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Research Article

Effective Hygiene of the Mouth Cavity of the Diabetes Mellitus of the Second Type

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Abstract

Despite that for the present day a lot of different methods of the papulopathy prevention have been studied and developed often the preventive measures are adynamic. This refers to that besides local factors of the parodontium some general factors are present, among them different endocrine, nervosomatic diseases, rheumapira, TB, vitamin deficiency, metabolic disorder, stress conditions and other reasons which affect the morphofunctional condition of the mouth cavity [1-4]. Therefore often the treatment and prevention of the parodontium are complicated with the presence of any common somatic illness. One of these common diseases is the diabetes mellitus. Clinical manifestations of the diabetes mellitus in the mouth cavity are diversified and often anticipate the clinical symptom. Relying on the knowledge of the local manifestations of the diabetes mellitus in the mouth cavity the doctors of the dental surgery should not only to compose the treatment plan with account of all specifics of this disease but to appoint the customized healthful measures [4-9].

Keywords: *Diabetes Mellitus of the Second Type; Mouth Cavity Hygiene; SugarSTOP!*

Introduction

The Ministry of Health of RF gives the following definition of the Diabetes mellitus (DM): "DM is a group of metabolic diseases which are characterized by the chronic hyperglycemia, which is the result of the insulin secretion dyscrasia, the insulin analysis or of both these factors".

In the present time it occupies the third place among the reasons of death after the cardiovascular and oncology pathologies. According to the WHO forecasts, for the period of 2005 - 2030 the number of DM-related will double [1,10,11].

The medical and social importance of DM is determined by the heaviness of its complications as sharp as well as late. Sharp complications of the diabetes mellitus are imposing the most threat for the human life. The disorders of the carbohydrate, fat and protein metabolism with DM may be followed to the development of the comatose states of the various forms: ketoacidotic, hyperosmolar, Lactic acidosis. The main forgoers of the diabetic coma are acid intoxication and the tissue dehydration. The later complications are developing within several years of the disease. Their danger is not in the sharp development but in the steady deterioration of the patient state. Such diseases as angiopathy, retinopathy, polyneuropathy, diabetic foot are related to the later DM complications. The main reason for such disorders is hyperglycemia, which leads to the blood vessel damage and functional disorder of different tissues and organs [12-14].

Thereby the DM patients are often exposed to phlogistic processes in the mouth cavity which correlate with the duration and heaviness of the disease.

It is established that the carbohydrate and glucosamine metabolism disorder causes hypoxia and microangiopathy of the periodontal tissues, what leads to the nutritional modifications in the oral cavity soft tissues, decrease of the local immunity and, as the consequence, to the rapid microorganisms breeding. This assists the formation of the abundant dental plaque and calculus formation, the modification of the saliva microbiologic composition and the state of the teeth hard tissues [5,15].

The pathologic mouth cavity modifications characteristic for the DM such as:

- Prodontic tissues inflammation caused by hypoxia and microangiopathy of the tissues;
- Abundant dental plaque and the presence of a lot of dental calculus what is determined by the rapid microorganisms breeding due to the nutritional disorders of the mouth cavity tissues;
- Reduced local immunity and violated metabolism which negatively affect the microbiological composition of the saliva and the state of the teeth hard tissues; allow to diagnose the disease at the early stages [6,16] (Figure 1).

Figure 1: *Patients with DM of the 2nd type who undergo orthodontic treatment on the nondetachable apparatus.*

In 2015 at the chair of orthodontic of the Moscow state medical and stomatological university named after A.I. Yevdokimov the hygienic prophylactic middle was developed which is adapted for the orthodontical patients and patients with DM of the 2nd type, -foam "SugarStop!". It contains such active components as the magnolia bark extraction, focus vesiculosus extract, stevia extract, allantoin as well as the other assistive substances - xylitol, polyvinyl pyrrolidone, hydrogenated castor oil, sodium laurel sarcosine, natrium citrate, trilon B, natrium saccharinate.

This middle after entering of the mouth cavity coats the teeth and thanks to the dispersive properties freely penetrates the locations which are hard to reach for the traditional hygienic middles. It delivers antimicrobial, antifungal, anti-inflammatory and antioxidant effect. The characteristic feature of the "SugarStop!" foam is the presence of stevia extraction in its composition. It normalizes the organism ferment systems what assists the normalization of the metabolism and also the hydrocarbon metabolism [17].

