Journal of Health Study and Medicine
2019, nr 2
ss. 139-156
DOI 10.36145/JHSM.2019.15

Blood Sugar Levels and Treatment Methods – Management of Therapeutic Processes in Type 2 Diabetes

Katarzyna Siedlacka-Pasierbiak[1]

Marian Sygit[2]
https://orcid.org/0000-0002-7902-7761

Katarzyna Sygit[2]
https://orcid.org/0000-0001-7173-2266

Jan Krakowiak[3]
https://orcid.org/0000-0002-3435-9658

[1] Poddebice Health Center, Poddebice, Poland
[2] State University of Applied Sciences, Kalisz, Poland
[3] Department of Social Medicine, Medical University of Lodz, Lodz, Poland

Address for correspondence:

Katarzyna Sygit
State University of Applied Sciences
4 Nowy Świat Str., 62-800 Kalisz, Poland
e-mail: ksygit@poczta.onet.pl

Abstract

Introduction: *Over the past few decades we have seen an increase in the incidence of type 2 diabetes in Poland and around the world. Fighting this disease is one of the main tasks of medicine in the 21st century.*

Aim: *The aim of this study was to describe the impact on the blood sugar level: physical activity, diabetes and antidiabetic drugs and other medicines and what is the ranking of these factors – in order to seek "new procedures" in the fight against diabetes.*

Material and methods: *The study concerned the period from 2012 to 2017, in which the impact of specific procedures used in the treatment of type 2 diabetes was analyzed through systematic daily testing of blood sugar levels, and the study of glycosylated hemoglobin levels.*

Results: *It was found that systematic measurements of sugar levels are important information for the patient about the proper health behavior of a person suffering from type 2 diabetes. A multivariant (comprehensive) treatment is the most effective method of lowering blood sugar levels. It was indicated that in the fight against type 2 diabetes, it is not enough to have an antidiabetic diet, only antidiabetic drugs or only physical activity.*
There has been a positive influence of the use of probiotics and vitamins in lowering the blood sugar level not described in the literature so far.

Conclusions: *The need to search for epigenetic factors determining the prevalence of type 2 diabetes was emphasized, with particular attention to the role of probiotics and vitamins.*

Key words: *prevention, treatment, diabetes, blood sugar, glycosylated haemoglobin level*

Introduction

Over the few past decades there has been a true explosion in the incidence of type 2 diabetes. Many specialists claim that fighting diabetes is one of the main goals of medicine in the 21st century. Due to the rapid increase in its incidence, it is justified to use the term "epidemic" in relation to type 2 diabetes – despite the fact that it is not a contagious disease. It is believed that the rapid increase in incidence of diabetes is related to the lifestyle of people around the world, associated mainly with a decrease in physical activity and an inappropriate, too caloric diet [1, 2, 3, 4, 5, 6]. Currently, 68% of US citizens are classified as obese or overweight [5, 6]. According to WHO, over 220 million people suffer from type 2 diabetes. In 2004, type 2 diabetes was the cause of 3.4 million deaths and the number of annual deaths caused by diabetes is expected to double by 2030 [6].

The epidemic of diabetes is expensive for both individuals and healthcare systems in individual countries. According to WHO, China alone will lose 558 billion dollars between 2006 and 2015 due to diabetes and its complications [5]. According to Centers for Disease Control and Prevention (CDC), 25.8 million people in the USA (or 8.3% of the total population) suffer from diabetes, while only 18.8 million are diagnosed. More than 79 million US citizens were diagnosed with pre-diabetes condition, and in 2010 alone 1.9 million new cases of diabetes were diagnosed [7].

Type 2 diabetes is a progressive disease. Initially, slight disturbances in the homoeostasis of energy metabolism trigger the mechanism of the vicious circle, which results in the development of the disease and its accompanying complications, leading to a significant reduction in the quality of life, disability and death. Due to the availability of blood glucose lowering drugs and numerous insulin formulations, the aforementioned acute complications of diabetes are not the main cause of mortality for those suffering from the disease. The main causes are: late complications in blood vessels (micro- and macroangiopathies), which may cause limb amputation, heart attack and stroke. Patient treatment is therefore focused on stopping the development of late complications; the search for an

effective method to stop the development of this disease is ongoing [8, 9, 10, 11, 12].

In patients with diabetes, the risk of heart attack and stroke is 2 to 4 times higher than in healthy individuals [13].

