

Probioticbulletin

An update for healthcare professionals

Exercise and immune function

By Prof Mike Gleeson, School of Sport & Exercise Sciences, Loughborough University and Dr Linda Thomas, science manager, Yakult UK.

With the Beijing 2008 Olympics in August, it seemed a good time to take a closer look at this interesting new area of probiotic research.

The effect of exercise and training on the immune system

Athletes dread the thought of picking up an infection as this can interfere with training, impair performance and even prevent them from competing. Unfortunately, athletes engaged in heavy training programmes, particularly those involved in endurance events, appear to be more susceptible than normal to infection. Although there is some evidence that participation in regular moderate exercise may slightly reduce the risk of picking up upper respiratory tract infections compared with a sedentary lifestyle (Matthews *et al* 2002), it appears that sore throats and flu-like symptoms are more common in endurance athletes than in the general population (Nieman, 1994). Furthermore, an accumulation of factors such as extreme environmental conditions, improper nutrition and psychological stress can lead to a chronically depressed immune function and hence increased susceptibility to opportunistic infections in athletes.

Causes of exercise-induced immune depression

Repeated bouts of intense prolonged exercise may decrease the circulating numbers and functional capacities of leukocytes. This may be due to increased levels of stress hormones during exercise (Northoff *et al* 1998). When exercise is repeated frequently, there may not be sufficient time for the immune system to recover fully. Falls in the blood concentration of glutamine have also been suggested as a possible cause of the immunodepression associated with heavy training,



Measuring aerobic capacity whilst exercising for a probiotic trial

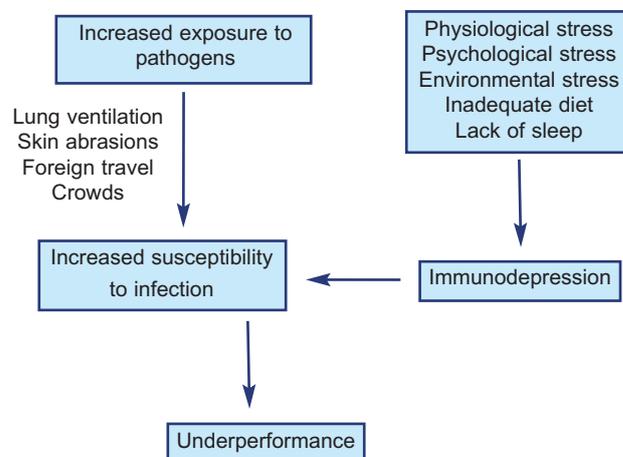


Figure 1: Causes of increased infection risk in athletes

though the evidence for this is less compelling (Hiscock & Pedersen, 2002). During exercise there is an increased production of reactive oxygen species and some immune cell functions can be impaired by an excess of these free radicals (Niess *et al* 1999). An increase in gut permeability may also allow increased entry of gut bacterial endotoxins into the circulation, particularly during prolonged exercise in the heat (Gil *et al* 1998). The cause of the increased incidence of infection in athletes is therefore likely to be multifactorial: a variety of stressors - physical, psychological, environmental, or nutritional, all of which can suppress immune function. These effects could make the athlete more susceptible to infection, but degree of exposure to pathogens is also an important factor in determining actual infection incidence (see figure 1).

The immune system, the gut flora and probiotics

There is now a reasonable body of evidence to suggest that certain probiotic strains may help support the immune system and, in general, the body's natural defences that are gut-related. Although to date there are few published studies of the effectiveness of probiotic use in athletes, interest is beginning to grow. This interest mainly centres around the potential of probiotics in helping to maintain overall general health, enhancing immune function or reducing exercise-induced immunodepression, but also for any potential ergogenic (performance-enhancing) benefit (Nichols, 2007). Indications of immune benefit has come from studies such as the small placebo-controlled pilot study (Gleeson, 2008) conducted at Loughborough University with Yakult. An acute bout of prolonged exercise (cycling for 2.5 hours at 60% of aerobic capacity) resulted in slightly larger increases in blood lymphocytes and neutrophils on the probiotic compared with the placebo treatment in competitive cyclists.

