YALE JOURNAL OF BIOLOGY AND MEDICINE 95 (2022), pp.1-2.

INTRODUCTION

YALE JOURNAL OF BIOLOGY AND MEDICINE
YJBM
CELEBRATING 90 YEARS 1928–2018

The Science of Stress

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The term stress was widely popularized in its biological connotation in 1936 by Hans Selye, who defined it as "the non-specific response of the body to any demand for change" [1]. Stress was originally understood to be a collection of peripheral symptoms that accompany a variety of chronic illnesses affecting different parts of the body. However, since its conception, the term has taken on a broader meaning and encompasses the body's response to any mental, emotional, or physical disturbance. It is now well accepted that stress is both a symptom and a major risk factor for anxiety, migraines, substance abuse, obesity, and heart disease [2]. In 2007, the American Psychological Association launched a Stress in America™ survey to document national levels of stress, assess mental and physical impacts, and correlate stress intensity to external factors, including the political climate and the state of the economy. The outcomes of subsequent surveys have established stress as a major contributor to the national mental health crisis that disproportionately impacts different groups across the country [3].

In a perspectives piece on the neuroscience of stress, Simisola Johnson discusses the evolution of the stress response and the role of the nervous system in eliciting neuroendocrine and behavioral responses that promote survival. However, as opposed to acute stress that can have beneficial effects, chronic stress can lead to severe impairments in circuits that regulate neuroendocrine signaling. For example, in addition to the direct biological consequences of SARS-CoV2 infection on the brain, chronic stress associated with the COVID-19 pandemic impacts similar neuronal signaling pathways in the CNS and PNS that hamper normal physiological function. In addition to impacting the brain, chronic stress also alters metabolism at the cellular level. Using a house sparrow model system, Beattie et al. combined chronic psychological stress and daily food restriction to test whether chronic stress decreases the animals' ability to cope with acute stressors. The study measures a variety of parameters including levels of metabolites, total activity, and markers of the neuroendocrine stress response to assess overall stress responses. Both of these papers highlight the importance of studying the compounding effects of stress that are increasingly prevalent in a post-pandemic era.

Stress experienced by mothers during pregnancy can have deleterious effects on both the infant's neuropsychiatric and behavioral health. Various studies have found associations between maternal prenatal distress and child developmental outcomes. Children exposed to prenatal stress are at increased risk for displaying disruptive behavioral problems, possessing lower motor function, and even developing neuropsychiatric illnesses at later stages. However, in a self-reported study examining the initiation and course of breastfeeding and room-sharing, Simons et al. found that there was no link between the quality of maternal caregiving and maternal prenatal distress. Although they found that levels of prenatal evening cortisol (a physiological marker of stress) at the end of pregnancy are positively correlated with their study parameters, a lack of homology with other stress markers urges future studies to examine alternative mechanisms. Davis et al. examine how increased reactive oxygen species in the

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Abbreviations: PTSD, post-traumatic stress disorder

Keywords: stress

embryonic brain generated due to prenatal stress affect the morphology and activity of neuronal cells during development and in mature brains. The authors found that treatment with antioxidant agents reversed the observed effects on neuronal cells but did not prevent behavioral impacts. The results of these studies emphasize a need to study intergenerational transmission of stress and its long-term effects.

The World Health Organization estimates that approximately 3.6% of the world's population has experienced post-traumatic stress disorder (PTSD) [4]. Risk factors for developing PTSD include exposure to a traumatic life event, lack of social support, and a genetic predisposition. Liu et al. examined the relationship between personality type, social support, and prevalence of PTSD among Shidu Parents in China. They determined that those with social support and extroverted personalities were least likely to develop PTSD after losing a child. Nagy Youssef provides a perspectives piece on studying the transgenerational epigenetic inheritance of trauma. Conducting more studies on the inheritance of DNA methylation across generations can provide new insights into the impact of trauma and resilience across communities.

In this issue, the biological and social dynamics of stress are examined. Original research, reviews, and perspectives are presented on how stress affects development, metabolism, and various cellular and organ level processes of physiology. We hope this issue contributes to an emerging field and highlights the importance of an interdisciplinary approach to understanding the wide implications of stress.

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