

Further Possibilities in the Treatment of Lactose Intolerance: Lactobacilli

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After administration of 2 billion lactobacilli per day for two weeks the lactose tolerance improved in 21 patients with lactose intolerance from milk on average by 1.62 g, cream cheese by 0.96 g and cheese by 0.27 g. The calcium intake increased from milk on average by 50 mg, cream cheese only by 20 mg but from cheese by 103 mg. The favourable effect of lactobacilli is probably due to the content of beta-galactosidase in their cells, which breaks down lactose into simple and readily absorbed hexoses - glucose and galactose. In the small intestine bile must be present which increases the permeability of the cellular wall for lactobacilli and lactose thus enters their cells more easily and it makes easier penetration of the enzyme into the intestinal contents possible and thus promotes further breakdown of lactose in the intestine.

Abstract

Lactose intolerant patients were once offered nothing more than a restrictive diet that was graded according to the severity of intolerance. Diets ranged from the omission of sweet milk, to the limitation of milk and milk products, to the complete elimination of lactose when neither butter nor bread made with milk are allowed, nor medical products containing lactose as a filler (5).

Somewhat later, milks appeared that were declared as lactose-free or with reduced lactose content. This reduction was attained either by centrifugation (the product of Nutrilact Co., liquid low-lactose sterilised milk containing 0.7% lactose), or by the decomposition of lactose with lactase added into milk before distribution (the resulting product is sweeter because of the higher content of glucose).

Other techniques for products with a reduced content of lactose, e.g. melting of soft cheese, are no longer realised.

Another possible method is the addition of lactase into milk by patients themselves (1-2 ml of lactase to 1 litre of milk 4-8 hours prior to consumption). Such preparations include the Danish produced Lactozym and Novo, and the American produced Maxilact and Fermentation. A disadvantage, however, remains in the necessary continuous agitation of milk and in the maximum activity of enzyme added at 37°C when there is a danger of bacteria propagation in insufficiently pasteurised or incidentally contaminated milk.

Recently, we tested the therapeutic agent *Lactobacillus acidophilus* Rosell-52, produced by the Institut Rosell Inc. (Canada), which contains two billion living bacteria per gelatin capsule. The loss of activity during storage in a cold place is 2-3% per month. We tested the therapeutic agent in patients with dyspepsia caused by enteral dysbiosis, i.e. by over propagation of bacteria by unsuitable composition of microflora for various reasons. The results obtained are as follows.

Materials

and

Methods

We followed the toleration of lactose in the diets of 21 patients (7 male and 14 females of average age 43.13612.10 years). All the patients suffered from lactose intolerance that was confirmed by the positive test of lactose tolerance. It was also proven histo-chemically by enteral biopsy of three patients. The diagnoses of all patients are presented in table 1.

The patients recorded the tolerance of the studied food while fasting in the morning, before treatment and after 14 days of regular administration of one capsule daily (the variant without lactose) after breakfast. Most patients only estimated the amount of tested food based on long time tolerance experience. The testing was carried out on fasting participants, because the tolerance of milk after meals, especially solid meal, is higher.

During the same period, further investigations were undertaken. Patients were given a point table of varying degrees, grading the difficulties after having ingested lactose. They were asked to determine, on average, the point-grade of their condition after their tolerated amount of food was increased by 33% (i.e. by one third). [For example, if they tolerated 20 ml of milk, we asked them to drink 26 ml; if they tolerated 50 g of cheese; we asked them to eat 65 g, etc.] At the same time, they were asked to record the number and consistency of their stools. Number of stools per day and its consistency was indicated as 0: tough, 1: formed, 2: pasty, and 3: watery. As a special note, they were able to record their own findings concerning the interval between taking the tested food and their stool, character of stool, and further subjective feelings.

For the sake of simplicity, 3 kinds of foods were tested: (1) low-fat mild, (2) soft cottage cheese and (3) Eidam cheese. The amount of milk was recorded in ml while the other two foods were in grams.

Results

The group of 19 patients (7 men, 12 women) tolerated only 20-30 ml of milk before treatment. After treatment, tolerance increased to 40-50 g. Before treatment, patients tolerated 40-70 g of cheese after treatment 70-80 g.

The results of lactose tolerance before and after treatment, calculated according to the tabulated valued (100 ml of milk contains 4.4 g lactose, 100 g of cottage cheese 4.8 g lactose and 100 g of Eidam cheese 1.8 g lactose), are presented in table 2. At the same time, the difference in tolerance for individual kinds of food was also calculated. These relations are plotted in figure 1. At the bottom of table 2, the amounts of calcium in tolerated food are calculated similarly as for lactose (the content of Ca in 100 ml milk is 125 mg, in 100 g cottage cheese 101 mg and in 100 g Eidam cheese 690 mg). These valued are graphically displayed in figure 2.

As follows from the results, the highest increase of lactose tolerance was for milk, then for cottage cheese, and then for hard cheese. However, the absolute amount of calcium supply was highest for cheese followed by milk, whereas soft cheese provided the lowest Ca supply.

