

THERAPEUTIC EFFECTS OF HONEY AND DIABETES HYPOGLYCAEMIA

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Diabetes hypoglycaemia management

Several factors may determine the cause of diabetes hypoglycaemia, like a higher dose of insulin, less food intake, meal out of schedule, stress, physical activity, etc.

An adult will probably be able to manage well the whole process to find a desired equilibrium to avoid insulin reactions. On the other hand, juvenile diabetes may cause a difficulty in the optimal management, because there are too many constraints and too many factors to be considered. In most cases, this is a very hard task for a child who wants to enjoy life like all other children of his age.

The Diabetes Control and Complications Trial study (DCCT) conducted for 7 years, showed that with more accurate self-monitoring of the blood glucose level, in between normal values, diabetes complications are prevented and diminished even when already existing.

Also, before intense physical activity if the glucose level is under 100 mg/dl, 5.5 mmol/l it is preferable to ingest 15 g (10 for children) of quick carbohydrates to avoid a later reaction. For children it is recommended to give them 5 g per 20 kg of their weight.

When exercising for long periods, it is recommended to take a carbohydrate snack or a quickly absorbed carbohydrate at least every half hour.

In the normal process of digestion, solid food needs to be chewed and needs some liquid to be ingested. As a natural course of digestion, saliva is automatically injected in the mouth by the salivary glands. When ingesting a solid food, like a sandwich, powder sugar or a glucose tablet, the saliva plays a major role.

People with diabetes have little saliva when hypoglycaemia occurs and it is difficult for them to ingest glucose tablets. The absorption of glucose, to overcome the hypoglycaemia, is therefore slowed down. Under these circumstances, it takes a longer time to re-establish blood glucose normal conditions.

When eating regular food, the assimilation of the glucose needed by the body is very slow. This is due to the break up in sugar chains. Furthermore, the use of candy bars, which contain undesired elements such as chocolate, peanuts, etc., can use several problems such as obesity, cholesterol and the absorption of unwanted stimulants.

It is known that the assimilation of sugar in a liquid form is very quick, but other problems appear when drinking beverages to counterbalance hypoglycaemia, for example most beverages need to be refrigerated. Also, they may contain undesired elements like caffeine or other stimulants, fats, carbon dioxide, etc.

Not knowing when hypoglycaemia will occur, a person with diabetes should always carry remedies for hypoglycaemia, but this sometimes leads to other problems. In fact, it is difficult to carry food or beverages especially when using public transportation, when working, when in class, etc. Two main factors are to be taken in consideration. The first is the way to carry the remedies and the second is the way to preserve them. Indeed, when the temperature is high, food will deteriorate very rapidly, making the food (e.g. sandwiches, candy bars, chocolate) inedible after a short time and its ingestion dangerous (i.e. may lead to food poisoning). In addition hot fruit juices may cause diarrhoea. The problem of fresh deterioration can be solved by buying the food when necessary or by staying at home, but this is not always possible.

Even if the above problems are solved by some people, the costs are very high, and the majority of people cannot afford them.

Therefore, it appears evident under those circumstances that solid remedies are not well suited to people with diabetes when hypoglycaemia occurs. However, a sandwich or a more substantial food might be needed to sustain the glucose blood level over a long period of time if a meal is not be taken soon. In addition, it is recognized that in severe stages, glucose-chewing candies are not recommended because of the danger of choking.

We can conclude that solid food is not an optimal solution to solve hypoglycaemia. It appears that to always efficiently counterbalance hypoglycaemia, people with diabetes need a unique solution responding to the following criteria: it should have a quick (and lasting) action, it should be easy to carry, it should be cheap, it should be able to be preserved over a long period without deterioration, it should be easy to use by everyone: children, adults and the elderly alike, and it should be easy to buy.

Honey for hypoglycaemia treatment

Honey is well suited when diabetes hypoglycaemia occurs and several specialists have recommended it. Moreover, it is well suited because its acidity and its hygroscopicity will induce salivation, augmenting its liquidity. Since honey is already in a liquid form and contains an average of 17% of water, this will increase the speed of sugar absorption and assimilation.