Continued on page 2...

Continued from page 1...

Potential benefits of the probiotic supplementation appeared to be an increased number of circulating CD4+ cells and an increased CD4+/CD8+ (T-helper/T-suppressor) ratio which was evident both at rest and post-exercise. There was also an increase in levels of IgA in the cyclists' saliva during this time. However, subject numbers were too few and the supplementation period was too short to evaluate possible effects on infection incidence, so the implication of these results needs to be explored in a larger trial. Other trials investigating the use of probiotics in elite athletes have been summarised in the table below.

From the research reviewed in this article alone, one cannot of course reach a solid conclusion of probiotic benefit for sportspeople. However there is now sufficient understanding of the mechanism of action of certain probiotic strains, and enough evidence from trials with athletes and sportspeople to signify that this is a promising area of research with mostly positive indications at present. Larger scale trials are indicated for some of the strains mentioned here.

A longer version of this article can be found in *Complete Nutrition*, a magazine for healthcare professionals working in the nutrition field. Visit www.nutrition2me.com/CN.html

Subjects (Reference)	Intervention	Results showing benefit
9 athletes with fatigue and impaired performance, symptoms consistent with re-activation of EBV infection. Control group of 18 healthy athletes (Clancy <i>et al</i> 2006).	2 x 10 ¹⁰ <i>L. acidophilus</i> LAFTI® L10 daily for 4 weeks.	<ul style="list-style-type: none"> Significant increase in stimulated IFN-γ production by T cells in the fatigued athletes, to the same level as the healthy controls. Almost significant increase in concentration of salivary IFN-γ in healthy controls.
20 healthy elite male distance runners (Cox <i>et al</i> 2007).	1.2 x 10 ¹⁰ CFU <i>L. fermentum</i> VRI003 or placebo during 4 months winter training.	<ul style="list-style-type: none"> Less than half the number of days of respiratory symptoms in the probiotic group. Less severe illness in the probiotic group Two-fold higher change in whole blood culture IFN-γ in probiotic group
5 male cyclists (Gleeson, 2008).	1.3 x 10 ¹⁰ <i>L. casei</i> Shirota or placebo daily for 2 weeks during training, followed by a cycle ergometer exercise trial.	<ul style="list-style-type: none"> Increased circulating CD4+ cells and improved CD4+/CD8+ ratio at rest and post-exercise in the probiotic group.
141 marathon runners (Kekkonen <i>et al</i> 2007).	<i>L. rhamnosus</i> GG or placebo for 3 months' in summer. The runners then took part in a marathon and were followed up for 2 weeks.	<ul style="list-style-type: none"> Trend for shorter GI-episodes during training in the probiotic group. Significantly shorter GI-episodes after the marathon in the probiotic group. No difference in incidence of respiratory infections or GI episodes.
25 athletes (Pujol <i>et al</i> 2000).	500 ml <i>L. casei</i> probiotic drink or milk drink for one month.	<ul style="list-style-type: none"> Less decrease in natural killer cells after exercise stress test in the probiotic group
47 army cadets (Tiollier <i>et al</i> 2007).	Daily 100 ml <i>L. casei</i> DN-114 001 probiotic drink or placebo for 3 weeks training, followed by a 5-day combat.	<ul style="list-style-type: none"> Greater incidence of rhinopharyngitis symptoms in probiotic group, thought to indicate prevention of more serious lower respiratory tract illness. No difference in incidence of respiratory illness. Significant saliva IgA decrease only in placebo group. Higher level of dehydroepiandrosterone sulphate (DHEAS) in probiotic group.

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IBS Forum in Cork

By Deirdre Jordan, science officer

On Saturday, June 14th, University College Cork (UCC) hosted an IBS open day to which members of the public were invited to attend, free of charge. The open day was hosted by the Alimentary Pharmabiotic Centre in collaboration with Yakult Ireland. It was chaired by Professor Eamonn Quigley, Professor of Medicine and Human Physiology, UCC and Consultant Gastroenterologist at Cork University Hospital. Professor Quigley is the current President of the World Gastroenterology Organisation. In his talk titled "What's new in IBS research?", Professor Quigley addressed new concepts such as post-infectious IBS, inflammation, and role of the gut flora. He also discussed exciting new developments which are already leading to new treatments and provided an update on the brain-gut axis which is the focus of new drug development programmes in IBS.



