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Influence of vitamin D status on respiratory infection incidence and immune function during 4 months of winter training in endurance sport athletes

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ABSTRACT

The incidence of respiratory infections is generally higher in athletes and low vitamin D status could be a contributing factor as vitamin D insufficiency has been reported to be common in athletes. The purpose of this study was to examine the influence of vitamin D status on mucosal and systemic immunity and the incidence, severity and duration of upper respiratory tract illness (URTI) episodes in endurance athletes during a 16-week winter training period. Blood was collected from 225 healthy subjects (157 males, 68 females) who were engaged in regular endurance sports training at the start of the study and plasma was analysed for total 25-hydroxy vitamin D (25(OH)D) and cathelicidin concentration. Blood was also collected at the end of the study and analysed for 25(OH)D and *in vitro* antigen-stimulated cytokine production. Timed collections of unstimulated saliva were obtained at monthly intervals during the study period and analysed for antimicrobial proteins. Weekly training and daily illness logs were kept. At the start and end of the study 38% and 55%, respectively, of the athlete cohort had inadequate or deficient vitamin D status. There was a significantly higher proportion of subjects who presented with symptoms of URTI in the vitamin D deficient status group (initial plasma 25(OH)D <30 nmol/L) during the study period than in the optimal vitamin D group (>120 nmol/L) (optimal 0.27, deficient 0.67, $P = 0.039$). Both the total number of URTI symptom days and the symptom-severity score in the vitamin D deficient group were significantly higher than in the other groups [median and interquartile range (IQR) URTI symptom days: optimal 1 (0-6), adequate 4 (0-8), inadequate 4 (1-8), deficient 9 (3-17), $P = 0.040$; median (IQR) symptom-severity score: optimal 43 (38-52), adequate 47 (40-69), inadequate 62 (46-74), deficient 102 (67-199), $P = 0.013$]. The plasma cathelicidin concentration positively correlated with the plasma 25(OH)D concentration ($r = 0.234$, $P = 0.036$). The saliva secretory immunoglobulin A (SIgA) secretion rate ($\mu\text{g}/\text{min}$) in the optimal vitamin D status group was significantly higher than in the other groups ($P = 0.018$). Deficient vitamin D status was associated with significantly lower pro-inflammatory cytokine production by monocytes (TNF- α , IL-1 β and IL-6) and lymphocytes (IFN- γ). Vitamin D status appears to have an important influence on systemic and mucosal immune function and URTI risk in endurance athletes.