Due to the high concentration of sugars (see Table I below), honey is considered a highly energetic food, 30 Kcal per 10 grams. The monosaccharides (69.5%) are directly absorbed by the body into the blood stream without need of digestion. The direct absorption of the dextrose (glucose) and the levulose (fructose) will higher the blood glucose level quickly and re-establish blood glucose normal conditions and maintain them. Fructose is more slowly absorbed than glucose, and does not need insulin supply. If the fructose and glucose are not used directly, they will be transformed and stored in the liver as glycogen. The other remaining sugars will be assimilated more slowly, and will contribute slightly, with fructose, to maintain the normal blood glucose level over a long period.

Table I

Carbohydrates categories and percentage in honey

Monosaccharides	%	Disaccharides	%	Trisaccharides and higher sugars	%
Levulose (Fructose)	38.2	Sucrose	1.3	Erllose, dextrantriose, melezitose, panose, raffinose, 1-kestose and others	
Dextrose (Glucose)	31.3	Maltose and other disaccharides	7		
Total of category	69.5		8.6		1.5
Total sugars %	79.6				
Percentage of total for each category					
Monosaccharides	87.3	Disaccharides	10.8	Trisaccharides and higher sugars	1.9

The table is derived from *Apiculture*, p. 12; WHITE, "Composition of honey", in CRANE, 1975, p. 162, 166; CRANE, 1980, p. 40-42, 169; WHITE, "Honey", in: *The Hive*, p. 873, 876-877.

Honey can also be used when a person is unconscious, by pouring a little honey onto one's clean finger and gently rubbing the internal cheek of the unconscious person. Thus the carbohydrates will be absorbed by the mucous membrane. A trained person should administer this practice.

Furthermore, due to its composition, honey should not damage the renal system; on the contrary, it should help with toxin elimination and should restore the osmotic equilibrium. As we know, kidney malfunctions are one of the most severe complications of diabetes.

Also, the taste of honey is attractive, especially to children, which is important when they are obliged to eat something to raise their blood glucose level and hypoglycaemia occurs. Thus making the process easier for them.

Diabetes complications and other honey properties

Honey has several other healing properties that may be beneficial to people with diabetes. Here are few effects that are to be considered in diabetes, and diabetes complications.

Antibacterial effects: Honey has proven antibacterial effects. Honey is known to be hygroscopic. STURTEVANT, in the 50's, has shown that this physical characteristic of honey absorbs the humidity from the germ's infested parts, thus killing them.

Cardiovascular: Heart: Researches showed that honey has a beneficial effect on the heart. It regulates cardiac arrhythmia. It increases the coronary blood flow and decreases the heart rate due to the presence of acetylcholine and glucose. In addition, honey strengthens the heart.

Blood: It appears that honey ameliorates the blood stream's fluidity, lowers blood pressure, and prevents and cures arteriosclerosis. Also, researches have shown that a regular intake of honey will increase the level of haemoglobin, improving the system's oxygenation. The rise of haemoglobin will fight anaemia.

Child growth: Honey can be used instead of other sweeteners to help children's growth. Several studies have shown that children tolerate honey better than sucrose and honey will increase their growth. The risk of fermentation is really small, which is very important for children. The assimilation of honey, because it supplies its own minerals and vitamins, will not detract from the child's body these latter elements during digestion. Furthermore, its vitamins, minerals, proteins and amino acids, will sustain a normal growth for the entire body, as well as bone structure, including teeth. Honey is very helpful in cases of anemia, rickettsia and demineralization because it supplements the child's body, even if slightly, with essential elements needed for growth, which are totally assimilated.

Digestive system: In the process of producing honey, bees digest and transform the nectar. Thus, honey is pre-digested, which gives it a unique characteristic. Among foods, it is one of the most easily assimilated.