Numerous research results indicate a positive effect of physical activity and diabetic diet on the course of the disease [6, 14, 15, 16, 17, 18]. New anti-diabetic drugs are being constantly created and introduced; however, they are expensive and not all of them are refunded, which is a big limitation of their use.

The diabetic prevention – including maintaining normal body mass and appropriate, systematically undertaken physical activity and diet – is promising, but it is not sufficiently common, and its principles are not always observed by patients [19, 20, 21, 22].

The life of a patient with diabetes – especially the insulin therapy – is extremely tedious and disruptive –88yg d and it lowers the quality of life. Actions are being taken to search for more effective drugs, but also for other methods of combating the disease, both in terms of prevention and treatment.

This paper presents the results of long-term studies (observations) of various therapeutic procedures and their effect on the level of sugar in the blood serum. An important premise for conducting an analysis of daily tests was the fact that some significant correlations between blood sugar levels and treatment procedures were noticed.

The aim of the study

The aim of this study was to describe the effect of various therapeutic procedures on sugar levels in blood serum.

Research hypotheses

Based on our own (authors') observations and information obtained from patients treated for diabetes, it was assumed that various types of standard treatment may be helpful in treating type 2 diabetes.

Materials and methods

In the years 2012–2017 a population experiment was conducted, according to authors' planned research project. Its aim was to find supportive therapeutic methods for non-insulin-dependent diabetes mellitus. The experiment was carried out on a doctor diagnosed with type 2 diabetes – one of the co-authors of this study.

During the experiment, the sugar level was measured four times a day: on an empty stomach; 2 hours after breakfast; 2 hours after lunch; 2 hours after dinner.

Sugar levels were measured with the Aceu-Chec Activ glucose meter; glycated haemoglobin levels (HbA1c) were measured each time when the treatment method changed.

These measurements were performed during two hospital treatments (in a diabetology ward) in 2006 and 2007, and during six stays and sanatorium treatments, as well as during outpatient and home treatment in between local treatments.

The procedures which were added to the standard treatment were:

- Physical activity, which consisted of 2 hours of Nordic walking per day and half an hour of stationary bike riding a day, at a moderate pace.
- Rehabilitation treatments, in accordance with the ZUS (Social Insurance Institution) program.
- The treatment included additionally: probiotic (1 x day), vitamin $B_{complex}$ (3 x 1) and vitamin $C_{0.5}$ (3 x 1).

The preliminary analysis included results from 2,648 blood sugar tests and the results of HbA1c tests. To analyse the significance of statistical differences, mean values comparison test was used, namely the Student's t test, where p=0.05.

Results. Commentary

Table 1 contains results of blood sugar level tests. The patient used anti-diabetic drugs and anti-diabetic diet under hospital control.

There were no statistically significant differences between 2016 and 2017 (a, b) regarding blood sugar levels both on an empty sto-

mach and 2 hours after breakfast, 2 hours after lunch and 2 hours after supper.

The levels of glycosylated haemoglobin were lower by 0.11 in 2016 (a) and by 0.9 in 2017 (b). The observed differences were not statistically significant ($p>0.05$).

In Table 2, for 2 months the patient undertook systematic physical activity – Nordic Walking (2 hours a day) and ½ hour of stationary bike riding. The patient was on an anti-diabetic diet and used anti-diabetic drugs. Different sugar levels were recorded (on an empty stomach, 2 hours after dinner and 2 hours after supper): levels were significantly lower when the patient undertook physical activity (Nordic Walking for 2 hours a day and ½ hour ride on a stationary bike). The biggest differences were noted: 2 hours after supper, 2 hours after breakfast, and on an empty stomach; the smallest differences were observed two hours after dinner.

Table 3 presents the results of inclusion of other variables (apart from the use of anti-diabetic diet, anti-diabetic drugs and physical activity), which differentiated the blood sugar levels, namely: probiotics (1 x a day), vitamin $B_{complex}$ (3 x 1), vitamin $C_{0.5}$(3 x a day). It was observed that the highest blood sugar levels in 4 tests were accompanied by permanent stress and mental depression. The lowest levels were recorded when using the probiotics (1 x a day) and vitamin B_c (3 x a day).

