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Homeland Defense & Security
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Overview

A member of the United States Pacific Command requested information concerning the isolation of various biomarkers in human DNA in order to assess various physiological and psychological characteristics relevant to military recruitment.

Findings

The use of genetic biomarkers in military recruitment is not a standard practice. However, HDIAC identified several studies linking specific genetic biomarkers to human physiological and psychological attributes relevant to the warfighter.

Influence of Genetic Polymorphisms on Physical Performance Tests

In a 2017 study, researchers from the University of Sao Paulo, Brazil tested male athletes to ascertain the correlation of various genetic polymorphisms to enhanced performance in jumping, sprinting, and endurance. They found that athletes who carried ACTN3 and ACE genotypes exhibited heightened performance during spring and jump tests; athletes with ID/II genotypes exhibited higher endurance; and athletes with the AMPD1 genotype demonstrated heightened ability in a 10-meter sprint test [1]. These observed polymorphisms could be used to enhance DoD recruiting, as they can select for recruits with a proclivity for greater strength, speed, and endurance.

Genetic Predictors of Emotional Dysregulation

Researchers at the University of Texas tested FK506 binding protein 5 (FKBP5) polymorphisms (which alter a human's response to threatening stimuli) to determine if they are a reliable predictor of aggressive behavior in adults [2]. Though researchers note their small sample size (N=47), their experiment linked FKBP5 to aggression, supporting growing literature connecting this same binding protein to emotional dysregulation (psychopathy, deficient inhibitory control, and aggressive behavior) [2].

The link between FKBP5 and aggression could be an ideal asset for warfighter recruitment procedures, as it could allow for the identification of individuals with adverse behavioral traits.

Genetic Polymorphisms for Sustained Operations in High Altitude

Researchers from the University of Adelaide, Australia identified two candidate genes for hypoxia defense—the SFTPD gene, which “encodes a surfactant pulmonary-associated protein involved in normal respiration and innate host defense [3],” and the FAM213A gene, which functions as an “antioxidant to lower oxidative stress and may help to maintain bone mass [3].”

Researchers from the Utah School of Medicine found that the EGLN1 gene (which encodes prolyl hydroxylase 2 (PHD2)) mitigates erythropoiesis, a primary physiological response to hypoxia [4] in observed Tibetan populations.

These findings indicate that U.S. military recruits with FTPD, FAM213A, or EGLN1 genes may be ideally suited for extended operations at high altitudes. Screening for these genetic biomarkers would allow for role-specific recruitment across the DoD.

Conclusion

HDIAC identified several studies linking biomarkers to physiological and psychological traits. Further identification of biomarkers relevant to warfighter performance could enhance warfighter recruitment. HDIAC can investigate the optimization of biomarker identification as part of an HDIAC Core Analysis Task, which could provide a comprehensive analysis of state-of-the-art genomic mapping as it relates to the physiological and psychological aspects of performance, as well as best practices for implementing such approaches into standard warfighter recruitment practices.

We request your feedback on this Inquiry: <https://www.hdiac.org/new-inquiry-assessment-form/>

References

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