

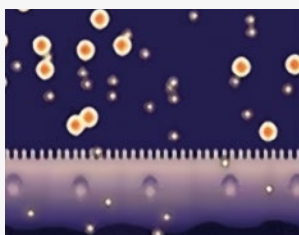
THE ROLE OF PROBIOTICS IN ALLERGIC DISEASES

INTRODUCTION

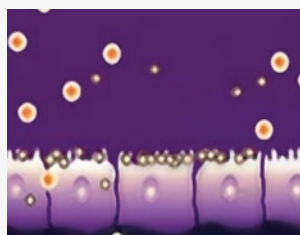
The incidence of allergic diseases is ever increasing, now affecting up to 20% of children in the Western population¹. It appears that each are often interlinked, with common immune and gut alterations observed². Allergy is said to be a malfunction of the immune system, in which harmless environmental or food substances are interpreted as being harmful, causing the immune system to react incorrectly towards them³. First contact can cause elevated levels of allergen specific IgE immune markers (antibodies), primed to remember and overreact in the future. Current treatment is to suppress this immune response with various medications. However, as this is the same defence mechanism the body uses to protect us from truly harmful pathogens, their long term use may not be ideal.

The gut mucosal barrier houses approximately 70% of the body's immune cells⁴, and is lined and influenced by a diverse microflora that play an important role in the development and function of the corresponding immune system⁵. Specific beneficial strains appear to stimulate more regulatory or calming immune cells⁶. Dysbiosis (imbalanced microflora), or a less diverse range of species, has been observed in those suffering allergic diseases^{6,7}. The 'hygiene hypothesis' suggests the sterile environment of the Western world has reduced our interaction with a wide range of microbes and necessary stimulation to the developing immune system^{8,9}. This possibly results in an imbalance between Th1 and Th2 type immune responses that favour the development of IgE-mediated allergies¹⁰.

The intestinal wall provides an important defence barrier to foreign invaders such as nasty bugs, toxins, inflammatory cytokines and large undigested food particles. Damage to this lining where it becomes more porous is said to lead to intestinal permeability or 'leaky gut syndrome', where foreign substances are able to seep through, causing a hypersensitive immune response. Leaky gut has long been associated with the development of allergies^{11,12,13}.



Healthy digestive tract – the mucosal membrane allows nutrients to pass the barrier while blocking the entry of toxins.



Leaky Gut Syndrome – the barrier is irritated & the mucosal membrane is dysfunctional. This blocks nutrient absorption at the damaged villi while permitting toxins to enter the blood stream.

The use of probiotics could therefore be considered as part of a management plan to rebalance the gut flora, modulate the corresponding immune system, control pathogenic overgrowth and their toxic by-products, to improve digestive efficiency and to restore a healthy gut lining^{3,11,12,14}.

ECZEMA



Eczema (atopic dermatitis) is a common skin condition, especially in infants¹⁵, where the skin becomes inflamed, dry and itchy. The skin provides a physical barrier against the environment and consists of a small number of microflora compared to the gut¹⁶. This barrier is impaired in eczema, resulting in an abnormal inflammatory response to harmless environmental allergens or irritants such as chemicals and detergents. Dysbiosis, leaky gut and food allergies have been associated with the condition^{12,17}. In some studies probiotic supplementation has been seen to rebalance the gut flora, improve immune function¹, reduce severity of symptoms¹⁸ and reduce the need for medication¹⁹. In 2011, Farid *et al*¹⁵ found that a multi-strain probiotic (Protexin) significantly reduced eczema symptoms in infants and young children within just 8 weeks. In 2001, Kalliomäki *et al*²⁰ found that a *Lactobacillus rhamnosus* probiotic given preventatively during pregnancy, and directly to infants for the first 6 months of life, halved the risk of the infants developing atopic eczema during the first two years of life.

