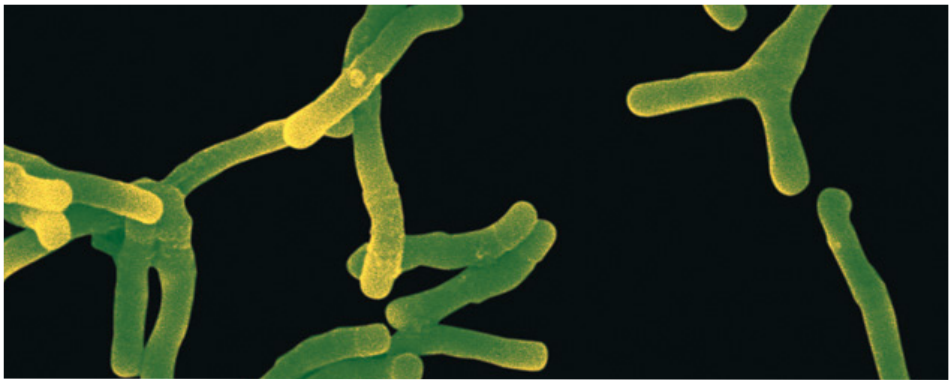
Protexin health care

Issue 3 November 2009

Probiotic News

Bifidobacteria



3d rendered close up of Bifidobacteria

Bifidobacteria are the second most popular type of bacterium (after lactobacilli) used in probiotic products. They are included for several reasons. Firstly, bifidobacteria are found naturally in the intestines of breast-fed infants at very high levels. On average they constitute about three-quarters of all the bacterial cells in the gut of such infants, which compares with a much lower proportion (about 3%) found in the gut microflora of adults[1]. Breast milk stimulates the growth of bifidobacteria, and this effect is a clear indication that bifidobacteria are protective of vulnerable individuals[2].

Secondly, bifidobacteria tend to live in a different part of the intestine to lactobacilli and therefore these two types of probiotic microbe complement each other. Members of the Lactobacillus genus can grow with or without oxygen (aerobic or anaerobic), and prefer environments with small amounts of oxygen. As such, they live comfortably in the small intestine.

In comparison, members of the Bifidobacterium genus only grow without oxygen. They thrive in the large intestine, because the small amounts of oxygen present in the small intestine are gradually consumed by aerobic bacteria, leaving the large intestine an almost completely anaerobic environment. Furthermore, the large intestine has plenty of food suitable for bifidobacteria. They are adept at breaking down more complex carbohydrates, and these are abundant in the large intestine (mostly derived from the parts of plant-based foods that human enzymes are unable to digest). A probiotic product that contains both lactobacilli and bifidobacteria is therefore able to influence the whole of the intestine[3].

Thirdly, there is evidence that people over the age of 50 have alterations to their intestinal microflora, and those changes include a decline in the number of bifidobacteria[4]. Potential exists for influencing these changed microflora by consuming bifidobacteria.

Characteristics of bifidobacteria

The form that Bifidobacterium cells take varies between species, but generally they are rod-shaped, slim, and with slightly bulbous or clubbed ends. When nutrients are short, bifidobacteria tend to fork at one or both ends[5]. These split ends give the bacterium its name, from the Latin word bifidus, meaning 'split in two'.

Currently, thirty-two species of bifidobacteria have been identified[6], mostly from the intestines of mammals. The species discovered from human intestines are: B. adolescentis, B. angulatum, B. bifidum, B. breve, B. catenulatum, B. gallicum, B. infantis, B. longum and B. pseudocatenulatum[7].

The main by-products of the metabolism of bifidobacteria are acetic acid and lactic acid, in about equal proportion. These two acids lower the pH (increase acidity) within the intestine, especially in the caecum and the ascending (right-sided) colon. It is likely that the ability of bifidobacteria to increase the acidity of the intestine is a factor in their probiotic effects, as many harmful microbes are inhibited in a low pH environment[8].

There is also some evidence that bifidobacteria produce anti-bacterial substances that inhibit harmful bacteria, such as Yersinia and Shigella species[6]. Eight different Bifidobacterium species showed this effect in laboratory experiments[9]. The anti-bacterial substances have not yet been

Published by: Protexin, Matts Lane, Stoke sub Hamdon, Somerset, TA14 6QE, UK. Tel: +44 (0) 1935 822921 Email: info@bio-kult.com www.bio-kult.com

identified, but may be similar to bacteriocins produced by lactobacilli.

