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Protexin® health care

Probiotic News

Lactobacillus - the 'pioneer' of probiotics?

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Background

The bacterium most often used in probiotics is the *Lactobacillus*. There are several reasons for its popularity.

Firstly, lactobacilli are found naturally in the human microflora. They are particularly common in the small bowel. Lactobacilli grow in atmospheres free of oxygen or containing small amounts of oxygen[1]. The oxygen present in the small bowel is gradually exhausted by aerobic (oxygen-using) bacteria, only small amounts remain in the terminal ileum (the last part of the small intestine), and this is where most lactobacilli are found.

Lactobacilli feed almost exclusively on sugars, of which there are plenty in the intestine. They are however quite 'fussy eaters', in that they require a lot of minor nutrients to enable them to live and grow. This is another reason why they are a common bacterium in the small bowel, because there is a wide range of food in that part of the intestine. There are fewer lactobacilli in the large bowel, because the undigested food entering the large bowel has a smaller range of nutrients within it. There are still lactobacilli in the large bowel, but they are heavily outnumbered by other types of bacteria, and constitute less than 1% of the colonic microflora.

Not only are lactobacilli found in the intestine, they are also found in the vagina. They are the dominant resident bacteria there and they protect against vaginal infection[2].

Another reason for the popularity of lactobacilli as probiotics is the degree to which they have been studied. The first type of bacterium favoured by a respected scientist as having probiotic qualities was a *Lactobacillus*. The scientist was Ilya Metchnikov, a Nobel laureate immunologist based at the Pasteur Institute, Paris. At the beginning of the 20th century, Metchnikov argued for the benefits of fermented milk consumed by Bulgarian peasants containing a *Lactobacillus* species, later named *Lactobacillus bulgaricus*. This early interest in lactobacilli was taken up by other scientists and consequently lactobacilli became more deeply studied than other probiotic microbes.

Lactobacilli were one of the first bacteria with evidence of anti-pathogen effects (controlling harmful strains of *E. coli* and reducing their numbers)[3]. Subsequently, many laboratory experiments have shown various *Lactobacillus* species being able to inhibit the growth of different pathogens and to stimulate immune cells. Increasingly, animal studies and human clinical research have shown lactobacilli being able to accelerate recovery from a range of intestinal conditions, and preventing infection.

Some *Lactobacillus* species also tend to be naturally resistant to the destructive effects of acid. As such, they survive passage through the stomach much better than many other microbes.

How do lactobacilli work probiotically?

There are many different ways by which lactobacilli produce a probiotic effect:

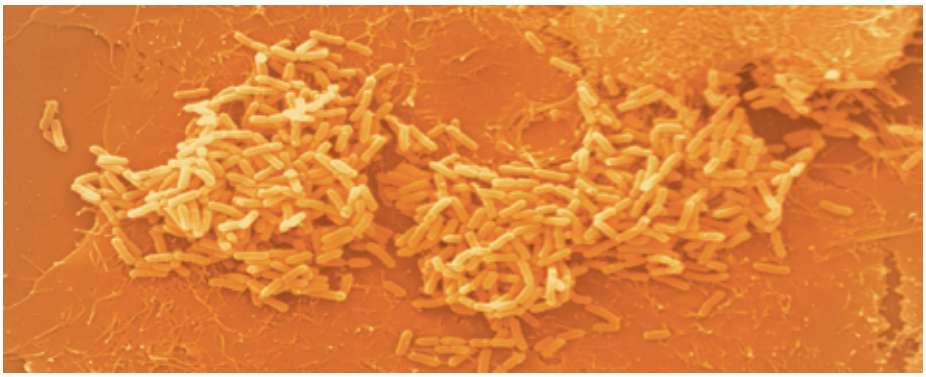
- increasing the acidity of a local area of the intestine
- producing various anti-microbial substances
- attaching to the intestinal lining
- promoting larger quantities of intestinal mucus
- competing with pathogens for nutrients
- modulating the host immune system

These factors are explained more fully below.

Lactic acid lowers the pH of the latter part of the small bowel (ileum) and the first part of the large bowel (caecum). This increased acidity discourages harmful bacteria[4]. Some lactobacilli also produce acetic acid, and this has an even stronger anti-pathogenic effect than lactic acid[5].

Lactobacilli produce antibiotic-like proteins called bacteriocins, which may help to restrict the growth of some intestinal pathogens[6]. Also, some lactobacilli produce hydrogen peroxide, a chemical that has an antibacterial effect. More is produced in the small intestine than in the colon, as lactobacilli need some oxygen for the chemical process involved. Hydrogen peroxide is also produced by some types of lactobacilli in the vagina.

