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Effect of probiotic cultures in improving the health status of the host

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Abstract

Probiotics are nonpathogenic microorganisms which, when ingested, exert a positive influence on the health or physiology of the host. A probiotic food can be defined as functional agent, which provide adequate nutritional effects in a way that is relevant to either the state of well-being and health, or to a reduction in disease incidence. Dairy based yoghurt prepared using two different Lactic acid bacterial strains for the present study, and their mechanisms of action and effects were also studied. This study summarizes and comments on evidence for the positive effects of probiotics in various clinical situations such as improving the nutritional and health status of the host.

Key words: Probiotic, Physiology, Yoghurt, Nutrition, etc.,

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INTRODUCTION

Metchnikoff first hypothesized the importance of lactobacilli for human health and longevity at the beginning of 19 th century. He considered the gut microbes as detrimental rather than beneficial and suggested that desirable effects might only be expected from their substitution by yogurt bacteria. Since then attempts have been made, especially during the last two to three decades to improve the health status by modulating the indigenous intestinal microflora by live microbial adjunct, now called "probiotics" (Holzapfel *et al*., 1998). The word "probiotic" was derived from the Greek word which means "on behalf of ". The concept was introduced by Lilly and Stillwell (1965) and was intended to stimulate substances produced by one microorganism to enhance the growth of another. Probiotic therefore is the exact opposite of antibiotic. The word probiotic was used later to refer to animal feed supplements and was defined as a live microbial feed supplement, which beneficially affects the host animal by improving its intestinal microbial balance (Fuller, 1989). The word probiotic was used later to refer to animal feed supplements and was defined as a live microbial feed supplement, which beneficially affects the host animal by improving its intestinal microbial balance (Fuller, 1989). The health and nutritional benefits ascribed to probiotics can be generalized under the following categories: maintenance of normal intestinal microflora balance in infant and old age, improvement of lactose tolerance and digestibility of the milk products, anti tumorogenic activity, reduction of serum cholesterol levels, synthesis of B-complex vitamins, and absorption of calcium (David and Dauas, 1991).

In the present work strains of Weissella confusa and Bifidobacterium bifidum were isolated from various fermented cereals and evaluated for their potentiality to be used as a Probiotic. The isolated organisms were used to prepare probiotic yoghurt. Yoghurt samples were analysed for their ability to improve nutritional and health status of the consumers.

MATERIALS AND METHODS

Impact on the consumer

Since the probiotic products are meant for improving nutritional and health status of the individual consumers, studies relating to these aspects were carried out *in vivo* using experimental animal (rats).

Nutritional Status

Common fact regarding the probiotic food is that, it improves the nutritional status of the individual, which was studied by inoculating 5ml of prepared yoghurt containing 10^8cells / ml to the experimental rats twice a day along with the feed orally for a period of two weeks. The parameters such as body weight and blood chemistry were checked (Akalin *et al*., 1997).

Body weight

It was detected by using standard weighing balance.

Blood chemistry

Blood samples were collected by vein puncture method for the determination of serum cholesterol (Cholesterol Oxidase peroxidase method) (Akalin *et al*., 1997), HDL-

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Cholesterol (Immuno inhibition method) (Kiessling *et al*., 2002), LDL-cholesterol (Enzyme Selective protection method), Triglycerides (GPO-PAP - One Step Method. (Wiebe and Smith 1985)

Table.1. Body Weight

S. No.	Weeks	Body weight in gms			
		S2	S3	S2S3	Control
1	1st Week	152	155	153	155
2	2nd Week	157	160	158	155
3	3rd Week	168	180	175	158
4	4th Week	199	210	201	158
5	5th Week	201	216	205	163
6	6th Week	204	222	212	163

S2 – Weissella confusa, S3 – Bifidobacterium bifidum, S2S3 – Weissella confusa + Bifidobacterium bifidum

Table.1a. Body Weight -Karl Pearson Correlation Analysis

Variables	S2	S3	S2S3	Control
S2	1	0.995**	0.994**	0.877**
S3	0.995**	1	1.000**	0.909**
S2S3	0.994**	1.000**	1	0.905**
Control	0.877*	0.909*	0.905*	1

** Correlation is significant at the 0.01 level (Highly Significant)

* Correlation is significant at the 0.05 level (Significant)

Table.2. Total cholesterol (mg / dl)

Samples	1st Week	6th Week
S2 yoghurt	96	87
S3 Yoghurt	95	83
Control	98	110

S2 – Weissella confusa , S3 – Bifidobacterium bifidum

Table.2a. t-test Total cholesterol

Groups	N	Mean	SD	t-value	P Value
1st week	3	96.33	1.52	0.397	0.729 (NS)
6th week	3	93.33	14.6		

