Small but mighty

How probiotics can influence several aspects of digestive health & overall wellbeing
Introduction

A well-balanced gut microbiome is a significant factor for good digestive health, and therefore overall wellbeing. Consumption of probiotics has long been recognised to support this.

Recent advancements in technology and scientific knowledge have enabled us to characterise different probiotic strains and better explore their specific health outcomes. *Lactobacillus rhamnosus* HN001 (LactoB 001) and *Bifidobacterium lactis animalis* HN019 (BifidoB 019), are two particularly well researched probiotic strains which have an strong link to several health benefits – demonstrating how something small can make a big impact on our wellbeing.

THE MICROBIOME

Our bodies are constantly changing in response to our environment, which can heavily influence our state of health. A significant factor in this interplay is the effect of our diets on our microbiome. The human microbiome is a term used to describe the collection of microorganisms that live on an individual. Although microbes can be found on our skin and in our mouths, over 95% of our microbiome actually resides in our gastrointestinal tract. This subset of microbes is referred to as our gut microbiome. Everyone’s gut microbiome contains a unique mix of helpful, neutral and harmful organisms such as yeasts, bacteria or even viruses; together they form your own microbiome ‘fingerprint’.

The makeup of an individual’s microbiome is influenced by diet, what our mothers did or ate during pregnancy, genetics, your current state of health and other environmental factors. A healthy gut will contain a balanced mix of many, many different types of microorganisms. The vast majority of these are considered neutral or helpful, and under normal circumstances keep harmful micro-organisms in check. The microbiome also interacts with the immune system and in normal circumstances helps it maintain a suitable level of function.

There is a growing body of research into the gut microbiome and the importance of maintaining a balanced functional microbiome for good gut health, digestion and mental wellbeing. Probiotics are generally associated with a functional microbiome with better mineral absorption (Parvenah et al 2014), higher levels of circulating anti-oxidants (Martarelli et al., 2011), reduced oxidative stress during endurance exercise (Mach & Fuster Botella, 2017), nutrient absorption, immune function (Lescheid, 2014), and intestinal maintenance and function (Lamprecht et al., 2012). Probiotics are also increasingly being recognised as impacting the gut-brain axis.

A key component of intestinal maintenance and function is gut integrity. This refers to the ability of the gut lining to act as an effective ‘gate-keeper’ between your body and the contents of the gut (which are technically outside of the body). When the gut barrier is intact and functioning correctly, it permits certain things that the body recognises, and ‘deems as safe’, to cross the gut lining and enter the blood stream or tissues. Other compounds (e.g. toxins) and organisms (e.g. pathogens) are excluded to prevent infection or systematic inflammation.

Sometimes factors such as antibiotics or other medications, stress, dietary changes and clinical conditions like inflammatory bowel disease, can result in the usual balance of gut microflora being disrupted. This is called dysbiosis and can result in undesirable symptoms such as gut discomfort.

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**Figure 1:** Research has shown that good gut health can provide multiple benefits by supporting many other areas of health.

- **Diabetes**
- **Cognition**
- **Stress & Mood**
- **Gut Health**
- **Inflammation**
- **Anti-infection**
- **Nutrient Absorption**
- **IBS / IBD**
The body sometimes corrects microflora imbalances on its own. However, probiotic supplementation is commonly recommended to support a healthy balance of gut microbes, especially for individuals who lead busy and active lifestyles. Probiotics, along with a healthy diet, are generally recognised to provide a good basis for overall health.

Probiotics are defined as live micro-organisms that, when administered in adequate amounts, confer a health benefit to the host.

*(Probiotics in food: Health and nutritional properties and guidelines for evaluation - FAO Food and Nutrition Paper 85. 2006)*

**NZMP PROBIOTIC STRAINS**

NZMP has two probiotics that have been researched since the 1990s. LactoB 001 and BifidoB 019 were developed from a screening of approximately two thousand strains held at the Fonterra Research and Development Centre, for those that met the qualifying description of a possible probiotic (Prasad et al., 1998). The strains were screened to survive environmental conditions that would be encountered in the intestinal tract, such as the low pH of the stomach and high levels of bile acids which are secreted into the small intestine to aid fat digestion (Prasad et al., 1998).

Evidence that LactoB 001 & BifidoB 019 survive the passage through the gut was supported by studies re-isolating the probiotics from stool samples of consumers (Tannock et al., 2000; Prasad et al., 2013) and from a human simulated gastrointestinal model (Makelainen et al., 2009). Both strains have proven clinical benefits to gut health.

**GUT INTEGRITY**

Gut integrity is essential for good gut health and the health of the whole body. Where gut integrity is poor the gut barrier allows pathogens or microbial components and by-products to enter the body promoting inflammation of different degrees and locations (Figure 2). In in-vitro studies NZMP LactoB 001 has been shown to tighten the gut barrier (Anderson et al., 2010; Barnett et al., 2018; Putaala et al., 2008) and was found to be the best commercially available strain tested (Anderson et al., 2010). NZMP LactoB 001 does not degrade the components of the protective mucous layer that lines the intestinal tract (Zhou et al 2001) so the body maintains this natural barrier to infection.

