



Diverse sensorial responses to miraculin taken after sour food in diabetics and individuals who went on protein diet, suffering from ketosis

Lorenzo Martini

Department of Pharmaceutical Biotechnologies, University of Siena, Italy

Abstract

The taste modifying proteins represent an amazing goal to treat obesity in Man, let diabetics have a better and more satisfactory lifestyle and in the same way all the people suffering from ketosis (especially epileptic patients which undergo a ketogenic diet, people who made up their mind to follow a hunger-strike, alcoholics and maniacs who choose to follow a protein diet or low carbohydrate diet or compulsive children who are fully keen about chocolate and candies and are subject to tooth decay).

Results of my research show that type 1 diabetics do feel a more intensive taste of sweetness in their mouth compared to people who follow a severe protein diet.

Both diabetics and people who follow a protein diet suffer from ketosis.

Keywords: diabetics, hunger-strike, alcoholics, maniacs, protein diet

Introduction

Two kinds of people can develop the sensation of sweet taste in their mouth, due to ketosis, that is evoked both by type I diabetes and by low carb diet (idest protein diet).

The former type of misleading taste is provoked by a specific illness and the second one by a voluptuary lifestyle.

Diabetes is a common cause of a sweet taste in the mouth. Diabetes affects how well the body can use insulin, which has a direct effect on the body's ability to control blood sugar.

Uncontrolled diabetes can result in high levels of sugar in the blood. Diabetes can often cause a sweet taste in the mouth.

1. Diabetic ketoacidosis (DKA) is a buildup of acids in blood. It can happen when the level of blood sugar is too high for too long. It could be life-threatening, but it usually takes many hours to become that serious.
2. It usually happens because human body doesn't have enough insulin. Cells can't use the sugar in blood for energy, so they use fat for fuel instead. Burning fat produces ketones and, if the process goes on for a while, they could build up the blood. That excess can change the chemical balance of blood and throw off the entire system.
3. People with type 1 diabetes are at risk for ketoacidosis, since their bodies don't make any insulin. Ketones can also go up when one misses a meal, is sick or stressed, or has an insulin reaction.
4. DKA can happen to people with type 2 diabetes, but it's rare. Patients who have type 2 diabetes, especially when older, are more likely to have a condition with some similar symptoms called HHNS (hyperosmolar hyperglycemic nonketotic syndrome) and it can lead to severe dehydration.

On the other hand, people who are on low carbohydrate diets may find that they develop a similar fruity, sweet taste in the mouth. Carbohydrates are a common source of fuel in the

body and going without them makes the body burn fat instead. Ketosis is the only responsible of evoking a sweet taste in the mouth.

My study is based on the diverse organoleptic and sensorial responses of two classes of volunteers: type 1 diabetic patients and people who decided to undergo a protein diet and feel the neat sensation of sweetness in their mouth to the assumption of a determined quantity of miraculin after having eaten bitter food.

Miraculin is a taste modifier, a glycoprotein extracted from the fruit of *Synsepalum dulcificum* ^[1].

Synsepalum dulcificum, native to West Africa, is a plant known for its berry that, when eaten, causes sour foods (such as lemons and limes) subsequently consumed to taste sweet. In West Africa, where the species originates, these berries are called agbayun, taami, asaa, and ledidi.

Miraculin itself is not sweet. After the taste buds are exposed to miraculin (which binds to sour receptors on the tongue), acidic foods that are ordinarily sour (such as citrus) are perceived as sweet ^[1] This effect lasts up to an hour ^[2, 3].

Objectively the duration and intensity of the sweetness-modifying effect of miraculin depends on various factors, such as miraculin concentration, duration of contact of the miraculin with the tongue, and acid concentration ^[2].

Generally the sweetener power of miraculin is 300-40000 times stronger than a solution (6%) of sucrose ^[4-6].

Miraculin is not easily retrievable on the market, but it can be bought on line in the form of capsules (300-600 mg) but even the same powder is available on line from manifold Asian countries and it is not expensive.