NS – Non-significant

Table.3a. t-test HDL (mg / dl)

Groups	N	Mean	SD	t-value	P Value
1st week	3	29.67	1.5	9.5	0.011 (S)
6th week	3	36	2.7		

S – Significant

Table. 4. LDL (mg / dl)

Samples	1st Week	6th Week
S2 yoghurt	45	39
S3 Yoghurt	44	37
Control	47	51

S2 – *Weissella confusa* , S3 – *Bifidobacterium bifidum*

Table.4a. t-test LDL

Groups	N	Mean	SD	t-value	P Value
1st week	3	45.33	1.5	0.854	0.483 (NS)
6th week	3	42.33	7.6		

NS – Non-significant

Table.5. Triglycerides (mg / dl)

Samples	1st Week	6th Week
S2 yoghurt	70	77
S3 Yoghurt	69	81
Control	72	75

S2 – *Weissella confusa* , S3 – *Bifidobacterium bifidum*

Table. 5a. test Triglycerides

Groups	N	Mean	SD	t-value	P Value
1st week	3	70.33	1.53	2.817	0.106 (NS)
6th week	3	77.67	3.06		

NS – Non-significant

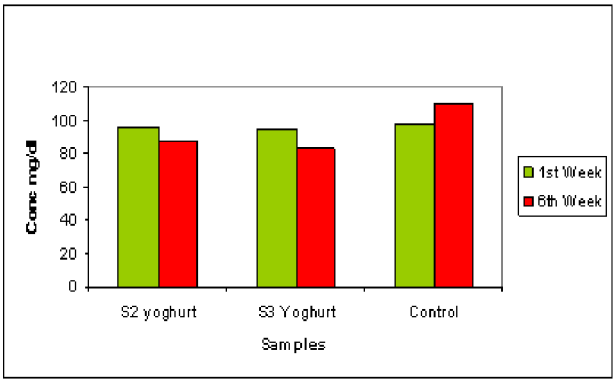

Fig.1. Total Cholesterol

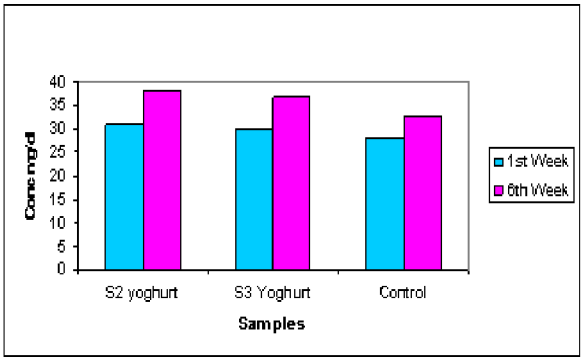

Fig.2. Serum HDL

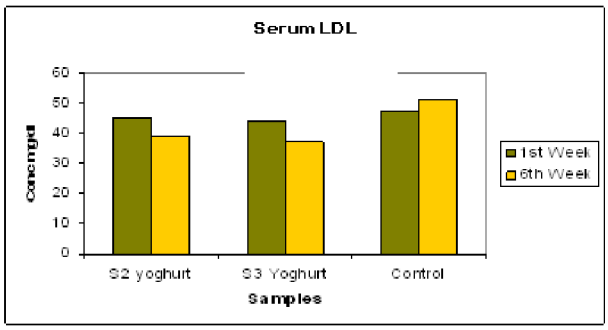

Fig.3. Serum LDL

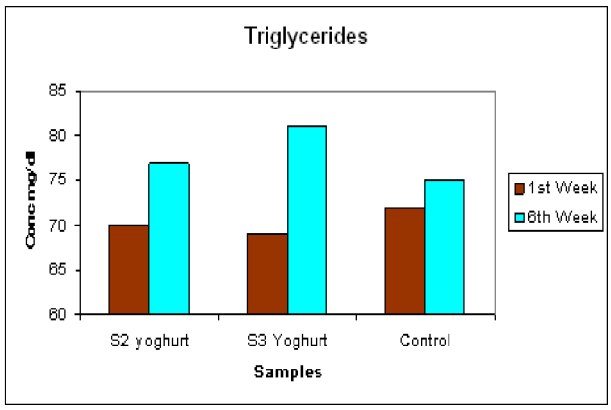

Fig.4. Triglycerides

RESULTS

Impact on the consumers

Nutritional status

Definition of probiotics itself clearly states that it is a viable preparation in the form of food or dietary supplements to improved the health of humans or animals. So the probiotic organisms *Bifidobacterium* and *Weissella* in the form of yoghurt were ingested into laboratory experimental animals

