

URINE PROTEOMICS AS A NON-INVASIVE APPROACH TO MONITOR EXERTIONAL RHABDOMYOLYSIS DURING MILITARY TRAINING

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ABSTRACT

Exertional rhabdomyolysis (ERM), a condition often associated with strenuous exercise, a common practice in the military activities, can be defined as the process of injury and rupture of muscle cell membranes, with leakage of its components into the bloodstream. Creatine kinase (CK) has been used for ERM diagnosis, albeit several studies reported the discrepancy between CK levels and clinical signs or symptoms. In this study, we analyzed the biochemical profile of the blood, and the urinary proteome of ten marine soldiers in a special training course. The samples were collected in two periods, M1 and M2, which correspond to the lowest and highest CK levels during training, respectively. Quantitative urinary proteome profile of M1 and M2 showed changes in proteins involved in immune system and cell adhesion-related pathways after strenuous physical exercise. Changes in the abundance of several proteins was observed in individuals carrying genetic polymorphisms related to greater risk for muscle damage. A panel of proteins (CTSH, PIK3IP1, DEFB1, ITGB1, BCAN, and TNFRSF10C) presented high correlation with classical blood biochemical markers of ERM and AGT MET235Thr and ACE I/D polymorphisms. These proteins represent potential urine markers of muscle damage due to intense physical conditions such as military training activities.

SIGNIFICANCE: This study analyzed the blood and urine of a cohort of marine soldiers enrolled in a special training program including missions with low and high exposure to strenuous exercise. The biochemical blood profile, polymorphisms mapping and mass spectrometry-based analyses of the urinary proteome was evaluated in such a controlled samples. A total of 226 urinary proteins associated to immune system, cell adhesion and redox homeostasis were significantly changes during ERM shedding lights on the disease pathogenesis. In particular, a panel of six proteins were associated to classical ERM markers and could be used as early non invasive biomarkers.

Keywords: Exertional rhabdomyolysis; Military training; Strenuous exercise; Urine proteome.

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