

# 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

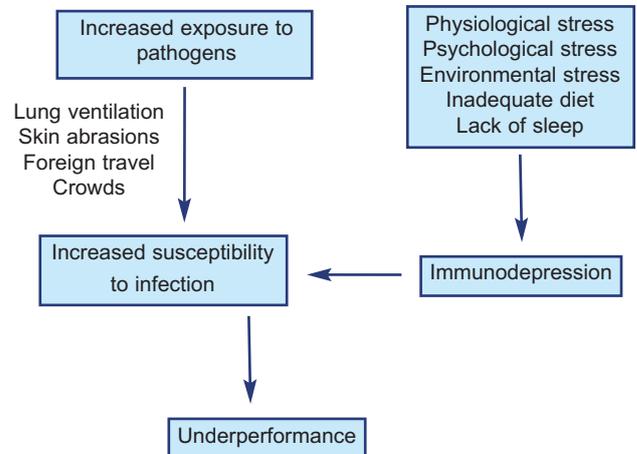


Figure 1: Causes of increased infection risk in athletes

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 also came from a 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 leukocytes and neutrophils on the probiotic compared with the placebo treatment in

Continued on page 2...

Continued from page 1...

competitive cyclists. 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](http://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 <sup>10</sup> <i>L. acidophilus</i> LAFTI® L10 daily for 4 weeks.	<ul style="list-style-type: none"> <li>Significant increase in stimulated IFN-<math>\gamma</math> production by T cells in the fatigued athletes, to the same level as the healthy controls.</li> <li>Almost significant increase in concentration of salivary IFN-<math>\gamma</math> in healthy controls.</li> </ul>
20 healthy elite male distance runners (Cox <i>et al</i> 2007).	1.2 x 10 <sup>10</sup> CFU <i>L. fermentum</i> VRI003 or placebo during 4 months winter training.	<ul style="list-style-type: none"> <li>Less than half the number of days of respiratory symptoms in the probiotic group.</li> <li>Less severe illness in the probiotic group</li> <li>Two-fold higher change in whole blood culture IFN-<math>\gamma</math> in probiotic group</li> </ul>
5 male cyclists (Gleeson, 2008).	1.3 x 10 <sup>10</sup> <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"> <li>Increased circulating CD4+ cells and improved CD4+/CD8+ ratio at rest and post-exercise in the probiotic group.</li> </ul>
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"> <li>Trend for shorter GI-episodes during training in the probiotic group.</li> <li>Significantly shorter GI-episodes after the marathon in the probiotic group.</li> <li>No difference in incidence of respiratory infections or GI episodes.</li> </ul>
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"> <li>Less decrease in natural killer cells after exercise stress test in the probiotic group</li> </ul>
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"> <li>Greater incidence of rhinopharyngitis symptoms in probiotic group, thought to indicate prevention of more serious lower respiratory tract illness.</li> <li>No difference in incidence of respiratory illness.</li> <li>Significant saliva IgA decrease only in placebo group.</li> <li>Higher level of dehydroepiandrosterone sulphate (DHEAS) in probiotic group.</li> </ul>

- Clancy RL, Gleeson M, Cox A *et al*. Reversal in fatigued athletes of a defect in interferon gamma secretion after administration of Lactobacillus acidophilus. *Br J Sports Med* 2006; **40**:351-354.
- Cox AJ, Pyne DB, Saunders PU and Fricker PA. Oral administration of the probiotic Lactobacillus fermentum VRI-003 and mucosal immunity in endurance athletes. *Br J Sports Med* 2007; doi: 10.1136/bjism.2007.044628.
- Gil SM, Yazaki E and Evans DF. Aetiology of running-related gastrointestinal dysfunction. How far is the finishing line. *Sports Med* 1998; **26**:365-378.
- Gleeson M. The effect of 14 days supplementation with a probiotic on circulating hormonal, leukocyte, and cytokine responses to prolonged cycling in man. 13th European College of Sports Science Congress 09-12 July 2008; Estoril, Portugal.
- Hiscock N and Pedersen BK. Exercise-induced immunodepression- plasma glutamine is not the link. *J Appl Physiol* 2002; **93**: 813-822
- Kekkonen RA, Vasankari TJ, Vuorimaa T *et al*. The effects of probiotics on respiratory infections and gastrointestinal symptoms during training in marathon runners. *Int J Sport Nutr Exer Metabol* 2007; **17**:352-363.
- Matthews CE, Ockene IS, Freedson PS *et al*. Moderate to vigorous physical activity and the risk of upper-respiratory tract infection. *Med Sci Sports Exerc* 2002; **34**:1242-1248.
- Nieman DC. Exercise, infection and immunity. *Int J Sports Med* 1994;**15**:S131-S141.
- Niess AM, Dickhuth H-H, Northoff H and Fehrenbach E. Free radicals and oxidative stress in exercise – immunological aspects. *Exerc Immunol Rev* 1999; **5**:22-56.
- Northoff H, Berg A and Weinstock C. Similarities and differences of the immune response to exercise and trauma: the IFN-g concept. *Can J Physiol Pharmacol* 1998; **76**:497-504.
- Nichols AW. Probiotics and athletic performance: a systematic review. *Curr Sports Med Reports* 2007; **4**:269-273.
- Pujol P, Huguet J, Drobnic F *et al*. The effect of fermented milk containing Lactobacillus casei on the immune response to exercise. *Sports Med Train Rehab* 2000; **9**:209-223.
- Tiollier E, Chennaoui CDTM, Gomez-Merino D *et al*. Effect of a probiotics supplementation on respiratory infections and immune and hormonal parameters during intense military training. *Military Med* 2007; **172**:1006-1011.

