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Probiotic Bulletin

AN UPDATE FOR HEALTHCARE PROFESSIONALS

SPORT SPECIAL

Digestive health

what does that really mean to an athlete?

The thoughts of Jeanette Crosland, Paralympic Sports Nutritionist/Freelance Sports Dietitian, UK

Perhaps realistically it is how we feel, and this often comes down to a very basic issue – bowel habits! Something that occupies a fair amount of conversation time in my profession – as a dietitian working in sport! To elite athletes focusing on major competitions, an "out of sorts" digestive system can have dramatic consequences.

What are the problems for athletes?

At a very simple level, athletes need to feel comfortable when performing and they plan timing and "bulk" of food for every training session. During sport, our blood flow gives priority to working muscle, reducing the flow of blood to the digestive system. This can have a fairly dramatic effect on endurance athletes such as marathon runners, causing what is often referred to as "runners' trots". Careful management of dietary intake, particularly fibre, might be needed to help maintain a "comfortable" bowel during races. Even in shorter events the "butterflies" or tension that accompanies competition can upset normal habits, requiring some athletes to decrease their fibre intake prior to events.

However this isn't the only issue. Most elite athletes travel around the world, and eating regularly and healthily can be difficult. Obtaining the amount of fruit and vegetables or the range of higher fibre cereals that athletes are used to can be hard. The result – constipation due to travel! At least one athlete has missed a medal due to "simple" constipation.

Athletes are not immune to more medical issues such as IBS (irritable bowel syndrome). Stress is known to be a factor affecting IBS and dietary habits are also important. Given the travel and the tension of competition it is not surprising that some individuals find their digestive health regularly compromised.

Much of my work is in the field of disability sport, which raises a whole new set of issues - issues which maybe some find uncomfortable to talk about, but issues that are vital to helping individuals manage their sporting life.

For example, there are athletes with spinal cord injuries – injuries which can be at any point along the spinal column.

The higher the injury the more affected the function of the bowel will normally be, and good bowel management is a vital part of maintaining health and wellbeing. This might mean that some individuals have a need to maintain faecal matter at a consistency that suits their bowel management. Compared to any clinical definition this might be considered constipation, but individual care is the key.

Equally whilst runners' trots are a major problem for some athletes, for the athlete who uses a wheelchair this could be catastrophic, causing not only physical management issues but damage to the skin resulting in pressure sores.

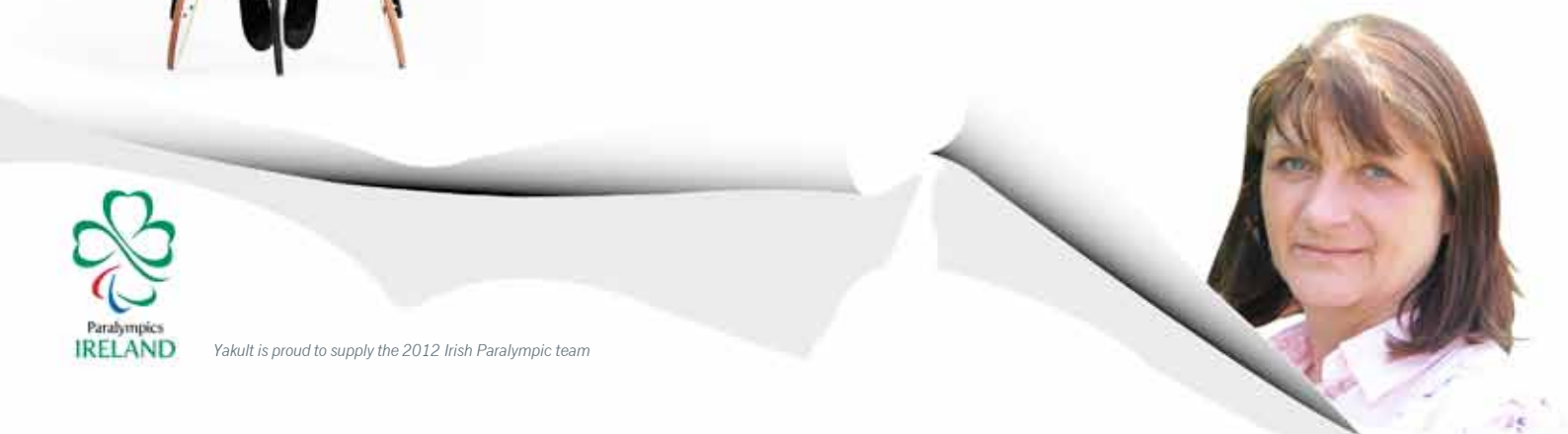
Other athletes, for example those with more severe forms of cerebral palsy or those with other medical conditions causing nervous or muscle damage, often have specific care needs with regard to their digestive health.