The results of the second part of this investigation are shown in table 3. An increase in lactose by a mere one third above the tolerated amount caused abdominal pain in 7 patients and diarrhoea in 7 patients. After 14 days of lactobacilli administration, the number of patients suffering from abdominal pain decreased to 4, and only 3 patients had diarrhoea. On the other hand, 3 patients were without any problems. The total 'score' decreased by approximately 1 point; a statistically significant difference. Before treatment, four patients had three bowel movements daily, seven had two bowel movements a day, and eight patients had one. After treatment, only four patients had two bowel movements per day, and fifteen had only one. On average, the number of stools decreased after lactobacilli treatment by 0.57; a statistical difference. However, the best results were obtained in the consistency of the stools: before treatment 12 patients had (after administration of tested food) watery stool (in the note, all patients describe the stool as foamed, with acid odour and 10 patients complained of burning in the anal

region). Seven patients had pasty stool and none of the patients had formed stool. After treatment, the consistency of stools improved markedly: 8 patients recorded a pasty stool, 8 had formed stool, and 3 patients had tough stool. None of the patients recorded watery stool. The average improvement in stool consistency was 1.37 points (the scale: 0-tough, 1-formed, 2-pasty, 3-watery). Anal irritation disappeared in all patients.

Two female patients with proven total alactasia were omitted in the survey of final results. They did not resist trace amounts of lactose before treatment and reacted to pastry or bread (with a small amount of milk in dough) with diarrhoea. The women did not even resist butter and suffered from diarrhoea after administration of drugs, e.g. of anti-diarrhoeal preparation Reasec (it contains lactose as a filler). These two 'detectors' of trace amounts of lactose withstood, after 14 days of treatment with lactobacilli, pastry, bread, butter, milk in sauces and the above mentioned drugs without problems and enthusiastically reported that withstood also 10 g of processed cheese.

Discussion

It is obvious from our results that the amount of lactose tolerance by patients without problems increased after 14 days of treatment with lactobacilli. This effect was by the action of living bacteria and not the effect of lactose distribution directly in the milk product by milk fermentation or cheese ripening. The so-called 'living yogurt' was more efficient than fermented milk (3, 13). Lactose from yogurt was two to four times better tolerated than lactose from sweet milk (2). A similar effect was exhibited by bacteria from non-fermented products (8). This favourable effect was caused by beta-galactosidase present in the cells of lactobacilli, which was activated at body temperature (6). However, its activity was lost after pasteurisation above 80°C (7). The enzyme is located intracellularly and therefore it is protected from inactivation from stomach acid (9). The presence of gall in duodenum has two effects: it increases permeability of cell walls and, in this way, facilitates the saturation of lactose into cells, on one hand, and released said enzymes into intestine (12).

Investigators, who use the content of H₂ in breath as an indicator of lactose decomposition in intestine, obtained the analogous results because this parameter closely correlates with clinical symptoms. After partaking in yoghurt treatment, only 1/5 of H₂ was eliminated in breath, compared to the H₂ amount in breath after ingesting the same amount of milk (11).

A high percentage of patients with lactose intolerance exhibit osteoporosis as a result of calcium deficiency (5, 10). By improving lactose tolerance with lactobacilli it is possible to increase the Ca supply into organism. Our results have proven this assumption. While the lactose tolerance improved for the use of milk (i.e. in liquid medium) smaller effects were found for cottage cheese and cheese. Cheese proved to be the most suitable medium for increasing Ca supply (the increase in Ca supply was 104 mg in day), then milk as secondary (25 mg Ca in day) and the cottage cheese as the least efficient (20 mg Ca in day). In addition to the improved tolerance of lactose, lactobacilli has a favourable effect on the decomposition of enteral microflora and, moreover, an advantageous effect on nutrition: it increases digestibility of proteins from food and synthesises some vitamins of the B and K group (1). The increased tolerance of lactose relieves many patients of unpleasant gastrointestinal problems (4).

The application of lactobacilli opens further possibilities of how to help patients with lactose intolerance and their associated complications.

Table 1: Patients with lactose intolerance

	Male	Female
Lactose Intolerance Primary:	----	4
Lactose Intolerance Secondary:		
- Resection of Stomach B II.	1	2
- Vagotomie and Pyloroplastic	2	----
- Cholelithiasis (biliar dyspepsia)	----	2
- Chronical enteritis	2	----
- Sprue	----	2
- M. Crohn (reg. Ileitis)	1	3
- St. p. resection of small intestine	1	1
Total	7	14

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Table 2: Average quantity of lactose tolerance in grams before and after the treatment and after 14 days of treatment by lactobacilli. Average quantity of calcium in mg consumed before and after treatment.

- average increasing of both values

- t: value t: test; p: probability

	Before		After				
	X	S	X	S		t	p
Lactose:							
Milk	0.99	0.17	2.61	0.28	1.62	22.1478	+++
Cottage Cheese	1.20	0.18	2.16	0.28	0.96	12.9157	+++
Cheese	1.08	0.17	1.35	0.20	0.27	4.6065	+++
Calcium:							
Milk	28	4.96	77.2	16.65	49.9	12.7457	+++
Cottage Cheese	25	4.51	45.0	7.78	200.0	9.9599	+++
Cheese	414	75.19	517.0	98.98	103.5	3.7289	+++

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Table 3: Number of patients which have reached certain symptoms after consumption of tolerated quantity of lactose, increased for 1/3, before treatment and after 14 days of treatment. From these points is calculated the average score. Number of stools in a day and its consistency before and treatment.

t: value t; test; p: probability

	Before	After		
0- without problems	0	3		
1- meteorism	3	2		
2- flatulence	2	7		
3- stomach pain	7	4		
4- diarrhoea	7	3	t	P
'Score'				
X	2.94	2.10	2.2548	+
S	1.07	1.28		
# of Stools				
X	1.78	1.21	2.8968	++
S	0.78	0.41		
Consistency of stool				
X	2.63	1.26	6.9782	+++
S	0.49	0.73		
			+ 0.05 > p > 0.01	
			++ 0.01 > p > 0.001	
			+++ p > 0.001	

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