Table 4 illustrates sugar levels recorded in 4 tests, when the patient used only diet, only physical activity and only drugs. It was found that the use of only physical activity and only anti-diabetic drugs resulted in the lowest reduction of sugar levels. However, only the anti-diabetic diet and only anti-diabetic drugs had a similar effect on the sugar level. Difference between 'only physical activity' and 'only diet' was statistically significant ($p<0.05$), as well as 'only physical activity' and 'the use of anti-diabetic drugs' ($p<0.05$).

Table 5 presents the effect of using probiotics, vitamin C, vitamin $_c$, physical activity, anti-diabetic drugs and no diet during a 2-month period.

Table 6 presents the effect of using probiotics, vitamin C, vitamin $_c$, physical activity, anti-diabetic drugs and diet during a 2-month period.

There was a slight decrease in sugar level in blood serum compared to Table 5, but it was not statistically significant (p>0,05). However, the use of probiotics, vitamin C, vitamin B_2 and anti-diabetic diet resulted in a significant decrease in sugar levels (to normal values).

Table 7 presents sugar levels in blood serum measured 4 times a day during stays (from 2012 to 2017, in sanatoria), using anti-diabetic diet, anti-diabetic drugs and intense physical exercise. Differences in the sugar level between individual stays in the sanatorium were statistically insignificant (p>0.05). All of them exceeded acceptable standards. Adding probiotics and vitamins (C and B) to the treatment caused the lowest blood sugar levels.

Table 1. Levels ($\bar{x}$) of blood sugar. The patient used anti-diabetic drugs and anti-diabetic diet

Hospital stay and treatment (days)	Blood sugar levels				HbA1c	Number of measurements
	on an empty stomach	2h after breakfast	2h after dinner	2h after supper		
	$\bar{x}\pm\sigma$	$\bar{x}\pm\sigma$	$\bar{x}\pm\sigma$	$\bar{x}\pm\sigma$		
2016 (15)	105±16	139±15	147±15	140±10	7.09	240
2017 a (20)	108±17	143±13	149±10	143±9	6.98	240
2017 b (20)	116±10	153±8	160±7	138±11	7.0	240
Total	109±14.3	145±12	152±10.6	140±10	7.2	720

Table 2. Levels of blood sugar. The patient used anti-diabetic diet, anti-diabetic drugs and physical activity

Research period (number of months)	Periods of physical activity	Blood sugar levels				HbA1c	Number of measurements
		on an empty stomach	2h after breakfast	2h after dinner	2h after supper		
		$\bar{x}\pm\sigma$	$\bar{x}\pm\sigma$	$\bar{x}\pm\sigma$	$\bar{x}\pm\sigma$		
2	Nordic walking 2h daily	103±8.0	130±5.0	133±7	129±12	7.0	120
2	Nordic walking 2 hours daily + ½-hour ride on a stationary bike, daily	98±4.0	120±10.0	130±4.0	111±7	7.1	124

Table 3. Average levels of blood sugar. The patient used anti-diabetic diet, anti-diabetic drugs, physical activity, vitamins and probiotics

Research period (days)	Variables	Blood sugar levels				HbA1c	Number of measurements
		on an empty stomach	2h after breakfast	2h after dinner	2h after supper		
		$\bar{x}\pm\sigma$	$\bar{x}\pm\sigma$	$\bar{x}\pm\sigma$	$\bar{x}\pm\sigma$		
30	Probiotics 1 a day	100±20	120±11	124±9	111±10	6.81	120
30	Vitamin Bc (3x1)	99±6	122±8	130±4	110±9	7.07	120
30	Vitamin C0.5 (3x1)	100±9	140±4	137±4	130±10	7.10	124

Table 4. Levels of blood sugar. The patient used only diet, only physical activity, only drugs

Research period (days)	Blood sugar levels				HbA1c	Number of measurements
	on an empty stomach	2h after breakfast	2h after dinner	2h after supper		
	$\bar{x}\pm\sigma$	$\bar{x}\pm\sigma$	$\bar{x}\pm\sigma$	$\bar{x}\pm\sigma$		
Only diet (20)	140±13	157±10	164±11	159±15	7.80	80
Only physical activity (20)	130±11	141±9	155±7	133±9	7.41	80
Only drugs (20)	140±10	160±13	161±9	148±12	7.52	80

Table 5. Average levels of blood sugar. The patient used probiotics, vitamin Bc, vitamin C, physical activity, anti-diabetic drugs