Honey's sugars are readily absorbed, excluding the risk of fermentation (which may rarely occur). If used diluted, by mixing with other foods or spread on bread etc., it should not irritate even the more sensitive mucouses. Till now, it seems that no allergies have been reported due to honey. However, some mild intolerance or mild gastric troubles have been reported, especially when honey is eaten pure. These reactions are called idiosyncrasy. To reduce or eliminate these reactions, it might help to dilute honey in a warm beverage, or by spreading it on bread or a similar substance or by mixing it with other food. If the unease still persists, do not consume honey.

Honey is a pre-digested food and is used to treat disorders of the digestive system. Honey does not ferment. Its action reduces dyspepsia. It is easily absorbed so the digestive system does not require work. It has a mild laxative effect, offering relief from constipation. Its actions regulate the intestinal bacterial flora, which is helpful to reduce diarrhetic states. The five enzymes found in honey will contribute to ameliorate digestion.

Honey is known to cure gastric and intestinal ulcers because it normalizes the acidity of the gastric juices and lessens the irritability of the organs' nervous system.

For better results, when treating ulcers, indigestion and digestive disorders, honey should be taken in a warm beverage, instead of eating it pure. A warm beverage will not produce a temperature contrast between the beverage and the digestive organs, thus helping them to work properly and maintaining or restoring the lost equilibrium.

Honey has a cleansing and protecting action on the liver due to the increased glycogen accumulation.

Taken before mealtime, honey will stimulate the gastric juices inducing appetite. However, if one is very hungry it will reduce the appetite, because of its supply of calories.

Nervous system: Honey is effective on the nervous system, restoring its equilibrium. Its sedative effect will calm down the nervous individuals. It soothes aggressiveness, depression, burnouts, headaches, and anxiety. Honey is well suited for intellectual activities due to its glucose and its phosphorus content. Also, it is excellent in producing sleep.

Renal system – Kidneys: Honey is recognized to be diuretic and to help the renal system to fulfil its cleansing functions. It spares the kidneys, reducing tissue destruction. Its composition, especially its antibacterial power and its acids are of help in renal system disorders, like nephritis and cystitis. It is well suited to kidney disorders because its content is low in sodium and protein, two elements contraindicated in those disorders.

Skin: Honey has been proven to have a beneficial action on skin affections. As already mentioned, honey is a bactericide and it will cure wounds and burns, and other skin affections, even when they are infected. Its action will quicken healing. It has been used successfully by surgeons after operations to heal the extensive wounds.

Honey acts as a good protective shield over wounds because of its viscosity, however it is water soluble, therefore easily removed. Coagulated blood will not adhere to gauze. When water is used, the glucose oxidase activity will increase, producing a higher amount of hydrogen peroxide, which will give further protection to the affected part.

It is noticed that when honey is applied to skin there is an increase in flow of blood and lymph, which will produce a cleansing and bactericidal effect on an affected part. When skin is damaged, this will accelerate the healing process. When applied, it will reduce pain considerably, it will prevent the formation of blisters on skin burns and scars from wounds will barely appear.

Honey is bactericidal, non-irritating, non-toxic, nutritive, easily applied and re-moved, easily found and after all cheap. Therefore, honey is an effective way to heal wounds and burns with topical applications, which can be changed daily or as necessary.

Furthermore, honey has a tonic, moisturizing and demulcent action on the skin. Its components will nourish the subcutaneous nervous ramifications and the epithelial tissues. Its action and properties will soften and cleanse the skin, rejuvenating it, especially after the age of forty.

Advantages of honey over other sugars:

1. Honey is directly assimilated without need of digestion.
2. It contains fully assimilable elements (minerals, trace elements, vitamins, etc.)
3. It supplies quick and lasting energy, increasing the blood glucose level, without an abnormal need of insulin; on the other hand, sucrose will provoke an abnormal insulin production, which can lead to another incident of hypoglycaemia, in normal people.