Other useful characteristics of bifidobacteria are the production of various B vitamins, and a tendency to adhere well to the intestinal wall, thus excluding pathogenic bacteria[10]. Bifidobacteria do not produce any gas and therefore may be helpful for people suffering from bloating and flatulence.

Evidence of probiotic effects

Much of the clinical research involving bifidobacteria has been undertaken with the bifidobacteria being part of a probiotic mixture with lactobacilli or another type of microbe. Although such research has produced positive results, in almost all cases, it is not possible to separate out the specific contribution of the bifidobacteria.

There has, however, been some human research undertaken with bifidobacteria alone. This research points to bifidobacteria lessening the effects of lactose intolerance, reducing cholesterol levels, improving the gut immune system, reducing diarrhoea (both rotavirus and antibiotic-associated) and reducing constipation[6,11,12]. Also, bifidobacteria appear to be helpful in preventing infections of the gut in infants[5]. And there has been one good study which found that a B. infantis significantly reduced symptoms in IBS patients, and was more effective than a Lactobacillus salivarius[13].

Safety

Bifidobacteria have been studied for a long time, and were first identified in 1899 (by Henry Tissier at the Pasteur Institute, Paris). Their high numbers in pre-weaning infants (as mentioned above) is a good indicator of the safety of bifidobacteria. A recent review reported that there is no record of anyone developing a Bifidobacterium infection from consuming a probiotic product "despite their widespread consumption in Europe and Japan". The review concluded that the "Bifidobacterium genus is certainly among the safest genera"[14].

References

1. Macfarlane, G.T., Gibson, G.R., Drasar, B.S. & Cummings, J.H. (1995) Metabolic significance of the gut microflora. In Gastrointestinal and Oesophagal Pathology (Whitehead, R., ed.) Churchill Livingstone, Edinburgh, Scotland.: 249-274.

2. Ballongue, J. (1998) Bifidobacteria and Probiotic Action. In Lactic Acid Bacteria (Salminen, S. & von Wright, A., eds.). Marcel Dekker. New York, U.S.A.: 519-587.

3. Axelsson, L. (2004) Lactic Acid Bacteria: Classification and Physiology. In Lactic Acid Bacteria: Microbiological and Functional Aspects, Third Edition (Salminen, S., von Wright, A., Ouwehand, A., eds.). Marcel Dekker, New York, U.S.A.: 1-66.

4. Woodmansey, E.J. (2007) Intestinal bacteria and ageing. Journal of Applied Microbiology 102: 1178-1186.

5. Hoover, D.G. (2000) Bifidobacterium. In Encyclopedia of Food Microbiology, Vol. 1 (Robinson, R.K., Batt, C.A. & Patel, P.D., eds.). Academic Press, San Diego, U.S.A.: 210-217.

6. Biavati, B., Vescovo, M., Torriani, S. & Bottazzi, V. (2000) Bifidobacteria: history, ecology, physiology and applications. Annals of Microbiology 50: 117-131.

7. Ventura, M, O'Connell-Motherway, M., Leahy, S. et al. (2007) From bacterial genome to functionality; case bifidobacteria. International Journal of Food Microbiology 120: 2-12.

8. Rasic, J.L. & Kurmann, J.A. (1983) Bifidobacteria and their Role. Experientia Supplementum 39: 1-295.

9. Gibson, G.R. & Wang, X. (1994) Regulatory effects of bifidobacteria on the growth of other colonic bacteria. Journal of Applied Bacteriology 77: 412-420.

10. Bernet, M-F., Brassart, D., Neeser, J-R. & Servin, A.L. (1993) Adhesion of Human Bifidobacterial Strains to Cultured Human Intestinal Epithelial Cells and Inhibition of Enteropathogen–Cell Ineractions. Applied and Environmental Microbiology 59: 4121-4128.

11. Leahy, S.C., Higgins, D.G., Fitzgerald, G.F. & van Sinderen, D. (2005) Getting better with bifidobacteria. Journal of Applied Microbiology 98: 1303-1315.

12. Picard, C, Fioramonti, J., Francois, A. et al. (2005) Review article: bifidobacteria as probiotic agents - physiological effects and clinical benefits. Alimentary Pharmacology and Therapeutics 22: 495-512.

13. O'Mahony, L., McCarthy, J., Kelly, P. et al. (2005) Lactobacillus and Bifidobacterium in Irritable Bowel syndrome: Symptom Responses and Relationship to Cytokine Profiles. Gastroenterology 128: 541-551.

14. Meile, L., Le Blay, G. & Thierry, A. (2008) Safety assessment of dairy microorganisms: Propionibacterium and Bifidobacterium. International Journal of Food Microbiology 126: 316-320.