Research period	Blood sugar levels				HbA1c	Number of measurements
	on an empty stomach	2h after breakfast	2h after dinner	2h after supper		
	$\bar{x}\pm\sigma$	$\bar{x}\pm\sigma$	$\bar{x}\pm\sigma$	$\bar{x}\pm\sigma$		
2 months	100±5.0	140±2.0	138±9	133±10	6.71	244

Table 6. Average levels of blood sugar. The patient used probiotics, vitamin Bc, vitamin C, physical activity, anti-diabetic drugs and anti-diabetic diet

Research period	Blood sugar levels				HbA1c	Number of measurements
	on an empty stomach	2h after breakfast	2h after dinner	2h after supper		
	$\bar{x}\pm\sigma$	$\bar{x}\pm\sigma$	$\bar{x}\pm\sigma$	$\bar{x}\pm\sigma$		
2 months	97±4.0	137±7.0	131±5.0	130±2.0	6.52	248

Table 7. Average levels of blood sugar. The patient was on a diabetic diet, used drugs and intense physical activity, as well as rehabilitation treatments as per the ZUS program

Sanatorium stay and treatment (cardiac rehabilitation - 21 days)	Blood sugar levels				HbA1c	Number of measurements
	on an empty stomach	2h after breakfast	2h after dinner	2h after supper		
	$\bar{x}\pm\sigma$	$\bar{x}\pm\sigma$	$\bar{x}\pm\sigma$	$\bar{x}\pm\sigma$		
2012	115±10	148±10	150±10	133±8	7.62	84
2013	120±11	150±9	149±3	144±10	7.51	84
2014	110±13	140±12	140±5	139±9	7.63	84
2015	130±9	143±11	147±8	137±10	6.91	84
2016	119±10	145±13	140±10	143±8	7.03	84
2017	108±9	141±10	137±7	133±7	7.53	84
Total	117±10.3	144±10.8	143±6.0	138±8.6	7.37	84

Discussion

Undoubtedly, the anti-diabetic diet, physical activity and anti-diabetic drugs are widely recommended for patients with type 2 diabetes [5, 6, 14]. However, many diabetic patients use either only drugs or only diet and few patients take up physical activity [6].

Diabetes patients either do not fully believe in the need for such treatment or do not have enough knowledge; effective drugs are difficult to access, and the lack of refunds makes them very expensive [19].

Scientists are constantly looking for new drugs and new methods for treating patients with diabetes. It is also made possible by observing patients, analysing their feedback and doubts [2.5].

The problem of effective prevention and treatment of diabetes is extremely poignant. Treatment of the consequences of diabetes is very expensive and not very effective. Therefore, gathering data, patient feedback, or the use of specific methods or procedures which are not very common is extremely important for the fight against diabetes [20].

Thus, it is still important to pay special attention to the implementation of a proper diabetic diet and physical activity.

Numerous studies indicate a resignation from percentage norms for carbohydrate, i.e. 40-50% of the energy value of the diet. The rationale behind this change is the lack of sufficient scientific evidence to determine the optimal amount of carbohydrates in the diet of a diabetic patient. Experts believe that the supply of calories provided in the form of carbohydrates should be broadly individualized (which is similar to the recommendations of other societies, such as the American Diabetes Association) [7]. Weight loss may be achieved using diets with reduced caloric content and various proportions of macro-elements (proteins, fats, carbohydrates). Depending on the individual preferences of patients, prevention and treatment of diabetes may use the following diets: Mediterranean, DASH (Dietary Approaches to Stop Hypertension), vegetarian or vegan, low-fat or low-carbohydrate. Despite the different views on the ideal proportions of macro-nutrients, the golden mean for the treatment of diabetes in patients requiring weight reduction remains a diet with reduced carbohydrate con-

tent. The main source of carbohydrates should be products with a glycaemic index <55 IG. In terms of salt intake, a general recommendation of up to 6g/day was left without restrictions for people with moderate hypertension and diabetic kidney disease [6, 21, 22, 23, 24].

