

AUSTRALASIAN DENTIST ...ONLINE

Oral probiotic pioneer begins tour in Melbourne

Melbourne-born microbiologist, Professor John Tagg, who's spent the last 40 years pioneering the development of oral probiotics at the University of Otago, New Zealand, has returned to his hometown as the first stop on a world tour to both further his research and to tell of his discoveries. "I'm embarking on a voyage of exploration," the Chair of Microbiology at Otago University said, "I'll be visiting microbiology labs in Australia, the USA and Europe as part of a study leave to both further my research and to spread the word about BLIS."

BLIS, short for Bacteriocin-like Inhibitory Substances, are naturally-occurring antibiotics produced in the mouth by certain bacteria that Professor Tagg has commercialised into a range of oral probiotics. Probiotics are live microorganisms that when given in sufficient quantities can confer a health benefit to the host and the best known of these is probably Yakult.

"When I was first studying microbiology at Melbourne University some 40 years ago, one of the teachers had just come back from a trip to America with the notion of using bacteria to fight other bacteria. She fed us milk laced with 'friendly' bacteria to counter intestinal bacterial infections. The experiment failed, probably because there were too many bacteria already there, but it did leave its mark.



"So it was 40 years ago that I got the idea of applying the same principle to the oral cavity. I had a sharp focus on strep because as a 12 year old I'd been assaulted by a strep throat that resulted in rheumatic fever. I had to take penicillin for the next 10 years to stop more attacks so I smelt like fungus every time I broke into a sweat.

"So in university, I started to think about how to use friendly bacteria instead of penicillin that would fight against *Streptococcus pyogenes* which is the cause of strep throat. That pursuit occupied me quite happily for 35 years until I hit upon *Streptococcus salivarius* K12."

Professor Tagg had tracked a group of test subjects from the age of 5 to 11 and found that while strep throat was a common occurrence, a small group of the subjects never became ill. Testing showed that *S. pyogenes* was absent or in low numbers in this group, which conversely had large populations of a special type of *S. salivarius* he dubbed K12. *S. salivarius* is one of the most common bacteria found in the healthy human mouth and can comprise up to 10% of all oral flora present there.

His research demonstrated that the K12 variety of *S. salivarius* provides a natural defence, known as bacterial interference, against *S. pyogenes* infections. and this led to the discovery of the antibiotics Salivaricin A and Salivaricin B. Produced by *S. salivarius*, Salivaricin B is technically known as a BLIS. The discovery that Salivaricin B appears capable of killing all *S. pyogenes* is a major advance in the global battle against increasing antibiotic resistance.

"*S. salivarius* K12 views other streptococci as natural competitors and its strategy to stop them from growing too fast is to produce these peptide antibiotics that I call BLIS," Professor Tagg said. "These

peptides are far more specific in their killing activity than, for example, penicillin which covers a very broad spectrum. Bacteriocins are relatively targeted. *S. salivarius* is a very common species, doesn't stray from the mouth and generally doesn't cause infections. It's an innocuous organism we have as part of the natural flora present on our tongue.

"K12 produces lots of BLIS - four or five varieties that target *S. pyogenes* and also other bacteria that cause periodontal disease, gingivitis, halitosis and more." Following the discovery, the University of Otago patented the organism and a new biotech company was subsequently established to commercialise a range of products. BLIS Technologies was created in 2000 and the first product on the market was the BLIS K12 Throat Guard lozenge.

"Targeting *S. pyogenes* was the aim of my research but the same BLIS K12 Throat Guard also had the benefit of reducing the sulphur score on your breath. If you have a bad equilibrium of organisms on your tongue - a lot of anaerobes - they tend to hang out in the crevices in your tongue and feed on proteins in your diet, breaking them down to produce sulphurous compounds. Taking K12 muscles out some of the anaerobes by occupying space on your tongue and giving you a better breath score.

"We currently can't sell it in Australia as a lozenge because it would be an ingestible. So Dr Geoff Speiser, a dentist who practices in Sydney, helped to develop it into a rinse which he subsequently uses as the basis of halitosis treatment at his Dr Speiser's Australian Breath Clinic. "K12 has a number of other potential benefits as well. While we have no data as yet, it could prevent oral thrush by occupying more space on the tongue thereby preventing the candida fungi from taking hold." Professor Tagg said an ideal time to take K12 was immediately after coming off a course of antibiotics when bacteria levels in the mouth are relatively low. This allows recolonisation of the tongue with *S. salivarius* K12.

"If you colonise in the latter stages of pregnancy, it also has the benefit of reducing pregnancy gingivitis and bad breath as well as boosting the newborn's bioflora as they receive most of their oral biota from their primary care giver. In this area, we are particularly interested in trialing K12 on pregnant Aboriginal women, as their babies have a high incidence of middle ear infections. If we can colonise the mothers immediately prior to giving birth, it may reduce the occurrence of these infections."

Professor Tagg said some patients colonise easily for long periods whereas others colonised with difficulty due to competing types of bacteria targeting the K12. "There are a whole range of possibilities for K12 in dentistry and medicine and we continue to explore these. We are looking at making yoghurt with the BLIS antimicrobial included as well as other products. It is an exciting field of science and one I am off to tell the world about."

BLIS products in Australia, are sold under the KFORCE brand and is currently available as a chewing gum and in powdered form that can be hydrated to form a mouth rinse. Registration with the TGA in Australia is currently underway and on approval, other BLIS-based products will become available. For more information, see www.breezecare.com.au or call 1300-653-335.