Dr Martin Buckley, Consultant Gastroenterologist at the Centre for Gastroenterology at the Mercy University Hospital discussed the current mode of diagnosis of irritable bowel syndrome and the various treatments. Ms Ellen O'Mahony, dietitian at Cork University Hospital spoke about "Diet and IBS". Her talk covered dietary treatment options for IBS, including healthy eating, symptom management, focus on fibre and food intolerance. A question and answer session followed the talks to assist patients with their individual queries.

After the forum had been closed patients were free to ask more questions to the on-site nurses and also had a chance to visit the Yakult stand to try some Yakult samples and get some healthy recipe books.

The APC is a UCC/Teagasc Research Centre funded by Science Foundation Ireland and industry which focuses on gastrointestinal health and the development of new therapies for debilitating disorders such as Crohn's disease, colitis, irritable bowel syndrome and food poisoning (<http://apc.ucc.ie>).



Professor Eamonn Quigley

Breaking news - probiotics & hay fever

Scientists at the Institute of Food Research in Norwich have published potentially promising results looking into the effect of taking a probiotic (Yakult) on seasonal hay fever.



Hay fever is an allergic reaction to pollen or fungal spores, most commonly grass pollen. The immune system mistakes the spores for harmful invaders and produces excessive amounts of the antibody IgE to bind to them and fight them off. IgE stimulates the release of histamine to flush out the spores, and this irritates the airways making them swell and producing the symptoms of hay fever.

In the study 20 volunteers with a history of seasonal hay fever drank a daily Yakult with or without live *Lactobacillus casei* Shirota over five months. The study was double-blinded and placebo controlled.

Blood samples were taken before the grass pollen season, then again when it was at its peak (June), and finally four weeks after the end of season. There were no significant differences in levels of IgE in the blood between the two groups at the start of the study, but IgE levels were lower in the probiotic group both at the peak season and afterwards. At the same times, levels of the antibody IgG (a type of antibody that in contrast to IgE is thought to play a protective role against allergic reactions), were higher.

"The probiotic strain we tested changed the way the body's immune cells respond to grass pollen, restoring a more balanced immune response", says Dr Kamal Ivory, a senior member of the research group.

The changes observed may also in theory reduce the severity of symptoms, but clinical symptoms were not measured in this study. The research group hopes to perform a similar study in the near future to see if the immunological changes translate into a real reduction in the clinical symptoms of hay fever. They would also like to examine the mechanisms involved. The Institute of Food Research is well positioned to conduct this kind of research, as it has expertise in microbiology, immunology, flow cytometry and human nutrition research.

"This was a pilot study based on small numbers of patients, but we were fascinated to discover a response... The probiotic significantly reduced the production of molecules associated with allergy."

Dr Claudio Nicoletti, Research Leader

Yakult Awards

By Becky Day, assistant science manager and Deirdre Jordan, science officer

Travel Award

At Yakult we are committed to investing in sponsorship and awards to support research in the fields of probiotics and digestive health. As part of this we have been running a travel award scheme to help scientists with the cost of travelling to present their work at conferences and meetings.

This year, applicants to the travel award scheme were asked to submit their abstracts under the subject: 'The role of intestinal microbiota in health & disease prevention – specifically in the area of probiotics'.

The judges scored applicants according to the science and significance of their work. The winners are shown below along with the subject of their abstract and where they will be presenting their work.

	Abstract subject	Meeting
Winner Dr Siew C Ng St Mark's Hospital, London	Probiotics and Ulcerative Colitis	American Gastroenterology Association Digestive Diseases Week, San Diego, America
Runner up Miss Silke Heinzmann Imperial College, London	Obesity-related metabolic and gut microbial differences in humans	2nd ASM Conference on Beneficial Microbes, San Diego, America

University of Ulster Coleraine Award

This year Yakult has worked with a number of universities and research institutes to set up student awards to further our support of young scientists.



