The Psychoneurobiology Of Aging: The Wear And Tear Of Stress

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Age may be more related to reactions to stress and the absence of disease rather than to a person's chronological age, say leading researchers in the fields of neurobiology and psychoneuroendocrinology. And healthy aging is a good bet if stress can be moderated along with adopting an active, healthy lifestyle. This finding was presented at the 114th Annual Convention of the American Psychological Association (APA).

From a review of studies on how stress hormones affect the brain, psychologist Bruce McEwen, PhD, of the Laboratory of Neuroendocrinology at The Rockefeller University, finds more evidence that biological and behavioral stress responses can be adaptive in the aftermath of stress, but can also cause damage when they are over- or under-produced and go on for a long time. "**Acute stress** seems to enhance immune function and improves memory but ***chronic stress*** has the opposite effect and can lead to disorders like depression, diabetes and cognitive impairment in aging," said Dr. McEwen.

Cumulative stress effects, said McEwen, are showing up in people who are under constant stress, like those in caregiver situations or those who suffer from obesity and/or diabetes. These people are more likely to have decreased telomerase activity. Telomeres are enzymes that regulate how many times an individual cell can divide. Telomeric sequences shorten each time the DNA replicates, which is a process that happens prior to cells dividing. When at least some of the telomeres reach a critically short length, the cell stops dividing and ages (senesces) which may cause or contribute to some age-related diseases.

There is also more evidence that the brain is more involved in a person's stress response than previously thought, said McEwen. The brain interprets what is threatening, i.e., what is stressful (whether it be public speaking or perceptions of social status) and then regulates the behavioral and physiological responses through the autonomic, immune and neuroendocrine systems. If the brain is under too much stress for too long, said McEwen, "we can see structural and functional remodeling changes that affect how it functions."

"These brain changes, which appear to be reversible, are able to change by not only pharmaceutical agents but also by lifestyle changes like exercise, diet and social support," said McEwen.

In another review of the current literature on the interactions of the brain, stress

and the endocrine system, more evidence shows how cumulative stress and the occurrence of disease may define age more than chronological aging. According to the review, certain diseases start to occur when the anabolic hormone levels start to decrease - when the tissue builders like growth hormones, testosterone, estrogen and thyroid functions start to drop off and when the catabolic hormones start to increase. These hormones, the tissue fuelers, can become too active and actually break the body down. **Cortisol** - a stress hormone - can become more reactive when responding to acute challenges as one gets older.

This imbalance between the anabolic and catabolic hormones is likely to be responsible for many of the psychiatric and medical diseases associated with aging, said researcher Elissa S. Epel, PhD, of the University of California, San Francisco. According to a model of neuroendocrine aging, "subtle yet chronic changes in hormonal patterns can exert pathological effects on health over time."

It is also known, said Epel, that ***chronically elevated cortisol*** reduces lean mass, bone density and shifts fat distributions that can precede the onset of many age-related diseases like osteoporosis, metabolic syndrome, Alzheimer's disease and major depression. But, she added, certain behavioral factors, like lifestyle and exercise can modify some of these hormonal effects that seem to accelerate aging.

Compared to healthy older adults under 100 years of age, healthy centenarians, said Epel, tend to show slower insulin and glucose rates when fasting, have higher or similar thyroid hormones and have similar cortisol and growth hormone levels. Even though older adults are exposed to more chronic stressors (more health problems, fewer social connections), they do not necessarily experience greater daily stress. The authors believe that the healthy centenarians are using coping techniques such as finding meaning in activities and strengthening meaningful social ties to help moderate chronic stress.

Centenarians also report using three coping strategies to deal with their health problems: acceptance, not worrying and taking things one day at a time. Those older adults who do not employ these types of strategies, said Epel, may become more vulnerable to stress over time.

Many of the neuroendocrine changes that occur with aging are not inevitable, said Epel, and "this is demonstrated by healthy centenarians. **Certain age-related changes can be modified with physical activity, sufficient sleep and good coping techniques. It is when chronic stress, inactivity and added body weight take hold that the neuroendocrine system becomes off balance.** This imbalance between the anabolic and catabolic hormones now appears to be the most common profile of aging and may be a valuable marker

for biological aging."

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Presentation: "Neurobiology of Stress: Implications for Behavioral Medicine," Bruce McEwen, PhD, Laboratory of Neuroendocrinology, The Rockerfeller University, Session 2115 - Invited Address: Annual Neal Miller Lecture, August 11, Morial Convention Center, .

Presentation: "Role of Biostress Markers in Optimal Aging," Elissa S. Epel, PhD, University of California, San Francisco, Session 3065 - Invited Address, August 12, Morial Convention Center.

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