ANNALS OF RESEARCH IN SPORT AND PHYSICAL ACTIVITY

Immune cell profiles distinguish Australian olympic athletes with or without upper respiratory symptoms

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IMMUNE CELL PROFILES DISTINGUISH AUSTRALIAN OLYMPIC ATHLETES WITH OR WITHOUT UPPER RESPIRATORY SYMPTOMS

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INTRODUCTION

Preventing upper respiratory symptoms (URS) during training and competition, is recognized as critical to optimum athletic performance. While exercise has both acute and chronic effects on the immune system, few parameters are associated with URS prevalence. The rapid growth in high throughput analysis is now allowing a more detailed examination of the immune system. Mass cytometry is a novel high resolution method that allows the simultaneous assessment of >40 cell populations from a single sample with sensitivity to detect rare cell populations below 10^{-4} . We examined differences in immune cell profiles between athletes selected for the Rio 2016 Olympics who experienced URS in the lead up to the games and those with good health.

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METHODS

A cross-sectional study compared peripheral immune cell frequency in 75 elite Australian athletes. URS prone athletes were classified based on responses from a retrospective illness symptoms log for the previous month. Peripheral blood immune cell frequency of T cells subsets, B cell subsets, monocytes, natural killer and dendritic cells was assessed via mass

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cytometry (Helios, Fluidigm). Mass cytometry data was normalised and immune cell profiles were compared between groups. Immune cell gene expression was assessed using the Immune Profiling Panel (NanoString Technologies).

RESULTS

The illness symptoms log determined two groups; URS prone athletes ($n=39$; age: 25 ± 4.2 ; mean $\pm$ SD) and healthy athletes ($n=36$, age: 24.2 ± 3.6 ; mean $\pm$ SD). URS prone athletes had a significantly higher frequency immune cells ($p=0.014$), including T cells ($p=0.022$), CD4+ T cells ($p=0.012$) CD4+ memory T cells ($p=0.013$) and CD4+ naive T cells ($p=0.036$), CD8+ memory T cells ($p=0.22$), B cells ($p=0.041$) and plasma cells ($p=0.037$). Immune gene expression signatures further differentiated immune cell frequencies between groups.

DISCUSSION

Regular intense exercise can exert a chronic effect on the immune system that may influence URS prevalence in some athletes. The observed differences in immune cell profiles yield insights into immune regulation. These data support the value of new technologies including mass cytometry and digital gene expression analysis in profiling immune phenotypes at greater resolution than has been possible previously. The utility of these approaches in illness prediction needs to be further evaluated in prospective studies.