IMMUNE FUNCTION & RUNNING PERFORMANCE

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The ability to stay healthy during training and prior to competition is critical for athletes to achieve their best performances. Illnesses are a constant cause of impaired performance due to the amount of time taken off from training in the build-up to major competitions and/or causing athletes to be run-down and fatigued during a competition. Reducing the incidence of illness during a season allows runners to achieve more consistent training, which is critical to building a base for the competition period. Similarly, preventing illnesses occurring before major competitions allows runners to go into races uninhibited by the fatigue caused by many illnesses. This article will detail illnesses that can affect distance runners and methods that can be used to prevent many illnesses from occurring. It will also outline how the immune system fights off illnesses, and how it changes during the training and racing phases.

MODERATE intensity exercise has been shown to have positive effects on the function of the immune system which, over time, can translate to fewer days of sickness with the common cold and other upper respiratory tract infections (3). These benefits, as well as others most notably to do with cardiovascular health, provide the basis for public health guidelines urging individuals to engage in near-daily moderate intensity physical activity of 30 minutes or more. However, chronic intense exercise undertaken by elite athletes may actually result in potentially detrimental changes in some immune parameters, and it has been demonstrated that high performance athletes have a greater prevalence of self-reported upper respiratory tract infections than groups who don't exercise as much (4). This increased incidence of illness in highly trained athletes is likely a result of impaired immune function after intense training (5) making these athletes more susceptible to viral infections (Figure 1).

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Upper respiratory tract infection (URTI) is the most common reported infectious illness in both the general population and elite athletes, accounting for 30-40% of visits to sports medicine clinics. Reported cases of URTI are predominantly of viral origin with obvious symptoms 1-2 days after infection and persisting for up to 2 weeks.

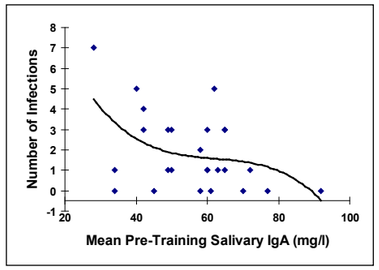

Figure 1. *Relationship between low salivary IgA and increase in the number of upper respiratory tract infections in elite swimmers. Taken from Gleeson et al., 1999 (2).*

Athletes exhibiting URTI frequently present with a sore throat and nasal congestion, and may experience headache, enlarged lymph nodes and fever (1). Epstein-Barr Virus (EBV) infection has been proposed as a possible cause of URTI in high-performance athletes. EBV is a member of the herpes group of viruses and is the causative agent for the condition commonly referred to as glandular fever. EBV is transmitted in saliva and has been detected in the saliva of healthy individuals who have previously been exposed to EBV with stable levels of EBV-specific antibodies reported years after the primary infection. The suppression of the immune system associated with intense exercise has the potential for high-performance athletes to experience reactivation of EBV and it is this reactivation that has the potential to induce URTI typical of those noted in elite athletes after intense training or competition (1).

The body's first line of defence is the mucous membranes located on all of our internal surfaces which are exposed to external elements, for example in the mouth, nose and lungs. The immune system has various defence mechanisms secreted in mucous to fight off pathogens that we are regularly exposed to. Collection and analysis of saliva is an easy way to measure the mucosal immune responses. Salivary immunoglobulins (IgA) reflect the ongoing levels of the mucosal immune response,

Figure 2. *Enlarged images of probiotic bacteria.*

with lower levels increasing susceptibility to URTI. Our research group has identified total salivary IgA levels as a clinical marker for individuals with an increased risk of respiratory illness (lower levels increasing the risk of illness), and changes in IgA levels that occur with moderate and intensive exercise (6). Research in AIS athletes has produced evidence suggesting that salivary IgA levels may be predictive of the frequency of sore throats, the presence of which have the potential to impact negatively on performance. Low salivary IgA levels at the beginning of training periods have been associated with an increased incidence of illness and underperformance. Additionally, it has been recognised that in some cases suppression of immunity may result in reactivation of EBV and that this phenomenon may account for the appearance of illness symptoms.

An area that we have researched extensively over the past 3 years is the use of probiotic supplementation to improve immune function and reduce the incidence and severity of illnesses in highly trained distance runners. Probiotic bacteria (such as acidophilus, bifidobacteria and lactobacilli – Figure 2) are best known through their use in fermented milk products, especially yoghurt. Probiotics are preparations of live bacteria and have considerable popularity in the community despite a lack of scientific evidence to support their use. Probiotics have been suggested to boost the immune system thereby protecting individuals from infection and modifying allergic responses. Much of the interest in probiotic bacteria has focused on Lactobacilli strains. Research from our group has shown that *L. acidophilus* drives the T lymphocytes (cells in the body which monitor and destroy foreign pathogens such as viruses) to produce interferon gamma (IFN-γ), a chemical important for host protection against infection. Specifically, two pilot studies at the AIS and the University of Newcastle have shown enhancement of IFN-γ in human subjects following supplementation with different Lactobacilli strains. Therefore, probiotic supplementation has the ability to provide immune protection at the mucosal surfaces and in elite athletes may provide a novel strategy for preventing exercise-induced mucosal immune suppression.

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Practical guidelines to reduce illnesses:

- Adequate hygiene including washing hands frequently to reduce the risk of being exposed to pathogens.
- Structure training with appropriate rest periods to avoid suppressing the immune system and increasing the risk of illness.
- Avoid close contact with large crowds after heavy training or competitions, as this is a period of suppressed immune function and being exposed to pathogens will increase the risk of getting sick.
- Avoid high intensity/volume training sessions that are likely to suppress immune system in the days leading up to major competitions.
- Balanced diet (fruit/vegetables, lean meat, dairy products, breads/cereals) with adequate calories to provide the energy to train and recover from training.
- Vitamin C, Zinc and aspirin may boost immune function when around sick people or when feeling run down.
- Use of probiotics may help improve immune function and fight off many pathogens you are exposed to.

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