The Polish Diabetes Association (PTD) emphasizes in its recommendations the huge role of physical exercise in the overall treatment of diabetes [16, 17, 18]. The overall fitness of the patient and accompanying diseases should be determined. Open-air exercises with a slow start and slow finish are especially recommended, as well as avoidance of exercises that cause tension and shortness of breath. The most appropriate form of activity in patients with type 2 diabetes aged 65+ and/or overweight is fast walking (up to shortness of breath), 3-5 times a week (approx. 150 minutes per week). Adequate physical activity for people with diabetes and overweight/obesity at any age is 'Nordic walking'. Individuals without significant contraindications, especially younger ones, should be encouraged to take up high-intensity physical activity, including sports. Such patients require additional education regarding the glycaemic effect caused by various types of physical activity (e.g. oxygen, resistance, interval exercises) [7, 14, 24, 25, 26, 27].

It is still unclear whether or not the use of, for example, diabetic diet is more important than the use of physical activity, and whether mere use of drugs is sufficient. Patient knowledge is insufficient in this regard.

In another publication, the authors [28] confirmed the need to look for other therapeutic procedures than the standard ones, and indicated the effectiveness of probiotics and physical activity – which significantly improved the quality of life of patients with type 2 diabetes. The health benefits related to the use of probiotics were – according to the researchers – significant, such as the elimination of the lactose intolerance effect through the bacterial β-galactosidase's impact on lactose [29].

Own (authors') observation, meticulous and professional conduct during the long-term experiment presented in this paper may encourage similar analyses aimed at facilitating the lives of people with diabetes and improving the quality of their lives [29, 30, 31, 32].

Conclusions

Following detailed observations and analyses, the collected data allows us to provide some insights regarding the conditions of blood sugar levels, namely:

1. Systematic tests of sugar levels (4 x a day) are important feedback to guide the health behaviour of a person suffering from diabetes.
2. Multivariant treatment procedures effectively lower sugar level in blood serum.
    - Not only the diet, anti-diabetes drugs or physical activity are beneficial; so are probiotics and vitamins C and B.
3. There is a need for further epidemiological and clinical studies and observations in order to search for epigenetic factors which determine the incidence, prevention and treatment of type 2 diabetes, with particular emphasis on the role of probiotics and vitamins B_c and C.
4. The study results confirmed the research hypothesis which assumed the existence of various non-standard therapeutic methods in the treatment of diabetes.

References

1. The Task Force on Diabetes and cardiovascular diseases of the European Society of Cardiology (ESC) and of the European Association for the Study of Diabetes (EASD). European Heart Journal 2017; 9 (suppl. C).

2. Gorska-Ciebiada M, Saryusz-Wolska M, Ciebiada M. Mild. Cognitive impairment and depressive symptoms in elderly patients with diabetes – prevalence, risk factors and co-morbidity. J Diabetes Res 2014; 17(2): 96-103. doi: 10.1155/2014/179648.

3. American Diabetes Association: Standards of medical care in diabetes-2016. Diabetes Care 2016; 39(6): 45-51.

4. Bailey CJ, Gross JL, Pieters A Bastien A, List JF. Effect of dapagliflozin in patients with type 2 diabetes who have inadequate glycaemic control with metformin: a randomised, double-blind, placebo-controlled trial. Lancet 2010; 375(22): 222-9. doi: 10.1016/S0140-6736(10)60407-2.

5. Sygit M. Zdrowie Publiczne [Pubic health]. Warszawa: Wolters Kluwer; 2017.

6. Sygit K, Sygit M. Eider J. The change of HbA1c parameters and the Body Mass Index In diabetes treatment cycle depending on the frequency of the undertaken physical activity program. Handel wewnętrzny 2017; 4(369): 412-24.

7. Tahrani AA, Bailey CJ, Del Prato S. Barnett AH. Management of type 2 diabetes: new and future developments in treatment. Lancet 2011; 378(9786): 182-197. doi: 10.1016/S0140-6736(11)60207-9.

8. List JF, Woo V, Morales E, Tang W, Fiedorek FT. Sodium-glucose cotransport inhibition with dapagliflozin in type 2 diabetes. Diabetes Care 2019; 32(6): 506-11. doi: 10.2337/dc08-1863.

9. Kearney PM, Blackwell L, Collins R, Keech A, Simes J, Peto R et al. Cholesterol Treatment Trialists' (CTT) Collaborators: Efficacy of cholesterol--lowering therapy in 18,686 people with diabetes in 14 randomised trials of statins: a meta-analysis. Lancet 2008; 371(22): 117-25. doi: 10.1016/S0140-6736(08)60104-X.

10. Brownlee M. Biochemistry and molecular cell biology of diabetic complications. Nature 2011; 414(16): 813-20. doi:10.1038/414813a.