Effective probiotic lactobacilli tend to be good



Scanning electron microscopy image illustrating a colony of *Lactobacillus* spp. in epithelial cell culture.
Image courtesy of Alun Carter, Addlestone Research Institute, Surrey, UK.

at attaching to the mucosa (mucus-covered intestinal lining)[7]. By attaching, they are able to multiply and form temporary colonies. From there they may block the attachment of pathogens and also influence the immune cells in the gut wall.

Some probiotic lactobacilli stimulate the extra production of mucus by goblet cells (found in the gut lining), and this may be a way in which the lactobacilli inhibit the attachment of pathogenic bacteria[8]. Mucus also contains substances that are harmful to pathogens[9].

Since lactobacilli use a wide range of nutrients, they increase the chances of depriving pathogens of key nutrients, thus inhibiting the growth of such pathogens.

There is growing evidence that lactobacilli enhance immunity by increasing antibody levels and activating macrophages[1]. This occurs through the close proximity of lactobacilli to the gut wall, with its gut-associated lymphoid tissue. Immune tissues of other mucus-layered surfaces of the body may also be influenced by lactobacilli.

There are 165 species of *Lactobacillus*[10], with quite a broad range of characteristics. Only a few have been used in probiotic products, including: *Lactobacillus acidophilus, Lactobacillus casei, Lactobacillus crispatus, Lactobacillus delbrueckii, Lactobacillus johnsonii, Lactobacillus paracasei, Lactobacillus plantarum, Lactobacillus reuteri, Lactobacillus rhamnosus and Lactobacillus salivarius.* Even among this small number of species there are a lot of differences. By using different species within a probiotic product an increased range of beneficial characteristics can be provided.

Bio-Kult®
Candéa

Powerful Candida Defence

Bio-Kult Candéa from Protexin® is a probiotic supplement with added garlic and grapefruit seed extract.

Bio-Kult Candéa contains:

- Seven strains of probiotic bacteria to reinforce the gut microflora, helping to prevent *Candida* from finding sites in the gut to grow. They also lower the gut pH so that *Candida*, which prefers a more alkaline environment, cannot thrive.
- Garlic and grapefruit seed extract - proven natural antifungals. These are also proven to be compatible with the probiotic bacteria in Bio-Kult Candéa.

Taken daily it can help strengthen the body's natural defences against *Candida* and may help to prevent it changing from its yeast-like form to the invasive filamentous fungus form.

References:

1. Barbes C. 2008. Lactobacilli. *Therapeutic Microbiology: Probiotics and Related Strategies* (Versalovic, J. & Wilson, M., eds.). ASM Press, Washington DC, USA: 19-33.

2. Reid G & Heinemann C. 1999. The role of the microflora in bacterial vaginosis. *Medical Importance of the Normal Microflora* (Tannock, G.W., ed.) Kluwer Academic Publishers, Dordrecht, Netherlands: 477-486.

3. Fuller R. 1989. Probiotics in man and animals. *Journal of Applied Bacteriology* **66**: 365-378.

4. Fang W, Shi M, Huang L, Chen J, Wang Y. 1996. Antagonism of lactic acid bacteria towards Staphylococcus aureus and Escherichia coli on agar plates and in milk. *Veterinary Research* **27**: 3-12.

5. Teixeira PCM 2000 Lactobacillus brevis *Encyclopedia of Food Microbiology, Vol. 2* (Robinson RK, Batt CA & Patel PD, eds.) Academic Press, San Diego, USA: 1144-1151.

6. Gilliland SE. 1990. Health and nutritional benefits from lactic acid bacteria. *FEMS Microbiology Reviews* **87**: 175-188.

7. Bengmark S 1998. Ecological control of the gastrointestinal tract. The role of probiotic flora. *Gut* **42**: 2-7.

8. Mack DR, Michail S, Wei S, McDougall L, Hollingsworth MA 1999. Probiotics inhibit enteropathogenic E. coli adherence in vitro by inducing intestinal mucin gene expression. *American Journal of Physiology* **276**: G941-G950.

9. Yolken RH, Ojeh C, Khatri IA, Sajjan U, Forstner JF 1994. Intestinal mucins inhibit rotavirus replication in an oligosaccharide-dependent manner. *Journal of Infectious Diseases* **169**: 1002-6.

10. DSMZ 2009. Bacterial Nomenclature Up-to-date: Lactobacillus. http://www.dsmz.de/microorganisms/bacterial_nomenclature_info.php?genus=LACTOBACILLUS (accessed 28/12/10).

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