

Conversely, chronic inflammation is longer term, and in some instances unending. This form of inflammatory response occurs in situations of persistent infection such as that occurs in diseases such as cancer, TB, and rheumatoid arthritis. Chronic inflammation is associated with increased acute-phase proteins which can increase the risk of other diseases such as heart disease. Chronic inflammation can exist at different severity levels. High grade chronic inflammation occurs in patients suffering from rheumatoid arthritis, whereas low grade chronic inflammation is more common in people with obesity. Low grade chronic inflammation is thought to increase the risk of Alzheimer's, diabetes and heart disease.

5. Outline the effects of moderate exercise training on the immune system and risk of infection.

Exercise can have both a positive and negative effect on the risk of infection depending on the duration and the intensity of the activity. Moderate aerobic exercise protects against infection. With research to suggest that those who engage in regular bouts of moderate aerobic exercise (i.e. 20-40 minutes of exercise at 40-60% VO₂ max per day) catch fewer colds than sedentary individuals.

There are a number of explanations for why moderate exercise is protective;

1. Exercise bouts transiently increase blood levels of natural killer T cells, neutrophils and antibodies → positively boosting the innate and adaptive immune systems.
2. Improved psychological wellbeing → less stress
3. Improved lifestyle → good nutritional status, more sleep

6. Explain how an acute bout of exercise and prolonged exercise affects immune function and the risk of infection.

Anecdotal reports state that athletes who engage in intense training are more susceptible to infections. This is supported by research with numerous studies supporting the concept that intensive endurance training increases the number of URTI's when compared to URTI incidence in sedentary individuals or those doing moderate exercise. For example, the risk of developing an URTI is 2 to 6 fold greater in those training for a marathon than those who do not exercise.

There are again a number of explanations for why intense, prolonged exercise increases disease risk which all result in a depression of the immune system's ability to defend against invading pathogens;

1. Decreased blood levels of B cells, T cells and natural T killer cells
2. Decreased activity of T cells
3. Decreased nasal neutrophil phagocytosis
4. Increased pro and anti-inflammatory cytokines

The reason for the immune suppression post exercise (which is again transient and usually only lasts between 3-24 hours) is likely the result of increased concentrations of stress hormones such as cortisol which have immunosuppressive effects.

In addition to a depressed immune system, there are also other factors that can increase infection risk in those engaging in intense training, these include;

1. Reduced sleep
2. Mental stress
3. Increased exposure to pathogens due to travelling/ large crowds/ air travel
4. Inadequate diet to support immune health

7. Discuss the impact of exercise in hot, cold and high altitude environments on the immune system and the risk of infection.

Exercise in environmental extremes can increase circulating stress hormones such as cortisol. As stress hormones can depress immune function, it is hypothesized that extreme environments may increase infection risk. However, this is not necessarily true.