All athletes train hard, pushing their bodies to the limit and placing them on the verge of "breaking down", increasing the risk of infections. Hard training combined with travel, poor toilet facilities, flights, warm hotels shared with lots of people and food provided outside their control results in an even more increased risk of infection affecting the upper respiratory tract, as well as the digestive tract. It means that our athletes need to be acutely aware of every means of protection e.g. care purchasing food, carrying their own food supplies, using probiotics, using hand gels, as well as eating a healthy well balanced diet.

So...bowel habits may not be the most politically correct topic for discussion, but digestive health is one of the vital necessities for our elite athletes, so long may these discussions go on!

Written by: Jeanette Crosland

Paralympic Sports Nutritionist/Freelance Sports Dietitian, UK



Paralympics IRELAND

We've got a huge fridge of Yakult at our training venue at Bisham Abbey so we are able to go and help ourselves to it. We all take two a day - one on waking in the morning and one after training. We all consider it to be an important nutritional strategy during training and competitions.

Anne Panter, England and GB Hockey

Exploring Human Host-Microbiome Interactions in Health and Disease:
a conference report

At this Wellcome Trust scientific conference, held in Hinxton (Cambridge) from 8 -10 May, we heard from experts researching how the human host-microbiome affects health and different disease states, using the very latest technologies to identify and profile microbial communities and their metabolic effects.

After a high level keynote lecture by Professor Jeremy Nicholson (Imperial College London), five topics were covered: (i) diversity of the microbiome; (ii) influence of the microbiome on disease; (iii) metabolism interactions; (iv) modulating the microbiome (probiotics and prebiotics) and (v) functional metagenomics and drugable therapies. With the current level of research interest in this area, it was not surprising that there was strong international interest with speakers and delegates coming from all around the world, even as far as Israel, Iceland, Ecuador, Australia and Switzerland.

Speakers from the UK and Ireland included Julian Marchesi (Cardiff University), Glenn Gibson (Reading University), Simon Murch (Warwick University), Allan Walker (Wellcome Trust), Douwe van Sinderen and Fergus Shanahan (UCC), Paul Cotter (Teagasc FRC), Harry Gilbert (Newcastle University), Karen Scott (Rowett Research Institute), Ian Wilson (AstraZeneca), and Kathleen Sim, Jia Li, Elisa Noll, Elaine Holmes and Renaud Mestdagh, all from Imperial College London.

At the end of the first two days there was a drinks reception, giving delegates a chance to view the posters, network and discuss the research. This was a very interesting and successful conference – the complexity and scope of the research was very impressive.

Digestive Disorders Meeting Liverpool, June 2012:
a conference report

One of the major conferences of the year took place between 17-20th June, with over 3500 attendees; the Digestive Disorders Federation Conference 2012! The first combined meeting of the British Society of Gastroenterology (BSG), the Association of Upper Gastrointestinal Surgeons (AUGIS), the British Association for the Parental and Enteral Nutrition (BAPEN) and the British Association for the Study of the Liver (BASL). The four day meeting was a great success - very interesting and thought-provoking!

Written by: Kaman Lee
Science Officer, Yakult U.K Ltd

Free resources

Introducing 'The Little Book of Fitness' – Yakult's new 50-page book packed with practical tips and advice on how to improve fitness levels and have fun at the same time. Contact the science team at science@yakult.ie for a free copy or download it at www.yakult.ie/fit.

Request our 'Sports' leaflet, one of our NEW series of educational leaflets about the science behind Yakult and *Lactobacillus casei* Shirota. Contact the science team at science@yakult.ie to request a copy or a free educational talk on probiotic research for you and your colleagues.

Probiotic efficacy in maintaining the digestive health of athletes during training and competitions

With the London 2012 Olympics approaching, we thought we would look at the digestive health of athletes. I think we all know moderate exercise is healthy, which is why the Irish physical activity guidelines recommend adults (aged 18–64) should undertake at least 30 minutes a day of moderate activity five days a week (or 150 minutes a week) [1]. This activity can be broken up into smaller bouts of exercise but these bouts should last at least ten minutes.