4. It supplies five enzymes to the digestive organs.
5. It does not ferment, but very rarely, (very important for children), contrary to industrial sucrose.
6. It is generally non-irritating to the digestive system and better tolerated than industrial sugars.
7. It is a natural and mild laxative.
8. It has an alkalising and antacid power (sucrose provokes acidity).
9. It does not provoke metabolic imbalances as industrial sugars do. The latter will subtract elements from the body to be digested provoking metabolic imbalances, if these elements are not supplied by other food or within the food where industrial sugars are present; i.e. most likely to occur when consumed pure.
10. It is generally in a liquid form, thus speeding up the assimilation of sugars when hypoglycaemia occurs. Even when granulated, the water content is still present. It melts quicker.
11. It is a reconstituent; it will quicken recovery from fatigue due to physical and intellectual activities.
12. It spares the kidneys more than all industrial sugars.
13. It increases haemoglobin.
14. It is a sedative, it will re-equilibrate and calm down irritability, anxiety and other unbalances of the nervous system.
15. It produces sleep.
16. It is a tonic.
17. It has antibacterial effects.
18. It heals burns and wounds.
19. It will enhance the body's immune system. Whereas industrial sugars (like sucrose) seem to interfere with it.
20. It has several healing properties.
21. It contains more than one carbohydrate.
22. It is more palatable than industrial sugars. It has an infinite number of tastes.
23. It can be part of a first aid kit due to its several uses and effects.
24. It is hygroscopic.

We can conclude that honey may be beneficial to people with diabetes by preventing and reducing some of its complications when used to counterbalance hypoglycaemia. Further clinical research is suggested. Hereafter, a crossover clinical research is proposed.

Crossover Clinical Research Proposal

Subject: Study the effects of pure honey (non-pasteurized, unheated, unfiltered) when used to counterbalance hypoglycaemia episodes in people with diabetes (IDDM and NIDDM).

Aim: Assess if honey, compared to glucose solution, will prevent and reduce some of diabetes complications and increases the well-being and general health of people with diabetes.

Aspects to be studied in patients

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| 1. General aspects: | <ol style="list-style-type: none">1.1. Reaction of honey vs. glucose on hypoglycaemia;1.2. Recurrence of hypoglycaemia;1.3. Changes in level of awareness of hypoglycaemia episodes. |
| 2. General conditions: | <ol style="list-style-type: none">2.1. Immune system;2.2. Occurrence of common diseases and ailments;2.3. Fatigue;2.4. Skin condition;2.5. General mood;2.6. Bones and teeth;2.7. Sight;2.8. Detoxification;2.9. Other aspects. |

- 3. Nervous system:**
- 3.1. Anxiety, irritability and aggressiveness;
 - 3.2. Hypoglycaemia fear;
 - 3.3. Sleeping difficulties;
 - 3.4. Concentration;
 - 3.5. Hyperactivity;
 - 3.6. Depression, burnout, etc.
- 4. Cardiovascular system:**
- 4.1. Coronary problems;
 - 4.2. Arteriosclerosis;
 - 4.3. Arrhythmia;
 - 4.4. Haemoglobin level;
 - 4.5. Vitamin and mineral level.
- 5. Renal system:**
- 5.1. Nephritis;
 - 5.2. Cystitis;
 - 5.3. Kidneys;
 - 5.4. Other complications of the system.
- 6. Digestive system:**
- 6.1. Food digestion;
 - 6.2. Bowel movements;
 - 6.3. Irritability of the organs;
 - 6.4. Gastric troubles;
 - 6.5. Ulcers;
 - 6.6. Enzymes;
 - 6.7. Liver.
- 7. Respiratory system:**
- 7.1. Reaction to allergies;
 - 7.2. Vulnerability to external elements;
 - 7.3. Colds and influenza: recurrence, intensity of symptoms and length of time necessary to recover;
 - 7.4. Sinusitis: recurrence, intensity of symptoms and length of time necessary to recover;
 - 7.5. Other respiratory and ORL affections: recurrence, intensity of symptoms and length of time necessary to recover.
- 8. Other aspects:**
- 8.1. Appeal of the remedy;
 - 8.2. Palatability;
 - 8.3. Remedy preference of use.