## Yakult dives into the action!

By Sonya Hayden, senior PR executive

Earlier this year, Manchester played host to the 9th FINA World Swimming Championships (25m) – and as an official event partner, Yakult was poised poolside to witness all the action. For one week only, the city's famous MEN Arena was transformed from a concert venue into a swimming stadium, boasting two purpose-built swimming pools in which 750 top international swimmers competed for Championship glory.

Yakult was on hand throughout the Championships, not only to provide product samples to the athletes throughout training, heats



and races, but also to educate and entertain event-goers in the 'Yakult health marquee'. Constructed especially for the Championships in the city's Cathedral Gardens, the interactive marquee comprised of various different zones, each dedicated to a specific aspect of health.

From the 'nutrition zone' with Yakult's specialist nutritionists dispensing healthy eating advice, to the free massages on offer in the 'chill-out zone' and the exercise info available at the 'fitness zone', visitors to the marquee were treated to expert information on all aspects of a healthy lifestyle. And with a range of digestive games and quizzes, spot prizes and (of course) free samples of Yakult on offer, it is little wonder that the stand attracted around 40,000 visitors in just five days.

And we're pleased to report that the event was not just a success for those people who visited the Yakult stand – but also for Great Britain, who, with 24 medals, were the most decorated country of the Championship!

## Meet our new science officer

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



## Breaking news - probiotics & hay fever

Scientists at the Institute of Food Research in Norwich have published potentially promising results have been published by 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 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

### Travel Award

At Yakult we are committed to investing in sponsorship and awards to support and promote 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
<b>Winner</b> Dr Siew C Ng St Mark's Hospital, London	Probiotics and Ulcerative Colitis	American Gastroenterology Association Digestive Diseases Week, San Diego, America
<b>Runner up</b> 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 Surrey Student 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.

We provided the University of Surrey with a cash prize to award to their best student on the Nutritional Medicine MSc course. This year's winner was Dr David Lloyd who



completed the course to gain a broad education in nutritional science, which supported his specialist training in Gastroenterology and General Medicine in the Wessex Deanery, and supported his more specialist research at St Mark's Hospital.

Email [science@yakult.co.uk](mailto:science@yakult.co.uk) if you are interested in Yakult supporting a student award at your university.

Above picture L-R: Prof Margaret Rayman, the Programme Director; Dr David Lloyd, award winner and Dr Bruce Griffin, David's project supervisor.

## 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. Over indulging on 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.

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...

Continued from page 4...

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 and August are quiet months for conferences, so the next time we'll be out with our science stand is the first week of September. You can meet us at:

- Food Microbiology 2008, Aberdeen, 1<sup>st</sup> – 4<sup>th</sup> September
- Clinical Nutrition Course, Leeds, 3<sup>rd</sup> – 4<sup>th</sup> September

## Contact Us

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

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## Competition!

Win a place at our symposium & a bottle of champagne



We hope you have heard that we're holding a Yakult Symposium for healthcare professionals later on this year. Full details and the registration form can be found at [www.yakultsymposium.co.uk](http://www.yakultsymposium.co.uk), or you can contact the science team to find out more. The theme of the day is "Probiotic Relevance: Putting Theory into Practice". In light of this, we would like to hear any case studies in which Yakult has been given to patients.

Healthcare professionals are recommending probiotics more and more for patients, whether it's alongside antibiotics, for IBS or other digestive complaints. We would be interested to hear about your experiences. For a chance to win a free place at our symposium and a bottle of champagne, just submit a case study whereby you tried Yakult with a patient. We are looking for 400 – 600 words outlining the condition, the stage of the intervention, and the outcome\*.

Applications will be judged on the writing style and the quality of the case study. In addition to winning a place at the symposium and a bottle of champagne, we will also publish the winning case study in a future issue of the *Probiotic Bulletin*. The deadline is September 30th 2008. Either post your applications to the address below, for the attention of Hannah Baker, or email them to [hbaker@yakult.co.uk](mailto:hbaker@yakult.co.uk). The winner will be notified by the 7th October 2008.

The Yakult symposium will be held at 76 Portland Place on Tuesday 21st October 2008 and will feature eminent probiotic researchers. There will also be an opportunity to discuss the practicalities of using probiotics during a round table discussion chaired by dietitian, Catherine Collins.

To take advantage of our early bird discount please register before 31st July 2008.

Visit [www.yakultsymposium.co.uk](http://www.yakultsymposium.co.uk) for full details.

Good Luck – we look forward to hearing from you!

\*All case studies will need to be guaranteed by another member of staff for authenticity - please give their name, job title, place of work and signature.

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