

## **Macrophage migratory inhibitory factor (MIF) profiles are associated with indicators of physical and psychosocial stress in professional rugby league players**

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### ABSTRACT

**Introduction:** MIF is an inflammatory cytokine which has a remarkable array of functions, including immune, metabolic and angiogenic effects. There is substantial evidence linking MIF to hypothalamic-pituitary-adrenal (HPA) axis functions, with MIF hypothesised to counter-regulate the anti-inflammatory actions of glucocorticoids (GC) at least partially by reducing the GC-sensitivity of immune cells. There is also evidence that changes in MIF are part of the well-established bi-directional links between psychological stress factors and dysregulation of inflammatory systems and HPA function. In professional athletes there is a unique combination of both physical and psychosocial stress which has been hypothesised to include immune dysfunction. The current study examined the association between indicators of physical and psychosocial stress on changes in MIF across a competitive season in professional rugby league players.

**Methods:** Players (n=29) from a Sydney National Rugby League club participated in the study from February - August 2012. MIF was analysed in resting blood samples taken at least 24 hrs after the most recent exercise bout on six occasions approximately 1 month apart, with the first (baseline) sample taken prior to season start. From the same time points, data from standardised wellness questions was extracted from player diaries.

**Results:** A significant effect of Time was observed in MIF levels ( $p < .001$ ), with a nadir at time 4 (May), and no difference between baseline and final samples (Feb-Aug). To determine salient associations, change in MIF from baseline to time 4 was calculated, and found to be negatively associated with the change over the same time period in stress/mood, sleep and muscle soreness, such that better mood, sleep quality and less muscle soreness were associated with lower levels of MIF.

**Conclusion:** The current findings provide evidence that in a highly physically fit cohort, inflammatory markers are associated with indicators of both physical and psychosocial stress. MIF appears to be a reactive marker associated with stress and deserves further attention. Further, it may be important for athlete preparation to determine sleep and psychosocial stress influences on the homeostasis of inflammatory stress through GC function.