11. Cosentino F, Lüscher TF. Endothelial dysfunction in diabetes mellitus. J Cardiovasc Pharmacol 1998; 32 Suppl 3: 54-61. PMID:9883749

12. Vlassara H, Bucala R, Striker L. Pathogenic effects of advanced glycosylation: biochemical, biologic, and clinical implications for diabetes and aging. Lab Invest 1994; 70(10): 138-51.

13. Kozek E. Cukrzyca i stany przecukrzycowe a choroby sercowo-naczyniowe. In: Podolec P, editors. Polskie Forum Profilaktyki. Kraków: Medycyna Praktyczna 2007; 243-9.

14. Rutkowski M, Bandosz P, Czupryniak L. Prevalence of diabetes and impaired fasting glucose in Poland – the NATPOL 2011 Study. Diabet Med 2014; 31(12): 1568-71. doi: 10.1111/dme.12542.

15. Czupryniak L. Diabetologia kompendium. Poznań: Termedia; 2014.

16. Zalecenia kliniczne dotyczące postępowania u chorych na cukrzycę 2016 Stanowisko Polskiego Towarzystwa Diabetologicznego. Diabetol Klin 2016; 5, suppl A.

17. Zalecenia kliniczne dotyczące postępowania u chorych na cukrzycę 2015 Stanowisko Polskiego Towarzystwa Diabetologicznego. Diabetol Klin 2015; 4, suppl A.

18. Zalecenia kliniczne dotyczące postępowania u chorych na cukrzycę 2014 Stanowisko Polskiego Towarzystwa Diabetologicznego. Diabetol Klin 2014; 3, suppl A.

19. Czech A. Profesjonalna edukacja terapeutyczna i behawioralna jako fundament opieki diabetologicznej — badania własne i standardy metodologiczne. Diab Prak 2011; 12(B): 10-18.

20. Pupek-Musialik D, Bogdański P, Zatoński W. Otyłość – zagrożenie XXI wieku. Otyli żyją krócej. Kardiol Dypl 2010; 9(7): 21-7.

21. Brytek A. Pandemia otyłości. Terapia, uzależnienia i współuzależnienia 2005; 1(40): 27-9.

22. Narodowy Program Zdrowia na lata 2016-2020 Ministerstwo Zdrowia [Internet]. 2016 [cited 2018 Jul 11]. Available from: https://www.gov.pl/zdrowie/npz-2016-2020.

23. Koalicja na Rzecz Walki z Cukrzycą. Raport o cukrzycy. Warszawa; 2013.

24. Esposito C, Gerlach H, Brett J, Stern D, Vlassara H. Endothelial receptor-mediated binding of glucose-modified albumin is associated with increased monolayer permeability and modulation of cell surface coagulant properties. J Exp Med 1989; 170(21): 1387-407. PMID:2551990.

25. Gugliucci A. Glycation as the glucose link to diabetic complications. J Am Osteopath Assoc 2011; 100(15): 621-34.

26. Niezaj M, Szymańska-Garbacz E, Pawłowski M. Świadomość własnej masy ciała u chorych na cukrzycę typu 2. Diab Prak 2011;12(B): 52-60.

27. Junik R. Dieta w profilaktyce nadmiernego przyrostu masy ciała. Diab Prak 2011; 12(B): 63-9.

28. Sygit M, Sygit K, Karkowski T, Krakowiak J. Lifestyle versus a person-s's life span. Central European Journal of Sport Sciences and Medicine 2018; 2(2): 51-60.

29. Szajewska H. Probiotyki w Polsce – kiedy jakie i dlaczego? Gastroenterologia Kliniczna 2010; 2(1): 1-9. doi: 10.18276/cej2018.2-6.

30. Steinka I. Wybrane aspekty stosowania probiotyków. Am Acad Med Geclan 2011; 41(4): 97-108.

31. Szajewska H, Fordymacka A, Badrowski J. Microbiological and genetic analysis of probiotic products licensed for medicinal purposes. Med Sci Monit 2004; 10(6): 346-50.

32. Szajewska H, Mrukowicz J. Probiotics in the treatment and prevention of acute infectious diarrhea in infants and children: a systematic review of published randomized, doubleblind, placebo controlled trias. J Pediatr Gastroenterol Nutr 2001; 33(15): 17-25.