

The Paradox of Knowledge: Health Benefits of Being Active

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The relationship between physical inactivity, obesity and chronic diseases has been widely investigated over the last decades. Several research and review papers have been published on the topic [1-4]. Even though this area still requires further research, one thing is clear: chronic exercise exerts a positive effect on our body's immune system by decreasing the prevalence of chronic diseases. These illnesses – cardiovascular diseases, cancers, chronic respiratory diseases and dementia – not only compose over 80% of global deaths from noncommunicable diseases [5,6], but all have the same predictor of risk: a chronic low grade inflammatory state.

According to the World Health Organization statistics 2012 [6] 13% of global deaths can be attributed to raised blood pressure, 6% to raised blood glucose, 6% to physical inactivity and 5% to being overweight/obese. Physical activity can be considered a medicine because it can reverse all of the above [5], not to mention the other health benefits of being fit [7,8]. Nevertheless, obesity and inactivity continues to increase all over the world. Obesity alone is a lesser risk factor compared to physical inactivity; studies have shown that some beneficial effects of physical activity are achieved even without changes in body mass or body composition [4]. The benefits are mainly due to the anti-inflammatory effects of exercise, which have been shown to be responsible for decreasing the prevalence of chronic diseases via, for example:

Reduction of Toll-Like Receptor (TLR) Expression on Monocytes and Macrophages

TLRs are trans-membrane proteins that provide important functions both for the innate and the adaptive immune system [9-11]. Their main role includes recognizing and responding to a variety of Pathogen-Associated Molecular Patterns (PAMPS) via intracellular signaling and the recognition of endogenous signals following tissue damage. Over the last decade, it has been shown that acute and chronic exercise can lead to a down regulation of TLRs expression on monocytes and macrophages cell surfaces and also a shift in macrophage phenotype (from M1-type which produces inflammatory cytokines to M2-type which produces anti-inflammatory cytokines); thus, leading to an increase in the anti-inflammatory milieu [12-14].

Production and Release of Anti-Inflammatory Cytokines

During exercise – Interleukin (IL)-6 is a cytokine that can also be considered a myokine when it is released by the contracting muscles during exercise [15]. Its release depends on the exercise intensity, duration and the amount of muscle mass recruited during the exercise bout. The peak in circulating levels of IL-6 has been reported to occur at the end of exercise or shortly after. This myokine has both a metabolic effect – increasing hepatic glucose production and lipolysis – and an anti-inflammatory effect. In the latter, IL-6 is responsible for the suppression of pro-inflammatory cytokines (i.e. TNF- α) and the increase in circulating levels of anti-inflammatory cytokines, such as IL-10 and IL-1ra [2,15,16]. Thus, when exercising chronically, individuals maintain a more pronounced anti-inflammatory milieu, which protects them against low grade inflammatory processes. Other immunomodulatory factors, such as hormones and heat shock proteins, released during and after an exercise bout also contribute to the body's anti-inflammatory environment post-exercise.

Chronic exercise, leading to a decrease in adipose tissue also contributes to the decrease of the inflammatory state. This happens because adipose tissue can produce pro-inflammatory cytokines (adipokines): TNF, leptin, IL-6, IL-18, amongst other [17]. In addition, an increase in the size of adipocytes stimulates the recruitment, to this tissue, of pro-inflammatory macrophages (M1) [18,19]. Therefore, overweight and obese individuals, with elevated body fat, will possibly present an inflamed adipose tissue that contributes to the overall low grade inflammatory state.

Although we have scientific evidences for the benefits of exercising and being lean, still the World Health Organization [6] has shown that obesity (body mass index ≥ 30 kg/m²) has doubled in almost 30 years (from 1980 - 2008), and this seems to be an on-going process. Is the scientific information only reaching a small part of the population and some governments? Even though, physical inactivity and obesity are a burden to a country's economy [20-23]. What can we, as health professionals, do to help change this pattern and make the population more active and thus healthier? We have evolved to save and accumulate energy, but in the modern world, where calories are ever more abundant, will this be our down fall? This paradox between knowledge and practice has to change.

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