It is now known, however, that the physiological and psychological stresses of intense and prolonged exercise, as seen in athletes, can increase gastrointestinal (GI) problems and impair the immune response, making athletes susceptible to common infections. The impact of physical activity on the GI tract is an area of emerging interest, and while much effort has been put into investigating the hazards and benefits of physical activity, lately there has been more emphasis on the benefits of nutritional interventions, such as probiotics for athletes.

GI symptoms, including nausea, heartburn, diarrhoea, and GI bleeding, are common in athletes participating in endurance training and in sports such as long distance running and triathlons. Sometimes these symptoms are so serious they can severely affect training, performance and even participation in events. Incidence of such symptoms varies from 20-50% depending on duration and intensity of exercise, age, training status, sex, dietary intake, occurrence of symptoms at rest and method of investigation [2].

It is now accepted that a relationship exists between exercise intensity and GI symptoms. A systematic literature review published in 2003 concluded that light and moderate exercise was well tolerated and beneficial to patients with inflammatory bowel disease and liver disease and, in most groups, physical activity also improved gastric emptying and lowered the relative risk of colon cancer. Severe, exhaustive exercise, however, appeared to inhibit gastric emptying, interfere with GI absorption and causes many GI symptoms, most notably GI bleeding [3].

The mechanisms by which exercise causes gastrointestinal symptoms are not well known, but the following have been proposed: decreased GI blood flow, increased GI motility, increased mechanical bouncing and altered neuroendocrine modulation. All of these are associated with increased exercise intensity. GI bleeding, the most serious symptom of intense exercise, can lead to iron deficiency and anaemia, which will further affect an athlete's performance [4].

It is important to remember that elite athletes are also affected by changes in diet and sanitary conditions associated with travel in foreign countries. A nutrition strategy is integral to athletes' preparation for all sports, and the type and timing of their diet impacts upon athletes' GI health. The sports and athletics communities are becoming increasingly interested in including probiotics due to their potential in indirectly helping training and performance by their influence on GI function and the immune system. Bearing in mind that probiotic effects are considered strain specific, there are studies that show probiotic intervention can reduce susceptibility to acute infectious diarrhoea and its associated symptoms [5]. Recent probiotic studies focusing on the GI symptoms of athletes have been conducted at Loughborough University and the University of Helsinki.

At Loughborough University in 2011, Prof Mike Gleeson's group recruited 84 endurance athletes who consumed either a probiotic *L. casei* Shirota drink or a placebo drink, twice daily during four months of winter training. 'GI problems' was one of the clinical endpoints examined. The results showed that the number of days that the subjects experienced GI symptoms was 33% lower in the probiotic group compared to placebo ($p<0.008$) [6]. GI symptoms were also examined in a study of athletes by Kekkonen *et al* in Finland. The subjects (n=141) received *L. Rhamnosus* GG (LGG) or placebo for a three month training period after which they took part in a marathon, and then were followed up for a two week period. The results showed that GI system episodes were shorter in the probiotic group compared to the placebo group: 2.9 vs. 4.3 days during the training period, and 1.0 vs. 2.3 days after the race [7].

If you have a client or patient competing or training at a high level, it is important to be aware that this can have a negative effect on health, and it is worth keeping up with probiotic research in this area.

Enjoy the games!

Written by: Deirdre Jordan
Senior Science Officer, Yakult Ireland

The health benefits of **moderate exercise**

- Weight control
- Reduced risk of cardiovascular disease, type 2 diabetes and some cancers
- Improved bone density and muscle strength (helping improve mobility during later life)
- Improved cognitive performance
- Increased alertness
- Improvement of overall mood
- Improved immune response to infection

References

1 http://www.getirelandactive.ie/content/wp-content/uploads/2011/12/Get-Ireland-Active-Guidelines-GIA.pdf.

2 Peters HPF *et al* (2001) Gut **48**:435-439.

3 Bi L *et al* (2003) *Clin Gastroenterol Hepatol* **1(5)**:345-355.

4 Nielson P *et al* (1998 *Sports Med* **26:**207-16.

5 West NP *et al* (2009) *Exerc Immunol Rev* **15:**107-26.

6 Gleeson M *et al* (2011) *International Journal of Sport Nutrition and Exercise Metabolism* **21:**55-64.

7 Kekkonen RA *et al* (2007) *Int J Sport Nutr Exerc Metab* **17(4):**352-630

Research round-up

Intestinal microbiota in functional bowel disorders: a Rome foundation report

The Rome Foundation is an independent organisation that aims to improve understanding and management of functional gastrointestinal disorders (FGID).