Research Design:

The study should be:

1. Multicentered;
2. Multinational;
3. Conducted for at least 15 months, with crossover at 7.5 months;
4. With the crossover preferably in the beginning of the first month of winter;
5. With 80% IDDM and 20% NIDDM subjects;
6. With patients between age 6 and 60, with 20% aged between 6 and 15;
7. With a minimum of traumatic testing on patients especially those aged between 6 and 15.

REFERENCES

- Apiculture: qualité et manipulation du miel. Edited by "Comité apiculture du CPVQ (Conseil des productions végétales du Québec)"; editing committee: Marie-José Feller-Demalsy, Bernard Levac, Jocelyn Marceau. Québec: CPVQ, 1996, p. 39
- Baugé-Prévost, Jacques. La santé par les produits de la ruche. Outremont: Éditions Quebecor, cop., 1994, p. 149
- Beck, Bodog Felix, Honey and your health: a nutrimental, medicinal and historical commentary / by B.F. Beck and Doree Smedley. London: Museum Press, 1947, p. 231
- Belmonte, Mimi M., The diabetic child and young adult: a primer for parents and professionals. 1st ed. Montréal: Eden Press, c1983. viii, p. 308
- Bennett, Margaret, Tout savoir sur le diabétique: questions-réponses et plus encore... [Montréal]: Stanké, [c1997], p. 227
- Bernstein Richard K., Diabetes: the GlucograF method for normalizing blood sugar. In collaboration with members of the Diabetes Research and Training Center of the Albert Einstein College of Medicine and Montefiore Hospital and Medical Center. Los Angeles: Boston: J.P. Tarcher; Distributed by Houghton Mifflin, c1984, xxvi, p. 294
- Block Mary Ann, "Ear infections and bacterial resistance". Nature's Impact. Burnaby, B.C.: Impakt Communications, Inc. February/March, 1998, p. 24-27
- Bordeleau Charles, Le miel: aliment miracle. [Montréal]: Editions Héritage, 1979, p. 73
- Contini Mila, L'alimento miele in cucina. Dr. Luciano Pecchiai: Centro di Eubiotica umana: Ospedale dei Bambini «Vittore Buzzi» di Milano. 2nd ed. Studio Edizioni, Milano, 1980, p. 215
- Crane Eva Ethel, A book of honey, New York: Scribner, 1980, p. 193
- Crane Eva Ethel, Honey: a comprehensive survey / edited by Eva Crane. Bee Research Association. London: Heinemann, 1975, xvi, p. 608. "Biological properties of honey", p. 258-265. White Jr. Jonathan W. "Composition of honey", p. 157-194. "Physical characteristics of honey", p. 207-236. Willson R.B., and Crane Eva E, "Uses and products of honey", p. 378-390
- DCCT Research Group: The Diabetes Control and Complications Trial Research Group. "The effect of intensive treatment of diabetes on the development and progression of long-term complications in insulin-dependent diabetes mellitus". The New England Journal of Medicine. Boston: Massachusetts Medical Society. Vol. 329, No. 14 (September 30, 1993), p. 977-986
- Diabetaide: renseignements à l'intention des diabétiques / [réalisé par Roger Alarie et al.] 2^e éd. Rév. Montréal: Association du diabète du Québec, 1980, p. 64
- Diabetes sourcebook: basic information about insulin-dependent and noninsulin-dependent *diabetes mellitus*, gestational diabetes, and diabetic complications symptoms, treatments, and research results... Edited by Karen Bellenir and Peter D. Dresser. Detroit, MI: Omnigraphics, 1994. xvii, p. 827
- Gautier J.F., et al., "Activité physique et diabète". Diabetes & Metabolism. Paris: Masson. Vol. 24, No. 3 (June 1998), p. 281-290