Beginning from 2015 a number of scientific studies of the "SugarSTOP!" foam on the organism was performed. The aim of our studies is for the first the minimization of the complications in the process of the orthodontic treatment and after its completion with the patients who suffer diabetes mellitus of the 2nd type.

Maltase activity change as the result of the "SugarSTOP!" usage

In 2016 the study of the "SugarSTOP!" foam effectiveness to the glucose level in the mouth cavity of the patients with DM 2nd type was performed. The study results showed that the middle significantly reduces the level of glucose in the composition of the mixed saliva. So, the glucose level reduced in 7,9 times in average.

In 2017 the decision was taken to research the influence of the "SugarSTOP!" foam to the quantity of maltose in the composition of the mixed saliva with the patients with DM.

As we know, the splitting of the complex carbohydrates of the food begins in the mouth cavity under impact of the saliva ferments - alpha-amylase and maltase in small quantity. Amylase splits starch and glycogen and maltase - maltose which in its turn splits to the molecules of glucose (Figure 2). From this follows that the maltase ferment activity directly affects the maltose quantity in saliva.

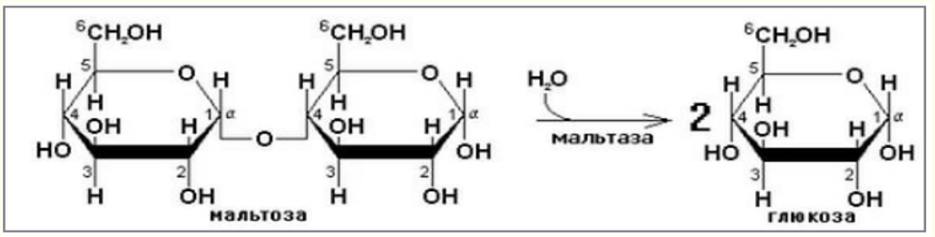

Figure 2: *The maltose molecule splitting into two molecules under influence of the maltase ferment.*

Materials and Methods

Study subjects

The screening of 50 people was performed. We found on the basis of the hydrocarbon metabolism indicators and its compensation state that:

1. Glycohemoglobin (Hb_{A1c}) is an integral indicator of the hydrocarbon metabolism for 3 months - up to 7,5%;
2. Glycemia level in the fasted state 4,5 - 6,0 mmol/l;
3. Glycemia level after meal lower than 10 mmol/l (satisfactory).

24 people were selected, all of them suffer diabetes mellitus of the 2nd type and were at the age of 50, the disease duration up to 10 years, gender did not matter. They were randomized into 2 equal groups. The first group after meal treated the mouth cavity with the "Sugar STOP!" foam, the second washed the mouth cavity with simple water. All participants of the study had as substantial, as well as insubstantial teeth abnormalities and needed the orthodontic treatment.

All patients who participated in the trial were informed in detail about the basic methodics of the study and the treatment. Also the Informed Consent was requested and the patients' participation in the trial was voluntary.

The study method

At the Chemical department of the M.V. Lomonosov MSU the saliva analysis for the modification of the sugar levels -glucose and maltose-was performed with the high-performance liquid chromatography method with tandem mass-spectrometric detection and thereby the maltase ferment activity in the saliva was exposed.

Both groups (with 17 people in each) within 1 week were strictly observing the prescribed diet (Table). After that in the 1st group the mouth cavity hygiene middle "Sugar STOP!" was distributed. The first group was informed about the middle application rules and treated the mouth cavity with the foam after each meal with the observation of the prescribed diet. The second group simply observed the diet and treated the mouth cavity with the simple water.

Within a month saliva probes were collected from all patients into individual eppendorfs in the fasted state in 30 and 90 minutes after the first food transfer into the mouth cavity. The collected eppendorfs were given to the department of chemistry of M.V. Lomonosov MSU.

The obtained results were compared with the original data.

The primary method of the statistical data processing was used with the mean arithmetic value calculation and the error of the mean arithmetic value.

Results

For the saliva samples of the 1st group of the patients after the "SugarSTOP!" middle application the increase of the maltose level relatively to the glucose level in comparison to the original saliva samples. For the calculation results the mean value of the maltose level increase relatively to glucose level in 30 minutes after meal is 16,85%, after 90 minutes - 22,82%.