ASTHMA

Asthma is an inflammatory disorder of the respiratory system, where the airways become inflamed and swollen with excess mucus production, which in turn narrows the airways and restricts airflow, producing symptoms such as breathlessness, wheezing, chest tightness and coughing. Intestinal permeability has been observed in those with

asthma¹³. Although the effectiveness of probiotic use within asthma remains debated, some studies have shown early positive effects of reducing allergen specific IgE antibodies, in part by modulating systemic cytokine production. Certain probiotics have been shown to decrease inflammatory markers, airway hyper-responsiveness and asthmatic symptoms by inducing regulatory mechanisms^{10,21}.

HAY FEVER

Hay fever, or seasonal allergic rhinitis, involves inflammation of the mucosal lining of the nasal passages, throat and eyes, causing symptoms such as sore eyes, blocked nose, itching and sneezing. Airborne particles released from local trees, grasses and flowers are inhaled, and from memory are perceived as foreign invaders causing an over-stimulated immune response and the release of histamine. In 2011, Wassenberg *et al*²² found that a *Lactobacillus* probiotic consumed for a month lowered nasal congestion and itching, and down-regulated immune markers in allergic rhinitis sufferers. Even where probiotics have failed to improve symptoms in the short time period of the study, many are showing positive reductions in immune markers, and a particular positive shift between the Th1 and Th2 ratio^{23,24}. This indicates that it may take some time to influence gut microflora balance and elevated immune responses, especially in the adult population.

FOOD ALLERGIES

A food allergy is a hypersensitive reaction to specific food components (often proteins such as cereal gluten or milk casein), typically within a few minutes to a couple of hours after eating the offending food. This is again a consequence

of a malfunctioning immune system¹⁷ where specific IgE antibodies falsely target these components as hazardous and trigger the release of inflammatory chemicals such as histamine. The most common symptoms include tingling, itching or swelling in the mouth or face, nasal congestion, trouble breathing, abdominal pain, diarrhoea, vomiting or dizziness. In life threatening anaphylaxis, symptoms will be more severe. In a true allergy the offending food should be avoided entirely. A food intolerance reaction on the other hand is much slower to appear, sometimes days later, and could cause nausea, bloating, abdominal pain and diarrhoea. Leaky gut has long been associated with the development of food sensitivities^{11,12}. A study by Majamaa *et al*²⁵, indicated that a *Lactobacillus* probiotic may act as a useful tool in the treatment of food allergy by alleviating intestinal inflammation.

CONCLUSION

Probiotic effectiveness for allergic diseases varies greatly in studies, as do the strains, dosage and length of time consumed by varying individuals, often appearing to be more effective in prevention of atopic diseases opposed to treatment²⁶. It could be said that it is the balancing of the whole gut ecology with a wide mix of microbes over the long term that is of greater benefit than the presence of one individual strain during a short trial. The health of the mother's gut flora is therefore extremely important during pregnancy, vaginal birth and breastfeeding to influence the healthy development of the infant's gut flora and corresponding immune system. As individual probiotic strains are seen to have specific beneficial effects, a multi-strain probiotic could therefore be considered more effective.

Possible food allergens to be aware of²⁷:

- milk products (especially pasteurised cow's milk)
- wheat and gluten containing grains
- peanuts
- eggs
- soya
- fish and shellfish
- preservatives, additives and food colourings
- caffeine and alcohol

Natural fresh whole foods less likely to have an allergenic effect:

- a colourful range of vegetables, salad and fruits (esp onions, garlic, leeks and spring onions)
- poultry, meat and offal (said to have components that feed intestinal cells)
- olive oil, seed oils and coconut oil
- cayenne pepper, ginger and turmeric (said to have natural anti-inflammatory properties)
- locally-produced unpasteurised honey (especially before the hay fever season starts)
- herbal teas - nettle, hibiscus, ginger or chamomile (natural anti-histamines)
- oily fish (known to have anti-inflammatory properties but can still be allergenic to some)

As a multifaceted intervention, trials are also indicating the beneficial immune modulatory effects of mothers getting enough vitamin D during pregnancy² which is most efficiently gained from short careful daily sun exposure without sunscreen, as well as supplementation during winter months.

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