- Gerbert Rebecca Marie, "Le nourisson, le jeune enfant et la famille". IDF Bulletin. [Germany]: International Diabetes Federation, Belgium. Vol. 42: No. 2 (June 1997); French version, p. 10-15
- Greenwood David, "Wound healing "Honey for superficial wounds and ulcers"". The Lancet. North America Edition, Baltimore: Williams & Wilkins Vol. 341, No. 8837 (Jan. 9, 1993), p. 90-91
- Grimaldi A., et al., "Hypoglycaemias of the diabetic patient". Diabetes & metabolism. Paris: Masson. Vol. 23, No. 1 (February 1997), p. 100-108
- Hanson Louise G., The basic beekeeping and honey book. Lily A. Davis. New York: D. McKay, c1977. xii, p.196
- Honey, In: The New Encyclopaedia Britannica. 15th ed. Chicago [etc.]: Encyclopaedia Britannica, 1992. Vol. 6, Micropedia, p. 35b
- IDF Bulletin. "Le défi de DCCT". [Germany]: International Diabetes Federation, Belgium. Vol. 42: No. 1 (February 1997); French version. p. 5-12. Vaaler Stein. "Une leçon à apprendre, une question à poser", p. 5. Williams Rhys. "Point de vue". p. 6-7. Apfel Jack. "Les implications du DCCT pour un diabétique". p. 8-12. Rosenqvist Urban. "Les limites de l'auto-surveillance peuvent-elles être repoussées?". p. 14-16. Herman, William H. "Les implications économiques de DCCT". p. 17-21
- Insulin-dependent diabetes mellitus: current concepts and approaches / edited by Wah Jun Tze, Anders A.F., Sima, Joseph Tai Montreal: Rodar Pub., 1991. xi, p. 316
- Jarvis, De Forest Clinton. Folk medicine; a Vermont doctor's guide to good health. New York, Holt, 1958. viii, p.182
- Levine Mazur Marcia. "Snack Happy". Diabetes Forecast. New York, American Diabetes Association. Vol 50, No. 9 (September 1997), p. 38-42
- L'exercice et le diabète. Un projet du comité national des publications. Association canadienne du diabète = Canadian Diabetes Association
- McArdle, William D., Physiologie de l'activité physique: énergie, nutrition, performance. Frank I., Katch, Victor L. Katch; traduction et adaptation, Marcel Nadeau. 2^e ed. Paris: Vigot, c1987, p. 536
- Morse Roger A., "Beekeeping". In: McGraw-Hill encyclopedia of science & technology: an international reference work in twenty volumes including index. 7th ed. New York: McGraw-Hill, 1992, Vol. 2, p. 504-508
- Norris P.E., Le miel; [translated from English by Xaviere Kholer]. [Montréal]: Griffe, 1997, p. 113
- Nutrition care of people with diabetes mellitus: a nutrition reference for health professionals. Penelope S. Easton et al., New York: Food Products Press, c1991. xiii, p. 263
- Signorini Régine. Le miel, source de vie; drawings, Yolande du Puytison Montréal: Editions France-Amérique, 1980, 173, [3], p
- The Hive and the Honeybee: a new beekeeping which continues the tradition of "Langstroth on the Hive and the Honeybee" / edited by Joe M. Graham; with individual chapters written by a staff of specialists, J.T. Ambrose et al. Hamilton, Ill: Dadant, 1992. Rev. ed. xxv, 1324 p. White Jr., Jonathan W. "Honey"
- Valensi P., et al., "Autonomic neuropathy of the diabetic patient". Diabetes & metabolism. Vol. 23, No. 1 (1997). Paris: Masson, p. 88-98
- Vogel A., Le petit docteur: un ensemble varié de conseils utiles tiré de la médecine populaire suisse. Nouv. Ed. rev. et corr. Genève: Édi inter, cop. 1991; [Montreal]: Éditions Frémontel, [1994], p. 570