will also contain active substances. As honey also contains components which are not sensitive to heat, this beehive product may also be used for baking and cooking. Very tasty are the steaks which have previously been oiled with oil and honey and spiced with salt and pepper. If we want to spice warm dishes, such as soups, sauces, puddings, then, it is recommended that honey be added only after boiling. If it is possible, the respective meal should not be boiled after the honey is added, as many active substances may be lost.

Honey is used not only for the famous ginger bread, but also for almost all the cakes. But it must not be forgotten that honey contains much more water than the sugar. If, in a recipe, we will replace sugar with honey, then we will reduce the liquid which is added to the pastry by 2-3 table spoons. It is also recommended to add half a tea spoon of baking powder to the pastry.

Many housewives believe that the amount of sugar in their jams is too large. The sugar in jelly may be replaced with honey, if some agar-agar or a liquid gelatinous substance is supplementary used. In correspondence with the acidity content of the fruits, for 1 kg of fruits, 300-500 g of honey and 15 g of agar-agar are necessary.

7. Final Conclusion

For the maintainance in good health of the human organism, not only the consumption of some nutritive substances, in sufficient amounts is important, but also their quantitative ratio, as well as the form under which they are offered to the organism. If these nutritive substances still belong to a natural association of aliments, then, the chance of a complete utilization of all the components is greater. It is possible that the recoveries noticed after the consumption of honey – cases which have been transmitted along the centuries from one generation to another – found their explantation in the composition of nutritive substances of honey, which is an optimal composition for the human organism. Even though many mechanisms of action of honey have been insufficiently or not at all made clear, from the medical point of view, it is certain that honey has a positive action on the various organs.

In the next years, the purchase of natural aliments processed as little as possible, as well as their recognition from among the multitude of aliments offered, will be very difficult. This is why, beginning from today, such a natural product as honey is has to be given the proper attention.

BIBLIOGRAPHY

1. Ärztezeitung 11. 10.1989
2. ELMADFA, I., D. FRITZSCHE, H.-D. CREMER – Die große GU Nährwerttabelle, Gräfe und Unzer, 1989
3. GRUNEWALD, H. – Alles was süß macht, Verbraucherzentrale Niedersachsen e.V.
4. HERLOD, E. – Heilwerte aus dem Bienenvolk, Ehrenwirth, München, 1988
5. KASPAR, H. – Ernährungsmedizin und Diätetik, Urban und Schwarzenberg, München, 1987
6. KOERBER/MÄNNLE/LEITZMANN – Vollwerternährung, Haug-Verlag, Heidelberg 1981
7. KLOPFLEISCH, R., A. MAYWALD – Es ist angereichert, Rasch und Röhring, Hamburg, 11989
8. KONOPKA, P., W. OBERGFELL – Die gesunde Ernährung des Sportlers, CD-Verlagsgesellschaft Stuttgart, 1980
9. MAURITIO, Z. – Der Honig, Ulmer Verlag
10. MEHRL, H. – Honig und seine Inhaltsstoffe, Imkerfreund 6/87
11. Pharmathek 2/90, Pharmathek Verlags- GmbH