For the second year running Yakult Ireland provided the University of Ulster Coleraine with a cash prize for the best overall student on their BSc (Hons) Human Nutrition course.

This year's winner was Joanne McCarron. Joanne has been accepted to Kings College to study a PgD/MSc in Dietetics so we are sure her prize will be extremely useful. We wish her all the best in the future.

Email science@yakult.ie if you are interested in Yakult supporting a student award at your university.

British Dietetic Association (BDA) Conference Report

By Dang Ngoc Tran, science officer

In June, Francesca and I attended the BDA Conference at the Adelphi Hotel in Liverpool. The conference programme catered for the many aspects of nutrition that dietitians are involved in and there was such a vast range of topics that I am only able to review a few here.

The cancer management session provided some interesting information on risk factors for breast cancer. Overindulging in alcohol can increase the risk by 6% for



every unit/day that is drunk over the recommended allowance. Another risk factor is having a BMI greater than 23, but more importantly it was the amount of weight gain from pre-to-post menopause that increases risk. It was reassuring to know that physical activity continues to decrease your risks. For breast cancer, you can reduce the risk by including a moderate amount of exercise in your day to day life.

Also, if we hadn't already talked about bowels enough, Dr Jervoise Andreyev shared his top causes of diarrhoea!

1. Bile salt malabsorption
2. Small bowel bacterial overgrowth
3. Pancreatic insufficiency
4. Free fatty acid malabsorption

It's interesting to rethink what might be contributing to diarrhoea other than blaming it on feeds or medication. His overriding message was also to clarify whether it is diarrhoea or steatorrhoea (increased fat in stools).

The parallel session run by Dietitians in Sports and Exercise Nutrition group (DISEN) was well presented from a very experienced group of sports dietitians. It was really interesting to hear about the planning involved in providing the right food and fluids for the British team at the Beijing Olympics.

Above picture, Dang & Francesca at the Yakult stand.

Continued on page 5...

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The 2008 Olympics will be opened at 8.08pm on the 08/08/08, (these numbers have significance in China) and it will close on 24/08/08. Besides the obvious nutritional issues involved in sports nutrition, we didn't realise the importance of food safety at the events. The last thing athletes want to deal with is a bout of food poisoning, especially when travelling to a foreign country where their familiar foods may not be readily available and standards of hygiene may differ.

There was a good update on continuing professional development (CPD) and the Health Professionals Council. It was reassuring to hear that dietitians will be given three months' notice if chosen in the dietitians' audit in 2010 and are required to submit a CPD profile.

The profile will consist of:

1. Summary of practice history
2. Statement of how standards have been met
3. Evidence of CPD activities

The conference was a good opportunity to put some faces to familiar BDA names that work in the Birmingham office and it was great to meet so many dietitians who were interested in probiotics and hear feedback about the use of probiotics in various clinical areas.

Where to find us

With the summer holidays upon us, July, August and September are quiet months for conferences, so the next time we'll be out with our science stand is in October. You can meet us at:

- INDI AGM, Croke Park, 11th October
- Irish Practise Nurse Association Conference, Slieve Russell, Hotel, 17th and 18th October

Contact Us

If you have any questions about probiotics please write, email or phone.

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Meet our new science officer

We would like to welcome Francesca Joy to our science team. Francesca is a dietitian who started part-time work with us at the beginning of June 2008, based in the Midlands (UK). If you work in this area please email fjoy@yakult.co.uk if you would like more information about probiotics, or would like Francesca to visit your department and give a talk.



How we can support you

- free literature – new primary care booklet
- free educational DVD of digestive system
- Probiotic Bulletin
- supply of product for limited trial period
- Yakult Symposium 21 Oct 2008, London
- free educational talks by our team of nutritionists and dietitians
- advice on probiotics
- dedicated website - www.yakult.ie/hcp

*subject to agreement

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