Ten ml of yoghurt per day with a bacterial concentration of 10^8 cells per ml was given orally to the animals for a period of 6 weeks as suggested by Robinson (1987). Quantity and concentration of probiotic organisms actually are responsible for getting desired therapeutic effects from probiotic products (Shah, 2000). It has been (Anonymous, 1992) reported that these organisms should be present in a food to a minimum level of 10^6 cfu / g or daily intake should be about 10^8 cfu / g. Xiao *et al.* (2003) also reported the intake of probiotic organisms at a concentration of 10^8 cfu / g. Such high numbers could have been suggested to compensate the possible reduction in the numbers of the probiotic organisms during passage through the stomach and the intestine (Shah, 2000).

The effect of fermented milks on rats was checked by body weight gain and blood chemistry analysis.

Body Weight

In the present study, body weight of the rats gained gradually and increased from the first week to the sixth week, in all the cases (Table 1). During the first two weeks there was a slow increase in weight which might be due to the time taken for adaptability of these organisms into the intestine of the animals where they might compete with the other organisms for colonization, nutrition, etc.. During the subsequent weeks, there was an excellent improvement in the weight gain by the animals approximately of 10g / week in case of *Weissella* and 20g / week in case of *Bifidobacterium* and the weight gain was more or less similar in the case of combination (Table 1). But in the case of control there was a little increase in the body weight. In a similar study Xiao *et al.* (2003) found that 20gms of feed / day inoculated with *Bifidobacterium*, showed an increase in body weight by 7.2+1.1 g / d.

Blood Chemistry analysis

The blood chemistry parameters such as serum cholesterol, serum protein, serum phosphorus, calcium and glucose were checked. Blood samples were collected at the end of each week and all the parameters were cheeked.

Serum Cholesterol

When the serum cholesterol level was considered, the results of the present study revealed that the *Bifidobacterium* yoghurt (S3) and *Weissella* yoghurt (S2) were more effective in controlling serum lipids in rats than the control. In comparison with the control, S2 (yoghurt) and S3 has reduced significantly the levels of serum total cholesterol, LDL cholesterol and triglycerides (Fig.1-4).

Bifidobacterium fermented milk is more efficient in lowering the serum total cholesterol concentration in rats than *Weissella*. This lends support to other studies involving various milk products containing selected strains of lactic acid bacteria, Akalin *et al.* (1997)

demonstrated that yoghurt fermented with *L. acidophilus* significantly reduced the serum total cholesterol concentration in milk, where as yoghurt fermented with ordinary yoghurt starters containing

S. thermophilus and *L. delbreukii*, did not show any reduction.

In experiments with rats, Beena and Prasad (1997) demonstrated that bifidus yoghurt fortified with condensed whey lowered the cholesterol level, more than the ordinary yoghurt fortified with condensed whey. Reduction of serum total cholesterol and triglycerides were observed with selected strains including *L.acidophilus* (Danielson *et al.,* 1989), *L. reuteri* (Taranto *et al.,* 1998, De Roos *et al.,* 1999), *L. casei* (Hashimoto *et al.,* 1999), and *L. gasseri* (Usman and Hosono, 2000) in the experimental animal.

In the present study with animal indicated a slight non-significant decrease in the concentration of LDL - cholesterol but a significant increase in the concentration of HDL - cholesterol in both S2 and S3 yoghurt in comparison with the control yoghurt. A decrease in total cholesterol was found with a simultaneous increase of HDL-cholesterol in some studies (Taranto *et al.,* 1998; Hashimoto *et al.,* 1999).

From these results it is obvious that serum total cholesterol is reduced by inhibiting absorption in the intestine as a result of the assimilation and binding of cholesterol as well as bile acids by lactic acid bacteria. It is known that the serum cholesterol level decreases when a component suppresses resorption of bile acid in the intestine because the catabolism of cholesterol is promoted in the liver (Xiao *et al.,* 2003)

Serum Protein, Calcium, Phosphorus and Blood glucose

The level of serum protein showed a slight decrease in the second week, but during the subsequent weeks, it was increased in all the treatments. *Bifidobacterium* (S3) yoghurt showed more increase in the level of serum protein than *Weissella* yoghurt (S2) and even the combination (S2S3 yoghurt) also showed an increase in the level of serum protein (Table 1). The change in the level of serum calcium, serum phosphorus and blood glucose was almost comparable with that of serum protein. All these reports are indirectly corresponding to the results of the body weight of the animals because protein and other nutrients are essential for the body weight gain, and in the body weight gain of animals also the drastic increase in the weight occurred only after 2nd week.

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