*Figure 2: In a healthy gut, the integrity of the gut wall prevents undesirable gut contents from entering the body. In a compromised gut these components can find their way into the blood resulting in immune and inflammatory responses.*
GUT DISCOMFORT

Gut discomfort is a relatively prevalent complaint amongst adult populations. Gut discomfort can encompass several symptoms including bloating, distention, abdominal pain, excessive gas, gastrointestinal cramping, diarrhoea and constipation. Of these symptoms, constipation is the number one reason that US consumers first seek out probiotics.

NZMP BifidoB 019 has been shown to support gut comfort by decreasing intestinal transit time in constipation sufferers (Waller et al., 2011; Magro et al., 2014 (as part of a combination with L. acidophilus NCFM and polydextrose; Ibarra et al., 2018). A further study combined BifidoB 019 with both LactoB 001 and FOS (Fructo-oligosaccharide), which also improved symptoms of constipation (Waitzberg et al., 2013).

INFLAMMATION

The busy modern lifestyle is often attributed to increased levels of stress in the general population, which in turn may lead to elevated levels of inflammatory markers in the blood.

Amongst more active sections of the population, exercise related inflammation can pose an additional problem when the body is pushed to physical limits and has insufficient time to recover. This is starting to emerge as a wider issue given the increasing popularity of high impact or intensity training programmes and endurance sports. In these situations, individuals may experience higher levels of inflammatory markers in their blood immediately post exercise which can lead to gut barrier dysfunction (van Wick et al., 2011).

Probiotics can reduce the effects of exercise induced gut dysfunction (Lamprecht et al., 2012). A double blind randomised control with NZMP LactoB 001 in a symbiotic combination with GOS (Galactooligosaccharide, a milk derived prebiotic) has shown reduction in the inflammation associated with raised cytokine Interleukin 6 levels (Gonzalez-Hernandez et al., 2012). This finding supported earlier animal research that had shown NZMP LactoB 001 (and BifidoB019) are not pro-inflammatory (Zhou and Gill, 2005). In short LactoB 001 is not pro-inflammatory on its own, and can actively lower inflammatory markers.

INFECTIONS

Intestinal tract infections are problematic for the general population. The risk of gastrointestinal infections is even more pronounced for individuals travelling to compete in sporting activities. Infection related traveller’s diarrhoea is the most common gastrointestinal illness in athletes (Boggess, 2007) impacting both competition preparation and performance. Meta-analysis has shown that probiotics can significantly reduce the incidence of traveller’s diarrhoea (McFarland, 2007).

NZMP LactoB 001 has demonstrated protection against pathogens in pre-clinical studies (Gill et al., 2001; Shu and Gill, 2002), whilst wider clinical research also demonstrated reduction in the occurrence of intestinal infection rates.

Staphylococcus aureus is a well-known cause of infection that primarily colonises the nostrils, gastrointestinal tract, oropharynx (middle part of the throat) and armpit. Eggers et al. (2018) reported that in 100 veterans, NZMP LactoB 001 reduced S. aureus carriage within stool samples, therefore also reducing pathogen levels in the gastrointestinal tract.

When NZMP LactoB 001 was combined with L. acidophilus NCFM, the treatment succeeded in reducing the level of the diarrhoea causing Clostridium difficile in the human intestine (Lahtinen et al., 2018).

NZMP BifidoB 019 also exhibits strong evidence of protection against infection related to diarrhoea (Hemalatha et al., 2014), alongside other types of infection such as periodontitis (Invenici et al., 2018; Oliveira et al., 2017; Ricoldi et al., 2017), dysentery, pneumonia, febrile illness and lower respiratory infections (Sazawal et al., 2010a and b). BifidoB 019 also reduces inflammation associated with infection (Invenici et al., 2018; Oliveira et al., 2017; Ricoldi et al., 2017).
NUTRIENT ABSORPTION

Probiotics are well known for enhancing the absorption of minerals that are critical to the body’s everyday functions. This is facilitated through probiotic production of short chain fatty acids (SCFA). The production of the SCFA lowers the pH in the gut promoting the flow of minerals from the lumen of the gut into the blood stream. Probiotics have been shown to increase the absorption of a variety of minerals including iron, magnesium and calcium.

NZMP LactoB 001 has been shown to improve calcium and magnesium retention and increase bone mineral density in pre-clinical trials (Kruger et al., 2009).

Calcium is an important mineral for the contraction of muscle and for bone health, whilst magnesium is a mineral involved in energy metabolism and muscle action (Zhang et al., 2017).

NZMP BifidoB 019 is clinically proven to improve iron availability. In children already receiving iron supplementation, the addition of NZMP BifidoB 019 and GOS showed a 45% reduction in anaemia and iron deficiency compared to the group not receiving the probiotic/prebiotic (Sazawal et al., 2010a and b).

The implication is that probiotics can help certain groups (e.g. individuals with low appetite or restricted or limited diets) to maximise the availability of nutrients in the food or supplements they are consuming.
Conclusion

Probiotics are generally proven to have positive effects on several aspects of gut health. Between them, NZMP Lacto 001 and BifidoB 019 have shown clinical benefits in supporting gut integrity and nutrient absorption, as well as addressing gut discomfort, infections and inflammation. These digestive health concerns are prevalent across the adult population, so addressing these represents a real opportunity to influence overall wellbeing.

REFERENCES


Probiotics in food: Health and nutritional properties and guidelines for evaluation - FAO Food and Nutrition Paper 85. 2006


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