Overcoming microbial hurdles: keeping the Olympics infection-free

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“...is it possible to keep the Olympics infection free? ... single bouts of prolonged strenuous exercise are associated with a temporary suppression of many aspects of immune function, and this may provide a ‘window of opportunity’ for infections to enter the body.”

In the coming weeks, over 11,000 athletes are expected to arrive in the UK for the XXX Olympic Games and XV Paralympic Games, or as it is more commonly known, London 2012. The arrival of so many athletes, coaches and other support staff from over 200 nations, many of which will be living in close proximity in the Olympic Village, provides an ideal environment for the transmission of infectious diseases. Of course, this situation is not uncommon for any large gathering, but for the athletes arriving in London over the next few weeks, this is the culmination of years of hard work, dedication and sacrifice for the chance to perform (and hopefully win) on the Olympic stage. Contracting an infection at any time can lead to absence from training and impaired performance. Contracting an infection during the Games can be devastating.

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Anecdotal reports from both athletes and coaches stretching back over 60 years document a high frequency of symptoms associated with respiratory infections in athletes. In support of this notion, there is now a large body of published literature suggesting that highly trained and elite athletes suffer more frequently from symptoms of upper respiratory infections (URIs) than those who are sedentary or who are recreationally active [1]. For example, 13% of a cohort of over 2000 runners in the 1987 Los Angeles Marathon reported symptoms of URIs during the week after the event, compared with only 2% of a group of similarly experienced

runners who did not compete. In addition, 40% of the runners experienced at least one episode of URI during the 2 months prior to the marathon itself [2]. Recent analysis of the 126 reported illnesses in athletes competing at last year's World Athletics Championships in Daegu, South Korea, revealed that 40% of illnesses affected the upper respiratory tract, with confirmed infection in approximately 20% of cases [3]. Other than sickness associated with exercise-induced dehydration (12% of cases), gastroenteritis/diarrhea was the next most common illness reported (10% of cases).

So is it possible to keep the Olympics infection free? It is now widely accepted that single bouts of prolonged strenuous exercise are associated with a temporary suppression of many aspects of immune function, and this may provide a ‘window of opportunity’ for infections to enter the body [1]. These effects may be cumulative over a period of time, so that during periods of heavy training and competition, athletes' immune systems may become chronically suppressed. Management of training load and recovery to maintain immune health is therefore crucial to minimize infection incidence in athletes. Having said this, there are several other factors that can also influence this risk. Poor dietary practices, heightened psychological stress, and poor sleep quality and quantity all impact on immune function and subsequent risk of infection [4]. Furthermore, practices such as sharing drinking bottles, a lack of hand washing, coming into contact with infected people, consuming contaminated food or beverages and living in close proximity to others can all increase the transmission of infectious pathogens. With this in mind, several practical lifestyle, nutritional and hygiene strategies to minimize infection risk in athletes

Keywords

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have been suggested, including avoiding people with infectious illness where possible, practicing good personal hygiene (washing hands, brushing teeth regularly), not sharing drinking bottles or cutlery, getting adequate sleep, managing psychological stress, maintaining energy and fluid balance, and considering vaccinations particularly against seasonal influenza. These should become part of an athlete's normal routine.

The ability to withstand infections during periods of heightened physiological and psychological strain could actually be a prerequisite for elite performance. In a recent study of URI symptoms, reported by 80 endurance-trained athletes over a 4-month winter period, we found that those athletes who were illness-prone had lower levels of salivary IgA secretion and higher release of IL-10 from antigen-stimulated blood cultures [5]. The identification of biomarkers for subsequent infection risk in athletes is certainly a key area of focus and future investigations will no doubt also look to identify possible genetic variations associated with an illness-prone phenotype. Identification of athletes who are naturally predisposed to infections would enable better management of infection risk to allow athletes to continue to train and perform optimally.

“While we will never be able to keep the Olympics ‘infection’-free, by being aware of the many causes of infectious symptoms in athletes, we can help athletes to stay symptom-free and give them the best chance of achieving their true potential.”

While it is certainly true that symptoms of respiratory illness are commonly reported in athletes, an infectious cause of these symptoms has not always been confirmed. A study examining the causes of symptoms of respiratory illness in both elite and recreational triathletes, and sedentary control subjects of similar age over a 5-month period found that only 11 out of 37 illness episodes had identifiable infectious cause [6]. Rhinovirus was the most commonly identified pathogen, with a small number of bacterial pathogens, including *Streptococcus pyogenes*, *Haemophilus influenzae* and *Mycoplasma pneumoniae* also responsible. This aside, almost 75% of reported symptoms of URI tested negative for detectable infectious agents. Even sports physicians can overestimate the occurrence of actual infections. In an evaluation study of symptoms of URI in elite Australian athletes, physicians characterized 89% of cases as

viral or bacterial URIs, yet only 57% of cases were actually associated with an identified pathogen or laboratory measure consistent with infection [7].

In order to implement effective strategies to both prevent and manage respiratory illnesses in athletes, the cause of the symptoms needs to be clearly identified and this itself is an area of current debate. In the studies of Spence *et al.* [6] and Cox *et al.* [7], the fact that causes were unidentified does not necessarily mean that these illnesses were not infectious; there are many reasons why a pathogen may not be identified, including the limitations of current diagnostic techniques and existence of as yet unknown pathogens. Having said this, there is now a convincing line of thought that airway inflammation may be at least partly responsible for the illnesses without identifiable pathogenic cause. Lung ventilation rates can increase 10–20-fold with intensive exercise. This can damage the airways causing an increase in airway osmolarity and stimulating bronchial epithelial cells to release chemoattractants to promote the movement of immune cells into the airways [8]. The resulting noninfectious inflammation leads to many of the same symptoms as infectious respiratory illnesses. Furthermore, allergy and exposure to environmental factors such as cold dry air, pollutants and chlorine-related products can all trigger an inflammatory response and subsequent symptoms of URI. In support of this, a recently published study found a strong correlation between the prevalence of allergy and post-race reporting of symptoms of URI in over 200 runners who had taken part in the 2010 London Marathon [9]. This suggests that a high proportion of the symptoms may be allergic, rather than infectious in nature. Allergy is both treatable and manageable if correctly diagnosed, yet is often overlooked. In the evaluation study of symptoms of URI in elite Australian athletes, laboratory investigation identified allergy in almost 40% of the athletes presenting with URI, yet the sports physicians did not consider allergy as a possible cause of these symptoms for any of the episodes [7]. This is a substantial proportion of cases and certainly suggests that screening for common allergens would be a wise addition to the recommended strategies to help minimize infectious symptoms in elite athletes.

Current guidance to help athletes avoid illness, particularly of the upper respiratory tract, is focused on minimizing pathogen transmission and maintaining immune competence. This seems sensible if we assume that these symptoms all have an infectious cause. With

several reports suggesting that a substantial proportion of URI symptoms experienced by athletes are of noninfectious inflammatory cause, strategies to prevent respiratory illness in athletes need to also look beyond avoidance of bacterial or viral pathogen transmission. Ongoing clarification of both the causes of symptoms of respiratory illness in athletes and those athletes who are most vulnerable to these symptoms is necessary to help identify the most appropriate treatment and management strategies. While we will never be able to keep the Olympics 'infection' free, by being aware of the many causes of infectious symptoms in

athletes, we can help athletes to stay symptom-free and give them the best chance of achieving their true potential.

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