

KEEPING ATHLETES HEALTHY

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Moderate to severe illness at the wrong time can compromise training and competitive performance, and derail the best laid plans. Coaches, athletes and medical personnel should adopt guidelines that reduce the risk of illness in athletes preparing for high level competition. This article outlines some strategies for reducing the problems of illness and infection in athletes preparing for high level competition.

Illness and sporting performance

The most common illness observed in athletes is a mild and self-limiting viral infection of the upper respiratory tract (URTI) – i.e. the common cold. The symptoms of the common cold are well known and include mild headache, sore throat, nasal congestion, cough and mild fatigue (4). Viral URIs occur throughout the year although seasonal peaks are usually observed in the autumn and spring. Seasonal changes should be kept in mind particularly for those athletes preparing for competition during the autumn and winter months. Athletes with a known allergy or a prior history of problems with asthma or exercise-induced asthma should consult their physician prior to international travel.

While URIs are generally mild and self-limiting (a short incubation period of a few days and duration of illness from a few days to two weeks) their presence may interrupt training or competition performance. On average, adults will average about 2-3 episodes of URTI per year, with more than 4 episodes being considered abnormal. Research at the Australian Institute of Sport has shown that athletes in high level training also experience about 3 URIs per year, but 15% (1 in 7 athletes) will suffer from four or more (2). The more illness-prone athletes require special attention, but any athlete suffering from an illness immediately prior to or during competition is likely to underperform. Studies with the Australian swimmers at international competitions show that athletes with URTI were likely to perform more poorly than their counterparts who were free from illness.

Preventing illness – maintaining performance: The 5-Point Plan

The body's immune system that protects host tissues infection is influenced by a wide range of physical, environmental, psychological, and behavioural factors. Examination of the relevant medical and scientific literature, the results of scientific research conducted with Australian athletes, and the experience of coaches, athletes and support staff, underpins a 5 point-plan to the reduce the risk of illness (7). The 5 basic points are:

1. Managing physical training loads
2. Managing psychological stress
3. Limiting environmental stress
4. Reinforcing basic self-management skills
5. Medical considerations

1. Managing physical training loads

Research and practical experience indicate that acute bouts of exercise and prolonged training can stress athletes leading to fatigue, injury and illness. Careful management of training loads is required to maintain the fine balance between maximizing fitness and maintaining health (1). While fitness and physical conditioning is a central part of the preparation in individual sports, even team game athletes can feel 'run down' and experience health problems.

In individual endurance sports such as running, cycling, rowing, swimming and triathlon, training consists largely of high volume-low intensity work. Improvements in performance are primarily achieved through systematic increases in the volume and intensity of training, and large volumes of work are necessary to build a proper endurance base and competitive fitness (11). However the athlete needs adequate rest and recovery to offset high training loads. An imbalance between training loads and recovery is a major contributor to the onset of fatigue, overtraining and illness in highly trained athletes. Recovery practices (massage, water running, hot and cold water therapies, ice therapy, and low-intensity recovery days) are recommended.

Sudden increases in either training volume or intensity, or both in combination, may place additional pressure on immunity and health. The risk of overtraining is increased by monotonous training without alternating hard and easy training days, a lack of a complete rest day once per week, increasing loads when the total load is already high, and too many competitions. Athletes can succumb to illness in the periods immediately prior to, during and after the competition (6). While the stress and risk of illness may be influenced by the psychological stress of competition, athletes should be cautious when boosting their training loads prior to competing. A common mistake is including too many quality sessions immediately before competition.

The beneficial effects of moderate exercise should not be overlooked. While intense exercise can be stressful, moderate intensity exercise can boost or prime immune function (10). Developing aerobic fitness builds a reserve or general adaptation capacity that serves as a protective buffer during more intensive specific training and competitive phases. For these reasons, moderate aerobic exercise should be included during interval sessions, on recovery days, during the return from illness and injury, and during the off season to maintain fitness. Athletes often feel better for a light run or session to clear the head and sinuses.

There can be striking individual differences in how athletes respond to training. Most athletes can train with high loads provided their program includes strategies devised to control the overall strain and stress. Athletes should be encouraged to undertake intensive training knowing that variations in performance and fatigue are symptoms to be respected, and not necessarily problems to overcome.

Practical Recommendations (Training Loads):

- start training with low to moderate volume and intensity;
- employ a gradual periodised increase in training volumes and loads;
- employ variety in volume and intensity to avoid training monotony and stress; avoid excessive mileage (training) that could lead to exhaustion, illness or injury;
- include non-specific cross training to offset staleness;
- include sufficient rest and recovery;
- implement a monitoring and/or testing program for identifying signs of fatigue, illness and poor performance.