Patient	Screened volume of saliva, mcl	Dissolution coefficient	The available glucose concentration in the original saliva probe in the fasted state, mcg/ml	The available concentration of maltose in the original saliva probe in the fasted state, mcg/ml	The available concentration of glucose in the original saliva probe in 30 minutes time, mcg/ml	The available concentration of maltose in the original saliva in 30 minutes time, mcg/ml	The available concentration of glucose in 90 minutes time, mcg/ml	The available concentration of maltose in 90 minutes time, mcg/ml
1	150	10	15,00	14,00	13,00	15,00	12,00	14,00
2	150	10	8,00	6,00	7,00	9,00	4,00	8,00
3	150	10	23,00	22,00	19,00	22,00	12,00	17,00
4	150	10	56,00	47,00	48,00	50,00	49,00	51,00
5	150	10	34,00	26,00	30,00	36,00	28,00	32,00
6	150	10	20,00	14,00	19,00	19,00	15,00	19,00
7	150	10	16,00	9,00	9,00	14,00	11,00	16,00
8	150	10	12,00	11,00	11,00	14,00	8,00	9,00
9	150	10	32,00	23,00	28,00	32,00	22,00	26,00
10	150	10	43,00	28,00	39,00	43,00	34,00	36,00
11	150	10	41,00	29,00	34,00	39,00	27,00	29,00
12	150	10	32,00	19,00	20,00	22,00	23,00	31,00
13	150	10	17,00	12,00	14,00	17,00	9,00	9,00
14	150	10	39,00	28,00	27,00	28,00	21,00	24,00
15	150	10	14,00	12,00	11,00	10,00	12,00	11,00
16	150	10	28,00	24,00	26,00	29,00	23,00	24,00
17	150	10	9,00	8,00	7,00	10,00	4,00	6,00

Table 1: *Calculation of the available data for the 1st group (with application of "SugarSTOP!").*

Patient	Screened volume of saliva, mcl	Dissolution coefficient	The available glucose concentration in the original saliva probe in the fasted state, mcg/ml	The available concentration of maltose in the original saliva probe in the fasted state, mcg/ml	The available concentration of glucose in the original saliva probe in 30 minutes time, mcg/ml	The available concentration of maltose in the original saliva in 30 minutes time, mcg/ml	The available concentration of glucose in 90 minutes time, mcg/ml	The available concentration of maltose in 90 minutes time, mcg/ml
1	150	10	26,00	16,00	40,00	31,00	39,00	32,00
2	150	10	30,00	11,00	38,00	26,00	41,00	22,00
3	150	10	19,00	4,00	22,00	10,00	28,00	14,00
4	150	10	28,00	21,00	39,00	29,00	44,00	26,00
5	150	10	14,00	9,00	19,00	11,00	28,00	16,00
6	150	10	42,00	36,00	51,00	44,00	56,00	38,00
7	150	10	37,00	28,00	52,00	40,00	54,00	41,00
8	150	10	24,00	14,00	29,00	18,00	41,00	29,00
9	150	10	29,00	25,00	36,00	30,00	48,00	32,00
10	150	10	16,00	7,00	29,00	19,00	37,00	30,00
11	150	10	25,00	20,00	30,00	13,00	38,00	26,00
12	150	10	40,00	27,00	48,00	29,00	53,00	44,00
13	150	10	14,00	6,00	29,00	16,00	30,00	18,00
14	150	10	19,00	12,00	27,00	21,00	40,00	21,00
15	150	10	24,00	16,00	37,00	29,00	44,00	32,00
16	150	10	32,00	19,00	39,00	32,00	52,00	40,00
17	150	10	26,00	13,00	34,00	17,00	35,00	27,00

Table 2: *Calculation of the available data for the 2nd group (without "SugarSTOP!" application).*

For the saliva samples of the 2nd group of patients with application of simple water from the table 2 data the maltose level decrease is characteristic relatively to glucose level in comparison to the original saliva samples. For the calculation results the mean value of the maltose level decrease within 30 minutes time after meal is 32,65%, after 90 minutes time - 32,06%.

