Exploring Genetic, Immune, and Physiological Resilience Trends in Active-Duty Warfighters

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Background: Optimizing performance and enhancing resilience among military personnel who are frequently exposed to traumatic situations is challenging. Outstanding physical fitness, the foundation for military, could be affected by immunological, physiological and genetic factors. There are no specific resilience measures identifying those who are most likely to successfully complete elite fitness training programs. Objective: To determine immune, physiological and genetic factors identifying resilience among elite military trainees (EMT). Methods: Prospective study of EMT enrolled on a special warfare training exercise program. Variables included immune biomarkers (CD4,CD8 determining immune-health-grade-IHG), PR biomarkers (proteins, Vitamin-D) and specific gene SNPs that positively correlate with graduation data. Results: N=519, age 18-45, 100% male. When comparing graduates vs. not, IGH-IIA (excellent) was predominant among graduates (55%, p=0.012) and acute illness during training decreased chances of graduation (p=0.011). As per physiological resilience (PR), non-graduates had higher Vitamin-D levels (p=0.06). Genetically, only the HTR2A gene showed significant association between allele type and graduation status (p=0.008) suggesting that this gene may influence traits such as risk, mood, or stress response. Likewise, HTR2A is linked to stronger physical fitness but was associated with lower cognitive performance as per IQ scores (p=0.008). Conclusion: IR and PR biomarkers may accurately predict EMT's performance. HTR2A gene is linked to stronger physical fitness but may be associated with lower cognitive performance. Such predictions may help to prevent associated injuries, address treatable conditions and identify resilient trends among our heroes.

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