This Rome foundation report discusses the role of the gut microbiota in the development of FGID and the evidence behind the numerous hypotheses that the microbiota could be a useful therapeutic target.

Simrén M *et al* (2012) Intestinal microbiota in functional bowel disorders: a Rome foundation report. *Gut.*[Epub ahead of print]

Can probiotics prevent the onset of non-alcoholic fatty liver disease (NAFLD) in mice?

Endotoxemia, bacterial overgrowth of the small intestine and increased intestinal permeability have been associated with the development of non-alcoholic fatty liver disease (NAFLD). Therefore, therapies protecting against these changes could be useful in preventing the onset of NAFLD. This study used a mouse model of fructose-induced steatosis and investigated the effects of feeding *Lactobacillus casei* Shirota on markers of the disease.

L. casei Shirota protected the mice from hepatic lipid accumulation and attenuated TLR-4 signalling in the liver. The authors suggest that these results indicate that *L. casei* Shirota protects the animals from onset of NAFLD by either reducing translocation of bacterial endotoxin or reducing the effects of endotoxin at the liver.

Wagnerberger *et al* (2012) *Lactobaccilus casei* Shirota protects from fructose-induced liver steatosis: A mouse model. *Journal of Nutritional Biochemistry* [Epub ahead of print]

A Science special issue: The Gut Microbiota

Arguably the world's leading scientific journal, Science, and its sister journal Science Translational Medicine have joined forces to produce a special issue on The Gut Microbiota. With a remarkable collection of articles from the leading minds within the field, this is a must-read for all those interested in the wonderfully complex relationship between humans and their microbial symbionts.

With free access to the articles until the 15th August, head to the Science website to get your fill: http://www.sciencemag.org/site/special/gut_micro/

Science 8 June 2012: **336** (6086)
Sci Transl Med 6 June 2012: **4** (137)

Human Papilloma Virus

Women who were identified as having a precancerous cellular abnormality (low-grade squamous intraepithelial lesion; LSIL) following a PAP smear test were recruited to this study. Usual procedure is for these women to undergo a repeat PAP smear in six months' time as abnormalities such as these may naturally resolve without intervention. During this six month period half the subjects received no intervention (control group; n= 27) and half received *L. casei* Shirota every day (probiotic group; n = 24). At the beginning of the study all subjects were positive for HPV.

After six months, and after excluding from analysis any cytological smears that were unclear, 30.7% of the cytological abnormalities had resolved in the control group, compared to 60% in the probiotic group (P=0.047). Furthermore, there was a trend for HPV clearance to be greater in the probiotic group compared to the control group (29.2% vs. 19.2% respectively). Further investigation is required as this was a small pilot study, which was not blinded.

Verhoeven *et al* (2012) Probiotics enhance the clearance of human papillomavirus-related cervical lesions: a prospective controlled pilot study. *Eur J Cancer Prev* [Epub ahead of print]

Exercise-generated ammonia: an intriguing new research area for probiotics

Reviewed by Dr Linda Thomas
(Science Director)

Fuskevag O-M *et al* (2012) *Lactobacillus casei* Shirota modulation of ammonia metabolism in physical exercise. *International Journal of Probiotics & Prebiotics* **7**(1):13-16 (reprints available on request).

Ammonia is a potent metabolic toxin normally removed via the liver but in decompensated liver disease patients, the liver fails to do this adequately, so that ammonia levels rise in the brain and CNS fluid, sometimes resulting in severe encephalopathy. Furthermore, even a modest increase in ammonia levels may impair neutrophil function.

Circulating levels of ammonia also become markedly elevated during periods of prolonged exercise, which may promote fatigue and perhaps also reduce cognitive function.

This small unblinded study explored the hypothesis that *Lactobacillus casei* Shirota could prevent ammonia build-up through its production of phenylacetate, which would facilitate ammonia removal through glutamine sequestration as phenyacetylglutamine via the kidneys.

Male adult footballers (20) were assigned to one of two groups: those taking two bottles of probiotic per day for one month and those not. The effects of this were assessed by comparing analyses from urine samples taken after an exhaustive exercise routine in a 9-station static exercise programme done before intervention and one month later.