2. Managing psychological stress

The potential for psychological stress to influence immunity should not be underestimated. Medical research shows that significant life stresses such as bereavement, sleep deprivation, examination stress, marital or relationship problems, and divorce can cause a short-term suppression of immune function. Similarly, psychological stress and anxiety associated with competitive sports can increase the risk of illness (3). This situation applies to both athletes and coaches. Preliminary research on Australian coaches and support staff indicates they may be just as prone to the stress of competition and illness as their athletes.

Practical Recommendations (Psychological Stress):

- Implement a psychological skills training program
- Work with a sports psychologist
- Consider and respect the needs of other team members
- Recognise the personality, arousal and motivation differences between individuals
- Recognise group versus individual needs and goals
- Monitor psychological factors such as mood, anxiety and general behaviour

3. Limiting environmental stress

Athletes often train or compete in adverse climatic conditions including heat and humidity, cold wintery conditions, medium to high-level altitude and polluted environments. The impact of hot and humid weather and air pollution will vary according to the duration and intensity of training or competition, the severity of conditions, the duration of exposure, the fitness levels of individual athletes, the degree of acclimatization, and attention to practical issues such as clothing and fluid replacement. Fortunately, there several training and management strategies that limit the potentially harmful effects of these adverse conditions. These strategies are generally centred on limiting exposure to adverse conditions and acclimatising athletes prior to competition.

The potential of exercise in hot and humid conditions to elicit fatigue, exhaustion and heat stress is well known. Exercise in the heat may also have consequences for immune function. Heat and intensive exercise have an interactive effect on stress hormones. It would be unwise to expose relatively untrained individuals to the combined demands of increased training loads, exposure to high altitude and high ambient temperatures. The process of heat acclimatisation is well described in the scientific and coaching literature and ameliorates the debilitating effects of heat and maintaining performance. Regular exposure to hot and/or humid conditions over 7-14 days elicits several physiological adaptations which offset the effects of these conditions on athletic performance.

Changing seasons from summer to winter, or winter to summer, with long haul travel can present problems. Athletes typically need a couple of days to adjust to either hotter or colder conditions and training, clothing and nutrition should be managed accordingly. In the long winter months, many athletes and coaches report the benefits of a short 'warm' weather camp. Training for long periods indoors in enclosed and heated environments, coupled with increased exposure to winter illnesses, can be problematic. A short period training in warmer outdoor settings should be enough to recharge the immune system.

Practical Recommendations (Environmental Factors):

- Limit exposure to adverse environmental conditions
- Wear appropriate clothing
- Acclimatise athletes to the specific conditions experienced
- Monitor for signs of heat stress
- Arrange alternative training sessions if required

4. Reinforcing self-management skills

One of the main strategies in avoiding illness is to limit exposure to potentially infectious pathogens such as the common cold and 'flu (6). Individuals won't get sick if they do not come into contact with these pathogens. Even if the immune system is a little run down, athletes will remain healthy if they avoid contact with the viral agents. There are three main avenues of contacting illness: i) common source exposure, such as contaminated drink bottles, eating utensils, clothing or towels, ii) air-borne pathogens, particularly respiratory viruses which can be transmitted by sneezing in infected individuals, and iii) direct physical contact, which may occur in both sporting and non-sporting situations.

Potential situations where the risk of transmission may be increased include travel (departure lounges, aircraft cabins, bus travel, train carriages), accommodation (communal living and dining, shared sleeping arrangements), community facilities (shopping malls, cinemas, restaurants) and sporting facilities (stadiums, change rooms, public and common areas). Attention to personal hygiene is also important and athletes should always wash their hands prior to eating; avoid sharing towels, drink bottles and eating utensils; and avoid cross contamination with sporting equipment and appliances.

Long haul travel is a particularly important area because it is often required for domestic and international training camps and/or competition. Athletes should be healthy and rested before departure, manage their diet, hydration and sleep on long flights, and take two of three days to adjust or acclimatize upon arrival. The same process applies on the return trip home as athletes can get sick after competition as well as before.

The links between nutrition, supplements and immunity generates considerable discussion in sporting circles. Most athlete's diet generally has sufficient calories and range of both macro- and micro-nutrients to maintain good health. An athlete would require a very radical diet before immune function and resistance to infection are compromised. There are two major groups of athletes who are most at risk are: those who voluntarily restrict caloric and nutrient intake to make weight limits or for aesthetic reasons (more commonly female athletes), and those who consume excessive calories and/or nutritional supplements in the expectation of performance improvements and muscle bulking (more commonly male athletes). Athletes should be advised that immune responses can be jeopardised by both deficiencies and excessive intake of certain nutrients (9). Many athletes falsely assume that higher levels of nutritional supplementation automatically have a beneficial effect on health, immunity and performance.