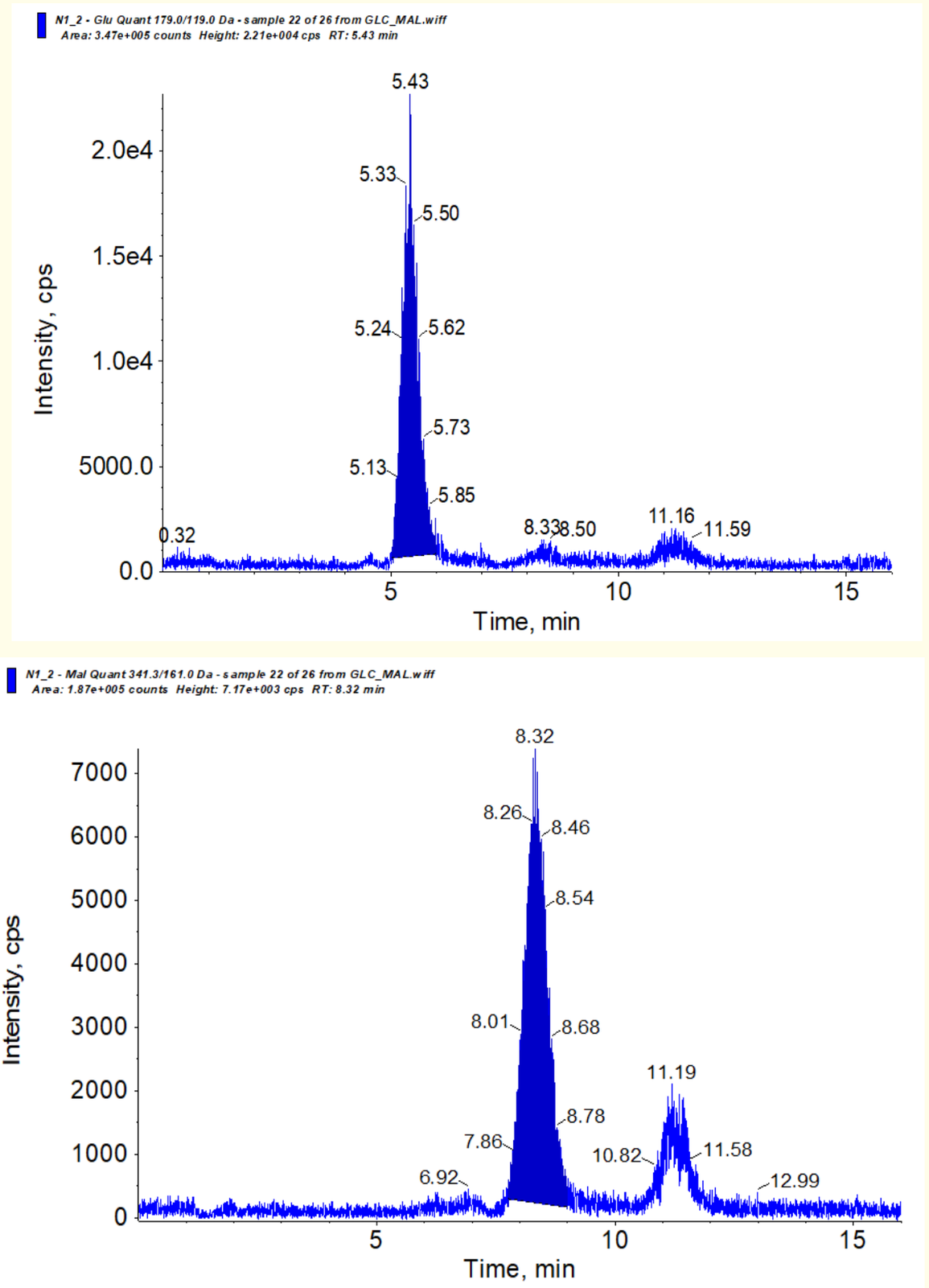

Figure 3: *Example of one of the patients samples in 30 minutes time after meal with application of the "SugarSTOP!" foam.*

Deriving on the calculations above we may suppose that the "SugarSTOP!" foam is acting as the maltase ferment inhibitor and is reducing its activity.

Discussion and Conclusion

For the present day the modern stomatology, in particular, orthodontic also is in the boost stage and is in the search of the new, more updated treatment methods. At the treatment of dentofacial anomalies the orthodontists apply different modern methodics, working as with the detachable as well as with nondetachable orthodontic equipment [18]. The popularity of nondetachable equipment in the orthodontical treatment predicated the development of the soft and hard tissue of the mouth cavity diagnostics.

