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Some Evidence of Youthful Aging: Elevated Cortisol and the Association With DNA Damage

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Some Evidence of Youthful Aging: Elevated Cortisol and the Association with DNA Damage

Jason M. Fly

Professor: M. Catherine DeSoto

Introduction

Chronic psychological stress as measured by the elevation of the stress hormone cortisol is thought to play a crucial role in the biological mechanisms involved in disease and accelerated aging. In 2011, a critical connection was reported between cortisol and the oxidative damage to DNA in a study of elderly participants (ages 63-83) via 24-hour urinary samples (Joergensen, et. al., 2011). This connection, if verified, has implications for how stress may accelerate aging and the onset of disease. The possible relationship between psychological stress and the cellular damage that underlies aging and disease is explored here, replicating the prior study with a sample of 49 young adults (ages 18-26) via direct salivary assay. A significant association was also found, suggesting a link between elevated cortisol and DNA damage at earlier ages.

Background

- Stress response system consists of the hypothalamus region of the brain, the pituitary gland, and the adrenal cortex (HPA axis)
- When a stressful event occurs, this axis is stimulated to produce stress hormones, mainly cortisol, to aid in physiological and neurological functioning during and after the stressful event
- Cortisol levels are thought to be linked to risk for stress-related psychiatric disorders, and play a role in direct cellular damage (Flint, Baum, Chambers, & Jenkins, 2007)

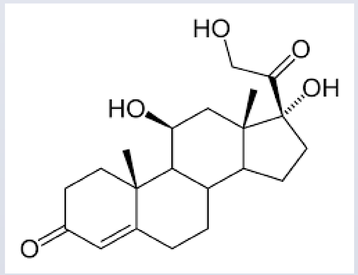
- Chronic stress may lead to an overload of the inherent anti-oxidant function of cells
- Oxidative stress is linked to numerous diseases, including cancer, diabetes, and heart disease
- DNA damage from oxidative stress is linked to accelerated aging and the onset of these diseases (Joergensen, et. al., 2015)

Methods

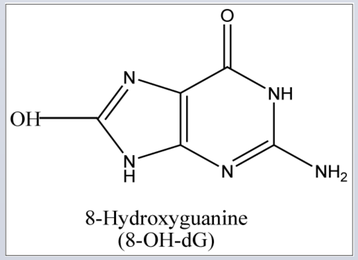
Participants: Undergraduate students (n = 49) from a medium sized Mid-western university, ages 18-26 years. All persons received partial course credit for their participation. IRB approval was obtained.

Procedure: Participants provided three samples over an approximately 90-minute time span via salivary assay. Cortisol levels were averaged from these samples. Due to deviation from normal distribution, a log-transformation was used. DNA damage biomarkers were measured from the second sample.

Salivary Assays: All samples were assayed in duplicate in the Psychoneuroendocrinology Lab (PNEL) at the University of Northern Iowa using enzyme immunoassays. Research shows a strong correlation between salivary and urine levels of both cortisol and DNA damage biomarkers. Salivary assays represent a minimally invasive and accurate technique for hormone/biomarker measurement.



Cortisol

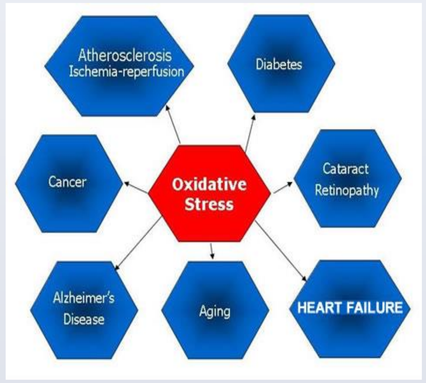


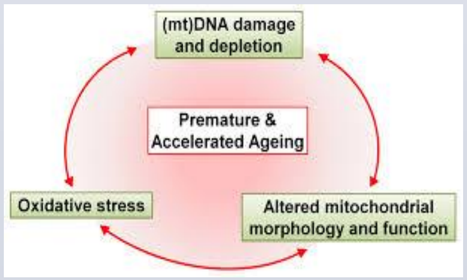
DNA damage biomarker

Results

A significant correlation was found between cortisol and DNA damage biomarkers, such that higher levels of cortisol were associated with greater amounts of DNA damage.

$r(47) = .35, p < .05$





Epigenetic Changes and Aging

Conclusions

- This is believed to be the first research to link elevated cortisol and DNA damage with a younger age group
- At-risk individuals for the epigenetic changes associated with aging and disease can be screened if the link between cortisol and DNA damage can be confirmed. If this is evident at earlier ages, lifestyle changes may have more of an effect on health
- Because of known sex differences in stress response in humans (Desoto & Salinas, 2015) this link may have a role in explaining the differences in life expectancy between males and females and/or the development of certain illnesses well before onset (Wang, et. al. 2007)
- Further research is warranted in mitigating the effects of harmful chronic stress, including current stress management techniques or future medications to help regulate the stress response system

References

DeSoto, M. C., & Salinas, M. (2015). Neuroticism and cortisol: The importance of checking for sex differences. *Psychoneuroendocrinology*, *62*174-179. doi:10.1016/j.psyneuen.2015.07.608

Flint, M. S., Baum, A., Chambers, W. H., & Jenkins, F. J. (2007). Induction of DNA damage, alteration of DNA repair and transcriptional activation by stress hormones. *Psychoneuroendocrinology*, *32*(5), 470-479. doi:10.1016/j.psyneuen.2007.02.013

Joergensen, A., Broedbaek, K., Weimann, A., Semba, R. D., Ferrucci, L., Joergensen, M. B., & Poulsen, H. E. (2011). Association between urinary excretion of cortisol and markers of oxidatively damaged DNA and RNA in humans. PLoS ONE, 6(6), e20795. http://doi.org/10.1371/journal.pone.0020795

Wang, J., Korczykowski, M., Rao, H., Fan, Y., Pluta, J., Gur, R. C., & ... Detre, J. A. (2007). Gender difference in neural response to psychological stress. *Social Cognitive And Affective Neuroscience*, *2*(3), 227-239. doi:10.1093/scan/nsm018

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