In Europe it can be acquired on line in the following countries: Italy, UK, The Netherlands, Portugal, Spain, Austria, Finland, Czech Republic, Norway, Denmark, Sweden, Poland, Romania, France, Latvia, Hungary, Germany.

The bitter food I have chosen for the experiments are the following:

- Artichokes
- Ginger
- Broccoli
- Italian chicory
- Arugula
- Brussels spouts
- Chicory
- Endive
- Grapefruit
- Bitter chocolate
- Black beer
- Dandelion
- Aubergine.

Materials and Methods

I have selected six volunteers (a, b, c, d, e, f) suffering from type 1 diabetes who assert to feel a clear sensation of fruity sweetness in their mouth when hungry and when are in hypoglycemia and six people (g, h, i, l, m, n) who are since almost one month (more or less) on protein diet and do assure that feel always a sweet taste in their mouth too.

Amongst the several empiric methods to determine the sweetening efficacy of the glycoprotein miraculin compared to sucrose (6% aqueous solution), I have chosen the Fechner's

law revisited by Stanley Smith Stevens, that corresponds to the equation:

$$\text{Log}(S) = \log(I) + \log(k) = \alpha \log(I) + k$$

Where

- S is the Stimulus magnitude
- K is an arbitrary constant determining the scale unit
- I is the Stimulus intensity
- A is an exponent depending on the modality (corresponds to 1.3 for sucrose).

I must stress that each volunteer assumed 600 mg of miraculin after having eaten 50 g of diverse bitter food and each of every volunteer had to follow the sensory magnitude estimation method, based on the Steven's law itself, to denounce the sweetness they do feel after having assumed miraculin.

Each proof had to be made separately from the others (for example: artichokes at 9 o'clock in the morning, Ginger at midday, broccoli at 3 o'clock in the afternoon, Italian chicory at 6 o'clock in the afternoon, Arugula at 9 o'clock of the evening and so on).

Results

In table I all the values of the sensory magnitude estimation recorded after every proof.

Table 1

Case	Artichokes	Ginger	Broccoli	Italian Chicory	Aragula	Brussels spouts	Chicory	Endive	Grapefruits	Bitter chocolate	Black beer	Dandelion	Aubergine
A	6000	4500	5000	3500	4500	3700	6000	9000	11000	6500	2900	8000	7500
B	5500	4200	5000	4200	5500	2900	5500	7000	9000	5400	2700	7500	6800
C	4800	4100	4900	3800	4400	1900	4700	6800	8500	4500	1900	6000	7100
D	4600	3900	4600	4100	4200	1800	3900	5700	7500	3900	2200	5800	6900
E	5900	4400	4800	3100	4300	2100	3700	5400	6800	3600	1900	4800	7700
F	6100	3900	4400	2900	4100	1900	3300	4800	6600	3200	2100	4700	6700
G	4000	2600	3100	2400	3100	2800	4800	6700	7500	4900	890	6100	4700
H	3700	1900	2600	2200	3700	2400	4100	5900	6300	3900	1000	5600	3900
I	4100	2200	2400	1900	3000	2200	3900	4700	5900	2700	1100	4800	3100
L	3800	1900	2200	2100	3100	2500	3300	4100	5300	1900	900	3700	2900
M	3500	2200	1900	2000	2700	2100	4100	3600	4900	2300	1000	4700	2400
N	3300	1900	2000	1800	2400	1900	3700	3300	4400	1900	700	3800	2200

Conclusions

It is suggestive to remark that undoubtedly the volunteers on protein diet feel a sweet taste in their mouth less intensive than volunteers suffering from type 1 diabetes.

Keeping on account that the most sour food are:

- Artichokes
- Broccoli
- Endive
- Grapefruit
- Dandelion

It is noticeable that the difference in the sensation of sweetness in the mouth is more strong in diabetics than in people on protein diet.

Diabetics assuming 600 mg of miraculin feel a stronger sensation of sweet taste in their mouth relatively to the sourness of the food they eat.

This fact highlights an important factor concerning type 1 diabetes: people suffering from this disease do perceive a sensation of sweetness in the mouth stronger when food or beverages they eat or drink is more sour.

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