Bio-Kult powers forward following acquisition by Protexin Healthcare

Bio-Kult, the 14-strain probiotic supplement originally formulated by a team of doctors, nutritionists and scientists, has been sold by Cambridge Bioceuticals to Protexin.

Protexin is a global probiotic specialist based in Somerset, with 20 years’ experience of manufacturing and marketing a wide range of probiotic supplements. Protexin’s recent purchase of Bio-Kult is a natural progression in the brand’s growth and development in support of UK Health Care Practitioners. This is because Bio-Kult has always been produced by Protexin at its UK manufacturing facility, providing the manufacturing expertise from the start.

The takeover of Bio-Kult enables the brand to grow significantly, maximising its potential as a leading probiotic supplement. Jonathan Sowler, Commercial Director at Protexin comments: “Bio-Kult has everything to gain by preserving its stand-alone brand identity within Protexin, yet reaping the marketing benefits of an association with Protexin’s own globally-trusted brand.”

Peter Cartwright BA (Hons), MA, MSc

Peter is the author of three books on intestinal health (including Probiotics for Crohn’s and Colitis) and has 17 years experience in self-help and patient associations. He has recently completed his MSc in Microbiology. Peter has been working closely with Protexin for several years. As well as presenting seminars worldwide for us he also writes regular reviews on many subjects. The first one we would like to share with you is his review of the evidence behind using Bacillus subtilis as a probiotic.

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Bacillus subtilis: 
Transit through the gut & effect on Lactobacilli

Peter Cartwright BA (Hons), MA, MSc looks at the evidence behind using Bacillus subtilis as a probiotic

Although Bacillus subtilis has been used as a probiotic for many years in parts of South-East Asia and Southern Europe, some observers have doubted that it could have any beneficial effect. The scepticism rests on the fact that the B. subtilis in probiotic products are in spore form, which is a dormant state, and it was hard to imagine the dormant spore having any influence on the human intestine. Furthermore, it had seemed unlikely that a spore would germinate into its normal active state (known as vegetative form) within the gut.

A study by Tam et al (2006) helped to clarify how B. subtilis behaves in a mammalian gut.

Transit through the digestive tract

Bacteria of the genus Bacillus are Gram-positive rods that are commonly found in the soil. They form spores with a harder cell wall and a more rounded shape than the normal (vegetative) state. Spores are formed as a way of survival in adverse environments. B. subtilis in vegetative form is very unlikely to survive stomach acid, but the spore should survive passage unharmed. But what happens during transit through the rest of the intestine?

Bacillus spore germination (into vegetative state) is usually triggered by the presence of nutrients, and in some Bacillus species germination is triggered by a low pH (acid environment). The authors argue that “spore germination should occur readily in the GIT” (gastrointestinal tract), and they point out that this was confirmed recently in another study.

The Tam et al (2006) study checked this result and explored further. By examining the intestines of mice fed special versions of B. subtilis spores (that expressed a gene only in vegetative form), it was possible to confirm that some of the spores were germinating (about 1-10%). This occurred in the jejunum (upper small intestine) of the mice. Furthermore, it appeared that these vegetative bacilli were able to colonise the gut temporarily, because spores were being excrated from the mouse up to 27 days after the last dose of bacilli.

B. subtilis bacteria were thought to be strict aerobes. Now it is known that, while they prefer aerobic metabolism, they can live anaerobically, although with a much slower metabolism. It is presumed, although not proven, that the vegetative bacilli start to sporulate as they reach the large bowel, as there is very little oxygen present and they find this environment less satisfactory. B. subtilis can sporulate in as little as four hours at human body temperature. Laboratory tests have shown that such bacteria can sporulate in anaerobic conditions.

A second part of the study by Tam et al (2006), examined human stool from 30 healthy volunteers. All of the volunteers were found to be carrying bacillus spores, at an average concentration of about 10,000 per gram of stool. This suggests that spores of bacilli are a normal part of the human GIT, and therefore the addition of B. subtilis as a probiotic is not conflicting with a natural process.

Effect of Bacillus subtilis on Lactobacillus species

A study by Hosoi et al (1999) examined the effect of Bacillus subtilis on the gut microflora of mice. This was undertaken to clarify earlier conflicting evidence. Three studies had shown that the administration of B. subtilis increased the numbers of Lactobacillus, Bifidobacterium and Streptococcus species, but two other studies had not found this effect.

The current study tried to clarify this matter by feeding the mice different diets to see if that influenced the effectiveness of B. subtilis in increasing the numbers of lactic acid bacteria.

The results of the Hosoi et al (1999) study were that the effects of B. subtilis on gut flora were influenced by the diet consumed by the mice. For example, mice fed on an egg-white diet had a reduction in numbers of lactobacilli in their faeces, but there was no reduction if B. subtilis spores were added to the mice (by intubation) at a similar time.

This effect was examined in greater detail by in vitro studies whereby a mouse-organised Lactobacillus was mixed with B. subtilis and different nutrients. Lactobacillus numbers increased when the nutrients were sugars such as sucrose, glucose, maltose and fructose, but not with polysaccharides such as starch, solubles starch or microcrystalline cellulose. It was not clear why B. subtilis increased the numbers of lactobacilli in the gut of mammals or what role sugars played in the process.

The same team of researchers continued their studies and published a follow-up paper. In this study, the researchers co-cultured B. subtilis with each of three Lactobacillus species (an L. reuteri and an L. acidophilus from human intestine, and an L. murinus from a rat). They found that the B. subtilis spores improved the growth of L. reuteri and L. murinus, but not the L. acidophilus.

Confirmation by another research team

A different research team has confirmed the growth effect of B. subtilis on lactobacilli. This team is from China, while Hosoi et al are from Japan. Strain B. subtilis MA 139 was fed to pigs and compared with a control (basal diet) and an antibiotic diet. The bacillus diet had a significantly better feed conversion rate compared with the control and was similar to the conversion rate of the antibiotic diet.

By the twenty-eighth day of feeding, the lactobacilli counts in the B. subtilis diet group were significantly increased (about nine-fold greater) compared with the control diet (P = 0.02).

The Chinese team were not able to explain how B. subtilis increases lactobacilli numbers. They suggested two possibilities:

- decreased oxidation-reduction potential caused by the germination of spores in the intestine (a process which has been shown to benefit the growth of lactobacilli in another study)

- Production of antimicrobials (e.g. aminocumarin A and bacteriocin).

In summary, the best evidence suggests that, within mammals, B. subtilis spores pass safely through the stomach, a proportion germinate in the jejunum, replicate for a few rounds, possibly form attached colonies, and then probably re-sporulate in the large intestine. In this way, the vegetative cells have a chance of influencing the small intestine and possibly parts of the large intestine.

Two independent research teams have shown that Bacillus subtilis stimulates the growth of Lactobacillus species in the gut of animals. These results support three earlier studies that showed this effect. The different animals involved in these studies were mice, pigs and chickens. The mechanisms of this effect are unknown, although various ideas have been put forward. There is some evidence that the pro-lactobacillus effect occurs in an environment of sugars, of which there should be plenty in the small intestine of humans.

References