The absence of the observable symptomatic of the diabetes mellitus at the early stages is one of the chief problems. Often the patients even do not know about their disease, however, it is worth to note, that its evidence in the mouth cavity often precede the general clinic symptoms. Therefore in many countries of the world the particular role is allocated to the organization of the medical assistance to the diabetes mellitus patients. Early diagnosis of this disease allows to prevent the complications of this dreadful illness.

For the present day a sharp necessity originates to establish the cooperation of the doctors of stomatology and thyroid specialists for the treatment of the diabetes mellitus patients. There is a necessity present to include into the thyroid specialist treatment plan the stomatological survey, and to strengthen the diabetes mellitus patients motivation to support the good hygiene quality, to modernize the means and methods of the such patients mouth cavity individual hygiene.

The development of such middle as the "SugarSTOP!" foam is very critical for today's practice. This study that we performed is testifying that the "SugarSTOP!" foam is directly affecting the maltase ferment and is acting like inhibitor. The glucose quantity which is forming as the result of the maltose-sugar is reducing what favourable influences the periodontal tissues and the mouth cavity mucous membrane, particularly of the patients who suffer diabetes mellitus of the 2nd type.

The "SugarSTOP!" foam, owing to its influence to the saliva glucose level is reducing the risk of inflammable and dystrophic processes in the mouth cavity, improves the trophicity of the periodontal tissues, improves the regenerating capacity of the mucous membrane, increases the local immunity and improves the mouth cavity hygiene thus improving the life quality of the diabetes mellitus type 2 patients. The survey of the examined patients has shown that such symptoms as aptyalia, fetor ex ore, painful feelings due to the presence of multiple ulcers have been reduced or disappeared at all.

Bibliography

1. Gorbacheva IF. "General somatic aspects of pathogenesis and treatment of generalized periodontitis". *Stomatology* 80.1 (2001): 26-34.

2. Karton EA. "The study of dynamics of the microbiological status of the patients with nondetachable orthodontic equipment". *Orthodonty* 1.69 (2015): 28-34.

3. Mashenko IS. "New aspects of pathogenesis and treatment of generalized periodontitis". *Stomatology News* 1 (2002): 12-15.

4. Ryaian MA., *et al*. "Diabetes mellitus and inflammatory processes in the mouth cavity". *Clinical Stomatology* 4 (2006): 62-64.

5. Barer GM and Lemetskaya TI. "Parodontium diseases. Part 2 – M". GEOTAR-Media (2008): 30, 114, 173.

6. Barer GM and Volkov EA. "Therapeutic stomatology of the mouth cavity mucous membrane diseases". 2nd edition - M. GEOTAR-Media (2010): 146.

7. Novikov AM. "Science and practice today". *Journal of Higher Education in Russia* 6 (2006): 20.

8. Faizullina DB. "The state of the periodontium tissues of the diabetes mellitus patients". *Bashkortostan Medical News* 4.5 (2009): 69-74.

9. Tsepin LM., *et al*. "The particularities of the inflammatory diseases of periodontium and treatment tactics at diabetes mellitus". *Parodontology* 3 (2002): 15-22.

10. Victorova IA. "Diagnostics and treatment of the diabetes mellitus 2nd type in ambulatory conditions: clinical recommendations and real practice". The general practice doctor's handbook 8 (2013): 14-20.

11. Kiseleva DS. "General practice doctor handbook" 8 (2013): 14-20.

12. Dedov II and Shestakova MV. "Diabetes mellitus: sharp and chronical complications". M: OOO "Medical Information Agency" (2011): 480.

13. Dedov II and Fadeev VV. "Introduction into diabetology: handbook for the doctors". M: Bereg (1998): 200.

14. Severin ES. "Biochemistry". 4th Edition M: GEOTAR-Media, (2007): 594.

15. Atrushkevich VG. "Osteoporosis in the clinics of the parodontal diseases. Part 2. Generalized periodontitis and systemic osteoporosis". *Russian Journal of Stomastology* 1 (2008): 48-51.

16. Ivanyushko *TP*. ''Comples study of the cronical inflammation development at periodontitis". *Stomatology* 4 (2000): 13-16.

17. Ozerova VM Stevia. "Honey grass against diabetes". Series. Nature pantries -SPb: PG "Ves" (2005): 26.

18. Goldfabr NI and Verderevskaya NN. "Exersize book in physics". M. MIFI (1961): 57.

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