The results showed supplementation with *L.casei* Shirota caused significant increase in phenyacetylglutamine levels ($P<0.01$) and a trend for lower ammonia levels, suggesting that this probiotic might be useful in controlling exercise-generated ammonia.

Professor Murray Griffin, the study leader, commented: 'In view of the fact that there are no interventions that attempt to manage ammonia overspill in prolonged exercise, the use of probiotic supplementation is a novel suggestion. Maintaining athletes' health, thereby facilitating uninterrupted training programs – in this case by reducing infections by maintaining a functional immune system – is clearly of interest to the sporting community. If there is an additional benefit by maintaining cognitive abilities towards to end of critical sporting activities where a small mistake from ammonia-induced cerebral fatigue can have significant deleterious repercussions, probiotic supplementation may have an, as yet, unseen role'.

60 Second interview with Sharon Madigan, Performance Nutritionist from the Irish Institute of Sport

With the Olympics drawing near we thought it was a good time to chat to Performance Nutritionist with the Irish Institute of Sport, Sharon Madigan[SM].

Thank you agreeing to talk to us regarding the nutritional strategy you provide for the athletes of the Irish Institute of Sport.

You have been working with Irish elite athletes preparing them for this year; what have you found to be your biggest challenges?

SM: Some athletes have had over 12 months of qualifying competition for the games and other athletes just one or two possible chances to qualify. Tapering nutrition plans to suit this and the range of varying requirements across a range of sports is challenging!

Are the athletes all receptive to the nutrition messages you give to them?

SM: Some are and others are not but over the years I have learned that that is not necessarily a bad thing. At various stages and phases, athletes find that nutrition can affect some of their key performance objectives to a greater or lesser extent. Sometimes it is also about developing relationships with athletes and that takes time. I am lucky that I work with a great Sports Science and Medicine team at the Institute and often the nutrition message is filtered through a range of disciplines.

Has it been hard to encourage the athletes to include probiotics into their diet?

SM: Not at all. We do it as part of the overall nutrition plan and there have been no complaints so far!

Can you describe the diet for one of the elite athletes on a typical day in training?

SM: Typical is a difficult place to get to in elite sport but I try and work around a training week as mostly athletes train twice or even three times a day. Quite often there are a couple of days, often mid-week, when the training load is very high and this can have a major impact on the quality and consistency of training for the rest of the week. Due to the timing of training or the duration it is essential that athletes at least match their calorie expenditure and meet their requirements for carbohydrate especially if it is an endurance sport. In sports such as judo, boxing etc. there is an added stress of trying to keep the weight down, so the athlete may be cutting calories in an attempt to reduce weight. Recovery is important as is fluid intake – and for me, keeping the suggestions simple and suiting the athletes' lifestyle is very important.

What are you looking forward to most about the Olympics?

SM: This is my third Olympic cycle and I am delighted to see so many athletes who have worked so hard for so long get to perform on the largest stage of all. Four years ago I worked with a number of athletes who just missed out on going to the games and they have made it this time. I am looking forward to seeing the athletes compete in London - and then my holidays at the end of August!

Science Team Notice Board

Diary Dates:

5th - 6th	October	IPNA AGM and Conference, Tullamore Court Hotel
10th - 13th	October	European Mucosal Immunology Group Meeting
13th	October	INDI AGM Shelbourne hotel Dublin

International Yakult Symposium 2013

Stop Press!

22 – 23 April International Yakult Symposium 2013

at the Queen Elizabeth II Conference Centre, London. Preliminary information is available at www.yakultsymposium.com but contact us directly if you want to know more.

Watch this space for further details – there will be a call for posters - and a prize for the best one!

Good luck Team Ireland

How can we support you?

- Free educational talk for your department
- NEW complete series of the 'Find the science behind Yakult' leaflets.
- Advice on probiotics
- Free supply of Yakult for a trial period (subject to discussion)
- Probiotic Bulletin newsletter
- A dedicated website for healthcare professionals; provides easy to read summaries of the major *L. casei* Shirota studies, nutritional information and FAQs: www.yakult.ie/hcp

Find the science behind Yakult **yakult.ie/hcp**

Pass it on

If you enjoy reading the Probiotic Bulletin, please forward it on and encourage your colleagues to email science@yakult.ie to sign up.

Contact us

If you have any questions about probiotics, please do not hesitate to get in touch.

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