The macronutrients carbohydrate, fat and protein all play critical roles in maintaining immunocompetence. Unless dietary intake is extremely low or high, immune function is unlikely to be compromised. Even highly trained vegetarian athletes with low protein intakes appear to have normal immune function. A series of studies with marathon and ultramarathon runners suggests that vitamin C supplementation can be effective in reducing the incidence of illness (5). There is some evidence that therapeutic ingestion of vitamin C and zinc at the onset of URTI symptoms may be helpful.

Practical Recommendations (Self-Management Skills):

- Ensure a balanced diet of macro- and micro-nutrients
- Review prophylactic and interventionist use of specific vitamins and minerals
- Use throat protectors such as lozenges, honey-lemon drinks, steam baths
- Avoid exposure to large crowds and infected individuals
- Emphasize personal hygiene practices

5. Medical Considerations

The sports medicine physician plays a central role in coordinating the provision of medical care for athletes. The physician's responsibilities include medical screening and assessment, coordination and supervision of medical treatments, immunization and disease prevention, athlete and coach education, dealing with issues related to drugs in sport, and liaison with team management and other scientific or medical personnel. In terms of respiratory illnesses frequently encountered by athletes, the physician evaluates localised and systemic symptoms and make an assessment whether the illness is viral, bacterial or inflammatory in origin. Systemic symptoms and signs such as fever, elevated heart rate, fatigue, aching muscles or joints, and swollen glands indicate a more significant illness and a greater need for rest from exercise and training. The amount of time off training will vary according to the individual and rate of recovery from illness (8).

Should athletes exercise when suffering an illness? This is an important issue requiring careful consideration by the athlete, doctor and coach. In general, caution is required for athletes suffering, or possibly suffering from myocarditis, infectious mononucleosis or related viral syndromes. Athletes should refrain from exercise during the early course of a fever. Viral myocarditis is a particular concern and athletes with this condition should avoid exercise until a medical clearance is obtained. Myocarditis can be caused by a variety of micro-organisms and may or may not be associated with fever, malaise and upper respiratory tract illness. In all cases, a medical opinion should be sought if an athlete is in doubt about their health status or course of recovery from illness or infection.

Practical Recommendations (Medical Considerations):

- Consult the team doctor on a regular basis
- Review vaccination schedules before overseas travel
- Be vigilant with Drugs in Sport policies
- Refer allergy sufferers for medical review
- Beware of systemic signs of illness (fever, elevated pulse)

Concluding Comment

All team members including athletes, coaches and team staff should be educated on the ways of managing training, health and lifestyle to maximize training and competition performance. The 5-point illness prevention plan provides a framework for minimizing the risk of illness in athletes. The athlete and coach should jointly monitor progress and manage training and recovery before fatigue, illness or injury interfere with performance.

References

1. Foster, C. Monitoring training in athletes with reference to overtraining syndrome. *Med. Sci. Sports Exerc.* 30: 1164-1168, 1998.
2. Fricker, P. A., W. A. McDonald, M. Gleeson, A. Flanagan, D. B. Pyne and R. L. Clancy: Do elite swimmers experience more upper respiratory illness than nonathletes. *J. Clin. Ex. Physiol.* 2(3): 155-158, 2000.
3. Mackinnon, L. T. Immunity in athletes. *Int. J. Sports Med.* 18: S62-S68, 1997.
4. McDonald, W. A. (1997). Upper respiratory tract infections, In Fields KB, Fricker PA (eds): *Medical Problems in Athletes*, Malden, p 6-10, Blackwell Science.
5. Peters-Futre, E. M. Vitamin C, neutrophil function and upper respiratory tract infection risk in distance runners: the missing link. *Exer. Immunol. Rev.* 3: 32-52, 1997.
6. Pyne, D. B. and M. Gleeson. Effects of intensive exercise training on immunity in athletes. *Int. J. Sports Med.* 19: S183-S194, 1998.
7. Pyne, D. B., M. Gleeson, W. A. McDonald, R. L. Clancy, C. Perry and P. A. Fricker. Training strategies to maintain immunocompetence in athletes. *Int. J. Sports Med.* 20: S51-S60, 2000.
8. Pyne, D. B., A. B. Gray and W. A. McDonald. Exercise, training and immunity, In Bloomfield J, Fricker P, Fitch K (eds): *Textbook of Science and Medicine in Sport*, Melbourne, 1995, p 602-615, Blackwell Science.
9. Shephard, R. J. and P. N. Shek. Immunological hazards from nutritional imbalance in athletes. *Exer. Immunol. Rev.* 4: 22-48, 1998.
10. Smith, J. A., M. S. Baker, A. B. Gray, D. B. Pyne, R. D. Telford and M. J. Weidemann. Submaximal exercise triggers both priming and activation of neutrophils. *Am. J. Physiol.* 270: R838-R845, 1996.
11. Steinacker, J. M., W. Lormes, M. Lehmann and D. Alternburg. Training of rowers before world championships. *Med. Sci. Sports Exerc.* 30: 1158-1163, 1998.